

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Ameenah R. Farhan, Balraj Singh		NDS 110,1917 (2009)	30-Jun-2009

$Q(\beta^-)=955$ 11; $S(n)=8721$ 4; $S(p)=13159$ 5; $Q(\alpha)=-8530$ 5 [2012Wa38](#)

Note: Current evaluation has used the following Q record \$ 955 10 8719 4 13159 5 -8530 4 [2009AuZZ,2003Au03](#).

$S(2n)=14792$ 4, $s(2p)=24137$ 4 ([2009AuZZ](#)).

Values in [2003Au03](#): $Q(\alpha)=-8580$ 50, $s(2p)=24300$ 80 ([2003Au03](#)); others same as in [2009AuZZ](#).

Other reaction: $^{238}\text{U}(p,F)$, $E=25$ MeV, measured fission fragment mass distribution ([1997Hu09](#)).

[Additional information 1](#).

Nuclear structure calculations: [2008Yo07](#) (high-spin levels, B(E2), shell model), [1992Er02](#), [1992Hs02](#).

Double β decay calculation: [2001Ka15](#).

 ^{78}Ge LevelsCross Reference (XREF) Flags

A	^{78}Ga β^- decay (5.09 s)	D	Coulomb excitation
B	^{79}Ga β^-n decay (2.847 s)	E	$^{82}\text{Se}(d,^6\text{Li})$
C	$^{76}\text{Ge}(t,p)$	F	$^{192}\text{Os}(^{82}\text{Se},X\gamma)$

E(level) [†]	J π [‡]	T _{1/2} [#]	XREF	Comments
0.0 [@]	0 ⁺	88.0 min 10	ABCDEF	$\% \beta^- = 100$ T _{1/2} : from 1965Kv01 . Others: 88 min 2 (1965Fr04), 86 min 1 (1953Su04).
619.36 [@] 12	2 ⁺	13.5 ps 24	A CDEF	J π : level is Coulomb excited from 0 ⁺ ; L(t,p)=2. T _{1/2} : weighted average of 15.9 ps 28 from $\beta\gamma\gamma(t)$ in β^- decay (1993Ch05) and 11.1 ps 7 from B(E2) $\uparrow=0.222$ 14 (2005Pa23).
1186.51 12	2 ⁺	12 ps 6	A C E	J π : L(t,p)=2.
1546.6 4	0 ⁺	25 ps 11	A C E	J π : L(t,p)=0.
1570.20 [@] 19	4 ⁺	<3.5 ps	A C EF	J π : L(t,p)=4.
1644.58 14	(2,3,4 ⁺)	15 ps 6	A	J π : log ft=6.64 from (3 ⁺); γ to 2 ⁺ .
1842.73 22	2 ⁺		A C	J π : L(t,p)=2.
2292 3	(4 ⁺)		C	J π : L(t,p)=(4).
2319.57 20	(2,3,4)	43 ps 5	A	J π : log ft=6.26 from (3 ⁺).
2330 3			C	J π : L(t,p)=(4,5) suggests (4 ⁺ ,5 ⁻), another L(t,p)=(0,4) suggests (0 ⁺ ,4 ⁺). The 2330 peak in (t,p) may contain contribution from 2319 level as well.
2404? 5			C	
2438.71 19	(2 ⁺)	<7 ps	A C	J π : L(t,p)=2.
2652 3	(5 ⁻)		C	J π : L(t,p)=5.
2665.63 17	(2,3,4 ⁺)	4.2 ps 25	A	J π : log ft=5.81 from (3 ⁺); γ to 2 ⁺ .
2706.01 19	(2 ⁺)		A	J π : log ft=6.29 from (3 ⁺); γ to 0 ⁺ .
2748.2 [@] 11	(6 ⁺)		F	J π : yrast population in ($^{82}\text{Se},X$).
2759 10	(3 ⁻ ,4 ⁺)		C	J π : L(t,p)=(3,4).
2850 10	(5 ⁻)		C	J π : L(t,p)=5.
2857.14 19	(2,3,4 ⁺)		A	J π : log ft=6.20 from (3 ⁺); γ to 2 ⁺ .
2952.9 3	(4 ⁺)	9 ps 4	A C	J π : L(t,p)=4.
3120.60 20	(2,3,4 ⁺)	<2.8 ps	A	J π : log ft=5.65 from (3 ⁺); γ to 2 ⁺ .
3183 10	(2 ⁺)		C	J π : L(t,p)=2.
3236 10	(1 ⁻ &3 ⁻)		C	J π : L(t,p)=1+3.
3287 10	(6 ⁺)		C	J π : L(t,p)=6.
3350 10	(0 ⁺)		C	J π : L(t,p)=0.
3389.91 22	(2 ⁺ ,3,4 ⁺)		A C	J π : log ft=6.18 from (3 ⁺); γ 's to 2 ⁺ and (4 ⁺).
3615 10	(3 ⁻)		C	J π : L(t,p)=3.
3638 10	(2 ⁺)		C	J π : L(t,p)=2.
3667 10	0 ⁺		C	J π : L(t,p)=0.

