

$^{92}\text{Zr}(^{13}\text{C},3\text{n}\gamma)$  1976Gr12

| Type            | Author       | History Citation     | Literature Cutoff Date |
|-----------------|--------------|----------------------|------------------------|
| Full Evaluation | D. De Frenne | NDS 110, 1745 (2009) | 31-Dec-2008            |

1976Gr12:  $^{92}\text{Zr}(^{13}\text{C},3\text{n}\gamma)$ , E=45-56 MeV; measured:  $I_{\gamma}(E(^{13}\text{C}))$ ,  $I_{\gamma}(\theta)$ ,  $\gamma\gamma$ -coin,  $\gamma\gamma(\theta)$  from oriented nuclei, linear polarization.

 $^{102}\text{Pd}$  Levels

| E(level) <sup>a</sup>       | J <sup>π</sup> <sup>†</sup> | Comments                                                                                                                                         |
|-----------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 <sup>‡</sup>              | 0 <sup>+</sup>              |                                                                                                                                                  |
| 556.5 <sup>‡</sup> 5        | 2 <sup>+</sup>              |                                                                                                                                                  |
| 1275.78 <sup>‡</sup> 10     | 4 <sup>+</sup>              |                                                                                                                                                  |
| 1534.71 18                  | 2 <sup>+</sup>              |                                                                                                                                                  |
| 2111.27 <sup>‡</sup> 11     | 6 <sup>+</sup>              |                                                                                                                                                  |
| 2111.60 15                  | 3 <sup>+</sup>              |                                                                                                                                                  |
| 2137.76 12                  | 4 <sup>+</sup>              |                                                                                                                                                  |
| 2294.43 11                  | (4 <sup>-</sup> )           |                                                                                                                                                  |
| 2300.90 10                  | (4 <sup>+</sup> )           |                                                                                                                                                  |
| 2474.17 10                  | 5 <sup>-</sup>              | J <sup>π</sup> : J=5 from $\gamma(\theta)$ results of 1981Pi02; level populated by E2-cascade from 3727 level (J <sup>π</sup> =9 <sup>-</sup> ). |
| 2913.88 <sup>#</sup> 12     | 6 <sup>-</sup>              | J <sup>π</sup> : E2+M1 $\gamma$ to 5 <sup>-</sup> ; J=5,7 ruled out from $\gamma(\theta)$ and $\gamma$ (linear pol) results of 1981Pi02.         |
| 3012.99 <sup>‡</sup> 11     | 8 <sup>+</sup>              |                                                                                                                                                  |
| 3187.97 <sup>&amp;</sup> 12 | 7 <sup>-</sup>              |                                                                                                                                                  |
| 3340.18 12                  | 8 <sup>+</sup>              |                                                                                                                                                  |
| 3389.57? 16                 | (7 <sup>-</sup> )           |                                                                                                                                                  |
| 3670.40 <sup>#</sup> 12     | 8 <sup>-</sup>              |                                                                                                                                                  |
| 3727.64 <sup>@</sup> 12     | 9 <sup>-</sup>              |                                                                                                                                                  |
| 3889.17 <sup>&amp;</sup> 16 | (9 <sup>-</sup> )           |                                                                                                                                                  |
| 3992.64 <sup>‡</sup> 12     | 10 <sup>+</sup>             |                                                                                                                                                  |
| 4317.5 <sup>#</sup>         | 10 <sup>-</sup>             |                                                                                                                                                  |
| 4328.62 13                  | (10 <sup>+</sup> )          |                                                                                                                                                  |
| 4432.60 <sup>@</sup> 12     | 11 <sup>-</sup>             |                                                                                                                                                  |
| 4645.9 <sup>&amp;</sup> 3   | (11 <sup>-</sup> )          |                                                                                                                                                  |
| 4747.1 3                    |                             |                                                                                                                                                  |
| 4836.9?                     |                             |                                                                                                                                                  |
| 5055.03 <sup>‡</sup> 13     | 12 <sup>+</sup>             |                                                                                                                                                  |
| 5093.90 <sup>#</sup> 13     | 12 <sup>-</sup>             |                                                                                                                                                  |
| 5260.52 17                  | (12 <sup>+</sup> )          |                                                                                                                                                  |
| 5325.75 <sup>@</sup> 14     | 13 <sup>-</sup>             |                                                                                                                                                  |
| 5984.59 <sup>#</sup> 14     | 14 <sup>-</sup>             |                                                                                                                                                  |
| 6138.56 20                  | 14 <sup>+</sup>             |                                                                                                                                                  |
| 6222.7?                     | (14 <sup>+</sup> )          |                                                                                                                                                  |
| 6344.83 <sup>@</sup> 16     | 15 <sup>-</sup>             |                                                                                                                                                  |
| 6987.92 <sup>#</sup> 16     | 16 <sup>-</sup>             |                                                                                                                                                  |
| 7461.13 <sup>@</sup> 19     | 17 <sup>-</sup>             |                                                                                                                                                  |

