^{24}Mg(t,α),(t,$\alpha\gamma$) 1970Po08,1971Da14,1976Sh03

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia[#], A. Chakraborty[##]	NDS 171,1 (2021)	1-Jun-2020

Other references: 1988Ma23, 1990PiZW, and 1991Pi09.

$J^\pi(^{24}Mg)=0^+$.

1970Po08: ^{24}Mg(t,$\alpha\gamma$) E=2.80 MeV. Measured γ angular distribution with NaI(Tl) detectors.

1971Da14: ^{24}Mg(t,$\alpha\gamma$) E=4.0-4.5 MeV. Measured $\sigma(E_p, E_\gamma, \theta(\alpha\gamma))$, NaI(Tl).

1976Sh03: ^{24}Mg(t,α) E=15, 23.5 MeV. Measured $\sigma(E_\alpha,\theta)$, DWBA analysis. FWHM 18- and 80-keV for E_t=15- and 23.5-MeV, respectively.

1988Ma23: ^{24}Mg(t,α) E=33 MeV. Measured $\sigma(\theta)$, deduced excited levels, spectroscopic factors. FWHM 30 keV.

^{23}Na Levels

E(level)[†]	J^π[#]	L[†]	C^2S[‡]	Comments
0	$3/2^+$	2	0.39	C^2S: Others: 0.43 (1976Sh03 for E_t=23.5 MeV), 0.28 (1988Ma23).
438 *5*	$5/2^+$	2	2.3	C^2S: Others: 2.2 (1976Sh03 for E_t=23.5 MeV), 2.29 (1988Ma23).
2081 *5*	$7/2^+$	4	(0.12)	C^2S: Others: (0.16) (1976Sh03 for E_t=23.5 MeV), (0.06) (1988Ma23).
2392 *5*	$1/2^+$	0	0.19	C^2S: Others: 0.19 (1976Sh03 for E_t=23.5 MeV), 0.16 (1988Ma23).
2641 *5*	$1/2^-$	1	1.8	C^2S: Others: 1.9 (1976Sh03 for E_t=23.5 MeV), 1.56 (1988Ma23).
2706 *5*	$9/2^+$	4	(0.10)	C^2S: Other: (0.09) (1988Ma23).
2984 *5*	$3/2^+$	2	0.39	C^2S: Others: 0.30 (1976Sh03 for E_t=23.5 MeV), 0.19 (1988Ma23).
3680 *5*	$3/2^-$	1	0.56	C^2S: Others: 0.52 (1976Sh03 for E_t=23.5 MeV), 0.71 (1988Ma23).
3851 *5*	$5/2^-$	3	(0.17)	C^2S: Others: (0.20) (1976Sh03 for E_t=23.5 MeV), (0.05) (1988Ma23).
3916 *5*	$5/2^+$	2	0.04	C^2S: Other: 0.01 (1988Ma23). J^π: 5/2 from 1970Po08, based on γ-ray transition strength analysis.
4436 *10*	$1/2^+$	0	0.11	C^2S: Others: 0.12 (1976Sh03 for E_t=23.5 MeV), 0.08 (1988Ma23).
4778 *10*	$7/2^+$	4	(0.17)	C^2S: Others: (0.20) (1976Sh03 for E_t=23.5 MeV), 0.05 (1988Ma23).
5383 *10*	$3/2^+,5/2^+$	2	0.61,0.40	C^2S: Others: 0.72,0.50 (1976Sh03 for E_t=23.5 MeV), 0.39 (1988Ma23).
5537 *10*	$11/2^+$	6	(0.17)	C^2S: Other: (0.09) (1988Ma23).
5748 *10*	$3/2^+,5/2^+$	2		
5773 *10*		(3)	(0.06)	
5931 *10*		(0)	(0.03)	
5971 *10*	$1/2^-,3/2^-$	1	0.40	
6050 *10*				
6124 *10*				
6197 *10*				
6237 *10*		(6)	(0.25)	
6311 *10*	$1/2^+$	0	0.03	
6358 *10*		(5)	(0.64)	

[†] From 1976Sh03.

