Experimental report

04/01/2021

Proposal: 5-31-2748 **Council:** 4/2020

Title: Self Organisation of Mixed Superconducting States under the Application of a Current

Research area: Physics

This proposal is a continuation of TEST-568

Main proposer: Xaver BREMS

Experimental team: Robert CUBITT
Xaver BREMS
Sebastian MUEHLBAUER

Local contacts: Robert CUBITT

Samples: Nb

Instrument	Requested days	Allocated days	From	To
D33	5	2	14/09/2020	16/09/2020

Abstract:

The intermediate mixed state (IMS) in a superconductor is found between complete magnetic flux expulsion (Meissner state) and the penetration of an array of supercurrent vortices (mixed state). In Niobium we find, due to a rare attractive interaction between vortices, a coincidence of these two phases separated on the micron scale. Bitter decoration of pure Nb samples shows both laminar and tubular structure of the IMS as also seen in the equivalent intermediate state of type-I superconductors. An applied current was shown to transform between these intermediate state patterns in a type-I superconductor. We want to study the self organisation of mixed superconducting states under the application of a current in the type-II superconductor Nb. In the EASY-568 beamtime on D33 we were for the first time able to investigate the IMS in a sample in the state of flux-flow. In this continuation study we want to increase the resolution in the low-q regime of the anisotropic scattering around the masked direct beam due to the reorganization of the IMS under the influence of the current.

Exprimental Report 5-31-2748 R. Cubitt

We have established that application of current in the intermediate mixed state of Nb results in a self organization of superconducting and non-superconducting areas of the sample as shown in the anisotropy of the small angle scattering from the boundaries of the two regions.

The experiment was a success. A paper is in progress.