Abstract Submitted
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**Effective three-particle interactions in atoms with partly filled f-shell**[1] MIKHAIL KOZLOV, ELENA KONOVALOVA, Petersburg Nuclear Physics Institute, Gatchina 188300, Russia, ANNA VIATKINA, Department of Physics, St. Petersburg State University, St. Petersburg 198504, Russia, MARIANNA SAFRONOVA, Department of Physics and Astronomy, University of Delaware, Newark, DE 19716, USA — Three particle forces are known to be very important in nuclear physics. In atoms such forces appear between valence electrons in the second order of many-body perturbation theory due to the exchange interaction with the core. Usually their contribution to the valence energy is very small, of the order of few inverse centimeters. However, for atoms and ions with partly filled d and f shells the overlap between valence and core electrons may be large. This leads to significant enhancement of the effective three particle interactions. In Ti II (ground configuration (GC) $3d^24s$) these interactions change binding energy by few hundred inverse centimeters [Berengut et al., J. Phys. B, **41**, 235702 (2008)]. In Ce I (GC $4f5d6s^2$) these interactions contribute few thousand inverse centimeters. Three particle forces are also important for highly charged ions with low-lying f shell, such as $Pr^{9+,10+}$, $Nd^{10+,11+}$, and $Sm^{13+}$. These ions may have narrow optical transitions [Safronova et al., Phys. Rev. Lett., **113**, 030801 (2014)] and are now considered for the new generation of optical clocks.

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Mikhail Kozlov
Petersburg Nuclear Physics Institute

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