$^{128}Te(^{16}O,5n\gamma)$:ciae 2008Xu05

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

2008Xu05: E=90 MeV beam provided by HI-13 accelerator at China Institute of Atomic Energy. Enriched target. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$(DCO) using an array of 14 Ge detectors with Compton suppression. Comparisons with triaxial rotor model calculations.
1978Gi11: E=90 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$. Nine levels and 10 γ rays reported up to (29/2$^+$).
See also separate dataset from 2007Ku12 using the same reaction at 85 MeV.
The level schemes proposed in 2008Xu05 and 2007Ku12 are in general agreement, except in two places. 1. The ordering of γ rays in band #4, reported by 2007Ku12 is 463.0 -> 636.0 -> 303.2 -> 419.9 -> 375.6 -> 611.7, with 535.5γ and 405.2γ in parallel to 636.0γ and 303.2γ. 2. An 868.8γ from 1967.4 to 1098.6 is not seen by 2007Ku12. Other gamma rays seen by 2007Ku12 have been confirmed in 2008Xu05, in addition to several new gamma rays reported by 2008Xu05.

^{139}Nd Levels

All band configurations are tentative according to 2008Xu05.

E(level)[†]	Jπ[&]	T$_{1/2}$	Comments
0.0	3/2$^+$		
231.15[a] *5*	11/2$^-$	5.50 h *20*	%ε+%β$^+$=87.0 *10*; %IT=13.0 *10* T$_{1/2}$ and decay modes from Adopted Levels. Configuration=$\nu h^{-1}_{11/2}\otimes$(0$^+$ of even-even core).
896.2[@a] *4*	15/2$^-$		
1098.6[@] *4*	13/2$^-$		
1343.3	(13/2$^-$)		E(level): level from 1978Gi11.
1944.4[#] *4*	15/2$^-$		
1967.4[#] *5*	17/2$^-$		
1990.2[‡] *5*	15/2$^-$		
2053.8[#a] *5*	19/2$^-$		
2246.2[‡] *4*	17/2$^-$		
2542.8[‡d] *6*	19/2$^-$		
2571.9[b] *5*	19/2$^+$		
2617.1 *6*	(17/2$^-$)		
2622.6[‡a] *5*	21/2$^-$		
2710.7[‡d] *5*	23/2$^-$		
2720.3[b] *5*	(19/2$^+$)		Possible configuration=$\nu(h^{-2}_{11/2}s_{1/2})$.
2842.3[b] *6*	21/2$^+$		Possible configuration=$\nu(h^{-2}_{11/2}s_{1/2})$.
3074.8[b] *7*	23/2$^+$		Possible configuration=$\nu h^{-1}_{11/2}\otimes\pi(h_{11/2}d^{-1}_{5/2})$.
3078.9 *6*	(21/2$^-$)		
3238.0 *7*	(23/2$^-$)		
3297.3[b] *7*	25/2$^+$		Possible configuration=$\nu h^{-1}_{11/2}\otimes\pi(h_{11/2}d^{-1}_{5/2})$.
3495.0[d] *7*	27/2$^-$		
3527.4[b] *9*	27/2$^+$		Possible configuration=$\nu h^{-1}_{11/2}\otimes\pi(h_{11/2}g^{-1}_{7/2})$.
3728.8 *7*	(25/2$^-$)		
3823.2 *7*	25/2$^-$		
3838.5[f] *7*	25/2$^-$		
3963.4[b] *10*	29/2$^+$		Possible configuration=$\nu h^{-1}_{11/2}\otimes\pi(h_{11/2}g^{-1}_{7/2})$ coupled to 2$^+$ of even-even core.
3977.9[f] *6*	27/2$^-$		
4164.5[c] *8*	(29/2$^-$)		
4289.5[f] *8*	29/2$^-$		

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$^{128}Te(^{16}O,5n\gamma)$:ciae 2008Xu05 (continued)

^{139}Nd Levels (continued)

