^{167}Er(d,d′) 1973St18

History

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

1973St18: E(d)=12.109 MeV. Two experiments were performed: 1. ^{167}Er target separated using University of Aarhus isotope separator with a ≈40 μg/cm^2 thickness deposited on 40 μg/cm^2 carbon foil. Differential cross sections measured at 60½ 90° and 125°. 2. ≈90% enriched ^{167}Er target of ≈150 μg/cm^2 thickness on carbon foil. Differential cross sections measured at 90°, 125°, and 150°. Deuteron spectra were measured using a magnetic spectrometer at Niels Bohr Institute Tandem accelerator facility. In 1978Kv01 (from the same laboratory as 1973St18), experimental data in 1973St18 have been analyzed by expanding Nilsson potential with hexadecapolar deformation for model calculations, and deduction of B(E2) values for selected levels.

^{167}Er Levels

The L-values deduced from dσ/dΩ(90°)/dσ/dΩ(125°) ratios and σ(θ) data are not explicitly given in 1973St18. Values of ≈2 for ratio has been taken by authors as indicative of E2 (L=2) transition and that of ≈1.3 or less for higher multipolarities (L≥3). However, authors made a cautionary statement: "The angular distribution might be, however, rather strongly affected by interference from other types of excitation. Therefore, the determination of *l* by these simple methods should be taken with considerable reservation".

B(E2)(up) values are from 1973St18, estimated from 90° cross sections and using empirical rules for even-even nuclei, with the same reservation as stated by authors above for L-transfers. Due to their tentative nature, the B(E2) values from this dataset have not been considered in the Adopted Levels, Gammas dataset.

E(level)	J^π[†]	Comments
0[‡&]	7/2$^+$[‡]	dσ/dΩ (mb/sr)=405 (60°), 60.6 (90°), 13.0 (125°), 7.0 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=4.7.
79[‡&] *2*	9/2$^+$[‡]	B(E2)↑=2.34 *12* dσ/dΩ (mb/sr)=3.91 (60°), 2.64 (90°), 1.56 (125°), 1.18 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.7.
178[‡&] *2*	11/2$^+$[‡]	B(E2)↑=0.66 *4* dσ/dΩ (mb/sr)=1.10 (60°), 0.739 (90°), 0.426 (125°), 0.337 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.7.
296[‡&] *2*	13/2$^+$[‡]	dσ/dΩ (μb/sr)=25 (60°), 27 (90°), 30 (125°), 23 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.9.
346 *2*		dσ/dΩ (μb/sr)=5 (90°), 3 (125°), 1 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.7.
411 *2*		dσ/dΩ (μb/sr)=11 (60°), 4 (90°), 3 (125°), 1 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.6.
433[‡&] *2*	15/2$^+$[‡]	dσ/dΩ (μb/sr)=18 (60°), 13 (90°), 15 (125°), 11 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.9. E(level),J^π: complex peak with one component assigned 15/2$^+$.
532[‡c] *2*	3/2$^+$[‡]	B(E2)↑=0.037 *3* dσ/dΩ (μb/sr)=52 (60°), 32 (90°), 14 (125°), 7 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=2.3. E(level),J^π: complex peak with one component assigned 3/2$^+$.
573[‡c] *2*	5/2$^+$[‡]	B(E2)↑=0.040 *4* dσ/dΩ (μb/sr)=42 (60°), 35 (90°), 14 (125°), 9 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=2.4.
592[#&] *2*	(17/2$^+$)[#]	dσ/dΩ (μb/sr)=13 (60°), 8 (90°), 5 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.4.
639[‡c] *2*	7/2$^+$[‡]	B(E2)↑=0.020 *2* dσ/dΩ (μb/sr)=15 (60°), 17 (90°), 18 (125°), 12 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.0.
711[‡d] *2*	11/2$^+$&(9/2$^+$)[‡]	B(E2)↑=0.079 *6* dσ/dΩ (μb/sr)=95 (60°), 68 (90°), 42 (125°), 21 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.6. E(level),J^π: complex peak with one component assigned 11/2$^+$ and tentative (9/2$^+$).
730 *2*		dσ/dΩ (μb/sr)=6 (90°), 5 (125°), 2 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.3.
771[#&] *2*	(19/2$^+$)[#]	dσ/dΩ (μb/sr)=4 (90°), 4 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.9.
788[@c] *2*	(11/2$^+$)[@]	B(E2)↑=0.004 *2* dσ/dΩ (μb/sr)=3 (90°), 4 (125°), 2 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.7.
810[‡a] *2*	5/2$^+$[‡]	B(E2)↑=0.046 *5* dσ/dΩ (μb/sr)=41 (60°), 40 (90°), 27 (125°), 19 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.7.
826[‡d] *2*	13/2$^+$[‡]	dσ/dΩ (μb/sr)=11 (60°), 16 (90°), 23 (125°), 17 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.7.
872[‡a] *2*	7/2$^+$[‡]	B(E2)↑=0.048 *4*

