Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	T. W. Burrows[a]	NDS 109, 1879 (2008)	14-Jul-2008

Q(β^-)=2002 *3*; S(n)=10129 *6*; S(p)=9625 *3*; Q(α)=−12370 *3* 2012Wa38
Note: Current evaluation has used the following Q record.
Q(β^-)=2006 *4*; S(n)=10128 *6*; S(p)=9627.2 *29*; Q(α)=−12369 *11* 2003Au03

^{49}Sc Levels

Resonance parameters: see data cited below In (p,X), (p,Xγ), and (d,n),(^{3}He,d),(α,t)... Tables.
Γ_p,Γ_n: from (p,X) and (p,Xγ). By one-channel multilevel and Breit-Wigner analysis for ^{49}Ca g.s. IAS′s and non-IAR resonances (1972Ga09) and by analysis of the average resonance shape for the ^{49}Ca 2023 IAS (1982Si19).

Cross Reference (XREF) Flags

A	^{49}Ca β^- decay	E	^{48}Ca(p,Xγ) res: non-IAR′s	I	^{48}Ca(^{48}Ca,Xγ) E=210 MeV
B	^{46}Ca(α,p) E=25 MeV	F	^{48}Ca(d,n),(^{3}He,d),(α,t),	J	^{50}Ti(d,^{3}He)
C	^{48}Ca(p,Xγ) IAR: ^{49}Ca g.s.	G	^{48}Ca(^{7}Li,^{6}He),(^{14}N,^{13}C),	K	^{48}Ca(p,X) res: general
D	^{48}Ca(p,Xγ): other ^{49}Ca IAR′s	H	^{48}Ca(^{15}N,^{14}C),(^{16}O,^{15}N),	L	^{48}Ca(p,X),(d,n),(^{3}He,d),(α,t)

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	XREF	Comments
0.0	7/2$^-$	57.18 min *13*	ABCDEFGHIJ	%β^-=100 J$^\pi$: L=3 In (d,n),(^{3}He,d),(A,t).... Empirical shape of A(θ) In (pol d,^{3}He). T$_{1/2}$: weighted av of 57.15 min *20* (1969Fl02; 4$\pi\beta$, Si(Li), chem), 57.5 min *1* (1961Re06; mag spect, scin, chem), and 57.00 min *18* (1969Ra16; isotope sep, α(P)); mean of 57.26 min *10* (NRM) and 57.11 min *13* (RT) with ΔT$_{1/2}$ from RM. 1969Fl02 and 1961Re06 used ^{49}Ca β^- decay for production while 1969Ra16 used U(p,X) E=0.59, 18 GeV. Others: see 1978Ha15.
2228.63[@] *22*	1/2$^+$	29.9 ns *11*	A C EFGH J	T$_{1/2}$: from $\gamma\gamma$(t) In (p,Xγ) res: non-IAR′s.
2371.82[@] *22*	3/2$^+$[&]	1.40 ns *9*	A CDEFGH J	T$_{1/2}$: from $\gamma\gamma$(t) In (p,Xγ) res: non-IAR′s.
3084.52[@] *10*	3/2$^-$	48 fs *29*	ABCD FGH	J$^\pi$: L=1 In (d,n),(^{3}He,d),(α,t).... E2 γ to 7/2$^-$.
3300?[a]			J	
3516.7[@] *4*	3/2$^-$[&]		A C FGH	
3521.7 *7*			I	
3550?[a]	(3/2$^+$,5/2$^+$)[b]		J	
3581 *10*	7/2$^-$		F	
3755 *8*	3/2$^+$,5/2$^+$		F J	
3808.8[@] *5*	7/2$^-$[c]	21 fs *19*	BC FGH	
3914.9[@] *8*	(9/2$^-$)[d]		B FG I	
3951 *10*			F	
3991.0[@] *9*	1/2$^+$	≥0.7 ns	BC FG J	
4046.5[@] *8*	(9/2$^-$)[d]		F I	
4072.04[@] *10*	5/2$^-$[c]	28 fs *14*	ABC FGH	
4192 *10*	(11/2$^-$)[d]		F	
4220 *8*			F	
4239.6 *13*			I	
4267 *10*	(15/2$^-$)[d]		F	
4285 *8*	(5/2$^+$)[d]		F	

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Adopted Levels, Gammas (continued)

^{49}Sc Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
4332.2[@] 10	5/2$^-$[c]		AB FG	
4426 10			F j	
4459 10			F j	
4493.44[@] 22	1/2$^-$[c]	≤23 fs	ABC FGH j	
4579 8	1/2$^-$,3/2$^-$		B F j	
4714.8[@] 8	1/2$^-$,3/2$^-$		A F	
4738.45[@] 20	5/2$^-$[c]	≤14 fs	ABC FG	
4810 8	5/2$^-$,7/2$^-$		F	
4948 8	(1/2$^-$,3/2$^-$)		F	
4987 10	(3/2$^+$,5/2$^+$)		b F J	XREF: J(4.86 MeV).
5015 8	1/2$^-$,3/2$^-$		b F	
5022? 10	(1/2$^+$)		b F H	Jπ: probable interference between direct and two-step processes In (α,t).
5030	3/2$^-$		GH	E(level): from (^{7}Li,^{6}He). Jπ: from characteristic shape of $\sigma(\theta)$ In (^{7}Li,^{6}He).
5077 8	5/2$^-$		B FGH	Jπ: from characteristic shape of $\sigma(\theta)$ In (^{7}Li,^{6}He).
5142 10			aB F	
5229 10	(9/2$^-$,11/2$^-$)		a F	
5230 8	3/2$^+$,5/2$^+$[e]		a F j	
5269 10	[e]		F j	
5376.3[@] 5	5/2$^-$[c]	21 fs 10	BC FGH	
5438 8			F	
5460 10			F	
5562 10	(9/2$^-$,11/2$^-$)		F	
5578 8	3/2$^+$,5/2$^+$		F J	
5632 10	(17/2$^+$)[d]		b F	
5663 8	3/2$^-$[c]		b FG	
5735 10	(15/2$^-$)[d]		F	
5815 8	1/2$^-$[c]		B FGH	
5845 8			F	
5930?			H	
5979 10			F	
6010.7[@] 11		≤50 fs	abC F	Jπ: (3/2$^-$,5/2 to 9/2,11/2$^-$) from (D,E2) γ to 7/2$^-$.
6014 20			ab F	
6069 20	(3/2$^+$,5/2$^+$)		a F	
6180 20	3/2$^+$,5/2$^+$		F	
6212 10	[e]		F j	
6250 20	(7/2$^+$)[d]		F	
6266 20	[e]		F j	
6306 2	5/2$^-$[&]		C F	E(level): from (p,Xγ) IAR: ^{49}Ca g.s..
6330 10	[e]		F j	XREF: j(6.32 MeV,6.43 MeV).
6415.5[@] 4	7/2$^-$[&]	21 fs 9	C FG	
6451 10	[e]		F j	
6504.5[@] 5	3/2[e]		C F j	XREF: F(6476). Jπ: from primary $\gamma(\theta)$ In (p,Xγ) IAR: ^{49}Ca g.s.. Jπ: L=1+4 doublet In (d,n),(^{3}He,d),(α,t)...
6527 20			F	
6624 10			F	
6685 20			F j	
6728[f] 2	3/2$^-$[&]		C F j	
6745 10			F j	
6816 20	1/2$^-$,3/2$^-$		F j	
6829 10	5/2$^-$,7/2$^-$		b F j	

