^{159}Tb(^{40}Ar,5nγ) 2020He17

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 177, 1 (2021)	3-Sep-2021

2020He17: E=182, 185 and 190 MeV ^{40}Ar beam was produced from the K=130−MeV cyclotron at the Accelerator Laboratory of the University of Jyvaskyla (JYFL). Targets were ^{159}Tb on Au or C backings. Evaporation residues were separated and identified by the recoil separator RITU and focused to the focal plane GREAT spectrometer. γ rays were detected with the JUROGAM II HPGe array. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(DCO), $\gamma\gamma$(lin pol). Deduced levels, J^{π}, band structures, γ-ray multipolarities, B(M1)/B(E2) ratios, alignments and configurations.

^{194}Bi Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
161 *8*	(10$^-$)		E(level): taken by 2020He17 from 2019Gh11. Level energy, without uncertainty, kept fixed in least-squares fitting procedure.
265.6 *1*	(9$^-$)		
687.2[@] *1*	(11$^-$)		
700.1 *1*	(10$^-$)		There is a slight non-physical negative intensity balance of −2.8 *5* at this level. However, the intensity of the 539.4γ from this level is given only as a lower limit. Intensity balance suggests Iγ(539.4)=5.1 *5*.
794.1[#] *1*	(10$^+$)	≈1 ns	$T_{1/2}$: estimated by 2020He17 from recoil shadow anisotropy method (RSAM).
910.9 *1*	(11$^-$)		There is a slight non-physical negative intensity balance of −7 *4* at this level. One reason could be that multipolarity of 107.9γ feeding transition from the 1018.5 level is not established.
936.0[#] *2*	(11$^+$)		
1018.5[@] *1*	(12$^-$)		
1162.9[#] *2*	(12$^+$)		
1225.6 *1*	(12$^-$)		
1315.9 *2*	(11$^+$)		
1348.8[@] *1*	(13$^-$)		
1370.1 *1*			
1382.5 *1*	(11$^-$)		
1426.3[#] *2*	(13$^+$)		
1482.2 *1*	(12)		
1499.9 *2*	(12$^+$)		
1592.0[@] *1*	(14$^-$)		
1643.1 *1*	(13$^-$)		
1698.6 *1*	(13$^-$)		
1720.2[#] *2*	(14$^+$)		
1724.6 *1*			
1844.9 *2*			
1888.4 *1*	(14$^-$)		
1895.9 *2*	(13$^-$)		
1926.2 *2*			
1955.5[@] *1*	(15$^-$)		
1956.6 *2*			
1985.3 *2*			
2030.2 *1*	(14$^-$)		
2033.3[#] *2*	(15$^+$)		
2060.27 *19*			
2086.9 *1*			
2113.0 *2*	(15)		
2230.6 *2*	(15$^-$)		
2245.4[@] *1*	(16$^-$)		
2268.9 *2*			

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^{159}Tb(^{40}Ar,5nγ) 2020He17 (continued)

^{194}Bi Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	Comments
2348.7 *1*	(15)	
2367.8[#] *2*	(16$^+$)	
2427.5[&] *2*	(16$^+$)	
2429.4 *2*	(16$^-$)	
2460.3 *2*	(16)	
2557.8? *2*		
2612.0[&] *2*	(17$^+$)	
2646.3[@] *1*	(17$^-$)	
2721.1[#] *2*	(17$^+$)	
2783.7? *2*		
2808.2? *3*		
2966.5[&] *2*	(18$^+$)	
2978.5[@] *2*	(18$^-$)	
3091.9[#] *2*	(18$^+$)	
3203.90 *21*		
3410.70[&] *25*	(19$^+$)	
3843.9[&] *3*		
4301.8[&] *4*		
x[a]	(16)	J$^{\pi}$: 2020He17 assign ≈(16). Note that J=(17) for the bandhead in Table 1 of 2020He17.
139.4+x[a] *1*	(17)	
280.7+x[a] *2*	(18)	
446.6+x[a] *2*	(19)	
648.3+x[a] *2*	(20)	
891.0+x[a] *2*	(21)	
1165.9+x[a] *2*	(22)	
1469.0+x[a] *3*	(23)	
1799.3+x[a] *3*	(24)	
2117.3+x[a] *3*	(25)	
2403.1+x?[a] *3*	(26)	E(level): level energy is either 2403.1+x or 2384.6+x as, according to 2020He17, ordering of the 285.8γ and 267.3γ is tentative.
2670.4+x[a] *4*	(27)	
y[b]	J	2020He17 suggest this level as an isomer from absence of transitions from the lower-lying structures in their $\gamma\gamma$-coin spectra.
124.8+y[b] *1*	(J+1)	
335.9+y[b] *2*	(J+2)	
595.1+y[b] *2*	(J+3)	
958.5+y[b] *2*	(J+4)	
1396.6+y[b] *2*	(J+5)	

[†] From a least-squares fit to γ-ray energies by keeping energy of the 161-keV level fixed, without its uncertainty of 8 keV, and with doubled uncertainties in Eγ values for six γ rays as indicated, resulting in reduced χ^2=3.2 as compared to critical χ^2=1.7. Without this adjustment, reduced χ^2=5.9. It appears that the listed uncertainties in γ-ray energies are somewhat underestimated. All the level energies are relative to 161-keV level, with no uncertainty. For absolute uncertainties, 8 keV uncertainty in the 161-keV level should be considered.

[‡] As proposed by 2020He17, based on measured $\gamma\gamma(\theta)$(DCO) and $\gamma\gamma$(lin pol), band assignments, and γ-decay patterns.

