CMB-S4

Conceptual Design Team

Update

AAAC, NSF

2017 January 26

Charge To the CDT

Excerpt from the letter to Buell from three NSF Divisions and DOE HEP requesting the AAAC to 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".

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.

CDT Members

CDT	
Julian Borrill	LBNL
John Carlstrom	Chicago
Tom Crawford	Chicago
Mark Devlin	Penn
Jo Dunkley	Princeton
Raphael Flauger	UCSD
Brenna Flaugher	FNAL
Shaul Hanany	U Minnesota
Kent Irwin	Stanford/SLAC
Bill Jones	Princeton
Brian Keating	UCSD
John Kovac	Harvard
Akito Kusaka	LBNL
Charles Lawrence (Chair)	JPL
Adrian Lee	Berkeley/LBNL
Jeff McMahon	Michigan
Mike Niemack	Cornell
Steve Padin	Chicago
Clem Pryke	Minnesota
Suzanne Staggs	Princeton
Ed Wollack	GSFC

Contacts:		
	Kathy Turner	DOE
	Rich Barvainis	NSF
	Brian Keating	AAAC

Advisory Board:		
	Lloyd Knox	UCD
	Sarah Church	Stanford
	Amber Miller	USC
	Lyman Page	Princeton
	John Ruhl	CWR
	Martin White	Berkeley

Comments on CDT Set-up

- CDT is a continuation of the S4 work, not a replacement
  - Agencies have established methods and routes for accepting input and advice from the science community
  - Using those established routes is an advantage

    $$\text{S4} \rightarrow \text{CDT} \rightarrow \text{AAAC} \rightarrow \text{NSF, DOE, (NASA)}$$

  - CDT provides a structure for the design activity

    But job is bigger than 20 people, and will require the efforts of the entire S4 community

- To succeed, anything this big needs essentially unanimous support from its own community, and broad support from outside

Operations

- Agency sign-off complete 21 November 2016
- Team members notified
- First of weekly telecons was 07 December 2016
- Face-to-face meetings
  - First at NSF 29–30 January 2017
  - Second at SLAC 01–02 March 2017
  - Number and dates of more TBD

The Job

SCIENCE REQUIREMENTS $\Rightarrow$ MEASUREMENT REQUIREMENTS $\Rightarrow$ HARDWARE REQUIREMENTS

$\Rightarrow$ EXPERIMENT DESIGN

OPERATIONS SCENARIO

- Process is iterative, but the logic starts on the left and flows down to the right
  - It makes no sense to talk about detectors, telescopes, sites, etc., until measurement requirements are in hand
- Science requirements
  - Start from the CMB-S4 "Science Book"
  - This is not the usual way of operating for ground-based CMB experiments, but is familiar for NASA missions and large DOE experiments
  - Science requirements should be thought of as guarantees, not marketing claims

    Not the place for hopes and wishes, but rather for realism and conservatism
- Measurement requirements
  - A lot of good work has been done, but simulations of foreground removal and instrument performance haven't included, e.g., foreground model uncertainties and residual instrumental systematics at the necessary $\sim$10 nK level.

Schedule

- Science and measurement requirements due in June
- Final report due in October

Summary

- We're up and running...
- ...and making good progress
  - First-pass science requirements
  - Organizing simulations