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Adopted Levels, Gammas (continued)

^{49}Sc Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	XREF	Comments
6867 *10*			b F j	
6910 *20*	$(1/2^+)$		F	
6917 *10*			F	
6939 *10*			F	
6985.8[@] *4*	$5/2^-$	≤14 fs	C F	J^{π}: L=3 In (d,n),(^{3}He,d),(α,t).... ≤$7/2^+$ from D,E2 γ to $3/2^+$.
7026 *20*	$1/2^-,3/2^-$		F j	
7041 *10*			F j	
7059 *20*	$7/2^+,9/2^+$		f j	J^{π}: assumed to Be L=4 member of 1+4 doublet In (d,n),(^{3}He,d),(α,t)....
7062.5[@] *5*	$1/2^-$		C f j	J^{π}: assumed to Be L=1 member of 1+4 doublet In (d,n),(^{3}He,d),(α,t).... J=1/2 from $\gamma(\theta)$ In (p,Xγ) IAR: ^{49}Ca g.s..
7151 *20*	$5/2^-,7/2^-$		F j	
7172 *10*	[e]		F j	XREF: j(7.12 MeV,7.37 MeV).
7186 *20*	$(7/2^+,9/2^+)$		F j	May correspond to 7193 state if L In (d,n),(^{3}He,d),(α,t),... incorrect.
7193 *2*	$5/2$[e]		C j	XREF: j(7.12 MeV,7.37 MeV). J^{π}: from primary $\gamma(\theta)$ In (p,Xγ) IAR: ^{49}Ca g.s..
7228.8[@] *6*	$5/2$[e]		C F j	XREF: j(7.12 MeV,7.37 MeV). J^{π}: from primary $\gamma(\theta)$ In (p,Xγ) IAR: ^{49}Ca g.s..
7253 *20*	$1/2^-,3/2^-$		F	
7293 *10*	[e]		F j	
7320 *20*	$1/2^-,3/2^-$		F	
7342 *20*	$5/2^-,7/2^-$		F	
7375 *20*	$5/2^-,7/2^-$		F	
7421 *20*	$5/2^-,7/2^-$		F	
7442 *20*	$1/2^-,3/2^-$		F	
7483 *20*	$5/2^-,7/2^-$		F	
7500 *20*	$1/2^-,3/2^-$		F	
7529 *20*	$(7/2^+,9/2^+)$		F	
7583 *20*	$(3/2^+,5/2^+)$[b]		F J	
7653 *20*	$1/2^-,3/2^-$		F	
7678 *20*	$(7/2^+,9/2^+)$		F	
7723 *20*	$1/2^-,3/2^-$		F	
7746 *20*	$(7/2^+,9/2^+)$		F	
7795 *20*	$(7/2^+,9/2^+)$		F	
7832 *20*	$1/2^-,3/2^-$		F	
7890 *20*	$1/2^-,3/2^-$		F	
7940 *20*			F	
7998 *20*	$1/2^-,3/2^-$		F	
8029 *20*			F	
8094 *20*	$1/2^-,3/2^-$		F	
8147 *20*	$1/2^-,3/2^-$		F	
8177 *20*	$(7/2^+,9/2^+)$		F	
8200 *20*	$1/2^-,3/2^-$		F	
8246 *20*			F	
8289 *20*	$1/2^-,3/2^-$		F	
8330 *20*	$5/2^-,7/2^-$		F	
8355 *20*	$1/2^-,3/2^-$		F	
8434 *20*	$1/2^-,3/2^-$		F	
8465 *20*	$5/2^-,7/2^-$		F	
8625 *20*	[e]		F j	
8693 *20*	$3/2^+,5/2^+$[e]		F j	
8721 *20*	$1/2^-,3/2^-$		F	
8751 *20*			F	J^{π}: L=1+(4) doublet In (d,n),(^{3}He,d),(α,t)...
8781 *20*	$1/2^-,3/2^-$		F	
8813 *20*	$1/2^-,3/2^-$		F	

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Adopted Levels, Gammas (continued)

