

## Radioactive ions and atoms in superfluid helium

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We are investigating several issues related to radioactive ions and atoms in superfluid helium. In first instance, the use of superfluid helium to stop high-energy radioactive ions and extract them as a cold ion beam is being developed. An overview will be given of the relevant properties of the superfluid state and of the behaviour of ions and atoms in superfluid helium. The recent successful proof-of-principle experiments performed by the authors [1] will be summarized. These experiments showed that the extraction of ions across the surface of superfluid helium at temperatures close to 1 K is the point to be improved. Experiments performed in 2005 focusing on this issue will be described. Figure 1 shows parts of the apparatus. The performance of the technique in terms of efficiency and delay time will be compared to that of the helium gas cell technique. Future plans will be laid out.

The possibilities to use superfluid helium as a storage medium for ions and atoms is being looked at. Two items will be discussed in some more detail: laser spectroscopy and the creation of radioactive muonic atoms.

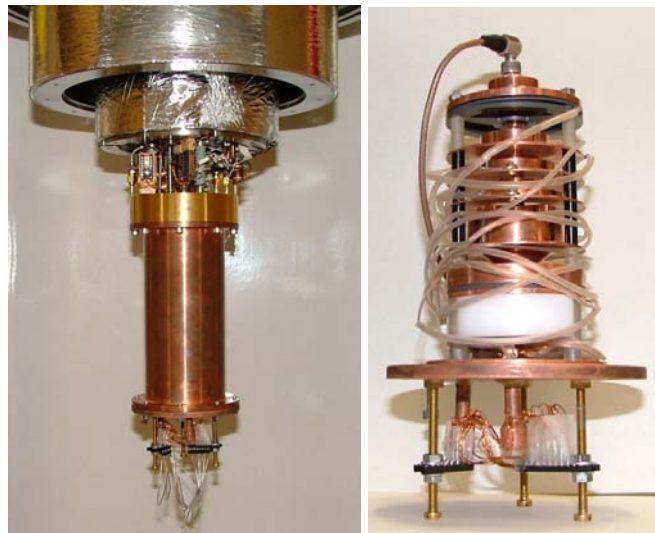


Figure 1: Equipment used to investigate the extraction of ions from the surface of superfluid helium. Left: experimental cell attached to the 1 K pot of the cryostat. Right: electrode structure inside the experimental cell.

[1] W.X. Huang *et al.*, *Europhys. Lett.* **63**, 687 (2003)