harmonic®

2019 Annual Report

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

Form 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2019

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

Commission File No. 000-25826

HARMONIC INC.
(Exact name of registrant as specified in its charter)

Delaware	**77-0201147**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**

4300 North First Street
San Jose, CA 95134
(408) 542-2500
(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Securities registered pursuant to section 12(b) of the Act:

Title of each class	Trading Symbol	Name of each exchange on which registered
Common Stock, par value $0.001 per share	HLIT	The NASDAQ Global Select Market

Securities registered pursuant to Section 12(g) of the Act:
None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. **Yes** ☐ **No** ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Exchange Act. **Yes** ☐ **No** ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. **Yes** ☒ **No** ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). **Yes** ☒ **No** ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer", "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☐	**Accelerated filer**	☒
Non-accelerated filer	☐	**Smaller reporting company**	☐
Emerging growth company	☐		

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). **Yes** ☐ **No** ☒

Based on the reported closing sale price of the Common Stock on The NASDAQ Global Select Market on June 28, 2019, the aggregate market value of the voting Common Stock held by non-affiliates of the registrant was approximately $160,833,000. Shares of Common Stock held by each executive officer and director and by each person who owns 5% or more of the outstanding Common Stock have been excluded in that such persons may be deemed to be affiliates. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

The number of shares outstanding of the Registrant's Common Stock, $0.001 par value, was 95,891,967 on February 25, 2020.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the Proxy Statement for the Registrant's 2020 Annual Meeting of Stockholders (which will be filed with the Securities and Exchange Commission within 120 days of the end of the fiscal year ended December 31, 2019) are incorporated by reference in Part III of this Annual Report on Form 10-K.

HARMONIC INC.

FORM 10-K

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Forward Looking Statements

Some of the statements contained in this Annual Report on Form 10-K are forward-looking statements that involve risk and uncertainties. The statements contained in this Annual Report on Form 10-K that are not purely historical are forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended (the "Securities Act"), and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), including, without limitation, statements regarding our expectations, beliefs, intentions or strategies regarding the future. In some cases, you can identify forward-looking statements by terminology such as, "may," "will," "should," "expects," "plans," "anticipates," "believes," "intends," "estimates," "predicts," "potential," or "continue" or the negative of these terms or other comparable terminology. These forward-looking statements include, but are not limited to, statements regarding:

- developing trends and demands in the markets we address, particularly streaming and over-the-top services and emerging markets;
- economic conditions, particularly in certain geographies, and in financial markets;
- new and future products and services of ours or of those in the markets we address;
- spending of our customers;
- our strategic direction, future business plans and growth strategy;
- industry and customer consolidation;
- expected demand for and benefits of our products and services;
- concentration of revenue sources;
- expectations regarding our CableOS solutions;
- expectations regarding the impact of the software license agreement with Comcast on our business;
- potential future acquisitions and dispositions;
- anticipated results of potential or actual litigation;
- our competitive environment;
- the impact of our restructuring plans;
- the impact of governmental regulations, including with respect to tariffs and economic sanctions;
- anticipated revenue and expenses, including the sources of such revenue and expenses;
- expected impacts of changes in accounting rules;
- expectations regarding the usability of our inventory and the risk that inventory will exceed forecasted demand;
- expectations and estimates related to goodwill and intangible assets and their associated carrying value; and
- use of cash, cash needs and ability to raise capital, including repaying our convertible notes.

These statements are subject to known and unknown risks, uncertainties and other factors, which may cause our actual results to differ materially from those implied by the forward-looking statements. Important factors that may cause actual results to differ from expectations include those discussed in "Risk Factors" beginning on page 14 in this Annual Report on Form 10-K. All forward-looking statements included in this Annual Report on Form 10-K are based on information available to us on the date thereof, and we assume no obligation to update any such forward-looking statements. The terms "Harmonic," "Company," "we," "us," "its," and "our", as used in this Annual Report on Form 10-K, refer to Harmonic Inc. and its subsidiaries and its predecessors as a combined entity, except where the context requires otherwise.

PART I

Item 1. ***BUSINESS***

We are a leading global provider of (i) versatile and high performance video delivery software, products, system solutions and services that enable our customers to efficiently create, prepare, store, playout and deliver a full range of high-quality broadcast and "over-the-top" (OTT) video services to consumer devices, including televisions, personal computers, laptops, tablets and smart phones and (ii) cable access solutions that enable cable operators to more efficiently and effectively deploy high-speed internet, for data, voice and video services to consumers.

We operate in two segments, Video and Cable Access. Our Video business provides video processing and production and playout solutions and services worldwide to cable operators and satellite and telecommunications (telco) pay-TV service providers, which we refer to collectively as "service providers," and to broadcast and media companies, including streaming media companies. Our Video business infrastructure solutions are delivered either through shipment of our products, software licenses or as software-as-a-service ("SaaS") subscriptions. Our Cable Access business provides cable access solutions and related services, including our CableOS software-based cable access solution, primarily to cable operators globally.

Across our two business segments, we derived approximately 56% of our revenue from the Americas in 2019. The Europe, Middle East and Africa (EMEA) and Asia Pacific (APAC) regions accounted for 29% and 15% of our 2019 revenue, respectively.

Harmonic was initially incorporated in California in June 1988, and was reincorporated in Delaware in May 1995. Our principal executive offices are currently located at 4300 North First Street, San Jose, California 95134, and commencing on May 1, 2020, our principal executive offices will be located at 2590 Orchard Parkway, San Jose, California 95131. Our telephone number is (408) 542-2500. Our Internet website is http://www.harmonicinc.com. Other than the information expressly set forth in this Annual Report on Form 10-K, the information contained or referred to on our website is not part of this report.

Industry Overview and Market Trends

Video Business

We believe our customers must continue to employ innovative technologies and services to address key trends in the dynamic video industry.

- *Demand for Streaming services.* In our ubiquitous multiscreen video environment, video programming and content needs to be transformed into multiple formats, bit rates and resolutions for display on a broad range of devices using streaming technology.
- *Demand for High Quality Video*. Consumer demand for high quality video anytime, anywhere and on any device requires ever-increasing bandwidth capacity in service providers' networks, as well as technology that maximizes network bandwidth efficiency. With Ultra High Definition (Ultra HD) televisions and "over-the-top" (OTT) services increasingly being rendered in "4K" high resolution and consuming approximately four times the bandwidth of traditional HD channels, we believe next-generation compression technologies, such as High Efficiency Video Compression (HEVC) or advances in H.264/AVC codecs, as well as increasing requirements for HDR encoding, will continue to remain a high priority for distributors of video.
- *Time-Shifted Viewing.* "Time-shifting" technologies include digital video recorders (DVRs), cloud and network DVRs (cDVR and nDVR) that allow a subscriber to store programming on the service provider's servers or in the cloud, and video-on-demand (VOD) services.

In response to these trends and the success of OTT streaming media companies, as well as the growing trend of "cord-cutters" (i.e., consumers who cancel traditional pay-TV subscriptions in favor of streaming services), "cord-shavers" (i.e., consumers who switch to smaller bundles of pay-TV subscriptions) and "cord-nevers" (i.e., consumers who have never had a pay-TV subscription):

- service providers and broadcast and media companies continue to provide more of their own OTT streaming video services, including OTT streaming of live (or "linear") television programming;

- we believe providers of these OTT services will continue to expand monetization opportunities with personalized and dynamic ad insertion, thereby expanding technological and infrastructure requirements;
- service providers are competing to offer higher quality video signals in HD, including evolving initiatives to deliver video in 4K Ultra HD resolution;
- service providers are developing and expanding their content delivery and Internet Protocol (IP) networks, and increasing the capacity and efficiency of their networks with investments in various delivery infrastructure technologies to, among other things, maximize video quality and minimize bandwidth utilization;
- service providers continue to consolidate to achieve greater economies of scale and subscriber concentration, and acquire media companies to expand their content libraries and capabilities to develop original content;
- service providers continue to enhance and differentiate their content offerings, either through in-house development of new content or through acquisitions of existing content brands; and
- service providers have an ongoing need, despite the migration of traffic to OTT, to provide services over their existing broadcast distribution infrastructures.

We believe that the delivery of video over IP will continue to change traditional video viewing habits and distribution methods and alter the traditional advertising and subscription business models of major service providers.

Our Video Markets

Service Providers

- *Cable Operators*. Cable operators continue to focus on various initiatives to improve and differentiate their service offerings from competing service providers, including: bundled digital video, voice and high speed data services; expansion of VOD libraries, live sporting events and on-demand and streaming service offerings; upgraded consumer-facing applications; video delivery over IP to broadband enabled consumer devices; and capacity enhancement of high-speed data services.
- *Satellite Operators*. Satellite operators around the world have established digital television services that serve tens of millions of subscribers, with the ability to provide tens of thousands of linear channels. We expect satellite operators to expand their offerings and launch new streaming services, such as Sling TV and DirecTV Now, to address younger generation viewers and new consumption habits.
- *Telcos and Mobile Operators*. Many telcos and a growing number of mobile operators have established video offerings to successfully compete in the video marketplace, including high-quality HD content, larger VOD libraries, time-shifting television services, bundled voice, data and video packages and, more recently, streaming services. In many cases, telcos are making significant infrastructure investments to expand their video offerings into IP services and gain market share, while certain telcos are also acquiring satellite and/or cable companies to achieve market reach and scale.

Broadcast and Media Companies

- Network broadcasters, programmers and content owners require video contribution and distribution solutions to transmit live programming of news and sports to their studios for subsequent broadcast, and deliver the same programming and content to service providers for distribution to their subscribers. Broadcasters generally produce their own news and sports highlight content, along with hundreds of channels of network programming that is played-to-air under strict reliability requirements using playout servers and software.
- With broadcast and media companies continuing to expand their offerings to support a wide range of live and linear content and making content available in higher quality video formats and on-demand, we believe these trends are accelerating demand for functionally collapsed playout systems with integrated media orchestration software, as well as increasing demand for media servers and video-optimized storage solutions equipped to support higher resolution formats. In addition, in order to achieve faster time-to-market and reduce operational costs, we believe content providers are adopting cloud-based technologies and transitioning portions of their operations into public cloud environments, thereby enabling expanded services at a more rapid pace, the distribution of video directly to consumers or to distributors over IP and public networks, and more efficient and scalable global operations.
- In the terrestrial broadcasting market, while broadcasters in various countries that have not yet completed converting from analog to digital transmission continue with change-over efforts, operators in numerous other

countries around the world are adopting the next generation of digital transmission technologies, such as the DVB-T2 standard and ATSC 3.0 standards. The ongoing conversion from analog to digital transmission and the adoption of next-generation transmission standards provides the opportunity to deliver new channels, HD and Ultra HD services, premium content, and interactive services.

Over-the-Top (OTT) Streaming

- According to an annual study on Internet data traffic published by Cisco Systems, IP video traffic accounts for a significant majority of Internet traffic globally, and video traffic will only continue to increase for the foreseeable future. We believe service providers and broadcast and media companies with OTT services and offerings will continue to require high-quality video processing solutions and new technologies in order to process and distribute large amounts of live and VOD content from a wide variety of sources to a broad array of consumer devices, and to optimize adaptive bitrate video streaming quality and bandwidth utilization.
- With the continued proliferation of OTT streaming content and program channels similar to channels currently available from service providers, monetizing this content through the use of national, regionalized and personalized advertising delivered to the varied devices of individual viewers has become a key area of focus for companies with OTT offerings. We believe OTT ad insertion and other related content customization solutions will continue to attract increased investments from OTT companies.

Emerging Markets

- With a growing middle class across emerging markets, we believe the Pay-TV business will continue to grow for the foreseeable future in the Asia Pacific region, South Asia, the Middle East, Africa and Central and South America. We currently derive a meaningful portion of our revenue from countries in emerging markets.
- Many consumers who are entering the middle class are now able to afford a monthly video service to gain access to their favorite programs and movies. We believe some of the leading video service providers serving emerging markets will experience high subscriber growth rates and may become worldwide industry leaders.
- We believe subscribers in these markets will demand increasingly sophisticated video services over time as consumer consumption trends in these markets track to those in more developed markets. A growing number of new regional OTT entrants in emerging markets, where global brands such as Netflix and Amazon’s Prime Video are less dominant, are delivering a variety of OTT services and experiencing rapid growth. As a result, we believe that the infrastructure and technology investments of these service providers and new market entrants are likely to grow significantly for the foreseeable future.
- Media companies addressing emerging markets are aggressively investing in the creation of new content, particularly content that is localized and responsive to consumer demands, with the goal of creating strong brands and a growing, loyal customer base. We believe that this growth in content creation will require these media companies to significantly increase their capabilities in video storage, processing and related technologies.

Video Infrastructure Technology Trends

- *Network Function Virtualization*. We believe the industry will continue to adopt network function virtualization and unified video processing systems, whereby what had been historically discrete hardware video processing functions are integrated into software and run on the latest Intel processors in order to leverage high-performance and scalable appliance-based hardware, and as software-only virtual instances designed to run on private and/or public cloud environments.
- *Function collapse.* By combining historically discrete video chain functions into unified playout, distribution and streaming subsystems, we believe functionally collapsed video infrastructures with integrated control systems will enable content and service providers to run their operations more efficiently and, as a result, deliver broader and higher-quality services to their end-customers.
- *Outsourcing of Video Infrastructure Functionality*. We believe there is industry momentum for shifting virtualized and unified video processing infrastructure from broadcast center or production facilities to third party SaaS offerings hosted on public cloud infrastructure. We believe this transition enables media companies and new OTT entrants to more rapidly adapt to market dynamics, utilize A/B testing methodologies to optimize service offerings and expand within and beyond core markets.

Cable Access Business

Industry Challenges

Cable operators continue to face challenges from the rapid growth of demand for broadband bandwidth in their networks, driven primarily by:

- more users with more connected devices and applications;
- bundled digital video, voice and high-speed data services; and
- bandwidth-intensive VOD and OTT streaming video services, and interactive cloud applications.

In addition, the operation of network infrastructure is space, power and personnel intensive. Hardware-centric networks can also be expensive to update or replace. To remain competitive, especially in the face of heightened competition from non-cable service providers such as telcos to deliver gigabit data rates, cable operators need to significantly upgrade existing equipment and network technologies.

Technology Trends

- *DOCSIS 3.1*. We believe the cable industry will continue to deploy the DOCSIS 3.1 standard, which enables high bandwidth data transfer over existing broadband infrastructure.
- *Virtualization*. We believe cable operators are moving toward more software-driven architectures. Virtualized software solutions that are decoupled from underlying hardware and run on commercial off-the-shelf (COTS) servers and/or cloud-native architectures allow for significantly increased efficiencies, upgradability, configuration flexibility, service agility and scalability not feasible with hardware-centric approaches. We believe a software-based cable access solution can significantly reduce cable operator facility costs, especially costs related to physical space and power consumption, and increase operational efficiency, and that the deployment of these systems will be an important step in cable operators’ transition to all-IP networks.
- *Distributed Access Architecture*. In addition to centralized cable access solutions, we believe there is growing interest in distributed Remote PHY solutions, particularly in competitive gigabit service markets where cable operators are competing with fiber-to-the-home (FTTH) services and are extending fiber networks deeper into their access networks. A Remote PHY architecture coupled with a software-based cable access solution running on COTS servers at a headend, and the distribution of Remote PHY nodes closer to end users, alleviates the power and space requirements of centralized systems at headend sites due to the fact that the RF processing is distributed into the field outside of the headend. We believe this distributed architecture will enable service providers to efficiently scale to support data and IP video growth.

Our Products and Solutions

Video Processing and Delivery Solutions

We offer two categories of solutions - a broad range of software-based video appliances and software-as-a-service platforms - to deliver broadcast and streaming services and capabilities in the media market.

Appliances. Our video processing appliances, which include network management and application software and hardware products, provide our customers with the ability to acquire a variety of signals from different sources and in different protocols in order to deliver a variety of real-time and stored content to their subscribers for viewing on a broad range of devices.

Broadcast and OTT encoders. Our high-performance encoders compress video, audio and data channels to low bit rates while maintaining high video quality. Our latest software-based Electra encoders can deliver video in multiple formats, including standard, HD and Ultra HD, and in any video compression standard, including MPEG-2, MPEG-4 AVC and HEVC. This capability allows the encoders to converge workflows targeted for all forms of video delivery, whether broadcast, cable, satellite, IPTV or OTT. Today’s Electra and VOS solutions all leverage the same Harmonic PURE Compression Engine, a software-based technology that incorporates many of the encoding algorithm and processing techniques developed by Harmonic over the past two decades. The benefits of the PURE Compression Engine include a faster rate of video quality innovation, the ability to dynamically balance workflow efficiency and resource utilization, and improved investment protection. Our EyeQ real-time content-aware encoding solution is an optional enhancement for systems featuring PURE Compression. The EyeQ compression solution leverages the mechanics of the human eye to assess video quality and optimize encoding parameters in real time. Our VOS cloud-native software application supports a subset of broadcast and OTT encoding functionality.

Contribution encoders. Our ViBE contribution encoders provide broadcasters with video compression solutions for real-time news gathering, live sports coverage and other remote events, and enable our customers to deliver these feeds to their studios for further processing. Our latest models can encode HD and Ultra HD video signals in HEVC or AVC 4:2:2 10-bit resolution, enabling the transmission of very high-quality video with very low latency.

High-density transcoders and stream processing. We offer high-density, real-time transcoding of video for broadcast and OTT delivery with our Electra XT Xtream transcoder. This modular and scalable platform is designed to cost effectively transcode any incoming audio and video signal at a "good enough" video quality. Our latest ProStream X and ProStream XVM real-time stream processing systems are software-based and provide high-performance, high-throughput processing for mission-critical IP video delivery applications, including multiplexing, scrambling, splicing and blackout switching. Our VOS cloud-native software application supports stream processing.

Multiscreen delivery. Our VOS cloud-native software application enables the packaging and delivery of high-quality OTT services, including live streaming, VOD, catch-up TV, start-over TV, nDVR and cDVR services through hypertext transfer protocol (HTTP) streaming to any device. Capabilities include real-time and file-based transcoding, stream packaging, and multiscreen workflow management, as well as support for digital rights management (DRM) processes with a number of DRM partners. Our VOS cloud-native application ingests transcoded, segmented and encrypted output from Electra systems to provide high-volume live adaptive bitrate streaming and the delivery of time-shifted services.

Decoders and descramblers. Our family of ProView integrated receivers-decoder (IRD) products allows service providers to acquire content delivered via satellite, IP or terrestrial networks for distribution to their subscribers. These products, including the ProView 7100 and ProView 8100 series, are used by broadcasters to decode signals backhauled from live news and sporting events in contribution applications, as well as by content owners looking to distribute their content in a controlled manner to a large base of video service providers. Our VOS cloud-native software application supports a subset of these decoding and descrambling capabilities.

Video servers. Our video playout solutions, including media orchestration software, are based on scalable video servers used by broadcast and media companies to create and playout television channels. Our Spectrum family of video server systems are used by broadcast and media companies to create play-to-air television channels. Our customers typically use these video server products to record incoming content from either live feeds or from tapes, encoding that content in real-time into standard media files that are then stored in the server's file system until the content is needed for playback as part of a scheduled playlist. Clips stored in the server are decoded in real-time and played-to-air according to a playout schedule in a frame-accurate, back-to-back manner to create a seamless television channel. Our Spectrum servers support SD, HD and Ultra HD programming, as well as many different media formats. Our Polaris media orchestration software solutions work with our Spectrum products and provide our customers with playout management and control tools for channel-in-a-box and integrated channel playout applications. Our VOS cloud-native software application supports a subset of these video server functionalities.

Video-optimized Storage

MediaGrid. Our MediaGrid shared storage system is a scale-out, network-attached storage system with a built-in media file system optimized for media production workflows. Architected as a clustered storage system with a distributed file system, MediaGrid provides highly scalable storage capacity and access bandwidth to support demanding media production applications, such as video editing, content transformation and media library management. In addition, MediaGrid systems are increasingly being employed for VOD, time-shifted television services and OTT adaptive bitrate streaming. Our VOS cloud-native software application relies on external infrastructure for storage, and is compatible with MediaGrid video-optimized storage when deployed into a customer's traditional data center environment.

Unified Video Playout and Processing SaaS

Cloud-native SaaS solutions. Our VOS360 SaaS platforms provide both streaming and channel origination and distribution services in a public cloud environment that is fully managed and operated by our 24/7 teams. We believe an increasing number of customers are seeking to leverage the inherent commercial and infrastructure flexibility offered by our VOS360 SaaS platforms.

Cable Access Products and Solutions

Software-Based Cable Access Solution. As demand continues to rapidly grow for high-speed broadband services such as OTT streaming, VOD, time-shift TV and cloud DVR, we believe we can help cable operators take advantage of this opportunity with our CableOS software-based cable access solution, an end-to-end cable access solution that we believe delivers unprecedented scalability, agility and cost savings. Our CableOS solution enables the migration to multi-gigabit broadband capacity and the fast deployment of DOCSIS 3.1 data, video and voice services. We believe our solution resolves space and power constraints in cable operator facilities, eliminates dependence on hardware upgrade cycles, and reduces total cost of ownership. Our CableOS solution can be deployed based on a centralized, distributed Remote PHY or hybrid architecture.

Edge QAM products. Our Narrowcast Services Gateway (NSG) products are fully integrated edge gateway products that integrate routing, multiplexing, scrambling and modulation into a single package for the delivery of narrowcast services to subscribers over cable networks. NSG systems allow cable operators to deliver IP signals from the headend to the edge of the network for subsequent modulation onto a HFC network. Originally developed for VOD applications, the NSG has evolved to support multiple applications, including switched digital video and modular CMTS applications, as well as large-scale VOD deployments.

We believe that our CableOS solution, which includes a software-based CMTS, will have an opportunity to be sold into a significantly larger and growing market, with growth driven by virtualization and the distributed Remote PHY architecture.

Technical Support and Professional Services

We provide maintenance and support services to most of our customers under service level agreements that are generally renewed on an annual basis. We also provide consulting, implementation and integration services to our customers worldwide. We draw upon our expertise in broadcast television, communications networking, compression technology and cable access technologies to design, integrate and install complete solutions for our customers, including integration with third-party products and services. We offer a broad range of services, including SaaS-related support and deployment, program management, technical design and planning, building and site preparation, integration and equipment installation, end-to-end system testing and comprehensive training.

Customers

We sell our products to a variety of cable, satellite and telco, and broadcast and media companies. Set forth below is a representative list of our significant end user and integrator/reseller customers, listed alphabetically, based, in part, on revenue during 2019.

United States	International
AT&T	Atos IT Services
Charter Communications	Avcom
Comcast	Com Hem
Cox Communications	EVS Broadcast Equipment
DigitalGlue	Groupe Canal+
Dish Network	Guangdong Fuhaitong
Fox Networks Group	Netorium
Heartland Video Systems	Sky Perfect JSAT Corp.
Scripps Media-TV	Telecom Argentina
Turner Broadcasting	Vodafone

Sales to our 10 largest customers in 2019, 2018 and 2017 accounted for approximately 49%, 37% and 24% of our net revenue, respectively. Although we continue to seek to broaden our customer base by penetrating new markets and further expanding internationally, we expect to see continuing industry consolidation and customer concentration.

During 2019 and 2018, Comcast accounted for 23% and 15% of our net revenue, respectively. During 2017, no single customer accounted for more than 10% of our net revenue. The loss of any significant customer, or any material reduction in orders from any significant customer, or our failure to qualify our new products with any significant customer could materially and adversely affect our operating results, financial condition and cash flows. In addition, we are involved in most quarters in one or more relatively large individual transactions. A decrease in the number of relatively larger individual transactions in which we are involved in any quarter could adversely affect our operating results for that quarter.

Sales and Marketing

In the U.S. and internationally, we sell our products through our own direct sales force, as well as through independent resellers and systems integrators. Our direct sales team is organized geographically and by major customers and markets to support customer requirements. Our principal sales offices outside of the U.S. are located in Europe and Asia, and we have support staff in Switzerland and France to support our international customers and operations. Our international resellers are generally responsible for importing our products and providing certain installation, technical support and other services to customers in their territory after receiving training from us.

Our direct sales force and resellers are supported by a highly trained technical staff, which includes application engineers who work closely with our customers to develop technical proposals and design systems to optimize system performance and economic benefits for our customers. Our technical support teams provide a customized set of services, as required, for ongoing maintenance, support-on-demand and training for our customers and resellers, both in our facilities and on-site.

Our product management organization develops strategies for product lines and markets and, in conjunction with our sales force, identifies the evolving technical and application needs of customers so that our product development resources can be most effectively and efficiently deployed to meet anticipated product requirements. Our product management organization is also responsible for setting price levels, demand forecasting and general support of the sales force, particularly at major accounts.

Our corporate marketing organization is responsible for building awareness of the Harmonic brand in our markets and driving engagement with our strategies, solutions and products. The group develops all of our corporate messaging and manages all customer and industry communication channels, including public relations, Web and social media, events and trade shows, as well as demand generation marketing campaigns in conjunction with our sales force.

Manufacturing and Suppliers

We rely on third-party contract manufacturers to assemble our products and the subassemblies and modules for our products. In 2003, we entered into an agreement with Plexus Services Corp. to act as our primary contract manufacturer. Plexus currently provides us with a majority of the products we purchase from our contract manufacturers. This agreement has automatic annual renewals, unless prior notice for nonrenewal is given, and has been automatically renewed for a term expiring in October 2020. We do not generally maintain long-term agreements with any of our contract manufacturers.

Many components, subassemblies and modules necessary for the manufacture or integration of our products are obtained from a sole supplier or a limited group of suppliers. While we expend considerable efforts to qualify additional component sources, consolidation of suppliers in the industry and the small number of viable alternatives have limited the results of these efforts. We do not generally maintain long-term agreements with any of our suppliers.

Intellectual Property

As of December 31, 2019, we held 93 issued U.S. patents and 57 issued foreign patents and had 70 patent applications pending. Although we attempt to protect our intellectual property rights through patents, trademarks, copyrights, licensing arrangements, maintaining certain technology as trade secrets and other measures, we cannot assure you that any patent, trademark, copyright or other intellectual property rights owned by us will not be invalidated, circumvented or challenged, that such intellectual property rights will provide competitive advantages to us, or that any of our pending or future patent applications will be issued with the claims, or the scope of the claims, sought by us, if at all. We cannot assure you that others will not develop technologies that are similar or superior to our technology, duplicate our technology or design around the patents that we own. In addition, effective patent, copyright and trade secret protection may be unavailable or limited in which we do business or may do business in the future.

We enter into confidentiality or license agreements with our employees, consultants, vendors and customers as needed, and generally limit access to, and distribution of, our proprietary information. However, no assurances can be given that these actions will prevent misappropriation of our technology. In addition, if necessary, we are prepared to take legal action, in the future, to enforce our patents and other intellectual property rights, to protect our trade secrets, to determine the validity and scope of the proprietary rights of others, or to defend against claims of infringement or invalidity. Any such litigation could result in substantial costs and diversion of resources, including management time, and could negatively affect our business, operating results, financial position and cash flows.

In order to successfully develop and market our products, we may be required to enter into technology development or licensing agreements with third parties. Although many companies are often willing to enter into such technology development or licensing agreements, we cannot assure you that such agreements can be negotiated on reasonable terms or at all. The failure to enter into technology development or licensing agreements, when necessary, could limit our ability to develop and market new products and could harm our business.

Backlog

We schedule production of our products and solutions based upon our backlog, open contracts, informal commitments from customers and sales projections. Our backlog consists of unfilled firm purchase orders by our customers which have not been completed. Approximately 90% of our backlog is projected to be converted to revenue within a rolling one-year period. As of December 31, 2019 and 2018, we had backlog, including deferred revenue, of $210.2 million and $186.4 million, respectively. Delivery schedules on such orders may be deferred or canceled for a number of reasons, including reductions in spending by our customers or changes in specific customer requirements. In addition, due to annual budget cycles at many of our customers, the amount of our backlog at any given time is not necessarily indicative of actual revenues for any succeeding period.

Competition

The markets in which our Video and Cable Access businesses operate are extremely competitive and have been characterized by rapid technological change and declining average selling prices in the past. The principal competitive factors in these markets include product performance, functionality and features, reliability, pricing, breadth of product offerings, brand recognition and awareness, sales and distribution capabilities, technical support and services, and relationships with end customers. We believe that we compete favorably in each of these categories.

Our competitors in our Video business include CommScope, Synamedia and MediaKind. In certain product lines, our competitors include companies such as ATEME and Elemental Technologies (an Amazon Web Services company). With respect to production and playout products, competitors include Evertz Microsystems, EVS, Grass Valley (which is being sold by Belden to a private equity firm) and Imagine Communications. In the OTT market, our competitors include end-to-end online video platforms such as Brightcove and Verizon Digital Media Services, who provide comprehensive OTT infrastructure solutions, some of which overlap with our products and services.

Our competitors in our Cable Access business include CommScope, Casa Systems, Cisco Systems and Huawei Technologies.

Research and Development

We have historically devoted a significant amount of our resources to research and development. Research and development expenses in 2019, 2018 and 2017 were approximately $84.6 million, $89.2 million and $96.0 million, respectively. Research and development expenses as a percentage of revenue in 2019, 2018 and 2017 were approximately 21.0%, 22.1% and 26.8%, respectively. Our internal research and development activities are conducted primarily in the United States (California, Oregon and New Jersey), France, Israel and Hong Kong. In addition, a portion of our research and development is conducted through third-party partners with engineering resources in Ukraine and in India.

Our research and development program is primarily focused on developing new products and systems, and adding new features and other improvements to existing products and systems. Our development strategy is to identify features, products and systems, in both software and hardware solutions, that are, or are expected to be, needed by our customers. For our Video business segment, our current research and development efforts are focused on next-generation video processing and delivery across different deployment environments, particularly cloud-native and SaaS delivery models, and enhanced video compression, video quality, and multiscreen solutions. We also devote significant resources to production and playout and distribution solutions. With respect to our Cable Access business segment, our major research and development efforts are focused on cable access solutions for both video and data, particularly the ongoing development of our centralized and distributed CableOS software-based cable access solutions.

Our success in designing, developing, manufacturing and selling new or enhanced products will depend on a variety of factors, including the identification of market demand for new products, product selection, timely product design and development, product performance, effective manufacturing and assembly processes and sales and marketing. Because of the complexity inherent in such research and development efforts, we cannot assure you that we will successfully develop new products, or that new products developed by us will achieve market acceptance. Our failure to successfully develop and introduce new products would materially and adversely affect our business, operating results, financial condition and cash flows.

Employees

As of December 31, 2019, we employed a total of 1,172 full time employees, including 434 in research and development, 179 in sales, 303 in service and support, 64 in operations, 78 in marketing (corporate and product) and 114 in a general and administrative capacity. Of those employees, 370 were located in the U.S. and Canada, and 802 employees were located outside of North America in 25 countries in Central and South America, the Middle East and Africa, Europe and the Asia Pacific region. From time to time, we also employ a number of temporary employees and consultants on a contract basis. Our employees in France are represented by labor unions and an employee works council. None of our other employees are represented by a labor union with respect to their employment with us. We have not experienced any work stoppages, and we consider our relations with our employees to be good.

Available Information

Harmonic makes available free of charge, on the Harmonic web site, the Company's Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K (via link to the SEC website, which itself is available at http://www.sec.gov), and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after Harmonic files such material with, or furnishes such material to, the Securities and Exchange Commission. The address of the Harmonic web site is http://www.harmonicinc.com. Except as expressly set forth in this Form 10-K, the contents of our web site are not incorporated into, or otherwise to be regarded as part of, this report.

Item 1A. *RISK FACTORS*

We depend on cable, satellite and telco, and broadcast and media industry spending for our revenue and any material decrease or delay in spending in any of these industries would negatively impact our operating results, financial condition and cash flows.

Our revenue has been derived from worldwide sales to service providers and broadcast and media companies, as well as, in recent years, streaming media companies. We expect that these markets will provide our revenue for the foreseeable future. Demand for our products will depend on the magnitude and timing of spending by customers in each of these markets for the purpose of creating, expanding or upgrading their systems. These spending patterns are dependent on a variety of factors, including:

- the impact of general economic conditions, actual and projected;
- access to financing;
- annual budget cycles of customers in each of the industries we serve;
- the impact of industry consolidation;
- customers suspending or reducing spending in anticipation of: (i) new video or cable industry standards; (ii) industry trends and technology shifts, such as virtualization and cloud-based solutions, and (iii) new products, such as products and services based on our VOS software platform or our CableOS software-based cable access solutions;
- delayed or reduced spending as customers transition to or contemplate adopting new business and operating models enabled by software- and cloud-based solutions, including software-as-a-service (SaaS) unified video processing solutions;
- federal, state, local and foreign government regulation of telecommunications, television broadcasting and streaming media;
- overall demand for communication services and consumer acceptance of new video and data technologies and services;
- competitive pressures, including pricing pressures;
- the impact of fluctuations in currency exchange rates; and
- discretionary end-user customer spending patterns.

In the past, specific factors contributing to reduced spending have included:

- weak or uncertain economic and financial conditions in the U.S. or one or more international markets;
- uncertainty related to development of digital video industry standards;
- delays in evaluations of new services, new standards and systems architectures by many operators;
- emphasis by operators on generating revenue from existing customers, rather than from new customers, through construction, expansion or upgrades;
- a reduction in the amount of capital available to finance projects of our customers and potential customers;
- proposed and completed business combinations and divestitures by our customers and the length of regulatory review of each;
- completion of a new system or significant expansion or upgrade to a system; and

- bankruptcies and financial restructuring of major customers.

In the past, adverse economic conditions in one or more of the geographies in which we offer our products have adversely affected our customers' spending in those geographies and, as a result, our business. During challenging economic times, and in tight credit markets, many customers may delay or reduce capital expenditures. This could result in reductions in revenue from our products, longer sales cycles, difficulties in collection of accounts receivable, slower adoption of new technologies and increased price competition. If global economic and market conditions, or economic conditions in the U.S., Europe or other key markets, deteriorate, we could experience a material and adverse effect on our business, results of operations, financial condition and cash flows. Additionally, since most of our international revenue is denominated in U.S. dollars, global economic and market conditions may impact currency exchange rates and cause our products to become relatively more expensive to customers in a particular country or region, which could lead to delayed or reduced spending in those countries or regions, thereby negatively impacting our business and financial condition.

In addition, industry consolidation has in the past constrained, and may in the future constrain or delay, spending by our customers. Further, if our product portfolio and product development plans do not position us well to capture an increased portion of the spending of customers in the markets on which we focus, our revenue may decline.

As a result of these various factors and potential issues related to customer spending, we may not be able to maintain or increase our revenue in the future, and our operating results, financial condition and cash flows could be materially and adversely affected.

The markets in which we operate are intensely competitive.

The markets for our products are extremely competitive and have been characterized by rapid technological change and declining average sales prices in the past.

Our competitors in our Video business include CommScope, Synamedia and MediaKind. In certain product lines, our competitors include companies such as ATEME and Elemental Technologies (an Amazon Web Services company). With respect to production and playout products, competitors include Evertz Microsystems, EVS, Grass Valley (which is being sold by Belden to a private equity firm) and Imagine Communications. In the OTT market, our competitors include end-to-end online video platforms such as Brightcove and Verizon Digital Media Services, who provide comprehensive OTT infrastructure solutions, some of which overlap with our products and services. Our competitors in our Cable Access business include CommScope, Casa Systems, Cisco Systems and Huawei Technologies.

A number of our principal business competitors in both of our business segments are substantially larger and/or may have access to greater financial, technical, marketing and other resources than we have. Consolidation in the Video industry has led to the acquisition of a number of our historic competitors over the last several years by substantially larger companies and private equity firms. With respect to our Cable Access business, our competitors are also substantially larger than us, and the acquisition of Arris by CommScope in 2019 has created a significantly larger combined business.

In addition, some of our larger competitors have more long-standing and established relationships with domestic and foreign customers. Many of these large enterprises are in a better position to withstand any significant reduction in spending by customers in our markets. They often have broader product lines and market focus, and may not be as susceptible to downturns in a particular market. These competitors may also be able to bundle their products together to meet the needs of a particular customer, and may be capable of delivering more complete solutions than we are able to provide. To the extent large enterprises that currently do not compete directly with us choose to enter our markets by acquisition or otherwise, competition would likely intensify.

Further, some of our competitors that have greater financial resources have offered, and in the future may offer, their products at lower prices than we offer for our competing products or on more attractive financing or payment terms, which has in the past caused, and may in the future cause, us to lose sales opportunities and the resulting revenue or to reduce our prices in response to that competition. Also, some competitors that are smaller than we are have engaged in, and may continue to engage in, aggressive price competition in order to gain customer traction and market share. Reductions in prices for any of our products could materially and adversely affect our operating margins and revenue.

Additionally, certain customers and potential customers have developed, and may continue to develop, their own solutions that may cause such customers or potential customers to not consider our product offerings or to displace our installed products with their own solutions. The growing availability of open source codecs and related software, as well as new server chipsets that incorporate encoding technology, has, in certain respects, lowered the barriers to entry for the video processing industry.

The development of solutions by potential and existing customers and the reduction of the barriers to entry to enter the video processing industry could result in increased competition and adversely affect our results of operations and business.

If any of our competitors' products or technologies were to become the industry standard, our business could be seriously harmed. If our competitors are successful in bringing their products to market earlier than us, or if these products are more technologically capable than ours, our revenue could be materially and adversely affected.

We need to develop and introduce new and enhanced products and solutions in a timely manner to meet the needs of our customers and to remain competitive.

All of the markets we address are characterized by continuing technological advancement, changes in customer requirements and evolving industry standards. To compete successfully, we must continually design, develop, manufacture and sell new or enhanced products and solutions that provide increasingly higher levels of performance and reliability and meet our customers changing needs. However, we may not be successful in those efforts if, among other things, our products and solutions:

- are not cost effective;

- are not brought to market in a timely manner;

- are not in accordance with evolving industry standards;

- fail to meet market acceptance or customer requirements; or

- are ahead of the needs of their markets.

