^{58}Ni(^{28}Si,2$\alpha\gamma$) 1997Ru03

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Ameenah R. Farhan, Balraj Singh	NDS 110, 1917 (2009)	30-Jun-2009

Includes reactions: ^{40}Ca(^{40}Ca,2pγ); ^{58}Ni(^{24}Mg,2p2nγ); ^{70}Ge(^{12}C,4nγ).

1997Ru03: E= 130 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$(DCO) using Gammasphere array of 57 HPGe detectors and 4π charged particle ball of 95 CsI(Tl) detectors. Comparisons with self-consistent (including pairing and deformation) total Routhian surface calculations.

Others:

1994Gr01: ^{40}Ca(^{40}Ca,2pγ) E=128 MeV. Measured Eγ, Iγ, $\gamma\gamma$, recoil-γ coin using EUROGAM array of 45 Compton-suppressed Ge detectors and Daresbury recoil separator. The g.s. band (1939-1745-1692-1533-1369- 1210-1058-895-712-504-278 cascade) reported up to 22$^+$.

1989Gr07: ^{58}Ni(^{24}Mg,2p2nγ) E=110 MeV. Measured Eγ, Iγ, nγ coin, $\gamma\gamma$ coin; neutron detectors and Compton suppressed Ge detectors. The g.s. band (1693-1534-1367-1210-1057-895-712.4-503.7- 278.5 cascade) reported up to 18$^+$.

1982Li08: ^{58}Ni(^{24}Mg,2p2nγ): measured γ, $\gamma\gamma$, $\gamma(\theta)$ and level lifetimes. The g.s. band (1054-890-714-503-278 cascade) reported up to 10$^+$.

1972InZO, 1972InZU: ^{70}Ge(^{12}C,4nγ) E=69 MeV. Measured γ, $\gamma\gamma$, γ(t), $\gamma(\theta)$; $\gamma(\theta)$ data taken at 45° and 90°. Authors reported 827-758-505 γ-ray cascade, as members of g.s. band. Only the 505γ is in agreement with 503γ from 1997Ru03, 1994Gr01, 1989Gr07 and 1982Li08, the other two γ rays are not confirmed in any of the other studies.

Additional information 1.

All data are from 1997Ru03 unless otherwise stated. The γ-ray intensities are available only from this study.

^{78}Sr Levels

E(level)†	J$^\pi$‡	T$_{1/2}$#	E(level)†	J$^\pi$‡	E(level)†	J$^\pi$‡
0.0[b]	0$^+$		3230.6?[c] 18		7190[d] 2	(14$^-$)
277.60[&b] 10	2$^+$	155 ps 19	3385.0[e] 9	7$^{(-)}$	7559.1[b] 8	16$^+$
780.80[ab] 15	4$^+$	5.1 ps 5	3446.2[b] 4	10$^+$	7671.3[e] 14	(15$^-$)
1477.6?[c] 10			3525.6[f] 6	(7$^-$)	8474[d] 2	(16$^-$)
1493.19[b] 25	6$^+$		3927.3[d] 10	(8$^-$)	8987[e] 2	(17$^-$)
1903.3 8			3963.9[g] 9	(8$^-$)	9253.8[b] 9	18$^+$
2243.6?[c] 15			4251.1[e] 9	(9$^-$)	9870[d] 3	(18$^-$)
2310.5?[f] 8	(3$^-$)		4400.6[f] 12	(9$^-$)	10448[e] 2	(19$^-$)
2388.4[b] 4	8$^+$		4657.5[b] 5	12$^+$	10995[b] 1	(20$^+$)
2537.1?[d] 8	(4$^-$)		4883.3[d] 11	(10$^-$)	11195[@] 1	(20$^+$)
2606.0[g] 5	4$^{(-)}$		5281.1[e] 11	(11$^-$)	11428[d] 4	(20$^-$)
2712.0?[e] 12	(5$^-$)		5468.6[f] 16	(11$^-$)	12109?[e] 3	(21$^-$)
2860.1[f] 5	5$^{(-)}$		5982.0[d] 12	(12$^-$)	12981[b] 2	(22$^+$)
3080.1 6	(6$^-$)		6025.4[b] 7	14$^+$	13294[@] 2	(22$^+$)
3138.9[d] 8	6$^{(-)}$		6035.8[@] 9	14$^+$	15233?[b] 4	(24$^+$)
3173.1[g] 6	6$^{(-)}$		6436.3[e] 12	(13$^-$)	17764?[b] 6	(26$^+$)

† From least-squares fit to Eγ's.

