Coulomb excitation 1996Ja09,1985Si08,1972Ro27

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 199,271 (2025)	1-Sep-2024

Others: 1957Wo32, 1968An12, 1969Sa23, 1974Co11.

1996Ja09: ^{28}Si(^{81}Br,^{81}Br′γ): E(^{81}Br=210 MeV), multilayer natural Si on Gd+Ta+Al; measured γ(θ,H,T), Si-γ coin, DSAM; deduced g, $T_{1/2}$, δ; particle-vibrator and particle-rotor coupling model calculations.

1985Si08: (p,p′γ): E(p)=2.5 MeV, natural target, Ge(Li) at θ=55°; measured Eγ, B(E2).

1972Ro27: (α,α′γ): Eα=2.5-8.2 MeV, 99.6% ^{81}Br target; measured Eγ, Iγ, γ(θ) (θ=0°, 90°; A_2=0 expected for J=1/2 or 3/2 excited states), one triple angular correlation, excit.

(^{16}O,^{16}O′γ): 1972Ro27; E(^{16}O)=33 MeV; measured Doppler broadening.

^{81}Br Levels

B(E2) determined from absolute γ-ray yields.

E(level)[†]	Jπ[‡]	$T_{1/2}$[&]	Comments
0[a]	3/2⁻	stable	Jπ: from Adopted Levels.
275.97[a] *16*	5/2⁻[#]	9.7 ps *14*	B(E2)↑=0.0508 *25*; g=0.64 *20* Jπ: 5/2 from 276γ(θ) (1972Ro27), M1+E2 γ to 3/2⁻. g-factor: from γ(θ,H,T), corrected for feeding from the 837 level (1996Ja09). $T_{1/2}$: from τ=14 ps *2* (1996Ja09 (DSAM)), applying a small correction for feeding from the 837 level. However, most of the 276γ intensity (≈84%) results from direct excitation of the 275 level. $T_{1/2}$=10 ps $^{7-5}$ from adopted 276γ properties and B(E2)↑. B(E2): weighted average of 0.0514 *27* (1972Ro27) and 0.0503 *25* (1985Si08). Others: 0.041 *4* (1969Sa23, relative to B(E2)[^{79}Br, 217 level]=0.040 *3*), 0.049 *10* (1968An12), 0.029 *5* (1957Wo32).
538.2 *3*	1/2⁻,3/2⁻[@]	0.76 ps *3*	B(E2)↑=0.0085 *5* Jπ: 538γ(θ) also allows J=5/2, but implied δ=−0.19 *4* or +10 (1972Ro27) is inconsistent with δ=0.059 *1* deduced from B(E2) and $T_{1/2}$ assuming J=5/2. $T_{1/2}$: from τ=1.09 ps *4* (1996Ja09 (DSAM)). Other: 0.60 ps *13* (1972Ro27 − from τ=0.87 ps *19*). B(E2): Same value in 1972Ro27 and 1985Si08.
566.1 *3*	3/2⁻,5/2⁻,7/2⁻		B(E2)↑=0.0035 *10* B(E2): unweighted average of 0.0025 *2* (1972Ro27) and 0.0044 *3* (1985Si08). Other: 0.031 *7* (1968An12) (possibly based on combined yields of 561γ and 566γ (1972Ro27)).
650.0 *4*	1/2⁻,3/2⁻,5/2[@]	2.6 ps *3*	B(E2)↑=0.00226 *13* $T_{1/2}$: from τ=3.8 ps *4* (1996Ja09). Others: 3.6 ps *+10−19* (1972Ro27 − from τ=5.2 ps *14-27*), 2.6 ps *4* from B(E2)↑ and adopted γ-ray properties. B(E2): weighted average of 0.00224 *13* (1972Ro27) and 0.0023 *2* (1985Si08).
767.2 *3*	(5/2)⁻[@]	0.54 ps *4*	B(E2)↑=0.0315 *16*; g=0.38 *15* g-factor: from γ(θ,H,T) (1996Ja09). B(E2): weighted average of 0.0301 *16* (1972Ro27) and 0.0340 *23* (1985Si08), and 0.04 *1* (1968An12). $T_{1/2}$: weighted average of 0.55 ps *3* (1996Ja09 − authors′ recommended value based on $T_{1/2}$=0.53 ps *3* (491γ) and 0.561 ps *14* (767γ)) and 0.42 ps *9* (1972Ro27). Other: 0.57 ps *6* from B(E2)↑ and adopted 767.2γ-ray properties. Jπ: not 7/2 from 767γ(θ); probably not 3/2 based on apparently non-zero A_2 for 767γ(θ) (1972Ro27).
828.5 *3*	3/2⁻[#]	0.46 ps *7*	B(E2)↑=0.0094 *10* Jπ: from Adopted Levels. $T_{1/2}$: weighted average of 0.49 ps *7* (1996Ja09 − from τ=0.7 ps *1*) and 0.36 ps *12*

