^{139}La(^{29}Si,4nγ) 1999To08

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen[#]	NDS 147, 1 (2018)	30-Nov-2017

Additional information 1.

1999To08 (also 1998To28,2002Sc11): E=145 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$(DCO) using Euroball detector array consisting of 13 clusters, 25 clovers and 28 single element tapered detectors. Deduced triaxial SD bands. Lifetime measurements by 2002Sc11 were used to deduce Q(transition) for SD-1 band.

Theory (band structure): 1999Do09.

^{164}Lu Levels

E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]
0+x[#]	8$^+$	3443.7+x[b]	20$^-$	8206.9+x[&]	34$^-$	633+z[e]	J1+2
19.9+x[&]	8$^-$	3520.4+x[#]	22$^+$	8306+x[d]	33$^+$	1324+z[e]	J1+4
101.9+x[a]	9$^-$	3661.7+x[a]	23$^-$	8568+x[b]	34$^-$	2071+z[e]	J1+6
104.1+x[@]	9$^+$	3819+x[d]	21$^+$	8806.7+x[a]	35$^-$	2874+z[e]	J1+8
174.9+x[&]	10$^-$	3837.3+x[@]	23$^+$	9096+x[@]	35$^+$	3733+z[e]	J1+10
244.9+x[#]	10$^+$	3981.8+x[&]	24$^-$	9241.8+x[&]	36$^-$	4646+z[e]	J1+12
268.1+x[a]	11$^-$	4001.7+x[b]	22$^-$	9246+x[d]	35$^+$	5612+z[e]	J1+14
413.6+x[@]	11$^+$	4184.9+x[#]	24$^+$	9532+x[b]	36$^-$	6617+z[e]	J1+16
433.8+x[&]	12$^-$	4370.7+x[a]	25$^-$	9911+x[a]	37$^-$	u[f]	J2
595.5+x[a]	13$^-$	4425+x[d]	23$^+$	10241+x[d]	37$^+$	546.0+u[f]	J2+2
623.7+x[#]	12$^+$	4539.3+x[@]	25$^+$	10330+x[&]	38$^-$	1151+u[f]	J2+4
832.6+x[&]	14$^-$	4617.7+x[b]	24$^-$	10556+x[b]	38$^-$	1815+u[f]	J2+6
848.7+x[@]	13$^+$	4704.8+x[&]	26$^-$	11073+x[a]	39$^-$	2542+u[f]	J2+8
1058.6+x[a]	15$^-$	4922.5+x[#]	26$^+$	11291+x[d]	39$^+$	3328+u[f]	J2+10
1115.6+x[#]	14$^+$	5090+x[d]	25$^+$	11454+x[&]	40$^-$	4174+u[f]	J2+12
1343.5+x[&]	16$^-$	5118.6+x[a]	27$^-$	11638+x[b]	40$^-$	5080+u[f]	J2+14
1382.8+x[@]	15$^+$	5293+x[b]	26$^-$	12260+x?[a]	(41$^-$)	6045+u[f]	J2+16
1627.9+x[a]	17$^-$	5317.4+x[@]	27$^+$	12395+x[d]	41$^+$	7068+u[f]	J2+18
1690.2+x[#]	16$^+$	5480.2+x[&]	28$^-$	12773+x[b]	42$^-$	8150+u[f]	J2+20
1940.7+x[&]	18$^-$	5755.5+x[#]	28$^+$	13555+x[d]	43$^+$	9284+u[f]	J2+22
1989.0+x[@]	17$^+$	5811+x[d]	27$^+$	14766+x[d]	45$^+$	v[g]	J3
2010.6+x[d]	13$^+$	5929.5+x[a]	29$^-$	y[c]	J	511+v[g]	J3+2
2136+x[b]	14$^-$	6026+x[b]	28$^-$	537+y[c]	J+2	1080+v[g]	J3+4
2272.8+x[a]	19$^-$	6196.4+x[@]	29$^+$	1137+y[c]	J+4	1708+v[g]	J3+6
2315.0+x[#]	18$^+$	6321.0+x[&]	30$^-$	1785+y[c]	J+6	2393+v[g]	J3+8
2364.6+x[d]	15$^+$	6588+x[d]	29$^+$	2490+y[c]	J+8	3134+v[g]	J3+10
2510.7+x[b]	16$^-$	6677.5+x[#]	30$^+$	3254+y[c]	J+10	3928+v[g]	J3+12
2597.7+x[&]	20$^-$	6813.4+x[a]	31$^-$	4077+y[c]	J+12	4775+v[g]	J3+14
2622.1+x[@]	19$^+$	6816+x[b]	30$^-$	4959+y[c]	J+14	5676+v[g]	J3+16
2787.6+x[d]	17$^+$	7155.4+x[@]	31$^+$	5896+y[c]	J+16	6632+v[g]	J3+18
2919.8+x[#]	20$^+$	7231.7+x[&]	32$^-$	6887+y[c]	J+18	7643+v[g]	J3+20
2946.7+x[b]	18$^-$	7420+x[d]	31$^+$	7929+y[c]	J+20	8713+v[g]	J3+22
2961.7+x[a]	21$^-$	7654+x[#]	32$^+$	9018+y[c]	J+22	w[h]	J4
3208.7+x[@]	21$^+$	7663+x[b]	32$^-$	10152+y?[c]	J+24	752+w[h]	J4+2
3271.6+x[d]	19$^+$	7773.4+x[a]	33$^-$	11323+y?[c]	J+26	1563+w[h]	J4+4
3284.7+x[&]	22$^-$	8106+x[@]	33$^+$	z[e]	J1	2429+w[h]	J4+6

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^{139}La(^{29}Si,4nγ) 1999To08 (continued)

^{164}Lu Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
3352+w[h]	J4+8	s[i]	J5	2382+s[i]	J5+6
4332+w[h]	J4+10	732+s[i]	J5+2	3300+s[i]	J5+8
5374+w[h]	J4+12	1526+s[i]	J5+4	4276+s[i]	J5+10

