# Deformation in the mid $fp$-shell region: isomer tagging in $^{59}$Cr

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The structure above the 96-$\mu$s isomer in the isotope $^{59}$Cr has been investigated to shed light on the nature of the developing nuclear shapes in the neutron-rich $fp$ shell. The current understanding in this region is somewhat muddled, with evidence having been previously interpreted in different cases as indicating strong prolate, mildly oblate, oblate and rather soft deformations in closely-lying isotopes. Neutron shell gaps appear at both prolate and oblate shapes near mass-60 that might help drive rapid shape changes. It has been suggested that the $^{59}$Cr isomer is associated with an oblate shape [1], but the experimental situation is rather uncertain, and other interpretations are possible [2]. This study was motivated by the need to establish the level structure built on the isomer in order to gain further insight.

The $^{13}$C($^{48}$Ca,2p)$^{59}$Cr reaction was used at Gammasphere to populate states above the isomer. Isomer-decay tagging was used in two different ways. Firstly, a Pb catcher placed after the target, along with beam pulsing, provided high-statistics, but complex, prompt-delayed correlations. Secondly, following recoil separation through the Fragment Mass Analyzer (FMA) and a transmission ion chamber, delayed transitions detected in a clover array behind the focal plane were correlated to prompt $\gamma$ rays in Gammasphere.

Presented here are the first results from this experiment and a discussion of the viability of combining these two methods of isomer tagging.

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