## $^{142}Nd(^{27}Al,5n\gamma),^{141}Pr(^{28}Si,5n\gamma)$ 2002Ro01

History

| Type | Author | Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Balraj Singh and Jun Chen# | NDS 147, 1 (2018) | 30-Nov-2017 |

2002Ro01 (also 2004Gu06): E($^{27}$Al)=150 MeV, E($^{28}$Si)=142 MeV. Measured Eγ, Iγ, γγ, γγ(θ)(DCO), γ(lin pol), recoil-shadow method for lifetimes using AFRODITE array with 8 Compton-suppressed Ge Clover detectors and 7 fourfold segmented LEPS detectors. Comparisons with total routhian surface calculations.

### $^{164}$Ta Levels

B(M1)/B(E2) ratios listed in the table assume mixing ratio δ=0 for cascading transitions in the bands.

| E(level)† | Jπ‡ | Comments |
|---|---|---|
| 0+x | | |
| 0+y& | | |
| 93.7+x *3* | | |
| 131.0+y& *10* | | |
| 188.7+x *4* | | |
| 321.0+y& *15* | | |
| 329.2+x@ *4* | (11⁻) | Depopulating (140.5 and 235.5) γ rays account for only ≈47% of the feeding intensity if E2 is assumed for 235.5γ and M1 for 140.5γ.<br>$T_{1/2}$: based on recoil-shadow method (2002Ro01,2004Gu06), this level is an isomer of few ns. The 93.7γ 140.5γ and 235.5γ were the only ones seen in the difference spectrum shown by these authors.<br>B(M1)/B(E2)=0.10 *1*, assuming E2 for 235γ and M1 for 140.5γ. |
| 515.0+y& *18* | | |
| 523.4+x# *5* | (12⁻) | |
| 704.1+x@ *5* | (13⁻) | B(M1)/B(E2)=1.3 *4* assuming E2 for 375γ. |
| 743.1+y& *19* | | |
| 987.4+x# *5* | (14⁻) | B(M1)/B(E2)=1.03 *21*. |
| 999.9+y& *19* | | B(M1)/B(E2)=1.1 *3*, assuming E2 for 485γ and M1 for 257γ. |
| 1234.1+x@ *5* | (15⁻) | B(M1)/B(E2)=1.33 *14*. |
| 1281.3+y& *20* | | B(M1)/B(E2)=1.1 *3*, assuming M1 for 281γ. |
| 1572.7+x# *6* | (16⁻) | B(M1)/B(E2)=0.89 *18*. |
| 1594.4+y& *21* | | B(M1)/B(E2)=1.0 *9*, assuming M1 for 313γ and E2 for 595γ. |
| 1872.6+x@ *6* | (17⁻) | B(M1)/B(E2)=1.6 *3*. |
| 1925.7+y& *21* | | |
| 2247.9+x# *6* | (18⁻) | B(M1)/B(E2)=2.7 *12*. |
| 2285.6+y& *22* | | |
| 2591.6+x@ *7* | (19⁻) | B(M1)/B(E2)=3.6 *16*. |
| 2995.9+x# *7* | (20⁻) | B(M1)/B(E2)=4.5 *6*. |
| 3350.7+x?@ *10* | (21⁻) | |

† From least-squares fit to Eγ data.
‡ As proposed by 2002Ro01 based on 11⁻ for the bandhead and interlocking cascades of M1 and E2 transitions in the π9/2[514]⊗ν1/2[660]band. The measured DCO ratios and polarization asymmetries are in general agreement.
# Band(A): π9/2[514]⊗ν1/2[660],α=0.
@ Band(a): π9/2[514]⊗ν1/2[660],α=1.
& Band(B): $\pi h_{11/2}\otimes\nu h_{9/2}\otimes(\nu i^2_{13/2})$ (?). Tentative configuration.

**$^{142}$Nd($^{27}$Al,5nγ),$^{141}$Pr($^{28}$Si,5nγ) 2002Ro01 (continued)**

γ($^{164}$Ta)

DCO ratios are for 45° and 90° geometry. With gates on stretched quadrupoles, expected DCO ratios are 0.8 for in-band cascade (M1+E2) transitions and 1.3 for in-band crossover (E2) transitions.

