## $^{82}$Se($^{19}$F,5n$\gamma$) 2001Bu19

History

| Type | Author | Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | D. Abriola(a), A. A. Sonzogni | NDS 109, 2501 (2008) | 1-Apr-2008 |

Includes Zn($^{36}$S,$\alpha$pxn$\gamma$) at 130 MeV.
E($^{19}$F)=68 MeV. Measured E$\gamma$, I$\gamma$, $\gamma\gamma$ $\gamma(\theta)$ and $\gamma\gamma(\theta)$(DCO) using two intrinsic Ge detectors and a 1 liter NE213 scintillator.
E($^{36}$S)=130 MeV. Measured E$\gamma$, I$\gamma$, $\gamma\gamma$ $\gamma(\theta)$ and $\gamma\gamma(\theta)$(DCO) using ÉUROGAM ii array comprised of 30 tapered coaxial Ge detectors and 24 clover detectors, all with Compton suppression shields.
Other: 2000Gh01, $^{65}$Cu($^{36}$S,$\alpha$N$\gamma$) E=142 MeV, 36-Germanium Gammasphere array.

### $^{96}$Tc Levels

| E(level)† | J$^\pi$ | E(level)† | J$^\pi$ | E(level)† | J$^\pi$ | E(level)† | J$^\pi$ |
|---|---|---|---|---|---|---|---|
| 0@ | 7$^+$ | 1447.99# *24* | 9$^+$ | 2818.0 *4* | | 5187.3@ *7* | 18$^+$ |
| 45.0 *13* | 5$^+$ | 1704.10# *23* | 10$^+$ | 3021.8‡ *4* | 12$^+$ | 6116.5@ *7* | 19$^+$ |
| 49.09# *25* | 6$^+$ | 1862.1‡ *3* | 9$^+$ | 3292.3‡ *4* | 13$^+$ | 6390.9‡ *6* | (19$^+$) |
| 319.0 *8* | 6$^+$ | 1922.9@ *3* | 11$^+$ | 3538.7@ *5* | 15$^+$ | 6848.0‡ *7* | (20$^+$) |
| 575.01# *20* | 7$^+$ | 2149.0# *3* | 11$^+$ | 3547.8 *4* | (13) | 7188.5@ *10* | 20$^+$ |
| 885.1 *3* | 7$^+$ | 2214.8‡ *3* | 10$^+$ | 3780.3‡ *4* | 14$^+$ | 7624.5@ *11* | 21$^+$ |
| 927.10@ *22* | 9$^+$ | 2318.7@ *3* | 12$^+$ | 4012.4@ *6* | 17$^+$ | 8044.0‡ *12* | (21,22) |
| 947.03# *20* | 8$^+$ | 2398.5‡ *3* | 11$^+$ | 4122.2‡ *4* | 15$^+$ | 8756@ *2* | |
| 1062.82‡ *23* | 8$^+$ | 2600.9@ *4* | 13$^+$ | 4905.4‡ *5* | (17$^+$) | 10048‡ *2* | |

† From least-squares fit to E$\gamma$'s , assuming $\Delta$(E$\gamma$)=0.3 keV for $\gamma$'s given to one decimal place and 1 keV for others.
‡ Band(A): gamma sequence based on 8$^+$.
# Band(B): gamma sequence based on 6$^+$.
@ Band(C): gamma sequence based on 7$^+$.

### $\gamma$($^{96}$Tc)

DCO ratios correspond to gates on $\Delta$J=1, dipole transitions unless otherwise stated.

