Experimental report

13/09/2018

Proposal: 5-41-916 **Council:** 4/2017

Title: Distortion of the Flux Line Lattice caused by spin triplet pairing intopological superconductor Nb0.25Bi2Se3 measured with SANS

Research area: Physics

This proposal is a new proposal

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Samples: Nb0.25Bi2Se3

Instrument	Requested days	Allocated days	From	To
D33	6	3	03/04/2018	06/04/2018

Abstract:

Topological superconductors, in analogy with topological insulators, give the possibility to study new kinds of electronic states that could be possibly exploited in spintronic applications and quantum computing. One of the recent features discovered on type II topological superconductors is a spin rotational symmetry braking which is interpreted as evidence of electronic states where Cooper-pair are in an odd-parity triplet configuration, thus a sign of unconventional superconductivity. These spin triplet pairs produce a magnetic field, and in this proposal, we decided to study the changes that this field produces on the flux lattice line (FLL) of the topological super conductor Nb0.25Bi2Se3, by means of Small Angle Neutron Scattering.

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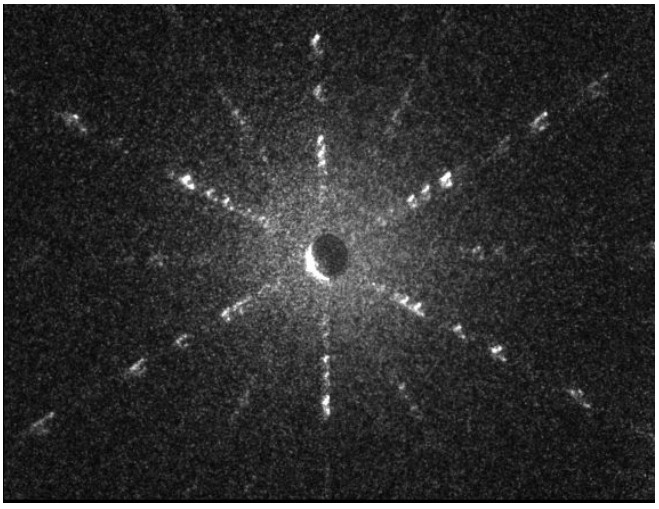
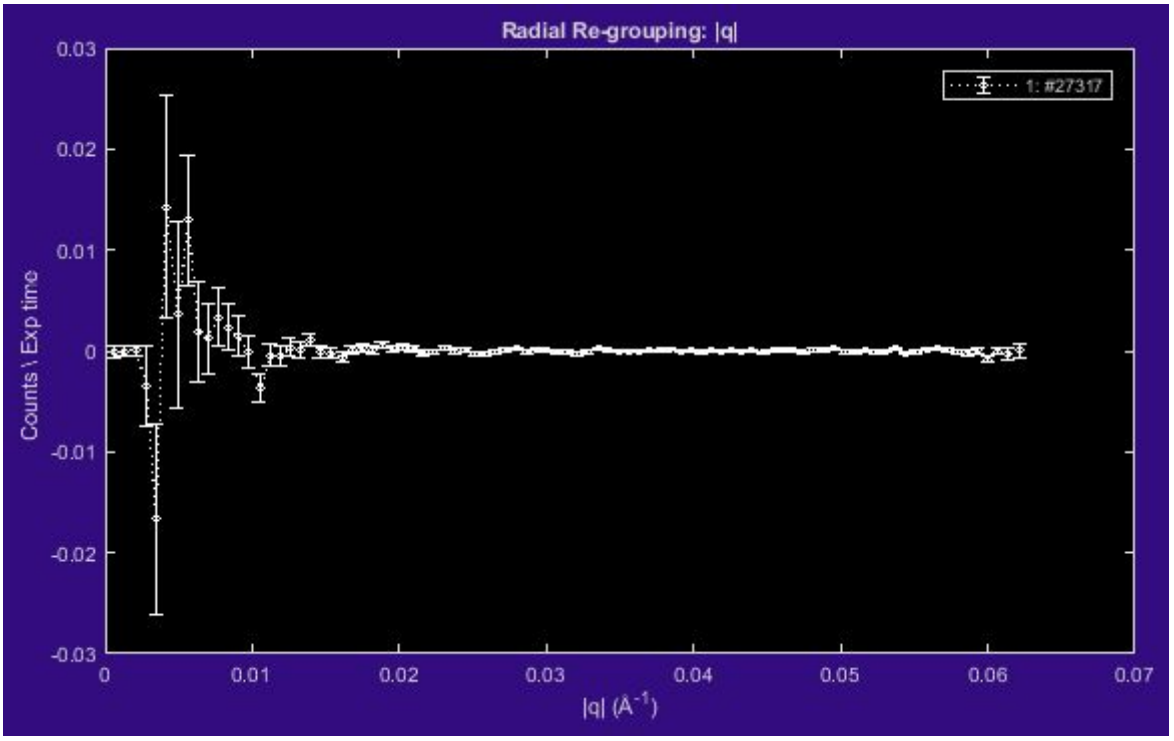
The purpose of this experiment was to probe unconventional superconductivity in NbBiSe, by measuring the distortion induced on the Flux Line Lattice by the magnetic signature associated to a spin triplet Cooper pair.

The sample has been oriented on OrientExpress before the experiment, with the c-axis longitudinal to the neutron beam. A picture of the alignment is shown below.



Unfortunately the experiment has not been successful, since we haven't been able to measure any scattering from the Flux Line Lattice, as shown by the IvsQ plot below, recorded at 0.2T.



We have measured at different applied magnetic fields (0.8T,0.5T,0.2T), temperatures (3.5K and 1.6K), and in different crystal directions, but in any of these cases we have been able to obtain significant scattering patterns.

We believe that the sample was a Type 1 superconductor, not showing any flux line lattice arrangement.