[#] Band(A): Band based on (10$^+$). Strongly coupled rotational band with proposed configuration=$\pi i_{13/2}\otimes\nu i^{-1}_{13/2}$ (2020He17).

[@] Band(B): ΔJ=1, dipole band based on (11$^-$). Strongly coupled rotational band with proposed Configuration=$\pi h_{9/2}\otimes\nu i^{-1}_{13/2}$

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^{159}Tb(^{40}Ar,5nγ) 2020He17 (continued)

^{194}Bi Levels (continued)

(2020He17).

& Band(C): ΔJ=1, dipole band based on (16$^+$). Possible magnetic-dipole (shears) rotational band. Proposed configurations: $\pi(h^2_{9/2}i_{13/2})\otimes\nu^+$ or $\pi h_{9/2}\otimes\nu i^{-2}_{13/2}\otimes\nu^-$, 4=qp band.

a Band(D): ΔJ=1, dipole band based on J≈(16). This band is interpreted as a strongly coupled rotational band, with the spin assignment for the bandhead based on a proposed configuration of $\pi i_{13/2}\otimes\nu i^{-2}_{13/2}\otimes\nu p_{3/2}$, based on comparison with similar transition energies between this band and positive-parity bands in the odd-A Bi nuclei after 2-neutron alignments. Such a configuration suggests negative parity for the band, although, 2020He17 do not assign parity for this band. 2020He17 stated that decrease in gamma energies above the J=25 state may indicate a band crossing. 2020He17 further conclude that deduced B(M1)/B(E2) values for this band exclude a magnetic dipole rotational (shears) structure. Note that spins in this dataset are taken from Fig. 1 and discussion in text in 2020He17. These are higher by one unit in authors′ Table 1.

b Band(E): ΔJ=1, dipole band. 2020He17 suggest the lowest energy level as an isomer from absence of transitions from the lower-lying structures in the γγ-coin spectra. The identification of this band is based on observation of Bi x rays, and that no such γ sequence has been observed in neighbouring odd-A Bi nuclei.

γ(^{194}Bi)

E_γ †	I_γ †	E_i(level)	J^π_i	E_f	J^π_f	Mult.‡	α[b]	Comments
59.6[c] *1*	2.8 *2*	2427.5	(16$^+$)	2367.8	(16$^+$)	[M1]	8.64	Mult.: M1 in 2020He17.
104.6 *1*	5.3 *3*	265.6	(9$^-$)	161	(10$^-$)	M1+E2	7.3 *17*	Mult.: from α(exp)>6.2 from comparison of photon intensity of the feeding 528.6γ from 794 level and 104.6γ. Mult.: M1 in 2020He17.
107.9 *1*	1.9 *2*	1018.5	(12$^-$)	910.9	(11$^-$)	[M1+E2]	6.5 *17*	
124.8 *1*	>20.4	124.8+y	(J+1)	y	J	(M1)	5.41	DCO=0.59 *6*
x131.0@ *1*	8.2 *4*							
139.4 *1*	>9.6	139.4+x	(17)	x	(16)	(M1)	3.95	DCO=0.67 *8*
141.3 *1*	9.6 *8*	280.7+x	(18)	139.4+x	(17)	(M1)	3.80	DCO=0.67 *8*
142.3# *1*	50.9 *16*	936.0	(11$^+$)	794.1	(10$^+$)	(M1)	3.73	DCO=0.60 *5* Mult.: M1 in 2020He17.
153.2 *1*	5.1 *3*	1315.9	(11$^+$)	1162.9	(12$^+$)	[M1]	3.02	Mult.: M1 in 2020He17.
x158.0& *2*	8.2 *4*							
x162.4@ *2*	5.5 *4*							
165.9 *1*	9.1 *5*	446.6+x	(19)	280.7+x	(18)	(M1)	2.41	DCO=0.87 *10*
183.9 *1*	8.9 *4*	1499.9	(12$^+$)	1315.9	(11$^+$)	M1	1.80	DCO=0.69 *12*; pol=−0.12 *2*
x184.0& *2*	8.2 *4*							
184.5 *1*	10.5 *4*	2612.0	(17$^+$)	2427.5	(16$^+$)	(M1)	1.79	DCO=0.78 *8* Mult.: M1 in 2020He17.
201.7 *1*	9.1 *4*	648.3+x	(20)	446.6+x	(19)	M1	1.393	DCO=0.68 *8*; pol=−0.18 *4*
x205.0@ *2*	3.7 *4*							
211.0 *1*	2.3 *2*	910.9	(11$^-$)	700.1	(10$^-$)	[M1]	1.228	
211.1 *1*	16.3 *10*	335.9+y	(J+2)	124.8+y	(J+1)	M1	1.226	DCO=0.65 *6*; pol=−0.13 *4*
224.6 *1*	3.4 *2*	2113.0	(15)	1888.4	(14$^-$)	D	0.54 *48*	DCO=0.85 *13*
227.0 *1*	100 *3*	1162.9	(12$^+$)	936.0	(11$^+$)	(M1)	1.001	DCO=0.61 *5* Mult.: M1 in 2020He17.
x237.6@ *1*	10.9 *6*							
x241.0@ *5*	5.0 *5*							
242.7 *1*	10.5 *4*	891.0+x	(21)	648.3+x	(20)	M1	0.832	DCO=0.67 *10*; pol=−0.063 *7*
243.3 *1*	17.5 *6*	1592.0	(14$^-$)	1348.8	(13$^-$)	M1	0.826	DCO=0.80 *7*; pol=−0.18 *2*
x249.6@ *2*	2.0 *2*							
259.2 *1*	13.4 *6*	595.1+y	(J+3)	335.9+y	(J+2)	(M1)	0.693	DCO=0.83 *7*
263.4 *1*	75.7 *23*	1426.3	(13$^+$)	1162.9	(12$^+$)	(M1)	0.663	DCO=0.61 *5* Mult.: M1 in 2020He17.

