^{92}Mo(^{50}Cr,3pγ) 1995Va22

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

1995Va22: E=220 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$(DCO) using TESSA3 array of 16 Compton-suppressed HPGe detectors with a 50-element BGO multiplicity filter. Deduced high-spin levels, J^π, bands, alignments. Total routhian surface calculations.

^{139}Eu Levels

E(level)	J$^\pi$†	E(level)	J$^\pi$†	E(level)	J$^\pi$†	E(level)	J$^\pi$†
0.0[&]	11/2$^-$	1811.99[d] *24*	21/2$^-$	3142.1[c] *4*	27/2$^-$	4787.1[‡] *3*	(37/2$^+$)
116.19 *8*	13/2$^-$	1890.66[#] *17*	19/2$^+$	3266.70[‡] *17*	29/2$^+$	5209.84[#] *25*	(39/2$^+$)
322.83[&] *7*	15/2$^-$	2212.61[c] *15*	23/2$^-$	3338.35[b] *25*	29/2$^-$	5211.3[@] *3*	(37/2$^-$)
426.69 *7*	13/2$^-$	2227.86[‡] *25*	21/2$^+$	3358.32[@] *18*	29/2$^-$	5701.3[‡] *4*	(41/2$^+$)
530.29[b] *8*	13/2$^-$	2344.96[#] *16*	23/2$^+$	3561.33[#] *20*	31/2$^+$	5937.1[a] *3*	(43/2$^-$)
865.41[c] *10*	15/2$^-$	2406.10[&] *16*	27/2$^-$	3809.52[a] *20*	35/2$^-$	6149.3[#] *4*	(43/2$^+$)
876.85[&] *12*	19/2$^-$	2431.44[b] *14*	25/2$^-$	3969.70[‡] *20*	33/2$^+$	6222.3[@] *5*	(41/2$^-$)
969.31[b] *9*	17/2$^-$	2611.7[d] *4*	25/2$^-$	4117.5 *4*	(33/2$^-$)	6715.4[‡] *5*	(45/2$^+$)
1039.89[d] *12*	17/2$^-$	2693.74[a] *17*	27/2$^-$	4281.92[@] *21*	(33/2$^-$)	7190.1[#] *4*	(47/2$^+$)
1438.01[c] *11*	19/2$^-$	2699.69[‡] *18*	25/2$^+$	4351.93[#] *23*	35/2$^+$	7265.3[a] *10*	(47/2$^-$)
1589.19[&] *14*	23/2$^-$	2878.03[#] *18*	27/2$^+$	4722.2 *4*	37/2$^-$		
1623.39[b] *12*	21/2$^-$	3097.12[a] *17*	31/2$^-$	4765.03[a] *22*	(39/2$^-$)		

† As proposed by 1995Va22 from DCO ratios and systematics of odd-proton, even-neutron nuclides in this mass region. See the footnotes on the individual bands for additional details. The assignments in Adopted Levels differ only in their being placed under parentheses due to lack of strong arguments even for the g.s.

‡ Band(A): ΔJ=2 band based on 21/2$^+$,α=+1/2. DCO ratios of in-band γ rays through spin 33/2 are consistent with stretched Q transitions. Average DCO ratio of 0.41 *4* for γ rays feeding the yrast band are consistent with a pure dipole character implying a band starting at 21/2.

Band(a): ΔJ=2 band based on 19/2$^+$,α=−1/2. DCO ratios of in-band γ rays through spin 33/2 are consistent with stretched Q transitions. DCO ratios of the three γ's feeding out of this band suggest either ΔJ=2 or ΔJ=0. The energy spacings and comparable Iγ values of this band and the ΔJ=2 band with J=21/2$^+$ bandhead suggests the two bands are signature partners with a relatively small signature splitting. If this is true, this band most likely feeds out with a ΔJ=0 γ and, therefore, has a bandhead J=19/2 since ΔJ=2 would imply a very large signature splitting. π=+ is most likely for these two bands since stretched ΔJ=2 γ's were not observed in the decay out of the band based on 21/2$^+$.

