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NAVAL POSTGRADUATE SCHOOL

NAVAL RESEARCH PROGRAM

MONTEREY, CALIFORNIA

**ATMOSPHERIC CHARACTERIZATION OF THE MARINE BASE
LAYER FOR A SUBMARINE BASED HIGH ENERGY LASER**

by

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December 1, 2014 to December 31, 2015

Prepared for: OPNAV N97

CAPT Brett Genoble

FY15 MID-YEAR REPORT

Background

The US Navy is developing lasers for surface and helicopter platforms to combat airborne and surface maritime threats. While these efforts mature, the Division of Undersea Warfare (OPNAV N97) is investigating the feasibility of implementing an HEL system on Virginia Class Submarine (VCS) BLK V platforms and beyond. An important aspect of this research is that the results can be used to develop Concepts of Operations (CONOPS) for this potential capability. These CONOPS will be informed by the limitations of HEL systems imposed by the physical environment. This study seeks to characterize the relevant atmospheric propagation phenomena at the marine base layer (ocean surface up to 15 feet) for the purposes of estimating laser performance. This, in turn, will inform CONOPS for employment of a 30-50 kW HEL weapon from a submarine.

Process

We have developed a fast and flexible code called ANCHOR that models the performance of HEL weapons in a variety of weather conditions. This code allows us to rapidly sample millions of different kinds of weather conditions and engagement scenarios. We are also collaborating with Paul Frederickson (Department of Meteorology), an expert on marine boundary layer turbulence, to characterize the atmosphere near the surface.

Findings and Conclusions

Preliminary results indicate that a 30 kW HEL weapon emitted from a 15 cm diameter beam director with typical weather and laser parameters will be effective out to about 2 km. This is based upon estimates of the beam quality of the laser, platform jitter, and damage threshold for the target. The effective range depends on target altitude, as indicated in the figure on the right.

Recommendations

The results from this study should be used to evaluate the viability of an HEL on a submarine platform and develop tactics regarding how HELs can be utilized in various weather conditions.

