^{108}Cd(^{19}F,3npγ) 2016Ch30

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 174, 1 (2021)	15-Apr-2021

2016Ch30: E=90 MeV ^{19}F beam was produced from the HI-13 Tandem Accelerator at the China Institute of Atomic Energy (CIAE). Target was 1.1 mg/cm^2 ^{108}Cd on a 14 mg/cm^2 lead. The γ rays were detected with 11 Compton-suppressed HPGe detectors and two planar HPGe detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, DCO ratios. Deduced high-spin levels, J^π, bands, configurations, B(E1)/B(E2) ratios, and octupole correlations. Potential-energy surface calculations. Comparisons with relativistic mean-field model, and cluster model calculations.

^{123}Ba Levels

E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]
0.0[a]	5/2$^+$	582.3[c] 3	13/2$^-$	1480.8[a] 3	17/2$^+$	2863.7[a] 3	25/2$^+$
92.5[b] 2	7/2$^-$	611.9[&] 2	11/2$^+$	1818.2[&] 3	19/2$^+$	3189.4[&] 5	27/2$^+$
120.9[#] 9	1/2$^+$	695.1[#] 9	9/2$^+$	1829.9[c] 4	21/2$^-$	3340.1[@] 10	(27/2$^+$)
153.6[@] 5	3/2$^+$	756.5[b] 3	15/2$^-$	1925.3[@] 7	19/2$^+$	3350.2[c] 5	29/2$^-$
169.0[&] 2	7/2$^+$	790.3[@] 6	11/2$^+$	2017.9[b] 3	23/2$^-$	3591.3[b] 6	31/2$^-$
202.3[c] 2	9/2$^-$	877.6[a] 3	13/2$^+$	2154.3[a] 3	21/2$^+$	4000.6[c] 7	33/2$^-$
327.9[#] 8	5/2$^+$	1136.5[c] 3	17/2$^-$	2516.0[&] 4	23/2$^+$	4360.2[b] 8	35/2$^-$
335.6[b] 3	11/2$^-$	1171.7[&] 3	15/2$^+$	2612.0[@] 9	23/2$^+$		
374.2[a] 2	9/2$^+$	1307.9[@] 6	15/2$^+$	2614.2[c] 4	25/2$^-$		
397.0[@] 6	7/2$^+$	1325.4[b] 3	19/2$^-$	2797.9[b] 4	27/2$^-$		

† From a least-squares fit to γ-ray energies.
‡ From 2016Ch30, based on measured γ(DCO) and band structures. See Adopted Levels for adopted assignments.
# Band(A): Band 1, configuration=$\nu s_{1/2}$, α=+1/2.
@ Band(a): Band 2, configuration=$\nu s_{1/2}$, α=−1/2.
& Band(B): Band 3, configuration=$\nu(d_{5/2}+g_{7/2})$, α=−1/2.
a Band(b): Band 4, configuration=$\nu(d_{5/2}+g_{7/2})$, α=+1/2.
b Band(C): Band 5, configuration=$\nu h_{11/2}$, α=−1/2.
c Band(c): Band 6, configuration=$\nu h_{11/2}$, α=+1/2.

γ(^{123}Ba)

DCO values are from e-mail reply of Oct 25, 2016 from one of authors of 2016Ch30, C. Xu.
The DCO ratios are for gates on ΔJ=2, quadrupole transitions. Expected DCO ratios are >1.0 for ΔJ=2, quadrupole transitions and <0.80 for ΔJ=1, dipole transitions. Mult=D+Q is assumed by the evaluator for DCO values between 0.8 and 1.0.

E$_\gamma$[†]	I$_\gamma$[†]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.[#]	Comments
69.1 5		397.0	7/2$^+$	327.9	5/2$^+$		
92.5 2	66.2 14	92.5	7/2$^-$	0.0	5/2$^+$	D	DCO=0.60 12
109.8 2	54 4	202.3	9/2$^-$	92.5	7/2$^-$	(D+Q)	DCO=0.85 4
133.3 2	60 4	335.6	11/2$^-$	202.3	9/2$^-$	(D+Q)[@]	DCO=0.94 5
153.6 5	9.4 6	153.6	3/2$^+$	0.0	5/2$^+$	D	DCO=0.77 11
169.0 2	48.9 8	169.0	7/2$^+$	0.0	5/2$^+$	D	DCO=0.61 6
174.2 2	21.3 15	756.5	15/2$^-$	582.3	13/2$^-$	(D+Q)[@]	DCO=0.99 7
183.7 5		2797.9	27/2$^-$	2614.2	25/2$^-$		
188.0 5		2017.9	23/2$^-$	1829.9	21/2$^-$		

