^{124}Sn(^{19}F,4nγ) 2012Ye06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	P. K. Joshi, B. Singh, S. Singh, A. K. Jain	NDS 138, 1 (2016)	15-Oct-2016

Includes ^{128}Te(^{14}N,3nγ) from 1980Ba47.

2012Ye06: ^{124}Sn(^{19}F,4nγ), E=80 MeV. Beam from Tandem accelerator at CIAE facility. Target=5.76 mg/cm^2 ^{124}Sn on a 14.85 mg/cm^2 Pb substrate. Gamma rays were detected by an array of twelve Compton-suppressed HPGe detectors and two planar HPGe detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, DCO. Deduced high spin states, J, π, configurations, bands, multipolarity. Calculated Total Routhian surfaces (TRS). Systematic comparison of the low-spin levels in N=80 isotones.

1980Ba47: ^{128}Te(^{14}N,3nγ), E=50-60 MeV. Measured excitation functions, γ, prompt and delayed $\gamma\gamma$-coincidences, and $\gamma(\theta)$. Authors report levels at 2484 (542.9γ, 762γ), 2730 (245.8γ), 2910 (179.7γ) but the associated γ rays have been placed elsewhere by 2012Ye06.

Other: 1987Dr12.

^{139}Pr Levels

E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]
0.0	5/2$^+$	3255.5 *11*	25/2$^-$	4905.6[@] *12*	31/2$^+$	6182.3 *14*	(37/2$^-$)
113.9 *4*	7/2$^+$	3265.4 *10*	23/2$^+$	4947.1[#] *12*	33/2$^-$	6281.7[@] *15*	(37/2$^+$)
821.8[b] *4*	11/2$^-$	3564.7 *10*	23/2$^-$	5055.5 *11*	(31/2$^+$)	6316.7 *14*	(37/2$^-$)
851.8 *7*	11/2$^+$	3578.7 *10*	(25/2$^+$)	5170.7 *13*	(33/2$^-$)	6371.1[#] *14*	41/2$^-$
1522.6[b] *6*	13/2$^-$	3626.5 *10*	(25/2$^+$)	5221.8 *11*	31/2$^-$	6386.6 *15*	(39/2$^-$)
1722.1[b] *6*	15/2$^-$	3697.6[#] *10*	25/2$^-$	5282.7[@] *13*	33/2$^+$	6399.2[&] *14*	39/2$^-$
1867.8 *9*	(15/2$^+$)	3971.6 *11*	(27/2$^+$)	5363.2 *11*	33/2$^-$	6524.8[a] *15*	(37/2$^-$)
1941.4[b] *8*	17/2$^-$	4052.1 *10*	(25/2$^-$)	5405.6[a] *13*	(33/2$^-$)	6719.2 *13*	(39/2$^-$)
2187.4[b] *9*	19/2$^-$	4100.3[a] *10*	27/2$^-$	5557.9 *12*	(35/2$^-$)	6735.7[&] *15*	41/2$^-$
2277.9 *9*	19/2$^-$	4275.8 *11*	27/2$^+$	5585.3 *14*	(35/2$^-$)	6772.0 *14*	(37/2$^-$)
2367.0[b] *9*	21/2$^-$	4316.3[#] *11*	29/2$^-$	5632.9[#] *13*	37/2$^-$	6853.5 *14*	(39/2$^-$)
2726.0 *8*	19/2$^-$	4411.7 *10*	27/2$^+$	5670.2 *12*	33/2$^-$	6915.7[@] *15*	(39/2$^+$)
2761.0 *9*	19/2$^-$	4443.3[@] *10*	27/2$^+$	5739.9[@] *14*	35/2$^+$	6937.6 *15*	(41/2$^-$)
2820.9 *9*	21/2$^+$	4536.2[a] *11*	29/2$^-$	5823.8[a] *14*	(35/2$^-$)	7218.9 *15*	(41/2$^-$)
2985.7 *10*	(21/2$^-$)	4625.6[@] *11*	29/2$^+$	5861.3[&] *12*	35/2$^-$	7219.0[#] *15*	(45/2$^-$)
3020.9 *10*	23/2$^+$	4833.4 *12*	(29/2$^+$)	6038.4 *13*	35/2$^-$		
3139.4 *11*	25/2$^-$	4862.2[a] *12*	31/2$^-$	6117.4[&] *13*	37/2$^-$		

[†] From least-squares fit to Eγ data.