^{49}Sc Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	XREF	Comments
8848 *20*	$1/2^-,3/2^-$		F	
8900 *20*	$3/2^+,5/2^+$		F	
8929 *20*	$5/2^-,7/2^-$		F	
8971 *20*	$(7/2^+,9/2^+)$		F	
9008 *20*	$3/2^+,5/2^+$		F	
9066 *20*	$5/2^-,7/2^-$		F	
9117 *20*	$3/2^+,5/2^+$[e]		F j	
9145 *20*	$(1/2^-,3/2^-)$		F	
9185 *20*	$(5/2^-,7/2^-)$		F	
9218 *20*	[e]		F j	
9247 *20*	$1/2^-,3/2^-$		F	
9295 *20*	$1/2^-,3/2^-$		F	
9335 *20*	[e]		F j	
9385 *20*	$1/2^-,3/2^-$		F	
9449 *20*	$5/2^-,7/2^-$		F	
9514 *20*	$5/2^-,7/2^-$		F	
9575 *20*	$1/2^-,3/2^-$		F	
9634 *20*	$1/2^-,3/2^-$		F	
9675 *20*	$1/2^-,3/2^-$		F	
9726 *20*	$1/2^-,3/2^-$		F	
9790 *20*	$1/2^-,3/2^-$		F	
9843 *20*	$1/2^-,3/2^-$		F	
9873 *20*	$1/2^-,3/2^-$		F	
9923 *20*	$1/2^-,3/2^-$		F	
9956 *20*	$5/2^-,7/2^-$		F	
9991 *20*	$1/2^-,3/2^-$		F	
10059 *20*	$1/2^-,3/2^-$		F	
10155 *20*	$5/2^-,7/2^-$		F	
10212 *20*			F	J^{π}: L=1+(3) doublet In (d,n),(^{3}He,d),(α,t)...
10413 *20*	$1/2^-,3/2^-$		F	
10473 *20*	$1/2^-,3/2^-$		F	
10569[f]			E	
10617 *20*	$1/2^-,3/2^-$		F	
10690 *20*	$1/2^-,3/2^-$		EF	E(level): from (^{3}He,d).
10787 *20*	$(1/2^-,3/2^-)$		F	
10870 *20*	$(1/2^-,3/2^-)$		F	
10957 *20*	$(1/2^-,3/2^-)$		F	
11021 *20*	$(1/2^-,3/2^-)$		F	
11030 *20*	$(1/2^-,3/2^-)$		F	
11138 *20*	$(1/2^-,3/2^-)$		F	
11271 *20*	$(1/2^-,3/2^-)$		F	
11425 *20*	$3/2^+,5/2^+$		F	
11510? *20*			F	May correspond to 11525 state if L(d,n),(^{3}He,d),(α,t) incorrect. J^{π}: L=(3,4) In (d,n),(^{3}He,d),(α,t)...
11525[f] *4*	$1/2^-$		E	
11534[f] *4*	$1/2^+$		E	
11538[fg] *3*	$(3/2^-)$[h]		C	Γ_p=50 eV *50*; Γ_n=70 eV *70*
11543[f] *3*			E	Γ_p=20 eV *20*; Γ_n=30 eV *30*
11547[fg] *3*	$3/2^-$[h]		C	Γ_p=0.10 keV *5*; Γ_n=0.40 keV *20*
11548[f] *3*			E	Γ_p=30 eV *30*; Γ_n=30 eV *30*
11552[fg] *3*	$3/2^-$[h]		C f	Γ_p=0.40 keV *10*; Γ_n=0.22 keV *6*
11563.2[@g] *4*	$3/2^-$[h]	1.5 keV *3*	C f	%p=79 *6*; %n=21 *14*; %g=0.31 *7*

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Adopted Levels, Gammas (continued)

^{49}Sc Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	XREF	Comments
				Γ_p=1.2 keV *3*; Γ_n=0.32 keV *8*; Γ_γ=4.8 eV *5* Γ_γ: from (p,Xγ) IAR: ^{49}Ca g.s..
11569[fg] *3*	(3/2⁻)[h]		C f	%p≈50; %n≈50 Γ_p=50 eV *50* or 70 eV *70*; Γ_n=50 eV *50* or 100 eV *50*.
11579[fg] *3*	(3/2⁻)[h]	0.29 keV *14*	C	%p=14 *13*; %n=86 *13* Γ_p=40 eV *40*; Γ_n=0.25 keV *13*
11583[fg] *3*	(3/2⁻)[h]	0.17 keV *8*	C	%p=12 *12*; %n=88 *12* Γ_p=20 eV *20*; Γ_n=0.15 keV *8*
11665 *20*	1/2⁻,3/2⁻		F	
11735 *20*			F	
11806 *20*			F	
11911 *20*	1/2⁻,3/2⁻		F	
11976 *20*	1/2⁻,3/2⁻		F	
12040 *40*	1/2⁻,3/2⁻		F	
12098 *40*	[i]		F	
12160 *40*	[i]		F	
12216 *40*	[i]		F	
12281 *40*	[i]		F	
12340 *40*	[i]		F	
12390 *40*	[i]		F	
12497 *40*	[i]		F	
12607 *40*	[i]		F	
12732 *40*	[i]		F	
12829 *40*	[i]		F	
12893 *40*	[i]		F	
12992 *40*	[i]		F	
13119 *40*	[i]		F	
13204 *40*	[i]		F	
13308 *40*	[i]		F	
13358 *40*	[i]		F	
13412 *40*	[i]		F	
13487[g] *40*	(1/2⁻)		F	Jπ: L=(1) In (d,n),(^{3}He,d),(α,t)...; IAS(^{49}Ca 2023, 1/2⁻).
13557[g] *40*	(1/2)⁻		F	Jπ: L=1 In (d,n),(^{3}He,d),(α,t)...; IAS(^{49}Ca 2023, 1/2⁻).
13572[fg] *5*	(1/2)⁻	226 keV *3*	D F	%p=66.4 *12*; %n=23.0 *5* Γ_p=151 keV *2*; Γ_n=52 keV *1* Jπ: L(p,p)=1; IAS(^{49}Ca 2023, 1/2⁻).
15108[g] *10*	5/2⁻[j]	12.8[k] keV *13*	D F	E(level): weighted av (INT.) of 15107 *10* from ^{48}Ca(p,X): other ^{49}Ca IAR's and 15105 *12* from (^{3}He,d).
15481[fg] *10*	(3/2)⁻	19.3[k] keV *20*	D	Jπ: L(p,p)=1 and (p,p′) to ^{48}Ca 3832, 2⁺. ≠ 1/2 from γ to 7/2⁻.
15544[f] *4*			E	
15563[fg] *6*	5/2⁻[j]	31[k] keV *8*	D F	
15583[f] *4*			E	
15600[f] *4*			E	
15622[fg] *6*	9/2⁺	18[k] keV *5*	D F	Jπ: L=4 in (d,n),(^{3}He,d),(α,t)... and (p,p). (p,p′) to ^{48}Ca 4507, 3⁻, indicates pure $\pi p_{3/2}$.
15662[f] *4*			E	
15878[fg] *10*	3/2⁺	19.8[k] keV *20*	D	Jπ: L(p,p)=2. (p,p′) to ^{48}Ca 4507, 3⁻, indicates pure $\pi p_{3/2}$.
16025[fg] *10*	5/2⁺	25.6[k] keV *26*	D	Jπ: L(p,p)=2. (p,p′) to ^{48}Ca 4507, 3⁻, indicates $\pi p_{1/2}$ component.
16509[fg] *10*	7/2⁺	14.8[k] keV *15*	D f	Jπ: L(p,p)=4. (p,p′) to ^{48}Ca 4507, 3⁻, indicates $\pi p_{1/2}$ component.
16994[fg] *10*	9/2⁺	18.8[k] keV *19*	D f	Jπ: L(p,p)=4. (p,p′) to ^{48}Ca 4507, 3⁻, indicates pure $\pi p_{3/2}$; to

