

Adopted Levels, Gammas

| Type            | Author                                                                             | History | Citation          | Literature Cutoff Date |
|-----------------|------------------------------------------------------------------------------------|---------|-------------------|------------------------|
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$Q(\beta^-) = -8378.27$ ;  $S(n) = 10444.20$ ;  $S(p) = 4290.30$ ;  $Q(\alpha) = 4140.30$  (2017Wa10)  
 $S(2n) = 18540.19$ ;  $S(2p) = 6508.31$ ;  $Q(\epsilon p) = 137.31$  (2017Wa10).

 $^{170}\text{W}$  LevelsCross Reference (XREF) Flags

- A  $^{170}\text{Re}$   $\epsilon$  decay  
 B  $^{174}\text{Os}$   $\alpha$  decay  
 C  $\text{Gd}(^{20}\text{Ne}, x n \gamma)$ ,  $^{122}\text{Sn}(^{52}\text{Cr}, 4 n \gamma)$   
 D  $^{186}\text{W}(n, 17 n \gamma)$

| E(level) <sup>†</sup>   | J <sup>π</sup> <sup>‡</sup>           | T <sub>1/2</sub> <sup>#</sup> | XREF | Comments                                                                                                                                                                                                                                                                                            |
|-------------------------|---------------------------------------|-------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.0 <sup>@</sup>        | 0 <sup>+</sup>                        | 2.42 min 4                    | ABC  | $\% \epsilon + \% \beta^+ = 100$<br>$\% \epsilon + \% \beta^+$ : $\% \alpha < 1$ from systematics of partial T <sub>1/2</sub> ( $\alpha$ ) vs Q( $\alpha$ ).<br>T <sub>1/2</sub> : from 1990Me12. Others: 4 min I (1971Na28); 2.4 min I (1987Es08),<br>2.47 min I (1990Me12), 2.8 min I (1992HeZV). |
| 156.72 <sup>@</sup> 13  | 2 <sup>+</sup>                        | 497 ps 10                     | A C  | J <sup>π</sup> : E2 $\gamma$ to 0 <sup>+</sup> .                                                                                                                                                                                                                                                    |
| 462.33 <sup>@</sup> 16  | 4 <sup>+</sup>                        | 19.6 ps 19                    | A C  | J <sup>π</sup> : stretched E2 $\gamma$ to 2 <sup>+</sup> ; g.s. band member.                                                                                                                                                                                                                        |
| 875.53 <sup>@</sup> 18  | 6 <sup>+</sup>                        | 4.3 ps 3                      | A CD | J <sup>π</sup> : stretched E2 $\gamma$ to 4 <sup>+</sup> ; g.s. band member.                                                                                                                                                                                                                        |
| 937.06 <sup>e</sup> 16  | (2 <sup>+</sup> )                     |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 952.50 <sup>d</sup> 21  | (2 <sup>+</sup> )                     |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 1073.57 <sup>e</sup> 19 | (3 <sup>+</sup> )                     |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 1153.03 20              | (2 <sup>+</sup> , 3, 4 <sup>+</sup> ) |                               | A    | J <sup>π</sup> : 690.7 $\gamma$ to 4 <sup>+</sup> , 996.3 $\gamma$ to 2 <sup>+</sup> .                                                                                                                                                                                                              |
| 1202.18 <sup>d</sup> 21 | 4 <sup>+</sup>                        |                               | A    | J <sup>π</sup> : E0+E2(+M1) 740 $\gamma$ to 4 <sup>+</sup> .                                                                                                                                                                                                                                        |
| 1220.00 <sup>e</sup> 19 | (4 <sup>+</sup> )                     |                               | A    | J <sup>π</sup> : 344.6 $\gamma$ to 6 <sup>+</sup> , 1063.2 $\gamma$ to 2 <sup>+</sup> .                                                                                                                                                                                                             |
| 1314.43 <sup>c</sup> 20 | (3 <sup>-</sup> )                     |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 1327.53 <sup>b</sup> 24 | (2 <sup>-</sup> )                     |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 1363.40 <sup>@</sup> 22 | 8 <sup>+</sup>                        | 1.9 ps 5                      | A CD | J <sup>π</sup> : stretched E2 $\gamma$ to 6 <sup>+</sup> ; g.s. band member.                                                                                                                                                                                                                        |