@ Band(B): ΔJ=2 band based on 29/2$^-$. Feeds out mainly into the yrast band through the 952γ. A weak 927γ from the first member of this band to 25/2$^-$ rules out ΔJ=2 for the 952γ and requires π=− for this band if the 952γ is ΔJ=1. From the DCO ratio for 952γ+956γ and the expected stretched E2 character of the 956γ, the 952γ is not stretched E2 in character and, most likely, is not pure dipole. This implies a mixed ΔJ=1 transition and J^π=29/2$^-$. If the 952γ were of a strongly mixed ΔJ=0 character, a bandhead J^π=27/2$^-$ would be implied, placing the band too far above the yrast band to explain its considerable intensity.

& Band(C): Yrast band based on g.s. This band was established by 1985Lu06 and 1988Bi03 up to 31/2$^-$. 1995Va22 extend the γ cascade to (47/2)$^-$, with the interpretation that the yrast band undergoes backbend at 691-keV transition. DCO ratios of in-band γ rays through the 35/2$^-$ state are consistent with stretched quadrupole transitions. A separate band is defined by 1995Va22 above the 31/2$^-$ state.

a Band(D): ΔJ=2 band based on 27/2$^-$. This band is an extension of the yrast band based on g.s.

b Band(E): ΔJ=2 band based on 13/2$^-$. DCO ratios of in-band γ rays are consistent with stretched Q transitions. DCO ratios of γ rays feeding the yrast band suggest (M1+E2) admixture, implying a band starting at J^π=13/2$^-$.

c Band(F): ΔJ=2 band based on 15/2$^-$. This band decays by several transitions into the yrast band and a ΔJ=2 band based on 13/2$^-$. The 865γ (to g.s.) DCO ratio suggests stretched Q and 335γ and 469γ to ΔJ=2 band based on 13/2$^-$ are consistent with

Continued on next page (footnotes at end of table)

^{92}Mo(^{50}Cr,3pγ) 1995Va22 (continued)

^{139}Eu Levels (continued)

ΔJ=1. This decay structure implies a band starting at $J^{\pi}=15/2^{-}$.

[d] Band(G): ΔJ=2 band based on $17/2^{-}$. This band depopulates through the 613γ whose DCO ratio is consistent with stretched Q into a $13/2^{-}$ state.

$\gamma(^{139}Eu)$

DCO ratios are for 37° and 90° geometry. For gates on stretched quadrupole transitions, expected DCO is 1.0 for stretched quadrupole and 0.4 for stretched dipole.

