TABLES OF PARTICLE PROPERTIES

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Stable Particle Table

For additional parameters, see Addendum to this table.

Quantities in italics have changed by more than one (old) standard deviation since April 1973.

Particle	$I^G(J^P)C_n$	Mass (MeV) $Mass^2$ $(GeV)^2$	Mean Life (sec) $c\tau$ (cm)	Partial decay mode: Mode	Fraction[a]	p or p_{max}[b] (MeV/c)
γ	$0,1(1^-)^-$	$0(<2)10^{-21}$	stable	stable		
ν ν_e ν_μ	$J=\frac{1}{2}$	$0(<60$ eV$)$ $0(<1.2)$	stable	stable		
e	$J=\frac{1}{2}$	0.5110034 ±.0000014	stable (>2×10²¹y)	stable		
μ	$J=\frac{1}{2}$	105.65948 ±.00035 $m^2=0.01116$ $m_\mu-m_{\pi^\pm}=-33.909$ ±.006	2.1994×10⁻⁶ ±.0006 S=1.1* $c\tau$=6.593×10⁴	$e\nu\bar{\nu}$ $e\gamma\gamma$ 3e $e\gamma$	100 % (<1.6)10⁻⁵ (<6)10⁻⁹ (<2.2)10⁻⁸	53 53 53 53
$\pi^\pm$	$1^-(0^-)$	139.5688 ±.0064 $m^2=0.0195$	2.6030×10⁻⁸ ±.0023 $c\tau$=780.4 $(\tau^+-\tau^-)/\overline{\tau}=$ (0.05±0.07)% (test of CPT)	$\mu\nu$ $e\nu$ $\mu\nu\gamma$ $\pi^0 e\nu$ $e\nu\gamma$ $e\nu e^+e^-$	100 % [c] (1.24±0.03)10⁻⁴ (1.24±0.25)10⁻⁴ [c] (1.02±0.07)10⁻⁸ [c] (3.0 ±0.5)10⁻⁸ (<3.4)10⁻⁸	30 70 30 5 70 70
π^0	$1^-(0^-)^+$	134.9645 ±.0074 $m^2=0.0182$ $m_{\pi^\pm}-m_{\pi^0}=4.6043$ ±.0037	0.84×10⁻¹⁶ ±.10 S=2.1* $c\tau$=2.5×10⁻⁶	$\gamma\gamma$ γe^+e^- $\gamma\gamma\gamma$ $e^+e^-e^+e^-$ $\gamma\gamma\gamma\gamma$	(98.83±0.05)% (1.17±0.05)% [d] (<5)10⁻⁶ (3.47)10⁻⁵ (<6.1)10⁻⁵	67 67 67 67 67