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^{108}Cd(^{19}F,3npγ) 2016Ch30 (continued)

γ(^{123}Ba) (continued)

E_γ †	I_γ †	E_i(level)	J^π_i	E_f	J^π_f	Mult. #	Comments
188.9 *5*		1325.4	19/2−	1136.5	17/2−		
205.2 *2*	34.2 *18*	374.2	9/2+	169.0	7/2+	(D+Q)	DCO=0.88 *6*
207.0 *5*	8.2 *6*	327.9	5/2+	120.9	1/2+	Q	DCO=1.72 *16*
237.7 *2*	25.6 *14*	611.9	11/2+	374.2	9/2+	(D+Q) @	DCO=0.96 *10*
243.1 *5*	19.2 *16*	335.6	11/2−	92.5	7/2−	Q	DCO=1.04 *8*
243.4 *2*	23.3 *12*	397.0	7/2+	153.6	3/2+		DCO=0.94 *6* Mult.: (D+Q) assumed from DCO value but ΔJ=2.
246.7 *2*	39.2 *24*	582.3	13/2−	335.6	11/2−	(D+Q) @	DCO=1.03 *10*
265.7 *5*	12.1 *9*	877.6	13/2+	611.9	11/2+		
294.1 *5*	14.6 *9*	1171.7	15/2+	877.6	13/2+		
309.1 *5*	8.8 *7*	1480.8	17/2+	1171.7	15/2+		
336.1 *5*		2154.3	21/2+	1818.2	19/2+		
337.4 *5*		1818.2	19/2+	1480.8	17/2+		
361.7 *5*		2516.0	23/2+	2154.3	21/2+		
367.2 *5*		695.1	9/2+	327.9	5/2+		
374.2 *5*	18.2 *4*	374.2	9/2+	0.0	5/2+		
380.0 *2*	24.1 *12*	582.3	13/2−	202.3	9/2−		
380.0 *2*	22 *4*	1136.5	17/2−	756.5	15/2−		DCO=1.29 *10* Mult.: DCO consistent with Q but ΔJ=1.
393.3 *2*	42 *4*	790.3	11/2+	397.0	7/2+	Q	DCO=1.57 *10*
409.6 *5*	13 *3*	611.9	11/2+	202.3	9/2−		
420.9 *2*	96 *5*	756.5	15/2−	335.6	11/2−	Q	DCO=1.43 *6*
442.9 *2*	27.3 *16*	611.9	11/2+	169.0	7/2+	Q	DCO=1.34 *11*
503.4 *2*	30.7 *18*	877.6	13/2+	374.2	9/2+	Q	DCO=1.00 *6*
504.5 *5*	11.8 *12*	1829.9	21/2−	1325.4	19/2−		
517.6 *2*	33.5 *17*	1307.9	15/2+	790.3	11/2+	Q	DCO=1.20 *8*
552.3 *5*		3350.2	29/2−	2797.9	27/2−		
554.2 *2*	35.9 *25*	1136.5	17/2−	582.3	13/2−	(Q)	DCO=0.96 *8*
559.8 *2*	47 *3*	1171.7	15/2+	611.9	11/2+	Q	DCO=1.03 *4*
568.9 *2*	100	1325.4	19/2−	756.5	15/2−	Q	DCO=1.14 *5*
575.2 *5*	8.0 *17*	3189.4	27/2+	2614.2	25/2−		
589.4 *5*	6.0 *14*	1171.7	15/2+	582.3	13/2−		
596.3 *5*		2614.2	25/2−	2017.9	23/2−		
603.2 *2*	33.2 *20*	1480.8	17/2+	877.6	13/2+	Q	DCO=1.24 *7*
617.4 *2*	25.7 *14*	1925.3	19/2+	1307.9	15/2+	Q	DCO=1.46 *11*
646.5 *2*	49 *3*	1818.2	19/2+	1171.7	15/2+	Q	DCO=1.90 *13*
650.4 *5*		4000.6	33/2−	3350.2	29/2−		
673.4 *5*	14.1 *24*	3189.4	27/2+	2516.0	23/2+	Q	DCO=1.76 *16*
673.5 *2*	35 *5*	2154.3	21/2+	1480.8	17/2+	Q	DCO=1.87 *10*
686.1 *5*	6.0 *19*	2516.0	23/2+	1829.9	21/2−		
686.7 *5*	19.9 *12*	2612.0	23/2+	1925.3	19/2+	Q	DCO=1.42 *13*
692.5 *2*	80 *6*	2017.9	23/2−	1325.4	19/2−	Q	DCO=1.93 *9*
693.4 *5*	16.4‡ *18*	1829.9	21/2−	1136.5	17/2−	(Q)	DCO=0.96 *6*
697.8 *5*	18.7 *13*	2516.0	23/2+	1818.2	19/2+	Q	DCO=1.08 *5*
709.4 *2*	25.2 *16*	2863.7	25/2+	2154.3	21/2+	Q	DCO=1.58 *10*
728.1 *5*	8.2 *7*	3340.1	(27/2+)	2612.0	23/2+		
736.0 *5*	8.9 *11*	3350.2	29/2−	2614.2	25/2−		
768.9 *5*		4360.2	35/2−	3591.3	31/2−		
780.0 *2*	48 *4*	2797.9	27/2−	2017.9	23/2−	Q	DCO=1.32 *8*
784.3 *5*	11.9 *18*	2614.2	25/2−	1829.9	21/2−		
793.4 *5*		3591.3	31/2−	2797.9	27/2−		
828.9 *5*	8.5 *24*	2154.3	21/2+	1325.4	19/2−		
845.8 *2*	26 *4*	2863.7	25/2+	2017.9	23/2−		