† From least-squares fit to Eγ data. The 0+x, (8^+) level here corresponds to 25.9+x, (8^+) in Adopted Levels and level with energy y corresponds to 3719.1+x, (20^+) in Adopted Levels.
‡ As given in 1999To08, based on previous assignments for low-lying levels and band structures in the present work.
# Band(A): $\pi g_{7/2}\otimes\nu i_{13/2},\alpha=0$.
@ Band(a): $\pi g_{7/2}\otimes\nu i_{13/2},\alpha=1$.
& Band(B): $\pi h_{11/2}\otimes\nu i_{13/2},\alpha=0$.
a Band(b): $\pi h_{11/2}\otimes\nu i_{13/2},\alpha=1$.
b Band(C): SD-1 (triaxial) band (1999To08,2002Sc11). Configuration=$\pi i_{13/2}\otimes\nu h_{9/2}$. Q(transition)=7.4 *+25−13* (2002Sc47), 7.1 *+5−6* (2002Sc11, same group as 2002Sc47), from lifetime (DSAM) measurements. Q(transition)(side-feeding)=6.7 *7* (2002Sc47).
c Band(D): SD-2 (triaxial) band (1999To08).
d Band(E): SD-3 (triaxial) band (1999To08). Configuration=πi13/2νi13/2. Positive parity is assigned based on possible E1 character of 1532γ.
e Band(F): SD-4 (triaxial) band (1999To08).
f Band(G): SD-5 (triaxial) band (1999To08).
g Band(H): SD-6 (triaxial) band (1999To08).
h Band(I): SD-7 (triaxial) band (1999To08).
i Band(J): SD-8 (triaxial) band (1999To08).

γ(^{164}Lu)

E_γ	E_i(level)	J_i^π	E_f	J_f^π	E_γ	E_i(level)	J_i^π	E_f	J_f^π
73	174.9+x	10^-	101.9+x	9^-	309	413.6+x	11^+	104.1+x	9^+
82	101.9+x	9^-	19.9+x	8^-	312#	3520.4+x	22^+	3208.7+x	21^+
93	268.1+x	11^-	174.9+x	10^-	313	1940.7+x	18^-	1627.9+x	17^-
104	104.1+x	9^+	0+x	8^+	318	3837.3+x	23^+	3520.4+x	22^+
141	244.9+x	10^+	104.1+x	9^+	320	3981.8+x	24^-	3661.7+x	23^-
162	595.5+x	13^-	433.8+x	12^-	323	3284.7+x	22^-	2961.7+x	21^-
166	433.8+x	12^-	268.1+x	11^-	325	2597.7+x	20^-	2272.8+x	19^-
169	413.6+x	11^+	244.9+x	10^+	326	2315.0+x	18^+	1989.0+x	17^+
210	623.7+x	12^+	413.6+x	11^+	327	595.5+x	13^-	268.1+x	11^-
225	848.7+x	13^+	623.7+x	12^+	332	2272.8+x	19^-	1940.7+x	18^-
226	1058.6+x	15^-	832.6+x	14^-	334	4704.8+x	26^-	4370.7+x	25^-
237	832.6+x	14^-	595.5+x	13^-	348@	4184.9+x	24^+	3837.3+x	23^+
245	244.9+x	10^+	0+x	8^+	354	2364.6+x	15^+	2010.6+x	13^+
259	433.8+x	12^-	174.9+x	10^-	355	4539.3+x	25^+	4184.9+x	24^+
267	1115.6+x	14^+	848.7+x	13^+	362	5480.2+x	28^-	5118.6+x	27^-
267	1382.8+x	15^+	1115.6+x	14^+	364	2961.7+x	21^-	2597.7+x	20^-
285	1343.5+x	16^-	1058.6+x	15^-	374	2510.7+x	16^-	2136+x	14^-
285	1627.9+x	17^-	1343.5+x	16^-	377	3661.7+x	23^-	3284.7+x	22^-
289	3208.7+x	21^+	2919.8+x	20^+	379	623.7+x	12^+	244.9+x	10^+
297	2919.8+x	20^+	2622.1+x	19^+	383	4922.5+x	26^+	4539.3+x	25^+
299	1989.0+x	17^+	1690.2+x	16^+	389	4370.7+x	25^-	3981.8+x	24^-
307	1690.2+x	16^+	1382.8+x	15^+	391	6321.0+x	30^-	5929.5+x	29^-
307	2622.1+x	19^+	2315.0+x	18^+	395	5317.4+x	27^+	4922.5+x	26^+

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^{139}La(^{29}Si,4nγ) 1999To08 (continued)

γ(^{164}Lu) (continued)