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Adopted Levels, Gammas (continued)

^{49}Sc Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
				^{48}Ca 5729, 5^-, indicates pure $\pi p_{1/2}$.
17662[fg] *10*	$5/2^+$	108[k] keV *11*	D f	Jπ: L(p,p)=2. (p,p′) to ^{48}Ca 4507, 3^-, indicates $\pi p_{1/2}$ component.
18152[fg]	$3/2^+,5/2^+$		D f	Jπ: L(p,p)=2.
18348[fg]	$3/2^+,5/2^+$		D f	Jπ: L(p,p)=2.

[†] From (d,n),(^{3}He,d),(α,t)..., except As noted In the comments, footnotes or XREF column.
[‡] From angular momentum transfer In (d,n),(^{3}He,d),(α,t)..., except As noted.
[#] $T_{1/2}$′s from DSAM In (p,Xγ) IAR: ^{49}Ca g.s. and Γ′s from (p,X): ^{49}Ca other IAR′s, except As noted.
[@] Calculated using least-squares adjustment procedures, assuming ΔE(γ)=1 keV when not given. Only primary γ′s with a known ΔE(γ) were included In the analysis.
[&] From angular momentum transfer In (d,n),(^{3}He,d),(α,t)... And primary γ(θ) In (p,Xγ) IAR: ^{49}Ca g.s..
[a] Existence considered doubtful due to energy resolution (FWHM=100-115 keV) In (d,^{3}He) and lack of observance In other reactions.
[b] From angular momentum transfer In (d,^{3}He). Parentheses added by evaluator due to energy resolution (FWHM=100-115 keV).
[c] From angular momentum In transfer (d,n),(^{3}He,d),(α,t)... And characteristic shape of σ(θ) In (^{7}Li,^{6}He). Note that these results sometimes differ from what would Be expected from the dominant No-recoil L transfer In (^{15}N,^{14}C). See comment by evaluator In this table.
[d] Tentative assignment based on coupled-reaction-channel analysis of (α,t). See this dataset for the configurations.
[e] L(d,^{3}He)=2 for multiplet.
[f] From (p,X) and (p,Xγ) data. Resonance E(level)=(0.9798419 *15*)E(p)+S(p) with S(p)=9627.2 keV *29* (2003Au03).
[g] Isobaric analog states of ^{49}Ca. See (p,X),(d,n),(^{3}He,d),(α,t) for correspondence with parent states.
[h] From analysis of elastic scattering excitation functions.
[i] See (d,n),(^{3}He,d),(α,t)... For L to states between 12098 and 13412.
[j] L=3 in (d,n),(^{3}He,d),(α,t)... and (p,p). (p,p′) to ^{48}Ca 3832, 2^+, indicates $\pi p_{1/2}$ component.
[k] See (p,Xγ): other ^{49}Ca IAR′s for elastic and inelastic Γ_p.

$\gamma(^{49}Sc)$

See (p,Xγ) IAR: ^{49}Ca g.s. for unplaced gammas.

B(Eλ)(W.u.),B(Mλ)(W.u.): calculated using adopted $T_{1/2}$'s and γ-ray properties for secondary gammas. Primary Γ_γ's were used for transitions from the 1974 resonance.

Γ_γ's: from (p,Xγ) IAR: ^{49}Ca g.s., except As noted As a a footnote on Iγ.

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	α[e]	Comments
2228.63	1/2$^+$	2228.75[#] *35*	100[@]	0.0	7/2$^-$	[E3]	0.000284 *4*	B(E3)(W.u.)=1.04 *4* α=0.000284 *4*; α(K)=2.85×10^{-5} *4*; α(L)=2.50×10^{-6} *4*; α(M)=3.09×10^{-7} *5* α(N+..)=0.000252 *4* α(N)=1.740×10^{-8} *25*; α(IPF)=0.000252 *4*
2371.82	3/2$^+$	143.2[@] *2*	5.6[@] *6*	2228.63	1/2$^+$	(M1,E2)	0.04 *4*	α(K)=0.04 *4*; α(L)=0.003 *3*; α(M)=0.0004 *4*; α(N+..)=2.2×10^{-5} *19* α(N)=2.2×10^{-5} *19* Mult.: D,E2 from comparison to RUL. $\Delta\pi$=No from level scheme.
		2371.75[#] *35*	100[@] *3*	0.0	7/2$^-$	[M2]	0.000275 *4*	α=0.000275 *4*; α(K)=2.46×10^{-5} *4*; α(L)=2.15×10^{-6} *3*; α(M)=2.67×10^{-7} *4* α(N+..)=0.000248 *4* α(N)=1.503×10^{-8} *21*; α(IPF)=0.000248 *4* B(M2)(W.u.)=0.0208 *16*
3084.52	3/2$^-$	712.6[@]	0.01[@]	2371.82	3/2$^+$			
		856.1[@] *5*	0.16[@] *1*	2228.63	1/2$^+$	(E1+(M2))[&]	0.00016 *10*	$\delta\leq$0.082 *3*; B(E1)(W.u.)=2.3×10^{-5} *15* α=0.00016 *10*; α(K)=0.00014 *9*; α(L)=1.3×10^{-5} *8*; α(M)=1.6×10^{-6} *10* α(N+..)=9.E−8 *6* α(N)=9.E−8 *6*
		3084.4[@] *1*	100.00[@] *4*	0.0	7/2$^-$	E2	0.000831 *12*	α=0.000831 *12*; α(K)=1.070×10^{-5} *15*; α(L)=9.34×10^{-7} *13*; α(M)=1.159×10^{-7} *17* α(N+..)=0.000820 *12* α(N)=6.53×10^{-9} *10*; α(IPF)=0.000820 *12* B(E2)(W.u.)=4.0 *24* Mult.: from $\gamma\gamma(\theta)$ In β^- decay and comparison to RUL.
3516.7	3/2$^-$	1144.5[@] *5*	100[@] *25*	2371.82	3/2$^+$			
		1288.4[@] *5*	67[@] *25*	2228.63	1/2$^+$			
3521.7		3521.8[b]		0.0	7/2$^-$			
3808.8	7/2$^-$	3808.6 *5*	100	0.0	7/2$^-$			
3914.9	(9/2$^-$)	393.1[b]		3521.7				
		3914.9[b]		0.0	7/2$^-$			
3991.0	1/2$^+$	1620.0 *15*		2371.82	3/2$^+$			
		1762		2228.63	1/2$^+$			