Continued on next page (footnotes at end of table)

Coulomb excitation 1996Ja09,1985Si08,1972Ro27 (continued)

^{81}Br Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[&]	Comments
			(1972Ro27 − from τ=0.52 ps *17*). B(E2): weighted average of 0.0087 *10* (1972Ro27) and 0.0103 *12* (1985Si08). 1972Ro27 datum derived from 552γ yield assuming I(828γ)/I(552γ)=3.0 *2* (cf. adopted value of 3.1 *3*) because 828γ was believed to include a contaminant.
836.5[a] *3*	7/2$^-$[@]	1.05 ps *7*	B(E2)↑=0.058 *5*; g=0.41 *11* Jπ: also from beam-561γ-276γ(θ) and 561γ(θ) (1972Ro27). $T_{1/2}$: weighted average of 1.04 *7* (1996Ja09, DSAM, based on 1.05 ps *4* from 561γ and 1.04 ps *7* from 837γ) and 1.29 ps *+34−28* from B(E2) and adopted 837γ branching. Other: 0.64 ps *15* from Doppler broadening of 561γ (1972Ro27); inconsistent with aforementioned values. B(E2): from 1985Si08. Others: 0.050 *17* (1968An12); 0.067 *10* (1972Ro27 datum, as recalculated by the evaluator from authors′ data using adopted branching of 27% *8* for the 836γ; 1972Ro27 report 0.055 *4* based on yield of the 561γ and $T_{1/2}$ from their DSAM measurements). g-factor: from γ(θ,H,T) (1996Ja09).
1322.8 *5*	(5/2)$^-$	≤0.31 ps	B(E2)↑=0.0123 *16* Jπ: from Adopted Levels. $T_{1/2}$: ≤0.20 ps, ≤0.31 ps, 0.33 ps *8* for J=3/2, 5/2, 7/2, respectively, from B(E2) and adopted branching; listed value is for the adopted J=5/2. B(E2) from 1972Ro27. Level not reported in 1985Si08.

† From a least-squares fit to Eγ.

‡ Since the mode of excitation is believed to be E2 and J^π(g.s.)=3/2$^-$, all directly excited states are expected to have odd parity and J=1/2 to 7/2. J is further limited based on γ(θ).

\# B(E2) for this level is predicted accurately by particle-rotor model, but not by particle-vibrator model (1996Ja09).

@ Based on particle-vibrator-core model, which predicts B(E2) for this level more accurately compared to the particle-rotor-core model, this state can be described by a wave function which contains a significant contribution from configuration: π $p_{3/2}$ coupled to 2$^+$ core (1996Ja09).

& From DSAM in 1996Ja09. In 1972Ro27, the deduced $T_{1/2}$ from Doppler broadening of γ-ray peaks and their stated $\Delta T_{1/2}$ includes the uncertainty in the fit and ±20% for uncertainty in the stopping power.

a Band(A): Possible g.s. band (1972Ro27).

$\gamma(^{81}Br)$

Additional information 1.
Yield measured at θ=55°. $\gamma\gamma$ measurement at θ=0° and 90°. NaI and Ge(Li) detectors (1972Ro27).

