Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-4388-18

Topic # N152-112

Ferroelectric Resonator Oscillator

Physical Optics Corporation

WHO

SYSCOM: ONR

Sponsoring Program: Code 35 - Hypervelocity Projectile

Transition Target: Hyper Velocity Projectile, SHD FY15-17, for PEO IWS 3C Surface Gunnery Program

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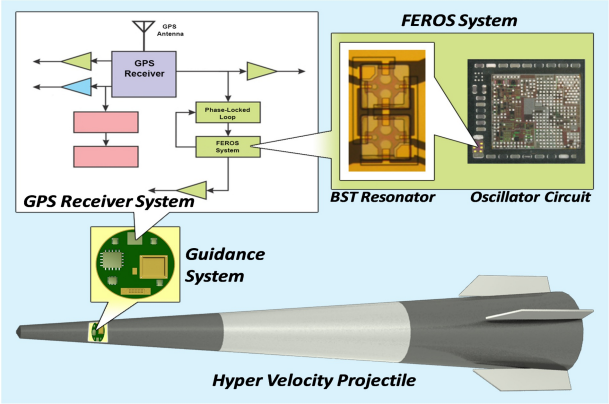
Other transition opportunities: Next generation clock references, timing circuits, and navigation systems

Notes: Image Description: Proposed concept of operations of the Ferroelectric Resonator Oscillator (FEROS) integrated within the guidance system of the Hypervelocity projectile.



WHAT

Operational Need and Improvement: The Global Positioning System (GPS) receiver in the Hyper Velocity Projectile utilizes oscillators as timing references to provide positional accuracy. Current quartz temperature-compensated crystal oscillators (TXCO) cannot withstand the harsh environment of a high-velocity, gun-launched guided projectile.
There is need for a high-G mechanical shock - and temperature-shock tolerant oscillator as a replacement for TXCOs.

Specifications Required: Specifications include: frequency stability <10 ppm. phase noise <-120 dBc/Hz @ 1kHz, mechanical shock >50,000 g, temperature fluctuation withstand 10C/min, and operating temperature range of -31C to +85C.

Technology Developed: Development of ferroelectric-based (barium strontium titanate) resonator circuit integrated with oscillator circuit in a compact form factor to withstand the harsh environment of a high-velocity, gun-launched guided projectile.

Warfighter Value: Integration of the FEROS technology within a miniaturized GPS receiver will help to improve accuracy of precision guided munitions operating under harsh operational conditions and adverse weather limitations.

WHEN

Contract Number: N68335-17-C-0155 **Ending on:** June 11, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Completion of Phase II prototype and initial testing	Low	Prototype measured in laboratory environment	5	2nd QTR FY19
Completion of prototype demonstration	Med	Prototype measured in relevant environment	6	3rd QTR FY19

HOW

Projected Business Model: During Phase III, the FEROS technology can begin low rate initial production (LRIP) within three months with a plan for full rate production (FRP) (50 units/month) within 6 months.

Company Objectives: The goal is to work with a prime contractor for the GPS receiver integration and transition this technology to the targeted platform.

Potential Commercial Applications: As a high-precision oscillator, it can provide a clock reference, clock generator, or timing circuit for the processor, memory functions, communication ports, analog-to-digital (A/D) and digital-to-analog (D/A) converters, and many other functions. In RF applications, the demands on the timing function are especially challenging, where the oscillator is not just a clock reference. In RF, it establishes basic carrier/channel tuning at frequencies in the hundreds of MHz and into the GHz range to ensure proper clocking of the A/D and D/A converters.

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