$^{49}_{21}Sc_{28}$-7

$\gamma(^{49}Sc)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	α[e]	Comments
4046.5	(9/2⁻)	525.2[b]		3521.7				
		4046.0[b]		0.0	7/2⁻			
4072.04	5/2⁻	987.3[@] *5*	0.95[@] *6*	3084.52	3/2⁻	D,E2[a]		
		4071.9[@] *1*	100.0[@] *3*	0.0	7/2⁻	D,E2[a]		
4239.6		324.7[b]		3914.9	(9/2⁻)			
4332.2	5/2⁻	4332.0[@]	100[@]	0.0	7/2⁻			
4493.44	1/2⁻	976.7[@]	1.25[@] *40*	3516.7	3/2⁻			
		1408.9[@] *2*	100.0[@] *17*	3084.52	3/2⁻	D+Q		$\delta>-1.8<0.0$ Mult.,δ: from $\gamma\gamma(\theta)$ In β^- decay.
		2264.7[@]	7.0[@] *12*	2228.63	1/2⁺			
4714.8	1/2⁻,3/2⁻	2486.3[@]	100[@] *26*	2228.63	1/2⁺			
		4714.4[@]	16[@] *5*	0.0	7/2⁻			
4738.45	5/2⁻	4738.2[@] *2*	100[@]	0.0	7/2⁻	D,E2[a]		
5376.3	5/2⁻	5376.0 *5*		0.0	7/2⁻			
6010.7		6010.3 *11*		0.0	7/2⁻	(D,E2)		Mult.: from comparison to RUL if Iγ(6010γ)>17%.
6306	5/2⁻	3225		3084.52	3/2⁻			
		6307		0.0	7/2⁻			
6415.5	7/2⁻	6415.4 *5*	100	0.0	7/2⁻	D,E2[a]		
6504.5	3/2	2436	100 *40*	4072.04	5/2⁻			
		4275	53 *47*	2228.63	1/2⁺			
6728	3/2⁻	3640	100	3084.52	3/2⁻			
6985.8	5/2⁻	4614.6 *5*	100 *27*	2371.82	3/2⁺	(E1)[&]	0.00190 *3*	B(E1)(W.u.)>0.00029 α=0.00190 *3*; α(K)=4.42×10^{-6} *7*; α(L)=3.85×10^{-7} *6*; α(M)=4.78×10^{-8} *7*; α(N+..)=0.00189 *3* α(N)=2.69×10^{-9} *4*; α(IPF)=0.00189 *3*
		6984	26 *12*	0.0	7/2⁻			
7062.5	1/2⁻	3978	92 *43*	3084.52	3/2⁻			
		4688	100 *43*	2371.82	3/2⁺			
7228.8	5/2	7224	100	0.0	7/2⁻			
10569		8340[c]		2228.63	1/2⁺			
10690	1/2⁻,3/2⁻	8318[c]		2371.82	3/2⁺			
11547	3/2⁻	4354	44 *19*	7193	5/2			
		4484	78 *19*	7062.5	1/2⁻			
		4561	100 *27*	6985.8	5/2⁻			
		4819	57 *19*	6728	3/2⁻			
		5042	59 *19*	6504.5	3/2			
		5131	72 *19*	6415.5	7/2⁻			
		5241	35 *19*	6306	5/2⁻			
		6808	50 *13*	4738.45	5/2⁻			
		7475	41 *13*	4072.04	5/2⁻			

