^{147}Sm(n,n′γ) 1983Av07,1984Ba62

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	N. Nica and B. Singh	NDS 181, 1 (2022)	9-Mar-2022

1983Av07,1984Ba62: E=fast neutrons (reactor), 99.5% enriched targets, Ge(Li) detector; measured Eγ, Iγ (1983Av07); measured Eγ, Iγ, γ(θ), deduced δ (1984Ba62).

^{147}Sm Levels

E(level)†	Jπ‡	Comments
0.0	7/2⁻	
121.18 *7*	5/2⁻	
197.47 *11*	3/2⁻	
716.26 *14*	11/2⁻	
798.55 *10*	3/2⁻	
809.16 *8*	9/2⁻	
922.91 *19*	(1/2⁻)	Jπ: L(p,d)=(1) gives J=(1/2⁻,3/2⁻); (1/2⁻) is suggested by 1983Av07 in (n,n′γ) in analogy to ^{145}Nd.
931.54 *17*	11/2⁺	
1030.34 *20*	13/2⁺	
1054.23 *21*	3/2⁺	Jπ: E1, ΔJ=0 γ to 3/2⁻, 197.
1063.61 *12*	5/2⁺	Jπ: E1, ΔJ=0 γ to 5/2⁻, 121.
1069.05? *10*	9/2⁻	Jπ: E2, ΔJ=2 γ to 5/2⁻, 121; M1+E2, ΔJ=1 γ to 7/2⁻, g.s.
1077.02 *9*	5/2⁻	Jπ: M1+E2, ΔJ=0 γ to 5/2⁻, 121.
1107.30 *20*	(3/2⁻ to 9/2⁻)	
1173.01 *20*	(⁻)	
1180.39 *13*	5/2⁺	
1318.20 *13*	3/2⁻,5/2⁻,7/2⁻	E(level),Jπ: assigned by 1983Av07 who considered the 1120γ, 1197γ and 1318γ originating from this level. However due to the ε decay dataset in which the γ′s originate from different levels, this level appears as split in the Adopted Levels.
1449.22 *17*	7/2⁻	
1453.52 *19*	3/2⁻	Jπ: 1/2⁻,3/2⁻,5/2⁻ from M1+E2 γ to 3/2⁻, 197; 3/2⁻ from M1+E2, ΔJ=1 γ to 5/2⁻, 121.
1457.80 *21*	15/2⁻	
1471.62 *23*	3/2⁻,5/2⁻,7/2⁻	E(level),Jπ: assigned by 1983Av07 who considered the 1274γ, 1350γ and 1472γ originating from this level. However due to the ε decay dataset in which the γ′s originate from different levels, this level appears as split in the Adopted Levels.
1717.4 *4*	9/2⁻	Jπ: 9/2⁻,11/2⁻ from M1+E2, ΔJ=1 γ to 7/2⁻, g.s.; 9/2⁻ from γ to 5/2⁻, 121.
1748.8 *4*		
1762.70 *19*		
1843.90 *24*	5/2⁻	Jπ: 5/2⁻,9/2⁻ from M1+E2, ΔJ=1 γ to 7/2⁻, g.s.; 9/2⁻ excluded from γ to 3/2⁻, 197.
1983.18 *22*		
2064.9 *6*	(3/2⁺,5/2⁺)	
2069.85 *17*	(7/2⁻)	Jπ: γ′s to 3/2⁻, 197, and 11/2⁻, 716, respectively.
2089.4 *3*		
2109.0 *4*	17/2⁻	
2202.97 *15*	(3/2⁻,5/2,7/2)	Jπ: γ′s to 5/2⁺, 1064, 5/2⁻, 121, and 7/2⁻, g.s., respectively.

† From least-squares fit to Eγ′s; normalized χ^2=2.0 is greater than critical χ^2=1.7.
‡ From Adopted Levels, unless noted otherwise.

