^{44}Ca(p,p),(p,p′γ),(p,γ) res

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	T. W. Burrows	NDS 109, 171 (2008)	30-Oct-2007

Others: see 1992Bu01.

A TV ^{44}Ca(p,γ) E=856, 906 keV Res 1974Sc02, 1974Sc07

TV1974Sc02: E=600-930 keV. Measured γ-excitation function (670-eV steps), γ′s, and γ(θ).
TVCalibration to ±1.5 keV; FWHM<0.7 keV at E=760 keV.
TV1974Sc07: E=856 keV. Continuation of 1974Sc07. DSAM.
TVOnly those resonances for which the gamma deexcitation patterns were studied are summarized here.

B TV ^{44}Ca(p,p),(p,γ) IAR: ^{45}Ca 1435 3/2$^-$ 1973Be39

TVE=1.24-1.27 MeV. Measured 363γ-excitation function, fine structure, elastic excitation
TVfunction (θ=149^o); NaI. FWHM(p,γ)≈0.5 keV.
TVThe 1251- and 1268-keV resonances were identified as the main components of the split isobaric
TVanalog of the 1435, 3/2$^-$ state of ^{45}Ca.

C TV ^{44}Ca(p,γ) E=1658 keV IAR 1972Ek02

TVMeasured γ′s (θ=55^o,90^o). Band assignments were made by comparing the excited states of ^{43}Sc
TVand ^{45}Sc. Thirty-three additional resonances between 1355 keV and 2465 kev were observed but
TVtheir gamma deexcitation patterns were not studied.

D TV ^{44}Ca(p,γ) E=1.58-1.78 MeV IAR 1971De25

TVMeasured γ-excitation function (NaI,FWHM≈3 keV) and γ′s at 90^o.

E TV ^{44}Ca(p,p),(p,p′γ),(p,γ) IAR 1976Wi12, 1975Wi09

TVE=1.58-3.01 MeV; fragmented analog states. Measured γ-excitation functions (NaI) and γ′s. R-matrix
TVand linear-correlation coefficient analysis.
TVAll information is from 1976Wi12, except as noted. See 1975Wi09 for many additional resonances whose
TVdeexcitations were not studied by 1976Wi12.

F TV ^{44}Ca(p,γ) E=1644, 1650 keV IAR 1979Aw02, 1967Er06

TV1967Er06: E=1652. Measured γ-excitation function (NaI) and γ′s and γ(θ).
TV1979Aw02: E=1620 to 1670 keV. Measured γ-excitation function, γ′s, and γ(θ).
TVAll information is from 1979Aw02, except as noted.

G TV ^{44}Ca(p,p),(p,p′),E=2.50-3.53 MeV 2005Lo06

TVBeam energy resolution of 250-350 eV. Measured σ(p,p$_0$) and σ(p,p$_1$) at θ=90°, 108°, 135°, and 165° (passivated
TV planar silicon detectors). Observed and analyzed ≈800 resonances.

^{45}Sc Levels

Bound-state band assignments are from a comparison to excited states In ^{43}Sc by 1972Ek02.
E(e),$T_{1/2}$(F) see discussion At the beginning of the Adopted Levels table on the 2341 and 2352 states.

TV L=1 Resonances: 1983Sh22 measured p(θ) and γ(θ) for L=1 resonances (2.80 MeV≤E(p)≤3.01 MeV) and studied each of the
TV59 p-wave resonances observed by 1975Wi09. Unambiguous results were obtained for 23 3/2$^-$ resonances and 5 1/2$^-$ resonances
TV L=2 Resonances: 1982Sh12 measured p(θ) and γ(θ) for L=2 resonance and observed the ≈100 resonances previously
TVidentified by 1975Wi09 along with some additional resonances (2.25 MeV≤E(p)≤3.01 MeV). 68 resonances were analyzed
TVin detail; the remainder were either too weak or were obscured by interference from nearby states. 53 resonances
TVwere assigned 5/2$^+$. See 1983Ho11 for an analysis of the possible influence of statistical experimental errors in the above analysis.

TV Summary of Analog States in ^{45}Sc (2005Lo06)

Parent E_x	J^π	Analog Fragments E_x	Resonance E_p	No. of Fragments	$\Sigma\Gamma_p$ keV	$\Sigma\Gamma_p^2$ keV

2842	3/2⁻	9387-9477	2555.9-2647.6	19	1.66	10.28
3241	3/2⁻	9900-9925	3080.5-3106.8	7	1.28	3.65
3442	1/2⁻	9956-10063	3138.3-3247.6	20	19.88	48.22

E TVSummary of bound-state excitation energies observed (X=observed but not used in evaluation)

Adopted	A	B	C	D	E	F	Adopted	A	B	C	F
12.40 *5*	12.3	12	12.40 *5*	X	X	12.4		2747.0 *10*			
2747.0 *10*											
376.4 *1*	376.5 *2*	375.5	376.4 *1*	X	X	376		2778.7 *5*		2778.7 *5*	
(2778.7)											
542.9 *1*	542.9 *2*	542.7	542.9 *1*	X	X	542		2862?			
2862?											
720.2 *1*	720.1 *2*	719.5	720.2 *1*	X	X	720		2895.1 *5*		2895.1 *5*	
939.1 *1*	938.9 *2*	938.7	939.1 *1*	X	X	938		2903.8 *7*		2903.8 *7*	
2910?											
974.5 *2*	974.3 *4*	973	974.5 *2*	X		973		2964.0? *15*		2964.0? *15*	
2964?											
1067.2 *2*	1067.2 *3*	1065.6	1067.2 *2*	X	X			2981.5 *7*		2981.5 *7*	
2978.0 *10*											
1236.4 *2*	1235.8 *6*	1239	1236.4 *2*			1237		3025.6 *10*		3025.5 *6*	
3025.6 *10*	3027										
1303.2 *2*	1303.1 *3*	1303.1	1303.2 *2*		X	1302		3092.0 *8*		3092.0 *8*	
1409.0 *2*	1408.5 *3*		1409.0 *2*			1408		3104	3099.0? *15*		3104
1433.4 *2*			1433.4 *2*						3111.2 *8*		3111.2 *8*
1555.1 *2*	1555.6 *3*		1555.1 *2*			1555		3136.3 *7*		3136.3 *7*	
1661.5 *5*			1661.5 *5*						3366.4 *8*		3366.4 *7*
1800.6 *3*	1800.0 *5*		1800.6 *3*						3457		
3457											
1900.7 *3*			1900.7 *3*						3462.1 *8*		3462.1 *8*
1930.6 *3*			1930.6 *3*						3475		
3475											
2029.6 *3*	2028.6 *8*		2029.6 *3*						3487.4 *8*		3487.4 *8*
2092.2 *5*	2092.2 *4*	2092.3	2092.2 *5*			2090		3525.2 *8*		3525.2 *8*	
2106.2 *5*			2106.2 *5*						3548.5 *8*		3548.5 *8*
2138.4 *5*			2138.4 *5*						3584.0 *10*		3584.0
10											
2151.0 *5*	2151.0 *5*					2156?		3714.3 *8*		3714.3 *8*	
2221.8 *5*			2221.8 *5*						3722.3 *10*		3722.3
10											
2303.8 *5*	2303.1		2303.8 *5*						3864.0? *15*		3864.0?
15											
2341.2 *5*			2341.2 *5*	X					3883		3883
2352.2 *5*	2352.2 *5*		2352.1 *5*			2350?		3983.0? *15*		3983.0? *15*	
2531.0 *5*	2531.0 *5*										4084.9
10	4084.9 *10*										
2590.0 *6*	2590.0 *6*										4502
4502											
2601.4 *5*	2601.4 *5*		2602.0 *10*						4674		
4674											

E TVSummary of proton resonance energies observed (S(p)=6888.3 *8* (2003Au03); Y=adopted):
TVBelow 1 MeV, the proton resonance energies are from ^{44}Ca(p,γ) E=856, 906 keV res.
TVBetween 1.2 and 1.7 MeV, the proton resonance energies are from ^{44}Ca(p,p),(p,γ) IAR: ^{45}Ca 1435 3/2⁻.

Adopted	C	D	E	F
1583		Y		
1619		Y		
1623.6			Y	
1632.4			Y	
1640		Y		
1646.0			1646.0	1644
1651.7	1650 *5*		1651.7	1650
1658	1660 *5*	1658		

TVAbove 1658, proton resonance energies are from ^{44}Ca(p,p),(p,p′γ),(p,γ) IAR, except for the 1757 resonance

TVfrom ^{44}Ca(p,γ) E=1.58-1.78 MeV IAR.
J TVResonance spins and parities are from line shape analysis in ^{44}Ca(p,p),(p,p$'\gamma$),(p,γ)
IAR, except as noted.
TVBound state spin and parities are from the Adopted Levels; Contributing arguments to the adopted
spins and
TVparities from these data are:

