**Journal articles**

1. **Lee, E.,** Sun, B., Luo, J., Yong, D., Yu, X., & Wang, Q. (2019). Megawatt peak power compact all-fiber MOFA CPA system using CFBG and CVBG at 2 µm *(Manuscript in preparation)*
   *Abstract: We report the generation of megawatt-peak power, picosecond pulses from a thulium-doped master oscillator fiber amplifier (MOFA) chirped pulse amplification (CPA) system. It comprises a large-mode area photonic crystal fiber-based MOFA and a compact multi-pass chirped volume Bragg grating (CVBG)-based compressor. The MOFA output is a linearly-polarized 1.8 ns pulse train at 100 kHz repetition rate with a peak power of 139 kW - this is the highest peak power for a linearly-polarized nanosecond MOFA output at 2 µm wavelength. Pulse compression was done with a (2+2)-pass CVBG to obtain a 2.8 ps pulse train with peak power of 16.7 MW.*

2. **Lee, E.,** Luo, J., Sun, B., Ramalingam, V., Zhang, Y., Wang, Q., & Yu, X. (2018). Flexible single-mode delivery of a high-power 2 µm pulsed laser using an antiresonant hollow-core fiber. Optics letters, 43(12), 2732-2735.
   *Abstract:*
   *We demonstrate flexible single-mode transmission of a high average power 2 µm nanosecond pulse using antiresonant hollow core fibers (AR-HCF). 39.1 W average power is delivered using a coiled 1.7 m AR-HCF, which is designed for single-mode guidance and good higher-order mode suppression. The effect of bending on the fiber output power and beam profile is also investigated. The Gaussian-like output beam profile is maintained up to 7.5 cm bending radius. This is the highest average power delivered by a flexible long HCF in this wavelength without the need for an enclosed controlled environment, to the best of our knowledge.*

3. Jin, X., **Lee, E.,** Luo, J., Sun, B., Ramalingam, V., Wang, Q., & Yu, X. (2018). High-efficiency ultrafast Tm-doped fiber amplifier based on resonant pumping. Optics letters, 43(7), 1431-1434.
   *Abstract:*
   *We demonstrated a high-efficiency ultrafast Tm-doped fiber amplifier based on a resonant pumping technique. A continuous-wave fiber laser at 1940 nm was employed as the pump laser. The slope efficiency of the resonantly pumped pulsed Tm-doped fiber amplifier reached 87% with respect to the launched pump power. The maximum average output power reached 40 W when the launched pump power was 53 W. The repetition rate and the pulse duration of the output pulses from a fiber amplifier were 248 MHz and 129 ps, respectively. The corresponding peak power was 1.25 kW, and the pulse energy was 161.3 nJ. To the best of our knowledge, this is the first demonstration of a resonant pumping enabled high-power high-efficiency ultrafast fiber laser operating at a 2 µm band.*

4. Ha TMH, Yong D, **Lee EMY**, Kumar P, Lee YK, et al. (2017) Activation and inactivation of Bacillus pumilus spores by kiloelectron volt X-ray irradiation. PLOS ONE 12(5): e0177571.
   *Abstract:*
   *In this study, we investigated the inactivation efficacy of endospore-forming bacteria, Bacillus pumilus, irradiated by low-energy X-rays of different beam qualities. The different low energy X-rays studied had cut-off energies of 50, 100 and 150 keV. Bacillus pumilus spores (in biological indicator strips) were irradiated at step doses between 6.5 to 390 Gy. The resulting bacteria populations were then quantified by a pour plate method. Results showed that X-rays of lower energies were more effective in inactivating bacterial spores. In addition, an increment in bacterial population was observed at doses below 13Gy. We attributed this increase to a radiation-induced activation of bacterial spores. Four kinetic models were then evaluated for their prediction of bacterial spore behavior under irradiation. This included: (i) first-order kinetics model; (ii) Shull model; (iii) Sapru model; and (iv) probabilistic model. From R2 and AIC analyses, we noted that the probabilistic model performed the best, followed by the Sapru model. We highlighted that for simplicity in curve fitting the Sapru model should be used instead of the probabilistic model. A 12-log reduction in bacterial population (corresponding to a sterility assurance level of 10−6 as required in the sterilization of medical devices) was computed to be achievable at doses of 1000, 1600 and 2300 Gy for the three different X-ray cut-off energies respectively. These doses are an order in magnitude lesser than that required in gamma irradiation. This highlights the applicability of cheaper and safer table-top X-ray sources for sterilization application.*

5. Yong, D., **Lee, E.,** Lee, K. Y., Yu, X., Chan, C. C., & Liu, Q. (2016). In-fiber Photo-immobilization of Bioactive Surfaces: An Optimization Study. Procedia Engineering, 140, 166-170.
   *Abstract:*
   *Bioactive surface formation within photonic crystal fibers (PCFs) was demonstrated via photochemical means in our earlier work. The bioactive surface consisted of streptavidin bound to a biotin-functionalized layer of protein. Here, we address the issue of non-specific binding between streptavidin molecules and any exposed silica surfaces within the PCF. Increasing the protein coverage mitigated this problem, where a denser coverage was achieved by repeating the protein passivation. Subsequent study on improving the specific*

*binding was also performed by increasing the duration of photobleaching, which resulted in more photochemically bound biotin. Optimal parameters were then selected based upon practicality and repeatability of results.*

