Abstract Submitted
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Properties of Th^{3+} from Optical Spectroscopy of High-L Rydberg states of Th^{2+1} JULIE KEELE, SHANNON WOODS, STEPHEN LUNDEEN, Colorado State University, CHARLES FEHRENBACH, Kansas State University — The Fr-like Thorium ion, Th^{3+}, has one valence electron outside a Rn-like closed shell, but its ground electronic state is $^2F_{5/2}$ instead of $^2S_{1/2}$ due to the high nuclear charge [1]. The positions of the lowest seven levels of this ion have been established by optical spectroscopy [2], but no other properties have been measured previously. We measure the properties of the Th^{3+} ground state that control its long-range interactions, such as polarizabilities and permanent moments, by attaching a single electron in a non-penetrating Rydberg state and measuring the details of its binding energy using the Resonant Excitation Stark Ionization Spectroscopy (RESIS) technique [3]. A typical transition is n=29 to n'=72. The laser excitation partially resolves the complex fine structure pattern in the lower state caused by the long-range interactions, and this leads to measurements of the core ion properties controlling those interactions.

[1] U.I. Safronova, et. al., Phys. Rev. A 76, 042504 (2007)
[2] URL = http://www.lac.u-psud.fr/Database/Contents.html
[3] M.E. Hanni, et. al. Phys. Rev. A 82, 022512 (2010)

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Stephen Lundeen
Colorado State University

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