In our Video business segment, our current research and development efforts are focused on next-generation video processing and delivery across different deployment environments, particularly cloud-native and SaaS delivery models, and enhanced video compression, video quality, and multiscreen solutions. We also devote significant resources to production and playout and distribution solutions. With respect to our Cable Access business segment, our major research and development efforts are focused on cable access solutions for both video and data, particularly the ongoing development of our centralized and distributed CableOS software-based cable access solutions.

The success of our significant and costly development efforts will be predicated, in part, on the timing of market adoption of the new standards on which the resulting products are based, and for other products, the timing of customer adoption of our products and solutions, as well as our ability to timely develop the features and capabilities of our products and solutions. If new standards or some of our new products are adopted later than we predict or not adopted at all, or if adoption occurs earlier than we are able to deliver the applicable products or functionality, we risk spending significant research and development time and dollars on products or features that may never achieve market acceptance or that miss the customer demand window and thus do not produce the revenue that a timely introduction would have likely produced.

If we fail to develop and market new and enhanced products and solutions on a timely basis, our operating results, financial condition and cash flows could be materially and adversely affected.

Our software-based cable access product initiatives expose us to certain technology transition risks that may adversely impact our operating results, financial condition and cash flows.

We believe our CableOS software-based cable access solutions, supporting centralized, distributed Remote PHY or hybrid configurations, will significantly reduce cable headend costs and increase operational efficiency, and are an important step in cable operators' transition to all-IP networks. If we are unsuccessful in developing and deploying our cable access solutions in a timely manner, or are otherwise delayed in making our solutions available to our customers, our business may be adversely impacted, particularly if our competitors develop and market similar products and solutions before we do.

We believe software-based cable access solutions will, over time, replace and make obsolete current CMTS solutions, which is a market our products have historically not addressed, as well as cable edge-QAM products. If demand for our software-based cable access solutions is weaker than expected, our near and long-term operating results, financial condition and cash flows could be adversely impacted. Further, in September 2016 we granted Comcast a warrant (the "Warrant") to purchase shares of our common stock to further incentivize them to purchase our products and adopt our technologies, particularly our CableOS software-based cable access solution. While Comcast's election in July 2019 to license our CableOS software contains commitments in software license fees to us, if Comcast deploys our CableOS solution in its networks more slowly than we anticipate or at a scale below our expectations, or if Comcast otherwise moves away from deploying our solutions, we may be unable to fully realize the anticipated benefits of our relationship with Comcast and our reputation, business and operating results, financial condition and cash flows could be materially and adversely affected. Moreover, if competitors adapt new cable industry technology standards into competing cable access solutions faster than we do, or promulgate a new or competitive architecture for next-generation cable access solutions that renders our CableOS solution obsolete, our business may be adversely impacted.

The sales cycle for our CableOS solutions tends to be long. For cable operators, upgrading or expanding network infrastructure is complex and expensive, and investing in a CableOS solution is a significant strategic decision that may require considerable time to evaluate, test and qualify. Potential customers need to ensure our CableOS solution will interoperate with the various components of its existing network infrastructure, including third-party equipment, servers and software. In addition, since we are a relatively new entrant into the CMTS market, we need to demonstrate significant performance, functionality and/or cost advantages with our CableOS solutions that outweigh customer switching costs. If sales cycles are significantly longer than anticipated or we are otherwise unsuccessful in growing our CableOS sales, our operating results, financial condition and cash flows could be materially and adversely affected.

Our future growth depends on market acceptance of several broadband services, on the adoption of new broadband technologies, and on several other broadband industry trends.

Future demand for many of our products will depend significantly on the growing market acceptance of emerging broadband services, including digital video, VOD, Ultra HD, IP video services (particularly streaming to tablet computers, connected TVs and mobile devices) and very high-speed data services. The market demand for such emerging services is rapidly growing, with many custom or proprietary systems in use, which increases the challenge of delivering interoperable products intended to address the requirements of such services.

The effective delivery of these services will depend, in part, on a variety of new network architectures, standards and devices, such as:

- the adoption of cloud-native media processing architectures;
- the adoption of advanced video compression standards, such as next generation H.264 compression and HEVC;
- the adoption of our cable access solutions;
- fiber to the premises, or FTTP, networks designed to facilitate the delivery of video services by telcos;
- the greater use of protocols such as IP;
- the further adoption of bandwidth-optimization techniques, such as DOCSIS 3.0 and DOCSIS 3.1 and associated specifications; and
- the introduction of new consumer devices, such as advanced set-top boxes, cloud DVRs, connected TVs, tablet computers, and a variety of smart phone mobile devices.

If adoption of these emerging services and/or technologies is not as widespread or as rapid as we expect, or if we are unable to develop new products based on these technologies on a timely basis, our operating results, financial condition and cash flows could be materially and adversely affected.

Furthermore, other technological, industry and regulatory trends and requirements may affect the growth of our business.
These trends and requirements include the following:

- convergence, whereby network operators bundle video, voice and data services to consumers, including mobile delivery options;
- the increasing availability of traditional broadcast video content and video-on-demand on the Internet;
- adoption of high-bandwidth technology, such as DOCSIS 3.x, next generation LTE and FTTP;

• the use of digital video by businesses, governments and educational institutions;

• efforts by regulators and governments in the U.S. and internationally to encourage the adoption of broadband and digital technologies, as well as to regulate broadband access and delivery;

• consumer interest in higher resolution video such as Ultra HD or retina-display technologies on mobile devices;

• the need to develop partnerships with other companies involved in video infrastructure workflow and broadband services;

• the continued adoption of the television viewing behaviors of consumers in developed economies by the growing middle class across emerging economies;

• the extent and nature of regulatory attitudes towards issues such as network neutrality, competition between operators, access by third parties to networks of other operators, local franchising requirements for telcos to offer video, and other new services, such as mobile video; and

• the outcome of disputes and negotiations between content owners and service providers regarding rights of service providers to store and distribute recorded broadcast content, which outcomes may drive adoption of one technology over another in some cases.

If we fail to recognize and respond to these trends, by timely developing products, features and services required by these trends, we are likely to lose revenue opportunities and our operating results, financial condition and cash flows could be materially and adversely affected.

We depend significantly on our international revenue and are subject to the risks associated with international operations, including those of our resellers, contract manufacturers and outsourcing partners, which may negatively affect our operating results.

Revenue derived from customers outside of the U.S. in the fiscal years ended December 31, 2019, 2018 and 2017 represented approximately 50%, 55% and 63% of our revenue, respectively. Although no assurance can be given with respect to international sales growth in any one or more regions, we expect that international revenue will likely continue to represent, from year to year, a majority, and potentially increasing, percentage of our annual revenue for the foreseeable future. A significant percentage of our revenue is generated from sales to resellers, value-added resellers (“VARs”) and systems integrators, particularly in emerging market countries. Furthermore, the majority of our employees are based in our international offices and locations, and most of our contract manufacturing occurs outside of the U.S. In addition, we outsource a portion of our research and development activities to certain third-party partners with development centers located in different countries, particularly Ukraine and India.

Our international operations, the international operations of our resellers, contract manufacturers and outsourcing partners, and our efforts to maintain and increase revenue in international markets are subject to a number of risks, which are generally greater with respect to emerging market countries, including the following:

• growth and stability of the economy in one or more international regions;

• fluctuations in currency exchange rates;

• changes in foreign government regulations and telecommunications standards;

• import and export license requirements, tariffs, taxes, economic sanctions, contractual limitations and other trade barriers;

• our significant reliance on resellers and others to purchase and resell our products and solutions, particularly in emerging market countries;

• availability of credit, particularly in emerging market countries;

• longer collection periods and greater difficulty in enforcing contracts and collecting accounts receivable, especially from smaller customers and resellers, particularly in emerging market countries;

- compliance with the U.S. Foreign Corrupt Practices Act (the “FCPA”), the U.K. Bribery Act and/or similar anti-corruption and anti-bribery laws, particularly in emerging market countries;

- the burden of complying with a wide variety of foreign laws, treaties and technical standards;

- fulfilling “country of origin” requirements for our products for certain customers;

- difficulty in staffing and managing foreign operations;

- business and operational disruptions or delays caused by political, social and economic instability and unrest, including risks related to terrorist activity, particularly in emerging market countries (e.g., recent significant civil, political and economic disturbances in Ukraine);

- changes in economic policies by foreign governments, including the imposition and potential continued expansion of economic sanctions by the U.S. and the European Union on the Russian Federation;

- changes in diplomatic and trade relationships, including the imposition of new trade restrictions, trade protection measures, import or export requirements, trade embargoes and other trade barriers, including those imposed by the U.S. against China;

- any negative economic impacts resulting from the political environment in the U.S. or the U.K.’s referendum to exit the European Union; and

- business and economic disruptions and delays caused by outbreaks of disease, epidemics and potential pandemics, such as the novel coronavirus, which has led and may continue to lead to trade shows and in-person meetings being canceled or delayed and certain employees working remotely, and which may impact our supply chain or general business in other manners.

We have certain international customers who are billed in their local currency, primarily the Euro, British pound and Japanese yen, which subjects us to foreign currency risk. In addition, a portion of our operating expenses relating to the cost of certain international employees, are denominated in foreign currencies, primarily the Euro, Israeli shekel, British pound, Singapore dollar, Chinese yuan and Indian rupee. Although we do hedge against the Euro, British pound, Israeli shekel and Japanese yen, gains and losses on the conversion to U.S. dollars of accounts receivable, accounts payable and other monetary assets and liabilities arising from international operations may contribute to fluctuations in our operating results. Furthermore, payment cycles for international customers are typically longer than those for customers in the U.S. Unpredictable payment cycles could cause us to fail to meet or exceed the expectations of security analysts and investors for any given period.

Most of our international revenue is denominated in U.S. dollars, and fluctuations in currency exchange rates could cause our products to become relatively more expensive to customers in a particular country or region, leading to a reduction in revenue or profitability from sales in that country or region. The potential negative impact of a strong U.S. dollar on our business may be exacerbated by the significant devaluation of a number of foreign currencies. Also, if the U.S. dollar were to weaken against many foreign currencies, there can be no assurance that a weaker dollar would lead to growth in customer spending in foreign markets.

Our operations outside the U.S. also require us to comply with a number of U.S. and international regulations that prohibit improper payments or offers of payments to foreign governments and their officials and political parties for corrupt purposes. For example, our operations in countries outside the U.S. are subject to the FCPA and similar laws, including the U.K. Bribery Act. Our activities in certain emerging countries create the risk of unauthorized payments or offers of payments by one of our employees, consultants, sales agents or channel partners that could be in violation of various anti-corruption laws, even though these parties may not be under our control. Under the FCPA and U.K. Bribery Act, companies may be held liable for the corrupt actions taken by their directors, officers, employees, channel partners, sales agents, consultants, or other strategic or local partners or representatives. We have internal control policies and procedures with respect to FCPA compliance, have implemented FCPA training and compliance programs for our employees, and include in our agreements with resellers a requirement that those parties comply with the FCPA. However, we cannot provide assurances that our policies, procedures and programs will prevent violations of the FCPA or similar laws by our employees or agents, particularly in emerging market countries, and as we expand our international operations. Any such violation, even if prohibited by our policies, could result in criminal or civil sanctions against us.

The effect of one or more of these international risks could have a material and adverse effect on our business, financial condition, operating results and cash flows.

We purchase several key components, subassemblies and modules used in the manufacture or integration of our products from sole or limited sources, and we rely on contract manufacturers and other subcontractors.

Our reliance on sole or limited suppliers, particularly foreign suppliers, and our reliance on contractors for manufacturing and installation of our products, involves several risks, including a potential inability to obtain an adequate supply of required components, subassemblies or modules; reduced control over costs, quality and timely delivery of components, subassemblies or modules; supplier discontinuation of components, subassemblies or modules we require; and timely installation of products. In addition, our financial results may be impacted by tariffs imposed by the U.S. on goods from other countries and tariffs imposed by other countries on U.S. goods, including the tariffs proposed by the U.S. government on various imports from China and by the Chinese government on certain U.S. goods, the scope and duration of which, if implemented, remain uncertain. If any such tariffs are imposed on products or components that we import, including those obtained from a sole supplier or a limited group of suppliers, we could experience reduced revenues or may have to raise our prices, either of which could have an adverse effect on our business, financial condition and operating results.

These risks could be heightened during a substantial economic slowdown, because our suppliers and subcontractors are more likely to experience adverse changes in their financial condition and operations during such a period. Further, these risks could materially and adversely affect our business if one of our sole sources, or a sole source of one of our suppliers or contract manufacturers, is adversely affected by a natural disaster or the outbreak of disease, epidemics and other pandemics, such as the novel coronavirus. While we expend resources to qualify additional component sources, consolidation of suppliers and the small number of viable alternatives have limited the results of these efforts. Managing our supplier and contractor relationships is particularly difficult during time periods in which we introduce new products and during time periods in which demand for our products is increasing, especially if demand increases more quickly than we expect.

Plexus Services Corp. (“Plexus”), which manufactures our products at its facilities in Malaysia, currently serves as our primary contract manufacturer, and currently provides us with a majority, by dollar amount, of the products that we purchase from our contract manufacturers. Most of the products manufactured by our French and Israeli operations are outsourced to another third-party manufacturer in France and Israel, respectively. From time to time we assess our relationship with our contract manufacturers, and we do not generally maintain long-term agreements with any of our suppliers or contract manufacturers. Our agreement with Plexus has automatic annual renewals, unless prior notice is given by either party, and has been automatically renewed for a term expiring in October 2020.

Difficulties in managing relationships with any of our current contract manufacturers, particularly Plexus, that manufacture our products off-shore, or any of our suppliers of key components, subassemblies and modules used in our products, could impede our ability to meet our customers’ requirements and adversely affect our operating results. An inability to obtain adequate and timely deliveries of our products or any materials used in our products, or the inability of any of our contract manufacturers to scale their production to meet demand, or any other circumstance that would require us to seek alternative sources of supply, could negatively affect our ability to ship our products on a timely basis, which could damage relationships with current and prospective customers and harm our business and materially and adversely affect our revenue and other operating results. Furthermore, if we fail to meet customers’ supply expectations, our revenue would be adversely affected and we may lose sales opportunities, both short and long term, which could materially and adversely affect our business and our operating results, financial condition and cash flows. Increases, from time to time, in demand on our suppliers and subcontractors from our customers or from other parties have, on occasion, caused delays in the availability of certain components and products. In response, we may increase our inventories of certain components and products and expedite shipments of our products when necessary. These actions could increase our costs and could also increase our risk of holding obsolete or excess inventory, which, despite our use of a demand order fulfillment model, could materially and adversely affect our business, operating results, financial condition and cash flows.

The loss of one or more of our key customers, a failure to continue diversifying our customer base, or a decrease in the number of larger transactions could harm our business and our operating results.

Historically, a significant portion of our revenue has been derived from relatively few customers, due in part to the consolidation of media customers. Sales to our top 10 customers in the fiscal years ended December 31, 2019, 2018 and 2017 accounted for approximately 49%, 37% and 24% of revenue, respectively. Although we continue to seek to broaden our customer base by penetrating new markets and further expanding internationally, we expect to see continuing industry consolidation and customer concentration.

In the fiscal years ended December 31, 2019 and 2018, Comcast accounted for 23% and 15% of our net revenue. In the fiscal year ended December 31, 2017, no single customer accounted for more than 10% of our net revenue. Further consolidation in the cable industry could lead to additional revenue concentration for us. The loss of any significant customer, or any material reduction in orders from any other significant customer, or our failure to qualify our new products with any significant customer could materially and adversely affect, either long term or in a particular quarter, our operating results, financial condition and cash flows. Further, while Comcast's election to license our CableOS software contains commitments in license fees to us, if Comcast deploys our solutions more slowly or at a scale that is lower than we anticipate, our operating results, financial condition and cash flows could be materially and adversely effected.

In addition, we are involved in most quarters in one or more relatively large individual transactions. A decrease in the number of the relatively larger individual transactions in which we are involved in any quarter could materially and adversely affect our operating results for that quarter.

As a result of these and other factors, we may be unable to increase our revenues from some or all of the markets we address, or to do so profitably, and any failure to increase revenues and profits from these customers could materially and adversely affect our operating results, financial condition and cash flows.

We rely on resellers, value-added resellers and systems integrators for a significant portion of our revenue, and disruptions to, or our failure to develop and manage our relationships with these customers or the processes and procedures that support them could adversely affect our business.

We generate a significant percentage of our revenue through sales to resellers, VARs and systems integrators that assist us with fulfillment or installation obligations. We expect that these sales will continue to generate a significant percentage of our revenue in the future. Accordingly, our future success is highly dependent upon establishing and maintaining successful relationships with a variety of channel partners.

We generally have no long-term contracts or minimum purchase commitments with any of our reseller, VAR or system integrator customers, and our contracts with these parties do not prohibit them from purchasing or offering products or services that compete with ours. Our competitors may provide incentives to any of our reseller, VAR or systems integrator customers to favor their products or, in effect, to prevent or reduce sales of our products. Any of our reseller, VAR or systems integrator customers may independently choose not to purchase or offer our products. Many of our resellers, and some of our VARs and system integrators are small, are based in a variety of international locations, and may have relatively unsophisticated processes and limited financial resources to conduct their business. Any significant disruption of our sales to these customers, including as a result of the inability or unwillingness of these customers to continue purchasing our products, or their failure to properly manage their business with respect to the purchase of, and payment for, our products, or their ability to comply with our policies and procedures as well as applicable laws, could materially and adversely affect our business, operating results, financial condition and cash flows. In addition, our failure to continue to establish or maintain successful relationships with reseller, VAR and systems integrator customers could likewise materially and adversely affect our business, operating results, financial condition and cash flows.

We have made, and may continue to make, acquisitions, and any acquisition could disrupt our operations, cause dilution to our stockholders and materially and adversely affect our business, operating results, cash flows and financial condition.

As part of our business strategy, from time to time we have acquired, and we may continue to acquire, businesses, technologies, assets and product lines that we believe complement or expand our existing business. Acquisitions involve numerous risks, including the following:

- unanticipated costs or delays associated with an acquisition;
- difficulties in the assimilation and integration of acquired operations, technologies and/or products;
- potential disruption of our business and the diversion of management's attention from the regular operations of the business during the acquisition process;
- the challenges of managing a larger and more geographically widespread operation and product portfolio after the closing of the acquisition;
- potential adverse effects on new and existing business relationships with suppliers, contract manufacturers, resellers, partners and customers;

- compliance with regulatory requirements, such as local employment regulations and organized labor in France;

- risks associated with entering markets in which we may have no or limited prior experience;

- the potential loss of key employees of acquired businesses and our own business as a result of integration;

- difficulties in bringing acquired products and businesses into compliance with applicable legal requirements in jurisdictions in which we operate and sell products;

- impact of known potential liabilities or unknown liabilities, including litigation and infringement claims, associated with companies we acquire;

- substantial charges for acquisition costs or for the amortization of certain purchased intangible assets, deferred stock compensation or similar items;

- substantial impairments to goodwill or intangible assets in the event that an acquisition proves to be less valuable than the price we paid for it;

- difficulties in establishing and maintaining uniform financial and other standards, controls, procedures and policies;

- delays in realizing, or failure to realize, the anticipated benefits of an acquisition; and

- the possibility that any acquisition may be viewed negatively by our customers or investors or the financial markets.

Competition within our industry for acquisitions of businesses, technologies, assets and product lines has been, and is likely to continue to be, intense. As such, even if we are able to identify an acquisition that we would like to consummate, we may not be able to complete the acquisition on commercially reasonable terms or because the target chooses to be acquired by another company. Furthermore, in the event that we are able to identify and consummate any future acquisitions, we may, in each of those acquisitions:

- issue equity securities which would dilute current stockholders’ percentage ownership;

- incur substantial debt to finance the acquisition or assume substantial debt in the acquisition;

- incur significant acquisition-related expenses;

- assume substantial liabilities, contingent or otherwise; or

- expend significant cash.

These financing activities or expenditures could materially and adversely affect our operating results, cash flows and financial condition or the price of our common stock. Alternatively, due to difficulties in the capital or credit markets at the time, we may be unable to secure capital necessary to complete an acquisition on reasonable terms, or at all. Moreover, even if we were to obtain benefits from acquisitions in the form of increased revenue and earnings per share, there may be a delay between the time the expenses associated with an acquisition are incurred and the time we recognize such benefits.

In addition to the risks outlined above, if we are unable to successfully receive payment of any significant portion of our existing French R&D tax credit receivables from the French tax authority as expected, or are unable to successfully apply for or otherwise obtain the financial benefit of new French R&D tax credits in future years, our ability to achieve the anticipated benefits of the acquisition as well as our business, operating results and financial condition could be adversely affected.

As of December 31, 2019, we had approximately $239.8 million of goodwill recorded on our balance sheet associated with prior acquisitions. In the event we determine that our goodwill is impaired, we would be required to write down all or a portion of such goodwill, which could result in a material non-cash charge to our results of operations in the period in which such write-down occurs.

If we are unable to successfully address one or more of these risks, our business, operating results, financial condition and cash flows could be materially and adversely affected.

We may not be able to effectively manage our operations.

As of December 31, 2019, we had 809 employees in our international operations, representing approximately 69% of our worldwide workforce. In recent years, we have expanded our international operations significantly. For example, upon the closing of our acquisition of TVN on February 29, 2016, we added 438 employees, most of whom were based in France. Our ability to manage our business effectively in the future, including with respect to any future growth, our operation as both a hardware and increasingly software- and SaaS-centric business, the integration of any acquisition efforts such as our recent acquisition of TVN, and the breadth of our international operations, will require us to train, motivate and manage our employees successfully, to attract and integrate new employees into our overall operations, to retain key employees and to continue to improve and evolve our operational, financial and management systems. There can be no assurance that we will be successful in any of these efforts, and our failure to effectively manage our operations could have a material and adverse effect on our business, operating results, cash flows and financial condition.

We face risks associated with having outsourced engineering resources located in Ukraine.

We outsource a portion of our research and development activities for both our Video and Cable Access business segments to a third-party partner with engineering resources located in Ukraine. Political, social and economic instability and unrest or violence in Ukraine, including the ongoing conflict with Russian-backed separatists or conflict with the Russian Federation directly, could cause disruptions to the business and operations of our outsourcing partner, which could slow or delay the development work our partner is undertaking for us. Instability, unrest or conflict could limit or prevent our employees from traveling to, from, or within Ukraine to direct and coordinate our outsourced engineering teams, or cause us to shift all or portions of the development work occurring in Ukraine to other locations or countries. The resulting delays could negatively impact our product development efforts, operating results and our business.

In order to manage our growth, we must be successful in addressing management succession issues and attracting and retaining qualified personnel.

Our future success will depend, to a significant extent, on the ability of our management to operate effectively, both individually and as a group. We must successfully manage transition and replacement issues that may result from the departure or retirement of members of our executive management. We cannot provide assurances that changes of management personnel in the future would not cause disruption to operations or customer relationships or a decline in our operating results.

We are also dependent on our ability to retain and motivate our existing highly qualified personnel, in addition to attracting new highly qualified personnel. Competition for qualified management, technical and other personnel is often intense, particularly in Silicon Valley, Israel and Hong Kong where we have significant research and development activities, and we may not be successful in attracting and retaining such personnel. Competitors and others have in the past attempted, and are likely in the future to attempt, to recruit our employees. While our employees are required to sign standard agreements concerning confidentiality, non-solicitation and ownership of inventions, we generally do not have non-competition agreements with our personnel. The loss of the services of any of our key personnel, the inability to attract or retain highly qualified personnel in the future or delays in hiring such personnel, particularly senior management and engineers and other technical personnel, could negatively affect our business and operating results. Furthermore, a certain portion of our personnel in the U.S. is comprised of foreign nationals whose ability to work for us depends on obtaining the necessary visas. Our ability to hire and retain foreign nationals in the U.S., and their ability to remain and work in the U.S., is affected by various laws and regulations, including limitations on the availability of visas. Changes in U.S. laws or regulations affecting the availability of visas may adversely affect our ability to hire or retain key personnel and as a result may impair our operations.

We face risks associated with having facilities and employees located in Israel.

As of December 31, 2019, we maintained facilities in Israel with a total of 182 employees, or approximately 16% of our worldwide workforce. Our employees in Israel engage in a number of activities, for both our Video and Cable Access business segments, including research and development, product development, product management, supply chain management for certain product lines and sales activities.

As such, we are directly affected by the political, economic and military conditions affecting Israel. Any significant conflict involving Israel could have a direct effect on our business or that of our Israeli contract manufacturers, in the form of physical damage or injury, restrictions from traveling or reluctance to travel to from or within Israel by our Israeli and other employees or those of our subcontractors, or the loss of Israeli employees to active military duty. Most of our employees in Israel are currently obligated to perform annual reserve duty in the Israel Defense Forces, and approximately 9% of those employees were called for active military duty in 2019. In the event that more of our employees are called to active duty, certain of our research and development activities may be significantly delayed and adversely affected. Further, the interruption or curtailment of trade between Israel and its trading partners, as a result of terrorist attacks or hostilities, conflicts between Israel and any other Middle Eastern country or organization, or any other cause, could significantly harm our business. Additionally, current or future tensions or conflicts in the Middle East could materially and adversely affect our business, operating results, financial condition and cash flows.

Our operating results are likely to fluctuate significantly and, as a result, may fail to meet or exceed the expectations of securities analysts or investors, causing our stock price to decline.

Our operating results have fluctuated in the past and are likely to continue to fluctuate in the future, on an annual and a quarterly basis, as a result of several factors, many of which are outside of our control. Some of the factors that may cause these fluctuations include:

- the level and timing of spending of our customers in the U.S., Europe and in other markets;

- economic and financial conditions specific to each of the cable, satellite and telco, and broadcast and media industries, as well as general economic and financial market conditions, including any stemming from an unstable political environment in the United States or abroad as well as those resulting from regulatory, trade or tax policy changes from the Tax Cuts and Jobs Act that was enacted in December 2017 (the “Tax Act”);

- changes in market acceptance of and demand for our products or our customers’ services or products;

- the timing and amount of orders, especially from large individual transactions and transactions with our significant customers;

- the mix of our products sold and the effect it has on gross margins;

- the timing of revenue recognition, including revenue recognition on sales arrangements and from transactions with significant service and support components, which may span several quarters;

- our transition to a SaaS subscription model for our Video business, which may cause near-term declines in revenue;

- the timing of completion of our customers’ projects;

- the length of each customer product upgrade cycle and the volume of purchases during the cycle;

- competitive market conditions, including pricing actions by our competitors;

- the level and mix of our domestic and international revenue;

- new product introductions by our competitors or by us;

- uncertainty in both the U.K. and the European Union due to the U.K.’s exit from the European Union and the impact of the U.K.’s transitional period following this exit, which could adversely affect our results, financial condition and prospects;

- changes in domestic and international regulatory environments affecting our business;

- the evaluation of new services, new standards and system architectures by our customers;

- the cost and timely availability to us of components, subassemblies and modules;

- the mix of our customer base, by industry and size, and sales channels;

- changes in our operating and extraordinary expenses;

- the timing of acquisitions and dispositions by us and the financial impact of such transactions;

- impairment of our goodwill and intangibles;
- the impact of litigation, such as related litigation expenses and settlement costs;
- write-downs of inventory and investments;
- changes in our effective federal tax rate, including as a result of changes in our valuation allowance against our deferred tax assets, and changes in our effective state tax rates, including as a result of apportionment;
- changes to tax rules related to the deferral of foreign earnings and compliance with foreign tax rules;
- the impact of applicable accounting guidance on accounting for uncertainty in income taxes that requires us to establish reserves for uncertain tax positions and accrue potential tax penalties and interest; and
- the impact of applicable accounting guidance on business combinations that requires us to record charges for certain acquisition related costs and expenses and generally to expense restructuring costs associated with a business combination subsequent to the acquisition date.

The timing of deployment of our products by our customers can be subject to a number of other risks, including the availability of skilled engineering and technical personnel, the availability of third-party equipment and services, our customers' ability to negotiate and enter into rights agreements with video content owners that provide our customers with the right to deliver certain video content, and our customers' need for local franchise and licensing approvals.

We often recognize a substantial portion of our quarterly revenue in the last month of the quarter. We establish our expenditure levels for product development and other operating expenses based on projected revenue levels for a specified period, and expenses are relatively fixed in the short term. Accordingly, even small variations in the timing of revenue, particularly from relatively large individual transactions, can cause significant fluctuations in operating results in a particular quarter.

As a result of these factors and other factors, our operating results in one or more future periods may fail to meet or exceed the expectations of securities analysts or investors. In that event, the trading price of our common stock would likely decline.

Fluctuations in our future effective tax rates could affect our future operating results, financial condition and cash flows.

We are required to periodically review our deferred tax assets and determine whether, based on available evidence, a valuation allowance is necessary. The realization of our deferred tax assets, which are predominantly in the United States, is dependent upon the generation of sufficient U.S. and foreign taxable income in the future to offset these assets. Based on our evaluation, a history of operating losses in recent years has led to uncertainty with respect to our ability to realize certain of our net deferred tax assets, and as a result we recorded a net increase in valuation allowance of $23.9 million and $0.9 million in 2019 and 2018, respectively, against the net deferred tax assets. The increases in valuation allowance in 2019 and 2018 were offset partially by the valuation allowance release of $5.6 million and $1.5 million, respectively. The releases of valuation allowance were associated with its Israel subsidiary due to a reduced tax rate as a result of a local tax authority ruling.

The calculation of tax liabilities involves dealing with uncertainties in the application of complex global tax regulations. We recognize potential liabilities for anticipated tax audit issues in the United States and other tax jurisdictions based on our estimate of whether, and the extent to which, additional taxes will be due. In the event we determine that it is appropriate to create a reserve or increase an existing reserve for any such potential liabilities, the amount of the additional reserve will be charged as an expense in the period in which it is determined. If payment of these amounts ultimately proves to be unnecessary, the reversal of the liabilities would result in tax benefits being recognized in the period when we determine the liabilities are no longer necessary. If the estimate of tax liabilities proves to be less than the ultimate tax assessment for the applicable period, a further charge to expense in the period such shortfall is determined would result. Either such charge to expense could have a material and adverse effect on our operating results for the applicable period.

Our future effective income tax rates could be adversely affected if tax authorities challenge our international tax structure or if the relative mix of U.S. and international income changes for any reason. Accordingly, there can be no assurance that our income tax rate will be less than the U.S. federal statutory rate in future periods.

We are subject to taxation related risks in multiple jurisdictions.

We are a U.S.-based multinational company subject to tax in multiple U.S. and foreign tax jurisdictions. Significant judgment is required in determining our global provision for income taxes, deferred tax assets or liabilities and in evaluating our tax positions on a worldwide basis. While we believe our tax positions are consistent with the tax laws in the jurisdictions in which we conduct our business, it is possible that these positions may be contested or overturned by jurisdictional tax authorities, which may have a significant impact on our global provision for income taxes.

Tax laws are dynamic and subject to change as new laws are passed and new interpretations of the law are issued or applied. The U.S. recently enacted significant tax reform, and certain provisions of the new law may adversely affect us. In addition, governmental tax authorities are increasingly scrutinizing the tax positions of companies. Many countries in Europe, as well as a number of other countries and organizations such as the Organization for Economic Cooperation and Development, are actively considering changes to existing tax laws that, if enacted, could increase our tax obligations in countries where we do business. If U.S. or other foreign tax authorities change applicable tax laws, our overall taxes could increase, and our business, financial condition or results of operations may be adversely impacted.

We or our customers may face intellectual property infringement claims from third parties.

Our industry is characterized by the existence of a large number of patents and frequent claims and related litigation regarding patent and other intellectual property rights. In particular, leading companies in the telecommunications industry have extensive patent portfolios. Also, patent infringement claims and litigation by entities that purchase or control patents, but do not produce goods or services covered by the claims of such patents (so-called "non-practicing entities" or "NPEs"), have increased rapidly over the last decade or so. From time to time, third parties, including NPEs, have asserted, and may assert in the future, patent, copyright, trademark and other intellectual property rights against us or our customers. Our suppliers and their customers, including us, may have similar claims asserted against them. A number of third parties, including companies with greater financial and other resources than us, have asserted patent rights to technologies that are important to us.

Any intellectual property litigation, regardless of its outcome, could result in substantial expense and significant diversion of the efforts of our management and technical personnel. An adverse determination in any such proceeding could subject us to significant liabilities and temporary or permanent injunctions and require us to seek licenses from third parties or pay royalties that may be substantial. Furthermore, necessary licenses may not be available on terms satisfactory to us, or at all. An unfavorable outcome on any such litigation matter could require that we pay substantial damages, could require that we pay ongoing royalty payments, or could prohibit us from selling certain of our products. Any such outcome could have a material and adverse effect on our business, operating results, financial condition and cash flows.

Our suppliers and customers may have intellectual property claims relating to our products asserted against them. We have agreed to indemnify some of our suppliers and most of our customers for patent infringement relating to our products. The scope of this indemnity varies, but, in some instances, includes indemnification for damages and expenses (including reasonable attorney's fees) incurred by the supplier or customer in connection with such claims. If a supplier or a customer seeks to enforce a claim for indemnification against us, we could incur significant costs defending such claim, the underlying claim or both. An adverse determination in either such proceeding could subject us to significant liabilities and have a material and adverse effect on our operating results, cash flows and financial condition.

We may be the subject of litigation which, if adversely determined, could harm our business and operating results.

We may be subject to claims arising in the normal course of business. The costs of defending any litigation, whether in cash expenses or in management time, could harm our business and materially and adversely affect our operating results and cash flows. An unfavorable outcome on any litigation matter could require that we pay substantial damages, or, in connection with any intellectual property infringement claims, could require that we pay ongoing royalty payments or prohibit us from selling certain of our products. In addition, we may decide to settle any litigation, which could cause us to incur significant settlement costs. A settlement or an unfavorable outcome on any litigation matter could have a material and adverse effect on our business, operating results, financial condition and cash flows.

We may sell one or more of our product lines, from time to time, as a result of our evaluation of our products and markets, and any such divestiture could adversely affect our continuing business and our expenses, revenues, results of operation, cash flows and financial position.

We periodically evaluate our various product lines and may, as a result, consider the divestiture of one or more of those product lines. We have sold product lines in the past, and any prior or future divestiture could adversely affect our continuing business and expenses, revenues, results of operations, cash flows and financial position.

Divestitures of product lines have inherent risks, including the expense of selling the product line, the possibility that any anticipated sale will not occur, delays in closing any sale, the risk of lower-than-expected proceeds from the sale of the divested business, unexpected costs associated with the separation of the business to be sold from the seller's information technology and other operating systems, and potential post-closing claims for indemnification or breach of transition services obligations of the seller. Expected cost savings, which are offset by revenue losses from divested businesses, may also be difficult to achieve or maximize due to the seller's fixed cost structure, and a seller may experience varying success in reducing fixed costs or transferring liabilities previously associated with the divested business.

Our failure to adequately protect our proprietary rights and data may adversely affect us.

At December 31, 2019, we held 93 issued U.S. patents and 57 issued foreign patents, and had 70 patent applications pending. Although we attempt to protect our intellectual property rights through patents, trademarks, copyrights, licensing arrangements, maintaining certain technology as trade secrets and other measures, we can give no assurances that any patent, trademark, copyright or other intellectual property rights owned by us will not be invalidated, circumvented or challenged, that such intellectual property rights will provide competitive advantages to us, or that any of our pending or future patent applications will be issued with the scope of the claims sought by us, if at all. We can give no assurances that others will not develop technologies that are similar or superior to our technologies, duplicate our technologies or design around the patents that we own. In addition, effective patent, copyright and trade secret protection may be unavailable or limited in certain foreign countries in which we do business or may do business in the future.

We may enter into confidentiality or license agreements with our employees, consultants, and vendors and our customers, as needed, and generally limit access to, and distribution of, our proprietary information. Nevertheless, we cannot provide assurances that the steps taken by us will prevent misappropriation of our technology. In addition, we have taken in the past, and may take in the future, legal action to enforce our patents and other intellectual property rights, to protect our trade secrets, to determine the validity and scope of the proprietary rights of others, or to defend against claims of infringement or invalidity. Such litigation could result in substantial costs and diversion of management time and other resources, and could materially and adversely affect our business, operating results, financial condition and cash flows.

Our products include third-party technology and intellectual property, and our inability to acquire new technologies or use third-party technology in the future could harm our business.

In order to successfully develop and market certain of our planned products, we may be required to enter into technology development or licensing agreements with third parties. Although companies with technology useful to us are often willing to enter into technology development or licensing agreements with respect to such technology, we cannot provide assurances that such agreements may be negotiated on commercially reasonable terms, or at all. The failure to enter, or a delay in entering, into such technology development or licensing agreements, when necessary or desirable, could limit our ability to develop and market new products and could materially and adversely affect our business.

We incorporate certain third-party technologies, including software programs, into our products, and, as noted, intend to utilize additional third-party technologies in the future. In addition, the technologies that we license may not operate properly or as specified, and we may not be able to secure alternatives in a timely manner, either of which could harm our business. We could face delays in product releases until alternative technology can be identified, licensed or developed, and integrated into our products, if we are able to do so at all. These delays, or a failure to secure or develop adequate technology, could materially and adversely affect our business, operating results, financial condition and cash flows.

Our use of open source software in some of our products may expose us to certain risks.

Some of our products contain software modules licensed for use from third-party authors under open source licenses. Use and distribution of open source software may entail greater risks than use of third-party commercial software, as open source licensors generally do not provide warranties or other contractual protections regarding infringement claims or the quality of the code. Some open source licenses contain requirements that we make available source code for modifications or derivative works we create based upon the type of open source software we use. If we combine our proprietary software with open source software in a certain manner, we could, under certain of the open source licenses, be required to release the source code of our proprietary software to the public. This could allow our competitors to create similar products with lower development effort and in less time and ultimately could result in a loss of product sales for us.

Although we monitor our use of open source closely, it is possible our past, present or future use of open source has triggered or may trigger the foregoing requirements. Furthermore, the terms of many open source licenses have not been interpreted by U.S. courts, and there is a risk that such licenses could be construed in a manner that could impose unanticipated conditions or restrictions on our ability to commercialize our products. In such event, we could be required to seek licenses from third parties in order to continue offering our products, to re-engineer our products or to discontinue the sale of our products in the event re-engineering cannot be accomplished on a timely basis, any of which could materially and adversely affect our operating results, financial condition and cash flows.

