^{70}Zn(^{36}S,α4nγ) 2000Ti07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen, Balraj Singh	NDS 164, 1 (2020)	15-Feb-2020

2000Ti07: E=130 MeV ^{36}S beam was produced from the Vivitron accelerator at IReS, Strasbourg. Target was made of two stacked self- supporting Zn foils (79% enriched in ^{70}Zn), 440 μg/cm^2 thick each. γ rays were detected with the EUROGAM-2 spectrometer. Measured Eγ, Iγ, $\gamma\gamma$(DCO), γ(lin pol), $\gamma\gamma$-coin, $\gamma\gamma\gamma$-coin. Deduced levels, J, π, band structures, γ-ray multipolarities. Comparisons with theoretical calculations using the Nilsson-Strutinsky cranking formalism.

The level scheme (high spin and energy region) proposed by 2000Ti07 differs significantly from that proposed by 1998Kh01 in ^{65}Cu(^{36}S,p2nγ). Only in the low-energy region, the two level schemes are in agreement. About 35 γ rays out of a total of about 65 γ rays and a large number of levels in 2000Ti07 were not reported by 1998Kh01. The ordering of some of the main cascades is also different in the two studies. The level scheme in 2000Ti07 is adopted by evaluators (see comments in Adopted Levels).

All data are from 2000Ti07.

^{98}Ru Levels

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†
0.0#	0$^+$	4003.9& *6*	10$^+$	6594.3@ *8*	15$^-$	14478.9 *10*
652.8# *3*	2$^+$	4675.8@ *6*	11$^-$	6597.0a *6*	(15$^+$)	14615.0 *10*
1398.7# *5*	4$^+$	4827.0a *6*	(11$^+$)	6872.7& *7*	16$^+$	14821 *4*
2223.9# *5*	6$^+$	4918.2& *6*	12$^+$	7626.6@ *8*	17$^-$	15000 *4*
2547.8 *5*	(6$^+$)	4991.3 *6*	(12$^+$)	8009.2 *7*	(17)	15415 *4*
3128.6# *6*	8$^+$	5222.0a *6*	(12$^+$)	8452.6@ *9*	19$^-$	15503.0 *11*
3192.4& *6*	8$^+$	5524.3@ *7*	13$^-$	9933.4@ *9*	21$^-$	17241 *4*
3286.4@ *6*	(7$^-$)	5628.8a *6*	(13$^+$)	11009.4 *10*	22$^-$	17595 *5*
3540.8 *6*	(8$^+$)	5822.4& *6*	14$^+$	11407.5@ *10*	23$^-$	19895 *5*
3581.5 *5*	(8$^+$)	6124.6a *6*	(14$^+$)	12285.1@ *10*	25$^-$	
3853.8@ *5*	9$^-$	6263.8 *7*	(14$^+$)	14288 *4*		

† From least-squares fit to γ-ray energies.
‡ From 2000Ti07, based on measured $\gamma\gamma$(DCO) and γ(lin pol).
# Band(A): g.s. band.
@ Band(B): Band based on (7$^-$).
& Band(C): Band based on 8$^+$.
a Band(D): Band based on (11$^+$).

γ(^{98}Ru)

E$_\gamma$†	I$_\gamma$†	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$
193.6# *5*	2.0 *5*	5822.4	14$^+$	5628.8	(13$^+$)
272.2# *5*	2.0 *5*	3853.8	9$^-$	3581.5	(8$^+$)
275.7 *5*	4 *1*	6872.7	16$^+$	6597.0	(15$^+$)
295.1# *10*	<1	3581.5	(8$^+$)	3286.4	(7$^-$)
302.2# *10*	<1	6124.6	(14$^+$)	5822.4	14$^+$
303.9# *10*	1.0 *5*	5222.0	(12$^+$)	4918.2	12$^+$
312.7# *5*	2.0 *5*	3853.8	9$^-$	3540.8	(8$^+$)
323.9# *10*	<1	2547.8	(6$^+$)	2223.9	6$^+$
333.2# *10*	1.0 *5*	6597.0	(15$^+$)	6263.8	(14$^+$)
395.0# *10*	1.0 *5*	5222.0	(12$^+$)	4827.0	(11$^+$)