[‡] From DCO measurements and band structures.

[#] Band(A): $\pi h_{11/2}\otimes\nu(h_{11/2},1/2[541])$.

[@] Band(B): ΔJ=1 band based on 27/2$^+$. Configuration=$\pi g_{7/2}\otimes\nu h^2_{11/2}$ or $\pi d_{5/2}\otimes\nu h^2_{11/2}$.

[&] Band(C): $\pi(g_{7/2}d_{5/2}h_{11/2})\otimes\nu h^2_{11/2}$.

[a] Band(D): $\pi 11/2[505]\otimes\nu h^2_{11/2}$.

[b] Band(E): γ cascade based on 11/2$^-$.

$\gamma(^{139}Pr)$

DCO ratios correspond to gate on ΔJ=2, M2 transition of 707.9 keV. Expected values are 1.1 for ΔJ=2, quadrupole and 1.67 for ΔJ=1, dipole.

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^{124}Sn(^{19}F,4nγ) 2012Ye06 (continued)

γ(^{139}Pr) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[†]	Comments
(48.2)		4100.3	27/2$^-$	4052.1	(25/2$^-$)			
(59.9)		2820.9	21/2$^+$	2761.0	19/2$^-$			
(71.1)		3697.6	25/2$^-$	3626.5	(25/2$^+$)			
(81.5)		6853.5	(39/2$^-$)	6772.0	(37/2$^-$)			
113.9 *5*	>112.6	113.9	7/2$^+$	0.0	5/2$^+$	[M1]	0.894 *17*	
128.7 *5*	0.16 *4*	4100.3	27/2$^-$	3971.6	(27/2$^+$)			
141.4 *5*	0.50 *11*	5363.2	33/2$^-$	5221.8	31/2$^-$	D+Q		DCO=1.52 *17*
179.6 *5*	25.0 *9*	2367.0	21/2$^-$	2187.4	19/2$^-$			
182.3 *5*	0.44 *5*	4625.6	29/2$^+$	4443.3	27/2$^+$	D+Q		DCO=1.64 *22*
194.7 *5*	0.61 *12*	5557.9	(35/2$^-$)	5363.2	33/2$^-$	D+Q		DCO=1.81 *20*
199.5 *5*	5.2 *9*	1722.1	15/2$^-$	1522.6	13/2$^-$			
200.0 *5*	2.6 *5*	3020.9	23/2$^+$	2820.9	21/2$^+$			
204.3 *5*	0.34 *5*	6386.6	(39/2$^-$)	6182.3	(37/2$^-$)	D+Q		DCO=1.71 *15*
213.9 *5*	0.46 *5*	4625.6	29/2$^+$	4411.7	27/2$^+$	D+Q		DCO=1.57 *12*
219.3 *5*	62.0 *9*	1941.4	17/2$^-$	1722.1	15/2$^-$			
244.5 *5*	0.24 *5*	3265.4	23/2$^+$	3020.9	23/2$^+$			
246.0 *5*	31.2 *10*	2187.4	19/2$^-$	1941.4	17/2$^-$			
256.1 *5*	0.39 *5*	6117.4	37/2$^-$	5861.3	35/2$^-$	D+Q		DCO=1.73 *8*
259.7 *5*	1.4 *2*	2985.7	(21/2$^-$)	2726.0	19/2$^-$	D+Q		DCO=1.56 *15*
278.3 *5*	0.21 *4*	6316.7	(37/2$^-$)	6038.4	35/2$^-$	D+Q		DCO=1.68 *12*
280.0 *5*	0.65 *13*	4905.6	31/2$^+$	4625.6	29/2$^+$	D+Q		DCO=1.66 *20*
281.8 *5*	0.32 *9*	6399.2	39/2$^-$	6117.4	37/2$^-$	D+Q		DCO=1.64 *8*
307.7 *5*	0.25 *5*	5363.2	33/2$^-$	5055.5	(31/2$^+$)			
