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【405】Motional Sideband Asymmetry in Quantum Optomechanics in the Presence of Kerr-type Nonlinearities

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Motional Sideband Asymmetry is a signature of the quantum regime of mechanical oscillators. It has been studied in several optomechanical systems as self-calibrated thermometry. We present sideband asymmetry measurement of a nano-optomechanical system sideband-cooled close to the ground state probing simultaneously with red- and blue-detuned tones. We show that this can exhibit an artificially modified sideband asymmetry due to Kerr-type nonlinear cavity response. The presence of the sideband cooling tone, creates oscillating intracavity field which leads to scattering between motional sidebands. We develop a theoretical model based on Floquet theory that describes our observations. This has wide-ranging implications for schemes utilizing several probing or pumping tones, as employed in backaction evasion measurements, dissipative squeezing and mechanical squeezing using reservoir engineering.

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