Nature of the $K^{\pi}=4^+$ bands in the Os isotopes*

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The $K^{\pi}=4^+$ bands in the even osmium isotopes have long been controversial. There were early suggestions that these bands were two-phonon γ vibrations since their energies are nearly twice that of the $K^{\pi}=2^+$ one-phonon states. Calculations with the *sd* IBM [1] supported this interpretation since they reproduced well the *E2* branching ratios. However, large (t,α) transfer strengths [2,3] were observed to the 4^+ levels in ^{190,192}Os, consistent with significant two-quasiparticle components in the wave functions, that cast doubt on the two-phonon interpretation. Inelastic scattering measurements [4,5] using the (α,α′) reaction strongly populated the $K^{\pi}=4^+$ states, and large *E4* matrix elements were extracted. However, in a very detailed series of Coulomb excitation experiments [6], enhanced *E2* matrix elements were extracted for the $K^{\pi}=4^+ \rightarrow K^{\pi}=2^+$ transitions in $^{186-192}$Os. The $K^{\pi}=4^+$ bands were interpreted [7] as two-phonon γ vibrations since the intrinsic matrix elements were consistent with that expected for double-phonon excitations.

Since the (t,α) reaction mechanism is not as well understood as other single-nucleon transfer reactions using light-ions, doubts were cast on the values of the extracted spectroscopic strengths in ^{190,192}Os. In order to avoid the uncertainties in the reaction mechanism and gain further insight in the structure of the $K^{\pi}=4^+$ bands, we have performed ^{185,187}Re(^{3}He,d)^{186,188}Os experiments at the tandem accelerator facility of the TUM/LMU using beams of 30 MeV ^{3}He ions. The deuterons were momentum analyzed with the Q3D magnetic spectrograph. Spectra were recorded at nine angles, ranging from 5 to 50 degrees, and absolute cross sections were determined. Results from these experiments will be presented, our conclusions regarding the nature of the $K^{\pi}=4^+$ bands, and remaining open questions on Os nuclear structure.

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