

⁴⁶Sc β⁻ decay 1978He21

Type	Author	History Citation	Literature Cutoff Date
Update	R. Helmer	ENSDF	01-Jan-2000

Parent: ⁴⁶Sc: E=0.0; J^π=4⁺; T_{1/2}=83.79 d 4; Q(β⁻)=2366.7 7; %β⁻ decay=100.0

⁴⁶Sc-Since Q(β⁺)=1379 4, an energy of 33 4 is available for ε decay to the 1346.0 3 J^π=2⁺ level of ⁴⁶Ca. For an assumed log ft=13 this ε branch would be ≈7×10⁻¹¹ and very difficult to measure.

(889γ)(1120γ)(θ): A₂=+0.1003 18, A₄=+0.0103 26 from 1967Ga13, 1966Mi03, 1964Ha12, 1964Ge06, 1963Si06, 1962La11, 1956Be75.

βγ circular-polarization correlation measured by scattering of γ's in magnetized iron; asymmetry parameter A=0.13 2 (1966Mi03).

For summary of 15 previous measurements, see 1966Mi03.

Plastic plus NaI detector system (1976Kl04); measured γγ(t) by centroid shift. For summary of 9 previous T_{1/2} measurements of 889 level, see 1976Kl04.

Plastic scintillators (1970Be61,1963Le15); measured βγ(t).

NaI detector (1963Ak01); resonant scattering of γ's vs source temperature to measure T_{1/2}.

An independent evaluation of this decay was carried out by R. G. Helmer as part of the international Decay Data Evaluation Project. Since the results are very similar to those given in this data set, they are included in this comment, rather than replacing the data set. From the analysis of 5 half-life values by three different methods (1985ZiZY 1992Ra08), a result of 83.788 d 22 is obtained. The intensities of the 889- and 1120-keV γ rays are deduced to be 99.9833 5 and 99.986 +4-36, respectively. The γ-ray energies can be replaced by 889.271 2 and 1120.537 3 from the 2000He14 evaluation. The details of this evaluation will be published by M.-M. Be in a report from the Laboratoire National Henri Becquerel.

⁴⁶Ti Levels

E(level)	J ^π †	T _{1/2}	Comments
0.0	0 ⁺		
889.286 3	2 ⁺	4.69 ps 34	T _{1/2} : weighted average of 4.65 ps 35 (1976Kl04) and 5.45 ps 145 (1963Ak01).
2009.846 5	4 ⁺		T _{1/2} : >2.3<8.7 ps (1970Be61), <3.5 ps (1963Le15); from βγ(t).

† Based on γγ(θ) and γ multiplicities.

β⁻ radiations

β energy measurements:

Liquid scin plus 2 NaI detectors, βγγ triple coin (1969Pr11)
 Double lens magnetic spectrometer (1956Wo09).
 Semi-circular β spectrometer (1953Yo03).

E(decay)	E(level)	Iβ ⁻ †	Log ft	Comments
357 3	2009.846	99.9964 7	6.200 3	av Eβ=111.8 3 E(decay): weighted average of values from 1969Pr11 and 1953Yo03.
1475 6	889.286	3.6×10 ⁻³ 7	12.94 9	av Eβ=580.8 4 E(decay),Iβ ⁻ : from 1956Wo09.

† Absolute intensity per 100 decays.

$^{46}\text{Sc} \beta^-$ decay 1978He21 (continued)

$\gamma(^{46}\text{Ti})$

γ 's measured with Be+BF₃ photo-neutron detector (1980Fu07,1949FI05).

γ energy measurements:

Ge(Li) detector (1978He21).

Bent-crystal spectrometer (1972Ga37).

α measurements:

Iron-free double-focusing magnetic spectrometer (1962Fr13).

High-resolution β spectrometer (1954Ke28).

Thin-lens magnetic spectrometer (1954St08 and 1950Mo62).

E_γ [†]	I_γ [#]	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [‡]	α [@]	$I_{(\gamma+ce)}$ [#]	Comments
889.277 3	99.984 1	889.286	2 ⁺	0.0	0 ⁺	E2	0.00017	100	$\alpha(\text{exp})=1.60 \times 10^{-4}$ 7 (1962Fr13).
1120.545 4	99.987 1	2009.846	4 ⁺	889.286	2 ⁺	E2		100	$\alpha(\text{exp})=0.95 \times 10^{-4}$ 4 (1962Fr13).
2010	1.3×10^{-5} 10	2009.846	4 ⁺	0.0	0 ⁺				E_γ : assumed from decay scheme and photo-neutrons from Be. I_γ : from 1980Fu07.

[†] From 1978He21.

[‡] From α measurements (all references).

[#] Absolute intensity per 100 decays.

[@] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ -ray energies, assigned multiplicities, and mixing ratios, unless otherwise specified.

$^{46}\text{Sc} \beta^-$ decay 1978He21

Decay Scheme

Intensities: I_γ per 100 parent decays

Legend

