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Characterization of Microwave Multiplexers for the RICOCHET Experiment

venerdì 21 giugno 2024 17:30 (2 ore)

The RICOCHET experiment measures the spectrum of coherent elastic neutrino-nuclear scattering (CEνNS) of reactor neutrinos to search for physics beyond the Standard Model. In RICOCHET's Q-Array detector, recoil energy deposited in an array of superconducting crystals is transferred to transition-edge sensors (TES) that convert temperature changes into current signals, which then get amplified and read out through a microwave multiplexer. Compared to more traditional multiplexing techniques such as time and code division multiplexing, a frequency-division multiplexer made with high Q superconducting resonators allows for faster pulse response, higher multiplexing factor, and lower power dissipation.

Together with Lincoln Laboratory, we designed, fabricated, and characterized aluminum microwave multiplexers in 6 and 18 channels configurations. The TES current signals couple inductively into RF SQUIDs that modulate the resonant frequency of the superconducting resonators, which all connect to a common RF feedline for signal readout. In this poster, we present some characterization results of this device, including sensitivity measurements, circuit parameter extraction, and the power dependence of the device behavior.

Poster prize

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