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Ramon Szmuk, Quantum Machines (QuCoS) - Pound locking for resonator frequency tracking and noise analysis

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The Pound technique is a powerful method for determining the relative detuning between a driving oscillator and a microwave resonator, allowing to lock one to the other and perform high bandwidth characterisations of resonator noise spectra, quality factors, and other parameters.
We present resonator frequency tracking with >10kHz lock bandwidth using Quantum Machine's Octave and OPX devices, allowing one to lock the controller to the resonator's frequency and vice versa for tunable resonators.
Power spectral densities of frequency noise can be extracted with >MHz bandwidths by calculating the autocorrelation, FFT, and averaging in real time, saving on data throughput and allowing for longer integration times.
We will also present the use of the Allan deviation as a statistical tool for studying long term drifts of resonators and will conclude by presenting ideas for scaling such techniques to many qubit systems.