<sup>†</sup> From  $\gamma$  mult and band structure.

<sup>‡</sup> Band(A): probable member of the g.s.  $\Delta J=2$  rotational band.

<sup>#</sup> Band(B): probable member of  $\Delta J=2$  rotational band on J<sup>π</sup>=6<sup>-</sup> level.

<sup>@</sup> Band(C): probable member of  $\Delta J=2$  rotational band on J<sup>π</sup>=9<sup>-</sup> level.

<sup>&</sup> Band(D): probable member of  $\Delta J=2$  rotational band on J<sup>π</sup>=7<sup>-</sup> level.

<sup>a</sup> Deduced by evaluators from a least-squares fit to  $\gamma$ -ray energies.

$^{92}\text{Zr}(^{13}\text{C},3n\gamma)$  **1976Gr12 (continued)** $\gamma(^{102}\text{Pd})$ 

| $E_\gamma$  | $I_\gamma$ | $E_i(\text{level})$ | $J_i^\pi$          | $E_f$    | $J_f^\pi$          | Mult. <sup>‡</sup> | $\delta^\dagger$ | Comments                                              |
|-------------|------------|---------------------|--------------------|----------|--------------------|--------------------|------------------|-------------------------------------------------------|
| 156.7 2     | 1.1 5      | 2294.43             | (4 <sup>-</sup> )  | 2137.76  | 4 <sup>+</sup>     |                    |                  |                                                       |
| 173.26 15   | 2.4 1      | 2474.17             | 5 <sup>-</sup>     | 2300.90  | (4 <sup>+</sup> )  | M2+E1              | -0.12 4          | $A_{22}=-0.370$ 26, $A_{44}=0.05$ 3.                  |
| 179.73 15   | 5.9 1      | 2474.17             | 5 <sup>-</sup>     | 2294.43  | (4 <sup>-</sup> )  | E2+M1              | +0.47 6          | $A_{22}=0.353$ 17, $A_{44}=-0.11$ 20.                 |
| 182.83 15   | 3.3 2      | 2294.43             | (4 <sup>-</sup> )  | 2111.60  | 3 <sup>+</sup>     | [M2+E1]            | -0.05 5          | $A_{22}=-0.260$ 21, $A_{44}=0.053$ 26.                |
| 274.1 2     | 3.1 3      | 3187.97             | 7 <sup>-</sup>     | 2913.88  | 6 <sup>-</sup>     | E2+M1              | +0.17 2          | $A_{22}=0.037$ 23, $A_{44}=0.019$ 29.                 |
| 327.20 5    | 6.9 3      | 3340.18             | 8 <sup>+</sup>     | 3012.99  | 8 <sup>+</sup>     | E2+M1              | -0.19 5          | $A_{22}=0.281$ 19, $A_{44}=-0.005$ 23.                |
| 336.0 1     | 5.6 4      | 4328.62             | (10 <sup>+</sup> ) | 3992.64  | 10 <sup>+</sup>    |                    |                  |                                                       |
| 336.4 1     | 8.5 6      | 2474.17             | 5 <sup>-</sup>     | 2137.76  | 4 <sup>+</sup>     |                    |                  |                                                       |
| 338.1 2     | 2.6 2      | 3727.64             | 9 <sup>-</sup>     | 3389.57? | (7 <sup>-</sup> )  |                    |                  | $A_{22}=0.41$ 11, $A_{44}=-0.13$ 7.                   |
