## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09

| Type | Author | History Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Jun Chen | NDS 146, 1 (2017) | 30-Sep-2017 |

2007Li12: E=64 MeV $^{14}$N beam was produced from the HI-13 tandem tandem accelerator at the China Institute of Atomic Energy (CIAE). Target was 3.3 mg/cm$^2$ isotopically enriched $^{128}$Te. $\gamma$ rays were detected with 14 Compton-suppressed Ge detectors (HWHM=1.8-2.2 keV at E$\gamma$=1.333 MeV). Measured E$\gamma$, I$\gamma$, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(DCO). Deduced levels, J, $\pi$, $\gamma$-ray branching and mixing ratios, multipolarities, band structures. Comparisons with cranked shell-model calculation. Systematics of neighboring isotopes.

2005Ga14: E=55-65 MeV $^{14}$N beam was produced from the 15UD Pelletron accelerator at the Nuclear Science Center, New Delhi. Target was about 800 $\mu$g/cm$^2$ thick prepared by evaporation 99.99% enriched $^{128}$Te onto a thin gold backing. $\gamma$ rays were detected with an array of 8 Compton-suppressed HPGe detectors with 14 BGO detectors. Measured E$\gamma$, I$\gamma$, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(DCO). Deduced levels, J, $\pi$, band structures. Comparisons with the Particle Rotor Model (PRM) calculations.

1992Ri09: E=55-63 MeV $^{14}$N beam was produced from the 8UD Pelletron tandem accelerator of the University of Sao Paulo. Target was of 930 $\mu$g/cm$^2$ enriched $^{128}$Te evaporated onto a 1 mg/cm$^2$ Ag backing. $\gamma$ rays were detected with 4 HPGe detectors and a NaI(Tl) detector. Measured E$\gamma$, $\gamma\gamma$-coin, $\gamma(\theta)$. Deduced levels, J, $\pi$, band structures. Comparisons with neighboring isotones.

Others: 2005Un01.

Level scheme is taken from 2007Li12.

### $^{138}$Pr Levels

| E(level)[†] | J$^\pi$[‡] | Comments |
|---|---|---|
| 364[#] *23* | 7$^-$ | Additional information 1.<br>Possible configuration=$\pi h_{11/2}\otimes\nu d_{3/2}$ (2005Ga14). |
| 382.8 *4* | (8) | |
| 563.1 *4* | 8$^-$ | Possible configuration=$\pi d_{5/2}\otimes\nu h_{11/2}$ (2005Ga14). |
| 696.3 *4* | (8$^-$) | |
| 912.5[f] *4* | (9$^+$) | |
| 1075.5 *4* | (8$^-$) | |
| 1078.1[@] *4* | (9$^+$) | J$^\pi$: assigned by 2007Li12 based on excitation energy systematics of $\pi h_{11/2}\otimes\nu h_{11/2}$ bands in the neighboring odd-odd nuclei. 2005Ga14 and 1992Ri09 assign $J^\pi=(8^+)$. |
| 1214.2[&] *6* | (10$^+$) | |
| 1327.6 *5* | (10$^-$) | |
| 1434.4 *5* | (10$^-$) | |
| 1599.4[f] *5* | (11$^+$) | |
| 1616.4[@] *6* | (11$^+$) | |
| 1938.3 *6* | (11$^+$) | |
| 2013.2[&] *6* | (12$^+$) | |
| 2420.7 *6* | (12$^+$) | |
| 2559.2[@] *6* | (13$^+$) | |
| 2610.8[a] *6* | (12$^+$) | |
| 2640.3[f] *6* | (13$^+$) | |
| 2689.2 *6* | (13$^+$) | |
| 2798.0[a] *6* | (13$^+$) | |
| 2878.2 *6* | (14$^+$) | |
| 2905.2[&] *6* | (14$^+$) | |
| 2981.9 *7* | (13$^+$) | |
| 3000.7 *8* | (13$^+$) | E(level): reported in 2005Ga14 and 1992Ri09 but not in 2007Li12.<br>J$^\pi$: from 2005Ga14. |
| 3049.7[a] *6* | (14$^+$) | |
| 3248.2[b] *7* | (14$^+$) | |

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## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09 (continued)

### $^{138}$Pr Levels (continued)

| E(level)† | Jπ‡ | E(level)† | Jπ‡ | E(level)† | Jπ‡ | E(level)† | Jπ‡ |
|---|---|---|---|---|---|---|---|
| 3294.0 *7* | (15$^+$) | 3832.9 *7* | (14) | 4481.1[c] *8* | (17$^+$) | 5420.5[c] *11* | (19$^+$) |
| 3357.5 *7* | (14$^+$) | 3920.1 *8* | (16$^-$) | 4561.8[d] *9* | (18$^+$) | 5466.0 *11* | (19$^+$) |
| 3390.9[a] *7* | (15$^+$) | 3935.2[b] *9* | (16$^+$) | 4798.1 *8* | (17) | 5596.4[e] *11* | (20$^-$) |
| 3400.3 *6* | (14$^-$) | 3965.6[c] *6* | (15$^+$) | 4821.2 *8* | (17) | 5898.2[d] *13* | (21$^+$) |
| 3510.3[f] *8* | (15$^+$) | 4108.5 *8* | (15) | 4893.0[c] *9* | (18$^+$) | 6040.4[e] *12* | (21$^-$) |
| 3545.2[b] *7* | (15$^+$) | 4186.9[c] *7* | (16$^+$) | 4947.8[d] *11* | (19$^+$) | 6108.4[c] *12* | (20$^+$) |
| 3552.2[@] *8* | (15$^+$) | 4188.2?[&] *5* | (16$^+$) | 4981.6[e] *8* | (18$^-$) | 6591.4[e] *8* | (22$^-$) |
| 3552.7 *8* | (15$^-$) | 4315.5[a] *9* | (17$^+$) | 5082.7[b] *12* | (18$^+$) | | |
| 3773.0[c] *6* | (14$^+$) | 4434.7[b] *10* | (17$^+$) | 5229.7[e] *9* | (19$^-$) | | |
| 3775.5[a] *8* | (16$^+$) | 4444.5 *8* | (16) | 5406.4[d] *12* | (20$^+$) | | |