308.5 *5*	0.42 *6*	5170.7	(33/2$^-$)	4862.2	31/2$^-$	D+Q		DCO=1.67 *9*
326.0 *5*	6.8 *4*	4862.2	31/2$^-$	4536.2	29/2$^-$	D+Q		DCO=1.59 *4*
336.5[‡] *5*	16.0[‡] *8*	2277.9	19/2$^-$	1941.4	17/2$^-$			
336.5[‡] *5*	0.12[‡] *2*	6735.7	41/2$^-$	6399.2	39/2$^-$	D+Q		DCO=1.62 *17*
345.1 *5*	0.37 *3*	3971.6	(27/2$^+$)	3626.5	(25/2$^+$)	D+Q		DCO=1.82 *12*
354.5 *5*	1.5 *2*	4052.1	(25/2$^-$)	3697.6	25/2$^-$	D+Q		DCO=1.11 *11* Mult.: ΔJ=(0) transition.
365.4 *5*	0.33 *5*	7218.9	(41/2$^-$)	6853.5	(39/2$^-$)	D+Q		DCO=1.57 *14*
377.1 *5*	0.42 *6*	5282.7	33/2$^+$	4905.6	31/2$^+$	D+Q		DCO=1.84 *7*
402.7 *5*	12.9 *6*	4100.3	27/2$^-$	3697.6	25/2$^-$	D+Q		DCO=1.48 *5*
414.6 *5*	0.35 *5*	5585.3	(35/2$^-$)	5170.7	(33/2$^-$)	D+Q		DCO=1.74 *12*
418.2 *5*	1.31 *9*	5823.8	(35/2$^-$)	5405.6	(33/2$^-$)	D+Q		DCO=1.70 *10*
421.7 *5*	0.11 *4*	4833.4	(29/2$^+$)	4411.7	27/2$^+$	D+Q		DCO=1.57 *20*
429.9 *5*	0.3 *1*	5055.5	(31/2$^+$)	4625.6	29/2$^+$	D+Q		DCO=1.69 *15*
435.9 *5*	11.5 *4*	4536.2	29/2$^-$	4100.3	27/2$^-$	D+Q		DCO=1.67 *4*
444.5 *5*	3.6 *6*	3265.4	23/2$^+$	2820.9	21/2$^+$			
453.9 *5*	2.6 *7*	2820.9	21/2$^+$	2367.0	21/2$^-$			
457.2 *5*	0.25 *3*	5739.9	35/2$^+$	5282.7	33/2$^+$	D+Q		DCO=1.58 *12*
483.1 *5*	0.9 *2*	2761.0	19/2$^-$	2277.9	19/2$^-$			
487.4 *5*	1.2 *2*	4052.1	(25/2$^-$)	3564.7	23/2$^-$	D+Q		DCO=1.79 *20*
541.8 *5*	0.13 *3*	6281.7	(37/2$^+$)	5739.9	35/2$^+$			
543.0 *5*	8.5 *12*	2820.9	21/2$^+$	2277.9	19/2$^-$			
543.4 *5*	3.3 *2*	5405.6	(33/2$^-$)	4862.2	31/2$^-$			
551.0 *5*	0.20 *7*	6937.6	(41/2$^-$)	6386.6	(39/2$^-$)	D+Q		DCO=1.72 *22*
557.8 *5*	0.5 *1*	3578.7	(25/2$^+$)	3020.9	23/2$^+$	D+Q		DCO=1.81 *13*
605.6 *5*	0.5 *2*	3626.5	(25/2$^+$)	3020.9	23/2$^+$	D+Q		DCO=1.87 *13*
618.7 *5*	2.5 *3*	4316.3	29/2$^-$	3697.6	25/2$^-$	Q		DCO=1.03 *13*
630.8 *5*	0.9 *2*	4947.1	33/2$^-$	4316.3	29/2$^-$	Q		DCO=0.96 *17*
633.5 *5*	1.6 *2*	2820.9	21/2$^+$	2187.4	19/2$^-$	D		DCO=1.47 *16*
634.0 *5*	<0.1	6915.7	(39/2$^+$)	6281.7	(37/2$^+$)			
685.8 *5*	0.7 *1*	5632.9	37/2$^-$	4947.1	33/2$^-$	Q		DCO=1.01 *7*
700.8 *5*	5.5 *9*	1522.6	13/2$^-$	821.8	11/2$^-$			

