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Development of a Cryostat to Characterize Nano-scale Superconducting Quantum Interference Devices MATTHEW LONGO, MITCHELL MATHENY, JASMINE KNUDSEN, University of Colorado Denver — We have designed and constructed a low-noise vacuum cryostat to be used for the characterization of nano-scale superconducting quantum interference devices (SQUIDs). Such devices are very sensitive to magnetic fields and can measure changes in flux on the order of a single electron magnetic moment. As a part of the design process, we calculated the separation required between the cryogenic preamplifier and superconducting magnet, including a high-permeability magnetic shield, using a finite-element model of the apparatus. The cryostat comprises a vacuum cross at room temperature for filtered DC and shielded RF electrical connections, a thin-wall stainless steel support tube, a taper-sealed cryogenic vacuum can, and internal mechanical support and wiring for the nanoSQUID. The Dewar is modified with a room-temperature flange with a sliding seal for the cryostat. The flange supports the superconducting 3 Tesla magnet and thermometry wiring. Upon completion of the cryostat fabrication and Dewar modifications, operation of the nanoSQUIDs as transported from our collaborator's laboratory in Israel will be confirmed, as the lead forming the SQUID is sensitive to oxidation and the SQUIDs must be shipped in a vacuum container. After operation of the nanoSQUIDs is confirmed, the primary work of characterizing their high-speed properties will begin. This will include looking at the measurement of relaxation oscillations at high bandwidth in comparison to the theoretical predictions of the current model.

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