

Polarized Microwave Background Technologies for Inflationary Gravitational Wave Detection

Completed Technology Project (2014 - 2018)



Project Introduction

The detection of primordial gravitational waves (PGWs) from the epoch of inflation is one of the next major goals in cosmology. These PGWs leave a signature on the polarization of the cosmic microwave background (CMB) called the primordial "B-modes." The quest for detection of this signature has launched substantial technological development because this signal is predicted to be one part in a billion of the unpolarized signal. The Cosmology Large Angular Scale Surveyor (CLASS) is a ground based telescope array which will measure the polarization of the CMB to unprecedented accuracy. This measurement will require the development of several technologies which will be required for the possible space mission outlined in the Epoch of Inflation Technology push. CLASS will be an important test-bed for these technologies and will raise the technology readiness level of several relevant instruments. CLASS will use extremely sensitive antenna-coupled transition edge sensors and a rapid front-end polarization modulator to make a multifrequency measurement of the polarized CMB on the largest angular scales. By searching for the predicted peak in the primordial B-mode power spectrum, CLASS will detect the PGW signature if the tensor to scalar ratio is greater than 0.01. A detection of primordial gravitational waves from the epoch of inflation would have transformative effects on the field of cosmology. The technological advances made through the development of CLASS could achieve this detection while simultaneously raising the technology readiness level for future missions.

Anticipated Benefits

A detection of primordial gravitational waves from the epoch of inflation would have transformative effects on the field of cosmology. The technological advances made through the development of CLASS could achieve this detection while simultaneously raising the technology readiness level for future missions.

Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
Johns Hopkins University	Lead Organization	Academia	Baltimore, Maryland

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Johns Hopkins University

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Tobias Marriage

Co-Investigator:

Kathleen Harrington

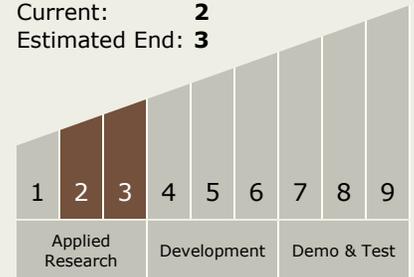
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Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destination

Outside the Solar System