A254-049: Affordable Ka-Band Metamaterial-Based Electronically Scanned Array Radar for Test and Training

ADDITIONAL INFORMATION
N/A

TECHNOLOGY AREAS:
Information Systems | Materials

MODERNIZATION PRIORITIES:
Advanced Computing and Software | Advanced Materials | Microelectronics

KEYWORDS:
Radar; antenna; metamaterials; scanning; array

OBJECTIVE:
The objective of this topic is to provide low-cost Ka-Band radar solutions through advancements in metamaterials to mimic the performance of an Active Electronically Scanned Array (AESA) without the high price. In addition, software-related technologies and any other applicable advanced technologies should be analyzed and utilized.

DESCRIPTION:
The Test and Evaluation community has a need for multiple low-cost high-performance Ka band radars that can be utilized to emulate threat representative systems. Currently the cost of these systems for the above-mentioned usage is prohibited. Advancements in metamaterials and low-cost software solutions show promise in reducing the cost of Ka-Band arrays while maintaining high performance. Metamaterial-based arrays could eliminate expensive transmit/receive modules utilized in traditional AESAs and reduce production cost substantially. The objective production cost of a turnkey metamaterial-based Ka-Band radar of interest is $300K. Feasibility of low cost to be analyzed during Phase I. The frequency range of interest is 30 GHz to 40 GHz, with beam switching speeds in the 10 microseconds to 20 microseconds range, switchable polarization (left and right hand circular), range of 20 Km (0dBsm).

PHASE I:
This topic is for Phase I submission only. The Department of the Army will accept Phase I proposals for the cost of up to $250,000 for a 6-month period of performance.
Successful Phase I will demonstrate the feasibility of developing a low-cost high-performance metamaterials-based Ka-Band radar prototype through analysis, simulation and experimental data. In addition, risk assessment, technical challenges and a proposed plan for Phase II will be delivered.

PHASE II:
Phase II will develop a prototype Ka-Band radar that could be utilized for demonstration and evaluation. Demonstration of key subsystems with emphasis on Ka metamaterials based electronically scanned array integrated in a laboratory, possibly in the field, environment will be accomplished.

PHASE III DUAL USE APPLICATIONS:
Commercial uses for the technology developed under this topic include high resolution radar systems for environmental monitoring, civil security such as surveillance and airport surface monitoring, maritime applications for surveillance and navigation, health care such as medical imaging and non-destructive inspection, disaster monitoring such as detecting landslides and floods, security applications such as perimeter security and intrusion detection.

REFERENCES:

1. https://radarindia.com/proceedings20Archive/IRSI-17/082.pdf

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