Abstract Submitted
for the HAW14 Meeting of
The American Physical Society

Effect of electron electric dipole moment on the spin dynamics of the YbF molecule KOTA SOGA, MASAHIRO FUKUDA, MASATO SENAMI, AKITOMO TACHIBANA, Graduate school of engineering, Kyoto Univ. — The existence of the large value of the electron electric dipole moment (EDM) is predicted in extensions of the standard model (SM). To find or exclude physics beyond SM, the EDM is studied in many experiments, where the precession motion of the electron spin is used for the detection. This motion depends on the internal effective electric field (EEF). The accurate prediction of the relation between the EDM and the spin motion is mandatory for deriving the constraint of the EDM. In addition to the computation of EEF, our group studies the spin dynamics by the equation of motion (EOM) of spin. In our group, we have studied the spin motion based on quantum field theory (QFT). In QFT, the spin motion is governed by the spin torque and zeta force. The latter gives local effects and cannot be described in quantum mechanics (QM). Hence, in our approach, there is a difference from ordinary treatment of the spin motion based on QM. In this work, we show that the existence of the EDM modifies our EOM of the spin, that is, the EDM gives the additional contribution to the spin torque. This torque is induced by not only electric field but also magnetic field as a result of relativistic generalization. Then we show our results of the local spin torque distribution for the YbF molecule.

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Date submitted: 30 Jun 2014 Electronic form version 1.4