E_x Adopted A B C F
Arguments

0 7/2$^-$ 7/2 TVFrom $\gamma(\theta)$.
12 3/2$^+$ 3/2 TVFrom $\gamma(\theta)$.
543 5/2$^+$ 5/2 TVFrom $\gamma(\theta)$.
720 5/2$^-$ 5/2 TVFrom $\gamma(\theta)$.
939 1/2$^+$ 1/2 TVFrom $\gamma(\theta)$ (1967Er06).
1067 3/2$^-$ 3/2 TVFrom $\gamma(\theta)$.
1303 3/2$^+$ 3/2 TVFrom $\gamma(\theta)$.
1555 3/2$^-$ 1/2,3/2 1/2 TVA: From $\gamma(\theta)$ (1974Sc02).
TVF: From $\gamma(\theta)$ (1967Er06).
1800 5/2$^+$ $\neq$3/2$^+$ TVγ's to 3/2$^+$, 5/2$^+$, and
7/2$^-$.
1901 ($\leq$7/2) TVγ to 3/2$^-$.
1931 ($\leq$5/2) TVγ to 1/2$^+$
2030 11/2$^+$ (11/2$^+$) TVFrom comparison to ^{43}Sc.
2092 5/2$^-$ 3/2$^-$,5/2,7/2$^-$ (5/2$^-$) TVA: D,E2 γ's to
3/2$^-$ and 7/2$^-$.
TVB: Direct deexcitation to g.s.
2106 ($\leq$7/2) ($\leq$7/2) TVγ to 3/2$^-$.
2138 (3/2,5/2) (3/2,5/2) TVγ's to 2/1$^-$ and 7/2$^-$.
2151 1/2 to 7/2$^+$ 1/2 to 7/2$^+$ TV$\leq$7/2
from isotropic γ's feeding and
TV deexciting state (1974Sc02). D,E2 γ
TV to 3/2$^+$.
2222 3/2$^-$,5/2,7/2$^+$ $\leq$7/2 TVγ to 3/2$^+$
2303 (5/2$^-$) $\leq$5/2 TV$\leq$7/2
from $\gamma(\theta)$ (1974Sc02). D,E
2 γ's to
TV 3/2$^-$ and 3/2$^+$.
2352 1/2$^-$,3/2 1/2$^-$,3/2 3/2 TVA: 1/2,3/2 from $\gamma(\theta)$ (1974Sc02).
D,E2
TV γ to 5/2$^-$.
TVF: From $\gamma(\theta)$.
2531 3/2 3/2 TVFrom
$\gamma(\theta)$ (1974Sc02).
2590 3/2$^-$,5/2,7/2$^-$ 3/2$^-$,5/2,7/2$^-$ TV3/2 to
7/2 from anisotropic γ to
TV 7/2$^-$ (1974Sc02). D,E2 γ's to 3/2$^-$
TV and 7/2$^-$.
2601 1/2$^+$,3/2,5/2 3/2 to 7/2 ($\leq$5/2) TVA: Anisotropic γ to 3/2$^-$
(1974Sc02).
TVB: γ's to 1/2, 3/2, and 5/2 and γ
TV from 3/2$^-$ IAR.
2778 3/2 to 7/2$^-$ 3/2 to 7/2$^-$ TV3/2 to
7/2 from anisotropic γ to 5/2$^-$
TV (1974Sc02). D,E2 γ to 3/2$^-$.
2895 1/2$^+$,3/2,5/2 1/2$^+$,3/2,5/2 TVPrimary
γ's from 3/2$^{(-)}$ and 3/2$^{(+)}$;
TV D,E2 γ to 5/2$^+$.
2903 $\leq$7/2 $\leq$7/2 TVFrom
$\gamma(\theta)$ (1974Sc02).
3092 $\leq$7/2 $\leq$7/2 TVFrom
$\gamma(\theta)$ (1974Sc02).
3104 (3/2,5/2) (3/2,5/2) TVFrom $\gamma(\theta)$ and
p-wave formation.
3111 (7/2$^+$) (7/2$^+$)
TVPrimary γ from 3/2$^{(+)}$; γ to 11/2$^+$.

TV M2 γ's inhibited in $1f_{7/2}$ nuclides.
TV (1974Sc02).
3366 3/2,5/2,7/2 3/2,5/2,7/2 TV≤7/2
from γ(θ); γ to 7/2⁻ (1974Sc02).
3462 ≤7/2 ≤7/2 TVFrom
γ(θ) (1974Sc02).
3525 ≤7/2 ≤7/2 TVFrom
γ(θ) (1974Sc02).
3548 1/2,3/2,5/2 1/2,3/2,5/2 TV≤7/2
from γ(θ); γ to 1/2⁺ (1974Sc02).
3584 ≤7/2 ≤7/2 TVFrom
γ(θ) (1974Sc02).
3714 ≤7/2 ≤7/2 TVFrom
γ(θ) (1974Sc02).
3883 1/2⁻ 1/2⁻ TVL(^{3}He,d)=1.
No δ(3/2) consistent
TV with isotropic γ to 3/2⁻.
4085 ≤5/2 ≤5/2 TVγ
to 1/2⁺.
4502 3/2⁻ 3/2⁻ TVL(^{3}He,d)=1.
J^{π}=3/2⁻ consistent with
TV anisotropic γ to (3/2,5/2).
4674 (1/2,3/2) (1/2,3/2) TVNo δ(5/2 to 9/2)
consistent with
TV γ(θ) from 1251-keV, 3/2⁻ IAR.

E(level)	J^{π}	$T_{1/2}$ †	E(level)	J^{π}	$T_{1/2}$ †
0.0	7/2⁻		2341.2 *5*	(7/2⁻)	
12.40‡ *5*	3/2⁺		2352.2 *5*	3/2⁻,5/2	42 fs *+28−17*
376.4# *1*	3/2⁻		2531.0 *5*	(1/2⁺,3/2,5/2)	81 fs *+38−17*
542.9‡ *1*	5/2⁺		2590.0 *6*	3/2⁻,5/2,7/2⁻	35 fs *8*
720.2# *1*	5/2⁻		2601.4 *5*	1/2⁺,3/2,5/2	
939.1@ *1*	1/2⁺		2747.0 *10*	5/2⁻,7/2⁻	
974.5‡ *2*	7/2⁺		2778.7 *5*	(1/2⁻,3/2,5/2)	13 fs *4*
1067.2 *2*	3/2⁻		2862?	(1/2⁻,3/2,5/2)	
1236.4 *2*	11/2⁻		2895.1 *5*	1/2⁺,3/2,5/2	7 fs *4*
1303.2@ *2*	3/2⁺		2903.8 *7*	3/2⁺,5/2⁺	
1409.0# *2*	(7/2)⁻	<0.12 ps	2964.0? *15*	(3/2⁺,5/2⁺)	
1433.4‡ *2*	9/2⁺		2981.5 *7*	3/2⁻	
1555.1 *2*	(3/2)⁻		3025.6 *10*	1/2⁻,3/2⁻	
1661.5# *5*	9/2⁻		3092.0 *8*	1/2⁺,3/2,5/2	
1800.6@ *3*	5/2⁺	0.07 ps *+6−4*	3104	(3/2,5/2)	
1900.7 *3*			3111.2 *8*	7/2⁺	
1930.6 *3*	1/2,3/2,5/2⁺		3136.3 *7*	5/2⁻,7/2⁻,9/2⁻	
2029.6‡ *3*	11/2⁺		3366.4 *8*	(5/2)⁻	
2092.2 *5*	5/2	8.3 fs *21*	3457	(5/2)⁻	
2106.2 *5*	≤7/2		3462.1	5/2⁻,7/2⁻	
2138.4 *5*	3/2⁻,5/2		3475	3/2⁺,5/2⁺	
2151.0 *5*	(1/2,3/2,5/2)	60 fs *+17−12*	3487.4 *8*	3/2⁻	
2221.8 *5*	(3/2⁻,5/2)		3525.2 *8*	3/2⁻,5/2	
2303.8 *5*	(5/2⁻)	55 fs *+35−17*	3548.5 *8*	1/2⁺,3/2,5/2,7/2⁺	

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^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

^{45}Sc Levels (continued)

E(level)	J^π	$T_{1/2}$[†]	Comments
3584.0 *10*	1/2,3/2,5/2$^+$		
3714.3 *8*	1/2,3/2,5/2	13 fs *+14−10*	
3722.3 *10*			
3864.0? *15*			
3883[&]	(1/2$^-$)		
3983.0?[&] *15*	3/2$^+$,5/2$^+$		
4084.9[&] *10*	(1/2$^-$,3/2$^-$)		
4502[&a]	1/2$^-$,3/2$^-$		
4674[a]	(1/2,3/2)		
S(p)+840.6 *15*			
S(p)+842.9 *15*			
S(p)+845.4 *15*			
S(p)+855.7 *15*	3/2$^{(-)}$[b]		
S(p)+906.2 *15*	3/2$^{(+)}$[b]		
S(p)+1251.1[c] *4*	3/2$^-$[d]	37 eV *9*	Γ_p=36 eV *9*; Γ_γ=1.3 eV *4*
S(p)+1258		20 eV *+8−18*	Γ_p=20 eV *+8−18*
S(p)+1267.6[c] *4*	3/2$^-$[d]	23 eV *7*	Γ_p=22 eV *7*; Γ_γ=0.87 eV *24*
S(p)+1583			
S(p)+1619			
S(p)+1623.6	(3/2)$^-$	12 eV *5*	Γ_p=12 eV *5*; Γ_γ=0.42 eV
S(p)+1632.4	(3/2)$^-$	25 eV *7*	Γ_p=25 eV; Γ_γ=0.17 eV
S(p)+1640	3/2$^-$		
S(p)+1646.0	3/2$^-$	80 eV *15*	Γ_p=80 eV *15*; Γ_γ=0.45 eV
S(p)+1651.7[e]	3/2$^-$	400 eV *40*	Γ_p=400 eV *40*; Γ_γ=0.41 eV
S(p)+1658	3/2$^-$		
S(p)+1664.6[e]	3/2$^-$	60 eV *10*	Γ_p=60 eV *10*; Γ_γ=0.34 eV
S(p)+1668.1[e]	3/2$^-$	30 eV *7*	Γ_p=30 eV *7*; Γ_γ=0.32 eV
S(p)+1677.4[e]	(3/2)$^-$	7 eV *5*	Γ_p=7 eV *5*; Γ_γ=0.16 eV
S(p)+1678.2[e]	(3/2)$^-$	5 eV *3*	Γ_p=5 eV *3*; Γ_γ=0.16 eV
S(p)+1682.2[e]	(3/2)$^-$	10 eV *5*	Γ_p=10 eV *5*; Γ_γ=0.11 eV
S(p)+1692.5[e]	(3/2)$^-$	10 eV *5*	Γ_p=10 eV *5*; Γ_γ=0.32 eV
S(p)+1702.2[f]	(1/2)$^-$	10 eV *5*	Γ_p=10 eV *5*; Γ_γ=0.28 eV
S(p)+1730.3[f]	1/2$^-$	50 eV *10*	Γ_p=50 eV *10*; Γ_γ=0.13 eV
S(p)+1741.8[f]	(1/2)$^-$	15 eV *5*	Γ_p=15 eV *5*; Γ_γ=0.12 eV
S(p)+1757			
S(p)+1767.1[f]	1/2$^-$	40 eV *10*	Γ_p=40 eV *10*; Γ_γ=0.37 eV
S(p)+1810.1[f]	(1/2)$^-$	26 eV *7*	Γ_p=25 eV *7*; Γ_γ=0.79 eV
S(p)+1817.0[f]	(1/2)$^-$	5 eV *3*	Γ_p=5 eV *3*; Γ_γ=0.23 eV; $\Gamma_{p'}$=0.003 eV
S(p)+1826.8[f]	(1/2)$^-$	15 eV *5*	Γ_p=15 eV *5*; Γ_γ=0.19 eV
S(p)+1849.2[f]	1/2$^-$	36 eV *7*	Γ_p=35 eV *7*; Γ_γ=0.51 eV; $\Gamma_{p'}$=0.002 eV
S(p)+1864.8[f]	(1/2)$^-$	15 eV *5*	Γ_p=15 eV *5*; Γ_γ=0.46 eV; $\Gamma_{p'}$=0.003 eV
S(p)+1869.3[f]	(1/2)$^-$	26 eV *7*	Γ_p=25 eV *7*; Γ_γ=0.85 eV; $\Gamma_{p'}$=0.005 eV

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^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

^{45}Sc Levels (continued)