| E$_\gamma$ | I$_\gamma$ | E$_i$(level) | J$_i^\pi$ | E$_f$ | J$_f^\pi$ | Comments |
|---|---|---|---|---|---|---|
| 49.3 | | 49.09 | 6$^+$ | 0 | 7$^+$ | E$_\gamma$: from Adopted Gammas. |
| 135.7 | 2.7 *3* | 1062.82 | 8$^+$ | 927.10 | 9$^+$ | |
| 169.7 | 19.7 *7* | 2318.7 | 12$^+$ | 2149.0 | 11$^+$ | DCO=1.05 *7*, A$_2$=−0.074 *6*, A$_4$=−0.062 *7*. |
| 183.6 | 13.6 *5* | 2398.5 | 11$^+$ | 2214.8 | 10$^+$ | DCO=0.79 *18*, A$_2$=−0.214 *5*, A$_4$=−0.060 *7*. |
| 203.8 | 2.3 *4* | 3021.8 | 12$^+$ | 2818.0 | | |
| 226.0 | 10.2 *3* | 2149.0 | 11$^+$ | 1922.9 | 11$^+$ | A$_2$=+0.10 *5*, A$_4$=0.00 *7*. |
| 232.4 | 7.9 *3* | 3780.3 | 14$^+$ | 3547.8 | (13) | DCO=0.79 *18*, A$_2$=−0.10 *6*, A$_4$=−0.10 *8*. |
| 256 | 16.8 *5* | 575.01 | 7$^+$ | 319.0 | 6$^+$ | I$_\gamma$: combined for 256+256.0.<br>DCO=1.8 *4*, A$_2$=−0.020 *5*, A$_4$=−0.069 *7* all values for 256+256.0 doublet. |
| 256.0 | 16.8 *5* | 1704.10 | 10$^+$ | 1447.99 | 9$^+$ | I$_\gamma$: combined for 256.0+256 doublet.<br>DCO=1.8 *4*, A$_2$=−0.020 *5*, A$_4$=−0.069 *7*, all values for 256.0+256 doublet. |
| 270 | 0.90 *24* | 3292.3 | 13$^+$ | 3021.8 | 12$^+$ | A$_2$=−0.28 *16*, A$_4$=+0.12 *22*. |
| 274† | | 319.0 | 6$^+$ | 45.0 | 5$^+$ | |
| 282.3 | 55.7 *4* | 2600.9 | 13$^+$ | 2318.7 | 12$^+$ | DCO=0.46 *2* (quadrupole gated), A$_2$=−0.152 *11*, A$_4$=−0.023 *15*. |
| 310† | | 885.1 | 7$^+$ | 575.01 | 7$^+$ | |
| 341.7 | 22.1 *7* | 4122.2 | 15$^+$ | 3780.3 | 14$^+$ | DCO=1.00 *18*, A$_2$=−0.214 *5*, A$_4$=+0.016 *7*. |
| 352.7 | 28.7 *3* | 2214.8 | 10$^+$ | 1862.1 | 9$^+$ | DCO=1.09 *21*, A$_2$=−0.122 *22*, A$_4$=−0.005 *28*. |

Continued on next page (footnotes at end of table)

