

The following table is from the Particle Data Group.¹

μ MEAN LIFE τ

Measurements with an error $> 0.001 \times 10^{-6}$ s have been omitted.

VALUE (10^{-6} s)	DOCUMENT ID	TECN	CHG	COMMENT
2.1969811 \pm 0.0000022 OUR AVERAGE				
2.1969803 \pm 0.0000021 \pm 0.0000007 ¹	TISHCHENKO 13	CNTR	+	Surface μ^+ at PSI
2.197083 \pm 0.000032 \pm 0.000015	BARCZYK 08	CNTR	+	Muons from π^+ decay at rest
2.197013 \pm 0.000021 \pm 0.000011	CHITWOOD 07	CNTR	+	Surface μ^+ at PSI
2.197078 \pm 0.000073	BARDIN 84	CNTR	+	
2.197025 \pm 0.000155	BARDIN 84	CNTR	–	
2.19695 \pm 0.00006	GIOVANETTI 84	CNTR	+	
2.19711 \pm 0.00008	BALANDIN 74	CNTR	+	
2.1973 \pm 0.0003	DUCLOS 73	CNTR	+	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.1969803 \pm 0.0000022	WEBBER 11	CNTR	+	Surface μ^+ at PSI
¹ TISHCHENKO 13 uses 1.6×10^{12} μ^+ events and supersedes WEBBER 11.				

From “ V minus A ” theory we have the following formula for muon lifetime τ .

$$\tau = \frac{96\pi^2 h}{G_F^2 (m_\mu c^2)^5}$$

G_F is Fermi coupling constant, m_μ is muon rest mass.

From NIST² we have

$$G_F = 1.1663787 \times 10^{-5} \text{ GeV}^{-2}$$

$$m_\mu = 1.883531627 \times 10^{-28} \text{ kilogram}$$

$$h = 6.62607015 \times 10^{-34} \text{ joule second (exact)}$$

$$c = 299792458 \text{ meter second}^{-1} \text{ (exact)}$$

$$1 \text{ eV} = 1.602176634 \times 10^{-19} \text{ joule (exact)}$$

Hence

$$\tau = 2.18735 \times 10^{-6} \text{ second}$$

The result is a bit smaller than the PDG value.

$$\frac{\tau}{2.1969811 \times 10^{-6} \text{ second}} = 0.9956$$

¹<https://pdg.lbl.gov/2020/listings/rpp2020-list-muon.pdf>

²<https://physics.nist.gov/cuu/Constants/index.html>