E(level)	J^π	$T_{1/2}$[†]	Comments
S(p)+1889.2[f]	1/2⁻	60 eV *10*	Γ_p=60 eV *10*; Γ_γ=0.33 eV
S(p)+1903.2[f]	(1/2)⁻	11 eV *5*	Γ_p=10 eV *5*; Γ_γ=0.91 eV; $\Gamma_{p'}$=0.009 eV
S(p)+1908.6[gh]	1/2⁻	100 eV *15*	Γ_p=100 eV *15*; Γ_γ=0.28 eV; $\Gamma_{p'}$=0.006 eV
S(p)+1920.7[g]	1/2⁻	52 eV *10*	Γ_p=50 eV *10*; Γ_γ=1.61 eV; $\Gamma_{p'}$=0.021 eV
S(p)+1949.3[g]	1/2⁻	76 eV *15*	Γ_p=75 eV *15*; Γ_γ=0.56 eV; $\Gamma_{p'}$=0.042 eV
S(p)+1962.3[g]	1/2⁻	35 eV *7*	Γ_p=35 eV *7*; Γ_γ=0.32 eV; $\Gamma_{p'}$=0.008 eV
S(p)+1968.8[g]	(1/2)⁻	21 eV *5*	Γ_p=20 eV *5*; Γ_γ=1.38 eV; $\Gamma_{p'}$=0.004 eV
S(p)+1979.9[gh]	(1/2)⁻	11 eV *5*	Γ_p=10 eV *5*; Γ_γ=0.52 eV; $\Gamma_{p'}$=0.038 eV
S(p)+1993.7[g]	1/2⁻	400 eV *40*	Γ_p=400 eV *40*; Γ_γ=0.29 eV; $\Gamma_{p'}$=0.018 eV
S(p)+2000.6[g]	1/2⁻	35 eV *7*	Γ_p=35 eV *7*; Γ_γ=0.10 eV; $\Gamma_{p'}$=0.005 eV
S(p)+2019.4[g]	1/2⁻	175 eV *20*	Γ_p=175 eV *20*; Γ_γ=0.28 eV; $\Gamma_{p'}$=0.010 eV
S(p)+2027.3[g]	1/2⁻	241 eV *25*	Γ_p=241 eV *25*; Γ_γ=0.40 eV; $\Gamma_{p'}$=0.099 eV
S(p)+2042.8[g]	1/2⁻	54 eV *10*	Γ_p=53 eV *10*; Γ_γ=0.50 eV; $\Gamma_{p'}$=0.267 eV
S(p)+2045.6[g]	1/2⁻	351 eV *35*	Γ_p=350 eV *25*; Γ_γ=0.31 eV; $\Gamma_{p'}$=0.207 eV
S(p)+2048.9[g]	1/2⁻	64 eV *10*	Γ_p=63 eV *10*; Γ_γ=0.61 eV; $\Gamma_{p'}$=0.180 eV
S(p)+2065.8[g]	1/2⁻	243 eV *25*	Γ_p=242 eV *25*; Γ_γ=0.75 eV; $\Gamma_{p'}$=0.568 eV
S(p)+2075.0[gh]	1/2⁻	36 eV *7*	Γ_p=35 eV *7*; Γ_γ=0.86 eV; $\Gamma_{p'}$=0.068 eV
S(p)+2093.2[g]	1/2⁻	64 eV *10*	Γ_p=63 eV *10*; Γ_γ=0.61 eV; $\Gamma_{p'}$=0.082 eV
S(p)+2106.2[g]	(1/2)⁻	20 eV *5*	Γ_p=19 eV *5*; Γ_γ=0.55 eV; $\Gamma_{p'}$=0.150 eV
S(p)+2107.4[g]	(1/2)⁻	16 eV *5*	Γ_p=15 eV *5*; Γ_γ=0.61 eV; $\Gamma_{p'}$=0.220 eV
S(p)+2120.0[g]	1/2⁻	60 eV *10*	Γ_p=60 eV *10*; Γ_γ=0.29 eV; $\Gamma_{p'}$=0.066 eV
S(p)+2124.2[g]	1/2⁻	31 eV *7*	Γ_p=30 eV *7*; Γ_γ=0.81 eV; $\Gamma_{p'}$=0.061 eV
S(p)+2141.8[g]	1/2⁻	49 eV *10*	Γ_p=48 eV *10*; Γ_γ=0.55 eV; $\Gamma_{p'}$=0.016 eV
S(p)+2155.9[g]	1/2⁻	40 eV *10*	Γ_p=40 eV *10*; Γ_γ=0.26 eV; $\Gamma_{p'}$=0.024 eV
S(p)+2177.1[g]	(1/2)⁻	12 eV *5*	Γ_p=11 eV *5*; Γ_γ=0.38 eV; $\Gamma_{p'}$=0.165 eV

[†] Bound-state $T_{1/2}$′s are from DSAM In ^{44}Ca(p,γ) E=856, 906 keV res. Resonant γ′s are from Γ_p and Γ_γ In ^{44}Ca(p,p),(p,γ) IAR: ^{45}Ca 1435 *3/2⁻* for the 1251.1, 1258, and 1267.6 resonances or Γ_p, Γ_γ, and $\Gamma_{p'}$ In ^{44}Ca(p,p),(p,p′γ),(p,γ) IAR for resonances with E(p)≥1623.6. For E(p)≥1623.6 Γ_p is from the R-matrix analysis of 1975Wi09 and $\Gamma_{p'}$ and Γ_γ are from the linear-correlation analysis of 1976Wi12.

[‡] Band(A): K^π=3/2⁺ band.

[#] Band(B): negative parity band.

[@] Band(C): K^π=1/2⁺ band.

[&] Many states between 3883 and 4502 keV (1973Be39).

[a] Many states between 4502 and 4674 keV (1973Be39).

[b] J from γ(θ); π from inhibition of M2 transitions for $1f_{7/2}$ nuclides (1974Sc02).

[c] Fragments of ^{45}Ca 1435, 3/2⁻, IAR. The 1251- and 1268-keV resonances were identified As the main components of the split isobaric analog of the 1435, 3/2⁻ state by 1973Be39.

[d] From γ(θ) and P-wave formation In ^{44}Ca(p,p),(p,γ) IAR: ^{45}Ca 1435 *3/2⁻*.

[e] Fine structure of the ^{45}Ca 1904, 3/2⁻, IAR.

[f] Background 1/2⁻ states.

[g] Fine structure of the ^{45}Ca 2251, 1/2⁻, IAR.

[h] Probable doublets.

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc)

A: All data are from 1974Sc02, except for multipolarities deduced from comparison to RUL. 1974Sc02 note that there are several transitions which remain unplaced in the decay scheme.

C: The uncertainties in Eγ varied from 0.1 keV for well-defined peaks with Eγ≈0.5 to 1.0 MeV to ≈0.3 keV for small peaks with Eγ≈2.5 MeV. The uncertainties in Iγ varied from 5% for prominent peaks to ≈30% for some of the smallest.

Where γ deexcitation patterns have been reported by two or more groups of authors for the same resonance, the placement of the transitions is marked As uncertain if reported by only one group.

Additional information 1.

Summary of Multipolarities and Mixing Ratios from γ(θ)

Eγ	A	BE4†	C
346		D(+Q)E4‡	
364		E4‡	
376		E4‡	
488	E4§		E4‡
530		E4‡	
542		E4‡	
563		E4‡	
690		D(+Q)E4‡	
720		E4‡	
760		E4‡	
796		D(+Q)E4‡	
926		E4‡	
847	E4§		
1236	E4§		
1398	E4a		
1534	E4a		
1927	E4§		
1988	E4a		
2059	E4a		
2138	E4§		
2291	E4§		
2590	E4a		
3438		D+Q	+0.07 *3*
3454		D+Q	+0.03 *3*
3507	E4§		
3610		D+Q	-0.06 *3*
3626		D+Q	0.00 *3*
4229		D+Q	+0.09 *2*
4245		D+Q	+0.05 *2*
5574	E4§		
5624	E4§		
6019		D+Q	-0.09 *4*
6036		D+Q	+0.06 *5*
6155		E4‡	
6707		D+Q	+2.4 *4*, +0.14 *6*
6786		D+Q	+0.03 *6*, -1.7 *1*
6836		D+Q	+0.03 *2*, -1.9 *1*
6943		D(+Q)E4‡	
7005		D+Q	-0.08 *5*, -2.6 *12*
7054		D+Q	-0.4 *1*, -1.6 *4*
7182		D+Q	-0.13 *+3−1*, -2.9 *+4−3*
7196		D+Q	-0.5 *+5−2*
7231		D+Q	-0.07 *+5−3*, -3.50 *+4−5*
7439		D(+Q)E4‡	
7561		D+Q	+0.10 *+17−8*
7564		D+Q	-0.10 *+3−7*, -1.7 *+3−4*
7762		D+Q	-0.19 *6*, >+12
7782		E4‡	
7785		E4‡	
7962		E4‡	
8099		D+Q	-0.03 *3*
8121		D+Q	-0.21 *+21−12*
8129		D	
8485		D+Q	-0.3 *+5−0*, -2.4 *+8−14*
8507		E4‡	

E4† TVFrom γ(θ), Γ_γ, and branching ratios.

E4‡ TVγ(θ) measured but explicit results not given.

E4§ TVIsotropic γ(θ).

E4a TVAnisotropic γ(θ).

Unplaced Transitions

E_γ	I_γE4†	
		E4†TVFrom $^{44}Ca(p,\gamma)$ E=1658 keV IAR.
494.50E4†		E4‡TVFrom $^{44}Ca(p,\gamma)$ E=856, 906 keV res. Placed as deexciting the 3136 state
603.18E4†	<1	TVby 1974Sc02. However, 1974Sc07 note that the 1900γ is fully shifted in
807.55E4†	<1	TVtheir DSAM measurements implying τ<10 fs and a multipolarity of M1
1900.7E4‡		TVwhich is inconsistent with the suggested placement.
2338E4§		E4§TVFrom $^{44}Ca(p,\gamma)$ E=1644, 1650 keV. 2338$\gamma(\theta)$ measured but explicit
2582.89E4†	7.8	TVresults were not given.
2590.45E4†	7.8	
4949E4§		