E(level)[†]	Jπ[&]	Comments
4329.4[b] 10	31/2+	Possible configuration=$\nu h_{11/2}^{-1}\otimes\pi(h_{11/2}g_{7/2}^{-1})$ coupled to 2+ of even-even core.
4448.8[d] 9	31/2−	
4713.0[c] 8	(31/2−)	
4720.9[e] 11	33/2+	
4752.1[f] 9	31/2−	
4818.1 11	(31/2+)	
4850.5[b] 11	33/2+	
4855.3[d] 10	35/2−	
4907.8 11	33/2+	
5110.4 11	(33/2+)	
5126.7[f] 10	33/2−	
5160.7[b] 12	35/2+	
5216.8 12	37/2+	
5230.2[e] 12	35/2+	
5285.3 10	(33/2−)	
5516.5 11		
5546.0[f] 12	35/2−	
5547.0[c] 9	(35/2−)	
5701.6[e] 13	37/2+	
5950.8 12	37/2−	
6134.8[c] 10	(37/2−)	
6181.5[f] 12	37/2−	
6372.4 13	(39/2+)	
6423.7 10	(39/2−)	E(level): connected to band based on (21/2−).
6483.8 13	39/2−	
6928.2[c] 11	(41/2−)	
6995.0[g] 14	41/2−	
7234.1[g] 15	43/2−	
7523.6[g] 15	45/2−	
7714.6[c] 12	(45/2−)	
7892.1[g] 16	47/2−	
x[h]	J	Additional information 1. E(level): x>4 MeV from possible feeding of 3963, 29/2+ level according to level scheme shown by 2008Xu05.
193.1+x[h] 5	J+1	
452.8+x[h] 7	J+2	
846.3+x[h] 9	J+3	
1308.3+x[h] 10	J+4	

[†] From least-squares fit to Eγ data.
[‡] Possible member of multiplet formed by coupling of $\nu h_{11/2}^{-1}$ with 6+ state of even-even core.
[#] Possible member of multiplet formed by coupling of $\nu h_{11/2}^{-1}$ with 4+ state of even-even core.
[@] Possible member of multiplet formed by coupling of $\nu h_{11/2}^{-1}$ with 2+ state of even-even core.
[&] As proposed in 2008Xu05 on the basis of DCO measurements and band structures.
[a] Band(A): Structure built on $\nu h_{11/2}^{-1}$ Possible oblate structure with $\gamma\approx-60°$.
[b] Band(B): γ cascade based on 19/2+.
[c] Band(C): γ cascade based on (29/2−).

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^{128}Te(^{16}O,5nγ):ciae 2008Xu05 (continued)

^{139}Nd Levels (continued)

[d] Band(D): γ cascade based on 19/2$^-$. Possible oblate structure with $\gamma\approx-60°$.
[e] Band(E): Band based on 33/2$^+$. Possible oblate structure with $\gamma\approx-60°$.
[f] Band(F): $\nu h^{-3}_{11/2}$.
[g] Band(G): $\pi(g^{-1}_{7/2}h_{11/2})\otimes\nu(d_{3/2}h^{-2}_{11/2})$.
[h] Band(H): $\nu d_{3/2}\otimes\nu h^{-2}_{11/2}$. In 2011Bh07, this structure is connected to the main level scheme with a different ordering of the transitions.

γ(^{139}Nd)

The DCO ratios seem to correspond to gates on ΔJ=2, quadrupole transitions. Expected values of DCO are: ≈0.9 for ΔJ=2, quadrupole, and ≈0.5 for a ΔJ=1, dipole transition.
A_2 and A_4 data are from 1978Gi11.