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^{159}Tb(^{40}Ar,5nγ) 2020He17 (continued)

$\gamma(^{194}Bi)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	α [b]	Comments
267.3[a] *1*	2.3 *2*	2670.4+x	(27)	2403.1+x?	(26)	[M1]	0.638	Mult.: (M1) in 2020He17.
274.8 *1*	8.1 *3*	1165.9+x	(22)	891.0+x	(21)	M1	0.590	DCO=0.69 *8*; pol=−0.13 *3*
283.1 *2*	1.6 *2*	1926.2		1643.1	(13^-)			
285.8[a] *1*	3.8 *2*	2403.1+x?	(26)	2117.3+x	(25)	[M1]	0.530	Mult.: M1 in 2020He17.
[x]289.2[@] *2*	12.6 *8*							
289.9 *1*	5.3 *3*	2245.4	(16^-)	1955.5	(15^-)	[M1]	0.510	Mult.: M1 in 2020He17.
294.0 *1*	61.8 *19*	1720.2	(14^+)	1426.3	(13^+)	M1	0.490	DCO=0.71 *5*; pol=−0.051 *4*
303.2 *1*	8.4 *4*	1469.0+x	(23)	1165.9+x	(22)	(M1)	0.451	DCO=0.62 *8*
[x]304.0[@] *4*	11.1 *7*							
313.2 *1*	43.1 *13*	2033.3	(15^+)	1720.2	(14^+)	M1	0.413	DCO=0.66 *5*; pol=−0.074 *5*
318.0 *1*	5.1 *2*	2117.3+x	(25)	1799.3+x	(24)	[M1]	0.396	Mult.: (M1) in 2020He17.
318.2 *2*	2.2 *2*	2348.7	(15)	2030.2	(14^-)			
[x]325.3[@] *2*	6.2 *6*							
330.2 *1*	33.1 *12*	1348.8	(13^-)	1018.5	(12^-)	M1	0.357	DCO=0.59 *6*; pol=−0.086 *7*
330.3 *1*	6.5 *3*	1799.3+x	(24)	1469.0+x	(23)	(M1)	0.357	DCO=0.80 *8* DCO listed as 0.8 *8* in Table 1 of 2020He17 seems a misprint, evaluators assume that it should be 0.80 *8*. Mult.: M1 in 2020He17.
331.3 *1*	15.2 *6*	1018.5	(12^-)	687.2	(11^-)	[M1]	0.354	Mult.: M1 in 2020He17.
331.5 *1*	4.0 *3*	2030.2	(14^-)	1698.6	(13^-)			Mult.: M1 in 2020He17.
334.6 *1*	18.2 *6*	2367.8	(16^+)	2033.3	(15^+)	M1	0.345	DCO=0.79 *7*; pol=−0.18 *2*
347.9[c] *2*	1.7 *2*	2808.2?		2460.3	(16)			
353.3 *1*	5.1 *3*	2721.1	(17^+)	2367.8	(16^+)	D		DCO=0.86 *9* Mult.: M1 in 2020He17.
354.5 *1*	14.7 *5*	2966.5	(18^+)	2612.0	(17^+)	(M1)	0.295	DCO=0.42 *8* Mult.: M1 in 2020He17.
363.4 *1*	4.8 *3*	958.5+y	(J+4)	595.1+y	(J+3)	(M1)	0.275	DCO=0.78 *11*
363.4 *1*	15.5 *6*	1955.5	(15^-)	1592.0	(14^-)	M1	0.275	DCO=0.68 *7*; pol=−0.109 *10*
368.8 *2*	5.1 *14*	1162.9	(12^+)	794.1	(10^+)			Mult.: E2 in 2020He17.
371.3[#] *1*	4.1 *3*	3091.9	(18^+)	2721.1	(17^+)	[M1]	0.260	Mult.: M1 in 2020He17.
379.7 *1*	9.1 *5*	1315.9	(11^+)	936.0	(11^+)	(M1)	0.245	DCO=1.7 *2* Mult.: DCO consistent with ΔJ=0, dipole. M1 in 2020He17.
394.2 *1*	23.6 *8*	2427.5	(16^+)	2033.3	(15^+)	M1	0.221	DCO=0.77 *9*; pol=−0.07 *4*
400.9 *1*	4.5 *4*	2646.3	(17^-)	2245.4	(16^-)			Mult.: (M1) in 2020He17.
427.0 *1*	5.6 *3*	2460.3	(16)	2033.3	(15^+)	D		DCO=0.83 *10*
433.2 *1*	3.3 *2*	3843.9		3410.70	(19^+)			
[x]437.1 *2*								E_γ: γ seen in prompt coincidence with 526γ in band #1 and 529γ in band #2 (see level-scheme Fig. 1 in 2020He17 for labeling of bands).
437.7 *1*	3.7 *3*	1348.8	(13^-)	910.9	(11^-)			
438.1 *1*	2.6 *2*	1396.6+y	(J+5)	958.5+y	(J+4)	D		DCO=0.76 *8* Mult.: (M1) in 2020He17.
444.1 *3*	1.8 *3*	891.0+x	(21)	446.6+x	(19)			Mult.: (E2) in 2020He17.
444.2 *1*	8.2 *3*	3410.70	(19^+)	2966.5	(18^+)	D		DCO=0.98 *13* Mult.: M1 in 2020He17.
456.7 *1*	10.3 *5*	1956.6		1499.9	(12^+)	D	0.08 *7*	pol=−0.17 *3* Mult.: (M1) in 2020He17.
457.9 *2*	1.9 *2*	4301.8		3843.9				
472.8 *1*	7.0 *4*	1698.6	(13^-)	1225.6	(12^-)	M1	0.1360	DCO=0.60 *9*; pol=−0.04 *1*
485.4 *1*	6.2 *3*	1985.3		1499.9	(12^+)			
490.3 *1*	11.1 *5*	1426.3	(13^+)	936.0	(11^+)	Q		DCO=1.12 *11* Mult.: E2 in 2020He17.

