The Development of a Novel, Low Cost, High Power, Tunable UV Supercontinuum Laser Source

Lee, Joseph

Tunable UV lasers have the potential to change the world in medicine and atmospherics. An ultra-broadband UV laser would make possible early detection and treatment of Alzheimer’s disease while a multi-wavelength tunable UV laser would enable accurate remote sensing of ozone and nitrogen dioxide in the atmosphere to allow analysis of pollution sources. There are no currently available broadband UV lasers with sufficient power for these applications. The cost of multi-wavelength tunable UV lasers limits the number of wavelengths which also limits the accuracy of the measurements (these “systems” are made by combining multiple single wavelength tunable lasers together). Presented is the basis for the development of an extremely affordable laser ($50,000 or less) capable both of broadband output and discrete multi-wavelength tunable output. Based upon supercontinuum generation in a fiber optic cable, what differentiates this laser from current supercontinuum sources are two novel techniques in the supercontinuum tuning: Changing Effective Length (CEL) and Seed Laser Tuning (SLT). The laser will provide both high power broadband UV output and sufficient multi-wavelength tuning efficiency to output as many UV or visible wavelengths as the acousto-optical tuner allows (currently eight wavelengths). This project is divided into three phases. The Phase I goals were to design, build, and test the pump laser. This was accomplished by developing a custom high pressure nitrogen laser system with an estimated >200 kW output and theoretical maximum of 800 ps pulse width. All Phase I goals were met; in addition, basic fiber coupling was achieved.

Awards Won:
Third Award of $1,000