E_γ	E_i(level)	J_i^π	E_f	J_f^π	E_γ	E_i(level)	J_i^π	E_f	J_f^π
399	832.6+x	14^-	433.8+x	12^-	700	3661.7+x	23^-	2961.7+x	21^-
414	5118.6+x	27^-	4704.8+x	26^-	701	4539.3+x	25^+	3837.3+x	23^+
418	7231.7+x	32^-	6813.4+x	31^-	705	2490+y	J+8	1785+y	J+6
423	2787.6+x	17^+	2364.6+x	15^+	709	4370.7+x	25^-	3661.7+x	23^-
434	8206.9+x	34^-	7773.4+x	33^-	721	5811+x	27^+	5090+x	25^+
435	848.7+x	13^+	413.6+x	11^+	723	4704.8+x	26^-	3981.8+x	24^-
435[&]	9241.8+x	36^-	8806.7+x	35^-	727	2542+u	J2+8	1815+u	J2+6
436	2946.7+x	18^-	2510.7+x	16^-	732	732+s	J5+2	s	J5
438	5755.5+x	28^+	5317.4+x	27^+	733	6026+x	28^-	5293+x	26^-
449	5929.5+x	29^-	5480.2+x	28^-	738	4922.5+x	26^+	4184.9+x	24^+
463	1058.6+x	15^-	595.5+x	13^-	741	3134+v	J3+10	2393+v	J3+8
484	3271.6+x	19^+	2787.6+x	17^+	747	2071+z	J1+6	1324+z	J1+4
492	1115.6+x	14^+	623.7+x	12^+	748	5118.6+x	27^-	4370.7+x	25^-
492	6813.4+x	31^-	6321.0+x	30^-	752	752+w	J4+2	w	J4
497	3443.7+x	20^-	2946.7+x	18^-	764	3254+y	J+10	2490+y	J+8
511	1343.5+x	16^-	832.6+x	14^-	775	5480.2+x	28^-	4704.8+x	26^-
511	511+v	J3+2	v	J3	777	6588+x	29^+	5811+x	27^+
522[&]	2510.7+x	16^-	1989.0+x	17^+	778	5317.4+x	27^+	4539.3+x	25^+
534	1382.8+x	15^+	848.7+x	13^+	786	3328+u	J2+10	2542+u	J2+8
537	537+y	J+2	y	J	790	6816+x	30^-	6026+x	28^-
542	7773.4+x	33^-	7231.7+x	32^-	794	3928+v	J3+12	3134+v	J3+10
546	546.0+u	J2+2	u	J2	794	1526+s	J5+4	732+s	J5+2
547	3819+x	21^+	3271.6+x	19^+	803	2874+z	J1+8	2071+z	J1+6
558	4001.7+x	22^-	3443.7+x	20^-	811	5929.5+x	29^-	5118.6+x	27^-
569	1627.9+x	17^-	1058.6+x	15^-	811	1563+w	J4+4	752+w	J4+2
569	1080+v	J3+4	511+v	J3+2	820[&]	2510.7+x	16^-	1690.2+x	16^+
570[&]	2510.7+x	16^-	1940.7+x	18^-	823	4077+y	J+12	3254+y	J+10
575	1690.2+x	16^+	1115.6+x	14^+	832	7420+x	31^+	6588+x	29^+
587	3208.7+x	21^+	2622.1+x	19^+	833	5755.5+x	28^+	4922.5+x	26^+
597	1940.7+x	18^-	1343.5+x	16^-	841	6321.0+x	30^-	5480.2+x	28^-
600	3520.4+x	22^+	2919.8+x	20^+	846	4174+u	J2+12	3328+u	J2+10
600[&]	8806.7+x	35^-	8206.9+x	34^-	847	7663+x	32^-	6816+x	30^-
600	1137+y	J+4	537+y	J+2	847	4775+v	J3+14	3928+v	J3+12
605	2919.8+x	20^+	2315.0+x	18^+	856	2382+s	J5+6	1526+s	J5+4
605	1151+u	J2+4	546.0+u	J2+2	859	3733+z	J1+10	2874+z	J1+8
606	1989.0+x	17^+	1382.8+x	15^+	866	2429+w	J4+6	1563+w	J4+4
606	4425+x	23^+	3819+x	21^+	879	6196.4+x	29^+	5317.4+x	27^+
616	4617.7+x	24^-	4001.7+x	22^-	882	4959+y	J+14	4077+y	J+12
625	2315.0+x	18^+	1690.2+x	16^+	883[&]	2510.7+x	16^-	1627.9+x	17^-
628	3837.3+x	23^+	3208.7+x	21^+	884	6813.4+x	31^-	5929.5+x	29^-
628	1708+v	J3+6	1080+v	J3+4	886	8306+x	33^+	7420+x	31^+
633	2622.1+x	19^+	1989.0+x	17^+	901	5676+v	J3+16	4775+v	J3+14
633	633+z	J1+2	z	J1	905	8568+x	34^-	7663+x	32^-
645	2272.8+x	19^-	1627.9+x	17^-	906	5080+u	J2+14	4174+u	J2+12
648	1785+y	J+6	1137+y	J+4	911	7231.7+x	32^-	6321.0+x	30^-
657	2597.7+x	20^-	1940.7+x	18^-	913	4646+z	J1+12	3733+z	J1+10
664	4184.9+x	24^+	3520.4+x	22^+	918	3300+s	J5+8	2382+s	J5+6
664	1815+u	J2+6	1151+u	J2+4	922	6677.5+x	30^+	5755.5+x	28^+
665	5090+x	25^+	4425+x	23^+	923	3352+w	J4+8	2429+w	J4+6
675	5293+x	26^-	4617.7+x	24^-	937	5896+y	J+16	4959+y	J+14
685	2393+v	J3+8	1708+v	J3+6	940	9246+x	35^+	8306+x	33^+
687	3284.7+x	22^-	2597.7+x	20^-	951	8106+x	33^+	7155.4+x	31^+
689	2961.7+x	21^-	2272.8+x	19^-	956	6632+v	J3+18	5676+v	J3+16
691	1324+z	J1+4	633+z	J1+2	959	7155.4+x	31^+	6196.4+x	29^+
697	3981.8+x	24^-	3284.7+x	22^-	960	7773.4+x	33^-	6813.4+x	31^-

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^{139}La(^{29}Si,4nγ) 1999To08 (continued)

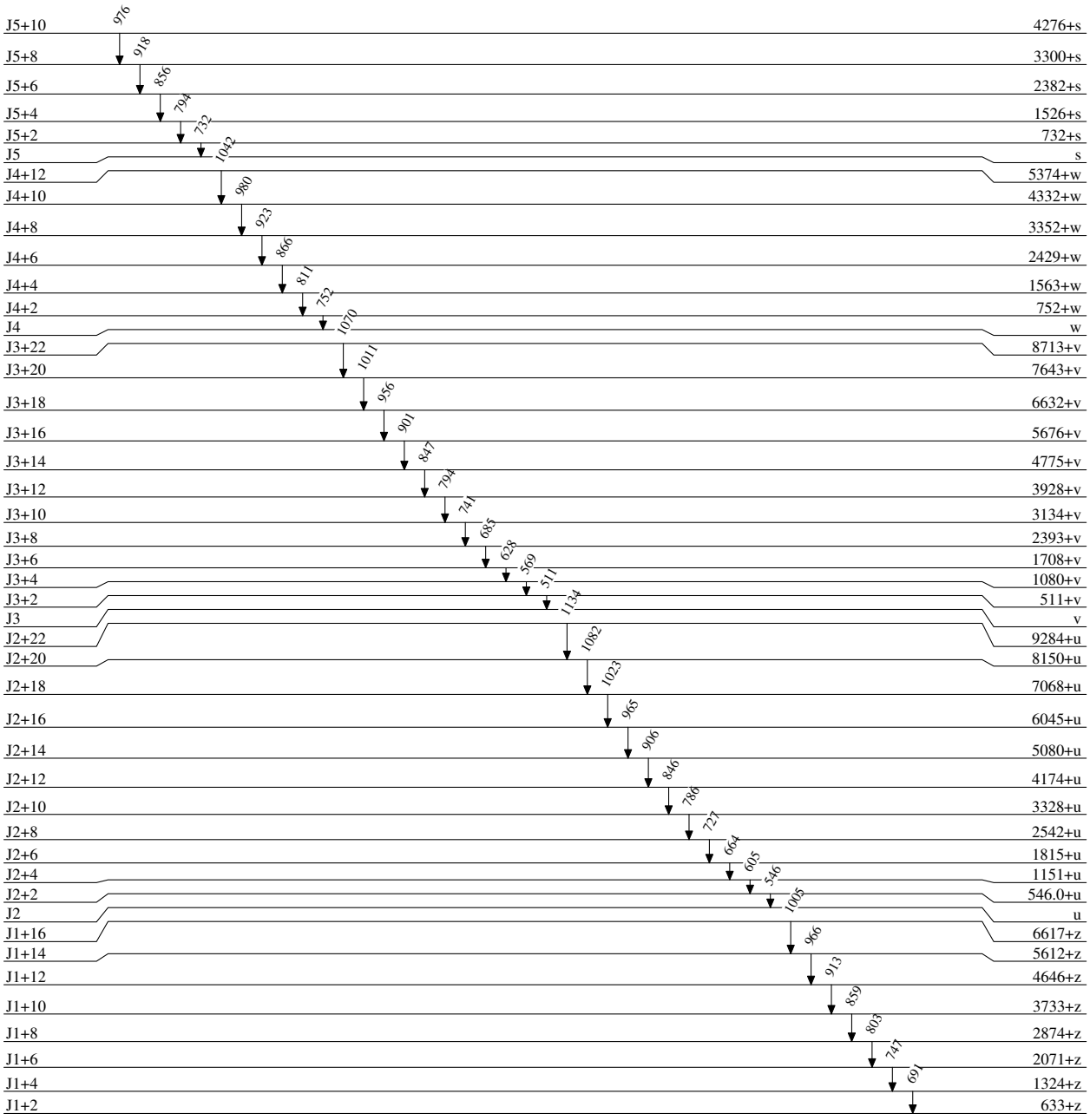
$\gamma(^{164}Lu)$ (continued)