| 1492.55 <sup>b</sup> 22 | (4 <sup>-</sup> )                     |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 1517.27 <sup>c</sup> 21 | 5 <sup>-</sup>                        |                               | A C  | J <sup>π</sup> : stretched E2 275 $\gamma$ from 7 <sup>-</sup> , 1055 $\gamma$ to 4 <sup>+</sup> .                                                                                                                                                                                                  |
| 1578.30 <sup>d</sup> 23 | 6 <sup>+</sup>                        |                               | A    | J <sup>π</sup> : E0+E2(+M1) 703 $\gamma$ to 6 <sup>+</sup> .                                                                                                                                                                                                                                        |
| 1718.83 22              | (4 <sup>+</sup> , 5, 6 <sup>+</sup> ) |                               | A    | J <sup>π</sup> : 843.4 $\gamma$ to 6 <sup>+</sup> , 1256.4 $\gamma$ to 4 <sup>+</sup> .                                                                                                                                                                                                             |
| 1791.71 <sup>c</sup> 22 | 7 <sup>-</sup>                        | 30 ps 7                       | A C  | J <sup>π</sup> : E1 916.0 $\gamma$ to 6 <sup>+</sup> ; D 428.4 $\gamma$ to 8 <sup>+</sup> .                                                                                                                                                                                                         |
| 1811.0 <sup>b</sup> 3   | (6 <sup>-</sup> )                     |                               | A C  |                                                                                                                                                                                                                                                                                                     |
| 1875.6 3                |                                       |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 1901.5 <sup>@</sup> 3   | 10 <sup>+</sup>                       | 1.30 ps 24                    | CD   | J <sup>π</sup> : stretched E2 $\gamma$ to 8 <sup>+</sup> ; g.s. band member.                                                                                                                                                                                                                        |
| 1974.7 3                |                                       |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 2080.0 3                |                                       |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 2153.6 <sup>c</sup> 3   | 9 <sup>-</sup>                        | 4.9 ps 10                     | C    | J <sup>π</sup> : E1 790 $\gamma$ to 8 <sup>+</sup> ; D 252 $\gamma$ to 10 <sup>+</sup> .                                                                                                                                                                                                            |
| 2203.5 <sup>b</sup> 3   | (8 <sup>-</sup> )                     |                               | C    |                                                                                                                                                                                                                                                                                                     |
| 2344.8 3                |                                       |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 2442.8 3                |                                       |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 2464.3 <sup>@</sup> 4   | 12 <sup>+</sup>                       | 1.11 ps 21                    | CD   | J <sup>π</sup> : stretched E2 $\gamma$ to 10 <sup>+</sup> ; g.s. band member.                                                                                                                                                                                                                       |
| 2481.1 3                |                                       |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 2551.8 <sup>a</sup> 4   | (10 <sup>-</sup> )                    |                               | C    |                                                                                                                                                                                                                                                                                                     |
| 2552.8 3                |                                       |                               | A    |                                                                                                                                                                                                                                                                                                     |
| 2577.5 <sup>c</sup> 4   | 11 <sup>-</sup>                       | 3.0 ps 8                      | C    | J <sup>π</sup> : stretched E2 424 $\gamma$ to 9 <sup>-</sup> , D 676 $\gamma$ to 10 <sup>+</sup> .                                                                                                                                                                                                  |

