



## NASA SBIR 2018 Phase I Solicitation

### S1.02 Technologies for Active Microwave Remote Sensing

Lead Center: JPL

Participating Center(s): GSFC

Technology Area: TA8 Science Instruments, Observatories & Sensor Systems

NASA employs active 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 MHz) radar sounders to G-band (160 GHz) radars for measuring precipitation and clouds, for planetary landing, upper atmospheric monitoring, surface water monitoring, soil moisture and global snow coverage, topography measurement and other Earth and planetary science applications. 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.

#### Deployable High-Frequency Antenna Technologies for CubeSats, NanoSats or SmallSats

Novel technologies are sought that enable X, Ku, Ka, W-band deployable antennas for small spacecraft, exceeding an effective deployed area of 3U or 30 cm x 30 cm. Techniques, hardware, electronics, materials, etc. are sought to advance the state of art in deployable high-frequency antennas for CubeSats, NanoSats or SmallSats.

#### Deployable Low-Frequency Antenna Technologies for CubeSats, NanoSats or SmallSats

Novel technologies are sought that enable HF, VHF, UHF deployable, electrically large antennas (half-wavelength or greater) for small spacecraft. Techniques, hardware, electronics, materials, etc. are sought to advance the state of art in deployable low frequency antennas for CubeSats, NanoSats or SmallSats.

Deployable Cylindrical Parabolic Antenna:

- Up to a four square meter aperture.
- Performance up to 36 GHz desired.

#### SoOp (Signal of Opportunity) Power Reduction Technologies

Technology to reduce the power consumption of Signal of Opportunity (SoOp) instruments, such as a correlator ASIC with >20 MHz BW, on-board ADCs, and differential delay and Doppler compensation.

V-band Power Amplifiers:

- Frequency: 65-70 GHz.

- 
- Output Power > 1.5W.
  - Or >2W over smaller bandwidth 67-69 GHz.

Compact mm-Wave phase array (Active or Passive) for Landing/Hazard Detection:

- Mm-Wave phased array antenna design.
- Low-Power TRMs/Solid State.
- Output Power > 20 dBm.
- Beam width < 8 mrad.

### **Large Aperture, High Aspect Ratio Antenna Technologies for MicroSats**

Novel technologies that enable antenna designs between L and X band with > 4 m<sup>2</sup> effective area aspect ratios > 4:1 stowing volume < 18,000 cm<sup>3</sup>.

VHF/P-band Dual-band dual-polarization antenna elements for small satellites or CubeSats:

- Needed for signals-of-opportunity remote sensing.
- Specifications: 137 MHz and 255 MHz.
- ~10% bandwidth, dual polarization.
- Stowable in <1U.
- Deployable in zero gravity (1-G also desired).
- Gain > 0 dBi -Combine into 2-element end-fire array.

### **VHF/P-band Dual-band Dual-Polarization Antenna Elements for Small Satellites or CubeSats**

VHF/P-band Dual-band dual-polarization antenna elements for small satellites or CubeSats are needed for signals-of-opportunity remote sensing. Specifications: 137 MHz and 255 MHz with ~10% bandwidth, dual polarization, stowable in <1U, deployable in zero gravity (1-G also desired), gain > 0 dBi. Combine into 2-element end-fire array.

### **Deployable Cylindrical Antennas**

Deployable cylindrical parabolic antenna with up to a four square meter aperture. Performance up to 36 GHz desired.

### **Deployable W-band (94 GHz) antenna suitable for CubeSats and SmallSats**

Aperture up to 1 square meter desired.

Surface Mount Non-Intrusive Hall Effect Current Sensor:

- Current Sensing: > 10-100 mA.
- Based on Hall Effect.
- Devices should sense current indirectly on PCB without being part of the circuit.

### **Technologies/Techniques for Super Resolution Radar Imaging**

Hardware and algorithms required to apply physics-based super resolution techniques to acquire and/or analyze data.