Contribution ID: **7** Type: **Poster**

Quantized Vortices in Superfluid Helium Thin Films

Monday 2 September 2024 17:00 (2 hours)

Quantized vortices are central to two-dimensional superfluidity and quantum turbulence. Though there is great interest in observing and understanding their behaviour, vortices in superfluid helium-4 are particularly challenging due to their Angstrom-sized cores and low refractive indices. I will present my work in the experimental exploration of vortex dynamics in thin films of superfluid helium by direct optical detection. This is achieved by cooling silicon photonic crystals to millikelvin temperatures, at which superfluid helium self-assembles into a nanometre-thick film along the surface of the crystal [1]. Advanced fabrication techniques enable the creation of high-quality silicon photonic crystals with small optical mode volumes that provide the ability to enhance interactions between light and quantized vortices. The presence of vortices creates a dimple in the superfluid film and shifts the resonance frequency of the optical cavity, providing a direct indication of the location of the vortices [2]. Going forward, we will be able to track the position of vortices with sub-nanometre resolution as well as employ optomechanical techniques to trap and control the vortices [3].

[1] W. W. Wasserman et al., Opt. Express, 30, 30822 (2022).
[2] Y. P. Sachkou et al., Science 366, 1480 (2019).
[3] X. He et al., Nature Physics 16, 4 (2020).

References

Short bio (50 words) or link to website

I am in the first year of my PhD at The University of Queensland under supervision by Warwick Bowen and Chris Baker. I have previously worked with Dirk Bouwmeester at The University of California, Santa Barbara and Leiden University, The Netherlands.

Relevant publications (optional)

Career stage

Student

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Session Classification: Posters I

Track Classification: FINESS