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[†]	Comments
103.9 *1*	0.2 *1*	426.69	$13/2^{-}$	322.83	$15/2^{-}$	(M1+E2)	1.88 *23*	DCO=0.27 *13*
116.2 *1*	0.7 *1*	116.19	$13/2^{-}$	0.0	$11/2^{-}$	(M1+E2)	1.31 *11*	DCO<1
207.5 *1*	0.6 *1*	530.29	$13/2^{-}$	322.83	$15/2^{-}$	(M1+E2)	0.214 *24*	DCO=0.43 *12*
287.6 *1*	0.8 *1*	2693.74	$27/2^{-}$	2406.10	$27/2^{-}$	D+Q		DCO=0.70 *20*
310.5 *1*	0.4 *1*	426.69	$13/2^{-}$	116.19	$13/2^{-}$	(M1+E2)	0.066 *14*	DCO=0.80 *14*
322.8 *1*	100.0 *7*	322.83	$15/2^{-}$	0.0	$11/2^{-}$	(E2)	0.0465	DCO=1.00 *1*
335.1 *1*	1.4 *1*	865.41	$15/2^{-}$	530.29	$13/2^{-}$	D+Q		DCO=0.26 *6*
403.3 *1*	1.2 *1*	3097.12	$31/2^{-}$	2693.74	$27/2^{-}$	(E2)		DCO=1.20 *20*
426.7 *1*	1.9 *2*	426.69	$13/2^{-}$	0.0	$11/2^{-}$	D+Q		DCO=0.38 *22*
439.0 *2*	0.9 *1*	865.41	$15/2^{-}$	426.69	$13/2^{-}$	D+Q		DCO=1.6 *8*
439.1 *1*	3.9 *1*	969.31	$17/2^{-}$	530.29	$13/2^{-}$	(E2)		DCO=1.30 *34*
454.3 *1*	1.6 *1*	2344.96	$23/2^{+}$	1890.66	$19/2^{+}$	(E2)		DCO=1.05 *22*
468.6 *1*	1.6 *1*	1438.01	$19/2^{-}$	969.31	$17/2^{-}$	D+Q		DCO=0.27 *7*
471.8[#] *2*	1.0[#] *1*	2699.69	$25/2^{+}$	2227.86	$21/2^{+}$			
471.8[#] *2*	0.9[#] *1*	2878.03	$27/2^{+}$	2406.10	$27/2^{-}$	D		DCO=1.41 *43* Mult.: ΔJ=0 transition. DCO value is probably for the doublet.
530.3 *1*	5.4 *7*	530.29	$13/2^{-}$	0.0	$11/2^{-}$	D+Q		DCO=0.25 *5*
533.1 *1*	8.0 *1*	2878.03	$27/2^{+}$	2344.96	$23/2^{+}$	(E2)		DCO=0.99 *10*
542.8 *2*	1.6 *1*	865.41	$15/2^{-}$	322.83	$15/2^{-}$			
554.0 *1*	69.6 *5*	876.85	$19/2^{-}$	322.83	$15/2^{-}$	(E2)		DCO=1.06 *1*
567.0 *1*	3.1 *1*	3266.70	$29/2^{+}$	2699.69	$25/2^{+}$	(E2)		DCO=0.94 *11*
572.7 *1*	3.4 *2*	1438.01	$19/2^{-}$	865.41	$15/2^{-}$	(E2)		DCO=1.07 *17*
613.2 *1*	4.3 *2*	1039.89	$17/2^{-}$	426.69	$13/2^{-}$	Q		DCO=0.80 *19*
646.3 *1*	7.8 *2*	969.31	$17/2^{-}$	322.83	$15/2^{-}$	D+Q		DCO=0.33 *2*
654.1 *1*	8.8 *2*	1623.39	$21/2^{-}$	969.31	$17/2^{-}$	Q		DCO=1.04 *7*
683.3 *1*	7.6 *2*	3561.33	$31/2^{+}$	2878.03	$27/2^{+}$	Q		DCO=0.99 *9*
691.1 *1*	15.1 *2*	3097.12	$31/2^{-}$	2406.10	$27/2^{-}$	Q		DCO=0.97 *6*
703.0 *1*	7.7 *2*	3969.70	$33/2^{+}$	3266.70	$29/2^{+}$	Q		DCO=0.93 *8*
712.3 *1*	60.0 *5*	1589.19	$23/2^{-}$	876.85	$19/2^{-}$	Q		DCO=0.95 *1* DCO for 712.3+712.4.
712.4 *1*	9.3 *3*	3809.52	$35/2^{-}$	3097.12	$31/2^{-}$	Q		DCO=0.95 *1* DCO for 712.4+712.3.
746.9 *3*	1.7 *2*	1623.39	$21/2^{-}$	876.85	$19/2^{-}$	D+Q		DCO=0.38 *8*
755.8 *1*	8.9 *1*	2344.96	$23/2^{+}$	1589.19	$23/2^{-}$	D		DCO=0.98 *8* Mult.: ΔJ=0 transition.
772.1 *2*	3.3 *2*	1811.99	$21/2^{-}$	1039.89	$17/2^{-}$	Q		DCO=1.16 *33*
774.6 *1*	5.6 *3*	2212.61	$23/2^{-}$	1438.01	$19/2^{-}$	Q		DCO=0.85 *15*
779.1 *3*	1.6 *2*	4117.5	$(33/2^{-})$	3338.35	$29/2^{-}$			
790.6 *1*	5.7 *2*	4351.93	$35/2^{+}$	3561.33	$31/2^{+}$	Q		DCO=1.05 *15*
799.7 *3*	1.9 *2*	2611.7	$25/2^{-}$	1811.99	$21/2^{-}$	(Q)		DCO=0.71 *19*
808.1 *1*	7.9 *2*	2431.44	$25/2^{-}$	1623.39	$21/2^{-}$	Q		DCO=0.90 *11*
816.9 *1*	38.9 *4*	2406.10	$27/2^{-}$	1589.19	$23/2^{-}$	Q		DCO=0.88 *2*
817.4 *2*	3.2 *3*	4787.1	$(37/2^{+})$	3969.70	$33/2^{+}$			