E_i(level)	J^π_i	E_γ[†]	I_γ[#]	E_f	J^π_f	Mult.[b]	δ[c]	α[f]	Comments
275.97	5/2⁻	275.9 *2*	100	0	3/2⁻	M1+E2	−0.10[d] *3*	0.00817 *15*	α(K)=0.00725 *13*; α(L)=0.000782 *14*; α(M)=0.0001243 *23* α(N)=1.159×10^{-5} *21* Additional information 2.
538.2	1/2⁻,3/2⁻	538.2 *3*	100	0	3/2⁻	M1+E2	0.087 *15*	1.63×10^{-3} *2*	α(K)=0.001454 *21*; α(L)=0.0001540 *22*; α(M)=2.448×10^{-5} *35* α(N)=2.293×10^{-6} *32* δ: average of abs(δ)=0.102 *4* if J=1/2, 0.072 *3* if J=3/2 (from B(E2) and $T_{1/2}$). Additional information 3.
566.1	3/2⁻,5/2⁻,7/2⁻	290.0 *3*	74 *2*	275.97	5/2⁻	D+Q	[e]		I_γ: weighted average of 76 *4* (1972Ro27) and 74 *2* (1985Si08).
		566.2 *4*	26 *2*	0	3/2⁻	M1+E2		0.00175 *30*	α(K)=0.00155 *26*; α(L)=0.000167 *30*; α(M)=2.6×10^{-5} *5* α(N)=2.5×10^{-6} *4* I_γ: weighted average of 24 *4* (1972Ro27) and 26 *2* (1985Si08).
650.0	1/2⁻,3/2⁻,5/2	650.0 *4*	100	0	3/2⁻	M1+E2	0.111 *7*	1.07×10^{-3} *2*	α(K)=0.000950 *13*; α(L)=0.0001003 *14*; α(M)=1.593×10^{-5} *22* α(N)=1.493×10^{-6} *21* δ: from B(E2)↑ and $T_{1/2}$ assuming J=3/2; abs(δ)=0.157 *10* if J=1/2. A_2 from $\gamma(\theta)$ consistent with 0, as expected for J=1/2 or 3/2.
767.2	(5/2)⁻	491.2 *3*	16[@] *3*	275.97	5/2⁻	M1+E2	+0.25 *13*	0.00208 *8*	α(K)=0.00185 *7*; α(L)=0.000196 *8*; α(M)=3.12×10^{-5} *13* α(N)=2.92×10^{-6} *12* I_γ: unweighted average of 13 *1* (1972Ro27) and 19 *2* (1985Si08). δ: +0.25 *13* or −3.2 *+10−22* from $\gamma(\theta)$ (1972Ro27); the latter solution implies B(E2)(W.u.)>180, making it less plausible. Additional information 4.
		767.2 *4*	84[@] *3*	0	3/2⁻	M1+E2	−0.260 *13*	7.48×10^{-4} *11*	A_2=+0.102 *9*; A_4=−0.065 *22* (1996Ja09) α(K)=0.000666 *9*; α(L)=7.01×10^{-5} *10*; α(M)=1.113×10^{-5} *16* α(N)=1.044×10^{-6} *15*

$^{81}_{35}Br_{46}$-3

$\gamma(^{81}Br)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[b]	δ[c]	α[f]	Comments
									I_γ: unweighted average of 87 *1* (1972Ro27) and 81 *2* (1985Si08). δ: absolute value from B(E2) and $T_{1/2}$, if J(767 level)=5/2; sign from $\gamma(\theta)$ in 1972Ro27. Other: −0.16 *3* or +7.8 from $\gamma(\theta)$ (1972Ro27); 0.33 *5* from $\gamma(\theta)$ measurements (A_2 and A_4) in 1996Ja09. Additional information 5.
828.5	3/2⁻	552.5 *3*	23[&] *3*	275.97	5/2⁻	M1+E2		0.00187 *33*	α(K)=0.00166 *29*; α(L)=0.000178 *34*; α(M)=2.8×10^{-5} *5* α(N)=2.6×10^{-6} *5* I_γ: in 1985Si08: 24 *3*. See footnote.
		828.7[‡] *5*	72[&] *3*	0	3/2⁻	M1+E2	0.18 *3*	6.29×10^{-4} *9*	α(K)=0.000560 *8*; α(L)=5.88×10^{-5} *8*; α(M)=9.34×10^{-6} *13* α(N)=8.76×10^{-7} *12* I_γ: in 1985Si08: 76 *3*. See footnote. Additional information 6.
836.5	7/2⁻	560.6 *3*	82[a] *6*	275.97	5/2⁻	M1+E2	−0.193 *12*	1.51×10^{-3} *2*	A_2=+0.173 *18*; A_4=+0.011 *8* (1996Ja09) α(K)=0.001340 *19*; α(L)=0.0001420 *20*; α(M)=2.256×10^{-5} *32* α(N)=2.112×10^{-6} *30* I_γ: unweighted average of 87 *4* (1972Ro27) and 76 *4* (1985Si08). δ: −0.193 *12* from A_2 for 561$\gamma(\theta)$ combined with beam-561γ-276γ triple angular correlation data (1972Ro27); 0.30 *4* (1996Ja09) from $\gamma(\theta)$. Additional information 7.
		836.5[‡] *5*	19[‡a] *6*	0	3/2⁻	E2		7.06×10^{-4} *10*	A_2=+0.351 *25*; A_4=−0.07 *4* (1996Ja09) α(K)=0.000627 *9*; α(L)=6.68×10^{-5} *9*; α(M)=1.059×10^{-5} *15* α(N)=9.86×10^{-7} *14* I_γ: unweighted average of 13 *4* (1972Ro27) and 24 *4* (1985Si08). Mult.: stretched Q from $\gamma(\theta)$ measurements (1996Ja09). Other $\gamma(\theta)$ in 1972Ro27. Additional information 8.
1322.8	(5/2)⁻	486.4 *4*	26 *6*	836.5	7/2⁻				I_γ: from 1972Ro27.
		1046.1 *10*	74 *6*	275.97	5/2⁻				I_γ: from 1972Ro27.
		(1322.8)		0	3/2⁻				Expected but not observed; Eγ from level energy difference.

