

SUCCESS STORY

TOPIC NUMBER:
NASA Z1.05

SBIR INVESTMENT:
\$121,671

PHASE III FUNDING:
\$8,895,000



EFFICIENT LASER POWER BEAMING

Lasermotive, Inc.'s (now PowerLight Technologies) power beaming system can transmit laser energy via fiber optic or free space over long distance to support autonomous systems and provide power in austere environments.

Lasermotive, Inc. (now PowerLight Technologies)

POC: Mike Hartnett
253-872-3300
Kent, Washington 98032

<https://powerlighttech.com/>

THE CHALLENGE

The DoD is increasingly reliant on mobile and autonomous systems, and on sensors and platforms connected through the Internet of Things. As the DoD conducts distributed and multidomain operations using these technologies, especially in austere and challenging environments, operational energy may not be readily available. The Navy is experimenting with different means of distributing operational energy support to autonomous systems and providing power sources in austere environments.

THE TECHNOLOGY

PowerLight Technologies is developing a means of delivering operational energy support through power beaming technology. Power beaming can be used in free space or through fiber optic cables. Power beaming uses high-intensity light generated by a transmitter to transfer power to a receiver which converts the light back to electricity. Power over fiber (PoF) utilizes fiber optic cables as the transfer medium for the laser power beam. Built-in sensing systems ensure that PowerLight's free space power beaming can be operated safely.

THE TRANSITION

PowerLight was awarded a Phase I under NASA topic NASA 21-Z105, Efficient Power Beaming for Lunar Operations. The Office of Naval Research (ONR) pursued the development of power beaming as a follow-on to a previous Phase III contract for optical power transmission, investigation, characterization, and limits. ONR awarded a Navy SBIR Phase III contract to PowerLight for Optical Power Transmission Integration & eXperimentation (OPTIX). OPTIX is a cost-plus fixed-fee contract to validate free space power beaming to have enough power to be used for autonomous systems and provide power in challenging environments. This contract was partially funded by the Operational Energy Capability Improvement Fund (OECIF). The OECIF is the DoD's premier joint operational energy investment program, whose mission is to guide operational energy innovation via high targeted science and technology investments.

THE NAVAL BENEFIT

Free space power beaming can be applied to dynamically powered unmanned aerial vehicles (UAVs), allowing more innovative and resilient employment of autonomous systems. It allows the utilization of remote sensors and actuators, keeping warfighters previously responsible for battery or fuel resupply or for installation of power cables in hostile locations out of harm's way. Free space power beaming eliminates the need for cable, increasing the speed and power of electrification while reducing costs. Independence from generators, small engines, and batteries increases a platform's capacity, and the absence of tethering allows freedom in distance and mobility, especially for autonomous vehicles operating in contested logistics environments. PowerLight's free space power beaming is safe for the surrounding environment as safety systems capture and control all generated light. If a foreign object approaches the beam path, the beam will turn off and reactivate once the beam path is clear. Since the power can be sent through a fiber optic cable with PoF, it can be used on unmanned underwater vehicles (UUVs) instead of copper wire, which corrodes, is heavier, and emits electromagnetic interference (EMI) that could impact the performance and safety of UUVs. Other potential applications for power beaming include powering autonomous ground vehicles or providing a temporary power source on a battlefield or in a disaster area.

THE FUTURE

PowerLight is working with a company that has a program of record with the Navy for fixed wing UAVs by augmenting this program with power beaming to extend the operational endurance of the UAV, increase its payload capacity, and decrease its sustainment requirements. Additionally, PowerLight is working on a DARPA project to build an airborne power relay system to provide long-range energy at high-altitude for global military operations, such as powering high-altitude UAVs, high altitude pseudo satellites (HAPS) and high-altitude balloon systems (HABS).