^{28}Si(^{32}S,α2pnγ) 2005Du19,1979Me03

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Huo Junde	NDS 110,2689 (2009)	31-Mar-2007

Includes ^{24}Mg(^{32}S,2pnγ) also from 2005Du19.
Includes ^{28}Si(^{28}Si,2pnγ) from 1979Me03.
2005Du19: ^{28}Si(^{32}S,α2pnγ): E=125 MeV. Measured Eγ, Iγ, $\gamma\gamma$, (charged particle)-γ coin, n-γ coin with the Gammasphere array of 78 Ge detectors, the 4π CsI-array Microball and the Neutron Shell, consisting of 30 liquid-scintillator detectors. ^{24}Mg(^{32}S,2pnγ): E=95 MeV. Measured Eγ, Iγ, $\gamma\gamma$, lifetimes with the GASP detector array of 40 HPGe detectors and 74 BGO elements, and the Cologne plunger device for recoil-distance method.
1979Me03: ^{28}Si(^{28}Si,2pnγ), E=65-90 MeV, measured: γ, $\gamma\gamma$, $\gamma(\theta)$.
2003Wi07: ^{24}Mg(^{32}S,2pnγ), E=95 MeV. Measured Eγ, Iγ, $\gamma\gamma\gamma$ using the Gammasphere array comprised of 101 Compton-suppressed HPGe detectors.
All data are from 2005Du19, except As noted.

^{53}Fe Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$[@]	Comments
0.0[d]	7/2$^-$		
741.11[b] *10*	3/2$^-$[#]	63.5 ns *14*	Additional information 1. E(level),$T_{1/2}$: From Adopted Levels.
774.42[a] *11*	1/2$^-$[#]		Additional information 2. E(level): From Adopted Levels.
1328.4[c] *4*	9/2$^-$		
1423.26[a] *14*	5/2$^-$[#]		
1696.08[b] *16*	7/2$^-$[#]		
2339.6[d] *4*	11/2$^-$		
2557.3[a] *4*	9/2$^-$		
2842.8[f] *5*	11/2$^-$		J$^\pi$: From angular distributions and correlations of both populating and depopulating transitions of level.
3040.7[h] *4*	19/2$^-$[#]	2.526 min *24*	E(level): Transitions depopulating isomer impossible to observe in prompt coin with feeding γ rays due to long half-life of level. $T_{1/2}$: From Adopted Levels.
3176.0[c] *4*	13/2$^-$		
3311.9[b] *5*	11/2$^-$		
3463.1[d] *4*	15/2$^-$		
3774.0[e] *5*	13/2$^-$		
4005.4[c] *5*	17/2$^-$		
4253.0[a] *8*	(13/2$^-$)		
4555.0[f] *5*	15/2$^-$		
4784.9 *9*	13/2		
4931.1 *10*	(15/2$^-$)		
5339.5[e] *6*	17/2$^-$		
5340.1[b] *10*	13/2$^-$,15/2$^-$		
5751.7 *7*			
5897.2 *7*	15/2$^-$		
6072.0 *11*			
6365.4[g] *11*	21/2$^-$	<2.8 ps	$T_{1/2}$: RDDS method (2005Du19), decay curve of 3325 transition was least-squares fitted with two lifetime components, one of which was fixed to a value corresponding to lower limit of the lifetime of th 25/2$^-$ state.
6689.3 *21*	17/2$^-$		
6828.6[h] *11*	23/2$^-$		

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^{28}Si(^{32}S,α2pnγ) 2005Du19,1979Me03 (continued)

^{53}Fe Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[@]	Comments
6935 3	17/2⁻		
7139 3	(19/2⁻)		
7181.3 12	(21/2)⁻		
7214 3			
7327.8[g] 11	25/2⁻	18.2 ps 22	$T_{1/2}$: RDDS method (2005Du19).
8273.8 12	25/2⁻	<0.14[&] ps	
8544.2 12	23/2⁻		
9098.3[h] 13	27/2⁻	<0.14[&] ps	
9287.8 12	(25/2⁻)		
9550.0 15	(25/2)		
9880.6 13	27/2⁻	<0.14[&] ps	
10876 3	(27/2⁻)		
11192.1[g] 14	(29/2⁻)	<0.14[&] ps	
11690 4	27/2		
12593 4			

