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Neutron Star Glitches in Dipolar Supersolids

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Glitches in neutron stars are sudden increases in their rotational frequency and are believed to originate from the stochastic unpinning of quantized vortices stored in their interior [1]. While previous studies explored this mechanism using externally imposed pinning potentials [2], dipolar atoms in the supersolid phase offer a distinct advantage: their intrinsic density modulation naturally provide the required pinning forces required for vortex trapping [3]. In this talk, I will employ dipolar supersolids as platform to explore vortex dynamics related to a glitch signal. By tuning the strength of the isotropic interaction, we investigate more accurately the dynamics of vortices across different phases (e.g. uniform-modulated superfluid), mimicking different radial depths of the star.
[1] A. Melatos et al 2008 ApJ 672 1103 (2008)
[2] Mon. Not. R. Astron. Soc. 415, 1611–1630 (2011)
[3] Phys. Rev. Lett. 131, 223401 (2023)

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