| 387.50 10   | 2.9 3      | 3727.64             | 9 <sup>-</sup>     | 3340.18  | 8 <sup>+</sup>     | M2+E1              | -0.15 4          | $A_{22}=-0.43$ 5, $A_{44}=-0.11$ 6.                   |
| 439.7 2     | 9.3 7      | 2913.88             | 6 <sup>-</sup>     | 2474.17  | 5 <sup>-</sup>     | E2+M1              | +0.32 3          | $A_{22}=0.214$ 20, $A_{44}=0.045$ 20.                 |
| 439.7 2     | 9.3 7      | 4432.60             | 11 <sup>-</sup>    | 3992.64  | 10 <sup>+</sup>    |                    |                  |                                                       |
| 482.43 10   | 2.5 1      | 3670.40             | 8 <sup>-</sup>     | 3187.97  | 7 <sup>-</sup>     | E2+M1              | +1.6 7           | $A_{22}=0.57$ 6, $A_{44}=0.22$ 5.                     |
| 508.3 @ 3   | 3.6 5      | 4836.9?             |                    | 4328.62  | (10 <sup>+</sup> ) |                    |                  |                                                       |
| 539.7 1     | 4.4 4      | 3727.64             | 9 <sup>-</sup>     | 3187.97  | 7 <sup>-</sup>     | E2                 |                  | $A_{22}=0.191$ 19, $A_{44}=-0.055$ 25.                |
| 556.41 5    | 100        | 556.5               | 2 <sup>+</sup>     | 0        | 0 <sup>+</sup>     | E2                 |                  | $A_{22}=0.272$ 10, $A_{44}=-0.080$ 10\$ Pol=0.454 14. |
| 590.0 1     | 2.1 3      | 4317.5              | 10 <sup>-</sup>    | 3727.64  | 9 <sup>-</sup>     | E2+M1              |                  | $A_{22}=-0.20$ 6, $A_{44}=0.11$ 8.                    |
| 619.4 2     | 3.1 4      | 2913.88             | 6 <sup>-</sup>     | 2294.43  | (4 <sup>-</sup> )  | E2                 |                  | $\delta=0.01$ 4 or <-8.                               |
| 647.18 5    | 7.9 2      | 4317.5              | 10 <sup>-</sup>    | 3670.40  | 8 <sup>-</sup>     | E2                 |                  | $A_{22}=0.13$ 4, $A_{44}=-0.05$ 3.                    |
| 701.22 # 10 | 4.8 2      | 3889.17             | (9 <sup>-</sup> )  | 3187.97  | 7 <sup>-</sup>     | E2                 |                  | $A_{22}=0.308$ 20, $A_{44}=-0.079$ 26.                |
| 704.95 5    | 20.3 5     | 4432.60             | 11 <sup>-</sup>    | 3727.64  | 9 <sup>-</sup>     | E2                 |                  | $A_{22}=0.29$ 4, $A_{44}=-0.06$ 5.                    |
| 713.8 2     | 12.2 11    | 3187.97             | 7 <sup>-</sup>     | 2474.17  | 5 <sup>-</sup>     | E2                 |                  | $A_{22}=0.308$ 16, $A_{44}=-0.107$ 20.                |
| 714.7 2     | 14.0 9     | 3727.64             | 9 <sup>-</sup>     | 3012.99  | 8 <sup>+</sup>     | M2+E1              | -0.05 4          | $A_{22}=-0.29$ 5, $A_{44}=0.02$ 5.                    |
