

Levitating superconductors as probe for quantum fluid dynamics

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We discuss recent experiments studying behaviour of quantum fluids using probe in the form of magnetically levitated superconducting balls fully detached from physical environment. Lead coated plastic ball is levitated and maneuvered in custom built magnetic trap setup allowing for steady or oscillatory motion. We have recently upgraded the system to be compatible with dilution refrigerator entering millikelvin region of temperatures and gaining on excellent physical and electromagnetic isolation properties of this platform. Our results show great potential of use not only for studies of turbulent transition in superfluid ^4He within wide range of temperatures but also for characterization of $^3\text{He-B}$ surface-bound states and very sensitive vacuum measurements with exceptionally-low dissipation rates. In addition, we are trying to approach the question of existence of the lift in superfluid via. operating wells turbine system in glass He II cryostat.