Adopted Levels, Gammas

$Q(\beta^-)$=3988.4 *19*; S(n)=8380.4 *20*; S(p)=12155.1 *20*; $Q(\alpha)$=−12332.0 *29* 2021Wa16
S(2n)=14663.1 *22*, S(2p)=30938 *7* (2021Wa16).
Isotope discovery (2012Th10): ^{232}Th(^{40}Ar,X) at Dubna (1971Ar32) and ^{37}Cl(γ,2p)^{35}P at Mainz (1971Gr53).
^{35}P production:
2012Kw02: ^{9}Be,^{nat}Ni(^{40}Ar,X) at E(^{40}Ar)=140 MeV/nucleon at NSCL. Measured fragmentation cross sections, parallel momentum transfers, and widths. Compared with empirical formula EPAX, and predictions from internuclear cascade and deep inelastic models using Monte Carlo ISABEL-GEMINI and DIT-GEMINI codes.
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: ^{9}Be,^{181}Ta(^{40}Ar,X) and (^{40}Ar,X) at E(^{40}Ar)=100 MeV/nucleon at RIKEN. Measured fragment momentum distributions and production cross sections.
1997Vo03: ^{56}Fe(p,X) at E_p=800 MeV at LANL. Measured γ radiation. Deduced production cross sections.
^{35}P decay measurements:
1972Go31: ^{35}P activity produced by the ^{18}O(^{19}F,2p) and ^{36}S(t,α) reactions from the second tandem of the Brookhaven National Laboratory tandem van de Graaff facility. Measured Eγ and $\beta\gamma$-coin. Deduced $T_{1/2}$ (48.1 s *14*) and log*ft*.
1972Ap01: ^{35}P β^- decay, ^{35}P activity produced by bombardment LiCl and NaCl using 16-MeV tritons at the Los Alamos tandem van de Graaff. Measured Eγ and Iγ. Deduced $T_{1/2}$ (47.4 s *8*) and masses.
1971Gr53: ^{35}P activity produced by the ^{37}Cl(γ,2p) reaction. Measured Eγ. Deduced $T_{1/2}$ (45 s *2*).
^{35}P radius measurement:
1999Ai02: Si(^{35}P,X) at NSCL. Measured energy-integrated reaction cross sections at E=38-80 MeV/ nucleon. Deduced strong absorption radii.
^{35}P mass measurements:
^{34}S(^{18}O,^{17}F) and ^{37}Cl(^{11}B,^{13}N) (1988Or01), ^{36}S(^{6}Li,^{7}Be) (1985Dr06), ^{36}S(d,3He) (1985Kh04), ^{36}S(^{14}C,^{15}N) (1984Ma49).
Theoretical calculations (binding energies, dipole moments, quadrupole moments, radii, levels, J, π, etc.): 2012BoZT, 2009No01, 2004Kh16, 2003Sm02, 1999Du05, 1988Wa04, 1987Wa10, 1986Wo02,1983Wi08, 1975JeZX.

^{35}P Levels

Cross Reference (XREF) Flags

A	^{35}Si β^- decay (0.78 s)	E	^{2}H(^{36}S,^{3}He)	I	^{36}S(d,^{3}He)
B	^{36}Si β^-n decay (503 ms)	F	^{9}Be(^{36}S,^{35}Pγ)	J	^{37}Cl(^{11}B,^{13}N)
C	^{1}H(^{34}Si,p):resonances	G	^{34}S(^{18}O,^{17}F)	K	^{160}Gd(^{37}Cl,Xγ)
D	^{2}H(^{34}Si,^{35}Pγ)	H	^{36}S(pol d,^{3}He)	L	^{208}Pb(^{36}S,^{35}Pγ)

E(level)[†]	J$^\pi$	$T_{1/2}$ or Γ[#]	XREF	Comments
0 *1*	1/2$^+$	47.3 s *8*	A DEFGHIJKL	%β^-=100 J$^\pi$: L(pol d,^{3}He)=0 from 0$^+$ and analyzing power. $T_{1/2}$: weighted average of 45 s *2* (1971Gr53), 47.4 s *8* (1972Ap01), and 48.1 s *14* (1972Go31).
2386.9 *11*	3/2$^+$	<0.69 ps	A DEFGH J L	XREF: G(2420) J$^\pi$: L(pol d,^{3}He)=2 from 0$^+$ and L-1/2 transfer from analyzing power.
3860.4 *11*	5/2$^+$	<0.69 ps	A DEF HIJKL	J$^\pi$: L(pol d,^{3}He)=2 from 0$^+$ and L+1/2 transfer from analyzing power.
4101.7 *11*	(7/2$^-$)[‡]	>69 ps	A D F KL	
4250 *20*			J	
4382.0 *12*	(5/2$^-$)		A F L	XREF: A(?) J$^\pi$: possibly allowed β^- feeding from 7/2$^-$ parent; 1994.9γ to 3/2$^+$.
4494.1 *12*	(7/2$^-$)[‡]	2.29 ps *49*	A D F H KL	XREF: H(4474) J$^\pi$: L=(3) in ^{9}Be(^{36}S,^{35}P) from 0$^+$.
4666.2 *16*	5/2$^+$		EF HIJ	XREF: J(4640) J$^\pi$: L(pol d,^{3}He)=2 from 0$^+$ and L+1/2 transfer from analyzing power.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{35}P Levels (continued)

