

Rockets for Extended Source Soft X-ray Spectroscopy

Active Technology Project (2018 - 2022)



Project Introduction

The soft X-ray background surrounds our local galactic environment yet very little is known about the physical characteristics of this plasma. A high-resolution spectrum could unlock the properties of this million degree gas but the diffuse, low intensity nature of the background have made it difficult to observe, especially with a dispersive spectrograph. Previous observations have relied on X-ray detector energy resolution which produces poorly defined spectra that are poorly fit by complex plasma models. Here we propose a series of suborbital rocket flights that will begin the characterization of this elusive source through high-resolution X-ray grating spectroscopy. The rocket-based spectrograph can resolve individual emission lines over the soft X-ray band and place tight constraints on the temperature, density, abundance, ionization state and age of the plasma. These payloads will draw heavily from the heritage gained from previous rocket missions, while also benefiting from related NASA technology development programs. The Pennsylvania State University (PSU) team has a history of designing and flying spectrometer components onboard rockets while also being scientific leaders in the field of diffuse soft X-ray astronomy. The PSU program will provide hands-on training of young scientists in the techniques of instrumental and observational X-ray astronomy. The proposed rocket program will also expose these researchers to a full experiment cycle – design, fabrication, tolerance analysis, assembly, flight-qualification, calibration, integration, launch, and data analysis – using a combination of technologies suitable for adaptation to NASA's major missions. The PSU program in suborbital X-ray astronomy represents an exciting mix of compelling science, heritage, cutting-edge technology development, and training of future scientists.

Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
Penn State	Supporting Organization	Academia	University Park, Pennsylvania
University of Iowa	Supporting Organization	Academia	Iowa City, Iowa



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Astrophysics Research and Analysis

Project Management

Program Director:

Michael Garcia

Continued on following page.



Project Management (cont.)

Program Manager:

Dominic J Benford

Principal Investigator:

Randall Mcentaffer

Co-Investigators:

James H Tutt

Abe Falcone

David N Burrows

Melissa T Gensimore

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.X Other Sensors and Instruments

Target Destination

Outside the Solar System