^{241}Np β^- decay 1981Pa20

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja	NDS 130, 183 (2015)	30-Sep-2015

Parent: ^{241}Np: E=0.0; J$^\pi$=5/2$^+$; $T_{1/2}$=13.9 min *2*; Q(β^-)=1.30×10^3 *7*; %β^- decay=100.0
^{241}Np-J$^\pi$: From Adopted Levels in ^{241}Np.
^{241}Np-$T_{1/2}$: From least squares decay analyses of the 175 keV γ.
^{241}Np-Q(β^-): From 2012Wa38.

1981Pa20: ^{241}Np produced via ^{238}U(α,p) with Eα=32 MeV and ^{244}Pu(n,p3n) with En=30-160 MeV at the Brookhaven MEIN facility. Irradiation were followed by chemical separation. Decay of ^{241}Np was studied by γ spectroscopy using a high resolution Ge(Li) detector and by β emission by a 4π proportional counter. Measured Eγ, absolute Iγ, and $T_{1/2}$.

1966Qa02: ^{241}Np produced via ^{238}U(α,p) at Nuffield Cyclotron at Birmingham University with Eα= 40 MeV. Irradiation was followed by chemical separation. A Geiger counter, anthrracene crystal scintillation β spectrometer, Xe proportional counter, NaI(Tl) detector, and a ZnS-Ag scintillation α counter were used to measure γ and β radiations. The half life from decay curves for ^{241}Np was 16.0 min *2* with an end-point energy of 1.25 MeV. The 3.4 hour activity was not detected.

1959Va32: ^{241}Np produced via ^{238}U(α,p) at Argonne cyclotron followed by chemical separation and measured with a 2π and end window proportional counters. β and γ spectrum were measured with the anthracene crystal and a NaI(Tl) detectors. The beta spectrum end point energy of the 16 minute component was 1.36 MeV *10* with log*ft* of 5.8.

^{241}Pu Levels

E(level)†	J$^\pi$‡	Comments
0.0	5/2$^+$	
41.97	7/2$^+$	
95.78	9/2$^+$	
161.69	1/2$^+$	E(level): The feeding of this level has not been established. It cannot be directly fed by a β branch, and no transitions feeding the level have been observed.
175.05	7/2$^+$	
404.45	(9/2)$^-$	J$^\pi$: See comment on *J*$^\pi$(404 level) in Adopted Levels.
518.81	5/2$^-$	
561.42	7/2$^-$	
834.84	3/2$^+$,5/2$^+$,7/2$^+$	
929.7 *2*	3/2,5/2,7/2	

† Rounded-off values from Adopted Levels, except for the 930 level, whose de excitation transition is seen only in β decay.
‡ From Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-†‡	Log *ft*	Comments
(3.7×10^2 *7*)	929.7	0.080 *20*	7.0 *4*	av Eβ=105 *22*
(4.7×10^2 *7*)	834.84	≈0.12	≈7.1	av Eβ=135 *23*
(7.4×10^2 *7*)	561.42	0.28 *6*	7.41 *18*	av Eβ=226 *25*
(7.8×10^2 *7*)	518.81	0.42 *4*	7.32 *15*	av Eβ=241 *25*
(9.0×10^2 *7*)	404.45	0.27 *3*	7	av Eβ=282 *26*
(1.12×10^3 *7*)	175.05	30.8 *15*	6.00 *10*	av Eβ=366 *27*
(1.26×10^3 *7*)	41.97			Iβ^-: The intensity balance gives Iβ=−2 *4*.
1.30×10^3 *7*	0.0	70 *4*	5.87 *9*	av Eβ=432 *27* E(decay): From adopted Q(β^-). Measured values are 1360 *100* (1959Va32) and 1250 (1966Qa02).

† From an intensity balance at each level.
‡ Absolute intensity per 100 decays.

γ(^{241}Pu)

Iγ normalization: Iγ(133γ)=0.86 *5* per 100 disintegrations (4π proportional counter 1981Pa20).