E(level)†	Jπ	$T_{1/2}$ or Γ#	XREF	Comments
4767.0 *13*	$(9/2^-)$‡		F L	
4869.6 *12*	$(5/2^-,7/2^-)$		A D L	Jπ: possibly allowed β^- feeding from $7/2^-$ parent; 1009.7γ to $5/2^+$.
4962.8 *12*	$(9/2^-)$‡		A F L	XREF: A(?)
5010 *20*			J	
5090.2 *13*	$(11/2^-)$‡		FG L	XREF: G(5070)
5199.3 *16*	$5/2^+$		EF HIJ	XREF: J(5220) Jπ: L(pol d,^{3}He)=2 from 0^+ and L+1/2 transfer from analyzing power.
5487.9 *13*			L	
5561.0 *13*	$(5/2^-)$		A L	Jπ: possibly allowed β^- feeding from $7/2^-$ parent; 3173.5γ to $3/2^+$.
5709.5 *23*	$(1/2^-)$		EF	Jπ: L=(1) in ^{9}Be(^{36}S,^{35}P) from 0^+; inteprted as the deeply bound $1p_{1/2}$ proton removal from 0^+ in ^{9}Be(^{36}S,^{35}P); 5709γ to $1/2^+$.
5.86×10^3 *5*			G J	XREF: G(5890)J(5840) E(level): weighted average of 5890 *70* from (^{18}O,^{17}F) and 5840 *50* from (^{11}B,^{13}N).
6222.7 *13*	$(7/2^-,9/2,11/2^-)$		L	Jπ: 1132γ to $(11/2^-)$ and 1729γ to $(7/2^-)$.
6440 *60*			G	
7050 *60*			G	
7440 *60*			G	
7526.9 *23*	$(1/2^-)$		F H	XREF: H(7520) Jπ: L=(1) in ^{9}Be(^{36}S,^{35}P) from 0^+; inteprted as the deeply bound $1p_{1/2}$ proton removal from 0^+ in ^{9}Be(^{36}S,^{35}P); 7526γ to $1/2^+$.
7590 *20*			J	
7920 *60*			G	
8390 *40*			J	
8.60×10^3 *10*			G	
9290 *50*			G	
14938 *24*	$1/2^+$	<12.7 keV	C	Jπ: L=0 in ^{1}H(^{34}Si,p).
15161 *3*	$5/2^-,7/2^-$	<4.4 keV	C	Jπ: L=3 in ^{1}H(^{34}Si,p).
15306 *24*	$3/2^+,5/2^+$	<30.4 keV	C	Jπ: L=2 in ^{1}H(^{34}Si,p).
15964 *18*	$3/2^+,5/2^+$	84 keV *25*	C	Jπ: L=2 in ^{1}H(^{34}Si,p).
16145 *36*	$1/2^-,3/2^-$	0.35 MeV *9*	C	Jπ: L=1 in ^{1}H(^{34}Si,p).
16605 *44*	$1/2^+$	0.22 MeV *15*	C	Jπ: L=0 in ^{1}H(^{34}Si,p).
17254 *12*	$3/2^+,5/2^+$	<11.6 keV	C	Jπ: L=2 in ^{1}H(^{34}Si,p).
17355 *15*	$1/2^-,3/2^-$	32 keV *22*	C	Jπ: L=1 in ^{1}H(^{34}Si,p).

† From a least-squares fit to γ-ray energies for levels connected with γ transitions, from particle-transfer reactions for other levels, or from proton elastic scattering for resonances.

‡ Comparisons with shell-model calculations (2019Gr08).

\# $T_{1/2}$ from the differential recoil-distance method (2019Gr08) in ^{208}Pb(^{36}S,^{35}Pγ) and widths from the R-matrix analysis of (^{34}Si,p) for resonances, unless otherwise noted.

