High Bandwidth, Free-Space Optical Communications

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At a Glance

What is it?

- The High Bandwidth, Free-Space Optical Communications Enabling Capability is developing free-space laser technologies to support high data communications between tactical users and platforms.

How does it work?

- It consists of two separate products: one focused on infra-red laser technologies for a terminal and the other focused on modulating retro reflector technologies for platforms or users with size, weight, and power constraints.

What will it accomplish?

- The High Bandwidth, Free-Space Optical Communications Enabling Capability is developing the technologies to support high bandwidth low probability of intercept/detection and anti-jam optical communications between tactical platforms/users.

Point of Contact

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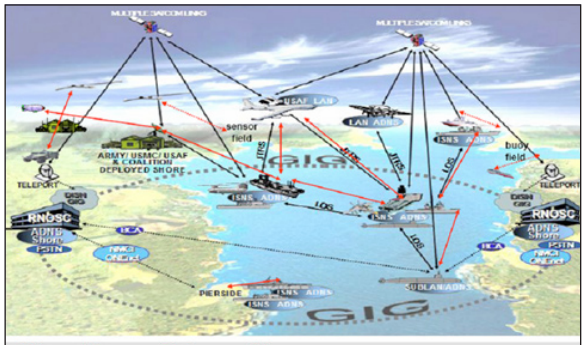
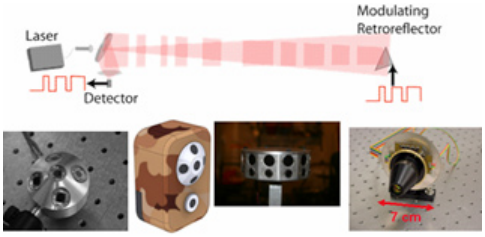
The High Bandwidth, Free-Space Optical Communications Enabling Capability consists of two separate products: a laser terminal and a modulating retro-reflector that can be interrogated by a laser terminal.



The laser terminal product is developing a full-duplex, line-of-sight terminal capable of communicating in direct mode (to another terminal) or in retro-reflector mode to a modulated retro-reflector unit. The terminal will have automatic pointing, acquisition and tracking to maintain links without user intervention. The objective of this product is to support data rates of 100 Mbps or greater and ranges between 16 and 70 kilometers, depending on the elevation of the terminal.

The modulating retro-reflector product is a low cost, weather-hardened modulating retro-reflector terminal. The retro-reflector is interrogated by a laser terminal that sends back information using the incident optical energy. The modulating retro-reflector unit is intended for temporary use or installation on disadvantaged platforms, sensors and individuals where size, weight and power restrictions preclude the use of a laser terminal. The objective of this product is to support data rates between 2 to 45 Mbps and ranges between 5 and 19 kilometers, depending on the elevation of the modulating retro-reflector unit.



The technologies will be transitioned to the U.S. Marine Corps to provide high-bandwidth communication links to supplement existing communication options at air fields, forward operating bases, tactical ground platforms, and with individual marines.

Research Challenges and Opportunities:

- Tight beam divergence control
- Auto acquisition/pointing/tracking algorithms
- Low noise avalanche photo diodes and arrays
- Forward error correction and other techniques for communications through clouds, fog, rain and other obscurants