Muonic atom **1979Ho23,1975Ze04**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 75,199 (1995)	31-May-1995

^{172}Yb(μ^-,x ray).

1979Ho23 (also 1977HoYL): measured muonic x rays and muonic-nuclear resonances. Deduced electric moments and isomer shifts.

1975Ze04: measured muonic x rays and nuclear γ rays. Deduced nuclear charge distribution, isotope and isomer shifts, and quadrupole moment.

Other: 1971KeZQ, measured nuclear γ rays.

Q(intrinsic)=7.91 *4* (1975Ze04).

Muonic x-ray data			
Transition	Energy		Intensity
	1979Ho23	1975Ze04	1979Ho23
4f5/2 - 3d5/2		676.92 3	
4f7/2 - 3d5/2		681.76 3	
4f5/2 - 3d3/2		699.59 9	
0^+,3d5/2 - 2^+,2p3/2	1766.99 24	1766.55 26	6.7 12
0^+,3d5/2 - 0^+,2p5/2	1843.01 15	1843.45 7	36 5
0^+,3d5/2 - 2^+,2p$_{1/2}$	1981.18 16	1981.61 9	23 3
0^+,3d3/2 - 0^+,2p$_{1/2}$	2005.10 22	2005.02 20	12.2 20
2^+,2p$_{1/2}$ - 2^+,1s1/2	4893.0 6	4893.95 22	13.9 21
0^+,2p$_{1/2}$ - 0^+,1s1/2	4925.1 6	4926.68 22	13.7 21
2^+,2p$_{1/2}$ - 0^+,1s1/2	4972.2 6	4972.76 16	5.5 9
0^+,2p3/2 - 2^+,1s1/2	5031.5 7	5032.11 21	11.9 19
0^+,3d3/2 - 3^-,1s1/2 + 3^-,2p3/2 - 3^-,1s1/2 + 0^+,2p3/2 - 0^+,1s1/2 + 2^+,2p3/2 - 2^+,1s1/2	5110.2 6	5110.93 14	50 8 (a)
1^-,2p3/2 - 1^-,1s1/2 + 0^+,3d3/2 - 1^-,1s1/2	5174.1 6		4.9 9 (a)

(a): composite of unresolved transitions

^{172}Yb Levels

E(level)[†]	J$^\pi$[‡]	Comments
0.0	0^+	
78.36 *5*	2^+	B(E2)=6.70 (1979Ho23). Q=−2.323 (1979Ho23).
259.18 *18*	4^+	
1039.3 *3*	0^+	
1119.1 *3*	2^+	
1154.2 *3*	(1^-)	
1169.3 *3*	3^+	
1757	(1^-)	Level from 1979Ho23. B(E1)=0.02, Q=−3.44 *10*, isomer shift=0.2 *7* (1979Ho23).
1820.3 *3*	3^-	B(E3)=0.001, Q=1.97 *10*, isomer shift=−2.0 *6* (1979Ho23).
6931.4?[#] *12*	(2^+)	

Continued on next page (footnotes at end of table)

Muonic atom 1979Ho23,1975Ze04 (continued)

^{172}Yb Levels (continued)

† The level energies deduced in this type of measurement are shifted relative to those deduced from electronic atoms. This shift (isomer shift) is due to the longer lifetime of the muon (in s1/2 state) than that of the excited nuclear state, and is related to the difference in charge distributions of the excited state and the g.s..

‡ From Adopted Levels.

Level proposed by 1975Ze04 on the basis of observation of anomalous enhancement of muonic K x ray intensity at 5111. 1975Ze04 assign a large part of this intensity to a transition from a 6931 level to 1820 level. But 1979Ho23 propose that such a level is unlikely for the following reasons: 1. B(E2)=1 assumed by 1975Ze04 is unreasonably large for a state at≈7 MeV. 2. A level at such an excitation should decay by many routes rather than by just one transition of 5111 keV.

