^{94}Zr(p,nγ) 1980Gu24,1979Mi08

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. Abriola(a), A. A. Sonzogni	NDS 107, 2423 (2006)	1-Jan-2006

^{94}Nb Levels

1980Gu24: E=2.7 MeV and 3.3 MeV. Enriched target. Ge(Li). Low-energy hyperpure germanium spectrometer. Measured Eγ, Iγ.
1979Mi08: E=5.06 MeV and 5.27 MeV. Enriched target. Ge(Li), FWHM=0.5 keV at 50 keV. Deduced α(exp) from absolute electron and γ counting, electrons measured with mini-orange spectrometer. Measured Iγ on/off the $d_{5/2}$ IAR to assign parity (on resonance enhances negative parity states).
1976Ha04: E=1.69 MeV to 3.70 MeV. Enriched target. Ge(Li), FWHM=2.0 keV at 1.33 MeV and 1.0 keV at 99 keV. Measured Eγ, Iγ, $\gamma\gamma$, excitation functions. Deduced J^π from Hauser-Feshbach calculations of σ(E).
1976Fe10: E=1.7 MeV to 3.0 MeV. Enriched target. Ge(Li), FWHM=2.5 keV at 1.33 MeV. Measured Eγ, n-γ coincidences, $\gamma\gamma$, excitation functions.

E(level)	J^π†	E(level)	J^π†	E(level)	J^π†	E(level)	J^π†
0.0	6^+	312.5 *19*	$(4,5)^+$	785.4 *19*	$(3)^+$	979.5 *19*	(2)
41.4 *19*	3^+	334.7 *19*	$(3)^+$	793.1 *19*	$(3,4)^+$	1163.5 *15*	$(3^+,4,5^+)$
58.9 *19*	$(4)^+$	396.7 *19*	$(3)^-$	818.1 *19*	$(3)^-$	1182.9 *21*	
113.38 *8*	$(5)^+$	450.7 *19*	$(3)^-$	901.4? *21*		1334.7? *16*	$(3^+,4,5^+)$
140.8 *19*	$(2)^-$	631.8 *4*	$(4)^+$	924.4 *19*	(2^+)		
302.1 *19*	$(2)^-$	666.2 *19*	$(3)^+$	933.7? *18*			

† From Adopted Levels, in general good agreement with values from 1980Gu24 and 1979Mi09.

γ(^{94}Nb)

α(K)exp, α(L+...)exp are from 1979Mi08.

E_γ†	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	δ#	αc	Comments
99.42 *6*	100 *10*	140.8	$(2)^-$	41.4	3^+	E1		0.122	α(K)exp=0.116 *8* α=0.122; α(K)=0.1074; α(L)=0.01223; α(M)=0.00214; α(N+..)=0.00037 α(K)exp,α(L+...)exp: From isomeric decay using the pulsed beam. α(K)exp=0.109 *10* from in-beam measurement.
113.38 *8*	3.8 *5*	113.38	$(5)^+$	0.0	6^+	(M1)		0.160	α(K)exp=0.106 *10* α=0.160; α(K)=0.1405; α(L)=0.01637; α(M)=0.00290; α(N+..)=0.00052 α(K)exp: value corrected for the contribution of the L+M line of a lower-energy transition using the theoretical coefficient for the L+M conversion and the associated K-line intensity.
x150.62 *9*	0.77 *15*								
161.26 *4*	40 *4*	302.1	$(2)^-$	140.8	$(2)^-$	M1+E2	0.31 *10*	0.075 *9*	α(K)exp=0.064 *6* α=0.075 *9*; α(K)=0.064 *7*; α(L)=0.0079 *11*; α(N+..)=0.00025 *4* δ: +0.20 *15* or −4.3 *29* from n-$\gamma(\theta)$ angular correlations (1979Fe10).

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^{94}Zr(p,nγ) 1980Gu24,1979Mi08 (continued)