γ(^{147}Sm)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[#]	Comments
121.14 *10*	148 *46*	121.18	5/2⁻	0.0	7/2⁻	M1+E2		
197.4 *2*	47 *10*	197.47	3/2⁻	0.0	7/2⁻	E2		
215.23 *10*	19 *2*	931.54	11/2⁺	716.26	11/2⁻	E1		
[x]222.3 *3*	0.61 *24*							
[x]277.6 *3*	1.0 *4*							
314.10 *15*	16 *2*	1030.34	13/2⁺	716.26	11/2⁻	E1		
371.2 *3*	0.52 *17*	1180.39	5/2⁺	809.16	9/2⁻			
[x]390.5 *2*	1.1 *3*							ΔIγ: 26 in 1983Av07, presumably a typographical error.
[x]420.83 *15*	1.2 *3*							ΔIγ: 30 in 1983Av07, presumably a typographical error.
427.5 *2*	0.96 *26*	1457.80	15/2⁻	1030.34	13/2⁺			
430.2 *6*	0.45 *21*	1748.8		1318.20	3/2⁻,5/2⁻,7/2⁻			
[x]456.9 *3*	0.9 *4*							
534.00 *15*	2.5 *5*	1983.18		1449.22	7/2⁻			
[x]575.1 *3*	0.55 *21*							
[x]585.6 *3*	1.9 *5*							
601.13 *15*	5.4 *11*	798.55	3/2⁻	197.47	3/2⁻	M1(+E2)	0.005 *8*	δ: adopted value.
651.2 *3*	0.34 *16*	2109.0	17/2⁻	1457.80	15/2⁻			
[x]657.4 *3*	0.79 *26*							
[x]659.8 *4*	0.32 *14*							
663.5 *3*	0.89 *25*	1843.90	5/2⁻	1180.39	5/2⁺			
677.28 *15*	8.1 *8*	798.55	3/2⁻	121.18	5/2⁻	M1+E2	−3.9 *39*	Mult.: M1+E2, ΔJ=1 from A_2(exp)=−0.02 *3*. δ: adopted value is −0.47 *4*.
684.6 *5*	1.2 *5*	1762.70		1077.02	5/2⁻			
687.91 *15*	12 *3*	809.16	9/2⁻	121.18	5/2⁻	E2		Mult.: E2, ΔJ=2 from A_2(exp)=0.08 *2* compared to A_2(E2,theor)=0.07.
716.15 *15*	100	716.26	11/2⁻	0.0	7/2⁻	E2		Mult.: from A_2(exp)=0.15 *3* compared to A_2(E2,theor)=0.16.
725.44 *15*	5.7 *6*	922.91	(1/2⁻)	197.47	3/2⁻			
741.5 *2*	8.8 *9*	1457.80	15/2⁻	716.26	11/2⁻	E2		Mult.: from A_2(exp)=0.23 *2* compared to A_2(E2,theor)=0.24.
[x]746.6 *2*	5.4 *11*							
[x]778.6 *3*	1.20 *25*							
798.58 *15*	3.9 *8*	798.55	3/2⁻	0.0	7/2⁻	(E2)		Mult.: from A_2(exp)=−0.08 *8* compared to A_2(E2,theor)=−0.008.
809.21 *10*	40 *6*	809.16	9/2⁻	0.0	7/2⁻	M1+E2		Mult.: M1+E2, ΔJ=1 from A_2(exp)=0.10 *2*. δ: δ=0.66 *11* or 2.5 *6*.
[x]814.4 *4*	0.23 *10*							
[x]830.7 *2*	4.6 *11*							
856.8 *2*	2.5 *4*	1054.23	3/2⁺	197.47	3/2⁻	E1		Mult.: E1, ΔJ=0 from A_2(exp)=−0.027 *22* compared to A_2(E1,theor)=0.
932.8 *5*	0.38[@] *16*	931.54	11/2⁺	0.0	7/2⁻	[M2]		
932.8 *5*	3.4[@]	1054.23	3/2⁺	121.18	5/2⁻	E1		
[x]938.5 *4*	1.0 *3*							
942.18 *15*	8.3 *18*	1063.61	5/2⁺	121.18	5/2⁻	E1		Mult.: E1, ΔJ=0 from A_2(exp)=0.008 *6* compared to A_2(E1,theor)=0.012.

