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Status and Science Goals of the Simons Array

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The Simons Array (SA) experiment is a set of three millimeter-wave telescopes designed for polarimetry, including measurements of the polarization of the cosmic microwave background (CMB) anisotropies, from an altitude of 5200 m in the Atacama Desert in Chile. Each of the three telescopes features a receiver with sufficient stability to study large angular scales, sufficient resolution to recover the polarization signal generated by gravitational lensing of the CMB, and sufficient sensitivity to further constrain the possible polarization anisotropy signal sourced by primordial tensor perturbations. We achieve these requirements with achromatic, continuously-rotating half-wave plates to modulate incoming polarization, a 3 m effective aperture for the off-axis Gregorian telescopes, and high-density focal-plane arrays with thousands of multichroic pixels. These technologies build on the heritage of the POLARBEAR telescope and receiver. The receivers on the first two telescopes, POLARBEAR 2-a (PB-2a) and PB-2b, will observe the sky in bands centered at 90 GHz and 150 GHz. The final receiver, PB-2c, will constrain dust foreground signals by observing in bands centered at 220 GHz and 270 GHz.

In this talk, I will discuss the scientific impact of future SA observations, including their sensitivity to primordial tensor perturbations, the sum of the neutrino masses, and sources of cosmic birefringence. To add to discussion of these goals, specifically the expected sensitivity of SA at large angular scales when using a half-wave plate, I will briefly discuss the results of a study of POLARBEAR data at large angular scales. I will then present the status of all three SA receivers, including early data recorded in the field with PB-2a, results from laboratory commissioning of the PB-2b receiver, and updates on the performance of PB-2c.

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