^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 191,1 (2023)	22-Aug-2023

Includes ^{141}Pr(^{30}Si,p3nγ) from 1999Sm13.

1999Cr01: ^{146}Nd(^{26}Mg,5nγ),E(^{26}Mg)=142 MeV. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(DCO) at 37° and 79° using 8π array with 20 HPGe detectors placed at θ=37°, 79°, 101°, 143°, and 71-element BGO detectors at Chalk River MP tandem accelerator. 97% ^{146}Nd self-supporting target. On-line Doppler shift correction to gamma-ray spectra. Total routhian plus cranked shell-model calculations.

1999Sm13: ^{141}Pr(^{30}Si,p3nγ),E(^{30}Si)=155 MeV. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(DCO) at θ=37°, 79° using NORDBALL detector array with 18 Ge detectors, two low-energy photon spectrometers, and multi-element 4π BaF_2 multiplicity filter at Niels Bohr Institute tandem accelerator facility. Two stacked self-supporting Pr targets were used. Seven rotational bands were discovered, with the $\nu i_{13/2}$ band up to (77/2$^+$). The γ-ray energies were given in level-scheme Figure to nearest keV, with no intensities. Measured DCO ratios were listed in very few cases. Band assignments and configurations were made using Woods-Saxon cranking model calculations.

^{167}Hf Levels

The level scheme and band structures are from 1999Cr01 and 1999Sm13, with some differences between the two, e.g. termination of the ν5/2[523],α=−1/2 band with J=19/2 suggested in 1999Sm13, rather than J=27/2 in 1999Cr01. Reversed order in 1999Sm13 for the 530γ-542γ cascade is not adopted since, in (^{16}O,4nγ), that would place the weaker of the two transitions lower in the γ cascade. Note that the ν5/2[523] and $\nu i_{13/2}$ bands were first established by 1977JoZQ.

E(level)[†]	J$^\pi$[‡]
0.0[#]	5/2$^-$
92.1[@] 4	7/2$^-$
145.0[&] 5	13/2$^+$
188.6[a] 5	11/2$^+$
207.2[#] 3	9/2$^-$
349.6[&] 4	17/2$^+$
355.3[@] 4	11/2$^-$
401.7[a] 4	15/2$^+$
504.6[#] 3	13/2$^-$
692.6[&] 4	21/2$^+$
706.5[@] 4	15/2$^-$
767.2[a] 4	19/2$^+$
883.7[#] 3	17/2$^-$
1120.8[@] 5	19/2$^-$
1151.5[&] 5	25/2$^+$
1253.5[a] 4	23/2$^+$
1323.9[#] 4	21/2$^-$
1561.4[e] 5	23/2$^-$
1704.6[&] 5	29/2$^+$
1797.2[#] 4	25/2$^-$
1832.1[a] 4	27/2$^+$
1995.3[e] 5	27/2$^-$
2244.8[b] 4	29/2$^-$
2289.6[d] 5	27/2$^-$
2331.6[&] 5	33/2$^+$

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^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13 (continued)

^{167}Hf Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	Comments
2339.1[c] 5	29/2$^-$	E(level): the order of the 542γ-530γ cascade was reversed in 1999Sm13 leading to E=2326.9 for this level.
2441.5[e] 5	31/2$^-$	
2479.5[a] 5	31/2$^+$	
2695.3[b] 4	33/2$^-$	
2769.9[d] 5	31/2$^-$	
2810.3 6	33/2$^+$	
2869.0[c] 6	33/2$^-$	
2937.4[e] 5	35/2$^-$	
3005.1[&] 5	37/2$^+$	
3179.9[a] 6	35/2$^+$	
3206.8[b] 4	37/2$^-$	
3260.0 5	37/2$^+$	
3288.5[d] 6	35/2$^-$	
3452.8[c] 7	37/2$^-$	
3502.4[e] 5	39/2$^-$	
3666.0[f] 5	41/2$^+$	
3787.9[b] 4	41/2$^-$	
3872.1[&] 5	41/2$^+$	
3875.3[d] 8	39/2$^-$	
3921.7[a] 7	39/2$^+$	
4103.5[c] 7	41/2$^-$	
4141.6[e] 5	43/2$^-$	
4333.8[f] 5	45/2$^+$	
4437.5[b] 4	45/2$^-$	
4526.2[d] 9	43/2$^-$	
4626.9[&] 5	45/2$^+$	
4672.3[a] 9	43/2$^+$	
4822.0[c] 8	45/2$^-$	
4850.9[e] 5	47/2$^-$	
5082.7[f] 5	49/2$^+$	
5151.6[b] 4	49/2$^-$	
5237.8[d] 10	47/2$^-$	
5429.5[&] 6	49/2$^+$	
5490.4?[a] 10	47/2$^+$	
5598.8[c] 9	49/2$^-$	
5623.8[e] 6	51/2$^-$	
5921.0[f] 6	53/2$^+$	
5927.5[b] 5	53/2$^-$	
6249.9[&] 7	53/2$^+$	
6457.9[e] 7	55/2$^-$	
6765.7[b] 6	57/2$^-$	
6835.9[f] 7	57/2$^+$	
7103.9[&] 12	(57/2$^+$)	
7354.6[e] 8	59/2$^-$	
7667.5[b] 6	61/2$^-$	
7806.2[f] 7	61/2$^+$	

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^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13 (continued)

^{167}Hf Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
8013.9[&] *16*	(61/2$^+$)	8810.3[f] *9*	65/2$^+$	10687.5[b] *11*	73/2$^-$
8314.3[e] *9*	63/2$^-$	9644.3[b] *10*	69/2$^-$	10876.6?[f] *15*	(73/2$^+$)
8630.5[b] *8*	65/2$^-$	9837.6[f] *10*	69/2$^+$	11939.6?[f] *18*	(77/2$^+$)

† From a least-squares fit to Eγ data, using uncertainties for γ-ray energies assigned by the evaluators, based on other studies using 8π array at Chalk River, such as data for ^{157}Ho in 1992Ra17. Uncertainty of 1 keV was assumed when not stated. Reduced χ^2=0.98.