$^{49}_{21}Sc_{28}$-8

$\gamma(^{49}Sc)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[e]	Comments
11547	3/2⁻	8030	9 *9*	3516.7	3/2⁻				
		8462	15 *6*	3084.52	3/2⁻				
		9175	73 *27*	2371.82	3/2⁺				
		9318	35 *7*	2228.63	1/2⁺				
11552	3/2⁻	4359	43 *10*	7193	5/2				
		4489	57 *8*	7062.5	1/2⁻				
		4566	100 *10*	6985.8	5/2⁻				
		4824	67 *10*	6728	3/2⁻				
		5047	50 *10*	6504.5	3/2				
		5136	67 *10*	6415.5	7/2⁻				
		5246	29 *8*	6306	5/2⁻				
		6813	21 *5*	4738.45	5/2⁻				
		7480	35 *5*	4072.04	5/2⁻				
		7561	9 *5*	3991.0	1/2⁺				
		8035	12 *8*	3516.7	3/2⁻				
		8467	16.4 *23*	3084.52	3/2⁻				
		9180	43 *15*	2371.82	3/2⁺				
		9323	17.0 *23*	2228.63	1/2⁺				
11563.2	3/2⁻	4333.1 *5*	44.4 *14*	7228.8	5/2	D+Q			
		4370.2	41 *8*	7193	5/2	D+Q			Γ=0.23 eV *7*
		4500.7 *5*	55 *7*	7062.5	1/2⁻	D+Q			Γ=0.45 eV *14*
		4577.8 *5*	100 *9*	6985.8	5/2⁻	D+Q			Γ=0.70 eV *21*
		4835.2	72 *10*	6728	3/2⁻	D+Q			Γ=0.66 eV *20*
		5059.1 *5*	90 *10*	6504.5	3/2	D+Q			Γ=0.63 eV *19*
		5147.7 *5*	48 *8*	6415.5	7/2⁻	E2(+M3)	[a]	0.0012 *3*	δ≤0.001534 *13*; B(E2)(W.u.)=16.109 *18*; Γ_γ=0.50 eV *15* α=0.0012 *3*; α(K)=6.6×10^{-6} *16*; α(L)=5.7×10^{-7} *14*; α(M)=7.1×10^{-8} *17* α(N+..)=0.0012 *3* α(N)=4.0×10^{-9} *10*; α(IPF)=0.0012 *3*
		5257.2	11 *6*	6306	5/2⁻	D+Q			Γ=0.27 eV *8*
		6824.8	30 *5*	4738.45	5/2⁻	D+Q			Γ=0.14 eV *5*
		7491.2	43 *5*	4072.04	5/2⁻	D+Q			Γ=0.21 eV *7*
		7572.2	24 *7*	3991.0	1/2⁺	(E1(+M2))[&]	[a]		δ≤0.276 *3*; B(E1)(W.u.)=0.000169 *5*; Γ=0.069 eV *21*
		7754.4	24 *10*	3808.8	7/2⁻	E2(+M3)			B(E2)(W.u.)=0.308 *12*; Γ=0.077 eV *23* δ: −1.75≤δ≤+0.09 from γ(θ) In (p,Xγ) IAR: ^{49}Ca g.s. δ<0.278 *11* from comparison to RUL.
		8041.5	10 *4*	3516.7	3/2⁻	D+Q			Γ=0.025 eV *8*
		8478.7	5.9 *27*	3084.52	3/2⁻	D+Q			Γ=0.014 eV *4*
		9191.4	9.8 *27*	2371.82	3/2⁺	(E1(+M2))			δ=−0.20 *+95−6*; B(E1)(W.u.)>5.025×10^{-5} *4*<7.851×10^{-5} *6*; Γ=0.055 eV *17* Mult.: D(+Q) from γ(θ). Δπ=yes from level scheme.
		9334.6	13.7 *13*	2228.63	1/2⁺	(E1+M2)	+0.07 *3*		B(E1)(W.u.)=0.00010 *3*; B(M2)(W.u.)=0.026 *24*; Γ=0.073 eV *22* Mult.: D+Q from γ(θ). Δπ=No from level scheme.

From ENSDF

$^{49}_{21}Sc_{28}$-9

$\gamma(^{49}Sc)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	Comments
11563.2	3/2⁻	11563.2	20.9 *20*	0.0	7/2⁻	(E2+M3)	+0.09 *5*	B(E2)(W.u.)=0.041 *13*; B(M3)(W.u.)=17 *+20−17*; Γ=0.073 eV *22* Mult.: Q+O from $\gamma(\theta)$. $\Delta\pi$=No from level scheme. δ: δ<0.068 *10* from comparison to RUL.
15481	(3/2)⁻	15481[d]		0.0	7/2⁻			
15544		15544[c]		0.0	7/2⁻			
15563	5/2⁻	12478[d]	[d]	3084.52	3/2⁻	D,E2		Γ>1.7 eV
		13191[d]	[d]	2371.82	3/2⁺	(E1(+M2))[&]	[a]	$\delta\leq$0.236 *8*; Γ=1.4 eV *5*; B(E1)(W.u.)=0.000657 *19*
		15563[d]	[d]	0.0	7/2⁻	D,E2		Γ=17 eV *5*
15583		15583[c]		0.0	7/2⁻			
15600		15600[c]		0.0	7/2⁻			
15622	9/2⁺	15622[d]	[d]	0.0	7/2⁻	(E1(+M2))[&]	[a]	$\delta\leq$0.092 *+23−47*; Γ=22 eV *+22−11*; B(E1)(W.u.)=0.006 *4*
15662		15662[c]		0.0	7/2⁻			

[†] From (p,Xγ) IAR: ^{49}Ca g.s., except As noted. Relative photon branching from each level. Energies are nominal values calculated by evaluator from the adopted excitation energies if No uncertainty is given.

[‡] From primary $\gamma(\theta)$ or comparison to RUL using Γ_γ's In (p,Xγ) IAR: ^{49}Ca g.s., except As noted. See (p,Xγ) IAR: ^{49}Ca g.s. for other possible δ's.

[#] Weighted av (INT.) of 2228.9 *5* from β^- decay and 2228.6 *5* from (p,Xγ) and 2371.7 *5* from β^- decay and 2371.8 *5* from (p,Xγ), respectively.

[@] From β^- decay.

[&] D,E2 from comparison to RUL. $\Delta\pi$=yes from level scheme.

[a] From comparison to RUL.

[b] From (^{48}Ca,Xγ).

[c] From (p,Xγ) res: non-IAR's. Nominal energies calculated by the evaluator from the adopted excitation energies.

[d] From (p,Xγ): other ^{49}Ca IAR's. Nominal energies calculated by the evaluator from the adopted excitation energies. Γ_γ's from (p,Xγ): other ^{49}Ca IAR's.