[†] From 1972Ro27, except as noted.

[‡] In 1972Ro27, the observed yield may not result entirely from Coulomb excitation of ^{81}Br; γ yield agrees with Coulomb excitation theory but abs(A_2) from $\gamma(\theta)$ is too large cf. theory. Contaminant suspected by 1972Ro27, but observed γ peak exhibits no broadening (so contaminant Eγ differs by <1 keV). Iγ(828)/Iγ(561) is

From ENSDF

$^{81}_{35}Br_{46}$-4

$\gamma(^{81}Br)$ (continued)

consistent with values from 1985Si08 and from (n,n′γ) and in-beam studies.

[#] % photon branching. Weighted average data in 1972Ro27 and 1985Si08, except where otherwise noted.

[@] Weighted average of data in 1972Ro27, 1974Co11 and 1985Si08. Data do not agree within authors′ stated uncertainties.

[&] Deduced by evaluator from I(553γ):I(829γ) in 1985Si08, assuming unobserved 178γ, 290γ together constitute 5.5% of branching from this level (from Adopted Levels); 178γ (1.5% *2* branch) not observed in Coulomb excitation and 290γ (4.0% *4* branch) not resolved in Coulomb excitation from 290γ deexciting 566 level. Other: 1974Co11.

[a] From γ-ray yields (1972Ro27). Others: Iγ(836γ)/Iγ(560γ)=(24 *4*)/(76 *4*) (1985Si08), (27 *5*)/(73 *5*) (1974Co11); all these values are consistent with branching in (α,pγ) and (n,n′γ) reactions. Iγ(836γ)=21.8 *24* based on B(E2) and $T_{1/2}$ from DSAM in 1996Ja09; however, 1972Ro27 favor Iγ(836γ)=13 *4*, based on their $T_{1/2}$ from DSAM (not adopted here) and yield of 561γ, assuming 837γ has pure E2 multipolarity.

[b] Based on γ(θ) and observation that γ yield varies with Eα as expected from E2 Coulomb excitation theory (1972Ro27).

[c] From γ(θ) (1972Ro27) if sign is indicated; abs(δ) from B(E2) and $T_{1/2}$, except where otherwise noted.

[d] Weighted average of 0.14 *3* from A_2=−0.041 *7*, A_4=−0.005 *6* (1996Ja09) and −0.085 *22* from 276γ(θ) (1972Ro27). Sign taken from 1972Ro27. Alternative solution (δ=+4.8 *5*, 1972Ro27) is incompatible with measured B(E2) and $T_{1/2}$ for 276 level.

[e] Combining 290γ-276γ(θ) data of 1963Ar01 (from $1/2^-$ ^{81}Se β^- decay) with their 276γ(θ) data, 1972Ro27 deduce J(566 level)≠1/2 and δ(290γ)=+0.07 *9* or −4.5 *+14−33* if J=3/2. However, neither of these δ values is consistent with δ(290γ)=+0.85 *30* from γγ(θ) in (p,γ) and 1.22 *+32−23* from ^{81}Se β^- decay.

[f] Additional information 9.