$^{147}_{62}Sm_{85}$-2

^{147}Sm(n,n′γ) 1983Av07,1984Ba62 (continued)

γ(^{147}Sm) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[#]	Comments
947.9[a] *1*	14 *2*	1069.05?	9/2⁻	121.18	5/2⁻	E2		Mult.: E2, ΔJ=2 from A_2(exp)=0.05 *3* compared to A_2(E2,theor)=0.07.
955.78 *15*	4.2 *6*	1077.02	5/2⁻	121.18	5/2⁻	M1+E2	1.1 *13*	Mult.: M1+E2, ΔJ=0 from A_2(exp)=−0.06 *4*.
[x]968.0	2.0 *4*							
[x]977.3 *3*	0.29 *13*							
[x]985.3 *3*	2.6 *6*							
[x]989.6 *4*	0.34 *9*							
1010.7 *5*	0.56 *16*	2064.9	(3/2⁺,5/2⁺)	1054.23	3/2⁺			
[x]1034.2 *5*	1.3 *3*							
1059.1 *2*	<3.8	1180.39	5/2⁺	121.18	5/2⁻			
1059.1 *2*	<3.8	2089.4		1030.34	13/2⁺			
1063.4 *2*	7.3 *18*	1063.61	5/2⁺	0.0	7/2⁻	E1		Mult.: E1, ΔJ=1 from A_2(exp)=0.048 *28* compared to A_2(E1,theor)=0.02.
1069.05[a] *10*	13 *2*	1069.05?	9/2⁻	0.0	7/2⁻	M1+E2		Mult.: M1+E2, ΔJ=1 from A_2(exp)=0.05 *4*. δ: 0.35 *15* or 7.16 *+73−389*.
1077.0 *1*	7.0 *14*	1077.02	5/2⁻	0.0	7/2⁻	M1(+E2)	−1.3 *15*	Mult.: M1+E2, ΔJ=1 from A_2(exp)=−0.03 *2*.
1107.3 *2*	20 *3*	1107.30	(3/2⁻ to 9/2⁻)	0.0	7/2⁻			
1120.5 *2*	3.2 *8*	1318.20	3/2⁻,5/2⁻,7/2⁻	197.47	3/2⁻	M1+E2		Mult.: M1+E2, ΔJ=0,1 from A_2(exp)=−0.05 *2*. δ: 1.5 *14* if ΔJ=0; 4.6 *41* if ΔJ=1.
[x]1127.0 *3*	0.70 *24*							E_γ: this energy might be incorrect since it is out of order in 1983Av07 (table 2, located between 1160 and 1235).
1138.7[&] *2*	1.5 *3*	2202.97	(3/2⁻,5/2,7/2)	1063.61	5/2⁺			
[x]1147.0 *3*	1.1 *3*							
[x]1152.1 *2*	1.6 *4*							
[x]1158.4 *4*	0.78 *26*							
[x]1160.8 *3*	1.1 *3*							
1173.0 *2*	10 *4*	1173.01	(⁻)	0.0	7/2⁻			
1180.5 *2*	8.8 *17*	1180.39	5/2⁺	0.0	7/2⁻	E1		Mult.: E1 from Adopted Gammas; M1+E2, ΔJ=1 from A_2(exp)=0.11 *2* from 1984Ba62 not adopted. δ: δ=0.62 *15* 12 or 2.8 *11* 6 if M1+E2.
1197.2 *2*	10 *3*	1318.20	3/2⁻,5/2⁻,7/2⁻	121.18	5/2⁻	M1+E2	−1.1 *8*	Mult.: M1+E2, ΔJ=0,1 from A_2(exp)=−0.02 *1*; E2 from ^{147}Eu ε decay is adopted (Adopted Gammas).
[x]1235.6 *2*	0.80 *16*							
1252.0 *5*	2.2 *6*	1449.22	7/2⁻	197.47	3/2⁻	[E2]		Mult.: M1+E2, ΔJ=0,1 from A_2(exp)=0.04 *3*; not adopted because of level scheme arguments.
1256.1 *2*	3.2 *9*	1453.52	3/2⁻	197.47	3/2⁻	M1+E2		Mult.: M1+E2, ΔJ=0,1 from A_2(exp)=0.07 *4*. δ: δ=−1.5 *6* if ΔJ=0 or −1.6 *16* if ΔJ=1.
1260.8 *2*	1.1 *3*	2069.85	(7/2⁻)	809.16	9/2⁻			
1274.4 *4*	1.4 *3*	1471.62	3/2⁻,5/2⁻,7/2⁻	197.47	3/2⁻			
1318.2 *2*	4.0 *10*	1318.20	3/2⁻,5/2⁻,7/2⁻	0.0	7/2⁻			
[x]1322.8 *5*	0.73 *30*							
1328.4 *7*	1.3 *5*	1449.22	7/2⁻	121.18	5/2⁻			
1332.2 *3*	1.3 *5*	1453.52	3/2⁻	121.18	5/2⁻	M1+E2	1.7 *11*	Mult.: M1+E2, ΔJ=1 from A_2(exp)=0.08 *4*.