| 719.34 10   | 81.6 22    | 1275.78             | 4 <sup>+</sup>     | 556.5    | 2 <sup>+</sup>     | E2                 |                  | $A_{22}=0.280$ 10, $A_{44}=-0.081$ 1.                 |
| 756.5 2     | 7.4 9      | 3670.40             | 8 <sup>-</sup>     | 2913.88  | 6 <sup>-</sup>     | E2                 |                  | $A_{22}=0.279$ 22, $A_{44}=-0.100$ 30.                |
| 756.7 # 1   | 7.4 9      | 4645.9              | (11 <sup>-</sup> ) | 3889.17  | (9 <sup>-</sup> )  | E2                 |                  | $A_{22}=0.279$ 22, $A_{44}=-0.100$ 30.                |
| 776.3 1     | 8.4 6      | 5093.90             | 12 <sup>-</sup>    | 4317.5   | 10 <sup>-</sup>    | E2                 |                  | $A_{22}=0.326$ 21, $A_{44}=-0.131$ 27.                |
| 835.49 5    | 61.3 10    | 2111.27             | 6 <sup>+</sup>     | 1275.78  | 4 <sup>+</sup>     | E2                 |                  | $A_{22}=0.301$ 11, $A_{44}=-0.091$ 12.                |
| 890.7 1     | 4.0 11     | 5984.59             | 14 <sup>-</sup>    | 5093.90  | 12 <sup>-</sup>    | E2                 |                  | $A_{22}=0.300$ 20, $A_{44}=-0.105$ 26.                |
| 893.14 7    | 13.7 3     | 5325.75             | 13 <sup>-</sup>    | 4432.60  | 11 <sup>-</sup>    | E2                 |                  | $A_{22}=0.272$ 22, $A_{44}=-0.097$ 29.                |
| 901.7 1     | 49.8 8     | 3012.99             | 8 <sup>+</sup>     | 2111.27  | 6 <sup>+</sup>     | E2                 |                  | $A_{22}=0.287$ 12, $A_{44}=-0.085$ 13.                |
| 931.9 1     | 5.4 7      | 5260.52             | (12 <sup>+</sup> ) | 4328.62  | (10 <sup>+</sup> ) | E2                 |                  | $A_{22}=0.300$ 23, $A_{44}=-0.135$ 30.                |
| 962.2 @ 2   | 3.2 6      | 6222.7?             | (14 <sup>+</sup> ) | 5260.52  | (12 <sup>+</sup> ) | E2                 |                  | $A_{22}=0.19$ 13, $A_{44}=-0.04$ 5.                   |
| 978.3 4     |            | 1534.71             | 2 <sup>+</sup>     | 556.5    | 2 <sup>+</sup>     |                    |                  |                                                       |
| 979.66 5    | 24.4 5     | 3992.64             | 10 <sup>+</sup>    | 3012.99  | 8 <sup>+</sup>     | E2                 |                  | $A_{22}=0.0279$ 15, $A_{44}=-0.095$ 18.               |
| 988.45 20   | 3.5 1      | 4328.62             | (10 <sup>+</sup> ) | 3340.18  | 8 <sup>+</sup>     | (E2)               |                  | $A_{22}=0.19$ 5, $A_{44}=0.19$ 5.                     |
| 1003.3 1    | 3.5 6      | 6987.92             | 16 <sup>-</sup>    | 5984.59  | 14 <sup>-</sup>    | E2                 |                  | $A_{22}=0.01$ 5, $A_{44}=-0.04$ 7.                    |
| 1018.6 1    | 5.2 7      | 2294.43             | (4 <sup>-</sup> )  | 1275.78  | 4 <sup>+</sup>     |                    |                  | $A_{22}=0.154$ , $A_{44}=-0.064$ 24.                  |