$\gamma(^{172}Yb)$

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
78.36 *5*	78.36	2^+	0.0	0^+	960.7 *4*	1039.3	0^+	78.36	2^+
180.59 *25*	259.18	4^+	78.36	2^+	1075.7 *3*	1154.2	(1^-)	78.36	2^+
651.0 *3*	1820.3	3^-	1169.3	3^+	1090.7 *3*	1169.3	3^+	78.36	2^+
666.0 *3*	1820.3	3^-	1154.2	(1^-)	1119.1 *3*	1119.1	2^+	0.0	0^+
701.2‡ *3*	1820.3	3^-	1119.1	2^+	1154.2 *4*	1154.2	(1^-)	0.0	0^+
859.9‡ *3*	1119.1	2^+	259.18	4^+	1741.7 *3*	1820.3	3^-	78.36	2^+
910.1 *4*	1169.3	3^+	259.18	4^+	5111‡ *1*	6931.4?	(2^+)	1820.3	3^-

† From 1975Ze04. The γ-ray energies from muonic atoms are shifted relative to those for the electronic atom due to longer lifetime of the muon than that of the excited nuclear state.

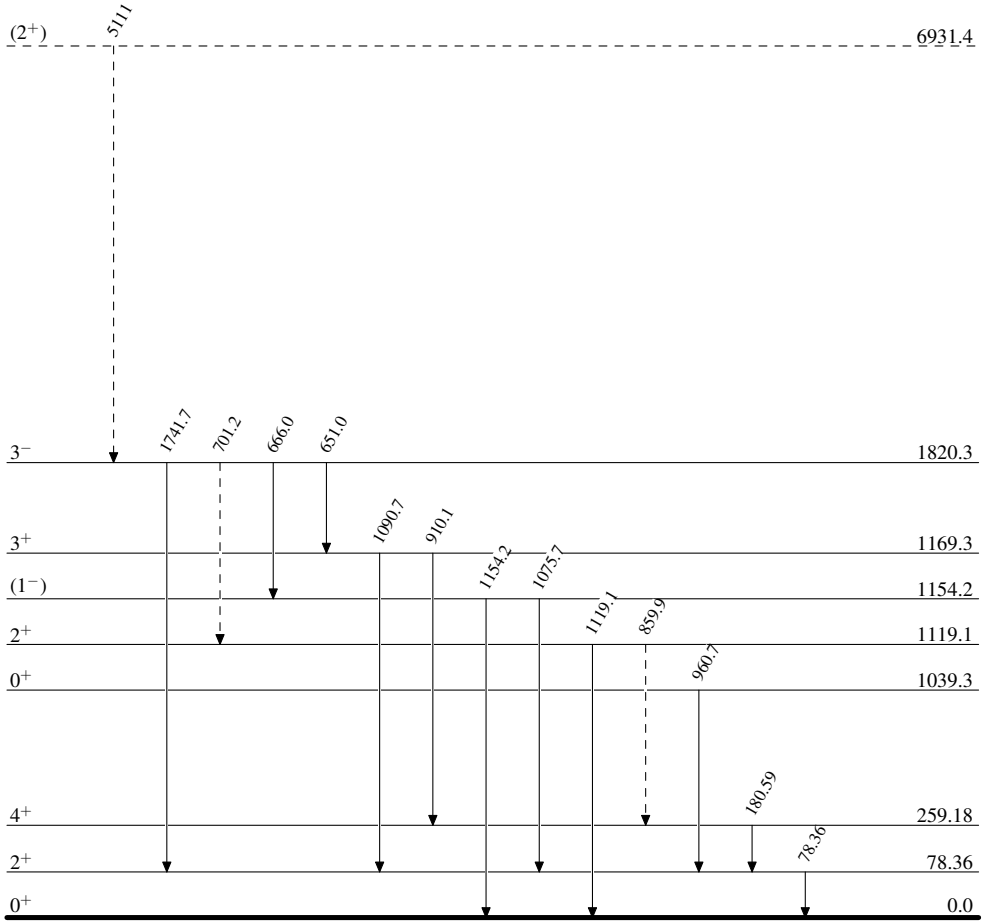
‡ Placement of transition in the level scheme is uncertain.

Legend

Muonic atom 1979Ho23,1975Ze04

Level Scheme

γ Decay (Uncertain)



$^{172}_{70}Yb_{102}$