† From a least-squares fit to $\gamma$-ray energies, assuming $\Delta E\gamma$=0.5 keV where not given and fixing level energy at 364 keV.
‡ From 2007Li12 based on measured DCO values, $\gamma$-ray intensity patterns, systematics of neighboring nuclei, unless otherwise noted.
# From Adopted Levels for $^{138}$Pr.
@ Band(A): $\pi h_{11/2}\otimes\nu h_{11/2}$, $\alpha$=1. Favored signature partner. Band crossing at $\hbar\omega\approx$0.36 MeV.
& Band(a): $\pi h_{11/2}\otimes\nu h_{11/2}$, $\alpha$=0. Unfavored signature partner. Band crossing at $\hbar\omega\approx$0.36 MeV.
[a] Band(B): $\pi g_{7/2}\otimes\nu(d_{3/2}h^2_{11/2})$, oblate (?).
[b] Band(C): $\pi d_{5/2}\otimes\nu(d_{3/2}h^2_{11/2})$, oblate (?).
[c] Band(D): $\pi h_{11/2}\otimes\nu h^3_{11/2}$, oblate (?).
[d] Band(E): Possible 6-quasiparticle, oblate band. Configuration=$\pi(g_{7/2}d^2_{5/2})\otimes\nu(d_{3/2}h^2_{11/2})$ (?).
[e] Band(F): Possible 6-quasiparticle, oblate band. Configuration=$\pi(d_{5/2}g_{7/2}h_{11/2})\otimes\nu(d_{3/2}h^2_{11/2})$ (?).
[f] Band(G): Band based on 912.5,(9$^+$) level.

### $\gamma$($^{138}$Pr)

Typical DCO values are ≈1.35 for a quadrupole ($\Delta$J=2) transition and ≈0.85 for a dipole ($\Delta$J=1) in 2007Li12. DCO values are also available in 2005Ga14 but no multipolarities and mixing ratios are deduced. For DCO values from 2005Ga14, DCO≈1 for $\Delta$J=2 or $\Delta$J=0 nonstretched pure dipole transitions gated on stretched E2 transitions while DCO ranged from 0-2 for mixed $\Delta$J=1 transitions with the same gate setting, depending on the value of $\delta$; for gating on strong $\Delta$J=1 predominantly dipole transition, DCO=1 $\Delta$J=1 transitions with small $\delta$ and values close to 0.5 for stretched E2 $\gamma$-rays. DCO(D) and DCO(Q) denote ratios whose gating transition was $\Delta$J=1 and $\Delta$J=2, respectively.

| $E_\gamma$† | $I_\gamma$‡ | $E_i$(level) | $J^\pi_i$ | $E_f$ | $J^\pi_f$ | Mult.# | Comments |
|---|---|---|---|---|---|---|---|
| (18.7) | | 382.8 | (8) | 364 | 7$^-$ | | |
| 133.1 | 5.8 *7* | 696.3 | (8$^-$) | 563.1 | 8$^-$ | | |
| 136.0 | 45.3 *18* | 1214.2 | (10$^+$) | 1078.1 | (9$^+$) | M1+E2 | $I_\gamma$: other: 33.4 *10* (2005Ga14).<br>DCO=0.91 *4* (2007Li12), DCO(D)=0.81 *5* (2005Ga14). |
| 152.5 | 2.2 *4* | 3552.7 | (15$^-$) | 3400.3 | (14$^-$) | (D+Q)[@] | $I_\gamma$: other: 2.9 *1* (2005Ga14).<br>DCO(D)=1.32 *15* (2005Ga14). |
| 160.4 | 0.5 *2* | 4981.6 | (18$^-$) | 4821.2 | (17) | (M1+E2,E1) | $I_\gamma$: other: 1.00 *3* (2005Ga14).<br>DCO=1.0 *4* (2007Li12). |
| 165.2 | 3.4 *4* | 1599.4 | (11$^+$) | 1434.4 | (10$^-$) | | $I_\gamma$: other: 1.9 *1* (2005Ga14). |
| 165.6 | 3.4 *4* | 1078.1 | (9$^+$) | 912.5 | (9$^+$) | | |
| 183.5 | 0.6 *2* | 4981.6 | (18$^-$) | 4798.1 | (17) | (M1+E2,E1) | $I_\gamma$: other: 1.1 *1* (2005Ga14).<br>DCO=1.1 *4* (2007Li12). |

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## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09 (continued)

