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Chairman Curbelo, Ranking Member Meng, and members of the committee, thank you for allowing me to testify before you today on the challenges that export control reform poses for America's small businesses. My name is Dr. Gregory Quarles, Chief Scientist for The Optical Society (OSA). I have also served as a CEO and COO of two small businesses and served on 8 corporate and non-profit boards. Among my research and business pursuits has been the development of new optical components and laser devices for medical, military and industrial applications.

With 95 percent of the world's consumers living abroad, and nearly three quarters of the world's purchasing power being leveraged by nations outside the United States, it is vital that American small businesses be afforded equal footing to compete in the global arena to effectively ensure continued growth for the U.S. economy. The Optical Society stands ready to partner with the federal government to assist small business to export more U.S. manufactured products abroad.

I will explain the three primary areas of concern impacting Small Businesses from Export Control Regulation which regulates optics and photonics technologies, such as lasers, infrared imaging systems, electro-optic subsystems, optical material accessories, and partnerships with global partners which might involve the exchange of technical data. These are: Impact on time to market for regulated products and components, cost of compliance, and the need to enhance government export assistance resources, particularly for small businesses.

The Optical Society is the leading professional organization for scientists, engineers, students and entrepreneurs who fuel discoveries, shape real-life applications and accelerate achievements in the science of light. Through world-renowned publications, meetings and membership initiatives, OSA provides quality research, networking opportunities and dedicated resources for its extensive global network of optics and photonics experts. Optics and photonics are highly specialized fields of physics and engineering known as the "science of light," which makes possible everything from life-saving medical imaging devices and solar energy to high-speed Internet connections, computer chips and Light Emitting Diodes, to lasers for military and commercial applications. Globally, optics and photonics annual revenues amount to more than \$400 billion according to an analysis by OSA Industry Development Associates. In short, optics and photonics are essential to solving problems, enabling innovation, facilitating economic growth and improving lives.

2016 marks an especially important year for The Optical Society and optics. It is our 100th anniversary. Originally founded in Rochester, New York with 10 scientists from industry and academia, OSA now spans 177 countries and brings together more than 19,000 individual members and more than 250 U.S. corporate members – from global organizations like IBM Corporation to manufacturers like Optimax in Rochester, New York, or Beckman Coulter Inc. in Miami, Florida.

Over 90 percent of The Optical Society's corporate members are small businesses that look to OSA to be their voice on issues, such as International Traffic in Arms Regulations (ITAR) that could adversely affect their ability to sell products abroad.

Related to the small business technology companies that The Optical Society represents, we believe that the U.S. government needs to conduct more educational outreach to potential exporting small business industry sectors on export control compliance and licensing requirements. Small companies, start-up companies—those without in-house in-depth export compliance expertise—are often challenged to sell export controlled products outside of the United States. U.S. small business companies at times due to the expense and complexity of export licensing decide against exporting. This issue needs to be addressed. The Optical Society is committed to work with the U.S. government on this endeavor.

The Optical Society (OSA) also wants to share with the committee the impact of export control on small business, related to the pending revisions in the ITAR, U.S. Munitions List (USML) Category XII, proposed under the Obama Administration's Export Control Reform (ECR) initiative. Category XII rules regulate export control compliance for optical and photonic-enabled devices. Even though these broad ECR changes have been ongoing since 2009, the final category for amending, Category XII, was saved for last due to its critical nature, overall complexity, and broad impact. Recognizing the potential negative impact on not only our members but the industry as a whole, we have partnered with two other groups, the Semiconductor Industry Association and SPIE, in educating Congress about the negative impacts on business and the optics industry.

Category XII revisions cover many of the commercially developed and manufactured optical and photonic components, as well as the potential impact of changes that extend to the three main constituents of The Optical Society, that being academia, industry and government researchers. Industry with an emphasis on small business and academia will need to be educated by government regulating agencies on the final rule changes to Category XII.

I have had the opportunity to speak with several leaders from the optics and photonics industry leading up to this Subcommittee Hearing. I have found their input to be enlightening, and paralleling much of my experience in research and development and the production of optical and photonics commodities and components. As scientists and business leaders, many of us are also familiar with U.S. government export control regulations related to selling controlled products abroad

and the ability to recruit international students for research endeavors that may be affected by export control regulations. The input shared by these OSA colleagues has been a well-defined path of obtaining their graduate degrees and opening a start-up or going to work in an industrial lab. Then, as they develop products for their customers, they are met with the requirement to review multiple export control requirements before shipping, which can sometimes lead to cancelled sales.

