



NASA SBIR 2009 Phase I Solicitation

S1.04 Sensor and Detector Technology for Visible, IR, Far IR and Submillimeter

Lead Center: JPL

Participating Center(s): ARC, GSFC, LaRC

NASA is seeking new technologies or improvements to existing technologies to meet the detector needs of future missions, as described in the most recent decadal surveys for Earth science (<http://www.nap.edu/catalog/11820.html>), planetary science (<http://www.nap.edu/catalog/10432.html>), and astronomy and astrophysics (<http://www.nap.edu/books/0309070317/html>).

The following specific technologies are of interest for instrument concepts such as Scanning Microwave Limb Sounder (<http://mls.jpl.nasa.gov/index-cameo.php>) on the Global Atmospheric Composition Mission, Climate Absolute Radiance and Refractivity Observatory (http://science.hq.nasa.gov/earth-sun/docs/Volz4_CLARREO.pdf), Methane Trace Gas Sounder, Single Aperture Far Infrared (SAFIR) Observatory (<http://safir.jpl.nasa.gov/technologies.shtml>), and Inflation Probe (cosmic microwave background, <http://universe.nasa.gov/program/probes/inflation.html>):

- New or improved technologies leading to measurement of trace atmospheric species (e.g., CO, CH₄, N₂O) from geostationary and low-Earth orbital platforms. Of particular interest are new techniques in gas filter correlation spectroscopy, Fabry-Perot spectroscopy, or improved component technologies.
- Uncooled or passively cooled detectors with specific detectivity (D^*) $\geq 10^{10}$ cm Hz^{1/2}/W in the operating wavelength ranges 6-14 μm and 10-100 μm .
- Efficient, flight qualifiable, spur free, local oscillators for SIS mixers operating in low earth orbit. Two bands: (1) tunable from 200 to 250 GHz, and (2) tunable from 600 to 660 GHz, phase-locked to or derived from an ultra-stable 5 MHz reference.
- Sideband separating SIS mixer with RF band from 580 to 680 GHz, IF band from 6 to 18 GHz, image rejection greater than 10 dB, and receiver noise temperature less than 300 Kelvin. Thermal load on 4 K and 15 K stage must be less than 4 and 30 mW respectively. Application: GACM.
- Quantum cascade laser-based local oscillators for astrophysics applications (2nd generation SOFIA instruments, SAFIR).

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- Technologies for calibrating millimeter wave spectrometers for spaceborne missions, including low power, flight qualifiable comb generators and low noise diodes for the bands from 180 to 270 and 600 to 660 GHz; very low return loss (70 dB or better) calibration targets and techniques for quantifying and calibrating out the impact of standing waves in broadband heterodyne submillimeter spectrometers.
 - Low power, stable, linear, spectrometers capable of measuring the band from 6-18 GHz with ~120 100 MHz wide channels.
 - Digital spectrometers with ~4 GHz bandwidth and 10 MHz resolution. Components for these digital spectrometers including high speed digitizers, efficient spectrometer firmware, and ASIC implementations.
 - Spatial Filter Array (SFA) consisting of a monolithic array of up to 1200 coherent, polarization preserving, single mode fibers that operate over a large fraction of the spectral range from 0.4 - 1.0 microns and such that each input and output lenslet is mapped to a single fiber. Uniformity of output intensity and high throughput is desired and fiber-to-fiber placement accuracies of http://planetquest.jpl.nasa.gov/TPF/tpf_index.cfm) and Stellar Imager (<http://hires.gsfc.nasa.gov/si/>).
 - High resolution wedged filters with resolving powers of 1,000 to 5,000 in the visible to short wave infrared spectral region. Of particular interest are filters in the 1 to 3.5 micron range.

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.