Adopted Levels

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	07-June-2023

Q(β^-)=8950 *syst*; S(n)=4690 *syst*; S(p)=11520 *syst*; Q(α)=−5260 *syst* 2021Wa16

Estimated uncertainties (2021Wa16): 400 for Q(β^-), 500 for S(n), 570 for S(p) and Q(α).

Q(β^-n)=4990 *400*, S(2n)=8480 *400*, S(2p)=26280 *500* (syst, 2021Wa16). Q(β^-2n)=−418 *400* (syst, deduced by evaluator from relevant mass excesses in 2021Wa16).

2017Wu04: ^{159}Pr produced and identified at the RIBF-RIKEN facility in ^{9}Be(^{238}U,F),E(^{238}U)=345 MeV/nucleon, optimized for the transmission of ^{158}Nd and ^{170}Dy, followed by the identification of the nuclide of interest using the BigRIPS separator by determining A/Q ratio using the tof-Bρ-ΔE method using the ZeroDegree Spectrometer, and finally implanted into the beta-counting system WAS3ABi, surrounded by the EURICA array of 84 HPGe detectors. Measured (implanted ions)β^-(t), (implanted ions)$\beta^-\gamma$(t) and (implanted ions)γ(t) correlations, and $T_{1/2}$ of the g.s. of ^{159}Pr.

2018Fu08: ^{159}Pr nuclide produced at the RIBF-RIKEN facility using the ^{9}Be(^{238}U,F) reaction with a $^{238}U^{86+}$ beam of E=345 MeV/nucleon produced by the RIBF accelerator complex. Target=^{9}Be with a thickness of 2.92 mm. Nuclidic identification (PID) was made by determining the atomic number Z and mass-to-charge (A/Q) ratio of the ions using magnetic rigidity, time-of-flight, and energy loss (tof-Bρ-ΔE method) using the BigRIPS fragment separator. The time-of-flight was measured using thin plastic scintillators placed at foci of the BigRIPS. The Bρ values were deduced from trajectory reconstruction of measured position and angle of fragments at each focus using parallel plate avalanche counters (PPACs). For ΔE values, separated fragments were transported to an achromatic focus and implanted in a Si stack with 14 layers of Si PIN detectors, surrounded by four HPGe clovers for isomer tagging by detecting delayed gamma rays from known isomeric states in fission fragments. Comparison of measured cross sections with theoretical calculations using LISE$^+$ abrasion-fission (AF) model.

^{159}Pr Levels

E(level)	$T_{1/2}$	Comments
0	134 ms *43*	%β^-=100; %β^-n=? %β^-: only the β^- decay mode has been observed and expected, followed by possible delayed neutron decay. The β^-2n decay mode is unlikely from Q(β^-)2n=−418 *400*. Theoretical $T_{1/2}$=94.9 ms, %β^-n=22, %β^-2n=0.0 (2019Mo01). Theoretical $T_{1/2}$=203.5 ms, %β^-n=21.4, 13.2; %β^-2n=0 (2021Mi17, two values of %β^-n for different fission barriers). A total of 653 counts were assigned to ^{159}Pr for spectrometer setting on Pr, and 119 counts for setting on Gd (2018Fu08). Production σ=0.68 nb *4* for Pr setting and 0.22 nb *2* for Gd setting, with 50% systematic uncertainty on σ values (2018Fu08). E(level): it is assumed that the observed events correspond to ground-state activity of ^{159}Pr. J$^\pi$: tentative (3/2$^-$) from π3/2[541] orbital, based on systematics of known quasiparticle states in neighboring nuclei, as proposed in the 2017 update of ^{159}Pr nuclide, and in 2021Ko07. Also, Ω_p=3/2$^-$ in 2019Mo01. $T_{1/2}$: from 2017Wu04, using a fit to the (implanted ions)β^- correlated decay curve using the least-squares and maximum-likelihood methods, including contributions from the parent, daughter and grand-daughter decays, as well as a constant background.