

Microfabrication of magnetic structures for on-chip magnetic field precise distribution

Background: The most sensitive detectors of signals between 100 GHz and about 1THz are Superconductor-Insulator-Superconductor (SIS) tunnel devices. SIS are therefore the main detector used in radio-astronomy heterodyne receivers. In order to perform optimally, the SIS detectors should be subjected to a constant magnetic field, which amplitude and orientation should be accurately controlled.

In modern receivers, the magnetic field is generated inside the receiver using coils and guided using leads made of magnetic materials to the vicinity of the SIS detectors. The leads are usually fabricated by traditional mechanical machining (milling) and hence cannot reach too close to the detector.

Thesis project: With this thesis, we propose for students to investigate a better way to control the magnetic field applied to THz sensor, using electroplating of magnetic materials. The electroplating of magnetic materials would allow a direct integration of the leads to the detector circuits and make possible micrometric control of the position and size of the magnetic leads as well as making possible their integration of the detector chip very close to the SIS detector.

The master thesis is divided into four different stages:

- Literature survey
- Development of a plating process
- Microfabrication of prototypes
- Characterisation of prototypes

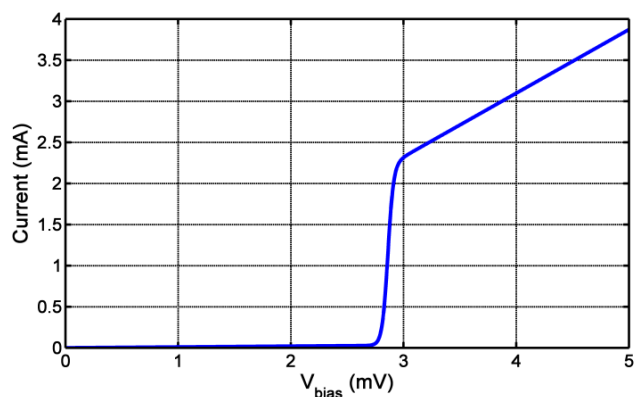


Fig.1: SIS junction IVC, when appropriate magnetic field applied

Prerequisites

Basic knowledge in electromagnetics and material Science.

Interest and understanding of microfabrication techniques.

Course in superconductivity, low temperature physics, or THz electronics are not required, but good to have.

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