Shape Coexistence in Pb Nuclei Probed by Static Electromagnetic Moments

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The neutron-deficient Pb nuclei offer one of the best illustration of the phenomenon of shape coexistence. Spherical states associated with the Z=82 shell closure are coexisting at low excitation energies with deformed states involving many particle-many hole (*np-nh*) proton excitations across the closed shell. Detailed theoretical calculations within the framework of mean-field [1,2] and interacting boson [3] approaches have been recently performed to describe this phenomenon. While the two complementary approaches provide a qualitatively good description of the spectra, they are predicting however different values for the underlying deformations.

An interesting feature of light Pb nuclei is the coexistence of high-spin isomers described by normal and intruder configurations. These isomers give the opportunity to elucidate the involved quasiparticle structure and deformation through static moment measurements.

We present recent results obtained within an experimental program devoted to precise determination of static moments for coexisting states in neutron-deficient Pb nuclei, undertaken at the XTU Tandem of the Laboratori Nazionali di Legnaro. 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 (TDPAD) method. Figure 1 illustrates perturbed spectra obtained for the 12^+ and 11^- isomeric states in ^{192}Pb, interpreted as a *spherical* $(1i^2_{13/2})$ neutron configuration and an *oblate* $(3s^{-2}_{1/2}1h_{9/2}1i_{13/2})$ proton intruder configuration, respectively. The values $|Q_s(12^+)|$=0.27(5) eb and $|Q_s(11^-)|$=2.5(3) eb have been derived for the spectroscopic quadrupole moments. Assuming a $K^\pi=11^-$ oblate configuration, the quadrupole deformation $\beta_2^{exp}(11^-)$=–0.11(1) is deduced. The experimental results will be compared with various theoretical predictions. New static moment measurements are needed for a better understanding of the coexisting structures in neutron-deficient Pb nuclei.

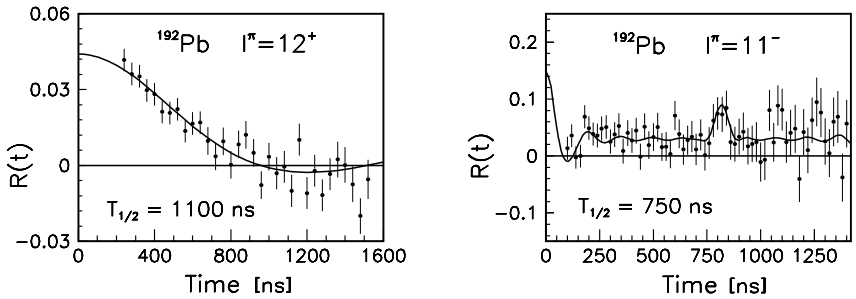

Figure 1: *TDPAD spectra showing the electric quadrupole interaction of the 12^+ and 11^- isomeric states in ^{192}Pb implanted in the polycrystalline lattice of metallic Bi.*

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[2] M. Bender *et al.*, Phys. Rev. **C 69**, 064303 (2004).

[3] V. Hellemans *et al.*, Phys. Rev. **C 71**, 034308 (2005).