

Abstract Submitted  
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<sup>138</sup>Ba<sup>+</sup> **Zeeman qubit operation through Raman transition** LIUDMILA ZHUKAS, graduate student, TOMASZ SAKREJDA, None, BORIS BLINOV, Associate Professor — Barium (Ba) and Ytterbium (Yb) are excellent candidates to perform sympathetic cooling [1] due to the relatively small mass difference between those species. It is possible to reach Doppler cooling limit for the Ba-Yb linear ion chain of multiple ions [2]. Here <sup>138</sup>Ba<sup>+</sup> is used as an informational qubit. We drive  $6S_{1/2} - 6P_{1/2}$  Raman transitions with a 532 nm mode-locked laser to perform qubit operations and use the narrow  $6S_{1/2} - 6D_{5/2}$  quadrupole transition for state detection and initialization. Starting with a linear chain of Ba ions, we discuss the possibility to incorporate <sup>174</sup>Yb<sup>+</sup> ions to perform sympathetic cooling. [1] D. Kielpinski et al., Phys. Rev. A 61, (2000) [2] T. P. Sakrejda, L. Zhukas, B. B. Blinov arXiv:1809.00240 [physics.atom-ph]

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