<sup>226</sup>U α decay (268 ms) 1998Gr19,2000He17,1989An13

	History		
Туре	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, M. S. Basunia, Jun Chen et al.	NDS 192,315 (2023)	25-Sep-2023

Parent: <sup>226</sup>U: E=0.0;  $J^{\pi}=0^+$ ;  $T_{1/2}=268$  ms 9;  $Q(\alpha)=7701$  4;  $\%\alpha$  decay=100

<sup>226</sup>U-T<sub>1/2</sub>: From α decay. Weighted average of measured values of 258 ms *13* (2002CaZU, from the same lab as 2000He17, but an independent experiment); 281 ms 9 (2000He17); 260 ms *10* (1998Gr19, also 260 ms 20 in 2001Ku07, 230 ms +60-40 in 1999Gr28, and 160 ms +2*1*-*17* tentative result in 1997En10, all from the same lab); and 200 ms *50* (1994Ye08,1990An22, also 0.25 s +15-10 in 1989An13 from the same lab). Others: 0.4 s *1* (2018Mi11), and 0.5 s 2 (1973Vi10).

<sup>226</sup>U-Q(*α*): From 2021Wa16.

<sup>226</sup>U-% $\alpha$  decay: Only the  $\alpha$  decay of <sup>226</sup>U has been observed. From theoretical  $T_{1/2}(\beta) > 100$  s and  $T_{1/2}(\alpha) = 0.65$  s (2019Mo01),  $\%\epsilon + \%\beta^+ < 0.65$ . Other:  $\%\epsilon + \%\beta^+ < 0.05$  (from gross theory of  $\beta$  decay, 1973Ta30).

This dataset prepared by P. Dimitriou, B. Singh, and IAEA-ICTP workshop participants: M.J. Lazaric and C. Ngwetsheni.

2000He17, 2002CaZU: <sup>226</sup>U was produced in heavy-ion fusion <sup>208</sup>Pb(<sup>22</sup>Ne,4n) at GSI. Fusion products were separated in-flight reaction using the velocity filter SHIP. Measured E $\alpha$ , I $\alpha$ , half-life of <sup>226</sup>U decay by  $\alpha\alpha$ - and  $\alpha\gamma$ -coin. FWHM=18-20 keV for E $\alpha$ . In 2002CaZU, half-life of <sup>226</sup>U decay was reported as 258 ms 13.

## Additional information 1.

- 1998Gr19, 1999Gr28 (also 2001Ku07, 1997En10): <sup>226</sup>U produced in <sup>208</sup>Pb(<sup>22</sup>Ne,4n),E(<sup>22</sup>Ne)=111 MeV at the K130 cyclotron facility of the University of Jyvaskyla, followed by the separation of fusion products using the gas-filled magnetic separator RITU. Measured Eα, Iα, half-life of <sup>226</sup>U decay by recoil-α tagging technique using silicon strip detector for α particles with FWHM better than 30 keV for Eα≈7.5–MeV. In 2001Ku07 (conference article), a position-sensitive PIPS Si detector was used for α detection for which resolution was stated as 35 keV.
  1989An13, 1990An22: <sup>226</sup>U and <sup>230</sup>Pu were produced in heavy-ion fusion reactions <sup>208</sup>Pb(<sup>22</sup>Ne,4n) and <sup>208</sup>Pb(<sup>26</sup>Mg,4n),
- 1989An13, 1990An22: <sup>226</sup>U and <sup>230</sup>Pu were produced in heavy-ion fusion reactions <sup>208</sup>Pb(<sup>22</sup>Ne,4n) and <sup>208</sup>Pb(<sup>26</sup>Mg,4n), respectively, at JINR. Fusion products were separated in-flight by the VASSILISSA kinematic separator. Measured E $\alpha$ , I $\alpha$ , T<sub>1/2</sub> using  $\alpha$ -spectroscopy, with FWHM=40-60 keV, and 35 keV, respectively.
- 1973Vi10: measured E $\alpha$ , T<sub>1/2</sub> of <sup>226</sup>U decay by bombarding <sup>232</sup>Th with 140 MeV <sup>4</sup>He ions from University of Maryland cyclotron, and using secular equilibrium technique. FWHM=50 keV for  $\alpha$ -particle detection.