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^{159}Tb(^{40}Ar,5nγ) 2020He17 (continued)

$\gamma(^{194}Bi)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	α[b]	Comments
517.9 *2*	2.1 *2*	1165.9+x	(22)	648.3+x	(20)			Mult.: (E2) in 2020He17.
526.2 *1*	>68	687.2	(11$^-$)	161	(10$^-$)	M1	0.1024	DCO=0.53 *7*; pol=−0.020 *2*
527.6[c] *1*	4.7 *3*	2557.8?		2030.2	(14$^-$)			
528.6 *1*	37.6 *13*	794.1	(10$^+$)	265.6	(9$^-$)	(E1)	0.00884	DCO=0.72 *7* B(E1)(W.u.)≈1.8×10^{-7} (2020He17) Mult.: E1 in 2020He17.
539.4 *1*	>2.3	700.1	(10$^-$)	161	(10$^-$)			
539.5 *1*	8.5 *4*	1888.4	(14$^-$)	1348.8	(13$^-$)	M1	0.0959	DCO=0.87 *9*; pol=−0.13 *2*
541.0 *1*	7.0 *3*	2429.4	(16$^-$)	1888.4	(14$^-$)	E2	0.0255	DCO=1.1 *2*; pol=+0.029 *5*
557.3 *1*	15.0 *6*	1720.2	(14$^+$)	1162.9	(12$^+$)	E2	0.0238	DCO=1.26 *11*; pol=+0.060 *6*
560.4 *1*	8.4 *4*	2060.27		1499.9	(12$^+$)			
564.4# *1*	6.7 *4*	1499.9	(12$^+$)	936.0	(11$^+$)			Mult.: M1 in 2020He17.
573.6 *1*	27.8 *12*	1592.0	(14$^-$)	1018.5	(12$^-$)	E2	0.0223	DCO=1.19 *14*; pol=+0.018 *2*
576.0 *1*	10.0 *7*	1370.1		794.1	(10$^+$)	D	0.044 *37*	pol=−0.12 *2* Mult.: (M1) in 2020He17.
577.6 *3*	2.0 *2*	1469.0+x	(23)	891.0+x	(21)			Mult.: (E2) in 2020He17.
587.7 *3*	2.0 *3*	2230.6	(15$^-$)	1643.1	(13$^-$)			Mult.: (E2) in 2020He17.
604.8 *2*	2.3 *3*	2086.9		1482.2	(12)			
606.6 *1*	12.5 *7*	1955.5	(15$^-$)	1348.8	(13$^-$)	Q		DCO=1.20 *12* Mult.: E2 in 2020He17.
606.9 *1*	15.5 *6*	2033.3	(15$^+$)	1426.3	(13$^+$)	E2	0.0196	DCO=1.24 *10*; pol=+0.23 *2*
624.5 *4*	2.5 *5*	1643.1	(13$^-$)	1018.5	(12$^-$)			Mult.: (M1) in 2020He17.
633.1 *1*	247 *8*	794.1	(10$^+$)	161	(10$^-$)	(E1)	0.00615	DCO=1.43 *11* B(E1)(W.u.)≈6.9×10^{-7} (2020He17) Mult.: DCO consistent with ΔJ=0, dipole. E1 in 2020He17.
647.4 *1*	8.4 *4*	2367.8	(16$^+$)	1720.2	(14$^+$)	E2	0.01703	DCO=1.14 *10*; pol=+0.22 *3*
653.5 *1*	14.4 *6*	2245.4	(16$^-$)	1592.0	(14$^-$)	E2	0.01669	DCO=1.30 *13*; pol=+0.064 *8*
661.8 *1*	16.2 *6*	1348.8	(13$^-$)	687.2	(11$^-$)	E2	0.01624	DCO=1.10 *13*; pol=+0.15 *3*
662.8 *1*	9.7 *4*	1888.4	(14$^-$)	1225.6	(12$^-$)	E2	0.01619	DCO=1.01 *13*; pol=+0.14 *4*
670.4 *2*	3.6 *3*	1895.9	(13$^-$)	1225.6	(12$^-$)	D		DCO=0.8 *3* Mult.: M1 in 2020He17.
681.2# *2*	5.2 *4*	1698.6	(13$^-$)	1018.5	(12$^-$)			Mult.: M1 in 2020He17. E_γ: poor fit in the level scheme. Level-energy difference=680.1.
688.2 *2*	3.3 *2*	2721.1	(17$^+$)	2033.3	(15$^+$)	Q		DCO=1.19 *14* Mult.: E2 in 2020He17.
690.8 *1*	7.2 *3*	2646.3	(17$^-$)	1955.5	(15$^-$)			Mult.: (E2) in 2020He17.
695.3 *1*	6.7 *4*	1382.5	(11$^-$)	687.2	(11$^-$)	(D)		DCO=1.4 *2* Mult.: DCO consistent with ΔJ=0, dipole. (M1) in 2020He17.
705.3# *1*	8.2 *6*	1499.9	(12$^+$)	794.1	(10$^+$)	E2	0.01417	DCO=1.4 *3*; pol=+0.16 *2*
706.1 *1*	8.1 *6*	1724.6		1018.5	(12$^-$)			
707.3 *1*	16.9 *6*	2427.5	(16$^+$)	1720.2	(14$^+$)	E2	0.01409	DCO=1.2 *2*; pol=+0.13 *5*
723.7# *1*	3.0 *2*	3091.9	(18$^+$)	2367.8	(16$^+$)	(Q)		DCO=2.1 *3* Mult.: DCO seems much larger than expected for stretched quadrupole. E2 in 2020He17.
733.1 *1*	4.2 *3*	2978.5	(18$^-$)	2245.4	(16$^-$)	Q		DCO=1.04 *14* Mult.: (E2) in 2020He17.
738.1 *1*	5.2 *3*	2086.9		1348.8	(13$^-$)	D	0.023 *18*	pol=−0.18 *5* Mult.: M1 in 2020He17.
749.6 *1*	5.7 *5*	910.9	(11$^-$)	161	(10$^-$)			
750.4[c] *1*	4.6 *3*	2783.7?		2033.3	(15$^+$)	(D+Q)		DCO=1.06 *12* Placement of this γ not shown as uncertain

