

Study of nuclear magnetic quadrupole moments at triatomic molecules

Saturday, 17 October 2020 10:15 (25 minutes)

Search for spatial parity and time-invariance violation is one of the most topical fields of particle physics. Observation of P,T-invariance violation at atomic and molecular physics may lead to some new restrictions for Standard Model extensions and even be indirect evidence of unknown particles existence. So, precise theoretical and experimental study of molecular electronic structure is necessary for construction of fundamental physical interactions theory.

At the present work the electronic structure of ytterbium monohydroxide molecule YbOH [1] and its iso-electronics is considered. Recent suggestion to perform this kind of experiments on triatomic molecules [2,3] promises to lead to new restrictions for electron electric dipole moment (eEDM) and other P,T-odd constants. Here we consider nuclear magnetic quadrupole moment (NMQM) of ^{173}Yb nucleus as such a constant. Its interaction with molecular electrons leads to energy shift, which is proportional to NMQM value. Calculation of proportionality constant is the main goal of the work, however, expected value of the energy shift is also estimated.

Solution of FSCC equations was supported by the Russian Science Foundation Grant № 19-72-10019. Calculation of Gaunt correction was supported by the Russian Foundation for Basic Research Grant №20-32-70177. Electronic structure calculations were performed at the PIK data center of NRC "Kurchatov Institute" –PNPI.

References:

- [1] D. Maison, L. Skripnikov, and V. Flambaum, Phys. Rev. A (2019), 100, 032514.
- [2] T. A. Isaev and R. Berger, Phys. Rev. Lett. (2016), 116, 063006.
- [3] I. Kozyryev and N. R. Hutzler, Phys. Rev. Lett. (2017), 119, 133002.

Primary author: Mr MAISON, Daniel (Petersburg Nuclear Physics Institute of NRC "Kurchatov Institute")

Co-author: Mr SKRIPNIKOV, Leonid (Petersburg Nuclear Physics Institute of NRC "Kurchatov Institute")

Presenter: Mr MAISON, Daniel (Petersburg Nuclear Physics Institute of NRC "Kurchatov Institute")

Session Classification: Section 1. Experimental and theoretical studies of the properties of atomic nuclei

Track Classification: Section 1. Experimental and theoretical studies of the properties of atomic nuclei.