We are subject to import and export control and trade and economic sanction laws and regulations that could subject us to liability or impair our ability to compete in international markets.

Our products are subject to U.S. export control laws, and may be exported outside the U.S. only with the required export license or through an export license exception, in most cases because we incorporate encryption technology into certain of our products. We are also subject to U.S. trade and economic sanction regulations which include prohibitions on the sale or supply of certain products and services to U.S. embargoed or sanctioned countries, governments, persons and entities. In addition, various countries regulate the import of certain technology and have enacted laws that could limit our ability to distribute our products, or could limit our customers' ability to implement our products, in those countries. Although we take precautions and have processes in place to prevent our products and services from being provided in violation of such laws, our products may have been in the past, and could in the future be, provided inadvertently in violation of such laws, despite the precautions we take. If we fail to comply with these laws, we and certain of our employees could be subject to civil or criminal penalties, including the possible loss of export privileges, monetary penalties, and, in extreme cases, imprisonment of responsible employees for knowing and willful violations of these laws. Additionally, our business and operating results be adversely affected through penalties, reputational harm, loss of access to certain markets, or otherwise.

In addition, we may be subject to customs duties that could have a significant adverse impact on our operating results or, if we are able to pass on the related costs in any particular situation, would increase the cost of the related product to our customers. As a result, the future imposition of significant increases in the level of customs duties or the creation of import quotas on our products in Europe or in other jurisdictions, or any of the limitations on international sales described above, could have a material adverse effect on our business, operating results, financial condition and cash flows. Further, some of our customers in Europe have been, or are being, audited by local governmental authorities regarding the tariff classifications used for importation of our products. Import duties and tariffs vary by country and a different tariff classification for any of our products may result in higher duties or tariffs, which could have an adverse impact on our operating results and potentially increase the cost of the related products to our customers.

We may need additional capital in the future and may not be able to secure adequate funds at all or on terms acceptable to us.

We engage in the design, development and manufacture and sale of a variety of video and cable access products and system solutions, which has required, and will continue to require, significant research and development expenditures.

We believe that our existing cash of approximately $93.1 million at December 31, 2019 will satisfy our cash requirements for at least the next 12 months. However, we may need to raise additional funds to take advantage of presently unanticipated strategic opportunities, satisfy our other cash requirements from time to time, or strengthen our financial position. Our ability to raise funds may be adversely affected by a number of factors, including factors beyond our control, such as weakness in the economic conditions in markets in which we sell our products and continued uncertainty in financial, capital and credit markets. There can be no assurance that equity or debt financing will be available to us on reasonable terms, if at all, when and if it is needed.

We may raise additional financing through public or private equity offerings, debt financings, or corporate partnership or licensing arrangements. To the extent we raise additional capital by issuing equity securities or convertible debt, our stockholders may experience dilution. To the extent that we raise additional funds through collaboration and licensing arrangements, it may be necessary to relinquish some rights to our technologies or products, or grant licenses on terms that are not favorable to us. To the extent we raise capital through debt financing arrangements, we may be required to pledge assets or enter into covenants that could restrict our operations or our ability to incur further indebtedness and the interest on such debt may adversely affect our operating results.

If adequate capital is not available, or is not available on reasonable terms, when needed, we may not be able to take advantage of acquisition or other market opportunities, to timely develop new products, or to otherwise respond to competitive pressures.

Cybersecurity incidents, including data security breaches or computer viruses, could harm our business by disrupting our business operations, compromising our products and services, damaging our reputation or exposing us to liability.

Cyber criminals and hackers may attempt to penetrate our network security, misappropriate our proprietary information or cause business interruptions. Because the techniques used by such computer programmers to access or sabotage networks change frequently and may not be recognized until launched against a target, we may be unable to anticipate these techniques or to implement adequate preventative measures. In the past, we have faced compromises to our network security. While we have invested in and continue to update our network security and cybersecurity infrastructure and systems, if our cybersecurity systems fail to protect against unauthorized access, sophisticated cyber-attacks, phishing schemes, data protection breaches, computer viruses, denial-of-service attacks and similar disruptions from unauthorized tampering or human error, our ability to conduct our business effectively could be damaged in a number of ways, including:

• our intellectual property and other proprietary data, or financial assets, could be stolen;

• our ability to manage and conduct our business operations could be seriously disrupted;

• defects and security vulnerabilities could be introduced into our product, software and SaaS offerings, thereby damaging the reputation and perceived reliability and security of our products; and

• personally identifiable data of our customers, employees and business partners could be compromised.

Should any of the above events occur, our reputation, competitive position and business could be significantly harmed, and we could be subject to claims for liability from customers, third parties and governmental authorities. Additionally, we could incur significant costs in order to upgrade our cybersecurity systems and remediate damages. Consequently, our business, operating results, financial condition and cash flows could be materially and adversely affected. In addition, our business operations utilize and rely upon numerous third-party vendors, manufacturers, solution providers, partners and consultants, and any failure of such third parties’ cybersecurity measures could materially and adversely affect or disrupt our business.

Our operating results could be adversely affected by natural disasters affecting us or impacting our third-party manufacturers, suppliers, resellers or customers.

Our corporate headquarters is located in California, which is prone to earthquakes. In addition, global warming trends are contributing to an increase in erratic weather patterns globally and intensifying the impact of certain types of catastrophes, such as floods and wildfires. We have employees, consultants and contractors located in regions and countries around the world. In the event that any of our business, sales or research and development centers or offices in the U.S. or internationally are adversely affected by an earthquake, flood, wildfire or by any other natural disaster, we may sustain damage to our operations and properties, which could cause a sustained interruption or loss of affected operations, and cause us to suffer significant financial losses.

We rely on third-party contract manufacturers for the production of our products. Any significant disruption in the business or operations of such manufacturers or of their or our suppliers could adversely impact our business. Our principal contract manufacturers and several of their and our suppliers and our resellers have operations in locations that are subject to natural disasters, such as severe weather, tsunamis, floods, fires and earthquakes, which could disrupt their operations and, in turn, our operations.

In addition, if there is a natural disaster in any of the locations in which our significant customers are located, we face the risk that our customers may incur losses or sustained business interruption, or both, which may materially impair their ability to continue their purchase of products from us. Accordingly, natural disaster in one of the geographies in which we, or our third-party manufacturers, their or our suppliers or our customers, operate could have a material and adverse effect on our business, operating results, cash flows and financial condition.

Our business and industry are subject to various laws and regulations that could adversely affect our business, operating results, cash flows and financial condition.

Our business and industry are regulated under various federal, state, local and international laws. For example, we are subject to environmental regulations such as the European Union’s Waste Electrical and Electronic Equipment (WEEE) and Restriction on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directives and similar legislation enacted in other jurisdictions worldwide. Our failure to comply with these laws could result in our being directly or indirectly liable for costs, fines or penalties and third-party claims, and could jeopardize our ability to conduct business in such regions and countries. We expect that our operations will be affected by other new environmental laws and regulations on an ongoing basis. Although we cannot predict the ultimate impact of any such new laws and regulations, they would likely result in additional costs, and could require that we redesign or change how we manufacture our products, any of which could have a material and adverse effect on our operating results, financial condition and cash flows.

We are subject to the Sarbanes-Oxley Act of 2002 which, among other things, requires an annual review and evaluation of our internal control over financial reporting. If we conclude in future periods that our internal control over financial reporting is not effective or if our independent registered public accounting firm is unable to provide an unqualified attestation as of future year-ends, we may incur substantial additional costs in an effort to correct such problems, and investors may lose confidence in our financial statements, and our stock price may decrease in the short term, until we correct such problems, and perhaps in the long term, as well.

We are subject to requirements under the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 that require us to conduct research, disclose, and report whether or not our products contain certain conflict minerals sourced from the Democratic Republic of Congo or its surrounding countries. The implementation of these requirements could adversely affect the sourcing, availability, and pricing of the materials used in the manufacture of components used in our products. In addition, we may incur certain additional costs to comply with the disclosure requirements, including costs related to conducting diligence procedures to determine the sources of conflict minerals that may be used or necessary to the production of our products and, if applicable, potential changes to products, processes or sources of supply as a consequence of such verification activities. It is also possible that we may face reputational harm if we determine that certain of our products contain minerals not determined to be conflict-free and/or we are unable to alter our products, processes or sources of supply to avoid such materials.

Changes in telecommunications legislation and regulations in the U.S. and other countries could affect our sales and the revenue we are able to derive from our products. In particular, on December 14, 2017, the U.S. Federal Communications Commission (FCC) voted to repeal the “net neutrality” rules and return to a “light-touch” regulatory framework. The FCC’s new rules, which took effect in June 2018, granted providers of broadband internet access services greater freedom to make changes to their services, including, potentially, changes that may discriminate against or otherwise harm our business. However, a number of parties have appealed these rules, which appeals are currently being reviewed by the D.C. Circuit Court of Appeals; thus the future impact of the FCC's repeal and any changes thereto remains uncertain. Additionally, on September 30, 2018, California enacted the California Internet Consumer Protection and Net Neutrality Act of 2018, making California the fourth state to enact a state-level net neutrality law since the FCC repealed its nationwide regulations, mandating that all broadband services in California must be provided in accordance with state net neutrality requirements. The U.S. Department of Justice has sued to block the law going into effect, and California has agreed to delay enforcement until the resolution of the FCC’s repeal of the federal rules. A number of other states are considering legislation or executive actions that would regulate the conduct of broadband providers. We cannot predict whether the FCC order or state initiatives will be modified, overturned, or vacated by legal action of the court, federal legislation, or the FCC. The repeal of the net neutrality rules or other regulations dealing with access by competitors to the networks of incumbent operators could slow or stop infrastructure and services investments or expansion by service providers. Increased regulation of our customers’ pricing or service offerings could limit their investments and, consequently, revenue from our products. The impact of new or revised legislation or regulations could have a material adverse effect on our business, operating results, financial condition and cash flows.

Some anti-takeover provisions contained in our certificate of incorporation and bylaws, as well as provisions of Delaware law, could impair a takeover attempt.

We have provisions in our certificate of incorporation and bylaws that could have the effect of rendering more difficult or discouraging an acquisition deemed undesirable by our Board. These include provisions:

- authorizing blank check preferred stock, which could be issued with voting, liquidation, dividend and other rights superior to our common stock;

- limiting the liability of, and providing indemnification to, our directors and officers;

- limiting the ability of our stockholders to call, and bring business before, special meetings;

- requiring advance notice of stockholder proposals for business to be conducted at meetings of our stockholders and for nominations of candidates for election to our Board;

- controlling the procedures for conducting and scheduling of Board and stockholder meetings; and

- providing our Board with the express power to postpone previously scheduled annual meetings and to cancel previously scheduled special meetings.

These provisions could delay hostile takeovers, changes in control of the Company or changes in our management. As a Delaware corporation, we are also subject to provisions of Delaware law, including Section 203 of the Delaware General Corporation law, which prevents some stockholders holding more than 15% of our outstanding common stock from engaging in certain business combinations without approval of the holders of substantially all of our outstanding common stock. Any provision of our certificate of incorporation or bylaws or Delaware law that has the effect of delaying or deterring a change in control could limit the opportunity for our stockholders to receive a premium for their shares of our common stock, and could also affect the price that some investors are willing to pay for our common stock.

The nature of our business requires the application of complex revenue and expense recognition rules and the current legislative and regulatory environment affecting generally accepted accounting principles is uncertain. Significant changes in current principles could affect our financial statements going forward and changes in financial accounting standards or practices may cause adverse, unexpected financial reporting fluctuations and harm our operating results.

United States generally accepted accounting principles (“U.S. GAAP”) are subject to interpretation by the FASB, the SEC and various bodies formed to promulgate and interpret appropriate accounting principles. We are also subject to evolving rules and regulations of the countries in which we do business. Changes to accounting standards or interpretations thereof may result in different accounting principles under U.S. GAAP that have a significant effect on our reported financial results and require us to incur costs and expenses in order to comply with the updated standards or interpretations.

In addition, we have in the past and may in the future need to modify our customer contracts, accounting systems and processes when we adopt future or proposed changes in accounting principles. The cost and effect of these changes may negatively impact our results of operations during the periods of transition.

We have implemented a new enterprise resource planning system, and if this new system proves ineffective, we may be unable to timely or accurately prepare financial reports, make payments to our suppliers and employees, or invoice and collect from our users.

We have implemented a new enterprise resource planning (ERP) system. Our ERP system is critical to our ability to accurately maintain books and records and to prepare our financial statements. If the ERP system does not work as planned, our ability to timely or accurately make payments to our suppliers and employees, and our ability to invoice, and collect from our customers could be harmed. Data integrity problems or other issues may be discovered which, if not corrected, could impact our business or financial results. In addition, we may experience periodic or prolonged disruption of our financial functions arising out of our reliance on our ERP system, periodic upgrades or updates, or other external factors that are outside of our control. If we encounter unforeseen problems with our ERP system or other related systems and infrastructure, it could adversely affect our financial reporting systems and our ability to produce financial reports, the effectiveness of internal controls over financial reporting, and our business, operating results and financial condition could be adversely affected.

Servicing our debt requires a significant amount of cash, and we may not have sufficient cash flow from our business to pay our substantial debt.

Our ability to make scheduled payments of the principal of, to pay interest on or to refinance our indebtedness, including the 2020 Notes and the 2024 Notes (together, the “Notes”), or to make cash payments in connection with any conversion of the Notes, depends on our future performance, which is subject to economic, financial, competitive and other factors beyond our control. Our business may not continue to generate cash flow from operations in the future sufficient to service our debt and make necessary capital expenditures. If we are unable to generate such cash flow, we may be required to adopt one or more alternatives, such as selling assets, restructuring debt or obtaining additional equity capital on terms that may be onerous or highly dilutive. Our ability to refinance our indebtedness, including the Notes will depend on the capital markets and our financial condition at such time. We may not be able to engage in any of these activities or engage in these activities on desirable terms, which could result in a default on our debt obligations, including the Notes.

Despite our current debt levels, we may still incur substantially more debt or take other actions which would intensify the risks discussed above.

Despite our current consolidated debt levels, we and our subsidiaries may be able to incur substantial additional debt in the future, subject to the restrictions contained in our debt instruments, some of which may be secured debt. We are not restricted under the terms of each indenture governing our Notes from incurring additional debt, securing existing or future debt, recapitalizing our debt or taking a number of other actions that are not limited by the terms of the indenture governing the notes that could have the effect of diminishing our ability to make payments on our debt (including the Notes) when due. In addition, the Credit Agreement we entered into with with JPMorgan Chase Bank, N.A., as lender, and Harmonic International GmbH, as co-borrower, on December 19, 2019, permits us to incur certain additional indebtedness and grant certain liens on our assets that could intensify the risks discussed above.

The conditional conversion feature of the Notes, if triggered, may adversely affect our financial condition and operating results.

In the event the conditional conversion feature of the Notes is triggered, holders of Notes will be entitled under the respective indenture governing such Notes to convert the Notes at any time during specified periods at their option. If one or more holders elect to convert their Notes, unless we elect to satisfy our conversion obligation by delivering solely shares of our common stock (other than paying cash in lieu of delivering any fractional share), we would be required to settle a portion or all of our conversion obligation through the payment of cash, which could adversely affect our liquidity. In addition, even if holders do not elect to convert their series of Notes, we could be required under applicable accounting rules to reclassify all or a portion of the outstanding principal of such series of Notes as a current rather than long-term liability, which would result in a material reduction of our net working capital.

The accounting method for convertible debt securities that may be settled in cash, such as the Notes, could have a material effect on our reported financial results.

In May 2008, the Financial Accounting Standards Board ("FASB") issued FASB Staff Position No. APB 14-1, Accounting for Convertible Debt Instruments That May Be Settled in Cash upon Conversion (Including Partial Cash Settlement), which has subsequently been codified as Accounting Standards Codification 470-20, Debt with Conversion and Other Options ("ASC 470-20"), an entity must separately account for the liability and equity components of the convertible debt instruments (such as the Notes) that may be settled entirely or partially in cash upon conversion in a manner that reflects the issuer's economic interest cost. The effect of ASC 470-20 on the accounting for each series of the Notes is that the equity component is required to be included in the additional paid-in capital section of stockholders' equity on our consolidated balance sheet at the issuance date, and the value of the equity component is treated as debt discount for purposes of accounting for the debt component of each series of Notes. This requires us to record a greater amount of non-cash interest expense as a result of the amortization of the discounted carrying value of each series of Notes to their face amount over the respective terms of the Notes. We report lower net income in our financial results because ASC 470-20 requires interest to include both the amortization of the debt discount and the instrument's coupon interest rate, which could adversely affect our future financial results or the trading price of our common stock.

In addition, under certain circumstances, convertible debt instruments (such as the Notes) that may be settled entirely or partly in cash are currently accounted for utilizing the treasury stock method, the effect of which is that the shares issuable upon conversion of the Notes are not included in the calculation of diluted earnings per share except to the extent that the conversion value of the Notes exceeds their principal amount. Under the treasury stock method, for diluted earnings per share purposes, the transaction is accounted for as if the shares of common stock that would be necessary to settle such excess, if we elected to settle such excess in shares, are issued.

In July 2019, the FASB issued an exposure draft that proposes to change the accounting for the convertible debt instruments described above. Under the exposure draft, an entity may no longer be required to separately account for the liability and equity components of convertible debt instruments. This could have the impact of reducing non-cash interest expense, and thereby increasing net income. Additionally, as currently proposed, the treasury stock method for calculating earnings per share will no longer be allowed for convertible debt instruments whose principal amount may be settled using shares. Rather, the if-converted method may be required, which would decrease our diluted weighted-average earnings per share. We cannot be sure that the proposed changes in this exposure draft will be adopted, or will be adopted in their current form. We also cannot be sure whether other changes may be made to the current accounting standards related to the Notes, or otherwise, that could have an adverse impact on our financial statements.

Our common stock price may be extremely volatile, and the value of an investment in our stock may decline.

Our common stock price has been highly volatile. We expect that this volatility will continue in the future due to factors such as:

- general market and economic conditions;

- actual or anticipated variations in operating results;
- increases or decreases in the general stock market or to the stock prices of technology companies;
- announcements of technological innovations, new products or new services by us or by our competitors or customers;
- changes in financial estimates or recommendations by stock market analysts regarding us or our competitors;
- announcements by us or our competitors of significant acquisitions, dispositions, strategic partnerships, joint ventures or capital commitments;
- announcements by our customers regarding end user market conditions and the status of existing and future infrastructure network deployments;
- additions or departures of key personnel; and
- future equity or debt offerings or our announcements of these offerings.

In addition, in recent years, the stock market in general, and The NASDAQ Global Select Market and the securities of technology companies in particular, have experienced extreme price and volume fluctuations. These fluctuations have often been unrelated or disproportionate to the operating performance of individual companies. These broad market fluctuations have in the past, and may in the future, materially and adversely affect our stock price, regardless of our operating results. In these circumstances, investors may be unable to sell their shares of our common stock at or above their purchase price over the short term, or at all.

Our stock price may decline if additional shares are sold in the market or if analysts drop coverage of or downgrade our stock.

Future sales of substantial amounts of shares of our common stock by our existing stockholders in the public market, or the perception that these sales could occur, may cause the market price of our common stock to decline. In addition, we issue additional shares upon exercise of stock options, including under our 2002 Employee Stock Purchase Plan (“ESPP”), and in connection with grants of restricted stock units (“RSUs”) on an ongoing basis. To the extent we do not elect to pay solely cash upon conversion of our Notes, we will also be required to issue additional shares of common stock upon conversion. Increased sales of our common stock in the market after exercise of outstanding stock options or grants of restricted stock units could exert downward pressure on our stock price. These sales also might make it more difficult for us to sell equity or equity-related securities in the future at a time and price we deem appropriate.

The trading market for our common stock relies in part on the availability of research and reports that third-party industry or securities analysts publish about us and our business. If we do not maintain adequate research coverage or if one or more of the analysts who do cover us downgrade our stock or publishes inaccurate or unfavorable research about our business, our stock price may decline. If one or more of these analysts cease coverage of us or fails to publish reports on us regularly, we could lose visibility in the market, which in turn could cause the liquidity of our stock and our stock price to decline.

Item 1B. *UNRESOLVED STAFF COMMENTS*

None.

Item 2. *PROPERTIES*

All of our facilities are leased, including our principal operations and corporate headquarters in San Jose, California. We have research and development centers in the United States, France, Israel and Hong Kong. We have sales and service offices primarily in the U.S. and various locations in Europe and Asia. Our leases, which expire at various dates through March 2030, are for an aggregate of approximately 456,000 square feet of space (this excludes 49,000 square feet of space that is vacant and available for sublease). Our current San Jose lease, which expires in April 2020, is for approximately 143,000 square feet of such space and our new San Jose office lease, for approximately 65,000 square feet, will be occupied in May 2020. We have two business segments: Video and Cable Access. Because of the interrelation of these segments, a majority of these segments use substantially all of the properties, at least in part, and we retain the flexibility to use each of the properties in whole or in part for each of the segments. We believe that the facilities that we currently occupy are adequate for our current needs and that suitable additional space will be available, as needed, to accommodate the presently foreseeable expansion of our operations.

Item 3. *LEGAL PROCEEDINGS*

From time to time, we are involved in lawsuits as well as subject to various legal proceedings, claims, threats of litigation, and investigations in the ordinary course of business, including claims of alleged infringement of third-party patents and other intellectual property rights, commercial, employment, and other matters. While certain matters to which we are a party may specify the damages claimed, such claims may not represent reasonably possible losses. Given the inherent uncertainties of litigation, the ultimate outcome of these matters cannot be predicted at this time, nor can the amount of possible loss or range of loss, if any, be reasonably estimated.

An unfavorable outcome on any litigation matters could require us to pay substantial damages, or, in connection with any intellectual property infringement claims, could require us to pay ongoing royalty payments or could prevent us from selling certain of our products. As a result, a settlement of, or an unfavorable outcome on, any of the matters referenced above or other litigation matters could have a material adverse effect on our business, operating results, financial position and cash flows. See Note 20, “Legal Proceedings,” of the Notes to our Consolidated Financial Statements for additional information on our Avid litigation settlement.

Our industry is characterized by the existence of a large number of patents and frequent claims and related litigation regarding patent and other intellectual property rights. From time to time, third parties have asserted, and may in the future assert, exclusive patent, copyright, trademark and other intellectual property rights against us or our customers. Such assertions arise in the normal course of our operations. The resolution of any such assertions and claims cannot be predicted with certainty.

Item 4. *MINE SAFETY DISCLOSURE*

Not applicable.

PART II

Item 5. *MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES*

Market Information of our Common Stock

Our common stock is traded on The NASDAQ Global Select Market under the symbol HLIT, and has been listed on NASDAQ since our initial public offering in 1995.

Holders

As of February 25, 2020 there were approximately 327 holders of record of our common stock.

Dividend Policy

We have never declared or paid any dividends on our capital stock. At this time, we expect to retain future earnings, if any, for use in the operation and expansion of our business and do not anticipate paying any cash dividends in the foreseeable future.

Unregistered Sales of Equity Securities

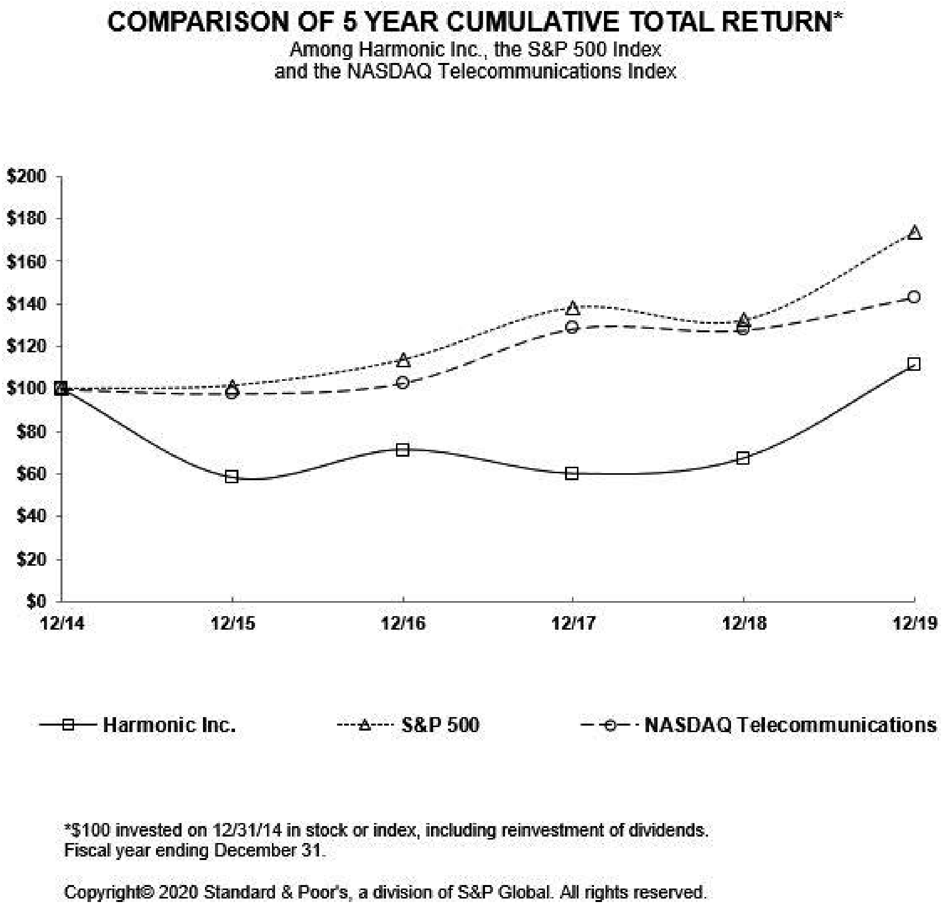
There were no unregistered sales of equity securities during the year ended December 31, 2019.

Issuer Purchases of Equity Securities

None.

Stock Performance Graph

Set forth below is a line graph comparing the annual percentage change in the cumulative return to the stockholders of our common stock with the cumulative return of The NASDAQ Telecommunications Index and of the Standard & Poor’s (S&P) 500 Index for the period commencing December 31, 2014 and ending on December 31, 2019. The graph assumes that $100 was invested in each of the Company’s common stock, the S&P 500 and The NASDAQ Telecommunications Index on December 31, 2014, and assumes the reinvestment of dividends, if any. The comparisons shown in the graph below are based upon historical data. Harmonic cautions that the stock price performance shown in the graph below is not indicative of, nor intended to forecast, the potential future performance of the Company’s common stock.



	12/14	12/15	12/16	12/17	12/18	12/19
Harmonic Inc.	100.00	58.06	71.33	59.91	67.33	111.27
S&P 500	100.00	101.38	113.51	138.29	132.23	173.86
NASDAQ Telecom	100.00	97.86	102.87	128.43	127.73	143.14

The information contained in this Stock Performance Graph section shall not be deemed to be “soliciting material”, “filed” or incorporated by reference in previous or future filings with the SEC, or subject to the liabilities of Section 18 of the Exchange Act, except to the extent that Harmonic specifically incorporates it by reference into a document filed under the Securities Act or the Exchange Act.

Item 6. *SELECTED FINANCIAL DATA*

The selected financial data set forth below as of December 31, 2019 and 2018, and for the fiscal years ended December 31, 2019, 2018 and 2017, are derived from our Consolidated Financial Statements included elsewhere in this Annual Report on Form 10-K. The selected financial data as of December 31, 2017, 2016 and 2015, and for the fiscal years ended December 31, 2016 and 2015 are derived from audited financial statements not included in this Annual Report on Form 10-K. This financial data should be read in conjunction with Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations, and the Consolidated Financial Statements and related notes included elsewhere in this Annual Report on Form 10-K. These historical results are not necessarily indicative of the results to be expected in the future.

On February 29, 2016, we completed our acquisition of TVN and applied the acquisition method of accounting for the business combination. The selected consolidated balance sheet data as of December 31, 2016 represents the consolidated statement of financial position of the combined company. The selected consolidated statement of operations data for the year ended December 31, 2016 of the combined entity includes 10 months of operating results of TVN, beginning March 1, 2016.

	Year ended December 31,				
	2019	2018	2017	2016	2015
	(In thousands, except per share amounts)				
Consolidated Statements of Operations Data					
Net revenue	$ 402,874	$ 403,558	$ 358,246	$ 405,911	$ 377,027
Cost of revenue	179,862	194,349	188,426	205,161	174,315
Gross profit	223,012	209,209	169,820	200,750	202,712
Operating expenses:					
Research and development	84,614	89,163	95,978	98,401	87,545
Selling, general and administrative	119,035	118,952	136,270	144,381	120,960
Amortization of intangibles	3,139	3,187	3,142	10,402	5,783
Restructuring and related charges	3,141	2,918	5,307	14,602	1,372
Total operating expenses	209,929	214,220	240,697	267,786	215,660
Income (loss) from operations	13,083	(5,011)	(70,877)	(67,036)	(12,948)
Interest expense, net	(11,651)	(11,401)	(11,078)	(10,628)	(333)
Loss on debt extinguishment	(5,695)	—	—	—	—
Other expense, net	(2,333)	(536)	(2,222)	(31)	(282)
Loss on impairment of long-term investments	—	—	(530)	(2,735)	(2,505)
Loss from continuing operations before income taxes	(6,596)	(16,948)	(84,707)	(80,430)	(16,068)
Provision for (benefit from) income taxes	(672)	4,087	(1,752)	(8,116)	(407)
Loss from continuing operations	$ (5,924)	$ (21,035)	$ (82,955)	$ (72,314)	$ (15,661)
Net loss per share from continuing operations:					
Basic and diluted	$ (0.07)	$ (0.25)	$ (1.02)	$ (0.93)	$ (0.18)
Shares used in per share calculations:					
Basic and diluted	89,575	85,615	80,974	77,705	87,514

	As of December 31,				
	2019	2018	2017	2016	2015
	(In thousands)				
Consolidated Balance Sheet Data					
Cash, cash equivalents and short-term investments	$ 93,058	$ 65,989	$ 57,024	$ 62,558	$ 152,794
Working capital	$ 59,463	$ 60,297	$ 29,686	$ 71,938	$ 201,250
Total assets	$ 587,327	$ 510,835	$ 508,059	$ 554,069	$ 524,957
Convertible notes, long-term	$ 88,629	$ 114,808	$ 108,748	$ 103,259	$ 98,295
Total stockholders' equity	$ 252,446	$ 228,250	$ 218,343	$ 270,641	$ 328,168

Item 7. *MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS*

The following discussion should be read in conjunction with the consolidated financial statements and the related notes. The following discussion contains forward-looking statements that reflect our plans, estimates and beliefs. Our actual results could differ materially from those discussed in the forward-looking statements. Factors that could cause or contribute to these differences include, but are not limited to, those discussed below and those listed under Item 1A, Risks Factors.

Business Overview

We are a leading global provider of (i) versatile and high performance video delivery software, products, system solutions and services that enable our customers to efficiently create, prepare, store, playout and deliver a full range of high-quality broadcast and OTT video services to consumer devices, including televisions, personal computers, laptops, tablets and smart phones and (ii) cable access solutions that enable cable operators to more efficiently and effectively deploy high-speed internet, for data, voice and video services to consumers.

We had previously classified our total revenue in two categories, "Product" and "Service". Beginning fiscal 2019, to better reflect the nature of our business and sharpen the focus on our revenue priorities, we have updated our revenue categories to "Appliance and integration" and "SaaS and service". The "Appliance and integration" revenue category includes hardware, licenses and professional services and is reflective of non-recurring revenue, while the "SaaS and service" category includes usage fees for our SaaS platform and support revenue stream from our appliance-based customers and reflects our recurring revenue stream.

We do business in three geographic regions: the Americas, EMEA and APAC and operate in two segments, Video and Cable Access. Our Video business provides video processing, production and playout solutions, and services worldwide to cable operators and satellite and telecommunications ("telco") Pay-TV service providers, which we refer to collectively as "service providers," as well as to broadcast and media companies, including streaming media companies. Our Video business infrastructure solutions are delivered either through shipment of our products, software licenses or as software-as-a-service ("SaaS") subscriptions. Our Cable Access business provides cable access solutions and related services, including our CableOS software-based cable access solution, primarily to cable operators globally.

Historically, our revenue has been dependent upon capital spending in the cable, satellite, telco, broadcast and media industries, including streaming media. Our customers' capital spending patterns are dependent on a variety of factors, including but not limited to: economic conditions in the U.S. and international markets; access to financing; annual budget cycles of each of the industries we serve; impact of industry consolidations; and customers suspending or reducing capital spending in anticipation of new products or new standards, new industry trends and/or technology shifts. If our product portfolio and product development plans do not position us well to capture an increased portion of the capital spending in the markets in which we compete, our revenue may decline. As we attempt to further diversify our customer base in these markets, we may need to continue to build alliances with other equipment manufacturers, content providers, resellers and system integrators, managed services providers and software developers; adapt our products for new applications; take orders at prices resulting in lower margins; and build internal expertise to handle the particular operational, payment, financing and/or contractual demands of our customers, which could result in higher operating costs for us.

Our Video segment customers continue to be cautious with investments in new technologies, such as next-generation IP architecture and Ultra HD. We believe a material and growing portion of the opportunities for our video business are linked to a migration by our customers to IP workflows and the distribution of linear and on-demand, OTT, and new mobile video services. We continue to steadily transition our video business away from legacy and customized computing hardware to more software-centric solutions and services, including OTT SaaS subscription offerings that enable video compression and processing through our VOS software platform running on standard off-the-shelf servers, data centers and in the cloud.

Our Cable Access strategy is to continue to deliver software-based cable access technologies, which we refer to as our CableOS solutions, to our cable operator customers. We believe our CableOS software-based cable access solutions are superior to hardware-based systems and deliver unprecedented scalability, agility and cost savings for our customers. Our CableOS solutions, which can be deployed based on a centralized, distributed Remote PHY or hybrid architecture, enable our customers to migrate to multi-gigabit broadband capacity and the fast deployment of DOCSIS 3.1 data, video and voice services. We believe our CableOS solutions resolve space and power constraints in cable operator facilities, eliminate dependence on hardware upgrade cycles and significantly reduce total cost of ownership, and will help us become a major player in the cable access market. In the meantime, we believe our Cable Access segment is gaining momentum in the marketplace as our customers have begun to adopt new virtualized DOCSIS 3.1 CMTS solutions and distributed access architectures. While we are in the early stages of field trials and deployments and may experience near-term challenges, we continue to make progress in the development of our CableOS solutions and in the growth of our CableOS business, with expanded commercial deployments, field trials, and customer engagements.

To support our Cable Access strategy and foster the further development and growth of this segment, in September 2016, we issued Comcast a Warrant to further incentivize them to purchase our products and adopt our technologies, particularly our CableOS solutions. Pursuant to the Warrant, Comcast may, subject to certain vesting provisions, purchase up to 7,816,162 shares of our common stock, for a per share exercise price of $4.76**.** On July 8, 2019, Comcast elected enterprise license pricing for the Company's CableOS software under the product supply agreement. In connection with the election, effective as of July 1, 2019 (the "Effective Date"), Comcast committed to $175 million in software license fees over the four-year term of the enterprise license, subject to certain incentive credits that may be earned by Comcast pursuant to other purchases of CableOS-related products. Comcast paid the initial $50 million of the enterprise license fees in 2019. In consideration for the election commitments and certain other purchase commitments, all of the remaining milestones and thresholds required to fulfill each of the vesting requirements of the Warrant were deemed satisfied and achieved or otherwise waived such that all Warrant shares were fully vested and exercisable as of the Effective Date. The Warrant is considered an incentive for Comcast to purchase the Company's products, and as a result the value of the Warrant is being recorded as a reduction in the Company's net revenues to the extent such value does not exceed net revenues from pertinent sales to Comcast. (See Note 17, "Warrants," of the Notes to our Consolidated Financial Statements for additional information).

A majority of our revenue has been derived from relatively few customers, due in part to the consolidation of our service provider customers. Sales to our 10 largest customers in 2019, 2018 and 2017 accounted for approximately 49%, 37% and 24% of our revenue, respectively. Although we are attempting to broaden our customer base by penetrating new markets and further expanding internationally, we expect to see continuing industry consolidation and customer concentration. During 2019 and 2018, Comcast accounted for 23% and 15% of our net revenue, respectively. During 2017, no single customer accounted for more than 10% of our net revenue. The loss of any significant customer, any material reduction in orders by any significant customer, or our failure to qualify our new products with any significant customer could materially and adversely affect our operating results, financial condition and cash flows.

Our net revenue decreased $0.7 million, or 0.2% in 2019, compared to 2018, primarily due to a decrease in our Video segment revenue of $35.8 million, partially offset by an increase in our Cable Access segment revenue of $34.0 million. The increase in our Cable Access segment revenue in 2019 was primarily due to the growing success of our CableOS solutions, reflected by additional customer deployments in 2019 compared to 2018. The decrease in our Video segment revenue in 2019 was primarily due to a shift in product mix to software-based products.

As the timing of our customers' investment decisions can be uncertain, we have implemented restructuring plans to better align the Company's resources and strategic goals. We continue to focus on expense controls on a company-wide basis. (See Note 11, "Restructuring and Related Charges" of the Notes to our Consolidated Financial Statements for additional information).

Our aggregate balance of cash and cash equivalents as of December 31, 2019 was $93.1 million, and we generated $31.3 million of cash from operations during the fiscal year ended December 31, 2019. We refinanced a portion of our 4.00% Senior Convertible Notes due 2020 (the "2020 Notes") by issuing 2.00% Convertible Senior Notes due 2024 (the "2024 Notes"). We also entered into a $25 million revolving loan facility with JPMorgan Chase Bank, N.A., in October 2019, which has not been used to withdraw any cash as of December 31, 2019. See Note 12, "Convertible notes, Other Debts and Finance Leases" of the Notes to our Consolidated Financial Statements for additional information. We expect that our current sources of liquidity will provide us adequate liquidity based on our current plan for the next twelve months.