E_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.
964	9532+x	36^-	8568+x	34^-	
965	6045+u	J2+16	5080+u	J2+14	
966	5612+z	J1+14	4646+z	J1+12	
975	8206.9+x	34^-	7231.7+x	32^-	
976	4276+s	J5+10	3300+s	J5+8	
977	7654+x	32^+	6677.5+x	30^+	
980	4332+w	J4+10	3352+w	J4+8	
990	9096+x	35^+	8106+x	33^+	
991	6887+y	J+18	5896+y	J+16	
995	10241+x	37^+	9246+x	35^+	
1005	6617+z	J1+16	5612+z	J1+14	
1006	2946.7+x	18^-	1940.7+x	18^-	
1011	7643+v	J3+20	6632+v	J3+18	
1023	7068+u	J2+18	6045+u	J2+16	
1024	10556+x	38^-	9532+x	36^-	
1033	8806.7+x	35^-	7773.4+x	33^-	
1035	9241.8+x	36^-	8206.9+x	34^-	
1042	7929+y	J+20	6887+y	J+18	
1042	5374+w	J4+12	4332+w	J4+10	
1050	11291+x	39^+	10241+x	37^+	
1070	8713+v	J3+22	7643+v	J3+20	
1082	11638+x	40^-	10556+x	38^-	
1082	8150+u	J2+20	7068+u	J2+18	
1088	10330+x	38^-	9241.8+x	36^-	
1089	9018+y	J+22	7929+y	J+20	
1104	9911+x	37^-	8806.7+x	35^-	
1104	12395+x	41^+	11291+x	39^+	
1124	11454+x	40^-	10330+x	38^-	
1128	2510.7+x	16^-	1382.8+x	15^+	D‡
1134&	10152+y?	J+24	9018+y	J+22	
1134	9284+u	J2+22	8150+u	J2+20	
1135	12773+x	42^-	11638+x	40^-	
1160	13555+x	43^+	12395+x	41^+	
1162	11073+x	39^-	9911+x	37^-	
1167	2510.7+x	16^-	1343.5+x	16^-	
1171&	11323+y?	J+26	10152+y?	J+24	
1187&	12260+x?	(41^-)	11073+x	39^-	
1211	14766+x	45^+	13555+x	43^+	
1452	2510.7+x	16^-	1058.6+x	15^-	
1532	2364.6+x	15^+	832.6+x	14^-	D†

† DCO=0.9 *2* is consistent with 0.8 expected for stretched dipole. It is further assumed (by 1999To08) as E1 since such a high energy transition of pure M1 is unlikely.
‡ DCO=1.0 *2* is consistent with 0.8 expected for stretched dipole.
# From level-energy difference. Eγ=346 given in figure 2 of 1999To08 does not fit the level scheme.
@ From level-energy difference. Eγ=383 given in figure 2 of 1999To08 does not fit the level scheme.
& Placement of transition in the level scheme is uncertain.