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**Adopted Levels, Gammas (continued)** $^{170}\text{W}$  Levels (continued)

| E(level) <sup>†</sup>       | J $\pi$ <sup>‡</sup> | T <sub>1/2</sub> <sup>#</sup> | XREF | Comments                                                                                                                                                                                |
|-----------------------------|----------------------|-------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2610.1 <sup>b</sup> 5       | (10 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 2650.3 3                    |                      |                               | A    |                                                                                                                                                                                         |
| 2898.4 <sup>a</sup> 5       | (12 <sup>-</sup> )   | 15 ps 3                       | C    |                                                                                                                                                                                         |
| 2910.9 <sup>&amp;</sup> 4   | (14) <sup>+</sup>    | 3.6 ps 7                      | C    | J $\pi$ : stretched E2 447 $\gamma$ to 12 <sup>+</sup> .                                                                                                                                |
| 3036.1 <sup>c</sup> 5       | (13) <sup>-</sup>    | 2.0 ps 5                      | C    | J $\pi$ : stretched E2 459 $\gamma$ to 11 <sup>-</sup> .                                                                                                                                |
| 3094.5 <sup>b</sup> 6       | (12 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 3118.0 <sup>@</sup> 5       | 14 <sup>+</sup>      |                               | C    |                                                                                                                                                                                         |
| 3343.8 <sup>&amp;</sup> 5   | (16) <sup>+</sup>    | 2.6 ps 3                      | C    | J $\pi$ : stretched E2 433 $\gamma$ to (14) <sup>+</sup> .                                                                                                                              |
| 3354.6 <sup>a</sup> 6       | (14 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 3537.6 <sup>c</sup> 6       | (15 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 3652.3 <sup>b</sup> 8       | (14 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 3815.9 <sup>@</sup> 6       | 16 <sup>+</sup>      |                               | C    |                                                                                                                                                                                         |
| 3874.0 <sup>&amp;</sup> 5   | (18) <sup>+</sup>    | 1.29 ps 24                    | C    | J $\pi$ : stretched E2 530 $\gamma$ to (16) <sup>+</sup> .                                                                                                                              |
| 3886.9 <sup>a</sup> 7       | (16 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 4094.7 <sup>c</sup> 8       | (17 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 4230.6 <sup>b</sup> 9       | (16 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 4460.4 <sup>a</sup> 7       | (18 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 4490.5 <sup>&amp;</sup> 8   | (20) <sup>+</sup>    | 0.37 ps 5                     | C    | J $\pi$ : stretched E2 617 $\gamma$ to (18) <sup>+</sup> .<br>T <sub>1/2</sub> : from Doppler-broadened line shape and Doppler-shift recoil analyses in ( $^{52}\text{Cr}, 4n\gamma$ ). |
| 4684.6 <sup>c</sup> 10      | (19 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 5056.8 <sup>a</sup> 8       | (20 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 5176.1 <sup>&amp;</sup> 9   | (22) <sup>+</sup>    | 0.17 ps 4                     | C    | T <sub>1/2</sub> : from Doppler-broadened line shape analysis in ( $^{52}\text{Cr}, 4n\gamma$ ).                                                                                        |
| 5276.3 <sup>c</sup> 12      | (21 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 5671.5 <sup>a</sup> 10      | (22 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 5894.7 <sup>c</sup> 14      | (23 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 5918.1 <sup>&amp;</sup> 9   | (24) <sup>+</sup>    | 0.26 ps +6-4                  | C    | T <sub>1/2</sub> : from Doppler-broadened line shape analysis in ( $^{52}\text{Cr}, 4n\gamma$ ).                                                                                        |
| 6334.2 <sup>a</sup> 10      | (24 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 6587.7 <sup>c</sup> 14      | (25 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 6713.8 <sup>&amp;</sup> 10  | (26) <sup>+</sup>    |                               | C    |                                                                                                                                                                                         |
| 7086.2 <sup>a</sup> 15      | (26 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 7359.3 <sup>c</sup> 14      | (27 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 7568.9 <sup>&amp;</sup> 10  | (28) <sup>+</sup>    |                               | C    |                                                                                                                                                                                         |
| 8202.3 <sup>c</sup> 17      | (29 <sup>-</sup> )   |                               | C    |                                                                                                                                                                                         |
| 8487.8 <sup>&amp;</sup> 11  | (30) <sup>+</sup>    |                               | C    |                                                                                                                                                                                         |
| 9431.3 <sup>&amp;</sup> 12  | (32) <sup>+</sup>    |                               | C    |                                                                                                                                                                                         |
| 10390.0 <sup>&amp;</sup> 16 | (34) <sup>+</sup>    |                               | C    |                                                                                                                                                                                         |
| 11369.6 <sup>&amp;</sup> 19 | (36) <sup>+</sup>    |                               | C    |                                                                                                                                                                                         |

<sup>†</sup> From least-squares fit to adopted E $\gamma$ .<sup>‡</sup> Based on  $\gamma(\theta)$ ,  $\gamma$  linear polarization in ( $^{20}\text{Ne}, x n \gamma$ ) and band structure, unless noted otherwise.<sup>#</sup> From Doppler-shift recoil distance analysis in ( $^{52}\text{Cr}, 4 n \gamma$ ) and/or ( $^{20}\text{Ne}, 5 n \gamma$ ), except as noted.<sup>@</sup> Band(A): g.s. band (1985Re06). And mult=E2 for 157.9 $\gamma$  J=2 to 0<sup>+</sup>.<sup>&</sup> Band(B): ( $\nu$  i<sub>13/2</sub><sup>2</sup>),  $\alpha=0$  s band (1985Re06). two quasi-particle AB band, crossed by (( $\nu$  i<sub>13/2</sub><sup>2</sup>)( $\pi$  i<sub>13/2</sub><sup>2</sup>)) band at  $\hbar\omega=0.45$  MeV.<sup>a</sup> Band(C):  $\pi=-$ ,  $\alpha=0$  band (1985Re06). predominantly a two quasi-particle BF band for  $\hbar\omega \geq 0.2$  MeV, but possibly includes

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**Adopted Levels, Gammas (continued)**

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 $^{170}\text{W}$  Levels (continued)

strong octupole vibration component at lower rotational frequencies ([1985Re06](#)).