‡ Authors′ values, based on measured DCO ratios and deduced band structure, also supported by total routhian plus cranked shell-model calculations (1999Cr01). Assignments for all the excited states are placed in parentheses by evaluators, as strong arguments for low-lying levels are lacking.

Band(A): ν5/2[523],α=+1/2. Band from 1999Sm13 and 1999Cr01.

@ Band(a): 5/2[523],α=−1/2. Band from 1999Sm13 and 1999Cr01. See comment for ν5/2[523]⊗ν5/2[642]^2,α=−1/2 band concerning J=23/2, 27/2 states.

& Band(B): ν5/2[642],α=+1/2. Band from 1999Cr01 and 1999Sm13. Probably undergoes ν7/2[633]^2 crossing around $\hbar\omega$=0.4 MeV, becoming a three-quasineutron structure at the highest spins.

[a] Band(b): ν5/2[642],α=−1/2. Band from 1999Cr01 and 1999Sm13. Evolves into a 3-quasineutron structure at the highest spins following (ν5/2[642]⊗ν7/2[633]) crossing at $\hbar\omega\approx$0.38 MeV.

[b] Band(C): ν5/2[523]⊗ν 5/2[642]^2,α=+1/2. Band from 1999Cr01 and 1999Sm13.

[c] Band(D): ν3/2[521]⊗ν 5/2[642]^2,α=+1/2. Band from 1999Cr01. 3/2[521] band not observed at frequencies below the first neutron alignment.

[d] Band(d): ν3/2[521]⊗ν5/2[642]^2,α=−1/2. Band from 1999Cr01. 3/2[521] band not observed at frequencies below the first neutron alignment.

[e] Band(E): ν5/2[523]⊗ν5/2[642]^2,α=−1/2. Band from 1999Sm13 and 1999Cr01, with the difference that 1999Cr01 assigned the J=23/2 and 27/2 states to the ν5/2[523],α=−1/2 band, instead.

[f] Band(F): ν7/2[633]⊗ν5/2[642]^2,α=+1/2. Band from 1999Cr01 and 1999Sm13. Yrast structure for J≥41/2. Probably becomes a five quasiparticle structure at highest spins after alignment of ($h^2_{11/2}$) or ($\pi h_{11/2}\otimes\pi h_{9/2}$) proton pair.

γ(^{167}Hf)

The DCO values, for gates on stretched quadrupole transitions are from 1999Cr01, where expected DCO ratios are 1.0 for ΔJ=2, quadrupole and ΔJ=0, dipole transitions, and 0.65 for ΔJ=1, dipole transitions. Only a few DCO values are from 1999Sm13.

E$_\gamma$†	I$_\gamma$@	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.&	Comments
92.3 *5*	0.9 *1*	92.1	7/2$^-$	0.0	5/2$^-$		Mult.: M1(+E2) in 1999Cr01.
115.4 *5*	1.0 *1*	207.2	9/2$^-$	92.1	7/2$^-$	D	DCO=0.43 *4* Mult.: M1(+E2) in 1999Cr01.
148.3[#] *5*		355.3	11/2$^-$	207.2	9/2$^-$		Mult.: M1(+E2) in 1999Cr01.
149.6[#] *5*		504.6	13/2$^-$	355.3	11/2$^-$		Mult.: M1(+E2) in 1999Cr01.
177‡		883.7	17/2$^-$	706.5	15/2$^-$		
202‡		706.5	15/2$^-$	504.6	13/2$^-$		
203‡		1323.9	21/2$^-$	1120.8	19/2$^-$		
204.6 *1*	89.5 *27*	349.6	17/2$^+$	145.0	13/2$^+$	Q	DCO=1.11 *1* Mult.: E2 in 1999Cr01.
207.1 *3*	4.4 *2*	207.2	9/2$^-$	0.0	5/2$^-$	Q	DCO=1.09 *2* Mult.: E2 in 1999Cr01.
213.1 *3*	4.4 *2*	401.7	15/2$^+$	188.6	11/2$^+$	Q	DCO=0.94 *4* Mult.: E2 in 1999Cr01.

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^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13 (continued)

$\gamma(^{167}Hf)$ (continued)

