

⁶⁵Cu(¹⁸O, α 2n γ) **1993Sy03**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	30-Sep-2020

1993Sy03: ⁶⁵Cu(¹⁸O, α 2n γ) E=65 MeV. Measured γ , $\gamma\gamma$, $\gamma\gamma(\theta)$ (DCO). Cranked shell-model calculations.

⁷⁷Br Levels

E(level) [†]	J π [‡]	T _{1/2}	Comments
0.0 [#]	3/2 ⁻		
105.89 ^{&} 9	9/2 ⁺	4.28 min 10	%IT=100 T _{1/2} : from the Adopted Levels.
129.51 10	5/2 ⁺		
162.01 [@] 9	5/2 ⁻		
417.4 ^a 3	7/2 ⁺		
575.97 [#] 9	7/2 ⁻		
640.21 ^{&} 13	13/2 ⁺		
782.82 ^b 24	9/2 ⁺		
790.80 [@] 12	9/2 ⁻		
947.66 ^a 16	11/2 ⁺		
1274.73 [#] 16	11/2 ⁻		
1305.08 ^b 23	13/2 ⁺		
1482.95 ^{&} 17	17/2 ⁺		
1539.16 [@] 14	13/2 ⁻		
1747.60 ^a 18	15/2 ⁺		
2022.13 [#] 15	15/2 ⁻		
2047.7 ^b 5	17/2 ⁺		
2340.12 [@] 16	17/2 ⁻		
2551.4 ^{&} 3	21/2 ⁺		
2648.40 ^a 20	19/2 ⁺		
2793.19 [#] 16	19/2 ⁻		
2931.9 ^c 6	17/2 ⁻		
3037.7 ^b 5	21/2 ⁺		
3201.3 [@] 4	21/2 ⁻		
3219.7 ^c 6	(19/2 ⁻)		
3610.0 ^c 6	21/2 ⁻		
3728.51 ^a 22	23/2 ⁺		
3729.8 [#] 5	23/2 ⁻		
3775.9 ^{&} 6	25/2 ⁺		
4150.0 ^c 12	(23/2 ⁻)		
4217.0 ^b 7	25/2 ⁺		
4247.6 [@] 5	25/2 ⁻		
4903.0 [#] 5	27/2 ⁻		
4981.3 ^a 4	27/2 ⁺		
5150.5 ^{&} 8	29/2 ⁺		
5517.7 [@] 6	29/2 ⁻		
5529.0 ^b 9	29/2 ⁺		
6297.0 [#] 11	31/2 ⁻		
6411.0 ^a 7	31/2 ⁺		

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⁶⁵Cu(¹⁸O, α 2n γ) **1993Sy03 (continued)**

⁷⁷Br Levels (continued)

E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]
6692.6 ^{&} 9	33/2 ⁺	8029.1 ^a 12	35/2 ⁺	9609.1 [#] 18	(39/2 ⁻)
6979.8 [@] 8	33/2 ⁻	8422 ^{&} 4	37/2 ⁺	10281 [@] 5	(41/2 ⁻)
7876.0 [#] 15	(35/2 ⁻)	8579.8 [@] 13	(37/2 ⁻)	10317 ^{&} 6	(41/2 ⁺)
				11344.1 [#] 21	(43/2 ⁻)

[†] From least-squares fit to E γ data.

[‡] As proposed in 1993Sy03 based on $\gamma\gamma(\theta)$ (DCO) data and band associations. The assignments are the same in Adopted Levels, except that parentheses have been added in the Adopted dataset, when strong arguments seem lacking.

[#] Band(A): g.s. band, $\alpha=-1/2$.

[@] Band(a): g.s. band, $\alpha=+1/2$.

[&] Band(B): $\nu g_{9/2}, \alpha=+1/2$.

^a Band(b): $\nu g_{9/2}, \alpha=-1/2$.

^b Band(C): Band based on (9/2)⁺, $\alpha=+1/2$.

