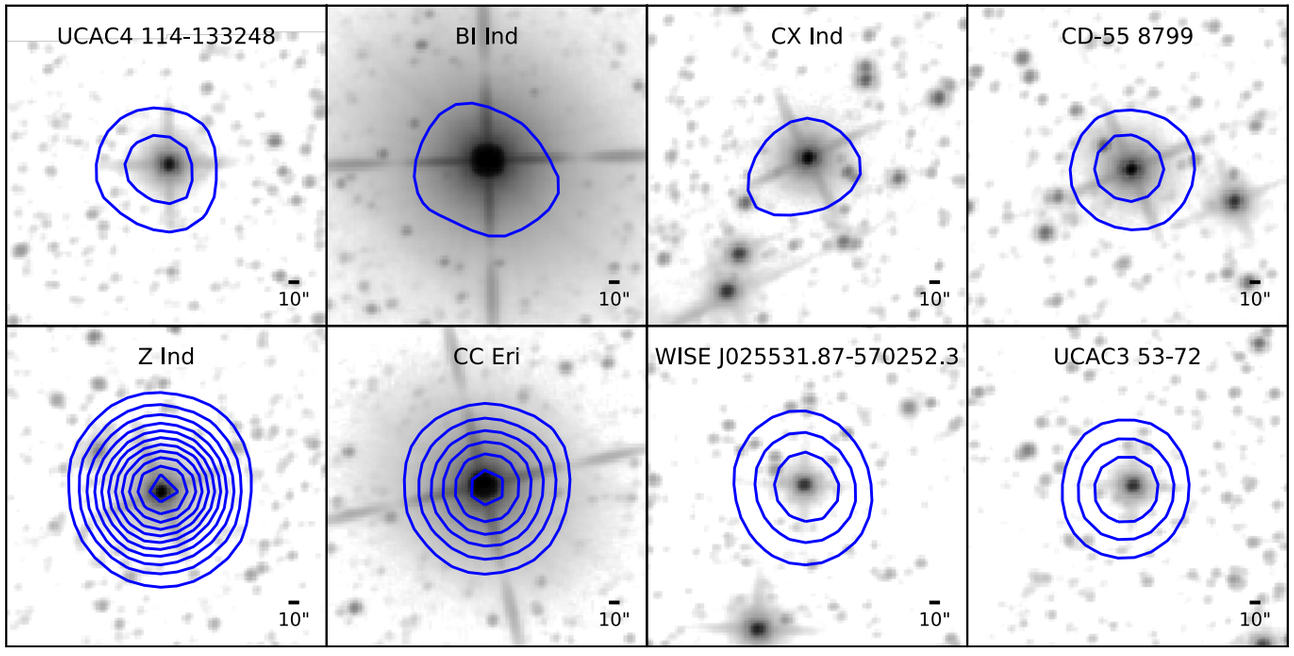
# CMB-S4
# Sources & Transients
# Working Group




Anna Ho & Joaquin Vieira

co-coordinators

CMB-S4 Spring Collaboration Meeting

12 May 2022

# Astro2020 Decadal Review

## CMB-S4

**Recommendation:** The National Science Foundation and the Department of Energy should jointly pursue the design and implementation of the next generation ground-based cosmic microwave background experiment (CMB-S4).

Particularly compelling to the survey is the fact that these observations open the opportunity for systematic **time-domain** studies in this part of the electromagnetic spectrum for the first time.

An important requirement for our strong endorsement is that the project broadly **engage astronomers beyond the traditional CMB community**. CMB-S4 will produce data sets of unprecedented sensitivity, cadence and spectral coverage that will advance general astrophysics and open discovery space opportunities for diverse scientific communities. Previous CMB experiments have not had the charge or funding to make data rapidly available and generally usable. It is essential that CMB-S4 produce transient alerts, as well as calibrated maps in all bands and on all angular scales that are openly usable and accessible on as rapid a cadence as practical. This is not necessarily at the same level of precision needed for CMB analysis. This will both maximize and justify the significant national investment in the observatory, even if it **does require some nominal level of additional funding** to accomplish.

The RMS panel views CMB-S4 as a powerful, cosmology-focused experiment that would address Astro2020 priority science questions at a level that no other concepts can. In support of the project's long- term success, the RMS panel offers the following two suggestions for its implementation. First, the panel suggests that third-generation CMB experiments aligned with CMB-S4—specifically, the SPO and the "nominal" version of the SO—be high priorities for federal support. Besides training students and postdoctoral researchers, thereby empowering them to play vital future roles in CMB-S4, these experiments are poised to help retire technical risk for CMB-S4 and usefully inform its strategies for surveying the sky and removing foreground signals. Second, **the panel views it as appropriate for an experiment at the cost scale of CMB-S4 to be more "observatory-like" in seeking broad engagement with astronomers beyond the traditional CMB community, and ensuring that (for example) plans for data management and event alerts maximize opportunities for transient science to the extent possible without sacrificing the primary cosmology goals. The panel therefore suggests that an articulated plan for engaging the broader astronomical community be a precondition for the start of CMB-S4 funding.**

(JV's highlights in bold)

