Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2019-0533

Topic # N17A-T011

High Density Capacitors for Compact Transmit and Receive Modules

Bioenno Tech, LLC

WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO IWS

Transition Target: AN/SPY-6 Radar, Surface Electronic Warfare Improvement Program (SEWIP) Block III

TPOC:
(812)854-4804

Other transition opportunities:
These capacitors could find applications in all electronics systems Pulsed power and RF systems

https://www.knowlescapacitors.com/News/News1

WHAT

Operational Need and Improvement: Military applications such as High Power Radio Frequency (HPRF) pulsed power systems, Transmit/Receive (T/R) modules, Directed Energy (DE) systems, pulse shaping systems and high temperature capable electronics require development of a new generation of reliable, high-energy-density capacitors that are thermally stable over a wide operating temperature range. In order to enable future compact, affordable, and higher-performance T/R modules, the Navy seeks to develop advanced, high-density capacitors that are robust, reliable, and highly compact for power conversion energy storage and filtering to reduce the size, weight, and manufacturing cost of those modules.

Specifications Required: Demonstrate at least a Two-Fold increase in energy storage density without compromising performance parameters such as
- internal impedance,
- voltage rating,
- leakage current,

temperature stability and,
- reliability.

when compared to existing capacitors of similar ratings and application.

Technology Developed: 1. Innovative material design of ceramic-glass nanocomposite
2. MLCC that utilize ceramic-glass nanocomposite and achieve high energy density and low power loss.
3. Low–cost scalable process that can directly utilize the industrial production lines.

Warfighter Value: Incorporation of this technology will enable development and fielding of higher power systems in a more compact form that are significantly more reliable than current systems.

WHEN

Contract Number: N68335-19-C-0339 **Ending on:** April 25, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Optimized Dielectric Materials	Low	with targeted performance	7	October 2019
Lab-scale MLCC device prototype	Low	with targeted performance	7	April 2020
Pilot-scale MLCC	Low	with targeted performance	7	April 2021
1-2 kW power module	Low	with targeted performance	7	April 2022

HOW

Projected Business Model: Develop, produce and market the products derived from the technology in this project, through teaming with (1) the major capacitor manufacturing company – Novacap (Bioenno provide developed dielectric materials for contracted manufacturing in Novacap to produce projected MLCCs and MLCC-based power systems) and (2) prime (Lockheed, Raytheon and L3) through a contracted manufacturing to build the MLCC-based system prototypes per Navy spec/reqt for transition products to Navy use. We are going to develop, manufacture and sell the a novel class of nanocomposite dielectric materials (that enable the fabrication of high-performance MLCCs) to major MLCC manufacturers.

Company Objectives: Develop, manufacture and sale a new generation of high-energy-density, low-power-loss, high-temperature-capable MLCCs and the associated MLCC-based capacitor modules.

Potential Commercial Applications: This novel class of MLCCs will find wide applications in military systems such as power conditioning for new radar platforms and rail guns, pulsed power systems in electronic fuzing, and electronic safe and arm devices, providing an attractive solution in the course of technology upgrades for use in Navy systems such as SPY-6, SEWIP Block 3, and the future EASR and AMDR-X radars. This class of capacitors will also possess broad application potentials in consumer, industrial, and commercial systems such as oil field exploration, mining, LCD displays, high power lasers, and other equipment based on high power RF systems requiring compact, high speed and high energy capacitors, etc..

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