

$^{94}\text{Zr}(^{74}\text{Ge},4n\gamma)$ 2013Ma73

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

2013Ma73: E(^{74}Ge)=330 MeV. Measured E γ , I γ , $\gamma\gamma$ coin, $\gamma\gamma(\theta)$ (DCO) using Gammasphere array of 99 Compton-suppressed HPGe detectors at ATLAS-ANL facility. Deduced triaxial strongly-deformed bands. Total energy surface (TES) calculations. DCO ratios are not listed in **2013Ma73**.

2013Ma73 state that eight normal-deformed bands have been extended to high spins, and that these data will be presented in a forthcoming paper. Based on NSR database search and current literature, no further publication from the authors of **2013Ma73** seems to have appeared as of November 2017.

Additional information 1.

Other:

2001Do09: E=291, 321 MeV ^{74}Ge beam was produced from the 88-Inch Cyclotron at LBNL. Target of 0.6 mg/cm² ^{94}Zr on a 11.6 mg/cm² Au backing. γ -rays were detected with the 8 π -spectrometer comprised of 20 Compton-suppressed Ge detectors and a 71-element BGO array. Measured E γ , I γ , $\gamma\gamma$ coin. Deduced γ -ray multiplicity, angular momentum. This work lists only nine levels up to 3210 level with eight γ rays.

 ^{164}Hf Levels

Quasiparticle labels for neutrons:

A: ($\pi=+, \alpha=+1/2$); $\nu i_{13/2}$ orbital, 5/2[642].

E: ($\pi=-, \alpha=+1/2$); $\nu h_{9/2}$ orbital, 3/2[521].

F: ($\pi=-, \alpha=-1/2$); $\nu h_{9/2}$ orbital, 3/2[521].

G: ($\pi=-, \alpha=+1/2$); $\nu f_{7/2}$ orbital, 5/2[523].

E(level) [†]	J $^{\pi}$	E(level) [†]	J $^{\pi}$	E(level) [†]	J $^{\pi}$	E(level) [†]	J $^{\pi}$
0.0 [‡]	0 ⁺	3945.3 ^{&} 23	15 ⁻	7459 [‡] 4	26 ⁺	11789 [#] 4	35 ⁻
211.0 [‡] 10	2 ⁺	4131.3 [@] 24	16 ⁻	7876 [#] 3	27 ⁻	12006 ^b 4	36 ⁻
587.0 [‡] 15	4 ⁺	4263 [‡] 3	18 ⁺	8169 ^{&} 3	27 ⁻	12308 [@] 4	36 ⁻
1085.2 [‡] 17	6 ⁺	4336.3 [#] 24	17 ⁻	8292 [@] 4	28 ⁻	12455 ^a 4	37 ⁻
1520.8 [#] 17	5 ⁻	4615.3 ^{&} 24	17 ⁻	8437 [‡] 4	28 ⁺	12486 [‡] 4	36 ⁺
1669.2 [‡] 18	8 ⁺	4767 [@] 3	18 ⁻	8768 [#] 3	29 ⁻	12792 [#] 4	37 ⁻
1836.4 [#] 17	7 ⁻	4940 [‡] 3	20 ⁺	8993 ^a 3	29 ⁻	12992 ^b 4	38 ⁻
1947.1 [@] 17	(6 ⁻)	5010.3 [#] 25	19 ⁻	9087 ^{&} 3	29 ⁻	13392 [@] 4	38 ⁻
2245.3 [#] 18	9 ⁻	5260.3 ^{&} 24	19 ⁻	9215 [@] 4	30 ⁻	13472 ^a 4	39 ⁻
2302.2 [@] 18	8 ⁻	5360 [@] 3	20 ⁻	9422 [‡] 4	30 ⁺	13807 [#] 4	39 ⁻
2305.3 [‡] 19	10 ⁺	5670 [#] 3	21 ⁻	9731 [#] 3	31 ⁻	14027 ^b 4	40 ⁻
2576.3 [@] 19	10 ⁻	5700 [‡] 3	22 ⁺	9774 ^a 3	31 ⁻	14545 ^a 4	41 ⁻
2699.3 [#] 19	11 ⁻	5895.3 ^{&} 25	21 ⁻	10190 ^b 4	32 ⁻	14856 [#] 4	41 ⁻
2872.3 [‡] 22	12 ⁺	5983 [@] 3	22 ⁻	10228 [@] 4	32 ⁻	15106 ^b 5	42 ⁻
2962.3 [@] 20	12 ⁻	6336 [#] 3	23 ⁻	10415 [‡] 4	32 ⁺	15669 ^a 4	43 ⁻
3156.3 [#] 21	13 ⁻	6545 [‡] 4	24 ⁺	10603 ^a 3	33 ⁻	16232 ^b 5	44 ⁻
3211.3 [‡] 24	14 ⁺	6603 ^{&} 3	23 ⁻	10759 [#] 4	33 ⁻	16834 ^a 4	45 ⁻
3302.3 ^{&} 21	13 ⁻	6674 [@] 4	24 ⁻	11074 ^b 4	34 ⁻	17413 ^b 5	46 ⁻
3494.3 [@] 22	14 ⁻	7064 [#] 3	25 ⁻	11259 [@] 4	34 ⁻	18643 ^b 5	48 ⁻
3679 [‡] 3	16 ⁺	7352 ^{&} 3	25 ⁻	11432 [‡] 4	34 ⁺		
3701.3 [#] 23	15 ⁻	7444 [@] 4	26 ⁻	11499 ^a 4	35 ⁻		

