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Instrumentation and Polar Infrastructure Development Supporting the BICEP Array Telescope

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Measurement of the polarized Cosmic Microwave Background (CMB) over the past few decades has enabled precision probes of the evolutionary history, composition, and dynamics of the primordial Universe. Next-generation CMB experiments will extend this scientific reach, allowing for tests of the inflationary theory of the early Universe, driven through constraints on the tensor-scalar ratio “ r ” via the search for primordial B-mode polarization. The BICEP Array telescope program is targeting observation of B-modes at large angular scales, building on constraints already placed by the BICEP/Keck program. BICEP Array comprises four BICEP3-class receivers which will operate in conjunction with BICEP3 at 30/40, 95, 150, and 220/270 GHz. The 30/40 GHz receiver was deployed to the Amundsen-Scott South Pole Station during the 2019-2020 Austral summer. With all receivers deployed, BICEP Array will measure primordial gravitational waves to a precision of $\sigma(r)$ between 0.002 and 0.004 after a full three years of observations, with over 30,000 detectors on the sky. This talk will provide an overview of the instrumentation design of the BICEP Array telescope, and infrastructure in development that will enable a sustainable future for BICEP Array and next-generation CMB science at the South Pole.

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