NASA SBIR 2011 Phase I Solicitation

S1.02   Active Microwave Technologies

Lead Center: JPL

Participating Center(s): GSFC, LaRC

NASA employs active sensors (radars) for a wide range of remote sensing applications (for example, see: http://www.nap.edu/catalog/11820.html). These sensors include low frequency (less than 10 MHz) sounders to G-band (160 GHz) radars for measuring precipitation and clouds and for planetary landing. We are seeking proposals for the development of innovative technologies to support future radar missions and applications. The areas of interest for this call are listed below:

Low-Loss, Dual-Polarized W-band Radiator Array With MMIC Integration

- Frequency: 94 GHz.

- Radiation Efficiency: >70%.

- Polarization isolation = 25 dB.

- Interconnect loss:
- No dielectric materials.

These radiator and interconnect technologies are critical to achieving the density and RF signal performance required for scanning millimeter-wave array radars.

High Performance W-band Millimeter-wave Transmit/Receive MMICs

- Frequency: 94 GHz.

- Transmit Power: >1W, TX PAE: >25%.

- TX Gain >20 dB.

- RX NF:
- RX Gain: > 20 dB.

- RX input power tolerance >250mW

- Monolithic integration of TR function is required to meet space constraints for high-density arrays and to reduce assembly costs.

Low-Cost mm-wave Beamforming MMIC Receiver

- Frequencies: 35.6, 94 GHz.

- Input Channels: 16.

- Phase shifter: 360 deg.

- 5-bits, Output IF: 1 channel @
- Bandwidth: >100 MHz.

- Serial phase update rate: >10kHz for all channels.

Millimeter-wave phased arrays require integration of a large number of phase shifters in a small space, leading to impossible interconnect requirements. Integrating many channels vastly reduces the number of interconnects required, achieving the needed array density.

High-Speed Radar Distributed Target Simulator

Given model inputs of radar parameters, radar/target geometries and distributed target properties, generates simulated radar echo signals. For some missions, a single scene would take approximately a year to simulate on a single processor and global simulations are not feasible. It is critical to reduce simulation time for global validation of on-board processor. The simulator should be able to produce and store simulated returns for a product of 40 billion targets and pulses per second.

Low-Jitter Programmable Delay/Divide Clock Distribution IC

- Total Jitter:
- Fanout: >=10.

- Prog. Delay: up to 192 ns.

- Delay Resolution: 2 ps.

- Divide by: 2 or 3.

- Temp. range: -40 to +80C.

- Implemented in radiation-hard technology.

This part is critical to high-speed real-time digital beamforming and processing required for next generation of Earth and space based high-resolution sensors.

L-band Array Antennas

- Compact, lightweight arrays (
- Dual-polarization.

- High polarization isolation (> 25 dB) for airborne and spaceborne radar applications.

- W-band (94 GHz).

- Ka-band (35GHz).

- Low loss (
- High speed (transition time
- Peak power >= 1.5 kW.

- Average power >= 75 W.

- Isolation >= 25 dB.

Fast Turn on and Turn Off Power Amplifiers

To increase solid state radar sensitivity NASA requires compact and high efficiency (> 50%) power amplifiers (> 25 W peak.) in P, L, and X-bands that can be switched off during the receive period to prevent noise leakage.
Â Switch on and switch off times under 1 Âµs, stable amplitude (

Small Radar Packaging Concepts for Unmanned Aerial Systems (UAV)

Miniaturization of radar and radiometer components while maintaining power and performance is a requirement for UAV science. Seeking high isolation switched filters and phase shifters for interleaved radar/radiometer operation at multiple channels, LNAs, stable noise sources, circulators, and solid-state power amplifiers for operation at L-, C- X-, and Ku-Bands.

Real Time Adaptive Waveform-Agile Radars for Very Weak Targets Detection in Strong Clutter/Noise Environment for Remote Sensing

NASA seeks novel ideas in advancing software and hardware technology of real time adaptive waveform-agile radars for detection and exploration of weak targets hidden behind strong targets (such as sub-surface planetary surfaces). -25 dB signal-to-clutter, range resolution