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The ECHo superconducting detectors and DAQ-electronics: From proof-of-concept to full-scale system

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Superconducting sensors offer highest sensitivity and enable more precise and novel measurements. By utilizing magnetic microcalorimeters (MMCs), many research fields will experience advancements, such as improved energy resolution in particle physics. The ECHo experiment aims to investigate the mass of the electron neutrino using large-scale MMC-based detector arrays. For readout of hundreds of MMCs the interface to the cryogenic environment is challenging and the thermal transfer from the cables must be minimized. A proposed readout concept based on microwave SQUID multiplexing is able to read out hundreds of sensors through a single cable. The concept for the processing steps and a prototype DAQ electronics have been developed. Following successful testing with 16 channels, the system is now scaled up for its operation in the ECHo-100k experiment. Here, 800 sensors within a bandwidth of 4 to 8 GHz must be read out. This presentation will provide an overview of the current state of the general DAQ electronics for superconducting sensors and describe the hardware, firmware, and software necessary to prepare the system for use in the ECHo experiment.

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