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Adopted Levels, Gammas (continued) ^{78}Ge Levels (continued)

E(level) [†]	J ^π [‡]	XREF	Comments
3687.73 17	(4 ⁺)	A C	XREF: C(3707). J ^π : L(t,p)=4.
3714.2@ 15	(8 ⁺)	F	J ^π : yrast population in (⁸² Se,X).
3797 10	(3 ⁻)	C	J ^π : L(t,p)=3.
3816 10	(2 ⁺)	C	J ^π : L(t,p)=2.
3898 10	0 ⁺	C	J ^π : L(t,p)=0.
3965 10	(2 ⁺)	C	J ^π : L(t,p)=2.
4015 10	(0 ⁺)	C	J ^π : L(t,p)=0.
4036 10	(5 ⁻)	C	J ^π : L(t,p)=5.
4070 10	(2 ⁺)	C	J ^π : L(t,p)=2.
4083.7 5	(2,3,4 ⁺)	A	J ^π : log ft=5.64 from (3 ⁺); γ to 2 ⁺ .
4115 10	(1 ⁻)	C	J ^π : L(t,p)=1.
4134 10	(2 ⁺)	C	J ^π : L(t,p)=2.
4270.08 23	(2,3,4 ⁺)	A C	XREF: C(4259). J ^π : log ft=5.76 from (3 ⁺); γ to 2 ⁺ .
4279.4 4	(2,3,4 ⁺)	A	J ^π : log ft=5.81 from (3 ⁺); γ to 2 ⁺ .
4305 10		C	
4335 10		C	
4378 10		C	
4745 10		C	
4816 10		C	
5078.2 10	(2,3,4 ⁺)	A	J ^π : log ft=5.68 from (3 ⁺); γ to 2 ⁺ .
5191 10		C	
5324 10		C	

[†] From least squares fit to Eγ's.[‡] From L transfer in (t,p) except as noted. The evaluators consider all assignments as tentative for levels above 1843 since there seem disagreements between the (t,p) data of 1978Ar12 and 1987Ma21. Moreover, L(t,p)>2 distribution patterns are generally not characteristic of a unique L value.# From βγγ(t) fast timing technique in β⁻ decay (1993Ch05), except as noted.

@ Band(A): yrast structure.

γ(^{78}Ge)

E _i (level)	J _i ^π	E _γ [†]	I _γ [†]	E _f	J _f ^π	Mult.	Comments
619.36	2 ⁺	619.40 16	100	0.0	0 ⁺	[E2]	B(E2)(W.u.)=23 4
1186.51	2 ⁺	567.06 16	91 5	619.36	2 ⁺	[E2]	B(E2)(W.u.)=19 11
		1186.42 16	100 5	0.0	0 ⁺	[E2]	B(E2)(W.u.)=0.53 24
1546.6	0 ⁺	927.2 3	100	619.36	2 ⁺		
1570.20	4 ⁺	950.77 17	100	619.36	2 ⁺	[E2]	B(E2)(W.u.)>11
1644.58	(2,3,4 ⁺)	458.00 15	47 3	1186.51	2 ⁺		
		1025.11 17	100 6	619.36	2 ⁺		
1842.73	2 ⁺	1223.36 18	100	619.36	2 ⁺		
2319.57	(2,3,4)	674.86 17	100	1644.58	(2,3,4 ⁺)		
2438.71	(2 ⁺)	891.3 16	12 7	1546.6	0 ⁺		
		1251.96 20	65 8	1186.51	2 ⁺		
		1819.59 21	100 16	619.36	2 ⁺		
2665.63	(2,3,4 ⁺)	345.76 26	63 9	2319.57	(2,3,4)		
		1021.2 4	15 4	1644.58	(2,3,4 ⁺)		
		1479.13 18	100 7	1186.51	2 ⁺		
		2046.32 25	67 7	619.36	2 ⁺		
2706.01	(2 ⁺)	862.8 15	25 11	1842.73	2 ⁺		
		1061.9 4	20 6	1644.58	(2,3,4 ⁺)		

