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PROGRAMME
Technical sessions
Abstracts
Exhibition
D2.1-04

Microwave controlled Josephson junctions

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The possibility of modulating an SNS Josephson junction by nonequilibrium effects in the normal metal film caused by microwave irradiation is studied theoretically in the frame of microscopic theory. It is supposed that the structure has a four terminal cross geometry with two normal and two superconducting electrodes. It is shown that a flow of microwave current across the normal terminals essentially modifies the form of the electron energy distribution function in the N film making it non-Fermi like. This results in variations of the critical current Ic of the structure, peripheral to microwave current direction. The dependencies of Ic upon signal amplitude and frequency are calculated numerically. The possibility of using this structure for detection of microwave irradiation is discussed.

D2.1-05

Fast Pulsed Device for Large Critical Current Measurements

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We describe an equipment for the measurement of pulsed transport critical currents in superconducting materials having a critical current of tens or hundreds of amperes. It is based on the appliance of an electrical current for a very short period of time, rapid enough to preserve the integrity of the current leads and minimize Joule effect. Power is applied to the wire-sample ensemble and the voltage drop is measured within seconds, with a resolution of the order of 10 nV. The hardware is composed of three parts: the current pulse generator, a low noise-quick response voltage amplifier and a PC with a DAC-ADC card. The data acquisition is achieved via an Assembler program.

D2.1-06

Software package for magnetic field, currents and inductance calculation

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Recently software package 3D-MLSI was developed for inductance calculation in multilayer superconducting integrated circuits. The key advantages of 3D-MLSI are: new mathematical model which takes into account 3D distribution of magnetic field, user interface compatible with the Cadence and ACAD design tools. The program is the most applicable in case of technology when both kinetic and magnetic inductances are important. The new version of the program include improved current visualization, effective inductance calculation for holes containing zero fluxoids and automatic generation of all possible terminal-to-terminal inductances for the layout. In the last case the output is compatible with circuit simulators. It is also possible to calculate currents induced by external magnetic field. The results for transformers and currents in sheets with holes are presented.

D2.1-07

Dynamics of some pl - junction interferometers

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The pl-junction superconducting circuit dynamics was studied by means of numerical simulation technique. Special attention was paid to the dynamics of superconducting quantum interferometers, containing the pl-junctions, which can act as phase "qubits" – the basic elements of a quantum computer. Experimental results for dc HTS interferometer, containing "0" and "p/2" junctions, are reported and discussed.

Parallel arrays consisting of Josephson junctions of both "0" and "p" type were also studied numerically, the results were compared with the experimental I-V curves for bicrystal high-Tc Josephson junctions. The array dynamics and I-V characteristics are discussed.

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D2.1-08

HTS scanning SQUID microscope with high spatial resolution for room temperature samples

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A HTS scanning SQUID microscope for imaging samples at room temperature and atmospheric pressure has been developed. A HTS SQUID combined with a flux-guide made of soft magnetic material is used as a sensor that allows magnetic imaging of warm samples with spatial resolution close to 100 micrometers. Magnetic images of a test current coil and simple magnetic structure measured by the developed microscope and by a high-resolution microscope with liquid-nitrogen cooled sample, having a bare SQUID as a sensor, are compared with results of a numerical modeling. The influence of the flux-guide on the image details has been studied.

D2.1-09

Different multilayer configurations in light-sensitive tunnel junctions

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Light-sensitive semiconducting films as barrier are a feasible tool to modify the tunneling behavior of superconducting junctions during the experiments. II-VI compounds have been demonstrated to be suitable to such a purpose, their fabrication procedure being compatible with all refractory Josephson junction technology.

Experiments performed on light-sensitive Josephson tunnel junctions have shown the relevant role of the metal/semiconductor interfaces in determining their transport properties. Different kind of all refractory NiW/Ni junctions have been fabricated involving CdS thin film in a sandwich-type structure. Semiconducting layer with a thickness up to