E_γ[†]	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	Comments
237[‡]		1120.8	19/2$^-$	883.7	17/2$^-$		
256.8 *3*	3.5 *1*	401.7	15/2$^+$	145.0	13/2$^+$	D	DCO=0.43 *2* Mult.: M1(+E2) in 1999Cr01.
263.0 *5*	1.8 *3*	355.3	11/2$^-$	92.1	7/2$^-$	Q	DCO=1.07 *10* Mult.: E2 in 1999Cr01.
297.4 *1*	24.0 *8*	504.6	13/2$^-$	207.2	9/2$^-$	Q	DCO=1.05 *2* Mult.: E2 in 1999Cr01.
343.0 *1*	100.0 *30*	692.6	21/2$^+$	349.6	17/2$^+$	Q	DCO=1.02 *1* Mult.: E2 in 1999Cr01.
351.0 *3*	3.3 *1*	706.5	15/2$^-$	355.3	11/2$^-$	Q	DCO=1.02 *8* Mult.: E2 in 1999Cr01.
365.5 *1*	14.0 *4*	767.2	19/2$^+$	401.7	15/2$^+$	Q	DCO=0.96 *3* Mult.: E2 in 1999Cr01.
379.2 *1*	26.4 *8*	883.7	17/2$^-$	504.6	13/2$^-$	Q	DCO=0.98 *2* Mult.: E2 in 1999Cr01.
412.8 *3*	6.9 *2*	2244.8	29/2$^-$	1832.1	27/2$^+$	D	DCO=0.62 *6* DCO=0.64 *10* (1999Sm13) Mult.: E1 in 1999Cr01.
414.2 *3*	3.2 *1*	1120.8	19/2$^-$	706.5	15/2$^-$	Q	DCO=1.01 *10* Mult.: E2 in 1999Cr01.
417.6 *3*	4.3 *2*	767.2	19/2$^+$	349.6	17/2$^+$	D	DCO=0.52 *6* Mult.: M1(+E2) in 1999Cr01.
434.0 *3*	5.2 *2*	1995.3	27/2$^-$	1561.4	23/2$^-$	Q	DCO=1.17 *12* Mult.: E2 in 1999Cr01.
440.2 *1*	27.1 *8*	1323.9	21/2$^-$	883.7	17/2$^-$	Q	DCO=1.06 *3* Mult.: E2 in 1999Cr01.
440.5 *3*	4.6 *2*	1561.4	23/2$^-$	1120.8	19/2$^-$	Q	DCO=0.88 *13* DCO=0.96 *19* (1999Sm13) Mult.: E2 in 1999Cr01.
446.4 *3*	9.7 *3*	2441.5	31/2$^-$	1995.3	27/2$^-$	Q	DCO=1.00 *7* Mult.: E2 in 1999Cr01.
447.6 *1*	21.0 *6*	2244.8	29/2$^-$	1797.2	25/2$^-$	Q	DCO=1.00 *4* DCO=0.91 *10* (1999Sm13) Mult.: E2 in 1999Cr01.
449.9[#] *5*		3260.0	37/2$^+$	2810.3	33/2$^+$		Mult.: E2 in 1999Cr01.
450.5 *1*	26.9 *8*	2695.3	33/2$^-$	2244.8	29/2$^-$	Q	DCO=0.96 *4* Mult.: E2 in 1999Cr01.
458.8 *1*	86.4 *26*	1151.5	25/2$^+$	692.6	21/2$^+$	Q	DCO=0.97 *2* Mult.: E2 in 1999Cr01.
473.3 *1*	23.7 *7*	1797.2	25/2$^-$	1323.9	21/2$^-$	Q	DCO=1.03 *4* Mult.: E2 in 1999Cr01.
479.1 *5*	2.7 *1*	2769.9	31/2$^-$	2289.6	27/2$^-$	Q	DCO=0.95 *15* E_γ: level-energy difference=480.3. Mult.: E2 in 1999Cr01.
486.3 *1*	15.7 *5*	1253.5	23/2$^+$	767.2	19/2$^+$	Q	DCO=1.00 *4* Mult.: E2 in 1999Cr01.
495.9 *1*	15.5 *5*	2937.4	35/2$^-$	2441.5	31/2$^-$	Q	DCO=1.00 *5* Mult.: E2 in 1999Cr01.
511.5 *1*	25.6 *8*	3206.8	37/2$^-$	2695.3	33/2$^-$	Q	DCO=0.95 *3* Mult.: E2 in 1999Cr01.
518.6 *3*	3.7 *2*	3288.5	35/2$^-$	2769.9	31/2$^-$	Q	DCO=1.18 *14* Mult.: E2 in 1999Cr01.
529.9 *3*	4.3 *2*	2869.0	33/2$^-$	2339.1	29/2$^-$	Q	DCO=0.99 *9* Mult.: E2 in 1999Cr01.
541.9 *3*	4.2 *2*	2339.1	29/2$^-$	1797.2	25/2$^-$	Q	DCO=1.08 *8* Mult.: E2 in 1999Cr01.

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^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13 (continued)

$\gamma(^{167}Hf)$ (continued)

E_γ [†]	I_γ [@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	Comments
543.5 *3*	3.6 *1*	1797.2	25/2$^-$	1253.5	23/2$^+$	D	DCO=0.64 *10* E1 in 1999Cr01.
553.1 *1*	67.3 *20*	1704.6	29/2$^+$	1151.5	25/2$^+$	Q	DCO=0.98 *2* Mult.: E2 in 1999Cr01.
561.3 *5*	2.5 *1*	1253.5	23/2$^+$	692.6	21/2$^+$	D	DCO=0.50 *7* Mult.: M1(+E2) in 1999Cr01.
565.0 *1*	14.2 *5*	3502.4	39/2$^-$	2937.4	35/2$^-$	Q	DCO=0.98 *6* Mult.: E2 in 1999Cr01.
578.6 *1*	11.1 *4*	1832.1	27/2$^+$	1253.5	23/2$^+$	Q	DCO=0.96 *10* Mult.: E2 in 1999Cr01.
581.1 *1*	20.9 *6*	3787.9	41/2$^-$	3206.8	37/2$^-$	Q	DCO=1.01 *6* Mult.: E2 in 1999Cr01.
583.8 *3*	3.6 *2*	3452.8	37/2$^-$	2869.0	33/2$^-$	Q	DCO=1.08 *5* Mult.: E2 in 1999Cr01.
586.8 *5*	2.8 *1*	3875.3	39/2$^-$	3288.5	35/2$^-$	(Q)[a]	DCO=0.87 *8* Mult.: E2 in 1999Cr01.
605.4 *3*	4.9 *2*	2937.4	35/2$^-$	2331.6	33/2$^+$	D	DCO=0.47 *11* Mult.: E1 in 1999Cr01.
612.1 *3*	3.0 *1*	3872.1	41/2$^+$	3260.0	37/2$^+$	(Q)[a]	DCO=0.83 *7* Mult.: E2 in 1999Cr01.
627.0 *1*	51.2 *16*	2331.6	33/2$^+$	1704.6	29/2$^+$	Q	DCO=0.94 *3* Mult.: E2 in 1999Cr01.
639.2 *1*	14.5 *29*	4141.6	43/2$^-$	3502.4	39/2$^-$	Q	DCO=1.00 *9* Mult.: E2 in 1999Cr01.
647.4 *3*	8.8 *3*	2479.5	31/2$^+$	1832.1	27/2$^+$	Q	DCO=0.93 *14* Mult.: E2 in 1999Cr01.
649.6 *1*	18.5 *6*	4437.5	45/2$^-$	3787.9	41/2$^-$	Q	DCO=0.98 *5* Mult.: E2 in 1999Cr01.
650.7 *3*	3.0 *2*	4103.5	41/2$^-$	3452.8	37/2$^-$	Q	DCO=1.01 *6* Mult.: E2 in 1999Cr01.
650.9 *3*	3.0 *1*	4526.2	43/2$^-$	3875.3	39/2$^-$	Q	DCO=1.02 *23* Mult.: E2 in 1999Cr01.
660.9 *1*	23.6 *7*	3666.0	41/2$^+$	3005.1	37/2$^+$	Q	DCO=0.93 *5* Mult.: E2 in 1999Cr01.
667.8 *1*	15.7 *5*	4333.8	45/2$^+$	3666.0	41/2$^+$	Q	DCO=1.09 *7* Mult.: E2 in 1999Cr01.
673.5 *1*	37.1 *10*	3005.1	37/2$^+$	2331.6	33/2$^+$	Q	DCO=0.95 *4* I_γ: unrealistic low uncertainty of 0.1 in 1999Cr01 appears to be a misprint. Evaluators assign uncertainty of 1.0. Mult.: E2 in 1999Cr01.
679.8 *5*	2.8 *1*	1832.1	27/2$^+$	1151.5	25/2$^+$	D	DCO=0.45 *21* Mult.: M1(+E2) in 1999Cr01.
700.4 *3*	4.5 *2*	3179.9	35/2$^+$	2479.5	31/2$^+$	Q	DCO=0.91 *12* Mult.: E2 in 1999Cr01.
709.3 *1*	12.1 *4*	4850.9	47/2$^-$	4141.6	43/2$^-$	Q	DCO=1.07 *9* Mult.: E2 in 1999Cr01.
711.6 *5*	2.7 *1*	5237.8	47/2$^-$	4526.2	43/2$^-$	Q	DCO=0.88 *9* Mult.: E2 in 1999Cr01.
714.1 *1*	14.6 *5*	5151.6	49/2$^-$	4437.5	45/2$^-$	Q	DCO=0.91 *6* Mult.: E2 in 1999Cr01.
718.5 *3*	3.6 *2*	4822.0	45/2$^-$	4103.5	41/2$^-$	Q	DCO=1.08 *10* Mult.: E2 in 1999Cr01.
727.9 *5*	1.3 *1*	2289.6	27/2$^-$	1561.4	23/2$^-$	Q	DCO=1.05 *20* Mult.: E2 in 1999Cr01.
737.0 *3*	9.1 *3*	2441.5	31/2$^-$	1704.6	29/2$^+$	D	DCO=0.60 *6*

