## Adopted Levels, Gammas

| Type | Author | History Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Balraj Singh | NDS 110, 1 (2009) | 20-Nov-2008 |

Q($\beta^-$)=2443 *4*; S(n)=5334.55 *10*; S(p)=9931 *9*; Q($\alpha$)=−1354 *9* 2017Wa10
S(2n)=12710.2 *10*; S(2p)=18851 *9* 2017Wa10

Additional information 1.

Other reaction: $^{150}$Nd(n,n) E=res (1968Ka28,1969Al09). Neutron transmission and $\gamma$ yields measured for neutron energies up to 10 keV and resonances in $^{151}$Nd determined. Neutron widths determined for all resonances and $\gamma$ partial widths for some. The Γ data are available for 16 strong resonances. Other: 1971Te04 (E<31 keV).

Theoretical references: 1983Ri10, 1981Be59, 1980Cw03, 1968Ma15.

Additional information 2.

See $^{150}$Nd(n,$\gamma$),(n,n):resonances dataset for 79 neutron resonances in the energy region: 78 eV to 13.9 keV.

### $^{151}$Nd Levels

Cross Reference (XREF) Flags

| | | | |
|---|---|---|---|
| A | $^{151}$Pr $\beta^-$ decay (18.90 s) | D | $^{150}$Nd(d,p$\gamma$) |
| B | $^{150}$Nd(n,$\gamma$) E=th | E | $^{252}$Cf SF decay |
| C | $^{150}$Nd(d,p) | | |

| E(level)[†] | J$^\pi$[‡] | $T_{1/2}$ | XREF | Comments |
|---|---|---|---|---|
| 0.0[b] | 3/2$^+$ | 12.44 min *7* | ABCD | %$\beta^-$=100<br>$T_{1/2}$: from 1966ZgZZ. Others: 12 min (1950Ma05), 12 min *1* (1952Ru10), 17 min *5* (1958Wi42), 1965Fo08, 1960Wi10, 1959Sc39.<br>J$^\pi$: log *ft*=5.4 to 5/2$^+$ and log *ft*=7.2 to 1/2$^+$. |
| 22.4506[b] *10* | (5/2)$^+$ | | ABCD | J$^\pi$: L(d,p)=2 and M1+E2 $\gamma$ to 3/2$^+$. Nilsson model favors 5/2. |
| 57.6741[c] *4* | (3/2)$^-$ | | ABCD | J$^\pi$: E1 $\gamma$ to 3/2$^+$, $\gamma$ to (5/2)$^+$ and primary $\gamma$ from 1/2$^+$. |
| 75.857[b] *4* | (7/2)$^+$ | | B D | J$^\pi$: M1(+E2) $\gamma$ to (5/2)$^+$ and probable member of g.s. band. |
| 95.9[b] *10* | (9/2$^+$) | | C | J$^\pi$: probable 9/2$^+$ member of g.s. band. |
| 0.0+x | (9/2$^+$) | | E | E(level): x≈96 if this level corresponds to 95.9, (9/2$^+$) level reported in (d,p). |
| 105.7524[c] *8* | 5/2$^-$ | | ABCD | XREF: C(107.5).<br>J$^\pi$: L(d,p)=3 and E1 $\gamma$ to 3/2$^+$. |
| 177.714[c] *2* | (7/2$^-$) | | ABCD | XREF: A(177.78)C(174.0).<br>J$^\pi$: $\gamma$ from (9/2$^-$), $\gamma$ to (5/2)$^+$ and probable $\gamma$ to (5/2)$^-$ suggest 5/2$^-$, 7/2 but 7/2$^-$ favored by probable assignment to 3/2[532] band. |
| 189.054[d] *1* | (3/2)$^-$ | <0.7 ns | ABCD | J$^\pi$: L(d,p)=1 and E1 $\gamma$ to 3/2$^+$.<br>$T_{1/2}$: from $\gamma\gamma$(t) in (d,p$\gamma$). |
| 149.4+x[h] | (13/2$^+$)[a] | | E | E(level): this level may correspond to 258.9, (9/2$^+$) level reported in (d,p), but energy difference between 13/2$^+$ and 9/2$^+$ does not match 149.4$\gamma$ reported by 1996Ba34. In neighboring N=91 nuclides, 13/2$^+$ bandhead is at 214 ($^{155}$Gd), 239 ($^{157}$Dy), 226 ($^{159}$Er). |
| 249.568[d] *2* | (5/2)$^-$ | | AB D | J$^\pi$: E1 $\gamma$ to 3/2$^+$; $\gamma$'s to (3/2)$^-$ and (7/2)$^+$. $\gamma$ from (9/2$^-$). |
| 258.9[b] *10* | (13/2$^+$) | | C | J$^\pi$: L(d,p)=(6) and probable member of g.s. band. |
| 335.72[d] *4* | (7/2)$^-$ | | BCD | J$^\pi$: L(d,p)=3 and probable member of 3/2[521] band. |
| 404.8 *10* | | | C | |
| 443.62[d] *11* | (9/2)$^-$ | | CD | J$^\pi$: L(d,p)=5 and possible 194-250 cascade to 3/2$^+$. |
| 376.5+x[h] | (17/2$^+$)[a] | | E | |
| 495.305[e] *4* | (1/2)$^-$ | | ABCD | J$^\pi$: E1 $\gamma$ to 3/2$^+$; M1,E2 $\gamma$ to (3/2)$^-$; L(d,p)=(1) and probable bandhead. |
| 506.953[e] *5* | (3/2)$^-$ | | ABCD | J$^\pi$: L(d,p)=1; E1 $\gamma$ to (5/2)$^+$; M1,E2 $\gamma$ to 5/2$^-$. |
| 531.85[f] *4* | (5/2$^-$,7/2$^-$) | | ABCD | J$^\pi$: L(d,p)=(3). Possibly the 5/2[523] bandhead. The $\gamma$-ray data between |

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**Adopted Levels, Gammas (continued)**

$^{151}$Nd Levels (continued)

| E(level)[†] | Jπ[‡] | XREF | Comments |
|---|---|---|---|
| | | | different reactions are discrepant. It is possible that two different levels are populated near this energy. |
| 542.80[e] *2* | (1/2 to 7/2)$^+$ | ABCD | Jπ: M1,E2 γ to 3/2$^+$. L(d,p)=(3) is inconsistent. |
| 581.0 *2* | | ABC | Jπ: γ to (3/2)$^-$ suggests 1/2, 3/2, 5/2, 7/2$^-$. |
| 599.22 *7* | (5/2$^+$) | ABCD | XREF: C(596.4).<br>Jπ: primary γ from 1/2$^+$ and γ′s to (7/2$^+$) and (7/2$^-$). |
| 622.53[f] *4* | 5/2$^-$,7/2$^-$ | BC | XREF: C(624.1).<br>Jπ: L=3 in (d,p). Possibly the 7/2$^-$ member of 5/2[523] band. |
| 626.68 *10* | (1/2 to 7/2)$^+$ | A | Jπ: M1,E2 γ to 3/2$^+$. |
| 634.8[e] *15* | 5/2$^-$,7/2$^-$ | C | Jπ: L(d,p)=3. Possibly the 7/2$^-$ member of the 1/2[530] band. |
| 673.90? *3* | 1/2,3/2,5/2$^+$[@] | B | |
| 685.30 *6* | (3/2,5/2)$^+$ | A | Jπ: M1,E2 γ′s to 3/2$^+$ and (5/2)$^+$; γ′s to (3/2)$^-$ and 5/2$^-$. |
| 703?[#] *3* | | C | |
| 725?[#] *3* | | C | |
| 736.30 *2* | (5/2,7/2$^-$) | BC | XREF: C(733).<br>Jπ: γ′s to (3/2)$^-$ and (5/2)$^+$. Absence of primary γ from 1/2$^+$ favors 5/2, 7/2. |
| 752.4 *15* | | C | |
| 766?[#] *3* | | C | |
| 684.4+x[h] | (21/2$^+$)[a] | E | |
| 846.65[g] *2* | 1/2$^-$,3/2$^-$ | ABCD | Jπ: L(d,p)=1. Probable γ to (7/2$^-$) disfavors 1/2$^-$. |
| 877.23 *9* | (1/2$^-$,3/2,5/2) | A | Jπ: γ′s to 3/2$^+$, (3/2)$^-$ and 5/2$^-$. |
| 880.10 *3* | (1/2,3/2)$^+$ | AB | Jπ: primary γ from 1/2$^+$; M1,E2 γ to 3/2$^+$; E1 γ′s to (3/2)$^-$ and (1/2)$^-$. |
| 892.97[g] *3* | 1/2$^-$,3/2$^-$ | ABCD | XREF: A(?).<br>Jπ: L(d,p)=1. |
| 942.57 *10* | (1/2,3/2,5/2) | A C | Jπ: γ′s to 3/2$^+$ and (3/2)$^-$. |
| 949.34 *8* | (1/2$^-$,3/2,5/2$^+$) | ABCD | XREF: C(951).<br>Jπ: primary γ from 1/2$^+$ and γ to 5/2$^-$. |
| 964.09 *8* | 1/2,3/2,5/2$^+$[@] | BC | |
| 986.0?[&] *15* | 1/2,3/2,5/2$^+$[@] | B | |
| 995.9 *20* | | C | |
| 1034.0 *20* | 5/2$^-$,7/2$^-$ | C | Jπ: L(d,p)=3. |
| 1065.72? *2* | | B | |
| 1079? *7* | | C | |
| 1104.1 *2* | | A | Jπ: γ to 3/2$^+$ suggests 1/2, 3/2, 5/2, 7/2$^+$. |
| 1110.0 *15* | | C | |
| 1130.68? *7* | 1/2,3/2,5/2$^+$[@] | B | |
| 1150.70 *6* | 1/2,3/2,5/2$^+$[@] | BC | XREF: C(1155). |
| 1068.2+x[h] | (25/2$^+$)[a] | E | |
| 1183.96?[&] *14* | 1/2,3/2,5/2$^+$[@] | AB | XREF: A(?). |
| 1212.17? *9* | 1/2,3/2,5/2$^+$[@] | AB | XREF: A(?). |
| 1220.3 *3* | 1/2,3/2,5/2$^+$[@] | BC | |
| 1229.84 *15* | (1/2,3/2,5/2) | A | Jπ: γ′s to 3/2$^+$ and (3/2)$^-$. |
| 1256.48 *6* | | B | |
| 1380?[#] *4* | | C | |
| 1409.6 *15* | | BC | |
| 1436.82 *8* | | BC | XREF: C(1432). |
| 1449.6 *2* | (1/2$^-$,3/2,5/2) | A | Jπ: γ′s to 3/2$^+$, (3/2)$^-$ and 5/2$^-$. |
| 1474?[#] *6* | | C | |
| 1512.1 *3* | | A | Jπ: γ to 3/2$^+$ suggests 1/2, 3/2, 5/2, 7/2$^+$. |
| 1519?[#] *7* | | C | |
| 1523.73 *17* | (1/2,3/2,5/2) | A | Jπ: γ′s to 3/2$^+$ and (3/2)$^-$. |