^{139}La(^{29}Si,4nγ) 1999To08

Level Scheme



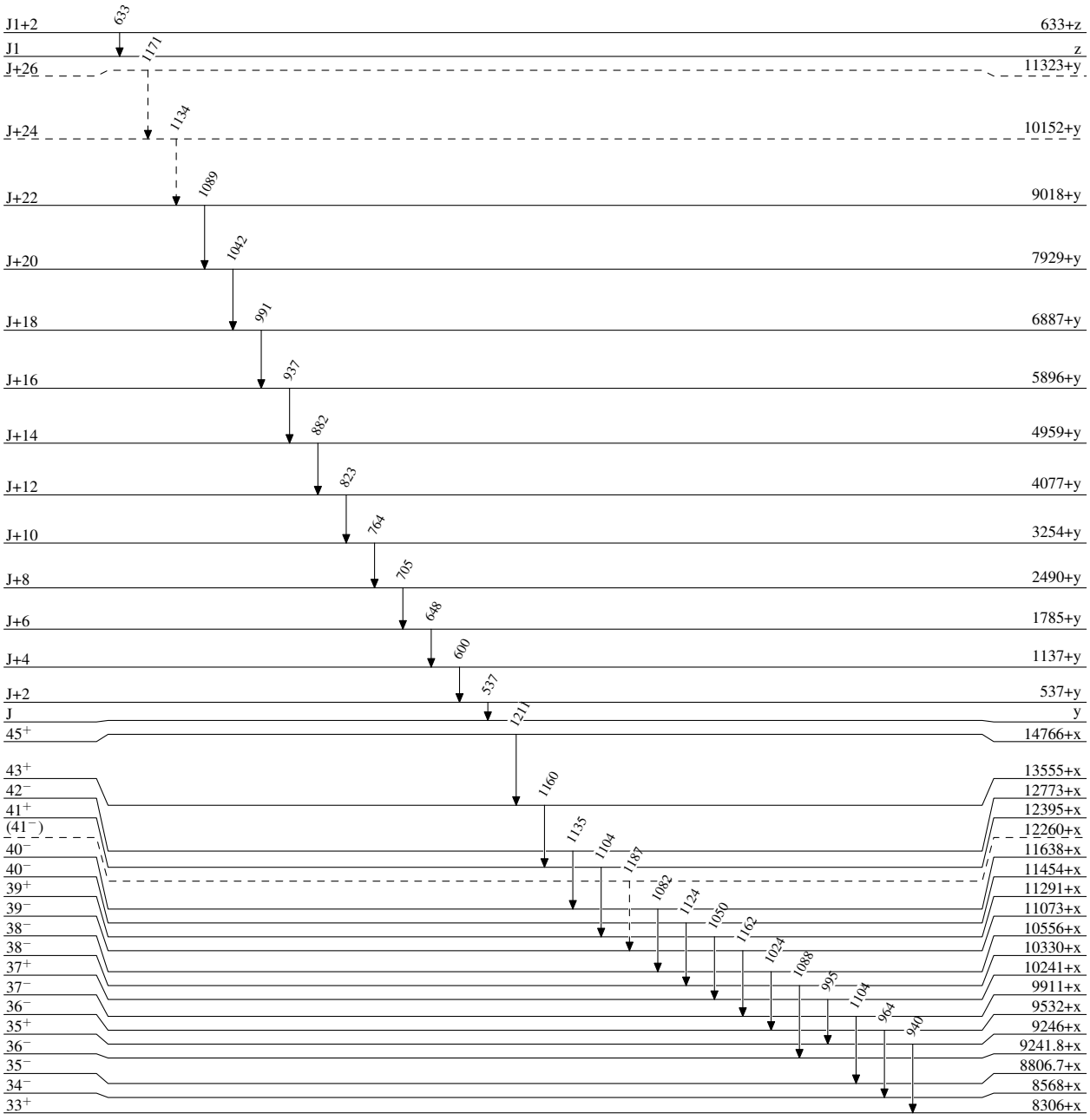
$^{164}_{71}Lu_{93}$

Legend

^{139}La(^{29}Si,4nγ) 1999To08

Level Scheme (continued)

γ Decay (Uncertain)



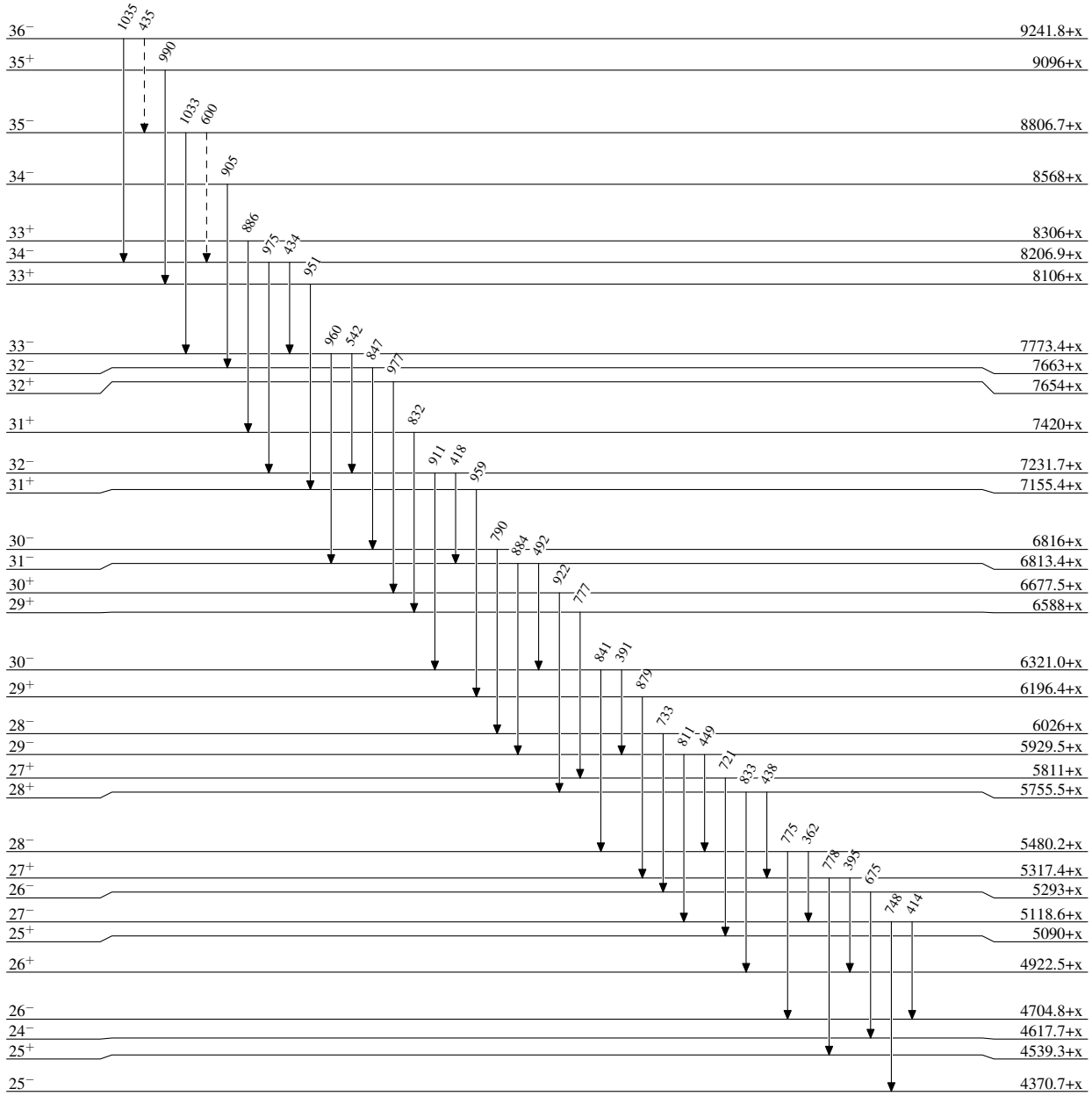
$^{164}_{71}Lu_{93}$

Legend

^{139}La(^{29}Si,4nγ) 1999To08

Level Scheme (continued)