‡ As proposed by 1997Ru03 based on $\gamma\gamma(\theta)$(DCO) data and band associations. The assignments are the same In 'Adopted Levels'.

From neutron-gated recoil-distance method (1982Li08).

@ Level connected with structure of g.s. band.

& Q transition=3.29 19 (deduced from lifetime data,1982Li08).

a Q transition=3.47 17 (deduced from lifetime data,1982Li08).

b Band(A): K^π=0$^+$, g.s. band.

c Band(B): ΔJ=2 band (?).

Continued on next page (footnotes at end of table)

^{58}Ni(^{28}Si,2$\alpha\gamma$) 1997Ru03 (continued)

^{78}Sr Levels (continued)

[d] Band(C): Band based on (4$^-$).
[e] Band(D): Band based on (5$^-$).
[f] Band(E): Band based on (3$^-$).
[g] Band(e): Band based on (4$^-$).

γ(^{78}Sr)

DCO ratios are for angles of 32° and 86° with gates on ΔJ=2 quadrupole transitions. Expected DCO=1.0 for ΔJ=2, quadrupole and 0.5-0.6 for ΔJ=1, dipole transitions.

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[#]	Comments
219.8 *3*	2 *1*	3080.1	(6$^-$)	2860.1	5$^{(-)}$			
254.0 *2*	7 *1*	2860.1	5$^{(-)}$	2606.0	4$^{(-)}$	D		DCO= 0.53 *14*.
277.6 *1*	100 *4*	277.60	2$^+$	0.0	0$^+$	E2	0.0252	α(K)=0.0220 *3*; α(L)=0.00266 *4*; α(M)=0.000447 *7*; α(N+..)=5.76×10^{-5} *9* α(N)=5.45×10^{-5} *8*; α(O)=3.11×10^{-6} *5* Additional information 2. DCO= 1.03 *4*.
313.0 *4*	3 *1*	3173.1	6$^{(-)}$	2860.1	5$^{(-)}$	D		DCO= 0.48 *15*.
352 *1*	1 *1*	3525.6	(7$^-$)	3173.1	6$^{(-)}$			
438 *1*	1 *1*	3963.9	(8$^-$)	3525.6	(7$^-$)			
445.4 *4*	2 *1*	3525.6	(7$^-$)	3080.1	(6$^-$)			
475 *1*	2 *1*	3080.1	(6$^-$)	2606.0	4$^{(-)}$			
503.2 *1*	100 *3*	780.80	4$^+$	277.60	2$^+$	E2	0.00360	α(K)=0.00317 *5*; α(L)=0.000360 *5*; α(M)=6.05×10^{-5} *9*; α(N+..)=7.96×10^{-6} *12* α(N)=7.50×10^{-6} *11*; α(O)=4.62×10^{-7} *7* Additional information 3. DCO= 0.98 *5*.
550 *1*	2 *1*	2860.1	5$^{(-)}$	2310.5?	(3$^-$)			
567 *1*	2 *1*	3173.1	6$^{(-)}$	2606.0	4$^{(-)}$			
601.7 *5*	4 *1*	3138.9	6$^{(-)}$	2537.1?	(4$^-$)			
665.6 *3*	6 *1*	3525.6	(7$^-$)	2860.1	5$^{(-)}$			
673 *1*	3 *1*	3385.0	7$^{(-)}$	2712.0?	(5$^-$)	Q		DCO= 1.03 *25*.
703 *1*	2 *1*	2606.0	4$^{(-)}$	1903.3				
712.4 *2*	84 *3*	1493.19	6$^+$	780.80	4$^+$	Q		DCO= 1.09 *7*.
766[@] *1*	2 *1*	2243.6?		1477.6?				
788.4 *5*	8 *1*	3927.3	(8$^-$)	3138.9	6$^{(-)}$	Q		DCO= 1.2 *3*.
791 *1*	2 *1*	3963.9	(8$^-$)	3173.1	6$^{(-)}$			
866.1 *3*	8 *1*	4251.1	(9$^-$)	3385.0	7$^{(-)}$			
875 *1*	8 *1*	4400.6	(9$^-$)	3525.6	(7$^-$)			
895.2 *2*	68 *2*	2388.4	8$^+$	1493.19	6$^+$	Q		DCO= 1.07 *8*.
956.0 *5*	8 *1*	4883.3	(10$^-$)	3927.3	(8$^-$)			
987[@] *1*	2 *1*	3230.6?		2243.6?				
1030.0 *5*	10 *1*	5281.1	(11$^-$)	4251.1	(9$^-$)			
1057.8 *2*	52 *2*	3446.2	10$^+$	2388.4	8$^+$	Q		DCO= 0.96 *7*.
1068 *1*	6 *1*	5468.6	(11$^-$)	4400.6	(9$^-$)			
1098.7 *6*	7 *1*	5982.0	(12$^-$)	4883.3	(10$^-$)			
1155.2 *6*	9 *1*	6436.3	(13$^-$)	5281.1	(11$^-$)			
1200[@] *1*	3 *1*	1477.6?		277.60	2$^+$			
1208[†] *1*	6 *1*	7190	(14$^-$)	5982.0	(12$^-$)			
1211.3[†] *3*	43 *2*	4657.5	12$^+$	3446.2	10$^+$	(Q)		DCO= 1.11 *9* for a doublet.
1235.0 *7*	8 *1*	7671.3	(15$^-$)	6436.3	(13$^-$)			

