

Abstract Submitted
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Example of a Quantum Anomaly in the Physics of Ultracold Gases¹ MAXIM OLSHANII, UMass Boston, HÉLÈNE PERRIN, VINCENT LORENT, Institut Galilée, Université Paris 13 — We propose an experimental scheme for the observation of a quantum anomaly—quantum-mechanical symmetry breaking—in a two-dimensional harmonically trapped Bose gas.² The anomaly manifests itself in a shift of the monopole excitation frequency away from the value dictated by the Pitaevskii-Rosch dynamical symmetry.³ While the corresponding classical Gross-Pitaevskii equation and the hydrodynamic equations derived from it do exhibit this symmetry, it is—as we show in our paper—violated under quantization. The resulting frequency shift is of the order of 1% of the carrier, well in reach for modern experimental techniques. We propose using the dipole oscillations as a frequency gauge.

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²Maxim Olshani, Hélène Perrin, Vincent Lorent, Phys. Rev. Lett. 105, 095302 (2010).

³L. P. Pitaevskii and A. Rosch, Phys. Rev. A 55, R853 (1997).

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