

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh		ENSDF	14-Jan-2022

$Q(\beta^-)=10502\ 24$; $S(n)=4061\ 26$; $S(p)=1269\times 10^1\ 43$; $Q(\alpha)=-871\times 10^1\ 43$ [2021Wa16](#)
 $S(2n)=10290\ 80$, $28250\ 300$ (syst), $Q(\beta^-n)=3466\ 25$ ([2021Wa16](#)).
 Mass measurements: [2008Su19](#), [2007Ha20](#).
[1994Be24](#), [1998Do08](#): ^{118}Rh first produced and identified in $\text{Pb}(^{238}\text{U},\text{F})$ at 750 MeV/nucleon followed by mass separation. Cross section= $160\ \mu\text{b}$.
[1997So07](#): $^{208}\text{Pb}(^{238}\text{U},\text{F})$, $E=20$ MeV/nucleon, $\sigma=336\ \mu\text{b}$.
[2006Wa10](#), [2000Jo18](#): ^{118}Rh produced in the proton-induced fission of of natural uranium followed by mass separation using ion-guide technique. Measured half-life, γ and β rays.
[2006Mo07](#): ^{118}Rh formed and identified in $^9\text{Be}(^{136}\text{Xe},\text{X})$ reaction at $E(^{136}\text{Xe})=121.8$ MeV/nucleon. The A1900 fragment separator at NSCL facility at MSU was used to separate nuclei of interest. The secondary beam was implanted into β -decay arrangement consisting of Si(PIN) detectors and Si strip detectors (DSSD) and single-sided Si strip detectors (SSSD). Implantation and decay events were time stamped and correlated. Measured half-life from β spectrum.
[2015Lo04](#): measured half-life from ion- β correlations, isotope produced in $^9\text{Be}(^{238}\text{U},\text{F})$ reaction at $E=345$ MeV/nucleon at RIKEN facility.
[2021Ha19](#): ^{118}Rh produced in $^9\text{Be}(^{238}\text{U},\text{F})$, $E=345$ MeV/nucleon at the RBIF-RIKEN accelerators. Identification of ^{118}Rh made on the basis of magnetic rigidity, time-of-flight and energy loss using the BigRIPS separator and ZeroDegree spectrometer. The separated nuclei were sent to the Advanced Implantation Detector Array (AIDA) for the detection of implanted ions and subsequent β^- and β^- -delayed neutrons using six double-sided silicon-strip detector (DSSDs) for particles, and BRIKEN neutron counter array of 140 ^3He proportional counters embedded in a high-density polyethylene (HDPE) matrix. Measured (implanted ions)- β and (implanted ions)- β -n correlated events to deduce half-life of decay and delayed-neutron emission probability ($\% \beta^-n$ or P_{1n}). Comparison of measured half-lives and P_n values with several theoretical calculations.
 Additional information 1.
 Theoretical calculations: two references for half-lives and decay modes from the NSR database available at www.nndc.bnl.gov/nsr/ are listed in the 'document' records in this dataset.

 ^{118}Rh LevelsCross Reference (XREF) FlagsA $^9\text{Be}(^{238}\text{U},\text{F}\gamma)$

E(level)	J $^\pi$	T $_{1/2}$	XREF	Comments
0		286 ms 10		$\% \beta^- = 100$; $\% \beta^-n = 2.1\ 9$ (2021Ha19) $\% \beta^-n$ adopted from 2021Ha19 , where (implants) $\beta\nu$ -coin method used. Other: $3.1\ 4$ (2006Mo07). Weighted average of the two values is $2.9\ 4$, and unweighted average is $2.6\ 5$. Theoretical $T_{1/2}=90.2$ ms, $\% \beta^-n=2$ (2019Mo01). Theoretical $T_{1/2}=391.7$ ms; $\% \beta^-n=2.11, 1.98$ (2021Mi17 , $\% \beta^-n$ for four different fission barriers). E(level): the observed activity is assumed to correspond to the ground state, although, from systematics of odd-odd Rh isotopes, two activities are expected, a low-spin g.s. and a high-spin isomer. Thus, it is possible that the observed activity is a mixture of the two activities, the other may correspond to $0+x, (7^-)$ level. J $^\pi$: expected to be low spin, possible 1^+ from systematics of odd-odd Rh nuclides. T $_{1/2}$: weighted average of 294 ms 17 (2021Ha19 , (implants) β -correlated decay curve); 285 ms 10 (2015Lo04 , (implants) β decay); 266 ms $+22-21$ (2006Mo07 , (implants) β -decay curve); 310 ms 30 (2000Jo18 , 574.6γ decay curve, authors also quote 300 ms 60 in the abstract). This half-life may correspond to a mixture of two activities.
$0+x^\dagger$	(7^-)		A	E(level), J $^\pi$: possible high-spin ($J=4-10$) isomer from systematics and from ^{118}Rh decay

Continued on next page (footnotes at end of table)

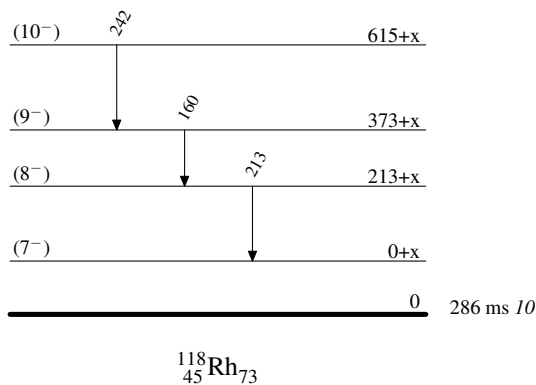
Adopted Levels, Gammas (continued) ^{118}Rh Levels (continued)

<u>E(level)</u>	<u>J^π</u>	<u>XREF</u>	<u>Comments</u>
			to ^{118}Pd (2006Wa10) which populates both low- and high-spin levels. See comments for the g.s.
213+x [†]	1 (8 ⁻)	A	
373+x [†]	2 (9 ⁻)	A	
615+x [†]	2 (10 ⁻)	A	

[†] Band(A): $\Delta J=1$ band.

 $\gamma(^{118}\text{Rh})$

<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_γ</u>	<u>E_f</u>	<u>J_f^π</u>
213+x	(8 ⁻)	213	0+x	(7 ⁻)
373+x	(9 ⁻)	160	213+x	(8 ⁻)
615+x	(10 ⁻)	242	373+x	(9 ⁻)

Adopted Levels, GammasLevel Scheme

Adopted Levels, GammasBand(A): $\Delta J=1$ band

<u>(10⁻)</u>	<u>615+x</u>
-------------------------	--------------

242

<u>(9⁻)</u>	<u>373+x</u>
------------------------	--------------

160

<u>(8⁻)</u>	<u>213+x</u>
------------------------	--------------

213

<u>(7⁻)</u>	<u>0+x</u>
------------------------	------------

 $^{118}_{45}\text{Rh}_{73}$