^{24}Mg(^{14}N,3pγ) 2014Ay01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Lijie Sun and Jun Chen	NDS 211,1 (2026)	30-Sep-2025

2014Ay01: ^{24}Mg(^{14}N,3p)^{35}S fusion-evaporation reaction. A 40-MeV, 5-pnA ^{14}N beam was delivered from the LNL XTU-Tandem accelerator and impinged on 1-mg/cm^2 thick, 99.7% isotopically enriched ^{24}Mg evaporated on an 8-mg/cm^2 gold layer. γ rays were detected using 4π-GASP array composed of 40 Compton-suppressed large volume HPGe detectors arranged in seven rings at different angles with respect to beam axis. Events were collected when at least two germanium detectors fired in coincidence. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma(\theta)$, $\gamma\gamma(\theta)$(ADO). Deduced levels, J, π, level lifetimes via the Doppler shift attenuation method (DSAM). Compared with large-scale shell model calculations.

^{35}S Levels

E(level)[†‡]	J$^\pi$[#]	E(level)[†‡]	J$^\pi$[#]	T$_{1/2}$[@]	E(level)[†‡]	J$^\pi$[#]	T$_{1/2}$[@]
0.0[a]	3/2$^+$	3816.0[&] *3*	9/2$^-$	0.28 ps *3*	5412.2 *3*	9/2$^+$	
1572.5 *3*	1/2$^+$	3886.4 *4*	5/2$^+$		5877.6[a] *3*	11/2$^+$	
1991.4[&] *2*	7/2$^-$	4023.2[&] *3*	11/2$^-$	0.32 ps *3*	6299.4 *4*	11/2$^+$	
2347.9 *3*	3/2$^-$	4822.9 *3*	9/2$^+$		6352.2[&] *5*	13/2$^-$	50 fs *10*
2717.1 *3*	5/2$^+$	4899.7 *4*	9/2$^+$		7179.8[a] *3*	15/2$^+$	3.1 ps *12*
3594.7[a] *3*	7/2$^+$	5010.2 *3*	11/2$^-$	0.45 ps *8*	8023.7[a] *9*	17/2$^+$	0.15 ps *4*

† Additional information 1.
‡ From a least-squares fit to γ-ray energies.
# As given in 2014Ay01, which quotes the known J^π assignments for four low-lying levels at 1572, 1991, 2347, and 2717 from 2011Ch48. 2014Ay01 assigns J^π for levels above 3 MeV based on the measured $\gamma\gamma(\theta)$(ADO) ratios. When considered in the Adopted Levels, the firm assignments here are placed within parentheses if there are no other strong arguments to support these firm assignments.
@ From DSAM line-shape analyses (2014Ay01).
& Seq.(A): ΔJ=1 sequence based on 7/2$^-$.
a Seq.(B): Sequence based on 3/2$^+$.

γ(^{35}S)

Additional information 2.
R_{ADO}=[Iγ(34°)+Iγ(146°)]/2Iγ(90°). Expected values are 0.8 for stretched dipole (ΔJ=1) and 1.4 for stretched quadrupole (ΔJ=2) or unstretched dipole (ΔJ=0) transitions.

E$_\gamma$	I$_\gamma$	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.[†]	Comments
207.0 *5*	0.4 *2*	4023.2	11/2$^-$	3816.0	9/2$^-$		
465.3 *3*	1.2 *1*	5877.6	11/2$^+$	5412.2	9/2$^+$	D	R_{ADO}=0.71 *9*.
775.4 *4*	1.4 *2*	2347.9	3/2$^-$	1572.5	1/2$^+$	D	R_{ADO}=0.68 *14*.
827.8 *6*	0.3 *1*	7179.8	15/2$^+$	6352.2	13/2$^-$		
843.9 *8*	1.6 *2*	8023.7	17/2$^+$	7179.8	15/2$^+$	D	R_{ADO}=0.8 *3*.
867.3 *3*	1.9 *1*	5877.6	11/2$^+$	5010.2	11/2$^-$	D	R_{ADO}=1.36 *20*, consistent with ΔJ=0.
877.6 *5*	0.4 *1*	3594.7	7/2$^+$	2717.1	5/2$^+$		
880.2 *4*	0.8 *1*	7179.8	15/2$^+$	6299.4	11/2$^+$		
887.0 *7*	0.4 *1*	6299.4	11/2$^+$	5412.2	9/2$^+$	D	R_{ADO}=0.6 *3*.
977.8 *3*	1.6 *1*	5877.6	11/2$^+$	4899.7	9/2$^+$	D+Q	R_{ADO}=1.43 *16*.
986.9 *3*	4.4 *2*	5010.2	11/2$^-$	4023.2	11/2$^-$	D	B(E1)(W.u.)=0.00102 *+22−16*; B(M1)(W.u.)=0.036 *+8−6* R_{ADO}=1.30 *13*, consistent with ΔJ=0.
1006.8 *2*	0.8 *1*	4822.9	9/2$^+$	3816.0	9/2$^-$	D	R_{ADO}=1.37 *11*, consistent with ΔJ=0.

