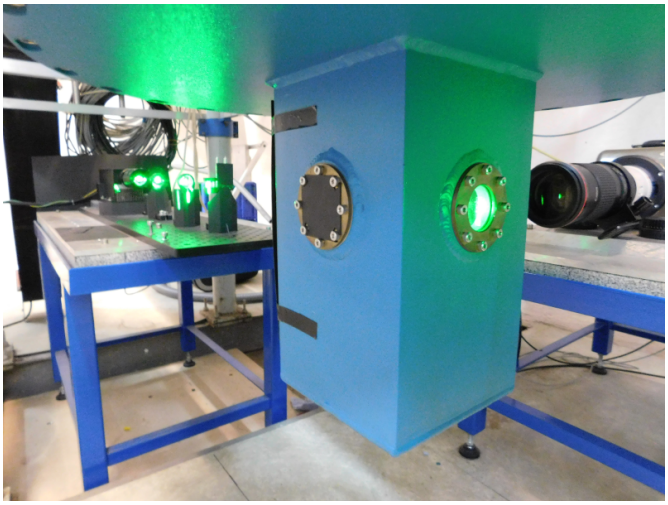
Visualization of superfluid helium flows

The investigation of superfluid helium flows is an active and challenging research field, which is not only interesting in its own right but that has also broader implications, related, for example, to turbulence in viscous fluids and to neutron stars.



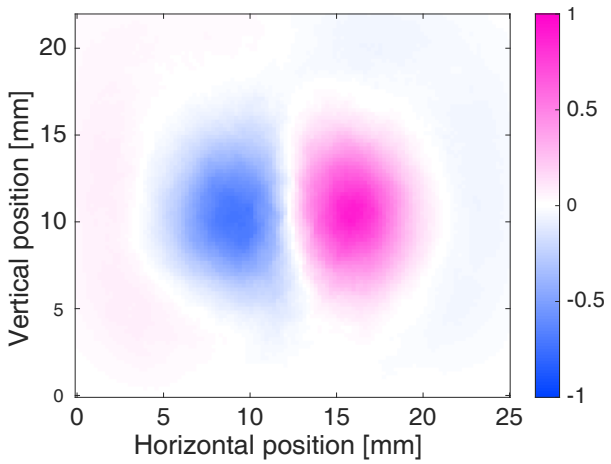
Flow visualization techniques, which allow following the motion of relatively small particles suspended in the fluid, have in recent years given significant contributions to our understanding of the underlying physics. Indeed, the cryogenic visualization laboratory of the Department of Low Temperature Physics, the first to be established in Europe, can be regarded as one of the leading laboratory in this research field.

The still **unsolved physical problems** to be addressed include (but are not limited to):

- behaviour of superfluid helium flows in the proximity of **boundaries**, that is, how does a solid boundary influence the motion of a fluid with an extremely small viscosity?
- flow development as a function of **flow geometry**, for example, how does the shape of an object accelerating in superfluid helium affect the generated flow behaviour?
- features of **large-scale vortices** in superfluid helium flows, that is, what are similarities and differences between vortical structures propagating in superfluid helium and in classical viscous fluids?

The **currently available projects** focus on the following tasks:

- preparation of **new low-temperature visualization experiments**, including (i) the design and manufacturing of experimental cells, and (ii) the implementation in the current setup of flow sources, such as electric motors, and force sensors
- **performing** of cryogenic visualization **experiments**
- **processing of experimental data**, by using adequate software, to be partly developed
- **physical interpretation** of the obtained results and preparation of scientific reports



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