γ(^{94}Nb) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[c]	Comments
193.96 *13*	1.02 *16*	334.7	$(3)^+$	140.8	$(2)^-$				
253.6[@] *3*		312.5	$(4,5)^+$	58.9	$(4)^+$	M1		0.0190	α(K)exp=0.0171 *19* α=0.0190; α(K)=0.01653; α(L)=0.00188
255.88 *7*	6.7 *7*	396.7	$(3)^-$	140.8	$(2)^-$	M1(+E2)	0.37 *18*	0.0212 *25*	α(K)exp=0.0184 *17* α=0.0212 *25*; α(K)=0.0183 *21*; α(L)=0.0022 *3*
293.21 *8*	30 *3*	334.7	$(3)^+$	41.4	3^+	M1		0.0132	α(K)exp=0.0123 *11* α=0.0132; α(K)=0.01142; α(L)=0.00130 δ: −1<δ<0 from n-γ(θ) angular correlations (1979Fe10).
301.9[&f] *17*		933.7?		631.8	$(4)^+$				
309.86 *6*	16.8 *17*	450.7	$(3)^-$	140.8	$(2)^-$	M1		0.0114	α(K)exp=0.0113 *10* α=0.0114; α(K)=0.00994; α(L)=0.00113 α(K)exp: value corrected for the contribution of the L+M line of a lower-energy transition using the theoretical coefficient for the L+M conversion and the associated K-line intensity. δ: −0.3<δ<+0.7 from n-γ(θ) angular correlations (1979Fe10).
313.54[a] *20*	2.9 *4*	979.5	(2)	666.2	$(3)^+$				
337.71 *28*	2.3 *4*	396.7	$(3)^-$	58.9	$(4)^+$	E1		0.0038	α(K)exp=0.0034 *7* α=0.0038
364.4 *4*	0.8 *3*	666.2	$(3)^+$	302.1	$(2)^-$				
458.39 *28*	2.4 *3*	793.1	$(3,4)^+$	334.7	$(3)^+$	M1		0.0044	α(K)exp=0.0041 *5* α=0.0044 δ: +0.32 *15* or +1.7 *5* from n-γ(θ) angular correlations if J=4 (1979Fe10).
474.3 *5*	0.64 *16*	924.4	(2^+)	450.7	$(3)^-$				
483.42[e] *21*	6.5[e] *8*	785.4	$(3)^+$	302.1	$(2)^-$	E1		0.0015	α(K)exp=0.0018 *5* α=0.0015 δ: +0.11 *10* or +2.9 *15* from n-γ(θ) angular correlations (1979Fe10).
483.42[e] *21*	6.5[e] *8*	818.1	$(3)^-$	334.7	$(3)^+$	E1		0.0015	α(K)exp=0.0018 *5* α=0.0015
504.7[&f] *10*		901.4?		396.7	$(3)^-$				
518.4[@] *4*		631.8	$(4)^+$	113.38	$(5)^+$	M1		0.0033	α(K)exp=0.0025 *8* α=0.0033
525.64 *24*	17.5 *18*	666.2	$(3)^+$	140.8	$(2)^-$	E1		0.0012	α(K)exp=0.0009 *2* α=0.0012 δ: −2.24<δ<−0.3 from n-γ(θ) angular correlations (1979Fe10).
[x]563.5 *4*	0.76 *20*								
621.8 *6*	1.8 *2*	924.4	(2^+)	302.1	$(2)^-$				δ: 0.53<δ<1.32 from n-γ(θ) angular correlations

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^{94}Zr(p,nγ) 1980Gu24,1979Mi08 (continued)

γ(^{94}Nb) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Comments
						(1979Fe10) if mult.=E1+M2, J=3 in conflict to the adopted value.
[x]639.2 *6*	8.5 *10*					
644.2[d] *4*	≤7	785.4	$(3)^+$	140.8	$(2)^-$	
644.2[d] *4*	≤7	979.5	(2)	334.7	$(3)^+$	
678[bf]		818.1	$(3)^-$	140.8	$(2)^-$	
751[bf]		793.1	$(3,4)^+$	41.4	3^+	
776.3 *5*	6.0 *7*	818.1	$(3)^-$	41.4	3^+	δ: +0.04 *12* or +3.7 *11* from n-γ(θ) angular correlations (1979Fe10) if mult.=M1+E2, J=4 in conflict to the adopted value.
783.2 *8*	8.6 *11*	924.4	(2^+)	140.8	$(2)^-$	
[x]812.1 *9*	1.62 *28*					
837.3 *8*	1.4 *5*	979.5	(2)	140.8	$(2)^-$	
880.8 *10*	1.96 *20*	1182.9		302.1	$(2)^-$	
[x]894.1 *11*	1.44 *21*					
[x]911.9 *10*	2.1 *3*					
[x]935.5 *12*	≤4.3					
[x]945.4 *12*	2.7 *5*					
1042.1 *14*	3.8 *6*	1182.9		140.8	$(2)^-$	
1050.1 *15*	0.9 *3*	1163.5	$(3^+,4,5^+)$	113.38	$(5)^+$	
1106.1 *15*	3.8 *6*	1163.5	$(3^+,4,5^+)$	58.9	$(4)^+$	
1120.5 *15*	2.5 *6*	1163.5	$(3^+,4,5^+)$	41.4	3^+	
[x]1206.8 *16*	2.1 *4*					
1221.3[f] *16*	3.4 *7*	1334.7?	$(3^+,4,5^+)$	113.38	$(5)^+$	