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^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13 (continued)

$\gamma(^{167}Hf)$ (continued)

E_γ[†]	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	Comments
							DCO=0.43 *19* (1999Sm13) Mult.: E1 in 1999Cr01.
741.8 *3*	3.7 *1*	3921.7	$39/2^+$	3179.9	$35/2^+$	*a*	DCO=1.13 *28* Mult.: E2 in 1999Cr01.
748.9 *1*	12.5 *4*	5082.7	$49/2^+$	4333.8	$45/2^+$	Q	DCO=0.99 *16* Mult.: E2 in 1999Cr01.
750.6 *5*	1.4 *1*	4672.3	$43/2^+$	3921.7	$39/2^+$		Mult.: E2 in 1999Cr01.
754.7 *3*	7.8 *3*	4626.9	$45/2^+$	3872.1	$41/2^+$	Q	DCO=1.17 *15* Mult.: E2 in 1999Cr01.
772.9 *3*	8.4 *3*	5623.8	$51/2^-$	4850.9	$47/2^-$	Q	DCO=1.07 *10* Mult.: E2 in 1999Cr01.
773[‡][b]		2479.5	$31/2^+$	1704.6	$29/2^+$		E_γ: shown as tentative because γ may be doublet in 1999Sm13. Eγ is somewhat lower than expected for this placement.
775.0 *3*	4.6 *2*	2769.9	$31/2^-$	1995.3	$27/2^-$	*a*	DCO=1.00 *29* Mult.: E2 in 1999Cr01.
775.9 *1*	10.8 *3*	5927.5	$53/2^-$	5151.6	$49/2^-$	Q	DCO=0.89 *6* Mult.: E2 in 1999Cr01.
776.8 *5*	1.7 *1*	5598.8	$49/2^-$	4822.0	$45/2^-$	Q	DCO=0.99 *12* Mult.: E2 in 1999Cr01.
802.6 *3*	6.3 *2*	5429.5	$49/2^+$	4626.9	$45/2^+$	Q	DCO=0.96 *16* Mult.: E2 in 1999Cr01.
818.1[b] *5*	1.6 *1*	5490.4?	$47/2^+$	4672.3	$43/2^+$		Mult.: E2 in 1999Cr01.
820.4 *3*	4.3 *2*	6249.9	$53/2^+$	5429.5	$49/2^+$	Q	DCO=0.96 *16* Mult.: E2 in 1999Cr01.
834.1 *3*	6.2 *2*	6457.9	$55/2^-$	5623.8	$51/2^-$	Q	DCO=1.02 *7* Mult.: E2 in 1999Cr01.
838.2 *3*	7.5 *2*	6765.7	$57/2^-$	5927.5	$53/2^-$	(Q)[a]	DCO=0.84 *6* Mult.: E2 in 1999Cr01.
838.3 *3*	8.1 *3*	5921.0	$53/2^+$	5082.7	$49/2^+$	(Q)[a]	DCO=0.86 *7* E_γ: 841 in 1999Sm13. Mult.: E2 in 1999Cr01.
843.9 *1*	12.3 *4*	1995.3	$27/2^-$	1151.5	$25/2^+$	D	DCO=0.56 *5* E1 in 1999Cr01.
854[‡]		7103.9	$(57/2^+)$	6249.9	$53/2^+$		
866.9 *3*	7.0 *2*	3872.1	$41/2^+$	3005.1	$37/2^+$	Q	DCO=0.95 *11* DCO=1.0 *4* (1999Sm13) Mult.: E2 in 1999Cr01.
868.9 *3*	4.6 *2*	1561.4	$23/2^-$	692.6	$21/2^+$	D	DCO=0.59 *5* Mult.: E1 in 1999Cr01.
896.7 *3*	3.6 *1*	7354.6	$59/2^-$	6457.9	$55/2^-$	Q	DCO=0.91 *10* Mult.: E2 in 1999Cr01.
901.8 *3*	4.1 *1*	7667.5	$61/2^-$	6765.7	$57/2^-$	(Q)[a]	DCO=0.97 *20* Mult.: E2 in 1999Cr01.
910[‡]		8013.9	$(61/2^+)$	7103.9	$(57/2^+)$		
914.9 *3*	5.3 *2*	6835.9	$57/2^+$	5921.0	$53/2^+$	Q	DCO=0.97 *1* Mult.: E2 in 1999Cr01.
928.2 *3*	5.7 *2*	3260.0	$37/2^+$	2331.6	$33/2^+$	Q	DCO=1.00 *20* Mult.: E2 in 1999Cr01.
959.7 *5*	2.0 *1*	8314.3	$63/2^-$	7354.6	$59/2^-$	(Q)[a]	DCO=1.44 *30* Mult.: E2 in 1999Cr01.
961.1 *3*	3.3 *2*	4626.9	$45/2^+$	3666.0	$41/2^+$		Mult.: E2 in 1999Cr01.
963.0 *5*	2.7 *1*	8630.5	$65/2^-$	7667.5	$61/2^-$	*a*	DCO=0.85 *22* Mult.: E2 in 1999Cr01.