| $E_\gamma$ [†] | $I_\gamma$ | $E_i$(level) | $J^\pi_i$ | $E_f$ | $J^\pi_f$ | Mult. [‡] | Comments |
|---|---|---|---|---|---|---|---|
| 93.7 *3* | | 93.7+x | | 0+x | | | DCO=0.91 *7*<br>DCO for 93.7+95.0. |
| 95.0 *3* | | 188.7+x | | 93.7+x | | | DCO=0.91 *7*<br>DCO for 93.7+95.0.<br>Mult.: stretched M1 expected from systematics. DCO value is in disagreement. |
| 131[#] *1* | 6.7 *5* | 131.0+y | | 0+y | | | DCO=1.1 *3* |
| 140.5 *3* | 25.0 *5* | 329.2+x | (11⁻) | 188.7+x | | | DCO=0.97 *5*<br>Mult.: stretched M1 expected from systematics. DCO value is in disagreement. |
| 180.7 *3* | 73 *15* | 704.1+x | (13⁻) | 523.4+x | (12⁻) | (M1) | DCO=0.75 *4*<br>POL=−0.05 *2* for unresolved doublet. |
| 190[#] *1* | | 321.0+y | | 131.0+y | | | DCO=0.65 *12* |
| 194[#] *1* | 59 *28* | 515.0+y | | 321.0+y | | | DCO=0.97 *14*<br>POL=−0.13 *2* for unresolved doublet. |
| 194.3 *3* | 100 *23* | 523.4+x | (12⁻) | 329.2+x | (11⁻) | (M1) | DCO=0.84 *6*<br>POL=−0.13 *2* for unresolved doublet. |
| 228 *1* | 22 *8* | 743.1+y | | 515.0+y | | (M1) | DCO=0.90 *9*<br>POL=−0.08 *1* for unresolved doublet. |
| 235.5 *3* | 43.7 *16* | 329.2+x | (11⁻) | 93.7+x | | | DCO=0.80 *6*<br>Mult.: stretched E2 expected from systematics. DCO and POL values are in disagreement.<br>POL=−0.03 *1*. |
| 246.7 *3* | 29.9 *14* | 1234.1+x | (15⁻) | 987.4+x | (14⁻) | (M1) | DCO=0.93 *11*<br>POL=+0.02 *1*. |
| 257 *1* | 8.4 *15* | 999.9+y | | 743.1+y | | | DCO=0.71 *9* |
| 281 *1* | 10 *5* | 1281.3+y | | 999.9+y | | | |
| 283.3 *3* | 45.5 *12* | 987.4+x | (14⁻) | 704.1+x | (13⁻) | (M1) | DCO=0.85 *7*<br>POL=−0.11 *1*. |
| 299.9 *5* | 7.2 *14* | 1872.6+x | (17⁻) | 1572.7+x | (16⁻) | (M1) | DCO=0.74 *10*<br>POL=−0.15 *2*. |
| 313 *1* | 3.2 *22* | 1594.4+y | | 1281.3+y | | (M1) | DCO=0.99 *16*<br>POL=−0.18 *2*. |
| 332 *1* | | 1925.7+y | | 1594.4+y | | (M1) | DCO=1.00 *16*<br>POL=−0.18 *2* for unresolved doublet. |
| 338.6 *3* | 13.2 *15* | 1572.7+x | (16⁻) | 1234.1+x | (15⁻) | (M1) | DCO=0.76 *6* |
| 343.7 *5* | 8.8 *12* | 2591.6+x | (19⁻) | 2247.9+x | (18⁻) | (M1) | DCO=0.64 *13*. |
| 355[#] | | 3350.7+x? | (21⁻) | 2995.9+x | (20⁻) | | |
| 360 *1* | | 2285.6+y | | 1925.7+y | | | |
| 374.8 *3* | 48 *10* | 704.1+x | (13⁻) | 329.2+x | (11⁻) | | POL=−0.02 *1* for unresolved doublet. |
| 375.3 *5* | 9 *3* | 2247.9+x | (18⁻) | 1872.6+x | (17⁻) | (M1) | POL=−0.02 *1* for unresolved doublet. |
| 404.3 *3* | 11.0 *3* | 2995.9+x | (20⁻) | 2591.6+x | (19⁻) | (M1) | DCO=0.85 *12*. |
| 464.0 *3* | 29 *6* | 987.4+x | (14⁻) | 523.4+x | (12⁻) | (E2) | DCO=1.15 *22*<br>POL=+0.07 *1*. |
| 485[#] *1* | 8.6 *20* | 999.9+y | | 515.0+y | | | |
| 530.0 *3* | 43 *4* | 1234.1+x | (15⁻) | 704.1+x | (13⁻) | (E2) | DCO=1.07 *20* |
| 538 *1* | 9 *4* | 1281.3+y | | 743.1+y | | (E2) | DCO=1.7 *4*<br>POL=+0.13 *2*. |
| 585.3 *3* | 18 *3* | 1572.7+x | (16⁻) | 987.4+x | (14⁻) | (E2) | DCO=1.32 *20*<br>POL=+0.03 *1* for unresolved doublet. |

Continued on next page (footnotes at end of table)