Allow me to delve more deeply into the first major impact – compliance causes delays, which can mean lost revenue opportunities.

Generating Revenue/Time to Market:

Compliance with Export Control regulations for products and components that are available from non-U.S. vendors adds time to the sales process--making U.S. businesses less competitive and impairing U.S. industry growth.

As all business development managers dealing with overseas sales will share, there are three critical components to booking a sale: price, lead-time, and ability to deliver (and receive an export license if necessary). One of the frustrating aspects with developing Intellectual Property and then trying to sell a product globally is the uncertainty of export licenses being approved and the lead-time involved. Many times a company will quote a product to a customer, with the caveat that they will deliver in 60 days, **IF** an export license is granted. After speaking with two colleagues in New York that routinely sell the same product, multiple times annually to repeat customers, the lead time for these licenses is averaging between 30 – 60 days for both Commerce Department Bureau of Industry and Security licensing for dual use technology exports and the Department of State Directorate of Defense Trade Controls on military technology export licensing.

The result? Foreign competitors can use this seemingly brief window of time as an opportunity to undercut a sale and win business from U.S. companies – regardless of product quality and in some instances price. It may be cliché, but time is money and U.S. businesses lose when regulatory compliance increases the time to purchase for the buyer.

When U.S. small businesses are competing with U.S. companies that have relocated subsidiaries overseas or with foreign entities that are not restricted by U.S. government export control regulations, there is a strong probability that you cannot even compete for these orders. Many foreign corporate competitors advertise products as being “ITAR-free” or “non-ITAR” meaning purchase from a U.S. export control regulated company and you will have delay times or cancelations in securing your needed product. Many prospective buyers from outside of the U.S. will not even ask for a quote when they learn about the delay or uncertainty in obtaining an export license. U.S. businesses aren’t competitive.

Delay time in securing export control licenses has a greater impact on small companies related to generating revenue compared to larger established U.S. companies. Delays or loss of foreign sales because of export control compliance timelines to secure a license can equate to layoffs and or the small business' long-term viability to continue operations while foreign corporations to earn higher revenues, and subsequently invest these revenues back into their corporate research and development programs and creating the opportunity for more rapid growth.

Further, the lack of U.S. growth can affect the research enterprise by discouraging bright young scholars from pursuing science and technology degrees. This leads to a shortage of qualified applicants for the high paying, high technology jobs. The final part of this negative cycle is that if U.S. companies developing these state-of-the-art technologies cannot achieve growth in their sales globally due to export control, then investment, by individuals or the corporations themselves, will diminish, leading to a decreasing opportunity to generate technology-based revenues sufficient to sustain operations.

Cost of U.S. Government Export Control Compliance:

Compliance is a necessary cost of doing business. However, it shouldn't be burdensome for small businesses.

A study by N.V. Crain and W. M. Crain of Lafayette College for the Small Business Administration summarized the compliance cost very well – it is essentially a “fixed-cost” regardless of the size of the company. Their comparisons were for companies ranging from five employees to 500 employees. Large corporations see a lower cost per employee, and the cost per employee in small business are 36 per cent higher than those in companies greater than 500 employees. Thus, small businesses face a substantial cost disadvantage when having to deal with export compliance regulations and fees when compared to their larger counterparts. The industrial sector of The Optical Society membership base is particularly concerned with the loss of potential revenue due to limitations to freely sell technologies that are sold as dual-use or in open markets by many of our allies globally.

I can also speak from my prior experience as CEO of a laser and opto-electronic corporation, which was a small business selling products that were export controlled by Commerce Department Bureau of Industry and Security licensing for dual use technology exports and the Department of State Directorate of Defense Trade Controls on USML/ITAR regulated licensing. The cost annually for personnel just to manage the compliance and export control team, exceeded \$500,000 annually. This excludes the cost for outside legal counsel and consultants for pursuit of problematic Technology Assistance Agreements (TAAs) or license challenges. The TAAs are the “rules” for working with international students and colleagues on export-controlled products. However, these rules limit collaboration and can often create confusion.

