

³⁶K εp decay (341 ms) 1996II02,1980Es01

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Lijie Sun and Jun Chen		NDS 211,1 (2026)	30-Sep-2025

Parent: ³⁶K: E=0; J^π=2⁺; T_{1/2}=341 ms 3; Q(εp)=4307.4 3; %εp decay=0.051

³⁶K-J^π,T_{1/2}: From the Adopted Levels of ³⁶K (2012Ni01).

³⁶K-Q(εp): From 2021Wa16.

³⁶K-%εp decay: %ε+β⁺p=5.1×10⁻² is scaled by evaluators from %ε+β⁺p=4.9×10⁻² reported in 1996II02. %ε+β⁺p=4.9×10⁻² in 1996II02 was normalized based on the strongest 970-keV ε+β⁺-delayed proton I_p=3.3×10⁻⁴ 9 measured by 1980Es01. 1980Es01 reported %ε+β⁺p=4.8×10⁻² and their I_p was normalized based on the strongest 1970-keV ε+β⁺-delayed γ ray %I_γ=79 8 measured by 1972Mi13. Evaluators adopt a more precise %I_γ(1970)=81.8 16 from the evaluated ³⁶K ε decay dataset (2012Ni01,1976Fr03) as the new normalization reference, and therefore, all original I_p values from 1996II02 and 1980Es01 are scaled by 1.04 11.

1996II02,1997II03: a 500-MeV proton beam was produced from the TRIUMF cyclotron and bombarded a CaO powder target. The spallation reaction products diffused out of the target and were selectively ionized at a Re surface. A=36 singly charged ions were selected by a magnetic mass analyzer and implanted into a carbon foil at 7.0×10⁵ pps. Protons and α particles were detected using a 30-μm silicon surface barrier detector with FWHM=23 keV. ³²S and ³⁵Cl recoils were detected using an MCP in a back-to-back geometry for timing stop signals. Measured E_p(>0.5 MeV) and I_p for 15 proton peaks, E_α(>1.5 MeV) and I_α for 19 α peaks, p(recoil)-coin, and α(recoil)-coin. Deduced levels, J, π, decay branching ratios, log ft, partial decay widths for ³⁶Ar, and ratios of ³⁵Cl(p,α)³²S to ³⁵Cl(p,γ)³⁶Ar reaction rates.

1980Es01: a 20-MeV proton beam was produced from the University of Jyväskylä MC-20 cyclotron and bombarded a stack of four ³⁶Ar-implanted Al foils. The ³⁶Ar(p,n) reaction products were thermalized by helium, transported with NaCl-loaded helium, and deposited onto a fast-transport Al-coated mylar tape in a measurement chamber. Protons and α particles were detected using 14 and 26-μm fully depleted (FWHM=40 keV) and 100-μm partially depleted Si(Au) surface barrier detectors. A polyethylene absorber foil was placed in front of Si(Au) to cause an energy shift for distinguishing p/α. Measured E_p(>0.5 MeV) and I_p for 11 proton peaks, E_α(>2.0 MeV) and I_α for 12 α peaks. Deduced levels, J, π, decay branching ratios, log ft, and partial decay widths for ³⁶Ar.

1980Ew01: a 600-MeV proton beam was produced from the synchrocyclotron at CERN-ISOLDE and bombarded a ScC₂ target. The ⁴⁵Sc(p,7n3p) spallation reaction products diffused out of the target and reached a tungsten surface ionization source where potassium isotopes were selectively ionized. The beam was extracted from the ion source, separated by the ISOLDE analyzing magnet, and collected by a carbon foil for proton measurements. Protons and α particles were detected using 20-μm and 100-μm silicon surface barrier detectors with FWHM=35 and 23 keV. Measured E_p(>0.5 MeV) and I_p for 3 proton peaks, E_α and I_α for 4 α peaks. Deduced levels, J, π, and decay branching ratios for ³⁶Ar.

³⁵Cl Levels

<u>E(level)</u>	<u>J^π†</u>
0	3/2 ⁺

† From the Adopted Levels.

Delayed Protons (³⁵Cl)

<u>E(p)†</u>	<u>E(³⁵Cl)</u>	<u>I(p)†@</u>	<u>E(³⁶Ar)#</u>	<u>Comments</u>
501.8 11	0	1.14×10 ⁻⁶ 33	9023	E(p): other: 501 10 (1980Es01). I(p): other: 3.6×10 ⁻⁶ 13 (1980Es01).
622.7 14	0	1.6×10 ⁻⁶ 5	9147	
693.5 8	0	7.9×10 ⁻⁵ 22	9220	E(p): other: 693 5 (1980Es01), 691 8 (1980Ew01). I(p): other: 7.8×10 ⁻⁵ 24 (1980Es01).
851.7 10	0	2.3×10 ⁻⁵ 7	9383	E(p): other: 849 5 (1980Es01). I(p): other: 2.0×10 ⁻⁵ 7 (1980Es01).
969.6 12	0	3.4×10 ⁻⁴ 10	9504	E(p): other: 970 5 (1980Es01), 959 7 (1980Ew01).

Continued on next page (footnotes at end of table)

^{36}K ε p decay (341 ms) 1996II02,1980Es01 (continued)Delayed Protons (continued)

<u>E(p)[†]</u>	<u>E(³⁵Cl)</u>	<u>I(p)^{†@}</u>	<u>E(³⁶Ar)[#]</u>	<u>Comments</u>
				I(p): from 1980Es01 and also adopted as the normalization reference by 1996II02.
1168.5 14	0	6.2×10 ⁻⁷ 7	9709	
1198.5 11	0	2.5×10 ⁻⁶ 7	9740	
1272.0 20	0	1.6×10 ⁻⁶ 5	9815	
1334.2 7	0	4.5×10 ⁻⁵ 12	9879	E(p): other: 1333 5 (1980Es01), 1325 7 (1980Ew01). I(p): other: 3.6×10 ⁻⁵ 11 (1980Es01).
1409.3 22	0	1.04×10 ⁻⁶ 33	9957	
1874 [‡] 10	0	1.1×10 ⁻⁶ [‡] 5	10435	
1992 [‡] 10	0	5.0×10 ⁻⁶ [‡] 20	10556	
2048 [‡] 10	0	4.9×10 ⁻⁶ [‡] 19	10613	
2458 [‡] 10	0	3.0×10 ⁻⁶ [‡] 13	11035	
2640 [‡] 10	0	2.1×10 ⁻⁶ [‡] 10	11222	

[†] From 1996II02, unless otherwise noted. E(p) is in lab frame.

[‡] From 1980Es01 and also adopted by 1996II02.

[#] E(level)(³⁶Ar)=E(p)_{lab}×[m(p)+m(³⁵Cl)]/m(³⁵Cl)+S(p)(³⁶Ar)+E(level)(³⁵Cl), where S(p)(³⁶Ar)=8506.97 4 (2021Wa16). Proton decay is assumed to populate only the ground state of the daughter nucleus ³⁵Cl based on the arguments proposed in 1996II02: (A) unreasonably small log ft values if populating excited states; (B) no pairs of particle groups characteristic of the g.s./first excited state energy difference; (C) compatible level matching with resonance reaction studies.

[@] Absolute intensity per 100 decays.

^{36}K ϵp decay (341 ms) 1996II02,1980Es01Decay Scheme

I(p) Intensities: I(p) per 100 parent decays