**$^{142}$Nd($^{27}$Al,5n$\gamma$),$^{141}$Pr($^{28}$Si,5n$\gamma$) 2002Ro01 (continued)**

$\gamma$($^{164}$Ta) (continued)

| $E_\gamma$ † | $I_\gamma$ | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult. ‡ | Comments |
|---|---|---|---|---|---|---|---|
| 595 *1* | 5.6 *33* | 1594.4+y | | 999.9+y | | | DCO=1.3 *4*<br>POL=−0.05 *1*. |
| 638.5 *3* | 12.7 *10* | 1872.6+x | (17$^-$) | 1234.1+x | (15$^-$) | (E2) | DCO=1.3 *4*<br>POL=+0.09 *1*. |
| 644 *1* | 9.7 *18* | 1925.7+y | | 1281.3+y | | | |
| 675.2 *5* | 6.2 *15* | 2247.9+x | (18$^-$) | 1572.7+x | (16$^-$) | (E2) | POL=+0.06 *1* for unresolved doublet. |
| 691 *1* | | 2285.6+y | | 1594.4+y | | (E2) | DCO=1.2 *3*.<br>POL=+0.07 *2*. |
| 719.0 *5* | 8 *4* | 2591.6+x | (19$^-$) | 1872.6+x | (17$^-$) | (E2) | DCO=1.67 *26*.<br>POL=+0.13 *2*. |
| 748.0 *5* | 6.0 *8* | 2995.9+x | (20$^-$) | 2247.9+x | (18$^-$) | (E2) | DCO=1.10 *16*. |
| 759# | | 3350.7+x? | (21$^-$) | 2591.6+x | (19$^-$) | | |

† Uncertainty of 0.3 keV assigned to most transitions, except 0.5 keV for I$\gamma$<10 and 1 keV for E$\gamma$ quoted to nearest keV, based on a general comment by 2002Ro01 about these uncertainties.

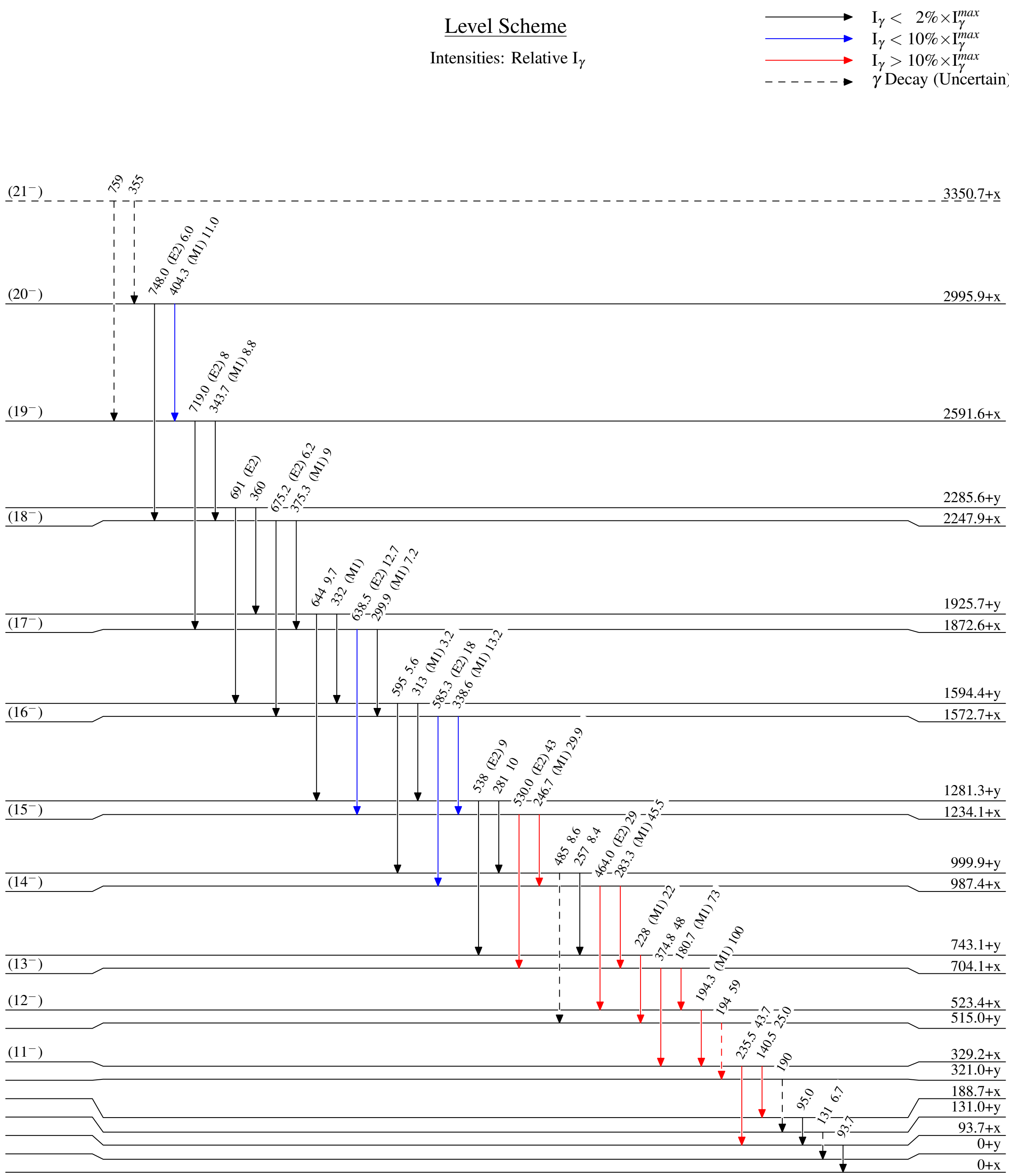
‡ From DCO ratios and POL values for transitions in coupled band structures.

