^{36}Ca εp decay (100.9 ms) 1997Tr05,2001Lo11,2015Su01

Parent: ^{36}Ca: E=0; $J^\pi=0^+$; $T_{1/2}$=100.9 ms *20*; Q(εp)=9275 *6*; %εp decay=54.1 *12*

^{36}Ca-J^π: From the Adopted Levels of ^{36}Ca (2012Ni01).

^{36}Ca-$T_{1/2}$: Weighted average of 102 ms *2* (1995Tr02,1997Tr05), 100.1 ms *23* (2007Do17), and 100.0 ms *24* (2015Su01). Other: 100 ms *+90−40* (1981Ay01).

^{36}Ca-Q(εp): Deduced by evaluators from ^{36}Ca mass excess of −6483 *6*; weighted average of −6483.6 *56* (2021Su04), −6480 *40* (2021La04), and −6450 *40* (2021Wa16,1977Tr03), and ^{35}Ar mass excess of −23047.3 *7* (2021Wa16). Q(εp) from 2021Wa16: 9310 *40*.

^{36}Ca-%εp decay: Unweighted average of %$\varepsilon+\beta^+$p=56.8 *13* (1997Tr05), 54.3 *18* (2001Lo11), 51.2 *10* (2007Do17), and 53.9 *72* (2015Su01).

1997Tr05,1995Tr02: A-300 AMeV ^{40}Ca primary beam was produced by the GSI heavy-ion synchrotron. The secondary ^{36}Ca beam was produced via the projectile fragmentation of ^{40}Ca impinging on a ^{9}Be target and was selected using ΔE-tof-Bρ by FRS at GSI, Darmstadt. A total of 2.8×10^4 ^{36}Ca ions were implanted into a 500−μm-thick Si detector. $\varepsilon+\beta^+$-delayed protons were detected by the implantation detector. β particles were detected by the implantation detector and two 500−μm-thick Si counters. γ rays were detected by two Ge detectors. Measured E_p, I_p, Eγ, Iγ, βp-coin, βγ-coin, and pγ-coin. Deduced levels, decay branching ratios, log *ft*, B(F), and B(GT). Deduced parent ^{36}Ca $T_{1/2}$ from the time spectrum of proton events accumulated during the beam-off in the pulsed-beam mode. Comparisons with shell-model calculations.

2001Lo11: A 95-MeV ^{40}Ca primary beam was produced by the SISSI facility at GANIL. The secondary ^{36}Ca beam was produced via the projectile fragmentation of ^{40}Ca impinging on a natNi target and was selected using ΔE-tof by the LISE3 spectrometer and purified by a velocity filter. A total of 102407 ^{36}Ca ions were implanted into a 500−μm-thick Si detector. $\varepsilon+\beta^+$-delayed protons were detected by the implantation detector. β particles were detected by two 500−μm-thick Si counters. γ rays were detected by three Ge detectors. Measured E_p, I_p, Eγ, Iγ, βp-coin, and βγ-coin. Deduced levels, decay branching ratios, log *ft*, B(F), and B(GT). Comparisons with shell-model calculations.

2015Su01: A 69.42-MeV/nucleon ^{40}Ca primary beam was produced by the Sector Focusing Cyclotron and Separated Sector Cyclotron at the Heavy Ion Research Facility in Lanzhou (HIRFL). The secondary ^{36}Ca beam was produced via the projectile fragmentation ^{40}Ca impinging on a ^{9}Be target and was selected using ΔE-tof-Bρ by RIBLL. A total of 22890 ^{36}Ca ions were implanted into a 525−μm-thick DSSD. $\varepsilon+\beta^+$-delayed protons were detected by the DSSD with a threshold of 500 keV. $\varepsilon+\beta^+$-delayed γ rays were detected by four Clover Ge detectors surrounding the DSSD chamber. Measured E_p, I_p, Eγ, Iγ, βp-coin, pγ-coin, and implant-decay time correlations. Deduced levels, decay branching ratios, and parent ^{36}Ca $T_{1/2}$. Also see 2016Li45.

2007Do17: A 74.5-MeV/nucleon ^{58}Ni primary beam was produced by the SISSI facility at GANIL. The secondary ^{36}Ca beam was produced via the projectile fragmentation of ^{58}Ni impinging on a natNi target and was selected using ΔE-tof-Bρ by the ALPHA-LISE3 separator. A total of 16991 ^{36}Ca ions were implanted into a 500−μm thick DSSD. $\varepsilon+\beta^+$-delayed protons were detected by the DSSD with a threshold of 60-80 keV. $\varepsilon+\beta^+$-delayed γ rays were detected by four Ge detectors surrounding the implantation array. A 5-mm thick lithium-drifted Si detector was used as a veto for implantation events and to detect β particles. Measured E_p, I_p, and implant-decay time correlations. Deduced levels, decay branching ratios, and parent ^{36}Ca $T_{1/2}$.