Critical Accounting Policies, Judgments and Estimates

The preparation of financial statements and related disclosures requires Harmonic to make judgments, assumptions and estimates that affect the reported amounts of assets and liabilities, the disclosure of contingencies and the reported amounts of revenue and expenses in the financial statements and accompanying notes. Material differences may result in the amount and timing of revenue and expenses if different judgments or different estimates were made. See Note 2 of the Notes to our Consolidated Financial Statements for details of our accounting policies. Critical accounting policies, judgments and estimates that we believe have the most significant impact on Harmonic's financial statements are set forth below:

- Revenue recognition;
- Valuation of inventories;
- Impairment of goodwill or long-lived assets;

- Accounting for income taxes; and
- Stock-based compensation.

Revenue Recognition

On January 1, 2018, the Company adopted ASC 606, Revenue from Contracts with Customers (“Topic 606”), using the modified retrospective method applied to those contracts which were not completed as of January 1, 2018. Results for the reporting period beginning January 1, 2018 are presented under Topic 606, while prior period amounts are not restated and continue to be reported in accordance with our historic accounting under ASC 605, Revenue Recognition (“Topic 605”). (See Note 3 “Revenue” for additional information about the Company’s revenue recognition policies.)

Valuation of Inventories

We state inventories at the lower of cost or net realizable value. Cost is computed using standard cost, which approximates actual cost, on a first-in, first-out basis. We write down the cost of excess or obsolete inventory to net realizable value based on future demand forecasts and historical consumption. If there were to be a sudden and significant decrease in demand for our products, or if there were a higher incidence of inventory obsolescence because of rapidly changing technology and customer requirements, we could be required to record additional charges for excess and obsolete inventory and our gross margin could be adversely affected. Inventory management is of critical importance in order to balance the need to maintain strategic inventory levels to ensure competitive lead times against the risk of inventory obsolescence because of rapidly changing technology and customer requirements.

Impairment of Goodwill or Long-lived Assets

Goodwill represents the difference between the purchase price and the estimated fair value of the identifiable assets acquired and liabilities assumed. We test for goodwill impairment at the reporting unit level, which is the same as our operating segment, on an annual basis in the fourth quarter of each of our fiscal years, and at any other time at which events occur or circumstances indicate that the carrying amount of goodwill may exceed its fair value.

In evaluating goodwill for impairment, we first assess qualitative factors to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying value (including goodwill). If we conclude that it is not more likely than not that the fair value of a reporting unit is less than its carrying value, then no further testing is required. However, if we conclude that it is more likely than not that the fair value of a reporting unit is less than its carrying value, then the two-step goodwill impairment test is performed to identify a potential goodwill impairment and measure the amount of impairment to be recognized, if any. The first step requires comparing the fair value of the reporting unit to its net book value, including goodwill. A potential impairment exists if the fair value of the reporting unit is lower than its net book value. The second step of the process, which is performed only if a potential impairment exists, involves determining the difference between the fair value of the reporting unit’s net assets other than goodwill and the fair value of the reporting unit. If this difference is less than the net book value of goodwill, an impairment exists and is recorded.

In the first step, the fair value of each of our reporting units is determined using both the income and market valuation approaches. Under the income approach, the fair value of the reporting unit is based on the present value of estimated future cash flows that the reporting unit is expected to generate over its remaining life. Under the market approach, the value of the reporting unit is based on an analysis that compares the value of the reporting unit to values of publicly-traded companies in similar lines of business. In the application of the income and market valuation approaches, we are required to make estimates of future operating trends and judgments on discount rates and other variables. Determining the fair value of a reporting unit is highly judgmental in nature and involves the use of significant estimates and assumptions. We base our fair value estimates on assumptions we believe to be reasonable but that are unpredictable and inherently uncertain. Actual future results related to assumed variables could differ from these estimates. In addition, we make certain judgments and assumptions in allocating shared assets and liabilities to determine the carrying values for each of our reporting units.

Under the income approach, we calculate the fair value of a reporting unit based on the present value of estimated future cash flows. Cash flow projections are based on management's estimates of revenue growth rates and operating margins, taking into consideration industry and market conditions. The discount rate used is based on the weighted-average cost of capital adjusted for the relevant risk associated with business-specific characteristics and the uncertainty related to the business's ability to execute on the projected cash flows. Under the market approach, we estimate the fair value based on market multiples of revenue and earnings derived from comparable publicly-traded companies with similar operating and investment characteristics as the reporting units, and then apply a control premium which is determined by considering control premiums offered as part of the acquisitions that have occurred in market segments that are comparable with our reporting units.

During the fourth quarter of 2019, we performed the first step of goodwill impairment testing for our two reporting units as part of our annual goodwill impairment test and concluded that goodwill was not impaired. We have not recorded any impairment charges related to goodwill for any prior periods.

We evaluate the recoverability of intangible assets and other long-lived assets when indicators of impairment are present. When impairment indicators are present, we evaluate the recoverability of intangible assets and other long-lived assets on the basis of undiscounted cash flows expected to result from the use of each asset group and its eventual disposition. If the undiscounted expected future cash flows are less than the carrying amount of the asset, an impairment loss is recognized in order to write down the carrying value of the asset to its estimated fair market value.

Accounting for Income Taxes

In preparing our financial statements, we estimate our income taxes for each of the jurisdictions in which we operate. This involves estimating our actual current tax expense and assessing temporary differences resulting from differing treatment of items, such as reserves and accruals, for tax and accounting purposes. These temporary differences result in deferred tax assets and liabilities, which are included within our Consolidated Balance Sheet.

We are subject to examination of our income tax returns by various tax authorities on a periodic basis. We regularly assess the likelihood of adverse outcomes resulting from such examinations to determine the adequacy of our provision for income taxes. We apply the provisions of the applicable accounting guidance regarding accounting for uncertainty in income taxes, which requires application of a more-likely-than-not threshold to the recognition and de-recognition of uncertain tax positions. If the recognition threshold is met, the applicable accounting guidance permits us to recognize a tax benefit measured at the largest amount of such tax benefit that, in our judgment, is more than fifty percent likely to be realized upon settlement. It further requires that a change in judgment related to the expected ultimate resolution of uncertain tax positions be recognized in earnings in the period in which such determination is made.

We file annual income tax returns in multiple taxing jurisdictions around the world. A number of years may elapse before an uncertain tax position is audited and finally resolved. While it is often difficult to predict the final outcome or the timing of resolution of any particular uncertain tax position, we believe that our reserves for income taxes reflect the most likely outcome. We adjust these reserves, as well as the related interest and penalties, in light of changing facts and circumstances. If our estimate of tax liabilities proves to be less than the ultimate assessment, a further charge to expense would result. If payment of these amounts ultimately proves to be unnecessary, the reversal of the liabilities would result in tax benefits being recognized in the period when we determine the liabilities are no longer necessary. Any changes in estimate, or settlement of any particular position, could have a material impact on our operating results, financial condition and cash flows.

Stock-based Compensation

We measure and recognize compensation expense for all stock-based compensation awards made to employees and non-employee directors and others, including stock options, restricted stock units and awards related to our Employee Stock Purchase Plan (“ESPP”), based upon the grant-date fair value of those awards. The grant date fair value of restricted stock units is based on the fair value of our common stock on the date of grant. The grant date fair value of our stock options and ESPP is estimated using the Black-Scholes option pricing model.

The determination of fair value of stock options and ESPP on the date of grant, using an option-pricing model, is affected by our stock price, as well as assumptions regarding a number of highly complex and subjective variables. These variables include our expected stock price volatility over the term of the awards, actual and projected employee stock option exercise behaviors, risk-free interest rates, and expected dividends. We estimated the expected life of the awards based on an analysis of our historical experience of employee exercise and post-vesting termination behavior considered in relation to the contractual life of the options and purchase rights. The risk-free interest rate assumption is based upon observed interest rates appropriate for the expected term of the awards. We do not currently pay cash dividends on our common stock and do not anticipate doing so in the foreseeable future. Accordingly, our expected dividend yield is zero.

We recognize the stock-based compensation expense for performance-based RSUs (“PRSUs”) based on the probability of achieving certain performance criteria, as defined in the PRSU agreements. We estimate the number of PRSUs ultimately expected to vest and recognize expense using the graded vesting attribution method over the requisite service period. Changes in our estimates related to probability of achieving certain performance criteria and number of PRSUs expected to vest could significantly affect the stock-based compensation expense from one period to the next.

If factors change and we employ different assumptions to determine the fair value of our stock-based compensation awards granted in future periods, the compensation expense may differ significantly from what we have recorded in the current period.

See Note 13, “Employee Benefit Plans and Stock-based Compensation,” of the notes to our Consolidated Financial Statements for additional information.

Results of Operations

Net Revenue

The following table presents the breakdown of net revenue by geographical region (in thousands, except percentages):

	Year ended December 31,						
	2019	2018	2017	2019 vs. 2018		2018 vs. 2017	
Americas	$ 224,193	$ 218,900	$ 171,736	$ 5,293	2 %	$ 47,164	27 %
EMEA	117,477	107,074	117,129	10,403	10 %	(10,055)	(9)%
APAC	61,204	77,584	69,381	(16,380)	(21)%	8,203	12 %
Total net revenue	$ 402,874	$ 403,558	$ 358,246	$ (684)	— %	$ 45,312	13 %
Regional revenue as a % of total net revenue:							
Americas	56%	54%	48%				
EMEA	29%	27%	33%				
APAC	15%	19%	19%				

Fiscal 2019 compared to Fiscal 2018

Net revenue in the Americas increased $5.3 million, or 2% in 2019, compared to 2018, primarily due to the growing success of our CableOS solutions, which was offset by a decrease in revenue from other products and services.

EMEA net revenue increased $10.4 million, or 10% in 2019, compared to 2018, primarily due to an increase in revenue from the sale of CableOS products and services, offset by a decrease in revenue in the Video segment.

APAC net revenue decreased $16.4 million, or 21% in 2019 compared to 2018, primarily due to a decrease in revenue in the Video segment. The decrease in revenue in our Video segment was primarily due to a shift in product mix to software and SaaS-based products.

Fiscal 2018 compared to Fiscal 2017

Net revenue in the Americas increased $47.2 million, or 27%, in 2018 compared to 2017, primarily due to an increase in revenue from sales of CableOS products and services.

EMEA net revenue decreased $10.1 million, or 9%, in 2018, compared to 2017, primarily due to lower Cable Access product volumes in the region and lower Video product volumes as a result of soft demand for our traditional linear broadcast products, which was partially offset by increased volumes of OTT-related products as our customers transition to OTT streaming.

APAC net revenue increased $8.2 million, or 12% in 2018 compared to 2017, primarily due to improved demand from our service provider and broadcast and media customers for our Video products and services.

Gross Profit

The following presents the gross profit and gross profit as a percentage of net revenue (“gross margin”) (in thousands, except percentages):

	Year ended December 31,						
	2019	2018	2017	2019 vs. 2018		2018 vs. 2017	
Gross profit	$ 223,012	$ 209,209	$ 169,820	$ 13,803	7%	$ 39,389	23%
As a percentage of net revenue ("gross margin")	55.4%	51.8%	47.4%	3.6%		4.4%	

Our gross margins are dependent upon, among other factors, the proportion of software sales, product mix, customer mix, product introduction costs, price reductions granted to customers and achievement of cost reductions.

Our gross margin increased 3.6% in 2019, as compared to 2018, primarily due to a higher proportion of software in the product mix for each of our business segments.

Gross margin increased 4.4% in 2018, as compared to 2017, primarily due to more favorable margins generated in our Cable Access segment due to increased CableOS sales activity. Our Video segment gross margin also improved marginally, primarily due to a favorable product mix.

Research and Development

Our research and development expenses consist primarily of employee salaries and related expenses, contractors and outside consultants, supplies and materials, equipment depreciation and facilities costs, all associated with the design and development of new products and enhancements of existing products. The research and development expense is net of French R&D tax credits.

The following table presents the research and development expenses, net and the expenses as a percentage of net revenue (in thousands, except percentages):

	Year ended December 31,						
	2019	2018	2017	2019 vs. 2018		2018 vs. 2017	
Research and development	$ 84,614	$ 89,163	$ 95,978	$ (4,549)	(5)%	$ (6,815)	(7)%
As a percentage of net revenue	21.0%	22.1%	26.8%				

The $4.5 million, or 5%, decrease in research and development expenses in 2019 compared to 2018 was primarily due to lower employee compensation costs due to headcount reductions as a result of our continuing transformation from a capital-intensive hardware development model to a predominantly software development model and lower stock-based compensation expense, offset by higher costs for third-party engineering services.

The $6.8 million, or 7%, decrease in research and development expenses in 2018 compared to 2017 was primarily due to lower employee compensation costs due to headcount reductions, lower utilization of third-party engineering services as the Company continued the process of transforming its research and development activities from capital intensive hardware development to predominantly software development and lower travel and other discretionary costs due to vigilant cost management throughout the Company. The decrease in research and development expenses was partially offset by $6.0 million in reimbursements of engineering spending by one of our large customers, which ended in 2017, and higher incentive compensation associated with the Company's performance.

Selling, General and Administrative

The following table presents our selling, general and administrative expenses and the expenses as a percentage of net revenue (in thousands, except percentages):

	Year ended December 31,						
	2019	2018	2017	2019 vs. 2018		2018 vs. 2017	
Selling, general and administrative	$ 119,035	$ 118,952	$ 136,270	$ 83	—%	$ (17,318)	(13)%
As a percentage of net revenue	29.5%	29.5%	38.0%				

Selling, general and administrative expenses increased slightly in 2019 compared to 2018, primarily due to higher tradeshow and marketing expenses, offset by lower employee compensation costs due to headcount reductions and lower stock-based compensation expense.

The $17.3 million, or 13%, decrease in selling, general and administrative expenses in 2018 compared to 2017 was primarily due to lower employee compensation costs due to headcount reductions, higher legal and settlement charges recorded during 2017 related to the Avid litigation, and lower travel and other discretionary costs due to vigilant cost management throughout the Company. This decrease was partially offset by higher incentive compensation associated with the Company's performance.

Segment Financial Results

The following table provides summary financial information by reportable segment (in thousands, except percentages):

	Year ended December 31,					
	2019	2018 [1]	2017	2019 vs. 2018		2018 vs. 2017	
Video							
Revenue	$ 278,028	$ 313,828	$ 319,473	$ (35,800)	(11)%	$ (5,645)	(2)%
Gross profit	162,156	178,170	173,414	(16,014)	(9)%	4,756	3 %
Operating income (loss)	15,837	26,170	(2,024)	(10,333)	(39)%	28,194	(1,393)%
Segment revenue as % of total segment revenue	*69.0%*	*77.5 %*	*89.2 %*	*(8.5)%*		*(11.7)%*	
Gross margin %	*58.3%*	*56.8 %*	*54.3 %*	*1.5 %*		*2.5 %*	
Operating margin %	*5.7%*	*8.3 %*	*(0.6)%*	*(2.6)%*		*8.9 %*	
Cable Access							
Revenue	$ 124,894	$ 90,908	$ 38,773	$ 33,986	37 %	$ 52,135	134 %
Gross profit	68,596	40,207	8,892	28,389	71 %	31,315	352 %
Operating income (loss)	22,219	(578)	(23,154)	22,797	(3,944)%	22,576	(98)%
Segment revenue as % of total segment revenue	*31.0%*	*22.5 %*	*10.8 %*	*8.5 %*		*11.7 %*	
Gross margin %	*54.9%*	*44.2 %*	*22.9 %*	*10.7 %*		*21.3 %*	
Operating margin %	*17.8%*	*(0.6)%*	*(59.7)%*	*18.4 %*		*59.1 %*	
Total							
Segment Revenue	$ 402,922	$ 404,736	$ 358,246	$ (1,814)	— %	$ 46,490	13 %
Gross profit	230,752	218,377	182,306	12,375	6 %	36,071	20 %
Operating income (loss)	38,056	25,592	(25,178)	12,464	49 %	50,770	(202)%

A reconciliation of our consolidated segment operating income (loss) to consolidated loss before income taxes is as follows (in thousands):

	Year ended December 31,		
	2019	2018 [1]	2017
Total segment operating income (loss)	$ 38,056	$ 25,592	$ (25,178)
Amortization of non-cash warrants	(48)	(1,178)	—
Unallocated corporate expenses	(4,532)	(3,769)	(20,767)
Stock-based compensation	(12,074)	(17,289)	(16,610)
Amortization of intangibles	(8,319)	(8,367)	(8,322)
Consolidated income (loss) from operations	13,083	(5,011)	(70,877)
Loss on debt extinguishment	(5,695)	—	—
Non-operating expense, net	(13,984)	(11,937)	(13,830)
Loss before income taxes	$ (6,596)	$ (16,948)	$ (84,707)

(1) We have historically employed an aggregate allocation methodology based on total revenues to attribute professional services revenue and sales expenses between our Video and Cable Access segments. Beginning in the fourth quarter of 2017, we have prospectively changed to a more precise attribution methodology as the activities of selling and supporting our CableOS solution have become increasingly distinct from those of our Video solutions. The impact of making this change for the year ended December 31, 2017 compared to our historical approach was an increase in operating loss of $5.9 million from the Video segment and a corresponding decrease in operating loss of the Cable Access segment. We believe that the updated allocation methodology provides greater clarity regarding the operating metrics of the Video and Cable Access business segments.

Unallocated Corporate Expenses

Together with amortization of intangibles and stock-based compensation, we do not allocate restructuring and related charges, and certain other non-recurring charges, to the operating income for each segment because our management does not include this information in the measurement of the performance of the operating segments.

Video

Our Video segment net revenue decreased $35.8 million, or 11% in 2019, compared to 2018, due to a decrease of $37.6 million in Video appliance and integration revenue, offset by an increase of $1.8 million in Video SaaS and service revenue. The decrease in our Video segment net revenue in 2019 was primarily due to a shift in product mix to software and SaaS-based products. Video segment operating margin decreased 2.6% in 2019, compared to 2018, primarily due to the decrease in revenue and related gross profit, offset by lower operating expenses due to headcount reductions and lower discretionary spending as a result of vigilant cost management throughout the Company.

Our Video segment net revenue decreased $5.6 million, or 2%, in 2018 compared to 2017, due to a decrease in Video appliance and integration revenue, offset by an increase in Video SaaS and service revenue. Video segment operating margin increased 8.9% in 2018, compared to 2017, primarily due to better margins as a result of a more favorable product mix, lower operating expenses due to headcount reductions and lower other discretionary costs as a result of vigilant cost management throughout the Company. The increase in Video segment margin was partially offset by a decrease due to the change in methodology for allocating professional services revenue between segments in the fourth quarter of 2017.

Cable Access

Our Cable Access segment net revenue increased $34.0 million, or 37% in 2019, compared to 2018, primarily due to the growing success of our Cable OS solutions, reflected by additional customer deployments in 2019 compared to 2018. Cable Access segment operating margin increased 18.4% in 2019, compared to 2018, primarily due to Comcast CableOS software license revenue being recorded at higher margins than other software revenue in our Cable Access segment.

Our Cable Access segment net revenue increased $52.1 million, or 134%, in 2018 compared to 2017, primarily due to increased shipments of hardware, software and services relating to our CableOS solutions. Our Cable Access segment operating margin increased 59.1% in 2018, compared to 2017, due to higher revenue and related higher margins on sales of both software and professional services. The change in methodology for allocating professional services revenue between segments in the fourth quarter of 2017 also contributed to the increase in Cable Access margins in 2018 as compared to 2017.

Amortization of Intangibles

The following table summarizes the amortization of intangibles (in thousands, except percentages):

	Year ended December 31,			2019 vs. 2018		2018 vs. 2017	
	2019	2018	2017				
Amortization of intangibles	$ 3,139	$ 3,187	$ 3,142	$ (48)	(2)%	$ 45	1%
As a percentage of net revenue	0.8%	0.8%	0.9%				

The amortization of intangibles expense remained flat in each of the last three years.

Restructuring and Related Charges

We have implemented several restructuring plans in the past few years. The goal of these plans is to bring operational expenses to appropriate levels relative to our net revenues, while simultaneously implementing extensive company-wide expense control programs. We account for our restructuring plans under the authoritative guidance for exit or disposal activities. The restructuring and related charges are included in "Cost of revenue" and "Operating expenses-restructuring and related charges" in the Consolidated Statements of Operations. The following table summarizes the restructuring and related charges (in thousands):

	Year ended December 31,					
	2019	2018	2017	2019 vs. 2018		2018 vs. 2017	
Cost of revenue	$ 1,391	$ 857	$ 1,279	$ 534	62%	$ (422)	(33)%
Operating expenses-Restructuring and related charges	3,141	2,918	5,307	223	8%	(2,389)	(45)%
Total restructuring and related charges	$ 4,532	$ 3,775	$ 6,586	$ 757	20%	$ (2,811)	(43)%

The $0.8 million increase in restructuring and related charges in 2019, compared to 2018, was primarily due to higher severance and employee benefit costs recorded in conjunction with restructuring activities during 2019.

The $2.8 million decrease in restructuring and related charges in 2018, compared to 2017, was primarily due to higher French VDP and severance costs recorded in 2017 and related to the Harmonic 2016 and 2017 Restructuring Plans, partially offset by facility exit costs and severance costs recorded under the Harmonic 2018 Restructuring Plan.

See Note 11, "Restructuring and Related Charges," of the Notes to our Consolidated Financial Statements for details on each of our restructuring plans.

Interest Expense, Net

Interest expense, net was $11.7 million, $11.4 million and $11.1 million during 2019, 2018 and 2017, respectively. The increase in interest expense, net from 2018 to 2019, was primarily due to higher amortization of debt discount and issuance costs for the 2020 Notes and from amortization of debt discount and issuance costs for the 2024 Notes issued in September 2019, offset by lower interest due to the partial repurchase of the 2020 Notes during 2019. See Note 12, "Convertible Notes, Other Debts and Finance Leases," of the Notes to our Consolidated Financial Statements for additional information.

The increase in interest expense, net from 2017 to 2018, is primarily due to higher amortization of debt discount and issuance costs for the 2020 Notes issued in December 2015.

Loss on Debt Extinguishment

The loss on debt extinguishment of $5.7 million during 2019 relates to the repurchase of a portion of the 2020 Notes in September 2019. See Note 12, "Convertible Notes, Other Debts and Finance Leases," of the Notes to our Consolidated Financial Statements for additional information.

Other Expense, Net

Other expense, net was $2.3 million, $0.5 million and $2.2 million during 2019, 2018 and 2017, respectively. Other expense, net is primarily comprised of foreign exchange gains and losses on cash, accounts receivable and intercompany balances denominated in currencies other than the functional currency of the reporting entity. Our foreign currency exposure is primarily driven by the fluctuations in the foreign currency exchanges rates of the Euro, British pound, Japanese yen and Israeli shekel. The increase in other expense, net in 2019 compared to 2018 was primarily due to higher foreign exchange losses resulting from the change in Euro against the U.S. dollar in 2019, due to recovery of previously expensed bad debts and a gain from a change in the fair valuation of equity investment in 2018 which did not recur in 2019. See "Foreign Currency Exchange Risk" under Item 7A of this Annual Report on Form 10-K for additional information.

Loss on Impairment of Long-term Investments

In 2014, we acquired a 3.3% equity interest investment in Vislink plc ("Vislink"), a U.K. public company listed on the AIM exchange, for $3.3 million. On February 3, 2017, Vislink completed the disposal of its hardware division and changed its name to Pebble Beach Systems ("PBS"). Since mid-2016, the stock price of PBS has traded below its cost basis, as a result of which we recorded a total of $2.7 million and $0.5 million in impairment charges in 2016 and 2017, respectively. We sold this investment for $0.1 million in 2018.

Income Taxes

We reported the following operating results for each of the three years ended December 31, 2019, 2018 and 2017 (in thousands, except percentages):

	Year ended December 31,		
	2019	2018	2017
Loss before income taxes	(6,596)	(16,948)	(84,707)
Provision for (benefit from) income taxes	(672)	4,087	(1,752)
Effective income tax rate	10%	(24)%	2%

Our effective tax rate generally differs from the U.S. federal statutory rate of 21% due to favorable tax rates associated with certain earnings from our operations in lower tax jurisdictions throughout the world and our valuation allowance in the U.S. In addition, our effective tax rates vary in each period primarily due to specific one-time, discrete items that affected the tax rate in the respective period.

In 2019, our effective income tax rate of 10% differed from the U.S. federal statutory rate of 21% primarily due to geographical mix of income and losses, full valuation allowance against U.S. federal, California and other states deferred tax assets, foreign withholding taxes and income taxes on earnings from operations in foreign tax jurisdictions. In addition, during 2019, we recorded a one-time benefit of approximately $2.0 million due to changes in our global tax structure and a $0.8 million benefit from a valuation allowance release for one of our foreign subsidiaries. This release of the valuation allowance was due to changes in forecasted taxable income resulting from receiving a favorable tax ruling during 2019.

In 2018, our effective income tax rate of (24)% differed from the U.S. federal statutory rate of 21% primarily due to geographical mix of income and losses, full valuation allowance against U.S. federal, California and other states deferred tax assets, foreign withholding taxes and income taxes on earnings from operations in foreign tax jurisdictions.

In 2017, our effective income tax rate of 2% differed from the U.S. federal statutory rate of 35% primarily due to our geographical income mix, favorable tax rates associated with certain earnings from operations in lower-tax jurisdictions, tax rate changes in foreign jurisdictions, tax benefits associated with the release of tax reserves for uncertain tax positions resulting from the expiration of the applicable statute of limitations, a one-time benefit from the reduction of a valuation allowance on alternative minimum tax (“AMT”) credit carryforwards that will be refundable as a result of the TCJA, partially offset by the increase in the valuation allowance against U.S. federal, California and other state deferred tax assets, detriment from non-deductible stock-based compensation, and the net of various other discrete tax adjustments.

For a reconciliation of our effective tax rate to the U.S. federal statutory rate of 21% and further explanation of our provision for taxes, see Note 15, “Income Taxes,” of the notes to our Consolidated Financial Statements.

Liquidity and Capital Resources

As of December 31, 2019, our principal sources of liquidity consisted of cash and cash equivalents of $93.1 million, net accounts receivable of $88.5 million, our $25.0 million revolving credit facility with JPMorgan Chase Bank, N.A., described in more detail below, and financing from French government agencies. As of December 31, 2019, we had $115.5 million in principal amount of convertible senior notes outstanding, bearing interest at a rate of 2.00% per year, payable semiannually on March 1 and September 1 of each year (the “2024 Notes”) which are due on September 1, 2024, and $45.8 million in principal amount of convertible notes outstanding, bearing interest at a rate of 4.00% per year, payable in cash on June 1 and December 1 of each year (the “2020 Notes”) which are due on December 1, 2020. We also had debts with French government agencies and to a lesser extent, with other financial institutions, primarily in France, in the aggregate of $17.2 million at December 31, 2019.

Our cash and cash equivalents of $93.1 million as of December 31, 2019 consisted of bank deposits held throughout the world, of which $53.2 million of the cash and cash equivalents balance was held outside of U.S. At present, such foreign funds are considered to be indefinitely reinvested in foreign countries to the extent of indefinitely reinvested foreign earnings. In the event funds from foreign operations are needed to fund cash needs in the United States and if U.S. taxes have not already been previously accrued, we may be required to accrue and pay additional U.S. and foreign withholding taxes in order to repatriate these funds.

Our principal uses of cash will include repayments of debt and related interest, purchases of inventory, payroll, restructuring expenses, and other operating expenses related to the development and marketing of our products, purchases of property and equipment and other contractual obligations for the foreseeable future. We believe that our cash and cash equivalents of $93.1 million at December 31, 2019 will be sufficient to fund our principal uses of cash for at least the next 12 months. However, we may need to raise additional funds to fund our operations, to take advantage of unanticipated strategic opportunities or to strengthen our financial position. In the future, we may enter into other arrangements for potential investments in, or acquisitions of, complementary businesses, services or technologies, which could require us to seek additional equity or debt financing. Additional funds may not be available on terms favorable to us or at all.

On December 19, 2019, we entered into a Credit Agreement (the "Credit Agreement") with JPMorgan Chase Bank, N.A., as lender, and Harmonic International GmbH, as co-borrower. The Credit Agreement provides for a secured revolving loan facility in an aggregate principal amount of up to $25.0 million, which may also be used for the issuance of letters of credit. Under the terms of the Credit Agreement, the principal amount of outstanding loans, plus the face amount of any outstanding letters of credit, at any time cannot exceed an amount equal to the lesser of (i) $25.0 million and (ii) the sum of 85% of our eligible receivables and 50% of our eligible inventory, with a maturity date of October 31, 2020. The loans under the Credit Agreement will bear interest, at our election, at a floating rate per annum equal to either (1) 1.25% plus the greater of (i) 1 month LIBOR on any day plus 2.50% and (ii) the prime rate as reported in the Wall Street Journal from time to time or (2) 2.25% plus LIBOR for an interest period of one, two or three months. Interest on the revolving loans is payable monthly in arrears, in the case of prime rate loans, and at the end of the applicable interest period, in the case of LIBOR loans. We are also obligated to pay other customary closing fees, commitment fees and letter of credit fees for a credit facility of this size and type. Our obligations are required to be guaranteed by certain material domestic subsidiaries, and all such obligations, including the guarantees, are secured by substantially all of the assets of the Company and such guarantors and certain assets of Harmonic International GmbH. The Credit Agreement contains customary affirmative and negative covenants, including covenants limiting our ability to, among other things, incur debt, grant liens, undergo certain fundamental changes, make investments, make certain restricted payments, dispose of assets, enter into transactions with affiliates, and enter into burdensome agreements, in each case, subject to limitations and exceptions set forth in the Credit Agreement. The Company is also required to maintain compliance with an adjusted quick ratio, a minimum EBITDA covenant (tested quarterly) and a minimum liquidity covenant, in each case, determined in accordance with the terms of the Credit Agreement. As of December 31, 2019, there was $0.3 million of outstanding letters of credit issued under the Credit Agreement. There were no revolving borrowings under the Credit Agreement from the closing of the Credit Agreement through December 31, 2019. As of December 31, 2019, we were in compliance with the covenants under the Credit Agreement.

We terminated our secured revolving credit facility with Silicon Valley Bank effective September 10, 2019, in conjunction with the issuance of the 2024 Notes.

The table below presents selected cash flow data for the periods presented (in thousands):

	Year ended December 31,		
	2019	2018	2017
	(In thousands)		
Net cash provided by operating activities	$ 31,295	$ 12,284	$ 3,064
Net cash used in investing activities	(10,328)	(6,940)	(4,501)
Net cash provided by financing activities	6,305	2,651	895
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(203)	(763)	1,879
Net increase in cash, cash equivalents and restricted cash	$ 27,069	$ 7,232	$ 1,337

Operating Activities

Net cash provided by operating activities increased $19.0 million in 2019 compared to 2018, primarily due to a decrease in net loss, offset in part by higher cash being used for our working capital needs.

Net cash provided by operating activities increased $9.2 million in 2018 compared to 2017, primarily due to a decrease in net loss, offset in part by higher cash being used for our working capital needs.

We expect that cash provided by or used in operating activities may fluctuate in future periods as a result of a number of factors, including fluctuations in our operating results, shipment linearity, accounts receivable collections performance, inventory and supply chain management, and the timing and amount of compensation and other payments.

Investing Activities

Net cash used in investing activities increased $3.4 million in 2019 compared to 2018, primarily due to an increase in purchases of property and equipment.

Net cash used in investing activities increased $2.4 million in 2018 compared to 2017, primarily due to a decrease in proceeds from sales and maturities of investments of $6.8 million, offset by a decrease in purchases of property and equipment of $4.4 million.

Financing Activities

Net cash provided by financing activities increased $3.7 million in 2019 compared to 2018, primarily due higher proceeds from the exercise of options, partially offset by higher payment of tax withholding obligations related to net share settlements of restricted stock units.

Net cash provided by financing activities increased $1.8 million in 2018 compared to 2017, primarily due to lower payment of tax withholding obligations related to net share settlements of restricted stock units.

Off-Balance Sheet Arrangements

None as of December 31, 2019.

Contractual Obligations and Commitments

Future payments under contractual obligations and other commercial commitments, as of December 31, 2019 are as follows (in thousands):

	Payments due in each fiscal year				
	Total Amounts Committed	**Less than 1 year**	**1 to 3 years**	**4 to 5 years**	**More than 5 years**
Convertible debt	$ 161,285	$ 45,785	$ —	$ 115,500	$ —
Operating leases (1)	46,760	9,169	15,519	4,503	17,569
Purchase commitments (2)	62,272	51,019	11,236	17	—
TVN debt	17,152	6,664	10,264	112	112
Interest on convertible debt	13,298	4,058	6,930	2,310	—
Other commitments (4)	2,366	1,654	712	—	—
Avid litigation settlement fees	2,000	2,000	—	—	—
French VDP obligations (3)	806	806	—	—	—
Finance lease	71	49	22	—	—
Total contractual obligations	$ 306,010	$ 121,204	$ 44,683	$ 122,442	$ 17,681
Other commercial commitments:					
Standby letters of credit	$ 2,674	$ 2,591	$ 83	$ —	$ —
Total commercial commitments	$ 2,674	$ 2,591	$ 83	$ —	$ —

(1) We lease facilities under operating leases expiring through March 2030. Certain of these leases provide for renewal options for periods ranging from one to five years in the normal course of business.

(2) Includes commitments to purchase inventory and property, plant and equipment. During the normal course of business, in order to reduce manufacturing lead times and ensure adequate component supply, we enter into agreements with certain contract manufacturers and suppliers that allow them to purchase inventory and services based upon criteria defined by the Company.

(3) In 2016, we established the French VDP to enable the French employees of our French subsidiary to voluntarily terminate their employment with certain benefits. See Note 11, “Restructuring and Related Charges” of the notes to our Consolidated Financial Statements for additional information.

(4) Primarily includes variable lease payments that do not depend on an index or rate, or usage of an underlying asset, and payments associated with lease arrangements with an initial term of twelve months or less.

Due to the uncertainty with respect to the timing of future cash flows associated with our unrecognized tax benefits at December 31, 2019, we are unable to make reasonably reliable estimates of the period of cash settlement with the respective taxing authority. Therefore, $0.2 million of unrecognized tax benefits classified as "Income taxes payable, long-term" in the accompanying Consolidated Balance Sheet as of December 31, 2019, had been excluded from the contractual obligations table above. See Note 15, "Income Taxes," of the notes to our Consolidated Financial Statements for a discussion on income taxes.

New Accounting Pronouncements

See Note 2 of the accompanying Consolidated Financial Statements for a full description of recent accounting pronouncements, including the respective expected dates of adoption and effects on results of operations and financial condition.

Item 7A. *QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK.*

Foreign Currency Exchange Risk

We market and sell our products and services through our direct sales force and indirect channel partners in North America, EMEA, APAC and Latin America. Accordingly, we are subject to exposure from adverse movements in foreign currency exchange rates, primarily the Euro, British pound, Israeli shekel and Japanese yen. Our U.S. dollar functional subsidiaries account for approximately 94%, 95% and 95% of our consolidated net revenues in 2019, 2018 and 2017, respectively. We recorded net billings denominated in foreign currencies of approximately 16%, 14% and 18% of total company billings in 2019, 2018 and 2017, respectively. In addition, a portion of our operating expenses, primarily the cost of personnel to deliver technical support on our products and professional services, sales and sales support and research and development, are denominated in foreign currencies, primarily the Euro, Israeli shekel and British pound.

We use derivative instruments, primarily forward contracts, to manage exposures to foreign currency exchange rates and we do not enter into foreign currency forward contracts for trading purposes.

Derivatives Not Designated as Hedging Instruments (Balance Sheet Hedges)

We enter into forward currency contracts to hedge foreign currency denominated monetary assets and liabilities. These derivative instruments are marked to market through earnings every period and mature generally within three months. Changes in the fair value of these foreign currency forward contracts are recognized in "Other expense, net" in the Consolidated Statement of Operations, and are largely offset by the changes in the fair value of the assets or liabilities being hedged.

The U.S. dollar equivalents of all outstanding notional amounts of foreign currency forward contracts are summarized as follows (in thousands):

	December 31,	
	2019	2018
Derivatives not designated as hedging instruments:		
Purchase	$ 14,806	$ 28,975
Sell	$ 2,629	$ —

Interest Rate Risk

Our exposure to market risk for changes in interest rates relates primarily to our outstanding debt arrangements with variable rate interests as well as our borrowings under the Credit Agreement.

On December 19, 2019, we entered into a Credit Agreement with JPMorgan Chase Bank, N.A., and Harmonic International GmbH, as co-borrower. The Credit Agreement provides for a secured revolving loan facility in an aggregate principal amount of up to $25.0 million, based on a borrowing base of eligible accounts receivable and inventory, with a maturity date of October 31, 2020. The revolving loans bear interest, at our election, at a floating rate per annum equal to either

(1) 1.25% plus the greater of (i) 1 month LIBOR on any day plus 2.50% and (ii) the prime rate as reported in the Wall Street Journal from time to time or (2) 2.25% plus LIBOR for an interest period of one, two or three months. Interest on the revolving loans is payable monthly in arrears, in the case of prime rate loans, and at the end of the applicable interest period, in the case of LIBOR.

As of December 31, 2019, the Company had $0.3 million of outstanding letters of credit issued under the Credit Agreement. We had no revolving borrowings under the Credit Agreement from the closing of the Credit Agreement through December 31, 2019.

On September 27, 2017, the Company entered into a Loan and Security Agreement (the “Loan Agreement”) with Silicon Valley Bank (the “Bank”). The Loan Agreement provided for a secured revolving credit facility in an aggregate principal amount of up to $15.0 million. Under the terms of the Loan Agreement, the principal amount of loans, plus the face amount of any outstanding letters of credit, at any time could not exceed up to 85% of the Company’s eligible receivables. Under the terms of the Loan Agreement, the Company could also request letters of credit from the Bank.

We terminated our secured revolving credit facility with Silicon Valley Bank effective September 10, 2019, in conjunction with the issuance of the 2024 Notes. There were no borrowings under the Loan Agreement prior to the termination, except $2.2 million committed towards security for letters of credit, which were unsecured as of December 31, 2019. The Company was in compliance with the covenants under the Loan Agreement prior to the termination.

As of December 31, 2019, our cash balance was $93.1 million. We had no short-term investments as of December 31, 2019.

