^{58}Co ε decay (70.86 d)

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Caroline D. Nesaraja, Scott D. Geraedts and Balraj Singh	NDS 111, 897 (2010)	12-Jan-2010

Parent: ^{58}Co: E=0.0; $J^\pi=2^+$; $T_{1/2}$=70.86 d *6*; Q(ε)=2307.6 *12*; %ε+%$β^+$ decay=100.0

^{58}Co-$T_{1/2}$: weighted average of 70.75 d *7* (1982HoZJ), 70.916 d *22* (1980Ho17), 70.81 d *3* (1976Va30), 70.78 d *4* (1975La16), 72 d 6 (1973ArZI), 71.1 d *2* (1972We17), 70.8 d *9* (1972Cr02), 70.4 d *10* (1972Cr02), 71.5 d *8* (1968De08). Older measurements: 1956Sc87, 1955Co31, 1952Ru23, 1952Ho58, 1941Li01.

1992So04: measured p(K)ω(K)=0.313 *3* in the decay of ^{58}Co. This gives the fluorescence yield ω(K)=0.352 *4* using a calculated value of p(K)=0.889 *3*.

1992BeZE: measured electron capture to positron emission ratio in the decay of ^{58}Co.

1991BaZS: evaluation and recommended values by the IAEA coordinated research project on x-ray and γ-ray standards for detector calibration. Recommended values from this evaluation are indicated in comments.

2001Kr26: Measured βγ coin, deduced end-point energy for β transition to the first excited state.

Measured γ: 1982Gr10, 1979Gr01, 1978He21, 1972DyZY, 1971He20, 1968Ri03, 1956Fr17, 1946Go01.

Measured ce: 1962Fr13, 1962Ma33.

Measured γγ(θ): 1971Si15, 1969Si13, 1969Sc11, 1966Ra22, 1964Ma09, 1962Ma33, 1956Fr17.

Measured $β^+$,β-shape: 1963Rh02.

Measured β(θ), γ(θ) from polarized ^{58}Co: 1983Le13.

Measured γ(θ,temp or H): 1980Bo33, 1972Fo05, 1962Ma33, 1961Ch12, 1958Da05, 1956Gr52, 1952Da19.

Measured: $β^+$: 1968Ba49, 1966Bi13, 1963Rh02, 1961Ra13, 1958Da03, 1958Ko64, 1955Co31, 1952Ch31, 1944De01.

Measured β(θ): 1983Le13, 1973An06, 1958Po59, 1957Po35, 1957Am51.

Measured βγ(θ): 1970Wo07, 1968Sa01.

Measured βγ(circular polarization)(θ): 1971Pi05, 1968Me21, 1967Be20, 1967Bh04, 1965Co18, 1965Da03, 1965Ma06, 1958Bo90.

ε/$β^+$=5.05 *9* (1968Ba49), 4.9 *9* (1961Jo22); εL(exp)/εK(exp)=0.110 *8* (1973Ba67).

Additional information 1.

The level scheme is consistent since the total decay energy computed by RADLST is 2307.6 *29* compared to the Q value of 2307.5 *12*.

1968Ba49: measured ε/$β^+$=5.05 *9*, I(K x ray).

^{58}Fe Levels

E(level)	J^π †	$T_{1/2}$	Comments
0.0	0^+		
810.7666 *20*	2^+	<1 ns	$T_{1/2}$: from 1964Ma09.
1674.736 *5*	2^+		

† From 'Adopted Levels'.

ε,$β^+$ radiations

The probability for K-shell electron shakeoff = 16.6×10^{-4} *21* (1983Sc09), 13.8×10^{-4} *24* (1983Nh01).

E(decay)	E(level)	Iβ+ †	Iε†	Log *ft*	I(ε+β+)†	Comments
(632.9 *12*)	1674.736		1.21 *2*	7.69 *1*	1.21 *2*	εK=0.8875; εL=0.09573; εM+=0.01675
1496 *5*	810.7666	14.9 *2*	83.9 *2*	6.61 *1*	98.8 *2*	av Eβ=201.10 *51*; εK=0.7546 *11*; εL=0.08046 *11*; εM+=0.014062 *20* E(decay): from E($β^+$)=474 *5* (1963Rh02). Others: 471 *8* (2001Kr26), 472 *6* (1952Ch31). Iβ+: calculated from I(γ+ce) and ε/$β^+$=5.61 *8* from LOGFT code; measured values include: 14.96 *18* (1968Ba49), 15.2 *2*

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^{58}Co ε decay (70.86 d) (continued)

ε,β+ radiations (continued)

E(decay)	E(level)	Iβ+ †	Iε†	Log *ft*	I(ε+β+)†	Comments
						(1966Bi13) ε/β+=5.65 *11* (1992BeZE), 5.76 *6* (1970Wi14), 5.82 *10* (1962Kr02), εK(exp)/β+=4.85 *9* (1992BeZE), 4.94 *8* (1970Bi02), 5.05 *5* (1968Ba49) 4.83 *10* (1962Kr02), 4.92 *9* (1961Jo22); εL(exp)/εK(exp)=0.108 *4* (1963Mo12).
(2307.6 *12*)	0.0	0.00063	0.00012	12.8	0.00075	av Eβ=553.12 *54*; εK=0.1473 *4*; εL=0.01566 *4*; εM+=0.002735 *7* Iβ+: from 1958Da03.