$^{147}_{62}Sm_{85}$-3

^{147}Sm(n,n′γ) 1983Av07,1984Ba62 (continued)

γ(^{147}Sm) (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	δ #	Comments
1350.0 *3*	5.3 *16*	1471.62	3/2⁻,5/2⁻,7/2⁻	121.18	5/2⁻	M1+E2		Mult.: M1+E2, ΔJ=0,1 from A_2(exp)=−0.024 *11*. δ: δ=−1.0 *7* if ΔJ=1; −0.10 +*15*−*12* or 2.1 *10* 6 if ΔJ=0.
1353.6 *5*	3.4 *10*	2069.85	(7/2⁻)	716.26	11/2⁻			
x1364.9 *5*	0.27 *12*							
x1368.0 *5*	1.6 *4*							
x1370.8 *5*	0.65 *22*							
x1395.6 *6*	0.7 *3*							
x1408.0 *5*	1.5 *4*							
x1420.6	1.1 *3*							
x1434.7 *4*	0.50 *22*							
x1442.4 *3*	0.53 *20*							
1449.2 *2*	5.8 *8*	1449.22	7/2⁻	0.0	7/2⁻	M1+E2		Mult.: M1+E2, ΔJ=0,1 from A_2(exp)=−0.05 *4*.
1472.4 *5*	0.38 *11*	1471.62	3/2⁻,5/2⁻,7/2⁻	0.0	7/2⁻			
x1522.3 *2*	1.9 *4*							
x1525.6 *3*	0.27 *13*							
x1555.9 *2*	0.68 *18*							
x1576.7 *2*	0.84 *24*							
1596.0 *4*	2.5 *7*	1717.4	9/2⁻	121.18	5/2⁻			
x1605.7 *3*	0.70 *24*							
x1622.4	0.64 *20*							
1627.4 *8*	0.24 *8*	1748.8		121.18	5/2⁻			
x1635.4 *6*	0.28 *10*							
1641.8 *2*	3.1 *6*	1762.70		121.18	5/2⁻			
1646.3 *4*	0.87 *24*	1843.90	5/2⁻	197.47	3/2⁻			
x1653.6	0.81 *30*							
x1659.8 *4*	0.61 *18*							
x1664.5 *3*	0.91 *21*							
x1676.7	1.4 *4*							
1717.8 *5*	2.0 *5*	1717.4	9/2⁻	0.0	7/2⁻	M1+E2	1.5 *7*	Mult.: M1+E2, ΔJ=1 from A_2(exp)=0.16 *3*.
1749.2 *5*	0.74 *22*	1748.8		0.0	7/2⁻			
1762.0 *5*	0.46 *20*	1762.70		0.0	7/2⁻			
x1811.1	2.6 *7*							
1844.2 *6*	1.6 *4*	1843.90	5/2⁻	0.0	7/2⁻	M1+E2	1.6 *9*	Mult.: M1+E2, ΔJ=1 from A_2(exp)=0.15 *4*.
1861.6 *5*	0.74 *22*	1983.18		121.18	5/2⁻			
1870.7 *8*	0.6 *3*	2069.85	(7/2⁻)	197.47	3/2⁻			
x1875.7 *8*	0.44 *20*							
x1881.4 *8*	1.0 *4*							
x1891.3 *4*	0.47 *18*							
x1897.3 *5*	0.38 *15*							
x1921.0 *4*	0.73 *22*							
x2057.3 *4*	0.83 *27*							
2069.8 *3*	1.1 *3*	2069.85	(7/2⁻)	0.0	7/2⁻			
2082.5 & *2*	1.0 *3*	2202.97	(3/2⁻,5/2,7/2)	121.18	5/2⁻			
2202.7 *4*	0.9 *3*	2202.97	(3/2⁻,5/2,7/2)	0.0	7/2⁻			

$^{147}_{62}Sm_{85}$-4

^{147}Sm(n,n′γ) 1983Av07,1984Ba62 (continued)

γ(^{147}Sm) (continued)