Continued on next page (footnotes at end of table)

^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13 (continued)

$\gamma(^{167}Hf)$ (continued)

E_γ[†]	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	Comments
970.3 *3*	3.2 *1*	7806.2	61/2$^+$	6835.9	57/2$^+$	(Q)[a]	DCO=0.84 *8* E_γ: 973 in 1999Sm13. Mult.: E2 in 1999Cr01.
1004.1 *5*	1.7 *1*	8810.3	65/2$^+$	7806.2	61/2$^+$	(Q)[a]	DCO=1.40 *30* Mult.: E2 in 1999Cr01.
1013.8 *5*	1.3 *1*	9644.3	69/2$^-$	8630.5	65/2$^-$		Mult.: E2 in 1999Cr01.
1027.3 *5*	1.3 *1*	9837.6	69/2$^+$	8810.3	65/2$^+$		Mult.: E2 in 1999Cr01.
1039[‡b]		10876.6?	(73/2$^+$)	9837.6	69/2$^+$		
1043.2 *5*	0.9 *1*	10687.5	73/2$^-$	9644.3	69/2$^-$		Mult.: E2 in 1999Cr01.
1063[‡b]		11939.6?	(77/2$^+$)	10876.6?	(73/2$^+$)		
1095		5429.5	49/2$^+$	4333.8	45/2$^+$		E_γ: from level scheme Fig. 1, absent in Table II of 1999Cr01. Observed and tentatively placed by 1999Sm13.
1105.9[# *5*]		2810.3	33/2$^+$	1704.6	29/2$^+$		E_γ: 1108 in 1999Sm13. Mult.: E2 in 1999Cr01.
1137.3 *5*	1.5 *1*	2289.6	27/2$^-$	1151.5	25/2$^+$	(D)[a]	DCO=0.68 *27* Mult.: E1 in 1999Cr01.

† From 1999Cr01, except as noted. Uncertainties are not stated by the authors. Note that 1999Cr01 report better values for Eγ derived from their (^{16}O,4nγ) and/or (^{26}Mg,5nγ) studies. 1999Sm13 report Eγ to the nearest keV only and do not give uncertainties. Based on other studies using 8π array at Chalk River such as data for ^{157}Ho in 1992Ra17, evaluators assign 0.1 keV for strong γ rays (I$\gamma\geq$10), 0.3 keV for medium intensity (Iγ=3-9.9) and 0.5 keV for weak γ rays (I$\gamma\leq$3).

‡ γ reported only by 1999Sm13.

From ^{155}Gd(^{16}O,4nγ) (1999Cr01); γ not observed in ^{146}Nd(^{26}Mg,5nγ) reaction. 1999Sm13 give an energy to nearest keV.

@ From 1999Cr01. Values are for (^{26}Mg,5nγ) at E=142 MeV. The Iγ data were not given by 1999Sm13.

& From measured DCO ratios. Expected values are 1.00 for stretched quadrupole (or ΔJ=0, dipole) and 0.65 for stretched dipole transitions. Note that the reaction (^{26}Mg,5nγ) and/or (^{16}O,4nγ) in which DCO values were measured is not specified by the authors. These may have been from either of the two reactions. 1999Cr01 assign several multipolarities based simply on ΔJ^π values, with no supporting DCO data. Evaluators have listed such assignments only in comments, and have not listed in data records here or in the Adopted dataset.

[a] The DCO value is not uniquely consistent with either stretched quadrupole or ΔJ=1 transition, thus, evaluators either assign multipolarity in parentheses or none at all.

