Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

3D nano-SQUIDs with nano-constriction junctions. HAO WANG, XIAOYU LIU, LONG WU, LEI CHEN, ZHEN WANG, Shanghai Institute of Microsystem And Information Technology (SIMIT), Chinese Academy of Sciences, China, SHANGHAI INSTITUTE OF MICROSYSTEM AND INFORMATION TECHNOLOGY (SIMIT) TEAM, UNIVERSITY OF CHINESE ACADEMY OF SCIENCES (CAS) TEAM — Nano-SQUIDs (superconducting quantum interference devices) significantly shrink the SQUID washer by replacing the traditional tunneling junctions with the nano-constriction junctions. In such a design, the spin sensitivity of nano-SQUIDs, which is proportional to the radius of SQUID washer, are greatly improved. Additionally, the nano-SQUID with nano-constriction junctions are also excel in a high working field range, a direct coupling from spins to the nano-constrictions. However, current planar nano-SQUIDs made of Nb and NbN showed relatively a shallow flux modulation depth. Here, we developed a fabrication method for nano-SQUIDs based on Nb and NbN by replacing the planar design with a 3D structure. We studied the main parameters limited the flux modulation depth of the Nb and NbN nanoSQUID. As a result, we made Nb and NbN nano-SQUIDs with a reversible current-voltage curve and flux modulation depth above 60% and 35% respectively. The working field range and flux noise of the Nb nanoSQUID is 0.5 T and 0.34 $\mu\Phi 0\sqrt{\text{Hz}}$.

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Date submitted: 06 Nov 2016 Electronic form version 1.4