## $^{82}$Se($^{19}$F,5n$\gamma$) 2001Bu19 (continued)

### $\gamma$($^{96}$Tc) (continued)

| $E_\gamma$ | $I_\gamma$ | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Comments |
|---|---|---|---|---|---|---|
| 372.0 | 21.8 *6* | 947.03 | $8^+$ | 575.01 | $7^+$ | DCO=0.97 *7*, $A_2$=−0.028 *27*, $A_4$=−0.01 *4*. |
| 385.3 | 10.7 *6* | 1447.99 | $9^+$ | 1062.82 | $8^+$ | $A_2$=+0.31 *5*, $A_4$=−0.05 *7*. |
| 395.8 | 49.7 *4* | 2318.7 | $12^+$ | 1922.9 | $11^+$ | DCO=0.57 *3* (quadrupole gated), $A_2$=−0.086 *13*, $A_4$=0.000 *17*. |
| 419.5 | 2.6 *5* | 2818.0 | | 2398.5 | $11^+$ | |
| 436[†] | | 7624.5 | $21^+$ | 7188.5 | $20^+$ | |
| 444.9 | 7.9 *3* | 2149.0 | $11^+$ | 1704.10 | $10^+$ | $A_2$=−0.40 *8*, $A_4$=+0.28 *10*. |
| 457.1 | 10.3 *5* | 6848.0 | $(20^+)$ | 6390.9 | $(19^+)$ | DCO=1.14 *20*, $A_2$=−0.313 *5*, $A_4$=+0.011 *7*. |
| 473.7 | 25.5 *3* | 4012.4 | $17^+$ | 3538.7 | $15^+$ | DCO=1.04 *6* (quadrupole gated), $A_2$=+0.339 *24*, $A_4$=−0.08 *3*. |
| 487.7 | 24.2 *7* | 3780.3 | $14^+$ | 3292.3 | $13^+$ | $I_\gamma$: combined for 487.7+488.1 doublet.<br>DCO=1.16 *8*, $A_2$=−0.11 *4*, $A_4$=+0.01 *6*, all values for 488.1+487.7 doublet. |
| 488.1 | 24.2 *7* | 1062.82 | $8^+$ | 575.01 | $7^+$ | $I_\gamma$: combined for 488.1+487.7 doublet.<br>DCO=1.16 *8*, $A_2$=−0.11 *4*, $A_4$=+0.01 *6*, all values for 488.1+487.7 doublet. |
| 500.9 | 5.9 *6* | 1447.99 | $9^+$ | 947.03 | $8^+$ | $A_2$=−0.20 *11*, $A_4$=−0.06 *15*. |
| 510.8 | ≈6 | 2214.8 | $10^+$ | 1704.10 | $10^+$ | |
| 525.9 | 43.7 *6* | 3547.8 | (13) | 3021.8 | $12^+$ | $I_\gamma$: combined for 526.0+525.9 doublet.<br>DCO=0.92 *8*, $A_2$=−0.272 *22*, $A_4$=−0.04 *3* all values for 526.0+525.9 doublet. |
| 526.0 | 43.7 *6* | 575.01 | $7^+$ | 49.09 | $6^+$ | $I_\gamma$: combined for 526.0+525.9 doublet.<br>DCO=0.92 *8*, $A_2$=−0.272 *22*, $A_4$=−0.04 *3*, all values for 526.0+525.9 doublet. |
| 536.3 | 19.1 *12* | 2398.5 | $11^+$ | 1862.1 | $9^+$ | DCO=2.3 *9*, $A_2$=+0.32 *6*, $A_4$=−0.15 *8*. |
| 575.0 | 4.2 *5* | 575.01 | $7^+$ | 0 | $7^+$ | $A_2$=+1.1 *3*, $A_4$=+0.4 *3*. |
| 614.6 | 15.2 *6* | 2318.7 | $12^+$ | 1704.10 | $10^+$ | $A_2$=+0.79 *11*, $A_4$=0.00 *14*. |
| 623.2 | 12.2 *15* | 3021.8 | $12^+$ | 2398.5 | $11^+$ | DCO=0.95 *26*, $A_2$=+0.70 *13*, $A_4$=−0.25 *17*. |
| 757.3 | 7.9 *9* | 1704.10 | $10^+$ | 947.03 | $8^+$ | $A_2$=+0.25 *9*, $A_4$=−0.31 *13*. |
| 758.8 | 23.8 *7* | 3780.3 | $14^+$ | 3021.8 | $12^+$ | DCO=1.7 *3*, $A_2$=+0.241 *6*, $A_4$=−0.052 *7*. |