Adopted Levels, Gammas (continued)

$\gamma(^{35}P)$

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.	δ	α[#]	Comments
2386.9	3/2+	2386.3 *6*	100	0	1/2+	[M1,E2]		0.00046 *5*	E_γ: weighted average of 2386.4 *6* from ^{35}Si β^- decay, 2386 *2* from ^{9}Be(^{36}S,^{35}Pγ), and 2386 *1* from ^{208}Pb(^{36}S,^{35}Pγ). B(M1)(W.u.)>0.0023 if M1, B(E2)(W.u.)>1.6 if E2.
3860.4	5/2+	1473.5 *5*	15.6 *14*	2386.9	3/2+	[M1,E2]		8.3×10^{-5} *13*	E_γ: weighted average of 1473.4 *5* from ^{35}Si β^- decay, 1473 *2* from ^{9}Be(^{36}S,^{35}Pγ), and 1474 *1* from ^{208}Pb(^{36}S,^{35}Pγ). I_γ: weighted average of 14.1 *33* from ^{35}Si β^- decay and 15.9 *14* from ^{208}Pb(^{36}S,^{35}Pγ). B(M1)(W.u.)>0.0012 if M1, B(E2)(W.u.)>2.1 if E2.
		3860.2 *10*	100.0 *32*	0	1/2+	[E2]		1.12×10^{-3} *2*	B(E2)(W.u.)>0.12 E_γ: weighted average of 3859.5 *10* from ^{35}Si β^- decay, 3860 *2* from ^{9}Be(^{36}S,^{35}Pγ), and 3861 *1* from ^{208}Pb(^{36}S,^{35}Pγ). I_γ: From ^{208}Pb(^{36}S,^{35}Pγ). Other: 100 *7* from ^{35}Si β^- decay.
4101.7	(7/2−)	241.3 *5*	100[†] *7*	3860.4	5/2+	[E1]		0.000665 *10*	B(E1)(W.u.)<4.4×10^{-4} E_γ: weighted average of 241.4 *3* from ^{35}Si β^- decay, 237 *2* from ^{9}Be(^{36}S,^{35}Pγ), and 241 *1* from ^{208}Pb(^{36}S,^{35}Pγ). I_γ: other: 100 *4* from ^{35}Si β^- decay.
		1714.8 *6*	6.6[†] *17*	2386.9	3/2+	[M2]		7.93×10^{-5} *11*	B(M2)(W.u.)<0.16 E_γ: weighted average of 1714.7 *6* from ^{35}Si β^- decay and 1715 *1* from ^{208}Pb(^{36}S,^{35}Pγ). I_γ: other: 22 *5* from ^{35}Si β^- decay.
		4101.4 *10*	54[†] *8*	0	1/2+	[E3]		0.000924 *13*	B(E3)(W.u.)<4.8 E_γ: weighted average of 4100.8 *10* from ^{35}Si β^- decay and 4102 *1* from ^{208}Pb(^{36}S,^{35}Pγ). I_γ: other: 135 *8* from ^{35}Si β^- decay.
4382.0	(5/2−)	1994.9 *6*	100	2386.9	3/2+				E_γ: weighted average of 1994.8 *6* from ^{35}Si β^- decay, 1995 *2* from ^{9}Be(^{36}S,^{35}Pγ), and 1995 *1* from ^{208}Pb(^{36}S,^{35}Pγ). Placement by 1988DuZS, 2008Wi09, and 2016Mu03. 1988DuZT and 1987Wa10 placed this γ as the 6096−>4101 transition. 1988Or01 placed this γ as the 6488−>4493 transition.
4494.1	(7/2−)	392.3 *3*	100 *5*	4101.7	(7/2−)	[M1+E2]	<0.22	0.000199 *12*	B(M1)(W.u.)=0.117 *+42−29* E_γ: weighted average of 392.3 *3* from ^{35}Si β^- decay, 391

