**μ-Spec: An Integrated Spectrometer for THz Spectroscopy**

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μ-Spec is an integrated submillimeter (~100 GHz - 1 THz) spectrometer technology under development at NASA-Goddard for astrophysical science applications. The compact architecture of the spectrometer will enable μ-Spec to be fielded onboard future balloon-borne or space-flight science instruments, and to provide astronomers with a deeper understanding of the evolution of structure and star formation in our universe across cosmic time.

μ-Spec operates as an analog to a diffraction grating spectrometer, and integrates all of the spectrometer elements onto a silicon chip using superconducting planar transmission lines. These spectrometer elements include: a planar slot antenna for optical coupling to off-chip optics; a microstripline phase delay network where the light is split and a linear phase delay gradient is introduced; 2-D receiver and emitter feeds and a 2-D parallel plate waveguide region, which allows the phase-delayed light to interfere and to combine at wavelength-dependent locations on a focal plane; and superconducting microwave kinetic inductance detectors, which detect the light from each of the spectrometer channels.

We will present an overview and the current status of our development of this technology. We will discuss our specific design and fabrication approaches and their impacts on the spectrometer performance. We will also discuss two prototype spectrometers designs, one with resolution $R=\lambda / \Delta\lambda =64$, operating at 400-600 GHz, which was previously demonstrated, and a second R=512 prototype, operating at 420-540 GHz, whose demonstration is currently in progress. Here we will highlight some of the spectrometer component designs for these prototypes, and the measured and expected spectrometer performance results. Finally, we will discuss briefly our plans to field an R=512 μ-Spec on a planned balloon-borne science instrument, The Experiment for Cryogenic Large-aperture Intensity Mapping, EXCLAIM.