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## Adopted Levels, Gammas (continued)

### $^{151}$Nd Levels (continued)

| E(level)[†] | J$^{\pi}$[‡] | XREF | Comments |
|---|---|---|---|
| 1559 *7* | | C | |
| 1575.57[&] *8* | 1/2,3/2,2,5/2$^+$[@] | B | |
| 1616?[#] *8* | | C | |
| 1520.6+x[h] | (29/2$^+$)[a] | E | |
| 1638.2[&] *1* | 1/2,3/2,2,5/2$^+$[@] | ABC | |
| 1672?[#] *5* | | C | |
| 1697?[#] *8* | | C | |
| 1745.85 *8* | | BC | XREF: C(1751). |
| 1777?[#] *7* | | C | |
| 1792.13?[&] *13* | 1/2,3/2,2,5/2$^+$[@] | B | |
| 1813?[#] *5* | | C | |
| 1836.27 *8* | | BC | XREF: C(1834). |
| 1844.28 *18* | (1/2$^-$,3/2,5/2) | A | J$^{\pi}$: $\gamma'$s to 3/2$^+$, (3/2)$^-$ and 5/2$^-$. |
| 1878.09 *15* | (1/2,3/2,5/2) | A C | J$^{\pi}$: $\gamma'$s to 3/2$^+$ and (3/2)$^-$. |
| 1907.9 *2* | | A | J$^{\pi}$: $\gamma'$s to (3/2)$^-$ and 5/2$^-$ suggest 1/2$^-$, 3/2, 5/2, 7/2$^-$. |
| 1918?[#] *4* | | C | |
| 1951.94 *11* | | BC | |
| 2001?[#] *7* | | C | |
| 2024?[#] *5* | | C | |
| 2040?[#] *7* | | C | |
| 2080?[#] *4* | | C | |
| 2094.31[&] *11* | 1/2,3/2,2,5/2$^+$[@] | B | |
| 2129?[#] *5* | | C | |
| 2033.2+x[h] | (33/2$^+$)[a] | E | |
| 2160?[#] *5* | | C | |
| 2182?[#] *8* | | C | |
| 2205?[#] *6* | | C | |
| 2235?[#] *6* | | C | |
| 2312.5 *2* | (1/2$^-$,3/2,5/2) | A | J$^{\pi}$: $\gamma'$s to 3/2$^+$, (3/2)$^-$ and 5/2$^-$. |
| 2341.4 *2* | (1/2$^-$,3/2,5/2) | A | J$^{\pi}$: $\gamma'$s to 3/2$^+$, (3/2)$^-$ and 5/2$^-$. |
| 2429.8 *3* | | A | J$^{\pi}$: $\gamma'$s to (3/2)$^-$ and 5/2$^-$ suggest 1/2$^-$, 3/2, 5/2, 7/2$^-$. |
| 2600.8+x[h] | (37/2$^+$)[a] | E | |
| 3220.8+x[h] | (41/2$^+$)[a] | E | |

[†] From least-squares fit to E$\gamma'$s for levels populated in $\gamma$-ray studies. Normalized $\chi^2$=1.8. Others are from (d,p) reaction.

[‡] No spins have been directly measured, no internal conversion coefficients are known and rather sparse coincidence measurements exist. Thus, most spin assignments are in parentheses. The model-dependent arguments are in agreement with most of these assignments.

[#] Based on weak peak in (d,p) seen only by 1967Ne08.

[@] Primary $\gamma$ from 1/2$^+$ capture state gives J$^{\pi}$=1/2,3/2,5/2$^+$.

[&] Level based on capture $\gamma$ seen by either 1975SmZT or 1976Pi13 but not by both.

[a] Probable $i_{13/2}$ band.

[b] Band(A): 3/2[651]+3/2[402]. Coriolis perturbed band (1985BuZU,1975SmZT).

[c] Band(B): 3/2[532] band. band assignment from 1985BuZU and 1975SmZT.

[d] Band(C): 3/2[521] band. band assignment from 1985BuZU and 1975SmZT.

[e] Band(D): 1/2[530] band. band assignment from 1985BuZU and 1975SmZT.

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## Adopted Levels, Gammas (continued)

### $^{151}$Nd Levels (continued)

[f] Band(E): 5/2[523] band. band assignment from 1985BuZU and 1975SmZT.
[g] Band(F): 1/2[521]+$\gamma$ vib on 3/2[521]. band assignment from 1985BuZU and 1975SmZT.
[h] Band(G): 3/2[651] or 5/2[642] band. The band assignment from 1996Ba34. Similar bands reported in other N=91 nuclides, $^{155}$Gd, $^{157}$Dy and $^{159}$Er.

