Adopted Levels, Gammas

Q(β^-)=−11874.4 *9*; S(n)=12740.3 *7*; S(p)=5896.2 *7*; Q(α)=−6429.7 *7* 2021Wa16

Q(β^-n)=−29632 *17*, from mass excesses of −1487 *17* for ^{34}K measured by 2024Dr01; −23047.3 *7* for ^{35}Ar from 2021Wa16. Value from 2021Wa16: Q(β^-n)=−29900 *200* (syst).

S(2n)=29805.6 *8*, S(2p)=11039.4 *7*, Q(ε)=5966.2 *7* (2021Wa16).

Isotope discovery (2012Th10): ^{32}S(α,n)^{35}Ar at Purdue (1940Ki12,1941Ki01,1941El04).

^{35}Ar production:

2012Zh06: ^{9}Be,^{181}Ta(^{40}Ar,X) at E(^{40}Ar)=57 MeV/nucleon at HIRFL. Measured momentum distributions and production cross sections of fragments. Observed competition between projectile fragmentation and other mechanisms. Compared with EPAX, abrasion- ablation, and HIPSE models. Studied target dependence of fragment cross sections.

2007No13: ^{181}Ta(^{40}Ar,X) at E(^{40}Ar)=100 MeV/nucleon at RIKEN. Measured fragment momentum distributions and production cross sections.

^{35}Ar radius measurements:

2002Oz03: C(^{35}Ar,X) at E(^{35}Ar)≈950 MeV/nucleon at RIKEN. Measured interaction cross sections. Deduced effective radii and proton skin features.

2000Ge20: ^{35}Ar produced at ISOLDE. Measured β asymmetry and hyperfine structure using β-NMR spectroscopy. Deduced mean squared charge radii and quadrupole moments.

1996Kl04,1995KlZZ: ^{35}Ar produced by ISOLDE. Measured isotope shifts and hyperfine structure using collinear fast-beam laser spectroscopy. Deduced mean square charge radii and electric quadrupole moments.

^{35}Ar mass measurement: 2011Tu09.

Theoretical calculations: 2020Ri06, 2020RiZX, 2020RiZZ.

^{35}Ar Levels

Cross Reference (XREF) Flags

A	^{35}K ε decay (175 ms)	E	^{24}Mg(^{16}O,αnγ)	I	^{36}Ar(p,d)
B	^{36}Ca εp decay (100.9 ms)	F	^{32}S(α,n)	J	^{36}Ar(d,t)
C	^{1}H(^{36}Ar,d)	G	^{33}S(^{3}He,nγ)	K	^{36}Ar(^{3}He,α)
D	^{16}O(^{24}Mg,αnγ)	H	^{35}Cl(^{3}He,t)		

E(level)[†]	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0	3/2$^+$	1.7756 s *14*	ABCDEFG IJK	%ε+%β^+=100 μ=+0.6322 *2* (2002Ma41,2019StZV) Q=−0.084 *15* (1996Kl04,2021StZZ) μ: β−NMR (2002Ma41). Others: +0.633 *2* (1965Ca04), +0.633 *7* (1996Kl04) using β-NMR. Q: β-NMR (1996Kl04). J$^\pi$: L(p,d)=L(d,t)=L(^{3}He,α)=L^{1}H(^{36}Ar,d)=2 from 0$^+$. Allowed ε+β^+ feedings to 1/2$^+$ levels in ^{35}Cl. Mirror level: 3/2$^+$ ^{35}Cl g.s. T$_{1/2}$: weighted average of 1.83 s *3* (1956Ki29), 1.83 s *2* (1959Al10), 1.79 s *1* (1960Ja12), 1.84 s *10* (1960Wa04), 1.76 s *3* (1963Ne05), 1.770 s *6* (1969Wi18), 1.787 s *12* (1971Ge04), 1.774 s *4* (1977Az01), and 1.7754 s *11* (2006Ia05). Evaluated rms nuclear charge radius R=3.3636 fm *42* (2013An02).
1184.08 *25*	1/2$^+$		ABC FG IJK	XREF: F(890) E(level): 1963Ne05 (α,n) observed the first excited state in ^{35}Ar at 890 *50* keV. J$^\pi$: L(p,d)=L(d,t)=L(^{3}He,α)=0 from 0$^+$.
1750.78 *22*	(5/2)$^+$		A DEFG IJK	XREF: F(2030)I(1700)J(1700) E(level): 1963Ne05 (α,n) observed the second excited state in ^{35}Ar at 2030 *80* keV. J$^\pi$: L(^{3}He,α)=2 from 0$^+$. Mirror level: 5/2$^+$ at 1763 keV in ^{35}Cl.
2603.22 *28*	7/2$^{(+)}$		DE G	J$^\pi$: ΔJ=2 γ to 3/2$^+$ in (^{16}O,αnγ). Mirror level: 7/2$^+$ at 2646 keV in ^{35}Cl.
2638.01 *26*	3/2$^+$		A IJK	XREF: I(2615)K(2649)