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^{24}Mg(^{14}N,3pγ) 2014Ay01 (continued)

$\gamma(^{35}S)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.†	δ†	Comments
1054.5 *3*	3.0 *2*	5877.6	11/2$^+$	4822.9	9/2$^+$	D		R_{ADO}=0.72 *11*.
1228.1 *3*	1.1 *1*	4822.9	9/2$^+$	3594.7	7/2$^+$	D		R_{ADO}=0.78 *9*.
1302.2 *2*	13.5 *8*	7179.8	15/2$^+$	5877.6	11/2$^+$	E2		B(E2)(W.u.)=6.6 *+42−19* R_{ADO}=1.40 *5*, A_2=+0.27 *5*, A_4=−0.07 *5*.
1304.8 *12*	0.6 *2*	4899.7	9/2$^+$	3594.7	7/2$^+$			
1389.0 *4*	3.9 *4*	5412.2	9/2$^+$	4023.2	11/2$^-$	D		R_{ADO}=0.79 *11*.
1525.7 *8*	0.6 *1*	5412.2	9/2$^+$	3886.4	5/2$^+$			
1538.4 *8*	0.5 *2*	3886.4	5/2$^+$	2347.9	3/2$^-$			
1572.4 *3*	1.4 *4*	1572.5	1/2$^+$	0.0	3/2$^+$	D		R_{ADO}=0.88 *10*.
1824.6 *2*	24.9 *15*	3816.0	9/2$^-$	1991.4	7/2$^-$	M1+E2	+0.55 *9*	B(M1)(W.u.)=0.0099 *+14−12*; B(E2)(W.u.)=3.4 *+10−9* Mult.,δ: D+Q and δ from $\gamma(\theta)$ in 2014Ay01; E1+M2 ruled out by RUL. R_{ADO}=1.58 *5* indicating ΔJ=2 or 0 seems questionable considering ΔJ=1 from level scheme. A_2=+0.48 *4*, A_4=+0.08 *6*.
1854.4 *4*	1.7 *1*	5877.6	11/2$^+$	4023.2	11/2$^-$			
1894.9 *4*	2.1 *3*	3886.4	5/2$^+$	1991.4	7/2$^-$	D		R_{ADO}=0.69 *10*.
1991.3 *2*	100 *6*	1991.4	7/2$^-$	0.0	3/2$^+$	Q		R_{ADO}=1.45 *15*.
2031.8 *3*	68 *4*	4023.2	11/2$^-$	1991.4	7/2$^-$	E2		B(E2)(W.u.)=7.5 *+8−7* R_{ADO}=1.41 *10*, A_2=+0.29 *4*, A_4=−0.10 *6*.
2061.5 *3*	3.8 *2*	5877.6	11/2$^+$	3816.0	9/2$^-$	D		R_{ADO}=0.65 *9*.
2275.9 *6*	1.0 *2*	6299.4	11/2$^+$	4023.2	11/2$^-$			
2282.9 *4*	2.6 *1*	5877.6	11/2$^+$	3594.7	7/2$^+$			
2329.5 *9*	3.6 *7*	6352.2	13/2$^-$	4023.2	11/2$^-$	D		B(E1)(W.u.)=6.7×10^{-4} *+17−13*; B(M1)(W.u.)=0.023 *+6−5* R_{ADO}=0.8 *3*.
2347.8 *3*	3.8 *3*	2347.9	3/2$^-$	0.0	3/2$^+$			
2483.6 *8*	0.9 *2*	6299.4	11/2$^+$	3816.0	9/2$^-$			
2535.8 *11*	1.8 *2*	6352.2	13/2$^-$	3816.0	9/2$^-$	E2		B(E2)(W.u.)=5.3 *+17−11* R_{ADO}=1.5 *5*.
2717.0 *4*	0.5 *3*	2717.1	5/2$^+$	0.0	3/2$^+$			
2831.4 *9*	0.4 *1*	4822.9	9/2$^+$	1991.4	7/2$^-$			
2908.3 *5*	1.1 *2*	4899.7	9/2$^+$	1991.4	7/2$^-$	D		R_{ADO}=0.74 *14*.
3018.5 *7*	1.9 *2*	5010.2	11/2$^-$	1991.4	7/2$^-$	E2		B(E2)(W.u.)=0.223 *+49−39* R_{ADO}=1.35 *34*.
3420.6 *9*	1.1 *1*	5412.2	9/2$^+$	1991.4	7/2$^-$			
3594.7 *7*	4.3 *4*	3594.7	7/2$^+$	0.0	3/2$^+$	Q		R_{ADO}=1.36 *16*.
3886.0 *13*	0.3 *1*	5877.6	11/2$^+$	1991.4	7/2$^-$			

