Department of the Navy SBIR/STTR Transition Program

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NAVAIR SPR-2026-0696

Topic # N241-006
Two-color Mid-Wave Infrared (MWIR) LED Array Infrared Scene Projector (IRSP)
Amethyst Research Incorporated

WHO

SYSCOM: NAVAIR

Sponsoring Program: NAVAIR SBIR Program; Naval Air Warfare Center Aircraft Division (NAWCAD), Patuxent River, MD

Transition Target: U.S. Navy Hardware-in-the-Loop (HWIL) infrared scene projector test assets supporting seeker and missile-warning-system test and evaluation at NAWCAD Patuxent River

TPOC: (240) 256-0895

Other Transition Opportunities: U.S. Air Force HWIL test facilities (Air Force Research Laboratory, 782nd Test Squadron); infrared sensor test and evaluation organizations across the Department of Defense (DoD); commercial chemical and gas sensing, biomedical spectroscopy, and infrared sensor calibration

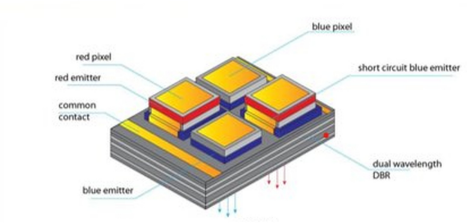

Image courtesy of Amethyst Research, Inc., 2026

Notes: Phase I successfully demonstrated feasibility of the two-color pixel design and validated its spectral performance. The same light-emitting diode (LED) platform, previously matured under U.S. Air Force funding for single-color mid-wave infrared (MWIR) and long-wave infrared (LWIR) emitters, supports a family of single-color and two-color scene projector arrays. Amethyst has teamed with Santa Barbara Infrared (system integration) and Attollo Engineering (hybridization and packaging) to provide a complete, production-ready supply chain. Image shows the two-color resonant-cavity LED array concept.

WHAT

Operational Need and Improvement: The Navy verifies infrared seekers and missile-warning sensors in Hardware-in-the-Loop (HWIL) laboratories using infrared scene projectors that present realistic, dynamic scenes without costly live-fire testing. A solid-state, two-color LED scene projector adds independent dual-wavelength emission from every pixel at high radiance and fast frame rates, enabling more realistic and spectrally accurate test scenes than previously possible and improving test fidelity for next-generation sensors.

Specifications Required: Per Topic N241-006, the projector array must provide two-color MWIR emission at 3.9 and 4.6 microns from each pixel with narrow spectral bandwidth (less than 100 nm), external quantum efficiency of at least 1 percent, output exceeding 10 mW per sq. cm, low optical cross-talk (less than 3 percent) between adjacent pixels, and an architecture scalable to a 2048 x 2048 array compatible with the universal Read-In Integrated Circuit (RIIC).

Technology Developed: Amethyst Research has developed resonant-cavity LED (RC-LED) pixel technology in which each pixel contains two independently addressable active regions emitting at 3.9 and 4.6 microns. Phase I validated the two-color design through modeling and proof-of-concept devices. Phase II fabricates and tests devices, scaling from single pixels to a 64 x 64 hybridized array, using wet-etch processing and surface passivation for high uniformity, on a path to a full-format 2048 x 2048 array.

Warfighter Value: Higher-fidelity HWIL testing of seekers and missile-warning systems improves sensor performance assessment and operational readiness while reducing reliance on expensive live-fire events. True two-color scene simulation allows laboratories to test advanced multi-band sensors against realistic threats. The modular LED platform also provides simpler single-color MWIR and LWIR projector options, giving the test community a family of solutions from one qualified supply chain.

WHEN

Contract Number: N68335-25-C-0516 **Ending on:** Sep 01, 2027

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Two-color pixel design feasibility demonstrated (Phase I)	N/A	Dual-wavelength (3.9 and 4.6 micron) resonant-cavity LED pixel design validated through modeling and proof-of-concept results	3	3rd QTR FY26
Two-color fabrication process established; single-pixel devices demonstrated	Medium	Devices emit independently at both wavelengths with narrow spectral bandwidth (less than 100 nm) and low optical cross-talk	4	4th QTR FY26
Small-format two-color array fabricated and hybridized	Medium	64 x 64 array bump-bonded to read-in circuit; radiance and frame-rate targets met	5	3rd QTR FY27
Base effort complete: prototype array characterized and final report delivered	Medium	Array performance validated against hardware-in-the-loop test requirements	5	4th QTR FY27
If Option exercised, extended array testing and integration toward large-format read-in integrated circuit	Medium	Compatibility demonstrated with universal 2048 x 2048 read-in integrated circuit architecture	6	4th QTR FY28

HOW

Projected Business Model: Amethyst Research provides the core RC-LED array technology and will transition through an established infrared scene projector system integrator, Santa Barbara Infrared, with Attollo Engineering providing hybridization and packaging. Revenue combines technology licensing and royalties, a per-system commission on integrated projector sales, and continued development funding. This high-performance, low-volume model fits the specialized HWIL projector market and places a qualified, production-ready supply chain — device design, III-V epitaxy, packaging, and integration — at the Navy's disposal.

Company Objectives: Amethyst seeks to connect with Navy and DoD HWIL test organizations and program offices that operate or procure infrared scene projection assets, and with prime contractors and system integrators developing infrared sensor test capability. The company aims to qualify its supply chain during Phase II, secure Phase III commitments for the full-format array, and establish itself as the source for solid-state single-color and two-color infrared emitter arrays.

Potential Commercial Applications: The single- and two-color infrared LED platform extends to chemical and environmental gas sensing (carbon dioxide, methane, nitrogen dioxide), biomedical multi-wavelength spectroscopy, infrared sensor and camera calibration, and aerospace, automotive, and industrial inspection markets requiring compact mid-infrared sources.

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