February 24, 2016

The Honorable Lamar S. Smith
Chairman, Committee on Science, Space and Technology
United States House of Representatives
Washington, DC 20515

RE: Unlocking the Secrets of the Universe: Gravitational Waves

Dear Mr. Chairman,

On behalf of the National Photonics Initiative, I thank you and members of the Committee on Science, Space and Technology for holding a hearing on the tremendous discovery of the US-based Laser Interferometer Gravitational-Wave Observatory (LIGO). A huge step in astrophysics was achieved with LIGO thanks to the support of Congress and the work of the National Science Foundation.

LIGO's recent discovery and measurement of gravitational waves from a binary black hole merger confirms Einstein's Theory of General Relativity and was made possible by the creation of ultra-precise laser-based interferometers enabled by photonics. This discovery underscores the boundless potential of science and the foundational role of optics and photonics – the science and application of light – in significant scientific advancement and innovation.

The LIGO instrument is capable of making the most precise distance measurements ever recorded. For example, it can detect the change in spacing between two mirrors separated by over 2.5 miles to a precision of much less than one-trillionth the diameter of a human hair. To achieve the sensitivity required to measure the gravitational waves, the laser interferometer had to become many orders of magnitude more accurate and stable over the past decades. Even Prof. Einstein thought this might never be possible due to technological limitations.

As such, major strides in optics and photonics innovation and technology were necessary to achieve LIGO technology objectives including the development of coherent lasers, stable optical elements and sensitive photo detectors. While these technology advances enabled LIGO's precise measurements, they are not restricted to scientific discovery. For example, interferometers can be used as key building blocks in multi-functional sensors, filters, clocks, communication systems and gyroscopes. Commercial systems using interferometers can expect

dramatic increases in performance in the future due to the optics and photonics advances from LIGO.

LIGO's discovery reflects the innovative optics and photonics community across the nation. From Washington to Louisiana, California, Massachusetts, Texas and many other states, US companies and researchers throughout the country contributed to the greatest physics discovery of the century. In turn, LIGO's investment in optics and photonics will grow businesses, create jobs and revolutionize industries here in the US.

As Chairman of the National Photonics Initiative, I encourage the Committee to look at the contributions of optics and photonics to LIGO and next generation technologies such as high performance computing, high powered lasers, quantitative microscopic instruments, new high speed imaging devices and more, which will aid scientific discoveries in physics, medicine and national security and impact nearly every economic sector in the US.

Thank you for the opportunity to share the perspective of the National Photonics Initiative.

Sincerely,

Alan E. Willner, Ph.D.
Chairman, National Photonics Initiative

About the NPI: The National Photonics Initiative is a collaborative alliance among industry, academia and government to raise awareness of photonics and the impact of photonics on our everyday lives; increase cooperation and coordination among US industry, government and academia to advance photonics-driven field; and drive US funding and investment in areas of photonics critical to maintaining US economic competitiveness and national security. The initiative is led by top scientific societies including the American Physical Society (APS), the IEEE Photonics Society, the Laser Institute of America (LIA), The Optical Society (OSA) and SPIE, the international society for optics and photonics (SPIE). For more information visit www.lightourfuture.org.