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An ambient temperature monitoring system for precision measurements of CMB polarization with TES bolometers at the Simons Array

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The Simons Array (SA) is an array of three telescopes at the Atacama Desert in Chile, which are designed to observe the polarization pattern of cosmic microwave background (CMB). It is a project evolved from POLARBEAR-2. Each receiver uses 7,588 transition edge sensor bolometers cooled down to a 0.3 K base temperature. A diameter of the primary beam is 2.5 m and the field of view is 4.8 degrees. We aim to constrain the tensor-to-scalar ratio and test the inflation hypothesis. Sensitivity at large angular scales, which is crucial to the inflation study, can be improved by monitoring temperature drift in various electrical and optical elements for mitigation in analysis. In particular, temperature fluctuations of the readout system and the telescope reflectors cause excess systematic error that can compromise the low-frequency stability. In this presentation, we first present how the temperature fluctuation of the warm components affects the detector signal. We then present the design and performance of the temperature monitoring system recently developed and deployed at the SA observation site.

Less than 5 years of experience since completion of Ph.D

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Student (Ph.D., M.Sc. or B.Sc.)

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