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Characterizing aluminum nanobridge Josephson junctions for molecular magnetometry[1] R. VIJAY, E.M. LEVENSON-FALK, I. SIDDIQI, QUANTUM NANOELECTRONICS LABORATORY, UC BERKELEY TEAM — NanoSQUIDs, which consist of a superconducting loop interrupted by two submicron weak link Josephson junctions,are commonly used for measuring nanomagnets. The weak links enhance flux coupling, and also reduce the junction area, thereby permitting the application of large in-plane magnetic fields to tune the energy level structure of the nanomagnet. However, these type of SQUIDs have lower flux sensitivity than conventional tunnel junction based devices, mainly on account of reduced nonlinearity in their current-phase relation. We explore different weak link junction geometries to optimize flux sensitivity. In particular, we have fabricated 30 nm wide and 50-400 nm long aluminum nanobridges contacted with 2D and 3D banks. We present I-V characteristics and critical current modulation data for both designs. The 3D nanoSQUIDs show enhanced flux modulation of the critical current. With 3D banks the phase drop across the junction is mainly confined to the nanobridge, thus enhancing nonlinearity. When combined with dispersive microwave techniques, these nanoSQUIDs can be used for high speed, low backaction measurements.

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