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Adopted Levels, Gammas (continued)

^{35}Ar Levels (continued)

E(level)[†]	Jπ	XREF	Comments
			Jπ: L(p,d)=L(^{3}He,α)=2 from 0^+ with J dependence in (p,d).
2982.79 *12*	$5/2^+$	A C IJK	XREF: I(2970) Jπ: L(p,d)=L(d,t)=L(^{3}He,α)=2 from 0^+ with J dependence in (p,d).
3196.98[‡] *26*	$7/2^-$	CDE G IJK	Jπ: L(p,d)=L(^{3}He,α)=3 from 0^+. ΔJ=1 γ to $(5/2)^+$ and ΔJ=2 γ to $3/2^+$ in (^{16}O,αnγ) and (^{24}Mg,αnγ); band assignment.
3882 *5*	$1/2^+$	K	Jπ: L(^{3}He,α)=0 from 0^+.
4001 *3*	$1/2^-$,$3/2^-$	K	Jπ: L(^{3}He,α)=1 from 0^+.
4065.0? *4*	$(1/2^+,3/2^+,5/2^+)$	A	XREF: A(?) Jπ: possibly allowed $\varepsilon+\beta^+$ feeding from $3/2^+$ parent with log *ft*=5.6 *+4–2*.
4113 *4*		K	
4135 *4*	$1/2^-$,$3/2^-$	K	Jπ: L(^{3}He,α)=1 from 0^+.
4359.0 *5*	$(9/2^-)$	DE K	Jπ: ΔJ=(1) γ to $7/2^-$ in (^{16}O,αnγ). Possible mirror level: $9/2^-$ at 4348 keV in ^{35}Cl.
4528.3 *4*	$(1/2^+,3/2^+,5/2^+)$	A K	XREF: K(4515) Jπ: possibly allowed $\varepsilon+\beta^+$ feeding from $3/2^+$ parent with log *ft*=5.4 *+4–2*.
4725.9 *6*	$1/2^+$	A Hi K	XREF: i(4756)K(4713) Jπ: L(^{3}He,α)=0 from 0^+. Other: L(p,d)=0 from 0^+ for a group at 4756 *28*.
4785.8 *11*	$1/2^+$,$3/2^+$,$5/2^+$	A Hi K	XREF: i(4756)K(4774) Jπ: allowed $\varepsilon+\beta^+$ feeding from $3/2^+$ parent with log *ft*=5.2 *2*. Other: L(p,d)=0 from 0^+ for a group at 4756 *28*.
5059 *11*		K	
5116 *2*	$3/2^+$,$5/2^+$	HI K	E(level): weighted average of 5102 *20* from (p,d) and 5116 *2* from (^{3}He,α). Jπ: L(^{3}He,α)=2 from 0^+. Discrepancy: L(p,d)=3 from 0^+ (1968Ko04). 1973Be26 also considered L=3 but found L=2 gives a much better fit of the data than L=3 does.
5207 *3*		H K	E(level): from (^{3}He,α).
5384.2[‡] *4*	$(11/2^-)$	DE HI K	XREF: I(5400) Jπ: ΔJ=2 γ to $7/2^-$ in (^{16}O,αnγ) and (^{24}Mg,αnγ); band assignment. γ to $(9/2^-)$ in (^{16}O,αnγ) and (^{24}Mg,αnγ). Possible mirror level: $11/2^-$ at 5407 keV in ^{35}Cl.
5482 *2*	$3/2^+$,$5/2^+$	H K	E(level): from (^{3}He,α). Jπ: L(^{3}He,α)=2 from 0^+.
5572.67 *15*	$3/2^+$	A G	T=3/2 XREF: G(5537) Jπ: isobaric analog state of $3/2^+$ ^{35}K g.s. with log *ft*=3.31 *4*. L(^{3}He,n)=(0) from $3/2^+$. ^{35}Cl(^{3}He,t) attempted to search this T=3/2 level, but did not find it.
5594 *2*	$3/2^+$,$5/2^+$	C HI K	XREF: C(5570) E(level): weighted average of 5598 *20* from (p,d) and 5594 *2* from (^{3}He,α). Jπ: L(p,d)=L(^{3}He,α)=2 from 0^+. Evaluators consider the 5994 level to be different from the 5572.67 T=3/2 level because (p,d) and (^{3}He,α) from T=0 targets should not populate T=3/2 levels.
5613.6 *9*	$(11/2^-)$	E	Jπ: Possible mirror level: $11/2^-$ at 5927 keV in ^{35}Cl.
5765.8 *5*	$(13/2^-)$	DE	Jπ: ΔJ=1 γ to $(11/2^-)$ in (^{16}O,αnγ) and (^{24}Mg,αnγ). ΔJ=(2) γ to $(9/2^-)$ in (^{16}O,αnγ). Possible mirror level: $13/2^-$ at 6087 keV in ^{35}Cl.
5915 *3*		H JK	E(level): weighted average of 5913 *5* from (d,t) and 5916 *3* from (^{3}He,α).
5991 *3*		J	
6037 *3*	$3/2^+$,$5/2^+$	HIJK	XREF: I(6024) E(level): weighted average of 6037 *3* from (d,t) and 6036 *3* from (^{3}He,α). Other: 6024 *20* from (p,d). Jπ: L(p,d)=L(^{3}He,α)=2 from 0^+.

