



NASA SBIR 2011 Phase I Solicitation

S1.03 Passive Microwave Technologies

Lead Center: GSFC

Participating Center(s): JPL

NASA employs passive microwave and millimeter-wave instruments for a wide range of remote sensing applications from measurements of the Earth's surface and atmosphere (http://www.nap.edu/catalog.php?record_id=11820) to cosmic background emission. Proposals are sought for the development of innovative technology to support future science and exploration missions employing 450 MHz to 5 THz sensors. Technology innovations should either enhance measurement capabilities (e.g., improve spatial, temporal, or spectral resolution, or improve calibration accuracy) or ease implementation in spaceborne missions (e.g., reduce size, weight, or power, improve reliability, or lower cost). While other concepts will be entertained, specific technology innovations of interest are listed below for missions including decadal survey missions (<http://www.nap.edu/catalog/11820.html>) such as PATH, SCLP, and GACM and the Beyond Einstein Inflation Probe (Inflation Probe - cosmic microwave background, <http://science.gsfc.nasa.gov/660/research/>):

- High emissivity (>40 dB return loss) surfaces/structures for use as onboard calibration targets that will reduce the weight of aluminum core targets, while reliably improving the uniformity and knowledge of the calibration target temperature. Earth Science Decadal survey missions which apply: SCLP and PATH.
- Room temperature LNAs for 165 to 193 GHz with low 1/f noise, and a noise figure of 6.0 dB or better; and cryogenic LNAs for 180 to 270 GHz with noise temperatures of less than 150K. Earth Science Decadal Survey missions that apply: PATH, GACM and future Earth Venture Class low cost millimeter wave instruments.
- Low noise amplifiers, MMIC or discrete transistor, at frequencies below 2 GHz, operating at room temperature or thermoelectrically cooled, and giving noise figures below 0.25 dB (17K noise temperature). Amplifier should have S11 25 dB, over an octave band, and be stable for any generator impedance at any frequency. For highly red shifted hydrogen spectroscopy for early universe cosmology.
- 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 devices that can work as frequency multipliers in the frequency range of 1-3 THz.
- Enabling technology for ultra-stable microwave noise references (three or more) embedded in switched network with reference stability (after temperature correction) to within 0.01K/year. Applies to: PATH, SCLP,

GACM, SWOT.

- RFI mitigation approaches employing channelizers for broadband (>100MHz) radiometers at frequencies between 1 and 40 GHz. These systems should demonstrate both detection and removal approaches for mitigating RFI. Earth Science Decadal Survey missions that apply: SCLP, SWOT.
- Multi-Frequency and/or multi-Beam Focal Plane Arrays (FPA) as a primary feed for reflector antennas. Earth Science Decadal Survey missions that apply: PATH, SCLP, SWOT.
- In addition to the technologies listed above, proposals for innovative passive microwave instruments for a wide range of remote sensing applications from measurements of the Earth's surface and atmosphere to cosmic background emission would also be welcome.

Proposals should show an understanding of one or more relevant science needs, and present a feasible plan to fully develop a technology and infuse it into a NASA program.