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[@]	Comments
86.4 5	2.9 6	2053.8	19/2$^-$	1967.4	17/2$^-$	D+Q		DCO=0.48 8
88.1 5	12.3 1	2710.7	23/2$^-$	2622.6	21/2$^-$	D+Q		DCO=0.56 7
103.2 5	4.5 5	2720.3	(19/2$^+$)	2617.1	(17/2$^-$)			
122.0 5	14.5 2	2842.3	21/2$^+$	2720.3	(19/2$^+$)	D+Q		DCO=0.40 6
139.4 5	15.2 1	3977.9	27/2$^-$	3838.5	25/2$^-$	D+Q		DCO=0.68 8
148.4 5	7.1 3	2720.3	(19/2$^+$)	2571.9	19/2$^+$	D+Q		DCO=0.65 11 Mult.: ΔJ=0 transition.
154.7 5	5.5 3	3977.9	27/2$^-$	3823.2	25/2$^-$	D+Q		DCO=0.55 9
159.1 5	4.0 4	3238.0	(23/2$^-$)	3078.9	(21/2$^-$)			
167.9 5	3.1 5	2710.7	23/2$^-$	2542.8	19/2$^-$	Q		DCO=0.87 14
193.1 5	7.3 4	193.1+x	J+1	x	J			
222.5 5	38.7 1	3297.3	25/2$^+$	3074.8	23/2$^+$	D+Q		DCO=0.58 8 A_2=−0.41 10; A_4=+0.10 11
230.1 5	33.8 1	3527.4	27/2$^+$	3297.3	25/2$^+$	D+Q		DCO=0.66 7 A_2=−0.65 6; A_4=+0.07 6
(231.15 5)		231.15	11/2$^-$	0.0	3/2$^+$	M4	14.51	E_γ,Mult.: from Adopted Gammas.
232.5 5	41.1 1	3074.8	23/2$^+$	2842.3	21/2$^+$	D+Q		DCO=0.68 6 A_2=−0.32 5; A_4=−0.12 20
239.1 5	0.6 3	7234.1	43/2$^-$	6995.0	41/2$^-$	D+Q		DCO=0.30 6
249.1 5	2.6 4	3977.9	27/2$^-$	3728.8	(25/2$^-$)			
256.0 5	3.9 3	2246.2	17/2$^-$	1990.2	15/2$^-$	D+Q		DCO=0.47 14
259.7 5	4.1 5	452.8+x	J+2	193.1+x	J+1			
270.4 5	28.2 2	2842.3	21/2$^+$	2571.9	19/2$^+$	D+Q		DCO=0.58 8 A_2=−0.36 1; A_4=−0.06 6
289.5 5	0.6 8	7523.6	45/2$^-$	7234.1	43/2$^-$	D+Q		DCO=0.58 10
301.8 5	8.9 3	2246.2	17/2$^-$	1944.4	15/2$^-$	D+Q		DCO=0.58 6
302.3 5	5.1 7	6483.8	39/2$^-$	6181.5	37/2$^-$	D+Q		DCO=0.58 6
309.0 5	3.2 5	5216.8	37/2$^+$	4907.8	33/2$^+$	Q		DCO=0.87 8
310.2 5	4.9 3	5160.7	35/2$^+$	4850.5	33/2$^+$	D+Q		DCO=0.61 9
311.6 5	25.1 1	4289.5	29/2$^-$	3977.9	27/2$^-$	D+Q		DCO=0.60 13
325.7 5	2.9 5	2571.9	19/2$^+$	2246.2	17/2$^-$			
326.0 5	2.6 6	4164.5	(29/2$^-$)	3838.5	25/2$^-$	Q		DCO=0.81 9
358.6 5	2.7 5	3078.9	(21/2$^-$)	2720.3	(19/2$^+$)			Mult.: 2008Xu05 list (M1), but their Δ(J^π) assignment requires E1.
366.0 5	17.6 1	4329.4	31/2$^+$	3963.4	29/2$^+$	D+Q		DCO=0.57 14
368.5 5	0.4 8	7892.1	47/2$^-$	7523.6	45/2$^-$	D+Q		DCO=0.41 13
374.6 5	9.8 2	5126.7	33/2$^-$	4752.1	31/2$^-$	D+Q		DCO=0.55 10
391.5 5	4.3 4	4720.9	33/2$^+$	4329.4	31/2$^+$	D+Q		DCO=0.59 14
393.5 5	4.1 3	846.3+x	J+3	452.8+x	J+2			

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^{128}Te(^{16}O,5nγ):ciae 2008Xu05 (continued)

