Session 23bA

Statistical Properties of the Transition from Potential Flow to Turbulence Created by an Oscillating Sphere in HeII at mK Temperatures **23bA1**

Wilfried Schoepe

Fakultät für Physik, Universität Regensburg, D-93040 Regensburg, Germany

The statistical properties of the transition to turbulence in the flow of superfluid He-4 at mK temperatures around an oscillating micro-sphere are investigated by recording time series of the intermittent switching between potential flow and turbulence which is observed in a narrow interval of driving forces between stable potential flow at lower drives and stable turbulence at larger ones. The probability for switching from a laminar phase to turbulence is a linear function of the velocity amplitude above the critical velocity indicating a Weibull distribution. Metastable laminar phases above the critical velocity can be observed whose lifetime is only limited by natural background radioactivity. The results are compared with the statistical properties of single vortex nucleation experiments with micro-apertures.

Energy Spectrum of Superfluid Turbulence made by a Quantized Vortex Tangle without Normal Fluid **23bA2**

Makoto Tsubota[a], Tsunehiko Araki[a], Sergey K. Nemirovskii[b]

[a] *Department of Physics, Osaka City University, Osaka 558-8585, Japan*
[b] *Institute of Thermophysics, Academy of Science, Novosibirsk 630090, Russia*

The energy spectrum of the superfluid turbulence without the normal fluid is studied numerically under the vortex filament model subject to the full nonlocal Biot-Savart law. The almost isotropic and homogeneous vortex tangle is prepared by two methods; one starts from the Taylor-Green vortex, and the other by that Schwarz's mixing procedure under the counterflow and the mutual friction. The vortex tangle freely decaying shows the energy spectrum for $k < 2\pi/\ell$ very similar to the Kolmogorov's -5/3 law, where k is the wave number of the Fourier component of the velocity field and ℓ the average intervortex spacing. The vortex size distribution has a scaling property consistent with the Kolmogorov law.

23bA3 Direct Observation of the Andreev Reflection of a Quasiparticle Beam by Quantum Turbulence in Superfluid ^{3}He-B

D.I. Bradley, S.N. Fisher, A.M. Guénault, M.R. Lowe, G.R. Pickett, A. Rahm

Department of Physics, Lancaster University, Lancaster, LA1 4YB, UK.

A beam of quasiparticles from a black-body radiator is directed at a localized region of quantum turbulence generated by a vibrating wire resonator driven at super-critical velocity. We are able to measure directly the fraction of the incident quasiparticle beam which is retro-reflected from the turbulence by Andreev processes. Combining these measurements with those on the spatial extent of the turbulence[1] allows us to infer the vortex line density. We estimate that the maximum vortex line density produced by a vibrating wire resonator is $\approx 10^8\,\mathrm{m}^{-2}$ corresponding to an intervortex spacing of $\approx 100\,\mu$m.

[1] Reported elsewhere in this conference.

23bA4 Vortex Nucleation and texture of rotating ^{3}He-A in cylindrical cells with $R \simeq 10\xi_D$.

R. Ishiguro[a], M. Yamashita[a], T. Igarashi[b], E. Hayata[a], O. Ishikawa[c], Y. Sasaki[a], K. Fukuda[d], M. Kubota[b], T. Takagi[e], T. Ohmi[a], H. Ishimoto[b], T. Mizusaki[a]

[a] *Department of Physics, Graduate School of Science, Kyoto University , Kyoto 606-8502, Japan*
[b] *Institute for Solid State Physics, University of Tokyo , Chiba 277-8581, Japan.*
[c] *Graduate School of Science, Osaka City University, Osaka 558-8585, Japan*
[d] *College of Medical Technology, Kyoto University ,Kyoto 606-8507, Japan*
[e] *Department of Applied Physics, Fukui University, Fukui 910-8507, Japan*

We measured cw-NMR of ^{3}He-A in cylinders with 0.1 and 0.2mm ϕ. Broad textural spectrum in 0.1mmϕ continuously changed with rotation speed. Nucleation of a single vortex was observed in 0.2mmϕ above a critical rotation speed and hysteresis appeared for vortex nucleation and annihilation.

23bA5 Torsional Oscillator Studies of Rotating ^{3}He-A in a Slab

Paul M. Walmsley[a], Derek J. Cousins[a], John R. Hook[b], Henry E. Hall[a], Andrei I. Golov[a]

[a] *Department of Physics and Astronomy, University of Manchester, Manchester, M13 9PL, U.K.*
[b] *Deceased*

Using a rotating cryostat we have manipulated textures of ^{3}He-A in a slab contained in a torsional oscillator. The uniformity of the texture or the presence of vortices can be characterised by the torsional resonance. Several different textural configurations can be stabilised by vortices induced by rotation at different speeds and directions. The configuration and dynamics of vortices as well as the conditions needed to prepare a uniform texture have been investigated. Application of a magnetic field leads to a textural transition known as the Fréedericksz transition. We are attempting to detect the spontaneous orbital magnetisation of ^{3}He-A by measuring the change in the critical field of the Fréedericksz transition after flipping the direction of the uniform l-texture.