[‡] From 1976Sh03 for E_t=15 MeV. Values for E_t=23.5 MeV (1976Sh03) and 1988Ma23 are listed in comments. In 1976Sh03 values extracted from measured cross section using the relation: $(d\sigma/d\Omega)_{exp}= NC^2S(\sigma_{DWUCK}/(2j+1))$, N=9.3 and 12.7 for 15– and 23.5-MeV, respectively. In 1988Ma23: $(d\sigma(\theta)/d\Omega)_{exp}= 2.0C^2S(l,j)((d\sigma(\theta)/d\Omega)_{FRUCK-2}$.

[#] From 1976Sh03, except where otherwise noted, based on $\sigma(\theta)$ and DWBA calculations.

^{24}Mg(t,α),(t,αγ) 1970Po08,1971Da14,1976Sh03 (continued)

γ(^{23}Na)

E_i(level)	J_i^π	E_γ [†]	I_γ [#]	E_f	J_f^π	Mult.[‡]	δ [#]	Comments
438	5/2+	438	100	0	3/2+	D+Q	+0.07 *3*	A_2=−0.22 *3*; A_4=−0.06 *4* (1970Po08) δ: Wt. ave. of +0.08 *3* (1970Po08) and +0.05 *3* (1971Da14).
2081	7/2+	1643	93 *2*	438	5/2+	D+Q	+0.16 *2*	A_2=+0.01 *3*; A_4=+0.07 *5* (1970Po08) I_γ: Wt. ave. of 94 *2* (1970Po08) and 92 *2* (1971Da14). δ: Wt. ave. of +0.18 *4* (1970Po08) and +0.16 *2* (1971Da14).
		2081	7 *2*	0	3/2+			I_γ: Wt. ave. of 6 *2* (1970Po08) and 8 *2* (1971Da14).
2392	1/2+	311	<2	2081	7/2+			
		1954	34 *3*	438	5/2+			I_γ: Wt. ave. of 36 *4* (1970Po08) and 33 *3* (1971Da14).
		2392	66 *3*	0	3/2+			I_γ: Wt. ave. of 64 *4* (1970Po08) and 67 *3* (1971Da14).
2641	1/2−	2641	100	0	3/2+			
2706	9/2+	314	<6	2392	1/2+			
		625	38 *4*	2081	7/2+			A_2=−0.30 *6*; A_4=+0.09 *9* (1970Po08)
		2268	62 *4*	438	5/2+	Q(+O)	−0.01 *3*	A_2=+0.43 *3*; A_4=−0.27 *6* (1970Po08)
		2706	<2	0	3/2+			
2984	3/2+	343	<6	2641	1/2−			
		592	<1	2392	1/2+			
		903	<4	2081	7/2+			
		2546	42 *2*	438	5/2+	D+Q	−0.05 *7*	A_2=−0.03 *7*; A_4=−0.06 *11* (1970Po08) I_γ: Wt. ave. of 41 *4* (1970Po08) and 42 *2* (1971Da14). δ: Other value −0.07 *21* (1970Po08).
		2984	58 *2*	0	3/2+	D+Q	+0.03 *6*	A_2=+0.44 *3*; A_4=−0.02 *4* (1970Po08) I_γ: Wt. ave. of 59 *2* (1970Po08) and 58 *2* (1971Da14). δ: Other value +0.30 *6* or +3.5 *8* (1971Da14).
3680	3/2−	1039	18 *1*	2641	1/2−	D+Q	−0.11 *6*	A_2=−0.65 *6*; A_4=−0.02 *7* (1970Po08) I_γ: Wt. ave. of 19 *4* (1970Po08) and 18 *1* (1971Da14).
		1288	2 *1*	2392	1/2+			I_γ: From 1970Po08. Same value in 1971Da14.
		1599	<3	2081	7/2+			
		3242	76 *2*	438	5/2+	D+Q	−0.01 *5*	A_2=−0.08 *3*; A_4=−0.01 *3* (1970Po08) I_γ: Wt. ave. of 77 *4* (1970Po08) and 76 *2* (1971Da14).
		3680	4 *1*	0	3/2+			I_γ: From 1971Da14 to satisfy ∑Iγ=100 from this level. Other: 2 *1* (1970Po08).
3851	5/2−	1770	50	2081	7/2+			
		3851	50	0	3/2+			
3916	5/2+	236	<2	3680	3/2−			
		932	2 *1*	2984	3/2+			
		1210	<4	2706	9/2+			
		1275	<4	2641	1/2−			
		1524	<4	2392	1/2+			
		1835	11 *3*	2081	7/2+	D(+Q)	+0.12 *12*	A_2=−0.32 *8*; A_4=−0.04 *8* (1970Po08)
		3478	6 *3*	438	5/2+			
		3916	81 *4*	0	3/2+	D+Q	+0.22 *3*	A_2=+0.07 *2*; A_4=+0.02 *2* (1970Po08)
4436	1/2+	2044	7 *3*	2392	1/2+			I_γ: Other value 5 (1970Po08).
		4436	93 *3*	0	3/2+			I_γ: Other value 95 (1970Po08).
4778	7/2+	862	<3	3916	5/2+			
		1098	<3	3680	3/2−			
		1794	<5	2984	3/2+			
		2072	15 *4*	2706	9/2+			
		2137	<6	2641	1/2−			
		2386	<2	2392	1/2+			
		2697	28 *5*	2081	7/2+	D(+Q)	−0.06 *12*	A_2=+0.42 *5*; A_4=−0.01 *7* (1970Po08) I_γ: Other value 26 *4* (1971Da14).
		4340	57 *4*	438	5/2+	D+Q	+0.15 *4*	A_2=−0.05 *2*; A_4=+0.00 *3* (1970Po08) I_γ: Other value 74 *4* (1971Da14).