Continued on next page (footnotes at end of table)

^{58}Ni(^{28}Si,2$\alpha\gamma$) 1997Ru03 (continued)

$\gamma(^{78}Sr)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	Comments
1284 *1*	5 *1*	8474	(16^-)	7190	(14^-)		
1316 *1*	7 *1*	8987	(17^-)	7671.3	(15^-)		
1367.9 *4*	31 *2*	6025.4	14^+	4657.5	12^+	Q	DCO= 1.07 *15*.
1378 *1*	11 *1*	6035.8	14^+	4657.5	12^+		
1396 *2*	4 *1*	9870	(18^-)	8474	(16^-)		
1461 *1*	5 *1*	10448	(19^-)	8987	(17^-)		
1523 *1*	8 *1*	7559.1	16^+	6035.8	14^+		
1530†@ *1*	3 *1*	2310.5?	(3^-)	780.80	4^+		E_γ: from level-energy difference.
1533.7 *4*	21 *1*	7559.1	16^+	6025.4	14^+	Q	DCO= 1.00 *13*.
1558 *3*	2 *1*	11428	(20^-)	9870	(18^-)		
1626 *1*	3 *1*	1903.3		277.60	2^+		
1646 *1*	6 *1*	3138.9	$6^{(-)}$	1493.19	6^+		DCO= 1.3 *4* consistent with ΔJ=0 transition.
1661@ *2*	3 *1*	12109?	(21^-)	10448	(19^-)		
1694.7 *5*	16 *1*	9253.8	18^+	7559.1	16^+	Q	Additional information 4. DCO= 1.00 *19*.
1741 *1*	8 *1*	10995	(20^+)	9253.8	18^+		Additional information 5.
1756 *1*	4 *1*	2537.1?	(4^-)	780.80	4^+		
1825.0 *5*	11 *1*	2606.0	$4^{(-)}$	780.80	4^+		DCO= 0.90 *24* consistent with ΔJ=0 transition.
1862 *2*	5 *1*	4251.1	(9^-)	2388.4	8^+		
1892 *1*	6 *1*	3385.0	$7^{(-)}$	1493.19	6^+	D	DCO= 0.54 *20*.
1931† *2*	3 *1*	2712.0?	(5^-)	780.80	4^+		
1941† *1*	6 *1*	11195	(20^+)	9253.8	18^+		Additional information 6.
1986 *2*	5 *1*	12981	(22^+)	10995	(20^+)		
2080 *2*	5 *1*	2860.1	$5^{(-)}$	780.80	4^+		
2099 *2*	3 *1*	13294	(22^+)	11195	(20^+)		
2252@ *3*	3 *1*	15233?	(24^+)	12981	(22^+)		
2531@ *4*	2 *1*	17764?	(26^+)	15233?	(24^+)		

† Unresolved doublet structure (1997Ru03).
‡ From DCO ratios, also RUL used for γ's from 277.6 and 780.8 levels for which lifetimes are known.
# 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.
@ Placement of transition in the level scheme is uncertain.

