LASERCOOLED RaF AS A LABORATORY FOR TESTING FUNDAMENTAL SYMMETRIES

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Modern spectroscopical methods allow to reach an accuracy in measurements of molecular spectra that is sufficient for testing symmetry violation in fundamental weak interactions. As was demonstrated in recent experimental search for a permanent electric dipole moment of the electron in YbF [1] and PbO [2], diatomic molecules with an open electronic shell present extremely powerful instrument to study violations of space parity ($\mathcal{P}$-odd) and space parity and time reversal ($\mathcal{P}, \mathcal{T}$-odd) symmetries. In this talk we discuss the enhancement of $\mathcal{P}$-odd and $\mathcal{P}, \mathcal{T}$-odd effects in diatomic molecules and consider some prospective candidates for carrying out successful measurements. Radium monofluoride is shown to be a very prospective molecular candidate for observing possible symmetry violations due to its predicted suitability to direct laser cooling [3], large enhancement factors (both electronic and nuclear) [4] and efficient (for the given class of molecules) production route.

REFERENCES:

1. J. J. Hudson, D. M. Kara, I. J. Smallman, B. E. Sauer, M. R. Tarbutt and E. A. Hinds, Nature, 473 (2011)
2. S. Eckel, P. Hamilton, E. Kirilov, H.W. Smith and D. DeMille, http://arxiv.org/abs/1303.3075v1
3. T. A. Isaev, S. Hoekstra and R. Berger, Phys.Rev.A, 82, 5, 2010
4. T. A. Isaev and R. Berger, http://arxiv.org/abs/1302.5682