For our French entity, the aggregate debt balance at December 31, 2019 was $17.2 million, which is primarily comprised of debt instruments financed by French government agencies, and, to a lesser extent, term loans from other financing institutions. These debt instruments have maturities ranging from two to six years; expiring from 2020 through 2025. A majority of the loans are tied to the 1 month EURIBOR rate plus spread. (See Note 12, “Convertible notes, Other Debts and Finance Leases,” of the notes to our Consolidated Balance Sheets for additional information). As of December 31, 2019, a hypothetical 1.0% increase in market interest rates on our debts subject to variable interest rate fluctuations would increase our interest expense by approximately $0.2 million annually.

As of December 31, 2019, we had $45.8 million aggregate principal amount of the 2020 Notes outstanding, which have a fixed 4.00% coupon rate and $115.5 million aggregate principal of the 2024 Notes outstanding, which have a fixed 2.00% coupon rate.

Item 8. ***FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA***

Index to Consolidated Financial Statements

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of Harmonic Inc.:

Opinions on the Consolidated Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Harmonic Inc. and its subsidiaries (the Company) as of December 31, 2019 and 2018 and the related consolidated statements of operations, comprehensive loss, stockholders' equity, and cash flows for each of the two years ended December 31, 2019, and the related notes (collectively referred to as the consolidated financial statements). We also have audited the Company's internal control over financial reporting as of December 31, 2019, based on criteria established in Internal Control-Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the two years ended December 31, 2019 in conformity with accounting principles generally accepted in the United States of America. Also, in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on criteria established in Internal Control-Integrated Framework (2013) issued by COSO.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company changed its method of accounting for leases in 2019 due to the adoption of Accounting Standards Update (ASU) No. 2016-02, Leases (Topic 842).

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Report on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express an opinion on the Company's consolidated financial statements and an opinion on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/Armanino LLP

San Ramon, California
February 28, 2020

We have served as the Company's auditor since 2018.

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of Harmonic Inc.:

Opinion on the Financial Statements

We have audited the consolidated statements of operations, comprehensive loss, stockholders' equity and cash flows of Harmonic Inc. and its subsidiaries (the "Company") for the year ended December 31, 2017, including the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the results of operations and cash flows of the Company for the year ended December 31, 2017 in conformity with accounting principles generally accepted in the United States of America.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's consolidated financial statements based on our audit. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit of these consolidated financial statements in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud.

Our audit included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audit also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audit provides a reasonable basis for our opinion.

/s/ PricewaterhouseCoopers LLP

San Jose, California

March 5, 2018, except for the effects of the changes in presentation of revenue and cost of revenue discussed in Note 2 to the consolidated financial statements, as to which the date is February 28, 2020

We served as the Company's auditor from 1989 to 2018.

HARMONIC INC.

CONSOLIDATED BALANCE SHEETS

(In thousands, except per share data)

	December 31,	
	2019	2018
ASSETS		
Current assets:		
Cash and cash equivalents	$ 93,058	$ 65,989
Accounts receivable, net	88,500	81,795
Inventories, net	29,042	25,638
Prepaid expenses and other current assets	40,762	23,280
Total current assets	251,362	196,702
Property and equipment, net	22,928	22,321
Operating lease right-of-use assets	27,491	—
Goodwill	239,780	240,618
Intangibles, net	4,461	12,817
Other long-term assets	41,305	38,377
Total assets	$ 587,327	$ 510,835
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Other debts and finance lease obligations, current	$ 6,713	$ 7,175
Accounts payable	40,933	33,778
Income taxes payable	1,226	1,099
Deferred revenue	37,117	41,592
Accrued and other current liabilities	62,535	52,761
Convertible notes, short-term	43,375	—
Total current liabilities	191,899	136,405
Convertible notes, long-term	88,629	114,808
Other debts and finance lease obligations, long-term	10,511	12,684
Income taxes payable, long-term	178	460
Other non-current liabilities	41,254	18,228
Total liabilities	332,471	282,585
Commitments and contingencies (Note 19)		
Convertible notes	2,410	—
Stockholders' equity:		
Preferred stock, $0.001 par value, 5,000 shares authorized; no shares issued or outstanding	—	—
Common stock, $0.001 par value, 150,000 shares authorized; 91,875 and 87,057 shares issued and outstanding at December 31, 2019 and 2018, respectively	92	87
Additional paid-in capital	2,327,359	2,296,795
Accumulated deficit	(2,071,940)	(2,067,416)
Accumulated other comprehensive loss	(3,065)	(1,216)
Total stockholders' equity	252,446	228,250
Total liabilities and stockholders' equity	$ 587,327	$ 510,835

The accompanying notes are an integral part of these consolidated financial statements.

HARMONIC INC.

CONSOLIDATED STATEMENTS OF OPERATIONS

(In thousands, except per share data)

	Year ended December 31,		
	2019	**2018**	**2017**
Revenue:			
Appliance and integration	$ 275,797	$ 287,564	$ 246,353
SaaS and service	127,077	115,994	111,893
Total net revenue	402,874	403,558	358,246
Cost of revenue:			
Appliance and integration	130,284	148,472	142,545
SaaS and service	49,578	45,877	45,881
Total cost of revenue	179,862	194,349	188,426
Total gross profit	223,012	209,209	169,820
Operating expenses:			
Research and development	84,614	89,163	95,978
Selling, general and administrative	119,035	118,952	136,270
Amortization of intangibles	3,139	3,187	3,142
Restructuring and related charges	3,141	2,918	5,307
Total operating expenses	209,929	214,220	240,697
Income (loss) from operations	13,083	(5,011)	(70,877)
Interest expense, net	(11,651)	(11,401)	(11,078)
Loss on debt extinguishment	(5,695)	—	—
Other expense, net	(2,333)	(536)	(2,222)
Loss on impairment of long-term investments	—	—	(530)
Loss before income taxes	(6,596)	(16,948)	(84,707)
Provision for (benefit from) income taxes	(672)	4,087	(1,752)
Net loss	$ (5,924)	$ (21,035)	$ (82,955)
Net loss per share:			
Basic and diluted	$ (0.07)	$ (0.25)	$ (1.02)
Shares used in per share calculations:			
Basic and diluted	89,575	85,615	80,974

The accompanying notes are an integral part of these consolidated financial statements.

HARMONIC INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS

(In thousands)

	Year ended December 31,		
	2019	**2018**	**2017**
Net loss	$ (5,924)	$ (21,035)	$ (82,955)
Change in unrealized gain (loss) on available-for-sale securities:			
Unrealized loss, net	—	—	(658)
Loss reclassified into earnings	—	—	384
	—	—	(274)
Adjustment to pension benefit plan	(206)	202	528
Unrealized foreign exchange gain (loss), net on intercompany long-term loans	291	667	(1,705)
Change in foreign currency translation adjustments:			
Translation gain (loss)	(1,728)	(5,100)	11,471
Loss reclassified into earnings	56	11	106
	(1,672)	(5,089)	11,577
Other comprehensive income (loss) before tax	(1,587)	(4,220)	10,126
Provision for (benefit from) income taxes	262	378	(526)
Other comprehensive income (loss), net of tax	(1,849)	(4,598)	10,652
Total comprehensive loss	$ (7,773)	$ (25,633)	$ (72,303)

The accompanying notes are an integral part of these consolidated financial statements.

HARMONIC INC.

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

(In thousands)

	Common Stock		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Income (Loss)	Total Stockholders' Equity
	Shares	Amount				
Balance at December 31, 2016	78,456	$ 78	$ 2,254,055	$ (1,976,222)	$ (7,270)	$ 270,641
Cumulative effect to retained earnings related to adoption of ASU 2016-09	—	—	69	(69)	—	—
Cumulative effect to retained earnings related to adoption of ASU 2016-16	—	—	—	1,434	—	1,434
Balance at January 1, 2017	78,456	78	2,254,124	(1,974,857)	(7,270)	272,075
Net loss	—	—	—	(82,955)	—	(82,955)
Other comprehensive income, net of tax	—	—	—	—	10,652	10,652
Issuance of common stock under option, stock award and purchase plans	4,098	5	1,954	—	—	1,959
Stock-based compensation	—	—	16,612	—	—	16,612
Balance at December 31, 2017	82,554	83	2,272,690	(2,057,812)	3,382	218,343
Cumulative effect to retained earnings related to adoption of ASC 606 (1)	—	—	—	11,431	—	11,431
Balance at January 1, 2018	82,554	83	2,272,690	(2,046,381)	3,382	229,774
Net loss	—	—	—	(21,035)	—	(21,035)
Other comprehensive loss, net of tax	—	—	—	—	(4,598)	(4,598)
Issuance of common stock under option, stock award and purchase plans	4,503	4	4,713	—	—	4,717
Stock-based compensation	—	—	17,097	—	—	17,097
Issuance of warrant	—	—	2,295	—	—	2,295
Balance at December 31, 2018	87,057	87	2,296,795	(2,067,416)	(1,216)	228,250
Cumulative effect to retained earnings related to adoption of Topic 718 (2)	—	—	—	1,400	—	1,400
Balance at January 1, 2019	87,057	87	2,296,795	(2,066,016)	(1,216)	229,650
Net loss	—	—	—	(5,924)	—	(5,924)
Other comprehensive loss, net of tax	—	—	—	—	(1,849)	(1,849)
Issuance of common stock under option, stock award and purchase plans	4,014	4	6,910	—	—	6,914
Stock-based compensation	—	—	12,156	—	—	12,156
Issuance of warrant	—	—	16,142	—	—	16,142
Exercise of warrant	804	1	(1)	—	—	—
Reclassification from equity to mezzanine equity for 4.00% Convertible Senior Notes due in 2020	—	—	(2,410)	—	—	(2,410)
Portion of repurchase price recorded in additional paid-in capital in connection with partial repurchase of 4.00% convertible notes due 2020	—	—	(27,111)	—	—	(27,111)
Conversion feature of 2.00% convertible notes due 2024	—	—	24,878	—	—	24,878
Balance at December 31, 2019	91,875	$ 92	$ 2,327,359	$ (2,071,940)	$ (3,065)	$ 252,446

(1) See Note 2, "Summary of Significant Accounting Policies-Recently Adopted Accounting Pronouncements," for more information on the adoption of ASC 606, Revenue from Contracts with Customers ("Topic 606") issued by the Financial Accounting Standards Board.

(2) See Note 2, “Summary of Significant Accounting Policies-Recently Adopted Accounting Pronouncements,” for more information on the adoption of ASC 718, Compensation-Stock Compensation (“Topic 718”) issued by the Financial Accounting Standards Board.

The accompanying notes are an integral part of these consolidated financial statements.

HARMONIC INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Year ended December 31,		
	2019	**2018**	**2017**
Cash flows from operating activities:			
Net loss	$ (5,924)	$ (21,035)	$ (82,955)
Adjustments to reconcile net loss to net cash provided by operating activities:			
Amortization of intangibles	8,319	8,367	8,322
Depreciation	11,287	12,971	14,599
Stock-based compensation	12,074	17,289	16,610
Amortization of discount on convertible debt	6,756	6,060	5,489
Amortization of non-cash warrant	13,576	1,178	153
Restructuring, asset impairment and loss on retirement of fixed assets	124	1,491	1,906
Loss on impairment of long-term investments	—	—	530
Foreign currency adjustments	(290)	(1,906)	2,369
Loss on debt extinguishment	5,695	—	—
Deferred income taxes, net	(2,076)	661	2,189
Provision for doubtful accounts, returns and discounts	1,500	2,521	4,912
Provision for excess and obsolete inventories	1,479	1,649	6,005
Other non-cash adjustments, net	1,225	407	445
Changes in operating assets and liabilities:			
Accounts receivable	(8,388)	(14,700)	12,598
Inventories	(4,819)	(2,045)	11,687
Prepaid expenses and other assets	(3,347)	3,227	6,642
Accounts payable	5,086	1,018	3,432
Deferred revenues	(3,436)	(4,808)	(392)
Income taxes payable	(136)	440	(2,978)
Accrued and other liabilities	(7,410)	(501)	(8,499)
Net cash provided by operating activities	31,295	12,284	3,064
Cash flows from investing activities:			
Proceeds from maturities of investments	—	—	3,106
Proceeds from sales of investments	—	104	3,792
Purchases of property and equipment	(10,328)	(7,044)	(11,399)
Net cash used in investing activities	(10,328)	(6,940)	(4,501)
Cash flows from financing activities:			
Proceeds from convertible debt	115,500	—	—
Payments of convertible debt	(109,603)	—	—
Payment of convertible debt issuance costs	(4,277)	—	—
Proceeds from other debts and finance leases	4,684	5,066	6,344
Repayment of other debts and finance leases	(6,913)	(7,132)	(7,408)
Proceeds from common stock issued to employees	8,406	4,947	4,716
Payment of tax withholding obligations related to net share settlements of restricted stock units	(1,492)	(230)	(2,757)
Net cash provided by financing activities	6,305	2,651	895
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(203)	(763)	1,879
Net increase in cash, cash equivalents and restricted cash	27,069	7,232	1,337
Cash, cash equivalents and restricted cash, beginning of the year	65,989	58,757	57,420
Cash, cash equivalents and restricted cash, end of the year	$ 93,058	$ 65,989	$ 58,757
Supplemental disclosures of cash flow information:			
Income tax payments, net	$ 1,138	$ 2,031	$ 2,141

Interest payments, net		4,260		5,273		5,515
Supplemental schedule of non-cash investing and financing activities:						
Capital expenditures incurred but not yet paid	$	2,055	$	148	$	337
Issuance of warrant		16,142		2,295		—
Reconciliation of cash, cash equivalents, and restricted cash to the consolidated balance sheets						
Cash and cash equivalents	$	93,058	$	65,989	$	57,024
Restricted cash included in prepaid expenses and other current assets		—		—		530
Restricted cash included in other long-term assets		—		—		1,203
Total cash, cash equivalents and restricted cash	$	93,058	$	65,989	$	58,757

The accompanying notes are an integral part of these consolidated financial statements.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

NOTE 1: DESCRIPTION OF BUSINESS

Harmonic Inc. (“Harmonic” or the “Company”) is a leading global provider of (i) versatile and high performance video delivery software, products, system solutions and services that enable our customers to efficiently create, prepare, store, playout and deliver a full range of high-quality broadcast and “over-the-top” (OTT) video services to consumer devices, including televisions, personal computers, laptops, tablets and smart phones and (ii) cable access solutions that enable cable operators to more efficiently and effectively deploy high-speed internet, for data, voice and video services to consumers.

The Company operates in two segments, Video and Cable Access. The Video business sells video processing and production and playout solutions and services worldwide to cable operators and satellite and telecommunications (telco) pay-TV service providers, which are collectively referred to as “service providers,” and to broadcast and media companies, including streaming media companies. The Video business infrastructure solutions are delivered either through shipment of our products, software licenses or as software-as-a-service (“SaaS”) subscriptions. The Cable Access business sells cable access solutions and related services, including our CableOS software-based cable access solution, primarily to cable operators globally.

NOTE 2: SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation

The accompanying consolidated financial statements of Harmonic include the accounts of the Company and its wholly-owned subsidiaries. All intercompany accounts and transactions have been eliminated in consolidation. The Company’s fiscal quarters are based on 13-week periods, except for the fourth quarter which ends on December 31.

Use of Estimates

The preparation of consolidated financial statements in conformity with generally accepted accounting principles in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the consolidated financial statements and the reported amounts of revenues and expenses during the reporting period. The Company’s reported financial positions or results of operations may be materially different under changed conditions or when using different estimates and assumptions, particularly with respect to significant accounting policies. If estimates or assumptions differ from actual results, subsequent periods are adjusted to reflect more current information.

Reclassifications

Certain prior period balances have been reclassified to conform to the current year presentation. These reclassifications did not have material impact on previously reported financial statements.

Beginning in fiscal 2019, the Company changed the way total revenue and cost of revenue is classified in the Consolidated Statements of Operations from the two previous categories, “Product” and “Service”, to two new categories, “Appliance and integration” and “SaaS and service”. The Company has also adjusted revenue and cost of revenue retrospectively into the two new categories for all prior periods to conform to the current period’s presentation. This reclassification within revenue and cost of revenue did not have an impact on total revenue, cost of revenue or segment revenue for any periods presented.

Cash and Cash Equivalents

Cash and cash equivalents include all cash and highly liquid investments with maturities of three months or less at the date of purchase. The carrying amount of cash and cash equivalents approximates fair value because of the short maturity of those instruments.

Investments in Equity Securities

From time to time, the Company may acquire certain equity investments for the promotion of business and strategic objectives and these investments may be in marketable equity securities or non-marketable equity securities. Effective January 1, 2018, the Company adopted Accounting Standard Update (“ASU”) No. 2016-01, Financial Instruments (Topic 825): Recognition and Measurement of Financial Assets and Financial Liabilities, and accounts for its equity investments (except those accounted for under the equity method of accounting or those that result in consolidation of the investee) to be measured at fair value with changes in fair value recognized in net income. For equity investments that do not have readily determinable fair values, the Company measure these investments at cost minus impairment, if any, The Company's equity investments are classified as long-term investments and reported as a component of "Other long-term assets" on the Company's Consolidated Balance Sheets.

Prior to January 1, 2018, the Company accounted for its investments in entities that it did not have significant influence under the cost method. Investments in equity securities were carried at fair value if the fair value of the security is readily determinable. Unrealized gains and losses, net of taxes, on the long-term investments were included in the Company's Consolidated Balance Sheet as a component of accumulated other comprehensive loss. Investments in equity securities that did not qualify for fair value accounting or equity method accounting were accounted for under the cost method.

The Company's total investments in equity securities of other privately and publicly held companies were $3.6 million as of December 31, 2019 and 2018, respectively.

Liquidity

As of December 31, 2019, the Company's principal sources of liquidity consisted of cash and cash equivalents of $93.1 million, net accounts receivable of $88.5 million, and an aggregate principal amount of up to $25.0 million in revolving credit facility with JPMorgan Chase Bank, N.A., and financing from French government agencies. As of December 31, 2019, the Company had $115.5 million in principal amount of convertible senior notes outstanding, bearing interest at a rate of 2.00% per year, payable semiannually on March 1 and September 1 of each year (the "2024 Notes") which are due on September 1, 2024, and $45.8 million in principal amount of convertible notes outstanding, bearing interest at a rate of 4.00% per year, payable in cash on June 1 and December 1 of each year (the "2020 Notes") which are due on December 1, 2020. The Company also had debts with French government agencies and to a lesser extent, with other financial institutions, primarily in France, in the aggregate of $17.2 million at December 31, 2019.

The Company's principal uses of cash will include repayments of debt and related interest, purchases of inventory, payroll, restructuring expenses, and other operating expenses related to the development and marketing of our products, purchases of property and equipment and other contractual obligations for the foreseeable future. The Company believes that its cash and cash equivalents of $93.1 million at December 31, 2019 will be sufficient to fund its principal uses of cash for at least the next 12 months. However, if its expectations are incorrect, it may need to raise additional funds to fund our operations, to take advantage of unanticipated strategic opportunities or to strengthen our financial position. Additional funds may not be available on terms favorable to us or at all.

Credit Risk and Major Customers/Supplier Concentration

Financial instruments which subject the Company to concentrations of credit risk consist primarily of cash, cash equivalents, and accounts receivable. Cash and cash equivalents are invested in short-term, highly liquid, investment-grade obligations of commercial or governmental issuers, in accordance with the Company's investment policy. The investment policy limits the amount of credit exposure to any one financial institution, commercial or governmental issuer.

The Company's accounts receivable are derived from sales to worldwide cable, satellite, telco, and broadcast and media companies. The Company generally does not require collateral from its customers, and performs ongoing credit evaluations of its customers and provides for expected losses. The Company maintains an allowance for doubtful accounts based upon the expected collectability of its accounts receivable. One customer had a balance greater than 10% of the Company's net accounts receivable balance as of December 31, 2019 and two customers had a balance greater than 10% as of December 31, 2018. During the year ended December 31, 2019 and 2018, Comcast accounted for more than 10% of the Company's revenue.

Certain of the components and subassemblies included in the Company's products are obtained from a single source or a limited group of suppliers. Although the Company seeks to reduce dependence on those sole source and limited source suppliers, the partial or complete loss of certain of these sources could have at least a temporary adverse effect on the Company's results of operations and damage customer relationships.

Revenue Recognition

The Company's principal sources of revenue are from the sale of hardware, software, hardware and software maintenance contracts, and end-to-end solutions, encompassing design, manufacture, test, integration and installation of products. The Company also derives recurring revenue from subscriptions, which are comprised of subscription fees from customers utilizing the Company's cloud-based video processing solutions.

Beginning in fiscal 2019, the Company changed the way total revenue was classified in the Consolidated Statement of Operations from the two previous categories, “Product” and “Service”, to two new categories, “Appliance and integration” and “SaaS and service”. The “Appliance and integration” revenue category includes hardware, licenses and professional services and is reflective of non-recurring revenue, while the “SaaS and service” category includes usage fees for the Company’s SaaS platform and support revenue stream from the Company’s appliance-based customers and reflects the Company’s recurring revenue stream.

Revenue from contracts with customers is recognized using the following five steps:

a) Identify the contract(s) with a customer;
b) Identify the performance obligations in the contract;
c) Determine the transaction price;
d) Allocate the transaction price to the performance obligations in the contract; and
e) Recognize revenue when (or as) the Company satisfies a performance obligation.

A contract contains a promise (or promises) to transfer goods or services to a customer. A performance obligation is a promise (or a group of promises) that is distinct. The transaction price is the amount of consideration a Company expects to be entitled from a customer in exchange for providing the goods or services.

The unit of account for revenue recognition is a performance obligation. A contract may contain one or more performance obligations, including hardware, software, professional services and support and maintenance. Performance obligations are accounted for separately if they are distinct. A good or service is distinct if the customer can benefit from the good or service either on its own or together with other resources that are readily available to the customer, and the good or service is distinct in the context of the contract. Otherwise performance obligations will be combined with other promised goods or services until the Company identifies a bundle of goods or services that is distinct.

The transaction price is allocated to all the separate performance obligations in an arrangement. It reflects the amount of consideration to which the Company expects to be entitled in exchange for transferring goods or services, which may include an estimate of variable consideration to the extent that it is probable of not being subject to significant reversals in the future based on the Company’s experience with similar arrangements. The transaction price also reflects the impact of the time value of money if there is a significant financing component present in an arrangement. The transaction price excludes amounts collected on behalf of third parties, such as sales taxes.

Revenue is recognized when the Company satisfies each performance obligation by transferring control of the promised goods or services to the customer. Goods or services can transfer at a point in time or over time depending on the nature of the arrangement.

Refer to Note 3, “Revenue” for additional information.

Inventories

Inventories are stated at the lower of cost or net realizable value. Cost is computed using standard cost, which approximates actual cost, on a first-in, first-out basis. The cost of inventories is comprised of material, labor and manufacturing overhead. The Company’s manufacturing overhead standards for product costs are calculated assuming full absorption of forecasted spending over projected volumes. The Company establishes provisions for excess and obsolete inventories to reduce such inventories to their estimated net realizable value after evaluation of historical sales, future demand and market conditions, expected product life cycles and current inventory levels. Such provisions are charged to cost of revenue in the Company’s Consolidated Statements of Operations.

Capitalized Software Development Costs

External-use software. Research and development costs are generally charged to expense as incurred. The Company has not capitalized any such development costs because the costs incurred between the attainment of technological feasibility for the related software product through the date when the product is available for general release to customers has been insignificant.

Internal-use software. The Company capitalizes costs associated with internally developed and/or purchased software systems for internal use that have reached the application development stage. Capitalized costs include external direct costs of materials and services utilized in developing or obtaining internal-use software and payroll and payroll-related expenses for employees who are directly associated with and devote time to the internal-use software project. Capitalization of such costs begins when the preliminary project stage is complete and ceases no later than the point at which the project is substantially complete and ready for its intended purpose. These capitalized costs are amortized on a straight-line basis, generally three years.

During the years ended December 31, 2019, 2018 and 2017, the Company capitalized $1.1 million, $0.9 million and $1.1 million, respectively, of its software development costs related to the development of its SaaS offerings.

Capitalized Software Implementation Costs

In a hosting arrangement that is a service contract, the Company capitalizes costs for implementation activities in the application development stage depending on the nature of the costs. The costs incurred during the preliminary project and post-implementation stages are expensed as the activities are performed. The costs capitalized are expensed over the term of the hosting arrangement, which is the fixed, noncancelable term of the arrangement, plus any reasonably certain renewal periods. The capitalized implementation costs and amortization expense related to these costs are included in “Other long-term assets” and “Selling, general and administrative” in the Consolidated Balance Sheets and Consolidated Statements of Operations, respectively. The payments for capitalized implementation costs are included as operating activities in the Consolidated Statements of Cash Flows.

During the year ended December 31, 2019, the Company capitalized $3.6 million of its software implementation costs. During the year ended December 31, 2018, the amount of capitalized software implementation cost was not significant.

Property and Equipment

Property and equipment are recorded at cost. Depreciation is computed using the straight-line method over the estimated useful lives of the assets. Estimated useful lives are generally, five years for furniture and fixtures, three years for software and four years for machinery and equipment. Depreciation for leasehold improvements are computed using the shorter of the remaining useful lives of the assets or the lease term of the respective assets.

Goodwill

As of December 31, 2019, the Company had goodwill of $239.8 million which represents the difference between the purchase price and the estimated fair value of the identifiable assets acquired and liabilities assumed. The Company tests for goodwill impairment at the reporting unit level on an annual basis, or more frequently if events or changes in circumstances indicate that the asset is more likely than not impaired. The Company has two reporting units, which are the same as its operating segments.

The Company’s annual goodwill impairment test is performed in the fiscal fourth quarter, with a testing date at the end of fiscal October. In evaluating goodwill for impairment, the Company first assesses qualitative factors to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying value (including goodwill). If the Company concludes that it is not more likely than not that the fair value of a reporting unit is less than its carrying value, then no further testing is required. However, if the Company concludes that it is more likely than not that the fair value of a reporting unit is less than its carrying value, then the two-step goodwill impairment test is performed to identify a potential goodwill impairment and measure the amount of impairment to be recognized, if any. The first step requires comparing the fair value of the reporting unit to its net book value, including goodwill. A potential impairment exists if the fair value of the reporting unit is lower than its net book value. The second step of the process, which is performed only if a potential impairment exists, involves determining the difference between the fair value of the reporting unit’s net assets other than goodwill and the fair value of the reporting unit. If this difference is less than the net book value of goodwill, an impairment exists and is recorded.

In the first step, the fair value of each of the Company’s reporting units is determined using both the income and market valuation approaches. Under the income approach, the fair value of the reporting unit is based on the present value of estimated future cash flows that the reporting unit is expected to generate over its remaining life. Under the market approach, the value of the reporting unit is based on an analysis that compares the value of the reporting unit to values of publicly-traded companies in similar lines of business. In the application of the income and market valuation approaches, the Company is required to make estimates of future operating trends and judgments on discount rates and other variables. Determining the fair value of a reporting unit is highly judgmental in nature and involves the use of significant estimates and assumptions. The Company bases its fair value estimates on assumptions the Company believes to be reasonable but that are unpredictable and inherently uncertain. Actual future results related to assumed variables could differ from these estimates. In addition, the Company makes certain judgments and assumptions in allocating shared assets and liabilities to determine the carrying values for each of its reporting units.

Under the income approach, the Company calculates the fair value of a reporting unit based on the present value of estimated future cash flows. Cash flow projections are based on management's estimates of revenue growth rates and operating margins, taking into consideration industry and market conditions. The discount rate used is based on the weighted-average cost of capital adjusted for the relevant risk associated with business-specific characteristics and the uncertainty related to the business's ability to execute on the projected cash flows. Under the market approach, the Company estimates the fair value based on market multiples of revenue and earnings derived from comparable publicly-traded companies with similar operating and investment characteristics as the reporting units, and then apply a control premium which is determined by considering control premiums offered as part of the acquisitions that have occurred in market segments that are comparable with its reporting units.

There was no impairment of goodwill resulting from the Company's fiscal 2019 annual impairment testing. (See Note 8, "Goodwill and Identified Intangible Assets," for additional information).

Long-lived Assets

Long-lived assets represent property and equipment and purchased intangible assets. Purchased intangible assets from business combinations and asset acquisitions include customer contracts, trademarks and trade names, and maintenance agreements and related relationships, the amortization of which is charged to general and administrative expenses, and core technology and developed technology, the amortization of which is charged to cost of revenue. The Company evaluates the recoverability of intangible assets and other long-lived assets when indicators of impairment are present. When impairment indicators are present, the Company evaluates the recoverability of intangible assets and other long-lived assets on the basis of undiscounted cash flows expected to result from the use of each asset group and its eventual disposition. If the undiscounted expected future cash flows are less than the carrying amount of the asset, an impairment loss is recognized in order to write down the carrying value of the asset to its estimated fair market value. There were no impairment charges for long-lived assets in the years ended December 31, 2019, 2018 and 2017.

Leases

On January 1, 2019, the Company adopted ASC 842, Leases ("Topic 842"), using the modified retrospective method, applying Topic 842 to all leases existing at the date of initial application. The Company elected to use the effective date as the date of initial application. Consequently, prior period balances and disclosures have not been restated. The Company elected certain practical expedients, which among other things, allowed the Company to carry forward prior conclusions about lease identification and classification.

Under Topic 842, operating lease expense is generally recognized evenly over the term of the lease. The Company has operating leases primarily consisting of facilities with remaining lease terms of 1 year to 11 years. The lease term represents the non-cancelable period of the lease. For certain leases, the Company has an option to extend the lease term. These renewal options are not considered in the remaining lease term unless it is reasonably certain that the Company will exercise such options.

Refer to Note 4, "Leases" for additional information.

Foreign Currency

The functional currency of the Company's Israeli, Cayman and Swiss operations is the U.S. dollar. All other foreign subsidiaries use the respective local currency as the functional currency. When the local currency is the functional currency, gains and losses from translation of these foreign currency financial statements into U.S. dollars are recorded as a separate component of other comprehensive income (loss) in stockholders' equity.

The Company's foreign currency exposure is also related to its net position of monetary assets and monetary liabilities held by its subsidiaries in their nonfunctional currencies. These monetary assets and monetary liabilities are being remeasured into the functional currencies of the subsidiaries using exchange rates prevailing on the balance sheet date. Such remeasurement gains and losses are included in other expense, net in the Company's Consolidated Statements of Operations. During the years ended December 31, 2019, 2018 and 2017, the Company recorded remeasurement losses of approximately $1.5 million, $0.6 million and $2.2 million, respectively.

Derivative Instruments

The Company enters into derivative instruments, primarily foreign currency forward contracts, to minimize the short-term impact of foreign currency exchange rate fluctuations on certain foreign currency denominated assets and liabilities as well as certain foreign currencies denominated expenses. The Company does not enter into derivative instruments for trading purposes and these derivatives generally have maturities within twelve months.

The derivative instruments are recorded at fair value in prepaid expenses and other current assets or accrued and other current liabilities in the Company’s Consolidated Balance Sheet. For derivative instruments designated and qualifying as cash flow hedges of forecasted foreign currency denominated transactions expected to occur within twelve months, the effective portion of the gain or loss on these hedges is reported as a component of “Accumulated other comprehensive loss” in stockholders’ equity, and is reclassified into earnings when the hedged transaction affects earnings. If the transaction being hedged fails to occur, or if a portion of any derivative is (or becomes) ineffective, the gain or loss on the associated financial instrument is recorded immediately in earnings. For derivative instruments used to hedge existing foreign currency denominated assets or liabilities, the gains or losses on these hedges are recorded immediately in earnings to offset the changes in the fair value of the assets or liabilities being hedged.

The Company did not enter into any cash flow hedges during the year ended December 31, 2019 and 2018.

Research and Development

Research and development (“R&D”) costs are expensed as incurred and consists primarily of employee salaries and related expenses, contractors and outside consultants, supplies and materials, equipment depreciation and facilities costs, all associated with the design and development of new products and enhancements of existing products.

The Company’s French Subsidiary participates in the French Crédit d’Impôt Recherche (“CIR”) program which allows companies to monetize eligible research expenses. The R&D tax credits receivable from the French government for spending on innovative R&D under the CIR program is recorded as an offset to R&D expenses. In the years ended December 31, 2019, 2018 and 2017, the Company had R&D tax credits of $4.7 million, $5.9 million and $5.9 million respectively.

Restructuring and Related Charges

The Company’s restructuring charges consist primarily of employee severance, one-time termination benefits related to the reduction of its workforce, and other costs. Liabilities for costs associated with a restructuring activity are recognized when the liability is incurred and are measured at fair value. One-time termination benefits are expensed at the date the entity notifies the employee, unless the employee must provide future service, in which case the benefits are expensed ratably over the future service period. Termination benefits are calculated based on regional benefit practices and local statutory requirements. See Note 11, “Restructuring and Related Charges” for additional information.

Warranty

The Company accrues for estimated warranty costs at the time of revenue recognition and records such accrued liabilities as part of cost of revenue. Management periodically reviews its warranty liability and adjusts the accrued liability based on the terms of warranties provided to customers, historical and anticipated warranty claims experience, and estimates of the timing and cost of warranty claims.

Advertising Expenses

All advertising costs are expensed as incurred and included in “Selling, general and administrative expenses” in the Company’s Consolidated Statements of Operations. Advertising expense was $0.7 million, $1.0 million and $0.7 million for the years ended December 31, 2019, 2018 and 2017, respectively.

Stock-based Compensation

The Company measures and recognizes compensation expense for all stock-based compensation awards made to employees, including stock options, restricted stock units (“RSUs”) and awards related to the Company’s Employee Stock Purchase Plan (“ESPP”), based upon the grant-date fair value of those awards.

Prior to January 1, 2017, stock-based compensation was recorded net of estimated forfeitures over the requisite service period and, accordingly, was recorded for only those stock-based awards that the Company expected to vest. Upon the adoption of ASU No. 2016-09, Compensation - Stock Compensation (Topic 718), issued by the Financial Accounting Standards Board (“FASB”), the Company changed its accounting policy to account for forfeitures as they occur. The change was applied on a modified retrospective approach with a cumulative effect adjustment of $69,000 to retained earnings as of January 1, 2017 (which increased the accumulated deficit).

The fair value of the Company’s stock options and ESPP is estimated at grant date using the Black-Scholes option pricing model. The fair value of the Company’s RSUs is calculated based on the market value of the Company’s stock at the grant date. The fair value of the Company’s market-based RSUs (“MRSUs”) is estimated using the Monte-Carlo valuation model with market vesting conditions.

The Company recognizes the stock-based compensation for performance-based RSUs ("PRSUs") based on the probability of achieving certain performance criteria, as defined in the PRSU agreements. The Company estimates the number of PRSUs ultimately expected to vest and recognizes expense using the graded vesting attribution method over the requisite service period. Changes in the estimates related to probability of achieving certain performance criteria and number of PRSUs expected to vest could significantly affect the related stock-based compensation expense from one period to the next.

Pension Plan

Under French law, the Company's subsidiaries in France, including the acquired TVN French Subsidiary, is obligated to provide for a defined benefit plan to its employees upon their retirement from the Company. The Company's defined benefit pension plan in France is unfunded.

The Company records its obligations relating to the pension plans based on calculations which include various actuarial assumptions including employees' age and period of service with the company; projected mortality rates, mobility rates and increases in salaries; and a discount rate. The Company reviews its actuarial assumptions on an annual basis as of December 31 (or more frequently if a significant event requiring remeasurement occurs) and modifies the assumptions based on current rates and trends when it is appropriate to do so. The Company believes that the assumptions utilized in recording its obligations under its pension plan are reasonable based on its experience, market conditions and input from its actuaries.

The Company accounts for the actuarial gains (losses) in accordance with ASC 715, "Compensation - Retirement Benefits". If the net accumulated gain or loss exceeds 10% of the projected plan benefit obligation, a portion of the net gain or loss is amortized and included in expense for the following year based upon the average remaining service period of active plan participants, unless the Company's policy is to recognize all actuarial gains (losses) when they occur. The Company elected to defer actuarial gains (losses) in accumulated other comprehensive income (loss). As of December 31, 2019, the Company did not meet the 10% threshold, and therefore no amortization of 2019 actuarial gain would be recorded in 2020.

See Note 13, "Employee Benefit Plans and Stock-based Compensation-French Retirement Benefit Plan," for additional information.

Income Taxes

In preparing the Company's financial statements, the Company estimates the income taxes for each of the jurisdictions in which the Company operates. This involves estimating the Company's current tax expense and assessing temporary and permanent differences resulting from differing treatment of items, such as reserves and accruals, for tax and accounting purposes. These temporary differences result in deferred tax assets and liabilities, which are included within the Company's Consolidated Balance Sheet.

The Company's income tax policy is to record the estimated future tax effects of temporary differences between the tax bases of assets and liabilities and amounts reported in the Company's accompanying Consolidated Balance Sheets, as well as operating loss and tax credit carryforwards. The Company follows the guidelines set forth in the applicable accounting guidance regarding the recoverability of any tax assets recorded on the Consolidated Balance Sheet and provides any necessary allowances as required. Determining necessary allowances requires the Company to make assessments about the timing of future events, including the probability of expected future taxable income and available tax planning opportunities. A history of operating losses in recent years has led to uncertainty with respect to our ability to realize certain of our net deferred tax assets, and as a result we applied a full valuation allowance against our U.S. net deferred tax assets as of December 31, 2019. In the event that actual results differ from these estimates or the Company adjusts these estimates in future periods, the Company's operating results and financial position could be materially affected.

The Company is subject to examination of its income tax returns by various tax authorities on a periodic basis. The Company regularly assesses the likelihood of adverse outcomes resulting from such examinations to determine the adequacy of its provision for income taxes. The Company has applied the provisions of the applicable accounting guidance on accounting for uncertainty in income taxes, which requires application of a more-likely-than-not threshold to the recognition and de-recognition of uncertain tax positions. If the recognition threshold is met, the applicable accounting guidance permits the Company to recognize a tax benefit measured at the largest amount of tax benefit that, in the Company's judgment, is more than 50% likely to be realized upon settlement. It further requires that a change in judgment related to the expected ultimate resolution of uncertain tax positions be recognized in earnings in the period of such change.