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

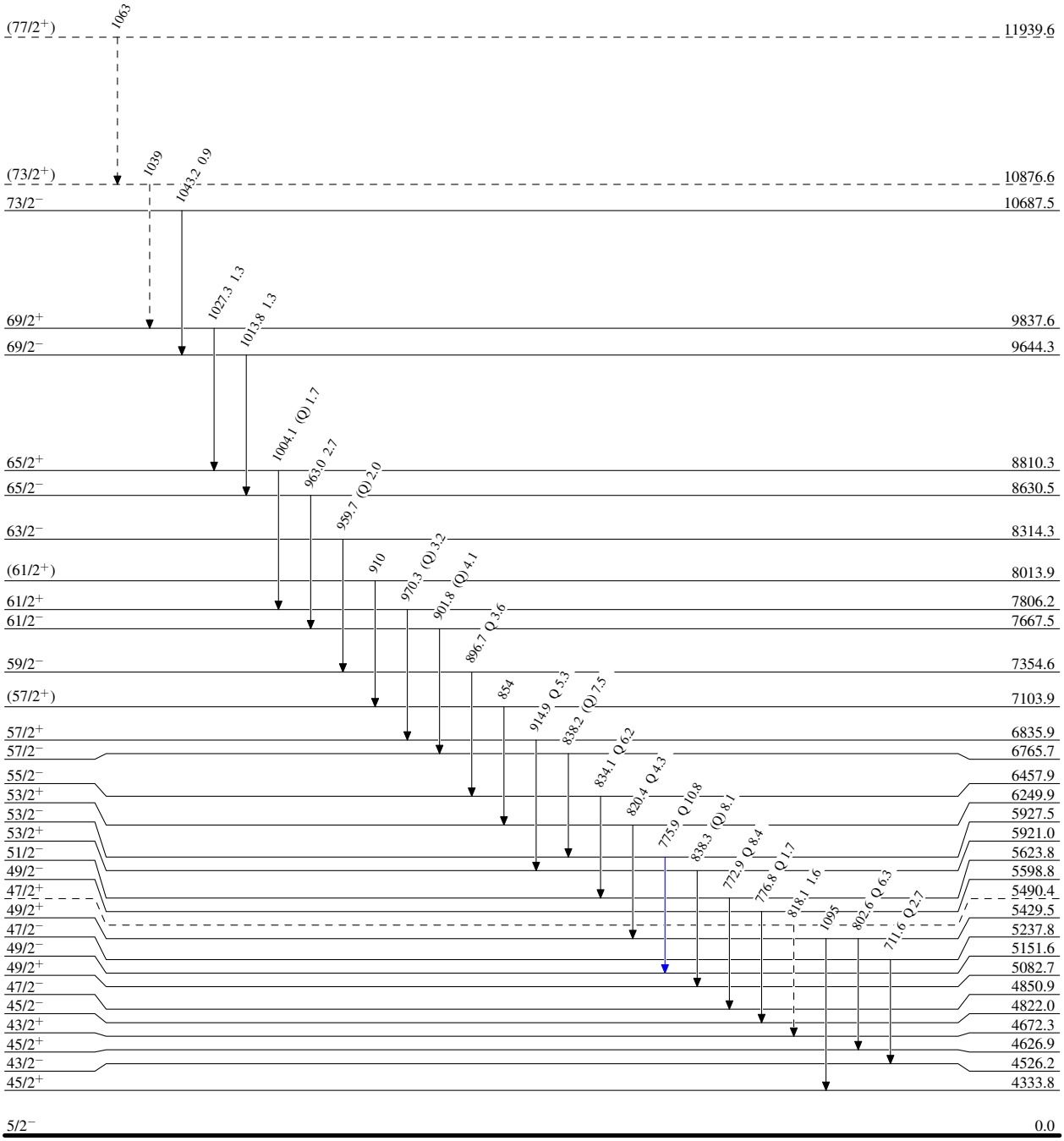
^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13

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)

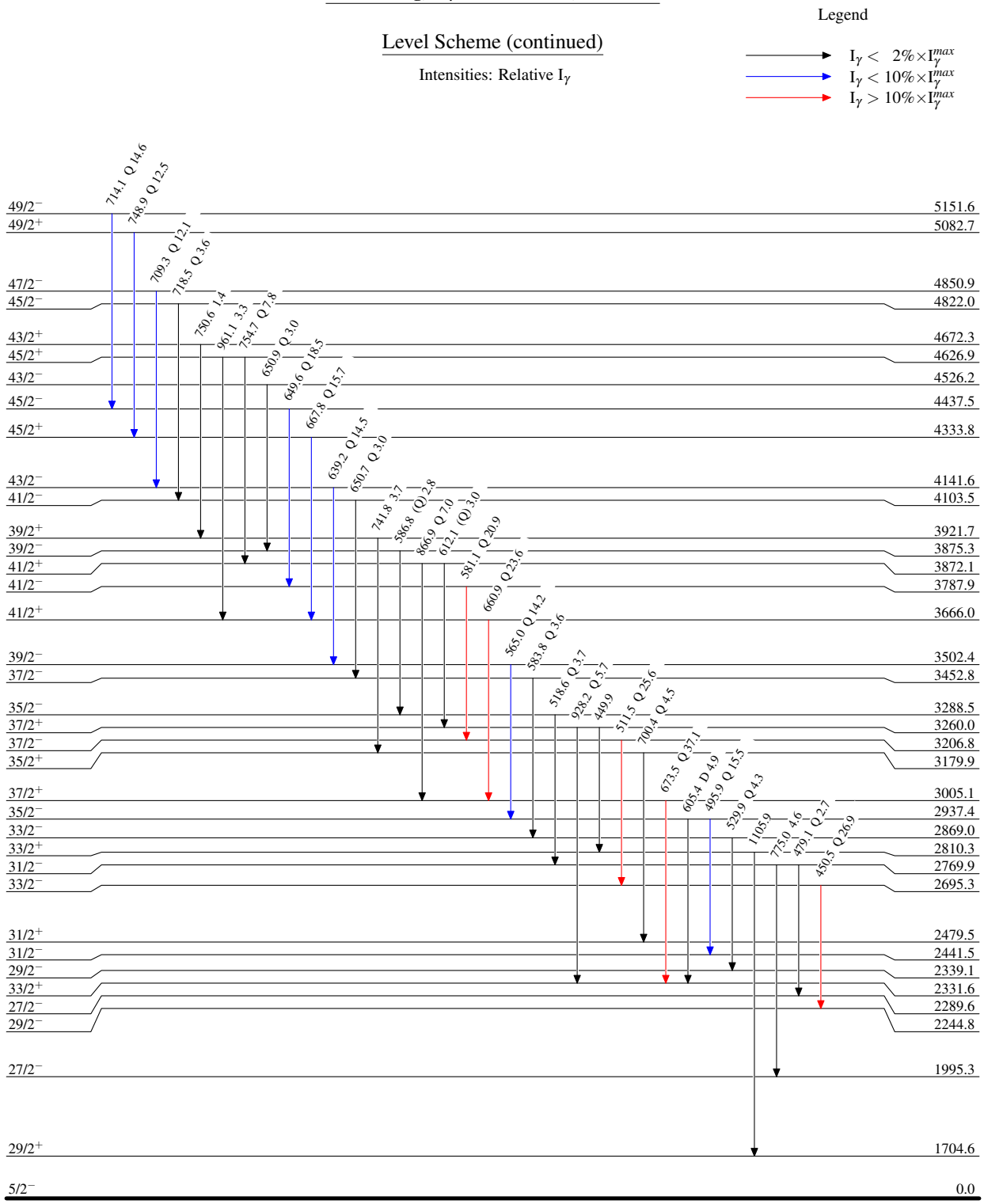


$^{167}_{72}Hf_{95}$

^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13

Level Scheme (continued)

