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Rotating dipolar quantum gases

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Here we will present the latest results of our research on ultracold dipolar quantum gases in Innsbruck. In particular, we will focus on the creation of quantized vortices in both the BEC [1] and in two-dimensional circular supersolid phases [2-3]. While in condensates, the density is nearly homogeneous and the vortices are almost free to move, in supersolids, a state in which local density maxima and minima alternate periodically with a wavelength comparable with the very radius of the vortex core, the vortices find intersize equilibrium positions and experience a pinning force that limits their motion. Our experimental protocol uses an ultracold quantum gas of dysprosium atoms as the main resource, which is put into rotation by exploiting the new magnetostirring technique in which the atoms follow the rotational motion of an external magnetic field.

[1] L. Klaus, T. Bland et al., Nature Physics 18, 1453–1458 (2022).
[2] M. A. Norcia, C. Politi et al., Nature 596, 357-361 (2021).
[3] T. Bland et al., Phys. Rev. Lett. 128, 195302 (2022).

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