[†] From 1980Gu24, if not noted otherwise.
[‡] Relative intensities at E=3.3 MeV, θ=55°.
[#] From α(K)exp, α(L+...)exp.
[@] From 1979Mi08.
[&] From 1976Ha04. Not seen in other experiments.
[a] A γ was seen at 312 keV *1* by 1979Mi08 and tentatively placed from the 311-keV level. The evaluator assumes that this γ is identical to the 313.5γ seen by 1980Gu24.
[b] From 1976Fe10. Not seen in other experiments.
[c] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[d] Multiply placed.
[e] Multiply placed with undivided intensity.
[f] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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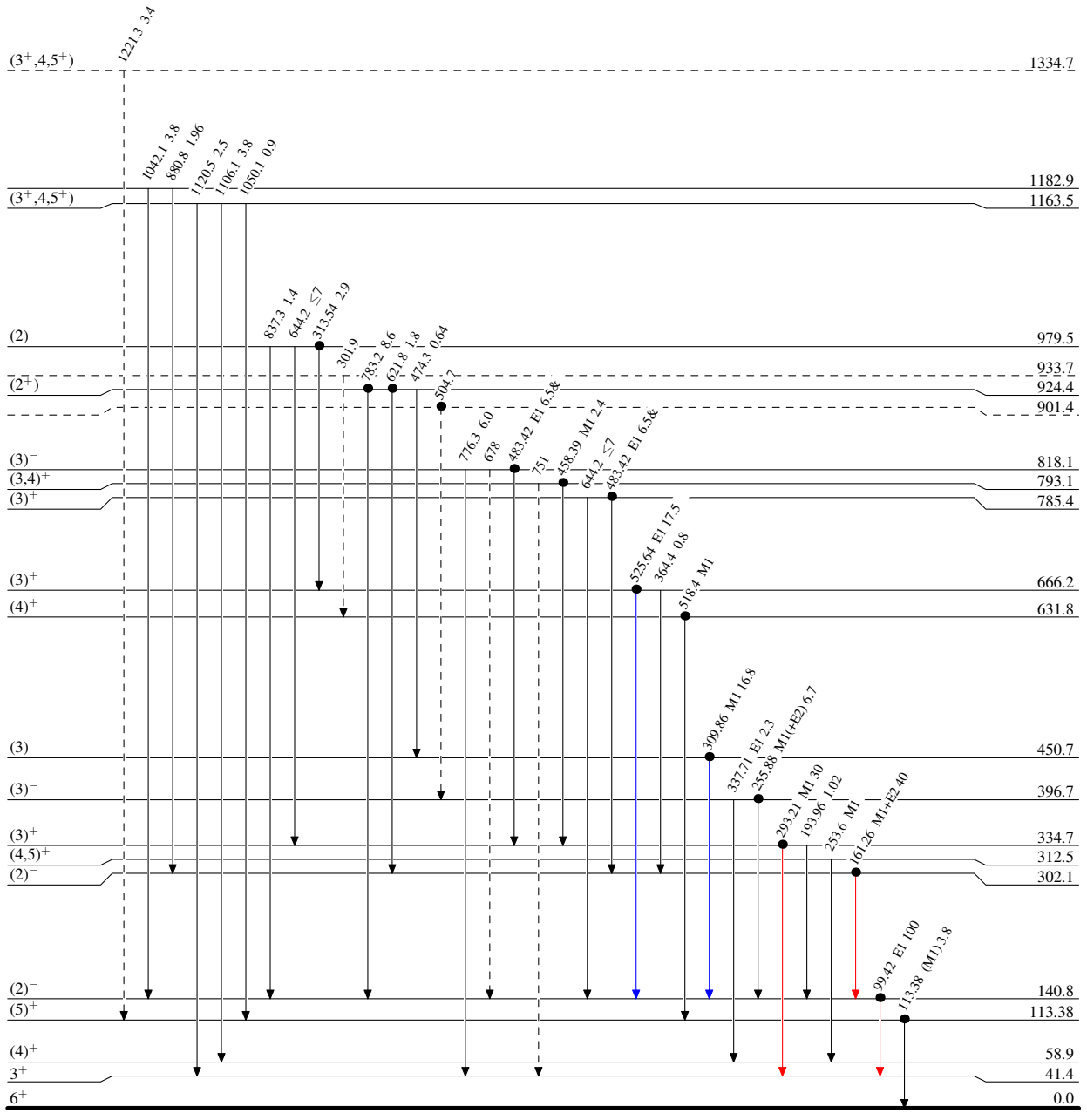
Level Scheme

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence



$^{94}_{41}Nb_{53}$