Continued on next page (footnotes at end of table)

$^{94}\text{Zr}(^{74}\text{Ge},4n\gamma)$ **2013Ma73 (continued)** ^{164}Hf Levels (continued)

† From least-squares fit to E_γ data assuming 1 keV uncertainty for each γ ray.

‡ Band(A): g.s. band.

Band(B): AE band.

@ Band(b): AF band.

& Band(C): AG band.

^a Band(D): TSD-1 band. Proposed configuration=4-qp involving high-j intruder $\pi i_{13/2}^2$.

^b Band(E): TSD-2 band. Proposed configuration=4-qp involving high-j intruder $\pi i_{13/2}^2$.

 $\gamma(^{164}\text{Hf})$

E_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π
211	211.0	2 ⁺	0.0	0 ⁺	751		1836.4	7 ⁻	1085.2	6 ⁺
263	2962.3	12 ⁻	2699.3	11 ⁻	760		5700	22 ⁺	4940	20 ⁺
274	2576.3	10 ⁻	2302.2	8 ⁻	770		7444	26 ⁻	6674	24 ⁻
316	1836.4	7 ⁻	1520.8	5 ⁻	781		9774	31 ⁻	8993	29 ⁻
331	2576.3	10 ⁻	2245.3	9 ⁻	812		7876	27 ⁻	7064	25 ⁻
339	3211.3	14 ⁺	2872.3	12 ⁺	817		8169	27 ⁻	7352	25 ⁻
355	2302.2	8 ⁻	1947.1 (6 ⁻)		824	2.5 3	8993	29 ⁻	8169	27 ⁻
376	587.0	4 ⁺	211.0	2 ⁺	829		10603	33 ⁻	9774	31 ⁻
386	2962.3	12 ⁻	2576.3	10 ⁻	845		6545	24 ⁺	5700	22 ⁺
394	2699.3	11 ⁻	2305.3	10 ⁺	846		11074	34 ⁻	10228	32 ⁻
409	2245.3	9 ⁻	1836.4	7 ⁻	848		8292	28 ⁻	7444	26 ⁻
426	1947.1 (6 ⁻)		1520.8	5 ⁻	862		1947.1 (6 ⁻)		1085.2	6 ⁺
454	2699.3	11 ⁻	2245.3	9 ⁻	872	0.3 1	10603	33 ⁻	9731	31 ⁻
457	3156.3	13 ⁻	2699.3	11 ⁻	884		11074	34 ⁻	10190	32 ⁻
466	2302.2	8 ⁻	1836.4	7 ⁻	885		5895.3	21 ⁻	5010.3	19 ⁻
468	3679	16 ⁺	3211.3	14 ⁺	892		8768	29 ⁻	7876	27 ⁻
498	1085.2	6 ⁺	587.0	4 ⁺	896		11499	35 ⁻	10603	33 ⁻
532	3494.3	14 ⁻	2962.3	12 ⁻	914		7459	26 ⁺	6545	24 ⁺
545	3701.3	15 ⁻	3156.3	13 ⁻	918		9087	29 ⁻	8169	27 ⁻
567	2872.3	12 ⁺	2305.3	10 ⁺	923		9215	30 ⁻	8292	28 ⁻
576	2245.3	9 ⁻	1669.2	8 ⁺	924		5260.3	19 ⁻	4336.3	17 ⁻
584	1669.2	8 ⁺	1085.2	6 ⁺	932	1.6 7	12006	36 ⁻	11074	34 ⁻