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^{124}Sn(^{19}F,4nγ) 2012Ye06 (continued)

γ(^{139}Pr) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
701.0 *5*	<0.1	6524.8	(37/2$^-$)	5823.8	(35/2$^-$)		
707.9 *5*	100.0 *4*	821.8	11/2$^-$	113.9	7/2$^+$		
737.9 *5*	12.6 *2*	851.8	11/2$^+$	113.9	7/2$^+$		
738.2 *5*	0.16 *6*	6371.1	41/2$^-$	5632.9	37/2$^-$	Q	DCO=1.19 *11*
772.4 *5*	1.4 *2*	3139.4	25/2$^-$	2367.0	21/2$^-$	Q	DCO=1.04 *10*
776.7 *5*	0.51 *6*	6182.3	(37/2$^-$)	5405.6	(33/2$^-$)	Q	DCO=1.06 *12*
786.7 *5*	2.6 *5*	4052.1	(25/2$^-$)	3265.4	23/2$^+$	D	DCO=1.76 *8*
819.6 *5*	14.5 *9*	2761.0	19/2$^-$	1941.4	17/2$^-$	D+Q	DCO=1.72 *7*
821.8 *5*	4.8 *9*	821.8	11/2$^-$	0.0	5/2$^+$		
827.0 *5*	0.9 *2*	5363.2	33/2$^-$	4536.2	29/2$^-$	Q	DCO=1.29 *14*
833.0 *5*	0.19 *4*	4411.7	27/2$^+$	3578.7	(25/2$^+$)	D+Q	DCO=1.68 *22*
847.9 *5*	0.14 *5*	7219.0	(45/2$^-$)	6371.1	41/2$^-$		
864.6 *5*	0.10 *3*	4443.3	27/2$^+$	3578.7	(25/2$^+$)		
888.5 *5*	0.4 *1*	3255.5	25/2$^-$	2367.0	21/2$^-$	Q	DCO=0.94 *11*
900.3 *5*	66 *4*	1722.1	15/2$^-$	821.8	11/2$^-$		
948.2 *5*	0.32 *7*	6772.0	(37/2$^-$)	5823.8	(35/2$^-$)	D+Q	DCO=1.71 *24*
999.1 *5*	0.55 *9*	5861.3	35/2$^-$	4862.2	31/2$^-$	Q	DCO=1.02 *5*
1003.9 *5*	1.5 *3*	2726.0	19/2$^-$	1722.1	15/2$^-$	Q	DCO=1.03 *11*
1010.4 *5*	0.24 *5*	4275.8	27/2$^+$	3265.4	23/2$^+$	Q	DCO=1.25 *17*
1016.0 *5*	12.3 *19*	1867.8	(15/2$^+$)	851.8	11/2$^+$		
1029.7 *5*	0.64 *9*	6853.5	(39/2$^-$)	5823.8	(35/2$^-$)	Q	DCO=1.09 *11*
1121.5 *5*	0.8 *2*	5221.8	31/2$^-$	4100.3	27/2$^-$	Q	DCO=1.29 *14*
1134.0 *5*	1.0 *2*	5670.2	33/2$^-$	4536.2	29/2$^-$	Q	DCO=1.02 *10*
1161.3 *5*	0.3 *1*	6719.2	(39/2$^-$)	5557.9	(35/2$^-$)	Q	DCO=1.25 *20*
1176.2 *5*	0.8 *1*	6038.4	35/2$^-$	4862.2	31/2$^-$	Q	DCO=1.19 *14*
1197.7 *5*	0.5 *2*	3564.7	23/2$^-$	2367.0	21/2$^-$	D+Q	DCO=1.63 *22*
1325.1[#] *5*	0.10 *8*	5861.3	35/2$^-$	4536.2	29/2$^-$	[M3+E4]	Mult.: transition considerd unlikely by evaluators due to unusual high multipolarity.
1330.6 *5*	19.2 *10*	3697.6	25/2$^-$	2367.0	21/2$^-$	Q	DCO=0.98 *4*
1377.3 *5*	1.2 *3*	3564.7	23/2$^-$	2187.4	19/2$^-$	Q	DCO=1.08 *12*
1390.8 *5*	0.5 *2*	4411.7	27/2$^+$	3020.9	23/2$^+$	Q	DCO=1.12 *10*
1422.4 *5*	0.5 *2*	4443.3	27/2$^+$	3020.9	23/2$^+$	Q	DCO=1.16 *14*

† Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

‡ Multiply placed with intensity suitably divided.