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^{108}Cd(^{19}F,3npγ) 2016Ch30 (continued)

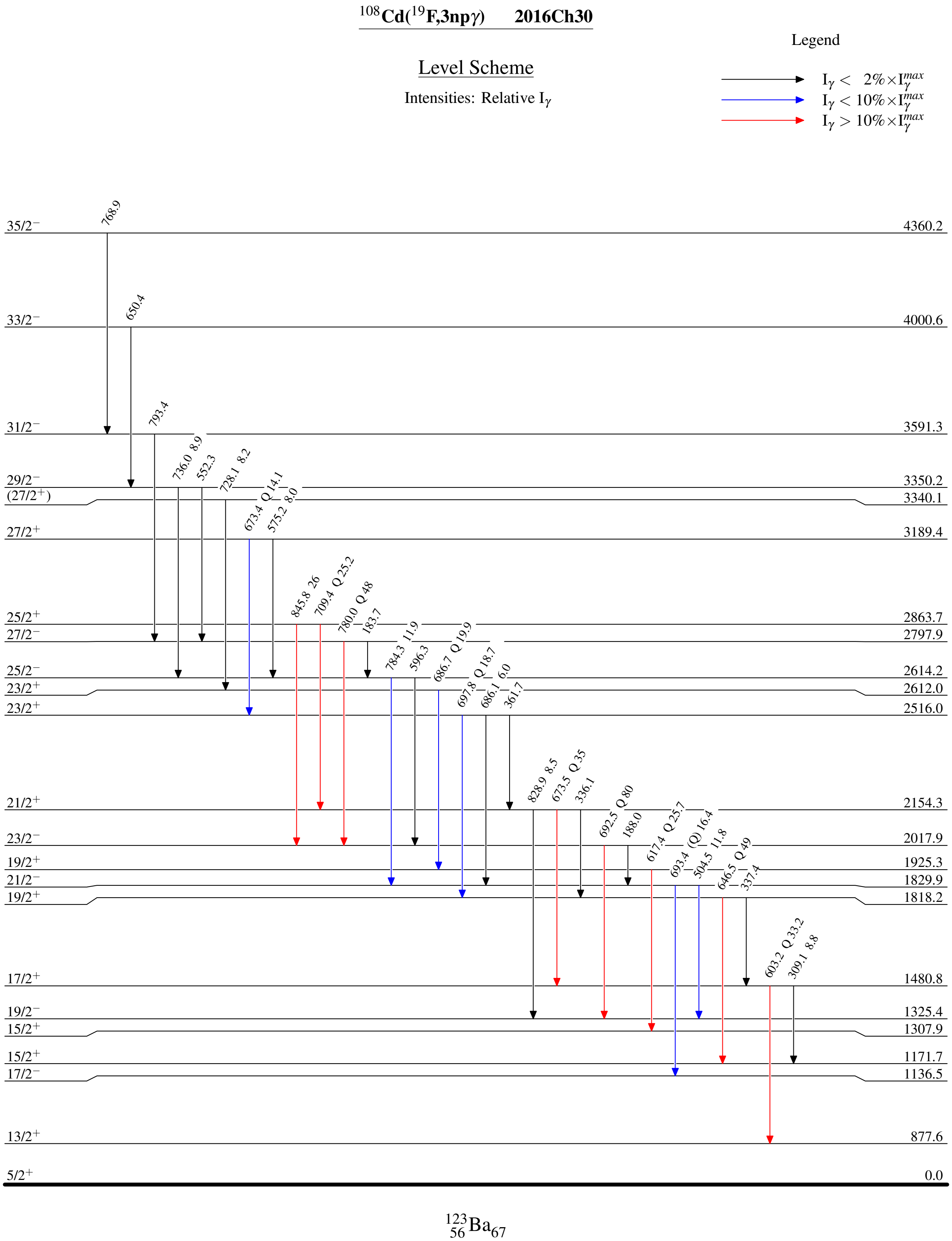
γ(^{123}Ba) (continued)