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^{70}Zn(^{36}S,α4nγ) 2000Ti07 (continued)

$\gamma(^{98}Ru)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. @	Comments
398.1 *3*	14 *2*	11407.5	23^-	11009.4	22^-	M1	DCO=0.63 *9*; pol=−0.29 *25*
406.7 *5*	2.0 *5*	5628.8	(13^+)	5222.0	(12^+)		
412.0# *10*	1.0 *5*	3540.8	(8^+)	3128.6	8^+		
441.4# *10*	1.0 *5*	6263.8	(14^+)	5822.4	14^+		
472.4# *10*	1.0 *5*	6597.0	(15^+)	6124.6	(14^+)		
495.8# *10*	1.0 *5*	6124.6	(14^+)	5628.8	(13^+)		
567.4# *10*	1.0 *5*	3853.8	9^-	3286.4	(7^-)		
635.0# *10*	1.0 *5*	6263.8	(14^+)	5628.8	(13^+)		
637.5# *10*	1.0 *5*	5628.8	(13^+)	4991.3	(12^+)		
652.8 *1*	100 *5*	652.8	2^+	0.0	0^+	E2	DCO=0.98 *14*; pol=+0.23 *13*
661.3# *5*	2.0 *5*	3853.8	9^-	3192.4	8^+		
710.6# *10*	1.0 *5*	5628.8	(13^+)	4918.2	12^+		
725.4 *1*	50 *3*	3853.8	9^-	3128.6	8^+	E1	DCO=0.63 *9*; pol=+0.27 *15*
745.9 *1*	100 *5*	1398.7	4^+	652.8	2^+	E2	DCO=1.01 *14*; pol=+0.36 *14*
774.6# *5*	4 *1*	6597.0	(15^+)	5822.4	14^+		
x800‡ *1*	15 *2*						
811.4 *5*	9 *2*	4003.9	10^+	3192.4	8^+	E2	DCO=1.11 *16*; pol=+0.5 *4*
822.0 *1*	55 *3*	4675.8	11^-	3853.8	9^-	E2	DCO=1.15 *16*; pol=+0.5 *4* DCO and POL for 822.0+826.0.
823.1# *10*	1.0 *5*	4827.0	(11^+)	4003.9	10^+		
825.1 *1*	100 *5*	2223.9	6^+	1398.7	4^+	E2	DCO=1.08 *19*; pol=+0.29 *22*
826.0 *1*	35 *2*	8452.6	19^-	7626.6	17^-	E2	DCO=1.15 *16*; pol=+0.50 *24* DCO and POL for 822.0+826.0.
831.0# *5*	8 *2*	5822.4	14^+	4991.3	(12^+)		
848.5 *1*	52 *3*	5524.3	13^-	4675.8	11^-	E2	DCO=1.09 *15*; pol=+0.38 *25*
875.4 *3*	12 *2*	4003.9	10^+	3128.6	8^+	E2	DCO=1.04 *19*; pol=+0.29 *36*
877.6 *3*	11 *2*	12285.1	25^-	11407.5	23^-	E2	DCO=1.02 *14*; pol=+0.5 *4*
888.1 *5*	2.0 *5*	15503.0		14615.0			
904.3 *3*	11 *2*	5822.4	14^+	4918.2	12^+	E2	DCO=0.98 *14*; pol=+1.3 *7* DCO and POL for doublet 904.7+904.3.
904.7 *1*	83 *4*	3128.6	8^+	2223.9	6^+	E2	DCO=0.98 *14*; pol=+1.3 *7* DCO and POL for doublet 904.7+904.3.
914.3 *3*	15 *2*	4918.2	12^+	4003.9	10^+	E2	DCO=1.16 *16*; pol=+1.3 *8*
968.2# *10*	<1	6597.0	(15^+)	5628.8	(13^+)		
968.5 *3*	15 *2*	3192.4	8^+	2223.9	6^+	E2	DCO=1.08 *15*; pol=+0.7 *4*
987.4 *3*	11 *2*	4991.3	(12^+)	4003.9	10^+	(E2)	pol=+0.8 *7*
993.0 *10*	<1	3540.8	(8^+)	2547.8	(6^+)		
x995‡ *1*	20 *3*						
1024.0 *5*	3 *1*	15503.0		14478.9			
1032.3 *1*	47 *3*	7626.6	17^-	6594.3	15^-	E2	DCO=1.14 *16*; pol=+0.39 *22*
1033.7# *10*	<1	3581.5	(8^+)	2547.8	(6^+)		
1050.3 *5*	8 *2*	6872.7	16^+	5822.4	14^+	E2	DCO=0.94 *14*; pol=+1.4 *12*
1062.6# *10*	<1	3286.4	(7^-)	2223.9	6^+		
1070.0 *1*	49 *3*	6594.3	15^-	5524.3	13^-	E2	DCO=1.00 *14*; pol=+0.6 *4*
1076.0 *3*	15 *2*	11009.4	22^-	9933.4	21^-		
1136.5# *5*	4 *1*	8009.2	(17)	6872.7	16^+	D	DCO=0.64 *10*
1149.1# *10*	<1	2547.8	(6^+)	1398.7	4^+		
1206.4# *10*	1.0 *5*	6124.6	(14^+)	4918.2	12^+		
1218.1# *5*	2.0 *5*	5222.0	(12^+)	4003.9	10^+		
x1230‡ *1*	20 *3*						