† Absolute intensity per 100 decays.

γ(^{58}Fe)

Iγ normalization: $I_{\gamma+ce}(811)+I_{\gamma+ce}(1674)=100$.

Eγ †	Iγ ‡@	Ei(level)	J_i^π	Ef	J_f^π	Mult.#	δ#	α&	Comments
810.7593 *20*	100	810.7666	2+	0.0	0+	E2		3.32×10^{-4}	α(K)=0.000299 Mult.: α(K)exp=3.0×10^{-4} *1*, K/(L+M)=8 *1*, α=3.4×10^{-4} *1* (1962Fr13). Other: K/L=11.8 (1962Ma33).
863.951 *6*	0.69 *1*	1674.736	2+	810.7666	2+	M1+E2	−0.69 *5*	2.33×10^{-4} *4*	α(K)=0.000210 Iγ: from weighted average of 0.77 *4* (Hill, report BNWL-SA-315, 1965), 0.81 *3* (1968Ri03), 0.70 *2* (1972DyZY), 0.645 *15* (1973Ba67), 0.69 *2* (Denecke as quoted in 1973Ba67), 0.69 *2* [Legrand et al., Atomic Energy Review 11 (1973) 524], 0.74 *4* (1974HeYW), and 0.682 *17* (1982Gr10). The internal uncertainty is 0.008, the reduced-χ^2 is 4.4, and the external uncertainty 0.016. Mult.: α(K)exp=0.00024 *4* (1962Ma33). δ: from γγ(θ) and γ(θ,t) (1972Fo05).
1674.725 *7*	0.52 *1*	1674.736	2+	0.0	0+	E2			Iγ: from weighted average of 0.68 *5* (Hill, report BNWL-SA-315, 1965), 0.57 *3* (1968Ri03), 0.49 *3* (1972DyZY), 0.506 *15* (1973Ba67), 0.527 *15* (Denecke as quoted in 1973Ba67), 0.525 *13* [Legrand et al., Atomic Energy Review 11, 524

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γ(^{58}Fe) (continued)

E_γ [†]	E_i(level)	Comments
		(1973)], 0.54 *4* (1974HeYW), and 0.511 *15* (1982Gr10). The internal uncertainty is 0.007, the reduced χ^2 is 2.2, and the external uncertainty 0.01. Additional information 2.

[†] From 2000He14.
[‡] $I_{K\ x\ ray}$=26.7 *3* calculated from this decay scheme; the same value is given in the 1991BaZS evaluation where $I_{K\alpha}$ =23.5 *3* and $I_{K\beta}$ = 3.2 *1*.
[#] From 'Adopted Gammas'.
[@] For absolute intensity per 100 decays, multiply by 0.9945 *1*.
[&] 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.

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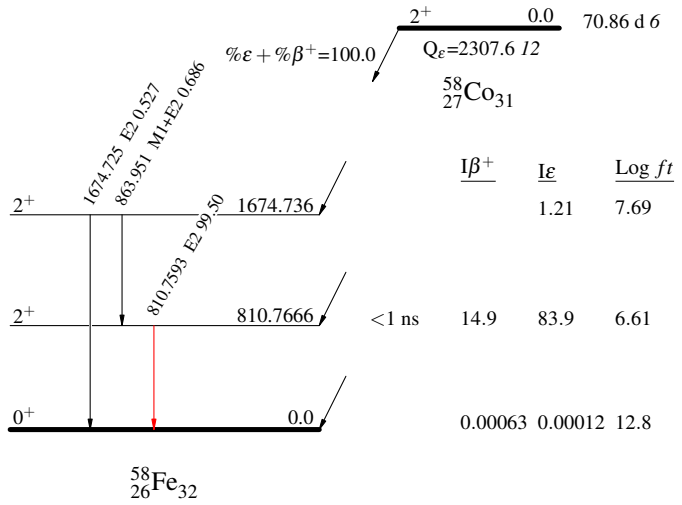
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

Legend

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



$^{58}_{26}Fe_{32}$