† From e-mail reply of Oct 25, 2016 from C. Xu. Energy uncertainty is stated by the authors as 0.2-0.5 keV and is assigned here to be 0.2 keV for γ rays with I$\gamma \geq 20$, and 0.5 keV for Iγ<20.

‡ Uncertainty of 1.18 in the data sent by e-mail reply seems a misprint and is assumed to be 1.8 here.

From 2016Ch30 based on measured DCO ratios and the authors′ statement on expected DCO values for ΔJ=2 quadrupole and ΔJ=1 dipole transitions.

@ The DCO ratio is too large to be consistent with ΔJ=1, dipole transition. Perhaps the transition is heavily mixed with quadrupole radiation.



^{108}Cd(^{19}F,3npγ) 2016Ch30
Level Scheme
Intensities: Relative Iγ
Legend
Iγ < 2%×Iγ max
Iγ < 10%×Iγ max
Iγ > 10%×Iγ max
35/2− 4360.2
33/2− 4000.6
31/2− 3591.3
29/2− 3350.2
(27/2+) 3340.1
27/2+ 3189.4
25/2+ 2863.7
27/2− 2797.9
25/2− 2614.2
23/2+ 2612.0
23/2+ 2516.0
21/2+ 2154.3
23/2− 2017.9
19/2+ 1925.3
21/2− 1829.9
19/2+ 1818.2
17/2+ 1480.8
19/2− 1325.4
15/2+ 1307.9
15/2+ 1171.7
17/2− 1136.5
13/2+ 877.6
5/2+ 0.0
768.9
650.4
793.4
736.0 8.9
552.3
728.1 8.2
673.4 Q 14.1
575.2 8.0
845.8 26
709.4 Q 25.2
780.0 Q 48
183.7
784.3 11.9
596.3
686.7 Q 19.9
697.8 Q 18.7
686.1 6.0
361.7
828.9 8.5
673.5 Q 35
336.1
692.5 Q 80
188.0
617.4 Q 25.7
693.4 (Q) 16.4
504.5 11.8
646.5 Q 49
337.4
603.2 Q 33.2
309.1 8.8
$^{123}_{56}Ba_{67}$

^{108}Cd(^{19}F,3npγ) 2016Ch30

Level Scheme (continued)