Continued on next page (footnotes at end of table)

^{159}Tb(^{40}Ar,5nγ) 2020He17 (continued)

$\gamma(^{194}Bi)$ (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[b]	Comments
								in 2020He17, even though the level in authors' Fig. 1 is marked as dotted. Mult.: (M1+E2) in 2020He17.
756.7 *1*	4.6 *3*	2348.7	(15)	1592.0	(14$^-$)	D		DCO=0.68 *9* Mult.: no assignment in 2020He17.
776.4 *1*	2.7 *2*	3203.90		2427.5	(16$^+$)			
795.1 *1*	9.7 *5*	1482.2	(12)	687.2	(11$^-$)	D		DCO=0.60 *8*
804.7 *2*	3.2 *3*	2030.2	(14$^-$)	1225.6	(12$^-$)	E2	0.01078	DCO=1.4 *3*; pol=+0.09 *3*
842.6 *1*	5.8 *4*	2268.9		1426.3	(13$^+$)	D	0.017 *13*	pol=−0.076 *6* Mult.: (M1) in 2020He17.
857.5 *1*	59 *3*	1018.5	(12$^-$)	161	(10$^-$)	E2	0.00948	DCO=1.37 *13*; pol=+0.050 *4*
881.7 *2*	3.0 *3*	2230.6	(15$^-$)	1348.8	(13$^-$)	E2	0.00897	DCO=1.1 *2*; pol=+0.16 *4*
956.0 *1*	9.8 *5*	1643.1	(13$^-$)	687.2	(11$^-$)	E2	0.00764	DCO=0.94 *11*; pol=+0.16 *3*
1011.4 *1*	5.0 *3*	1698.6	(13$^-$)	687.2	(11$^-$)			Mult.: E2 in 2020He17.
1064.6 *1*	>24	1225.6	(12$^-$)	161	(10$^-$)	E2	0.00620	DCO=1.26 *14*; pol=+0.21 *4*
1157.7 *2*	2.7 *3*	1844.9		687.2	(11$^-$)			
1208.6 *2*	2.9 *3*	1895.9	(13$^-$)	687.2	(11$^-$)			Mult.: E2 in 2020He17.

[†] From 2020He17.

[‡] From 2020He17 based on measured $\gamma\gamma(\theta)$(DCO) and $\gamma\gamma$(lin pol), unless otherwise noted. In cases where multipolarity assignments in 2020He17 are assigned from (parity-insensitive) DCO ratios only, evaluators have assigned (M1) or (E2) when conversion coefficients are significant, and D or Q in other cases. The assignments in 2020He17, when different from those assigned here, are listed in comments. All the DCO values in 2020He17 are for gates on stretched quadrupole transitions, where expected values are ≈0.7 for stretched dipole and ≈1.2 for stretched quadrupole. For polarization asymmetry POL, expected values are −0.12 for magnetic (ΔJ=1) and +0.12 for electric (ΔJ=2 or 1) multipolarities. Evaluators note that for ΔJ=0, dipole transitions, POL is expected as negative for E1 and positive for M1 transitions.

[#] Uncertainty in Eγ value doubled in five cases to 0.2 keV and 0.4 keV for the 681.2γ (from 1699 level), as with the listed uncertainties, the fit is poor in the level scheme.

[@] γ seen in prompt coincidence with transitions from the lowest states in band #1 and in group A (see level-scheme Fig. 1 in 2020He17 for labeling of bands and groups).

[&] γ seen in prompt coincidence with transitions from levels in group C (see level-scheme Fig. 1 in 2020He17 for labeling of groups).

[a] According to 2020He17, ordering of the 285.8γ and 267.3γ in band #4 in level-scheme Fig. 1 is tentative.

[b] 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.

[c] Placement of transition in the level scheme is uncertain.

[x] γ ray not placed in level scheme.

