Quadrupole moments for isomeric states with normal and intruder configurations in neutron-deficient Pb nuclei *

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An interesting feature of the neutron-deficient Pb nuclei is the coexistence of high-spin isomers with different deformations. In the even-mass $^{188-196}$Pb isotopes, spherical 12^+ isomeric states described by the $(1i^2_{13/2})$ two-quasineutron configuration are coexisting with 11^- isomers involving the $(3s^{-2}_{1/2}1h_{9/2}1i_{13/2})$ two-proton intruder configuration. Enhanced strengths of the $E3$ transitions from the 11^- isomers were recently reported in $^{190-196}$Pb [1], and interpreted as an evidence that these states are oblate-deformed. Independent experimental information concerning the deformation of the intruder isomers in ^{194,196}Pb was provided by static quadrupole moment measurements [2].

We have recently started an experimental program aiming to provide new evidence concerning the shape coexistence in light Pb nuclei by precise static moment measurements. Spectroscopic quadrupole moments for three short-lived isomeric states in ^{193}Pb, one of them being the bandhead of a magnetic rotational band involving the coupling of the 11^- two-proton intruder excitation with a $(1i_{13/2})$ quasineutron, have been reported in [3,4]. In this contribution we present results of new investigations, devoted to the 11^- and 12^+ isomeric states in ^{192,194}Pb. The isomers were populated and aligned in the ^{168}Er(^{28}Si,4n)^{192}Pb and ^{170}Er(^{29}Si,5n)^{194}Pb reactions with pulsed beams delivered by the XTU-Tandem accelerator of Laboratori Nazionali di Legnaro. They were subject to the interaction with the electric field gradient (EFG) of the polycrystalline lattice of metallic Bi in which the excited Pb nuclei were in-beam implanted. The quadrupole interaction has been investigated by the method of time-differential observation of the perturbed angular distribution (TDPAD) of de-exciting γ-rays. Figure 1 illustrates perturbed spectra obtained for the isomeric states of ^{194}Pb. The known spectroscopic quadrupole moment $|Q_s(12^+,^{194}\mathrm{Pb})|$=0.49(3) eb was used to deduce the EFG strength for the Pb nuclei substitutionally implanted in the Bi lattice: V_{zz}(PbBi) = 1.36(10) x $10^{21} V/m^2$. With this calibration, the values derived for the spectroscopic quadrupole moments are $|Q_s(12^+,^{192}\mathrm{Pb})|$=0.32(4) eb, $|Q_s(11^-,^{192}\mathrm{Pb})|$=2.9(3) eb, and $|Q_s(11^-,^{194}\mathrm{Pb})|$=3.6(4) eb. The experimental quadrupole moments and deformations are compared with the theoretical predictions of phenomenological and microscopical models.

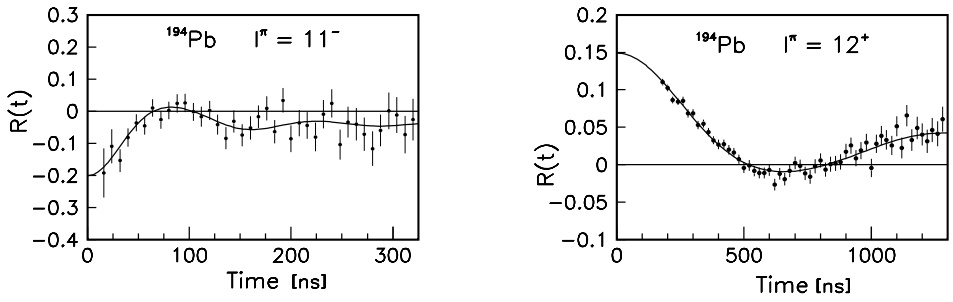

Figure 1: *TDPAD spectra showing the electric quadrupole interaction of the 11^- and 12^+ isomeric states in ^{194}Pb implanted in the polycrystalline lattice of metallic Bi.*

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