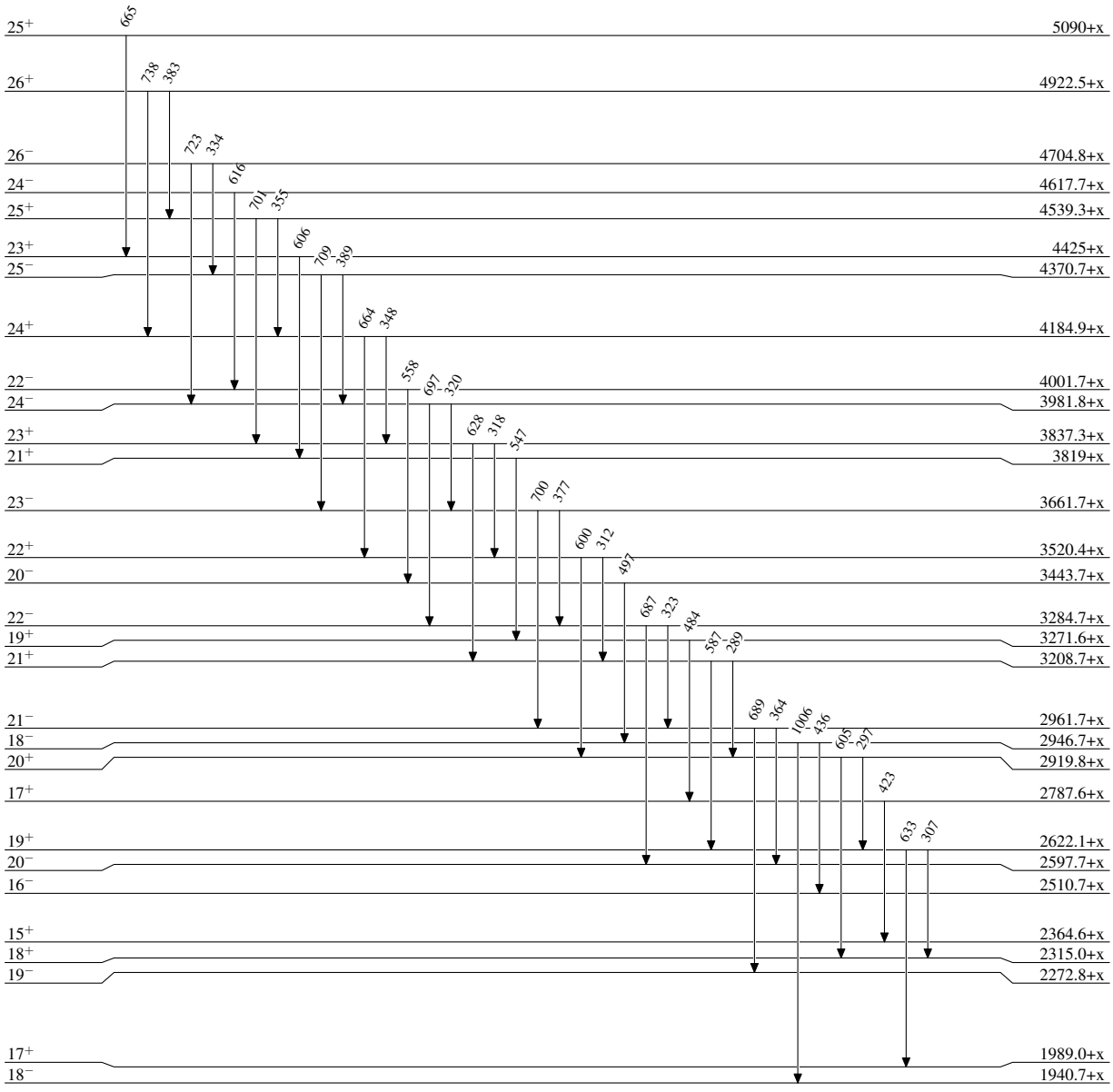
γ Decay (Uncertain)



$^{164}_{71}Lu_{93}$

^{139}La(^{29}Si,4nγ) 1999To08

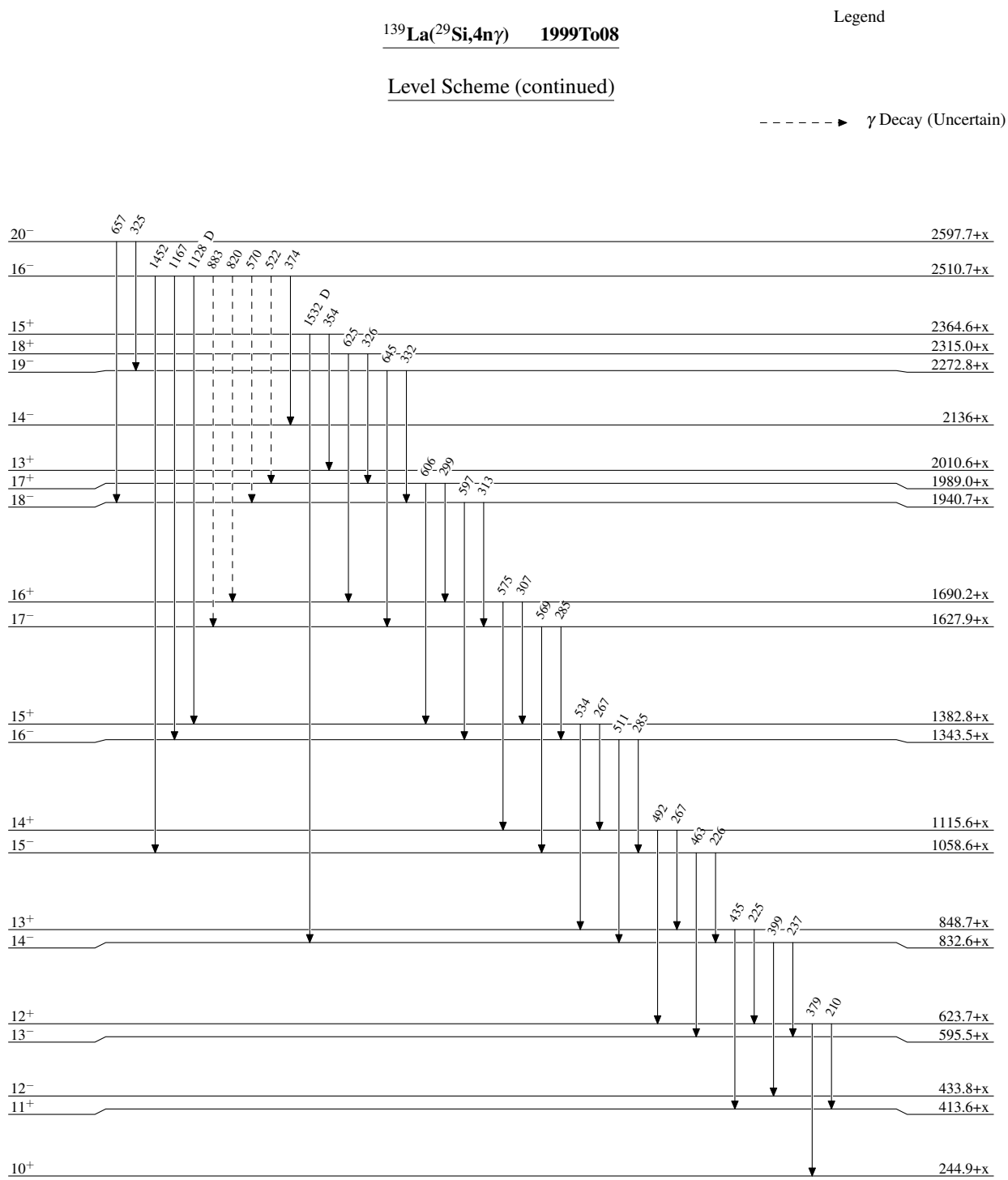
Level Scheme (continued)