$^{81}_{35}Br_{46}$-5

Legend

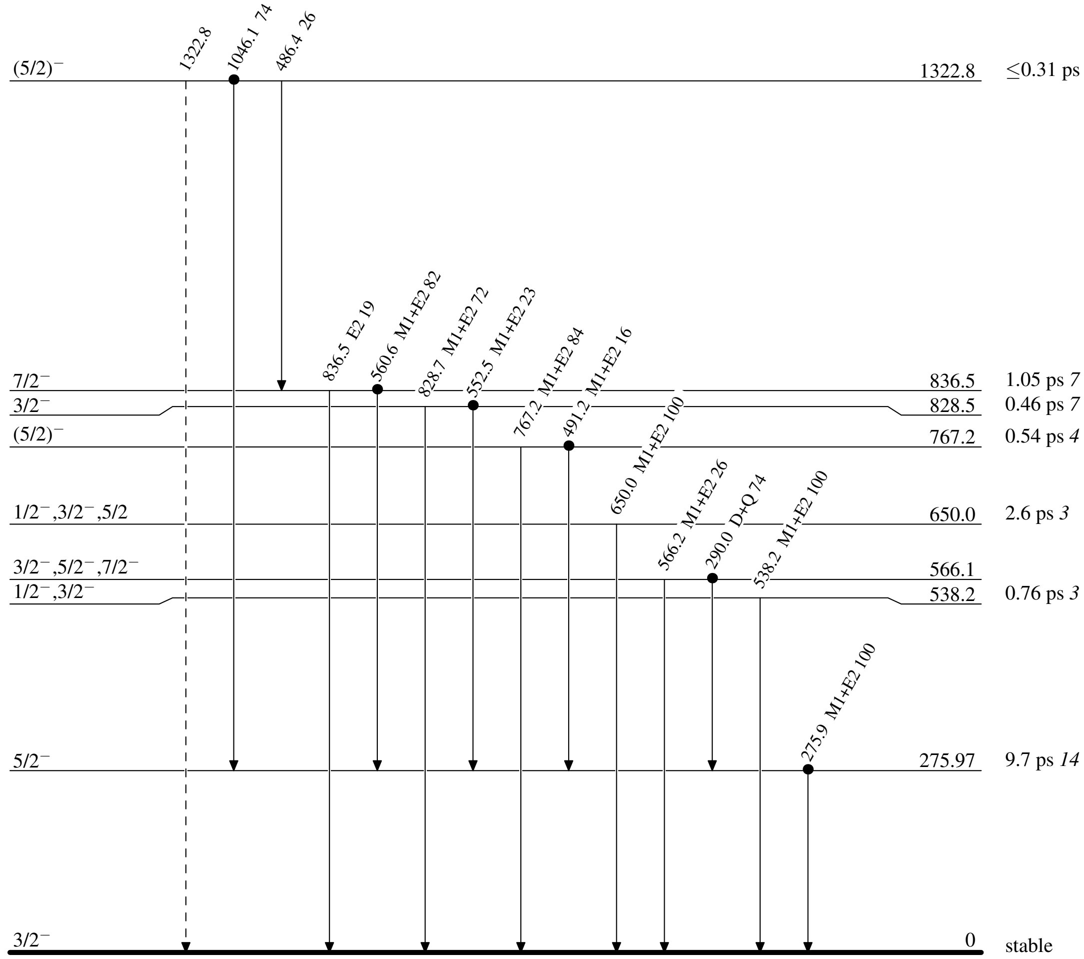
Coulomb excitation 1996Ja09,1985Si08,1972Ro27

Level Scheme

Intensities: % photon branching from each level

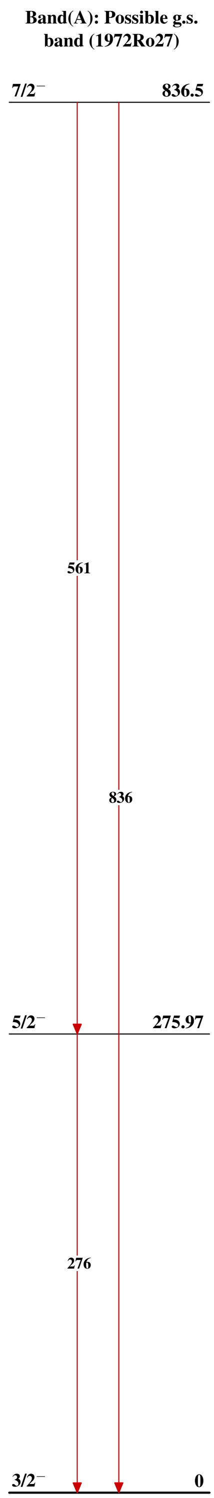
- - - - - -► γ Decay (Uncertain)

● Coincidence



$^{81}_{35}Br_{46}$

Coulomb excitation 1996Ja09,1985Si08,1972Ro27



$^{81}_{35}Br_{46}$