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On-sky demonstration of the SPT-3G frequency domain multiplexed readout

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Frequency domain multiplexing (fMux) is an established technique for the readout of large arrays of transition edge sensor (TES) bolometers. Each TES in a multiplexing module has a unique AC voltage bias that is selected from a combined waveform by a resonant filter. This scheme enables the operation and readout of multiple bolometers on a single pair of wires, reducing thermal loading onto sub-Kelvin thermal stages. The current receiver on the South Pole Telescope, SPT-3G, uses an 68x fMux system to operate its large-format camera of ~16,000 TES bolometers. SPT-3G is currently in its second year of survey observations of the cosmic microwave background. We present here the successful implementation and performance of the SPT-3G readout as measured in the fully integrated on-sky configuration. Measurements of the instrumental noise demonstrate that SPT-3G is operating in the photon-noise dominated regime.

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

N

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

N

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