† From least-squares fit to Eγ′s (by compilers), unless stated otherwise.
‡ From DCO and γγ(coin).
\# From Adopted Levels.
@ Deduced by 2005Du19 from recoil distance Doppler shift (RDDS) technique, unless otherwise stated.
& Effective half-life (2005Du19).
a Band(A): 1/2⁻ band, α=+1/2.
b Band(a): 1/2⁻ band, α=−1/2.
c Band(B): yrast cascade based on g.s., α=+1/2.
d Band(b): yrast cascade based on g.s., α=−1/2.
e Band(C): γ sequence based on 11/2⁻, α=+1/2.
f Band(c): γ sequence based on 11/2⁻, α=−1/2.
g Band(D): γ sequence based on 19/2⁻, α=−1/2.
h Band(d): γ sequence based on 19/2⁻, α=+1/2.

γ(^{53}Fe)

R_{DCO}(150-97)=I(γ_1 at 150°; gated with γ_2 at 97°)/ I(γ_1 at 97°; gated with γ_2 at 150°).

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.[a]	Comments
33.31[#] 2	[&]	774.42	1/2⁻	741.11	3/2⁻	M1	E_γ: γ below the ≈60 keV low-energy threshold of detector arrays.
272.8 1	0.9 2	1696.08	7/2⁻	1423.26	5/2⁻	M1+E2	R_{150-97}=0.60 7.
287.1 1	38 1	3463.1	15/2⁻	3176.0	13/2⁻	M1	DCO=0.64 12 R_{150-97}=0.74 3.
463.2 4	0.6 1	6828.6	23/2⁻	6365.4	21/2⁻	M1	
499.3 2	20 1	7327.8	25/2⁻	6828.6	23/2⁻	M1+E2	DCO=0.79 7 R_{150-97}=1.09 5.
503.1 4	1.8 3	2842.8	11/2⁻	2339.6	11/2⁻	[c]	
542.2 2	6.6 3	4005.4	17/2⁻	3463.1	15/2⁻	[b]	DCO=1.3 3 R_{150-97}=0.70 5.
648.3 2	1.8 2	1423.26	5/2⁻	774.42	1/2⁻	E2	R_{150-97}=1.26 17.

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^{28}Si(^{32}S,α2pnγ) 2005Du19,1979Me03 (continued)

γ(^{53}Fe) (continued)