### $\gamma(^{138}Pr)$ (continued)

| $E_\gamma$[†] | $I_\gamma$[‡] | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult.[#] | Comments |
|---|---|---|---|---|---|---|---|
| 187.2 | 3.5 *4* | 2798.0 | (13$^+$) | 2610.8 | (12$^+$) | M1+E2 | $I_\gamma$: other: 5.3 *2* (2005Ga14).<br>DCO=0.98 *11* (2007Li12), DCO(D)=0.90 *16* (2005Ga14). |
| 189.0 | 2.4 *3* | 2878.2 | (14$^+$) | 2689.2 | (13$^+$) | | $I_\gamma$: other: 2.4 *1* (2005Ga14). |
| 192.6 | 1.4 *2* | 3965.6 | (15$^+$) | 3773.0 | (14$^+$) | M1+E2 | $I_\gamma$: other: 2.3 *1* (2005Ga14).<br>DCO=1.03 *15* (2007Li12). |
| 199.0 | 100.0 *21* | 563.1 | 8$^-$ | 364 | 7$^-$ | M1+E2 | $I_\gamma$: other: 100.0 (2005Ga14).<br>DCO=0.74 *2* (2007Li12), DCO(D)=1.42 *4* (2005Ga14). |
| 216.0 | 1.0 *2* | 2905.2 | (14$^+$) | 2689.2 | (13$^+$) | D+Q[@] | $I_\gamma$: other: 4.2 *1* (2005Ga14).<br>DCO(D)=1.22 *16* (2005Ga14). |
| 216.3 | 8.0 *6* | 912.5 | (9$^+$) | 696.3 | (8$^-$) | D+Q[@] | $I_\gamma$: other: 11.9 *4* (2005Ga14).<br>DCO(D)=0.90 *10* (2005Ga14). |
| 221.3 | 1.7 *3* | 4186.9 | (16$^+$) | 3965.6 | (15$^+$) | M1+E2 | $I_\gamma$: other: 6.4 *2* (2005Ga14).<br>DCO=0.79 *14* (2007Li12), DCO(D)=1.00 *14* (2005Ga14). |
| 238.8 | 0.4 *1* | 2798.0 | (13$^+$) | 2559.2 | (13$^+$) | | |
| 246.3 | 0.6 *2* | 4561.8 | (18$^+$) | 4315.5 | (17$^+$) | | |
| 248.1 | 1.6 *3* | 5229.7 | (19$^-$) | 4981.6 | (18$^-$) | D+Q[@] | $I_\gamma$: other: 5.2 *2* (2005Ga14).<br>DCO(D)=1.13 *15* (2005Ga14). |
| 251.7 | 8.8 *9* | 3049.7 | (14$^+$) | 2798.0 | (13$^+$) | M1+E2 | $I_\gamma$: other: 13.3 *4* (2005Ga14).<br>DCO=0.90 *7* (2007Li12), DCO(D)=0.98 *10* (2005Ga14). |
| 251.8 | 1.9 *3* | 1327.6 | (10$^-$) | 1075.5 | (8$^-$) | | $I_\gamma$: other: 6.2 *3* (2005Ga14).<br>Mult.: DCO(D)=1.02 *14* (2005Ga14) indicates D+Q, but inconsistent with level-spin difference of (10$^-$) to (8$^-$). Note that there is a 251.7$\gamma$ with Mult.=M1+E2 from the 3050 level. |
| 271.6 | 2.3 *3* | 1599.4 | (11$^+$) | 1327.6 | (10$^-$) | D+Q[@] | $I_\gamma$: other: 4.0 *2* (2005Ga14).<br>DCO(Q)=0.83 *16* (2005Ga14). |
| 275.6 | 1.9 *3* | 4108.5 | (15) | 3832.9 | (14) | | $I_\gamma$: other: 1.1 *1* (2005Ga14). |
| 294.2 | 1.6 *3* | 4481.1 | (17$^+$) | 4186.9 | (16$^+$) | D+Q[@] | $I_\gamma$: other: 7.3 *2* (2005Ga14).<br>DCO(D)=1.16 *11* (2005Ga14). |
| 297.0 | 2.0 *3* | 3545.2 | (15$^+$) | 3248.2 | (14$^+$) | M1+E2 | DCO=0.80 *12* (2007Li12). |
| 319.0 | 1.4 *3* | 2878.2 | (14$^+$) | 2559.2 | (13$^+$) | D+Q[@] | $I_\gamma$: other: 3.4 *1* (2005Ga14).<br>DCO(D)=1.05 *16* (2005Ga14). |
| 321.9 | 1.9 *3* | 1938.3 | (11$^+$) | 1616.4 | (11$^+$) | | |
| 332.1 | 26.3 *12* | 696.3 | (8$^-$) | 364 | 7$^-$ | M1+E2 | $I_\gamma$: other: 24.0 *2* (2005Ga14).<br>DCO=0.89 *4* (2007Li12), DCO(D)=0.90 *7* (2005Ga14). |
| 336.0 | 1.7 *3* | 4444.5 | (16) | 4108.5 | (15) | (D+Q)[@] | $I_\gamma$: other: 2.5 *1* (2005Ga14).<br>DCO(D)=1.33 *20* (2005Ga14). |
| 341.2 | 5.1 *5* | 3390.9 | (15$^+$) | 3049.7 | (14$^+$) | M1+E2 | $I_\gamma$: other: 14.6 *5* (2005Ga14).<br>DCO=0.99 *10* (2007Li12), DCO(D)=0.98 *10* (2005Ga14). |
| 346.0 | 1.8 *3* | 2905.2 | (14$^+$) | 2559.2 | (13$^+$) | M1+E2 | $I_\gamma$: other: 4.1 *1* (2005Ga14).<br>DCO=1.01 *17* (2007Li12), DCO(D)=0.86 *16* (2005Ga14). |
| 349.4 | 4.4 *5* | 912.5 | (9$^+$) | 563.1 | 8$^-$ | (E1) | $I_\gamma$: other: 6.0 *2* (2005Ga14).<br>DCO=0.81 *9* (2007Li12), DCO(Q)=0.43 *12* (2005Ga14). |
| 353.6 | 0.8 *2* | 4798.1 | (17) | 4444.5 | (16) | (M1+E2,E1) | $I_\gamma$: other: 6.0 *1* (2005Ga14).<br>DCO=1.01 *25* (2007Li12), DCO(D)=1.25 *13* (2005Ga14). |
| 359.2 | 0.4 *1* | 1434.4 | (10$^-$) | 1075.5 | (8$^-$) | | $I_\gamma$: other: 2.7 *2* (2005Ga14). |
| 366.7 | 1.3 *3* | 5596.4 | (20$^-$) | 5229.7 | (19$^-$) | M1+E2 | $I_\gamma$: other: 4.1 *1* (2005Ga14).<br>DCO=0.98 *23* (2007Li12), DCO(D)=1.04 *17* (2005Ga14). |
| 367.4 | 1.8 *4* | 3920.1 | (16$^-$) | 3552.7 | (15$^-$) | D+Q[@] | $I_\gamma$: other: 3.9 *1* (2005Ga14).<br>DCO(Q)=0.49 *17* (2005Ga14). |
| 375.6 | 0.5 *2* | 3357.5 | (14$^+$) | 2981.9 | (13$^+$) | | |
| 376.7 | 0.7 *2* | 4821.2 | (17) | 4444.5 | (16) | | $I_\gamma$: other: 0.6 *1* (2005Ga14). |
| 377.3 | 0.3 *1* | 2798.0 | (13$^+$) | 2420.7 | (12$^+$) | | |
| 378.8 | 1.4 *3* | 1075.5 | (8$^-$) | 696.3 | (8$^-$) | | $I_\gamma$: other: 2.0 *1* (2005Ga14). |

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## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09 (continued)

