



1 Decay Scheme

Zr-89 (half-life of 78.42 h) undergoes 100% EC/positron decay (Q_{EC} of 2832.8(28) keV) to various nuclear levels, including the metastable and ground states of Y-89.

Le zirconium 89 se désintègre par capture électronique et/ou transitions bêta plus vers plusieurs niveaux de l'yttrium 89, y compris le niveau isomérique et le niveau fondamental.

2 Nuclear Data

$T_{1/2}(^{89}\text{Zr})$:	78,42	(13)	h
$T_{1/2}(^{89\text{m}}\text{Y})$:	15,84	(18)	s
$Q^+(^{89}\text{Zr})$:	2832,8	(28)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,5}$	211 (3)	0,745 (10)	allowed	6,18	0,8575 (17)	0,1165 (13)	0,0223 (5)
$\epsilon_{0,4}$	266 (3)	0,106 (5)	allowed	7,25	0,8615 (16)	0,1134 (13)	0,0216 (5)
$\epsilon_{0,3}$	303 (3)	0,074 (5)	allowed	7,52	0,8632 (16)	0,1120 (13)	0,0213 (4)
$\epsilon_{0,2}$	1088 (3)	0,123 (4)	unique 1st forbidden	9,09	0,8677 (15)	0,1082 (12)	0,0208 (4)
$\epsilon_{0,1}$	1924 (3)	76,2 (3)	allowed	6,152	0,8731 (15)	0,1041 (12)	0,0196 (4)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta_{0,1}^+$	902 (3)	22,8 (3)	allowed	6,152

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	P _{γ+ce} (%)	Multipolarity	α _K (10 ⁻³)	α _L (10 ⁻⁴)	α _M (10 ⁻⁴)	α _T (10 ⁻³)	α _π (10 ⁻⁴)
γ _{1,0} (Y)	908,97 (3)	99,873 (23)	M4	7,43 (11)	9,06 (13)	1,561 (22)	8,51 (12)	
γ _{3,1} (Y)	1620,83 (20)	0,074 (5)	M1+E2					
γ _{4,1} (Y)	1657,58 (15)	0,106 (5)	M1+E2					
γ _{5,1} (Y)	1713,1 (3)	0,745 (10)	M1+E2					
γ _{2,0} (Y)	1744,74 (18)	0,1231 (40)	E2	0,1722 (25)	0,186 (3)	0,0317 (5)	0,382 (6)	1,88 (3)

3 Atomic Data

3.1 Y

ω _K	:	0,716	(4)
ω _L	:	0,0289	(7)
n _{KL}	:	1,081	(4)

3.1.1 X Radiations

	Energy (keV)		Relative probability
X _K			
Kα ₂	14,8829		52,1
Kα ₁	14,9585		100
Kβ ₃	16,7259	}	25,1
Kβ ₁	16,7381		
Kβ ₅ ''	16,88		
Kβ ₂	17,0156	}	3,48
Kβ ₄	17,0362		
X _L			
Lℓ	1,686		
Lα	1,92 - 1,923		
Lη	1,762		
Lβ	1,996 - 2,078		
Lγ	2,153 - 2,347		

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	12,205 - 12,784	100
KLX	14,238 - 14,956	37,6
KXY	16,251 - 17,034	3,53
Auger L	1,27 - 1,89	579

4 Electron and Positron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e _{AL}	(Y)	1,27 - 1,89	79,5 (7)
e _{AK}	(Y)		
	KLL	12,205 - 12,784	} 19,4 (3)
	KLX	14,238 - 14,956	
	KXY	16,251 - 17,034	
ec _{1,0} T	(Y)	891,93 - 908,97	0,84 (3)
ec _{1,0} K	(Y)	891,93 (3)	0,73 (3)
ec _{1,0} L	(Y)	906,60 - 906,89	0,089 (3)
ec _{1,0} M+	(Y)	908,58 - 908,97	0,017 (1)
$\beta_{0,1}^+$	max:	902 (3)	} 22,8 (3)
	avg:	395,7 (14)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Y)	1,686 - 2,347	2,36 (5)	
XK α_2	(Y)	14,8829	14,08 (13)	} K α
XK α_1	(Y)	14,9585	27,01 (20)	
XK β_3	(Y)	16,7259	} 6,78 (8)	K' β_1
XK β_1	(Y)	16,7381		
XK β_5''	(Y)	16,88		
XK β_2	(Y)	17,0156	} 0,94 (4)	K' β_2
XK β_4	(Y)	17,0362		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
γ^\pm	511	45,6 (6)
$\gamma_{1,0}(Y)$	908,97 (3)	99,03 (2)
$\gamma_{3,1}(Y)$	1620,81 (20)	0,074 (5)
$\gamma_{4,1}(Y)$	1657,56 (15)	0,106 (5)
$\gamma_{5,1}(Y)$	1713,1 (3)	0,745 (10)
$\gamma_{2,0}(Y)$	1744,72 (18)	0,123 (4)

6 Main Production Modes

- { Y – 89(p,n)Zr – 89
- { Possible impurities: Zr – 88(EC)Y – 88, Zr – 89m
- Y – 89(d,2n)Zr – 89
- Y – 89(α ,p3n)Zr – 89
- { Zr – 90(n,2n)Zr – 89
- { Possible impurities: Zr – 89m
- Zr – 90(p,2n)Nb – 89(EC)Zr – 89
- Zr – 90(p,pn)Zr – 89
- Zr – 90(γ ,n)Zr – 89

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