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Melting of a vortex lattice in a fast rotating Bose gas

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Weakly interacting quantum gases offer a very convenient platform for the study of superfluid dynamics. One of the many intringuing properties of superfluids is their behavior in the presence of an imposed rotation. At zero temperature, the ground state of the rotating gas supports a triangular vortex lattice, the vortex density being set by the rotation frequency. As temperature increases, however, the triangular lattice is expected to be gradually destroyed, by displacement of the vortex centers and eventually strong phase fluctuations. Here, we present our experimental observations as we rotate a rubidium quantum gas in a very smooth oblate potential. We observe the progressive melting of the vortex lattice at large rotation frequency and finite temperature. We compare our findings to theoretical predictions by Gifford and Baym.

Primary authors: SHARMA, Rishabh (LPL - USPN - CNRS); REY, David (LPL - USPN - CNRS); BADR, Thomas (LPL - CNRS - USPN); PERRIN, Aurélien (LPL - CNRS - USPN); LONGCHAMBON, Laurent (LPL - USPN - CNRS); PERRIN, Hélène (Laboratoire de physique des lasers - CNRS - Université Sorbonne Paris Nord); DUBESSY, Romain (LPL - USPN - CNRS)

Presenter: PERRIN, Hélène (Laboratoire de physique des lasers - CNRS - Université Sorbonne Paris Nord)

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