

A FULLY-SAMPLED PLANAR SUPERCONDUCTING BOLOMETER ARRAY FOR THE GREEN BANK TELESCOPE

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We describe a close-packed, two-dimensional imaging detector system for operation at 90 GHz (3.3 mm) for the 100 m Green Bank Telescope (GBT), being built by the University of Pennsylvania, NASA/GSFC, and NRAO. This system will provide high sensitivity ($\sim 500 \mu\text{Jy}$ in 1s) rapid imaging ($15' \times 15'$ to $250 \mu\text{Jy}$ in 1 hr) at the world's largest steerable telescope. The heart of this camera is an 8×8 close-packed, Nyquist-sampled array of superconducting transition edge sensor (TES) bolometers. We have designed and are producing a functional superconducting bolometer array system using a monolithic planar architecture and high-speed multiplexed readout electronics. With an NEP of $\sim 2 \times 10^{-17} \text{ W}/\sqrt{\text{Hz}}$, the TES bolometers will provide fast, linear, sensitive response for high performance imaging. The detectors are read out by an 8×8 time domain SQUID multiplexer, including dark SQUID channels for drift signal reduction. A digital/analog electronics system has been designed to enable high speed control and readout of the SQUID multiplexer. The detector and first stages of SQUID amplification are cooled to $\sim 300 \text{ mK}$ by means of a compact $^3\text{He}/^4\text{He}$ two-stage sorption refrigerator coupled to a pulse tube cooler, for a cryogen-free cooling system. The cryogenic system has been demonstrated to be robust, and is capable of cycling autonomously, providing $15 \mu\text{W}$ of cooling below 286 mK with a hold time over 70 h. Although modest in size, a combination of the collecting area of the GBT and the low noise of the TES detectors will make this receiver one of the most sensitive of its kind. First light for this instrument on the GBT is expected in the coming winter.

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