^{159}Tb(^{40}Ar,5nγ) **2020He17**

Level Scheme

Intensities: Relative I_γ

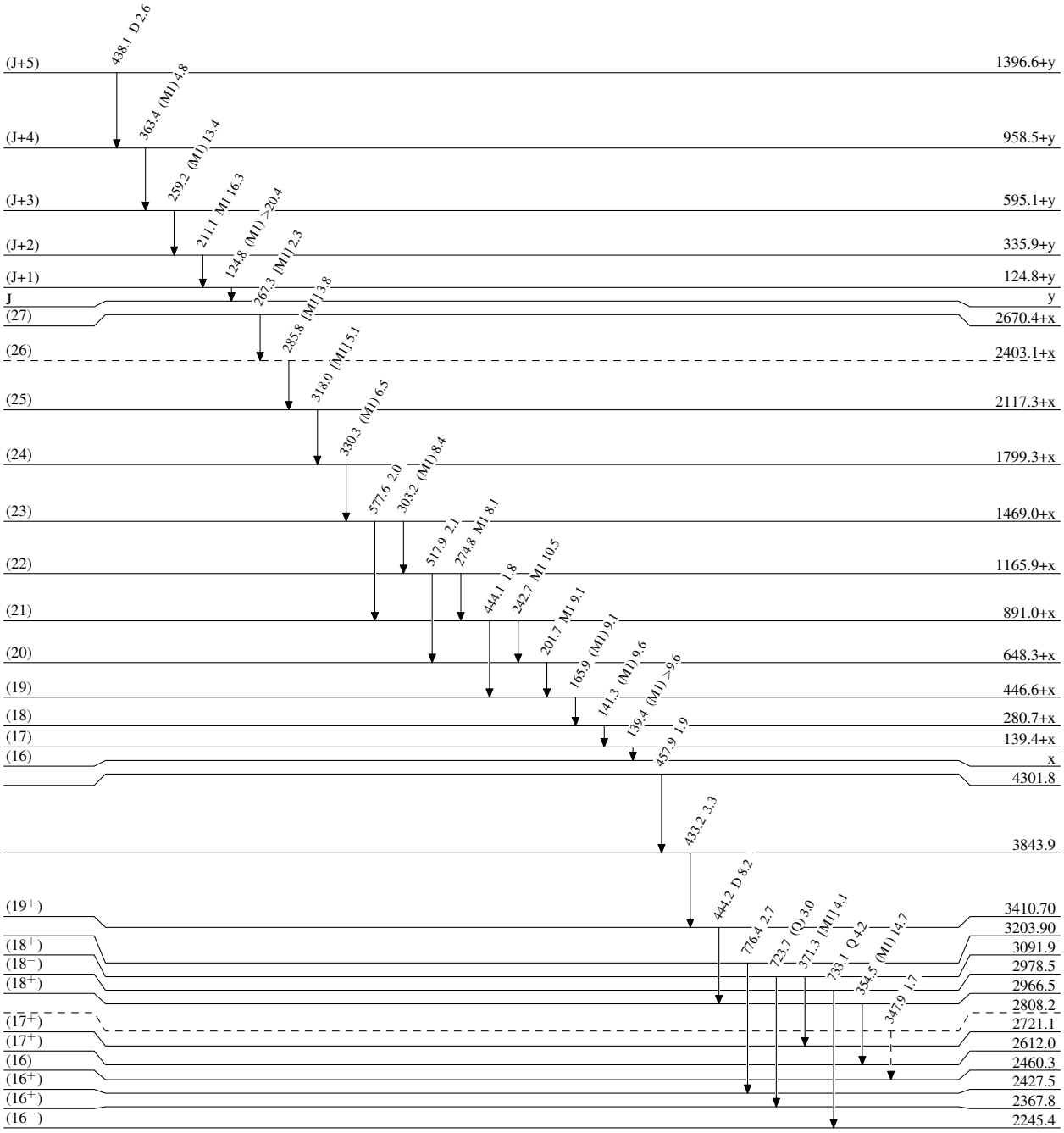
Legend

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

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

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

γ Decay (Uncertain)



$^{194}_{83}Bi_{111}$

^{159}Tb(^{40}Ar,5nγ) 2020He17

Level Scheme (continued)