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^{92}Mo(^{50}Cr,3pγ) 1995Va22 (continued)

γ(^{139}Eu) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	Comments
842.1 *2*	3.0 *2*	2431.44	25/2$^-$	1589.19	23/2$^-$		
857.9 *1*	4.2 *2*	5209.84	(39/2$^+$)	4351.93	35/2$^+$		
860.6 *1*	3.2 *2*	3266.70	29/2$^+$	2406.10	27/2$^-$	D	DCO=0.40 *5*
865 *1*	0.8 *2*	865.41	15/2$^-$	0.0	11/2$^-$	Q	DCO=1.06 *24*
906.9 *2*	5.1 *2*	3338.35	29/2$^-$	2431.44	25/2$^-$	Q	DCO=0.85 *19*
912.7 *3*	1.8 *2*	4722.2	37/2$^-$	3809.52	35/2$^-$	D+Q	DCO=0.23 *6*
914.2 *2*	2.8 *2*	5701.3	(41/2$^+$)	4787.1	(37/2$^+$)		
923.6 *1*	7.0 *2*	4281.92	(33/2$^-$)	3358.32	29/2$^-$		
927.1 *4*	1.9 *2*	3358.32	29/2$^-$	2431.44	25/2$^-$		
929.4 *2*	3.5 *2*	5211.3	(37/2$^-$)	4281.92	(33/2$^-$)		
929.5 *3*	2.3 *2*	3142.1	27/2$^-$	2212.61	23/2$^-$	Q	DCO=1.24 *44*
939.5 *2*	2.9 *1*	6149.3	(43/2$^+$)	5209.84	(39/2$^+$)		
952.2 *1*	14.2 *3*	3358.32	29/2$^-$	2406.10	27/2$^-$	D+Q	DCO=0.70 *5* DCO for 952.2+955.5.
955.5 *1*	5.5 *2*	4765.03	(39/2$^-$)	3809.52	35/2$^-$	(Q)	DCO=0.70 *5* DCO for 955.5+952.2 doublet.
1011.0 *3*	2.1 *2*	6222.3	(41/2$^-$)	5211.3	(37/2$^-$)		
1013.8 *2*	3.9 *3*	1890.66	19/2$^+$	876.85	19/2$^-$	(D)	DCO=0.73 *10*
1014.1 *3*	2.3 *2*	6715.4	(45/2$^+$)	5701.3	(41/2$^+$)		
1040.8 *2*	2.1 *1*	7190.1	(47/2$^+$)	6149.3	(43/2$^+$)		
1104.4 *2*	6.1 *3*	2693.74	27/2$^-$	1589.19	23/2$^-$	Q	DCO=1.00 *15*
1110.5 *2*	5.7 *3*	2699.69	25/2$^+$	1589.19	23/2$^-$	D	DCO=0.38 *7*
1172.1 *2*	2.6 *1*	5937.1	(43/2$^-$)	4765.03	(39/2$^-$)		
1328.2 *9*	0.7 *1*	7265.3	(47/2$^-$)	5937.1	(43/2$^-$)		
1350.8 *5*	2.0 *2*	2227.86	21/2$^+$	876.85	19/2$^-$	D	DCO=0.45 *13*

† From BrIcc code. For M1+E2, value overlaps that for pure M1 and for pure E2.

