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Mapping the CMB at High-Frequency with Kinetic Inductance Detectors on the South Pole Telescope

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Microwave kinetic inductance detectors provide a scalable platform for mapping the cosmic microwave background, especially at frequencies above 150 GHz, where arrays of transition-edge sensors cannot be made densely enough to efficiently sample telescope focal planes. Arcminute-resolution CMB observations at these higher frequencies can fill a unique niche in cosmology, yielding high-fidelity foreground-cleaned measurements of the kinetic Sunyaev-Zeldovich effect, improved constraints on the optical depth to reionization and thus the neutrino mass, and an initial detection of Rayleigh scattering of the CMB at recombination. SPT-4 is a new experiment that aims to make these cosmological measurements by leveraging high-density MKID focal planes and next-generation RF readout deployed on the South Pole Telescope. I will describe the science goals of SPT-4 and the key technology developments that enable its powerful yet compact design.

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