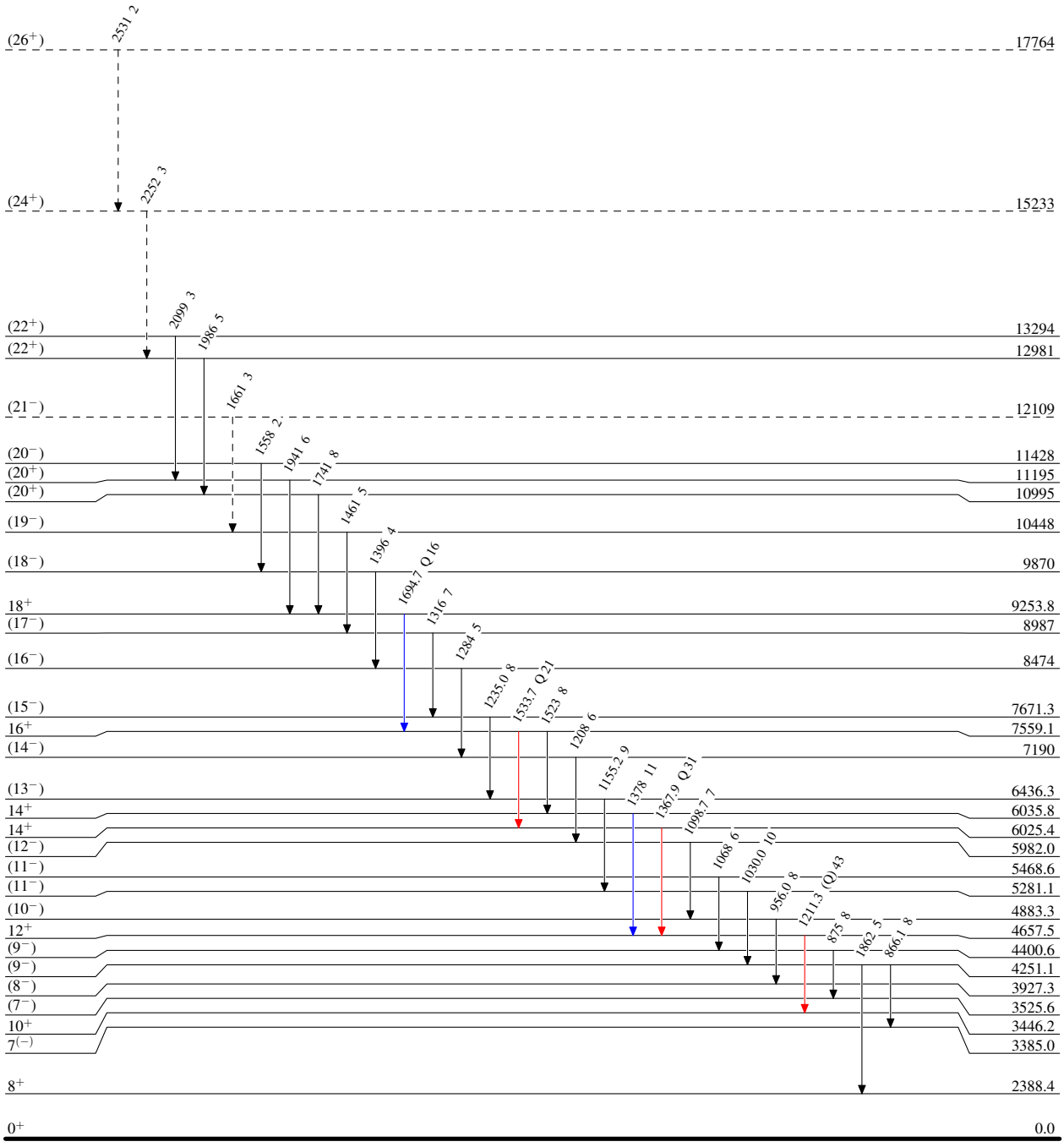
^{58}Ni(^{28}Si,2$\alpha\gamma$) 1997Ru03

