

$^{166}\text{Er}(^{16}\text{O}, ^{15}\text{O}\gamma), (^{12}\text{C}, ^{11}\text{C})$ 1981Bo16

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen		NDS 191,1 (2023)	22-Aug-2023

1981Bo16: $E(^{16}\text{O})=120$ MeV, $E(^{12}\text{C})=95$ MeV from Brookhaven National Laboratory tandem facility. Targets were enriched ^{166}Er , 50-200 $\mu\text{g}/\text{cm}^2$ thick evaporated on thin C backings. Measured ^{15}O and ^{11}C spectra at 42° , $(^{15}\text{O})\gamma$ -coin using Q3D magnetic spectrometer with position sensitive E- ΔE gas proportional counter, with γ rays measured at 130° using a Ge(Li) detector. Typical FWHM=100-150 keV for ^{15}O , and 80-120 keV for ^{11}C ions. Deduced relative populations of levels above the g.s. and assigned spins based on these populations.

 ^{167}Er Levels

In selective population of high-j and high-K states in ^{167}Er in heavy-ion induced single-neutron-transfer reactions, $L+1/2$ final states were strongly favored in $(^{16}\text{O}, ^{15}\text{O})$ reaction, whereas $L+1/2$ and $L-1/2$ final state populations were comparable observed in the $(^{12}\text{C}, ^{11}\text{C})$ reaction.

E(level) [†]	J π	Relative population	Comments
294 20	13/2 ⁺	2.2	J π : this peak is strong in both the reactions, suggesting 13/2 ⁺ , and as a 13/2 ⁺ member of the $\nu 7/2[633]$ Nilsson configuration.
413 20		0.4	
430 20	7/2 ⁻	1.0	J π : this peak is reduced in intensity compared to that of the 294-keV peak, suggesting 7/2 ⁻ , and the 7/2 ⁻ member of $\nu 5/2[512]$ Nilsson configuration.
434 20	15/2 ⁺	<0.2	E(level), J π : 15/2 ⁺ member of the $\nu 7/2[633]$ Nilsson configuration, weakly populated, likely in a multi-step process.
1320 20	9/2 ⁻		J π : this peak is very strong in $(^{12}\text{C}, ^{11}\text{C})$, and is absent in $(^{16}\text{O}, ^{15}\text{O})$, implying 9/2 ⁻ assignment, and the 9/2 ⁻ member of $\nu 7/2[514]$ Nilsson configuration.
1530 20	13/2 ⁺		J π : this peak is strong in $(^{16}\text{O}, ^{15}\text{O})$ reaction, but a doublet in $(^{12}\text{C}, ^{11}\text{C})$. This level yields γ rays exclusively from the low-lying members of the $\nu 7/2[633]$ band in $(^{15}\text{O})\gamma$ -coin, which is with this state as 13/2 ⁺ member of the $\nu 9/2[624]$ band.

[†] In heavy-ion-induced transfer reactions, $\sigma(\theta)$ distributions are bell shaped, independent of angular momentum transfer. Spectra of ^{15}O and ^{11}C ions were taken at the peak of $\sigma(\theta)$ distribution and converted to excitation energies. Evaluators note that in spectral Fig. 2, there are several other unlabeled peaks in both the $(^{16}\text{O}, ^{15}\text{O})$ and $(^{12}\text{C}, ^{11}\text{C})$ reactions up to about 3.5-MeV excitation energy, implying population of additional levels in ^{167}Er .