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Quantum synchronization of quantum van der Pol oscillators with trapped ions TONY LEE, HOSSEIN SADEGHPOUR, ITAMP / Harvard — Van der Pol oscillators are prototypical driven-dissipative oscillators that have been used to study synchronization phenomena in classical systems. We study the van der Pol oscillator in the quantum limit, when the oscillator is near the quantum ground state, and the behavior is sensitive to the quantization of energy levels. We consider four scenarios: one oscillator with and without an external drive, two coupled oscillators, and an infinite number of oscillators with global coupling. We find that phase-locking is much more robust in the quantum model than in the equivalent classical model. Trapped-ion experiments are ideally suited to simulate van der Pol oscillators in the quantum regime via sideband heating and cooling of motional modes. Phys. Rev. Lett. (in press), arXiv:1306.6359

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