## Adopted Levels, Gammas (continued)

### γ($^{151}$Nd)

| $E_i$(level) | $J_i^\pi$ | $E_\gamma$[†] | $I_\gamma$[†] | $E_f$ | $J_f^\pi$ | Mult.[‡] | δ | α[a] | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 22.4506 | $(5/2)^+$ | 22.51 *10* | 100 | 0.0 | $3/2^+$ | M1+E2 | 0.16 *3* | 49 *13* | α(L)=38 *10*; α(M)=8.5 *23*; α(N+..)=2.1 *6*<br>α(N)=1.8 *5*; α(O)=0.25 *6*; α(P)=0.00602 *13*<br>δ: from $^{151}$Pr $\beta^-$ decay, based on ce data and intensity balance arguments. |
| 57.6741 | $(3/2)^-$ | 35.227 *2* | 17.3 *16* | 22.4506 | $(5/2)^+$ | [E1] | | 0.762 | α(L)=0.603 *9*; α(M)=0.1280 *18*; α(N+..)=0.0315 *5*<br>α(N)=0.0276 *4*; α(O)=0.00369 *6*; α(P)=0.0001452 *21* |
| | | 57.6740 *4* | 100 | 0.0 | $3/2^+$ | E1 | | 1.144 | α(K)=0.955 *14*; α(L)=0.1495 *21*; α(M)=0.0316 *5*; α(N+..)=0.00791 *11*<br>α(N)=0.00690 *10*; α(O)=0.000964 *14*; α(P)=4.41×10$^{-5}$ *7* |
| 75.857 | $(7/2)^+$ | 53.408 *4* | 100 *9* | 22.4506 | $(5/2)^+$ | M1(+E2) | | 16 *8* | α(K)=6.1 *13*; α(L)=8 *7*; α(M)=1.8 *16*; α(N+..)=0.4 *4*<br>α(N)=0.4 *4*; α(O)=0.05 *4*; α(P)=0.00036 *13*<br>α: for M1. |
| | | 75.95 *10* | 14 *2* | 0.0 | $3/2^+$ | [E2] | | 5.99 | α(K)=2.51; α(L)=2.71; α(M)=0.62; α(N+..)=0.15<br>α(N)=0.13; α(O)=0.017; α(P)=0.00011<br>$I_\gamma$: from $^{151}$Pr $\beta^-$. Iγ=38 *4* in (n,γ). |
| 105.7524 | $5/2^-$ | 29.97 *10* | 4.2 *6* | 75.857 | $(7/2)^+$ | [E1] | | 1.202 *21* | α(L)=0.950 *16*; α(M)=0.202 *4*; α(N+..)=0.0493 *9*<br>α(N)=0.0434 *8*; α(O)=0.00570 *10*; α(P)=0.000212 *4* |
| | | 83.300 *1* | 59 *5* | 22.4506 | $(5/2)^+$ | E1 | | 0.427 | α(K)=0.360 *5*; α(L)=0.0527 *8*; α(M)=0.01114 *16*; α(N+..)=0.00281 *4*<br>α(N)=0.00245 *4*; α(O)=0.000349 *5*; α(P)=1.748×10$^{-5}$ *25* |
| | | 105.753 *1* | 100 *5* | 0.0 | $3/2^+$ | E1 | | 0.222 | α(K)=0.189 *3*; α(L)=0.0268 *4*; α(M)=0.00566 *8*; α(N+..)=0.001437 *21*<br>α(N)=0.001248 *18*; α(O)=0.000180 *3*; α(P)=9.47×10$^{-6}$ *14* |
| 177.714 | $(7/2^-)$ | ≈72[c] | <10 | 105.7524 | $5/2^-$ | | | | |
| | | 155.263[b] *2* | <100[b@] | 22.4506 | $(5/2)^+$ | | | | |
| 189.054 | $(3/2)^-$ | 83.3 *3* | 2.7 *14* | 105.7524 | $5/2^-$ | | | | $E_\gamma$,$I_\gamma$: from $^{151}$Pr $\beta^-$. |
| | | 131.381 *2* | 10.3 *7* | 57.6741 | $(3/2)^-$ | M1,E2 | | 0.74 *9* | α(K)=0.546 *12*; α(L)=0.15 *8*; α(M)=0.034 *18*; α(N+..)=0.008 *5*<br>α(N)=0.007 *4*; α(O)=0.0010 *5*; α(P)=3.0×10$^{-5}$ *6* |
| | | 166.603 *1* | 33.3 *18* | 22.4506 | $(5/2)^+$ | E1 | | 0.0642 | B(E1)(W.u.)>1.5×10$^{-5}$<br>α(K)=0.0547 *8*; α(L)=0.00751 *11*; α(M)=0.001583 *23*; α(N+..)=0.000405 *6*<br>α(N)=0.000351 *5*; α(O)=5.16×10$^{-5}$ *8*; α(P)=2.91×10$^{-6}$ *4* |
| | | 189.057 *2* | 100 *5* | 0.0 | $3/2^+$ | E1 | | 0.0456 | B(E1)(W.u.)>3.1×10$^{-5}$<br>α(K)=0.0389 *6*; α(L)=0.00530 *8*; α(M)=0.001117 *16*; α(N+..)=0.000286 *4*<br>α(N)=0.000248 *4*; α(O)=3.66×10$^{-5}$ *6*; α(P)=2.10×10$^{-6}$ *3* |
| 149.4+x | $(13/2^+)$ | 149.4 | 100 | 0.0+x | $(9/2^+)$ | | | | |
| 249.568 | $(5/2)^-$ | 60.519 *3* | 29 *3* | 189.054 | $(3/2)^-$ | [M1,E2] | | 10 *4* | α(K)=4.6 *6*; α(L)=4 *4*; α(M)=1.0 *9*; α(N+..)=0.24 *20*<br>α(N)=0.21 *18*; α(O)=0.027 *22*; α(P)=0.00026 *8* |
| | | 143.5 *3* | 3 *2* | 105.7524 | $5/2^-$ | [M1,E2] | | 0.56 *6* | α(K)=0.421 *14*; α(L)=0.11 *5*; α(M)=0.024 *12*; α(N+..)=0.006 *3* |





$^{151}_{60}Nd_{91}$-5

## Adopted Levels, Gammas (continued)

### γ($^{151}$Nd) (continued)

| $E_i$(level) | $J_i^\pi$ | $E_\gamma$[†] | $I_\gamma$[†] | $E_f$ | $J_f^\pi$ | Mult.[‡] | α[a] | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | α(N)=0.0053 *25*; α(O)=0.0007 *3*; α(P)=2.4×10$^{-5}$ *5* |
| | | | | | | | | $E_\gamma$,$I_\gamma$: from $^{151}$Pr β$^-$. In (n,γ), Eγ=143.806 *18* may be placed here, but its intensity in (n,γ) is too large to be assigned with this level. |
| 249.568 | (5/2)$^-$ | 173.714 *5* | 39 *3* | 75.857 | (7/2)$^+$ | | | |
| | | 191.889 *10* | 25 *2* | 57.6741 | (3/2)$^-$ | | | |
| | | 227.135 *5* | 57 *11* | 22.4506 | (5/2)$^+$ | | | |
| | | 249.563 *2* | 100 *7* | 0.0 | 3/2$^+$ | E1 | 0.0218 | α(K)=0.0186 *3*; α(L)=0.00250 *4*; α(M)=0.000528 *8*; α(N+..)=0.0001357 *19* |
| | | | | | | | | α(N)=0.0001172 *17*; α(O)=1.742×10$^{-5}$ *25*; α(P)=1.034×10$^{-6}$ *15* |
| 335.72 | (7/2)$^-$ | 86.28 *10* | 44 *8* | 249.568 | (5/2)$^-$ | | | |
| | | 146.54 *10* | <7 | 189.054 | (3/2)$^-$ | | | |
| | | 229.7 *1* | ≈10[#] | 105.7524 | 5/2$^-$ | | | |
| | | 259.77 *10* | 17 *3* | 75.857 | (7/2)$^+$ | | | |
| | | 313.2 *1* | 100 *9* | 22.4506 | (5/2)$^+$ | | | |
| 443.62 | (9/2)$^-$ | 107.9 *1* | 100[#] | 335.72 | (7/2)$^-$ | | | |
| | | 194 *1* | [#] | 249.568 | (5/2)$^-$ | | | |
| | | 266 *1* | ≈50[#] | 177.714 | (7/2$^-$) | | | |
| 376.5+x | (17/2$^+$) | 227.1 | 100 | 149.4+x | (13/2$^+$) | | | |
| 495.305 | (1/2)$^-$ | 306.243 *7* | 11.4 *18* | 189.054 | (3/2)$^-$ | M1,E2 | 0.057 *8* | α(K)=0.047 *9*; α(L)=0.0077 *3*; α(M)=0.00167 *8*; α(N+..)=0.000426 *15* |
| | | | | | | | | α(N)=0.000369 *15*; α(O)=5.41×10$^{-5}$ *8*; α(P)=2.8×10$^{-6}$ *7* |
| | | 389.5[&] *1* | 2.4 *2* | 105.7524 | 5/2$^-$ | | | |
| | | 437.631 *8* | 49 *3* | 57.6741 | (3/2)$^-$ | M1,E2 | 0.021 *5* | α(K)=0.018 *4*; α(L)=0.0027 *3*; α(M)=0.00057 *6*; α(N+..)=0.000147 *15* |
| | | | | | | | | α(N)=0.000127 *13*; α(O)=1.89×10$^{-5}$ *24*; α(P)=1.1×10$^{-6}$ *3* |
| | | | | | | | | $I_\gamma$: from $^{151}$Pr β$^-$. Other: 78 *7* (n,γ). |
| | | 495.309 *6* | 100 *7* | 0.0 | 3/2$^+$ | E1 | 0.00402 | α(K)=0.00345 *5*; α(L)=0.000450 *7*; α(M)=9.47×10$^{-5}$ *14*; |
| | | | | | | | | α(N+..)=2.45×10$^{-5}$ *4* |
| | | | | | | | | α(N)=2.11×10$^{-5}$ *3*; α(O)=3.18×10$^{-6}$ *5*; α(P)=2.01×10$^{-7}$ *3* |
| 506.953 | (3/2)$^-$ | 257.38 *5* | 3.6 *3* | 249.568 | (5/2)$^-$ | M1,E2 | 0.094 *9* | α(K)=0.077 *11*; α(L)=0.0135 *16*; α(M)=0.0029 *4*; α(N+..)=0.00074 *9* |
| | | | | | | | | α(N)=0.00065 *8*; α(O)=9.4×10$^{-5}$ *8*; α(P)=4.6×10$^{-6}$ *11* |
| | | | | | | | | $I_\gamma$: from $^{151}$Pr β$^-$. Other: 11 *1* (n,γ). |
| | | 317.912 *15* | 9.3 *12* | 189.054 | (3/2)$^-$ | M1,E2 | 0.051 *8* | α(K)=0.042 *8*; α(L)=0.00688 *14*; α(M)=0.00148 *5*; α(N+..)=0.000379 *8* |
| | | | | | | | | α(N)=0.000329 *9*; α(O)=4.82×10$^{-5}$ *11*; α(P)=2.6×10$^{-6}$ *7* |
| | | | | | | | | $I_\gamma$: from $^{151}$Pr β$^-$. Other: 18 *2* (n,γ). |
| | | 401.17 *10* | 13.6 *15* | 105.7524 | 5/2$^-$ | M1,E2 | 0.027 *6* | α(K)=0.023 *5*; α(L)=0.0034 *3*; α(M)=0.00073 *5*; α(N+..)=0.000189 *15* |
| | | | | | | | | α(N)=0.000163 *12*; α(O)=2.42×10$^{-5}$ *24*; α(P)=1.4×10$^{-6}$ *4* |
| | | | | | | | | $I_\gamma$: from $^{151}$Pr β$^-$. Other: 19 *2* (n,γ). |
| | | 449.3[&] *1* | 13 *1* | 57.6741 | (3/2)$^-$ | M1,E2 | 0.020 *5* | α(K)=0.017 *4*; α(L)=0.0025 *3*; α(M)=0.00053 *6*; α(N+..)=0.000137 *15* |
| | | | | | | | | α(N)=0.000118 *13*; α(O)=1.76×10$^{-5}$ *23*; α(P)=1.0×10$^{-6}$ *3* |
| | | 484.501 *5* | 100 *5* | 22.4506 | (5/2)$^+$ | E1 | 0.00423 | α(K)=0.00363 *5*; α(L)=0.000474 *7*; α(M)=9.97×10$^{-5}$ *14*; |
| | | | | | | | | α(N+..)=2.58×10$^{-5}$ *4* |
| | | | | | | | | α(N)=2.22×10$^{-5}$ *4*; α(O)=3.35×10$^{-6}$ *5*; α(P)=2.11×10$^{-7}$ *3* |
| | | 507.0[&] *1* | 24 *1* | 0.0 | 3/2$^+$ | | | |