Intensities: Relative I_γ



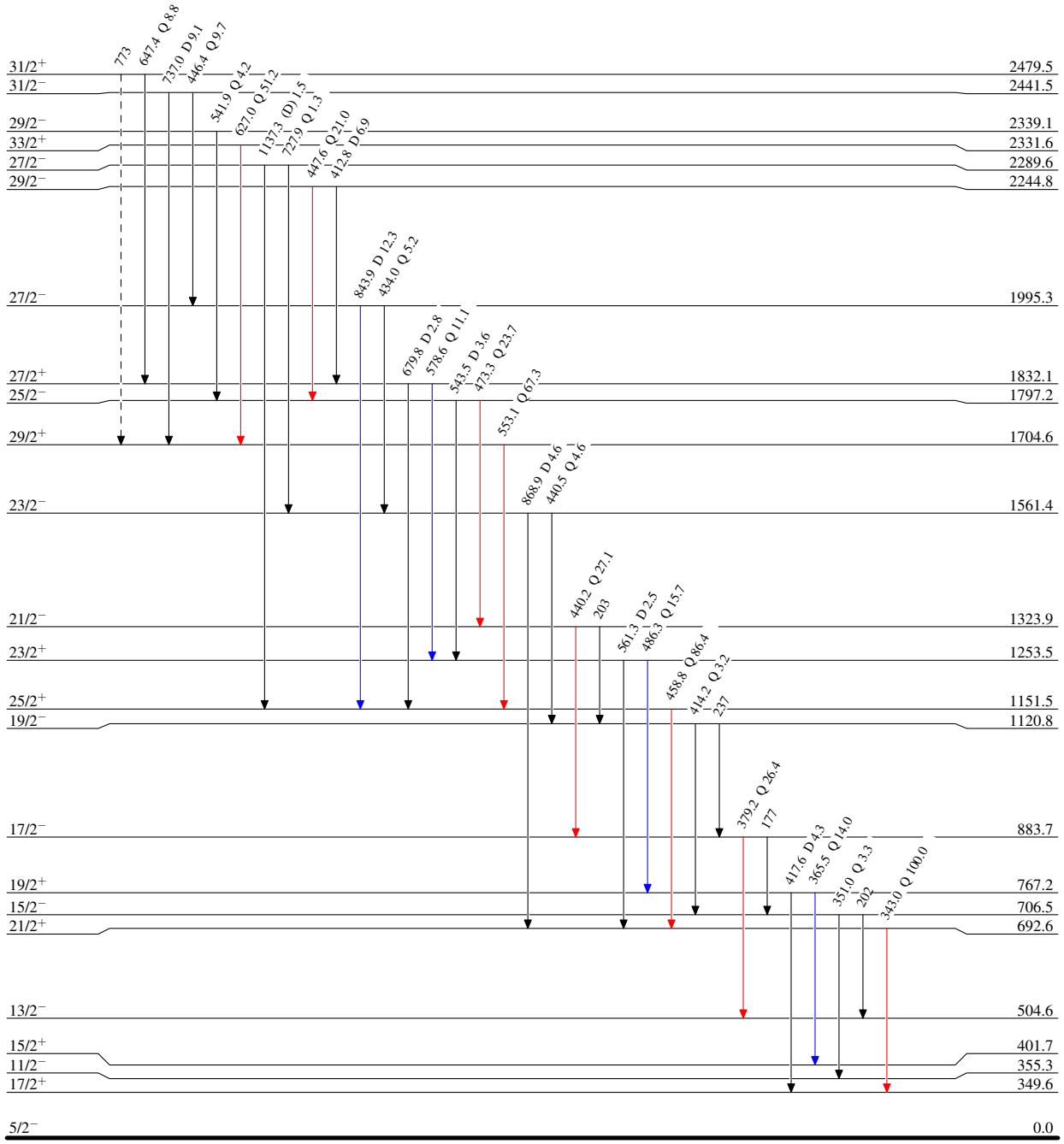
$^{167}_{72}Hf_{95}$

^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13

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)



$^{167}_{72}Hf_{95}$

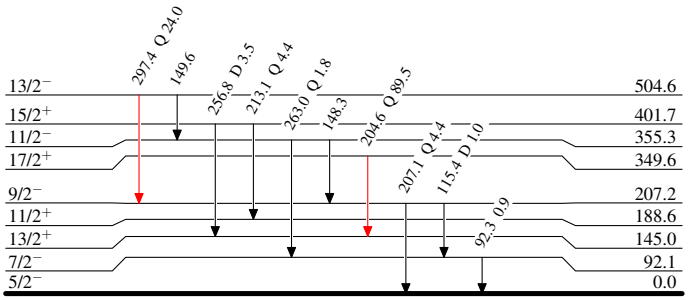
^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13

Level Scheme (continued)