# Sources & Transients: The last year of telecons

21 April 22 — “Millimeter observations of blazars” – Yannis Liodakis (and workshop planning)

02 April 22 — Workshop planning

24 March 22 — Polarization requirements discussion

24 Feb 22 — Pablo Torne — “Sub-mm observations of magnetars"

09 Feb 22 — Ben Margalit — “Modeling millimeter emission from cosmic transients"

26 Jan 22 — Working group planning and coordination

15 Dec 21 — Followup discussion from Stars Day

1 Dec 21 — Stars Day
- Tim Bastien, NRAO
- Rachel Osten, STScI
- Greg Sivakoff, U. Alberta
- Tom Maccarone, Texas Tech
- Lynn Mattheys, MIT Haystack
- Gregg Hallinan, Caltech

3 Nov 21 — Going over CMB-S4 Sources & Transients overview slides and discussion of continuum studies

20 Oct 21 — Community Needs Document & Key Projects

22 Sept 21 — Transients Science Case discussion

2 Sept 21 — Community use cases

10 Aug 21 — CMB-S4 Collab Science Workshop

22 July 21 — planning CMB-S4 Workshop Parallel sessions

8 July 21 — PDBR

10 June 21 — Clusters

# WORKSHOP: ASTROPHYSICS WITH THE CMB-S4 SURVEY

CHICAGO

APRIL 15-16, 2019

KICP

CMB-S4
Next Generation CMB Experiment

THE KAVLI FOUNDATION

THE UNIVERSITY OF CHICAGO

# WORKSHOP: ASTROPHYSICS WITH THE CMB-S4 SURVEY

## APRIL 15, 2019 - MONDAY

| | |
|---|---|
| **8:15 AM - 9:00 AM** | Breakfast |
| | **Morning Session**<br>***Chair: John Carlstrom*** |
| **9:00 AM - 9:10 AM** | **John E Carlstrom**, University of Chicago, ANL<br>*Welcome* [PDF, 0.44 MB] |
| **9:10 AM - 10:15 AM** | CMB-S4 in broader context |
| **10:15 AM - 10:35 AM** | Coffee break |
| **10:35 AM - 12:15 PM** | Galaxies, Gas & Feedback<br>Vieira, Chen, Oppenheimer |
| **12:15 PM - 1:45 PM** | Lunch |
| | **Afternoon Session**<br>***Chair: John Carlstrom*** |
| **1:45 PM - 3:15 PM** | Feedback & Galaxy Clusters<br>Barnes, Battaglia, Gladders, Bleem |
| **3:15 PM - 3:35 PM** | Coffee Break |
| **3:35 PM - 4:35 PM** | Reionization<br>Gnedin, Alvarez |
| **4:35 PM - 5:30 PM** | Discussion, wrap-up & homework |

## APRIL 16, 2019 - TUESDAY

| | |
|---|---|
| **8:00 AM - 9:00 AM** | Breakfast |
| | **Morning Session**<br>***Chair: Gilbert Holder*** |
| **9:00 AM - 10:00 AM** | CMB-S4 in broader context |
| **10:00 AM - 10:30 AM** | Solar system objects<br>Holder [summary of Penn workshop] |
| **10:30 AM - 10:45 AM** | Coffee Break |
| **10:45 AM - 12:30 PM** | Extragalactic transients & Multimessenge<br>Eftekhari, Kaplan, Madejski |
| **12:30 PM - 2:00 PM** | Lunch |
| | **Afternoon Session**<br>***Chair: Gilbert Holder*** |
| **2:00 PM - 3:30 PM** | Our Galaxy<br>Fissel, Sokolovsky, Scott |
| **3:30 PM - 3:45 PM** | Coffee break |
| **3:45 PM - 4:30 PM** | Discussion, wrap-up & homework |

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

# Astrophysics with the CMB-S4 Survey — Part II

Search this site

Home Participants Program

July 6 & 7
Hybrid — local in-person pods at UC Berkeley and U. Illinois / NCSA
Registration free, etc

Agenda:
Day 1: Transient / Variable / Time-domain Day:
A) Galactic transients
B) ExGal transients / variable
Day 2: Static Source Day:
C) ExGal (AGN / SMGs / protoclusters)
D) Galactic persistent sources

**SOC:**
Anna Ho, UC Berkeley
Tom Maccarone, Texas Tech University
Giuseppe Puglisi, Universita di Roma
Joaquin Vieira, U. Illinois / NCSA
Rachel Osten, STScI

## Home

The purpose of this workshop is to bring together leading astronomers and astrophysicists to collaborate, discuss, and plan for the rich astrophysical data set that will come from the CMB-S4 Legacy Survey, a multi-band millimeter wave survey covering roughly half the sky at unprecedented sensitivity and observing cadence. This includes the time variable sky as seen in solar system science, stellar variability, binary evolution, supernovae, tidal disruption events, gamma-ray bursts, and active galactic nuclei, as well as high-redshift star formation and studies of feedback from black holes and star formation on the intergalactic medium. This is the second in this series, the first being held at U. Chicago / KICP in April 2019.

## Event Information

July 6–7, 2022
Time TBD
Hybrid: in-person and online via Zoom

**We are currently contacting invited speakers and organizing schedule & logistics**

## CMB-S4: Sources and Transients

**Coming next:**

**—> Astrophysics Workshop II in July**

**—> Form EAB**

**—> Future telecons:**

- Forecasts for millimeter emission from core-collapse supernovae
- GRB forecasts
- VALIDATION for transients and clusters
- low-z galaxies
- solar system (& Planet 9)
- data access examples (Fermi, DES, etc)
- radio transients
- FRBs