‡ Assigned by the evaluators according to the expected DCO values for $\Delta J=2$ and $\Delta J=1$ transitions. Below 600 keV, RUL for E2 and M2 transitions is used to assign (E2) for stretched quadrupoles and below 300 keV, (M1+E2) for $\Delta J=1$ transitions, with the assumption that level half-lives are less than ≈10 ns. 1995Va22 assigned E2 for stretched quadrupoles, M1+E2 for $\Delta J=1$, mixed transitions, and E1 for $\Delta J=1$, dipole transitions. For γ rays where no DCO values were available, 1995Va22 assigned multipolarities as implied by their J^π values.

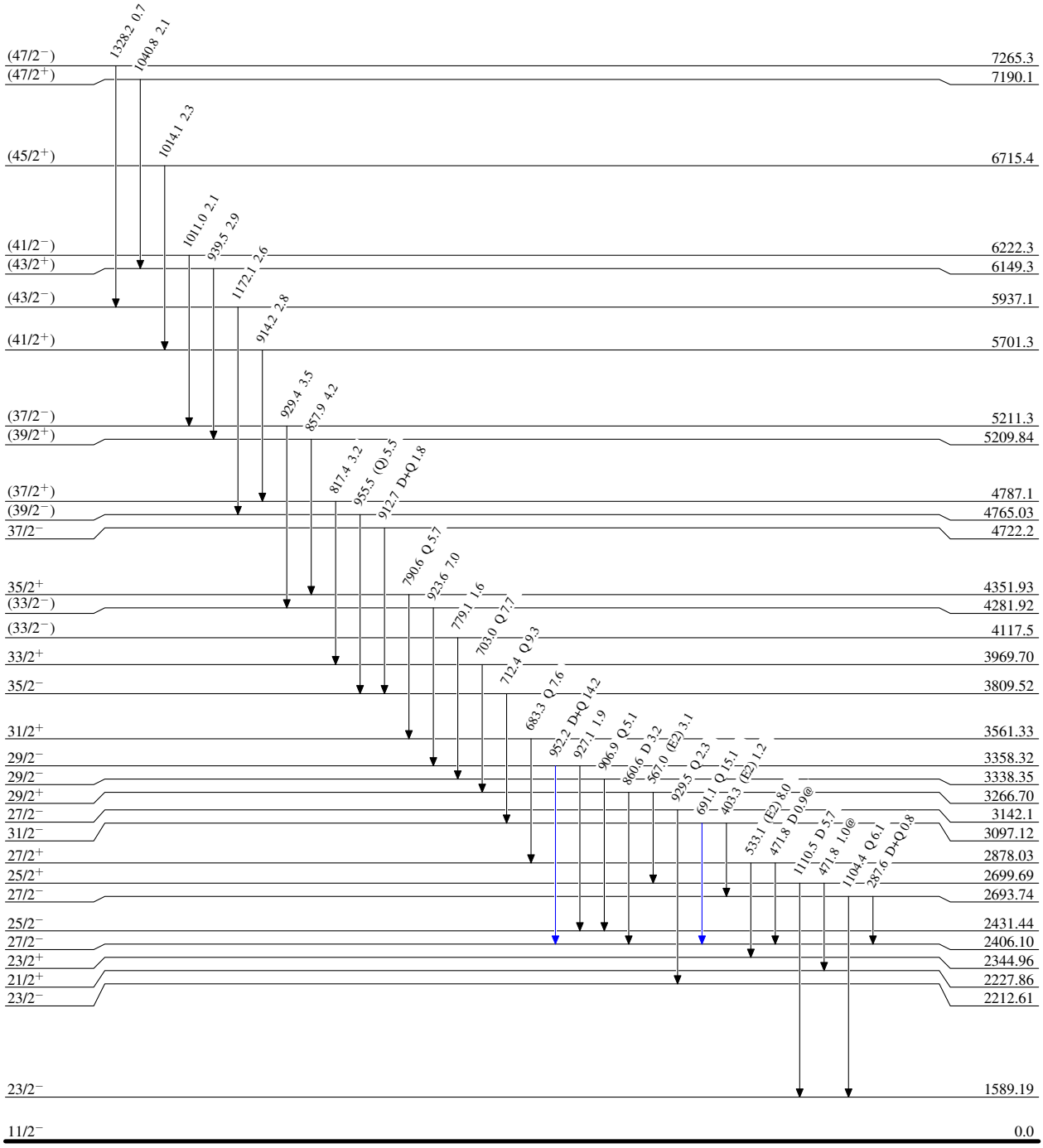
Multiply placed with intensity suitably divided.

