

**Adopted Levels**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	10-Jun-2021

S(n)=9150 *SY*; S(p)=2449 *I9*; Q(α)=8775 *9* [2021Wa16](#)

Estimated uncertainty=80 keV ([2021Wa16](#)).

Q(ε)=3245 *23*, S(2n)=17310 *30*, S(2p)=2982 *18*, Q(εp)=2400 *17* ([2021Wa16](#)).

**Additional information 1.**

<sup>218</sup>U produced in <sup>197</sup>Au(<sup>27</sup>Al,6n), and identified as parent of <sup>214</sup>Th ([1992An04](#)). [1997SaZQ](#) reported a cross section of 1.7 nb *12* at E=161 MeV for this reaction.

[2007Le14](#) (also [2005Le42](#)): <sup>218</sup>U produced in <sup>182</sup>W(<sup>40</sup>Ar,4n), E=186 MeV; fusion products were separated from beam particles with the RITU gas-filled separator and implanted into the DSSD of the GREAT spectrometer at the RITU focal plane. Measured half-lives of g.s. and an isomer.

[2015Ma37](#): <sup>218</sup>U produced and identified in <sup>182</sup>W(<sup>40</sup>Ar,4n), E(<sup>40</sup>Ar)=189.5 MeV using the Sector-Focusing cyclotron facility at HIRFL-Lanzhou. The evaporation residues (ERs) were separated from the incident beam particles using gas-filled recoil separator for heavy ions (SHANS). Measured Eα, (residues)α<sub>1</sub>α<sub>2</sub> correlations, where α<sub>1</sub> is from parent nucleus and α<sub>2</sub> from daughter nucleus, half-lives. The residues and α particles were detected by using multiwire proportional gas counter (MWPC) and position-sensitive silicon strip detectors (PSSD). From Fig. 2 of two-dimensional plot of mother and daughter α-decay energies for correlated (implants)-α<sub>1</sub>-α<sub>2</sub> events, it appears that two decay were observed for the ground state and one for the isomer.

[2018Ya01](#): <sup>218</sup>U g.s. and isomer produced in <sup>187</sup>Re(<sup>36</sup>Ar,4np), E(<sup>36</sup>Ar)=191.5 MeV reaction, followed by separation of fragments using SHANS separator and detection of (implants)α-correlated decay chains at HIRFL-Lanzhou accelerator facility. Authors reported three correlated decay chains for the g.s., and two chains for the isomeric state.

[2021Zh22](#): <sup>218</sup>U produced and identified in <sup>184</sup>W(<sup>40</sup>Ca,α2n), E(<sup>40</sup>Ca)=190, 206 MeV using the Sector-Focusing cyclotron facility at HIRFL-Lanzhou. The evaporation residues (ERs) were separated from the incident beam particles using gas-filled recoil separator for heavy ions (SHANS). Measured Eα, (residues)α<sub>1</sub>α<sub>2</sub> correlations, where α<sub>1</sub> is from parent nucleus and α<sub>2</sub> from daughter nucleus, and half-life. The residues and α particles were detected using multiwire proportional gas counter (MWPC) and position-sensitive silicon strip detectors (PSSDs). The α particles escaping the PSSD in the backward direction were collected by a system of eight silicon detectors. Energy resolution (FWHM) for α particles was 35 keV for Eα=6-9 MeV. A total of 76 ER-α correlated chains were observed which were assigned to the decay of <sup>218</sup>U g.s. Comparison with shell-model calculations.

[2021Zh22](#), [2018Ya01](#) and [2015Ma37](#) are from the same group and laboratory, shared by many of the same authors.

Theory references: consult NSR database ([www.nndc.bnl.gov/nsr/](http://www.nndc.bnl.gov/nsr/)) for 36 primary references for calculations of half-lives of radioactive decays, and 16 for nuclear structure.

<sup>218</sup>U Levels

E(level)	J <sup>π</sup>	T <sub>1/2</sub>	Comments
0	0 <sup>+</sup>	0.65 ms +8-7	%α=100 %α: only the α decay with E(α)=8612 <i>14</i> ( <a href="#">2021Zh22</a> ), 8612 <i>9</i> ( <a href="#">2007Le14</a> , <a href="#">2005Le42</a> ), 8600 <i>30</i> ( <a href="#">2015Ma37</a> ), 8625 <i>25</i> ( <a href="#">1992An04</a> ) has been observed. Theoretical partial T <sub>1/2</sub> for ε+β <sup>+</sup> decay=15.4 s ( <a href="#">2019Mo01</a> ) gives %ε+%β <sup>+</sup> =0.003. T <sub>1/2</sub> : from 76 (implants)α-correlated decay chains ( <a href="#">2021Zh22</a> ), highest statistics as compared to just a few events (≤10) in previous studies. Others: 0.131 ms +179-48 ( <a href="#">2018Ya01</a> , same group and laboratory as <a href="#">2021Zh22</a> and <a href="#">2015Ma37</a> ); 1.15 ms +158-42 ( <a href="#">2015Ma37</a> , two (implants)α-correlated decay chains); 0.51 ms +17-10 ( <a href="#">2007Le14</a> , also <a href="#">2005Le42</a> ); 1.5 ms +73-7 ( <a href="#">1992An04</a> ). Reduced α-width=53 keV +7-6 ( <a href="#">2021Zh22</a> , in Rasmussen formalism) suggests unhindered α transition, consistent with g.s., 0 <sup>+</sup> to g.s., 0 <sup>+</sup> α transition.
2105 <i>19</i>	(8 <sup>+</sup> )	0.56 ms +26-14	%α=?; %IT=? Only the α decay has been observed with Eα=10678 <i>17</i> ( <a href="#">2007Le14</a> , <a href="#">2005Le42</a> ), 10701 <i>30</i> ( <a href="#">2015Ma37</a> ) and 10685 <i>38</i> ( <a href="#">2018Ya01</a> ). E(level): from difference in Q(α) values (from Eα values in <a href="#">2007Le14</a> ) from the isomer and g.s. decay, assuming the isomer decays directly to the <sup>214</sup> Th g.s. through an L=8 transition. T <sub>1/2</sub> : from <a href="#">2007Le14</a> (also <a href="#">2005Le42</a> ). Others: 0.134 ms +244-53 ( <a href="#">2018Ya01</a> , from two

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Adopted Levels (continued) ${}^{218}\text{U}$  Levels (continued)

<u>E(level)</u>	<u>J<math>\pi</math></u>	<u>T<math>_{1/2}</math></u>	<u>Comments</u>
			(implants) $\alpha$ -correlated decay chains); 0.28 ms +130-12 (2015Ma37, from one (implants) $\alpha$ -correlated event). Weighted average of the three values is 0.45 ms 13. Evaluator prefers the half-life from 2007Le14 due to better statistics in this work as compared to those in 2018Ya01 and 2015Ma37. J $\pi$ : from 2007Le14 (also 2005Le42) based on comparison with ${}^{216}\text{Th}$ , (8 $^{+}$ ) isomer and expected similar structures of ${}^{216}\text{Th}$ and ${}^{218}\text{U}$ . Proposed configuration= $\pi h_{9/2} \otimes \pi f_{7/2}$ .