E_γ[†]	I_γ[c]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[‡b]	α[a]	Comments
42.0 *1*	0.10 *3*	41.97	7/2$^+$	0.0	5/2$^+$	M1+E2	0.186 *4*	102.2 *22*	α(L)=76.0 *16*; α(M)=19.4 *5* α(N)=5.29 *12*; α(O)=1.29 *3*; α(P)=0.231 *5*; α(Q)=0.01087 *17*
(53.81[@])	0.020[#] *6*	95.78	9/2$^+$	41.97	7/2$^+$	M1+E2	0.201 *8*	44.7 *11*	α(L)=33.3 *8*; α(M)=8.42 *21* α(N)=2.30 *6*; α(O)=0.563 *14*; α(P)=0.1021 *22*; α(Q)=0.00519 *8*
(79.26[@])	0.040 *4*	175.05	7/2$^+$	95.78	9/2$^+$	M1+E2	0.65 *+25−22*	22 *6*	α(L)=16 *4*; α(M)=4.3 *12* α(N)=1.2 *4*; α(O)=0.28 *8*; α(P)=0.047 *11*; α(Q)=0.00129 *22* I_γ: From Iγ/Iγ(133γ+175γ)=0.010 *1* in α decay.
(95.79[@])	0.003[#] *1*	95.78	9/2$^+$	0.0	5/2$^+$	E2		19.3	α(L)=14.00 *20*; α(M)=3.92 *6* α(N)=1.077 *15*; α(O)=0.254 *4*; α(P)=0.0404 *6*; α(Q)=0.0001375 *20*
133.1 *1*	0.86 *5*	175.05	7/2$^+$	41.97	7/2$^+$	M1+E2	0.222 *9*	11.35 *17*	α(K)=8.79 *13*; α(L)=1.92 *3*; α(M)=0.472 *7* α(N)=0.1287 *19*; α(O)=0.0319 *5*; α(P)=0.00599 *9*; α(Q)=0.000366 *6*
161.6 *2*	0.07 *1*	161.69	1/2$^+$	0.0	5/2$^+$	E2		1.97	α(K)=0.190 *3*; α(L)=1.292 *20*; α(M)=0.360 *6* α(N)=0.0991 *15*; α(O)=0.0234 *4*; α(P)=0.00379 *6*; α(Q)=2.32×10^{-5} *4*
175.1 *1*	3.1 *2*	175.05	7/2$^+$	0.0	5/2$^+$	M1+E2	0.217 *19*	5.20	α(K)=4.07 *7*; α(L)=0.854 *12*; α(M)=0.209 *3* α(N)=0.0569 *8*; α(O)=0.01413 *20*; α(P)=0.00267 *4*; α(Q)=0.000167 *3*
308.8 *2*	0.07 *2*	404.45	(9/2)$^-$	95.78	9/2$^+$	E1		0.0388	α(K)=0.0307 *5*; α(L)=0.00610 *9*; α(M)=0.001477 *21* α(N)=0.000399 *6*; α(O)=9.75×10^{-5} *14*; α(P)=1.761×10^{-5} *25*; α(Q)=9.22×10^{-7} *13*
362.4 *1*	0.19 *2*	404.45	(9/2)$^-$	41.97	7/2$^+$	E1		0.0276	α(K)=0.0220 *3*; α(L)=0.00425 *6*; α(M)=0.001028 *15* α(N)=0.000278 *4*; α(O)=6.81×10^{-5} *10*; α(P)=1.238×10^{-5} *18*; α(Q)=6.70×10^{-7} *10*
≈405[d]		404.45	(9/2)$^-$	0.0	5/2$^+$				E_γ: Only a slight indication for its existence was found in the γ spectrum. One expects Eγ=404.453. This transition is not seen in (n,γ). If one assumes that Iγ is smaller than that for the adjacent 404.707 and 405.90 γ's in (n,γ), one can estimate Iγ<0.01.
(465.65[@])	0.064 *17*	561.42	7/2$^-$	95.78	9/2$^+$	E1+M2	0.088 *+21−28*	0.024 *4*	α(K)=0.019 *3*; α(L)=0.0039 *8*; α(M)=0.00097 *20* α(N)=0.00026 *6*; α(O)=6.5×10^{-5} *14*; α(P)=1.2×10^{-5} *3*; α(Q)=7.1×10^{-7} *16* I_γ: From Iγ/Iγ(519γ+562γ)=0.321 *20* in (n,γ).
476.6 *2*	0.10 *1*	518.81	5/2$^-$	41.97	7/2$^+$	E1+M2	0.104 *+20−25*	0.025 *4*	α(K)=0.020 *3*; α(L)=0.0042 *8*; α(M)=0.00104 *20* α(N)=0.00028 *6*; α(O)=7.0×10^{-5} *14*; α(P)=1.3×10^{-5} *3*; α(Q)=7.7×10^{-7} *16*
518.81[&]	0.31[&] *3*	518.81	5/2$^-$	0.0	5/2$^+$	E1		0.01340	α(K)=0.01078 *15*; α(L)=0.00198 *3*; α(M)=0.000477 *7* α(N)=0.0001290 *18*; α(O)=3.17×10^{-5} *5*; α(P)=5.86×10^{-6} *9*; α(Q)=3.38×10^{-7} *5*