γ(^{139}Nd) (continued)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	Comments
404.8 5	3.0 8	5950.8	37/2⁻	5546.0	35/2⁻	D+Q	DCO=0.48 3
406.5 5	2.1 7	4855.3	35/2⁻	4448.8	31/2⁻	Q	DCO=1.07 8
419.3 5	8.2 4	5546.0	35/2⁻	5126.7	33/2⁻	D+Q	DCO=0.52 9
423.5 5	4.7 7	4713.0	(31/2⁻)	4289.5	29/2⁻	D+Q	DCO=0.50 6
436.0 5	24.9 1	3963.4	29/2⁺	3527.4	27/2⁺	D+Q	DCO=0.52 4
462.0 5	2.0 8	1308.3+x	J+4	846.3+x	J+3		
462.6 5	19.8 2	4752.1	31/2⁻	4289.5	29/2⁻	D+Q	DCO=0.45 2
471.4 5	1.6 7	5701.6	37/2⁺	5230.2	35/2⁺	D+Q	DCO=0.52 3
474.1 5	12.8 2	2720.3	(19/2⁺)	2246.2	17/2⁻	D	DCO=0.68 9
490.8 5	2.7 4	3728.8	(25/2⁻)	3238.0	(23/2⁻)		
504.5 5	0.7 8	6928.2	(41/2⁻)	6423.7	(39/2⁻)	D+Q	DCO=0.57 6
509.3 5	1.9 6	5230.2	35/2⁺	4720.9	33/2⁺	D+Q	DCO=0.62 9
511.2 5	3.6 4	6995.0	41/2⁻	6483.8	39/2⁻	D+Q	DCO=0.53 7
521.1 5	6.8 3	4850.5	33/2⁺	4329.4	31/2⁺	D+Q	DCO=0.41 11
533.0 5	1.6 8	6483.8	39/2⁻	5950.8	37/2⁻	D+Q	DCO=0.40 4
533.2 5	5.3 2	5285.3	(33/2⁻)	4752.1	31/2⁻	D+Q	DCO=0.46 10
548.5 5	2.4 4	4713.0	(31/2⁻)	4164.5	(29/2⁻)	D+Q	DCO=0.51 7
568.8 5	30.2 1	2622.6	21/2⁻	2053.8	19/2⁻	D+Q	DCO=0.48 2
578.4 5	4.0 5	4907.8	33/2⁺	4329.4	31/2⁺	Q	DCO=0.85 8
587.8 5	2.8 4	6134.8	(37/2⁻)	5547.0	(35/2⁻)	D+Q	DCO=0.56 6
604.5 5	38.9 2	2571.9	19/2⁺	1967.4	17/2⁻	D	DCO=0.66 4 A_2=+0.06 10; A_4=+0.03 10
624.0	10.0 20	1967.4	17/2⁻	1343.3	(13/2⁻)		A_2=+0.10 15; A_4=+0.1 2 E_γ,I_γ: from 1978Gi11.
635.5 5	4.8 5	6181.5	37/2⁻	5546.0	35/2⁻	D+Q	DCO=0.41 4
655.2 5	3.2 5	2622.6	21/2⁻	1967.4	17/2⁻		
656.9 5	4.3 3	2710.7	23/2⁻	2053.8	19/2⁻		
665.0 5	100.0	896.2	15/2⁻	231.15	11/2⁻	Q	DCO=0.93 4 A_2=+0.27 7; A_4=+0.07 11
680.6 5	1.8 7	3977.9	27/2⁻	3297.3	25/2⁺		
781.0 5	3.9 5	5110.4	(33/2⁺)	4329.4	31/2⁺		
784.3 5	7.2 3	3495.0	27/2⁻	2710.7	23/2⁻	Q	DCO=1.09 14
786.4 5	1.1 7	7714.6	(45/2⁻)	6928.2	(41/2⁻)	Q	DCO=0.98 9
793.4 5	2.3 5	6928.2	(41/2⁻)	6134.8	(37/2⁻)	Q	DCO=0.90 12
802.0 5	6.5 3	4329.4	31/2⁺	3527.4	27/2⁺	Q	DCO=1.06 13
834.0 5	5.3 3	5547.0	(35/2⁻)	4713.0	(31/2⁻)	Q	DCO=1.12 8
845.8 5	6.6 3	1944.4	15/2⁻	1098.6	13/2⁻	D+Q	DCO=0.64 5
854.7 5	4.1 7	4818.1	(31/2⁺)	3963.4	29/2⁺		
867.4 5		1098.6	13/2⁻	231.15	11/2⁻	D+Q	DCO=0.33 10
868.8 5		1967.4	17/2⁻	1098.6	13/2⁻	Q	DCO=1.05 7
876.7 5	2.1 8	6423.7	(39/2⁻)	5547.0	(35/2⁻)	Q	DCO=0.84 6
891.6 5	12.9 1	1990.2	15/2⁻	1098.6	13/2⁻	D+Q	DCO=0.44 6
953.8 5	3.2 6	4448.8	31/2⁻	3495.0	27/2⁻	Q	DCO=0.80 11
1025.1 5	3.1 7	3078.9	(21/2⁻)	2053.8	19/2⁻		
1071.2 5	40.8 2	1967.4	17/2⁻	896.2	15/2⁻	D+Q	DCO=0.36 9 A_2=−0.63 6; A_4=+0.07 6
1112.1	4.0 15	1343.3	(13/2⁻)	231.15	11/2⁻	D	A_2=−0.53 20; A_4=+0.02 10 E_γ,I_γ: from 1978Gi11.
1112.5 5	6.9 6	3823.2	25/2⁻	2710.7	23/2⁻	D+Q	DCO=0.38 4
1127.8 5	24.0 5	3838.5	25/2⁻	2710.7	23/2⁻	D+Q	DCO=0.21 3
1157.6 5	37.9 2	2053.8	19/2⁻	896.2	15/2⁻	Q	DCO=0.87 10 A_2=+0.27 4; A_4=+0.05 5
1187.1 5	2.5 7	5516.5		4329.4	31/2⁺		
1211.7 5	3.2 6	6372.4	(39/2⁺)	5160.7	35/2⁺		
1350.0 5	4.1 4	2246.2	17/2⁻	896.2	15/2⁻		
1646.6 5	3.8 4	2542.8	19/2⁻	896.2	15/2⁻	Q	DCO=1.12 13

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$^{128}Te(^{16}O,5n\gamma)$:ciae 2008Xu05 (continued)

$\gamma(^{139}Nd)$ (continued)

E_γ †	I_γ ‡	E_i(level)	J^π_i	E_f	J^π_f	Mult. #	Comments
1713.2 *5*	3.1 *5*	1944.4	15/2⁻	231.15	11/2⁻	Q	DCO=1.89 *10*
1720.9 *5*	9.1 *3*	2617.1	(17/2⁻)	896.2	15/2⁻	D+Q	DCO=0.43 *8*

† Uncertainty of 0.5 keV for each Eγ is assigned based on a general statement in the text of the 2008Xu05 paper.

