

WHO

SYSCOM: NAVAIR
Sponsoring Program: JSF Joint Strike Fighter
Transition Target: Naval Research Laboratory
TPOC: (301) 342-4122
Other Transition Opportunities:

Notes:



NP Photonics MiniROCK Fiber Laser

WHAT

Operational Need and Improvement: Develop and package fiber pigtailed high-power diode-pumped solid-state lasers for wideband Radio Frequency photonics applications.

Specifications Required: The developed linear-polarization laser packaging must include a single-spatial-mode polarization-maintaining fiber pigtail with the polarization aligned to one axis of the fiber having a polarization extinction ratio of better than -18dB. Single-longitudinal mode operation at 1.55-micron wavelength is the most desirable; however, it would be advantageous if multi-longitudinal-mode designs (i.e., laser mode spacing greater than 50 GHz) as well as wavelengths of 1.06 or 1.32 microns were also available in the same form factor package as the wide variety of applications may dictate the use of one of these alternative designs. The minimum target threshold for laser output power is 50 mW and stretch goals of 200 to 500 mW, all with shot-noise-limited intensity noise levels at RFs above 1 GHz. The packaged laser is required to have a height less than or equal to 14 mm, and an overall package volume of less than 50 cubic centimeters, not including the fiber optic pigtail, but including all power electronics for controlling pump laser current and/or temperature control. The packaged laser must operate over a minimum temperature range of 0°C to 70°C with a stretch goal of -40°C to 100°C, and maintain hermeticity and optical alignment upon exposure to air platform vibration, thermal shock, mechanical shock, and temperature cycling environments. Only fiber pigtailed lasers will be considered for this topic. Uncooled designs are preferred; however, thermoelectric cooled designs are acceptable especially given the operating temperature stretch goals.

Technology Developed: Miniature single-frequency fiber lasers at 1.55 and 1.06 microns have been developed with our highly rare-earth doped phosphate fiber laser technology. Prototype lasers with output power > 200 mW at 1.55 microns and > 400 mW at 1.06 microns have been manufactured. Several 1.55 micron prototypes have been shipped to Naval Research Labs and used in their radio-frequency photonics system.

Warfighter Value: In JSF Joint Strike Fighter, for example, replacement of coaxial cable used in various onboard RF/analog applications with RF/analog fiber optic links will provide increased immunity to electromagnetic interference, reduction in size and weight, and an increase in bandwidth. For many airborne platform applications, RF/analog fiber optic links require the development of shot noise limited lasers that can operate over extended temperature ranges (-40 C to 100 C).

WHEN

Contract Number: N68335-20-C-0921 **Ending on:** Sep 08, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrated > 200 mW single-frequency fiber laser at 1.55 microns	N/A	Bench-top single-frequency fiber laser was developed	4	1st QTR FY20
Developed a packaged single-frequency fiber laser with a volume < 50 cm cubic	Low	Manufactured a prototype	5	1st QTR FY21
Developed prototypes meeting or exceeding the requirements	Low	manufactured several prototypes	6	4th QTR FY21
Developed prototypes for environmental tests	Low	Manufactured 7 prototypes for environmental tests	7	4th QTR FY23

HOW

Projected Business Model: Technical cooperation and partnership with Program Office to develop business partnership(s) with DoD Prime(s) already involved with Program Office. Evolve to Phase III funding via DoD prime and joint product development.

Company Objectives: Phase III funding via DoD prime and joint product development.

Potential Commercial Applications: Fiber laser technology is superior to semiconductor lasers and is the preferred technology for this application. Developing packaged fiber lasers suitable to the application requirements has straightforward trajectory with low technical risk now that required performance has been demonstrated.