Summary of Primary Transition Widths

E_p	E_γ	Γ_γ D(eV)	E(meV)	E_p	E_γ	Γ_γ E(meV)	E_p	E_γ	Γ_γ E(meV)	E_p	E_γ	Γ_γ E(meV)
1624	6135		11	1682	7466	21	1889	7432	56	2043	7582	24
	7408		51		7594	9		7668	17		8873	167
	7536		45		7990	52		7796	26	2046	7585	88
	7755		21	1692	7476	39		8359	27		7949	83
	7933		62		7604	62		8723	17		8511	81
	8099		23		7823	32	1903	7446	34		8875	9
	8463		59		8000	51		7810	58	2049	7588	16
1632	7417		25		8166	7		8736	706		7824	70
	7941		10		8530	6	1909	7687	26		7952	53
	8472		4	1702	7485	31		7815	8		8515	139
1640	8115	0.15 *5*			7613	11		8377	14		8879	62
	8491	0.06 *2*			8176	6		8742	164	2066	7841	38
1646	6157		39		8540	14	1921	7463	319		8531	309
	7430		43	1730	7513	53		7699	89		8895	42
	7777		105		7641	14		7827	290	2075	7613	79
	7954		41		8567	12		8389	179		7978	49
	8121		87	1742	7524	18		8753	108		8540	33
	8485		30		7652	30	1949	7491	345		8904	454
1652	6163		24		8215	11		7727	37	2093	7631	28
	7436		18		8579	12		7855	13		7995	72
	7564		172	1767	7313	15		8417	12		8922	5
	7783		66		8239	125		8781	7	2106	7644	307
	7960		20		8603	45	1962	7503	120		8571	9
	8126		32	1810	7591	22		7867	26		8935	40
	8491		29		7719	58		8794	51	2107	7645	23
1665	6175		25	1817	7725	6	1969	8800	805		7881	17
	7577		151		8288	13	1980	7521	67		8572	25
	7796		29		8652	59		7757	64		8936	13
	8139		21	1827	7371	18		7885	31	2120	8584	64
	8503		3		7607	33		8447	27		8948	183
1668	6179		19		7735	42		8811	53	2124	8026	106
	7799		96		8298	14	1994	7898	209		8588	17
	8142		41		8662	27		8825	37		8952	183
	8507		58	1849	7629	137	2001	8467	6	2142	7679	43
1677	7461		19		7757	18		8832	13		7915	33
	7808		11		8319	42	2019	7559	65		8043	117
	7985		34		8684	84		7795	31		8605	230

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	8152	7	1865	7408	99		8486	59	2156	7693	25
	8516	15		7772	33		8850	37		8057	123
1678	6189	18		8335	27	2027	7567	115		8984	27
	7590	5		8699	32		7803	35	2177	8077	13
	8152	6	1869	7777	51		7932	75		9004	120
	8516	3		8339	62		8494	74			
				8703	237		8858	18			

E TVSummary of secondary transition energies (X=observed but not included in evaluation of E_γ; Y=adopted; TV*italics*=calculated by the evaluator from differences in the excitation energies)

E_x	Adopted	A		B		C	F
12	*12*						Y
376	364.01	364.7	X	364.01	X		
	376.47	376.8	X	376.47	X		
543	530.47	530.6	X	530.47	X		
	542.86	542.8	X	542.86	X		
720	720.19	720.1	X	720.19	X		
939	562.59	562.7		562.59	X		
	926.78	926.4	X	926.78	X		
974	431.32	431.6		431.32	X		
	962.15	961.5		962.15	X		
	974.55	974.5		974.55	X		
1067	346.99	347.9	X	346.99	X		
	690.83	690.6	X	690.83	X		
	1067.0	1067.0		1068.03			
1236	1236.35	1235.8		1236.35	X		
1303	760.30	760.3	X	760.30	X		
	926.78			926.78	X		
	1291.02	1290.7	X	1291.02	X		
1409	1408.96	1408.5		1408.96	X		
1433	890.53			890.53			
1555	487.85	487.9		487.85	X		
	616.3?	616.3		616.47?			
	1179.02	1179.9		1179.02			
1661	1661.5			1661.5			
1801	1257.75	1257.0		1257.75			
	1788.12	1788.4		1788.12			
	1800.73	1800.1		1800.73			
1901	833.45			833.45			
1931	991.49			991.49			
2030	1055.07	1054.8		1055.07			
2092	1024.69	1024.8		1024.69			
	1715.3?	1715.3					
	2092.42	2092.3	X	2092.42	X		
2106	1038.98			1038.98			
2138	583.34			583.34			
	2138.29			2138.29			
2151	847.4	847.4					
	2138.5	2138.5					
2222	2209.42			2209.42			
2304	1235.8	1235.8					
	1926.7	1926.7		1927.55			
	2290.7	2290.7					
2531	1227.6	1227.6					
	1988.1	1988.1					
	2518.3	2518.3					
2590	2214.0	2214.0					
	2590.0?	2590.0					
2601	1045.4	1045.4		1046.02			
	1534.2	1534.2		1535.50			
	2059.28?			2059.28			
	2224.3	2224.3		2225.6			
	2590.45?			2590.45			
2779	2058.6	2058.6					
	2402.0	2402.0		2402.58?			
2862?	*1558*?						Y
	2140?						Y
2895	2352.1	2352.1					
2904	1836.4	1836.4					
	2361.0	2361.0					
2964	*1990*?						Y
	2027?						Y
2982	1425.3	1425.3					
	2605.5	2605.5					
3026	933.4?	933.4					
	2305.82	2305.9		2305.82	X		
	2648.73?			2648.73	X		
3092	2024.4	2024.4					
	2550.3	2550.3					
3104	*3104*						Y
3111	1082.6	1082.6					
3366	1957.9	1957.9					
3457	*2216*						Y
	2520						Y
3462	3085.5	3085.5					
3487	2766.8	2766.8					
	3110.7	3110.7					
	3488.3	3488.3					
3525	1969.6	1969.6					
	3525.0	3525.0					
3548	3005.4	3005.4					
	3536.4	3536.4					
3584	2645.0	2645.0					
3714	1621.8	1621.8					
	2158.6	2158.6					

2341 1622.50 1622.50 3722 3345.7 3345.7
2341.17 2341.17 3883 2580 Y
2352 797.3 797.3 797.29 X 3507 Y
1285.7 1285.7 4085 3146.5 3146.5
1378.50? 1378.50 4502 1398 Y
1632.4 1632.4 3436 Y
2340.1 2340.1 4674 4299 Y
2351.51? 2351.51

RI TVSummary of secondary transition intensities:
E_x E_γ Adopted A(%) B(%) C(rel) F(%) E_x E_γ Adopted A(%) B(%)
C(rel)

12 12 100 100 2531 1228 28 6 14 3
376 364 100 10 92 9 93 209.8 93 1988 100 20 50 10
376 8.7 9 8.0 8 7 18.9 7 2518 72 14 36 7
543 530 100 10 61 6 37 54.7 64 2590 2214 100 20 36 7
543 64 7 39 4 63 40.6 36 2590? 67 14 24 5
720 720 100 100 10 100 100.0 100 2601 1045 30 6 16 3 2.3
939 563 22.0 22 18.0 18 10.9 20 1534 100 10 54 5 7.9
927 100 10 82 8 100 ≤47.0 80 2059? 35 15 2.8
974 431 41 8 22 4 4.8 20 2224 56 12 30 6 2.3
962 44 10 24 5 6.7 30 2590? 99 42 7.8
975 100 21 54 11 14.2 50 2779 2059 47 9 32 6
1067 347 31 4 23.0 23 17 15.7 26 2402 100 21 68 14 3.3
691 100 10 74 7 83 50.1 74 2895 2352 100 100 20
1067 4.1 8 3.0 6 1.9 2904 1836 100 20 62 12
1236 1236 100 100 20 7.8 100 2361 61 13 38 8
1303 760 100 10 64 6 54 16.0 53 2982 1425 100 20 52 10
927 42 ≤47.0 27 2606 92 20 48 10
1291 56 11 36 7 45 5.4 20 3026 933? 27 5 21 4
1409 1409 100 100 10 23.2 100 2306 100 21 79 16 1.3
1433 891 100 3.3 2649? 515 219 6.7
1555 488 100 11 88 9 19.9 100 3092 2024 100 21 58 12
616? 8.9 16 7.0 14 <1 2550 72 14 42 8
1179 5.7 12 5 1 2.1 3104 3104 100 100
1662 1662 100 5.6 3111 1083 100 100 20
1801 1258 35 7 21 4 5.7 3366 1958 100 100 20
1788 100 20 60 12 11.0 3462 3086 100 100 20
1801 32 7 19 4 4.9 3487 2767 89 19 34 7
1901 833 100 1.4 3111 74 16 28 6
1931 991 100 5.4 3488 100 21 38 8
2030 1055 100 100 20 3.2 3525 1970 43 9 30 6
2092 1025 15 3 12.0 24 1.0 3525 100 20 70 14
1715? 7.3 15 6.0 12 3548 3005 100 20 57 11
2092 100 10 82 8 100 17.9 3536 75 16 43 9
2106 1039 100 3.3 3584 2645 100 100 20
2138 583 40 12 1.4 3714 1622 64 14 39 8
2138 100 30 3.5 2159 100 20 61 12
2151 847 11.1 23 10.0 20 3722 3346 100 100 20
2138 100 10 90 9 3883 2580 79 20 44
2222 2209 100 8.7 3507 100 24 56
2304 1236 100 21 38 8 4085 3146 100 100 20

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	1927	92 *19*	35 *7*		4.9		4502	1398	100 *23*	61
	2291	71 *13*	27 *5*					3436	64 *17*	39
2341	1622	67 *20*		2.0			4674	4299	100	100
	2341	100 *30*		3.0						
2352	797	47 *9*	21 *4*		5.0	100				
	1286	20 *4*	9.0 *18*							
	1378	41 *17*		4.4						
	1632	100 *20*	45 *9*							
	2340	56 *12*	25 *5*							
	2352	47 *20*		5.0						

TVC: ΔI_γ ranges from 5% for prominent peaks to ≈30% for some of the smallest.

