^{28}Si(^{20}Ne,αpγ) 2007Ch40

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen[#]	NDS 126, 1 (2015)	31-Mar-2015

2007Ch40: E=84 MeV beam from ATLAS accelerator at Argonne National Laboratory. Target of self-supporting 0.5 mg/cm^2 ^{28}Si on Ta foil. γ-rays were detected by the Gammasphere array of 102 Compton- suppressed HPGe detectors and charged particles by an array of 95 CsI(T1) detectors with a 65% efficiency for detection α particles and 50% for protons. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$, $\gamma\gamma(\theta)$(DCO). Deduced levels, J, π, γ branching ratios.

A similar experiment was done by 2007Ch40 using the reaction ^{24}Mg(^{24}Mg,αpγ). The γ-ray energies and angular distribution/ correlation coefficients are averages from the two experiments. The coefficients from these measurements are listed in ^{24}Mg(^{24}Mg,αpγ) dataset.

^{43}Sc Levels

E(level)[†]	J$^\pi$	$T_{1/2}$[‡]	E(level)[†]	J$^\pi$	E(level)[†]	J$^\pi$
0.0[#]	$7/2^-$		6431.60[a] *13*	$23/2^+$	12053.72 *16*	$29/2^{(-)}$
152.25[a] *11*	$3/2^+$	438 μs *7*	6818.98 *15*	$(21/2^+)$	12073.76 *18*	$(29/2^-)$
845.42 *20*	$5/2^-$		7107.43[&] *13*	$23/2^+$	12615.45 *16*	$(31/2)^-$
880.97[b] *10*	$5/2^+$		7118.4 *10*		12704.2 *10*	
1337.85[a] *9*	$7/2^+$		7273.1 *10*		12804.7 *4*	
1408.38[@] *16*	$7/2^-$		7359.77[b] *14*	$25/2^+$	13045.3[&] *3*	$(29/2^+)$
1830.62[#] *9*	$11/2^-$		8010.6 *4*		13117.20 *18*	$(31/2^-)$
1932.83[b] *10*	$9/2^+$		8434.56 *17*	$23/2^-$	13123.1 *6*	
2554.07[a] *10*	$11/2^+$		8555.89[@] *14*	$23/2^-$	13584.6 *11*	$(29/2^+)$
2635.72[@] *12*	$11/2^-$		8703.53 *15*	$25/2^{(+)}$	14406.61 *17*	$(33/2^-)$
2988.74[#] *11*	$15/2^-$		8832.32[a] *16*	$27/2^+$	14452.1 *4*	$(29/2^+)$
3124.32[#] *13*	$19/2^-$	472 ns *4*	9219.2 *4*	$(21/2^-)$	14561.4[@] *3*	$31/2^-$
3142.46[b] *11*	$13/2^+$		9579.35 *18*	$(27/2^+)$	14916.7 *5*	31/2
3293.5 *5*	$7/2^-$		9995.34 *16*	$25/2^{(-)}$	15911.6[&] *3*	$(33/2^+)$
3756.04[a] *11*	$15/2^+$		10084.85 *14*	$27/2^-$	16704.3 *11*	
3960.31[@] *11*	$15/2^-$		10179.1 *6*		16708.9 *11*	
4301.5 *5*			10437.43[&] *22*	$(25/2^+)$	16711.5 *11*	
4383.67 *23*	$17/2^{(-)}$		10613.82 *17*	$(27/2^-)$	17769.8 *5*	(35/2)
5232.02[b] *13*	$17/2^+$		10856.86 *16*	$(27/2^-)$	17922.0 *5*	$(31/2^+)$
5519.53[a] *12*	$19/2^+$		11252.6 *10*	$25/2^+$	18197.0[@] *11*	$35/2^-$
5793.95 *23*			11355.67[@] *22*	$27/2^-$	18767.7 *5*	(37/2)
6067.70[@] *12*	$19/2^-$		11661.3 *5*		19210.5[&] *4*	$(37/2^+)$
6173.53[&] *14*	$19/2^+$		11807.67 *17*	$29/2^{(-)}$		
6284.04[b] *14*	$21/2^+$		11921.6 *5*	$25/2^{(+)}$		

† From least-squares fit to Eγ data. The normalized χ^2=5.8 for the uncertainties as quoted by 2007Ch40. This value is much larger than the critical χ^2=1.5. The uncertainties of the following ten γ-rays were increased by a factor of 2 or 3 to get an acceptable fit with normalized χ^2=2.5: 287.9, 860.4, 1157.5, 1595.2, 2177.8, 2369.6, 2418.3, 2598.0, 2725.6, 6081.0. It should be that the uncertainties for level energies quoted in Table V of 2007Ch40 are much larger than those given here.

‡ From Adopted Levels.

Band(A): γ sequence based on g.s.