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^{70}Zn(^{36}S,α4nγ) 2000Ti07 (continued)

γ(^{98}Ru) (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. @	Comments
x1287‡ *1*	6 *2*						
1357.6# *10*	<1	3581.5	(8$^+$)	2223.9	6$^+$		
x1404‡ *1*	6 *2*						
1474.0 *3*	15 *2*	11407.5	23$^-$	9933.4	21$^-$	E2	DCO=1.17 *25*; pol=+0.56 *31*
1480.8 *1*	30 *2*	9933.4	21$^-$	8452.6	19$^-$	E2	DCO=1.08 *23*; pol=+0.50 *25*
1738 *1*	1.0 *5*	17241		15503.0			
2003# *1*	2.0 *5*	14288		12285.1	25$^-$		
2180 *1*	1.0 *5*	17595		15415			
2193.6 *5*	5 *1*	14478.9		12285.1	25$^-$		
2330.0# *5*	4 *1*	14615.0		12285.1	25$^-$		
2536# *1*	1.0 *5*	14821		12285.1	25$^-$		
2654#& *1*	1.0 *5*	19895		17241			
2715# *1*	2.0 *5*	15000		12285.1	25$^-$		
3130# *1*	2.0 *5*	15415		12285.1	25$^-$		

† 2000Ti07 state that uncertainties are $\Delta E\gamma$=0.1 keV and $\Delta I\gamma$=5% for strong and/or well-resolved transitions rising to 1 keV and 50% for weak lines. According to that, evaluators have assigned $\Delta E\gamma$=0.1 keV and $\Delta I\gamma$=5% for $I\gamma$>25, 0.3 keV and 15% for $I\gamma$>10, 0.5 keV and 25% for $I\gamma$>1, 1.0 keV and 50% for weak lines, and $\Delta E\gamma$=1 keV when $E\gamma$ stated to nearest keV.

‡ 800-995-1230-1287-1404 cascade are seen in coin with γ rays in two bands in the level scheme, but exact placement of this cascade as proposed by 1998Kh01 in ^{65}Cu(^{36}S,p2nγ) could not be established and confirmed by 2000Ti07.

γ not reported by 1998Kh01 in ^{65}Cu(^{36}S,p2nγ).

@ From 2000Ti07, based on measured $\gamma\gamma$(DCO) and γ(lin pol).

& Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

^{70}Zn(^{36}S,α4nγ) 2000Ti07

Level Scheme

Intensities: Relative I_γ

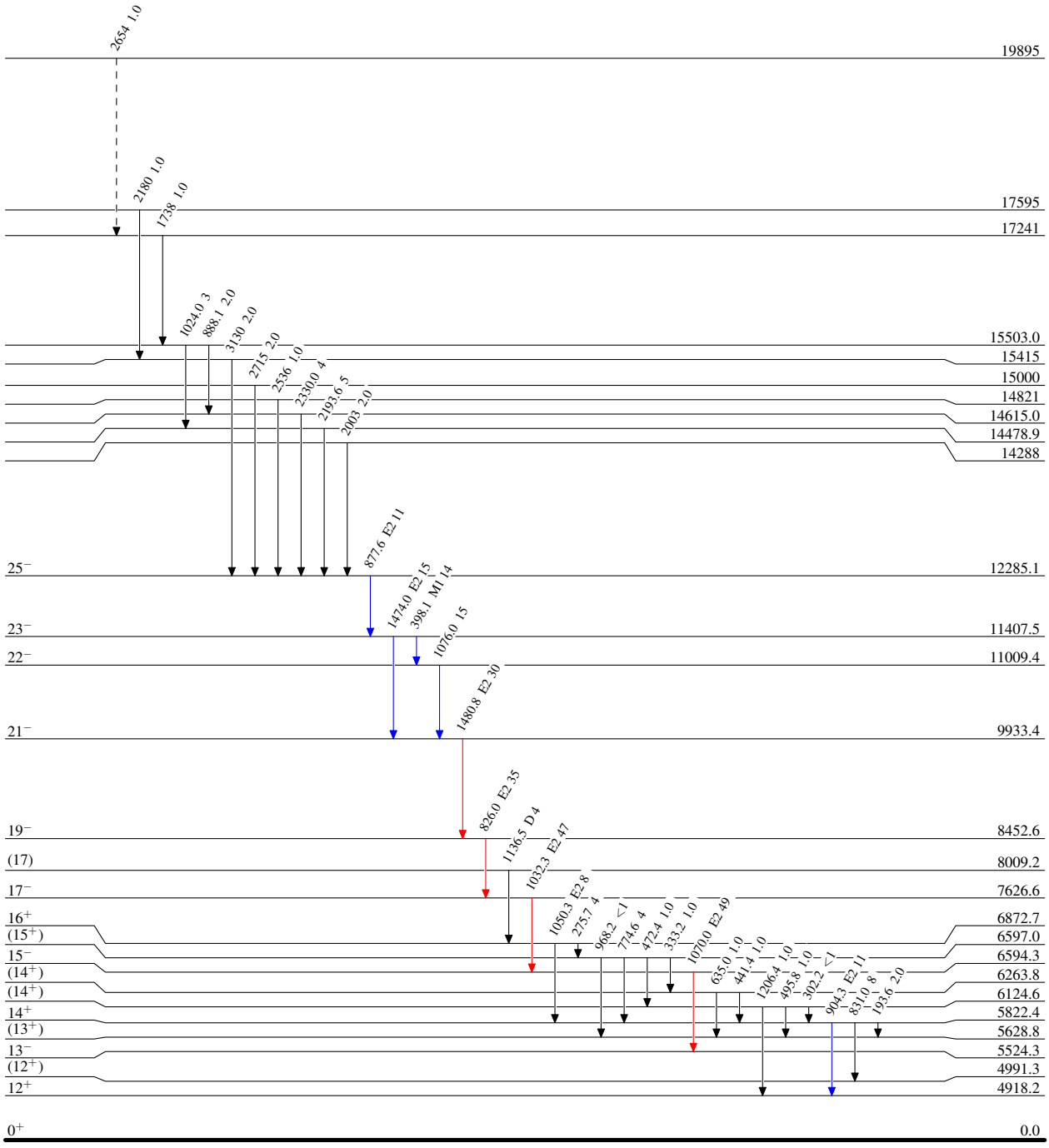
Legend

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

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

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

γ Decay (Uncertain)

