Direct decays of superdeformed ^{192}Pb and ^{196}Pb: excitation energies of superdeformed states in the Pb isotopes

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The existence of metastable superdeformed (SD) states in atomic nuclei is one of the most exciting discoveries of recent nuclear structure studies. Over the past two decades, rotational bands associated with such extremely elongated nuclear shapes have been observed in several regions of the nuclear chart [1] with 84 such bands observed in nuclei with $79 \leq Z \leq 84$ (the $A \approx 190$ region) alone. Unfortunately, precise measurement of the fundamental properties - excitation energy, spin and parity - of these states has only rarely been possible; to date, only such measurements have been successfully achieved for only six SD bands in this mass region [2,3,4,5,6,7]. This has been because of the difficulty in identifying the very weak discrete transitions linking SD states with levels at normal deformations (ND levels).

Recently, single-step transitions linking states in the SD minimum to ND states have been identified in ^{192}Pb [6] and ^{196}Pb [8]. In both cases, using the *time* correlations of γ-ray decays feeding and de-exciting isomeric states (as well as the usual energy correlations) proved to be the key to understanding the decay paths. Together with previous measurements of the excitation energy of SD states in ^{194}Pb [4,5], the results allow a systematic study of the SD well in a single isotope chain.

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