‡ The evaluators note that uncertainties for some of the intensities are unrealistically low, e.g. 0.3% for 230.1γ. Although not stated by 2008Xu05, it seems that the quoted uncertainties are only statistical.

Assignments are based on DCO ratios. Since the DCO ratios are insensitive to parity assignment, the evaluators assign mult=Q for stretched quadrupoles (E2 assigned in 2008Xu05), and mult=D or D+Q for ΔJ=1 transitions (M1+E2 or E1 assigned in 2008Xu05). The assignments in 2008Xu05 implied simply on their J^π assignments are not adopted by the evaluators. As indicated in a comment, there is only one ΔJ=0 transition at 148.4 keV from 2720 level. All DCO ratios from 2008Xu05.

@ 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.

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Level Scheme

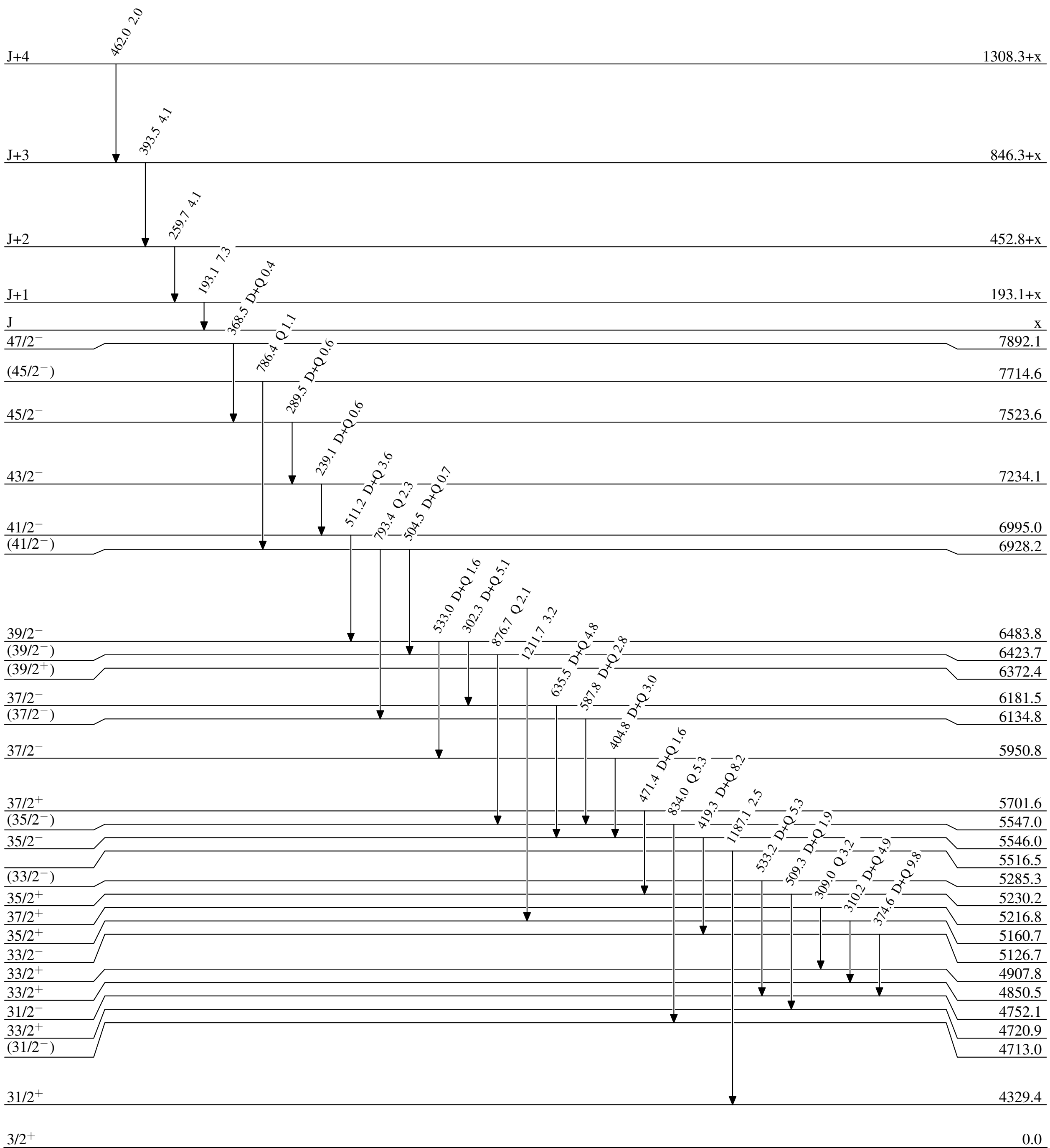
Intensities: Relative I_γ

Legend

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

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

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



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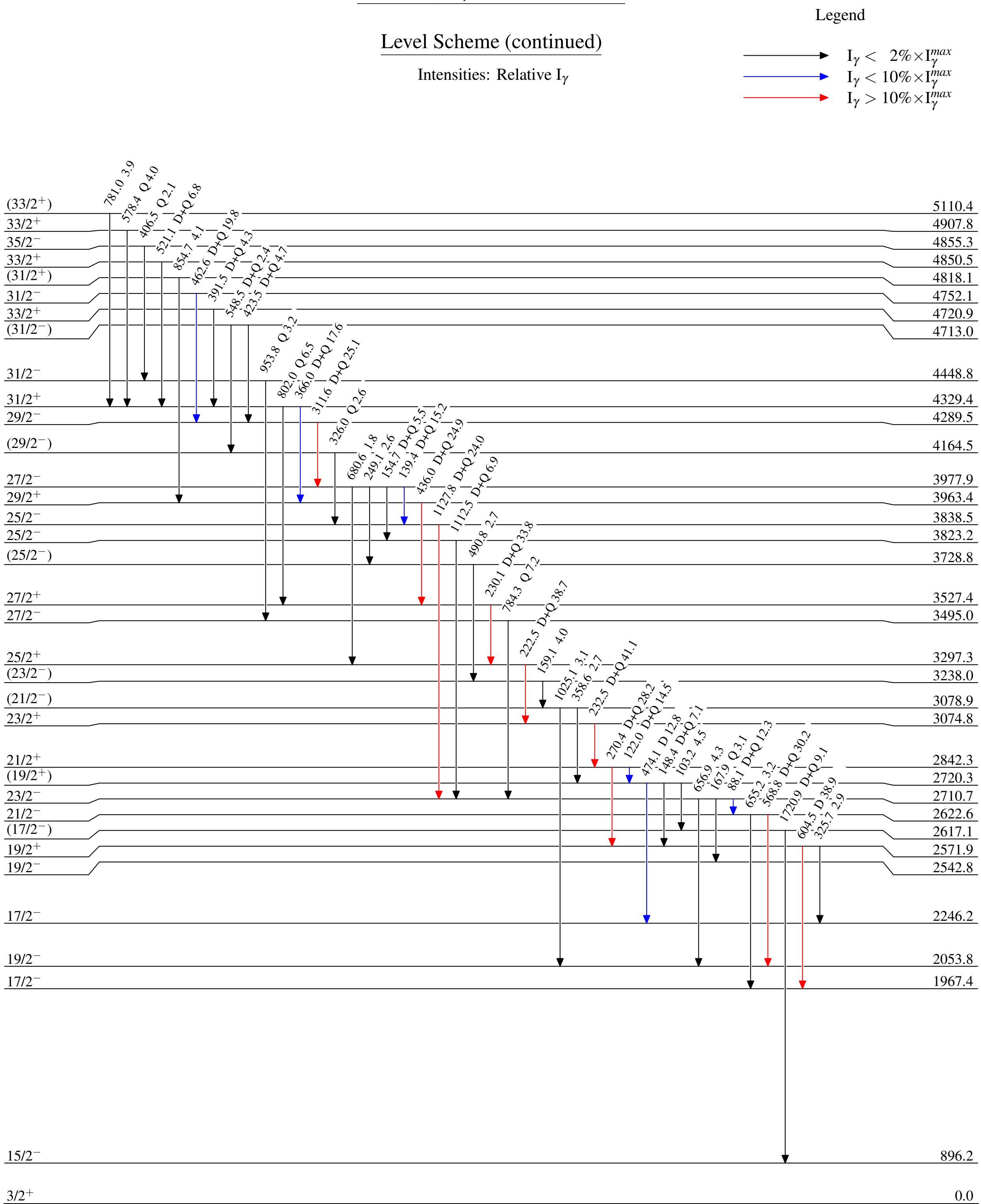
Level Scheme (continued)

