Lei Chen's Talk/ Abstract

Title: The development of 3D Nb and NbN nano-SQUIDs

Abstract: The SQUID miniaturized into nanoscale is promising in the inductive detection of a single electron spin. A nano-SQUID with a strong spin coupling coefficient, a low flux noise, and a wide working magnetic field range is highly desired in a single spin resonance measurement. Nano-SQUIDs with nano-bridge junctions excel in a high working field range and a direct coupling from spins to the bridge. However, the common planar structure of nano-SQUID is known for problems such as a shallow flux modulation depth and a readout-troublesome hysteresis in the current-voltage curves. Here, we developed a fabrication process for a 3D Nb nano-SQUIDs with nano-bridge junctions. The characterization of the device shows an up to 73% modulation depth with a reversible current-voltage curve. Owing to the large modulation depth, the measured flux noise is as low as 0.34 μΦ0/Hz1/2. The working field range of the SQUID is more than 0.5 T. We believe that the 3D Nb nano-SQUIDs provides a promising step towards the single-spin inductive detection.