E_i(level)	J^π_i	E_γ[†]	I_γ[†‡]	E_f	J^π_f	Mult.[#]
12.40	$3/2^+$	12	100	0.0	$7/2^-$	
376.4	$3/2^-$	364.01	100 *10*	12.40	$3/2^+$	
		376.47	8.7 *9*	0.0	$7/2^-$	
542.9	$5/2^+$	530.47	100 *10*	12.40	$3/2^+$	
		542.86	64 *7*	0.0	$7/2^-$	
720.2	$5/2^-$	720.19	100	0.0	$7/2^-$	
939.1	$1/2^+$	562.59	22.0 *22*	376.4	$3/2^-$	
		926.78	100 *10*	12.40	$3/2^+$	
974.5	$7/2^+$	431.32	41 *8*	542.9	$5/2^+$	
		962.15	44 *10*	12.40	$3/2^+$	
		974.55	100 *21*	0.0	$7/2^-$	
1067.2	$3/2^-$	346.99	31 *4*	720.2	$5/2^-$	D(+Q)
		690.83	100 *10*	376.4	$3/2^-$	D(+Q)
		1067.0[&]	4.1 *8*	0.0	$7/2^-$	
1236.4	$11/2^-$	1236.35	100	0.0	$7/2^-$	
1303.2	$3/2^+$	760.30	100 *10*	542.9	$5/2^+$	
		926.78	42	376.4	$3/2^-$	
		1291.02	56 *11*	12.40	$3/2^+$	
1409.0	$(7/2)^-$	1408.96	100	0.0	$7/2^-$	D,E2
1433.4	$9/2^+$	890.53	100	542.9	$5/2^+$	
1555.1	$(3/2)^-$	487.85	100 *11*	1067.2	$3/2^-$	[a]
		616.3[i]	8.9 *16*	939.1	$1/2^+$	
		1179.02	5.7 *12*	376.4	$3/2^-$	
1661.5	$9/2^-$	1661.5	100	0.0	$7/2^-$	
1800.6	$5/2^+$	1257.75	35 *7*	542.9	$5/2^+$	D,E2
		1788.12	100 *20*	12.40	$3/2^+$	D,E2
		1800.73	32 *7*	0.0	$7/2^-$	
1900.7		833.45	100	1067.2	$3/2^-$	
1930.6	$1/2,3/2,5/2^+$	991.49	100	939.1	$1/2^+$	
2029.6	$11/2^+$	1055.07[&]	100	974.5	$7/2^+$	
2092.2	5/2	1024.69	15 *3*	1067.2	$3/2^-$	D,E2
		1715.3[i]	7.3 *15*	376.4	$3/2^-$	D,Q
		2092.42	100 *10*	0.0	$7/2^-$	D,E2
2106.2	≤7/2	1038.98	100	1067.2	$3/2^-$	
2138.4	$3/2^-,5/2$	583.34	40 *12*	1555.1	$(3/2)^-$	
		2138.29	100 *30*	0.0	$7/2^-$	
2151.0	(1/2,3/2,5/2)	847.4	11.1 *23*	1303.2	$3/2^+$	D,E2
		2138.5	100 *10*	12.40	$3/2^+$	D,E2
2221.8	$(3/2^-,5/2)$	2209.42	100	12.40	$3/2^+$	

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$^{45}_{21}Sc_{24}$-12

2303.8	$(5/2^-)$	1235.8	100 *21*	1067.2	$3/2^-$	D,E2
		1926.7	92 *19*	376.4	$3/2^-$	D,E2

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†‡]	E_f	J^π_f	Mult.[#]
2303.8	(5/2$^-$)	2290.7	71 13	12.40	3/2$^+$	D,E2
2341.2	(7/2$^-$)	1622.50	67 20	720.2	5/2$^-$	
		2341.17[b]	100 30	0.0	7/2$^-$	
2352.2	3/2$^-$,5/2	797.3[b]	47 9	1555.1	(3/2)$^-$	D,E2
		1285.7[b]	20 4	1067.2	3/2$^-$	D,E2
		1378.50[bi]	41 17	974.5	7/2$^+$	
		1632.4[b]	100 20	720.2	5/2$^-$	D,E2
		2340.1[b]	56 12	12.40	3/2$^+$	D,E2
		2351.51[bi]	47 20	0.0	7/2$^-$	
2531.0	(1/2$^+$,3/2,5/2)	1227.6	28 6	1303.2	3/2$^+$	D,E2
		1988.1	100 20	542.9	5/2$^+$	D,E2[c]
		2518.3	72 14	12.40	3/2$^+$	D,E2
2590.0	3/2$^-$,5/2,7/2$^-$	2214.0	100 20	376.4	3/2$^-$	D,E2
		2590.0[i]	67 14	0.0	7/2$^-$	D,E2[c]
2601.4	1/2$^+$,3/2,5/2	1045.4	30 6	1555.1	(3/2)$^-$	
		1534.2	100 10	1067.2	3/2$^-$	[c]
		2059.28[i]	35 15	542.9	5/2$^+$	
		2224.3	56 12	376.4	3/2$^-$	
		2590.45[i]	99 42	12.40	3/2$^+$	
2778.7	(1/2$^-$,3/2,5/2)	2058.6	47 9	720.2	5/2$^-$	D,E2[c]
		2402.0	100 21	376.4	3/2$^-$	D,E2
2862?	(1/2$^-$,3/2,5/2)	1558[i]		1303.2	3/2$^+$	
		2140[i]		720.2	5/2$^-$	
2895.1	1/2$^+$,3/2,5/2	2352.1 5	100	542.9	5/2$^+$	D,E2
2903.8	3/2$^+$,5/2$^+$	1836.4	100 20	1067.2	3/2$^-$	
		2361.0	61 13	542.9	5/2$^+$	
2964.0?	(3/2$^+$,5/2$^+$)	1990[i]		974.5	7/2$^+$	
		2027[i]		939.1	1/2$^+$	
2981.5	3/2$^-$	1425.3	100 20	1555.1	(3/2)$^-$	
		2605.5	92 20	376.4	3/2$^-$	
3025.6	1/2$^-$,3/2$^-$	933.4[i]	27 5	2092.2	5/2	
		2305.82	100 21	720.2	5/2$^-$	
		2648.73[i]	5.2×10^2 22	376.4	3/2$^-$	
3092.0	1/2$^+$,3/2,5/2	2024.4	100 21	1067.2	3/2$^-$	
		2550.3	72 14	542.9	5/2$^+$	
3104	(3/2,5/2)	3104	100	0.0	7/2$^-$	
3111.2	7/2$^+$	1082.6	100	2029.6	11/2$^+$	
3366.4	(5/2)$^-$	1957.9	100	1409.0	(7/2)$^-$	
3457	(5/2)$^-$	2216		1236.4	11/2$^-$	
		2520		939.1	1/2$^+$	
3462.1	5/2$^-$,7/2$^-$	3085.5	100	376.4	3/2$^-$	

$^{45}_{21}Sc_{24}$-13

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†‡]	E_f	J_f^π	Mult.[#]
3487.4	3/2$^-$	2766.8	89 *19*	720.2	5/2$^-$	
		3110.7	74 *16*	376.4	3/2$^-$	
		3488.3	100 *21*	0.0	7/2$^-$	
3525.2	3/2$^-$,5/2	1969.6	43 *9*	1555.1	(3/2)$^-$	
		3525.0	100 *20*	0.0	7/2$^-$	
3548.5	1/2$^+$,3/2,5/2,7/2$^+$	3005.4	100 *20*	542.9	5/2$^+$	
		3536.4	75 *16*	12.40	3/2$^+$	
3584.0	1/2,3/2,5/2$^+$	2645.0	100	939.1	1/2$^+$	
3714.3	1/2,3/2,5/2	1621.8	64 *14*	2092.2	5/2	D,E2
		2158.6	100 *20*	1555.1	(3/2)$^-$	D,E2
3722.3		3345.7	100	376.4	3/2$^-$	
3883	(1/2$^-$)	2580	79 *20*	1303.2	3/2$^+$	
		3507	100 *24*	376.4	3/2$^-$	*a*
4084.9	(1/2$^-$,3/2$^-$)	3146.5	100 *20*	939.1	1/2$^+$	
4502	1/2$^-$,3/2$^-$	1398	100 *23*	3104	(3/2,5/2)	*c*
		3436	64 *17*	1067.2	3/2$^-$	
4674	(1/2,3/2)	4299	100	376.4	3/2$^-$	
S(p)+840.6		3991[h]	17[h] *4*			
		4225[h]	3.3[h] *7*			
		4577[h]	6.7[h] *14*			
		4614[h]	3.3[h] *7*	3104	(3/2,5/2)	
		4731[h]	17[h] *4*			
		4809[h]	3.3[h] *7*			
		4818[h]	6.7[h] *14*			
		4934[h]	23[h] *5*			
		5111[h]	3.3[h] *7*			
		5123[h]	10.0[h] *20*			
		5182[h]	10.0[h] *20*			
		5361[h]	3.3[h] *7*			
		5410[h]	6.7[h] *14*			
		5562[h]	3.3[h] *7*			
		5621[h]	6.7[h] *14*			
		6410[h]	3.3[h] *7*			
		6645[h]	10.0[h] *20*			
		6774[h]	100[h] *20*			
		6992[h]	33[h] *7*			
		7170[h]	20[h] *4*			
		7336[h]	17[h] *4*			

$^{45}_{21}Sc_{24}$-14

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	E_γ †	I_γ †‡	E_f	J^π_f
S(p)+840.6	7700[h]	23[h] *5*		
S(p)+842.9	3991[h]	17[h] *4*		
	4225[h]	3.3[h] *7*		
	4577[h]	6.7[h] *14*		
	4614[h]	3.3[h] *7*	3104	(3/2,5/2)
	4731[h]	17[h] *4*		
	4809[h]	3.3[h] *7*		
	4818[h]	6.7[h] *14*		
	4934[h]	23[h] *5*		
	5111[h]	3.3[h] *7*		
	5123[h]	10.0[h] *20*		
	5182[h]	10.0[h] *20*		
	5361[h]	3.3[h] *7*		
	5410[h]	6.7[h] *14*		
	5562[h]	3.3[h] *7*		
	5621[h]	6.7[h] *14*		
	6410[h]	3.3[h] *7*		
	6645[h]	10.0[h] *20*		
	6774[h]	100[h] *20*		
	6992[h]	33[h] *7*		
	7170[h]	20[h] *4*		
	7336[h]	17[h] *4*		
	7700[h]	23[h] *5*		
S(p)+845.4	3991[h]	17[h] *4*		
	4225[h]	3.3[h] *7*		
	4577[h]	6.7[h] *14*		
	4614[h]	3.3[h] *7*	3104	(3/2,5/2)
	4731[h]	17[h] *4*		
	4809[h]	3.3[h] *7*		
	4818[h]	6.7[h] *14*		
	4934[h]	23[h] *5*		
	5111[h]	3.3[h] *7*		
	5123[h]	10.0[h] *20*		
	5182[h]	10.0[h] *20*		
	5361[h]	3.3[h] *7*		

$^{45}_{21}Sc_{24}$-15

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†‡]	E_f	J^π_f	Mult.[#]	Comments
S(p)+845.4		5410[h]	6.7[h] *14*				
		5562[h]	3.3[h] *7*				
		5621[h]	6.7[h] *14*				
		6410[h]	3.3[h] *7*				
		6645[h]	10.0[h] *20*				
		6774[h]	100[h] *20*				
		6992[h]	33[h] *7*				
		7170[h]	20[h] *4*				
		7336[h]	17[h] *4*				
		7700[h]	23[h] *5*				
S(p)+855.7	3/2$^{(-)}$	3742[i]	20 *4*	939.1	1/2$^+$		
		4003	33 *7*				
		4359	27 *6*				
		4589	20 *4*				
		4633	27 *6*				
		4830	27 *6*				
		4947	53 *11*				
		5124	20 *4*				
		5135	33 *7*				
		5194	33 *7*				
		5422	60 *12*				
		5574	20 *4*			[a]	
		5633	40 *8*				
		6170	3.3 *7*				
		6422	3.3 *7*				
		6658	20 *4*				
		6786	20 *4*			D+Q	Additional information 2.
		7005	40 *8*			D+Q	Additional information 3.
		7182	100 *20*			D+Q	Additional information 4.
		7348	60 *12*				
		7713	6.7 *14*				
S(p)+906.2	3/2$^{(+)}$	3690	7.1 *15*				
		3911[i]	21.4 *43*				
		4061	35.7 *72*				
		4191	14.3 *29*	542.9	5/2$^+$		
		4226	14.3 *29*				
		4250	14.3 *29*				
		4287	21.4 *43*				
		4313	14.3 *29*				
		4408	7.1 *15*				
		4664	14.3 *29*				