584	4263	18 ⁺	3679	16 ⁺	933		6603	23 ⁻	5670	21 ⁻
593	5360	20 ⁻	4767	18 ⁻	934		1520.8	5 ⁻	587.0	4 ⁺
603	3302.3	13 ⁻	2699.3	11 ⁻	956		12455	37 ⁻	11499	35 ⁻
623	5983	22 ⁻	5360	20 ⁻	963		9731	31 ⁻	8768	29 ⁻
633	2302.2	8 ⁻	1669.2	8 ⁺	975		10190	32 ⁻	9215	30 ⁻
635	4336.3	17 ⁻	3701.3	15 ⁻	978		8437	28 ⁺	7459	26 ⁺
635	5895.3	21 ⁻	5260.3	19 ⁻	985		9422	30 ⁺	8437	28 ⁺
636	2305.3	10 ⁺	1669.2	8 ⁺	986		12992	38 ⁻	12006	36 ⁻
636	4767	18 ⁻	4131.3	16 ⁻	993		10415	32 ⁺	9422	30 ⁺
637	4131.3	16 ⁻	3494.3	14 ⁻	1003		12792	37 ⁻	11789	35 ⁻
643	3945.3	15 ⁻	3302.3	13 ⁻	1006	0.5 2	9774	31 ⁻	8768	29 ⁻
645	5260.3	19 ⁻	4615.3	17 ⁻	1013		10228	32 ⁻	9215	30 ⁻
660	5670	21 ⁻	5010.3	19 ⁻	1015		13807	39 ⁻	12792	37 ⁻
666	6336	23 ⁻	5670	21 ⁻	1017		11432	34 ⁺	10415	32 ⁺
670	4615.3	17 ⁻	3945.3	15 ⁻	1017		13472	39 ⁻	12455	37 ⁻
674	5010.3	19 ⁻	4336.3	17 ⁻	1028		10759	33 ⁻	9731	31 ⁻
677	4940	20 ⁺	4263	18 ⁺	1030		11789	35 ⁻	10759	33 ⁻
691	6674	24 ⁻	5983	22 ⁻	1031		11259	34 ⁻	10228	32 ⁻
708	6603	23 ⁻	5895.3	21 ⁻	1035		14027	40 ⁻	12992	38 ⁻
727	7064	25 ⁻	6336	23 ⁻	1049		12308	36 ⁻	11259	34 ⁻
749	7352	25 ⁻	6603	23 ⁻	1049		14856	41 ⁻	13807	39 ⁻

Continued on next page (footnotes at end of table)

$^{94}\text{Zr}(^{74}\text{Ge},4n\gamma)$ 2013Ma73 (continued) $\gamma(^{164}\text{Hf})$ (continued)

<u>E_γ</u>	<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>	<u>E_γ</u>	<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>	<u>E_γ</u>	<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>
1054	12486	36 ⁺	11432	34 ⁺	1084	13392	38 ⁻	12308	36 ⁻	1165	16834	45 ⁻	15669	43 ⁻
1073	14545	41 ⁻	13472	39 ⁻	1124	15669	43 ⁻	14545	41 ⁻	1181	17413	46 ⁻	16232	44 ⁻
1079	15106	42 ⁻	14027	40 ⁻	1126	16232	44 ⁻	15106	42 ⁻	1230	18643	48 ⁻	17413	46 ⁻

