



Professor Buell Jannuzi  
Department of Astronomy/Steward Observatory  
933 North Cherry Avenue, Rm. N204  
Tucson, AZ 85721-0065

Dear Professor Jannuzi:

The US Department of Energy (DOE), Office of High Energy Physics (HEP), and the National Science Foundation (NSF) Divisions of Astronomical Sciences (AST), Physics (PHY), and Polar Programs (PLR) request that the Astronomy and Astrophysics Advisory Committee (AAAC) establish a Cosmic Microwave Background Stage 4 Concept Definition Task force (CMB-S4 CDT) as a subcommittee in order to develop a concept for a CMB-S4 experiment.

### **Background**

Ground-based CMB generally falls under the purview of NSF and DOE, while NASA supports CMB projects within its long-duration balloon program and space missions. In its 2016 report, the interagency AAAC recommended the following: “We encourage DOE, NSF, and the university community to continue working toward a plan for a future (Stage 4) ground based CMB experiment.” Following that recommendation and other community input, NSF and DOE are requesting that the AAAC establish this CDT. The creation of the CDT also is in response to the favorable comments or recommendations on CMB science that have been made by community advisory groups over the past decade:

- 2010, Astronomy and Astrophysics Decadal Survey (charged by NASA Astrophysics, NSF-AST, and DOE-HEP): CMB projects are among the “projects thought compelling for a [competed] Mid-Scale Innovations Program” in NSF and “The committee recommends... continuing steps consistent with the DOE mission”
- 2014, Particle Physics Project Prioritization Panel (P5) of the High Energy Physics Advisory Panel (HEPAP) (charged by DOE-HEP and NSF Directorate for Mathematical and Physical Sciences, which includes NSF-PHY and NSF-AST): “Support CMB experiments as part of the core particle physics program. The multidisciplinary nature of the science warrants continued multi-agency support”
- 2015, National Academies report on “A Strategic Vision for NSF Investments in Antarctic and Southern Ocean Research” (charged by NSF-PLR): Identified continuation of studies of the Cosmic Microwave Background as one out of three strategic priorities

These community reports identify CMB as an important scientific priority for consideration by DOE-HEP, NSF-AST, NSF-PHY, and NSF-PLR, hence providing additional rationale for the CDT activity.

The Snowmass 2013 process (<http://science.energy.gov/hep/research/snowmass-p5-process/>) brought together the U.S.-based CMB community, including many of the current experimental teams, and began to define a coordinated next generation experiment which was termed CMB-S4. The CMB-S4 community-based collaboration has held semiannual meetings and produced a substantial CMB Science Book (see [arXiv:1610.02743](https://arxiv.org/abs/1610.02743) [pdf, other]) justifying the CMB-S4 science case. DOE-HEP national laboratories and some university groups are already actively engaged in technology

development for CMB-S4.

**Purpose and Charge**

The CMB-S4 CDT is asked to develop a concept for implementing a ground-based CMB-S4 experiment. The CDT will take as input the community CMB-S4 Science Book and any further community information as appropriate, and will consider the global landscape of CMB experiments (including ground, balloons, and space).

Specifically, the CDT is asked to deliver:

- The Science Requirements and their rationale
- Measurement and Technical Requirements derived from the Science Requirements
- Project Strawman Concept
- Options and Alternatives (prioritized to the extent possible) for:
  - Concept design (e.g. sites, telescopes, detectors)
  - Concept staging and schedule
  - Collaboration and Data models and interfaces
- R&D development needed, with priorities, to demonstrate technical readiness
- Cost ranges for the strawman concept, including explanations for how they were developed.

The CDT should provide a report on the Science and Measurement Requirements to the AAAC by June 2017 and a final report to AAAC by October 2017 for consideration. In accordance with Federal Advisory Committee Act (FACA) rules, the reports will be discussed and approved by the AAAC before formal transmittal to the agencies.

We appreciate your effort in establishing this subcommittee. Its deliberations and recommendations will inform the agencies on a concept for the CMB-S4 and contribute to the agencies' planning activities. The formation of the CDT does not imply any commitment by the agencies to specific funding or project status for CMB-S4.

We look forward to working with you in this important endeavor. The point of contact for each of the agency participants is listed below.

Sincerely,



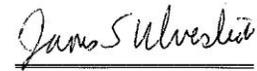
Denise Caldwell  
Division Director  
Division of Physics  
NSF



Eric Saltzman  
Section Head, Ant.  
Sciences, Div. of  
Polar Programs, NSF



James Siegrist  
Associate Director  
of Science for High  
Energy Physics, DOE



James Ulvestad  
Division Director  
Div. of Astronomical  
Sciences, NSF

17 November 2016  
Date

11/21/2016  
Date

11/18/16  
Date

11/21/2016  
Date

## Agency Points of Contact

For NSF: Dr. Richard Barvainis  
Program Officer  
Division of Astronomical Sciences  
Directorate for Mathematical and Physical Sciences  
Phone: 703-292-4891  
Email: [rbarvai@nsf.gov](mailto:rbarvai@nsf.gov)

For DOE: Dr. Kathleen Turner  
Program Manager  
Office of High Energy Physics  
Office of Science  
Phone: 301-903-1759  
Email: [Kathy.Turner@science.doe.gov](mailto:Kathy.Turner@science.doe.gov)