| 777.0 | 23.6 *5* | 1704.10 | $10^+$ | 927.10 | $9^+$ | $A_2$=+0.31 *4*, $A_4$=−0.01 *5*. |
| 783.2 | 14.1 *5* | 4905.4 | $(17^+)$ | 4122.2 | $15^+$ | DCO=1.5 *4*, $A_2$=+0.262 *6*, $A_4$=−0.038 *8*. |
| 799.3 | 28.9 *9* | 1862.1 | $9^+$ | 1062.82 | $8^+$ | DCO=1.21 *18*, $A_2$=−0.11 *6*, $A_4$=−0.05 *8*. |
| 807.0 | 22.2 *6* | 3021.8 | $12^+$ | 2214.8 | $10^+$ | DCO=1.8 *3*, $A_2$=+0.42 *6*, $A_4$=−0.14 *7*. |
| 830.0 | 4.7 *10* | 4122.2 | $15^+$ | 3292.3 | $13^+$ | $A_2$=+0.19 *18*, $A_4$=−0.15 *25*. |
| 872.8 | 7.5 *4* | 1447.99 | $9^+$ | 575.01 | $7^+$ | $A_2$=+0.48 *11*, $A_4$=+0.16 *13*. |
| 885.1 | 6.9 *4* | 885.1 | $7^+$ | 0 | $7^+$ | $A_2$=+0.57 *11*, $A_4$=−0.27 *14*. |
| 893.7 | 20.7 *4* | 3292.3 | $13^+$ | 2398.5 | $11^+$ | DCO=1.67 *18*, $A_2$=+0.26 *4*, $A_4$=−0.12 *5*. |
| 898.0 | 10.1 *5* | 947.03 | $8^+$ | 49.09 | $6^+$ | $A_2$=+0.36 *10*, $A_4$=−0.14 *13*. |
| 914.9 | 20.3 *5* | 1862.1 | $9^+$ | 947.03 | $8^+$ | DCO=0.97 *10*, $A_2$=−0.26 *4*, $A_4$=−0.06 *6*. |
| 927.1 | 100.0 *5* | 927.10 | $9^+$ | 0 | $7^+$ | $A_2$=+0.361 *13*, $A_4$=−0.103 *17*. |
| 929.2 | 10.1 *4* | 6116.5 | $19^+$ | 5187.3 | $18^+$ | $A_2$=+0.09 *7*, $A_4$=+0.01 *9*. |
| 937.8 | 35.5 *4* | 3538.7 | $15^+$ | 2600.9 | $13^+$ | DCO=1.03 *10* (quadrupole gated), $A_2$=+0.408 *21*, $A_4$=−0.14 *3*. |
| 947.0 | 16.2 *4* | 947.03 | $8^+$ | 0 | $7^+$ | $A_2$=−0.03 *5*, $A_4$=−0.20 *6*. |
| 995.8 | 68.2 *8* | 1922.9 | $11^+$ | 927.10 | $9^+$ | $I_\gamma$: contribution from 996$\gamma$ in $^{97}$Tc subtracted.<br>$A_2$=+0.337 *13*, $A_4$=−0.086 *18*. |
| 1013.6 | 15.1 *4* | 1062.82 | $8^+$ | 49.09 | $6^+$ | DCO=1.8 *4*, $A_2$=+0.47 *5*, $A_4$=+0.03 *7*. |
| 1072[†] | | 7188.5 | $20^+$ | 6116.5 | $19^+$ | |
| 1132[†] | | 8756 | | 7624.5 | $21^+$ | |
| 1152 | 5.7 *3* | 2214.8 | $10^+$ | 1062.82 | $8^+$ | $A_2$=+0.51 *18*, $A_4$=−0.20 *13*. |
| 1174.9 | 20.8 *5* | 5187.3 | $18^+$ | 4012.4 | $17^+$ | DCO=0.55 *11* (quadrupole gated), $A_2$=−0.32 *3*, $A_4$=+0.02 *4*. |
| 1179.5 | 3.8 *3* | 3780.3 | $14^+$ | 2600.9 | $13^+$ | $A_2$=−0.25 *15*, $A_4$=+0.16 *19*. |
| 1196.0 | 6.2 *4* | 8044.0 | (21,22) | 6848.0 | $(20^+)$ | DCO=1.5 *5*, $A_2$=+0.18 *11*, $A_4$=+0.09 *15*. |
| 1221.9 | 5.6 *8* | 2149.0 | $11^+$ | 927.10 | $9^+$ | $A_2$=+0.38 *12*, $A_4$=−0.09 *16*. |
| 1485.5 | 13.7 *5* | 6390.9 | $(19^+)$ | 4905.4 | $(17^+)$ | DCO=1.48 *23*, $A_2$=+0.250 *6*, $A_4$=−0.113 *8*. |
| 1508[†] | | 7624.5 | $21^+$ | 6116.5 | $19^+$ | |

