Probing quantum puddles: nonlinear dynamics in superfluid film optomechanics

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Stellingen

Behorend bij het proefschrift

Probing quantum puddles: Nonlinear dynamics in superfluid film optomechanics

I The large temperature dependence of the photothermal force is dominated by the large temperature dependence of the thermal capacity of silica.
Chapter 3 of this thesis

II The shift of the optical resonance frequency over the superfluid transition should not be taken as a direct measure of the superfluid film thickness.
Chapter 5 of this thesis

III Better understanding of boundary conditions for thin films of superfluid helium will help in improving high-quality third sound resonator designs.
Chapter 5 of this thesis

IV The mode-locked lasing of Bessel modes requires the harmonization of mode frequencies through nonlinearity instead of compensating for intrinsic dispersion.
Chapter 6 of this thesis

V The intrinsic strong nonlinearity of the restoring van-der-Waals forces makes thin films of superfluid helium ideal systems to explore mechanical quantum computing.
*Sfendla et al., npj Quantum Information **7.1**, 1-12 (2021)*

VI The true potential of superfluid helium optomechanics lies in space-based experiments.
*Brown et al., Phys. Rev. Lett. **130**, 216001 (2023)*

VII Large third sound resonators are suited to explore classical nonlinear fluid dynamics, whereas minituarized versions could be used for quantum mechanical measurements.
*Baker et al., New J. Phys. **18**, 123025 (2016)*

VIII Superfluid helium optomechanics on sapphire or diamond optical resonators is ideally suited to explore photothermal (ground state) cooling of mechanical modes.
*Restrepo et al., Comptes Rendus. Physique **12.9-10**, 860-870 (2011)*

IX Reliable nanopositoning at ultra-low temperatures would save valuable PhD lifetime.

X Developing an experiment and raising a child involve similar challenges.

XI Mixing construction sites and cleanroom environments is a recipe for disaster.

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