|             |            |                     |                    |          |                    |                    |                  | Possibly Doppler broadened.                           |
| 1019.1 1    | 7.1 7      | 6344.83             | 15 <sup>-</sup>    | 5325.75  | 13 <sup>-</sup>    | E2                 |                  | $A_{22}=0.154$ 18, $A_{44}=-0.064$ 24.                |
| 1019.5 4    | 7.1 7      | 4747.1              |                    | 3727.64  | 9 <sup>-</sup>     |                    |                  | $A_{22}=0.154$ 18, $A_{44}=-0.064$ 24.                |
| 1062.41 5   | 10.3 3     | 5055.03             | 12 <sup>+</sup>    | 3992.64  | 10 <sup>+</sup>    | E2                 |                  | $A_{22}=0.239$ 21, $A_{44}=-0.085$ 28.                |
| 1083.53 15  | 4.3 2      | 6138.56             | 14 <sup>+</sup>    | 5055.03  | 12 <sup>+</sup>    | E2                 |                  | $A_{22}=0.31$ 6, $A_{44}=0.00$ 18.                    |
| 1116.3 2    | 4.0 4      | 7461.13             | 17 <sup>-</sup>    | 6344.83  | 15 <sup>-</sup>    | E2                 |                  | $A_{22}=0.09$ 4, $A_{44}=0.07$ 6.                     |
| 1198.37 10  | 3.4 1      | 2474.17             | 5 <sup>-</sup>     | 1275.78  | 4 <sup>+</sup>     | M2+E1              | -0.04 6          | $A_{22}=-0.27$ 7, $A_{44}=-0.02$ 9.                   |
| 1228.94 20  | 1.4 1      | 3340.18             | 8 <sup>+</sup>     | 2111.27  | 6 <sup>+</sup>     | E2                 |                  | $A_{22}=0.10$ 10, $A_{44}=0.05$ 5.                    |
| 1278.31 15  | 3.6 1      | 3389.57?            | (7 <sup>-</sup> )  | 2111.27  | 6 <sup>+</sup>     | M2+E1              | -0.05 4          |                                                       |
| 1534.7 2    | 0.9 1      | 1534.71             | 2 <sup>+</sup>     | 0        | 0 <sup>+</sup>     |                    |                  | $A_{22}=0.13$ 19, $A_{44}=-0.11$ 27.                  |
| 1555.16 20  | 2.8 1      | 2111.60             | 3 <sup>+</sup>     | 556.5    | 2 <sup>+</sup>     | E2+M1              |                  | $A_{22}=0.07$ 6, $A_{44}=0.11$ 6.                     |
|             |            |                     |                    |          |                    |                    |                  | $\delta=0.24$ 6 or <15.                               |
| 1581.29 20  | 9.4 2      | 2137.76             | 4 <sup>+</sup>     | 556.5    | 2 <sup>+</sup>     | E2                 |                  | $A_{22}=0.306$ 24, $A_{44}=-0.10$ 3.                  |
| 1744.5 1    | 2.1 6      | 2300.90             | (4 <sup>+</sup> )  | 556.5    | 2 <sup>+</sup>     |                    |                  |                                                       |

