

# Ultrasensitive, Wideband Laser Warning Receiver

## Epitaxial Technologies, LLC

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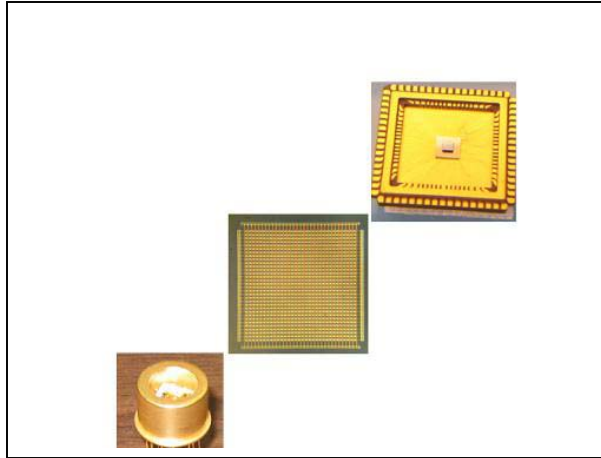
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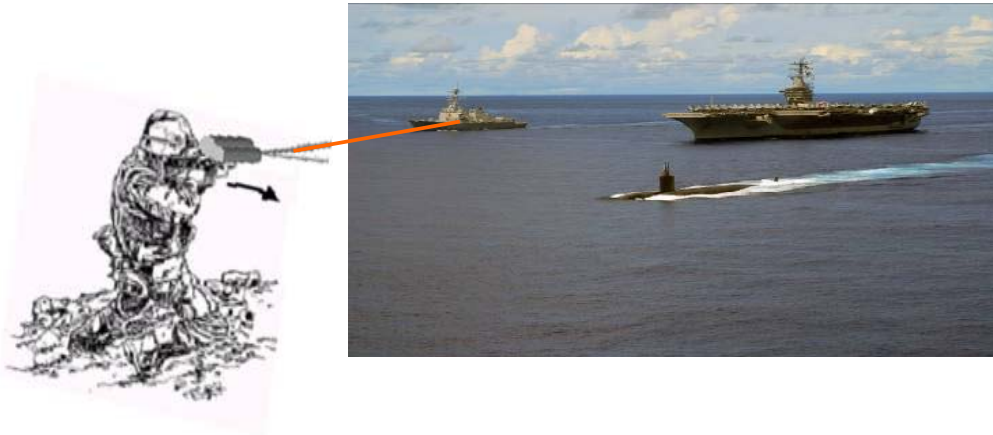


**Command: ONR - SBIR**

**Topic: N07-100**

## PROBLEM STATEMENT

Naval vessels in port or operating close to shore can be threatened by rocket-propelled munitions, mortars, or artillery systems that incorporate laser targeting systems. A wideband laser warning receiver is needed to alert the warfighters. Current solutions require multiple devices to cover all the desired wavelengths and angles. These technologies and products will be particularly applicable on large ships such as aircraft carriers and on coast guard vessels in coastal waterways as shown below:



*Figure 1. Laser threat and warning scenario*

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WHO CAN BENEFIT?

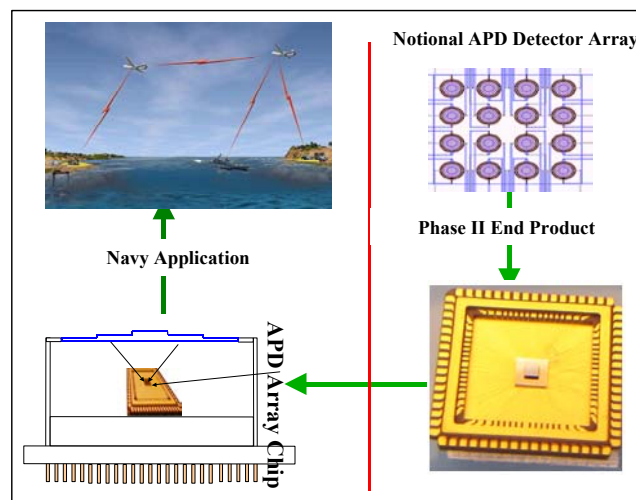
Laser designators and subsequent attack by RPGs and other kinetic weapons are critical anti-terrorism threats for the US Navy. Sponsored by ONR and PMS 480 Anti-Terrorism Afloat, Epitaxial Technologies is developing laser warning receivers that will also benefit the Army, Air Force & homeland security. The laser warning receiver can be modified to address other applications such as, laser ranging, laser radar target acquisition and discrimination and in underwater sensing.

