⁸⁹Ru ε decay (1.32 s) **2019Pa16**

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Full Evaluation Balraj Singh ENSDF 30-Nov-2021

Parent: ⁸⁹Ru: E=0.0; $J^{\pi}=(9/2^+)$; $T_{1/2}=1.32$ s 3; $Q(\varepsilon)=9025$ 25; $\%\varepsilon+\%\beta^+$ decay=100.0

⁸⁹Ru-J^π,T_{1/2}: From ⁸⁹Ru Adopted Levels, where J^{π} was from 1997He24 and T_{1/2} from 2019Pa16. Note that 2019Pa16 favored J^{π} =(7/2+) based on predicted %ε+%β+ feeding of ⁸⁹Tc g.s. (J^{π} =(9/2+) of 8% for J^{π} (⁸⁹Ru g.s.)=7/2+ and 66% for J^{π} (⁸⁹Ru g.s.)=9/2+; and strong observed feeding of the 179-keV, (7/2+) state of ⁸⁹Tc through the observation of 179γ. However, the decay scheme of ⁸⁹Ru ε+β+ decay is poorly known, and in the opinion of evaluator, no firm conclusion can be drawn for preference of (7/2+) over (9/2+) for g.s. of ⁸⁹Ru, the latter proposed by 1997He24 based on band assignment.

 89 Ru-Q(ε): From 2021Wa16.

Dataset adapted from compiled dataset in the XUNDL database from 2019Pa16 by E.A. McCutchan (NNDC,BNL), August 16, 2019.

2019Pa16: ⁸⁹Ru produced in ⁹Be(124 Xe,X),E=345 MeV/nucleon reaction followed by separation of fragments of interest using BigRIPS and ZeroDegree spectrometers, and separated ions implanted in WAS3ABi stopper and detector system consisting of three double-sided silicon strip detectors and ten single-sided silicon strip detectors at RIBF-RIKEN. The γ rays from the decay of ⁸⁹Ru were detected using the EURICA array consisting 84 HPGe detectors in 12 clusters. Measured E γ , I γ , β spectra, E(p), I(p), $\beta^+\gamma^-$, β^+ p- and $\gamma\beta^+$ p-coin, half-life and β^+ -delayed proton emission probability of ⁸⁹Ru decay.

⁸⁹Ru was found to decay by β^+ p decay mode to ⁸⁸Mo through the observation of 741-keV γ ray, a transition between the first 2⁺ state and the g.s. of ⁸⁸Mo.

⁸⁹Tc Levels

$J^{\pi +}$
$(9/2^+)$
$(7/2^+)$
$(5/2^+)$
$(7/2^+)$
$(5/2^+)$

[†] From Ey values.

$$\gamma$$
(89Tc)

Iγ normalization: 2019Pa16 report absolute intensities.

E_{γ}	$I_{\gamma}^{\dagger \ddagger}$	$E_i(level)$	\mathbf{J}_i^{π}	$\mathbf{E}_f \qquad \mathbf{J}_f^{\pi}$	Mult.	$\alpha^{\#}$	$I_{(\gamma+ce)}^{\ddagger}$	Comments
179.2 <i>I</i>	61.2 38	179.2	(7/2+)	0.0 (9/2+) [M1]	0.0567	64.7 40	$\alpha(K)=0.0496\ 7;\ \alpha(L)=0.00585\ 9;$ $\alpha(M)=0.001063\ 15;\ \alpha(N)=0.0001689$ 24 $\alpha(O)=1.119\times10^{-5}\ 16$ $I_{(\gamma+ce)}$: per 100 decays from 2019Pa16. I_{γ} : from $I(\gamma+ce)$ and α for assumed mult(179.2 γ)=M1.
								Relative $I_{\gamma}=100 \ 25$.
401.6 <i>4</i>	13.4 24	401.6	$(5/2^+)$	$0.0 (9/2^{+})$)			$I\gamma=20.7$ 39 relative to 100 for 179.2 γ .
^x 604.6 5	4.7 16							$I\gamma$ =7.3 25 relative to 100 for 179.2 γ .
^x 686.6 4	3.9 22							$I\gamma$ =6.0 34 relative to 100 for 179.2 γ .
835.4 <i>4</i>	2.9 21	1014.6	$(7/2^+)$	$179.2 (7/2^{+})$)			$I\gamma=4.5$ 33 relative to 100 for 179.2 γ .
^x 1140.0 5	3.4 20							$I\gamma=5.3$ 31 relative to 100 for 179.2 γ .
1339.0 5	8.6 19	1518.2	$(5/2^+)$	179.2 (7/2+)			I_{γ} =13.3 30 relative to 100 for 179.2 γ .

 $^{^{\}ddagger}$ From the Adopted Levels, where J^{π} assignments for 401.6, 1014.6, and 1518.2 levels are from 2019Pa16.

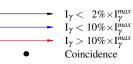
⁸⁹Ru ε decay (1.32 s) 2019Pa16 (continued)

γ (89Tc) (continued)

- [†] Absolute (per 100 decays of ⁸⁹Ru) γ -intensities given by 2019Pa16. Authors also reported relative intensities which are listed here in comments.
- † Absolute intensity per 100 decays.
- [#] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
- x γ ray not placed in level scheme.

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Legend



Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

$$\%\varepsilon + \%\beta^{+} = 100 / \frac{(9/2^{+})}{Q_{\varepsilon} = 9025} \frac{0.0}{25} = 1.32 \text{ s } 3$$

$$\frac{89}{44} \text{Ru}_{45}$$