Intensities: Relative I_γ

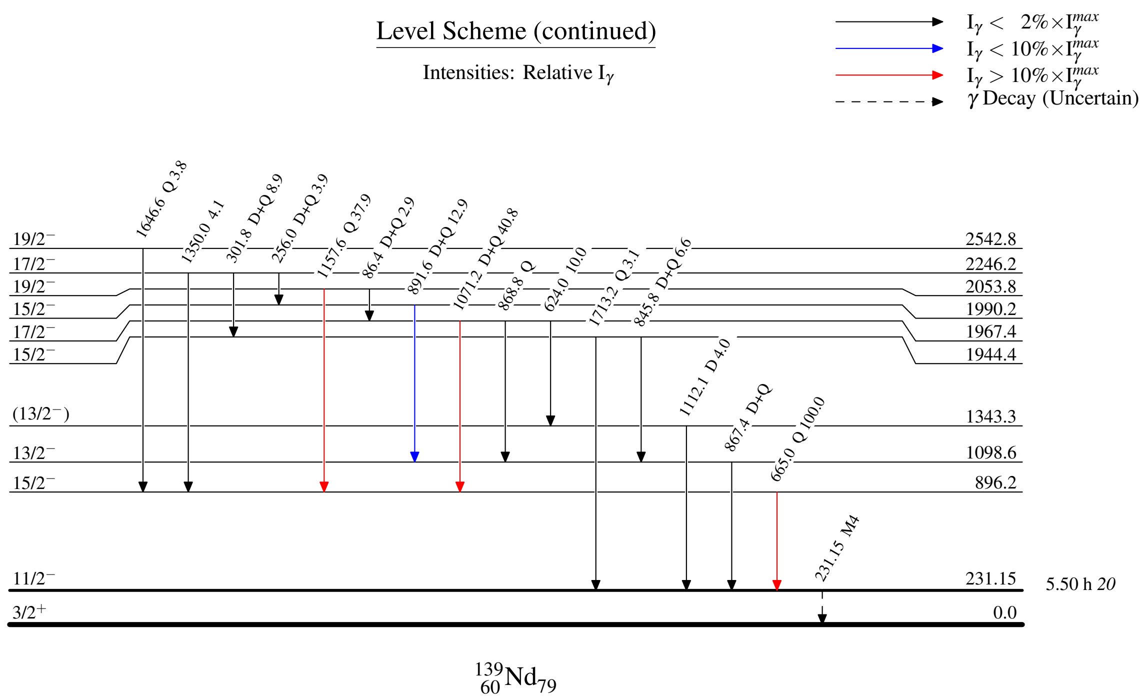


$^{139}_{60}Nd_{79}$

$^{128}Te(^{16}O,5n\gamma)$:ciae 2008Xu05

Level Scheme (continued)

Intensities: Relative I_γ



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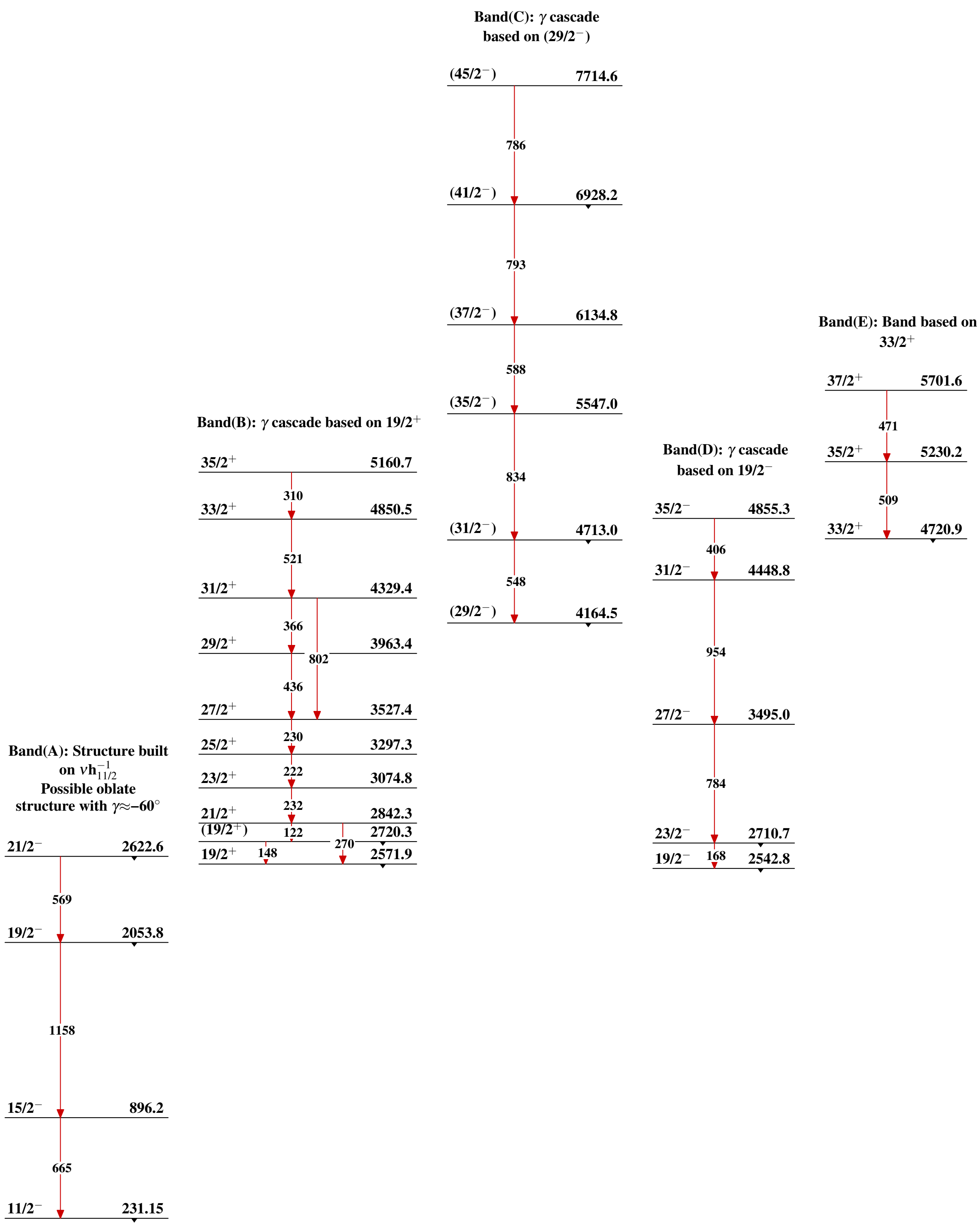