$^{241}_{94}$Pu$_{147}$-2

$\gamma(^{241}$Pu) (continued)

E_γ[†]	I_γ[c]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡b]	α[a]	Comments
519.43[&]	0.12[&] *4*	561.42	7/2$^-$	41.97	7/2$^+$	E1+M2	0.24 *+9−11*	0.05 *3*	α(K)=0.038 *22*; α(L)=0.009 *6*; α(M)=0.0023 *15* α(N)=0.0006 *4*; α(O)=0.00016 *10*; α(P)=2.9×10^{-5} *19*; α(Q)=1.8×10^{-6} *12*
561.1 *2*	0.08 *3*	561.42	7/2$^-$	0.0	5/2$^+$	(E1+M2)	0.27 *4*	0.048 *11*	α(K)=0.036 *8*; α(L)=0.0087 *21*; α(M)=0.0022 *6* α(N)=0.00059 *14*; α(O)=0.00015 *4*; α(P)=2.8×10^{-5} *7*; α(Q)=1.7×10^{-6} *4*
834.6 *2*	0.11 *3*	834.84	3/2$^+$,5/2$^+$,7/2$^+$	0.0	5/2$^+$	M1+E2	0.94 *+25−20*	0.048 *7*	α(K)=0.037 *6*; α(L)=0.0079 *10*; α(M)=0.00192 *22* α(N)=0.00052 *6*; α(O)=0.000130 *15*; α(P)=2.4×10^{-5} *3*; α(Q)=1.49×10^{-6} *22*
929.7 *2*	0.08 *2*	929.7	3/2,5/2,7/2	0.0	5/2$^+$				

[†] From 1981Pa20. Others: 1966Qa02.

[‡] From (n,γ) as given in adopted γ's.

[#] From an intensity balance at the 96 level and Iγ(96γ)/Iγ(54γ)=0.15 *3* from (n,γ).

[@] Rounded-off value from adopted γ's. Not seen in β decay.

[&] The authors report Eγ=518.8 *1* with Iγ=0.44 *3* for a transition doubly placed from the 519 and 561 levels. From Iγ/Iγ(477γ)=3.09 *16* for the 519 level, and Iγ/Iγ(561γ)=1.45 *13* for the 561 level, both from (n,γ), one gets Iγ=0.31 *3* and 0.12 *4* for these two placements, in agreement with the measured value for the doublet. The energies are rounded-off values from (n,γ).

[a] Additional information 1.

[b] If No value given it was assumed δ=1.00 for E2/M1, δ=1.00 for E3/M2 and δ=0.10 for the other multipolarities.

[c] Absolute intensity per 100 decays.

[d] Placement of transition in the level scheme is uncertain.

$^{241}_{94}Pu_{147}$-3

^{241}Np β^- decay 1981Pa20

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 decays through this branch