@ Band(B): γ sequence based on $7/2^-$.

& Band(C): γ sequence based on $19/2^+$.

a Band(D): γ sequence based on $3/2^+$.

b Band(E): γ sequence based on $5/2^+$.

^{28}Si(^{20}Ne,αpγ) 2007Ch40 (continued)

γ(^{43}Sc)

The DCO values are for ≈90° (range of 69.8°−110.2°) and forward/ backward angles (50.1°−129.9° range). The gates are on ΔJ=2, quadrupole or ΔJ=0, dipole transitions, unless otherwise stated. Expected values for ΔJ=1, dipole gate are: 1.6 for ΔJ=2, quadrupole or ΔJ=0, dipole; 1.0 for ΔJ=1, dipole; 0.5 to 1.9 for ΔJ=1, dipole+quadrupole; 1.1 to 1.7 for ΔJ=0, dipole+quadrupole. Expected values for ΔJ=2, quadrupole gate are: 1.0 for ΔJ=2, quadrupole or ΔJ=0, dipole; 0.6 for ΔJ=1, dipole; 0.3 to 1.2 for ΔJ=1, dipole+quadrupole; 0.6 to 1.1 for ΔJ=0, dipole+quadrupole. See ^{24}Mg(^{24}Mg,αpγ) dataset for values of the coefficients from these measurements.

E_γ[†]	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]
135.5 *1*	3.19 *18*	3124.32	19/2−	2988.74	15/2−	
252.3 *1*	2.26 *8*	7359.77	25/2+	7107.43	23/2+	
287.9[#] *1*	1.96 *7*	5519.53	19/2+	5232.02	17/2+	D
288.4 *1*	0.58 *3*	7107.43	23/2+	6818.98	(21/2+)	
456.7 *1*	3.60 *14*	1337.85	7/2+	880.97	5/2+	
562.9 *2*	0.57 *4*	1408.38	7/2−	845.42	5/2−	
588.2 *1*	2.88 *10*	3142.46	13/2+	2554.07	11/2+	
595.1 *1*	10.8 *3*	1932.83	9/2+	1337.85	7/2+	
613.5 *1*	31.3 *9*	3756.04	15/2+	3142.46	13/2+	D
621.3 *1*	5.73 *19*	2554.07	11/2+	1932.83	9/2+	D
645.4 *1*	1.33 *7*	6818.98	(21/2+)	6173.53	19/2+	
653.9 *2*	0.66 *6*	6173.53	19/2+	5519.53	19/2+	
675.9 *1*	7.33 *24*	7107.43	23/2+	6431.60	23/2+	D
728.7 *1*	50.8 *19*	880.97	5/2+	152.25	3/2+	D
764.3 *1*	2.29 *12*	6284.04	21/2+	5519.53	19/2+	D
766.9 *2*	0.97 *5*	3756.04	15/2+	2988.74	15/2−	D
771.6 *4*	0.53 *6*	10856.86	(27/2−)	10084.85	27/2−	
804.4 *3*	0.90 *8*	2635.72	11/2−	1830.62	11/2−	D
823.3 *1*	5.24 *19*	7107.43	23/2+	6284.04	21/2+	
845.3 *3*	0.29 *4*	845.42	5/2−	0.0	7/2−	
860.4[@] *2*	0.51 *4*	10856.86	(27/2−)	9995.34	25/2(−)	D
880.5 *2*	1.65 *10*	880.97	5/2+	0.0	7/2−	
912.0 *1*	100 *3*	6431.60	23/2+	5519.53	19/2+	Q
928.2 *1*	75.4 *24*	7359.77	25/2+	6431.60	23/2+	D
933.0 *5*	0.93 *7*	7107.43	23/2+	6173.53	19/2+	
941.4 *1*	1.11 *5*	6173.53	19/2+	5232.02	17/2+	
951.0 *3*	1.23 *6*	11807.67	29/2(−)	10856.86	(27/2−)	D
971.5 *1*	2.18 *8*	3960.31	15/2−	2988.74	15/2−	D
997.9 *1*	0.87 *4*	18767.7	(37/2)	17769.8	(35/2)	D
1043.6 *1*	1.19 *6*	13117.20	(31/2−)	12073.76	(29/2−)	D
1051.9 *1*	28.5 *9*	1932.83	9/2+	880.97	5/2+	Q
1052.9 *4*	0.07 *4*	6284.04	21/2+	5232.02	17/2+	
1075.6 *3*	0.70 *7*	7359.77	25/2+	6284.04	21/2+	
1157.5[@] *1*	15.2 *6*	2988.74	15/2−	1830.62	11/2−	Q
1185.6 *1*	9.2 *4*	1337.85	7/2+	152.25	3/2+	Q
1202.1 *1*	5.76 *19*	3756.04	15/2+	2554.07	11/2+	
1209.7 *1*	30.9 *9*	3142.46	13/2+	1932.83	9/2+	Q
1216.1 *1*	4.45 *17*	2554.07	11/2+	1337.85	7/2+	
1227.1 *3*	2.37 *19*	2635.72	11/2−	1408.38	7/2−	
1289.2 *3*	0.46 *4*	14406.61	(33/2−)	13117.20	(31/2−)	
1324.5 *1*	2.57 *11*	3960.31	15/2−	2635.72	11/2−	Q
1338.0 *1*	2.51 *12*	1337.85	7/2+	0.0	7/2−	D
1360.6 *4*	0.65 *6*	3293.5	7/2−	1932.83	9/2+	
1381.2 *1*	3.52 *12*	10084.85	27/2−	8703.53	25/2(+)	D
1394.9 *2*	1.75 *8*	4383.67	17/2(−)	2988.74	15/2−	D

