STUDY OF DIPOLE BANDS IN ^{194}Pb WITH EUROGRAM*

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New results have been obtained on the dipole bands in ^{194}Pb using the EUROGAM-I spectrometer array. The two dipole bands recently observed have been extended to higher spin and excitation energy. Band crossing is observed at the top of one band, which leads to a new configuration based on six quasi-particle excitation. The configuration assigned to the second band is confirmed at higher spin.

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Using the early implementation of EUROGAM detector array (*i.e.* 30 Compton Suppressed Germanium detectors (CSG)), two regular dipole bands have been observed in ^{194}Pb [1]. Their excitation energies and spin values have been determined, as the deexcitation γ-rays have been identified and placed in the level scheme. In one case, the deexcitation paths are very fragmented: about ten γ-rays have been identified, within an energy range from 700 to 1705 keV and an intensity of the order of few % of the reaction channel. The deexcitation of the two regular dipole bands proceeds mainly through the isomeric 11^- level interpreted as a $(\pi h9/2 \pi i13/2) K^\pi = 11^-$ two-proton state, corresponding to an oblate deformation. Similar results have also been reported in Ref. [2]. The comparison of these two bands with the rotational bands observed in the neighbouring isotone ^{192}Hg leads to the conclusion that the two high-spin structures in ^{194}Pb have the following multiparticle configurations:

$$\{\pi h9/2 \pi i13/2\} \otimes \{\nu i13/2\}^2 \text{ and } \{\pi h9/2 \pi i13/2\} \otimes \{(\nu i13/2)^3 \, \nu f5/2\}\,.$$

In order to study superdeformation in ^{194}Pb, a new experiment has been recently performed at the NSF at Daresbury using the EUROGAM-I spectrometer (45 CSG). The ^{184}W(^{16}O,6n) fusion-evaporation reaction was used at a beam energy of 113 MeV. The target consisted of two stacked foils of 325 μg/cm^2 thickness each. Five unsuppressed Ge were required in coincidence to record the events.

With this new data set, the two dipole bands have been extended to higher spin and excitation energy. Two new transitions of 442 and 428 keV have been observed at the top of the negative-parity band and four new ones of 421, 442, 462 and 485 keV are added on the top of the positive-parity band leading to the highest spin and excitation energy observed so far in the normally-deformed ^{194}Pb nucleus.

Figure 1 shows the variation of the excitation energy (with respect to the 11^- isomeric state) *versus* the spin of states in the negative-parity band and the positive-parity band in ^{194}Pb, compared, respectively, to the yrast band and the negative-parity band of ^{192}Hg [3, 4]. Including the new results obtained in ^{194}Pb, the top of the negative parity band shows a crossing, which takes place at the same energy in both isotones (Fig. 1a). Moreover, the orthogonal coupling of the $K^\pi = 11^-$ (due to the two protons ^{194}Pb) with the $J^\pi = 20^+$ (due to the breaking of two neutron pairs $\{\nu i13/2\}^4$, as in ^{192}Hg) leads to a total spin $I^\pi = 23^-$, which is precisely the spin value corresponding to the crossing observed in ^{194}Pb. Therefore, the configuration assigned to the top of the band is $\{\pi h9/2 \pi i13/2\} \otimes \{\nu i13/2\}^4$.

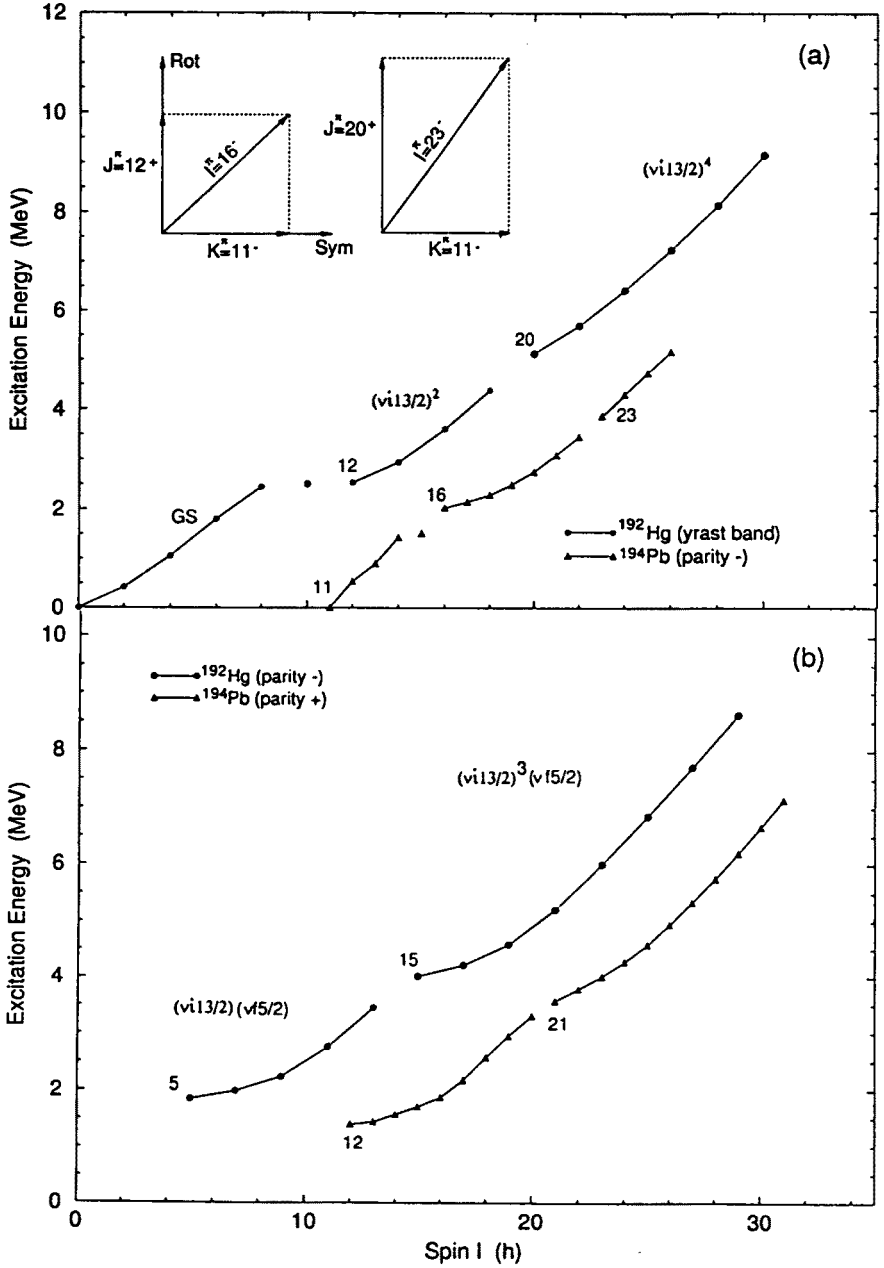

Fig. 1. Excitation energy as a function of spin value: comparison between (a) — negative-parity band in ^{194}Pb and yrast band in ^{192}Hg [3, 4]; (b) — positive-parity band in ^{194}Pb and negative-parity band in ^{192}Hg [3, 4].

On the other hand, the positive-parity band of ^{194}Pb (Fig. 1b) remains regular up to the highest spin observed in this work. This is consistent with the behaviour of the negative parity band of ^{192}Hg. The configuration assigned to this positive parity band in Ref. [1] is confirmed at higher spin, *i.e.* $\{\pi h9/2 \pi i13/2\} \otimes \{(\nu i13/2)^3 \nu f5/2\}$.

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