NASA SBIR 2012 Phase I Solicitation

S1.02 Microwave Technologies for Remote Sensing

Lead Center: JPL

Participating Center(s): GSFC, LaRC

NASA employs active (radar) and passive (radiometer) microwave sensors 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) sounders to G-band (160 GHz) radars for measuring precipitation and clouds, for planetary landing, upper atmospheric monitoring, and global snow coverage (SCLP). We are seeking proposals for the development of innovative technologies to support these future radar and radiometer missions and applications. The areas of interest for this call are listed below:

- Space qualifiable, High power and efficiency P-band power amplifiers: Center Frequency: 420-450, Gain: > 40 dB, Efficiency: >80%, Duty Cycle: 10%, Mass
- Space-qualifiable Single-Board Digital Radar Transceiver in PC-104e form factor. Frequency bands: 400-500, 1200-1300, with arbitrary waveform generator (100 us pulselength, 30 BW), 2-channel ADC, FPGA, PCIe bus, Size: Approx 9cm x 9.6cm x 3.1cm
- Cryogenic LNAs for 180 to 270 GHz with noise temperatures of less than 100K. Earth Science Decadal Survey missions that apply: PATH, GACM and future Earth Venture Class low cost millimeter wave instruments.
- Receiver technologies for the PATH mission including: low noise
  - Local Oscillator technologies for 2nd generation instruments for SOFIA, next generation HIFI, and suborbital instruments (GUSSTO). This can include: GaN based frequency multipliers that can work in the 200-400 GHz range (output frequency) with input powers up to 1 W. Graphene-based (or other suitable technology) devices that can work as frequency multipliers in the frequency range of 1-3 THz.
- Compact, light-weight array antennas with 50 - 60% bandwidth using electronic frequency hopping and tuning capabilities, dual-polarization, high cross-polarization isolation (> 25 dB) for airborne and spaceborne radar applications
  - P-, L-, C-, X band MMIC pulsed radar transceivers with dynamic load matching, wideband (> 50) high power efficiency (> 30%), high T/R isolation (> 90 dB)
  - Large (~5m) deployable parabolic cylindrical antennas, F=35, 94 GHz
- G-Band Microwave Components: For measurement of microphysical properties of clouds and upper atmospheric constituents (particles of less than mm sizes):
  - G-band Noise Source (ENR> 10dB).
  - W-band LO (6 dBm, Freq. Stability 5-10 (-20 C - 40 C) DC Power
  - G-band isolator (Isolation > 15 dB, Insertion Loss
  - G-band switching circulator (Isolation > 15 dB Insertion Loss
  - Integration and packaging G-band receiver for cubesat and microsat platforms.
- Multi-Frequency and/or multi-Beam Focal Plane Arrays (FPA) as a primary feed for reflector antennas. In NASA's SCLP mission, it is required to collect Earth science data at high spatial and as well as temporal
resolutions simultaneously. In addition to high spatial and temporal resolutions, the proposed antenna system must offer ways to suppress RFI and control antenna illumination. NASA is looking for a small (3 x 3) focal plane array system to be used as a feed for its main reflector. Wideband array element covering 19, and 37 GHz must be used as a basic element of the proposed FPA.