Placement of transition in the level scheme is uncertain.

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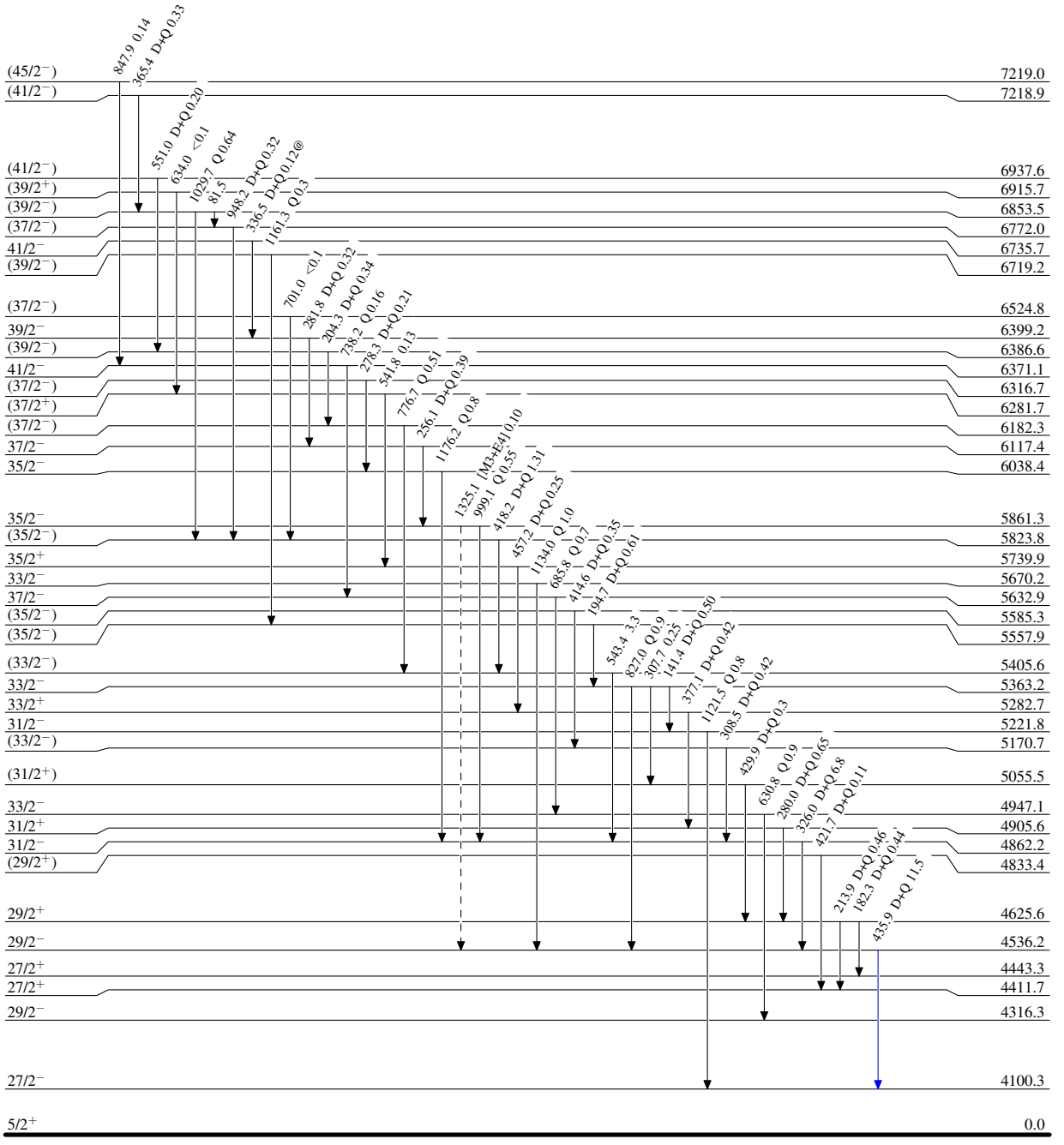
Level Scheme

