

# Experimental report

14/05/2024

**Proposal:** 5-42-579

**Council:** 4/2023

**Title:** Stop-and-go Kinetic Neutron Scattering of Current-driven Vortex Clusters

**Research area:** Physics

**This proposal is a continuation of 5-31-2911**

**Main proposer:** Xaver BREMS

**Experimental team:** Xaver BREMS

**Local contacts:** Robert CUBITT

**Samples:** Nb

Instrument	Requested days	Allocated days	From	To
D33	3	3	01/09/2023	04/09/2023

## Abstract:

Applying a sufficiently high current to a type-II superconductor filled with vortices can depin the vortex lattice resulting in the flux flow state. The elemental superconductor Niobium is found on the verge between type I and II and exhibits the intermediate mixed state, where the sample is only partially filled with vortices. The applied current is constrained to these areas resulting in an interesting topological scenario when a current is applied. Our SANS experiments have shown that a sufficiently high current reorganises this two domain structure into stripes in the direction of vortex flow. What has not been explored so far is the timescale on which this rearrangement process occurs. With this experiment we aim to fill this gap by making use of a stop-and-go approach to reach sub-millisecond time resolution.

## **Expt report 5-42-579**

It was indeed challenging to drive the vortex lattice with pulsed currents. It was very difficult to measure any associated pulsed voltages and hence to know if the vortices were indeed moving. The time was not wasted as we could continue with DC currents gaining useful data.