Continued on next page (footnotes at end of table)

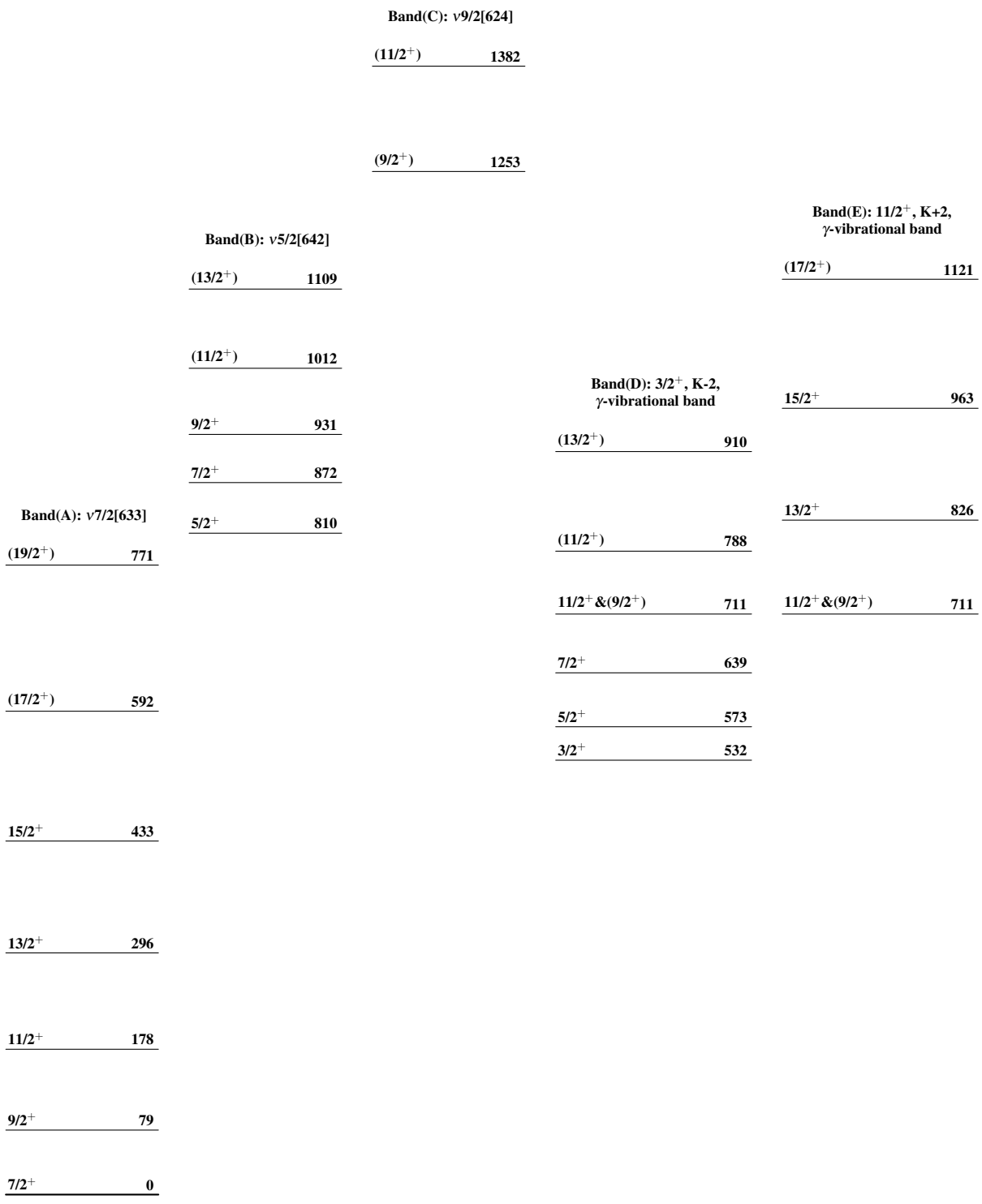
^{167}Er(d,d′) 1973St18 (continued)

^{167}Er Levels (continued)