$^{45}_{21}Sc_{24}$-16

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†‡]	E_f	J^π_f	Mult.[#]	δ[@]	Comments
S(p)+906.2	3/2$^{(+)}$	4676[i]	21.4 43	3104	(3/2,5/2)			
		4683	7.1 15					
		4749	42.3 86	0.0	7/2$^-$			
		4793	14.3 29					
		4811[i]	7.1 15					
		4873	35.7 72					
		4880	7.1 15					
		4996	7.1 15					
		5173	28.6 57					
		5244	7.1 15					
		5422	42.3 86					
		5472	21.4 43					
		5624	28.6 57			[a]		
		5682	14.3 29					
		5975	7.1 15					
		6219	21.4 43					
		6471	7.1 15					
		6707	21.4 43			D+Q		Additional information 5.
		6836	100 22			D+Q		Additional information 6.
		7054	28.6 57			D+Q		Additional information 7.
		7231	28.6 57			D+Q		Additional information 8.
		7398	28.6 57					
		7762	28.6 57			D+Q		Additional information 9.
S(p)+1251.1	3/2$^-$	3439	59 9			D+Q	+0.07 3	
		3611	55 9			D+Q	−0.06 3	
		4230	100 14			D+Q	+0.09 2	
		6021	91 14			D+Q	−0.09 4	
		7174	23					
		7393	27					
		7739	41					
		8101	50 9			D+Q	−0.03 3	
S(p)+1267.6	3/2$^-$	3456	77 12			D+Q	+0.03 3	
		3628	92 16			D+Q	0.00 3	
		4247	100 16			D+Q	+0.05 2	
		6038	69 12			D+Q	+0.06 5	
		7410	8					
		7587	23					
		8118	15					
S(p)+1583		7895[d]	100[d]					
		8060[d]	58[d]					
		8424[d]	42[d]					
		8436[d]	42[d]					

$^{45}_{21}Sc_{24}$-17

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†‡]	E_f	J_f^π	Mult.[#]	δ[@]	Γ_γ (eV)	Comments
S(p)+1619		7406[d]	69[d]						
		7498[d]	59[d]						
		7531[d]	62[d]						
		7930[d]	23[d]						
		8095[d]	36[d]						
		8459[d]	100[d]						
		8471[d]	33[d]						
S(p)+1623.6	(3/2)⁻	6135	18			D,E2		0.011	
		7408	82			D,E2		0.051	
		7536	73			D,E2		0.045	
		7755	34			D,E2		0.021	
		7933	100			D,E2		0.062	
		8099	37			D,E2		0.023	
		8463	95			D,E2		0.059	
S(p)+1632.4	(3/2)⁻	7417	100			D,E2		0.025	
		7941	40			D,Q		0.010	
		8472	16					0.004	
S(p)+1640	3/2⁻	7772[d]	94[d]						
		8115[d]	100[d]			D,E2		0.15 *5*	
		8491[d]	39[d]			D,E2		0.06 *2*	
S(p)+1646.0	3/2⁻	5042[ei]	<11[e]						
		5473[ei]	<11[e]	0.0	7/2⁻				
		5535[ei]	14[e]						
		5590[ei]		2903.8	3/2⁺,5/2⁺				
		5637[ei]	11[e]						
		6147[ei]	11[e]						
		6157[i]	37			D,E2		0.039	
		6343[ei]	4[e]						
		6943[e]	32[e]			D(+Q)			
		7196[e]	25[e]			D(+Q)	−0.5 *+5−2*		
		7430	41			D,E2		0.043	
		7529[ei] *5*	25[e] *3*						
		7561[ei]	22[e]			D+Q	+0.10 *+17−8*		
		7777	100			D,E2		0.105	I_γ: Iγ=65 (1979Aw02) discrepant.
		7954	39			D,E2		0.041	
		8121	83			D+Q	−0.21 *+20−12*	0.087	
		8485	29			D+Q		0.030	Additional information 10.
S(p)+1651.7	3/2⁻	4783[ei]	<3[e]						
		5027[ei]	<3[e]						
		5470[ei]	<3[e]	12.40	3/2⁺				

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†‡]	Mult.[#]	Γ_γ (eV)	Comments
S(p)+1651.7	3/2−	6152[ei]	18[e]			
		6163[i]	14	D,E2	0.039	
		6946[ei]	<3[e]			
		7298[ei]	<3[e]			not included In Adopted Gammas since ΔJ^π implies E4.
		7436	10	D,E2	0.043	I_γ: Iγ=21 (1979Aw02) discrepant.
		7564	100	D+Q		Additional information 11.
		7783	38	D,E2	0.105	
		7960	14	D,E2	0.041	
		8126	19	D,E2	0.087	
		8491	17	D,E2	0.030	
		8504[ei]	74[e]			
S(p)+1658	3/2−	5534[fgi]				
		5765[fgi]				
		5910[fgi]	21[f]			
		6170[fgi]	21[f]			
		6208[fgi]	6[f]			
		6711[fgi]	29[f]			
		7102[fgi]	17[f]			
		7208[fgi]	6[f]			
		7444[fgi]	33[f]			
		7537[fgi]	2[f]			
		7572[fgi]	46[f]			
		7792[f]	10[f]			
		7968[fgi]	12[f]			
		8135[f]	100[f]			
		8499[f]	58[f]			
		8511[f]	29[f]			
S(p)+1664.6	3/2−	6175	17	D,E2	0.025	
		7577	100	D,E2	0.151	
		7796	19	D,E2	0.029	
		8139	14	D,E2	0.021	
		8503	2		0.003	
S(p)+1668.1	3/2−	6179	20	D,E2	0.019	
		7799	100	D,E2	0.096	
		8142	43	D,E2	0.041	
		8507	60	D,E2	0.058	
S(p)+1677.4	(3/2)−	7461	56	D,E2	0.019	
		7808	32		0.011	
		7985	100	D,E2	0.034	
		8152	21		0.007	

$^{45}_{21}Sc_{24}$-19

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J^{π}_i	E_{γ}[†]	I_{γ}[†‡]	Mult.[#]	Γ_{γ} (eV)
S(p)+1677.4	(3/2)$^-$	8516	44		0.015
S(p)+1678.2	(3/2)$^-$	6189	100	D,E2	0.018
		7590	28		0.005
		8152	33		0.006
		8516	17		0.003
S(p)+1682.2	(3/2)$^-$	7466	40	D,E2	0.021
		7594	17		0.009
		7990	100	D,E2	0.052
S(p)+1692.5	(3/2)$^-$	7476	63	D,E2	0.039
		7604	100	D,E2	0.062
		7823	52	D,E2	0.032
		8000	82	D,E2	0.051
		8166	11		0.007
		8530	10		0.006
S(p)+1702.2	(1/2)$^-$	7485	100	D,E2	0.031
		7613	35		0.011
		8176	19		0.006
		8540	45		0.014
S(p)+1730.3	1/2$^-$	7513	100	D,E2	0.053
		7641	26		0.014
		8567	23		0.012
S(p)+1741.8	(1/2)$^-$	7524	60	D,E2	0.018
		7652	100	D,E2	0.030
		8215	91		0.011
		8579	91		0.012
S(p)+1757		7633[d]	50[d]		
		8230[d]	100[d]		
		8594[d]	91[d]		
		8606[d]	91[d]		
S(p)+1767.1	1/2$^-$	7313	12	D,E2	0.015
		8239	100	D,E2	0.125
		8603	36	D,E2	0.045
S(p)+1810.1	(1/2)$^-$	7591	38	D,E2	0.022
		7719	100	D,E2	0.058
S(p)+1817.0	(1/2)$^-$	7725	10		0.006
		8288	22		0.013
		8652	100	D,E2	0.059
S(p)+1826.8	(1/2)$^-$	7371	43	D,E2	0.018
		7607	79	D,E2	0.033
		7735	100	D,E2	0.042
		8298	33		0.014
		8662	64		0.027
S(p)+1849.2	1/2$^-$	7629	100	D,E2	0.137
S(p)+1849.2	1/2$^-$	7757	13	D,E2	0.018
		8319	31	D,E2	0.042
		8684	61	D,E2	0.084
S(p)+1864.8	(1/2)$^-$	7408	100	D,E2	0.099
		7772	33	D,E2	0.033
		8335	27	D,E2	0.027
		8699	32	D,E2	0.032
S(p)+1869.3	(1/2)$^-$	7777	22	D,E2	0.051
		8339	26	D,E2	0.062
		8703	100	D,E2	0.237
S(p)+1889.2	1/2$^-$	7432	100	D,E2	0.056
		7668	30	D,E2	0.017
		7796	46	D,E2	0.026
		8359	48	D,E2	0.027

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J^π_i	E_γ [†]	I_γ [†‡]	Mult. [#]	Γ_γ (eV)
S(p)+1889.2	1/2⁻	8723	30		0.017
S(p)+1903.2	(1/2)⁻	7446	5	D,E2	0.034
		8736	100	D,E2	0.706
S(p)+1908.6	1/2⁻	7687	16	D,E2	0.026
		7815	5		0.008
		8742	100	D,E2	0.164
S(p)+1920.7	1/2⁻	7462	100	D,E2	0.319
		7699	28	D,E2	0.089
		7827	91	D,E2	0.290
		8753	34	D,E2	0.108
S(p)+1949.3	1/2⁻	7491	100	D,E2	0.345
		7727	11	D,E2	0.037
		7855	4		0.013
		8781	2		0.007
S(p)+1962.3	1/2⁻	7503	100	D,E2	0.120
		8794	42	D,E2	0.051
S(p)+1968.8	(1/2)⁻	8800	100	D,E2	0.805
S(p)+1979.9	(1/2)⁻	7521	100	D,E2	0.067
		7757	96	D,E2	0.064
		7885	46	D,E2	0.031
		8811	79	D,E2	0.053
		8825	18	D,E2	0.037
		8832	100		0.013
S(p)+2019.4	1/2⁻	7559	100	D,E2	0.065
		7795	48	D,E2	0.031
		8850	57	D,E2	0.037
S(p)+2027.3	1/2⁻	7567	100	D,E2	0.115
		7803	30	D,E2	0.035
		7932	65	D,E2	0.075
		8858	16		0.018
		8873	100	D,E2	0.167
S(p)+2045.6	1/2⁻	7585	100	D,E2	0.088
		7949	94	D,E2	0.083
		8875	10		0.009
S(p)+2048.9	1/2⁻	7588	12	D,E2	0.016
		7824	50	D,E2	0.070
		7952	38	D,E2	0.053
		8879	45	D,E2	0.062
S(p)+2065.8	1/2⁻	7841	12	D,E2	0.038
		8895	14	D,E2	0.042
S(p)+2075.0	1/2⁻	7613	17	D,E2	0.079
		7978	11	D,E2	0.049
		8540	7	D,E2	0.033
		8904	100	D,E2	0.454
S(p)+2093.2	1/2⁻	7631	39	D,E2	0.028
		8922	7		0.005