Eγ	Iγ	Ei(level)	J^π_i	Ef	J^π_f	Mult.[a]	Comments
682.6 2	5.2 2	1423.26	5/2⁻	741.11	3/2⁻	M1+E2	R_{150-97}=1.08 8.
701.5[†] 5	15.3[‡]	3040.7	19/2⁻	2339.6	11/2⁻	E4	
741.2[†] 5	4.6[‡]	741.11	3/2⁻	0.0	7/2⁻	E2	
743 1	0.6 3	9287.8	(25/2⁻)	8544.2	23/2⁻	(M1)	
755.2 5	2.2 5	3311.9	11/2⁻	2557.3	9/2⁻	M1+E2	
780.7 4	8.2 5	4555.0	15/2⁻	3774.0	13/2⁻	M1	R_{150-97}=0.76 8.
782.3 5	0.7 2	9880.6	27/2⁻	9098.3	27/2⁻	c	
784.4 5	1.4 4	5339.5	17/2⁻	4555.0	15/2⁻	M1	
836.4 4	50 2	3176.0	13/2⁻	2339.6	11/2⁻	M1+E2	DCO=0.50 9 R_{150-97}=0.66 3.
861.3 4	1.6 3	2557.3	9/2⁻	1696.08	7/2⁻	M1	R_{150-97}=0.75 9.
903.4 6	0.8 2	12593		11690	27/2		
931.0 5	7.8 5	3774.0	13/2⁻	2842.8	11/2⁻	M1+E2	DCO=0.45 10 R_{150-97}=0.57 5.
945.8 6	3.4 3	8273.8	25/2⁻	7327.8	25/2⁻	c	DCO=1.1 3 R_{150-97}=1.47 10.
955.3 5	11 1	1696.08	7/2⁻	741.11	3/2⁻	E2	R_{150-97}=1.13 8.
962.6[@] 5	57 2	7327.8	25/2⁻	6365.4	21/2⁻	E2	R_{150-97}=1.26 5.
965.0[@] 6	8.0 8	4005.4	17/2⁻	3040.7	19/2⁻	M1+E2	
1011.1[†] 5	19.3[‡]	2339.6	11/2⁻	1328.4	9/2⁻	M1+E2	DCO=0.86 8 R_{150-97}=0.62 3.
1091.8 6	2.9 4	4555.0	15/2⁻	3463.1	15/2⁻	c	R_{150-97}=1.41 15.
1112 1	1.0 3	5897.2	15/2⁻	4784.9	13/2	D	
1123.6 6	8.7 8	3463.1	15/2⁻	2339.6	11/2⁻	E2	R_{150-97}=1.39 11.
1134.2 6	4.8 4	2557.3	9/2⁻	1423.26	5/2⁻	E2	R_{150-97}=1.26 17.
1157 1	3.2 5	4931.1	(15/2⁻)	3774.0	13/2⁻	(M1+E2)	R_{150-97}=0.94 14.
1196.7 6	1.3 3	5751.7		4555.0	15/2⁻		
1217 1	0.5 2	8544.2	23/2⁻	7327.8	25/2⁻	M1+E2	R_{150-97}=0.51 11.
1244 1	0.6 2	4555.0	15/2⁻	3311.9	11/2⁻	E2	
1276 1	0.4 2	9550.0	(25/2)	8273.8	25/2⁻		Mult.: ΔJ=0(?) transition.
1287.1 7	1.3 2	6072.0		4784.9	13/2		
1311 1	0.4 2	11192.1	(29/2⁻)	9880.6	27/2⁻	(M1+E2)	
1328.9[†] 5	27.0[‡]	1328.4	9/2⁻	0.0	7/2⁻	M1+E2	DCO=0.81 7 R_{150-97}=0.56 2.
1334 1	1.2 4	5339.5	17/2⁻	4005.4	17/2⁻	c	
1342.1 7	2.3 5	5897.2	15/2⁻	4555.0	15/2⁻	c	
1362 1	0.6 3	8544.2	23/2⁻	7181.3	(21/2)⁻	(M1+E2)	
1379.1 7	1.4 2	4555.0	15/2⁻	3176.0	13/2⁻	M1+E2	
1434 1	2.5 3	3774.0	13/2⁻	2339.6	11/2⁻	M1	R_{150-97}=0.68 9.
1445 1	14 1	8273.8	25/2⁻	6828.6	23/2⁻	M1+E2	DCO=0.65 9 R_{150-97}=1.01 6.
[x]1492							Eγ: From text of 2005Du19.
1514 1	1.2 2	2842.8	11/2⁻	1328.4	9/2⁻	M1	R_{150-97}=0.69 14.
1566 1	2.3 4	5339.5	17/2⁻	3774.0	13/2⁻	E2	
1606 1	3.4 4	9880.6	27/2⁻	8273.8	25/2⁻	M1+E2	DCO=0.68 19 R_{150-97}=0.99 11.
1614.9 8	10 1	3311.9	11/2⁻	1696.08	7/2⁻	E2	DCO=0.92 14 R_{150-97}=1.13 8.
1695 1	2.6 4	4253.0	(13/2⁻)	2557.3	9/2⁻	(E2)	R_{150-97}=1.29 14.
1696 1	0.6 1	1696.08	7/2⁻	0.0	7/2⁻	c	
1712 1	2.6 3	4555.0	15/2⁻	2842.8	11/2⁻	E2	
1712.6[#] 3	[&]	3040.7	19/2⁻	1328.4	9/2⁻	M5	
1715 1	0.6 2	8544.2	23/2⁻	6828.6	23/2⁻	c	R_{150-97}=1.3 4.
1746 1	2.2 4	5751.7		4005.4	17/2⁻		

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^{28}Si(^{32}S,α2pnγ) 2005Du19,1979Me03 (continued)