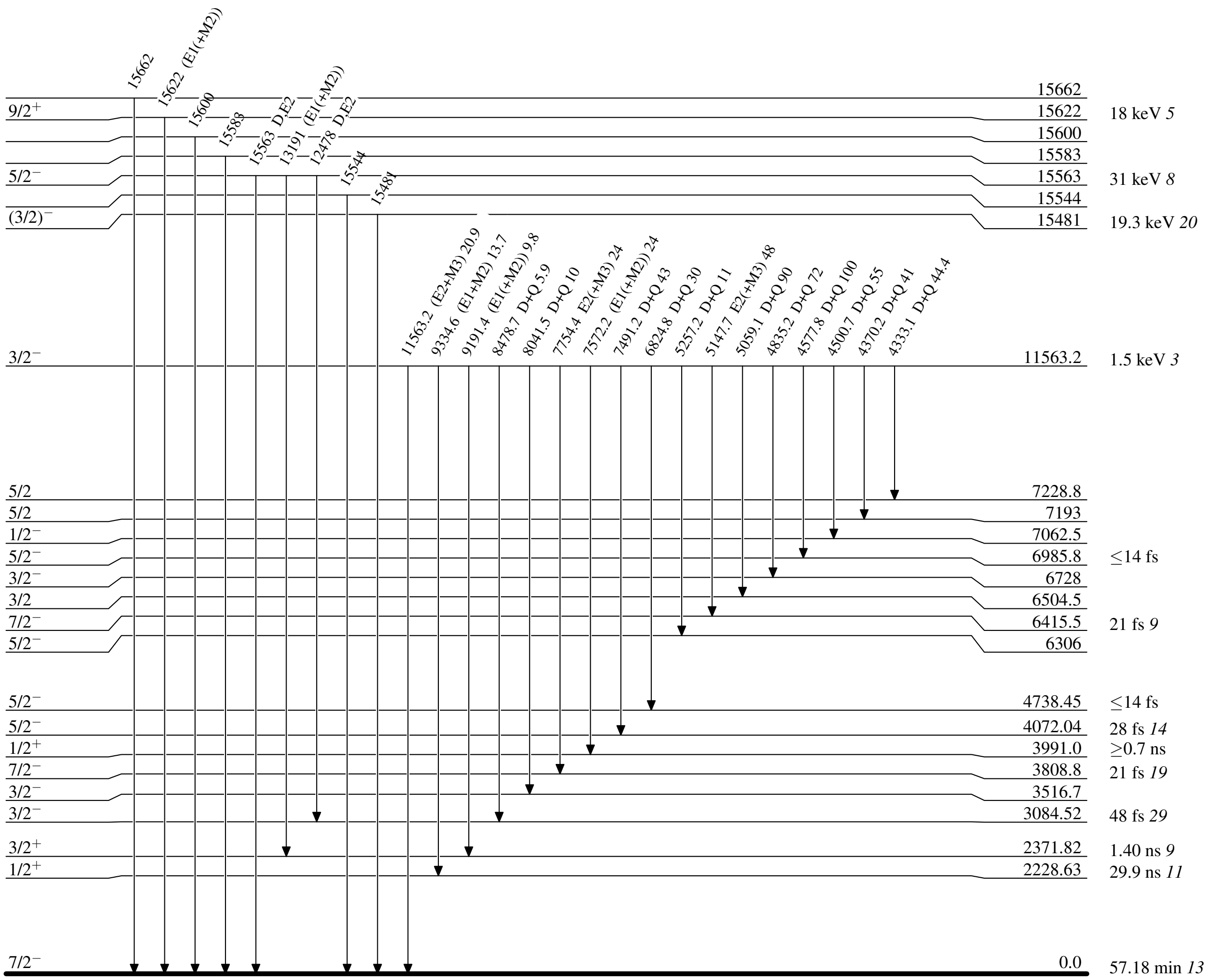
[e] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

