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Resonant Rydberg lines of a single trapped Rydberg ion: coupling to trap RF potential and fabircation-induced electric fields MARIUSZ PAWLAK, Faculty of Chemistry, Nicolaus Copernicus University in Torun, HOSSEIN JOOYA, HOSSEIN R. SADEGHPOUR, ITAMP, Harvard - Smithsonian Center for Astrophysics — An accurate numerical scheme is presented to calculate and analyze the spectral line shape and broadening of a single highly excited Rydberg ion in a Paul trap. The energy spectra of a free highly excited Ca^+ are accurately calculated for s, p, d, f, and g states (up to $n = 64$), using the parametric one-electron valence potential with spin-orbit coupling. The coupling of the ion and Rydberg electron to the trap potential is implemented within a Floquet formalism. The alternating *axial* electric field noise due to the applied RF, and the oscillating *radial* electric field emanating due to the trap fabrication are incorporated into the Floquet calculations. Detailed comparison with available observation (Feldker et. al, PRL 2015) is made.

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