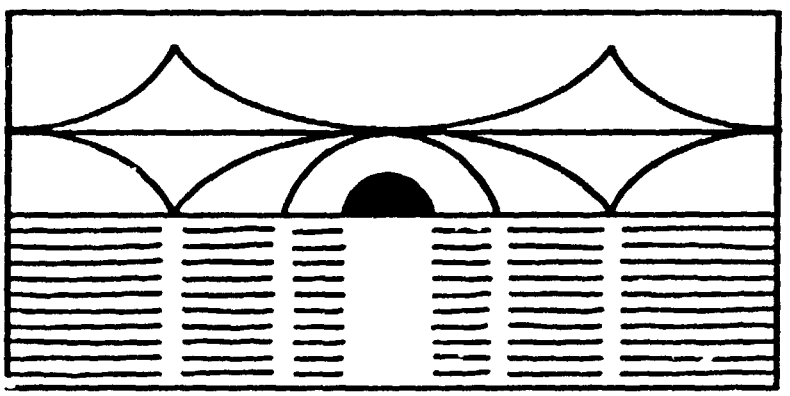
RISØ

Risø-R-628(EN)

Proceedings of the Joint Nordic Spring Meeting '92

Edited by Per-Anker Lindgård

JOINT NORDIC SPRING MEETING



7-10 MAY 1992
Nyborg Strand, Denmark

Risø National Laboratory, Roskilde, Denmark
May 1992

CISu2

SQUIDs

J. Flokstra

University of Twente, Faculty of Applied Physics, P.O.Box 217, 7500 AE Enschede, The Netherlands

The Superconducting QUantum Interference Device has proven to be a very successful tool for sensing very small signals. For example, the very weak (down to 10 fT) magnetic fields, originating from human brains activity (spontaneous or evoked), are presently detected by multichannel neuromagnetometers with low T_c dc SQUIDs. These sensors are often built with the favourable Nb/Al,AlO_x/Nb Josephson tunnel junctions, that are resistively shunted for eliminating the hysteretic behaviour. Noise levels are typically 10^{-6} $\phi_0/\sqrt{Hz}$ and the 1/f-noise onset is below 1 Hz. Further reduction of the 1/f-noise can be obtained by applying adequate modulation techniques. Design criteria for SQUIDs, properties of Nb/Al,AlO_x/Nb tunnel junctions, noise characteristics and improved SQUID read-out will be discussed.

High T_c dc SQUIDs differ in several aspects from the low T_c version. The higher operation temperature (77 K) has consequences for the various SQUID design parameters. The junctions are of SNS-type and may be of different origin. Ramp-type YBaCuO/(PrBaCuO)YBaCuO junctions and grain boundary junctions on bicrystal substrates or templates will be treated. Attention will be paid to the noise properties (white noise and 1/f noise) of the SQUIDs.

Two applications of high T_c SQUIDs will be discussed. The first is a small system for magneto-cardiography. The second application is a superconducting gravity gradiometer, being developed in a combined effort by Danish, Swedish and Dutch research groups.