Contribution ID: **33** Type: **Talk 18min**

Motional spin-locking spectroscopy

Wednesday 10 July 2024 09:36 (18 minutes)

Characterization of noise of a quantum harmonic oscillator is important for many experimental platforms. We experimentally demonstrate motional spin-locking spectroscopy, a method that allows to directly measure the motional noise spectrum of a quantum harmonic oscillator. In a spin-locking experiment, the free-evolution period of a Ramsey experiment is replaced with a continuous drive of a superposition of two states. Noise leads to depolarization of the initial state with a rate of depolarization that is determined by the noise strength. Probing the transition between two motional states gives access to the motional noise spectrum. We measure motional noise of a single trapped ion in a linear Paul trap in a frequency range from 200 Hz to 5 kHz with a power spectral density that resolves noise over two orders of magnitude. Coherent modulations in the oscillation frequency of the oscillator can be probed with a fractional frequency sensitivity at the 10^{-6} level.

Primary author: KRANZL, Florian

Co-authors: ROSPARS, Adria; ROOS, Christian F.; FRANKE, Johannes; JOSHI, Manoj K.; BLATT, Rainer

Presenter: KRANZL, Florian

Session Classification: Quantum Technologies

Track Classification: Quantum Technologies