^{92}Mo(^{50}Cr,3pγ) 1995Va22

Level Scheme

Intensities: Relative I_γ
@ Multiply placed: intensity suitably divided

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



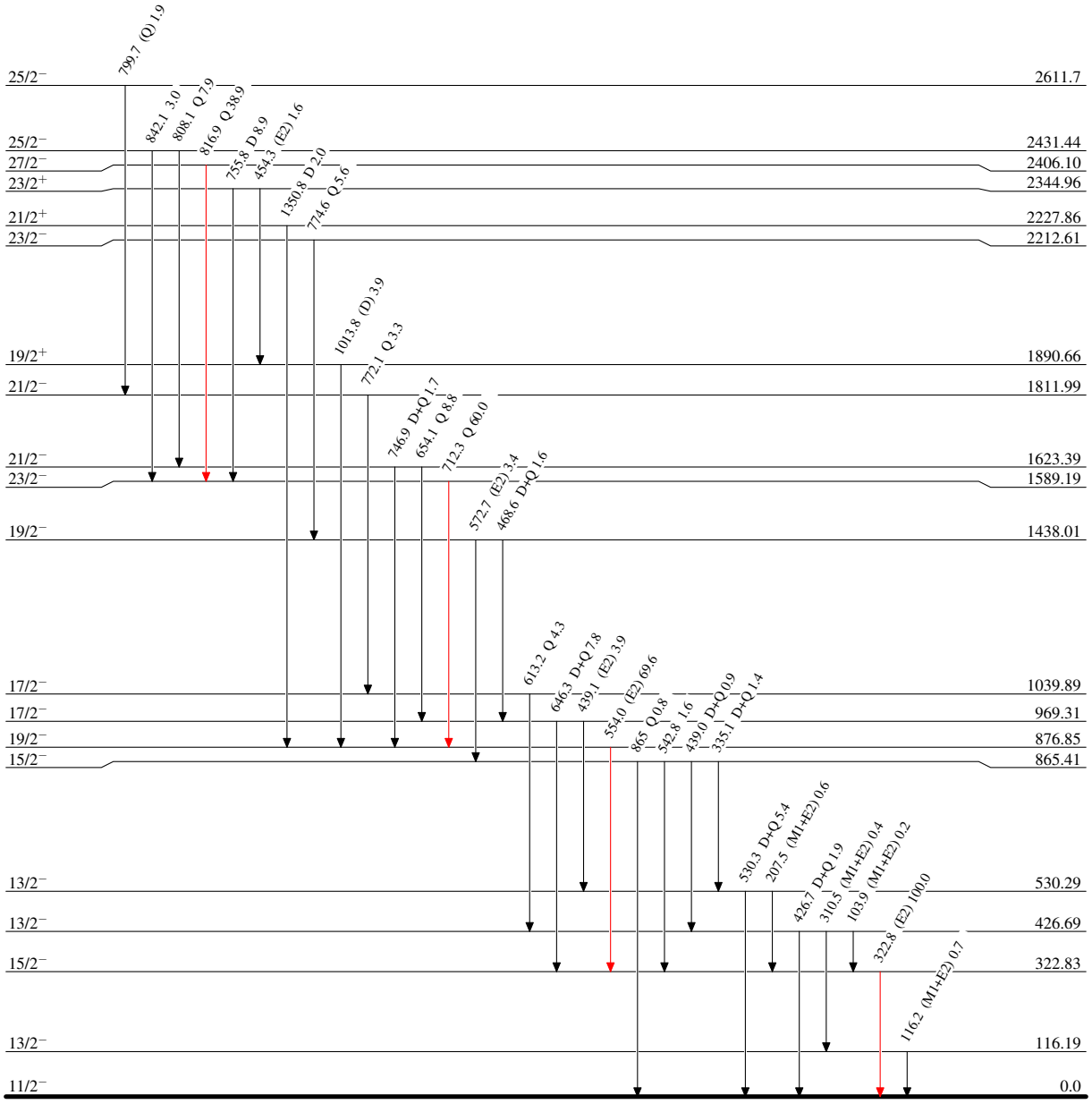