† From 1983Av07.
‡ From adopted values, unless noted in comments, which are from 1984Ba62 based on γ(θ). 1984Ba62 list only A_2 coefficients and mention that the A_4 coefficients are small compared to experimental uncertainties. Mult′s for pure transitions are deduced from comparison of experimental and theoretical A_2 values.
# From 1984Ba62 based on γ(θ), unless noted otherwise.
@ There are two gammas with energies close to 932 keV which are placed as transitions from the 931- and 1054-keV levels. The (n,n′γ) reaction feeds both these levels so that it measures the sum of the two intensities (<3.8) while the (^{3}He,4nγ) reaction feeds only the 931-keV level allowing one to determine the ratio I(γ)(932.8)/I(γ)(215)=0.020 *8* for the 932.8 contribution from this level. The (n,n′γ) data can then be analyzed for the two 932.8 intensities; I(γ) from 931 level=0.38 *16*, from 1054 level=3.4.
& Differ by 3σ from calculated value.
a Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

$^{147}_{62}Sm_{85}$-5

^{147}Sm(n,n′γ) 1983Av07,1984Ba62

Level Scheme

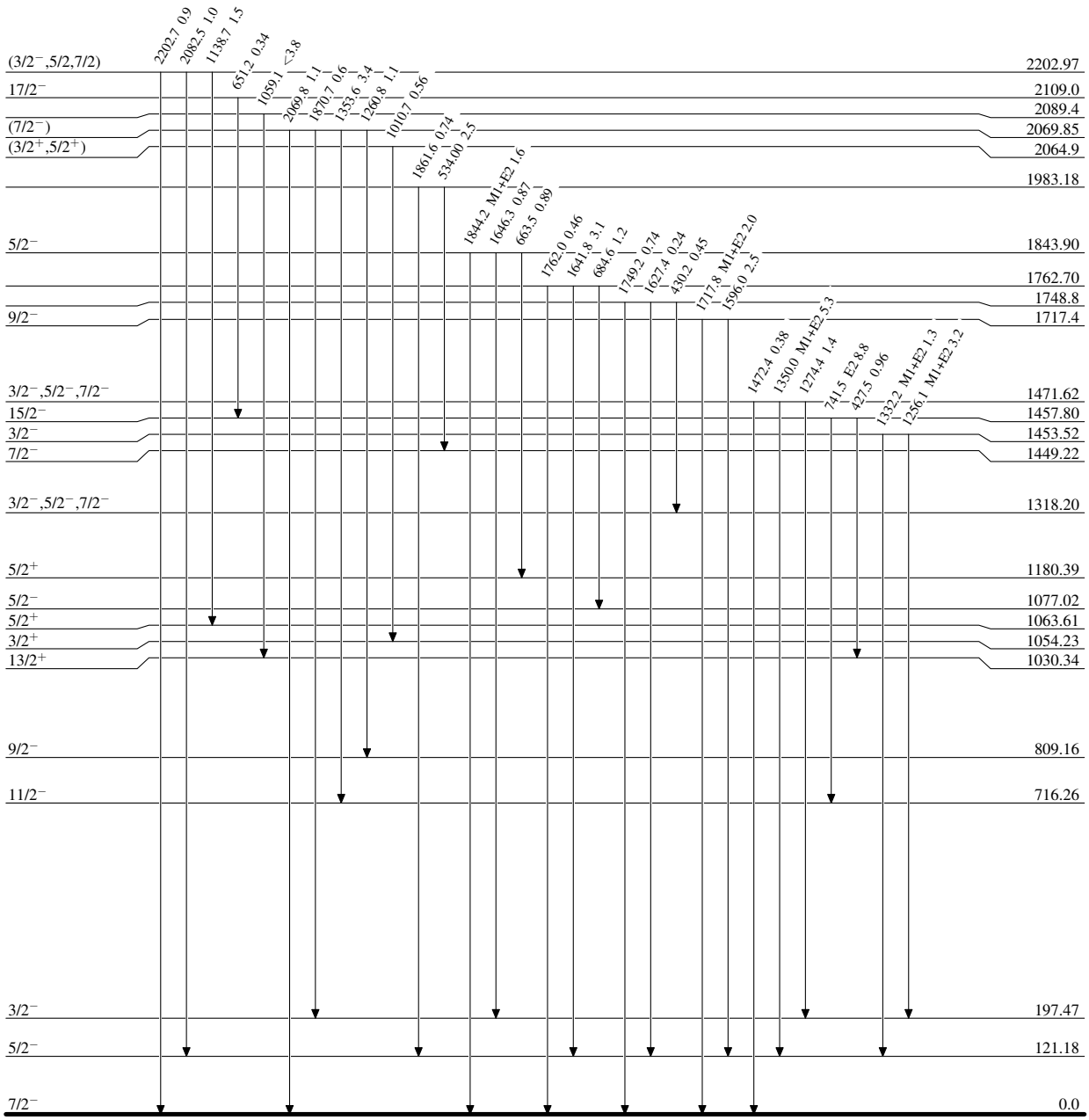
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



