## $^{129}$Nd ε decay:mixed 1997Gi07,2010Xu12

History

| Type | Author | Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Janos Timar and Zoltan Elekes, Balraj Singh | NDS 121, 143 (2014) | 31-May-2014 |

Parent: $^{129}$Nd: E=0; $J^\pi$=(5/2$^+$); $T_{1/2}$=6.7 s *4*; Q(ε)=7460 *SY*; %ε+%$β^+$ decay=100.0
Parent: $^{129}$Nd: E=0+x; $J^\pi$=(7/2$^-$); $T_{1/2}$≈7 s; Q(ε)=7460 *SY*; %ε+%$β^+$ decay=100.0
Parent: $^{129}$Nd: E=0+z; $J^\pi$=(1/2$^+$); $T_{1/2}$=2.6 s *4*; Q(ε)=7460 *SY*; %ε+%$β^+$ decay=100.0
$^{129}$Nd(0)-$J^\pi$,$T_{1/2}$: From Adopted Levels for all the three activities.
$^{129}$Nd(0)-Q(ε): 7460 *200* (syst,2012Wa38).
1997Gi07: $^{129}$Nd activity produced in bombardment of $^{92}$Mo and $^{94}$Mo targets by E=210, 255 MeV $^{40}$Ca beam at Grenoble, IGISOL technique to identify A=129 isotopes. Measured Eγ, Iγ, Iβ, γγ(t) and (x ray)(γ)(t), half-life of $^{129}$Nd g.s. This work is a short note; complete details of the level scheme are not available.
2010Xu12: $^{129}$Nd formed in $^{96}$Ru($^{36}$Ar,3p) at 220 MeV and $^{92}$Mo($^{40}$Ca,3p) at 173 MeV; tape transport system, measured Eγ, Iγ, γγ, (x ray)γ coin, (proton)γ coin, decay curves for half-life determination.

### $^{129}$Pr Levels

| E(level)† | $J^\pi$# | $T_{1/2}$# | E(level)† | $J^\pi$# | $T_{1/2}$# |
|---|---|---|---|---|---|
| 0@ | (3/2$^+$) | 30 s *4* | 497.3 *4* | (9/2$^+$) | ≈60 ns |
| 91.10@ *10* | (5/2$^+$) | | 516.83 *18* | (7/2$^-$) | |
| 241.82@ *16* | (7/2$^+$) | | 569.3 *4* | ($^+$) | |
| 327.3 *4* | (5/2$^+$,7/2$^+$) | | 580.3 *4* | ($^+$) | |
| 382.57‡ *24* | (11/2$^-$) | | 632.44@ *25* | (11/2$^+$) | |
| 418.43@ *23* | (9/2$^+$) | | 682.3 *4* | (11/2$^+$) | |
| 437.7 *4* | | | 724.5 *4* | (7/2$^+$,9/2$^+$,11/2$^+$) | |
| 452.7 *3* | (1/2$^+$,3/2$^+$) | | 728.87 *20* | (9/2$^-$) | |
| 462.1 *4* | | | 975.00 *10* | | |
| 471.21 *24* | (7/2$^+$,9/2$^+$) | | 986.10 *14* | (5/2$^+$,7/2$^+$) | |

† From least-squares fit to Eγ data. Due to poor fit, the 882γ was omitted in this procedure.
‡ Level proposed by 1997Gi07 to be an isomer but no half-life data are available.
# From Adopted Levels.
@ Band(A): g.s. band.

### γ($^{129}$Pr)

| Eγ | Iγ | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult. | α[a] | Comments |
|---|---|---|---|---|---|---|---|---|
| 91.1‡ *1* | 100 | 91.10 | (5/2$^+$) | 0 | (3/2$^+$) | | | |
| x116.6[b] *1* | 80[b] *10* | | | | | | | |
| 116.6[b]‡ *2* | 15[b] *1* | 569.3 | ($^+$) | 452.7 | (1/2$^+$,3/2$^+$) | | | |
| 127.6 *2* | 8 *4* | 580.3 | ($^+$) | 452.7 | (1/2$^+$,3/2$^+$) | | | |
| 134.0‡@ *4* | 35 *5* | 516.83 | (7/2$^-$) | 382.57 | (11/2$^-$) | [E2] | 0.752 *14* | α(K)=0.502 *9*; α(L)=0.195 *4*; α(M)=0.0437 *9* α(N)=0.00948 *18*; α(O)=0.00135 *3*; α(P)=2.79×10$^{-5}$ *5* |
| 140.9 *4* | 9 *3* | 382.57 | (11/2$^-$) | 241.82 | (7/2$^+$) | [M2] | 3.64 *7* | α(K)=2.90 *5*; α(L)=0.583 *11*; α(M)=0.1283 *23* α(N)=0.0287 *6*; α(O)=0.00454 *9*; α(P)=0.000298 *6* |
| 150.8‡ *2* | 43 *5* | 241.82 | (7/2$^+$) | 91.10 | (5/2$^+$) | | | |

Continued on next page (footnotes at end of table)

