

Can we use Mössbauer spectroscopy to search for CP-violating moments?

M. Scheck^{1,2}, R. Chapman^{1,2}, J. Dobaczewski³,
C. Ederer⁴, P. Ivanov⁵, G. Lorusso⁵, and D. O'Donnell^{1,2}

¹*University of the West of Scotland, Paisley, UK*

²*Scottish Universities Physics Alliance, Glasgow, UK*

³*University of York, York, UK*

⁴*ETH Zürich, Zürich, Switzerland and*

⁵*National Physical Laboratory, Teddington, UK*

Nuclei with strong octupole correlations have the tendency to adopt a pear-like shape [1]. It is predicted that in the ground state of a nucleus with enhanced octupole correlations [1], the coupling of these octupole correlations with the quadrupole deformation results in CP-violating odd-electric and even-magnetic moments (e.g. see Refs. [2,3,4] and references therein). Odd-mass nuclei with enhanced octupole correlations exhibit parity doublets, i.e. two nearly degenerate states with the same spin but opposite parity for which the lower-lying level is the ground state. These levels are connected with a low-energy $E1$ transition, which is perfectly suited to apply the technique of recoil-free selfabsorption, which is better known as Mössbauer spectroscopy.

In this contribution nuclei with enhanced octupole correlations, quadrupole-octupole coupling, and the physics causing in odd-mass nuclei parity doublets will be introduced. Furthermore, the experimental technique of Mössbauer spectroscopy is elucidated and how it possibly can be exploited to search for effects caused by the odd-electric $E1$ moment and the even-magnetic $M2$ moment in the ground state of ^{227}Ac [5]. The talk will end with an overview of the current status of the experimental efforts.

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