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^{28}Si(^{20}Ne,αpγ) 2007Ch40 (continued)

γ(^{43}Sc) (continued)

E_γ[†]	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]
1408.3 *2*	3.3 *8*	1408.38	7/2$^-$	0.0	7/2$^-$	D
1439.5 *1*	2.66 *10*	9995.34	25/2$^{(-)}$	8555.89	23/2$^-$	D
1440.7 *2*	0.79 *4*	19210.5	(37/2$^+$)	17769.8	(35/2)	
1460.1 *1*	3.12 *13*	12073.76	(29/2$^-$)	10613.82	(27/2$^-$)	D[a]
1472.5 *1*	35.9 *11*	8832.32	27/2$^+$	7359.77	25/2$^+$	D
1476.0 *1*	5.49 *20*	5232.02	17/2$^+$	3756.04	15/2$^+$	
1529.0 *1*	4.63 *16*	10084.85	27/2$^-$	8555.89	23/2$^-$	Q
1586.9 *3*	0.39 *4*	6818.98	(21/2$^+$)	5232.02	17/2$^+$	
1595.2[#] *3*	1.09 *7*	8703.53	25/2$^{(+)}$	7107.43	23/2$^+$	
1650.3 *1*	10.7 *4*	10084.85	27/2$^-$	8434.56	23/2$^-$	Q
1724.8 *2*	2.10 *10*	8832.32	27/2$^+$	7107.43	23/2$^+$	
1757.9 *7*	1.71 *9*	12615.45	(31/2)$^-$	10856.86	(27/2$^-$)	
1763.3 *1*	22.0 *7*	5519.53	19/2$^+$	3756.04	15/2$^+$	Q
1791.2 *1*	6.06 *21*	14406.61	(33/2$^-$)	12615.45	(31/2)$^-$	D
1830.5 *1*	22.9 *14*	1830.62	11/2$^-$	0.0	7/2$^-$	Q
1833.6 *2*	2.85 *13*	5793.95		3960.31	15/2$^-$	
1968.8 *1*	6.30 *25*	12053.72	29/2$^{(-)}$	10084.85	27/2$^-$	D
2058.7 *2*	1.23 *7*	12053.72	29/2$^{(-)}$	9995.34	25/2$^{(-)}$	
2107.3 *1*	16.5 *5*	6067.70	19/2$^-$	3960.31	15/2$^-$	Q
2129.7 *1*	15.1 *5*	3960.31	15/2$^-$	1830.62	11/2$^-$	Q
2177.8[#] *6*	0.40 *5*	10613.82	(27/2$^-$)	8434.56	23/2$^-$	Q[&]
2190.8 *3*	1.19 *6*	12804.7		10613.82	(27/2$^-$)	
2219.2 *2*	2.43 *10*	9579.35	(27/2$^+$)	7359.77	25/2$^+$	
2228.0 *2*	1.76 *8*	11807.67	29/2$^{(-)}$	9579.35	(27/2$^+$)	
2271.8 *1*	9.9 *3*	8703.53	25/2$^{(+)}$	6431.60	23/2$^+$	D
2353.2 *3*	1.57 *8*	14406.61	(33/2$^-$)	12053.72	29/2$^{(-)}$	Q[&]
2368.6 *5*	0.99 *7*	4301.5		1932.83	9/2$^+$	
2369.6[@] *4*	1.26 *7*	8434.56	23/2$^-$	6067.70	19/2$^-$	
2394.9 *1*	82 *3*	5519.53	19/2$^+$	3124.32	19/2$^-$	D
2418.3[#] *2*	1.18 *6*	6173.53	19/2$^+$	3756.04	15/2$^+$	
2488.2 *1*	13.9 *4*	8555.89	23/2$^-$	6067.70	19/2$^-$	Q
2491.0 *3*	2.69 *16*	8010.6		5519.53	19/2$^+$	
2503.1 *1*	3.68 *14*	13117.20	(31/2$^-$)	10613.82	(27/2$^-$)	Q[a]
2508.0 *3*	1.67 *8*	14561.4	31/2$^-$	12053.72	29/2$^{(-)}$	
2530.4 *1*	3.02 *12*	14452.1	(29/2$^+$)	11921.6	25/2$^{(+)}$	
2530.6 *1*	12.7 *4*	12615.45	(31/2)$^-$	10084.85	27/2$^-$	Q
2598.0[@] *1*	2.91 *11*	14406.61	(33/2$^-$)	11807.67	29/2$^{(-)}$	(Q)
2607.8 *2*	1.12 *5*	13045.3	(29/2$^+$)	10437.43	(25/2$^+$)	
2636.0 *3*	2.6 *4*	2635.72	11/2$^-$	0.0	7/2$^-$	
2644.5 *5*	0.97 *6*	14452.1	(29/2$^+$)	11807.67	29/2$^{(-)}$	
2725.6[#] *1*	1.93 *10*	10084.85	27/2$^-$	7359.77	25/2$^+$	D
2799.5 *2*	2.70 *10*	11355.67	27/2$^-$	8555.89	23/2$^-$	Q
2852.9 *1*	3.06 *11*	17769.8	(35/2)	14916.7	31/2	(Q)
2866.3 *2*	3.50 *12*	15911.6	(33/2$^+$)	13045.3	(29/2$^+$)	
2887.4 *6*	0.90 *6*	9995.34	25/2$^{(-)}$	7107.43	23/2$^+$	
2920.2 *10*	0.39 *5*	11355.67	27/2$^-$	8434.56	23/2$^-$	
2975.2 *1*	6.45 *21*	11807.67	29/2$^{(-)}$	8832.32	27/2$^+$	D[&]
3038.1 *5*	1.27 *9*	13123.1		10084.85	27/2$^-$	
3048.6 *8*	0.38 *9*	6173.53	19/2$^+$	3124.32	19/2$^-$	
3071.6 *5*	0.90 *6*	10179.1		7107.43	23/2$^+$	
3079.0 *1*	4.92 *17*	6067.70	19/2$^-$	2988.74	15/2$^-$	Q
3105.3 *4*	0.70 *4*	11661.3		8555.89	23/2$^-$	
3124.2 *3*	1.03 *5*	16708.9		13584.6	(29/2$^+$)	