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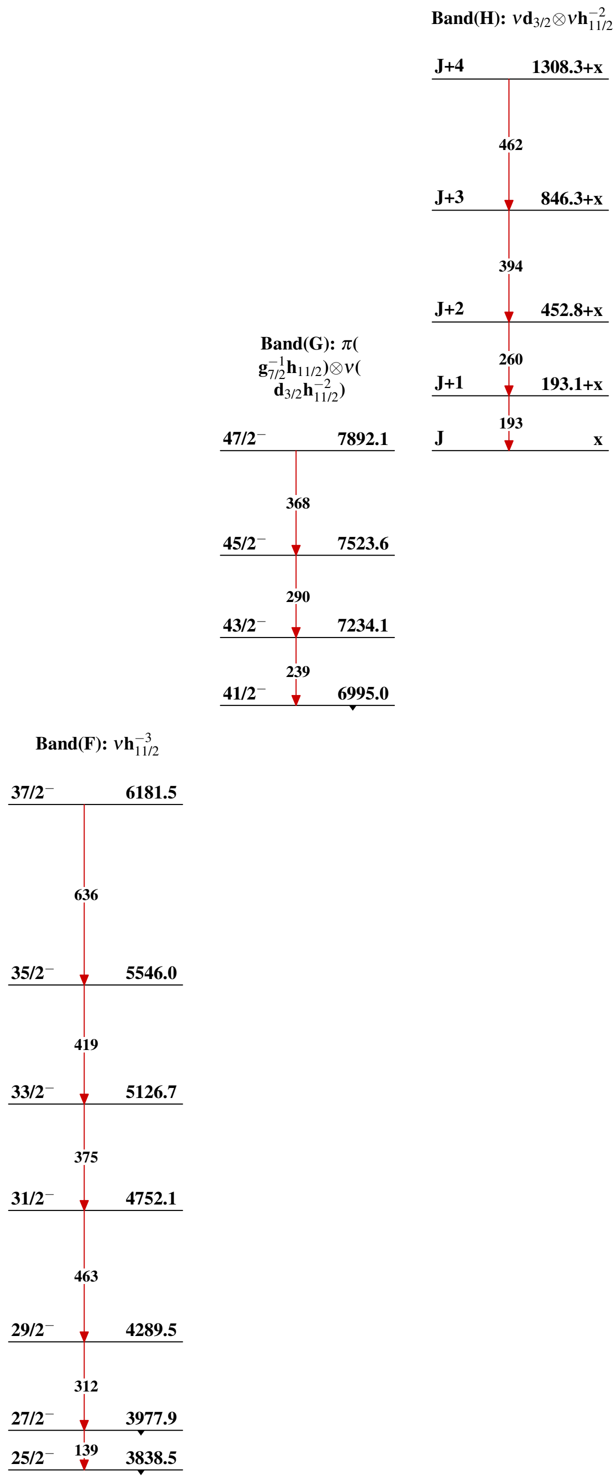

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