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Collective oscillations of an interacting quasi-2D Fermi gas. PAUL DYKE, TYSON PEPPLER, MARTA ZAMORANO, SASCHA HOINKA, CHRIS VALE, Swinburne University of Technology — Ultracold gases have become an important paradigm for studying many-body quantum phenomena. One example is a two-component 2D Fermi gas with tunable interactions that allows the study of the BCS to BKT superfluid crossover. We produce a 2D Fermi gas in a highly oblate trapping potential between the antinodes of a cylindrically focused, blue detuned, TEM01 mode laser beam. A weak magnetic field curvature provides a highly harmonic confinement in the two radial directions. We investigate the collective oscillations, in particular the breathing mode frequency, of a 2D Fermi gas of Li-6 atoms throughout the 2D to 3D crossover. The breathing mode frequency provides insight into the thermodynamic equation of state which displays different limiting behaviors in 2D and 3D. We observe in the 3D regime a breathing mode frequency approaching $\sqrt{3}\omega_r$, where ω_r is the radial trap frequency. In the weakly and non-interacting 2D regime we see that the breathing frequency approaches $2\omega_r$, consistent with the prediction of a classical scale invariance. However, for stronger interactions our results display an increase in the breathing mode frequency above $2\omega_r$, by around 4%, indicating that this classical scale invariance is broken by a quantum anomaly.

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