

TES Bolometers with High-Frequency Readout Circuit

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Abstract—The superconductor bolometers based on transition-edge sensing (TES) are nowadays of active interest, since their great potential for ultra-low-noise operation, also in imaging arrays. The small-size TES's are low-impedance devices (approx. 1-10 Ohm), so they are usually matched with SQUID's, which serve as ultra-low-noise current amplifiers. The method of frequency multiplexing has, in theory, a great potential for bolometer arrays. However, due to restricted bandwidth of SQUID's, there is a limit for such frequency division at relatively low frequencies. For this reason quite a number of SQUID's have to serve a large array of detectors that lead to both system complexity/cost and, potentially, to limited calibration accuracy and stability due to variations in regimes/parameters of the multiple SQUID's.

To improve the frequency multiplexing in TES arrays to about factor of 10 along with its easier operation, it is suggested using not SQUID's, but high-frequency low-noise amplifiers in the range of 1-10 GHz. This could result in only one amplifier (only one or two coaxial cables) serves for about 1000 TES detectors of an imaging array. The details of the new concept, which is somewhat similar to MKID's operation, will be presented along with comparison (pro's and con's) to other devices, which can use such high-frequency multiplexing.