NRL BAA Announcement
#56-09-05

OPTICAL SCIENCES R&D

Optical Science Division (NRL 5600) of the Naval Research Laboratory (NRL) is seeking proposals for innovative research supporting ongoing programs within the Optical Sciences Division related to a wide variety of topics in the following areas:

1) Research and technology development for making infrared-transmitting optical fibers, especially chalcogenide and heavy-metal oxide glass fibers, processing techniques for making IR fibers, purification of glass starting materials, novel crucible fiber drawing techniques, specialty fibers for chemical sensor applications, techniques for making chemical sensors, (POC Code 5606, e-mail).
2) Fiber optic sensors for detecting acoustic, magnetic and electric fields, rotation rate, strain, temperature, pressure, chemical, and other parameters; optical multiplexing, demultiplexing, and demodulation using frequency, wavelength and time division techniques; high frequency data transfer networks using fiber optics; signal processing in fiber optic links; optical-microwave delay lines for gigahertz signal transmission, high frequency directly modulated diodes and external modulators, and high speed detectors (particularly any aforementioned device that reduces delay line loss); materials research and development for specialty glasses and fibers for sensor applications and nuclear radiation hardness; glass and processing techniques for microwire glass technology; optical fibers with high mechanical strength, survivable coatings, and low bending loss; integrated optic devices for sensors, optical-microwave delay lines, signal processing, networks, digital or analog communication links; fiber devices such as amplifiers, fiber lasers, super-luminescent fibers, and phase shifters; laser diodes that meet military specifications and can operate in the multigigabit/s range; harmonic generation and mixing using laser diodes; nonlinear effects that impact fiber optic links such as soliton propagation, Brillouin scattering, and four-wave mixing. In addition methods are sought for improving fiber sensor performance, packaging, deployment, and survivability of these systems in a variety of environments. Novel interrogation, multiplexing and modulation/demodulation techniques that increase sensor count per fiber, decrease electronic demodulation power requirements, and provide all-optical signal processing, and lower total system cost are desired. Low phase noise laser sources that feature very good isolation from ambient effects to improve overall optical system performance are desired. Low power, high bandwidth, signal-

processing components with automatic signal detection are desired to fill current technology gaps, (POC Code 5670, e-mail)

3) Glass and processing techniques for nanochannel glass technology and holey fibers; novel nonlinear optical materials for optical limiters and switches to protect eyes and sensors against intense laser radiation; photonic band-gap materials; narrow band gap superlattices; quantum wells, wires and dots; bioconjugated quantum dots to probe cellular and environmental behavior; novel nanostructures; the interaction of light with single microdroplets; development of real-time *in-situ* optical instrumentation to detect bioaerosols, including single particles on-the-fly; development of type II "W" mid-IR lasers and quantum cascade lasers: organic light emitting sources and optoelectronics; slow light studies; nonlinear optical probes such as Fast CARS; and development of condition based sensors for oil debris monitoring. (POC Code 5610, e-mail).
4) Electro-optical, visible, infrared, multi spectral and hyperspectral technologies used in systems for reconnaissance and surveillance of air, ocean, and ground targets, from space, air, and surface platforms; high-speed digital optical/RF communications in a tactical environment, including architectural issues; algorithmic development, including digital image and signal processing algorithms for target detection and tracking; optical properties of materials and coatings; the measurement and theory of optical signatures of air and ocean targets; the acquisition, and characterization and simulation of large-area background imagery; infrared countermeasures and related systems for Navy aircraft; missile approach warning, fire control, missile guidance, and countermeasures' technology, atmospheric propagation effects relevant to missile warning, laser countermeasures, and imaging; laser warning components and systems; laser countermeasure techniques; electro-optical sensor technology including efficient high-speed photo-detectors, focal plane arrays and signal processing; electro-optical components; electronic shutters; signal processing and data compression for multi color electro-optical and infrared sensors; neural network processing and electronics particularly applicable to electro-optical sensors; advanced data compression techniques and electronics for very large area visible, infrared, and multi spectral; pulsed solid state blue-green lasers (POC Code 5660, e-mail).

Allow one month before requesting confirmation of receipt of White Paper (WP), if confirmation is desired. Substantive contact should not take place prior to evaluation of a WP by NRL. If necessary, NRL will initiate substantive contact.