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(I) Prospects for quantum computing with Ba⁺ ions

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The quest to engineer quantum computers of a useful scope faces many challenges that will require continued investigation of the physics underlying the devices. In this talk, we focus on trapped ion quantum computing. We discuss our efforts to implement quantum information processing with Ba⁺ ions and provide an overview of possible future benefits this ion could provide for quantum computing efforts, including architectures that are well suited for implementing quantum error correction, and exploration of exotic methods to encode quantum information more efficiently in quDits (multi-level versions of the more familiar two-level quBits). To this end, we present novel measurements related to an all-optical technique for isotope-selective ion production, and discuss why this technique may be critical for building quantum computing devices using the isotope Ba-133+.

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