<sup>b</sup> Band(D):  $\pi=-$ ,  $\alpha=0$  band ([1985Re06,2001Ki10](#)). Probably predominantly  $(\pi 9/2[514])\otimes(\pi 5/2[402])$ , for which  $K^\pi=2^-$  is favored, but 2-quasineutron admixtures may also contribute. Also, a strong octupole vibration is present at low rotational frequencies, and Coriolis mixing of different K components of this vibration may render K a poor quantum number.

<sup>c</sup> Band(d):  $\pi=-$ ,  $\alpha=1$  band ([1985Re06,2001Ki10](#)). Signature partner of  $\pi=-$ ,  $\alpha=0$  band; see comments on that band.

<sup>d</sup> Band(E):  $K^\pi=0^+$   $\beta$  band ([2001Ki10](#)). Assignment supported by  $\gamma$  decay pattern, particularly the strong E0 component in the  $740\gamma$  and  $703\gamma$  to the  $4^+$  and  $6^+$  states, respectively, of the g.s. band. From systematics, the J=0 member is expected at  $\approx 750$  keV, but it has not been observed yet.

<sup>e</sup> Band(F):  $K^\pi=2^+$   $\gamma$  band ([2001Ki10](#)). The energies of the J=2 and 4 members differ only by  $\approx 20$  keV from their counterparts in the  $\beta$  band, so significant  $\beta$  band and  $\gamma$  band mixing is expected.

Adopted Levels, Gammas (continued)

