Active Metamaterial Based Ultrasonic Guided Wave Transducer System, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

An active and tunable metamaterial phased array transducer for guided wave mode selection with high intensity per driving channel and with dramatically lower modal noise when compared to the state of the art. The innovation exploits aspect of phased array based guided wave mode selection theory, whose practical significance seems to be ignored in the state of the art. These aspects include a) low modal noise when the phased array has small inter-element distance and a large number of elements and; b) phased delays necessary for driving the phased array elements have an apparent periodicity and anti-symmetry. As a consequence of exploiting the first factors the proposed phased array transducer can be classified as an active tuneable metamaterial. The second factor is mentioned above is exploited to reduce the number of driving channels by using switching matrices to interface between the driving channels and the metamaterial transducer. Fidelity of inspection and cost-effectiveness are the primary features of the innovation.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: Potential NASA commercial applications include structural health monitoring and non-destructive evaluation of large thin walled complex structures, including metal and composite panels and; multiwalled pressure vessels.

To the commercial space industry:

Potential Non-NASA Commercial Applications: Potential Non-NASA Commercial applications, include structural health monitoring nondestructive inspection of petrochemical pressure vessels, tank bottom and pipelines as well as in aerospace structures that are of similar nature as those found in NASA applications.

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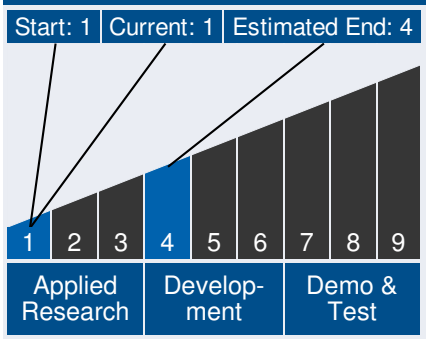
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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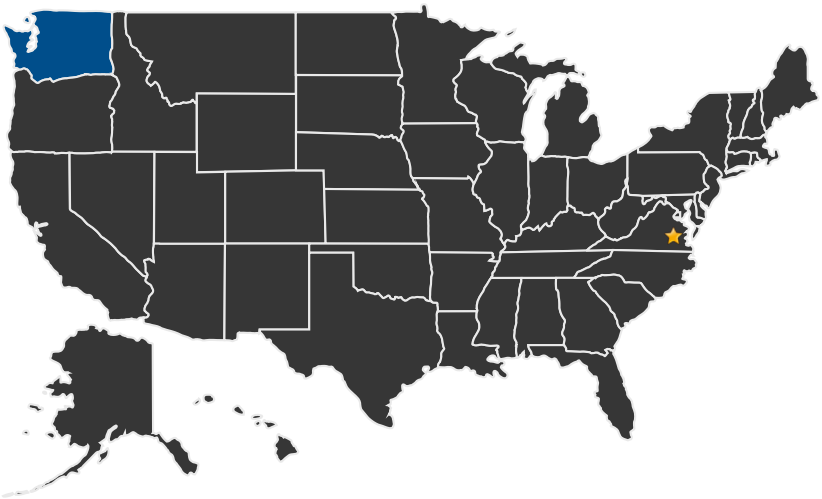
U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Langley Research Center

Other Organizations Performing Work:

- Quest Integrated, LLC (Kent, WA)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23265)

Management Team *(cont.)*

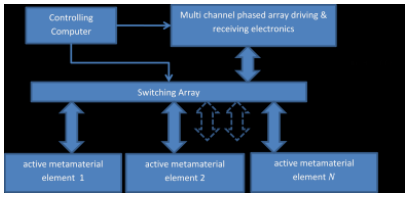
Principal Investigator:

- Haraprasad Kannajosyula

Technology Areas

Primary Technology Area:
Science Instruments, Observatories, and Sensor Systems (TA 8)
└ Remote Sensing Instruments and Sensors (TA 8.1)
  └ Detectors and Focal Planes (TA 8.1.1)

IMAGE GALLERY



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DETAILS FOR TECHNOLOGY 1

Technology Title

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Potential Applications

Potential NASA commercial applications include structural health monitoring and non-destructive evaluation of large thin walled complex structures, including metal and composite panels and; multiwalled pressure vessels.