Stable Particle Table *(cont'd)*

Particle	$I^G(J^P)C_n$	Mass (MeV) Mass^2 (GeV)^2	Mean life (sec) $c\tau$ (cm)	Partial decay mode: Mode	Fraction[a]	p or p_{max}[b] (MeV/c)
$K^\pm$	$\frac{1}{2}(0^-)$	493.707 ±0.037	1.2371×10^{-8} ±.0026 S=1.9*	$\mu\nu$	(63.54±0.19)%	236
			$c\tau$=370.8	$\pi\pi^0$	(21.12±0.17)%	205
		m^2=0.244	$(\tau^+-\tau^-)/\bar{\tau}$= (.11±.09)% (test of CPT)	$\pi\pi^-\pi^+$	(5.59±0.03)% S=1.1*	125
				$\pi\pi^0\pi^0$	(1.73±0.05)% S=1.4*	133
				$\mu\pi^0\nu$	(3.20±0.09)% S=1.7*	215
			S=1.2*	$e\pi^0\nu$	(4.82±0.05)% S=1.1*	228
				$e\pi^0\pi^0\nu$	(1.8 $^{+2.4}_{-0.6}$) 10^{-5}	207
	$m_{K^\pm}-m_{K^0}$ = -3.99 ±0.13 S=1.1*			$\pi\pi^\mp e^\pm\nu$	(3.7 ±0.2) 10^{-5}	203
				$\pi\pi^\pm e^\mp\nu$	(< 5) 10^{-7}	203
				$\pi\pi^\mp\mu^\pm\nu$	(0.9 ±0.4) 10^{-5}	151
				$\pi\pi^\pm\mu^\mp\nu$	(< 3) 10^{-6}	151
				$e\nu$	(1.38±0.20) 10^{-5}	247
				$e\nu\gamma$	c(< 7) 10^{-5}	247
				$\pi\pi^0\gamma$	h,c(2.71±0.19) 10^{-4}	205
				$\pi\pi^+\pi^-\gamma$	c(10 ±4) 10^{-5}	125
				$\mu\pi^0\nu\gamma$	c(< 6) 10^{-5}	215
				$e\pi^0\nu\gamma$	c(3.7 ±1.4) 10^{-4}	228
				πe^+e^-	(< 0.26) 10^{-6}	227
				$\pi^\mp e^\pm e^\pm$	(< 1.5) 10^{-5}	227
				$\pi\mu^+\mu^-$	(< 2.4) 10^{-6}	172
				$\pi\gamma\gamma$	c(< 3.5) 10^{-5}	227
				$\pi\gamma\gamma\gamma$	c(< 3) 10^{-4}	227
				$\pi\nu\bar{\nu}$	(< 0.6) 10^{-6}	227
				$\pi\gamma$	(< 4) 10^{-6}	227
				$e\pi^\mp\mu^\pm$	(< 3) 10^{-8}	214
				$e\pi^\pm\mu^\mp$	(< 1.4) 10^{-8}	214
				$\mu\nu\nu\bar{\nu}$	c(< 6) 10^{-6}	236
K^0	$\frac{1}{2}(0^-)$	497.70 ±0.13	50% K_{Short}, 50% K_{Long}			
K^0_S	$\frac{1}{2}(0^-)$	S=1.1* m^2=0.248	0.886×10^{-10} ±.007 S=2.4* $c\tau$=2.66	$\pi^+\pi^-$	(68.77±0.26)%	206
				$\pi^0\pi^0$	(31.23±0.26)% S=1.1*	209
				$\mu^+\mu^-$	(< 0.3) 10^{-6}	225
				e^+e^-	(<35) 10^{-5}	249
				$\pi^+\pi^-\gamma$	c(2.0 ±0.4) 10^{-3}	206
				$\gamma\gamma$	(< 0.4) 10^{-3}	249
K^0_L	$\frac{1}{2}(0^-)$		5.179×10^{-8} ±0.040 $c\tau$=1553	$\pi^0\pi^0\pi^0$	(21.3 ±0.6)% S=1.1*	139
				$\pi^+\pi^-\pi^0$	(*11.9* ±*0.4*)% S=2.2*	133
				$\pi\mu\nu$	(27.5 ±0.5)% S=1.1*	216
				$\pi e\nu$	(39.0 ±0.6)% S=1.1*	229
				$\pi e\nu\gamma$	c(1.3 ±0.8)%	229
	$m_{K_L}-m_{K_S}$ = $0.5403\times10^{10}\ \hbar\ sec^{-1}$ ±0.0035			$\pi^+\pi^-$	(*0.177±0.018*)%S=4.9*	206
				$\pi^0\pi^0$	(0.093±0.019)%S=1.5*	209
				$\pi^+\pi^-\gamma$	c(< 0.4) 10^{-3}	206
				$\pi^0\gamma\gamma$	(< 2.4) 10^{-4}	231
				$\gamma\gamma$	(4.9± 0.4) 10^{-4}	249
				$e\mu$	(< 1.6) 10^{-9}	238
				$\mu^+\mu^-$	i(< 1.6) 10^{-8}	225
				e^+e^-	(< 1.6) 10^{-9}	249
				$e^+e^-\gamma$	(< 2.8) 10^{-5}	249
η	$0^+(0^-)^+$	548.8 ±0.6 S=1.4* m^2=0.301	$^e\Gamma$=(2.63±0.58)keV			
			Neutral decays 71.1%	$\gamma\gamma$	(38.0 ±1.0)% S=1.2*	274
				$\pi^0\gamma\gamma$	e(3.1 ±1.1)% S=1.2*	258
				$3\pi^0$	(30.0 ±1.1)% S=1.1*	180
			Charged decays 28.9%	$\pi^+\pi^-\pi^0$	(23.9 ±0.6)% S=1.1*	175
				$\pi^+\pi^-\gamma$	(5.0 ±0.1)%	236
				$\pi^0e^+e^-$	(< 0.04)%	258
				$\pi^+\pi^-$	(< 0.15)%	236
				$\pi^+\pi^-e^+e^-$	(0.1 ±0.1)%	236
				$\pi^+\pi^-\pi^0\gamma$	(< 6) 10^{-4}	175
				$\pi^+\pi^-\gamma\gamma$	(< 0.2)%	236
				$\mu^+\mu^-$	(2.2 ±0.8) 10^{-5}	253
				$\mu^+\mu^-\pi^0$	(< 5) 10^{-4}	211