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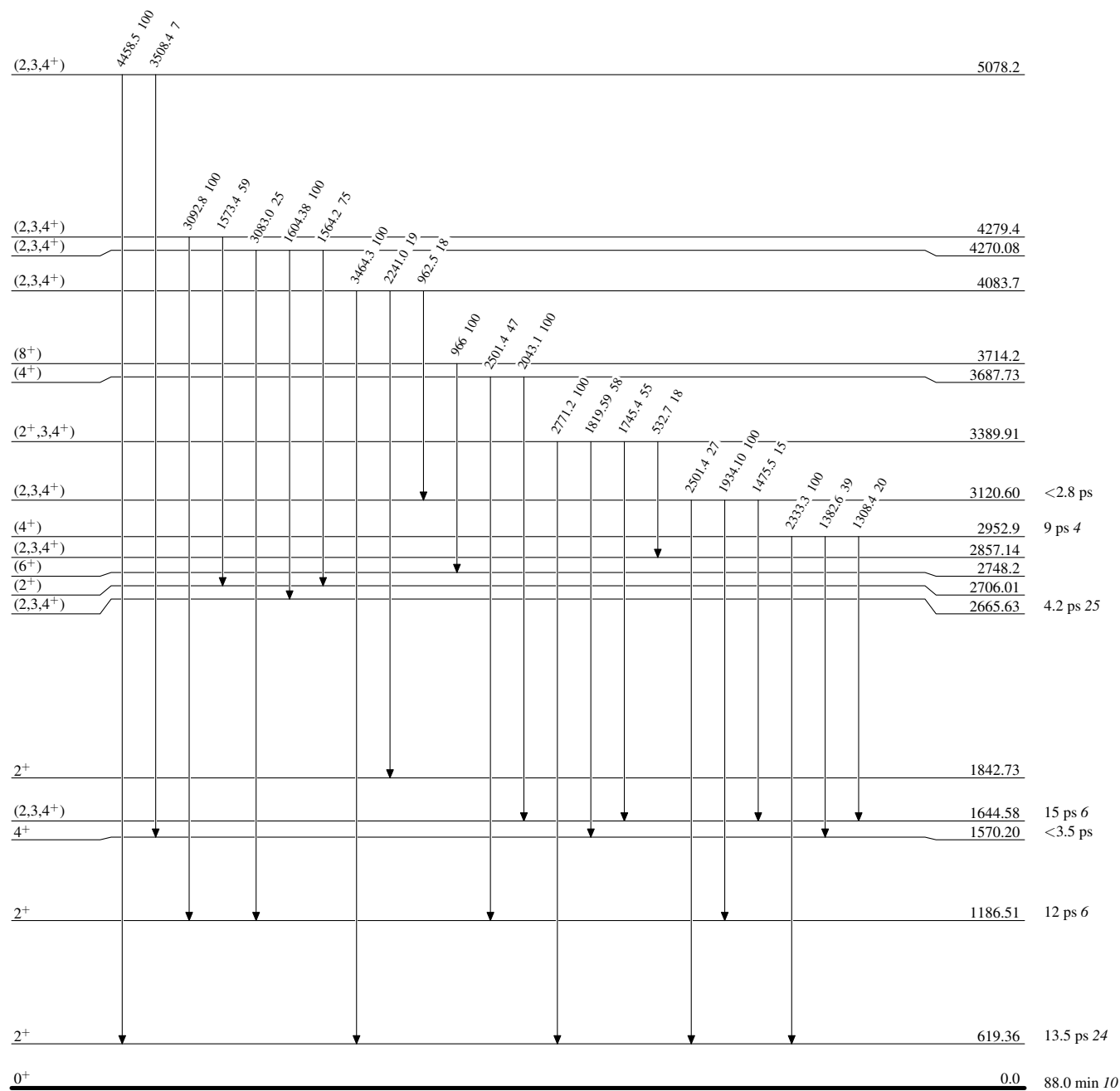
Adopted Levels, Gammas (continued) $\gamma(^{78}\text{Ge})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π
2706.01	(2 ⁺)	1519.32 24	47 7	1186.51	2 ⁺
		2706.2 4	100 11	0.0	0 ⁺
2748.2	(6 ⁺)	1178 [‡]	100 [‡]	1570.20	4 ⁺
2857.14	(2,3,4 ⁺)	1212.41 24	100 13	1644.58	(2,3,4 ⁺)
		1670.67 23	83 10	1186.51	2 ⁺
		2237.9 4	63 13	619.36	2 ⁺
2952.9	(4 ⁺)	1308.4 3	20 10	1644.58	(2,3,4 ⁺)
		1382.6 9	39 35	1570.20	4 ⁺
		2333.3 4	100 17	619.36	2 ⁺
3120.60	(2,3,4 ⁺)	1475.5 4	15 6	1644.58	(2,3,4 ⁺)
		1934.10 21	100 7	1186.51	2 ⁺
		2501.4 3	27 5	619.36	2 ⁺
