Cosmology
Large Angular Scale Surveyor

Tobias Marriage
CMB Foregrounds for B-mode Studies
Tenerife
October 2018
Science Goal #1: Quantum Gravitational Waves (B-modes)
Science Goal #2:
Optical Depth to Reionization ($\tau$)
(E-modes)
Primordial E-modes and B-modes

Galactic Foregrounds

Signal Strength

Frequency

40 GHz  90 GHz  150 GHz  220 GHz
Survey Boundary

40 GHz

-6 µK

90 GHz

-2 µK

150 GHz

-4 µK

220 GHz

12 µK

Output Best-fit Cleaned CMB

Input

Output

-0.5 µK

0.5 µK
Inflation

The measurement is more than $r$...

$r = 0.051^{+0.004}_{-0.004}$

To the Site!
40 GHz Time Spent at Bath Temperature

- 50 mK: 85%
- 70 mK: 88%
- 100 mK: 89%

90% Dilution Refrigerator Up Time

The atmosphere is (effectively) unpolarized.
Unpolarized Atmosphere

Polarized CMB, Foregrounds Etc

Power

Frequency

Signal

Power

Frequency

Unpolarized Atmosphere

Noise
Unpolarized Atmosphere + Polarized CMB

Diagram:

- **Left Graph**:
  - Power vs. Frequency
  - Signal

- **Right Graph**:
  - Power vs. Frequency
  - Unpolarized Atmosphere
  - Noise

Telescope
Unpolarized Atmosphere

Polarized CMB, Foregrounds Etc

Signal

Polarization at Detectors

Unpolarized Atmosphere

Signal

Power

Frequency

Power

Frequency

Modulator

Telescope
Variable Delay Polarization Modulator (VPM)

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CLASS
Signal Modulation Example
1 Hz (~1 deg)
0.1 Hz (~10 deg)
<0.01 Hz (>100 deg)
The CLASS Team is working hard!

2016: Survey Start

2018: First 90 GHz Telescope Observing

40 GHz papers in preparation
See talks by Katie Harrington (Today) and Joseph Eimer (Wednesday) for new results!