## $^{129}$Nd ε decay:mixed 1997Gi07,2010Xu12 (continued)

### γ($^{129}$Pr) (continued)

| $E_\gamma$ | $I_\gamma$ | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult. | α[a] | Comments |
|---|---|---|---|---|---|---|---|---|
| 176.6‡ *3* | 18 *3* | 418.43 | (9/2$^+$) | 241.82 | (7/2$^+$) | | | |
| 185.0 *1* | <5 | 682.3 | (11/2$^+$) | 497.3 | (9/2$^+$) | | | |
| 212.0 *1* | <5 | 728.87 | (9/2$^-$) | 516.83 | (7/2$^-$) | | | |
| 214.0 *1* | <5 | 632.44 | (11/2$^+$) | 418.43 | (9/2$^+$) | | | |
| 229.5 *3* | 6 *2* | 471.21 | (7/2$^+$,9/2$^+$) | 241.82 | (7/2$^+$) | | | |
| 236.2‡ *3* | 17 *3* | 327.3 | (5/2$^+$,7/2$^+$) | 91.10 | (5/2$^+$) | | | |
| 241.8‡ *3* | 11 *3* | 241.82 | (7/2$^+$) | 0 | (3/2$^+$) | | | |
| 255.5‡ *3* | 20 *4* | 497.3 | (9/2$^+$) | 241.82 | (7/2$^+$) | | | |
| 275.0 *1* | 6 *2* | 516.83 | (7/2$^-$) | 241.82 | (7/2$^+$) | | | |
| 291.6 *4* | 8 *3* | 382.57 | (11/2$^-$) | 91.10 | (5/2$^+$) | [E3] | 0.220 | α(K)=0.1437 *22*; α(L)=0.0598 *10*; α(M)=0.01355 *21* α(N)=0.00295 *5*; α(O)=0.000423 *7*; α(P)=9.55×10$^{-6}$ *14* |
| 327.2‡ *3* | 15 *3* | 418.43 | (9/2$^+$) | 91.10 | (5/2$^+$) | | | |
| 346.6[b]‡ *3* | 35[b]† *5* | 437.7 | | 91.10 | (5/2$^+$) | | | |
| 346.6[b]‡ *3* | 15[b]† *3* | 728.87 | (9/2$^-$) | 382.57 | (11/2$^-$) | | | |
| 371.0‡ *3* | 13 *3* | 462.1 | | 91.10 | (5/2$^+$) | | | |
| 380.0‡ *3* | 13 *3* | 471.21 | (7/2$^+$,9/2$^+$) | 91.10 | (5/2$^+$) | | | |
| 391.0 *5* | 6 *2* | 632.44 | (11/2$^+$) | 241.82 | (7/2$^+$) | | | |
| [x]399.0# | | | | | | | | |
| 452.7‡ *3* | 30 *4* | 452.7 | (1/2$^+$,3/2$^+$) | 0 | (3/2$^+$) | | | |
| 482.7‡ *3* | 13 *3* | 724.5 | (7/2$^+$,9/2$^+$,11/2$^+$) | 241.82 | (7/2$^+$) | | | |
| 487.0 *5* | <5 | 728.87 | (9/2$^-$) | 241.82 | (7/2$^+$) | | | |
| 882.0& *1* | 12 *2* | 975.00 | | 91.10 | (5/2$^+$) | | | |
| 895.0 *1* | 12 *2* | 986.10 | (5/2$^+$,7/2$^+$) | 91.10 | (5/2$^+$) | | | |
| 975.0 *1* | 25 *4* | 975.00 | | 0 | (3/2$^+$) | | | |

† 346.6γ is a doublet with separate intensities given in 1997Gi07, but the authors did not specify these intensities with levels. The evaluators have arbitrarily assigned higher intensity to the decay of the low-lying level.

‡ γ also reported In 2010Xu12 with the same energy As In 1997Gi07. No intensity is given.

# From 2010Xu12, in coin with 134.0γ, both assigned to the decay of 2.6-s activity.

@ 2010Xu12 assign this γ to 2.6-S activity of $^{129}$Nd, and In coin with a 399.0γ.

& Poor fit, level-energy difference=883.9.

[a] 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.

[b] Multiply placed with intensity suitably divided.

[x] γ ray not placed in level scheme.