## Adopted Levels, Gammas (continued)

### γ($^{151}$Nd) (continued)

| $E_i$(level) | $J_i^\pi$ | $E_\gamma$ † | $I_\gamma$ † | $E_f$ | $J_f^\pi$ | Mult.‡ | α[a] | Comments |
|---|---|---|---|---|---|---|---|---|
| 531.85 | (5/2$^-$,7/2$^-$) | 196.125 *11* | <26 | 335.72 | (7/2)$^-$ | | | From (n,γ) only. |
| | | 342.6 *1* | | 189.054 | (3/2)$^-$ | | | From $^{151}$Pr $\beta^-$ and (d,pγ). It is possible that this γ ray deexcites a level different from the one in (n,γ). |
| | | 474.21 *10* | 100 | 57.6741 | (3/2)$^-$ | | | From (n,γ) only. |
| 542.80 | (1/2 to 7/2)$^+$ | 542.776 *17* | 100 | 0.0 | 3/2$^+$ | M1,E2 | 0.012 *3* | α(K)=0.0103 *25*; α(L)=0.00148 *23*; α(M)=0.00031 *5*; α(N+..)=8.1×10$^{-5}$ *13*<br>α(N)=7.0×10$^{-5}$ *11*; α(O)=1.05×10$^{-5}$ *18*; α(P)=6.4×10$^{-7}$ *18* |
| 581.0 | | 523.22 *20* | 100 | 57.6741 | (3/2)$^-$ | | | A 523.5γ from $^{151}$Pr $\beta^-$ decay shown to deexcite a 599 level only, may also populate 581 level, as suggested by a comparison of branching ratios from 599 level. |
| 599.22 | (5/2$^+$) | 421.67 *10* | 100 *14* | 177.714 | (7/2$^-$) | | | |
| | | 493.6 *3* | 93 *14* | 105.7524 | 5/2$^-$ | | | γ not reported in (n,γ). |
| | | 523.5 *1* | <200 | 75.857 | (7/2)$^+$ | | | $I_\gamma$: from (n,γ). |
| 622.53 | 5/2$^-$,7/2$^-$ | 90.685 *5* | 100 *14* | 531.85 | (5/2$^-$,7/2$^-$) | | | |
| | | 373.17 *10* | 100 *50* | 249.568 | (5/2)$^-$ | | | |
| 626.68 | (1/2 to 7/2)$^+$ | 626.7 *1* | 100 | 0.0 | 3/2$^+$ | M1,E2 | 0.0085 *20* | α(K)=0.0072 *18*; α(L)=0.00101 *18*; α(M)=0.00021 *4*; α(N+..)=5.6×10$^{-5}$ *10*<br>α(N)=4.8×10$^{-5}$ *9*; α(O)=7.2×10$^{-6}$ *14*; α(P)=4.5×10$^{-7}$ *12* |
| 673.90? | 1/2,3/2,5/2$^+$ | 131.04[c] *3* | 100 | 542.80 | (1/2 to 7/2)$^+$ | | | |
| 685.30 | (3/2,5/2)$^+$ | 496.1 *5* | 3.5 *10* | 189.054 | (3/2)$^-$ | | | |
| | | 579.7 *1* | 23 *4* | 105.7524 | 5/2$^-$ | | | |
| | | 627.5 *3* | 9.3 *13* | 57.6741 | (3/2)$^-$ | | | |
| | | 662.8 *1* | 100 *5* | 22.4506 | (5/2)$^+$ | M1,E2 | 0.0074 *17* | α(K)=0.0063 *15*; α(L)=0.00087 *16*; α(M)=0.00019 *4*; α(N+..)=4.8×10$^{-5}$ *9*<br>α(N)=4.1×10$^{-5}$ *8*; α(O)=6.3×10$^{-6}$ *12*; α(P)=3.9×10$^{-7}$ *11* |
| | | 685.2 *1* | 34.3 *17* | 0.0 | 3/2$^+$ | M1,E2 | 0.0068 *16* | α(K)=0.0058 *14*; α(L)=0.00080 *15*; α(M)=0.00017 *3*; α(N+..)=4.4×10$^{-5}$ *8*<br>α(N)=3.8×10$^{-5}$ *7*; α(O)=5.7×10$^{-6}$ *11*; α(P)=3.6×10$^{-7}$ *10* |
| 736.30 | (5/2,7/2$^-$) | 155.263[b] *10* | <150[b] | 581.0 | | | | |
| | | 547.42 *20* | <128 | 189.054 | (3/2)$^-$ | | | |
| | | 678.30 *20* | <600 | 57.6741 | (3/2)$^-$ | | | |
| | | 713.62 *20* | 100 *17* | 22.4506 | (5/2)$^+$ | | | |
| 684.4+x | (21/2$^+$) | 307.9 | 100 | 376.5+x | (17/2$^+$) | | | |
| 846.65 | 1/2$^-$,3/2$^-$ | 110.353 *8* | 3.2 *3* | 736.30 | (5/2,7/2$^-$) | | | |
| | | 172.749[b] *19* | 3.1[b] *3* | 673.90? | 1/2,3/2,5/2$^+$ | | | |
| | | 657.615 *21* | 100 *9* | 189.054 | (3/2)$^-$ | | | |
| | | 668.56 *10* | <54 | 177.714 | (7/2$^-$) | | | $E_\gamma$: complex line. |
| | | 846.5 *3* | 59 *11* | 0.0 | 3/2$^+$ | | | From $^{151}$Pr $\beta^-$ only. With this intensity it should have been seen in (n,γ). |
| 877.23 | (1/2$^-$,3/2,5/2) | 688.2 *1* | 20 *3* | 189.054 | (3/2)$^-$ | | | |
| | | 771.5 *3* | 12 *10* | 105.7524 | 5/2$^-$ | | | |





