NASA SBIR 2007 Phase I Solicitation

S1.02 Active Microwave Technologies

Lead Center: JPL

Participating Center(s): GSFC

NASA employs active sensors (Radars) for a wide range of remote sensing applications. These sensors include low frequency (less than 10 MHz) sounders to W-band radars for measuring precipitation and clouds. We are seeking proposals for the development of innovative technologies to support future radar missions. Technology innovations should either enhance measurement capabilities (e.g., improve spatial, temporal, or spectral resolution) or ease implementation in spaceborne missions (e.g., reduce size, weight, power, improve reliability, or lower cost). The areas of interest for this call are listed below.

For L- and P-band radar components for surface deformation, topography and soil moisture measurements:

- Lightweight deployable L-band antenna structures and deployment mechanisms suitable for large aperture (reflectors or phased array of 50m$^2$ and larger) systems.
- Compact (probably sub-optimal), P-band antennas (possibly folded-dipole arrays, etc.) for airborne and spaceborne systems.
- Rad-hard, high-efficiency, low-cost, lightweight L- and P-band Transmit/Receive (TR) modules (~250 W peak RF output power at ~100 us pulsewidth and 20% duty cycle) with respective energy storage unit to provide pulsed DC power to the power amplifier while minimizing ripple on the primary DC power source.
- 12-bit, 1 GSps, 500MHz analog bandwidth ADCs and digital filtering with an emphasis on rad-tolerance and space-qualification.
- Implementation of radar transmitters/receivers using digital signal synthesis.

For Ku- and Ka-band radars for snow cover measurement (Ku) and wetland, river, ocean surface monitoring (Ka) and precipitation radars (X to W-band):

- Lightweight deployable reflectors (Ku-band and Ka-band) and active feed electronics.
• High efficiency Ka-band (34-36GHz) TR modules with output power of 5-10W. The LNAs should have a NF less than 3dB and gain better than 30dB. Included in the TR module is a low loss phase shifter.

• Power amplifier and associated LNA for a Ka-band (34-36GHz) radar system with a peak output power of 2KW to 10KW (duty cycle of 10%) and system bandwidth of up to 1 GHz and LNA NF of less than 1.5dB. The LNA needs to have enough isolation and power handling capability to operate in this high power transmission environment.

• Wide-bandwidth (~500 MHz BW), high-efficiency, rad-tolerant linear FM (chirp) signal generators (sweep rates ~500 MHz in 10 us).

• High performance, low power, compact, rad-hard, real-time radar processors, FPGA based digital receivers, SAR data processing algorithms and data reduction techniques.