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^{28}Si(^{20}Ne,αpγ) 2007Ch40 (continued)

γ(^{43}Sc) (continued)

Eγ[†]	Iγ	Ei(level)	J_i^π	Ef	J_f^π	Mult.[‡]
3147.7 2	2.80 11	9579.35	(27/2+)	6431.60	23/2+	
3151.4 3	1.53 7	9219.2	(21/2−)	6067.70	19/2−	(D)[&]
3159.8 2	10.0 5	6284.04	21/2+	3124.32	19/2−	D[a]
3205.3 3	2.09 9	14561.4	31/2−	11355.67	27/2−	Q[&]
3253.9 1	8.5 3	10613.82	(27/2−)	7359.77	25/2+	D
3296.0 4	1.24 7	15911.6	(33/2+)	12615.45	(31/2)−	
3298.8 3	1.58 7	19210.5	(37/2+)	15911.6	(33/2+)	
3307.6 2	8.9 3	6431.60	23/2+	3124.32	19/2−	[M2]
3329.9 2	2.04 9	10437.43	(25/2+)	7107.43	23/2+	
3362.2 10	0.40 5	7118.4		3756.04	15/2+	
3469.8 2	1.74 8	17922.0	(31/2+)	14452.1	(29/2+)	(D)
3497.0 1	4.99 18	10856.86	(27/2−)	7359.77	25/2+	D
3516.9 5	0.55 4	7273.1		3756.04	15/2+	
3586.9 5	0.47 3	16704.3		13117.20	(31/2−)	
3635.4 3	1.31 6	18197.0	35/2−	14561.4	31/2−	Q[&]
3892.6 3	2.96 12	11252.6	25/2+	7359.77	25/2+	
3906.6 5	0.58 5	16711.5		12804.7		
3972.5 2	1.75 7	12804.7		8832.32	27/2+	
3997.1 3	1.23 7	11355.67	27/2−	7359.77	25/2+	
4148.1 8	0.32 3	12704.2		8555.89	23/2−	
4213.0 3	1.88 7	13045.3	(29/2+)	8832.32	27/2+	D[&]
4341.7 3	1.66 7	13045.3	(29/2+)	8703.53	25/2(+)	
4560.5 3	1.89 8	11921.6	25/2(+)	7359.77	25/2+	D
4752.0 3	1.33 6	13584.6	(29/2+)	8832.32	27/2+	D[&]
5310.5 1	13.8 10	8434.56	23/2−	3124.32	19/2−	Q[&]
5489.0 3	3.19 12	11921.6	25/2(+)	6431.60	23/2+	D
5620.1 5	1.45 7	14452.1	(29/2+)	8832.32	27/2+	
5684.9 4	1.52 7	13045.3	(29/2+)	7359.77	25/2+	
6081.0[#] 3	4.69 16	14916.7	31/2	8832.32	27/2+	Q