^c Band(D): Band based on (17/2⁻), 3-qp. Possible configuration= $\pi g_{9/2} \otimes \nu g_{9/2} \otimes (\nu p_{1/2}$ or $\nu p_{3/2}$ or $\nu f_{5/2})$ (1993Do14). Similar bands are seen in ⁷⁹Br and ⁸¹Br.

$\gamma(^{77}\text{Br})$

E γ	I γ	E _i (level)	J _i ^π	E _f	J _f ^π	Mult. [‡]	$\alpha^{\#}$	Comments
(24.2 [†])		129.51	5/2 ⁺	105.89	9/2 ⁺	(E2) [†]	145.7	$\alpha(K)=82.2$ 12; $\alpha(L)=54.3$ 8; $\alpha(M)=8.60$ 12; $\alpha(N)=0.590$ 9
105.87 [†] 10		105.89	9/2 ⁺	0.0	3/2 ⁻	E3 [†]	6.30	$\alpha(K)=4.85$ 7; $\alpha(L)=1.236$ 19; $\alpha(M)=0.198$ 3; $\alpha(N)=0.01486$ 22 Mult.: from the Adopted dataset.
129.5 1	5	129.51	5/2 ⁺	0.0	3/2 ⁻			DCO=0.87 13
162.0 1	60	162.01	5/2 ⁻	0.0	3/2 ⁻	D		DCO=0.67 3
215.0 16	3	790.80	9/2 ⁻	575.97	7/2 ⁻			DCO=0.94 28
264.9 8	2	1539.16	13/2 ⁻	1274.73	11/2 ⁻	D		DCO=0.71 6
265 1	<1	1747.60	15/2 ⁺	1482.95	17/2 ⁺			DCO=1.17 8
287.8 1	4	3219.7	(19/2 ⁻)	2931.9	17/2 ⁻	(D)		DCO=0.89 1
300 1	<1	2047.7	17/2 ⁺	1747.60	15/2 ⁺	D+Q		DCO=1.31 11
307.4 1	5	947.66	11/2 ⁺	640.21	13/2 ⁺	D		DCO=0.72 3
311.5 3	4	417.4	7/2 ⁺	105.89	9/2 ⁺	D		DCO=0.68 3
317.8 2	2	2340.12	17/2 ⁻	2022.13	15/2 ⁻	D		DCO=0.74 7
357 1	2	1305.08	13/2 ⁺	947.66	11/2 ⁺			DCO=0.84 7
365.1 8	<1	782.82	9/2 ⁺	417.4	7/2 ⁺	(D)		DCO=0.79 7
389 [@]	<1	3037.7	21/2 ⁺	2648.40	19/2 ⁺			
390.3 1	10	3610.0	21/2 ⁻	3219.7	(19/2 ⁻)			
408.4 6	1	3201.3	21/2 ⁻	2793.19	19/2 ⁻	D		DCO=0.60 8
413.9 2	5	575.97	7/2 ⁻	162.01	5/2 ⁻	D		DCO=0.43 6
483.5 9	4	1274.73	11/2 ⁻	790.80	9/2 ⁻			DCO=0.86 6
518 [@]	<1	4247.6	25/2 ⁻	3729.8	23/2 ⁻			
521.9 4	13	1305.08	13/2 ⁺	782.82	9/2 ⁺	Q		DCO=1.06 5
530 1	3	947.66	11/2 ⁺	417.4	7/2 ⁺			
534.3 1	100	640.21	13/2 ⁺	105.89	9/2 ⁺	Q		DCO=1.01 4
540 1	7	4150.0	(23/2 ⁻)	3610.0	21/2 ⁻			
576.0 1	18	575.97	7/2 ⁻	0.0	3/2 ⁻	Q		DCO=0.92 6
592 1	5	2931.9	17/2 ⁻	2340.12	17/2 ⁻			DCO=1.34 9

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$^{65}\text{Cu}(^{18}\text{O},\alpha 2n\gamma)$ 1993Sy03 (continued) $\gamma(^{77}\text{Br})$ (continued)