## BASELINE TECHNOLOGY

Traditional pulsed Laser Warning Receiver (LWR) systems rely on main beam or port scatter from the laser source. Large ships or groups of ships would require numerous such LWR sensors for full ship or group coverage. The use of atmospheric scattering minimizes the necessity of multiple sensors for full ship or group coverage.<sup>1</sup> In addition, current solutions include laser warning sets like the AN/AVR2A & AN/AAR-47. They are not sensitive enough to permit detection using atmospheric scattering. In addition, they have no spectral & limited angular discrimination. They require multiple devices to cover all the desired wavelengths and angles.

## TECHNOLOGY DESCRIPTION

The laser warning system designed and being developed by Epitaxial Technologies as illustrated in Figure 2, comprises a detector array with ultra high sensitivity and broad spectral coverage. The notional specifications are: spectral coverage of 0.4-2.5 $\mu$ m, 10 nm discrimination. Sensitivity of 10 nW/cm<sup>2</sup>, 90° angular coverage and less than 1° angular resolution. The benefits are a low false alarm rate, part count reduction by a factor of five and a corresponding cost saving to outfit naval platforms. The advantages & benefits are summarized on Table 1.



*Figure 2. Laser warning receiver from array chip, packaged part to application*

<sup>1</sup> SBIR Solicitation N07-100

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**Table 1. Advantages & Benefits of Laser Warning Receiver**

<b>Features</b>	<b>Advantages</b>	<b>Benefits</b>
Sensitivity	10 times better than the state-of-the-art	High probability of detection Low false alarm rate
Spectral coverage & discrimination	Wider spectral coverage (0.45 to 2.5 um) Narrower spectral resolution (10-nm)	Can detect any laser threat Day/night capability
Angular coverage & discrimination	Wider angular coverage (90°) 1° resolution	Requires fewer receivers to cover Navy ships

## CURRENT STATE OF DEVELOPMENT

Key detector components have been produced, including a 32x32 array that will meet sensitivity and false alarm requirements. The angular discrimination component has been demonstrated and the spectral discrimination feature is currently being developed. A demo device is planned for year end at which point we will have reached a technology readiness level of 4. The milestones for the technology development and the trend of the technology readiness level are summarized on Table 2.

**Table 2. Technology Milestones and Readiness Levels**

<b>Milestone</b>	<b>TRL</b>	<b>Date</b>
Prototype LWR that meets only sensitivity & false alarm requirements & components that meet the spectral and angular requirements	4-5	Q3/2010
Prototype LWR that meets sensitivity, spectral & angular requirements	5	Q1/2011
Lab demo of LWR meeting all requirements	6	Q3/2011
Demonstration in Navy testbed	7	Q4/2011
Ruggedization & production to Navy package & interface specifications	8	Q4/2012
Range & field tests on relevant Navy platforms	9	Q3/2013

## REFERENCES

**Technical Point Of Contact**  
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ABOUT THE COMPANY



**EPITAXIAL  
TECHNOLOGIES<sub>LLC</sub>**

Epitaxial Technologies, LLC is a developer and producer of the next generation of sensor products, which has in its customer base major DoD prime contractors and commercial companies. Epitaxial Technologies has received several Phase III awards, including one from NASA and from DoD agencies. The Company has been granted 15 patents, including provisional patents. The company's technology & product achievements have been featured in news and story articles, which have generated considerable attention and numerous inquiries, in Laser Focus World, NASA Spinoff Magazine and Sensor Magazine. The Company is located in the University of Maryland Baltimore County (UMBC) Technology Center (Figure 3) near Baltimore, Maryland. The facility includes clean room and office/Lab space, where it develops, produces and has commercialized ultrasensitive avalanche photodiode arrays and the highest gain single photon counting detectors.



*Figure 3*

*Epitaxial Technologies' facility*