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

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	α[#]	Comments
								2 from $^9Be(^{36}S,^{35}P\gamma)$, and 392 *1* from $^{208}Pb(^{36}S,^{35}P\gamma)$. I_γ: From $^{35}Si\ \beta^-$ decay. Other: 100 *17* from $^{208}Pb(^{36}S,^{35}P\gamma)$. δ: deduced by evaluators from RUL=100 for B(E2)(W.u.).
4494.1	(7/2⁻)	633.6 *5*	34 *5*	3860.4	5/2⁺	[E1]	4.64×10^{-5} *7*	B(E1)(W.u.)=2.8×10^{-4} *+8−6* E_γ: weighted average of 633.7 *5* from $^{35}Si\ \beta^-$ decay, 634 *2* from $^9Be(^{36}S,^{35}P\gamma)$, and 633 *1* from $^{208}Pb(^{36}S,^{35}P\gamma)$. I_γ: weighted average of 38 *5* from $^{35}Si\ \beta^-$ decay and 27 *7* from $^{208}Pb(^{36}S,^{35}P\gamma)$.
4666.2	5/2⁺	804[‡] *2*		3860.4	5/2⁺			
		2279[‡] *2*		2386.9	3/2⁺			
		4668[‡] *2*		0	1/2⁺			
4767.0	(9/2⁻)	273 *1*	40.0[†] *25*	4494.1	(7/2⁻)			E_γ: weighted average of 274 *2* from $^9Be(^{36}S,^{35}P\gamma)$ and 273 *1* from $^{208}Pb(^{36}S,^{35}P\gamma)$.
		664 *1*	100[†] *47*	4101.7	(7/2⁻)			E_γ: weighted average of 666 *2* from $^9Be(^{36}S,^{35}P\gamma)$ and 664 *1* from $^{208}Pb(^{36}S,^{35}P\gamma)$.
4869.6	(5/2⁻,7/2⁻)	374[†] *1*	60[†] *20*	4494.1	(7/2⁻)			
		487[†] *1*	<40[†]	4382.0	(5/2⁻)			
		767.9 *4*	100[†] *20*	4101.7	(7/2⁻)			E_γ: weighted average of 768.0 *4* from $^{35}Si\ \beta^-$ decay and 767 *1* from $^{208}Pb(^{36}S,^{35}P\gamma)$. I_γ: other: 100 *18* from $^{35}Si\ \beta^-$ decay.
		1009.7 *5*	<20[†]	3860.4	5/2⁺			E_γ: weighted average of 1009.9 *5* from $^{35}Si\ \beta^-$ decay and 1009 *1* from $^{208}Pb(^{36}S,^{35}P\gamma)$. I_γ: other: 152 *32* from $^{35}Si\ \beta^-$ decay.
4962.8	(9/2⁻)	468.9 *4*	100[†] *8*	4494.1	(7/2⁻)			E_γ: weighted average of 468.9 *4* from $^{35}Si\ \beta^-$ decay, 469 *2* from $^9Be(^{36}S,^{35}P\gamma)$, and 468 *2* from $^{208}Pb(^{36}S,^{35}P\gamma)$.
		859[†] *3*	66[†] *9*	4101.7	(7/2⁻)			
5090.2	(11/2⁻)	128 *1*	50[†] *25*	4962.8	(9/2⁻)			E_γ: weighted average of 127 *2* from $^9Be(^{36}S,^{35}P\gamma)$ and 128 *1* from $^{208}Pb(^{36}S,^{35}P\gamma)$.
		322 *1*	100[†] *35*	4767.0	(9/2⁻)			E_γ: weighted average of 321 *2* from $^9Be(^{36}S,^{35}P\gamma)$ and 322 *1* from $^{208}Pb(^{36}S,^{35}P\gamma)$.
5199.3	5/2⁺	1337[‡] *2*		3860.4	5/2⁺			
		2811[‡] *2*		2386.9	3/2⁺			
		5202[‡] *2*		0	1/2⁺			
5487.9		993[†] *1*	100[†] *20*	4494.1	(7/2⁻)			
		1387[†] *1*	60[†] *20*	4101.7	(7/2⁻)			

$^{35}_{15}P_{20}$-4

Adopted Levels, Gammas (continued)

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

E_i(level)	J^{π}_i	E_γ	I_γ	E_f	J^{π}_f	Comments
5561.0	(5/2$^-$)	1459.4 *7*	34 *12*	4101.7	(7/2$^-$)	E_γ: weighted average of 1459.7 *5* from ^{35}Si β^- decay and 1458 *1* from ^{208}Pb(^{36}S,^{35}Pγ). I_γ: From ^{35}Si β^- decay.
		3173.5 *10*	100 *17*	2386.9	3/2$^+$	3173.5γ is not observed in ^{208}Pb(^{36}S,^{35}Pγ), but the weaker 1459γ deexiting the same level is observed in ^{208}Pb(^{36}S,^{35}Pγ). Further experiments are needed to resolve the discrepancy. E_γ,I_γ: From ^{35}Si β^- decay.
5709.5	(1/2$^-$)	5709‡ *2*		0	1/2$^+$	
6222.7	(7/2$^-$,9/2,11/2$^-$)	1132† *1*	<25†	5090.2	(11/2$^-$)	
		1260† *1*	100† *25*	4962.8	(9/2$^-$)	
		1729† *1*	100† *25*	4494.1	(7/2$^-$)	
7526.9	(1/2$^-$)	7526 *2*		0	1/2$^+$	

† From ^{208}Pb(^{36}S,^{35}Pγ).