Stable Particle Table *(cont'd)*

Particle	$I^G(J^P)C_n$	Mass (MeV) $Mass^2$ $(GeV)^2$	Mean Life (sec) $c\tau$ (cm)	Partial decay mode: Mode	Fraction[a]	p or p_{max}[b] (MeV/c)
p	$\frac{1}{2}(\frac{1}{2}^+)$	*938.2796* *±0.0027* m^2 =0.8804	stable ($> 2\times10^{28}$y)			
n	$\frac{1}{2}(\frac{1}{2}^+)$	*939.5731* *± 0.0027* m^2 =0.8828 $m_p - m_n$ =-1.29344 ±0.00007	918±14 $c\tau = 2.75\times10^{13}$	$pe^-\nu$	100 %	1
Λ	$0(\frac{1}{2}^+)$	1115.60 ±0.05 S=1.2* m^2 =1.245	2.578×10^{-10} ±.021 S=1.6* $c\tau$ =7.73	$p\pi^-$	(64.2±0.5)%	100
				$n\pi^0$	(35.8±0.5)%	104
				$pe\nu$	(8.13±0.29)10^{-4}	163
				$p\mu\nu$	(1.57±0.35)10^{-4}	131
				$p\pi^-\gamma$	c(0.85±0.14)10^{-3}	100
Σ^+	$1(\frac{1}{2}^+)$	1189.37 ±0.06 S=1.8* m^2 =1.415 $m_{\Sigma^+} - m_{\Sigma^-}$ =-7.99 ±.08 S=1.2*	0.800×10^{-10} ±.006 $c\tau$ =2.40	$p\pi^0$	(51.6±0.7)%	189
				$n\pi^+$	(48.4)%	185
				$p\gamma$	(1.24±0.18)10^{-3} S=1.4*	225
				$n\pi^+\gamma$	c(0.93±0.10)10^{-3}	185
				$\Lambda e^+\nu$	(2.02±0.47)10^{-5}	72
			$\frac{\Gamma(\Sigma^+\to\ell^+ n\nu)}{\Gamma(\Sigma^-\to\ell^- n\nu)}$ <.035	$n\mu^+\nu$	(< 2.4)10^{-5}	202
				$ne^+\nu$	(< 1.0)10^{-5}	224
				pe^+e^-	(< 7)10^{-6}	225
Σ^0	$1(\frac{1}{2}^+)$	1192.48 ±0.08 m^2=1.422	$<1.0\times10^{-14}$ $c\tau<3\times10^{-4}$	$\Lambda\gamma$	100 %	74
				Λe^+e^-	d(5.45)10^{-3}	74
Σ^-	$1(\frac{1}{2}^+)$	1197.35 ±0.06 m^2=1.434 $m_{\Sigma^0} - m_{\Sigma^-}$ =-4.87 ±.06	1.482×10^{-10} ±.017 S=1.5* $c\tau$ =4.44	$n\pi^-$	100 %	193
				$ne^-\nu$	(1.08±0.04)10^{-3}	230
				$n\mu^-\nu$	(0.45±0.04)10^{-3}	210
				$\Lambda e^-\nu$	(0.60±0.06)10^{-4}	79
				$n\pi^-\gamma$	c(1.0 ±0.2)10^{-4}	193
Ξ^0	$\frac{1}{2}(\frac{1}{2}^+)^f$	1314.9 ±0.6 m^2=1.729 $m_{\Xi^0} - m_{\Xi^-}$ =-6.4 ±.6	2.96×10^{-10} ±.12 $c\tau$ =8.93	$\Lambda\pi^0$	100 %	135
				$p\pi^-$	(< 0.9)10^{-3}	299
				$pe^-\nu$	(< 1.3)10^{-3}	323
				$\Sigma^+e^-\nu$	(< 1.5)10^{-3}	119
				$\Sigma^-e^+\nu$	(< 1.5)10^{-3}	112
				$\Sigma^+\mu^-\nu$	(< 1.5)10^{-3}	64
				$\Sigma^-\mu^+\nu$	(< 1.5)10^{-3}	49
				$p\mu^-\nu$	(< 1.3)10^{-3}	309
Ξ^-	$\frac{1}{2}(\frac{1}{2}^+)^f$	1321.29 ±0.14 m^2=1.746	1.652×10^{-10} ±.023 S=1.1* $c\tau$ =4.95	$\Lambda\pi^-$	100 %	139
				$\Lambda e^-\nu$	g(0.70±0.21)10^{-3}	190
				$\Sigma^0e^-\nu$	(< 0.5)10^{-3}	123
				$\Lambda\mu^-\nu$	(< 1.3)10^{-3}	163
				$\Sigma^0\mu^-\nu$	(< 0.5)%	70
				$n\pi^-$	(< 1.1)10^{-3}	303
				$ne^-\nu$	(< 1.0)%	327
Ω^-	$0(\frac{3}{2}^+)^f$	1672.2±.4 m^2=2.797	$1.3^{+0.3}_{-0.2}\times10^{-10}$ $c\tau$ = 3.9	$\Xi^0\pi^-$, $\Xi^-\pi^0$, ΛK^-	Total of 41 events seen	293, 290