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)



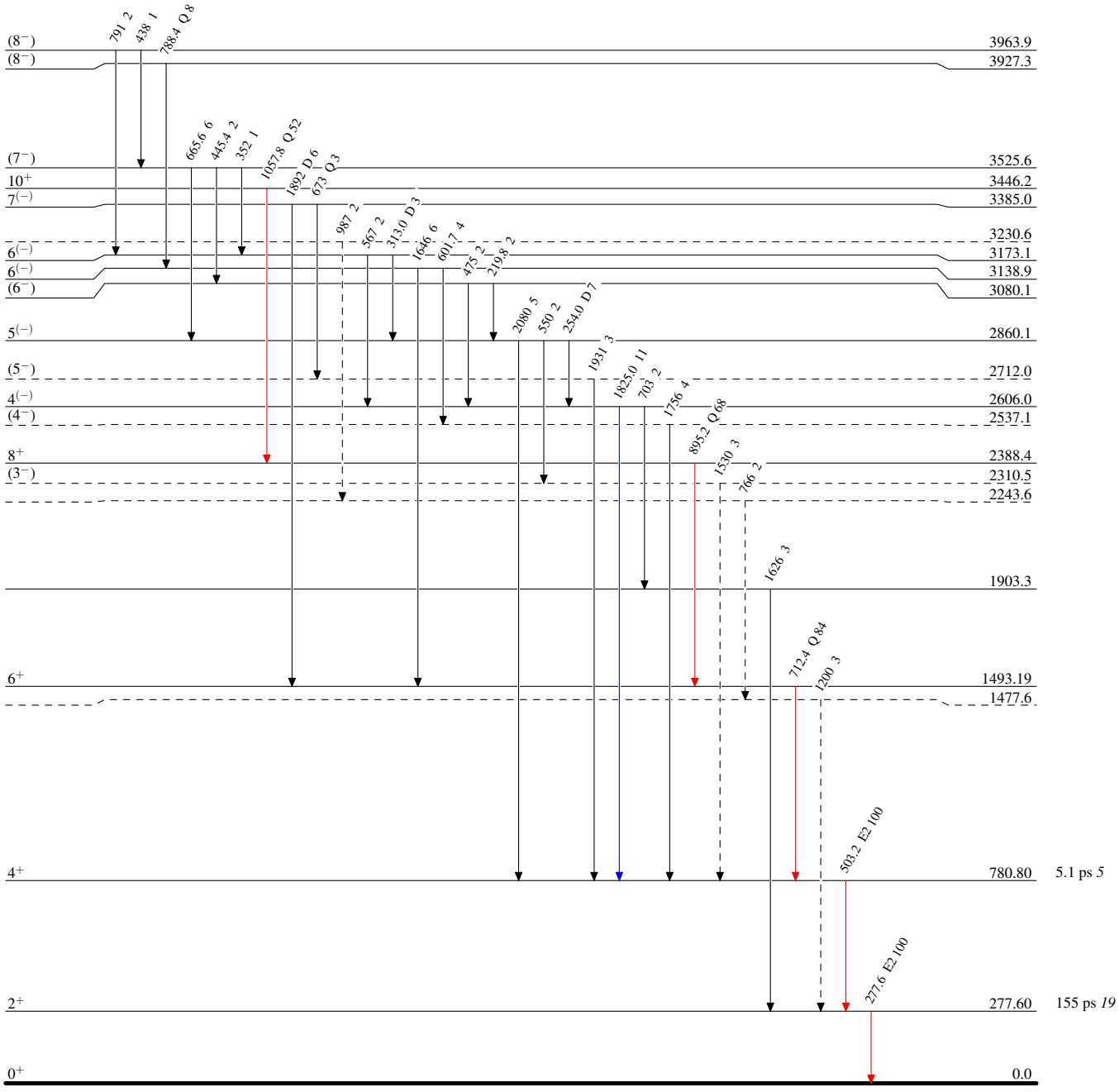
$^{78}_{38}Sr_{40}$

^{58}Ni(^{28}Si,2$\alpha\gamma$) **1997Ru03**

Level Scheme (continued)