‡ From ^{9}Be(^{36}S,^{35}Pγ).

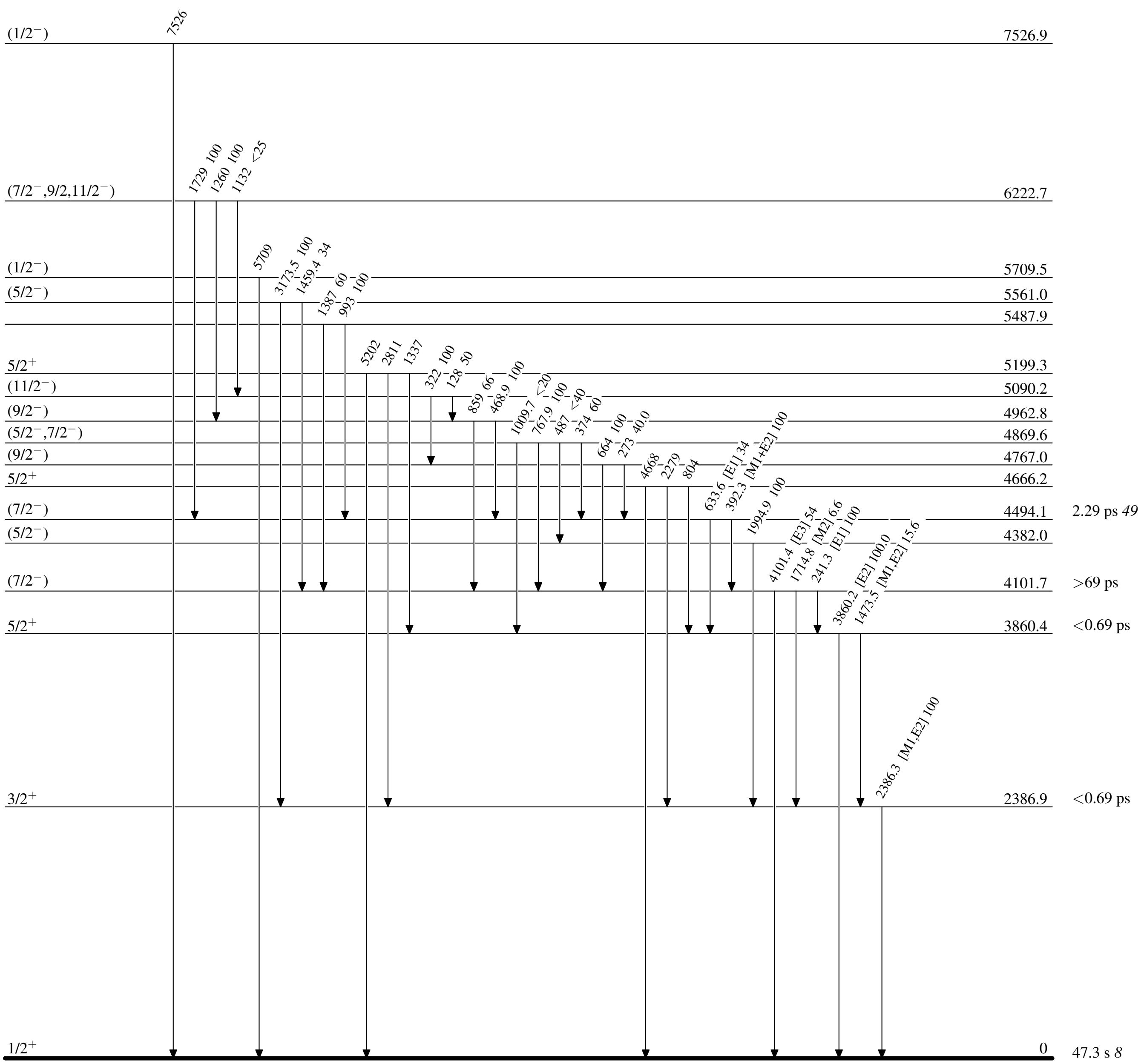
Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with "Frozen Orbitals" approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

$^{35}_{15}P_{20}$-5

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{35}_{15}P_{20}$