E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [‡]	Comments
614 [@]	<1	5517.7	29/2 ⁻	4903.0	27/2 ⁻		
628.8	1	790.80	9/2 ⁻	162.01	5/2 ⁻	Q	DCO=1.00 3
653.2	6	782.82	9/2 ⁺	129.51	5/2 ⁺	Q	DCO=1.06 9
665.1	3	1305.08	13/2 ⁺	640.21	13/2 ⁺		DCO=0.94 6
676.8	3	782.82	9/2 ⁺	105.89	9/2 ⁺		DCO=0.91 7
685.1	3	790.80	9/2 ⁻	105.89	9/2 ⁺	D	DCO=0.66 5
698.8	2	1274.73	11/2 ⁻	575.97	7/2 ⁻	Q	DCO=0.92 9
742.6	5	2047.7	17/2 ⁺	1305.08	13/2 ⁺	Q	DCO=1.03 5
747.4	1	2022.13	15/2 ⁻	1274.73	11/2 ⁻	Q	DCO=0.93 3
748.4	1	1539.16	13/2 ⁻	790.80	9/2 ⁻	Q	DCO=0.97 4
771.1	1	2793.19	19/2 ⁻	2022.13	15/2 ⁻	Q	DCO=0.94 6
799.9	1	1747.60	15/2 ⁺	947.66	11/2 ⁺	Q	DCO=0.98 9
801.0	1	2340.12	17/2 ⁻	1539.16	13/2 ⁻	Q	DCO=1.03 6
842 [@]	4	947.66	11/2 ⁺	105.89	9/2 ⁺		
842.6	2	1482.95	17/2 ⁺	640.21	13/2 ⁺	Q	DCO=1.06 4
861.0	5	3201.3	21/2 ⁻	2340.12	17/2 ⁻	Q	DCO=1.00 6
898	1	1539.16	13/2 ⁻	640.21	13/2 ⁺		
900.8	1	2648.40	19/2 ⁺	1747.60	15/2 ⁺	Q	DCO=1.04 5
936.6	4	3729.8	23/2 ⁻	2793.19	19/2 ⁻	Q	DCO=1.09 6
990.0	1	3037.7	21/2 ⁺	2047.7	17/2 ⁺	Q	DCO=1.16 7
1046.3	3	4247.6	25/2 ⁻	3201.3	21/2 ⁻	Q	DCO=1.05 4
1059	1	3610.0	21/2 ⁻	2551.4	21/2 ⁺		
1068.5	2	2551.4	21/2 ⁺	1482.95	17/2 ⁺	Q	DCO=1.07 3
1080.1	1	3728.51	23/2 ⁺	2648.40	19/2 ⁺	(Q)	DCO=0.87 15
1108.6	5	1747.60	15/2 ⁺	640.21	13/2 ⁺	D	DCO=0.68 1