$^{164}_{71}Lu_{93}$

^{139}La(^{29}Si,4nγ) 1999To08

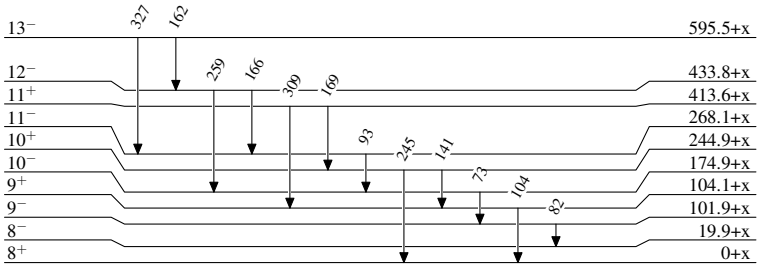
Level Scheme (continued)



$^{164}_{71}Lu_{93}$

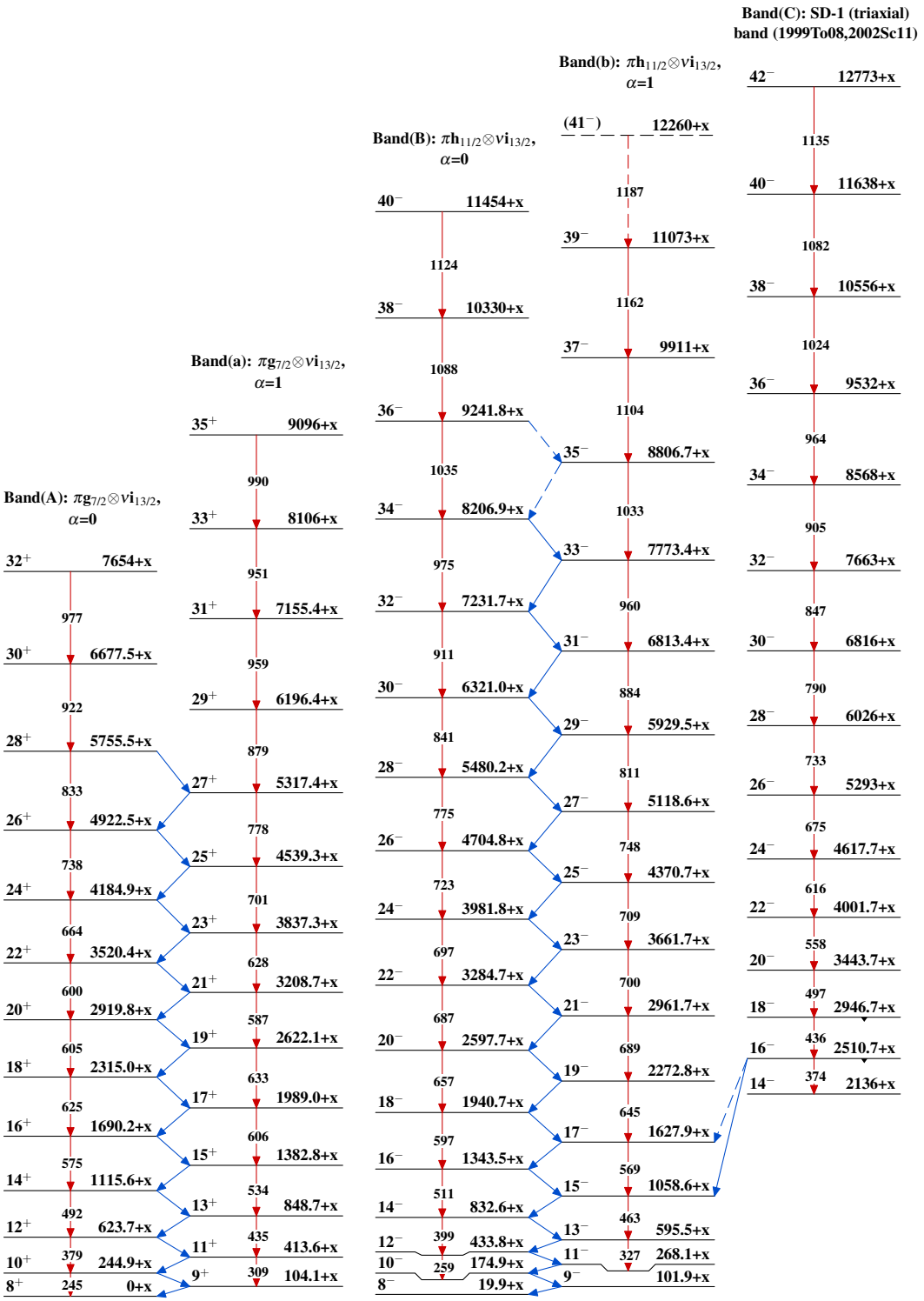
^{139}La(^{29}Si,4nγ) 1999To08

Level Scheme (continued)