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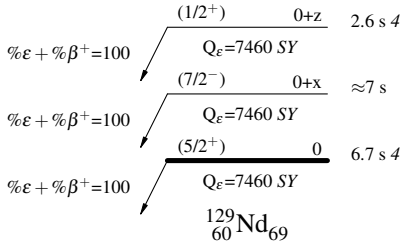
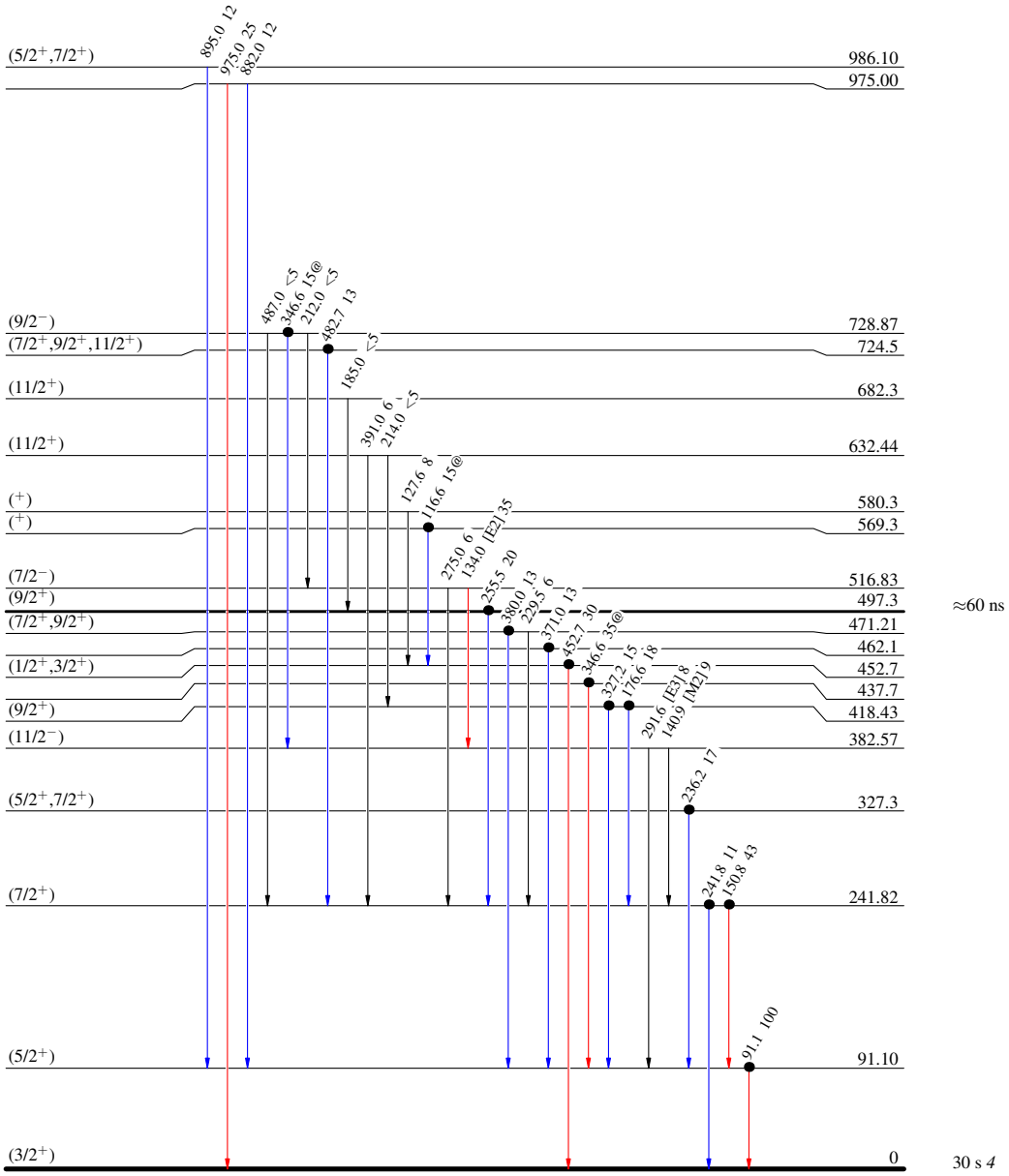
### Decay Scheme

Intensities: Type not specified
@ Multiply placed: intensity suitably divided

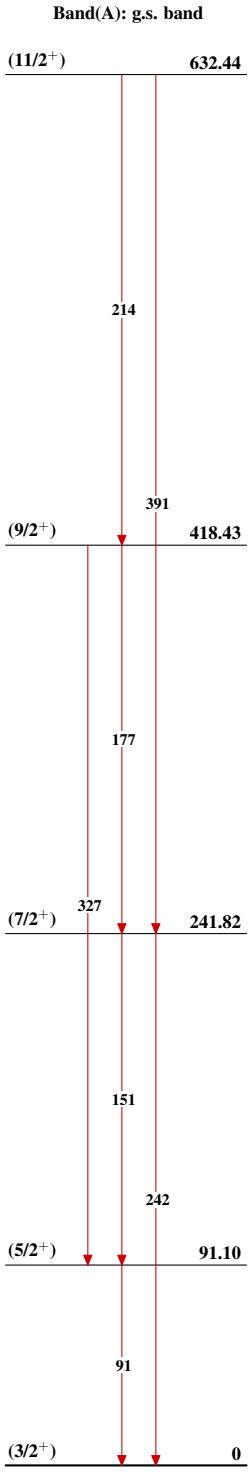
Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
Coincidence




$^{129}_{59}Pr_{70}$

## $^{129}$Nd ε decay:mixed 1997Gi07,2010Xu12




$^{129}_{59}Pr_{70}$