### $\gamma$($^{138}$Pr) (continued)

| $E_\gamma$[†] | $I_\gamma$[‡] | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult.[#] | Comments |
|---|---|---|---|---|---|---|---|
| 384.6 | 3.8 *4* | 3775.5 | (16$^+$) | 3390.9 | (15$^+$) | D+Q[@] | $I_\gamma$: other: 13.3 *4* (2005Ga14).<br>DCO(D)=0.97 *8* (2005Ga14). |
| 386.0 | 2.1 *3* | 4947.8 | (19$^+$) | 4561.8 | (18$^+$) | | $E_\gamma$: 2005Ga14 place a 385.8$\gamma$ from a level at 4159, with DCO(D)=0.86 *18*. |
| 388.8 | 0.2 *1* | 3294.0 | (15$^+$) | 2905.2 | (14$^+$) | | $I_\gamma$: other: 2.1 *1* (2005Ga14). |
| 390.0 | 1.6 *3* | 3935.2 | (16$^+$) | 3545.2 | (15$^+$) | | |
| 396.8 | 27.5 *13* | 2013.2 | (12$^+$) | 1616.4 | (11$^+$) | M1+E2 | $I_\gamma$: other: 38.9 *12* (2005Ga14).<br>DCO=0.91 *4* (2007Li12), DCO(D)=1.03 *5* (2005Ga14). |
| 402.2 | 41.0 *16* | 1616.4 | (11$^+$) | 1214.2 | (10$^+$) | M1+E2 | $I_\gamma$: other: 50.0 *15* (2005Ga14).<br>DCO=0.80 *3* (2007Li12), DCO(D)=0.98 *5* (2005Ga14). |
| 411.9 | 1.2 *3* | 4893.0 | (18$^+$) | 4481.1 | (17$^+$) | M1+E2 | $I_\gamma$: other: 4.3 *2* (2005Ga14).<br>DCO=0.85 *21* (2007Li12), DCO(D)=1.05 *18* (2005Ga14). |
| 415.5 | 0.2 *1* | 3773.0 | (14$^+$) | 3357.5 | (14$^+$) | | |
| 415.8 | 1.5 *3* | 3294.0 | (15$^+$) | 2878.2 | (14$^+$) | | $I_\gamma$: other: 3.4 *1* (2005Ga14). |
| 420.4 | | 3965.6 | (15$^+$) | 3545.2 | (15$^+$) | | |
| 444.0 | 0.5 *2* | 6040.4 | (21$^-$) | 5596.4 | (20$^-$) | M1+E2 | $I_\gamma$: other: 2.5 *1* (2005Ga14).<br>DCO=0.9 *3* (2007Li12), DCO(D)=1.05 *20* (2005Ga14). |
| 458.6 | 1.7 *3* | 5406.4 | (20$^+$) | 4947.8 | (19$^+$) | D+Q[@] | $E_\gamma$: 2005Ga14 place a 457.7$\gamma$ from a level at 4617, with DCO(D)=0.99 *19*. |
| 485.7 | 1.1 *3* | 3390.9 | (15$^+$) | 2905.2 | (14$^+$) | | $I_\gamma$: other: 1.9 *1* (2005Ga14). |
| 490.5 | 2.0 *4* | 3049.7 | (14$^+$) | 2559.2 | (13$^+$) | D+Q[@] | $I_\gamma$: other: 4.3 *1* (2005Ga14).<br>DCO(D)=1.06 *19* (2005Ga14). |
| 491.8 | 1.2 *3* | 5898.2 | (21$^+$) | 5406.4 | (20$^+$) | | |
| 495.0 | 1.3 *3* | 3400.3 | (14$^-$) | 2905.2 | (14$^+$) | | $I_\gamma$: other: 2.0 *1* (2005Ga14). |
| 499.5 | 1.2 *3* | 4434.7 | (17$^+$) | 3935.2 | (16$^+$) | | |
| 500.5 | 0.7 *2* | 4981.6 | (18$^-$) | 4481.1 | (17$^+$) | | $I_\gamma$: other: 1.6 *1* (2005Ga14). |
| 515.0 | 76.2 *24* | 1078.1 | (9$^+$) | 563.1 | 8$^-$ | (E1) | $I_\gamma$: other: 74.8 *23* (2005Ga14).<br>DCO=0.68 *2* (2007Li12), DCO(D)=1.06 *5* (2005Ga14). |
| 527.5 | 0.6 *2* | 5420.5 | (19$^+$) | 4893.0 | (18$^+$) | M1+E2 | $I_\gamma$: other: 2.8 *1* (2005Ga14).<br>DCO=0.62 *21* (2007Li12). |
| 540.0 | 1.6 *4* | 4315.5 | (17$^+$) | 3775.5 | (16$^+$) | M1+E2 | $I_\gamma$: other: 4.9 *2* (2005Ga14).<br>DCO=0.78 *20* (2007Li12), DCO(D)=1.12 *15* (2005Ga14). |
| 546.0 | 16.2 *11* | 2559.2 | (13$^+$) | 2013.2 | (12$^+$) | M1+E2 | $I_\gamma$: other: 19.9 *6* (2005Ga14).<br>DCO=0.57 *4* (2007Li12), DCO(D)=0.96 *7* (2005Ga14). |
| 551.0[&] | 0.2 *1* | 6591.4 | (22$^-$) | 6040.4 | (21$^-$) | | $I_\gamma$: other: 0.4 *1* (2005Ga14). |
| 561.2 | 0.7 *2* | 2981.9 | (13$^+$) | 2420.7 | (12$^+$) | | |
| 573.0 | 0.3 *2* | 5466.0 | (19$^+$) | 4893.0 | (18$^+$) | | $I_\gamma$: other: 0.6 *1* (2005Ga14). |
| 580.0 | | 3000.7 | (13$^+$) | 2420.7 | (12$^+$) | | $E_\gamma$: observed in 2005Ga14 and 1992Ri09 but not 2007Li12. |
| 597.6 | 5.9 *7* | 2610.8 | (12$^+$) | 2013.2 | (12$^+$) | D+Q[@] | $I_\gamma$: other: 4.0 *2* (2005Ga14).<br>DCO(D)=1.12 *15* (2005Ga14). |
| 608.1 | 0.1 *1* | 3965.6 | (15$^+$) | 3357.5 | (14$^+$) | | |
| 647.0 | 0.9 *3* | 3552.2 | (15$^+$) | 2905.2 | (14$^+$) | | |
| 648.0 | 0.6 *2* | 5082.7 | (18$^+$) | 4434.7 | (17$^+$) | | |
| 672.5 | 2.0 *4* | 2610.8 | (12$^+$) | 1938.3 | (11$^+$) | | |
| 676.0 | 8.2 *9* | 2689.2 | (13$^+$) | 2013.2 | (12$^+$) | (M1+E2) | $I_\gamma$: other: 9.5 *3* (2005Ga14).<br>DCO=0.72 *8* (2007Li12), DCO(D)=1.01 *10* (2005Ga14). |
| 686.9 | 8.4 *9* | 1599.4 | (11$^+$) | 912.5 | (9$^+$) | E2 | $I_\gamma$: other: 16.1 *5* (2005Ga14).<br>DCO=1.15 *12* (2007Li12), DCO(Q)=0.94 *8* (2005Ga14). |
| 687.9 | 0.4 *2* | 6108.4 | (20$^+$) | 5420.5 | (19$^+$) | | $I_\gamma$: other: 0.9 *1* (2005Ga14). |
| 695.3 | 42.1 *20* | 1078.1 | (9$^+$) | 382.8 | (8) | (M1+E2,E1) | $I_\gamma$: other: 40.0 *2* (2005Ga14).<br>DCO=0.71 *3* (2007Li12), DCO(D)=0.98 *5* (2005Ga14). |
| 711.9 | 1.1 *3* | 1075.5 | (8$^-$) | 364 | 7$^-$ | D+Q[@] | $I_\gamma$: other: 5.6 *5* (2005Ga14).<br>DCO(Q)=0.47 *14* (2005Ga14). |
| 717.4 | | 3965.6 | (15$^+$) | 3248.2 | (14$^+$) | | $E_\gamma$: $\gamma$ shown in figure 1 of 2007Li12. |

Continued on next page (footnotes at end of table)

## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09 (continued)