γ(^{53}Fe) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	δ	Comments
1771 *1*	32 *2*	9098.3	27/2⁻	7327.8	25/2⁻	M1+E2		DCO=0.77 *7* R_{150-97}=0.95 *4*.
1847 *1*	6.2 *6*	3176.0	13/2⁻	1328.4	9/2⁻	E2[b]		DCO=1.4 *3* R_{150-97}=1.32 *10*.
1876 *1*	6.8 *3*	5339.5	17/2⁻	3463.1	15/2⁻	M1+E2[b]		DCO=0.85 *21* R_{150-97}=0.66 *5*.
1892 *1*	1.5 *3*	5897.2	15/2⁻	4005.4	17/2⁻	D		
1908 *1*	0.5 *2*	8273.8	25/2⁻	6365.4	21/2⁻	E2		R_{150-97}=1.13 *23*.
1914 *1*	1.8 *4*	4253.0	(13/2⁻)	2339.6	11/2⁻	(M1+E2)		R_{150-97}=0.91 *15*.
1960 *1*	1.0 *2*	9287.8	(25/2⁻)	7327.8	25/2⁻			Mult.: ΔJ=0(?) transition. R_{150-97}=1.1 *3*.
2028 *1*	2.9 *5*	5340.1	13/2⁻,15/2⁻	3311.9	11/2⁻			
2094 *1*	6.0 *5*	11192.1	(29/2⁻)	9098.3	27/2⁻	(M1+E2)		DCO=1.0 *3* R_{150-97}=1.43 *10*.
2107 *1*	1.1 *3*	9287.8	(25/2⁻)	7181.3	(21/2)⁻	(E2)		
2179 *2*	0.6 *2*	8544.2	23/2⁻	6365.4	21/2⁻	M1+E2		R_{150-97}=1.7 *4*.
2216 *1*	4.9 *4*	4555.0	15/2⁻	2339.6	11/2⁻	E2		
2269 *2*	0.3 *1*	9098.3	27/2⁻	6828.6	23/2⁻	E2		
2338.2[†] *5*	6.5[‡]	2339.6	11/2⁻	0.0	7/2⁻	E2		DCO=1.6 *3* R_{150-97}=1.18 *7*.
2360 *2*	0.8 *2*	6365.4	21/2⁻	4005.4	17/2⁻	E2		R_{150-97}=1.5 *3*.
2434 *2*	1.0 *2*	5897.2	15/2⁻	3463.1	15/2⁻	[c]		R_{150-97}=1.14 *21*.
2445[d] *1*	7.7[d] *9*	3774.0	13/2⁻	1328.4	9/2⁻	E2		R_{150-97}=1.17 *16*.
2445[d] *1*	4.5[d] *9*	4784.9	13/2	2339.6	11/2⁻	D		R_{150-97}=0.82 *10*.
2554 *2*	3.5 *3*	9880.6	27/2⁻	7327.8	25/2⁻	M1+E2		R_{150-97}=1.59 *15*.
2558 *1*	1.5 *3*	2557.3	9/2⁻	0.0	7/2⁻	M1+E2		
2576 *2*	0.8 *2*	5751.7		3176.0	13/2⁻			
2592 *2*	1.9 *3*	4931.1	(15/2⁻)	2339.6	11/2⁻	(E2)		R_{150-97}=1.47 *21*.
2722 *2*	1.6 *2*	5897.2	15/2⁻	3176.0	13/2⁻	M1+E2		R_{150-97}=0.33 *8*.
2722 *2*	0.6 *2*	9550.0	(25/2)	6828.6	23/2⁻	(D)		Mult.: ΔJ=(1) transition from R_{150-97}=0.72 *22*.
2843 *1*	12 *1*	2842.8	11/2⁻	0.0	7/2⁻	E2		R_{150-97}=1.22 *9*.
3001 *2*	3.0 *7*	5340.1	13/2⁻,15/2⁻	2339.6	11/2⁻			
3040.6[#] *5*	[&]	3040.7	19/2⁻	0.0	7/2⁻	E6		
3175 *2*	2.0 *4*	7181.3	(21/2)⁻	4005.4	17/2⁻	(E2)		R_{150-97}=1.47 *19*.
3226 *2*	2.4 *5*	6689.3	17/2⁻	3463.1	15/2⁻	M1+E2		R_{150-97}=0.18 *5*.
3325 *2*	64 *2*	6365.4	21/2⁻	3040.7	19/2⁻	M1+E2	≈−1	DCO=1.33 *9* R_{150-97}=1.70 *7*. δ: Angular distribution for transition requires considerable ΔJ=2 admixture.
3472 *3*	1.2 *3*	6935	17/2⁻	3463.1	15/2⁻	M1+E2		R_{150-97}=0.36 *12*.
3548 *3*	0.6 *2*	10876	(27/2⁻)	7327.8	25/2⁻	(M1+E2)		
3676 *3*	1.8 *4*	7139	(19/2⁻)	3463.1	15/2⁻	(E2)		R_{150-97}=1.20 *24*.
3751 *3*	1.4 *3*	7214		3463.1	15/2⁻			
3788 *2*	39 *1*	6828.6	23/2⁻	3040.7	19/2⁻	E2		R_{150-97}=1.36 *6*.
3865[e] *3*	0.5 *2*	11192.1	(29/2⁻)	7327.8	25/2⁻	(E2)		
4048 *4*	0.8 *3*	10876	(27/2⁻)	6828.6	23/2⁻	(E2)		R_{150-97}=1.2 *5*.
4140 *3*	2.2 *2*	7181.3	(21/2)⁻	3040.7	19/2⁻	(M1+E2)		
4362 *3*	1.4 *2*	11690	27/2	7327.8	25/2⁻	D		R_{150-97}=0.54 *11*.

