

## Mirror Spectroscopy in the upper $fp$ -shell with GRETINA

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The idea of charge independence is related to the concept of isospin where the proton and neutron are treated as the same particle (the nucleon) distinguished by the isospin projection,  $T_z$ , on a quantization axis. Isospin symmetry is broken largely by the Coulomb interaction, having accounted for this there may be residual nuclear isospin non-conserving effects. Experimentally, to search for such effects, one examines energy differences between Isobaric Analogue States (IAS). These differences are described in terms of isovector and isotensor components.

Previous work on nuclei in the  $f_7$  shell has revealed new and unexpected isospin breaking effects which cannot easily be explored with the Coulomb interaction alone. To investigate such effects in even heavier systems of the upper  $fp$  shell, an experiment was carried out at the National Superconducting Cyclotron Laboratory in Michigan State University. A  $^{78}\text{Kr}$  primary beam was fragmented with secondary beam particles identified in the A1900 spectrometer, secondary fragmentation took place at the target position of the S800 spectrograph with the GRETINA detector system measuring gamma rays. New results include: 1) The structure of  $^{65}\text{As}$  investigated through mirrored knockout, the selection of observed states will be described by the emission of a  $g_{\frac{1}{2}}$  proton from an isomeric state; 2) new states in  $^{63}\text{Ge}$  are observed and allow us to measure the  $A = 63$  mirror energy differences. These results will be discussed and further described within the context of shell model calculations; 3) a candidate for the  $T = 1$   $J^\pi = 2^+$  state in  $^{62}\text{Ga}$  has been identified with better agreement to systematics of known odd-odd isobaric states than the candidate suggested in the literature.