### $\gamma(^{138}Pr)$ (continued)

| $E_\gamma$ [†] | $I_\gamma$ [‡] | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult.[#] | Comments |
|---|---|---|---|---|---|---|---|
| 723.3 | 1.5 *4* | 3773.0 | $(14^+)$ | 3049.7 | $(14^+)$ | | $I_\gamma$: other: 1.3 *1* (2005Ga14). |
| 724.1 | 4.5 *7* | 1938.3 | $(11^+)$ | 1214.2 | $(10^+)$ | | $I_\gamma$: other: 3.6 *2* (2005Ga14). |
| 738.0 | 2.9 *5* | 1434.4 | $(10^-)$ | 696.3 | $(8^-)$ | | $I_\gamma$: other: 4.1 *2* (2005Ga14). |
| 760.0 | 2.0 *5* | 3400.3 | $(14^-)$ | 2640.3 | $(13^+)$ | D+Q[@] | $I_\gamma$: other: 2.9 *1* (2005Ga14).<br>DCO(Q)=0.45 *17* (2005Ga14). |
| 764.7 | 0.4 *2* | 1327.6 | $(10^-)$ | 563.1 | $8^-$ | | $I_\gamma$: other: 9.7 *4* (2005Ga14). |
| 783.2[&] | 1.5 *8* | 3832.9 | (14) | 3049.7 | $(14^+)$ | | |
| 784.8 | 8.1 *9* | 2798.0 | $(13^+)$ | 2013.2 | $(12^+)$ | (M1+E2) | $I_\gamma$: other: 9.1 *3* (2005Ga14).<br>DCO=0.78 *9* (2007Li12), DCO(D)=0.97 *13* (2005Ga14). |
| 786.3 | 1.7 *4* | 4561.8 | $(18^+)$ | 3775.5 | $(16^+)$ | E2 | DCO=1.5 *3* (2007Li12). |
| 796.0 | 0.8 *3* | 4186.9 | $(16^+)$ | 3390.9 | $(15^+)$ | | $I_\gamma$: other:1.2 *1* (2005Ga14). |
| 799.0 | 7.3 *9* | 2013.2 | $(12^+)$ | 1214.2 | $(10^+)$ | E2 | $I_\gamma$: other: 13.0 *3* (2005Ga14).<br>DCO=1.43 *18* (2007Li12), DCO(D)=2.00 *10* (2005Ga14). |
| 804.3 | 0.7 *3* | 2420.7 | $(12^+)$ | 1616.4 | $(11^+)$ | | $I_\gamma$: other: 4.6 *2* (2005Ga14). |
| 860.1 | 0.9 *3* | 1938.3 | $(11^+)$ | 1078.1 | $(9^+)$ | | $I_\gamma$: other: 2.9 *2* (2005Ga14). |
| 865.0 | 0.9 *3* | 2878.2 | $(14^+)$ | 2013.2 | $(12^+)$ | | $I_\gamma$: other: 1.1 *1* (2005Ga14). |
| 870.0 | 1.7 *5* | 3510.3 | $(15^+)$ | 2640.3 | $(13^+)$ | E2 | $I_\gamma$: other: 3.0 *2* (2005Ga14).<br>DCO=1.1 *3* (2007Li12), DCO(Q)=1.22 *19* (2005Ga14). |
| 892.0 | 2.7 *6* | 2905.2 | $(14^+)$ | 2013.2 | $(12^+)$ | | $I_\gamma$: other: 0.8 *1* (2005Ga14). |
| 901.1 | 1.3 *4* | 4821.2 | (17) | 3920.1 | $(16^-)$ | | $I_\gamma$: other: 0.9 *1* (2005Ga14). |
| 915.9 | 2.5 *6* | 3965.6 | $(15^+)$ | 3049.7 | $(14^+)$ | | $I_\gamma$: other: 2.0 *1* (2005Ga14). |
| 942.8 | 2.2 *5* | 2559.2 | $(13^+)$ | 1616.4 | $(11^+)$ | | $I_\gamma$: other: 2.2 *1* (2005Ga14). |
| 975.0 | 1.2 *4* | 3773.0 | $(14^+)$ | 2798.0 | $(13^+)$ | | |
| 994.4 | 5.2 *8* | 2610.8 | $(12^+)$ | 1616.4 | $(11^+)$ | D+Q[@] | $I_\gamma$: other: 2.6 *1* (2005Ga14).<br>DCO(D)=0.81 *20* (2005Ga14). |
| 1041.0 | 11.6 *13* | 2640.3 | $(13^+)$ | 1599.4 | $(11^+)$ | E2 | $I_\gamma$: other: 16.6 *5* (2005Ga14).<br>DCO=1.52 *17* (2007Li12), DCO(Q)=1.16 *7* (2005Ga14). |
| 1072.8 | 1.0 *4* | 2689.2 | $(13^+)$ | 1616.4 | $(11^+)$ | | |
| 1181.6 | 0.2 *2* | 2798.0 | $(13^+)$ | 1616.4 | $(11^+)$ | | $I_\gamma$: other: 0.3 *1* (2005Ga14). |
| 1206.5 | 0.4 *3* | 2420.7 | $(12^+)$ | 1214.2 | $(10^+)$ | | |
| 1213.8 | 0.8 *4* | 3773.0 | $(14^+)$ | 2559.2 | $(13^+)$ | | $I_\gamma$: other: 1.2 *1* (2005Ga14). |
| 1235.0 | 2.8 *7* | 3248.2 | $(14^+)$ | 2013.2 | $(12^+)$ | E2 | DCO=1.3 *3* (2007Li12). |
| 1273.7 | 0.7 *3* | 3832.9 | (14) | 2559.2 | $(13^+)$ | | |
| 1283.0[&] | 0.4 *3* | 4188.2? | $(16^+)$ | 2905.2 | $(14^+)$ | | |
| 1396.6 | 3.6 *8* | 2610.8 | $(12^+)$ | 1214.2 | $(10^+)$ | | $I_\gamma$: other: 1.4 *1* (2005Ga14). |

[†] From 2007Li12, unless otherwise noted. Uncertainty is assumed to be $\Delta E\gamma$=0.5 keV where not given for fitting purpose.

[‡] From an e-mail reply of Mar 15, 2007 from the first author (M. L. Li) of 2007Li12 to the compilers (S. Geraedts and B. Singh), with values relative to I(199.0$\gamma$)=100.0 *21*. Data are also available in 2005Ga14, with values relative to I(199.0$\gamma$)=100.0.

[#] From 2007Li12 based on $\gamma\gamma(\theta)$(DCO), unless otherwise noted. When these assignments of multipolarities are considered in Adopted Gammas, D or Q are used instead of M1/E1 or M2/E2 if there is no experimental evidence for the assignments of polarities.

[@] Deduced by the evaluator based on $\gamma\gamma(\theta)$(DCO) in 2005Ga14.