1995Ga16: 60-keV ^{36}Ca was produced by the ISOLDE general-purpose on-line isotope separator at the CERN PS/Booster and implanted into the entrance window of a gas-Si-Si ΔE-E-veto detector telescope. Measured E_p. Deduced coefficients of the isobaric multiplet mass equation for A=36, T=2 quintets. A by-product of ^{37}Ca decay study (1995Ga03).

1981Ay01,1980AyZZ: ^{36}Ca was produced via the ^{40}Ca(^{3}He,α3n) reaction using a 95-MeV ^{3}He beam from the 88-inch Cyclotron at Lawrence Berkeley Laboratory. β-delayed protons were detected using a Si surface barrier detector telescope with FWHM=55 keV and a minimum threshold of ≈1.5 MeV. Measured E_p. Deduced ^{36}Ca $T_{1/2}$ and coefficients of the isobaric multiplet mass equation for A=36, T=2 quintets.

Theoretical studies involving ^{36}Ca decay: shell model (1984Mu25,1990Br26), covariant density functional theory (2013Ni09).

^{35}Ar Levels

E(level)	J^π†	Comments
0	$3/2^+$	
1184.3 *4*	$1/2^+$	E(level): from Eγ data.

† From the Adopted Levels.

^{36}Ca εp decay (100.9 ms) 1997Tr05,2001Lo11,2015Su01 (continued)

γ(^{35}Ar)

E_γ	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Comments
1184.3 *4*	1.2 *4*	1184.3	1/2$^+$	0	3/2$^+$	E_γ: weighted average of 1184.2 *4* (1997Tr05) and 1185 *1* (2001Lo11). I_γ: from 1997Tr05.

† Absolute intensity per 100 decays.

Delayed Protons (^{35}Ar)

E(p)†	E(^{35}Ar)	I(p)#	E(^{36}K)‡	Comments
1.37×10^3	1184.3	1.2 *4*	4281.7	E(p),I(p): from 1997Tr05. E(^{36}K): J^π=0, T=2 isobaric analog state in ^{36}K.
1648 *18*	0	8.4 *12*	3354	E(p): weighted average of 1676 *39* (1997Tr05), 1645 *21* (2001Lo11), 1660 *18* (2007Do17), and 1624 *22* (2015Su01). I(p): unweighted average of 11.3 *6* (1997Tr05), 9.3 *8* (2001Lo11), 7.3 *8* (2007Do17), and 5.7 *16* (2015Su01).
2549.9 *22*	0	37.4 *10*	4281.7	E(p): weighted average of 2519 *21* (1981Ay01), 2550.2 *22* (1995Ga16), 2548 *37* (1997Tr05), 2551 *21* (2001Lo11), 2538 *18* (2007Do17), and 2594 *30* (2015Su01). I(p): weighted average of 37.8 *10* (1997Tr05), 32.1 *42* (2007Do17), and 34.0 *58* (2015Su01). Other: 37 *1* (2001Lo11) without separating the weaker proton branch from the same level to ^{35}Ar first excited state. E(^{36}K): J^π=0, T=2 isobaric analog state in ^{36}K.
2713 *21*	0	2.6 *9*	4449	E(p): weighted average of 2713 *31* (1997Tr05) and 2713 *21* (2001Lo11). I(p): unweighted average of 1.7 *2* (1997Tr05) and 3.5 *5* (2001Lo11).
2921 *35*	0	1.3 *2*	4663	E(p): weighted average of 2937 *35* (1997Tr05) and 2895 *44* (2001Lo11). I(p): weighted average of 1.4 *2* (1997Tr05) and 1.0 *3* (2001Lo11).
3484 *21*	0	0.6 *2*	5242	E(p),I(p): from 2001Lo11.
3.98×10^3 *7*	0	0.9 *2*	5753	E(p),I(p): from 2001Lo11.
4.15×10^3 *5*	0	2.2 *5*	5927	E(p): weighted average of 4162 *45* (1997Tr05) and 4135 *44* (2001Lo11). I(p): unweighted average of 2.7 *4* (1997Tr05) and 1.7 *3* (2001Lo11).
4.99×10^3 *7*	0	0.4 *2*	6791	E(p): weighted average of 4989 *69* (1997Tr05) and 4983 *67* (2001Lo11). I(p): weighted average of 0.7 *2* (1997Tr05) and 0.3 *1* (2001Lo11).