1970Va13: measured E $\alpha$ , T<sub>1/2</sub> of <sup>222</sup>Th decay chain at the Berkeley HILAC.

2018Mi11 (conference article): <sup>226</sup>U from the  $\alpha$  decay of <sup>230</sup>Pu, produced in W(<sup>48</sup>Ca,X)<sup>230</sup>Pu,E(<sup>48</sup>Ca)=4.55 MeV/nucleon; measured E $\alpha$  and half-life for the decay of <sup>226</sup>U using the new COMPASS detection system with SHIP fragment separator at GSI facility.

2003MoZT: <sup>226</sup>U produced in a decay chain starting from <sup>234</sup>Bk decay, where the activity was produced in <sup>197</sup>Au(<sup>40</sup>Ar,3n),  $E(^{40}Ar)=188.4$  MeV, followed by separation of reaction products using the Gas-Filled Recoil-Ion Separator (GARIS) at RIKEN. For four events assigned to the decay of <sup>234</sup>Bk,  $\alpha$  decay times for <sup>226</sup>U  $\alpha$  decay were given as 196 ms, 149 ms, 464 ms, and 1370 ms.

## <sup>222</sup>Th Levels

E(level)	$J^{\pi}$	T <sub>1/2</sub>	Comments
0.0	$0^{+}$	1.964 ms 2	$T_{1/2}$ : from the Adopted Levels.
181 8	2+	240 ps 20	E(level): from $E\alpha = 7387$ 7 for decay to the 2 <sup>+</sup> level, and Q( $\alpha$ )=7701 4 for the decay of <sup>226</sup> U. Other: 182.9 2 in the Adopted Levels.
246 20	(1 <sup>-</sup> )		E(level): from E $\alpha$ =7323 20 for decay to the (1 <sup>-</sup> ) level, and Q( $\alpha$ )=7701 4 for the decay of $^{226}$ U.

 $J^{\pi}$ : proposed by 2000He17, based on systematics of 1<sup>-</sup> states in neighboring nuclei.

## $^{226}\mathrm{U}\,\alpha$ decay (268 ms) 1998Gr19,2000He17,1989An13 (continued)

## $\alpha$ radiations

Eα	E(level)	$I\alpha^{\ddagger}$	HF	Comments
7450 30				E $\alpha$ : from 2018Mi11 only, as authors report two $\alpha$ transitions: 7400 30 which likely corresponds to 7387 5 $\alpha$ , and 7450 30 $\alpha$ . Note that the two $\alpha$ energies reported by 2018Mi11 overlap within the uncertainties.
7323 20	246	31	4.0 14	$E\alpha$ , I $\alpha$ : from 2000He17.
7387 5	181	16 2	1.3 2	Eα: weighted average of 7384 20 (2002CaZU, from the same lab as but an independent experiment); 7374 10 (2000He17); and 7390 5 (1999Gr28, 7384 7 in 2001Ku07, 7394 20 in 1997En10). Others: two transitions of Eα=7400 30 and 7450 30 (2018Mi11), 7420 20 (1989An13). Iα: weighted average of 14 3 (2002CaZU, from the same lab as but an independent experiment); 15 3 (2000He17); 18 2 (1999Gr28, 15 5 in 2001Ku07, ≈28 in 1997En10); and
7563 5	0.0	84 <i>3</i>	1.00	Eα: weighted average of 7570 30 (2018Mi11); 7560 10 (2002CaZU, from the same lab as 2000He17 but an independent experiment); 7555 10 (2000He17); 7565 5 (1999Gr28, 1998Gr19, 7566 4 in 2001Ku07, 7566 20 in 1997En10); and 7570 15 (1990An22, 7570 20 in 1989An13). Others: 7430 30 (1973Vi10), 7500 50 (1970Va13). Iα: weighted average of 86 3 (2002CaZU, from the same lab as 2000He17, but an independent experiment); 82 5 (2000He17); 82 4 (1999Gr28, 85 11 in 2001Ku07, ≈72 in 1997En10); and 85 5 (1989An13).

<sup> $\dagger$ </sup> The nuclear radius parameter  $r_0(^{222}\text{Th})=1.5387\ 27$  is deduced by assuming HF=1.0 for the ground-state to ground-state alpha decay branch. <sup>‡</sup> Absolute intensity per 100 decays.