Continued on next page (footnotes at end of table)

^{24}Mg(t,α),(t,$\alpha\gamma$) 1970Po08,1971Da14,1976Sh03 (continued)

$\gamma(^{23}Na)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[‡]	δ[#]	Comments
5383	$3/2^+,5/2^+$	1467	<2	3916	$5/2^+$			
		1703	<10	3680	$3/2^-$			
		2399	<5	2984	$3/2^+$			
		2677	<3	2706	$9/2^+$			
		2742	<2	2641	$1/2^-$			
		2991	<2	2392	$1/2^+$			
		3302	29 *2*	2081	$7/2^+$	D+Q	−0.19 *12*	A_2=+0.05 *7*; A_4=−0.01 *8* (1970Po08) A_2=−0.17 *12*, A_4=−0.15 *16* (1971Da14). I_γ: Wt. ave. of 23 *5* (1970Po08) and 30 *2* (1971Da14). δ: Other value +0.03 *8* for 5/2 or <−8 for 3/2 (1971Da14).
		4944	57 *2*	438	$5/2^+$	D+Q	−0.10 *4*	A_2=+0.24 *3*; A_4=+0.00 *4* (1970Po08) I_γ: Wt. ave. of 63 *7* (1970Po08) and 57 *2* (1971Da14). δ: Average of −0.16 *7* (1970Po08) and −0.08 *4* for 5/2 (1971Da14).
		5382	14 *1*	0	$3/2^+$	D+Q	+0.04 *4*	A_2=−0.32 *9*; A_4=0.12 *14* (1971Da14) δ: From 1971Da14 for 5/2, or −3.0 *8* for 3/2. I_γ: Unweighted ave. of 14 *4* (1970Po08) and 13 *1* (1971Da14) to satisfy $\sum$=100 from this level.
5537	$11/2^+$	2553	76	2984	$3/2^+$			E_γ: Not observed by others and appears to be a $(11/2)^+$ to $3/2^+$ transition, not adopted.
		3456	24	2081	$7/2^+$			
5748	$3/2^+,5/2^+$	5310	40 *10*	438	$5/2^+$	D+Q	−0.19 *12*	A_2=+0.21 *4*; A_4=+0.07 *6* (1970Po08)
		5747	60 *10*	0	$3/2^+$	D+Q	+0.30 *14*	A_2=+0.20 *9*; A_4=−0.01 *14* (1970Po08)

[†] From level energy differences, recoil energy subtracted and rounded to nearest keV.
[‡] From γ-ray angular correlation coefficients (1970Po08, 1971Da14) by evaluators.
[#] From 1970Po08, except as noted.