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## $^{82}$Se($^{19}$F,5n$\gamma$) 2001Bu19 (continued)

### $\gamma$($^{96}$Tc) (continued)

| $E_\gamma$ | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ |
|---|---|---|---|---|
| 2001[†] | 7188.5 | $20^+$ | 5187.3 | $18^+$ |
| 2004[†] | 10048 | | 8044.0 | (21,22) |

[†] From figure 1 of 2001Bu19 (not listed in table 1 of 2001Bu19).

## $^{82}$Se($^{19}$F,5nγ) 2001Bu19

Level Scheme

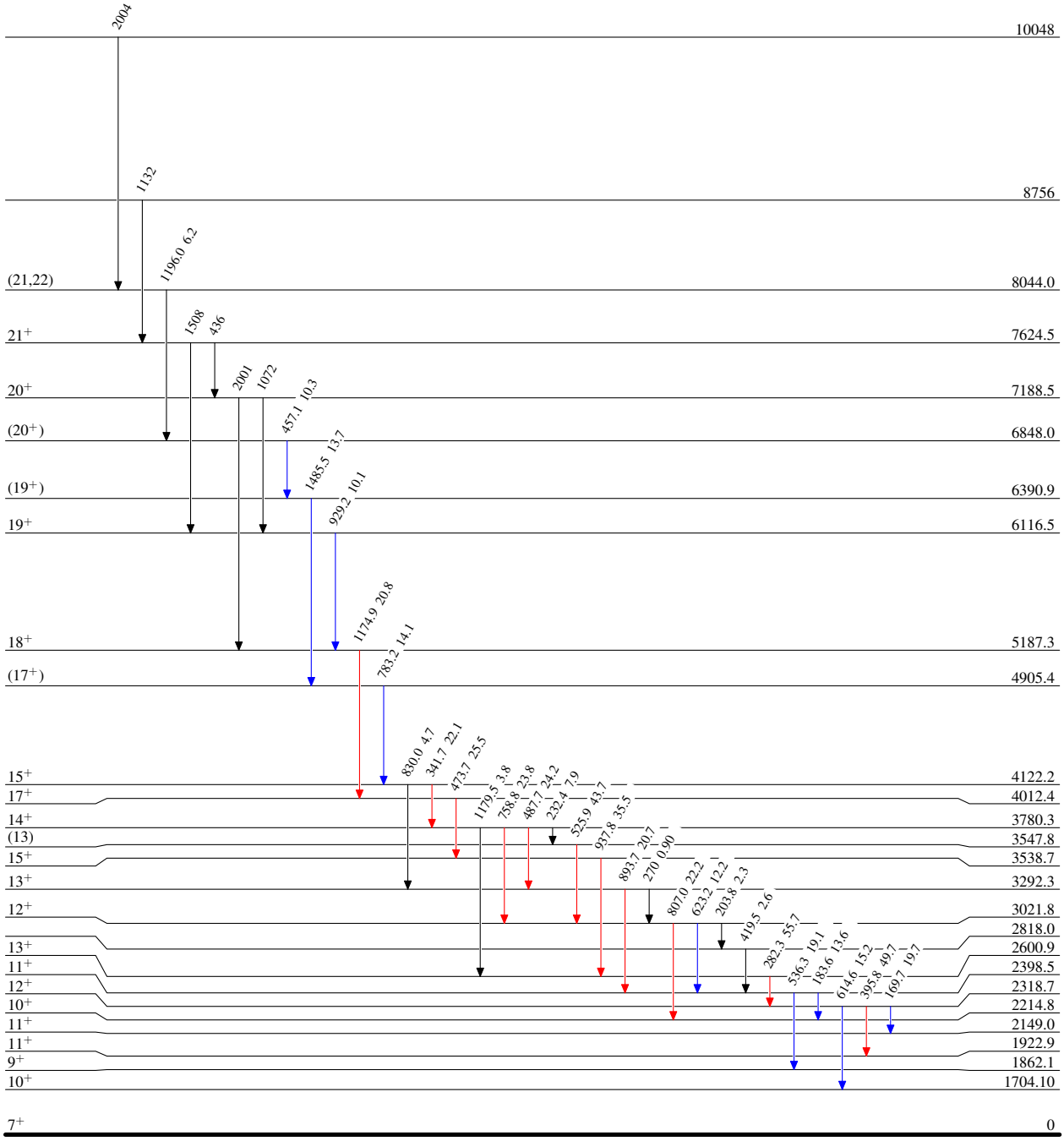
Intensities: Relative $I_\gamma$

Legend

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

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

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




$^{96}_{43}Tc_{53}$

**$^{82}$Se($^{19}$F,5nγ) 2001Bu19**

Level Scheme (continued)