[†] The quoted uncertainties are statistical only. Above 3.5 MeV (maximum range of calibration curve), systematic uncertainties can be 1-2 keV.
[‡] 2007Ch40 assign multipolarities for most of the transitions, many based only on J^π assignments. The evaluators assign mult=D for ΔJ=0,1 M1 or E1 and Q for ΔJ=2, Q transitions for which supporting angular distribution/correlation data are available. Dipole transitions with expected M1 character may include E2 component.
[#] Poor fit in the level scheme. The uncertainty is increased by a factor of 2 for fitting purposes.
[@] Poor fit in the level scheme. The uncertainty is increased by a factor of 3 for fitting purposes.
[&] DCO value corresponds to an alternative DCO-like analysis.
[a] DCO value corresponds to gate on ΔJ=2, quadrupole transition.

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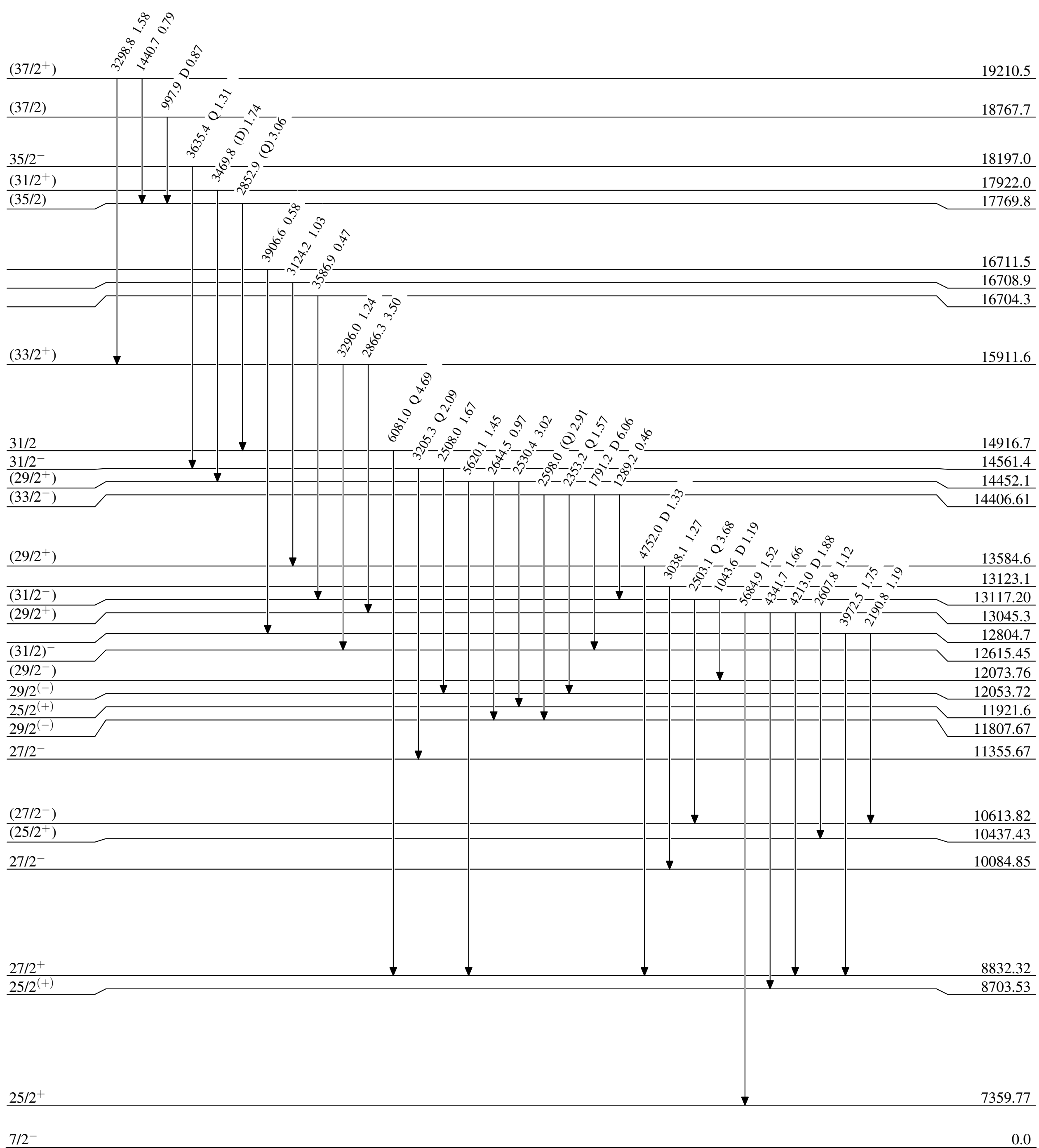
Level Scheme