Intensities: Relative I_γ
@ Multiply placed: intensity suitably divided

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)



$^{139}_{59}Pr_{80}$

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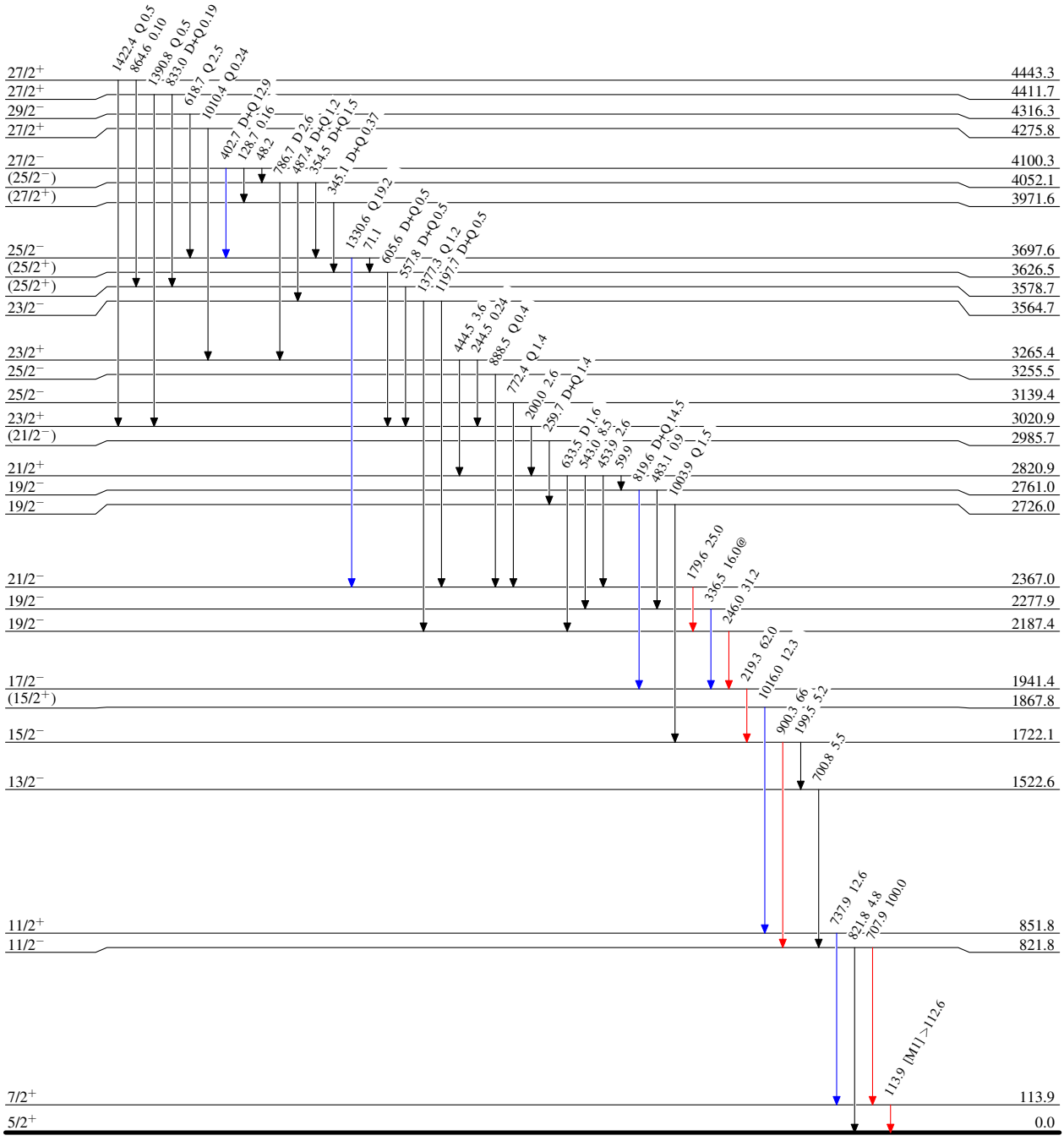
Level Scheme (continued)

