SENSITIVITY OF TRANSITIONS IN INTERNAL ROTOR MOLECULES TO A POSSIBLE VARIATION OF THE PROTON-TO-ELECTRON MASS RATIO

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Recently, methanol was identified as a sensitive target system to probe variations of the proton-to-electron mass ratio.[a] The high sensitivity of methanol originates from the interplay between overall rotation and hindered internal rotation of the molecule and it gives rise to a large enhancement of the sensitivity coefficient, K_μ. In this talk we will remind the general concepts that form the foundation of the high sensitivity in methanol and the approximate model which allows to estimate the sensitivities of transitions in internal rotor molecules with C_{3v} symmetry, without performing a full calculation of energy levels. We will show some examples by comparing obtained sensitivities for methanol, acetaldehyde, acetamide, methyl formate and acetic acid with a full analysis using the molecular Hamiltonian. The talk will give some details about how we obtain the energy levels from the BELGI code. From the molecules considered, methanol appears to be the most suitable candidate for laboratory and cosmological tests searching for a possible variation of μ.

[a] Jansen et al. Phys. Rev. Lett 106, 100801 (2011)