BROADBAND DIRECT DETECTION SUBMILLIMETER SPECTROMETER WITH MULTIPLEXED SUPERCONDUCTING TRANSITION EDGE THERMOMETER BOLOMETERS

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We present performance results based on the first astronomical use of multiplexed superconducting bolometers as direct detectors (i.e., with cold electrons) for spectoscopy. The Fabry-Perot Interferometer Bolometer Research Experiment (FIBRE) is a broadband submillimeter spectrometer for the Caltech Submillimeter Observatory (CSO). FIBRE's detectors are superconducting transition edge sensor (TES) bolometers read out by a SQUID multiplexer. The Fabry-Perot uses a low resolution grating to order sort the incoming light. A linear bolometer array consisting of 16 elements detects this dispersed light, capturing 5 orders simultaneously from one position on the sky. With tuning of the Fabry-Perot over one free spectral range, a spectrum covering $\Delta\lambda/\lambda = 1/7$ at a resolution of $\delta\lambda/\lambda \sim 1/1200$ can be acquired. This spectral resolution is sufficient to resolve Doppler-broadened line emission from external galaxies. FIBRE has been operated in the 350 μm (850 GHz) band. These bands cover line emission from the important star formation tracers neutral carbon [CI] and carbon monoxide (CO).