

High Sensitivity Magnetometers and Gradiometers Based on Nano-Josephson Junction SQUIDS

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We are developing high sensitivity magnetometers and gradiometers which utilize direct-write, high temperature superconducting (HTS) nano-Josephson junction SQUIDS fabricated with direct-write helium focused ion beam (FIB). Here, we will capitalize on our earlier results showing FIB SQUIDS with much lower flux noise than typical HTS SQUIDS. We investigate the effects of non-uniformity and dimension on the SQUID linearity, dynamic range and noise. We simulate, design, fabricate and evaluate magnetometer and gradiometer circuits integrating a helium FIB HTS SQUID and a flux concentrator to substantially increase sensitivity. Designs comprising both planar washer type direct-inject and flexible input coils are simulated, designed and evaluated. If successful, this will lead to high-sensitivity instrumentation with superior performance and small size, weight, and power (SWAP).

This work was supported by Air Force SBIR via contract # FA9550-17-P-0019.