$^{45}_{21}Sc_{24}$-21

^{44}Ca(p,p),(p,p′γ),(p,γ) res (continued)

γ(^{45}Sc) (continued)

E_i(level)	J^π_i	E_γ†	I_γ†‡	Mult.#	Γ_γ (eV)	E_i(level)	J^π_i	E_γ†	I_γ†‡	Mult.#	Γ_γ (eV)
								8571	3		0.009
								8935	13	D,E2	0.040
						S(p)+2107.4	$(1/2)^-$	7645	92	D,E2	0.023
								8572	100	D,E2	0.025
								8936	52		0.013
						S(p)+2120.0	$1/2^-$	8584	35	D,E2	0.064
								8948	100	D,E2	0.183
								8588	9		0.017
								8952	100	D,E2	0.183
						S(p)+2141.8	$1/2^-$	7679	19	D,E2	0.043
								7915	14	D,E2	0.033
								8605	100	D,E2	0.230
						S(p)+2155.9	$1/2^-$	7693	20	D,E2	0.025
								8984	22		0.027
						S(p)+2177.1	$(1/2)^-$	8077	11		0.013
								9004	100	D,E2	0.120

$^{45}_{21}Sc_{24}$-22

γ(^{45}Sc) (continued)

[†] Primary transition energies and intensities are from ^{44}Ca(p,γ) E=856, 906 keV res for E(p)<1 MeV, ^{44}Ca(p,p),(p,γ) IAR: ^{45}Ca 1435 *3/2*$^{-}$ for 1 MeV<E(p)<1.3 MeV, and from ^{44}Ca(p,p),(p,p′γ),(p,γ) IAR, except As noted In the following footnotes.

[‡] Relative photon branching ratio from each level.

[#] From comparison to RUL and γ(θ) (see summary table above). Multipolarities based on RUL differ from the values deduced by 1974Sc07 who assumed RUL(E2)=60.

[@] From γ(θ); see summary table above.

[&] Alternate placement of 1055γ As deexciting 1067 state and 1068γ As deexciting 2303 state by 1972Ek02 not confirmed In other resonance studies.

[a] Isotropic γ(θ); see summary table above.

[b] See footnote on the 2341 and 2352 states In the Adopted Levels table.

[c] Anisotropic γ(θ); see summary table above.

[d] From 1971De25.

[e] From 1979Aw02. The resonance energies and excitation energies cited by 1979Aw02 do not seem to Be consistent. Excitation energies calculated from S(p)=6888.3 *8* (2003Au03) and the E(p) of 1979Aw02 are≈6 keV less than those cited by 1979Aw02. From comparison to data of 1976Wi12, the resonance energies cited by 1979Aw02 appear to Be≈2 keV low while the Eγ appear to Be≈3 keV high. The evaluator has applied these corrections.

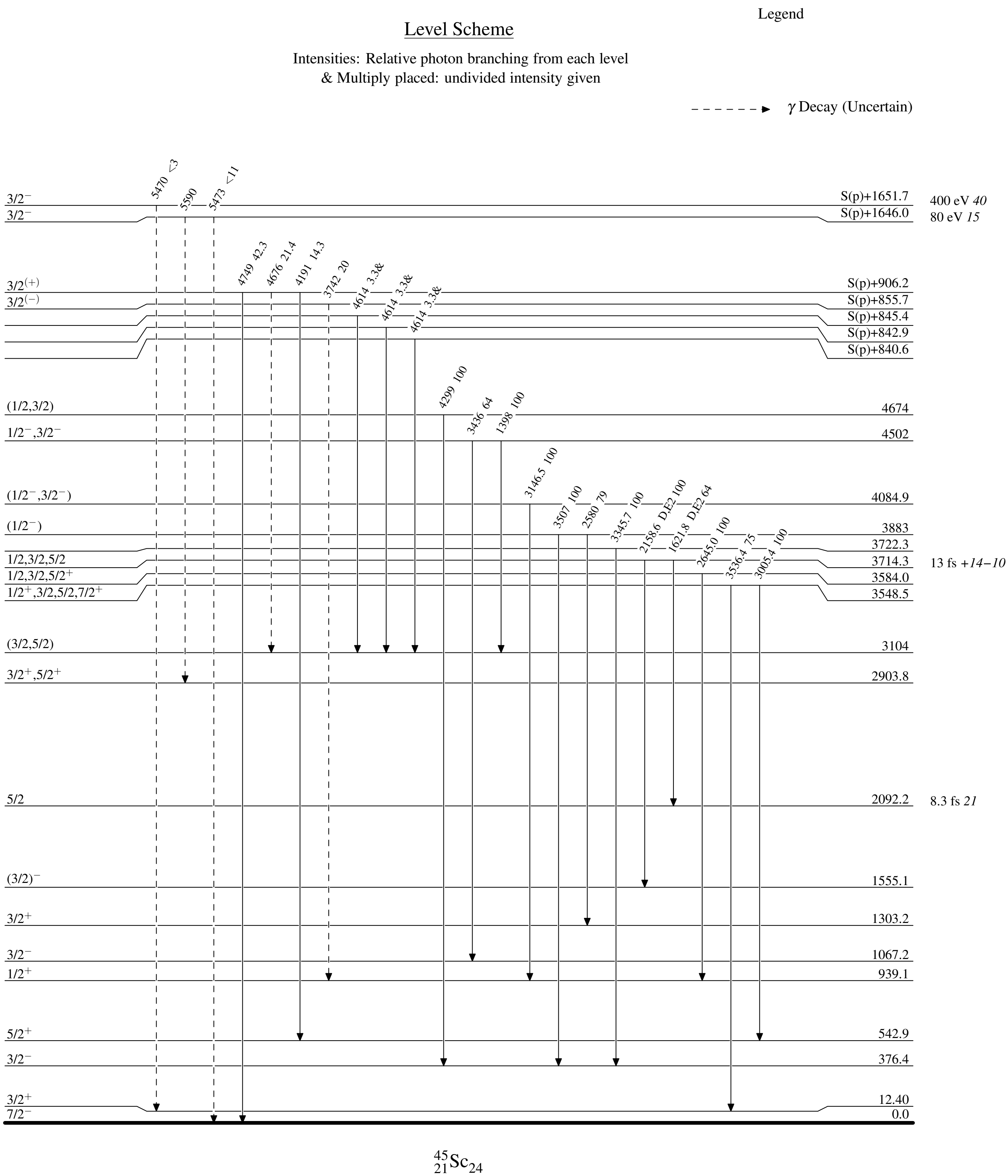
[f] From 1972Ek02.

[g] Not reported by 1971De25.

[h] Multiply placed with undivided intensity.

[i] Placement of transition in the level scheme is uncertain.