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Adopted Levels, Gammas (continued)

^{35}Ar Levels (continued)

E(level)[†]	J^π	XREF	Comments
6055? *3*		J	XREF: J(?)
6076 *3*		J	
6163 *2*		JK	E(level): weighted average of 6164 *3* from (d,t) and 6162 *2* from (^{3}He,α).
6253 *3*		Jk	XREF: k(6262)
6273 *3*		Jk	XREF: k(6262)
6302 *3*		J	
6332 *3*		J	
6345 *3*	(1/2,3/2,5/2)	A J	E(level): From (d,t). Other: 6348 *11* from ^{35}K ε decay. J^π: $\varepsilon+\beta^+$ feeding from $3/2^+$ parent with log *ft*=7.2 *1*.
6415 *2*		J	
6439? *4*		J	XREF: J(?)
6460 *3*		J	
6523 *3*		J	
6557 *3*		J	
6585 *3*		J	
6606 *3*		iJ	XREF: i(6620)
6616 *2*	$1/2^+$	iJK	XREF: i(6620) E(level): weighted average of 6617 *2* from (d,t) and 6615 *3* from (^{3}He,α). Other: 6620 *30* from (p,d). J^π: L(^{3}He,α)=L(p,d)=0 from 0^+.
6644 *3*		iJ	XREF: i(6620)
6651 *3*		iJ	XREF: i(6620)
6673 *4*	$5/2^-$,$7/2^-$	IJ	XREF: I(6700) E(level): weighted average of 6700 *20* from (p,d) and 6672 *3* from (d,t). J^π: L(p,d)=3 from 0^+.
6823 *2*	$3/2^+$,$5/2^+$	I K	E(level): from (^{3}He,α). Other: 6820 *30* from (p,d). J^π: L(p,d)=2 from 0^+.
6948 *2*		K	
7044 *4*	$3/2^+$,$5/2^+$	A I K	XREF: I(7030) E(level): weighted average of 7053 *11* from ^{35}K ε decay, 7030 *20* from (p,d), and 7043 *4* from (^{3}He,α). J^π: L(p,d)=2 from 0^+.
7117 *10*		K	
7255 *11*		A	
7289 *10*		A K	E(level): weighted average of 7283 *11* from ^{35}K ε decay and 7293 *10* from (^{3}He,α).
7427 *10*		A K	E(level): weighted average of 7431 *11* from ^{35}K ε decay and 7423 *10* from (^{3}He,α).
7509 *10*	$1/2^+$,$3/2^+$,$5/2^+$	A K	E(level): weighted average of 7518 *11* from ^{35}K ε decay and 7502 *10* from (^{3}He,α). J^π: allowed $\varepsilon+\beta^+$ feeding from $3/2^+$ parent with log *ft*<5.0.
7840 *10*		K	
8019 *10*		K	
8109.7[‡] *13*	$(15/2^-)$	E	J^π: γ to $(11/2^-)$ and $(13/2^-)$ in (^{16}O,αnγ); band assignment. Possible mirror level: $15/2^-$ at 8319 keV in ^{35}Cl.
8212.6 *8*	$(15/2^-)$	E	J^π: ΔJ=2 γ to $(11/2^-)$ and γ to $(13/2^-)$ in (^{16}O,αnγ). Possible mirror level: $15/2^-$ at 8487 keV in ^{35}Cl.
8393? *20*	$1/2^+$,$3/2^+$,$5/2^+$	A	XREF: A(?) E(level): From (^{35}K ε decay). J^π: allowed $\varepsilon+\beta^+$ feeding from $3/2^+$ parent with log *ft*=4.6 *+3−2*.
9906.0[‡] *20*	$(19/2^-)$	E	J^π: ΔJ=2 γ to $(15/2^-)$ in (^{16}O,αnγ); band assignment. Possible mirror level: $19/2^-$ at 10180 keV in ^{35}Cl.
12277.0[‡] *32*	$(23/2^-)$	E	J^π: ΔJ=2 γ to $(19/2^-)$ in (^{16}O,αnγ); band assignment. Possible mirror level: $23/2^-$ at 12571 keV in ^{35}Cl.

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Adopted Levels, Gammas (continued)

^{35}Ar Levels (continued)

† E(level) from a least-squares fit to γ-ray energies for levels connected with γ transitions; from particle-transfer reactions or ^{35}K $\varepsilon+\beta^+$-delayed proton decays for other levels.
‡ Band(A): Band based on $f_{7/2}$ orbital.

