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Atomic properties of Ra for a future EDM measurement[1] Z. ZUHRIANDA, MARIANNA SAFRONOVA, University of Delaware, SERGEY PORSEV, University of Delaware and Petersburg Nuclear Physics Institute, MIKHAIL KOZLOV, Petersburg Nuclear Physics Institute — Searches for non-zero permanent electric-dipole moments (EDM) of particles, atoms, and molecules represent remarkable opportunity to probe new physics beyond the standard model. The EDMs arise from the violations of both parity and time-reversal invariance. Atomic EDMs caused by the nuclear parity and time invariance violating effects are enhanced in certain diamagnetic atoms, such as ^{199}Hg and ^{225}Ra. For the latter, there is additional enhancement due to close states of opposite parity and the large nuclear charge Z [Dzuba et al., PRA 61, 062509 (2000)]. The search for EDM in ^{225}Ra is presently underway [Holt et al., Nucl. Phys. A 844, 53c (2010)]. Few atomic properties of Ra are experimentally known. In this work, we carry out a systematic study of Ra atomic properties of interest to the EDM search using recently developed relativistic *ab initio* method [Safronova at. al, PRA 80, 012516 (2009)] that allows to accurately treat correlation corrections in atoms with a few valence electrons. This method combines the coupled-cluster method, that yielded excellent results for monovalent systems, with the configuration-interaction approach. We have calculated energy levels, electric-dipole matrix elements, lifetimes, hyperfine constants, and polarizabilities.

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