† From $\gamma(\theta)$, $\gamma\gamma(\theta)$(ADO) data, and RUL when $T_{1/2}$ is available in 2014Ay01.

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Level Scheme

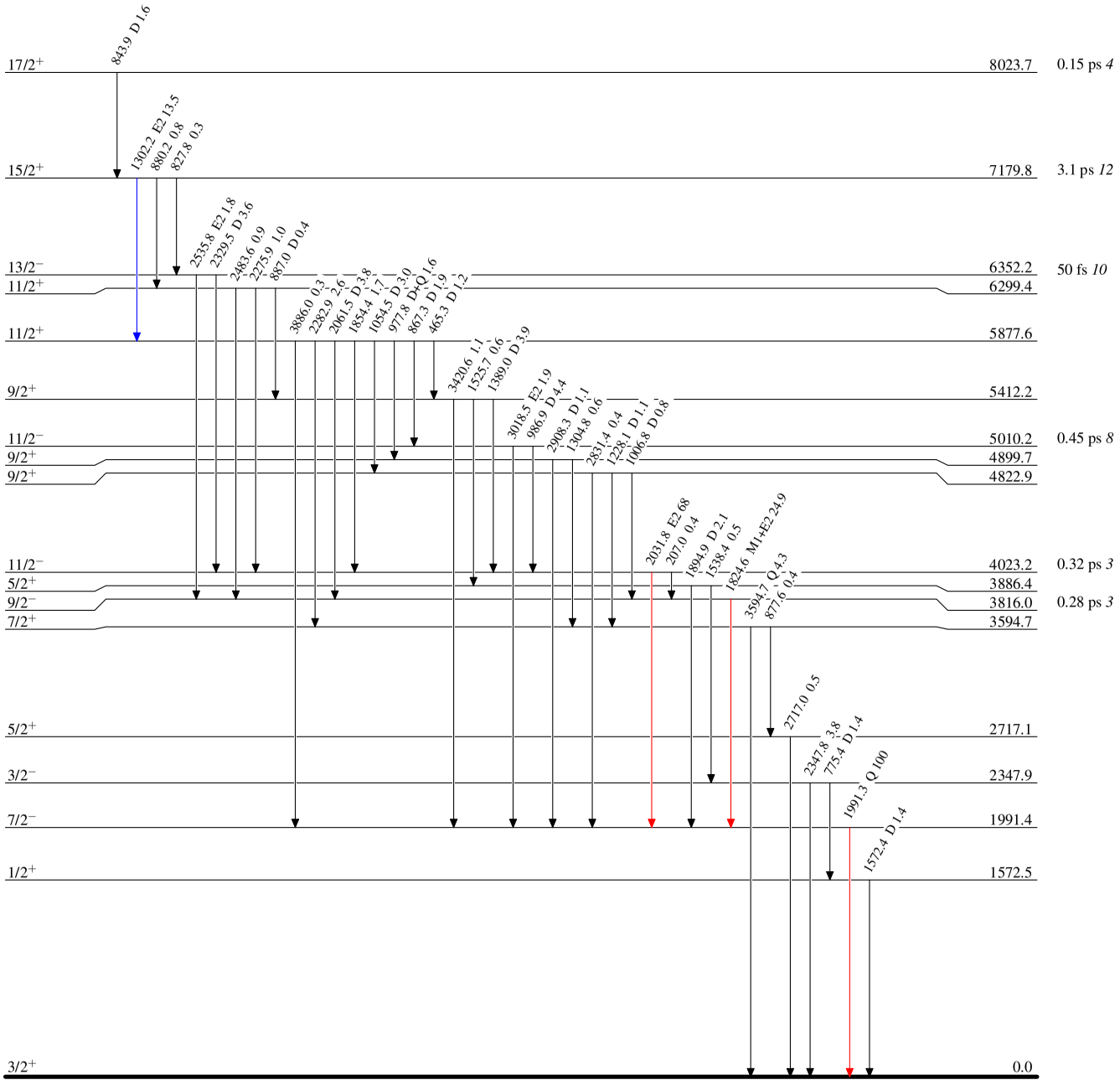
Intensities: Relative I_γ

Legend