3389.91	(2 ⁺ ,3,4 ⁺)	532.7 4	18 5	2857.14	(2,3,4 ⁺)
		1745.4 4	55 13	1644.58	(2,3,4 ⁺)
		1819.59 21	58 24	1570.20	4 ⁺
		2771.2 6	100 24	619.36	2 ⁺
3687.73	(4 ⁺)	2043.1 1	100 18	1644.58	(2,3,4 ⁺)
		2501.4 3	47 24	1186.51	2 ⁺
3714.2	(8 ⁺)	966 [‡]	100 [‡]	2748.2	(6 ⁺)
4083.7	(2,3,4 ⁺)	962.5 15	18 9	3120.60	(2,3,4 ⁺)
		2241.0 6	19 5	1842.73	2 ⁺
		3464.3 8	100 12	619.36	2 ⁺
4270.08	(2,3,4 ⁺)	1564.2 3	75 12	2706.01	(2 ⁺)
		1604.38 23	100 14	2665.63	(2,3,4 ⁺)
		3083.0 15	25 15	1186.51	2 ⁺
4279.4	(2,3,4 ⁺)	1573.4 3	59 11	2706.01	(2 ⁺)
		3092.8 7	100 17	1186.51	2 ⁺
5078.2	(2,3,4 ⁺)	3508.4 16	7 5	1570.20	4 ⁺
		4458.5 12	100 18	619.36	2 ⁺