$\gamma(^{35}Ar)$

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. ‡	Comments
1184.08	$1/2^+$	1184.1 *3*	100	0.0	$3/2^+$		E_γ: weighted average of 1184.0 *3* from ^{35}K ε decay and 1184.3 *4* from ^{36}Ca εp decay.
1750.78	$(5/2)^+$	1750.6 *3*	100	0.0	$3/2^+$		E_γ: weighted average of 1750.5 *3* from ^{35}K ε decay, 1750.7 *4* from (^{24}Mg,αnγ), and 1750.8 *5* from (^{16}O,αnγ).
2603.22	$7/2^{(+)}$	851.9 *9*	12.3 *33*	1750.78	$(5/2)^+$		E_γ: weighted average of 852 *1* from (^{24}Mg,αnγ) and 851.8 *9* from (^{16}O,αnγ). I_γ: weighted average of 10 *5* from (^{24}Mg,αnγ) and 13.3 *33* from (^{16}O,αnγ).
		2603.0 *5*	100 *10*	0.0	$3/2^+$	Q	E_γ: weighted average of 2603.0 *5* from (^{24}Mg,αnγ) and 2602.6 *15* from (^{16}O,αnγ). I_γ: other: 100 *22* from (^{24}Mg,αnγ).
2638.01	$3/2^+$	886.8# *5*	16# *6*	1750.78	$(5/2)^+$		
		2638.0# *4*	100# *13*	0.0	$3/2^+$		
2982.79	$5/2^+$	1798.9# *5*	3.5# *6*	1184.08	$1/2^+$		
		2982.68# *13*	100# *4*	0.0	$3/2^+$		
3196.98	$7/2^-$	593.7 *2*	16.4 *30*	2603.22	$7/2^{(+)}$		E_γ: weighted average of 593 *1* from (^{24}Mg,αnγ) and 593.7 *2* from (^{16}O,αnγ). I_γ: weighted average of 16 *8* from (^{24}Mg,αnγ) and 16.4 *30* from (^{16}O,αnγ).
		1446.2 *2*	100 *8*	1750.78	$(5/2)^+$	D	E_γ: weighted average of 1446.2 *2* from (^{24}Mg,αnγ), 1446.1 *6* from (^{16}O,αnγ), and 1446.0 *6* from (^{3}He,nγ). I_γ: other: 100 *9* from (^{24}Mg,αnγ).
		3197.0 *7*	21 *5*	0.0	$3/2^+$	Q	E_γ: from (^{24}Mg,αnγ). Other: 3197 *6* from (^{16}O,αnγ). I_γ: weighted average of 18 *5* from (^{24}Mg,αnγ) and 24 *5* from (^{16}O,αnγ).
4065.0?	$(1/2^+,3/2^+,5/2^+)$	1426.8# *4*	100	2638.01	$3/2^+$		
4359.0	$(9/2^-)$	1162.0 *8*	65 *24*	3196.98	$7/2^-$	(D)	E_γ: weighted average of 1162 *1* from (^{24}Mg,αnγ) and 1162.0 *8* from (^{16}O,αnγ). I_γ: unweighted average of 41 *11* from (^{24}Mg,αnγ) and 88 *18* from (^{16}O,αnγ).
		1756 *1*	100 *15*	2603.22	$7/2^{(+)}$		E_γ: weighted average of 1756 *1* from (^{24}Mg,αnγ) and 1756.3 *14* from

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Adopted Levels, Gammas (continued)

γ(^{35}Ar) (continued)