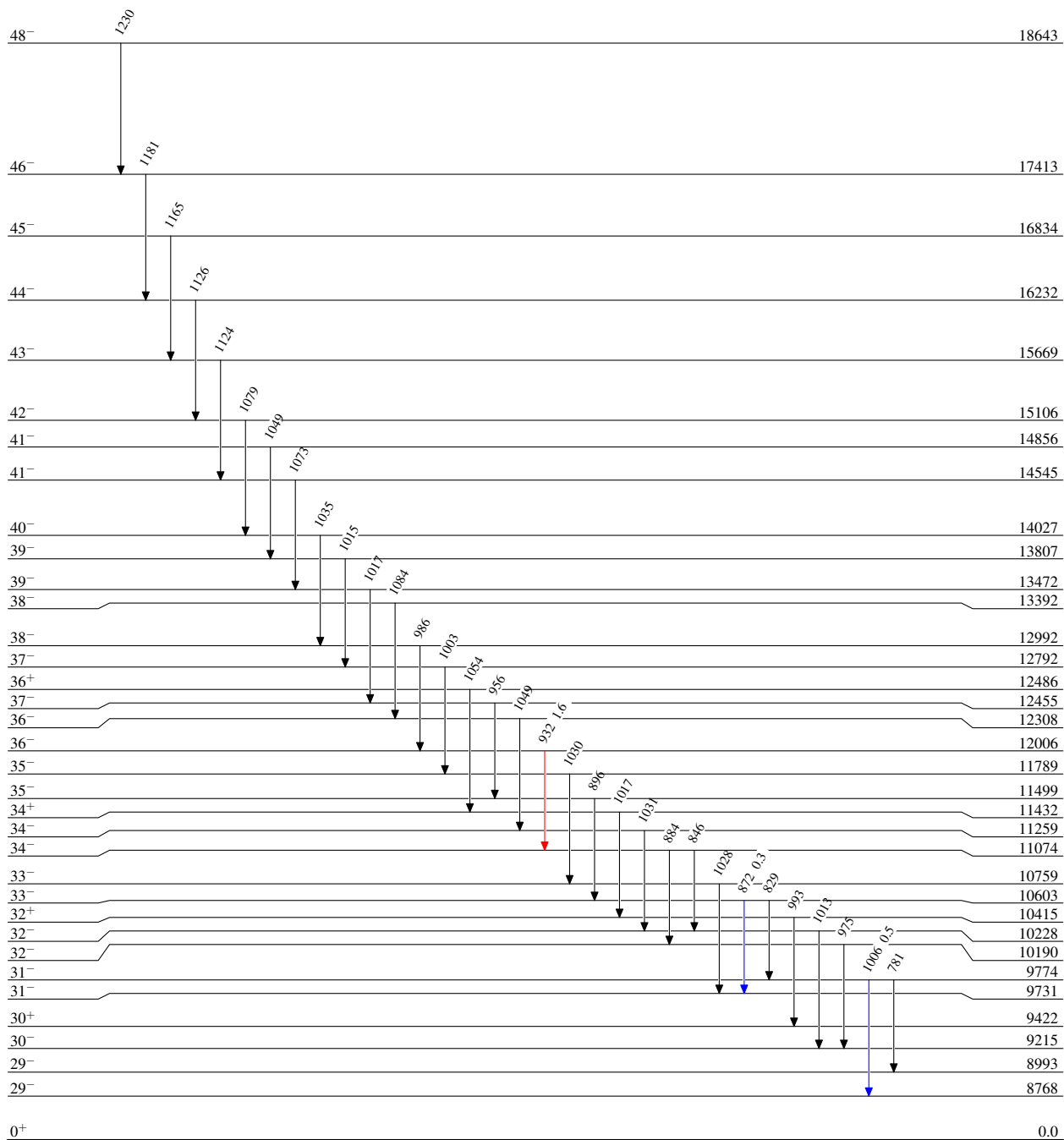
$^{94}\text{Zr}(^{74}\text{Ge},4n\gamma)$ 2013Ma73