6. Yong, D., **Lee, E.,** Yu, X., & Chan, C. C. (2016). Fluorospectroscopy of Dye-Loaded Liposomes in Photonic Crystal Fibers. IEEE Journal of Selected Topics in Quantum Electronics, 22(3), 21-26.
   *Abstract:*
   *The immobilization and probing of liposomes within photonic crystal fibers was demonstrated for the first time. A bioactive surface was used to tether the liposomes. This bioactive surface consisted of streptavidin bound to a photochemically functionalized biotin layer. Bound streptavidin, hence, enabled the further binding of biotinylated dye-loaded liposomes. In-fiber fluorescence spectroscopy was used to quantify the streptavidin coverage density. The same method was also used to characterize the surface-tethered liposomes. The further observation of a unique phenomenon-photobleaching dequenching-was used for the first time as an indication of liposomal content retention. This indicated no rupturing of liposomes, highlighting them as bioderived analogues to dye-doped nanoparticles. The demonstrated integration of liposomes with optical waveguides shows potential as a biointegrated photonic device.*

**Conference proceedings**

1. **Lee, E**., Sun, B., Luo, J., Yu, X., Yong, D., & Wang, Q. (2019) 1975 nm Linearly-Polarized MOFA CPA System based on CFBG Stretcher and 1+3-Pass CVBG Compressor Configuration (Accepted for CLEO/Europe-EQEC Conference)
   *Abstract:*
   *A 4.2ps, 50µJ, linearly-polarized 1975nm master oscillator fiber amplifier laser system using chirped pulse amplification technique at 100kHz repetition rate was demonstrated using chirped fiber Bragg gratings and 1+3-pass chirped volume Bragg grating compressor configuration.*

2. **Lee, E**., Deepak, C., Yong, D., & Wang, Q. (2019) Laser-Foaming on Agarose using a Picosecond 2µm Fiber Laser System (Accepted for ICMAT 2019)
   *Abstract:*
   *Studies have found that foams increase cell adhesion sites and different cell types grow optimally in certain range of pore sizes. Additionally, the foam structure has increased porosity which improves fluid permeability, thus facilitating oxygen and nutrient exchange. Hence in this work, we examine laser-foaming on agarose gels, a common hydrogel, using a linearly-polarized picosecond 2µm laser source at a repetition rate of 100kHz. The use of a 2µm laser source eliminates the need for photolabile materials as most biomaterials are water-rich and can absorb at this wavelength strongly. Control of the foaming was achieved by varying laser fluence and scanning speeds. Characterization of the laser-foamed agarose was done to establish the relationship between laser fluence and the resulting features.*

3. **Lee, E.**, Luo, J., Sun, B., Ji, J., Ramalingam, V., Yu, X., & Wang, Q. (2018) Flat-gain Wide-band Thulium-based Fiber Laser. In CLEO-PR 2018
   *Abstract:*
   *We report a design method for flat-gain wide-band all-fiber laser using cascaded bidirectional pumping of multi-segment thulium-doped fibers. Experimental demonstration of two-fiber setup achieved the widest reported 3-dB bandwidth of 178nm centered at 1944nm.*

4. **Lee, E.,** Luo, J., Sun, B., Ramalingam, V. L., Yu, X., Wang, Q., & Knight, J. C. (2018, May). 45W 2 µm Nanosecond Pulse Delivery Using Antiresonant Hollow-Core Fiber. In CLEO: Science and Innovations (pp. SF1K-1). Optical Society of America.
   *Abstract:*
   *We demonstrated the highest reported transmission of 44.9W average power from a 1980nm 1.2ns source using an antiresonant hollow-core delivery fiber with good output beam quality.*

5. **Lee, E.,** Chung, Y. S., Yu, X., Wang, Q., Yu, F., & Knight, J. C. (2017, July). 2-micron Pulse compression using gas-filled negative curvature hollow-core fiber. In Lasers and Electro-Optics Pacific Rim (CLEO-PR), 2017 Conference on (pp. 1-2). IEEE.
   *Abstract:*
   *Differential-pressured argon-filled negative curvature hollow-core fiber (NC-HCF) with an anomalous dispersion in the mid-infrared was studied for pulse compression. Preliminary simulation results show compression of 2-micron, 1.8-ps, 50 µJ pulse to 110 fs by using a negative-pressure-gradient argon-filled 8.2 m-long NC-HCF at a maximum pressure of 2.65 bar.*

**Book chapters**

1. Yu, X., Sun, B., Luo, J., & **Lee, E.** (2018). Optical Fibers for High-Power Lasers. Handbook of Optical Fibers, 1-18.
   *Abstract:*
   *Lasers with high output powers are demanded for a wide variety of applications, ranging from material processing, remote sensing, medical surgery, to fundamental science. Across all these application scenarios, there are two main challenges: the scaling of output power and the quality of the laser beam. In the past decade, there have been tremendous research efforts to tackle these two issues in both continuous wave (CW) and pulsed lasers, to improve the power level, wavelength tunability, coherence, line width, etc. Among them, fiber technology has enabled the flexible delivery of high-power laser beams with precision beam quality (Jauregui et al., Nat Photonics 7:861–867, 2013). The technology development could be summarized in two approaches: passive fiber technology and active fiber technology. Passive fibers offer the last step manipulation of high-power laser beams from gas laser, semiconductor lasers, or other solid-state lasers. Active fibers are the gain component in the fiber oscillator or amplifier to generate the optical emission. Compared with traditionally step-index fibers, new fiber structure designs open new horizons in laser technology. In this book chapter, the main content has been arranged according to different fiber structure designs. Typical specialty fibers have been chosen, including double-cladding fibers, large mode area photonic crystal fibers, large pitch fibers, leakage channel fibers, chirally coupled core fibers, pixelated Bragg fibers, and hollow-core fibers. The design principle, manufacturability, and future outlook have been discussed in each subsections.*