† In lab frame. Evaluators take a weighted average when multiple measurements of a E(p) are available. 2007Do17 and 2015Su01 reported $E_{c.m.}$. 1997Tr05 and 2001Lo11 reported the E(level) of ^{36}K proton-emitting levels. Evaluators deduced proton center-of-mass energies $E_{c.m.}$=E(level)(^{36}K)−S(p)(^{36}K)−E(level)(^{35}Ar) using their original S(p)=1666 *8*. Evaluators then deduced each $E(p)_{lab}=E_{c.m.}\times m(^{35}Ar)/[m(p)+m(^{35}Ar)]$.

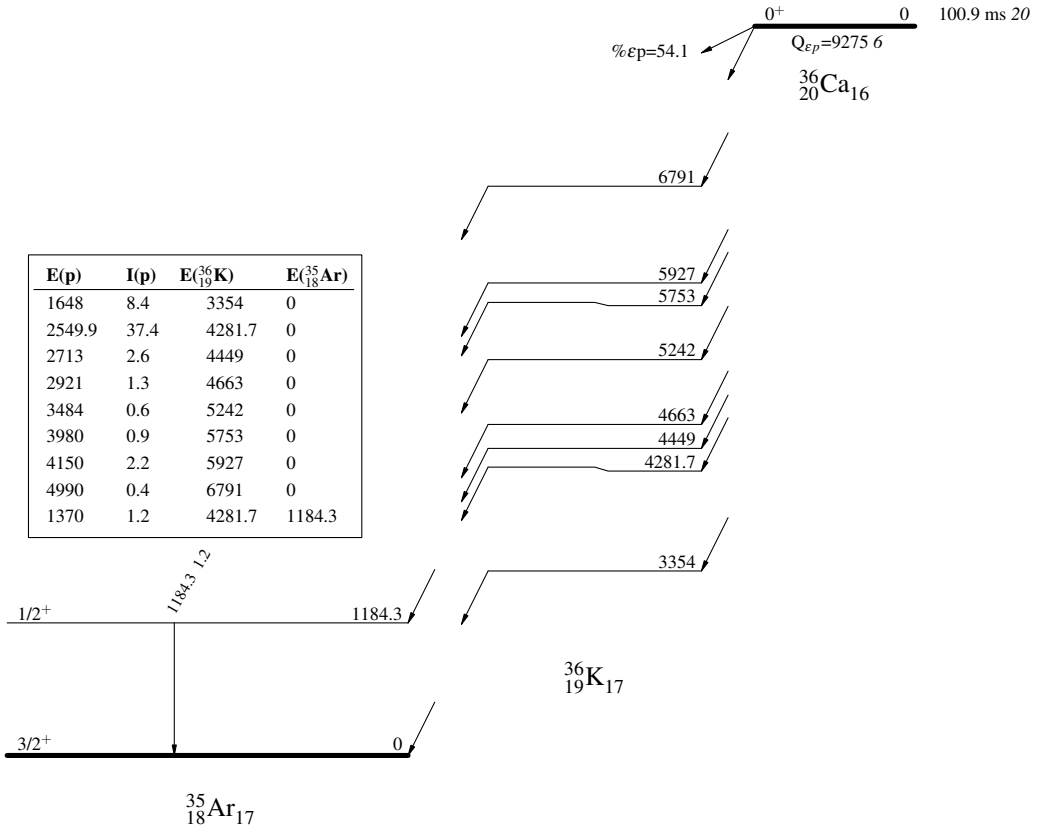
‡ $E(level)(^{36}K)=E(p)_{lab}\times[m(p)+m(^{35}Ar)]/m(^{35}Ar)+S(p)(^{36}K)+E(level)(^{35}Ar)$, where S(p)(^{36}K)=1658.9 *8* (2021Wa16).

Absolute intensity per 100 decays.

^{36}Ca εp decay (100.9 ms) 1997Tr05,2001Lo11,2015Su01

Decay Scheme

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



E(p)	I(p)	E($^{36}_{19}$K)	E($^{35}_{18}$Ar)
1648	8.4	3354	0
2549.9	37.4	4281.7	0
2713	2.6	4449	0
2921	1.3	4663	0
3484	0.6	5242	0
3980	0.9	5753	0
4150	2.2	5927	0
4990	0.4	6791	0
1370	1.2	4281.7	1184.3