Intensities: Relative I_γ

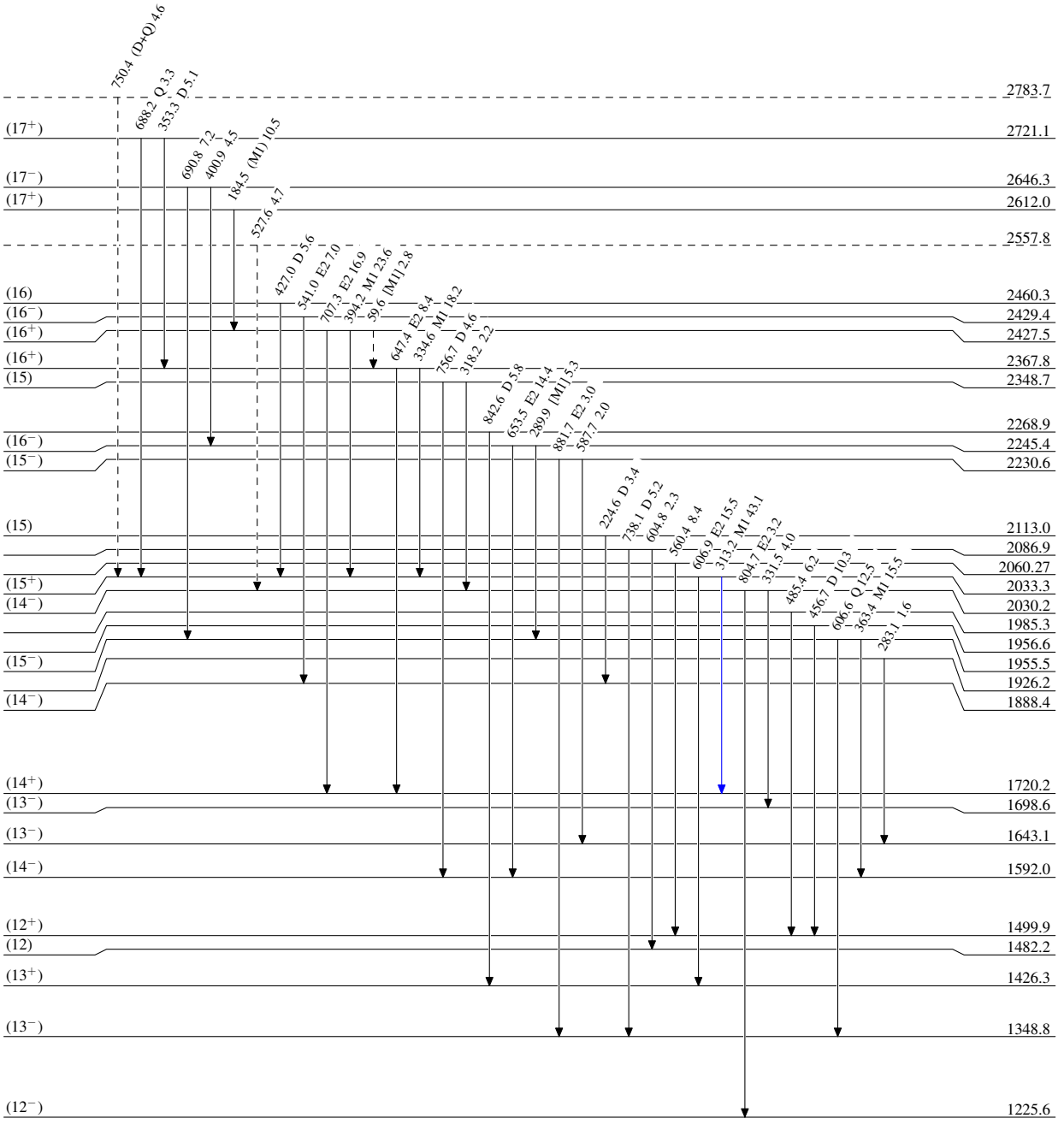
Legend

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

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

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

γ Decay (Uncertain)

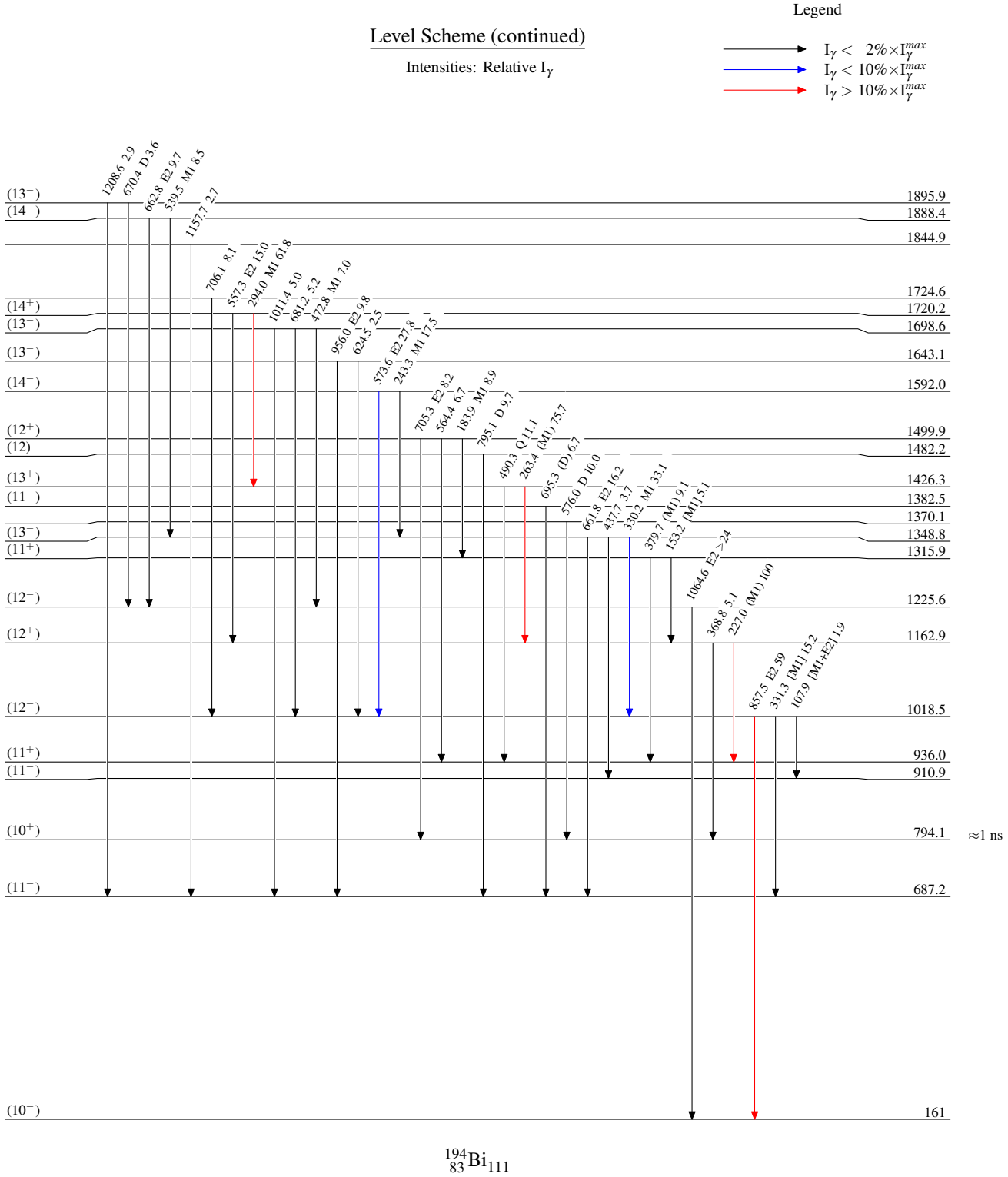


$^{194}_{83}Bi_{111}$

^{159}Tb(^{40}Ar,5nγ) 2020He17

Level Scheme (continued)