Intensities: Relative I_γ

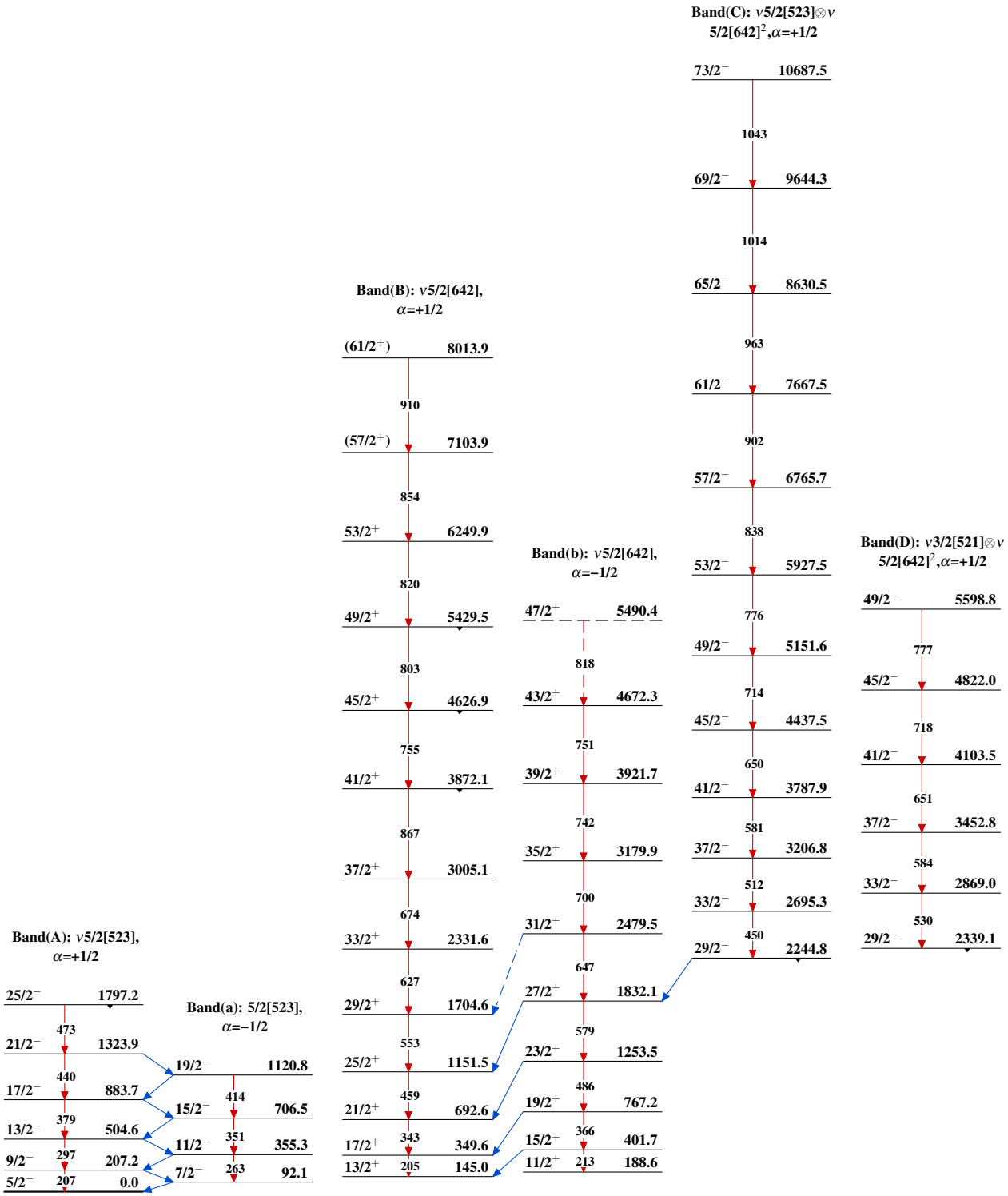
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



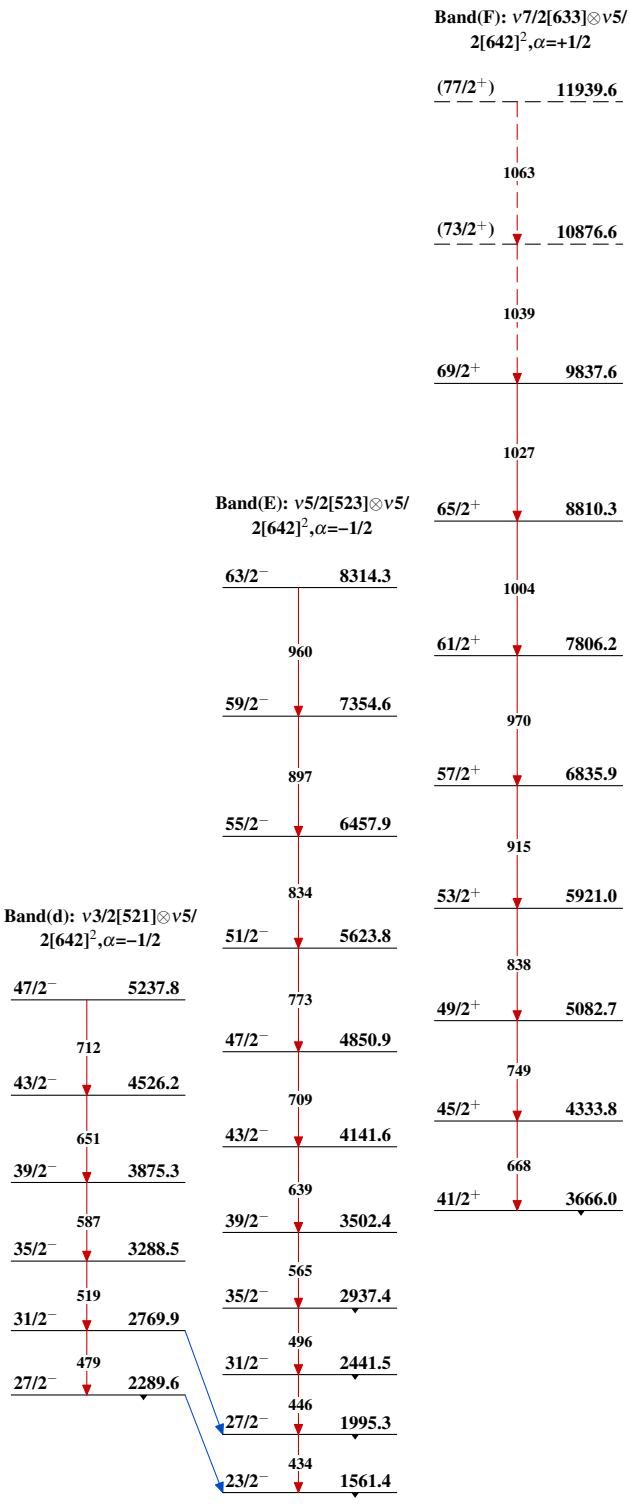
$^{167}_{72}Hf_{95}$

^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13



$^{167}_{72}Hf_{95}$

^{146}Nd(^{26}Mg,5nγ) 1999Cr01,1999Sm13 (continued)



$^{167}_{72}Hf_{95}$