CMB-S4: The Extended Science Case

Evolution of CMB-S4

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Inflation physics from the cosmic microwave background and large scale structure

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Neutrino physics from the cosmic microwave background and large scale structure

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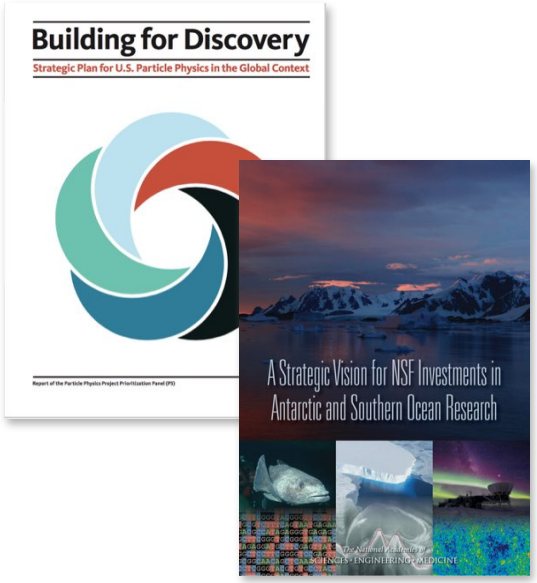

Decadal CDR

Cosmic Microwave Background
Stage 4
Concept Definition Task Force

REPORT
TO THE AAAC

CMB-S4 Science Book
First Edition

CMB-S4 Collaboration
August 1, 2016

CMB-S4 Technology Book

CMB-S4 Collaboration
Working Draft
February 27, 2017

Evolution of CMB-S4

- Evolution in **concept** of the **project**
- Evolution in **funding landscape**
- Evolution in **understanding** of the **power** of CMB-S4
  - all of these lead to an understanding that the CMB-S4 **science case** has evolved, and this needs to be reflected in (among other things), our next document.

Advertisement for Two Parallel Sessions Tomorrow

- P1-3 Extending the Science case for the Decadal CDR [Coordinator: Simone Ferraro] - 9-10am Tuesday.
  - what **is** the “extended science case”? exactly what topics does it contain (and not contain)?
- P2-3 Forecasting - the extended science case for the Decadal [Coordinators: Nick Battaglia & Colin Hill] - 10:15-11:15am Tuesday.
  - what are the science, measurement, and instrument requirements from the “extended science case”?
  - what forecasting and simulations do we need to answer this?
  - who is going to do this work for the Decadal CDR?

Advertisement for Two Parallel Sessions Tomorrow

Parallel Sessions P1-3 and P2-3

Extending the Science Case for the Decadal CDR

What? Who? When? & How?

with Simone, Colin, & Nick



Planning

E. Schaan - Halo Energetics

E. Pierpaoli - Polarized SZ

M. Alvarez - Reionization

C. Hill - tSZ

R.Datta - Sources

Forecasting

M. Alvarez - CITA sims

S. Habib - Argonne sims

Food for Thought

- All of the following have been mentioned as topics for “the CMB-S4 extended science case” (in pseudo-random order):

  - evolution of cosmic structure with CMB lensing and clusters, clusters as multi-talented cosmological probes, uniformly identifying and characterizing high-redshift clusters, cluster physics, probing the cosmic velocity field and gravity with the kSZ, characterizing the epoch of reionization with the kSZ, finding the missing baryons with tSZ and kSZ, testing star formation with high-redshift dusty galaxies, measuring dark-matter substructure with strongly lensed dusty galaxies, finding Planet Nine, finding killer asteroids, finding GRB afterglows, following up gravitational-wave events, measuring the remote quadrupole with polarized SZ, measuring baryons with polarized SZ, calibrating cosmic shear systematics with CMB lensing, constraining astrophysical feedback thus solving all problems in galaxy- and star-formation modeling, measuring baryonic effects on the matter power spectrum, constraining thermodynamic properties of the CGM, IGM, and ICM, measuring fNL and neutrino mass without sample variance by combining LSS and CMB lensing, providing cluster and source catalogs for all current and future small-FOV telescopes, everything I’ve forgotten…

EXTREMELY IMPORTANT QUESTION

- **What do we call it?**
  - I'm not joking. The CDT tried to come up with shorthand for this set of science topics and failed. It's not "clusters," it's not "large-scale structure," it's not "NSF science" (because inflation and light relics are NSF science, too), so what is it? Suggestions welcome.

See You at the Parallel Sessions Tomorrow

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