But what choice do business owners have? Spend tens of thousands of dollars on experts or risk fines of a million plus dollars – or even jail time? Regulations make it costly to compete. While discussing the impact of export control, I must also weigh in on behalf of the academic community, which makes up nearly 60 percent of the membership at The Optical Society. Export Control has been put into place to protect not only the technology, but national security, which should enhance the safety and position of the United States globally. However, restrictions as such are inconsistent with many mission statements for universities. The university experience is fundamental to provide a learning environment for all students, staff and faculty members where they are afforded the opportunity to pursue open inquiries, examine critically, and carry out research and teaching in an unrestricted environment. In the optics and photonics fields, that can be a challenge if a professor feels restricted by export control regulations that force them to limit interactions with non-U.S. citizen scientists and graduate students, or potentially face the threat of personal liability for possible violations.

Strengthening Government Export Assistance Resources (emphasis small business companies):

Regulations are an important part of ensuring sensitive technology does not harm our national security or limit U.S. competitiveness. However, the U.S. Government must provide the resources for small businesses to comply without burdensome expense.

An evaluation of surveys jointly conducted in 2010 and 2013 by the National Small Business Association (NSBA) and the Small Business Exporters Association (SBEA) indicates a sharp decline in the level of interaction U.S. small business exporters had with Small Business Administration (SBA) operated Export Assistance Centers. The surveys show that between 2010 and 2013, awareness of SBA Export Assistance Centers among small U.S. exporters declined from 18 percent to 15 percent. Fewer than one in five businesses are aware of export assistance.

Furthermore, the surveys found that while in 2010, 26 percent of small U.S. exporters had taken advantage of a U.S. located Export Assistance Center, in 2013, the amount of small U.S. exporters claiming to have been advantaged by an assistance center fell to a mere 10 percent.

The Optical Society acknowledges and applauds the cross-agency coordinated initiatives the Administration has set forth to assist small businesses offset the complexities of export compliance. While these services demonstrate the government's vested interest in supporting U.S. businesses, there remains opportunity to ensure resources are made aware and directly available to U.S. small businesses.

Analysis of the impact of Export Control on Small Business should also include suggestions for areas where the government can assist or provide resources, especially with the proposed changes forthcoming. The SBA has already established 103 Export Assistance Centers across 48 states. This is a good start, but more needs to be done. As shared by The Optical Society companies that I spoke with, this is an excellent resource for small business to start learning the basic requirements for export control compliance. These centers primarily have general knowledge in the Department of Commerce regulations.

However, numerous Optical Society members did reference that their local centers would search for Department of State and USML/ITAR general experts outside of the Export Assistance Center office for referrals. Most of the input stated that these employees were good for assisting beginners and novices, but detailed challenges were likely beyond their knowledge base. In order to engage highly qualified subject matter experts, it typically requires that a company create small businesses export control department or hire multiple consultants to help them navigate the challenges of export compliance. Either scenario is expensive and prohibitively so for many small businesses that could otherwise export their product overseas.

This is not an inexpensive path, nor is it guaranteed to win sales in the global market. It would be useful if those responsible for CCL/USML/ITAR regulations would establish and employ experts at these EACs to assist small businesses with their questions and education as they attempt to navigate the export control pathway. This seems to be a deficiency that causes some small businesses to shy away from manufacturing ITAR-controlled technologies utilizing optics and photonics.

Finally, with the upcoming export control rule changes to be finalized ITAR, U.S. Munitions List (USML) Category XII, we can expect massive confusion that will undoubtedly follow these rules changes being announced. It would be very proactive for the Department of Commerce, State and local Export Assistance Centers to start working with their various constituents to schedule seminars to highlight the changes, make clear the new definitions, and educate both university and industrial compliance officers on the nuances of the new regulations. There will obviously be an expense associated with this, but the investment into being proactive could infuse a confidence in these high-tech based small businesses to expand their revenues and pursue global sales with less fears and confusion.

Conclusion:

As Export Reform takes place, these reforms simplifying the regulatory process will allow small businesses and industry to comply without negative impact on their competitiveness globally. Also, the U.S. Government should strengthen its export assistance resources, particularly for small businesses.

Outreach and education will be required to increase the awareness of end-users, manufacturers, and compliance officers, and to prevent a drastic rise in export control violations. Providing low-cost or free webinars, training, and continuous education to compliance officers, at both universities and for small businesses likely will help to minimize future violations, especially with upcoming changes to the regulating licensing requirements for dual use and ITAR/USML compliance. The Optical Society is committed to partnering with the federal government related to export control education and outreach with U.S. industry in the photonics and optics markets.

On behalf of The Optical Society and the membership that we represent, thank you for the opportunity to testify today.

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