# $TAO^+$ CATION FOR THE STUDY OF QUADRUPLE NEUTRON DISTRIBUTION IN NUCLEI

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Studying the effects of spatial parity (P) nonconservation of fundamental interactions in atoms and molecules, it is possible to refine the parameters of the standard model in laboratory conditions, as well as to set constraints on the parameters of its extensions. Such experiments [1] were most successfully carried out for the Cs atom. Using the expression for the P-odd electron-nuclear weak interaction and expanding it in a series in terms of the multipole moments of the nuclear density, one can obtain the quadrupole term [2,3]. Since the weak charge of the neutron considerably exceeds the weak charge of the proton, the main contribution to the considered interaction is due to the neutron subsystem of the nucleus. Therefore, by studying the interaction of this type, it is possible (for the first time) to study the quadrupole distribution of neutrons in a nucleus. Using a two-step method for calculating the properties of atoms in compounds of heavy elements [4], we study the P-odd tensor interaction of the electron subsystem with the neutron quadrupole moment of the nucleus in the $TaO^+$ cation. We also study a possible contribution of the P-odd interaction of electrons with the Tl anapole moment. Finally, the energy levels of the $TaO^+$ molecule are predicted. The study was supported by a grant from the Russian Science Foundation (project No. 19-72-10019).

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