

Confirmation of a superdeformed band in ^{192}Pb

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A number of experiments have been performed to map out the region of superdeformed shapes in and around the neutron deficient Pb isotopes. Of particular interest are the edges of such regions, where theoretical nuclear models are most rigorously tested. For this purpose, during a brief test of the electronics of the GAMMASPHERE array at the 88-Inch Cyclotron we conducted a 7 hour test run using a reaction $^{173}\text{Yb}(^{24}\text{Mg},5n)$ to populate high spin states in ^{192}Pb at a beam energy of 140 MeV. In spite of the brief duration of the experiment, subsequent analysis allowed us to confirm the original observation [1] of the SD band assigned to ^{192}Pb [2], the assignment of which had previously been under dispute[3].

The increased resolution afforded by GAMMASPHERE with its 49 Compton-suppressed detectors permitted the SD band to be seen from only three clean gates at 304, 345 and 424 keV (Fig 1a). As previously reported [1] and as is seen in Figure 1b, the entire SD band consists of nine transitions, extending over a range of approximately 300 keV. The relatively small number of transitions populating ^{192}Pb in this experiment as compared with other heavier even-even lead isotopes may reflect greater fission competition as the reduction in the fissility parameter (which scales roughly as Z^2/A) for lighter isotopes in Pb makes it more difficult to populate a superdeformed (SD) band in ^{192}Pb . The γ -ray energies are also shown in Figure 1a and agree with previous published values to within 1 keV[1]. The band has a moment of inertia similar to ^{194}Pb SD band 1. The presence of low-lying isomers prevents definitive isotopic assignment to ^{192}Pb , although this has recently been confirmed[4]. The inband relative intensities of

the SD band transitions are shown in the inset of Figure 1b. In summary, we confirm the earlier observation of the SD band assigned to ^{192}Pb . To date, no SD bands in lighter Pb isotopes have been observed.

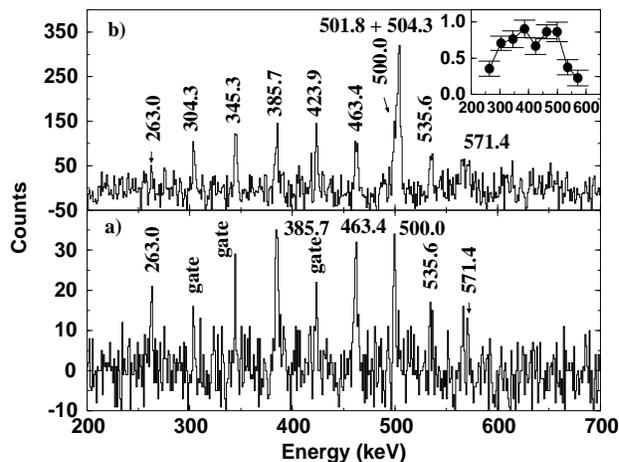


Figure 1: Sum of coincidence spectra of the SD band in ^{192}Pb , obtained from triples data, showing: a) from clean gates at 304, 345 and 424 keV, and b) a sum of all gates on known in-band transitions. Band members, are labelled with their energies in keV. Also labelled are the prominent $5^- \rightarrow 4^+$ and $4^+ \rightarrow 2^+$ transitions at 504.3 and 501.8 keV, respectively, in ^{192}Pb .

References

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