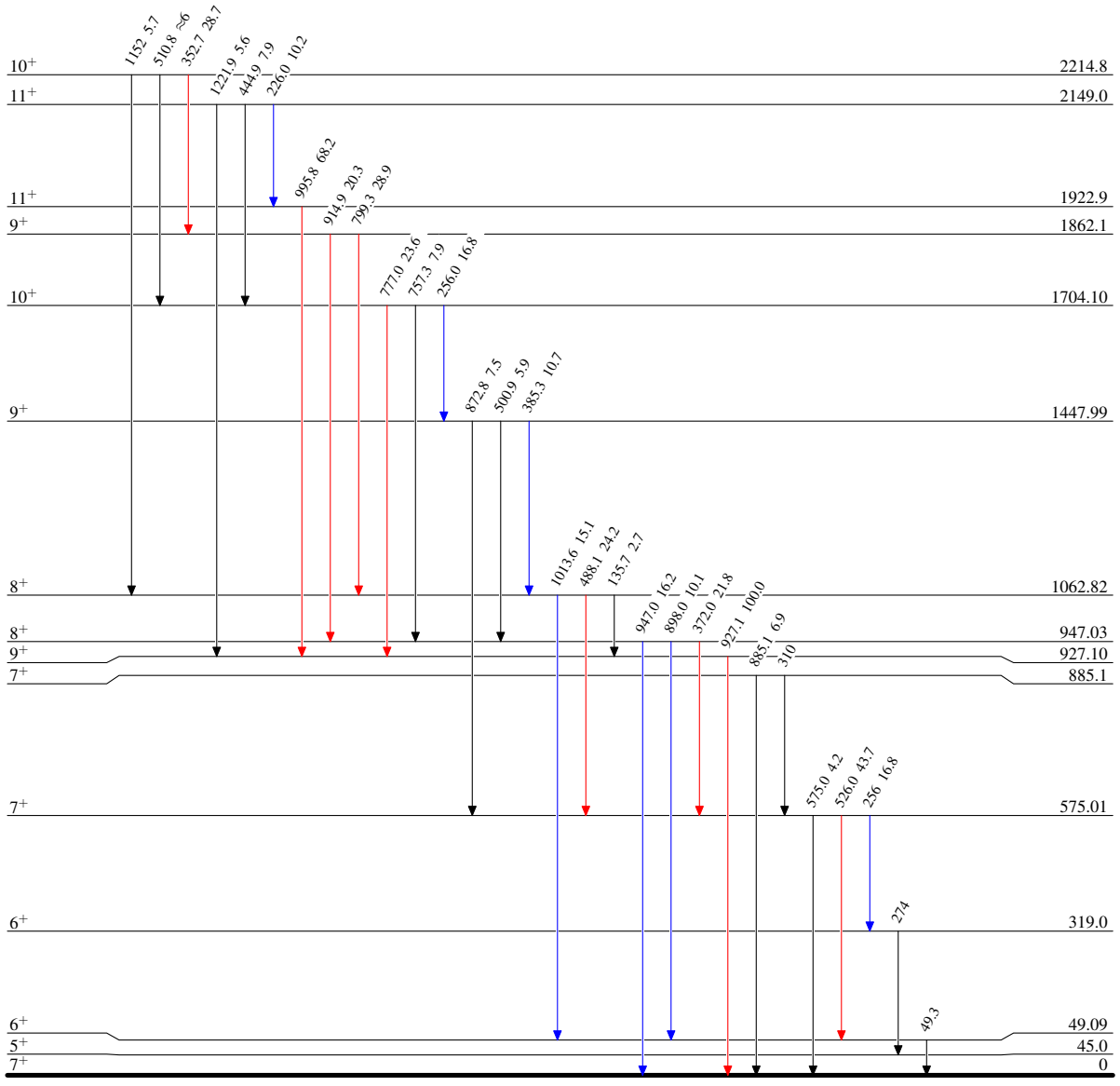
Intensities: Relative $I_\gamma$

Legend

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

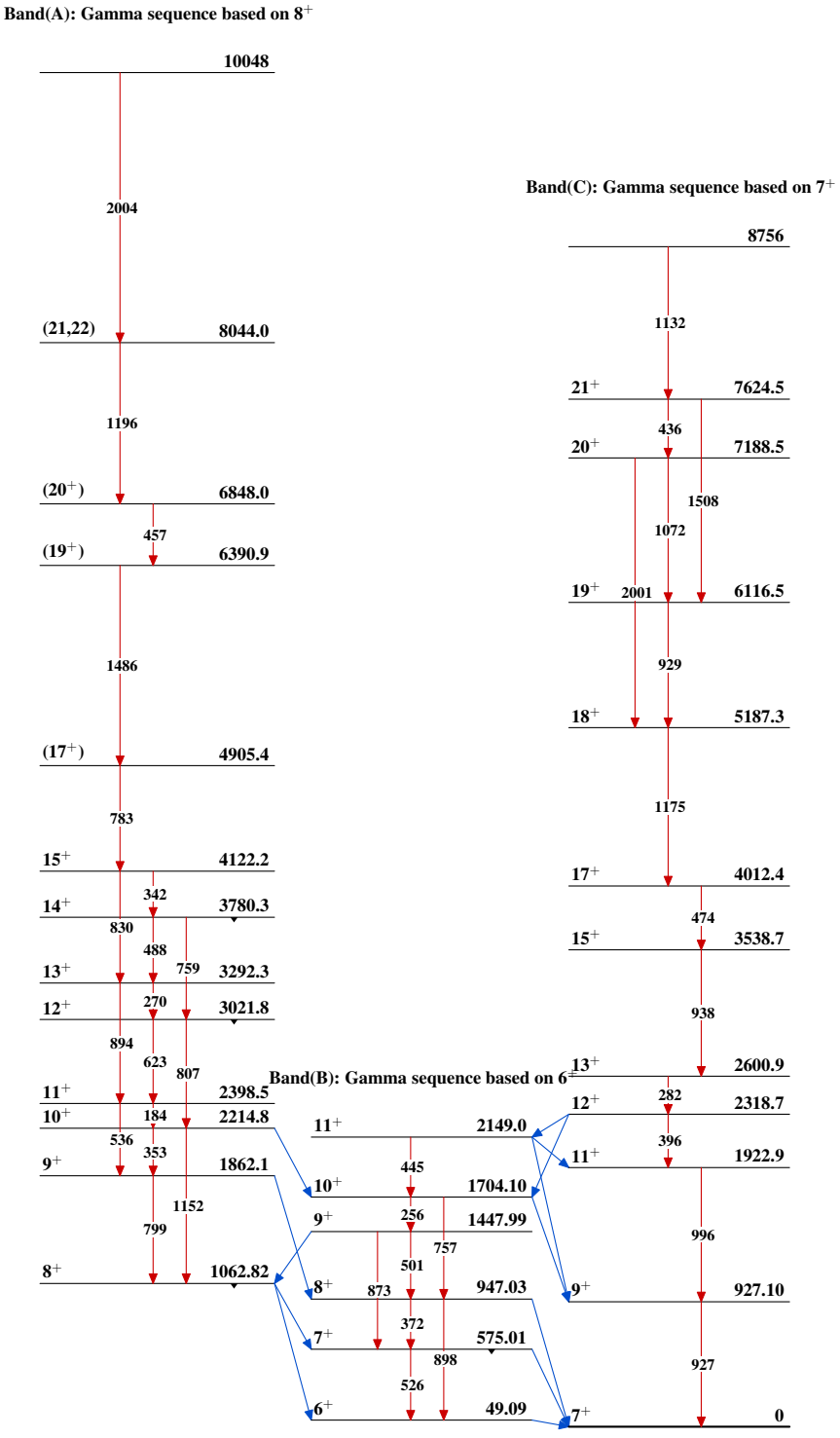
$I_\gamma < 10\% \times I_\gamma^{max}$

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




$^{96}_{43}Tc_{53}$

## $^{82}Se(^{19}F,5n\gamma)$ 2001Bu19




$^{96}_{43}Tc_{53}$