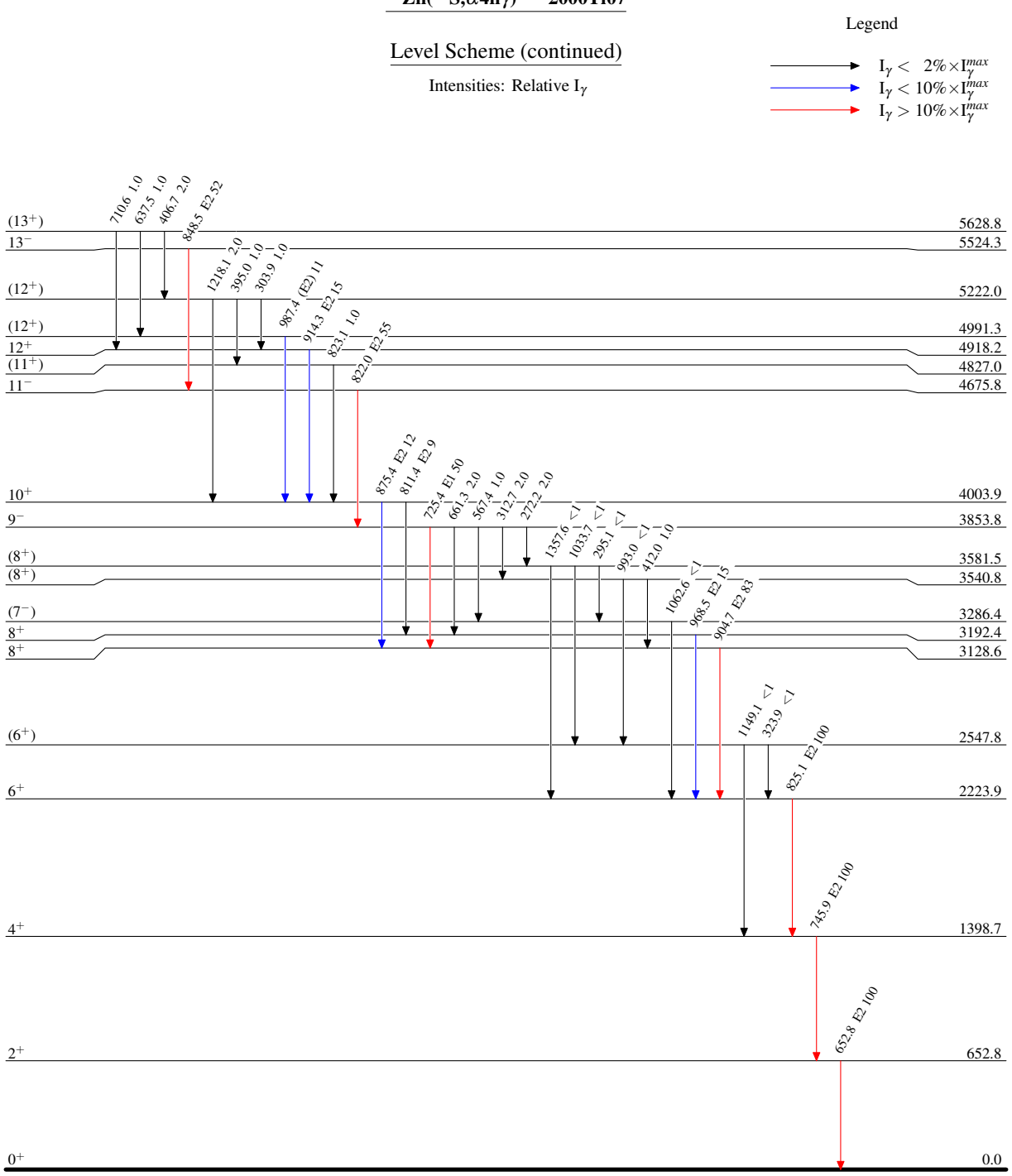


$^{98}_{44}Ru_{54}$

^{70}Zn(^{36}S,α4nγ) 2000Ti07

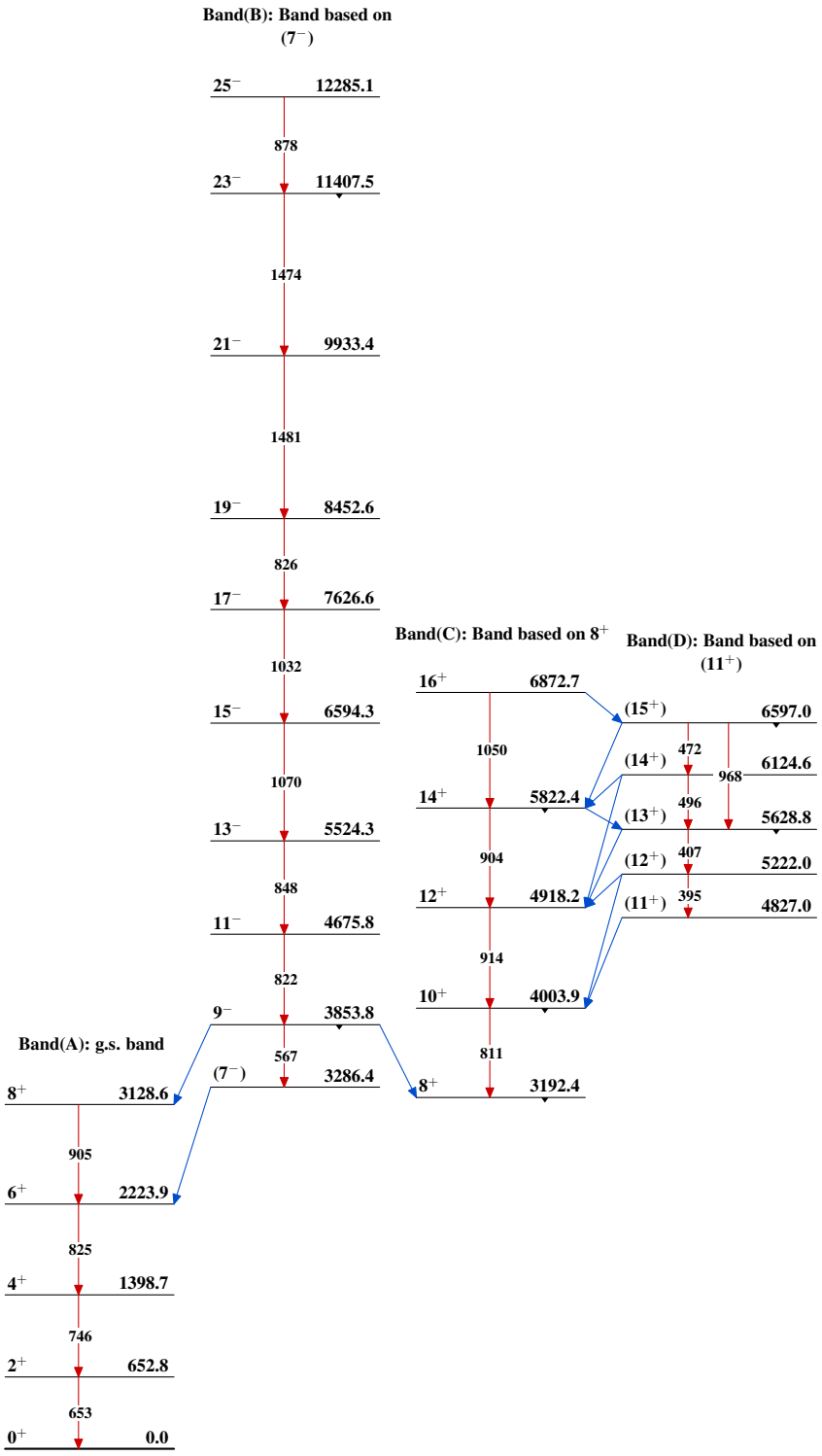
Level Scheme (continued)

Intensities: Relative I_γ



$^{98}_{44}Ru_{54}$

^{70}Zn(^{36}S,α4nγ) 2000Ti07



$^{98}_{44}Ru_{54}$