E(level)	Jπ†	Comments
		dσ/dΩ (μb/sr)=54 (60°), 42 (90°), 32 (125°), 16 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.3.
910@c 2	(13/2+)@	dσ/dΩ (μb/sr)=6 (90°), 4 (125°), 1 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.4.
931‡a 2	9/2+‡	B(E2)↑=0.023 3 dσ/dΩ (μb/sr)=16 (60°), 20 (90°), 10 (125°), 7 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=2.0.
963‡d 2	15/2+‡	dσ/dΩ (μb/sr)=8 (60°), 11 (90°), 13 (125°), 10 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.9.
1012a 4	(11/2+)	B(E2)↑<0.004 (1978Kv01) Jπ and configuration assignment by 1978Kv01 based on weakly populated state at 1012 keV in the (d,d′) spectrum of 1973St18, and theoretical analysis.
1042 2		B(E2)↑=0.004 2 dσ/dΩ (μb/sr)=8 (60°), 4 (90°), 3 (125°), 2 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.5.
1057 2		Tentative assignment as (11/2+) member of ν5/2[642] band is refuted in theoretical analysis of (d,d′) data by 1978Kv01, stating "If the levels at 932 and 1057 keV, assigned as the 9/2 and 11/2 members of the $K^{\pi}=5/2^{+}$ band are simultaneously included in the optimization procedure, reasonable value of χ^2 (Eq. (16)) cannot be achieved". Instead, 1978Kv01 assigned a weakly populated level in (d,d′) spectrum of 1973St18 at 1012 keV as the (11/2+) member of the ν5/2[642] band. dσ/dΩ (μb/sr)=6 (60°), 7 (90°), 5 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.3.
1109a 4	(13/2+)	Jπ and configuration assignment by 1978Kv01 based on weakly populated state at 1109 keV in the (d,d′) spectrum of 1973St18, and theoretical analysis.
1121@d 2	(17/2+)@	dσ/dΩ (μb/sr)=6 (60°), 4 (90°), 3 (125°), 2 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.9.
1175 2		dσ/dΩ (μb/sr)=8 (60°), 5 (90°), 3 (125°), 4 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.6.
1221 2		dσ/dΩ (μb/sr)=3 (90°), 4 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.7.
1253#b 2	(9/2+)#	B(E2)↑=0.020 3 dσ/dΩ (μb/sr)=18 (90°), 11 (125°), 9 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.6.
1283 2		dσ/dΩ (μb/sr)=9 (90°), 7 (125°), 5 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.3.
1382#b 2	(11/2+)#	B(E2)↑=0.017 4 dσ/dΩ (μb/sr)=15 (90°), 8 (125°), 6 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.9. E(level): complex peak.
1410 2		B(E2)↑=0.009 3 dσ/dΩ (μb/sr)=8 (90°), 4 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=2.2.
1550 2		B(E2)↑=0.007 2 dσ/dΩ (μb/sr)=6 (90°), 2 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=2.7.
1607 2		dσ/dΩ (μb/sr)=6 (90°), 10 (125°), 6 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.6.
1634 2		dσ/dΩ (μb/sr)=6 (90°), 4 (125°), 4 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.3.
1681 2		dσ/dΩ (μb/sr)=10 (90°), 8 (125°), 7 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.2.
1719 2		dσ/dΩ (μb/sr)=3 (90°), 3 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.1.
1738 2		B(E2)↑=0.008 2 dσ/dΩ (μb/sr)=7 (90°), 5 (125°), 6 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.5.
1775 2		dσ/dΩ (μb/sr)=4 (90°), 10 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.5.
1789 2		dσ/dΩ (μb/sr)=8 (90°), 9 (125°), 4 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=0.9.
1843 2		dσ/dΩ (μb/sr)=5 (90°), 4 (125°), 3 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.2.
1911 2		dσ/dΩ (μb/sr)=6 (90°), 5 (125°), 4 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.2.
1928 2		dσ/dΩ (μb/sr)=10 (90°), 10 (125°), 11 (150°); dσ/dΩ(90°)/dσ/dΩ(125°)=1.0.

† As given in Table 1 and Fig. 6 in 1973St18, based on σ(θ) and band assignments. Less certain assignments labeled as 'B' and 'C' are listed here in parentheses.
‡ Most certain Jπ and configuration assignments labeled by 'A' in Table 1 and Fig. 6 of 1973St18.
# Less certain Jπ and configuration assignments labeled by 'B' in Table 1 and Fig. 6 of 1973St18.
@ Least certain Jπ configuration assignments labeled by 'C' in Table 1 and Fig. 6 of 1973St18.
& Band(A): ν7/2[633].
a Band(B): ν5/2[642].
b Band(C): ν9/2[624].
c Band(D): 3/2+, K-2, γ-vibrational band.
d Band(E): 11/2+, K+2, γ-vibrational band.

^{167}Er(d,d′) 1973St18



$^{167}_{68}Er_{99}$