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Imaging of Quantum Vortices in Superfluid Helium Droplets

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Quantum rotation in single, isolated superfluid He nanodroplets is studied via x-ray diffraction imaging. The images indicate large centrifugal shape deformations of the droplets, providing a direct measure of the angular velocity. The droplets have axisymmetric shapes that persist to unusually high angular velocities well beyond the limits of classical liquid rotors. Regular vortex arrays formed within the rotating droplets are observed and characterized through their specific Bragg patterns. The droplets have high density of vortices giving access to unexplored regime of ultimate quantum vorticity.