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

**$^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09**

Level Scheme

Intensities: Relative $I_\gamma$

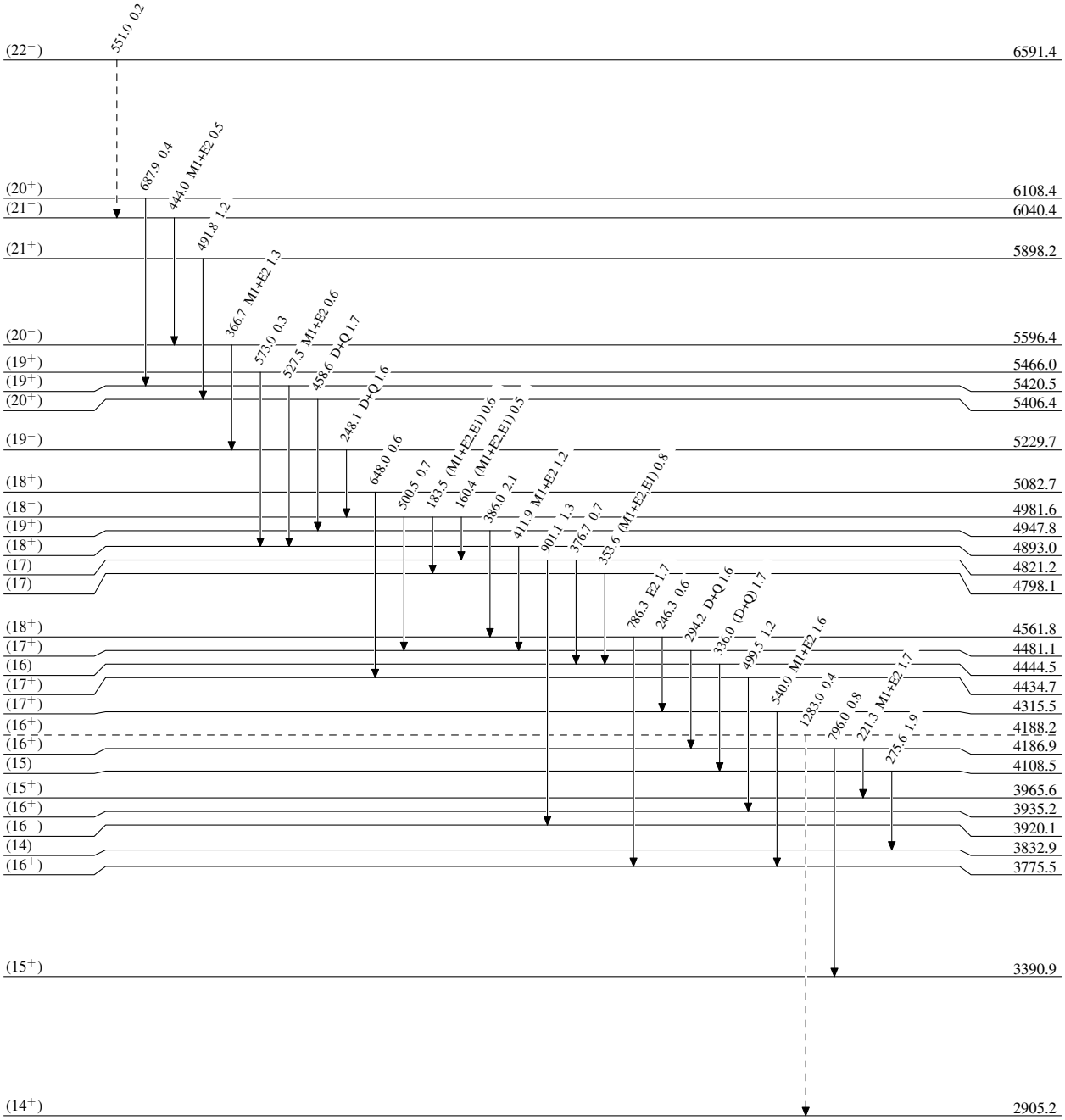
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

$\gamma$ Decay (Uncertain)