$^{49}_{21}Sc_{28}$-10

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

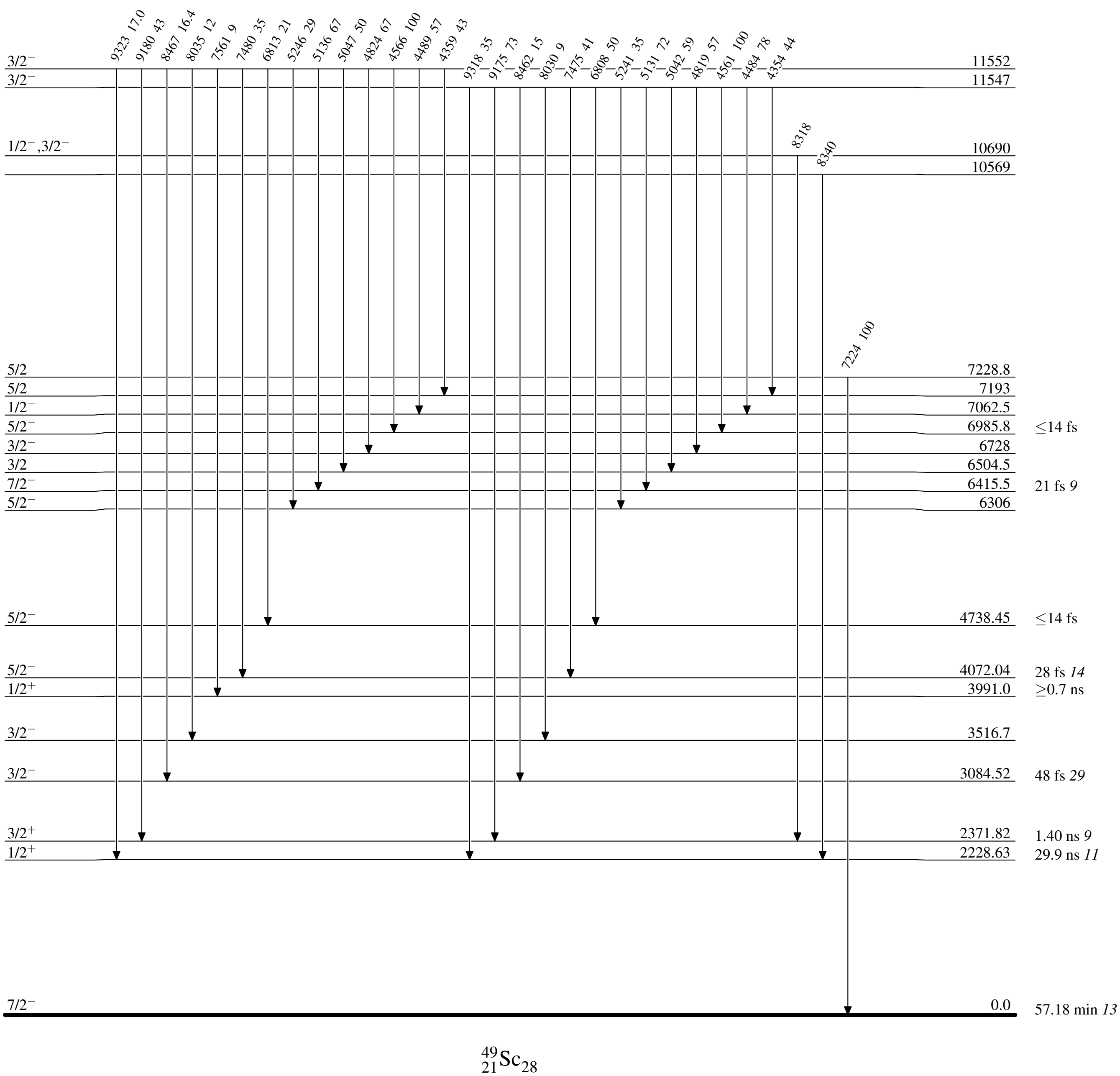


$^{49}_{21}Sc_{28}$

Adopted Levels, Gammas

Level Scheme (continued)

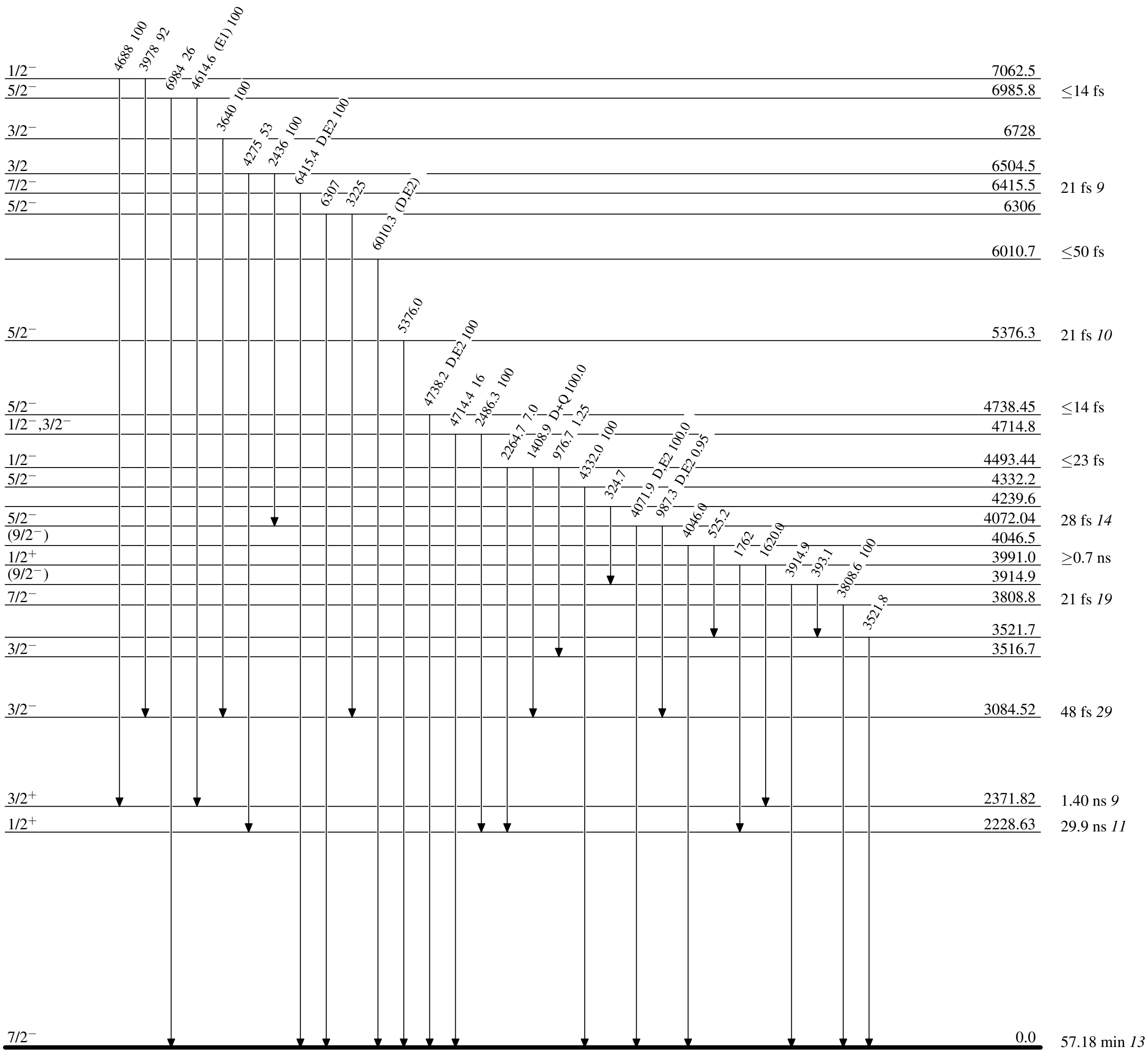
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

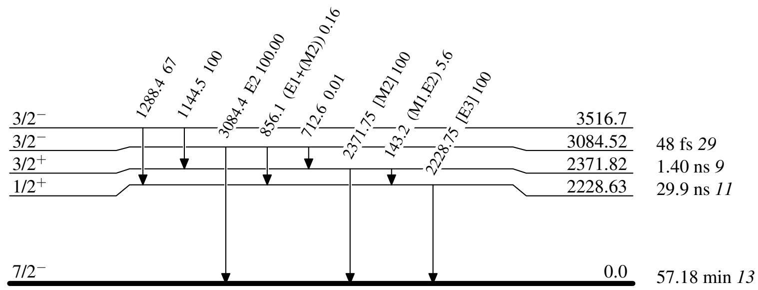


$^{49}_{21}Sc_{28}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{49}_{21}Sc_{28}$