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Cryogenic turbulence test facilities at CEA/SBT

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Recently, CEA Grenoble SBT has designed, built and tested three liquid helium facilities dedicated to turbulence studies.

All these experiments are able to operate either in HeI or HeII within the same cooldown. Another common technical specificity of these three facilities is the use of moving parts inside liquid helium.

The SHREK experiment is a von Karman swirling flow between 72cm diameter counterrotating disks equipped with blades. The HeJet facility is used to produce a liquid helium free jet inside a 20cm I.D., 47cm length stainless steel cylindrical testing chamber. Finally the OGRES experiment consists of an optical cryostat equipped with a particle injection device and an oscillating grid. It will be used either to study particle clustering or to visualize the flow produced by the oscillating grid.

We first detail specific techniques employed to accommodate with these stringent specifications. In particular, the so called Claudet bath is used to subcool the von Karman flow and free jet flow, allowing a pressurization above the critical point when necessary (e.g. it is needed to perform our home made Wollaston hot wire measurements). Another solution consisting in refilling with helium gas the upper part of the bath after pumping down is chosen for the oscillating grid as hot wires will not be employed (no mean velocity prohibits their use). Furthermore, the complexity of the Claudet bath leads to additional complexity for visualization (it would have required multiple viewports and complex particle seeding system).

Then control parameters as well as Re number and temperature ranges are detailed and results illustrating the possibilities of each experiment are presented.

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