Continued on next page (footnotes at end of table)

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$^{92}\text{Zr}(^{13}\text{C},3\text{n}\gamma)$     **1976Gr12 (continued)**

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$\gamma(^{102}\text{Pd})$  (continued)

<sup>†</sup> Weighted average of values from directional correlation of oriented nuclei (R(DCO)) and angular distribution results.

<sup>‡</sup> From  $\gamma(\theta)$  and  $\gamma(\text{linear pol})$ .

# The sequence of these  $\gamma$ -rays may be reversed.

@ Placement of transition in the level scheme is uncertain.

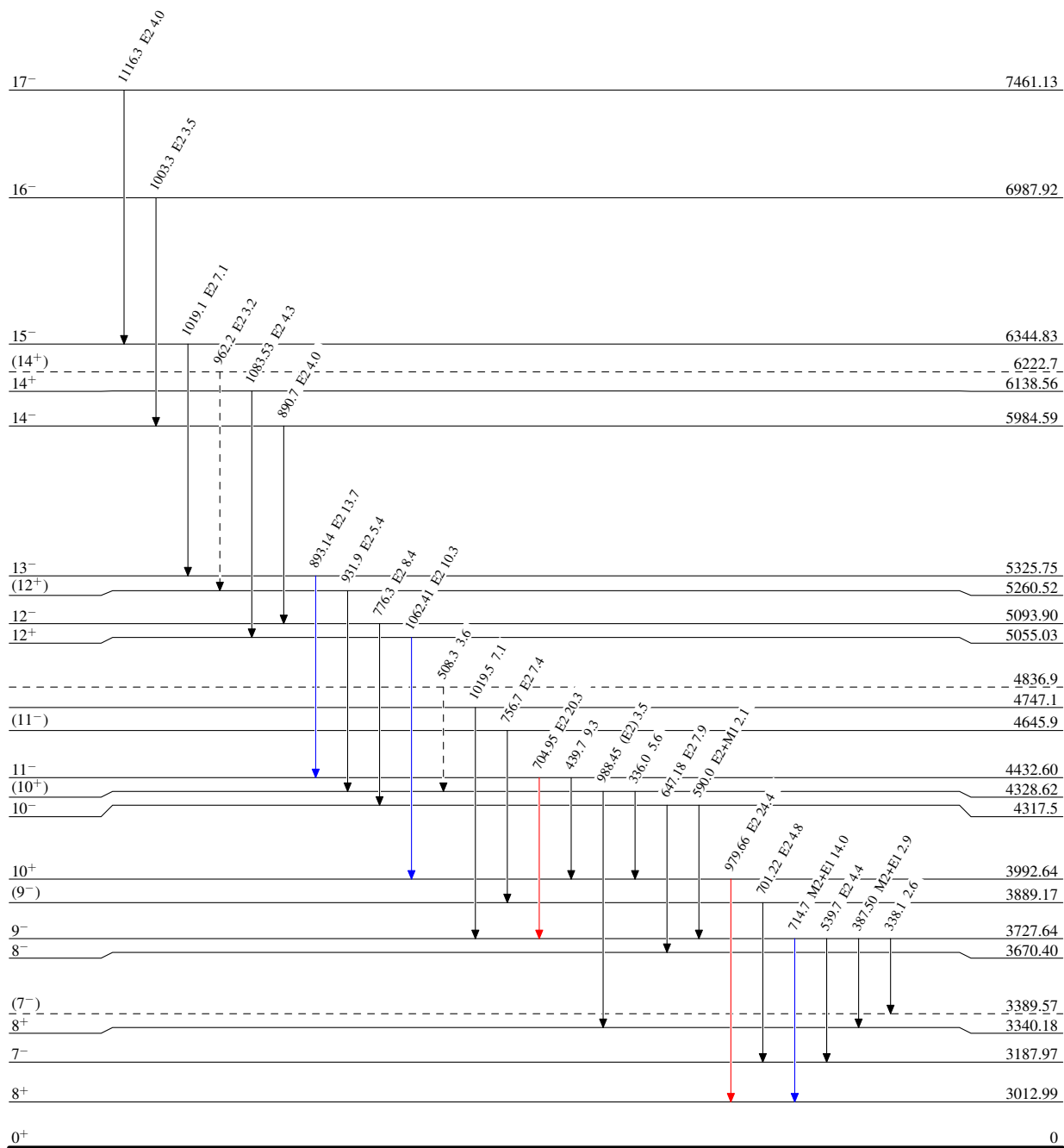
$^{92}\text{Zr}(^{13}\text{C}, 3n\gamma)$  1976Gr12

