

Performance of YBaCuO thick film rf SQUIDs at 77 K

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Abstract. RF SQUID behaviour has been observed at 77 K in YBaCuO thick films prepared by screen printing technique. A hole shunted with a microbridge type of geometry is patterned manually for observing rf SQUID behaviour. Flux noise spectrum is also studied and it is found to depend on the quality of the film. The spectral density of the flux noise in the white noise region is $1.7 \times 10^{-3} \Phi_0/\sqrt{\text{Hz}}$ at 77 K.

Keywords. rf SQUID; thick film; high temperature superconductor.

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There are many reports on the observation of quantum interference behaviour in high T_c superconductors. Both dc SQUID (Koch *et al* 1987; Nakane *et al* 1987; Sugishita *et al* 1987; de Waele *et al* 1987; Katoh *et al* 1988; Takeuchi *et al* 1988; Arora *et al* 1989; Irie *et al* 1989; Kataria *et al* 1989; Reddy *et al* 1989) and rf SQUID (Pegrum *et al* 1987; Zimmerman *et al* 1987; Harrop *et al* 1988 a, b; Tichy *et al* 1988; Zavaritsky *et al* 1988; Bobrakov *et al* 1989; Zhang *et al* 1989; Likhachev *et al* 1990; Tinchev and Hinken 1990; Khare *et al* 1990) effects have been observed in YBaCuO superconductor. Observation of rf SQUID effect requires one Josephson junction with a superconducting ring whereas observation of dc SQUID effect requires two similar types of Josephson junctions joined with a superconducting ring. Quantum interference effect observed in high T_c superconductors is due to grain boundary weak link which acts as a Josephson junction. The property of these grain boundary weak links is very much unpredictable. Thus realization of two identical grain boundary weak links for dc SQUID in high T_c superconductor is very difficult whereas it is always easy to get one weak link with a superconducting ring for rf SQUID effect. Moreover observation of rf SQUID effect does not require any direct contact with the high T_c material as it is required for dc SQUID effect, thus the problem of contact resistance does not come into picture. Most of the studies reported on rf SQUID behaviour in high T_c material are on bulk YBaCuO either in a small piece of low density YBaCuO pellet (Pegrum *et al* 1987; Tichy *et al* 1988; Khare *et al* 1990) or in two-hole and one-hole configurations (Harrop *et al* 1988a, b; Zavaritsky *et al* 1988; Bobrakov *et al* 1989; Zhang *et al* 1989; Likhachev *et al* 1990; Tinchev and Hinken 1990) made from bulk ceramic with a microbridge as a weak link or two-hole geometry with break junction as a weak link (Zimmerman *et al* 1987). The potentiality of one-hole bulk rf SQUID in measuring the magnetic field of heart has already been demonstrated (Likhachev *et al* 1990). Contrary to so much effort in bulk rf SQUID