$^{139}_{63}Eu_{76}$

^{92}Mo(^{50}Cr,3pγ) 1995Va22

Level Scheme (continued)

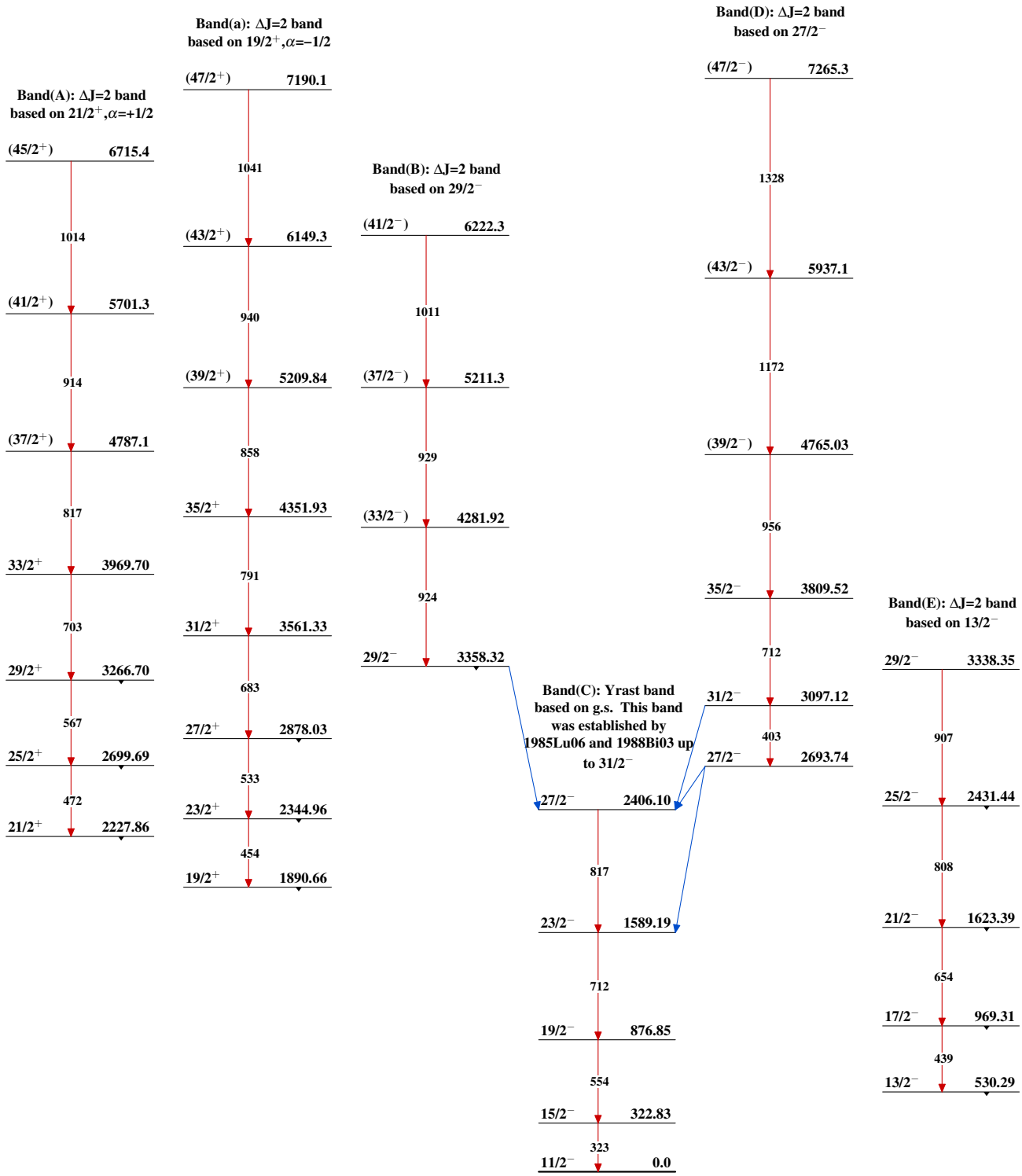
Intensities: Relative I_γ
@ Multiply placed: intensity suitably divided