[†] From 1979Me03.
[‡] From 1979Me03. Uncertainties are 10-30%.

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^{28}Si(^{32}S,α2pnγ) 2005Du19,1979Me03 (continued)

γ(^{53}Fe) (continued)

[#] From adopted gammas.
[@] 963 and 965 transitions form a doublet structure in 2005Du19. Doublet nature indicated by self-coincident peak at 964.
[&] Intensity could not be determined due to long half-life of parent level.
[a] From intensity ratios R_{150-97} and R(DCO)(150-97) measurements. Intensity ratios, R_{150-97} ≈1.2 and ≈0.8 for stretched E2 and ΔJ=1 transitions. R_{DCO}(150-97) is 1.0 and ≈0.6 for stretched E2 and ΔJ=1 transitions, respectively, when gated on an E2 γ ray, whereas R_{DCO}=1.0 and ≈1.6 for stretched ΔJ=1 and E2 transitions,respectively, when the gating γ ray is ΔJ=1, M1. Nonstretched ΔJ=0 γ rays have similar R_{150-97} and R_{DCO} values as for ΔJ=2, quadrupole transitions. Deviations from these estimates for ΔJ=1 indicate a nonzero mixing ratio of respective γ ray, δ(M1+E2)>0 (<0) for numbers smaller (larger) than expected for R_{150-97} and R_{DCO}.
[b] Pure, stretched M1 at 287 used as gate in determining R_{DCO}.
[c] ΔJ=0 transition.
[d] Multiply placed with intensity suitably divided.
[e] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

