New Structures in ^{178}Hf and Coulomb Excitation of Isomers*

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High-K isomers in ^{178}Hf exhibit electromagnetic (EM) transition hindrances ranging from 24 to 165 per degree of K-forbiddenness, indicating that K is a good quantum number independent of rotational effects. However, Coulomb excitation of the $K^{\pi}=6^{+},8^{-}$ and 16^{+} isomers in ^{178}Hf has been observed multiple times[1,2,3], raising the question of the origin of the apparent loss of K selection. Previous analysis deduced that the low-K bands were responsible for the K-mixing necessary to populate the high-K bands and showed that the mixing must be above I≈12 in the *yrast* band[3], but direct γ-decay transitions were below observable limits, consistent with the proposed B(Mλ) values.

Recent Coulomb excitation of a 985 MeV ^{178}Hf beam (ATLAS) by a 500 μg/cm^2 ^{208}Pb target with CHICO+Gammasphere has yielded ~3×10^9 p-p-γ events and approximately 368 γ-decay transitions involving 185 levels in 18 rotational bands, about 57 of which are newly identified. High-K isomer bands were populated at the 10^{-3} level normalized to the ground-state band (GSB).

A new “tilted” band crossing in the GSB provides a mechanism for the previously reported direct Coulomb excitation of the $K^{\pi}=6^{+}$ and 8^{-} two-quasiparticle isomer bands. Direct γ-decay feeding to some of the isomer band states has been observed, which could confirm the postulated breakdown of K conservation in the low-K bands[1]. There is evidence of a new band connected with the 16^{+}, 31 year isomer band, which may be consistent with a γ-vibration built on the isomer.

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