# Placement of transition in the level scheme is uncertain.

**$^{142}$Nd($^{27}$Al,5nγ),$^{141}$Pr($^{28}$Si,5nγ) 2002Ro01**

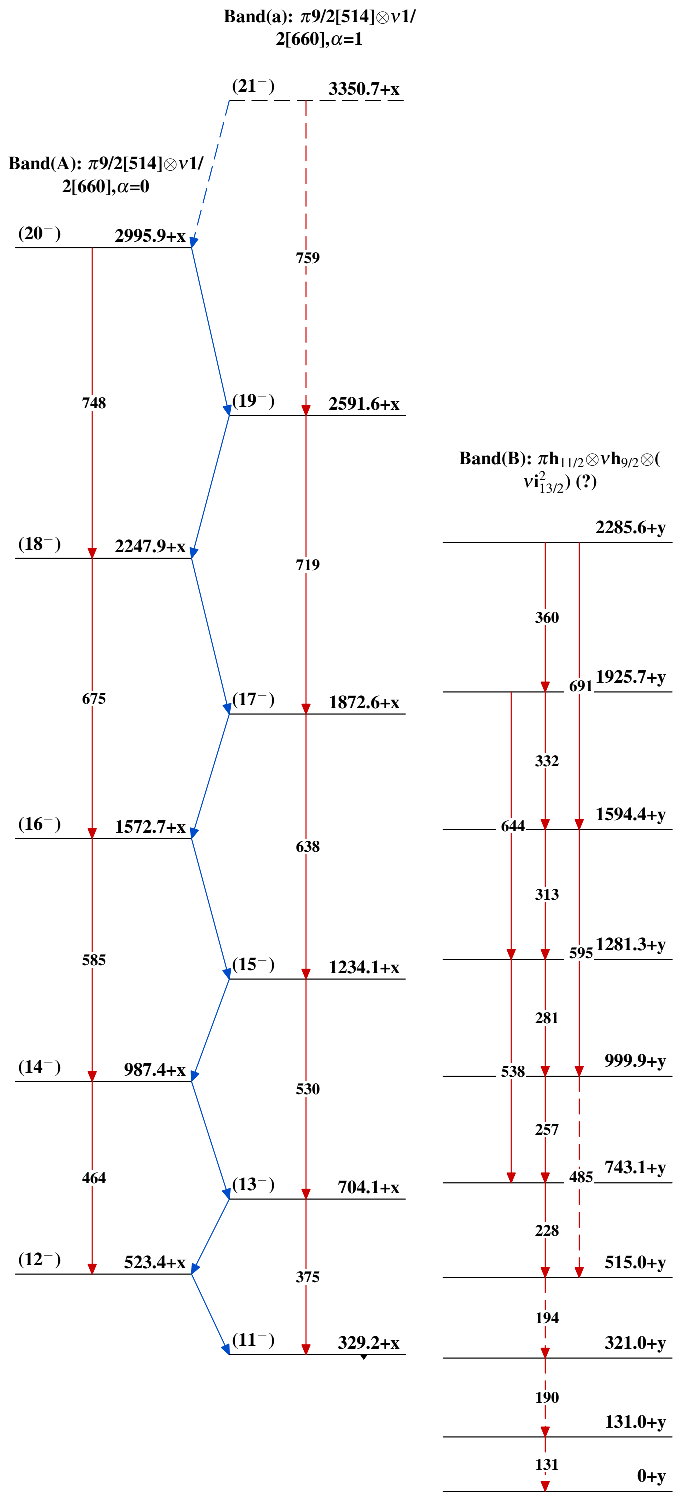
Level Scheme

Intensities: Relative $I_\gamma$




$^{164}_{73}Ta_{91}$

## $^{142}Nd(^{27}Al,5n\gamma),^{141}Pr(^{28}Si,5n\gamma)$ 2002Ro01




$^{164}_{73}Ta_{91}$