[†] From ^{78}Ga β^- decay unless otherwise stated.[‡] From $^{192}\text{Os}(^{82}\text{Se}, X\gamma)$ only.

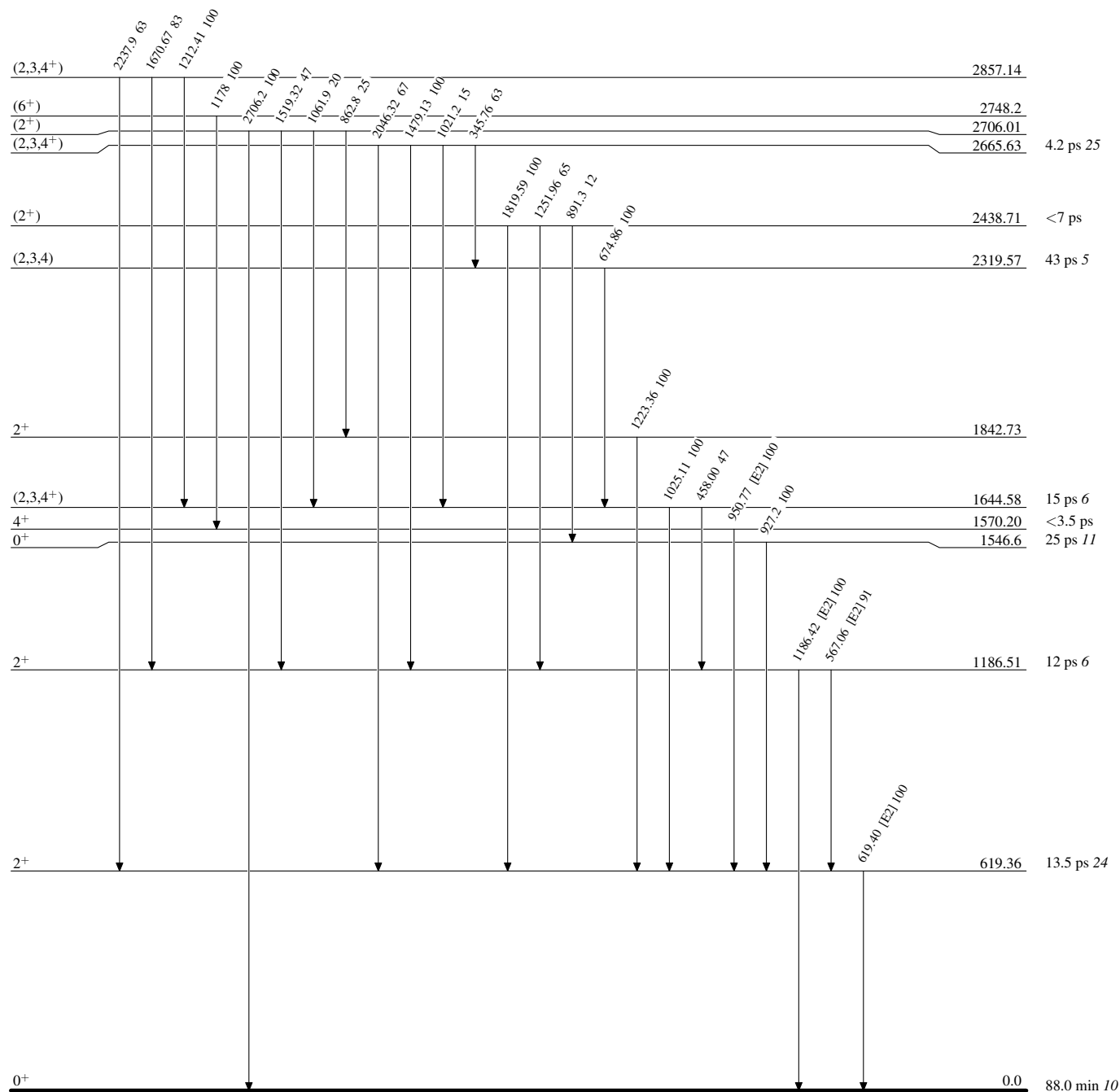
Adopted Levels, Gammas**Level Scheme**

Intensities: Relative photon branching from each level



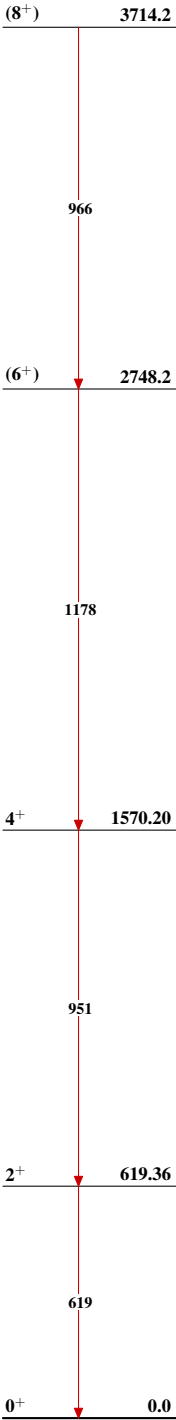
Adopted Levels, GammasLevel Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Band(A): Yrast structure



$^{78}_{32}\text{Ge}_{46}$