Intensities: Relative I_γ

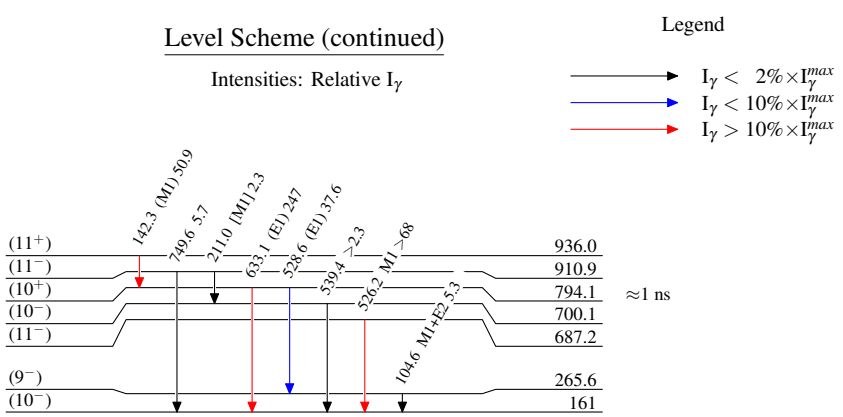


$^{194}_{83}Bi_{111}$

^{159}Tb(^{40}Ar,5nγ) 2020He17

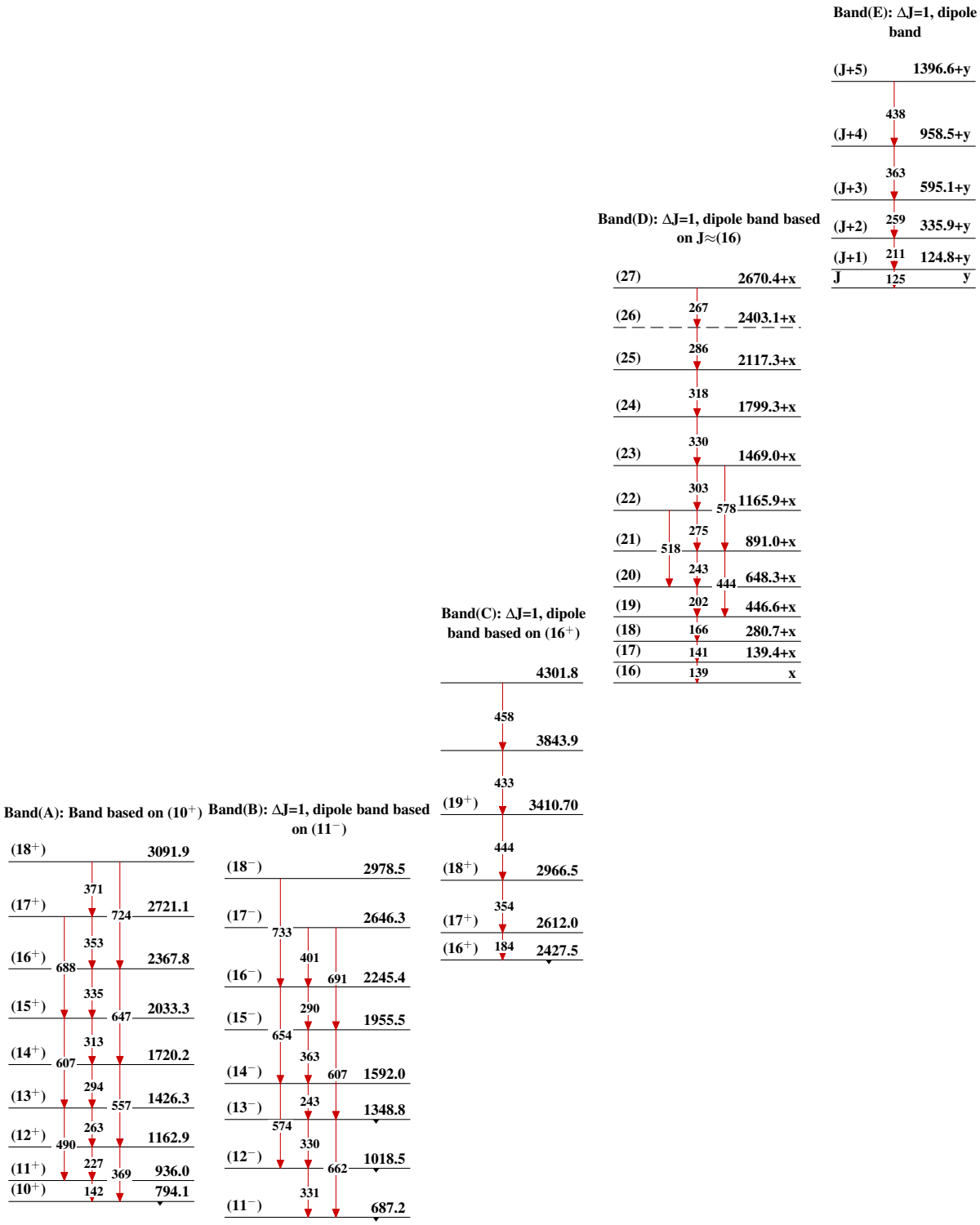
Level Scheme (continued)

Intensities: Relative I_γ



$^{194}_{83}Bi_{111}$

^{159}Tb(^{40}Ar,5nγ) 2020He17



$^{194}_{83}Bi_{111}$