1165.2	5	2648.40	19/2 ⁺	1482.95	17/2 ⁺	D	DCO=0.66 8
1173.2	1	4903.0	27/2 ⁻	3729.8	23/2 ⁻	Q	DCO=1.03 7
1177 [@]	<1	3728.51	23/2 ⁺	2551.4	21/2 ⁺		
1179.3	4	4217.0	25/2 ⁺	3037.7	21/2 ⁺	Q	DCO=1.00 7
1199.2	4	1305.08	13/2 ⁺	105.89	9/2 ⁺	Q	DCO=0.92 7
1224.5	5	3775.9	25/2 ⁺	2551.4	21/2 ⁺	Q	DCO=1.06 7
1252.8	3	4981.3	27/2 ⁺	3728.51	23/2 ⁺	Q	DCO=1.00 9
1270.1	3	5517.7	29/2 ⁻	4247.6	25/2 ⁻	Q	DCO=1.00 2
1310.2	1	2793.19	19/2 ⁻	1482.95	17/2 ⁺	D	DCO=0.70 7
1312.0	5	5529.0	29/2 ⁺	4217.0	25/2 ⁺	(Q)	DCO=1.15 20
1374.5	5	5150.5	29/2 ⁺	3775.9	25/2 ⁺	Q	DCO=0.98 5
1381	1	2022.13	15/2 ⁻	640.21	13/2 ⁺	D	DCO=0.53 9
1392	1	2931.9	17/2 ⁻	1539.16	13/2 ⁻	(Q)	DCO=0.99 10
1394	1	6297.0	31/2 ⁻	4903.0	27/2 ⁻	Q	DCO=1.00 8
1429.7	5	6411.0	31/2 ⁺	4981.3	27/2 ⁺	Q	DCO=0.97 8
1462.0	4	6979.8	33/2 ⁻	5517.7	29/2 ⁻	Q	DCO=1.07 7
1542.1	5	6692.6	33/2 ⁺	5150.5	29/2 ⁺	Q	DCO=1.10 8
1579	1	7876.0	(35/2 ⁻)	6297.0	31/2 ⁻	Q	DCO=1.16 12
1600	1	8579.8	(37/2 ⁻)	6979.8	33/2 ⁻	(Q)	DCO=1.22 19
1618	1	8029.1	35/2 ⁺	6411.0	31/2 ⁺	Q	DCO=1.11 13
1701	4	10281	(41/2 ⁻)	8579.8	(37/2 ⁻)	(Q)	DCO=1.22 25
1729	3	8422	37/2 ⁺	6692.6	33/2 ⁺	(Q)	DCO=0.96 10
1733	1	9609.1	(39/2 ⁻)	7876.0	(35/2 ⁻)		
1735 [@]	<1	11344.1?	(43/2 ⁻)	9609.1	(39/2 ⁻)		
1737	4	3219.7	(19/2 ⁻)	1482.95	17/2 ⁺	D	DCO=0.85 5
1895 [@]	5	10317?	(41/2 ⁺)	8422	37/2 ⁺		

