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Efficient Photoionization Loading of Ytterbium and Indium Ion Traps LI-BANG WANG, TUAN NGUYEN, MARTIN SCHAUER, JUSTIN TORGERSON, Los Alamos National Laboratory — We aim to perform precision optical spectroscopy on narrow transitions of In^+ and Yb^{2+} to search for possible time variation of fine-structure constant α. The high sensitivity of a transition frequency in Yb^{2+} to $\dot{\alpha}$ and its insensitivity to external fields make it one of the best systems to test the time variation of fine-structure constant. In this report, we present a simple and efficient method to load a Paul trap with In^+ and Yb^+ ions. Resonant lasers from blue laser diodes at 410 nm and 399 nm are used to excite $5^2P_{1/2}$-$6^2S_{1/2}$ transition of In and 6^1S_0-6^1P_1 transition of Yb, respectively. A second photon from the same 410 nm laser drives the In atoms into the continuum, while the Yb atoms are excited to high-lying Rydberg states by the same 399 nm laser and then subsequently ionized by the presence of a strong RF field. The progress of laser cooling of single trapped $In^+$and Yb^+ ions, the proposed method of producing doubly-ionized Yb^{2+} ions, and our approach using a frequency-comb laser for direct spectroscopy of clock transitions will be discussed. This work is supported by Los Alamos National Laboratory LDRD.

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