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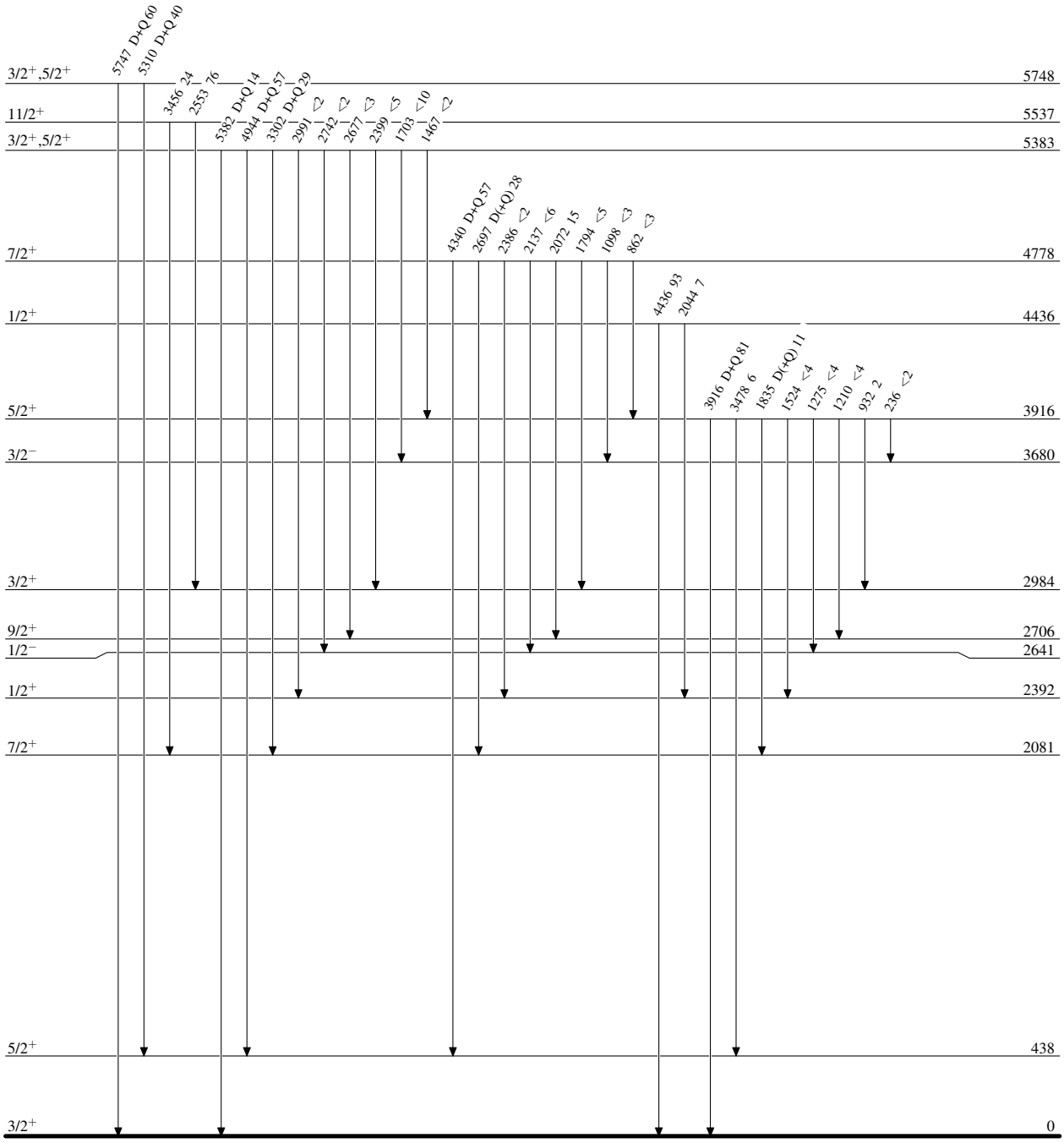
Level Scheme