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$^{65}\text{Cu}(^{18}\text{O},\alpha 2n\gamma)$ [1993Sy03](#) (continued)

$\gamma(^{77}\text{Br})$ (continued)

† From Adopted Gammas.

‡ From DCO ratios. Ratio(DCO)=1.0 indicates $\Delta J=2$, quadrupole. Ratio(DCO)=0.5 indicates $\Delta J=1$, dipole. Transitions with $\Delta J=1$, D+Q mixture can have ratio(DCO)=0.5-2.0.

Total theoretical internal conversion coefficients, calculated using the BrIcc code ([2008Ki07](#)) with Frozen orbital approximation based on γ -ray energies, assigned multiplicities, and mixing ratios, unless otherwise specified.

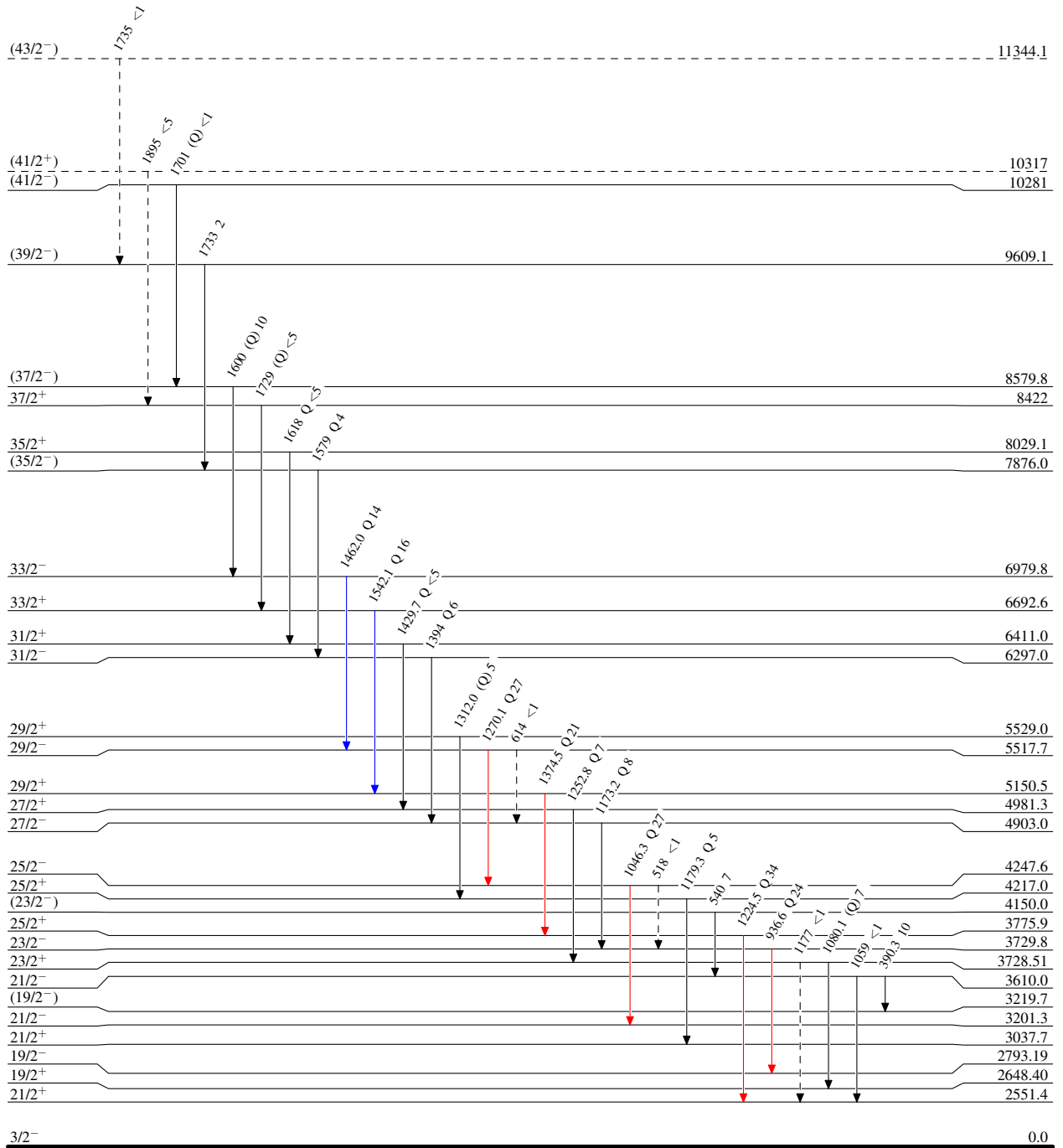
@ Placement of transition in the level scheme is uncertain.

⁶⁵Cu(¹⁸O,α2nγ) 1993Sy03

Legend

Level Scheme
Intensities: Relative I_γ

- ▶ I_γ < 2% × I_γ^{max}
- ▶ I_γ < 10% × I_γ^{max}
- ▶ I_γ > 10% × I_γ^{max}
- - - -▶ γ Decay (Uncertain)



