Electromagnetic moments for isomeric states in nuclei far from stability

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The electromagnetic moments provide essential information for elucidating the structure of nuclear states. The magnetic moment, $\mu = gI\mu_N$, is a sensitive probe to investigate the single particle configuration, because the nucleon g factors depend strongly on their orbital and total momentum. On the other hand, the spectroscopic electric quadrupole moment Qs, which is a measure of the deviation of the nuclear charge distribution from spherical symmetry, reflects the competition between single-particle and collective degrees of freedom and allows determining the nuclear shape.
An experimental program was undertaken at the XTU Tandem of Laboratori Nazionali di Legnaro, Italy, devoted to precise determination of static moments for isomeric states with lifetime in the ns-μs range in nuclei far from stability. The isomeric states were populated and aligned in fusion-evaporation reactions and their interactions with extranuclear fields were investigated by the time-differential perturbed angular distribution method. In the g-factor measurements the spin precession was studied in an external magnetic field applied at the target position. To determine spectroscopic quadrupole moments the excited nuclei were in-beam implanted in appropriate metallic hosts and the perturbation of the angular distribution due to the interaction with the crystalline lattice electric field gradients has been investigated.
The presentation will focus on experimental results illustrating topics of recent interest, as the properties of K isomers in transitional and deformed nuclei [1-3], the magnetic rotation phenomenon [4] and the coexistence of spherical and deformed structures in neutron-deficient Pb nuclei [5,6].

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