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/).

- **RF (GHz to THz) MEMS switches with low insertion loss (< 0.5 dB), high isolation (>18 dB), capable of switching with speeds of >100 Hz at cryogenic temperatures (below 5 K) for 10^8 or more cycles.** Technology applies to Beyond Einstein Probe.
- **MEMs variable delay line up to 40 GHz with 180 degree of phase variation at room temperature.** The delay line’s phase increment should be linear or with at least 16 discrete steps. Applies to: Venture class airborne instruments, SCLP.
- **MMIC Low Noise Amplifiers (LNA).** 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 and GACM.
- **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.
- **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.
- **Broad band 180 - 270 GHz radomes for aircraft borne submillimeter remote sensing instruments.**
- **Multi-Frequency and/or multi-Beam Focal Plane Arrays (FPA) as a primary feed for reflector antennas.** PATH, SCLP, SWOT.
- **Low power >200 Mb/s 1-bit A/D converters and cross-correlators for microwave interferometers.** Earth Science Decadal survey missions which apply: PATH, SCLP.
- **Automated assembly of 180 GHz direct conversion I-Q receiver modules.** This technology applies to both the Beyond Einstein Inflation probe and the Decadal Survey PATH concept.
- **Low DC power spectrometer (channelizer) covering >500 MHz with 125 kHz resolution for planetary radiometer missions and covering 4 GHz with 1 MHz resolution for Earth observing missions.** Also RFI mitigation approaches employing channelizers for broad band radiometers. Earth Science Decadal Survey
mission which applies: GACM

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.