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

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

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



$^{35}_{16}S_{19}$

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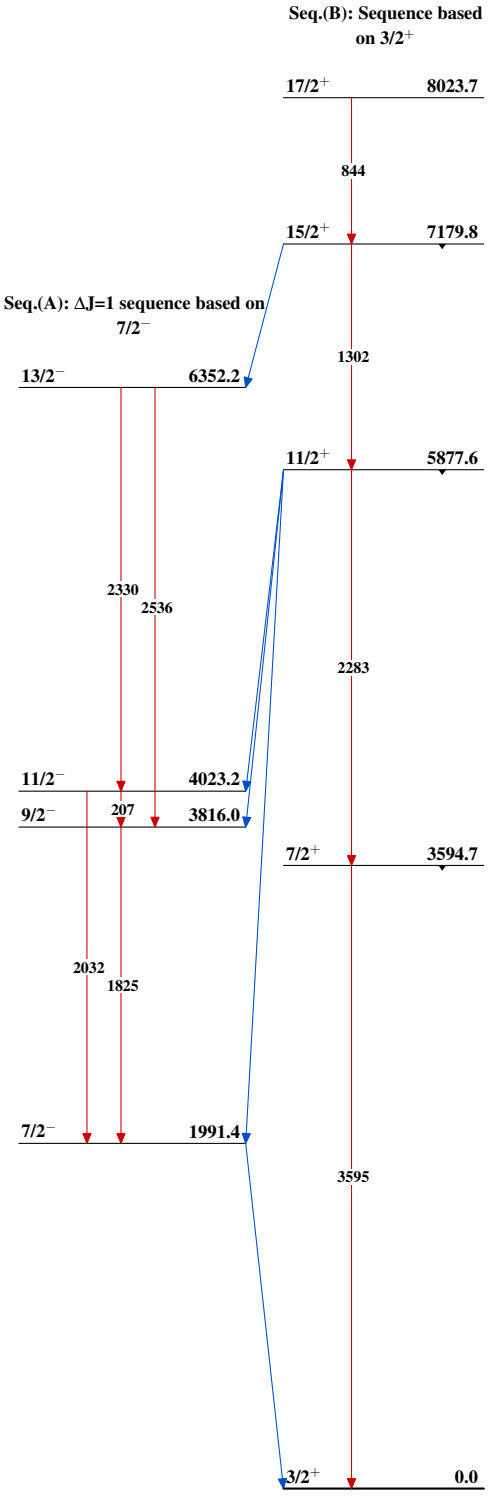

$^{35}_{16}S_{19}$