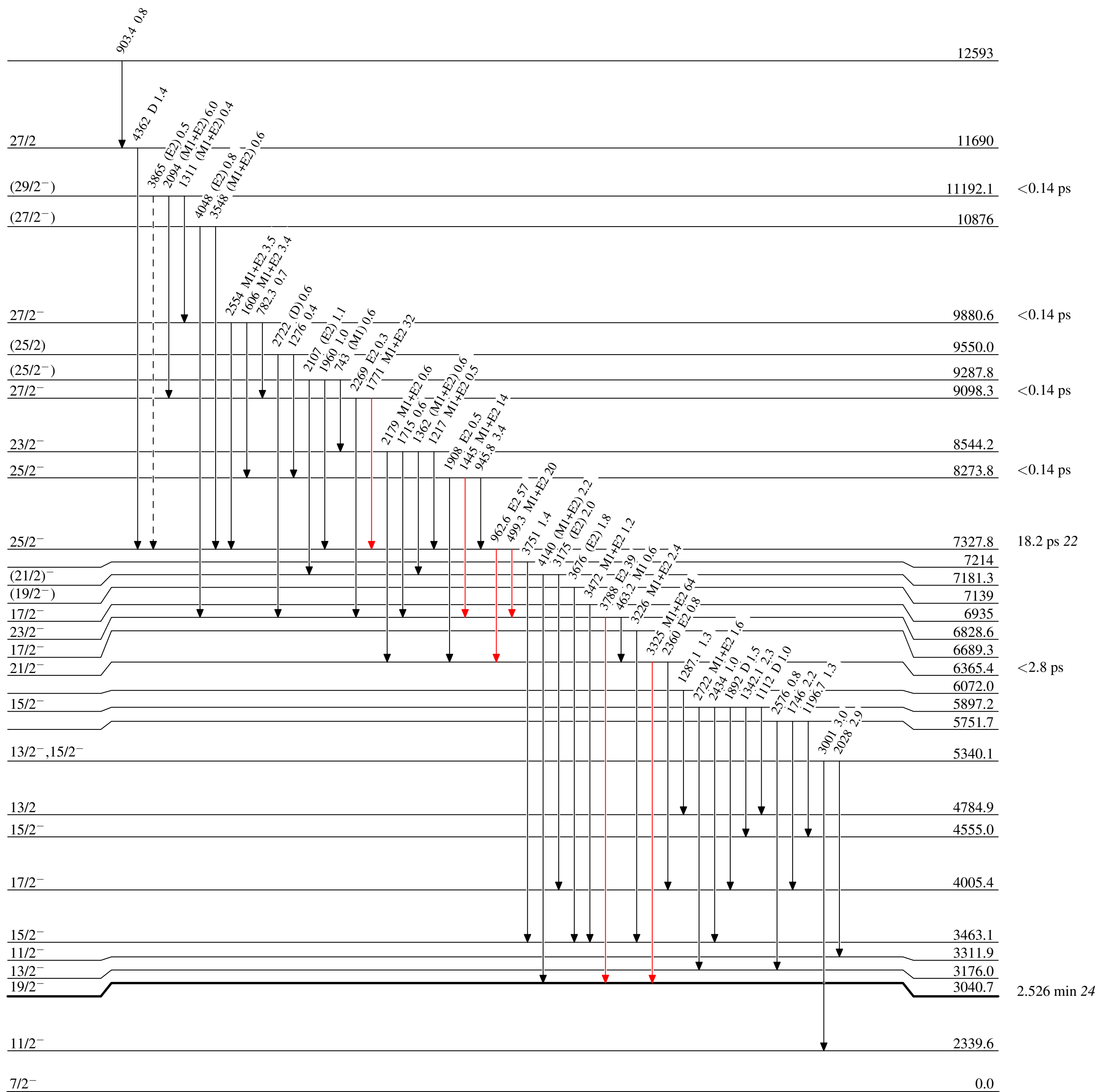
$^{28}Si(^{32}S,\alpha 2pn\gamma)$ 2005Du19,1979Me03

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)



$^{53}_{26}Fe_{27}$

$^{28}Si(^{32}S,\alpha 2pn\gamma)$ 2005Du19,1979Me03

Level Scheme (continued)