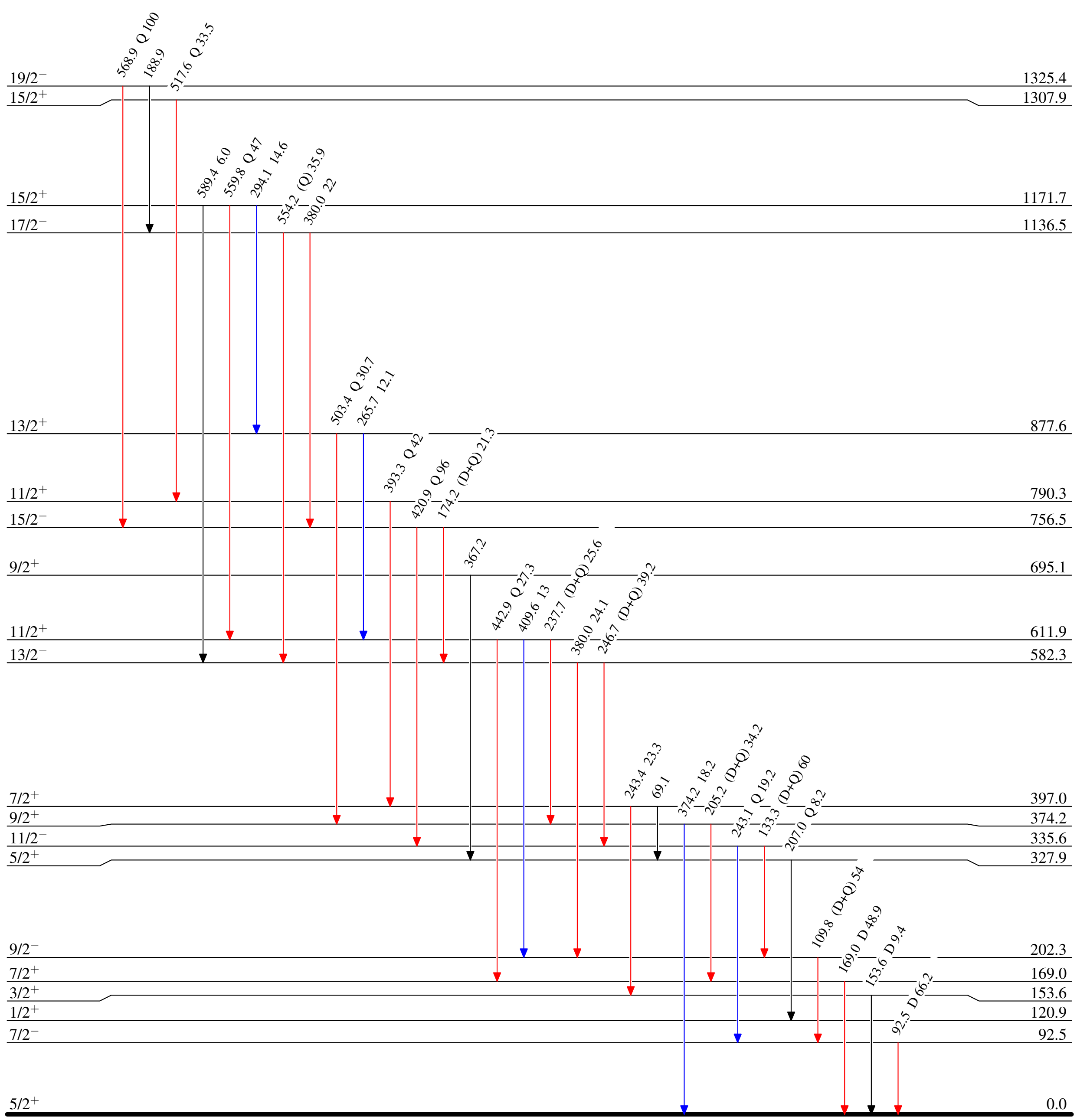
Intensities: Relative I_γ

Legend

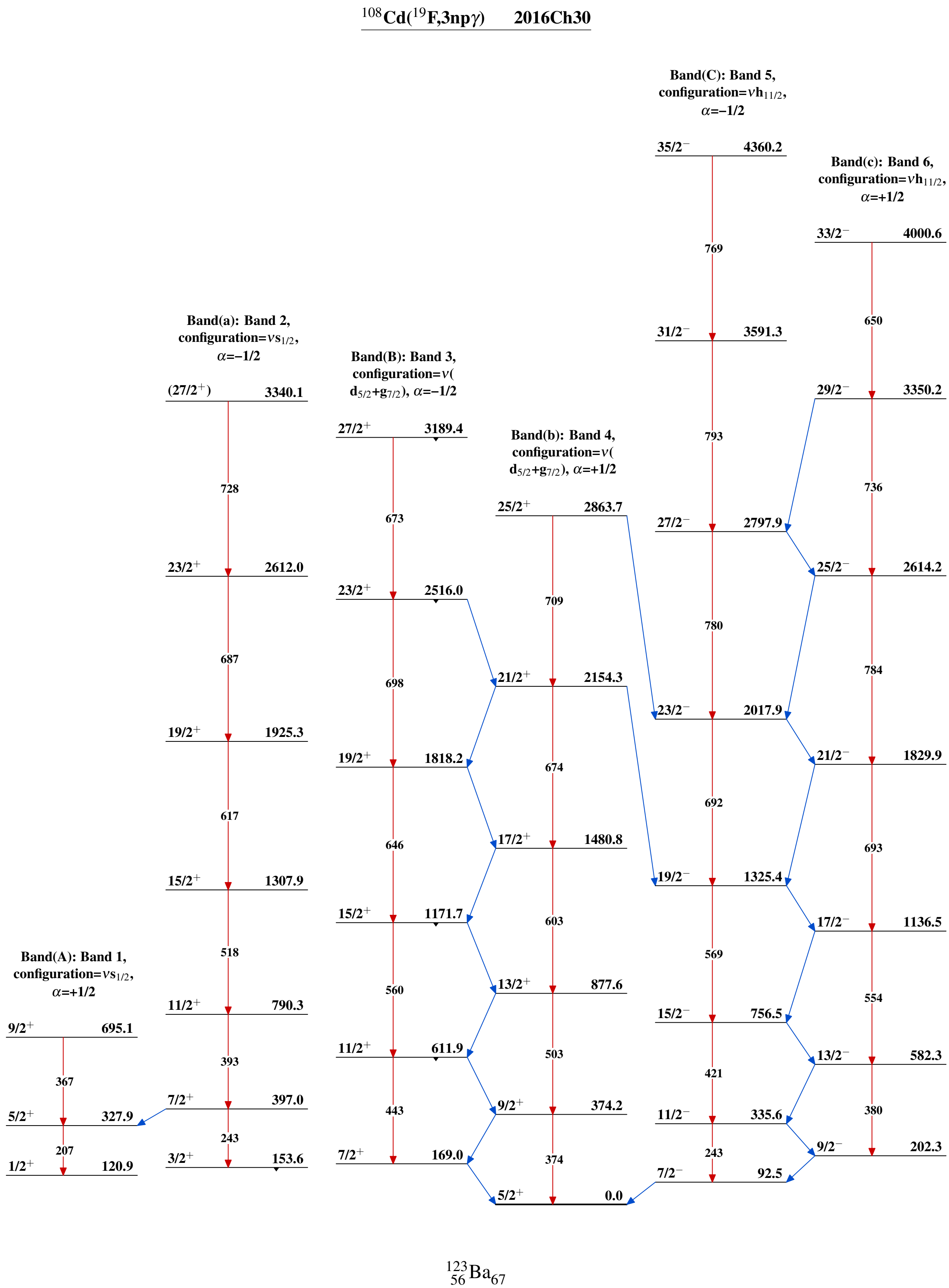
$I_\gamma < 2\% \times I_\gamma^{max}$

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

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



$^{123}_{56}Ba_{67}$



^{108}Cd(^{19}F,3npγ) 2016Ch30
Band(A): Band 1, configuration=νs1/2, α=+1/2
Band(a): Band 2, configuration=νs1/2, α=−1/2
Band(B): Band 3, configuration=ν(d5/2+g7/2), α=−1/2
Band(b): Band 4, configuration=ν(d5/2+g7/2), α=+1/2
Band(C): Band 5, configuration=νh11/2, α=−1/2
Band(c): Band 6, configuration=νh11/2, α=+1/2
9/2+ 695.1
5/2+ 327.9
1/2+ 120.9
367
207
(27/2+) 3340.1
23/2+ 2612.0
19/2+ 1925.3
15/2+ 1307.9
11/2+ 790.3
7/2+ 397.0
3/2+ 153.6
728
687
617
518
393
243
27/2+ 3189.4
23/2+ 2516.0
19/2+ 1818.2
15/2+ 1171.7
11/2+ 611.9
7/2+ 169.0
673
698
646
560
443
25/2+ 2863.7
21/2+ 2154.3
17/2+ 1480.8
13/2+ 877.6
9/2+ 374.2
5/2+ 0.0
709
674
603
503
374
35/2− 4360.2
31/2− 3591.3
27/2− 2797.9
23/2− 2017.9
19/2− 1325.4
15/2− 756.5
11/2− 335.6
7/2− 92.5
769
793
780
692
569
421
243
33/2− 4000.6
29/2− 3350.2
25/2− 2614.2
21/2− 1829.9
17/2− 1136.5
13/2− 582.3
9/2− 202.3
650
736
784
693
554
380

$^{123}_{56}Ba_{67}$