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STUDIES OF HIGH- K ISOMERS AT TRIUMF-ISAC

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The 8π spectrometer, an array of 20 Compton-suppressed HPGe detectors situated at TRIUMF, has been reconfigured as a high-efficiency device for γ -ray spectroscopy with radioactive beams [1], and recently augmented by the addition of the 20-plastic-scintillator SCEPTAR array and a moving tape transport. This powerful combination will be used for $\beta - \gamma$ coincidence measurements following the implantation of radioactive beams from the ISAC facility, produced by bombarding 500 MeV protons with refractory production targets. By detecting β and γ radiation, while removing long-lived isobars with the tape transport, isomers and β decays are characterized by their half-lives and decay schemes.

One of the first experimental programs to use the new detection system is a study of high- K isomers in neutron-rich nuclei with $A = 170 - 190$. Many such isomers, which arise because of the K -selection rule, are known [2] in this region of the nuclear chart (albeit closer to stability) and their properties elucidate basic nuclear-structure information, particularly on the interplay of single-particle and collective excitations. The initial focus at TRIUMF is on the doubly-mid-shell region around ^{170}Dy [3].

As a precursor to the radioactive-beam experiments, the decay of the remarkable $^{178m2}\text{Hf}$ isomer ($T_{1/2} = 31$ years) has been investigated with a 15 kBq source placed at the center of the 8π spectrometer [4]. High-multipolarity $M4$ and $E5$ transitions, which represent the first definitive evidence for γ -ray emission directly from the isomer, have been identified, together with other low-intensity transitions. Branching ratios for these latter transitions elucidate the spin-dependence of the mixing between the two $K^\pi = 8^-$ bands. The $M4$ and $E5$ transitions are the first strongly K -forbidden examples with such high multiplicities, and demonstrate a consistent extension of K -hindrance systematics. The ^{178}Hf results, and the status of the 8π -SCEPTAR experiments, will be discussed.

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