The Company files annual income tax returns in multiple taxing jurisdictions around the world. A number of years may elapse before an uncertain tax position is audited and finally resolved. While it is often difficult to predict the final outcome or the timing of resolution of any particular uncertain tax position, the Company believes that its reserves for income taxes reflect the most likely outcome. The Company adjusts these reserves and penalties, as well as the related interest, in light of changing facts and circumstances. Changes in the Company's assessment of its uncertain tax positions or settlement of any particular position could materially and adversely impact the Company's income tax rate, operating results, financial position and cash flows.

Segment Reporting

Operating segments are defined as components of an enterprise that engage in business activities for which separate financial information is available and is evaluated by the Chief Operating Decision Maker ("CODM"), which for the Company is its Chief Executive Officer, in deciding how to allocate resources and assess performance. The Company has two operating segments: Video and Cable Access.

Comprehensive Income (Loss)

Comprehensive income (loss) includes net loss and other comprehensive income (loss). Other comprehensive income (loss) includes cumulative translation adjustments, unrealized foreign exchange gains and losses on intercompany long-term loans, unrealized gains and losses on certain foreign currency forward contracts that qualify as cash flow hedges and available-for-sale securities, as well as actuarial gains and losses on pension plan.

Recently Adopted Accounting Pronouncements

Accounting Standards Codification (ASC) Topic 842, "Leases"

On January 1, 2019, the Company adopted ASC 842, Leases ("Topic 842"), using the modified retrospective method, applying Topic 842 to all leases existing at the date of initial application. The Company elected to use the effective date as the date of initial application. Consequently, prior period balances and disclosures have not been restated. The Company elected certain practical expedients, which among other things, allowed the Company to carry forward prior conclusions about lease identification and classification.

Adoption of the standard resulted in the balance sheet recognition of additional lease assets and liabilities of approximately $23.3 million; however, the adoption of the standard did not have an impact on the Company's beginning retained earnings, results from operations or cash flows. See Note 4, "Leases" for additional information.

ASU No. 2018-07, Compensation-Stock Compensation (Topic 718)

In June 2018, the FASB issued ASU No. 2018-07, Compensation-Stock Compensation ("Topic 718"): Improvements to Nonemployee Share-Based Payment Accounting. The new ASU expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. An entity should apply the requirements of Topic 718 to nonemployee awards except for specific guidance on inputs to an option pricing model and the attribution of cost. The Company adopted this new standard in the first quarter of fiscal 2019, and the adoption resulted in an adjustment of $1.4 million as the cumulative effect adjustment to opening retained earnings relating to the accounting of warrants which were previously granted to Comcast. This represents the cumulative impact of the remeasurement of unvested Comcast warrants on the date of adoption. See Note 17, "Warrants" for additional information.

ASU No. 2018-15, Intangibles-Goodwill and Other-Internal-Use Software (Subtopic 350-40)

In August 2018, the FASB issued ASU No. 2018-15, Intangibles-Goodwill and Other-Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement that is a Service Contract. This new standard requires an entity (customer) in a hosting arrangement that is a service contract to follow the guidance in Subtopic 350-40 to determine which implementation costs to capitalize as an asset related to the service contract and which costs to expense. Costs for implementation activities in the application development stage can be capitalized depending on the nature of the costs, while costs incurred during the preliminary project and post-implementation stages are expensed as the activities are performed. The costs capitalized are expensed over the term of the hosting arrangement. The amendments in the new ASU also require the entity to present the expense related to the capitalized implementation costs in the same line item in the statement of income as the fees associated with the hosting element (service) of the arrangement and classify payments for capitalized implementation costs in the statement of cash flows in the same manner as payments made for fees associated with the hosting element.

The Company early adopted this new standard in the third quarter of fiscal 2018 and applied it prospectively to all implementation costs incurred after the date of adoption. The adoption of this standard did not have a significant impact on the Company's Consolidated Financial Statements for the year ended December 31, 2018.

Recently Issued Accounting Pronouncements

In December 2019, the FASB issued ASU 2019-12, Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes, which removes certain exceptions to the general principles in Topic 740 and improves consistent application of and simplifies GAAP for other areas of Topic 740 by clarifying and amending existing guidance. The new ASU will be effective for the Company beginning in the first quarter of 2021 on a prospective basis. Early adoption of the standard is permitted, including adoption in interim or annual periods for which financial statements have not yet been issued. The adoption of the new ASU is not expected to have a material impact on the Company's consolidated financial statements.

In November 2019, the FASB issued ASU 2019-08, Compensation - Stock Compensation (Topic 718) and Revenue from Contracts with Customers (Topic 606): Codification Improvements - Share-Based Consideration Payable to a Customer, which clarifies guidance on measurement and classification of share-based payments to customers. The new ASU will be effective for the Company effective in the first quarter of 2020 and early adoption is permitted. The adoption of the new ASU is not expected to have a material impact on the Company's consolidated financial statements.

In January 2017, the FASB issued ASU No. 2017-04, Intangibles - Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment. The new ASU removes Step 2 of the goodwill impairment test and requires the assessment of fair value of individual assets and liabilities of a reporting unit to measure goodwill impairments. Goodwill impairment will then be the amount by which a reporting unit's carrying value exceeds its fair value. The new ASU will be effective for the Company beginning in the first quarter of fiscal 2020 on a prospective basis, and early adoption is permitted. The adoption of the new ASU is not expected to have a material impact on the Company's consolidated financial statements.

In August 2018, the FASB issued ASU 2018-13, which removes, modifies and adds to the disclosure requirements on fair value measurements in Topic 820. The amendments on changes in unrealized gains and losses, the range and weighted average of significant unobservable inputs used to develop Level 3 fair value measurements, and the narrative description of measurement uncertainty should be applied prospectively for only the most recent interim or annual period presented in the initial fiscal year of adoption. All other amendments should be applied retrospectively to all periods presented upon their effective date. This guidance will become effective for the Company in fiscal years beginning after December 15, 2019, including interim periods within that reporting period. Early adoption is permitted upon issuance of this updated guidance. An entity is permitted to early adopt any removed or modified disclosures upon issuance of this updated guidance and delay adoption of the additional disclosures until their effective date. The Company does not currently hold any level 3 assets or liabilities which require recurring measurements and the Company expects the impact to its disclosure will be relatively limited.

In August 2018, the FASB issued ASU No. 2018-14, Compensation - Retirement Benefits - Defined Benefit Plans - General Subtopic 715-20 - Disclosure Framework - Changes to the Disclosure Requirements for Defined Benefit Plans, which is designed to improve the effectiveness of disclosures by removing and adding disclosures related to defined benefit plans. The new ASU is effective for the Company for fiscal years ending after December 15, 2020, and early adoption is permitted. The Company expects the impact to its disclosure to be relatively limited.

NOTE 3: REVENUE

Revenue from contracts with customers is recognized using the following five steps:

a) Identify the contract(s) with a customer;
b) Identify the performance obligations in the contract;
c) Determine the transaction price;
d) Allocate the transaction price to the performance obligations in the contract; and
e) Recognize revenue when (or as) the Company satisfies a performance obligation.

A contract contains a promise (or promises) to transfer goods or services to a customer. A performance obligation is a promise (or a group of promises) that is distinct. The transaction price is the amount of consideration a Company expects to be entitled from a customer in exchange for providing the goods or services.

The unit of account for revenue recognition is a performance obligation. A contract may contain one or more performance obligations, including hardware, software, professional services and support and maintenance. Performance obligations are accounted for separately if they are distinct. A good or service is distinct if the customer can benefit from the good or service either on its own or together with other resources that are readily available to the customer, and the good or service is distinct in the context of the contract. Otherwise performance obligations will be combined with other promised goods or services until the Company identifies a bundle of goods or services that is distinct.

The transaction price is allocated to all the separate performance obligations in an arrangement. It reflects the amount of consideration to which the Company expects to be entitled in exchange for transferring goods or services, which may include an estimate of variable consideration to the extent that it is probable of not being subject to significant reversals in the future based on the Company's experience with similar arrangements. The transaction price also reflects the impact of the time value of money if there is a significant financing component present in an arrangement. The transaction price excludes amounts collected on behalf of third parties, such as sales taxes.

Revenue is recognized when the Company satisfies each performance obligation by transferring control of the promised goods or services to the customer. Goods or services can transfer at a point in time or over time depending on the nature of the arrangement.

Contract Balances. Deferred revenue represents the Company's obligation to transfer goods or services to a customer for which the Company has received consideration (or an amount of consideration is due) from the customer. The Company's payment terms vary by the type and location of its customer and the products or services offered. The term between invoicing and when payment is due is not significant. For certain products or services and customer types, the Company requires payment before the products or services are delivered to the customer.

Revenue recognized during the year ended December 31, 2019 that was included within the deferred revenue balance at January 1, 2019 was $41.1 million. Revenue recognized during the year ended December 31, 2018 that was included within the deferred revenue balance at January 1, 2018 was $46.9 million.

Contract assets exist when the Company has satisfied a performance obligation but does not have an unconditional right to consideration (e.g., because the entity first must satisfy another performance obligation in the contract before it is entitled to invoice the customer).

Contract assets and deferred revenue consisted of the following (in thousands):

	December 31,	
	2019	2018
Contract assets	$ 13,969	$ 3,834
Deferred revenue	43,450	46,922

Contract assets and Deferred revenue (long-term) are reported as components of "Prepaid expenses and other current assets" and "Other non-current liabilities," respectively, on the Consolidated Balance Sheets. See Note 10, "Certain Balance Sheet Components" for additional information.

Shipping and handling costs are accounted for as a fulfillment cost and are recorded in cost of revenue in the Company's Consolidated Statements of Operations. Sales tax and other amounts collected on behalf of third parties are excluded from the transaction price.

Hardware and Software. Revenue from the sale of hardware and software products is recognized when the control is transferred. For most of the Company's product sales (including sales to distributors and system integrators), the control is transferred at the time the product is shipped or delivery has occurred because the customer has significant risks and rewards of ownership of the asset and the Company has a present right to payment at that time. The Company's agreements with the distributors and system integrators have terms which are generally consistent with the standard terms and conditions for the sale of the Company's equipment to end users, and do not provide for product rotation or pricing allowances, as are typically found in agreements with stocking distributors. The Company offers return rights which are specifically identified and accrued for as sales returns at the end of the period.

Arrangements with Multiple Performance Obligations. The Company has revenue arrangements that include multiple performance obligations. The Company allocates transaction price to all separate performance obligations based on their relative standalone selling prices ("SSP"). See "*Significant Judgments*" for additional information.

Solution Sales. Solution sales for the design, manufacture, test, integration and installation of products, including equipment acquired from third parties to be integrated with Harmonic's products, that are customized to meet the customer's specifications are accounted for based on the percentage-of-completion basis, using the input method. Some of our arrangements may include acceptance provisions that require testing of the solution against specific performance criteria. The Company performs a detailed evaluation to determine whether the arrangement involves performance criteria based on our standard performance criteria. The Company has a long-standing history of entering into contractual arrangements to deliver the solution sales based on standard performance criteria. For this type of arrangement, we consider the customer acceptance clause not substantive and recognize product revenue when the customer takes possession on the product and recognize service on a percentage-of-completion basis using the input method. However, if the solution results in significant production, modification or customization, we consider the arrangement as a single performance obligation and recognize the revenue at a point in time, depending on the complexity of the solution and nature of acceptance.

Professional services. Revenue from professional services is recognized over time, on the percentage-of-completion basis using the input method.

Input method. The use of the input method requires the Company to make reasonably dependable estimates. We use the input method based on labor hours, where revenue is calculated based on the percentage of total hours incurred in relation to total estimated hours at completion of the contract. The input method is reasonable because the hours best reflect the Company's efforts toward satisfying the performance obligation over time. As circumstances change over time, the Company updates its measure of progress to reflect any changes in the outcome of the performance obligation. Such changes to an entity's measure of progress are accounted for as a change in accounting estimates.

Support and maintenance. Support and maintenance services are satisfied ratably over time as the customer simultaneously receives and consumes the benefits of the services.

Contract costs. The incremental costs of obtaining a contract are capitalized if the costs are expected to be recovered. Costs that are recognized as assets are amortized straight-line over the period as the related goods or services transfer to the customer. Costs incurred to fulfill a contract are capitalized if they are not covered by other relevant guidance, relate directly to a contract, will be used to satisfy future performance obligations, and are expected to be recovered.

The net capitalized contract costs as of December 31, 2019 were $2.0 million, of which $1.3 million and $0.7 million were reported as components of "Prepaid expenses and other current assets" and "Other long-term assets" on the Consolidated Balance Sheets, respectively. The amortization of the capitalized contract costs for the year ended December 31, 2019 was $1.5 million.

Significant Judgments. The Company has revenue arrangements that include promises to transfer multiple products and services to a customer. The Company may exercise significant judgment when determining whether products and services are considered distinct performance obligations that should be accounted for separately versus together.

The Company allocates transaction price to all separate performance obligations based on their relative standalone selling prices ("SSP"). The Company's best evidence for SSP is the price the Company charges for that good or service when the Company sells it separately in similar circumstances to similar customers. If goods or services are not always sold separately, the Company uses the best estimate of SSP in the allocation of transaction price. The objective of determining the best estimate of SSP is to estimate the price at which the Company would transact a sale if the product or service were sold on a standalone basis. The Company's process for determining best estimate of SSP involves management's judgment, and considers multiple factors including, but not limited to, major product groupings, geographies, gross margin objectives and pricing practices. Pricing practices taken into consideration include contractually stated prices, discounts offered and applicable price lists. These factors may vary over time, depending upon the unique facts and circumstances related to each deliverable. If the facts and circumstances underlying the factors considered change or should future facts and circumstances lead the Company to consider additional factors, the Company's best estimate of SSP may also change.

If the Company has not yet established a price because the good or service has not previously been sold on a standalone basis, SSP for such good and service in a contract with multiple performance obligations is determined by applying a residual approach whereby all other performance obligations within a contract are first allocated a portion of the transaction price based upon their respective SSP, using observable prices, with any residual amount of the transaction price allocated to the good or service for which the price has not yet been established.

Practical Expedients and Exemptions. Under Topic 606, incremental costs of obtaining a contract such as sales commissions are capitalized if they are expected to be recovered, and amortized on a straight-line basis. Expensing these costs as incurred is not permitted unless they qualify for a practical expedient. Other than capitalized costs of obtaining subscription contracts which are amortized regardless of the life of expected amortization period, the Company elected the practical expedient to expense the costs to obtain all other contracts as incurred, when the life of the expected amortization period is one year or less by using a portfolio approach.

The Company elected the practical expedient under Topic 606 to not disclose the transaction price allocated to remaining performance obligations, since the majority of the Company's arrangements have original expected durations of one year or less, or the invoicing corresponds to the value of the Company's performance completed to date. These performance obligations primarily relate to the Company's support and maintenance contracts which have a duration of one year or less and subscriptions services for which invoicing corresponds to the value of the Company's performance completed to date.

The Company elected the practical expedient that allows the Company to not assess a contract for a significant financing component if the period between the customer's payment and the transfer of the goods or services is one year or less.

In July 2019, Comcast elected enterprise license pricing for the Company's CableOS software as contemplated under certain existing commercial agreements between the Company and Comcast (the "CableOS software license agreement"), which also includes maintenance and support services, and material rights. As of December 31, 2019, the aggregate amount of the transaction price under this agreement allocated to the remaining performance obligations is $102.5 million, and the Company will recognize this revenue as the related performance obligations are delivered over the next three years to four years.

See Note 18, "Segment Information" for disaggregated revenue information.

NOTE 4. LEASES

Under Topic 842, operating lease expense is generally recognized evenly over the term of the lease. The Company has operating leases primarily consisting of facilities with remaining lease terms of 1 year to 11 years. The lease term represents the non-cancelable period of the lease. For certain leases, the Company has an option to extend the lease term. These renewal options are not considered in the remaining lease term unless it is reasonably certain that the Company will exercise such options.

The Company elected certain practical expedients under Topic 842 which are: (i) to not record leases with an initial term of twelve months or less on the balance sheet; (ii) to combine the lease and non-lease components in determining the lease liabilities and right-of-use assets, and (iii) to carry forward prior conclusions about lease identification and classification.

The Company's lease contracts do not provide an implicit borrowing rate, hence the Company determined the incremental borrowing rate based on information available at lease commencement to determine the present value of lease liability. The Company uses the parent entity's incremental borrowing rates as the treasury operations are managed centrally by the parent entity and, consequently, the pricing of leases at a subsidiary level is typically significantly influenced by the credit risk evaluated at the parent or consolidated group level on the basis of guarantees or other payment mechanisms that allow the lessor to look beyond just the subsidiary for payment.

During the year, the Company entered into new lease facilities, which were assessed under Topic 842 to be operating leases. The new leases resulted in the balance sheet recognition of $12.0 million in "Operating lease right-of use assets," $4.0 million in "Prepaid expenses and other current assets," $0.6 million in "Other non-current liabilities," and $15.5 million in "Accrued and other current liabilities."

The components of lease expense are as follows (in thousands):

	Year ended December 31, 2019
Operating lease cost	$ 9,574
Variable lease cost	3,232
Total lease cost	$ 12,806

Supplemental cash flow information related to leases are as follows (in thousands):

		Year ended December 31,
		2019
Cash paid for amounts included in the measurement of operating lease liabilities	$	9,702
ROU assets obtained in exchange for operating lease obligations	$	12,032

Other information related to leases are as follows:

	Year ended December 31,
	2019
Operating leases	
Weighted-average remaining lease term (years)	7.0
Weighted-average discount rate	7.1%

Future minimum lease payments under non-cancelable operating leases as of December 31, 2019 are as follows (in thousands):

Years ending December 31,		
2020	$	9,169
2021		6,181
2022		4,814
2023		4,524
2024		4,503
Thereafter		17,569
Total future minimum lease payments	$	46,760
Less: imputed interest		(11,546)
Total	$	35,214

Future minimum lease payments under non-cancelable operating leases as of December 31, 2018, as defined under the previous lease accounting guidance of ASC Topic 840, were as follows (in thousands):

Years ending December 31,		
2019	$	13,515
2020		10,139
2021		4,088
2022		2,523
2023		2,220
Thereafter		6,694
Total future minimum lease payments	$	39,179

NOTE 5: INVESTMENTS IN EQUITY SECURITIES

Unconsolidated Variable Interest Entities ("VIE")

From time to time, the Company may enter into investments in entities that are considered variable interest entities under Accounting Standards Codification (ASC) Topic 810. If the Company is a primary beneficiary of a variable interest entity ("VIE"), it is required to consolidate the entity. To determine if the Company is the primary beneficiary of a VIE, the Company evaluates whether it has (1) the power to direct the activities that most significantly impact the VIE's economic performance, and (2) the obligation to absorb losses or the right to receive benefits from the VIE that could potentially be significant to the VIE. The assessment of whether the Company is the primary beneficiary of its VIE requires significant assumptions and judgments.

EDC

In 2014, the Company acquired an 18.4% interest in Encoding.com, Inc. ("EDC"), a privately held video transcoding service company headquartered in San Francisco, California, for $3.5 million by purchasing EDC's Series B preferred stock. EDC is considered a VIE but the Company determined that it is not the primary beneficiary of EDC. As a result, EDC is measured at its cost minus impairment, if any. The Company determined that there were no indicators at December 31, 2019 and 2018 that EDC investment was impaired. The Company's maximum exposure to loss from the EDC's investment at December 31, 2019 and 2018, was limited to its investment cost of $3.6 million, including $0.1 million of transaction costs.

NOTE 6: DERIVATIVES AND HEDGING ACTIVITIES

Derivatives Not Designated as Hedging Instruments (Balance Sheet Hedges)

The Company's balance sheet hedges consist of foreign currency forward contracts which mature generally within three months. These forward contracts are carried at fair value and they are used to minimize the short-term impact of foreign currency exchange rate fluctuation on cash and certain trade and inter-company receivables and payables. Changes in the fair value of these foreign currency forward contracts are recognized in "Other expense, net" in the Consolidated Statement of Operations and are largely offset by the changes in the fair value of the assets or liabilities being hedged.

The locations and amounts of designated and non-designated derivative instruments' gains and losses reported in the Company's AOCI and Consolidated Statements of Operations are as follows (in thousands):

		Year ended December 31,		
	Financial Statement Location	**2019**	**2018**	**2017**
Derivatives not designated as hedging instruments:				
Gains (losses) recognized in income	Other expense, net	$ 1,374	$ (2,325)	$ 155

	December 31,	
	2019	**2018**
Derivatives not designated as hedging instruments:		
Purchase	$ 14,806	$ 28,975
Sell	$ 2,629	$ —

The locations and fair value amounts of the Company's derivative instruments reported in its Consolidated Balance Sheets are as follows (in thousands):

		Asset Derivatives	
	Balance Sheet Location	**December 31, 2019**	**December 31, 2018**
Derivatives not designated as hedging instruments:			
Foreign currency contracts	Prepaid expenses and other current assets	$ 43	$ —
		$ 43	$ —

	Balance Sheet Location	Liability Derivatives December 31, 2019	Liability Derivatives December 31, 2018
Derivatives not designated as hedging instruments:			
Foreign currency contracts	Accrued and other current liabilities	$ 112	$ 333
		$ 112	$ 333

Offsetting of Derivative Assets and Liabilities

The Company recognizes all derivative instruments on a gross basis in the Consolidated Balance Sheets. However, the arrangements with its counterparties allows for net settlement, which are designed to reduce credit risk by permitting net settlement with the same counterparty. As of December 31, 2019, information related to the offsetting arrangements was as follows (in thousands):

	Gross Amounts of Derivatives	Gross Amounts of Derivatives Offset in the Consolidated Balance Sheets	Net Amounts of Derivatives Presented in the Consolidated Balance Sheets
Derivative assets	$ 43	$ —	$ 43
Derivative liabilities	$ 112	$ —	$ 112

In connection with foreign currency derivatives entered in Israel, the Company's subsidiaries in Israel are required to maintain a compensating balance with their bank at the end of each month. The compensating balance arrangements do not legally restrict the use of cash. As of December 31, 2019 and 2018, the total compensating balance maintained was $1.0 million.

NOTE 7: FAIR VALUE MEASUREMENTS

The applicable accounting guidance establishes a framework for measuring fair value and requires disclosure about the fair value measurements of assets and liabilities. This guidance requires the Company to classify and disclose assets and liabilities measured at fair value on a recurring basis, as well as fair value measurements of assets and liabilities measured on a nonrecurring basis in periods subsequent to initial measurement, in a three-tier fair value hierarchy as described below.

The guidance defines fair value as the exchange price that would be received for an asset or paid to transfer a liability, in the principal or most advantageous market for the asset or liability, in an orderly transaction between market participants on the measurement date.

Valuation techniques used to measure fair value must maximize the use of observable inputs and minimize the use of unobservable inputs. The guidance describes three levels of inputs that may be used to measure fair value:

- Level 1 — Observable inputs that reflect quoted prices for identical assets or liabilities in active markets.
- Level 2 — Observable inputs other than Level 1 prices, such as quoted prices for similar assets or liabilities, quoted prices in markets that are not active, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities. The forward exchange contracts are classified as Level 2 because they are valued using quoted market prices and other observable data for similar instruments in an active market.
- Level 3 — Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities.

The carrying value of the Company's financial instruments, including cash equivalents, restricted cash, accounts receivable, accounts payable and accrued and other current liabilities, approximate fair value due to their short maturities.

The Company uses the market approach to measure fair value for its financial assets and liabilities. The market approach uses prices and other relevant information generated by market transactions involving identical or comparable assets or liabilities. The fair value of the Company’s convertible notes is influenced by interest rates, the Company’s stock price and stock market volatility. As of December 31, 2019 and 2018, the fair value of the Company’s 2020 Notes was approximately $66.8 million and $136.5 million, respectively. The fair value of Company’s 2024 Notes was approximately $131.9 million. The Company’s other debts assumed from the TVN acquisition are classified within Level 2 because these borrowings are not actively traded and majority of them have a variable interest rate structure based upon market rates currently available to the Company for debt with similar terms and maturities, therefore, the carrying value of these debts approximate its fair value. The other debts, excluding finance leases, outstanding as of December 31, 2019 and 2018 were in the aggregate of $17.2 million and $19.7 million, respectively. See Note 12, “Convertible Notes, Other Debts and Finance Leases,” for additional information.

The fair value of the Company’s French defined pension benefit plan liability as of December 31, 2019 and 2018 was $5.3 million and $4.9 million, respectively. See Note 13, “Employee Benefit Plans and Stock-based Compensation-French Retirement Benefit Plan,” for additional information.

During the years ended December 31, 2019, 2018 and 2017 there were no nonrecurring fair value measurements of assets and liabilities subsequent to initial recognition.

The following tables provide the fair value measurement amounts for other financial assets and liabilities recorded in the Company’s Consolidated Balance Sheets based on the three-tier fair value hierarchy (in thousands):

	Level 1	Level 2	Level 3	Total
As of December 31, 2019				
Prepaid and other current assets				
Derivative assets	$ —	$ 43	$ —	$ 43
Total assets measured and recorded at fair value	$ —	$ 43	$ —	$ 43
Accrued and other current liabilities				
Derivative liabilities	$ —	$ 112	$ —	$ 112
Total liabilities measured and recorded at fair value	$ —	$ 112	$ —	$ 112

	Level 1	Level 2	Level 3	Total
As of December 31, 2018				
Accrued and other current liabilities				
Derivative liabilities	$ —	$ 333	$ —	$ 333
Total liabilities measured and recorded at fair value	$ —	$ 333	$ —	$ 333

The Company’s liability for the French VDP at December 31, 2019 and 2018 was $0.8 million and $2.4 million, respectively. This amount is not included in the table above because its fair value at inception, based on Level 3 inputs, was determined during the fourth quarter of fiscal 2016. Subsequently there is no recurring fair value remeasurement for this liability based on the applicable accounting guidance.

NOTE 8: GOODWILL AND IDENTIFIED INTANGIBLE ASSETS

Goodwill

Goodwill represents the difference between the purchase price and the estimated fair value of the identifiable assets acquired and liabilities assumed. Goodwill is allocated among and evaluated for impairment at the reporting unit level, which is defined as an operating segment or one level below an operating segment. The Company has two reporting units, Video and Cable Access.

The Company tests for goodwill impairment at the reporting unit level on an annual basis, or more frequently if events or changes in circumstances indicate that the asset is more likely than not impaired. The Company’s annual goodwill impairment test is performed in the fiscal fourth quarter, with a testing date at the end of fiscal October. In evaluating goodwill for impairment, the Company first assesses qualitative factors to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying value (including goodwill). If the Company concludes that it is not more likely than not that the fair value of a reporting unit is less than its carrying value, then no further testing is required. However, if the Company concludes that it is more likely than not that the fair value of a reporting unit is less than its carrying value, then the two-step goodwill impairment test is performed to identify a potential goodwill impairment and measure the amount of impairment to be recognized, if any. The first step requires comparing the fair value of the reporting unit to its net book value, including goodwill. A potential impairment exists if the fair value of the reporting unit is lower than its net book value. The second step of the process, which is performed only if a potential impairment exists, involves determining the difference between the fair value of the reporting unit's net assets other than goodwill and the fair value of the reporting unit. If this difference is less than the net book value of goodwill, an impairment exists and is recorded.

In the first step, the fair value of each of the Company's reporting units is determined using both the income and market valuation approaches. Under the income approach, the fair value of the reporting unit is based on the present value of estimated future cash flows that the reporting unit is expected to generate over its remaining life. Under the market approach, the value of the reporting unit is based on an analysis that compares the value of the reporting unit to values of publicly-traded companies in similar lines of business. In the application of the income and market valuation approaches, the Company is required to make estimates of future operating trends and judgments on discount rates and other variables. Determining the fair value of a reporting unit is highly judgmental in nature and involves the use of significant estimates and assumptions. The Company bases its fair value estimates on assumptions the Company believes to be reasonable but that are unpredictable and inherently uncertain. Actual future results related to assumed variables could differ from these estimates. In addition, the Company makes certain judgments and assumptions in allocating shared assets and liabilities to determine the carrying values for each of its reporting units.

Under the income approach, the Company calculates the fair value of a reporting unit based on the present value of estimated future cash flows. Cash flow projections are based on management's estimates of revenue growth rates and operating margins, taking into consideration industry and market conditions. The discount rate used is based on the weighted-average cost of capital adjusted for the relevant risk associated with business-specific characteristics and the uncertainty related to the business's ability to execute on the projected cash flows. Under the market approach, the Company estimates the fair value based on market multiples of revenue and earnings derived from comparable publicly-traded companies with similar operating and investment characteristics as the reporting units, and then apply a control premium which is determined by considering control premiums offered as part of the acquisitions that have occurred in market segments that are comparable with its reporting units.

During the fourth quarter of 2019, the Company performed the first step of goodwill impairment testing for the two reporting units as part of our annual goodwill impairment test and concluded that goodwill was not impaired. The Company has not recorded any impairment charges related to goodwill for any prior periods. If future economic conditions are different than those projected by management, future impairment charges may be required.

The changes in the Company's carrying amount of goodwill are as follows (in thousands):

	Video	Cable Access	Total
Balance as of December 31, 2017	$ 182,012	$ 60,815	$ 242,827
Foreign currency translation adjustment	(2,173)	(36)	(2,209)
Balance as of December 31, 2018	$ 179,839	$ 60,779	$ 240,618
Foreign currency translation adjustment	(857)	19	(838)
Balance as of December 31, 2019	$ 178,982	$ 60,798	$ 239,780

Intangible Assets, Net

The following table provides a summary of the Company's identified intangible assets (in thousands):

		December 31, 2019			December 31, 2018		
	Weighted Average Remaining Life (Years)	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
Developed core technology	0.2	$ 31,707	$ (30,757)	$ 950	$ 31,707	$ (25,576)	$ 6,131
Customer relationships/contracts	1.2	44,577	(41,092)	3,485	44,650	(38,146)	6,504
Trademarks and tradenames	0.2	609	(583)	26	623	(441)	182
Maintenance agreements and related relationships	N/A	5,500	(5,500)	—	5,500	(5,500)	—
Order Backlog	N/A	3,085	(3,085)	—	3,112	(3,112)	—
Total identifiable intangibles		$ 85,478	$ (81,017)	$ 4,461	$ 85,592	$ (72,775)	$ 12,817

Amortization expense for the identifiable intangible assets was allocated as follows (in thousands):

	Year Ended December 31,		
	2019	2018	2017
Included in cost of revenue	$ 5,180	$ 5,180	$ 5,180
Included in operating expenses	3,139	3,187	3,142
Total amortization expense	$ 8,319	$ 8,367	$ 8,322

The estimated future amortization expense of identifiable intangible assets with definite lives as of December 31, 2019 is as follows (in thousands):

	Cost of Revenue	Operating Expenses	Total
Year ended December 31,			
2020	$ 951	$ 3,012	$ 3,963
2021	—	498	498
Total future amortization expense	$ 951	$ 3,510	$ 4,461

NOTE 9: ACCOUNTS RECEIVABLE

Accounts receivable, net of allowances, consisted of the following (in thousands):

	December 31,	
	2019	2018
Accounts receivable, net:		
Accounts receivable	$ 91,513	$ 85,292
Less: allowance for doubtful accounts and sales returns	(3,013)	(3,497)
Total	$ 88,500	$ 81,795

Trade accounts receivable are recorded at invoiced amounts and do not bear interest. The Company generally does not require collateral and performs ongoing credit evaluations of its customers and provides for expected losses. The Company maintains an allowance for doubtful accounts based upon the expected collectability of its accounts receivable. The expectation of collectability is based on the Company’s review of credit profiles of customers, contractual terms and conditions, current economic trends and historical payment experience. The Company offers return rights which are specifically identified and accrued for as sales returns at the end of the period.

The following table is a summary of activities in allowances for doubtful accounts and sales returns (in thousands):

	Balance at Beginning of Period	Charges to Revenue	Charges (Credits) to Expense	Additions to (Deductions from) Reserves	Balance at End of Period
Year ended December 31,					
2019	$ 3,497	$ 1,896	$ (396)	$ (1,984)	$ 3,013
2018	$ 4,631	$ 1,949	$ 572	$ (3,655)	$ 3,497
2017	$ 4,831	$ 4,030	$ 881	$ (5,111)	$ 4,631

NOTE 10: CERTAIN BALANCE SHEET COMPONENTS

The following tables provide details of selected balance sheet components (in thousands):

	December 31,	
	2019	2018
Inventories, net:		
Raw materials	$ 4,179	$ 1,705
Work-in-process	1,633	991
Finished goods	14,080	12,267
Service-related spares	9,150	10,675
Total	$ 29,042	$ 25,638

	December 31,	
	2019	2018
Prepaid expenses and other current assets:		
Contract assets (1)	$ 13,969	3,834
French R&D tax credits receivable (2)	7,343	$ 7,305
Deferred cost of revenue	2,631	3,671
Prepaid maintenance, royalty, rent, and property taxes	1,594	3,497
Capitalized commission	1,309	1,098
Other	13,916	3,875
Total	$ 40,762	$ 23,280

(1) Contract assets reflect the satisfied performance obligations for which the Company does not yet have an unconditional right to consideration.

(2) The Company's French Subsidiary participates in the French Crédit d'Impôt Recherche ("CIR") program (the "R&D tax credits") which allows companies to monetize eligible research expenses. The R&D tax credits can be used to offset against income tax payable to the French government in each of the four years after being incurred, or if not utilized, are recoverable in cash. The amount of R&D tax credits recoverable are subject to audit by the French government and during the year ended December 31, 2019 and 2018, the French government approved the 2015 and 2014 claims and refunded $6.4 million to the French Subsidiary in each of the periods, respectively. The remaining R&D tax credits receivable at December 31, 2019 were approximately $23.2 million and are expected to be recoverable from 2020 through 2023 with $7.3 million reported as a component of "Prepaid and other Current Assets" and $15.9 million reported as a component of "Other Long-term Assets" on the Company's Consolidated Balance Sheets.

	December 31,	
	2019	2018
Property and equipment, net:		
Machinery and equipment	$ 75,229	$ 75,094
Capitalized software	34,190	32,696
Leasehold improvements	15,170	14,951
Furniture and fixtures	6,036	6,049
Construction in progress	5,506	—
Property and equipment, gross	136,131	128,790
Less: accumulated depreciation and amortization	(113,203)	(106,469)
Total	$ 22,928	$ 22,321

	December 31,			
	2019		2018	
Other long-term assets:				
French R&D tax credits receivable	$	15,899	$	19,249
Deferred tax assets		10,575		8,695
Equity investment		3,593		3,593
Other		11,238		6,840
Total	$	41,305	$	38,377

	December 31,			
	2019		2018	
Accrued and other current liabilities:				
Accrued employee compensation and related expenses	$	19,454	$	21,451
Operating lease liability (short-term)		8,881		—
Accrued warranty		4,308		4,869
Customer deposits		3,557		4,642
Accrued royalty payments		2,642		1,998
Contingent inventory reserves		2,208		2,500
Accrued French VDP, current (1)		2,055		1,585
Accrued Avid litigation settlement fees, current		2,000		1,500
Other		17,430		14,216
Total	$	62,535	$	52,761

(1) See Note 11, “Restructuring and Related Charges,” for additional information on the Company’s French VDP liabilities.

	December 31,			
	2019		2018	
Other non-current liabilities:				
Operating lease liability (long-term)	$	25,766	$	—
Deferred revenue (long-term)		6,333		5,330
Others		9,155		12,898
Total	$	41,254	$	18,228

NOTE 11: RESTRUCTURING AND RELATED CHARGES

The Company has implemented several restructuring plans in the past few years. The goal of these plans was to bring operational expenses to appropriate levels relative to the Company's net revenues, while simultaneously implementing extensive company-wide expense control programs. The restructuring plans have primarily been comprised of excess facilities, severance payments and termination benefits related to headcount reductions.

The Company accounts for its restructuring plans under the authoritative guidance for exit or disposal activities. The restructuring and related charges are included in "Cost of revenue" and "Operating expenses - Restructuring and related charges" in the Consolidated Statements of Operations. The following table summarizes the restructuring and related charges (in thousands):

	Year ended December 31,		
Restructuring and related charges in:	2019	2018	2017
Cost of revenue	$ 1,391	$ 857	$ 1,279
Operating expenses - Restructuring and related charges	3,141	2,918	5,307
Total restructuring and related charges	$ 4,532	$ 3,775	$ 6,586

As of December 31, 2019 and December 31, 2018, the Company's total restructuring liability was $4.9 million and $5.3 million, respectively, of which $1.5 million and $3.3 million, respectively, were reported as a component of "Accrued and other current liabilities," and the remaining $3.4 million and $2.0 million, respectively, were reported as a component of "Other non-current liabilities" on the Company's Consolidated Balance Sheets.

For the year ended December 31, 2019, the Company recorded an aggregate amount of $4.1 million of restructuring and related charges for severance and employee benefits for certain employees within the Company's general and administrative functions and one specific function within the Video segment. The Company made $0.8 million in payments in 2019, with the remaining $3.3 million liability outstanding as of December 31, 2019.

As of December 31, 2019, total liabilities related to restructuring plans initiated prior to fiscal 2019 were $1.5 million.

The following table summarizes the activities related to the Company's restructuring plans during the fiscal year ended December 31, 2019 (in thousands):

	Excess facilities	Severance and Benefits	French VDP	Others	Total
Balance at December 31, 2018	$ 2,926	$ —	$ 2,409	$ —	$ 5,335
Charges for current period	—	4,102	50	380	4,532
Adjustments to restructuring provisions and others	(334)	11	(28)	—	(351)
Cash payments	(1,872)	(819)	(1,625)	(350)	(4,666)
Balance at December 31, 2019	$ 720	$ 3,294	$ 806	$ 30	$ 4,850

NOTE 12: CONVERTIBLE NOTES, OTHER DEBTS AND FINANCE LEASES

2.00% Convertible Senior Notes due 2024

In September 2019, the Company issued $115.5 million of the 2024 Notes pursuant to an indenture (the "2024 Notes Indenture"), dated September 13, 2019, by and between the Company and U.S. Bank National Association, as trustee. The 2024 Notes bear interest at a rate of 2.00% per year, payable semiannually on March 1 and September 1 of each year, beginning March 1, 2020. The 2024 Notes will mature on September 1, 2024, unless earlier repurchased by the Company, redeemed by the Company or converted pursuant to their terms.