⁷⁷Br₄₂

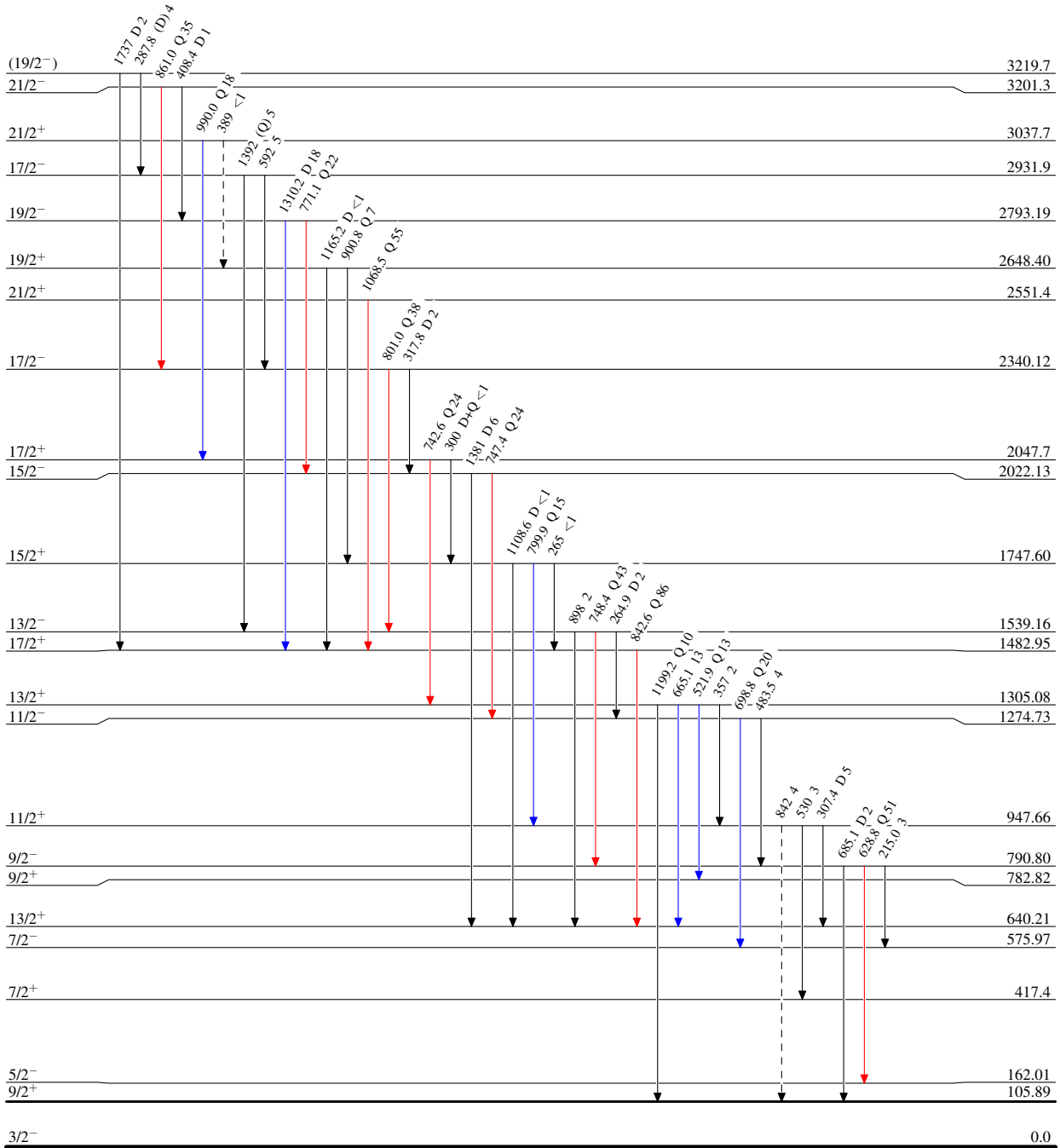
⁶⁵Cu(¹⁸O,α2nγ) 1993Sy03

Legend

Level Scheme (continued)

Intensities: Relative I_γ

- I_γ < 2% × I_γ^{max}
- I_γ < 10% × I_γ^{max}
- I_γ > 10% × I_γ^{max}
- - - - - γ Decay (Uncertain)



4.28 min 10

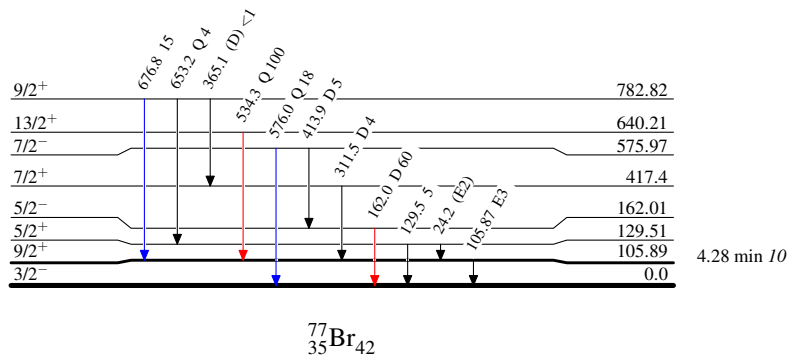
$^{65}\text{Cu}(^{18}\text{O},\alpha 2n\gamma)$ 1993Sy03