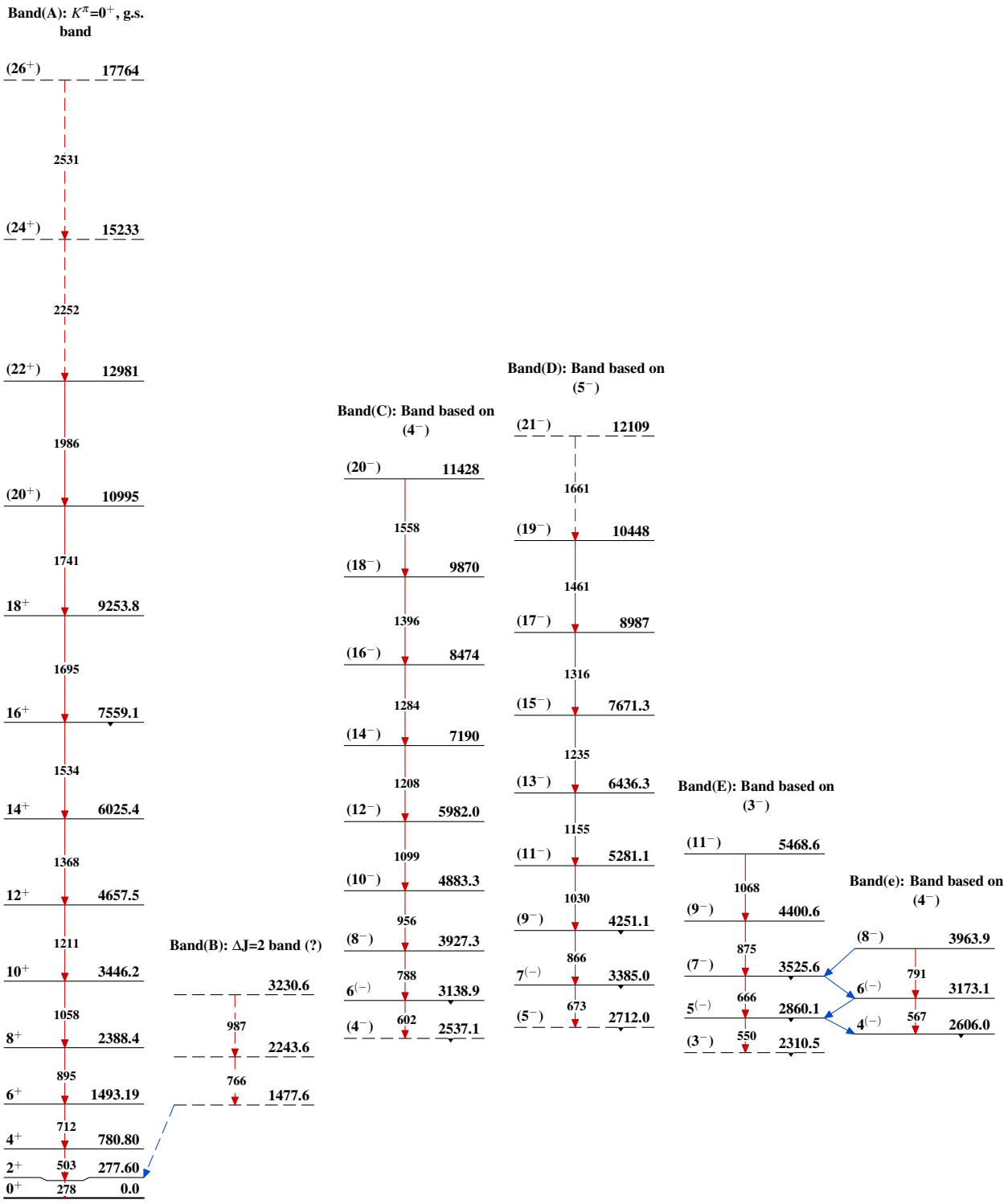
Intensities: Relative I_γ

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)



$^{78}_{38}Sr_{40}$

^{58}Ni(^{28}Si,2$\alpha\gamma$) 1997Ru03



$^{78}_{38}Sr_{40}$