NASA SBIR/STTR Technologies

Highly-Integrated, Reconfigurable, Large-Area Flexible Radar Antenna Arrays

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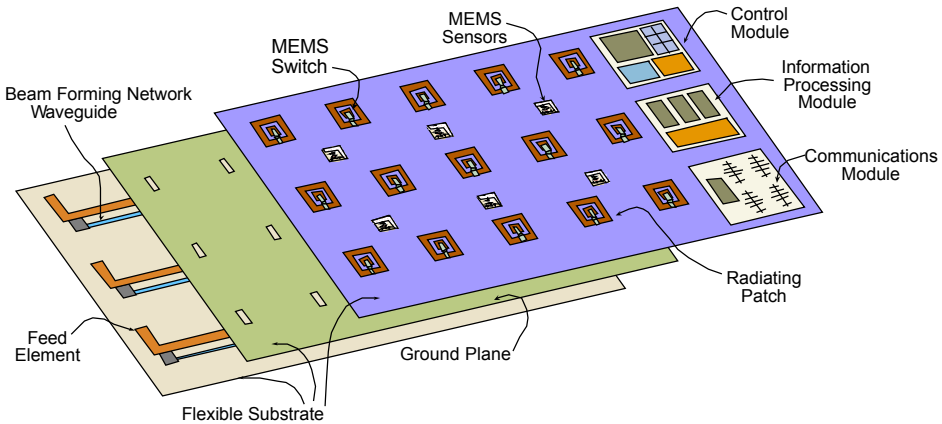
Topic No. S4.03 Advanced Flexible Electronics and Nanosensors

Highly-Integrated, Reconfigurable, Self-Monitoring Flexible Antenna Array



Description and Objectives

Develop a lithography-on-flex process for fabricating antennas on flexible substrates; and develop a preliminary flexible antenna design:

- Large-area roll-to-roll lithography technology enables high-resolution, high-throughput fabrication on large-area flexible substrates.
- Antenna designs incorporating integrated active elements, random arrays, and reconfigurable elements result in highly functional, narrow beamwidth antenna systems.
- Low-temperature crystallization processes allow for high levels of integration of instrumentation, sensors, communication, and command and control systems.

Technical Approach

The technical effort will include six key areas of research: (i) Selection of materials and processes for fabricating highly-integrated antenna arrays; (ii) Design and simulation of a wideband random array antenna; (iii) Development of processes for silicon crystallization on flex and waveguide fabrication on flex; (iv) Development of a process flow for fabricating MEMS on flex; (v) Fabrication of a single-element antenna on a flexible substrate, and testing of the antenna performance. (vi) Development of a plan and process flow for fabricating highly-integrated large-area flexible antennas

Activity	Month 1	2	3	4	5	6	7 – 30
Phase I							
1. Select materials and processes for fabricating highly-integrated radar antenna arrays.							
2. Design and simulate a wideband random array antenna.							
3. Select materials for silicon crystallization and waveguide fabrication on flexible substrates; conduct waveguide fabrication tests.							
4. Develop a process flow for fabricating MEMS on highly-integrated flexible antenna systems.							
5. Fabricate a single element antenna on a flexible substrate material, and test the antenna performance.							
6. Develop a plan and process flow for fabricating flexible antennas in the Phase II program.							
Phase II							
Develop a detailed antenna design; and a manufacturing process; and a lithography tool for fabricating flexible antennas; and fabricate fully functional antenna arrays.							

NASA and Commercial Applications

Highly functional flexible antennas • High-performance lightweight electronic, communication, and sensor systems • Cellular communications • Flat Panel Displays • RFIDs