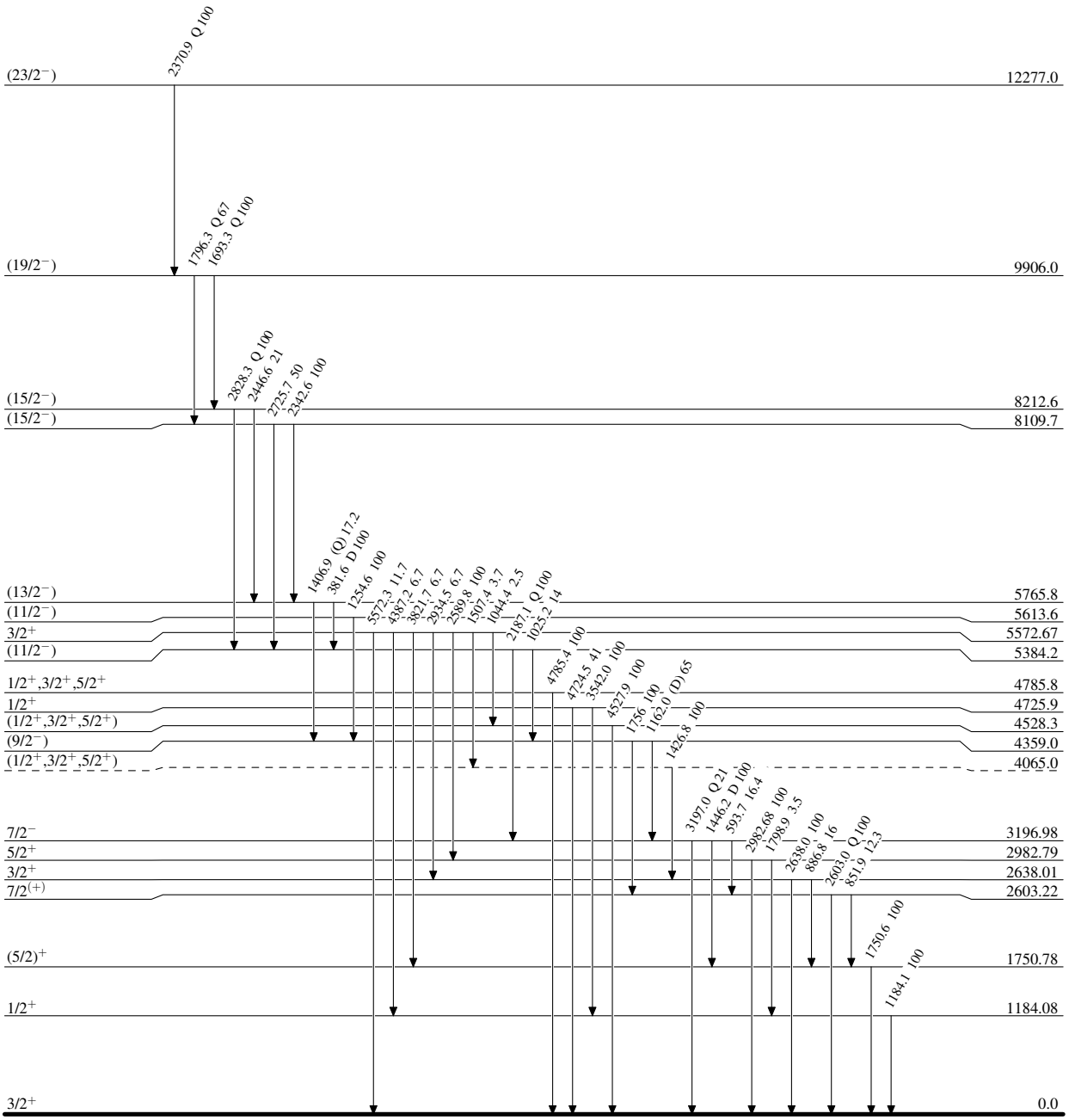
E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
							(^{16}O,αnγ). I_γ: from (^{24}Mg,αnγ). Other: 100 *53* from (^{16}O,αnγ).
4528.3	(1/2$^+$,3/2$^+$,5/2$^+$)	4527.9[#] *7*	100	0.0	3/2$^+$		
4725.9	1/2$^+$	3542.0[#] *6*	100[#] *21*	1184.08	1/2$^+$		
		4724.5[#] *11*	41[#] *17*	0.0	3/2$^+$		
4785.8	1/2$^+$,3/2$^+$,5/2$^+$	4785.4[#] *11*	100	0.0	3/2$^+$		
5384.2	(11/2$^-$)	1025.2 *4*	14 *4*	4359.0	(9/2$^-$)		E_γ: weighted average of 1025 *1* from (^{24}Mg,αnγ) and 1025.2 *4* from (^{16}O,αnγ). I_γ: weighted average of 21 *8* from (^{24}Mg,αnγ) and 12 *4* from (^{16}O,αnγ).
		2187.1 *4*	100 *6*	3196.98	7/2$^-$	Q	E_γ: weighted average of 2187.4 *4* from (^{24}Mg,αnγ) and 2186.8 *4* from (^{16}O,αnγ). I_γ: other: 100 *13* from (^{24}Mg,αnγ).
5572.67	3/2$^+$	1044.4[#] *4*	2.5[#] *8*	4528.3	(1/2$^+$,3/2$^+$,5/2$^+$)		