$^{151}_{60}Nd_{91}$-7

## Adopted Levels, Gammas (continued)

### γ($^{151}$Nd) (continued)

| $E_i$(level) | $J_i^\pi$ | $E_\gamma$[†] | $I_\gamma$[†] | $E_f$ | $J_f^\pi$ | Mult.[‡] | α[a] | Comments |
|---|---|---|---|---|---|---|---|---|
| 877.23 | (1/2$^-$,3/2,5/2) | 819.1 *3* | 23 *5* | 57.6741 | (3/2)$^-$ | | | |
| | | 877.3 *2* | 100 *7* | 0.0 | 3/2$^+$ | | | |
| 880.10 | (1/2,3/2)$^+$ | 253.7[&] *3* | 2.6 *6* | 626.68 | (1/2 to 7/2)$^+$ | | | |
| | | 373.3 *1* | 18 *2* | 506.953 | (3/2)$^-$ | E1 | 0.00785 | α(K)=0.00673 *10*; α(L)=0.000888 *13*; α(M)=0.000187 *3*; α(N+..)=4.83×10$^{-5}$ *7* α(N)=4.16×10$^{-5}$ *6*; α(O)=6.24×10$^{-6}$ *9*; α(P)=3.85×10$^{-7}$ *6* |
| | | 385.0[&] *1* | 37 *3* | 495.305 | (1/2)$^-$ | E1 | 0.00729 | α(K)=0.00625 *9*; α(L)=0.000822 *12*; α(M)=0.0001732 *25*; α(N+..)=4.47×10$^{-5}$ *7* α(N)=3.86×10$^{-5}$ *6*; α(O)=5.79×10$^{-6}$ *9*; α(P)=3.58×10$^{-7}$ *5* |
| | | 822.2[&] *3* | 3.5 *10* | 57.6741 | (3/2)$^-$ | | | |
| | | 857.5[&] *3* | 4.4 *13* | 22.4506 | (5/2)$^+$ | | | |
| | | 880.1 *1* | 100 *7* | 0.0 | 3/2$^+$ | M1,E2 | 0.0038 *9* | α(K)=0.0032 *8*; α(L)=0.00043 *9*; α(M)=9.2×10$^{-5}$ *17*; α(N+..)=2.4×10$^{-5}$ *5* α(N)=2.1×10$^{-5}$ *4*; α(O)=3.1×10$^{-6}$ *6*; α(P)=2.0×10$^{-7}$ *5* |
| 892.97 | 1/2$^-$,3/2$^-$ | 643.33 *5* | 100 *9* | 249.568 | (5/2)$^-$ | | | |
| | | 703.9 *2* | ≈180[#] | 189.054 | (3/2)$^-$ | | | |
| | | 787.42 *11* | 82 *7* | 105.7524 | 5/2$^-$ | | | |
| | | 893.40 *30* | 26 *2* | 0.0 | 3/2$^+$ | | | |
| 942.57 | (1/2,3/2,5/2) | 753.5 *1* | 100 *50* | 189.054 | (3/2)$^-$ | | | |
| | | 942.6 *3* | 67 *30* | 0.0 | 3/2$^+$ | | | |
| 949.34 | (1/2$^-$,3/2,5/2$^+$) | 760.15 *15* | 100 *24* | 189.054 | (3/2)$^-$ | | | |
| | | 843.2[&] *3* | 81 *16* | 105.7524 | 5/2$^-$ | | | |
| | | 891.82 *14* | 48 *16* | 57.6741 | (3/2)$^-$ | | | $I_\gamma$: from $^{151}$Pr $\beta^-$. Other: 140 *12* (n,γ). |
| 964.09 | 1/2,3/2,5/2$^+$ | 714.49 *9* | 100 *10* | 249.568 | (5/2)$^-$ | | | |
| | | 941.89[b] *17* | 300[b] *37* | 22.4506 | (5/2)$^+$ | | | |
| 1065.72? | | 172.749[b] *19* | 13[b] *1* | 892.97 | 1/2$^-$,3/2$^-$ | | | |
| | | 329.417 *8* | <75 | 736.30 | (5/2,7/2$^-$) | | | |
| | | 876.26 *20* | 100 *15* | 189.054 | (3/2)$^-$ | | | |
| 1104.1 | | 1104.1 *2* | 100 | 0.0 | 3/2$^+$ | | | |
| 1130.68? | 1/2,3/2,5/2$^+$ | 794.95 *7* | 100 *10* | 335.72 | (7/2)$^-$ | | | |
| | | 941.89[b] *17* | 335[b] *41* | 189.054 | (3/2)$^-$ | | | |
| | | 1072.86[c] *14* | 118 *12* | 57.6741 | (3/2)$^-$ | | | |
| 1150.70 | 1/2,3/2,5/2$^+$ | 1074.80[c] *14* | 288 *29* | 75.857 | (7/2)$^+$ | | | |
| | | 1150.46 *10* | 100 *12* | 0.0 | 3/2$^+$ | | | |
| 1068.2+x | (25/2$^+$) | 383.6 | 100 | 684.4+x | (21/2$^+$) | | | |
| 1183.96? | 1/2,3/2,5/2$^+$ | 641.00 *6* | 100 | 542.80 | (1/2 to 7/2)$^+$ | | | |
| 1212.17? | 1/2,3/2,5/2$^+$ | 332.21 *10* | 25 *3* | 880.10 | (1/2,3/2)$^+$ | | | |
| | | 876.26 *20* | 100 *15* | 335.72 | (7/2)$^-$ | | | |
| | | 1154.5 *3* | <135 | 57.6741 | (3/2)$^-$ | | | |





$^{151}_{60}Nd_{91}$-8

## Adopted Levels, Gammas (continued)

### γ($^{151}$Nd) (continued)

| $E_i$(level) | $J_i^\pi$ | $E_\gamma$ † | $I_\gamma$ † | $E_f$ | $J_f^\pi$ |
|---|---|---|---|---|---|
| 1220.3 | 1/2,3/2,5/2$^+$ | 970.8 *3* | 100 | 249.568 | (5/2)$^-$ |
| 1229.84 | (1/2,3/2,5/2) | 1040.6 *2* | 100 *17* | 189.054 | (3/2)$^-$ |
| | | 1172.6 *3* | 56 *6* | 57.6741 | (3/2)$^-$ |
| | | 1229.8 *3* | 22 *14* | 0.0 | 3/2$^+$ |
| 1256.48 | | 105.899 *12* | 6 *1* | 1150.70 | 1/2,3/2,5/2$^+$ |
| | | 724.49 *11* | 15 *2* | 531.85 | (5/2$^-$,7/2$^-$) |
| | | 761.36 *17* | 17 *2* | 495.305 | (1/2)$^-$ |
| | | 1256.6 *20* | 100 *30* | 0.0 | 3/2$^+$ |
| 1436.82 | | 1436.83 *20* | 100 | 0.0 | 3/2$^+$ |
| 1449.6 | (1/2$^-$,3/2,5/2) | 1343.9 *3* | 100 *26* | 105.7524 | 5/2$^-$ |
| | | 1391.5 *4* | 28 *8* | 57.6741 | (3/2)$^-$ |
| | | 1449.8 *3* | 93 *15* | 0.0 | 3/2$^+$ |
| 1512.1 | | 1512.1 *3* | 100 | 0.0 | 3/2$^+$ |
| 1523.73 | (1/2,3/2,5/2) | 1466.1 *2* | 100 *16* | 57.6741 | (3/2)$^-$ |
| | | 1523.6 *3* | 58 *8* | 0.0 | 3/2$^+$ |
| 1575.57 | 1/2,3/2,5/2$^+$ | 138.57 *4* | 7 *1* | 1436.82 | |
| | | 626.233 *11* | 100 *10* | 949.34 | (1/2$^-$,3/2,5/2$^+$) |
| | | 1032.61 *10* | <53 | 542.80 | (1/2 to 7/2)$^+$ |
| 1520.6+x | (29/2$^+$) | 452.4 | 100 | 1068.2+x | (25/2$^+$) |
| 1638.2 | 1/2,3/2,5/2$^+$ | 1638.3 *2* | 100 | 0.0 | 3/2$^+$ |
| 1745.85 | | 170.247 *16* | 51 *5* | 1575.57 | 1/2,3/2,5/2$^+$ |
| | | 309.036 *14* | 100 *10* | 1436.82 | |
| | | 852.56 *20* | <123 | 892.97 | 1/2$^-$,3/2$^-$ |
| | | 1164.6 *3* | <159 | 581.0 | |
| 1792.13? | 1/2,3/2,5/2$^+$ | 579.8[b] *4* | 7[b] *1* | 1212.17? | 1/2,3/2,5/2$^+$ |
| | | 1192.99 *12* | 100 *13* | 599.22 | (5/2$^+$) |
| 1836.27 | | 579.8[b] *4* | 6[b] *1* | 1256.48 | |
| | | 685.49 *5* | 21 *3* | 1150.70 | 1/2,3/2,5/2$^+$ |
| | | 1341.22 *18* | 100 *10* | 495.305 | (1/2)$^-$ |
| 1844.28 | (1/2$^-$,3/2,5/2) | 1655.4 *3* | 94 *21* | 189.054 | (3/2)$^-$ |
| | | 1738.4 *3* | 34 *6* | 105.7524 | 5/2$^-$ |
| | | 1844.2 *3* | 100 *13* | 0.0 | 3/2$^+$ |
| 1878.09 | (1/2,3/2,5/2) | 1689.1 *3* | 13 *3* | 189.054 | (3/2)$^-$ |
| | | 1820.5 *3* | 33 *6* | 57.6741 | (3/2)$^-$ |
| | | 1878.0 *2* | 100 *13* | 0.0 | 3/2$^+$ |
| 1907.9 | | 1802.0 *3* | 51 *26* | 105.7524 | 5/2$^-$ |
| | | 1850.3 *3* | 100 *32* | 57.6741 | (3/2)$^-$ |
| 1951.94 | | 1420.02 *10* | 100 | 531.85 | (5/2$^-$,7/2$^-$) |
| 2094.31 | 1/2,3/2,5/2$^+$ | 1028.52 *10* | 100 | 1065.72? | |
| 2033.2+x | (33/2$^+$) | 512.6 | 100 | 1520.6+x | (29/2$^+$) |
| 2312.5 | (1/2$^-$,3/2,5/2) | 2206.7 *3* | 58 *16* | 105.7524 | 5/2$^-$ |
| | | 2254.8 *3* | 100 *30* | 57.6741 | (3/2)$^-$ |
| | | 2312.7 *4* | 35 *18* | 0.0 | 3/2$^+$ |





