Ultra-High Brightness Mid-Infrared Laser Beam Fiber Combiner for Infrared Countermeasures Applications
Forward Photonics LLC

Operational Need and Improvement: There is a present need for an inexhaustible infrared (IR) countermeasure system for defeating IR heat-sinking missiles for a number of Direct Infrared Countermeasures (DIRCM) systems. A 100 W MWIR system with integrated cooling and fiber coupling supports multiple needs across the forces. With such high power and with the fiber coupling, only one laser will be required per craft and routed to multiple jam heads throughout the aircraft, representing a significant cost savings.

Specifications Required: >= 100 W Output in the Mid-Infrared Laser Modulate-able Integrated Water Free Cooling System Fiber Coupling
Hardened for environmental and vibrational operation

Technology Developed: Forward Photonics will use its proprietary Wavelength Beam Combination (WBC) to expand its current mid-infrared lasers based on quantum cascade lasers (QCLs) to reach power levels of 100 W or more. In addition to this unprecedented power level Forward Photonics has developed an integrated high capacity cooling system that eliminates the need for recirculating water in these high power systems, as water is not a flight qualifiable coolant. Additionally Forward Photonics is developing MWIR fiber components that will allow for the high output power to be coupled into an optical fiber. Current MWIR optical fibers can only handle < 1 W of output power.

Warfighter Value: 100 W output in this wavelength regime represents well over an order of magnitude power improvement on what is commercially available currently. Additionally laser IRCM systems provide significantly greater jam/signal ratio over currently fielded countermeasure systems. Forward Photonics’ laser provides greater engagement range, greater target specificity, has an inexhaustible capacity and could provide cost savings due to its integrated fiber coupling over other lasers systems.

Projected Business Model: Our goal is to design and manufacture the lasers, which will be used by Prime contractors in their laser propagation systems.

Company Objectives: Forward Photonics is looking to expand awareness of the utility of WBC lasers for defense and commercial uses. Such lasers offer high brightness output, an order of magnitude or higher brightness that can be achieved with non WBC direct diode systems. Direct diode systems offer some of the highest efficiency, lowest cost lasers available. Forward Photonics is eager to speak with laser integrators for both defense and commercial laser systems for defense platforms and materials processing.

Potential Commercial Applications: Potential commercial applications for MWIR high brightness WBC lasers are numerous and include , spectroscopy, advanced materials processing of plastics, glass, and carbon fiber composites.

Contact: Mike Cruz, Vice President
mikecruz@forwardphotronics.com 9782245488

WHO
SYSCOM: NAVAIR
Sponsoring Program: PEO(T)
Transition Target: Direct Infrared Countermeasures (DIRCM)
TPOC: (904)790-5916
Other transition opportunities: Tactical Aircraft Directable Infrared Countermeasures (TADIRCM)
Notes: 100 W Medium Wavelength Infrared (MWIR) Laser Concept Design

WHAT

WHEN
Contract Number: N68335-17-C-0147 Ending on: December 20, 2018

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Risk Level</th>
<th>Measure of Success</th>
<th>Ending TRL</th>
<th>Date</th>
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<tbody>
<tr>
<td>Cooling System Designed</td>
<td>Low</td>
<td>Integrated with laser system with adequate cooling</td>
<td>4</td>
<td>July 2018</td>
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<tr>
<td>Fiber Coupling</td>
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<td>Able to handle output power with minimal reflection loss</td>
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<td>September 2018</td>
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<tr>
<td>Laser Assembled</td>
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<td>100 W Output Power with High Beam Quality</td>
<td>5</td>
<td>November 2018</td>
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