		1507.4[#] *5*	3.7[#] *8*	4065.0?	(1/2$^+$,3/2$^+$,5/2$^+$)		
		2589.8[#] *1*	100[#] *4*	2982.79	5/2$^+$		
		2934.5[#] *5*	6.7[#] *12*	2638.01	3/2$^+$		
		3821.7[#] *7*	6.7[#] *14*	1750.78	(5/2)$^+$		
		4387.2[#] *9*	6.7[#] *16*	1184.08	1/2$^+$		
		5572.3[#] *10*	11.7[#] *31*	0.0	3/2$^+$		
5613.6	(11/2$^-$)	1254.6 *8*	100	4359.0	(9/2$^-$)		
5765.8	(13/2$^-$)	381.6 *1*	100 *10*	5384.2	(11/2$^-$)	D	E_γ: weighted average of 381.6 *1* from (^{24}Mg,αnγ) and 381.5 *3* from (^{16}O,αnγ).
		1406.9 *7*	17.2 *35*	4359.0	(9/2$^-$)	(Q)	
8109.7	(15/2$^-$)	2342.6 *28*	100 *25*	5765.8	(13/2$^-$)		
		2725.7 *14*	50 *13*	5384.2	(11/2$^-$)		
8212.6	(15/2$^-$)	2446.6 *16*	21 *7*	5765.8	(13/2$^-$)		
		2828.3 *7*	100 *18*	5384.2	(11/2$^-$)	Q	
9906.0	(19/2$^-$)	1693.3 *27*	100 *20*	8212.6	(15/2$^-$)	Q	
		1796.3 *25*	67 *20*	8109.7	(15/2$^-$)	Q	
12277.0	(23/2$^-$)	2370.9 *25*	100	9906.0	(19/2$^-$)	Q	