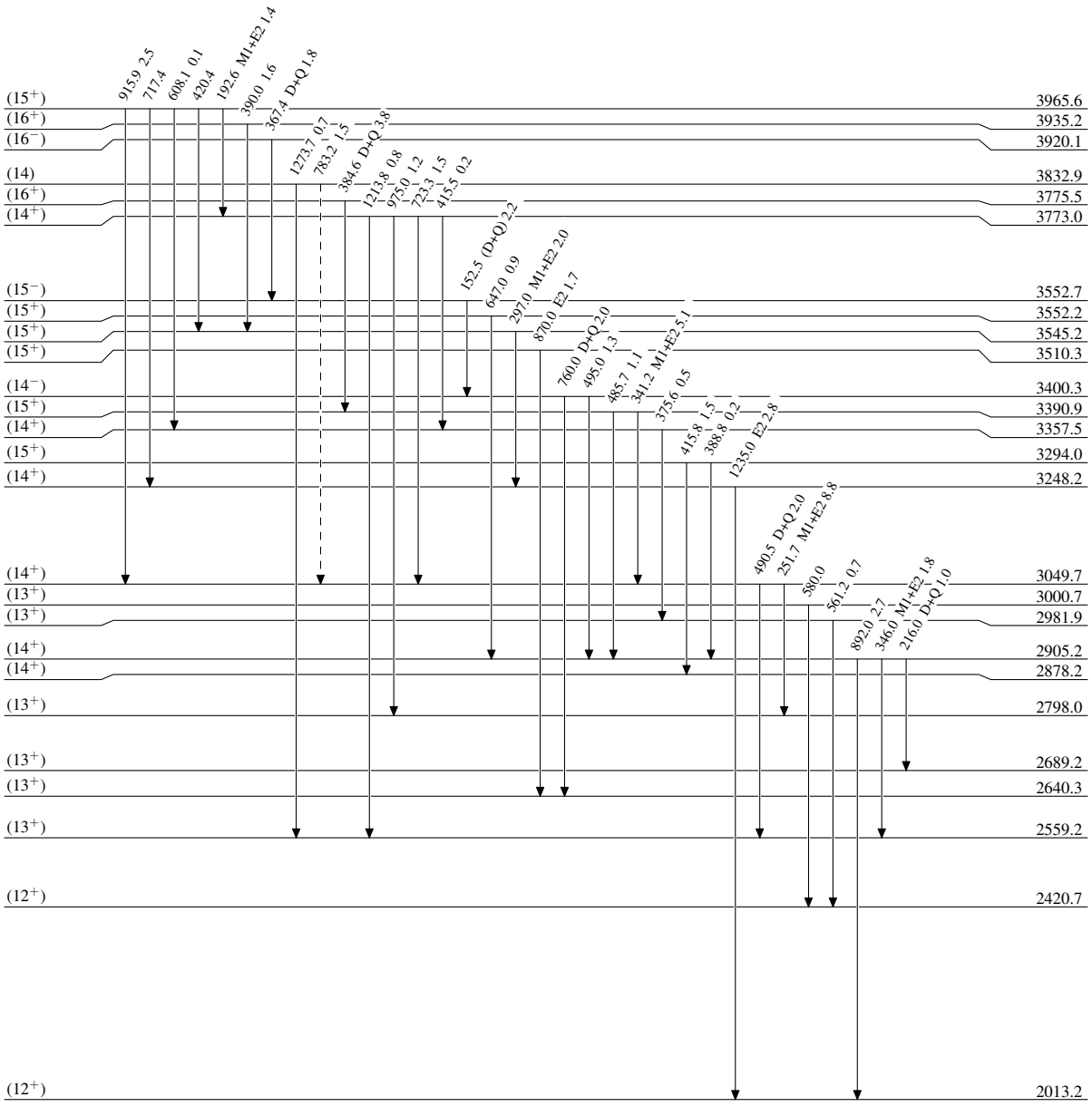

$^{138}_{59}Pr_{79}$

## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09

Level Scheme (continued)

Intensities: Relative $I_\gamma$

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- $\gamma$ Decay (Uncertain)



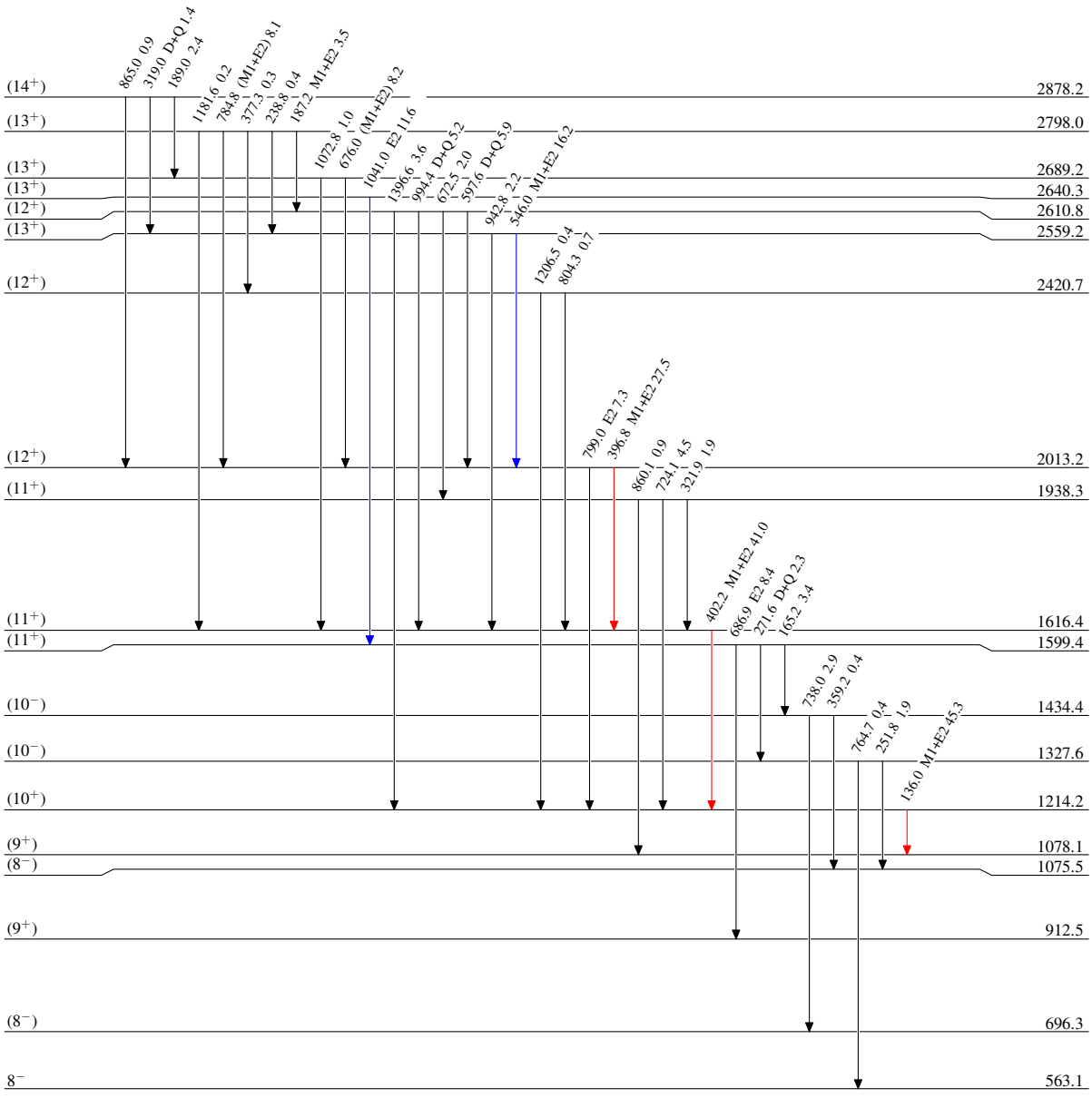

$^{138}_{59}Pr_{79}$

## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09

Level Scheme (continued)