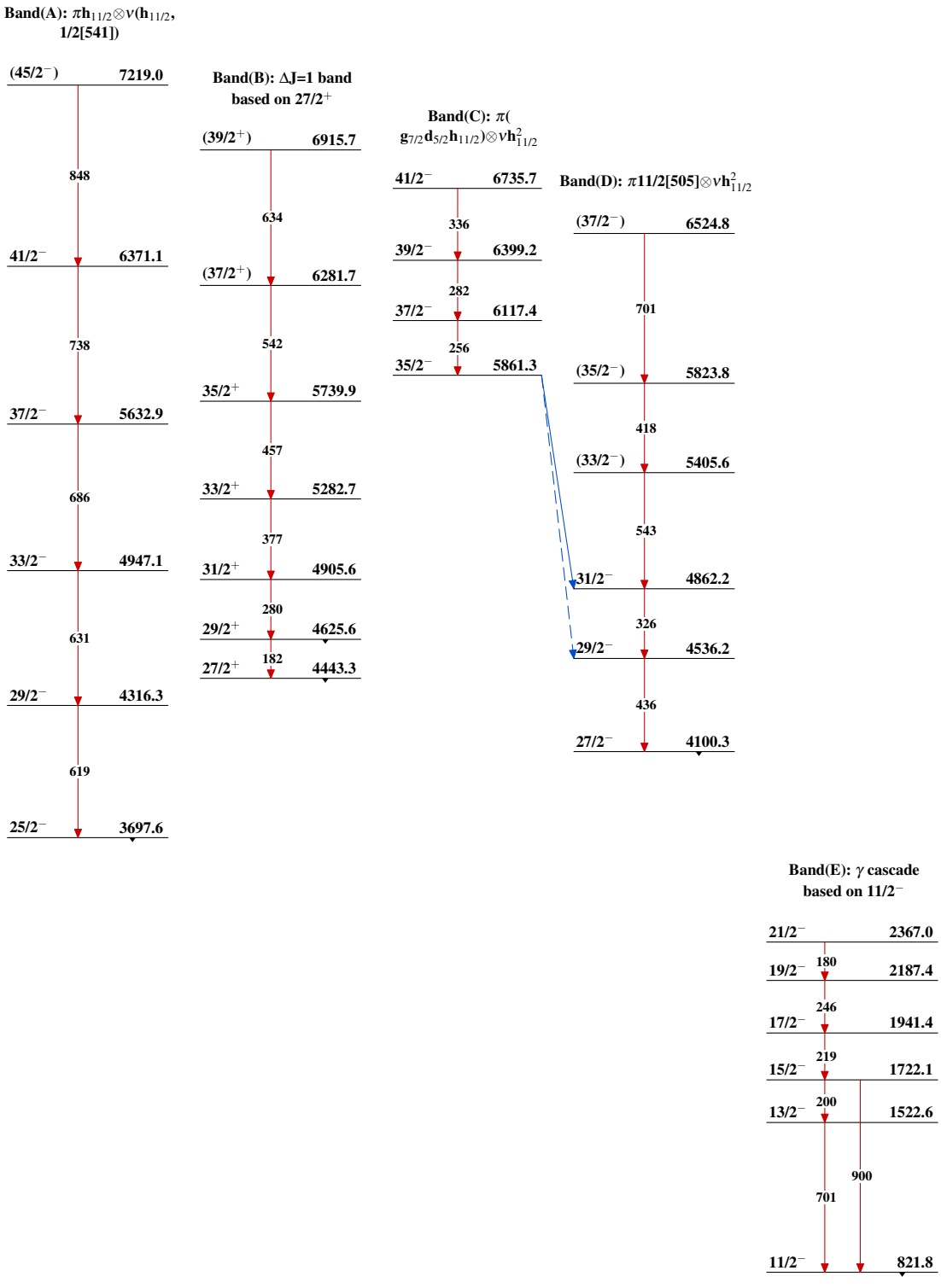
Intensities: Relative I_γ
@ Multiply placed: intensity suitably divided

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)



$^{139}_{59}Pr_{80}$

^{124}Sn(^{19}F,4nγ) 2012Ye06



$^{139}_{59}Pr_{80}$