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Trapped Barium Ions at the United States Air Force Research Laboratory

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Laser cooled and trapped atomic ions are promising platforms for quantum networking, sensing, and information processing because they are quantum systems well isolated from their surrounding environment. The species and isotope selected for trapping have different properties. Nuclear spin $I = \frac{1}{2}$ isotopes have long coherence times for a ground-state hyperfine qubit with robust manipulation capabilities. Other candidates have metastable excited states, enabling high-fidelity measurements via electron shelving. $^{133}\mathrm{Ba}^{+}$ uniquely combines both characteristics while also needing only visible wavelength lasers for cooling, trapping, and shelving operations. We will discuss the commissioning of a barium ion trapping experiment at the United States Air Force Research Laboratory [AFRL], including the work's context within broader quantum networking efforts at AFRL. Approved for Public Release [Case #AFRL-2021-2583] Distribution Unlimited.

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