Level Scheme

Intensities: Relative I_γ

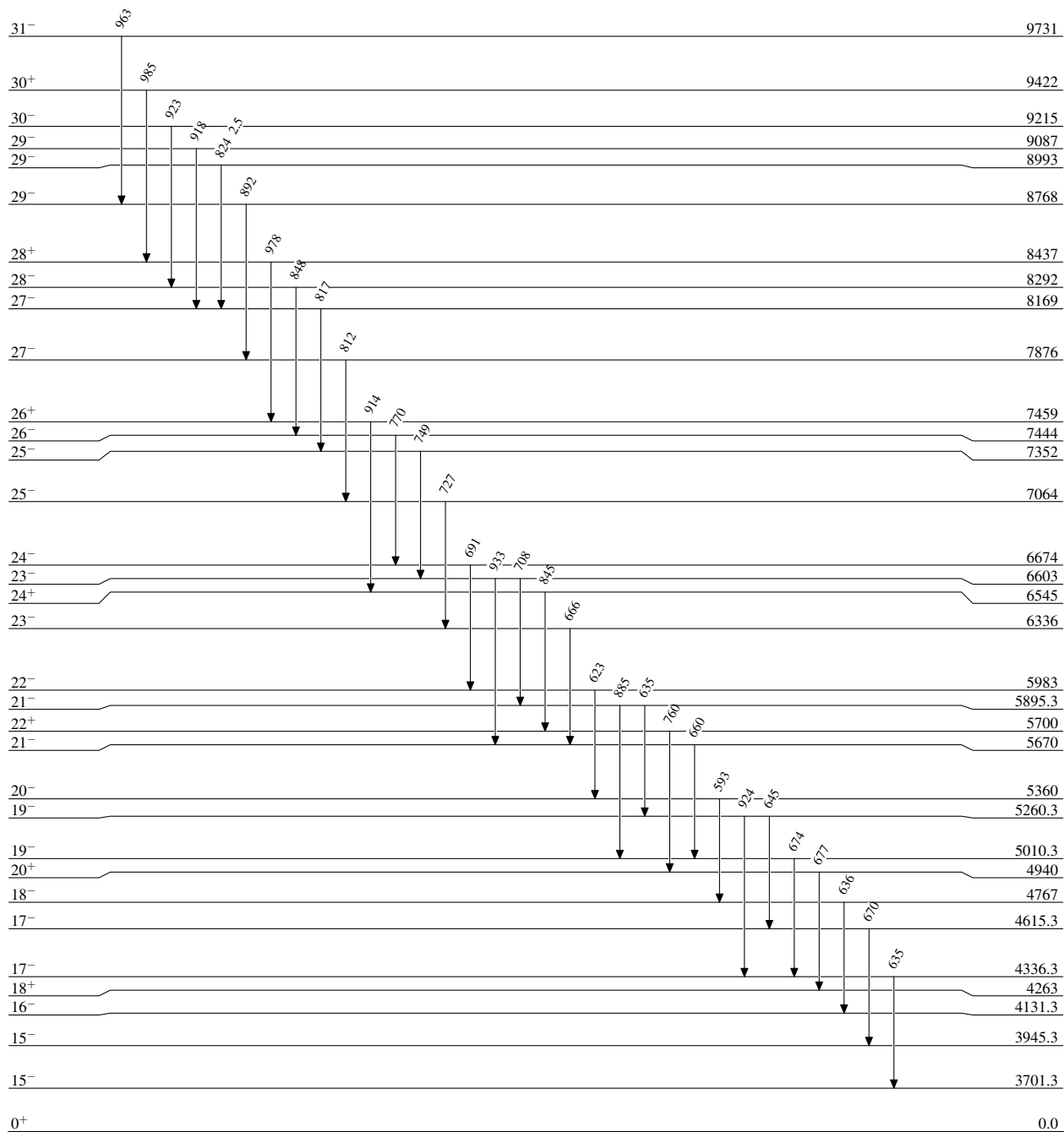
Legend

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



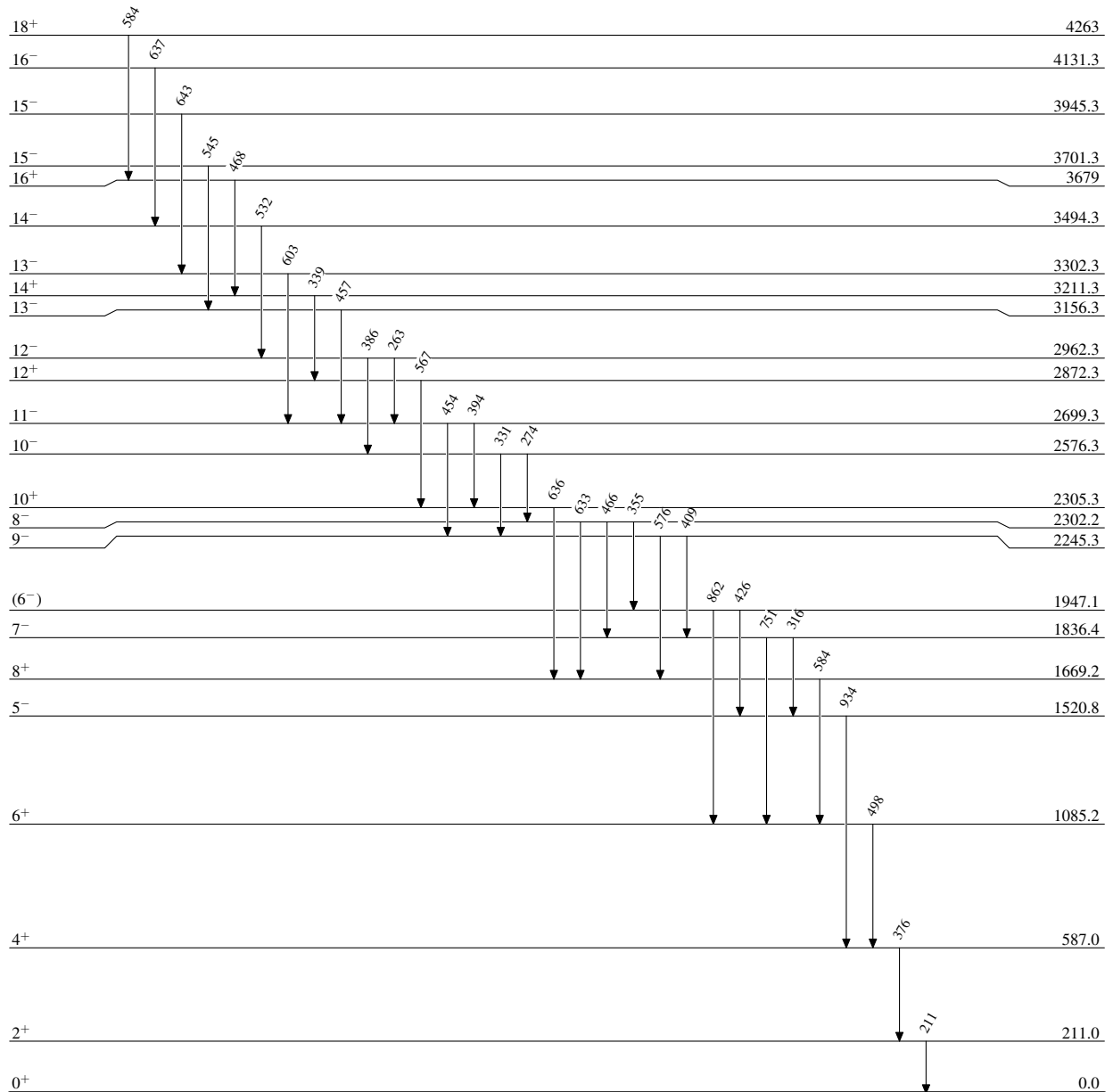
$^{94}\text{Zr}(^{74}\text{Ge},4n\gamma)$ 2013Ma73

Level Scheme (continued)

Intensities: Relative I_γ  $^{164}_{72}\text{Hf}_{92}$

$^{94}\text{Zr}(^{74}\text{Ge},4n\gamma)$ 2013Ma73

Level Scheme (continued)

Intensities: Relative I_γ  $^{164}_{72}\text{Hf}_{92}$

$^{94}\text{Zr}(^{74}\text{Ge},4n\gamma)$ 2013Ma73