$^{151}_{60}Nd_{91}$-9

## Adopted Levels, Gammas (continued)

### $\gamma(^{151}Nd)$ (continued)

| $E_i$(level) | $J_i^\pi$ | $E_\gamma$ † | $I_\gamma$ † | $E_f$ | $J_f^\pi$ |
|---|---|---|---|---|---|
| 2341.4 | (1/2⁻,3/2,5/2) | 2235.6 *3* | 47 *10* | 105.7524 | 5/2⁻ |
| | | 2283.7 *3* | 100 *26* | 57.6741 | (3/2)⁻ |
| | | 2341.6 *4* | 37 *23* | 0.0 | 3/2⁺ |
| 2429.8 | | 2324.1 *4* | 39 *33* | 105.7524 | 5/2⁻ |
| 2429.8 | | 2372.1 *3* | 100 *33* | 57.6741 | (3/2)⁻ |
| 2600.8+x | (37/2⁺) | 567.6 | 100 | 2033.2+x | (33/2⁺) |
| 3220.8+x | (41/2⁺) | 620.0 | 100 | 2600.8+x | (37/2⁺) |

† Mostly from $^{150}$Nd(n,$\gamma$). A number of $\gamma$'s not classified in (n,$\gamma$) work (1976Pi13) have been placed by the evaluator. If a $\gamma$ is suspected of being partially due to a contaminant, the intensity is given as an upper limit.

‡ From ce data in (n,$\gamma$) and $^{151}$Pr $\beta^-$ decay.

# From (d,p$\gamma$). Intensities estimated by the evaluator are from the published spectra given in 1984Ka12.

@ Half of I$\gamma$ reported in (n,$\gamma$) assigned to this location.

& $\gamma$ from $^{151}$Pr $\beta^-$ only.

a Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on $\gamma$-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

b Multiply placed with undivided intensity.

c Placement of transition in the level scheme is uncertain.



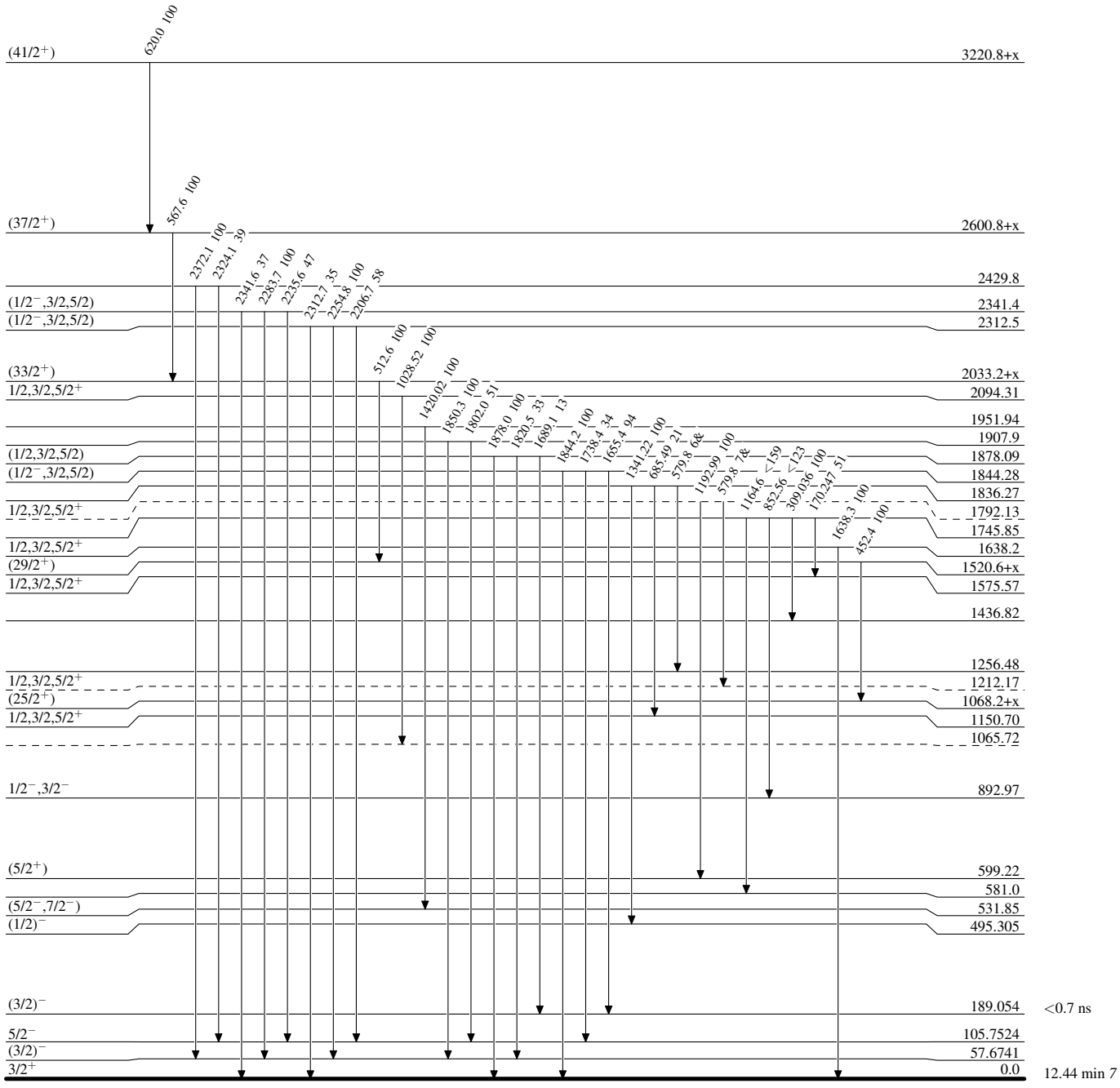


$^{151}_{60}Nd_{91}$-10

## Adopted Levels, Gammas

### Level Scheme

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

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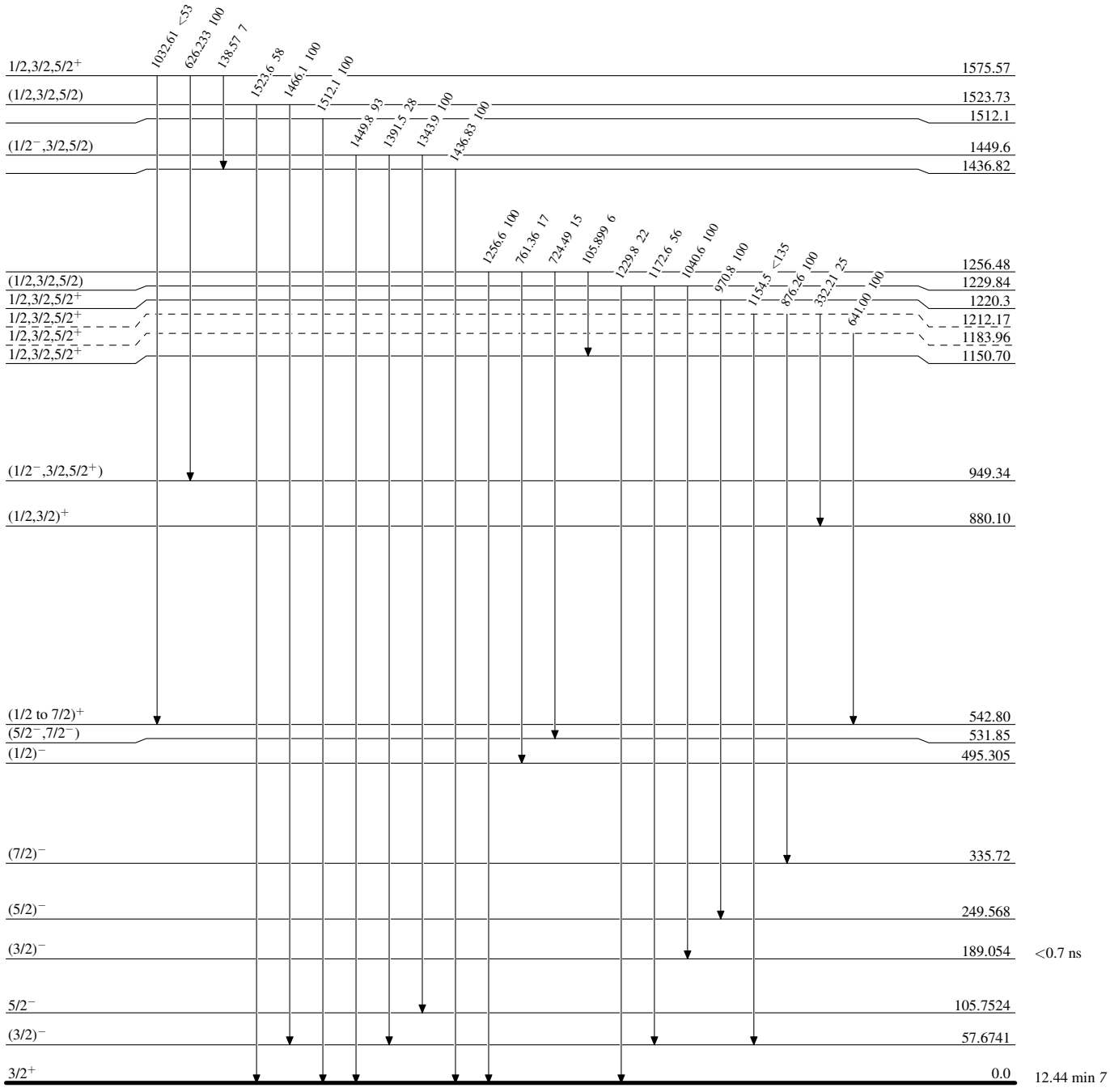
## Adopted Levels, Gammas

### Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given




$^{151}_{60}Nd_{91}$

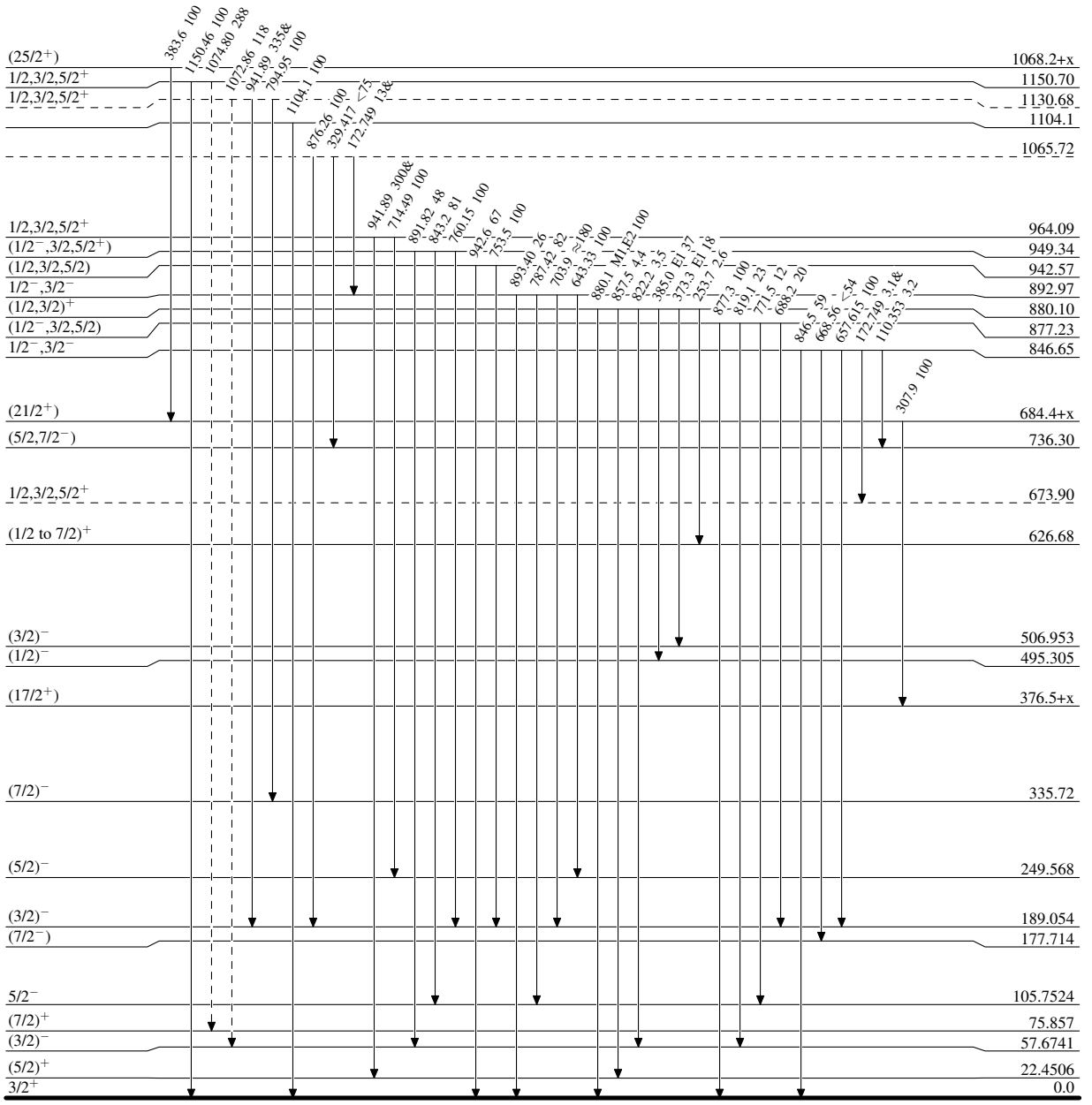
## Adopted Levels, Gammas

### Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

Legend

- - - - - - ► γ Decay (Uncertain)




$^{151}_{60}Nd_{91}$

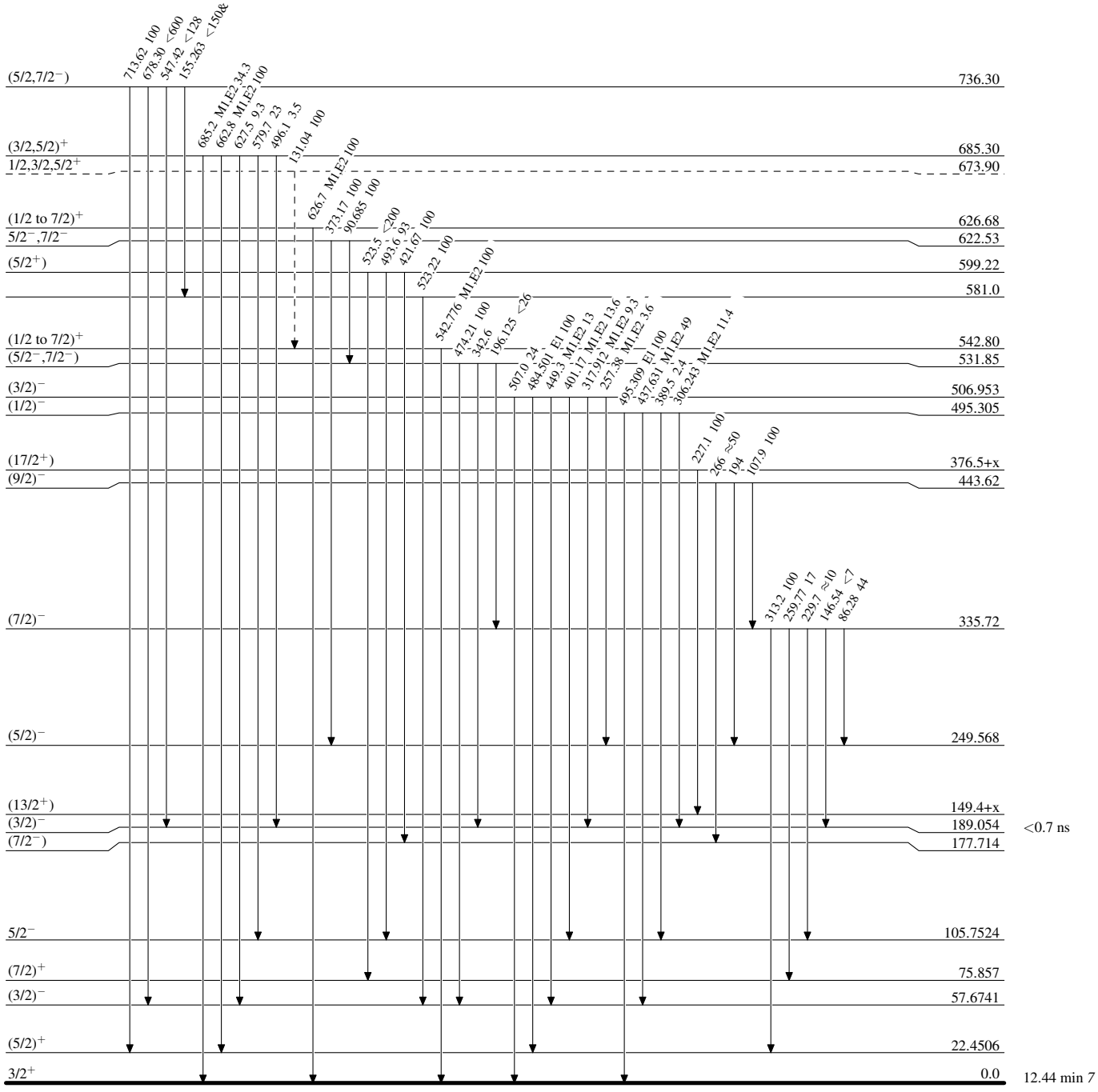
## Adopted Levels, Gammas

Legend

### Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

$\gamma$ Decay (Uncertain)