Intensities: Relative $I_\gamma$

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

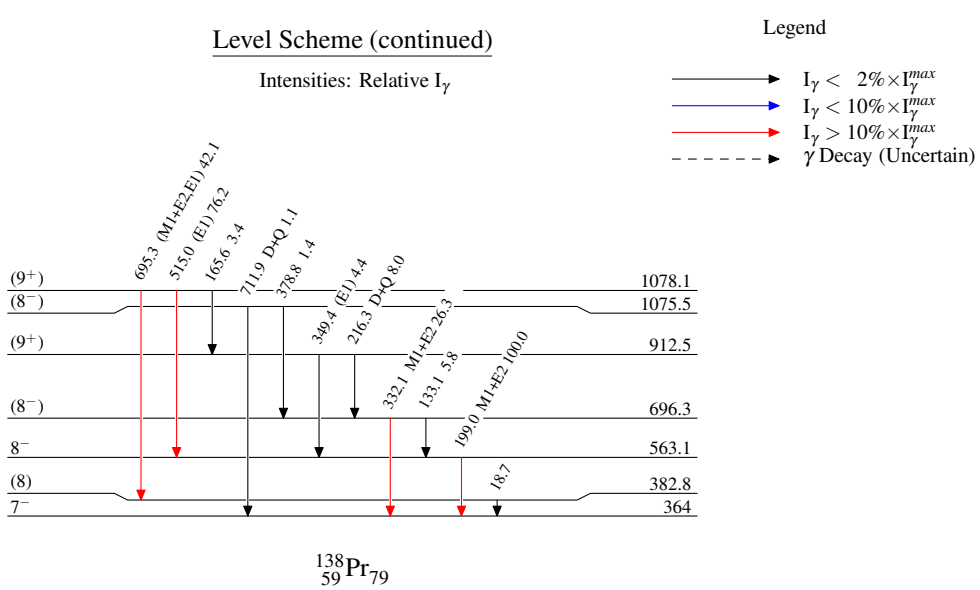



$^{138}_{59}Pr_{79}$

## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09

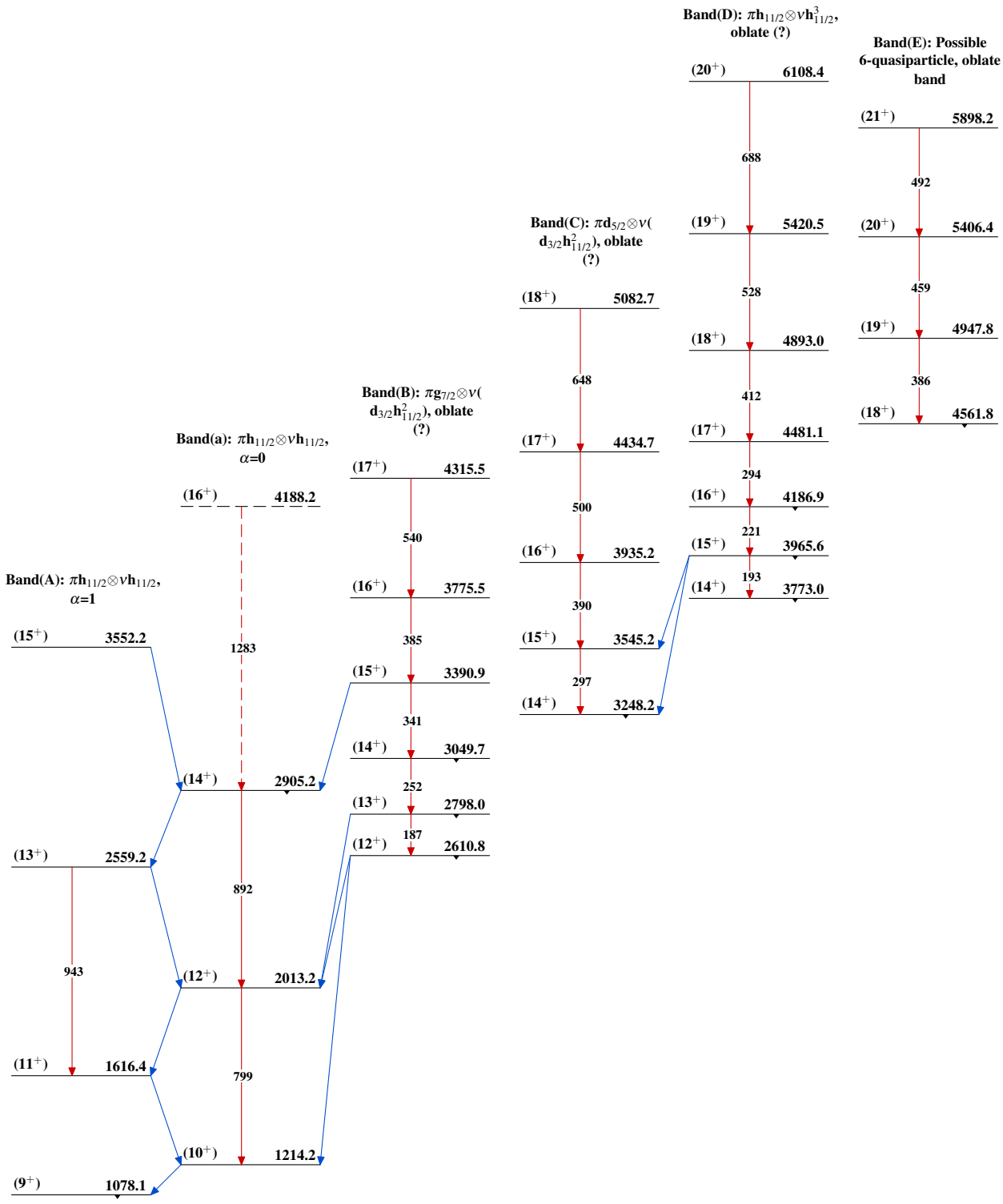
Level Scheme (continued)

Intensities: Relative $I_\gamma$



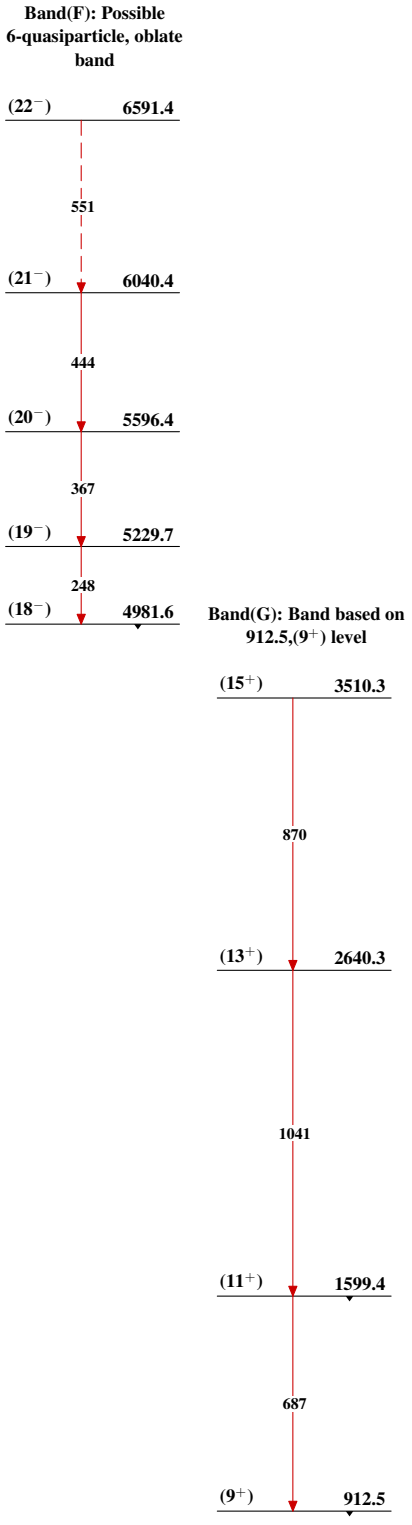

$^{138}_{59}Pr_{79}$

## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09




$^{138}_{59}Pr_{79}$

## $^{128}$Te($^{14}$N,4n$\gamma$) 2007Li12,2005Ga14,1992Ri09 (continued)




$^{138}_{59}Pr_{79}$