Contribution ID: **243** Type: **Poster**

Investigation of the vortex lattice in NbS2 –a potential FFLO candidate

Tuesday 21 March 2023 16:00 (2 hours)

To date, several materials have been proposed as hosts for the Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) spatially modulated superconducting state [1], but direct experimental proof has been challenging, with only the organic superconductors providing uncontested evidence for the state [2]. The FFLO state is expected to develop at high fields and low temperatures in materials with strong Pauli paramagnetic effects, an anisotropic Fermi surface, and clean superconductivity.
2H-NbS2 has recently been proposed as a potential candidate material based on torque magnetometry, specific heat and thermal expansion measurements as a function of orientation in magnetic field. Transition metal dichalcogenides (TMDs) are strongly anisotropic layered superconductors in which the two-dimensional planes are weakly coupled by van der Waals forces. The upper critical field of superconducting TMDs in the basal plane is shown to be dramatically enhanced by a special form of Ising spin orbit coupling [3]. When the field is applied exactly in the plane, the upper critical field increases dramatically above 16 T, beyond the limit expected from the Pauli paramagnetic effect. This behaviour is reminiscent of the
organic superconductors where the FFLO state is seen.

Using small angle neutron scattering, we have observed the vortex lattice in this material to test if this material is a good candidate to look for a direct FFLO diffraction signal. We have observed a strong intrinsic superconducting anisotropy between the c axis and the basal plane. Furthermore, we plan to go to higher magnetic fields and measure closer to 90° and try to get into the FFLO phase to look for direct diffraction signal.

[1] J. Wosnitza, Annalen der Physik 530, 1700282 (2017).
[2] C. Agosta, Crystals 8, 285 (2018).
[3] C.-W. Cho et al., Nature Comm. 12,3676 (2021).

Author: Mr ALSHEMI, Ahmed (Lund University)

Co-authors: FORGAN, Edward (University of Birmingham); BLACKBURN, Elizabeth (Lund University); CAMPILLO, Emma (Université de Sherbrooke)

Presenter: Mr ALSHEMI, Ahmed (Lund University)

Session Classification: Poster session TUESDAY

Track Classification: Magnetism, Superconductivity, Topological Systems, Magnetic Thin Films an other electronic phenomena