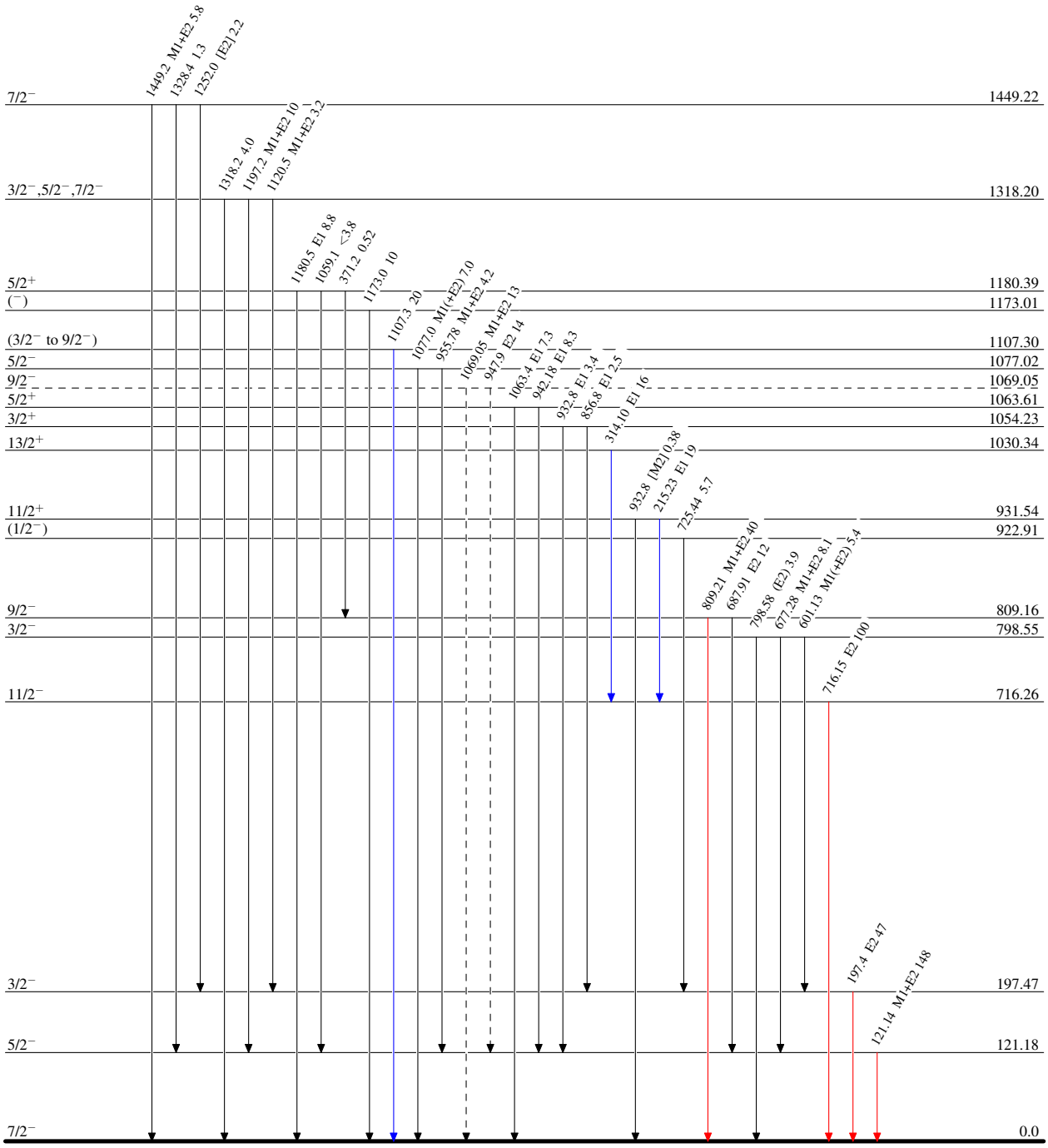
$^{147}_{62}Sm_{85}$

^{147}Sm(n,n′γ) 1983Av07,1984Ba62

Level Scheme (continued)

Intensities: Relative I_γ

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{147}_{62}Sm_{85}$