Topic: N152-112

Physical Optics Corporation

Ferroelectric Resonator Oscillator

Current quartz temperature-compensated crystal oscillators (TCXO) cannot withstand the harsh environment of a high-velocity, gun-launched guided projectile. The Ferroelectric Resonator Oscillator (FEROS) technology is a high-G mechanical shock and temperature shock tolerant, ferroelectric-based oscillator system that can replace TCXOs and be integrated into high-G miniaturized GPS receivers. Initial prototype devices have been fabricated and tested for electrical and temperature performance validating functionality. Physical Optics Corporation (POC) is an advanced systems integrator with expertise in optical, electronics, and avionics systems, surveillance equipment, sensors, x-ray, and software. Our goal is to work with a prime contractor for the GPS receiver integration and transition this technology into the initial targeted platform, the Hyper Velocity Projectile, SHD FY15-17, for the PEO IWS 3C Surface Gunnery Program.

Technology Category Alignment:

RF Components for sensing, transmission and communication

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SYSCOM: ONR

Contract: N68335-17-C-0155

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0155

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-4388-18

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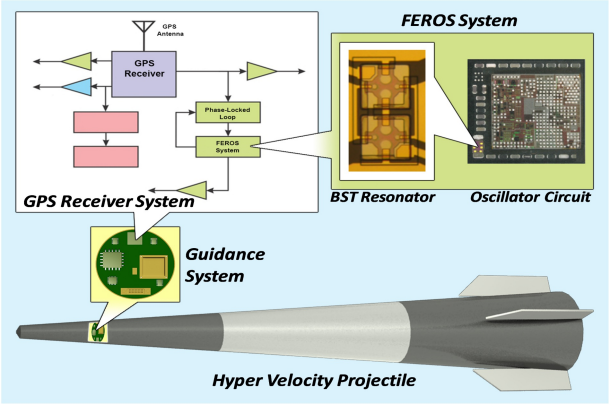
Other transition opportunities: Next generation clock references, timing circuits, and navigation systems

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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