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$

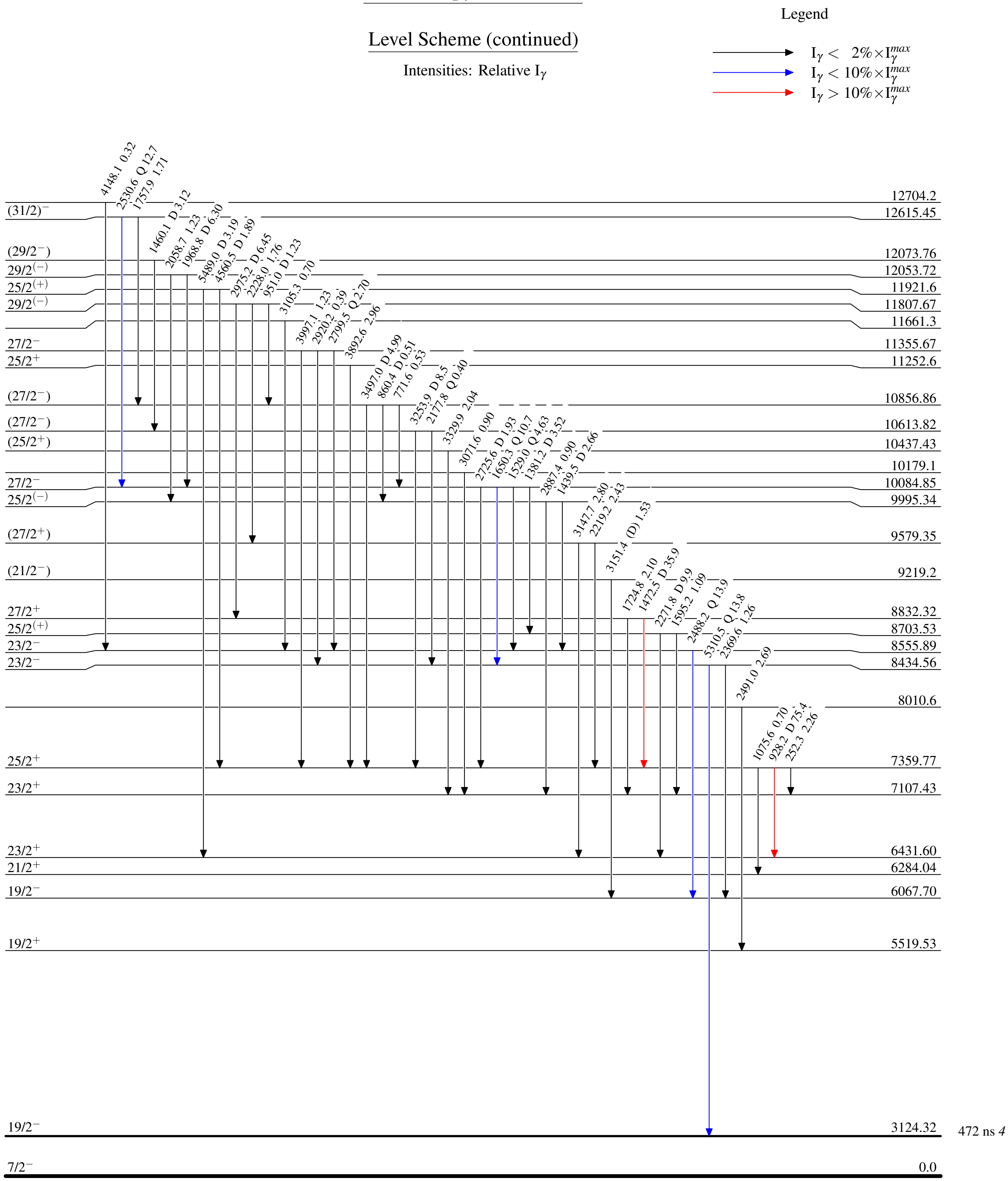


$^{43}_{21}Sc_{22}$

^{28}Si(^{20}Ne,αpγ) 2007Ch40

Level Scheme (continued)

