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Signatures of Fractional Exclusion Statistics in the Spectroscopy of Quantum Hall Droplets[1]

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One of the most dramatic features of strongly correlated phases is the emergence of quasiparticle excitations with unconventional quantum statistics. The archetypal example is the fractional, "anyonic," quantum statistics predicted for quasiparticles of the fractional quantum Hall phases. While experiments on semiconductor devices have shown that these quasiparticles have fractional charges, a direct observation of the fractional statistics has remained lacking. In this talk I shall show how precision spectroscopy measurements of rotating droplets of ultracold atoms might be used to demonstrate the Haldane fractional exclusion statistics of quasiholes in the Laughlin state of bosons. The characteristic signatures appear in the single-particle excitation spectrum. I shall show that the transitions are governed by a "many-body selection rule" which allows one to relate the number of allowed transitions to the number of quasihole states. I shall illustrate the theory with numerically exact simulations of small numbers of particles.

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