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SYMPOSIUM ON TECHNOLOGICAL REQUIREMENTS FOR FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS (A7)
Technology Needs for Future Missions, Platforms (3)

Author: Dr. Giuseppe Cataldo
National Aeronautics and Space Administration (NASA), Goddard Space Flight Center, United States

Dr. Emily Barrentine
United States
Dr. Ari Brown
National Aeronautics and Space Administration (NASA), Goddard Space Flight Center, United States
Dr. Negar Ehsan
United States
Dr. Samuel Harvey Moseley
United States
Dr. Omid Noroozian
United States
Dr. Thomas Stevenson
United States
Dr. Kongpop U-Yen
United States
Dr. Edward J. Wollack
NASA, United States

A HIGH-EFFICIENCY TRANSMISSION-LINE SPECTROMETER FOR FAR-INFRARED AND SUBMILLIMETER SPACE MISSIONS

Abstract

Micro-Spec (μ-Spec) is a direct-detection spectrometer-on-a-chip realized with superconducting microstrip transmission lines. Its operating spectral range is 300-650 GHz (450-1000 μm), a window of interest for many far-infrared and submillimeter spectroscopic applications in astronomy and Earth science. Due to its compact size ($\sim$ 10 cm^2), μ-Spec can enable a wide range of flight missions that are still difficult to realize due to the large size of current spectrometers and the required spectral resolution and sensitivity.

This paper will provide a report on the current status of the instrument development. An overview of the μ-Spec subsystems will illustrate details of each components and their operating principles. Emphasis will be given to the diffractive region and transmission line materials properties. Several optical designs generated for the diffractive region will be presented in terms of geometric layouts, imaging performance, and efficiency for different spectral resolutions. The loss of the dielectrics and superconductors will also be discussed. Finally, test measurement data from the prototype version currently under testing will be shown.