Intensities: Relative I_γ

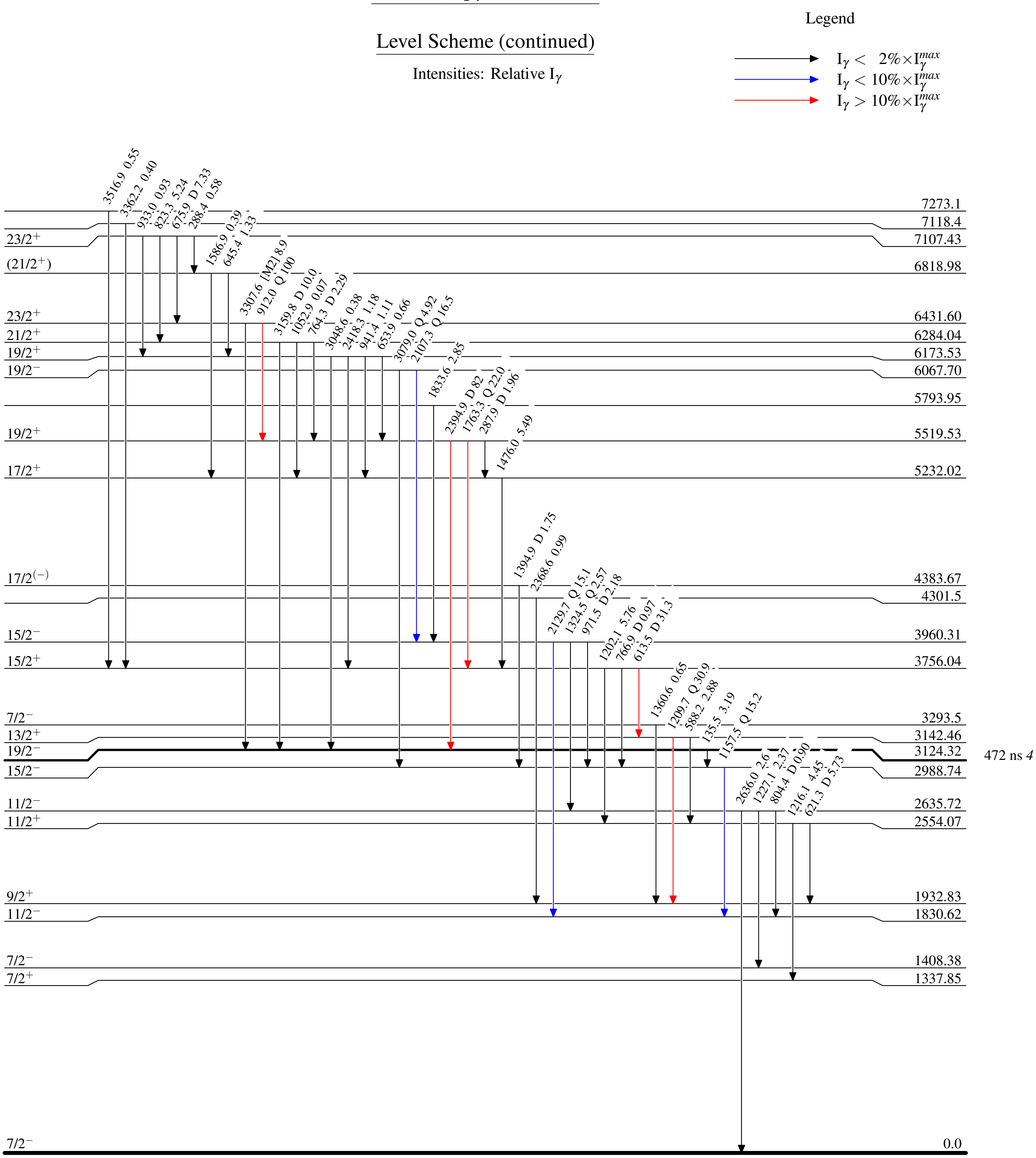


$^{43}_{21}Sc_{22}$

$^{28}Si(^{20}Ne,\alpha p\gamma)$ 2007Ch40

Level Scheme (continued)