The 2024 Notes are convertible into cash, shares of the Company's common stock, par value $0.001 ("Common Stock"), or a combination thereof, at the Company's election, at an initial conversion rate of 115.5001 shares of Common Stock per $1,000 principal amount of 2024 Notes (which is equivalent to an initial conversion price of approximately $8.66 per share). The conversion rate, and thus the effective conversion price, may be adjusted under certain circumstances, including in connection with conversions made following certain fundamental changes or a notice of redemption and under other circumstances, in each case, as set forth in the 2024 Notes Indenture.

Prior to the close of business on the business day immediately preceding June 1, 2024, the 2024 Notes will be convertible only under the following circumstances: (1) during any fiscal quarter commencing after the fiscal quarter ending on December 31, 2019, and only during such fiscal quarter, if the last reported sale price of the Common Stock for at least 20 trading days (whether or not consecutive) in a period of 30 consecutive trading days ending on, and including, the last trading day of the immediately preceding fiscal quarter is greater than or equal to 130% of the conversion price for the 2024 Notes on each applicable trading day; (2) during the five business day period after any five consecutive trading day period (the “measurement period”) in which the trading price per $1,000 principal amount of 2024 Notes for each trading day of the measurement period was less than 98% of the product of the last reported sale price of the Common Stock and the conversion rate on each such trading day; (3) if the Company calls any or all of the 2024 Notes for redemption, at any time prior to the close of business on the second scheduled trading day immediately preceding the redemption date; or (4) upon the occurrence of specified corporate events. On or after June 1, 2024, until the close of business on the second scheduled trading day immediately preceding the maturity date, holders of the 2024 Notes may convert all or any portion of their 2024 Notes regardless of the foregoing conditions.

In accordance with the accounting guidance on embedded conversion features, the conversion feature associated with the 2024 Notes was valued at $24.9 million and bifurcated from the host debt instrument and recorded in “Additional paid-in capital”. The resulting debt discount on the 2024 Notes is being amortized to interest expense at the effective interest rate over the contractual term of the 2024 Notes. The following table presents the components of the 2024 Notes as of December 31, 2019 (in thousands, except for years and percentages):

	December 31, 2019
Liability:	
Principal amount	115,500
Less: Debt discount, net of amortization	(23,652)
Less: Debt issuance costs, net of amortization	(3,219)
Carrying amount	$ 88,629
Remaining amortization period (years)	4.7 years
Effective interest rate on liability component	7.95%

4.00% Convertible Senior Notes due 2020

In December 2015, the Company issued $128.25 million in aggregate principal amount of the 2020 Notes pursuant to an indenture (the “2020 Notes Indenture”), dated December 14, 2015, by and between the Company and U.S. Bank National Association, as trustee. The 2020 Notes bear interest at a rate of 4.00% per year, payable in cash on June 1 and December 1 of each year and the 2020 Notes will mature on December 1, 2020 unless earlier repurchased or converted.

In September 2019, the Company used approximately $109.6 million of the net proceeds from the issuance of the 2024 Notes to repurchase $82.5 million aggregate principal of the 2020 Notes in privately negotiated transactions. The repurchase of the 2020 Notes was accounted for as a debt extinguishment, and the consideration transferred was allocated between the equity and liability components by determining the fair value of the conversion option immediately prior to the debt extinguishment and allocating that portion of the repurchase price to additional paid-in capital for $27.1 million, with the residual repurchase price allocated to the liability component, respectively. The partial repurchase of the 2020 Notes resulted in the recognition of a $5.7 million loss on debt extinguishment for the year ended December 31, 2019.

The 2020 Notes are convertible into cash, shares of the Company’s Common Stock, or a combination thereof, at the Company’s election, at an initial conversion rate of 173.9978 shares of Common Stock per $1,000 principal amount of 2020 Notes (which is equivalent to an initial conversion price of approximately $5.75 per share). The conversion rate, and thus the effective conversion price, may be adjusted under certain circumstances, including in connection with conversions made following certain fundamental changes and under other circumstances, in each case, as set forth in the 2020 Notes Indenture.

Prior to the close of business on the business day immediately preceding September 1, 2020, the 2020 Notes were convertible only under the following circumstances: (1) during any fiscal quarter (and only during such fiscal quarter), if the last reported sale price of the Company's common stock for at least 20 trading days (whether or not consecutive) during a period of 30 consecutive trading days ending on the last trading day of the immediately preceding fiscal quarter is greater than or equal to 130% of the conversion price of the 2020 Notes on each applicable trading day; (2) during the five business day period after any 5 consecutive trading day period (the "measurement period ") in which the trading price per $1,000 principal amount of 2020 Notes for each trading day of the measurement period was less than 98% of the product of the last reported sale price of the Company's common stock and the conversion rate on each such trading day; or (3) upon the occurrence of specified corporate events. Commencing on September 1, 2020 until the close of business on the second scheduled trading day immediately preceding the maturity date, the 2020 Notes were also scheduled to be convertible in multiples of $1,000 principal amount regardless of the foregoing circumstances.

In accordance with accounting guidance on embedded conversion features, the conversion feature associated with the 2020 Notes was initially valued at $26.1 million and bifurcated from the host debt instrument and recorded in "Additional paid-in capital". The resulting debt discount on the 2020 Notes is being amortized to interest expense at the effective interest rate over the contractual terms of the 2020 Notes. The following table presents the components of the 2020 Notes as of December 31, 2019 and December 31, 2018 (in thousands, except for years and percentages):

	December 31,	
	2019	2018
Liability:		
Principal amount	$ 45,785	$ 128,250
Less: Debt discount, net of amortization	(2,151)	(11,996)
Less: Debt issuance costs, net of amortization	(259)	(1,446)
Carrying amount	$ 43,375	$ 114,808
Remaining amortization period (years)	0.9 years	1.9 years
Effective interest rate on liability component	9.94%	9.94%

The 2020 Notes became convertible as of December 31, 2019, as the last reported sale price of the Company's common stock for at least 20 trading days during a period of 30 consecutive trading days ending on the last trading day of the immediately preceding fiscal quarter was greater than or equal to 130% of the conversion price of the 2020 Notes on each applicable trading day. As a result of the 2020 Notes becoming currently convertible for cash up to the principal amount of $45.8 million, the Company reclassified the unamortized debt discount for the 2020 Notes in the amount of $2.4 million from "Additional paid-in-capital" to convertible debt in the mezzanine equity section in the Consolidated Balance Sheet as of December 31, 2019.

The following table presents interest expense recognized for the 2020 Notes and the 2024 Notes (in thousands):

	Year ended December 31,		
	2019	2018	2017
Contractual interest expense	$ 4,835	$ 5,130	$ 5,130
Amortization of debt discount	6,013	5,408	4,898
Amortization of debt issuance costs	743	652	591
Total interest expense recognized	$ 11,591	$ 11,190	$ 10,619

Other Debts and Finance Leases

The Company has a variety of debt and credit facilities in France to satisfy the financing requirements of the operations of its French subsidiary. These arrangements are summarized in the table below (in thousands):

	December 31,	
	2019	2018
Financing from French government agencies related to various government incentive programs [1]	$ 16,566	$ 18,783
Term loans	587	914
Obligations under finance leases	71	162
Total debt obligations	17,224	19,859
Less: current portion	(6,713)	(7,175)
Long-term portion	$ 10,511	$ 12,684

(1) Loans backed by French R&D tax credit receivables were $15.1 million and $16.7 million as of December 31, 2019 and 2018, respectively. As of December 31, 2019, the French Subsidiary had an aggregate of $23.2 million of R&D tax credit receivables from the French government from 2020 through 2023. (See Note 10, "Certain Balance Sheet Components-Prepaid expenses and other current assets" for more information). These tax loans have a fixed rate of 0.6%, plus EURIBOR 1 month plus 1.3% and mature between 2020 through 2022. The remaining loans of $1.5 million and $2.1 million as of December 31, 2019 and 2018, respectively, primarily relate to financial support from French government agencies for R&D innovation projects at minimal interest rates, and the loans outstanding at December 31, 2019 mature between 2020 through 2025.

Future minimum repayments

The table below presents the future minimum repayments of debts and finance lease obligations in France as of December 31, 2019 (in thousands):

Years ending December 31,	Finance lease obligations	Other Debt obligations
2020	49	6,664
2021	22	5,216
2022	—	4,897
2023	—	151
2024	—	112
Thereafter	—	112
Total	$ 71	$ 17,152

Line of Credit

On December 19, 2019, the Company entered into a Credit Agreement (the "Credit Agreement") with JPMorgan Chase Bank, N.A., as lender. The Credit Agreement provides for a secured revolving loan facility in an aggregate principal amount of up to $25.0 million, based on a borrowing base of eligible accounts receivable and inventory, with a maturity date of October 31, 2020. The Company may use availability under the revolving loan facility for the issuance of letters of credit. The proceeds of the revolving loans may be used for general corporate purposes.

The revolving loans bear interest, at the Company's election, at a floating rate per annum equal to either (1) 1.25% plus the greater of (i) 1 month LIBOR on any day plus 2.50% and (ii) the prime rate as reported in the Wall Street Journal from time to time or (2) 2.25% plus LIBOR for an interest period of one, two or three months. Interest on the revolving loans is payable monthly in arrears, in the case of prime rate loans, and at the end of the applicable interest period, in the case of LIBOR loans.

The Credit Agreement contains customary affirmative and negative covenants, including covenants limiting the ability of the Company, among other things, incur debt, grant liens, undergo certain fundamental changes, make investments, make certain restricted payments, dispose of assets, enter into transactions with affiliates, and enter into burdensome agreements, in each case, subject to limitations and exceptions set forth in the Credit Agreement. The Company is also required to maintain compliance with an adjusted quick ratio, a minimum EBITDA covenant (tested quarterly) and a minimum liquidity covenant, in each case, determined in accordance with the terms of the Credit Agreement. As of December 31, 2019, the Company was in compliance with the covenants under the Credit Agreement.

As of December 31, 2019, there was $0.3 million of outstanding letters of credit issued under the Credit Agreement. There were no revolving borrowings under the Credit Agreement from the closing of the Credit Agreement through December 31, 2019.

On September 27, 2017, the Company entered into a Loan and Security Agreement (the "Loan Agreement") with Silicon Valley Bank (the "Bank"). The Loan Agreement provided for a secured revolving credit facility in an aggregate principal amount of up to $15.0 million. Under the terms of the Loan Agreement, the principal amount of loans, plus the face amount of any outstanding letters of credit, at any time cannot exceed up to 85% of the Company's eligible receivables. Under the terms of the Loan Agreement, the Company may also request letters of credit from the Bank.

The Loan Agreement with the Bank was terminated effective September 10, 2019, in conjunction with the issuance of the 2024 Notes. There were no borrowings under the Loan Agreement prior to the termination, except $2.2 million committed towards security for letters of credit, which were unsecured as of December 31, 2019. The Company was in compliance with the covenants under the Loan Agreement prior to the termination.

NOTE 13: EMPLOYEE BENEFIT PLANS AND STOCK-BASED COMPENSATION

Equity Award Plans

1995 Stock Plan

The 1995 Stock Plan provides for the grant of incentive stock options, non-statutory stock options and RSUs. Incentive stock options may be granted only to employees. All other awards may be granted to employees and consultants. Under the terms of the 1995 Stock Plan, no incentive stock option or non-statutory stock option may be granted in the ordinary course with a per share exercise price that is less than 100% of the fair value of the Company's common stock on the date of grant. RSUs have no exercise price. Both options and RSUs vest over a period of time as determined by the Company's Board of Directors (the "Board"), generally two to four years, and expire seven years from the date of grant. Until the Company's 2019 Annual Meeting of stockholders, grants of RSUs decreased the plan reserve by 1.5 shares for every unit or share granted, and any forfeitures of these awards due to their not vesting would increase the plan reserve by 1.5 shares for every unit or share forfeited. The Company's stockholders approved an amendment to the 1995 Stock Plan at the 2019 Annual Meeting to (i) modify the effect of grants of RSUs on the plan reserve such that grants of RSUs would decrease the plan reserve by one share for every unit or share granted, and any forfeitures of these awards due to their not vesting would increase the plan reserve by one share for every unit or share forfeited, and (ii) increase the number of shares of common stock reserved for issuance thereunder by 3,500,000 shares. As of December 31, 2019, an aggregate of 9,903,989 shares of common stock were reserved for issuance under the 1995 Stock Plan, of which 4,622,927 shares remained available for grant.

2002 Director Plan

The 2002 Director Plan provides for the grant of non-statutory stock options and RSUs to non-employee directors of the Company. Under the terms of the 2002 Director Plan, no non-statutory stock option may be granted with a per share exercise price that is less than 100% of the fair value of the Company's common stock on the date of grant. RSUs have no exercise price. Both options and RSUs vest over a period of time as determined by the Board, generally three years for the initial grant and one year for subsequent grants to a non-employee director, and expire seven years from the date of grant. Until the 2019 Annual Meeting, grants of RSUs decreased the plan reserve by 1.5 shares for every unit granted, and any forfeitures of these awards due to their not vesting would increase the plan reserve by 1.5 shares for every unit forfeited. The Company's stockholders approved an amendment to the 2002 Director Plan at the 2019 Annual Meeting to modify the effect of grants of RSUs on the plan reserve such that grants of RSUs would decrease the plan reserve by one share for every unit granted, and any forfeitures of these awards due to their not vesting would increase the plan reserve by one share for every unit forfeited. As of December 31, 2019, an aggregate of 650,257 shares of common stock were reserved for issuance under the 2002 Director Plan, of which 442,918 shares remained available for grant.

Employee Stock Purchase Plan

The 2002 Employee Stock Purchase Plan ("ESPP") provides for the issuance of share purchase rights to employees of the Company. The ESPP is intended to qualify as an "employee stock purchase plan" under Section 423 of the Internal Revenue Code. The ESPP enables employees to purchase shares at 85% of the fair market value of the Common Stock at the beginning or end of the offering period, whichever is lower. Offering periods generally begin on the first trading day on or after January 1 and July 1 of each year. Employees may participate through payroll deductions of 1% to 10% of their earnings. In the event that there are insufficient shares in the plan to fully fund the issuance, the available shares will be allocated across all participants based on their contributions relative to the total contributions received for the offering period. The Company's stockholders approved an amendment to the ESPP at the 2019 Annual Meeting which increased the number of shares of common stock reserved for issuance under the ESPP by 1,000,000 shares. Under the ESPP, 1,037,366, 1,132,438 and 1,291,875 shares were issued during fiscal 2019, 2018 and 2017, respectively, representing $4.1 million, $4.0 million and $4.4 million in contributions. As of December 31, 2019, 1,244,992 shares were reserved for future purchases by eligible employees.

Stock Option Activities

The following table summarizes the Company's stock option activities and related information during the year ended December 31, 2019 (in thousands, except per share amounts and terms):

	Stock Options Outstanding			
	Number of Shares	Weighted Average Exercise Price (per share)	Weighted Average Remaining Contractual Term (Years)	Aggregate Intrinsic Value
Balance at December 31, 2018	3,068	$ 5.76		
Granted	—	—		
Exercised	(801)	5.40		
Forfeited	—	—		
Canceled or expired	(379)	6.14		
Balance at December 31, 2019	1,888	5.83	1.8	$ 3,715.5
As of December 31, 2019				
Vested and expected to vest	1,888	$ 5.83	1.8	$ 3,715.5
Exercisable	1,888	$ 5.83	1.8	$ 3,715.5

Aggregate intrinsic value represents the difference between the exercise price of the stock options and the fair value of the Company's common stock. The intrinsic value of options exercised during the years ended December 31, 2019, 2018 and 2017 was $1.8 million, $0.3 million and $0.3 million, respectively.

The Company realized no income tax benefit from stock option exercises for the years ended December 31, 2019, 2018 and 2017 due to recurring losses and valuation allowances.

Restricted Stock Units ("RSUs") Activities

The following table summarizes the Company's RSUs activities and related information during the year ended December 31, 2019 (in thousands, except per share amounts and terms):

	Restricted Stock Units Outstanding	
	Number of Shares	Weighted Average Grant Date Fair Value Per Share
Balance at December 31, 2018	3,403	$ 3.99
Granted	2,717	5.78
Vested	(2,421)	4.02
Forfeited	(98)	5.10
Balance at December 31, 2019	3,601	$ 5.18

The estimated fair value of RSUs is based on the market price of the Company's common stock on the grant date. The fair value of all restricted stock units vested during the years ended December 31, 2019, 2018 and 2017 was $9.7 million, $15.6 million and $13.0 million, respectively.

Performance- and Market-based awards

Starting 2015, the Company began to settle a portion of its incentive bonus payment to eligible employees by issuing PRSUs from the 1995 Stock Plan. The Company granted 405,261, 1,443,168 and 1,165,685 PRSUs to its employees during the years ended December 31, 2019, 2018 and 2017, respectively, of which 220,261, 1,343,168 and 1,165,685 PRSUs vested during the years ended December 31, 2019, 2018 and 2017, respectively, for the purpose of settling amounts earned under the

Company’s incentive bonus plans. The vesting of the remaining PRSUs were based on the achievement of certain financial and non-financial operating goals of the Company, subject to the Board’s approval. The stock-based compensation recognized for PRSUs were $0.1 million, $6.1 million and $3.2 million for the years ended December 31, 2019, 2018 and 2017, respectively.

In the second quarter of 2019, the Company granted 200,000 market-based RSUs (“MRSUs”) under the 1995 Stock Plan to a key executive that is expected to vest during a three-year period. The vesting condition for the MRSUs included performance of the Company’s total shareholder return (“TSR”) relative to the TSR of the NASDAQ Telecommunication Index. The aggregate grant-date fair value of these shares was estimated to be $1.1 million using a Monte-Carlo simulation valuation method. The stock-based compensation recognized for the MRSUs for the year ended December 31, 2019 and December 31, 2018 was $0.3 million and $0.2 million respectively. None of these MRSUs had vested as of December 31, 2019.

In 2017, the Company granted 344,500 MRSUs under the 1995 Stock Plan to its key executives and certain eligible employees that may vest during a three-year period as part of its long-term incentive program. In 2018, the Company granted 40,000 MRSUs that may vest during an eighteen-month period from the date of grant. The vesting conditions of these awards are based on the market value of the Company's common stock. The fair value of these shares was estimated using a Monte-Carlo simulation and the stock-based compensation recognized in 2019 for these MRSUs was immaterial, and for 2018 and 2017 was $0.2 million and $0.9 million, respectively. 110,937 shares of these MRSUs had vested as of December 31, 2019.

French Retirement Benefit Plan

Under French law, the Company’s subsidiaries in France, including the French Subsidiary, are obligated to make certain payments to their employees upon their retirement from the Company. These payments are based on the retiring employee’s salary for a number of months that varies according to the employee’s period of service and position. Salary used in the calculation is the employee’s average monthly salary for the twelve months prior to retirement. The payments are made in one lump-sum at the time of retirement. The French pension plan is unfunded and there are no contributions to the plan required by related laws or funding regulations. No required contributions are expected in fiscal 2020, but the Company, at its discretion, may make contributions to the defined benefit plan.

The company’s defined benefit pension obligations are measured as of December 31. The present value of these lump-sum payments is determined on an actuarial basis and the actuarial valuation takes into account the employees’ age and period of service with the Company, projected mortality rates, mobility rates, increases in salaries and a discount rate.

The Company’s pension obligations as of December 31, 2019 and December 31, 2018 and the changes to the Company’s pension obligations for each of those years were as follows (in thousands):

	December 31,	
	2019	2018
Projected benefit obligation:		
Balance at January 1	$ 4,881	$ 5,033
Service cost	227	243
Interest cost	78	74
Actuarial (gains) losses	206	(202)
Benefits paid	(31)	(13)
Foreign currency translation adjustment	(102)	(254)
Balance at December 31	$ 5,259	$ 4,881
Presented on the Consolidated Balance Sheets under:		
Current portion (presented under “Accrued and other current liabilities”)	$ 30	63
Long-term portion (presented under “Other non-current liabilities”)	$ 5,229	4,818

The table below presents the components of net periodic benefit costs (in thousands):

	Year ended December 31,	
	2019	2018
Service cost	$ 227	$ 243
Interest cost	78	74
Net periodic benefit cost included in operating loss	$ 305	$ 317

The following assumptions were used in determining the Company's pension obligation:

	December 31,	
	2019	2018
Discount rate	0.7%	1.7%
Mobility rate	5.0%	6.0%
Salary progression rate	2.0%	2.0%

The Company evaluates the discount rate assumption annually. The discount rate is determined using the average yields on high-quality fixed-income securities that have maturities consistent with the timing of benefit payments.

The Company also evaluates other assumptions related to demographic factors, such as retirement age, mortality rates and turnover periodically, updating them to reflect experience and expectations for the future. The mortality assumption related to the Company's defined benefit pension plan used the most current mortality tables published by the French National Institute of Statistics and Economic Studies.

As of December 31, 2019, future benefits expected to be paid in each of the next five years, and in the aggregate for the five year period thereafter are as follows (in thousands):

Years ending December 31,	
2020	$ 30
2021	12
2022	—
2023	315
2024	370
2025 - 2029	3,105
	$ 3,832

401(k) Plan

The Company has a retirement/savings plan for its U.S. employees, which qualifies as a thrift plan under Section 401(k) of the Internal Revenue Code. This plan allows participants to contribute up to the applicable Internal Revenue Code limitations under the plan. The Company can make discretionary contributions to the plan of 25% of the first 4% contributed by eligible participants, up to a maximum contribution per participant of $1,000 per year. The Company's contributions to the plan were $0.3 million, $0.3 million and $0.3 million for fiscal 2019, 2018 and 2017, respectively.

Stock-based Compensation

The following table summarizes stock-based compensation expense for all plans (in thousands):

	Year ended December 31,		
	2019	2018	2017
Stock-based compensation in:			
Cost of revenue	$ 1,124	$ 1,953	$ 2,370
Research and development expense	3,261	5,192	5,313
Selling, general and administrative expense	7,689	10,144	8,927
Total stock-based compensation in operating expense	10,950	15,336	14,240
Total stock-based compensation recognized in net loss	$ 12,074	$ 17,289	$ 16,610

As of December 31, 2019, total unrecognized stock-based compensation cost related to unvested RSUs was $12.7 million and is expected to be recognized over a weighted-average period of approximately 1.32 years.

Valuation Assumptions

The Company estimates the fair value of employee stock options and stock purchase rights under the ESPP using a Black-Scholes option valuation model. The value of the stock purchase rights under the ESPP consists of: (1) the 15% discount on the purchase of the stock; (2) 85% of the fair value of the call option; and (3) 15% of the fair value of the put option. The call option and put option were valued using the Black-Scholes option pricing model. At the date of grant, the Company estimated the fair value of each stock option grant and stock purchase right granted under the ESPP using the following weighted average assumptions:

	Employee Stock Options	ESPP		
	2017	2019	2018	2017
Expected term (in years)	4.30	0.50	0.50	0.50
Volatility	42%	38%	55%	48%
Risk-free interest rate	1.8%	2.3%	1.9%	1.2%
Expected dividends	0.0%	0.0%	0.0%	0.0%

The expected term of the employee stock option represents the weighted-average period that the stock options are expected to remain outstanding. The computation of expected term was determined based on historical experience of similar awards, giving consideration to the contractual terms of the stock-based awards, vesting schedules and expectations of future employee behavior. The expected term of the stock purchase right under ESPP represents the period of time from the beginning of the offering period to the purchase date. The Company uses its historical volatility for a period equivalent to the expected term of the options to estimate the expected volatility. The risk-free interest rate that the Company uses in the Black-Scholes option valuation model is based on U.S. Treasury zero-coupon issues with remaining terms similar to the expected term. The Company has not paid and does not plan to pay any cash dividends in the foreseeable future.

There were no stock options granted during the years ended December 31, 2019 and 2018.

The fair value of stock options vested during the years ended December 31, 2019, 2018 and 2017 was $0.1 million, $0.7 million and $1.7 million, respectively.

The estimated weighted-average fair value per share of stock purchase rights under the ESPP, granted for the years ended December 31, 2019, 2018 and 2017 was $1.33, $1.33 and $1.50, respectively.

NOTE 14: STOCKHOLDERS’ EQUITY

Preferred Stock

Harmonic has 5,000,000 authorized shares of preferred stock. No shares of preferred stock were issued or outstanding in any of the periods presented.

Accumulated Other Comprehensive Income (Loss) (“AOCI”)

The components of AOCI, on an after-tax basis where applicable, were as follows (in thousands):

	December 31,	
	2019	2018
Foreign currency translation adjustments	$ (2,449)	$ (779)
Unrealized foreign exchange loss on intercompany long-term loans, net of taxes	(857)	(888)
Actuarial gain	241	451
Total accumulated other comprehensive income (loss)	$ (3,065)	$ (1,216)

NOTE 15: INCOME TAXES

Loss from operations before income taxes consists of the following (in thousands):

	Year ended December 31,		
	2019	2018	2017
United States	$ 1,769	$ (19,780)	$ (50,041)
International	(8,365)	2,832	(34,666)
Loss before income taxes	$ (6,596)	$ (16,948)	$ (84,707)

The components of the provision for (benefit from) income taxes consist of the following (in thousands):

	Year ended December 31,		
	2019	2018	2017
Current:			
Federal	$ (180)	$ (305)	$ (4,530)
State	108	116	129
International	1,525	2,958	273
Deferred:			
International	(2,125)	1,318	2,376
Total provision for (benefit from) income taxes	$ (672)	$ 4,087	$ (1,752)

The differences between the provision for (benefit from) income taxes computed at the U.S. federal statutory rate at 21% for 2019 and 2018, and 35% for 2017, and the Company’s actual provision for (benefit from) income taxes are as follows (in thousands):

	Year ended December 31,		
	2019	2018	2017
Benefit from for income taxes at U.S. Federal statutory rate	$ (1,384)	$ (3,559)	$ (29,648)
Differential in rates on foreign earnings	2,422	4,299	15,920
Tax Reform tax rate reduction	—	—	14,527
Change in valuation allowance	(923)	1,449	(2,834)
Change in liabilities for uncertain tax positions	(411)	(250)	(2,009)
Non-deductible stock-based compensation	553	1,363	1,934
Permanent Differences	(698)	1,096	380
Adjustments related to tax positions taken during prior years	(403)	184	(473)
Tax refund	—	(305)	(834)
Other	172	(190)	1,285
Total provision for (benefit from) income taxes	$ (672)	$ 4,087	$ (1,752)

The Company operates in multiple jurisdictions and its profits are taxed pursuant to the tax laws of these jurisdictions. The Company’s effective income tax rate may be affected by changes in its interpretations of tax laws and tax agreements in any given jurisdiction, utilization of net operating loss and tax credit carry forwards, changes in geographical mix of income and expense, and changes in management's assessment of matters such as the ability to realize deferred tax assets. The Company’s effective tax rate varies from year to year primarily due to the absence of several onetime, discrete items that benefited or decremented the tax rates in the previous years.

In 2019, the Company had a worldwide consolidated loss before tax of $6.6 million and tax benefit of $0.7 million, with an annual effective income tax rate of 10%. The Company’s 2019 effective income tax rate differed from the U.S. federal statutory rate of 21% primarily due to geographical mix of income and losses, full valuation allowance against U.S. federal, California and other states deferred tax assets, foreign withholding taxes and income taxes on earnings from operations in foreign tax jurisdictions. In addition, during 2019, the Company recorded a one-time benefit of approximately $2.0 million due to changes in the Company's global tax structure, and a $0.8 million benefit from a valuation allowance release for one of its foreign subsidiaries. This release of the valuation allowance was due to changes in forecasted taxable income resulting from the Company receiving a favorable tax ruling during 2019.

In 2018, the Company had a worldwide consolidated loss before tax of $16.9 million and tax expense of $4.1 million, with an annual effective income tax rate of (24)%. The Company’s 2018 effective income tax rate differed from the U.S. federal statutory rate of 21% primarily due to geographical mix of income and losses, full valuation allowance against U.S. federal, California and other states deferred tax assets, foreign withholding taxes and income taxes on earnings from operations in foreign tax jurisdictions.

In 2017, the Company had a worldwide consolidated loss before tax of $84.7 million and tax benefit of $1.8 million, with an annual effective tax rate of 2%. The Company’s 2017 effective income tax rate differed from the U.S. federal statutory rate of 35% primarily due to geographical income mix, favorable tax rates associated with certain earnings from operations in lower-tax jurisdictions, tax rate change in foreign jurisdictions, tax benefits associated with the release of tax reserves for uncertain tax positions resulting from the expiration of the statutes of limitations, a one-time benefit of $2.6 million from the reduction of a valuation allowance on alternative minimum tax (“AMT”) credit carryforwards that will be refundable as a result of the TCJA, partially offset by the increase in the valuation allowance against U.S. federal, California and other state deferred tax assets, detriment from non-deductible stock-based compensation, and the net of various other discrete tax adjustments.

The components of net deferred tax assets included in the Consolidated Balance Sheets are as follows (in thousands):

	December 31,	
	2019	2018
Deferred tax assets:		
Reserves and accruals	$ 20,622	$ 17,090
Net operating loss carryforwards	33,811	29,900
Research and development credit carryforwards	36,914	36,446
Deferred stock-based compensation	1,675	2,201
Intangibles	8,224	2,585
Operating lease liabilities	5,877	—
Capitalized research and development expenses	10,897	—
Other	—	939
Gross deferred tax assets	118,020	89,161
Valuation allowance	(95,518)	(77,144)
Gross deferred tax assets after valuation allowance	22,502	12,017
Deferred tax liabilities:		
Depreciation	(1,272)	(391)
Convertible notes	(6,275)	(2,931)
Operating lease right-of-use assets	(4,061)	—
Other	(319)	—
Gross deferred tax liabilities	(11,927)	(3,322)
Net deferred tax assets	$ 10,575	$ 8,695

The following table summarizes the activities related to the Company’s valuation allowance (in thousands):

	Year ended December 31,		
	2019	2018	2017
Balance at beginning of period	$ 77,144	$ 77,756	$ 74,480
Additions	23,929	928	9,028
Deductions	(5,555)	(1,540)	(5,752)
Balance at end of period	$ 95,518	$ 77,144	$ 77,756

Management regularly assesses the ability to realize deferred tax assets recorded based upon the weight of available evidence, including such factors as recent earnings history and expected future taxable income on a jurisdiction by jurisdiction basis. In the event that the Company changes its determination as to the amount of realizable deferred tax assets, the Company will adjust its valuation allowance with a corresponding impact to the provision for income taxes in the period in which such determination is made.

In 2019, the Company continued to record a valuation allowance against all of its United States deferred tax assets due to cumulative losses in the United States. In addition, during the 2019, it recorded a partial valuation allowance on its deferred tax assets in Switzerland due to the generation of current year losses in excess of the amount that can be realized. This results in an increase to the valuation allowance of $23.9 million. This increase in the valuation allowance is offset partially by the release of $5.6 million valuation allowance against its Israel subsidiary due to a reduced tax rate as a result of a local tax authority ruling. As of December 31, 2019, the Company had a valuation allowance of $95.5 million against all of its U.S. federal and states net deferred tax assets and certain foreign deferred tax assets.

On July 27, 2015, the U.S. Tax Court issued an opinion in Altera Corp. v. Commissioner, 145 T.C. No.3 (2015) related to the treatment of stock-based compensation expense in an intercompany cost-sharing arrangement. A final decision was entered by the U.S. Tax Court on December 1, 2015 (the “2015 Decision”). On February 19, 2016, the U.S. Internal Revenue Service filed a notice of appeal in Altera Corp. v. Commissioner, 145 T.C. No. 3 (2015), to the Ninth Circuit Court of Appeals. The Ninth Circuit was to decide whether a regulation that mandates that stock-based compensation costs related to the intangible development activity of a qualified cost sharing arrangement (a “QCSA”) must be included in the joint cost pool of the QCSA (the “all costs rule”) is consistent with the arm’s length standard as set forth in Section 482 of the Internal Revenue Code. On June 7, 2019, the Ninth Circuit overturned the earlier Tax Court decision and ruled to include share-based compensation in the cost sharing pool. On July 22, 2019, Altera Corp. filed a petition for an en banc rehearing before the U.S. Court of Appeals for the Ninth Circuit, which was denied on November 12, 2019. Altera Corp. has 90 days from this date to petition the U.S. Supreme Court for review of the decision. During 2019, the Company continued to include share-based compensation in the cost base consistent with the Ninth Circuit's ruling.

As of December 31, 2019, the Company had $159.8 million, $31.2 million, $27.0 million and $55.3 million of foreign, U.S. federal, U.S. California state, and U.S. other states net operating loss carryforwards (“NOL”), respectively. Certain foreign NOLs expire beginning in 2027, if not utilized, while the majority of the foreign NOLs carryforward indefinitely. The U.S. federal and California NOLs begin to expire at various dates beginning in 2026 through 2039, if not utilized.

As of December 31, 2019, the Company had U.S. federal and California state tax credit carryforwards of approximately $13.7 million and $35.7 million, respectively. If not utilized, the U.S. federal tax credit carryforwards will begin to expire in 2031, while the California tax credit carryforward will not expire.

The Company has not provided U.S. state income taxes and foreign withholding taxes, on approximately $20.5 million of cumulative earnings for certain non-U.S. subsidiaries, because such earnings are intended to be indefinitely reinvested. Determination of the amount of unrecognized deferred tax liability for temporary differences related to investments in these non-U.S. subsidiaries that are essentially permanent in duration is not practicable.

The Company applies the provisions of the applicable accounting guidance regarding accounting for uncertainty in income taxes, which require application of a more-likely-than-not threshold to the recognition and derecognition of uncertain tax positions. If the recognition threshold is met, the applicable accounting guidance permits the recognition of a tax benefit measured at the largest amount of such tax benefit that, in our judgment, is more than fifty percent likely to be realized upon settlement. It further requires that a change in judgment related to the expected ultimate resolution of uncertain tax positions to be recognized in earnings in the period in which such determination is made. The Company will continue to review its tax positions and provide for, or reverse, unrecognized tax benefits as issues arise. As of December 31, 2019, the Company had $15.7 million of unrecognized future tax benefits that would favorably impact the effective tax rate in future periods if recognized. The following table summarizes the activities related to the Company’s gross unrecognized tax benefits (in millions):

	Year ended December 31,		
	2019	2018	2017
Balance at beginning of period	$ 18.0	$ 18.8	$ 19.2
Increase in balance related to tax positions taken during current year	0.2	1.0	1.4
Decrease in balance as a result of a lapse of the applicable statues of limitations	(0.1)	(0.1)	(2.2)
Decrease in balance due to settlement with tax authorities	—	(1.6)	—
Increase in balance related to tax positions taken during prior years	—	0.2	1.8
Decrease in balance related to tax positions taken during prior years	(1.1)	(0.3)	(1.4)
Balance at end of period	$ 17.0	$ 18.0	$ 18.8

The Company recognizes interest and penalties related to unrecognized tax positions in income tax expenses on the Consolidated Statements of Operations. The net interest and penalties charges recorded for the years ended December 31, 2017 through 2019, were not material.

The 2016 through 2019 tax years generally remain subject to examination by U.S. federal and most state tax authorities.

NOTE 16: NET LOSS PER SHARE

Basic net loss per share is computed by dividing the net loss attributable to common stockholders for the applicable period by the weighted average number of common shares outstanding during the period. Potentially dilutive shares, consisting of outstanding stock options, restricted stock units, ESPP plan awards, warrant shares as well as the 2020 Notes and 2024 Notes, are excluded from the net loss per share computations when their effect is anti-dilutive.

The following table presents the calculation of basic and diluted net loss per share (in thousands, except per share amounts):

	Year Ended December 31,		
	2019	2018	2017
Numerator:			
Net loss	$ (5,924)	$ (21,035)	$ (82,955)
Denominator:			
Weighted average number of shares outstanding:			
Basic and diluted	89,575	85,615	80,974
Net loss per share:			
Basic and diluted	$ (0.07)	$ (0.25)	$ (1.02)

The diluted net loss per share is the same as basic net loss per share for the years ended December 31, 2019, 2018 and 2017, as the effect of inclusion of potential common shares outstanding would have been anti-dilutive due to the Company’s net losses for the years presented. The following table sets forth the potential weighted common shares outstanding that were excluded from the computation of basic and diluted net loss per share calculations (in thousands):

	December 31,		
	2019	2018	2017
Convertible notes	1,322	—	—
Stock options	2,568	3,327	4,470
Restricted stock units	2,955	2,997	3,059
Stock purchase rights under the ESPP	478	609	620
Warrants (1)	4,321	1,268	782
Total	11,644	8,201	8,931

(1) See Note 17, “Warrants,” for additional information.

The Company’s intent is to settle the principal amount of the 2020 Notes and the 2024 Notes in cash. The treasury stock method is used to calculate any potential dilutive effect of the conversion spread on diluted net income per share, if applicable.

- The conversion spread of 7,962,609 shares had a dilutive impact on diluted net income per share as the Company’s average market price of its common stock for a given period exceeded the conversion price of $5.75 per share for the 2020 Notes.

- The conversion spread of 13,337,182 shares will have a dilutive impact on diluted net income per share when the Company’s average market price of its common stock for a given period exceeds the conversion price of $8.66 per share for the 2024 Notes.

See Note 12, “Convertible Notes, Other Debts and Finance Leases” for additional information on the 2020 Notes and the 2024 Notes.

NOTE 17: WARRANTS

On September 26, 2016, the Company granted a warrant to purchase shares of common stock (the “Warrant”) to Comcast pursuant to which Comcast may, subject to certain vesting provisions, purchase up to 7,816,162 shares of the Company’s common stock subject to adjustment in accordance with the terms of the Warrant, for a per share exercise price of $4.76. Comcast may exercise the Warrant for cash or on a net share basis. The Warrant expires on September 26, 2023 or the prior consummation of a change of control of the Company.

Prior to the third quarter of fiscal 2019, Comcast had vested in 1,954,042 Warrant shares as a result of the achievement of certain milestones. On July 8 2019, in connection with the election by Comcast of enterprise licensing pricing for the Company’s CableOS software, the Company deemed that all of the remaining milestones and thresholds required to fulfill each of the vesting requirements of the Warrant were satisfied and achieved or otherwise waived such that all Warrant shares were fully vested and exercisable as of July 1, 2019. The remaining terms of the Warrant have not been modified or amended. The total fair value of the fully vested Warrants as of July 1, 2019 was $20.0 million, which includes $3.9 million in fair value for the Warrant shares which were vested prior to July 2019.