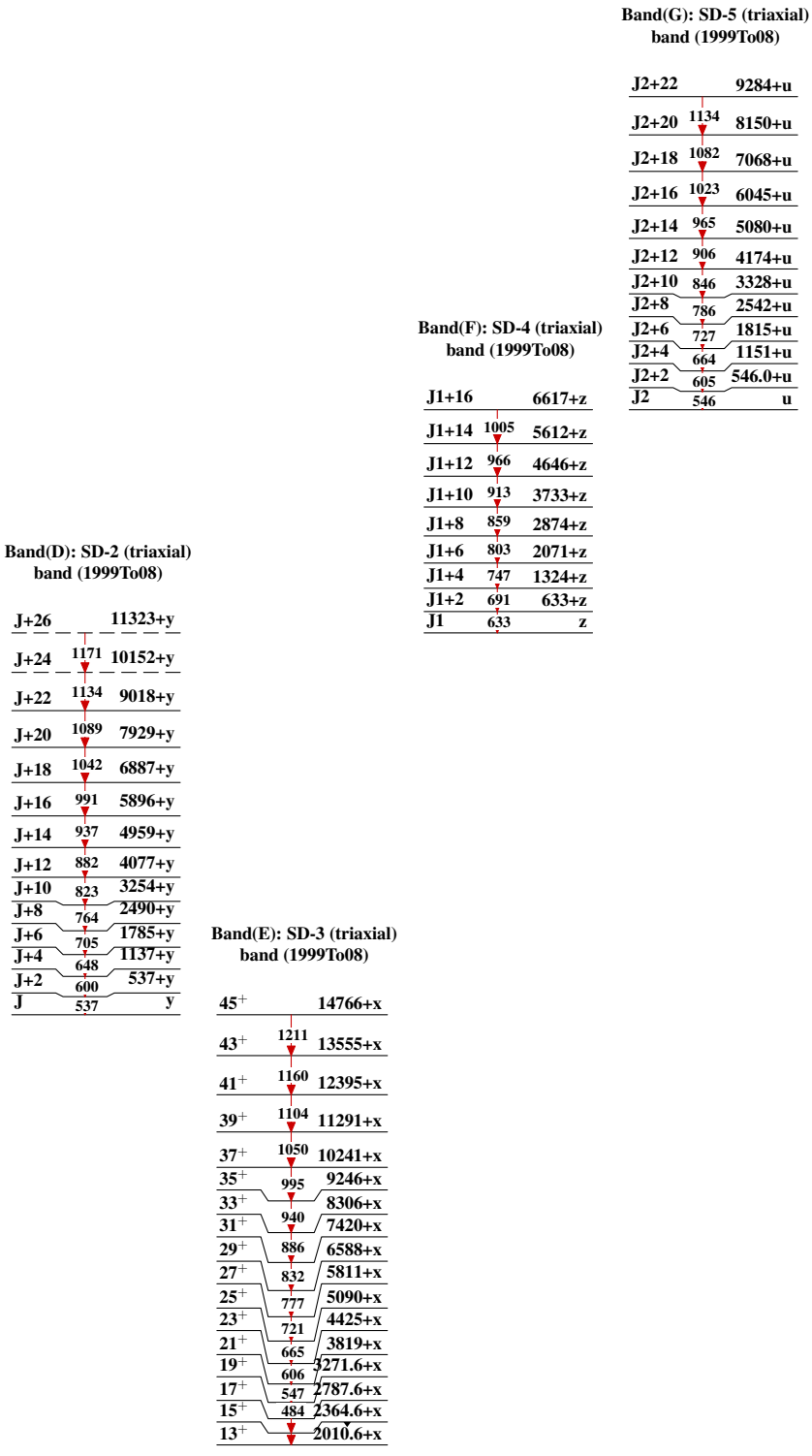
$^{164}_{71}Lu_{93}$

$^{139}La(^{29}Si,4n\gamma)$ 1999To08

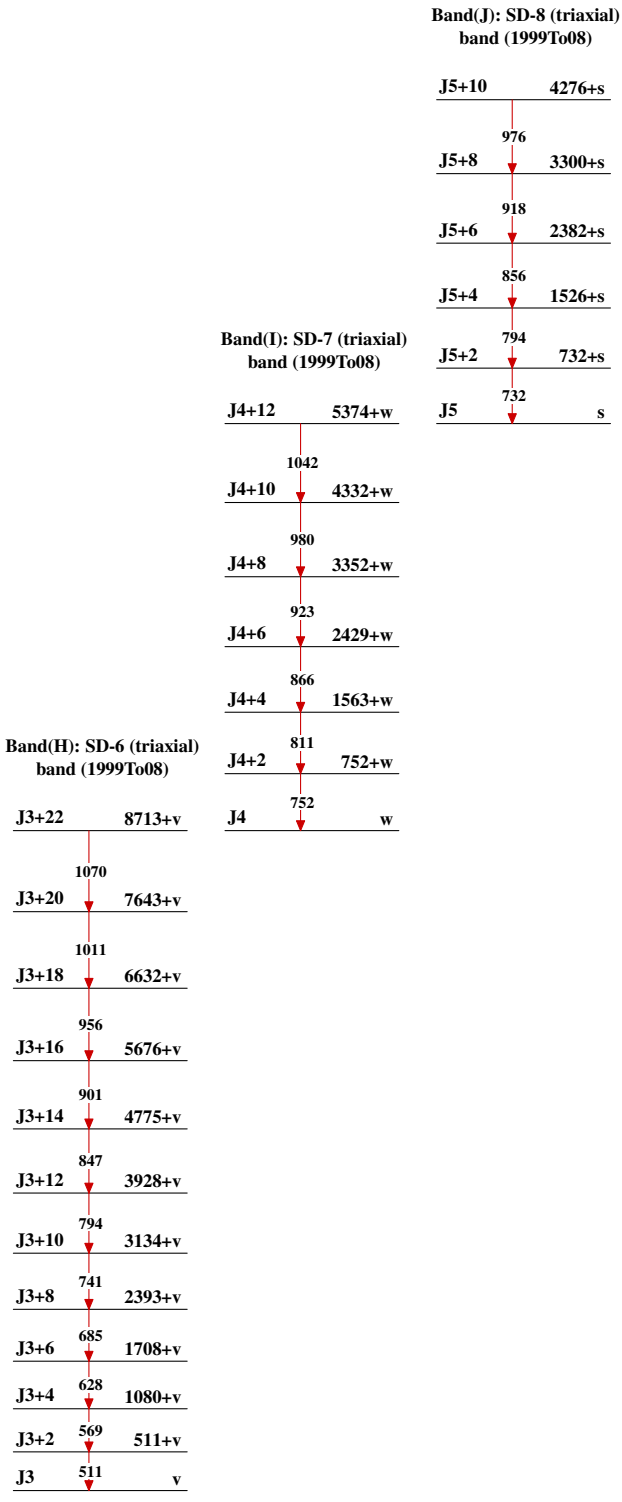


$^{164}_{71}Lu_{93}$

^{139}La(^{29}Si,4nγ) 1999To08 (continued)



$^{139}La(^{29}Si,4n\gamma)$ 1999To08 (continued)



$^{164}_{71}Lu_{93}$