

APEX-SZ: EXPERIMENTAL DESIGN AND INSTRUMENT STATUS

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The APEX-SZ experiment is a survey instrument designed to conduct a mass-limited survey of galaxy clusters via the Sunyaev-Zel'dovich effect at millimeter wavelengths. The instrument consists of a 320 element Transition Edge Sensor (TES) bolometer array camera operating initially at 2 mm wavelength. It will be deployed on the Atacama pathfinder experiment (APEX) telescope, a 12-m submm telescope currently undergoing commissioning tests on the Atacama plateau in Chile. The APEX-SZ survey instrument is scheduled to see first light in early 2005. In roughly five months of observation spread over several years, we will be able to image 100–200 square degrees of sky to $\sim 10\mu\text{K}$ with one arcminute resolution.

The survey will achieve this unprecedented sensitivity by utilizing the full 0.38 degree diameter field of view of APEX telescope. The tertiary optics for the APEX-SZ system have been designed to couple the large throughput to a small 13-cm diameter focal plane. The APEX-SZ focal plane detectors are Si_3N_4 spiderweb TES bolometers with backshort reflectors, monolithically fabricated in six pie-shaped wedges, and optically coupled via an array of conical horn feeds. The focal plane will be cooled to an operating temperature of 250 mK with a mechanical pulse tube cooler coupled with a three stage $^4\text{He}/^3\text{He}/^3\text{He}$ sorption refrigerator. We are also developing a shunt feedback SQUID amplifier to read out the voltage-biased bolometers. The bolometers are AC biased at frequencies up to several hundred kHz, well above the frequency of dewar microphonics. APEX-SZ will use individual readouts for every bolometer, although the hardware is upgradeable to the frequency domain multiplexing currently under development at Berkeley.

Both experimental design and instrument status will be discussed.

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