Contribution ID: **420** Type: **Oral**

CMB Detector Technology and the South Pole Telescope

Friday 6 June 2014 11:40 (20 minutes)

Advances in CMB instrumentation have opened a new era for studying fundamental physics through precision measurements of the Cosmic Microwave Background (CMB). CMB measurements are critical for our understanding of cosmology and provides a unique probe of Dark Energy, the Cosmic Neutrino Background, and the physics of inflation. The South Pole Telescope (SPT) collaboration has been actively developing new CMB detectors and has implemented focal plane arrays using state-of-the-art Transition Edge Sensor (TES) technology to enable new CMB science. Results include the first discovery of unknown galaxy clusters using the Sunyaev-Zeldovich effect and the first detection of the CMB B-mode polarization signal from gravitational lensing. In this talk, I will give an overview of the technological developments for the SPT science program and will illustrate how innovation in instrumentation has enabled new science. I will discuss the technical challenges limiting CMB experiments and describe how the ongoing SPT detector R&D program aims to overcome these limitations.

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Session Classification: II.b Astro & Space

Track Classification: Experiments: 2b) Astrophysics and Space Instrumentation