

Quantum interference effect in laser patterned BSCCO thick film

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Abstract. DC SQUID structure consisting of two microbridges and a circular hole was patterned on BSCCO thick film using laser ablation technique. Quantum interference effects on these patterned films were studied at fixed biasing current by applying changing magnetic field. The SQUID with $100\ \mu\text{m} \times 70\ \mu\text{m}$ microbridges showed noisy and irregular V-B behaviour whereas the SQUID containing smaller microbridges showed better V-B characteristic. Temperature dependence of the I-V and V-B characteristics of the SQUID is also reported.

Keywords. High T_c superconductors; SQUID; Bi-Sr-Ca-Cu-O superconductor; laser patterning.

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High T_c superconductors are granular in nature and various superconducting grains are connected with weak links which behave as Josephson junctions. Due to the presence of grain boundary weak links, these high T_c superconductors show Josephson effects in bulk (Gupta *et al* 1987; Meng *et al* 1987; Tomar *et al* 1987; Kataria *et al* 1988) as well as in thin films (Tanabe *et al* 1987; Cui *et al* 1987; Yamashita *et al* 1989). There are many reports on the observation of quantum interference effect due to grain boundary weak links in YBCO bulk (Robbes *et al* 1988; Kataria *et al* 1989), thick films (Lin *et al* 1989; Reddy *et al* 1989) and thin films (Koch *et al* 1987; Nakane *et al* 1987; Takeuchi *et al* 1988; Katoh *et al* 1988; Matsuda and Kuriki 1988; Irie *et al* 1989). In contrast to so many reports on quantum interference effect in YBCO there are only a few on BSCCO. Pegrum *et al* (1989) observed rf SQUID behaviour in 1112 BSCCO bulk at 4.2 K. Gergis *et al* (1988) have reported the observation of dc SQUID behaviour in BSCCO thin films up to 30 K. No work has been reported so far on BSCCO thick film dc SQUIDs.

For observing the quantum interference behaviour in high T_c superconducting film, SQUID geometry consisting of two superconducting microbridges separated by one circular hole is carved on the film. Two microbridges act as two Josephson junctions whereas the circular hole forms the superconducting ring. The diameter of the hole decides the inductance of the superconducting loop and thus the energy sensitivity of the SQUID. Gergis *et al* (1988) have used non aqueous photolithographic process and ion beam milling for fabricating the SQUID structure on the BSCCO film. Conventional photolithographic technique of patterning is a wet technique and it may lead to a deterioration in T_c of the BSCCO films after