Intensities: Relative I_γ

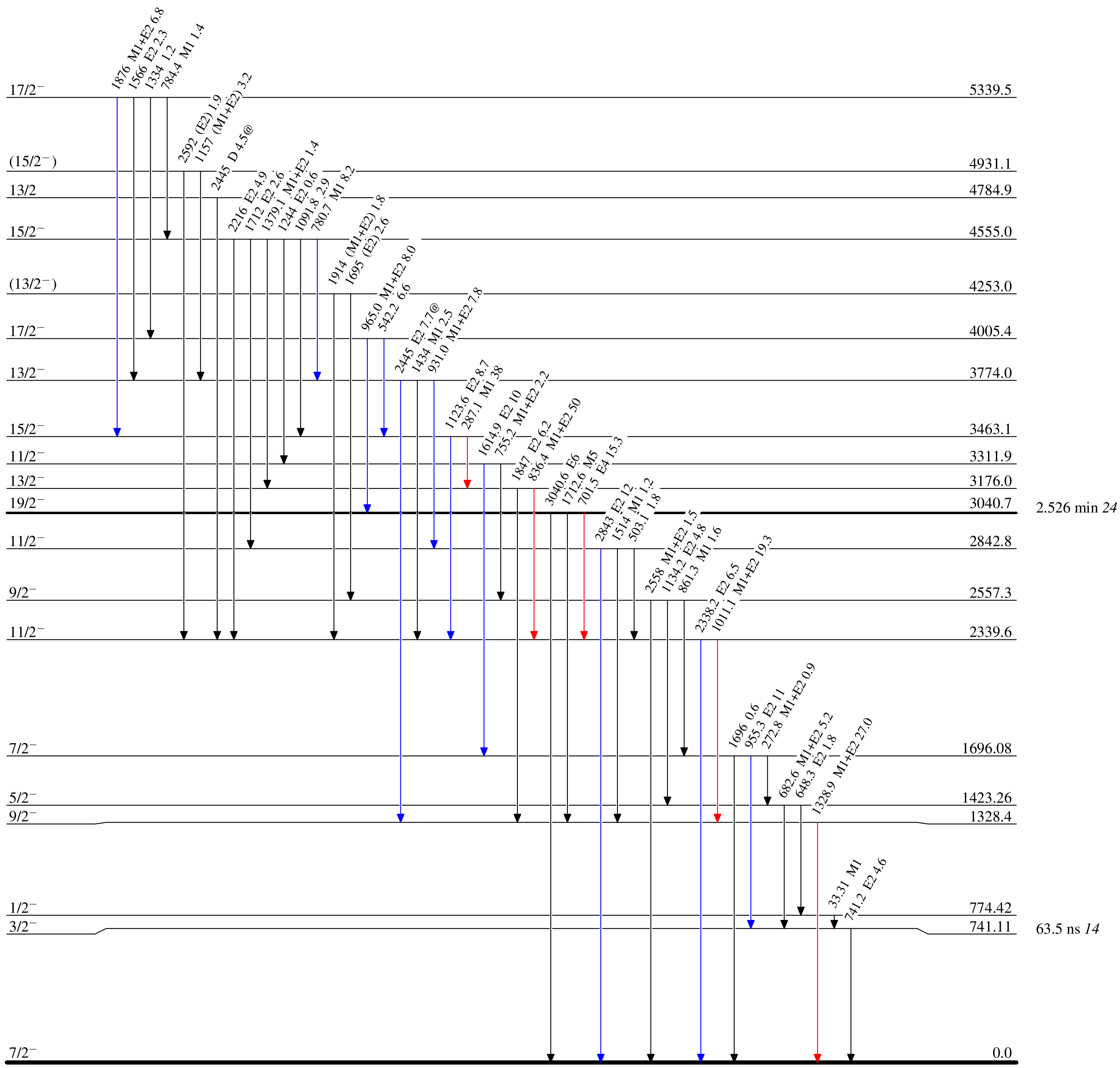
@ Multiply placed: intensity suitably divided

