Turbulence in superfluid ^{4}He generated and probed by injected ions

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We investigated several turbulent flows, characterized by different ratios of classical (large-scale) and quantum (small-scale) kinetic energy, in cold superfluid ^{4}He forced by injected ions:
(i) a cloud of polarized quantized vortex rings in which rare binary collisions of rings trigger an onset of turbulence;
(ii) a compact tangle of quantized vortex loops in which trapped ions in an applied electric field exert body force on the liquid resulting in a propagating giant classical vortex ring;
(iii) space-filling turbulence continuously pumped by a jet of injected ions;
(iv) free decay of all the flows mentioned above.
The experimental container had a shape of a cube. The characterization of the density, polarization and spread of the vortex tangle was done through measurements of the transport of negative ions either trapped by the tangle or propagating on probe vortex rings. Most observations are performed at $T < 0.5\,\mathrm{K}$ (i. e. with negligible density of thermal excitations), although the effect of small mutual friction at 0.6–0.8 K will also be reported. A comparison with the properties of turbulent flows induced by an impulsive spin-down will be made.
The results of numerical simulations of short-range interactions of individual quantized vortex rings and of large-scale flows forced by injected ions will be reported.

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