[†] From (^{16}O,αnγ), unless otherwise noted.
[‡] Deduced by evaluators from measured γγ(θ)(ADO) in (^{16}O,αnγ) and ratios of yields R(γ(θ)) in (^{24}Mg,αnγ), unless otherwise noted.
[#] From ^{35}K ε decay.

Adopted Levels, Gammas

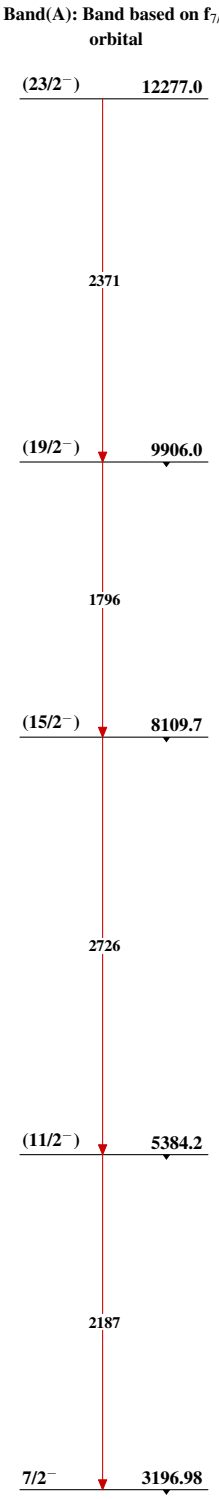
Level Scheme

Intensities: Relative photon branching from each level



$^{35}_{18}Ar_{17}$

Adopted Levels, Gammas



$^{35}_{18}Ar_{17}$