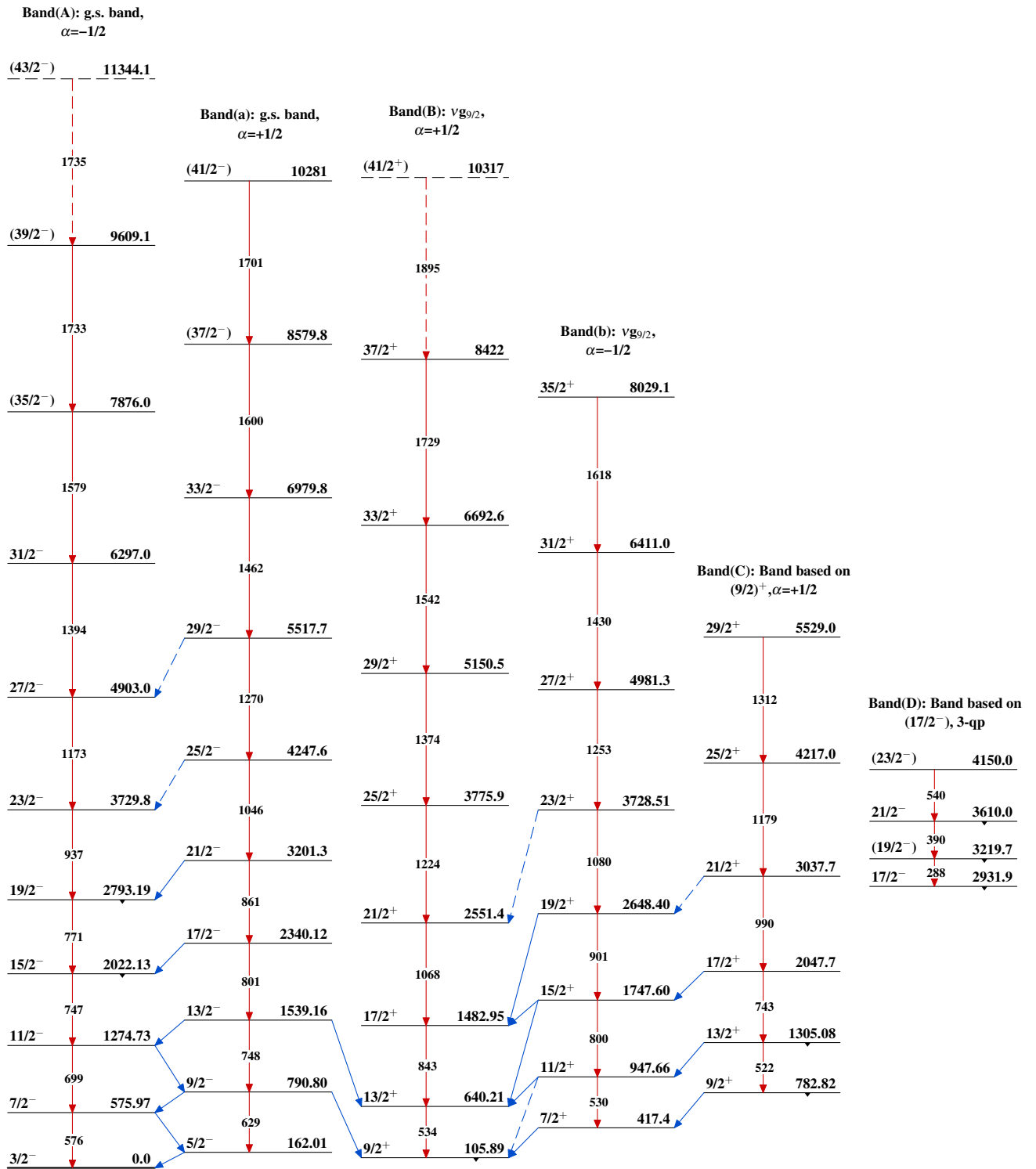
Level Scheme (continued)

Intensities: Relative I_γ

Legend

- ▶ $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- ▶ $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- ▶ $I_\gamma > 10\% \times I_\gamma^{\text{max}}$
- - - -▶ γ Decay (Uncertain)



$^{65}\text{Cu}(^{18}\text{O},\alpha 2n\gamma)$ 1993Sy03 $^{77}\text{Br}_{42}$