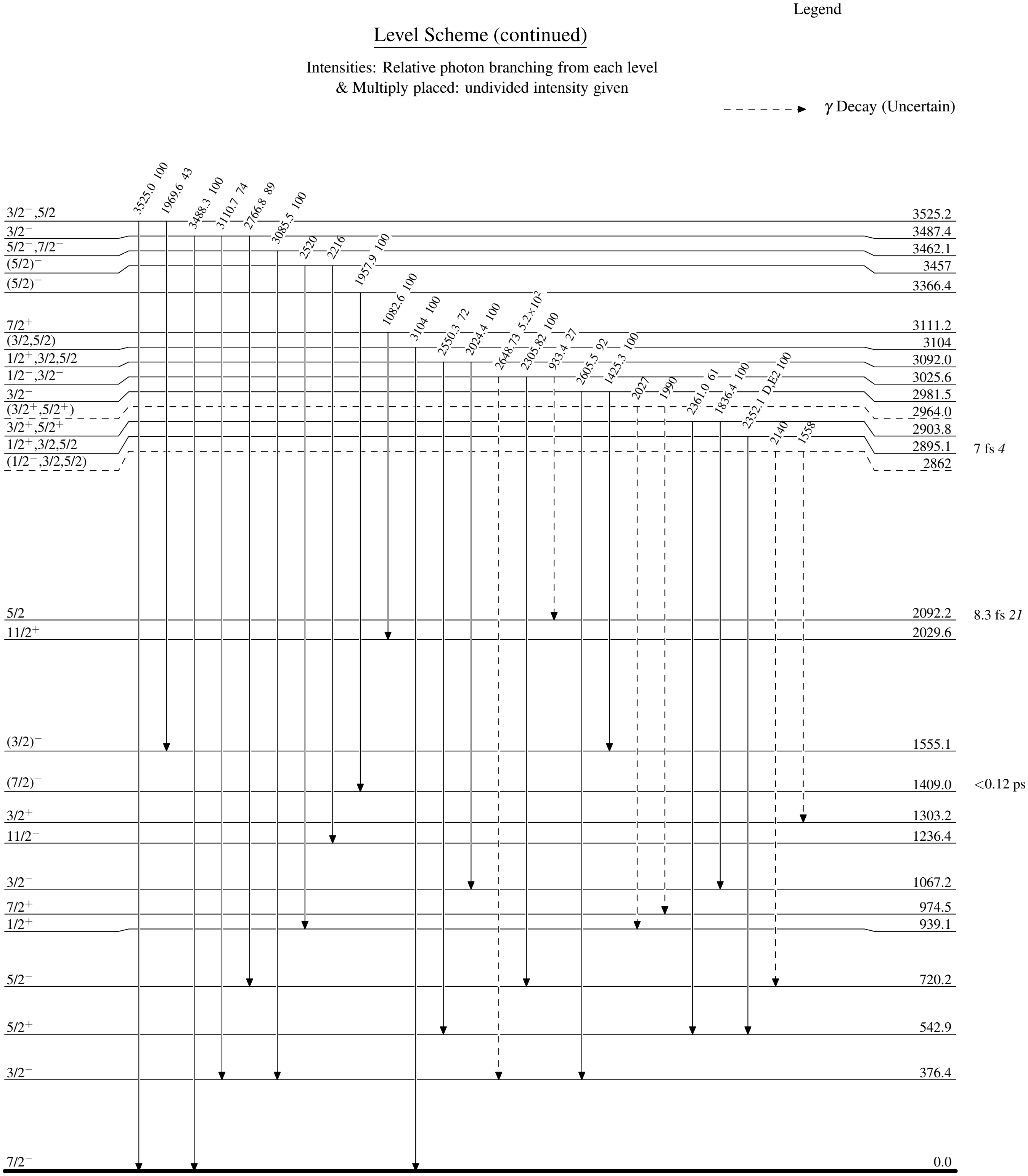
^{44}Ca(p,p),(p,p′γ),(p,γ) res



^{44}Ca(p,p),(p,p′γ),(p,γ) res

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



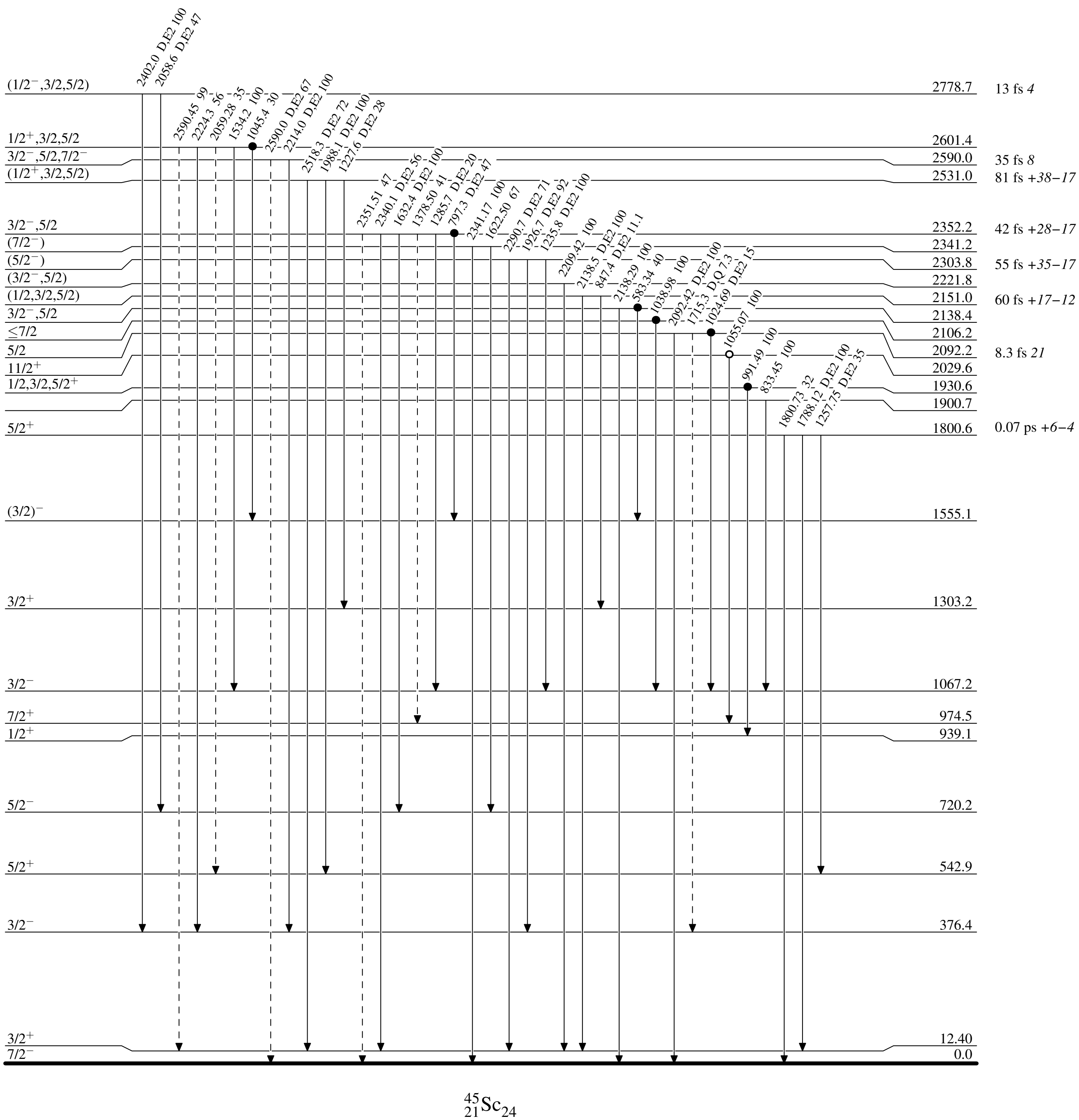
$^{45}_{21}Sc_{24}$

^{44}Ca(p,p),(p,p′γ),(p,γ) res

Level Scheme (continued)

Intentsities: Relative photon branching from each level
& Multiply placed: undivided intensity given

Legend
- - - - - ► γ Decay (Uncertain)
● Coincidence
○ Coincidence (Uncertain)

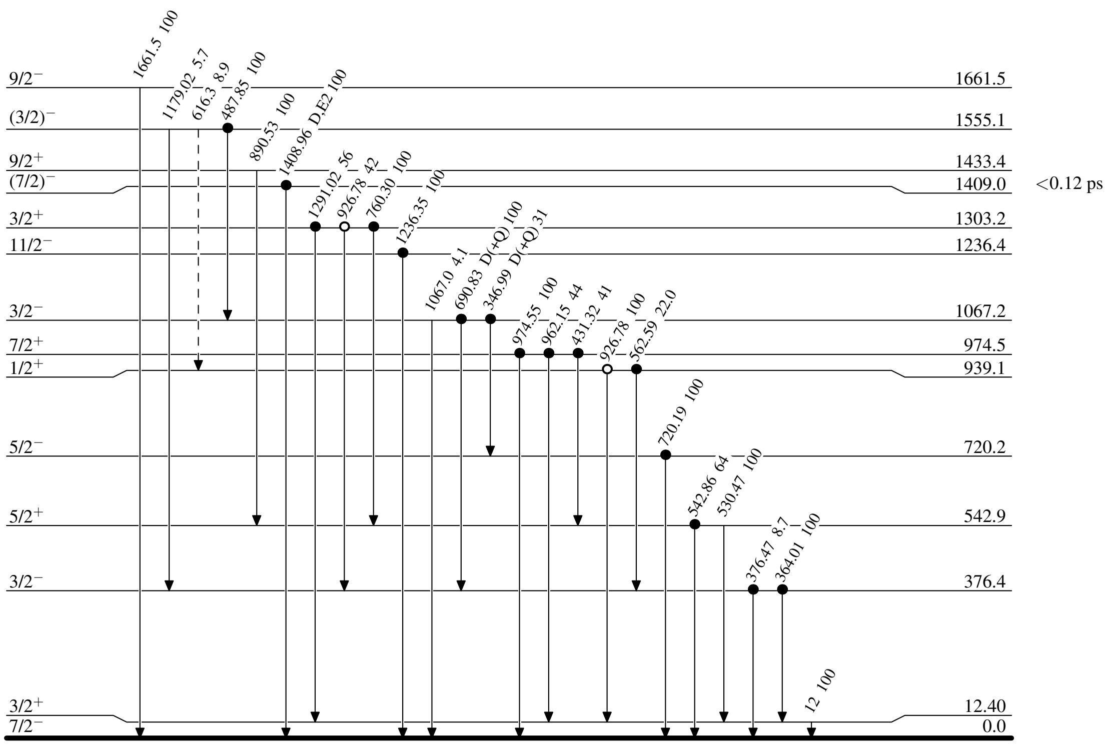


^{44}Ca(p,p),(p,p′γ),(p,γ) res

Level Scheme (continued)

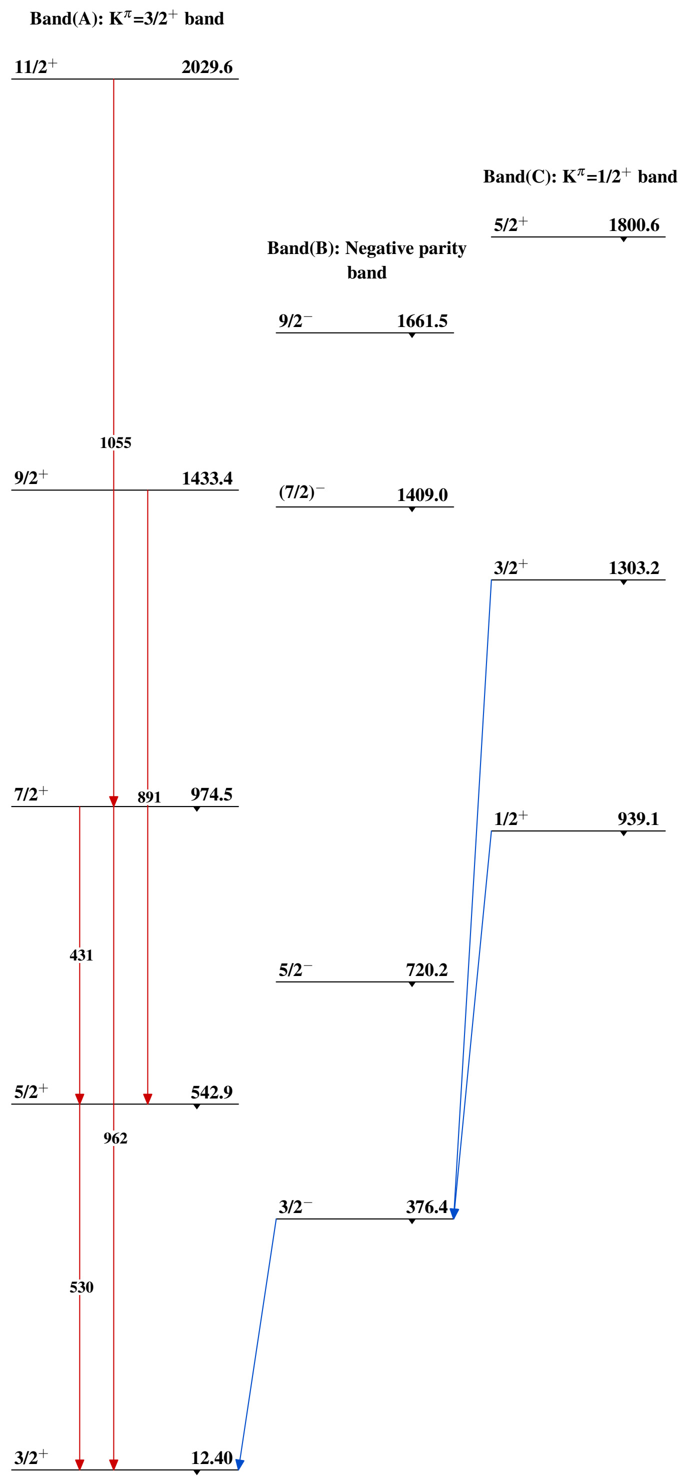
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

Legend
- - - - - -► γ Decay (Uncertain)
● Coincidence
○ Coincidence (Uncertain)



$^{45}_{21}Sc_{24}$

^{44}Ca(p,p),(p,p′γ),(p,γ) res



$^{45}_{21}Sc_{24}$