Legend

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

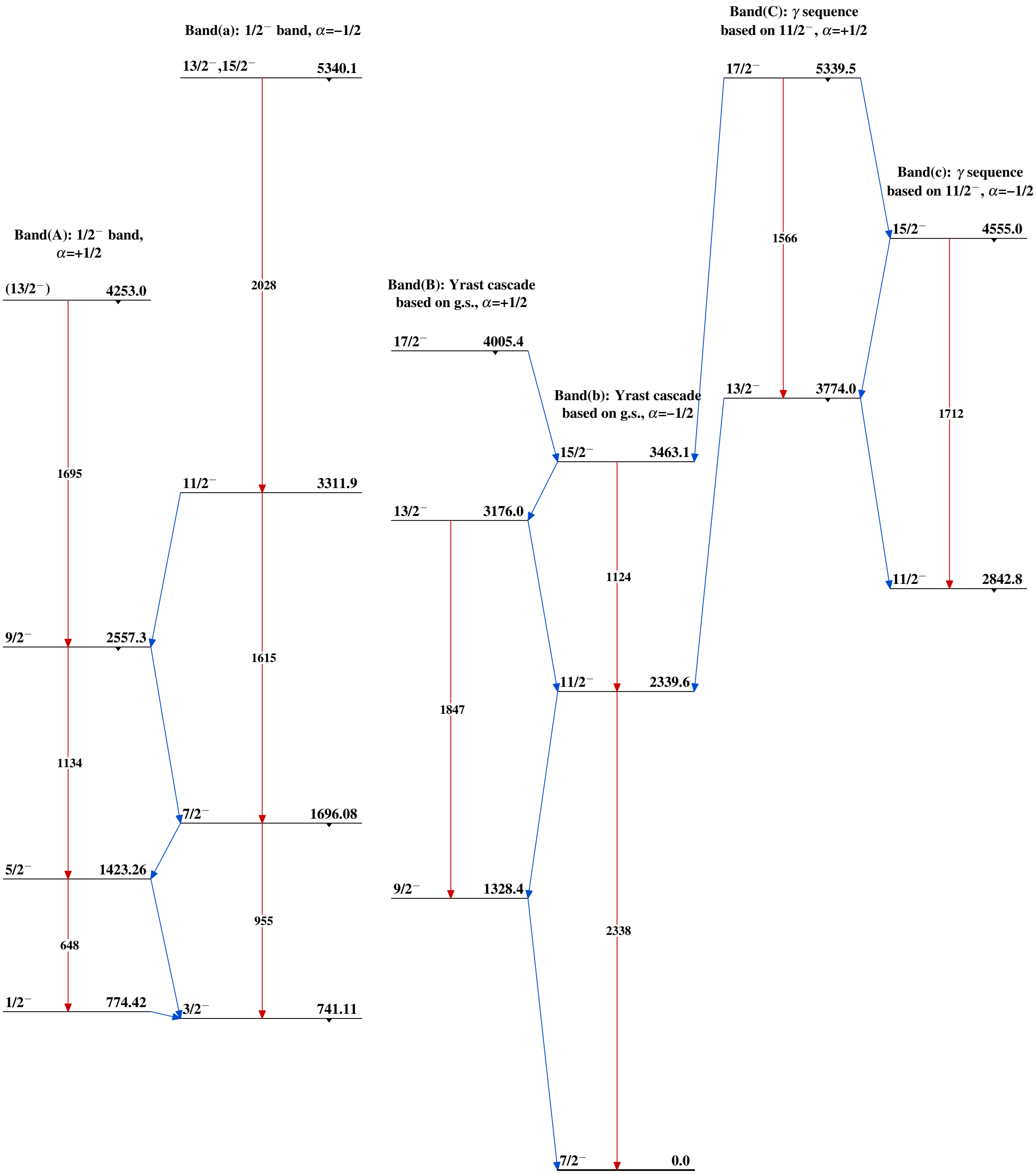
$I_\gamma < 10\% \times I_\gamma^{max}$

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



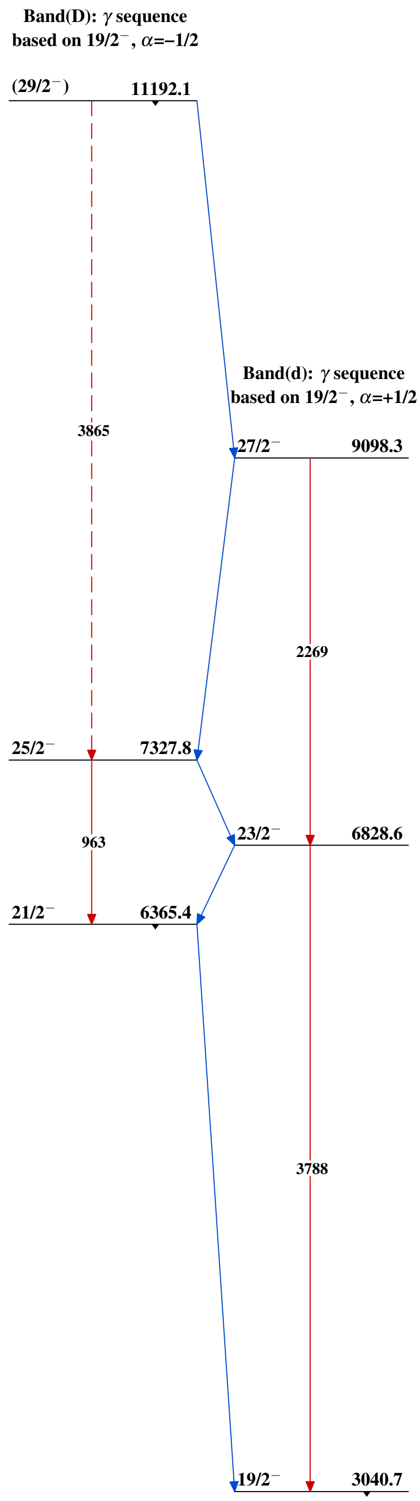
$^{53}_{26}Fe_{27}$

$^{28}Si(^{32}S,\alpha 2pn\gamma)$ 2005Du19,1979Me03



$^{53}_{26}Fe_{27}$

$^{28}Si(^{32}S,\alpha 2pn\gamma)$ 2005Du19,1979Me03 (continued)



$^{53}_{26}Fe_{27}$