## Level Scheme

Intensities: Type not specified

## Legend

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



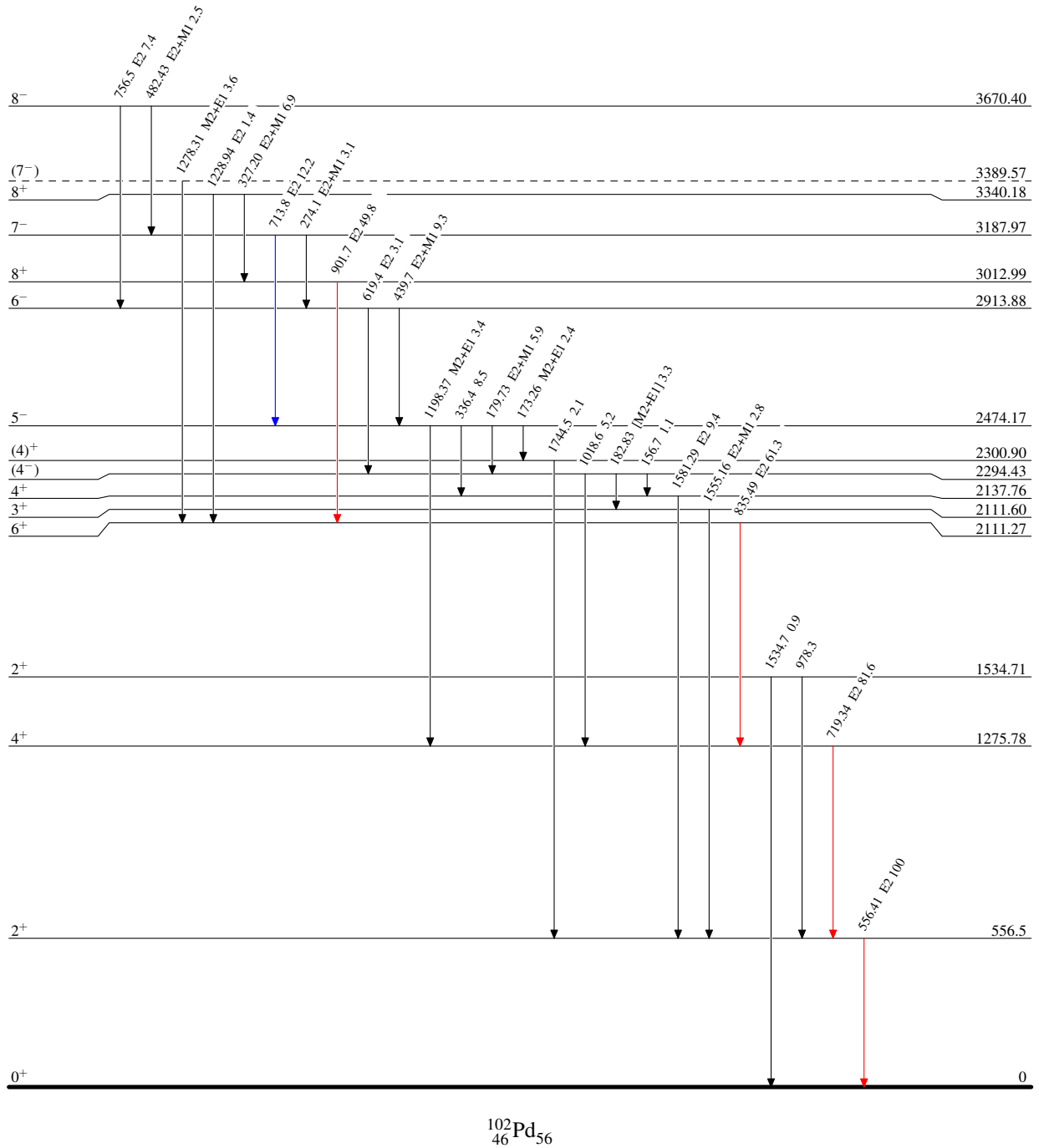
$^{92}\text{Zr}(^{13}\text{C}, 3n\gamma)$  1976Gr12

## Level Scheme (continued)

Intensities: Type not specified

## Legend

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



$^{92}\text{Zr}(^{13}\text{C},3\text{n}\gamma)$  1976Gr12