The fair value of the Warrant that vested in connection with the CableOS software license agreement was estimated to be $16.1 million on July 8, 2019, using the Black-Scholes option pricing model. The assumptions utilized in the Black-Scholes model included the risk-free interest rate, expected volatility, and expected life in years. The risk-free interest rate was based on the U.S. Treasury yield curve rates with maturity terms similar to the expected life of the Warrant, which was determined to be 1.9%. Expected volatility was determined utilizing historical volatility over a period of time equal to the expected life of the Warrant, which was determined to be 48.6%. Expected life was equal to the remaining contractual term of the Warrant, which was determined to be 4.2 years. The dividend yield was assumed to be zero since the Company had not historically declared dividends and did not have any plans to declare dividends in the future.

The fair value of the Warrant was considered as a payment made to the customer in the form of an equity instrument, and therefore was reduced from the transaction price of the Comcast CableOS software license agreement.

The fair value of the Warrant was recorded as a component of “Prepaid expenses and other current assets” and “Other long-term assets” with a corresponding offset to “Additional paid-in capital” on the Company’s Consolidated Balance Sheets. This asset is amortized as a reduction to the Company’s revenue, based on the recognition pattern of the related transaction price.

During the year ended December 31, 2019, the Company recorded $13.6 million, as a reduction to revenues in connection with amortization of the Warrant. During the year ended December 31, 2018 and 2017, the Company recorded $1.2 million and $0.2 million respectively, as a reduction to net revenues in connection with amortization of the Warrant.

On December 17, 2019, Comcast net exercised the Warrant in its entirety, resulting in a net issuance of 3,217,547 shares. The Company delivered 804,387 shares to Comcast on December 20, 2019, with the remaining 2,413,160 shares were delivered in January 2020.

NOTE 18: SEGMENT INFORMATION, GEOGRAPHIC INFORMATION AND CUSTOMER CONCENTRATION

Segment Information

Operating segments are defined as components of an enterprise that engage in business activities for which separate financial information is available and evaluated by the Company's CODM, which for the Company is its Chief Executive Officer, in deciding how to allocate resources and assess performance. Based on our internal reporting structure, the Company consists of two operating segments: Video and Cable Access. The operating segments were determined based on the nature of the products offered. The Video segment provides video processing and production and playout solutions and services worldwide to broadcast and media companies, streaming new media companies, cable operators, and satellite and telecommunications (telco) Pay-TV service providers. The Cable Access segment provides CableOS cable access solutions and related services to cable operators globally.

The following table provides summary financial information by reportable segment (in thousands):

	Year ended December 31, 2019	Year ended December 31, 2018 [(1)]	Year ended December 31, 2017
Video			
Revenue	$ 278,028	$ 313,828	$ 319,473
Gross profit	162,156	178,170	173,414
Operating income (loss)	15,837	26,170	(2,024)
Cable Access			
Revenue	$ 124,846	$ 89,730	$ 38,773
Gross profit	68,548	39,029	8,892
Operating income (loss)	22,171	(1,756)	(23,154)
Total			
Revenue	$ 402,874	$ 403,558	$ 358,246
Gross profit	230,704	217,199	182,306
Operating income (loss)	38,008	24,414	(25,178)

(1) The Company has historically employed an aggregate allocation methodology based on total revenues to attribute professional services revenue and sales expenses between its Video and Cable Access segments. Beginning in the fourth quarter of 2017, the Company prospectively changed to a more precise attribution methodology as the activities of selling and supporting the CableOS solution have become increasingly distinct from those of Video solutions. The impact of making this change for the fiscal year ended December 31, 2017 compared to the Company's historical approach was an increase in operating loss of $5.9 million from the Video segment and a corresponding decrease in operating loss of the Cable Access segment. The Company believes that the updated allocation methodology provides greater clarity regarding the operating metrics of the Video and Cable Access business segments.

A reconciliation of the Company's consolidated segment operating income (loss) to consolidated loss before income taxes is as follows (in thousands):

	Year ended December 31, 2019	Year ended December 31, 2018	Year ended December 31, 2017 [(1)]
Total segment operating income (loss)	$ 38,008	$ 24,414	$ (25,178)
Unallocated corporate expenses [(1)]	(4,532)	(3,769)	(20,767)
Stock-based compensation	(12,074)	(17,289)	(16,610)
Amortization of intangibles	(8,319)	(8,367)	(8,322)
Consolidated income (loss) from operations	13,083	(5,011)	(70,877)
Loss on debt extinguishment	(5,695)	—	—
Non-operating expense, net	(13,984)	(11,937)	(13,830)
Loss before income taxes	(6,596)	$ (16,948)	$ (84,707)

(1) For the year ended December 31, 2017, the unallocated corporate expenses included acquisition- and integration-related costs, French VDP costs (see Note 11, "Restructuring and Related charges," for more information on French VDP) and Cable Access product line inventory obsolescence costs, totaling $7.9 million. In addition, in fiscal 2017, the unallocated corporate expenses included $8.0 million of Avid litigation settlement cost and associated legal fees (see Note 20, "Legal

Proceedings," for more information). The remaining unallocated corporate expenses for all years presented above include primarily other restructuring charges and excess facilities charges.

Unallocated Corporate Expenses

Together with amortization of intangibles and stock-based compensation, the Company does not allocate restructuring and related charges, acquisition- and integration-related costs, and certain other non-recurring charges to the operating income (loss) for each segment because management does not include this information in the measurement of the performance of the operating segments. A measure of assets by segment is not applicable as segment assets are not included in the discrete financial information provided to the CODM.

Geographic Information

The geographic distribution of Harmonic's revenue and property and equipment, net is summarized in the tables below (in thousands):

	Year ended December 31,		
	2019	2018	2017
Net revenue [1]:			
United States	$ 202,272	$ 181,965	$ 131,773
Other countries	200,602	221,593	226,473
Total	$ 402,874	$ 403,558	$ 358,246

(1) Revenue is attributed to countries based on the location of the customer.

Other than the U.S., no single country accounted for 10% or more of the Company's net revenues for the years ended December 31, 2019, 2018 and 2017.

	As of December 31,	
	2019	2018
Property and equipment, net:		
United States	$ 13,301	$ 10,376
Israel	5,919	6,975
France	2,615	3,519
Other countries	1,093	1,451
Total	$ 22,928	$ 22,321

Customer Concentration

Net revenue from Comcast accounted for 23% and 15% of the total revenue during the years ended December 31, 2019 and 2018, respectively.

NOTE 19: COMMITMENTS AND CONTINGENCIES

Warranty

The Company accrues for estimated warranty costs at the time of product shipment. Management periodically reviews the estimated warranty liability and records adjustments based on the terms of warranties provided to customers, historical and anticipated warranty claims experience, and estimates of the timing and cost of warranty claims. Activity for the Company's warranty accrual, which is included in "Accrued and other current liabilities", is summarized below (in thousands):

	2019	2018	2017
Balance at beginning of period	$ 4,869	$ 4,381	$ 4,862
Accrual for current period warranties	5,524	6,612	5,117
Warranty costs incurred	(6,079)	(6,124)	(5,598)
Balance at end of period	$ 4,314	$ 4,869	$ 4,381

Bank Guarantees and standby Letters of Credit

As of December 31, 2019 and 2018, the Company has outstanding bank guarantees and standby letters of credit in aggregate of $2.7 million and $2.3 million, respectively, consisting of building leases and performance bonds issued to customers.

On December 19, 2019, the Company entered into a Credit Agreement (the “Credit Agreement”) with JPMorgan Chase Bank, N.A., as lender, and Harmonic International GmbH, as co-borrower. The Credit Agreement provides for a secured revolving loan facility in an aggregate principal amount of up to $25.0 million, based on a borrowing base of eligible accounts receivable and inventory, with a maturity date of October 31, 2020. The Company may use availability under the revolving loan facility for the issuance of letters of credit. The proceeds of the revolving loans may be used for general corporate purposes.

The revolving loans bear interest, at the Company’s election, at a floating rate per annum equal to either (1) 1.25% plus the greater of (i) 1 month LIBOR on any day plus 2.50% and (ii) the prime rate as reported in the Wall Street Journal from time to time or (2) 2.25% plus LIBOR for an interest period of one, two or three months. Interest on the revolving loans is payable monthly in arrears, in the case of prime rate loans, and at the end of the applicable interest period, in the case of LIBOR loans.

The Credit Agreement contains customary affirmative and negative covenants, including covenants limiting the ability of the Company, among other things, incur debt, grant liens, undergo certain fundamental changes, make investments, make certain restricted payments, dispose of assets, enter into transactions with affiliates, and enter into burdensome agreements, in each case, subject to limitations and exceptions set forth in the Credit Agreement. The Company is also required to maintain compliance with an adjusted quick ratio, a minimum EBITDA covenant (tested quarterly) and a minimum liquidity covenant, in each case, determined in accordance with the terms of the Credit Agreement. As of December 31, 2019, the Company was in compliance with the covenants under the Credit Agreement.

As of December 31, 2019, there were $0.3 million of outstanding letters of credit issued under the Credit Agreement. There were no revolving borrowings under the Credit Agreement from the closing of the Credit Agreement through December 31, 2019.

On September 27, 2017, the Company entered into a Loan and Security Agreement (the “Loan Agreement”) with Silicon Valley Bank (the “Bank”). The Loan Agreement provided for a secured revolving credit facility in an aggregate principal amount of up to $15.0 million. Under the terms of the Loan Agreement, the principal amount of loans, plus the face amount of any outstanding letters of credit, at any time cannot exceed up to 85% of the Company’s eligible receivables. Under the terms of the Loan Agreement, the Company may also request letters of credit from the Bank. The Loan Agreement with the Bank was terminated effective September 10, 2019, in conjunction with the issuance of the 2024 Notes. There were no borrowings under the Loan Agreement prior to the termination, except $2.2 million committed towards security for letters of credit, which were unsecured as of December 31, 2019. The Company was in compliance with the covenants under the Loan Agreement prior to the termination.

During 2017, one of the Company’s subsidiaries entered into a $2.0 million credit facility with a foreign bank for the purpose of issuing performance guarantees. The credit facility is secured by a $2.2 million guarantee issued by the parent company. There were no amounts outstanding under this credit facility as of December 31, 2019 and December 31, 2018.

Indemnification

The Company is obligated to indemnify its officers and its directors pursuant to its bylaws and contractual indemnity agreements. The Company also indemnifies some of its suppliers and most of its customers for specified intellectual property matters pursuant to certain contractual arrangements, subject to certain limitations. The scope of these indemnities varies, but, in some instances, includes indemnification for damages and expenses (including reasonable attorneys’ fees). There have been no amounts accrued in respect of the indemnification provisions through December 31, 2019.

Royalties

The Company has licensed certain technologies from various companies. It incorporates these technologies into its own products and is required to pay royalties for such use, usually based on shipment of the related products. In addition, the Company has obtained research and development grants under various Israeli government programs that require the payment of royalties on sales of certain products resulting from such research. Royalty expenses were $4.1 million, $4.2 million and $5.2 million for the years ended December 31, 2019, 2018 and 2017, respectively, and they are included in cost of revenue in the Company’s Consolidated Statements of Operations.

Purchase Obligations

The Company relies on a limited number of contract manufacturers and suppliers to provide manufacturing services for a substantial majority of its products. The Company had approximately $62.3 million of non-cancelable commitments to purchase inventories and other commitments as of December 31, 2019.

NOTE 20: LEGAL PROCEEDINGS

In October 2011, Avid Technology, Inc. (“Avid”) filed a complaint in the United States District Court for the District of Delaware alleging that Harmonic’s Media Grid product infringes two patents held by Avid. A jury trial on this complaint commenced on January 23, 2014 and, on February 4, 2014, the jury returned a unanimous verdict in favor of us, rejecting Avid’s infringement allegations in their entirety. In January 2015, Avid filed an appeal with respect to the jury’s verdict with the Federal Circuit. In January 2016, the Federal Circuit issued an order vacating the verdict of noninfringement and remanding the case to the trial court for a new trial on infringement.

In June 2012, Avid served a subsequent complaint in the United States District Court for the District of Delaware alleging that the Company’s Spectrum product infringes one patent held by Avid. The complaint sought injunctive relief and unspecified damages. In September 2013, the U.S. Patent Trial and Appeal Board (“PTAB”) authorized an inter partes review to be instituted as to claims 1-16 of the patent asserted in this second complaint. In July 2014, the PTAB issued a decision finding claims 1-10 invalid and claims 11-16 not invalid. We filed an appeal with respect to the PTAB’s decision on claims 11-16 in September 2014, and the Federal Circuit affirmed the PTAB’s decision in April 2016.

In July 2017, the court issued a scheduling order consolidating both cases and setting the trial date for November 6, 2017.

On October 19, 2017, the parties agreed to settle the consolidated cases by entering into a settlement and patent portfolio cross-license agreement, and the cases were dismissed with prejudice. In connection with the agreement, the Company recorded a $6.0 million litigation settlement expense in “Selling, general and administrative expenses” in the Company’s 2017 Consolidated Statement of Operations. Of the associated $6.0 million settlement liability, $2.5 million was paid in October 2017, $1.5 million was paid in April 2019 and $2.0 million will be paid in the third quarter of 2020.

From time to time, the Company is involved in lawsuits as well as subject to various legal proceedings, claims, threats of litigation, and investigations in the ordinary course of business, including claims of alleged infringement of third-party patents and other intellectual property rights, commercial, employment, and other matters. The Company assesses potential liabilities in connection with each lawsuit and threatened lawsuits and accrues an estimated loss for these loss contingencies if both of the following conditions are met: information available prior to issuance of the financial statements indicates that it is probable that a liability has been incurred at the date of the financial statements and the amount of loss can be reasonably estimated. While certain matters to which the Company is a party specify the damages claimed, such claims may not represent reasonably probable losses. Given the inherent uncertainties of litigation, the ultimate outcome of these matters cannot be predicted at this time, nor can the amount of possible loss or range of loss, if any, be reasonably estimated.

NOTE 21: SELECTED QUARTERLY FINANCIAL DATA

(UNAUDITED, IN THOUSANDS, EXCEPT PER SHARE AMOUNTS)

The following table sets forth our unaudited quarterly Consolidated Statement of Operations data for each of the eight quarters ended December 31, 2019. In management's opinion, the data has been prepared on the same basis as the audited Consolidated Financial Statements included in this report, and reflects all necessary adjustments, consisting only of normal recurring adjustments, necessary for a fair statement of this data.

	Fiscal 2019			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
	(In thousands, except per share amounts)			
Quarterly Data:				
Net revenue	$ 80,106	$ 84,865	$ 115,725	$ 122,178
Gross profit [(1)]	41,849	43,928	75,540	61,695
Net income (loss)	(11,306)	(11,845)	11,657	5,570
Net income (loss) per share:				
Basic	$ (0.13)	$ (0.13)	$ 0.13	$ 0.06
Diluted	$ (0.13)	$ (0.13)	$ 0.12	$ 0.06
Shares used in per share calculations:				
Basic	88,165	88,931	89,964	91,124
Diluted	88,165	88,931	97,596	97,499

	Fiscal 2018			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
	(In thousands, except per share amounts)			
Quarterly Data:				
Net revenue	$ 90,127	$ 99,160	$ 100,616	$ 113,655
Gross profit [(1)]	47,183	51,603	50,102	60,321
Net income (loss) [(2) (3)]	(13,694)	(2,913)	(7,758)	3,330
Net income (loss) per share:				
Basic and diluted	$ (0.16)	$ (0.03)	$ (0.09)	$ 0.04
Shares used in per share calculations:				
Basic	83,912	85,304	86,321	86,846
Diluted	83,912	85,304	86,321	89,028

(1) Gross margin in the first, second and fourth quarter of fiscal 2019 was 52.2%, 51.8% and 50.5%. The movement in gross margin in these quarters was primarily due to product mix. Gross margin increased to 65.3% in the third quarter of 2019 primarily due to the recognition of $37.5 million in software license revenue from the Comcast CableOS software license agreement during the third quarter of fiscal 2019. Gross margin decreased to 49.8% during the third quarter of 2018 compared to 52.0% during the second quarter of 2018 and increased to 53.1% during the fourth quarter primarily as a result of product mix.

(2) During the third and the fourth quarter of 2019, the Company recorded net income primarily due to growing success of our Cable OS solution and with stronger gross margins due to increase in revenue from Software. During the fourth quarter of 2018, the Company recorded net income primarily due to higher revenues with stronger gross margins of 53.1% coupled with reduced operating expenses as a result of our vigilant cost management.

(3) During the fourth quarter of 2019, the Company recorded a one-time benefit of approximately $2.0 million due to changes in the Company's global tax structure. In addition, the Company recorded a one-time benefit of approximately $0.8 million due to a valuation allowance release for one of its foreign subsidiaries due to changes in forecasted taxable income resulting from the Company receiving a favorable tax ruling during the first quarter of 2019. During the fourth quarter of 2018, the Company released $1.0 million of valuation allowance associated with one of Company's foreign subsidiaries.

Item 9. *CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE*

None.

Item 9A. *CONTROLS AND PROCEDURES*

Evaluation of Disclosure Controls and Procedures

We maintain “disclosure controls and procedures,” as such term is defined in Rule 13a-15(e) under the Exchange Act, that are designed to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in SEC rules and forms, and that such information is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure. In designing and evaluating our disclosure controls and procedures, management recognized that disclosure controls and procedures, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the disclosure controls and procedures are met. Additionally, in designing disclosure controls and procedures, our management necessarily was required to apply its judgment in evaluating the cost-benefit relationship of possible disclosure controls and procedures. The design of any disclosure controls and procedures also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions.

Based on their evaluation as of the end of the period covered by this Annual Report on Form 10-K, our Chief Executive Officer and Chief Financial Officer have concluded that our disclosure controls and procedures were effective.

Management’s Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rule 13a-15(f) under the Exchange Act). Management conducted an assessment of the effectiveness of the Company’s internal control over financial reporting based on the criteria set forth in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on the Company’s assessment, management concluded that its internal control over financial reporting was effective as of December 31, 2019.

The Company’s independent registered public accounting firm, Armanino LLP, has audited the effectiveness of the Company’s internal control over financial reporting, as stated in their report which appears in Part II, Item 8 of this Form 10-K.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting during our fourth quarter of fiscal year 2019, which were identified in connection with management’s evaluation required by paragraph (d) of rules 13a-15 and 15d-15 under the Exchange Act, that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. *OTHER INFORMATION*

None.

PART III

Certain information required by Part III is omitted from this Annual Report on Form 10-K pursuant to Instruction G to Exchange Act Form 10-K, and the Registrant will file its definitive Proxy Statement for its 2020 Annual Meeting of Stockholders, pursuant to Regulation 14A of the Securities Exchange Act of 1934, as amended (the “2020 Proxy Statement”), not later than 120 days after the end of the fiscal year covered by this Annual Report on Form 10-K, and certain information included in the 2020 Proxy Statement is incorporated herein by reference.

Item 10. ***DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE***

The information required by this item will be set forth in the 2020 Proxy Statement and is incorporated herein by reference.

Harmonic has adopted a Code of Business Conduct and Ethics (the “Code”) that applies to all employees, including Harmonic’s Chief Executive Officer, Chief Financial Officer and Corporate Controller. The Code is available on the Company’s website at www.harmonicinc.com.

Harmonic intends to satisfy the disclosure requirement under Form 8-K regarding an amendment to, or waiver from, a provision of this Code of Ethics by posting such information on our website, at the address specified above, and, to the extent required by the listing standards of The NASDAQ Global Select Market, by filing a Current Report on Form 8-K with the Securities and Exchange Commission disclosing such information.

Item 11. ***EXECUTIVE COMPENSATION***

The information required by this item will be set forth in the 2020 Proxy Statement and is incorporated herein by reference.

Item 12. ***SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS***

Information related to security ownership of certain beneficial owners and security ownership of management and related stockholder matters will be set forth in the 2020 Proxy Statement and is incorporated herein by reference.

Item 13. ***CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE***

The information required by this item will be set forth in the 2020 Proxy Statement and is incorporated herein by reference.

Item 14. ***PRINCIPAL ACCOUNTING FEES AND SERVICES***

The information required by this item will be set forth in the 2020 Proxy Statement and is incorporated herein by reference.

PART IV

Item 15. ***EXHIBITS AND FINANCIAL STATEMENT SCHEDULES***

1. *Financial Statements.* See Index to Consolidated Financial Statements in Item 8 on page of this Annual Report on Form 10-K.

2. *Financial Statement Schedules.* Financial statement schedules have been omitted because the information is not required to be set forth herein, is not applicable or is included in the financial statements or the notes thereto.

3. *Exhibits.* The documents listed in the Exhibit Index of this Annual Report on Form 10-K are filed herewith or are incorporated by reference in this Annual Report on Form 10-K, in each case as indicated therein.

Exhibit Number	Description
3.1(ii)	Certificate of Incorporation of Harmonic Inc., as amended
3.2 (xiv)	Amended and Restated Bylaws of Harmonic Inc.
4.1(i)	Form of Common Stock Certificate
4.2(iii)	Certificate of Designation of Rights, Preferences and Privileges of Series A Participating Preferred Stock of Harmonic Inc.
4.3(viii)	Indenture, dated December 14, 2015, by and between the Company and U.S. Bank National Association
4.4(vii)	Form of 4.00% Senior Convertible Note due 2020 (included in Exhibit 4.3)
4.5(ix)†	Warrant to Purchase Shares of Common Stock of Harmonic, Inc.
4.6 (xv)	Indenture, dated September 13, 2019, between the Company and U.S. Bank National Association
4.7 (xv)	Form of 2.00% Convertible Senior Note due 2024 (included in Exhibit 4.4)
4.8	Description of Common Stock
10.1(i)*	Form of Indemnification Agreement
10.2(vii)*	1995 Stock Plan, as amended and restated on June 5, 2019
10.3(xvii)*	2002 Director Stock Plan, as amended and restated on June 5, 2019
10.4(xiii)*	2002 Employee Stock Purchase Plan, as amended and restated on June 5, 2019
10.5(xii)*	Amended and Restated Change of Control Severance Agreement between Harmonic Inc. and Patrick Harshman, effective March 20, 2018
10.6(xii)*	Form of Amended and Restated Change of Control Severance Agreement between Harmonic Inc. and each of Sanjay Kalra, Nimrod Ben-Natan, Neven Haltmayer and Eric Louvet, effective March 20, 2018
10.7(vii)*	Harmonic Inc. 2002 Director Stock Plan Restricted Stock Unit Agreement
10.8(iv)	Professional Service Agreement between Harmonic Inc. and Plexus Services Corp., dated September 22, 2003
10.9(iv)	Amendment, dated January 6, 2006, to the Professional Services Agreement for Manufacturing between Harmonic Inc. and Plexus Services Corp., dated September 22, 2003
10.10(iv)	Addendum 1, dated November 26, 2007, to the Professional Services Agreement between Harmonic Inc. and Plexus Services Corp., dated September 22, 2003
10.11 (xi)	Harmonic Inc. 1995 Stock Plan Restricted Stock Unit Agreement
10.12(v)	Lease Agreement between Harmonic Inc. and CRP North First Street, L.L.C. dated December 15, 2009
10.14(x)	Put Option Agreement, dated as of December 7, 2015, by and between Harmonic Inc. and Mr. Eric Louvet, Mr. Eric Gallier, Mr. Jean-Marc Guiot, Mr. Claude Perron, Mrs. Crystele Trévisan-Jallu, Mrs. Delphine Sauvion, Mr. Marc Procureur, Mr. Christophe Delahousse, Mr. Hervé Congard, Mr. Arnaud de Puyfontaine, FPCI Winch Capital 3, Montalivet Networks and FPCI CIC Mezzanine 3
10.15(x)	Sale and Purchase Agreement, dated as of February 11, 2016, by and between Harmonic International AG and Mr. Eric Louvet, Mr. Eric Gallier, Mr. Jean-Marc Guiot, Mr. Claude Perron, Mrs. Crystele Trévisan-Jallu, Mrs. Delphine Sauvion, Mr. Marc Procureur, Mr. Christophe Delahousse, Mr. Hervé Congard, Mr. Arnaud de Puyfontaine, FPCI Winch Capital 3, Montalivet Networks and FPCI CIC Mezzanine 3 for the acquisition of Thomson Video Networks
10.17(xvi)	Credit Agreement, dated as of December 19, 2019, by and among Harmonic Inc. and Harmonic International GmbH, as co-borrowers, certain subsidiaries of Harmonic Inc. from time to time party thereto, as guarantors, and JPMorgan Chase Bank, N.A., as lender.

21.1	Subsidiaries of Harmonic Inc.
23.1	Consent of Independent Registered Public Accounting Firm
23.2	Consent of PricewaterhouseCoopers LLP - Independent Registered Public Accounting Firm
31.1	Certification of Principal Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2	Certification of Principal Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1	Certification of Principal Executive Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
32.2	Certification of Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101	The following materials from Registrant's Annual Report on Form 10-K for the year ended December 31, 2019, formatted in Extensible Business Reporting Language (XBRL) includes: Consolidated Balance Sheets at December 31, 2019 and December 31, 2018; (ii) Consolidated Statements of Operations for the Years Ended December 31, 2019, December 31, 2018 and December 31, 2017; (iii) Consolidated Statements of Comprehensive Loss for the Years Ended December 31, 2019, December 31, 2018 and December 31, 2017; (iv) Consolidated Statements of Stockholders' Equity for the Years Ended December 31, 2019, December 31, 2018 and December 31, 2017; (v) Consolidated Statements of Cash Flows for the Years Ended December 31, 2019, December 31, 2018 and December 31, 2017; and (vi) Notes to Consolidated Financial Statements.

* Indicates a management contract or compensatory plan or arrangement relating to executive officers or directors of the Company.

† Registrant has omitted portions of this exhibit and filed such exhibit separately with the Securities and Exchange Commission pursuant to a grant of confidential treatment under Rule 406 promulgated under the Securities Act.

(i) Previously filed as an Exhibit to the Company's Registration Statement on Form S-1 No. 33-90752.

(ii) Previously filed as an Exhibit to the Company's Annual Report on Form 10-K for the year ended December 31, 2001.

(iii) Previously filed as an Exhibit to the Company's Current Report on Form 8-K dated July 25, 2002.

(iv) Previously filed as an Exhibit to the Company's Current Annual Report on Form 10-K for the year ended December 31, 2008.

(v) Previously filed as an Exhibit to the Company's Current Report on Form 8-K dated December 18, 2009.

(vi) N/A

(vii) Previously filed as an Exhibit to the Company's Registration Statement on Form S-8, dated June 22, 2017.

(viii) Previously filed as an Exhibit to the Company's Current Report on Form 8-K dated December 14, 2015.

(ix) N/A

(x) Previously filed as an Exhibit to the Company's Annual Report on Form 10-K for the year ended December 31, 2016.

(xi) Previously filed as an Exhibit to the Company's Annual Report on Form 10-K for the year ended December 31, 2017.

(xii) Previously filed as an Exhibit to the Company's Current Report on Form 8-K dated March 26, 2018.

(xiii) Previously filed as an Exhibit to the Company' Registration Statement on Form S-8, dated June 28, 2019.

(xiv) Previously filed as an exhibit to the Company's Periodic Report on Form 10-Q, dated August 5, 2019.

(xv) Previously filed as an exhibit to the Company's Current Report on Form 8-K dated September 16, 2019.

(xvi) Previously filed as an exhibit to the Company's Current Report on Form 8-K dated December 26, 2019.

(xvii) Previously filed as an exhibit to the Company's definitive proxy statement on Schedule 14A dated April 26, 2019.

Item 16. ***FORM 10-K SUMMARY***

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15 (d) of the Securities Exchange Act of 1934, the Registrant, Harmonic Inc., a Delaware corporation, has duly caused this Annual Report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of San Jose, State of California, on February 28, 2020.

HARMONIC INC.

By: /s/ PATRICK J. HARSHMAN

Patrick J. Harshman

President and Chief Executive Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, this Annual Report on Form 10-K has been signed by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/s/ PATRICK J. HARSHMAN (Patrick J. Harshman)	President & Chief Executive Officer (Principal Executive Officer)	February 28, 2020
/s/ SANJAY KALRA (Sanjay Kalra)	Chief Financial Officer (Principal Financial and Accounting Officer)	February 28, 2020
/s/ PATRICK GALLAGHER (Patrick Gallagher)	Chairperson	February 28, 2020
/s/ SUSAN G. SWENSON (Susan G. Swenson)	Director	February 28, 2020
/s/ MITZI REAUGH (Mitzi Reaugh)	Director	February 28, 2020
/s/ NIKOS THEODOSOPOULOS (Nikos Theodosopoulos)	Director	February 28, 2020
/s/ DAVID KRALL (David Krall)	Director	February 28, 2020
/s/ DEBORAH L. CLIFFORD (Deborah L. Clifford)	Director	February 28, 2020

Description of Capital Stock

The authorized capital stock of Harmonic Inc. (“we”, “us”, “our” or “Harmonic”) consists of 150,000,000 shares of common stock, $0.001 par value, and 5,000,000 shares of preferred stock, $0.001 par value, 100,000 of which have been designated as Series A Participating Preferred Stock. The following description of our capital stock does not purport to be complete and is subject to, and qualified in its entirety by, our restated certificate of incorporation, as amended, our amended and restated bylaws, and the certificate of designation of rights, preferences and privileges of Series A Participating Preferred Stock.

Common Stock

The holders of our common stock are entitled to one vote per share on all matters to be voted upon by the stockholders. Subject to preferences that may be applicable to any outstanding preferred stock, the holders of our common stock are entitled to receive ratably such dividends, if any, as may be declared from time to time by our Board of Directors (our “Board”) out of funds legally available therefore. In the event of a liquidation, dissolution or winding up of Harmonic, the holders of our common stock are entitled to share ratably in all assets remaining after payment of liabilities and the liquidation preference of any then outstanding shares of our preferred stock. Holders of our common stock have no preemptive or conversion rights or other subscription rights. Our common stock is not subject to any redemption or sinking fund provisions. All of the outstanding shares of our common stock are fully paid and non-assessable. The rights, preferences, and privileges of holders of our common stock are subject to, and may be adversely affected by, the rights of holders of shares of our preferred stock, as discussed below.

Preferred Stock

No shares of preferred stock are outstanding. Pursuant to our restated certificate of incorporation, as amended, our Board has the authority, without further action by the stockholders, to issue from time to time up to 5,000,000 shares of preferred stock in one or more series. Our Board may designate the rights, preferences, privileges, and restrictions of the preferred stock, including dividend rights, conversion rights, voting rights, redemption rights, liquidation preference, sinking fund terms, and the number of shares constituting any series or the designation of any series. The issuance of preferred stock could have the effect of restricting dividends on the common stock, diluting the voting power of the common stock, impairing the liquidation rights of the common stock, or delaying, deterring, or preventing a change in control. Such issuance could have the effect of decreasing the market price of the common stock.

Anti-Takeover Provisions

Certain provisions of Delaware law and our certificate of incorporation and bylaws could make the acquisition of Harmonic by means of a tender offer, or the acquisition of control of Harmonic by means of a proxy contest or otherwise more difficult. These provisions, summarized below, are intended to discourage certain types of coercive takeover practices and inadequate takeover bids, and are designed to encourage persons seeking to acquire control of us to negotiate with our Board. We believe that the benefits of increased protection against an unfriendly or unsolicited proposal to acquire or restructure Harmonic outweigh the disadvantages of discouraging such proposals. Among other things, negotiation of such proposals could result in an improvement of their terms.

Delaware Anti-Takeover Law

We are subject to Section 203 of the Delaware General Corporation Law, an anti-takeover law. In general, Section 203 prohibits a publicly-held Delaware corporation from engaging in a “business combination” with an “interested stockholder” for a period of three years following the date the person became an interested stockholder, unless the “business combination” or the transaction in which the person became an interested stockholder is approved by our Board in a prescribed manner. Generally, a “business combination” includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. Generally, an “interested stockholder” is a person who, together with affiliates and associates, owns or, within three years prior to the determination of interested stockholder status, did own, 15% or more of a corporation’s voting stock. The existence of this provision may have an anti-takeover effect with respect to transactions not approved in advance by our Board, including discouraging attempts that might result in a premium over the market price for the shares of common stock held by stockholders.

Other Provisions in Our Certificate of Incorporation and Bylaws

Our restated certificate of incorporation, as amended, and our amended and restated bylaws provide other mechanisms that may help to delay, defer or prevent a change in control or prevent changes in control of our management team. These include provisions:

- authorizing blank check preferred stock, which could be issued by our Board, without additional stockholder approval, with voting, liquidation, dividend and other rights superior to our common stock;
- limiting the liability of, and providing indemnification to, our directors and officers;
- limiting the ability of our stockholders to call, and bring business before, special meetings;
- requiring advance notice of stockholder proposals for business to be conducted at meetings of our stockholders and for nominations of candidates for election to our Board;
- controlling the procedures for conducting and scheduling of Board and stockholder meetings; and
- providing our Board with the express power to postpone previously scheduled annual meetings and to cancel previously scheduled special meetings.

Transfer Agent and Registrar

Our transfer agent and registrar for common stock is Computershare Investor Services.

Listing

Our common stock is listed on The Nasdaq Global Select Market under the symbol “HLIT.”

HARMONIC INC. AND SUBSIDIARIES
SUBSIDIARIES OF THE REGISTRANT

The following table lists the direct and indirect subsidiaries of Harmonic Inc. as of December 31, 2019:

Name	State or Other Jurisdiction of Incorporation or Organization
Harmonic Delaware, L.L.C.	U.S.A.
Harmonic Germany GmbH	Germany
Harmonic Global Limited	Cayman Islands
Harmonic Japan GK	Japan
Harmonic India Private Limited	India
Harmonic International GmbH	Switzerland
Harmonic International Inc	U.S.A.
Harmonic International Limited	Bermuda
Harmonic Lightwaves (Israel) Ltd	Israel
Harmonic Singapore P.T.E. Ltd.	Singapore
Harmonic Spain SL	Spain
Harmonic Technologies (HK) Limited	Hong Kong
Harmonic (UK) Limited	United Kingdom
Harmonic Video Networks Ltd.	Israel
Horizon Acquisition Ltd	Israel
Harmonic Brasil LTDA	Brazil
Harmonic S.R.I.	Argentina
Harmonic Mexico International	Mexico
Harmonic Video Networks Malaysia Sdn Bhd	Malaysia
Harmonic International Australia Pty Ltd	Australia
Harmonic Italia Srl	Italy
Harmonic Technologies (Beijing) Co. Ltd	China
Kepler M2 SAS	France
Financiere Kepler SAS	France
Kepler SAS	France
Harmonic France SAS	France
Thomson Video Networks India Private Ltd	India

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-8 (Nos. 333-38025, 333-65051, 333-86649, 333-84720, 333-91464, 333-116467, 333-136425, 333-154715, 333-159877, 333-167197, 333-176211, 333-182931, 333-192089, 333-200032, 333-207866, 333-212242, 333-218902, 333-225874 and 333-232431) of our report dated February 28, 2020, relating to the consolidated financial statements of Harmonic Inc. (the "Company"), and the effectiveness of the Company's internal control over financial reporting, appearing in this Annual Report on Form 10-K for the year ended December 31, 2019.

/s/ Armanino LLP

Armanino LLP

San Ramon, California

February 28, 2020

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-8 (Nos. 333-38025, 333-65051, 333-86649, 333-84720, 333-91464, 333-116467, 333-136425, 333-154715, 333-159877, 333-167197, 333-176211, 333-182931, 333-192089, 333-200032, 333-207866, 333-212242, 333-218902, 333-225874, and 333-232431) of Harmonic Inc. of our report dated March 5, 2018, except for the effects of the changes in presentation of revenue and cost of revenue discussed in Note 2, as to which the date is February 28, 2020, relating to the financial statements, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP
San Jose, California
February 28, 2020

Exhibit 31.1

HARMONIC INC.

CERTIFICATION

I, Patrick J. Harshman, certify that:

1. I have reviewed this Annual Report on Form 10-K of Harmonic Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
    a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
    b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
    c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
    d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
    a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
    b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2020	By:	/s/ Patrick J. Harshman
		Patrick J. Harshman
		President and Chief Executive Officer
		(Principal Executive Officer)

Exhibit 31.2

HARMONIC INC.

CERTIFICATION

I, Sanjay Kalra, certify that:

1. I have reviewed this Annual Report on Form 10-K of Harmonic Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
   a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
   b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
   c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
   d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
   a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
   b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 28, 2020

By: /s/ Sanjay Kalra

Sanjay Kalra

Chief Financial Officer

Exhibit 32.1

HARMONIC INC.

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER

PURSUANT TO 18 U.S.C. SECTION 1350 AS ADOPTED PURSUANT TO

SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

As of the date hereof, I, Patrick J. Harshman, President and Chief Executive Officer of Harmonic Inc. (the “Company”), certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that the annual report of the Company on Form 10-K for the fiscal year ended December 31, 2019, as filed with the Securities and Exchange Commission (the “Report”), fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934 and that information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company. This written statement is being furnished to the Securities and Exchange Commission as an exhibit accompanying such Report and shall not be deemed filed pursuant to the Securities Exchange Act of 1934, as amended.

Date: February 28, 2020

/s/ Patrick J. Harshman

Patrick J. Harshman
President and Chief Executive Officer

Exhibit 32.2

HARMONIC INC.

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER

PURSUANT TO 18 U.S.C. SECTION 1350 AS ADOPTED PURSUANT TO

SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

As of the date hereof, I, Sanjay Kalra, Chief Financial Officer of Harmonic Inc. (the “Company”), certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that the annual report of the Company on Form 10-K for the fiscal year ended December 31, 2019, as filed with the Securities and Exchange Commission (the “Report”), fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934 and that information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company. This written statement is being furnished to the Securities and Exchange Commission as an exhibit accompanying such Report and shall not be deemed filed pursuant to the Securities Exchange Act of 1934, as amended.

Date: February 28, 2020

/s/ Sanjay Kalra

Sanjay Kalra
Chief Financial Officer