Intensities: Relative I_γ

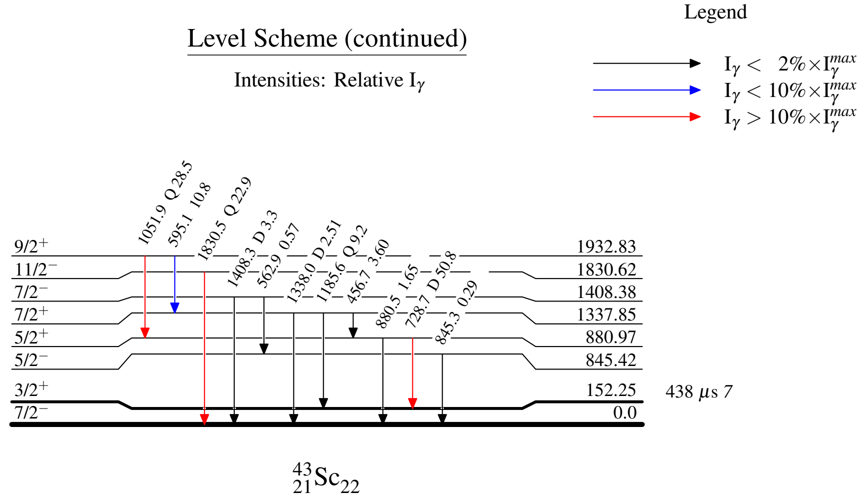


$^{43}_{21}Sc_{22}$

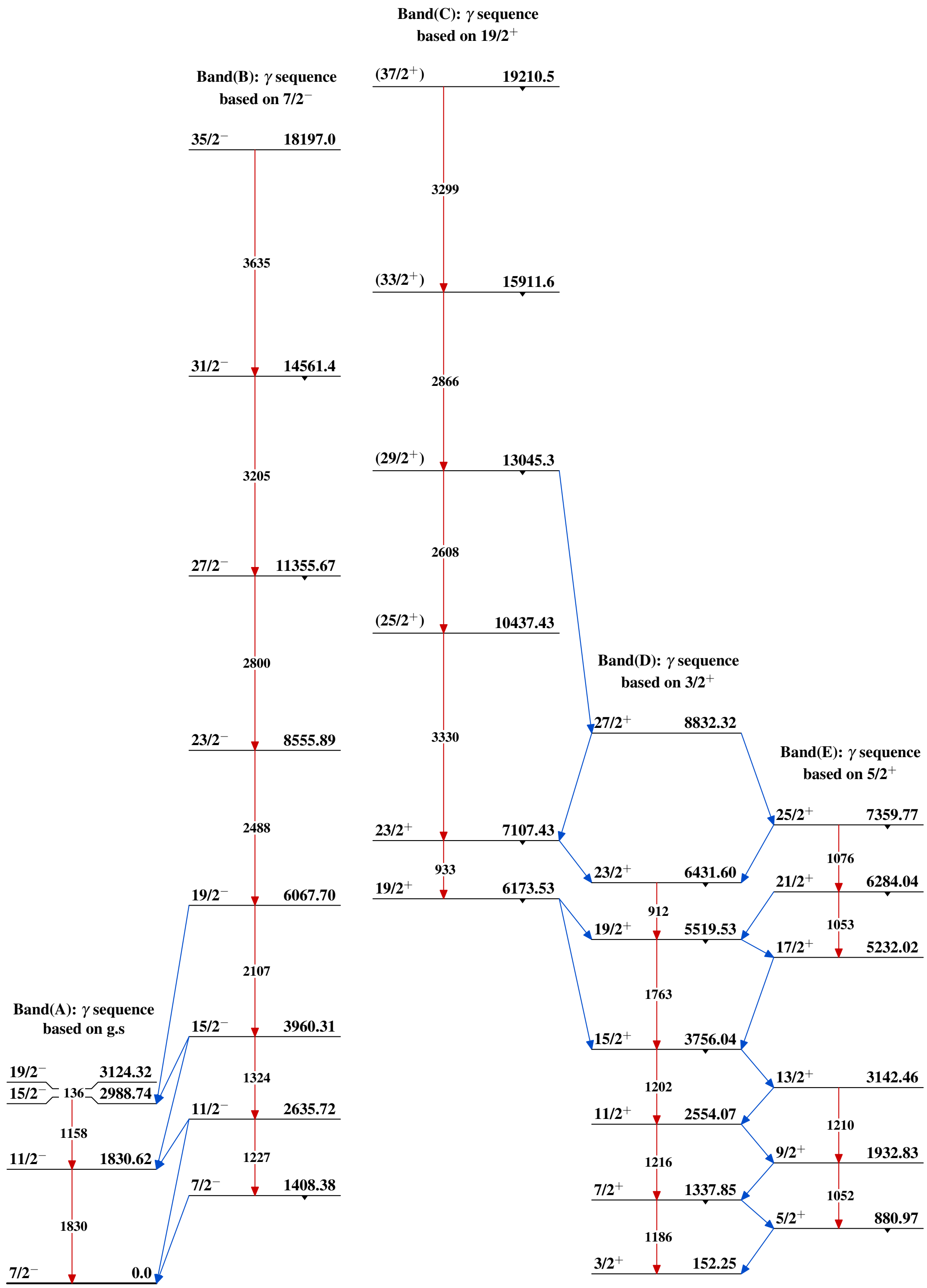
^{28}Si(^{20}Ne,αpγ) 2007Ch40

Level Scheme (continued)

Intensities: Relative I_γ



$^{28}Si(^{20}Ne,\alpha p\gamma)$ 2007Ch40



$^{43}_{21}Sc_{22}$