Design and Characterisation of a Detector for Quasiparticle and Quantum Turbulence Imaging Studies in Superfluid ^{3}He

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We have developed a quasiparticle video camera to visualise vortex dynamics in the pure quantum regime of superfluid ^{3}He-B. At such low temperatures vorticity can be non-invasively probed by ballistic quasiparticles, which are Andreev scattered by vortices. When illuminated by a beam of quasiparticles, a tangle of vortices (quantum turbulence) will cast a shadow. Each pixel of the camera will measure the local quasiparticle density, proportional to the incident flux. This should allow us to make crude images of quantum turbulence, with both time and spatial resolution.

The camera contains twenty-five pixels formed by custom-made 1-D arrays of miniature quartz tuning forks. Each array contains five forks of 50 μm thickness. All the forks have a tine width of 90 μm and lengths varying from 1400 μm to 1900 μm to give each a unique and well-separated resonant frequency ranging from 20kHz to 40kHz. Five such arrays have been mounted in a copper block to create the camera.

The camera design, characterisation and early results will be presented.

Section: VT - Vortices and turbulence

Keywords: Quartz Tuning Forks, Quantum Turbulence