$^{151}_{60}Nd_{91}$

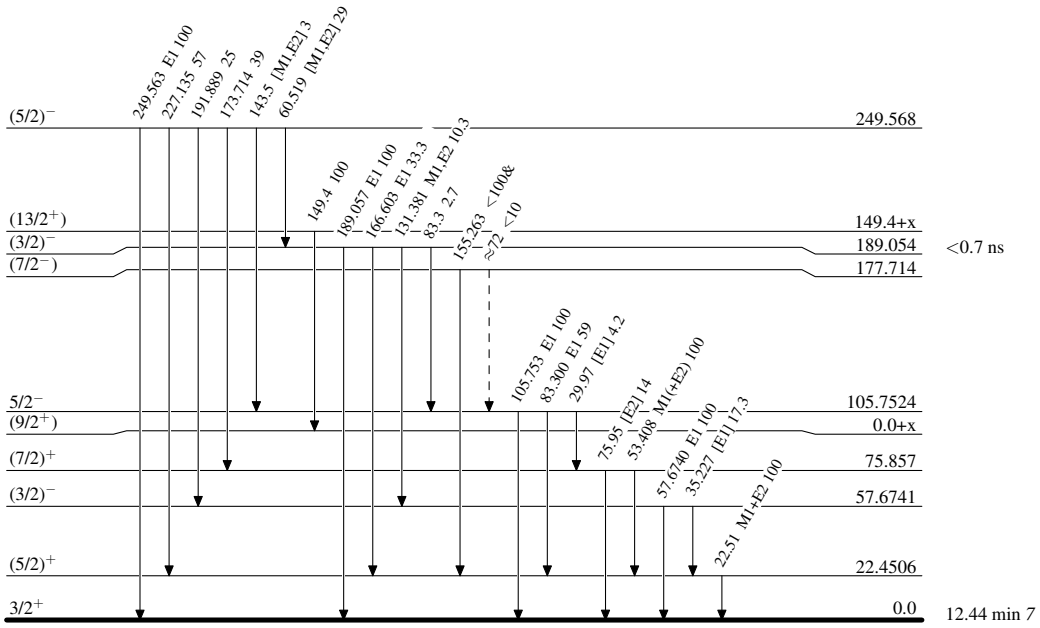
## Adopted Levels, Gammas

Legend

### Level Scheme (continued)

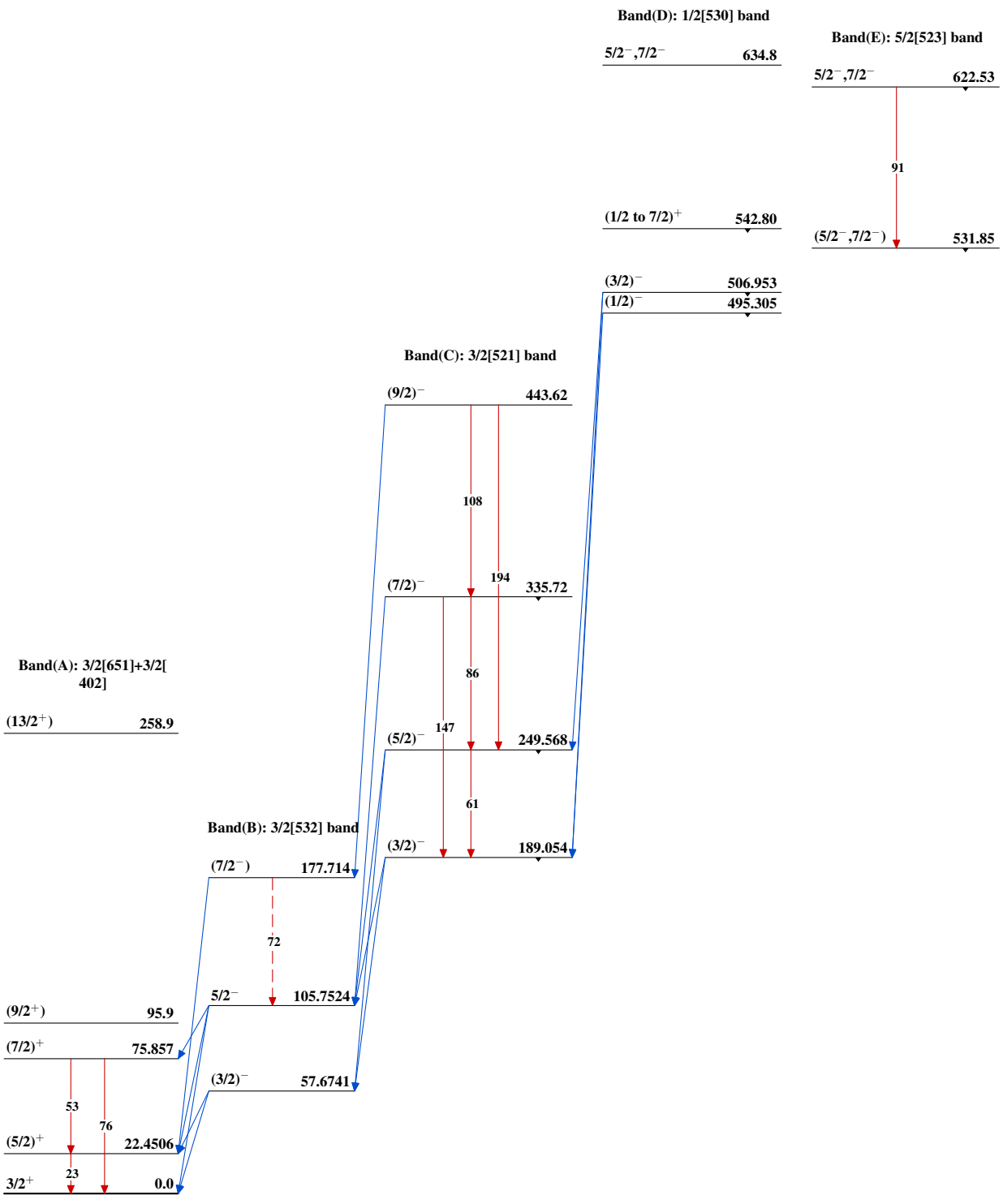
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

- - - - - - ► γ Decay (Uncertain)



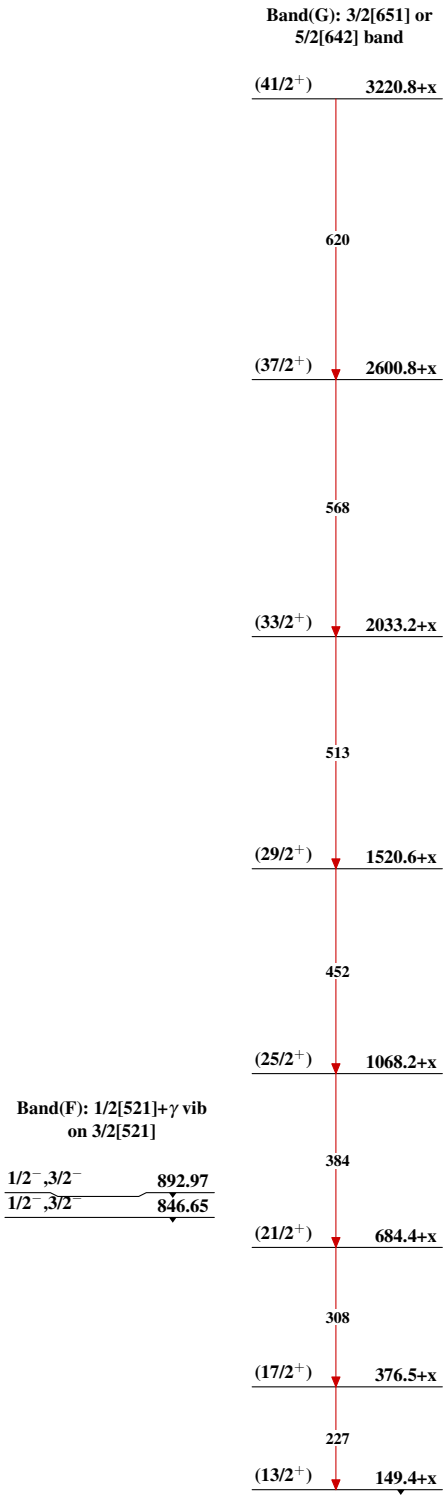

$^{151}_{60}Nd_{91}$

## Adopted Levels, Gammas




$^{151}_{60}Nd_{91}$

## Adopted Levels, Gammas (continued)




$^{151}_{60}Nd_{91}$