Lagrangian dynamics and second sound vorticity measurements in oscillating grid turbulence of cryogenic normal/superfluid ^{4}He

C. Bret*, P. Diribarne*, J. Duplat*, and B. Rousset*

The OGRES experiment (standing for Oscillating Grid Experiment in Superfluid) is uniquely designed to easily work below & above the transition temperature (T_λ =2.17K) to superfluid of ^{4}He. It consists of a pair of oscillating grids that generates a nearly homegenous, stationary and isotropic turbulence that aims to compare the behavior of classical and superfluid flows as possible differences could be observed at small scales. Therefore, we performed 2D Particles Tracking Velocimetry (PTV) measurements (between 1.6K to 3.5K), as well as 2$^{\text{nd}}$ sound attenuation measurements (between 1.6K to T_λ) using Oscillating Superleak Transducer (OST) to access both the Lagrangian dynamics of the flow and the vorticity of the supefluid component at different temperatures. The talk will mainly focus on preliminary results about the large-scale dynamics of the flow and its response to different amplitudes A_{mot} and frequencies f_{mot} of the mechanical forcing including a comparison to the classical Hopfinger & Tolly[1] observations ($u_{rms} \propto f_{mot} A_{mot}^{3/2}$). The mean vortex line density of the superfluid component will then be investigated as it also gives us the first insights about the small-scale dynamics of the flow, allowing us to assess the mean inter-vortex spacing, which is expected to behave as the Kolmogorov's viscous scale ($\propto Re_\lambda^{-3/2}$).

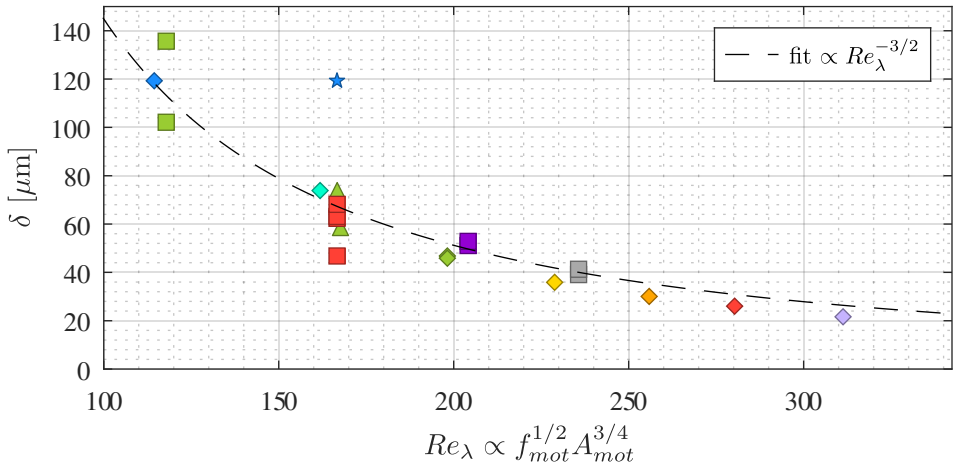

Figure 1: Decaying of the mean inter-vortex spacing as Re_λ. Symbols corresponds to unique motor amplitudes (square: 5mm, triangle: 8mm, losange: 10mm, star: 16.5mm) and colors to unique motor frequencies (blue: 1Hz, cyan: 2Hz, green: 3Hz, yellow: 4Hz, orange: 5Hz, red: 6Hz, light purple: 7.4Hz, purple: 9Hz, grey: 12Hz).

*University of Grenoble Alpes, CEA IRIG-DSBT-LRTH, F-38000 Grenoble, France

[1] Hopfinger and Toly, *J. Fluid Mech.* (1976).