Intensities: % photon branching from each level

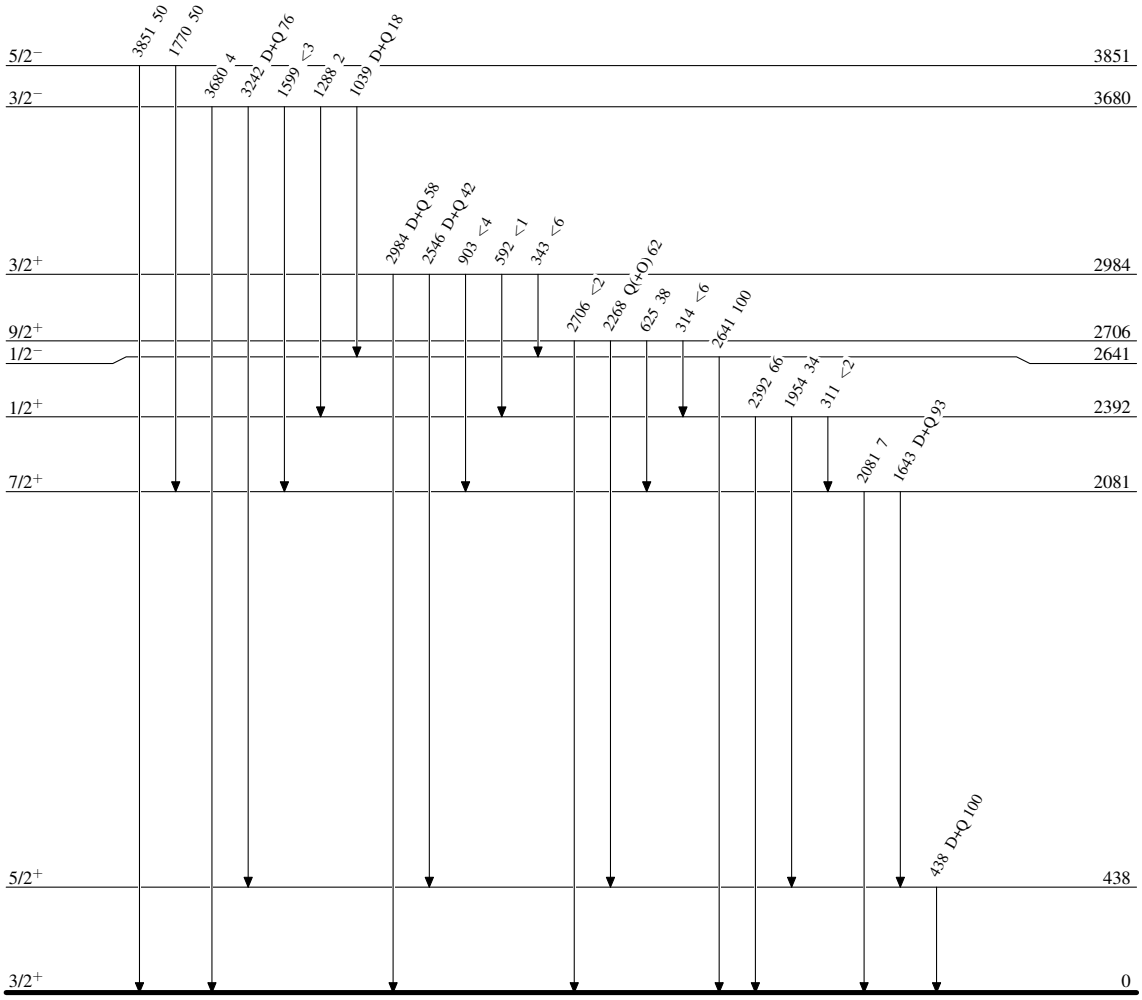


$^{23}_{11}Na_{12}$

^{24}Mg(t,α),(t,$\alpha\gamma$) 1970Po08,1971Da14,1976Sh03

Level Scheme (continued)

Intensities: % photon branching from each level



$^{23}_{11}Na_{12}$