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



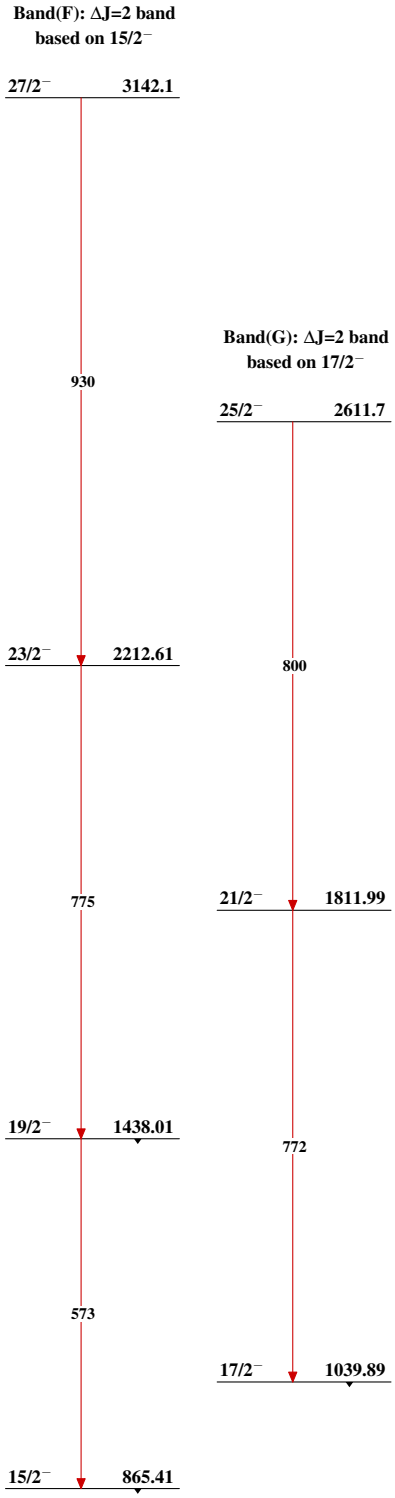
$^{139}_{63}Eu_{76}$

^{92}Mo(^{50}Cr,3pγ) 1995Va22



$^{139}_{63}Eu_{76}$

^{92}Mo(^{50}Cr,3pγ) 1995Va22 (continued)



$^{139}_{63}Eu_{76}$