| $E_i(\text{level})$ | $J_i^\pi$                           | $\gamma(^{170}\text{W})$ |                     | $E_f$   | $J_f^\pi$         | Mult. <sup>‡</sup> | $\delta$    | $\alpha^c$ | Comments                                                                                                                           |
|---------------------|-------------------------------------|--------------------------|---------------------|---------|-------------------|--------------------|-------------|------------|------------------------------------------------------------------------------------------------------------------------------------|
|                     |                                     | $E_\gamma$               | $I_\gamma^\dagger$  |         |                   |                    |             |            |                                                                                                                                    |
| 156.72              | 2 <sup>+</sup>                      | 156.73 <sup>#</sup> 14   | 100                 | 0.0     | 0 <sup>+</sup>    | E2                 |             | 0.717      | B(E2)(W.u.)=124 3<br><a href="#">Additional information 1.</a>                                                                     |
| 462.33              | 4 <sup>+</sup>                      | 305.65 <sup>#</sup> 14   | 100                 | 156.72  | 2 <sup>+</sup>    | E2                 |             | 0.0804     | B(E2)(W.u.)=179 18<br><a href="#">Additional information 2.</a>                                                                    |
| 875.53              | 6 <sup>+</sup>                      | 413.18 <sup>#</sup> 14   | 100                 | 462.33  | 4 <sup>+</sup>    | E2                 |             | 0.0343     | B(E2)(W.u.)=189 14<br><a href="#">Additional information 3.</a>                                                                    |
| 937.06              | (2 <sup>+</sup> )                   | 780.6 <sup>@</sup> 2     | 8.0 <sup>@</sup> 24 | 156.72  | 2 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
|                     |                                     | 936.8 <sup>@</sup> 2     | 100 <sup>@</sup> 7  | 0.0     | 0 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
| 952.50              | (2 <sup>+</sup> )                   | 796.0 <sup>@</sup> 2     | 100 <sup>@</sup>    | 156.72  | 2 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
| 1073.57             | (3 <sup>+</sup> )                   | 611.3 <sup>@</sup> 2     | 23 <sup>@</sup> 6   | 462.33  | 4 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
|                     |                                     | 916.7 <sup>@</sup> 2     | 100 <sup>@</sup> 9  | 156.72  | 2 <sup>+</sup>    | (M1+E2)            | ≤+15        |            | Mult., $\delta$ : $\delta(\text{D,Q})=+10+5-\infty$ from $\varepsilon$ decay;<br>$\Delta\pi=(\text{no})$ from level scheme.        |
| 1153.03             | (2 <sup>+</sup> ,3,4 <sup>+</sup> ) | 690.7 <sup>@</sup> 2     | 43 <sup>@</sup> 11  | 462.33  | 4 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
|                     |                                     | 996.3 <sup>@</sup> 2     | 100 <sup>@</sup> 22 | 156.72  | 2 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
| 1202.18             | 4 <sup>+</sup>                      | 249.9 <sup>@</sup> 2     | 11 <sup>@</sup> 4   | 952.50  | (2 <sup>+</sup> ) | [E2]               |             | 0.1491     |                                                                                                                                    |
|                     |                                     | 739.8 <sup>@</sup> 2     | 100 <sup>@</sup> 11 | 462.33  | 4 <sup>+</sup>    | E0+E2(+M1)         | ≤+1.7       | ≈0.061     | Mult., $\delta$ : from $\alpha(\text{K})\text{exp}$ and $\gamma(\theta)$ in $^{170}\text{Re}$ $\varepsilon$ decay.                 |
| 1220.00             | (4 <sup>+</sup> )                   | 344.6 2                  | 31 10               | 875.53  | 6 <sup>+</sup>    | [E2]               |             | 0.0567     |                                                                                                                                    |
|                     |                                     | 757.6 <sup>@</sup> 2     | 100 <sup>@</sup> 24 | 462.33  | 4 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
|                     |                                     | 1063.2 <sup>@</sup> 2    | 59 <sup>@</sup> 17  | 156.72  | 2 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
| 1314.43             | (3 <sup>-</sup> )                   | 852.3 <sup>@</sup> 2     | 83 <sup>@</sup> 26  | 462.33  | 4 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
|                     |                                     | 1157.5 <sup>@</sup> 2    | 100 <sup>@</sup> 26 | 156.72  | 2 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
| 1327.53             | (2 <sup>-</sup> )                   | 1170.8 <sup>@</sup> 2    | 100 <sup>@</sup>    | 156.72  | 2 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
| 1363.40             | 8 <sup>+</sup>                      | 487.95 <sup>#</sup> 14   | 100                 | 875.53  | 6 <sup>+</sup>    | E2                 |             | 0.0223     | B(E2)(W.u.)=190 50<br><a href="#">Additional information 4.</a>                                                                    |
| 1492.55             | (4 <sup>-</sup> )                   | 418.9 <sup>@</sup> 2     | 25 <sup>@</sup> 4   | 1073.57 | (3 <sup>+</sup> ) |                    |             |            |                                                                                                                                    |
|                     |                                     | 1030.3 <sup>@</sup> 2    | 100 <sup>@</sup> 12 | 462.33  | 4 <sup>+</sup>    | (E1+M2)            | -1.7 +11-39 | 0.017 10   | Mult., $\delta$ : D+Q from $\gamma(\theta)$ in $^{170}\text{Re}$ $\varepsilon$ decay;<br>$\Delta\pi=\text{yes}$ from level scheme. |
| 1517.27             | 5 <sup>-</sup>                      | 641.7 <sup>@</sup> 2     | 100 <sup>@</sup> 19 | 875.53  | 6 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
|                     |                                     | 1055.0 <sup>@</sup> 2    | 16 <sup>@</sup> 6   | 462.33  | 4 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
| 1578.30             | 6 <sup>+</sup>                      | 376.3 <sup>@</sup> 2     | 22 <sup>@</sup> 4   | 1202.18 | 4 <sup>+</sup>    | [E2]               |             | 0.0443     |                                                                                                                                    |
|                     |                                     | 702.6 <sup>@</sup> 2     | 100 <sup>@</sup> 10 | 875.53  | 6 <sup>+</sup>    | E0+E2+M1           | -1.7 +8-25  | ≈0.089     | Mult., $\delta$ : from $\alpha(\text{K})\text{exp}$ and $\gamma(\theta)$ in $^{170}\text{Re}$ $\varepsilon$ decay.                 |
| 1718.83             | (4 <sup>+</sup> ,5,6 <sup>+</sup> ) | 843.4 <sup>@</sup> 2     | 41 <sup>@</sup> 9   | 875.53  | 6 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
|                     |                                     | 1256.4 <sup>@</sup> 2    | 100 <sup>@</sup> 9  | 462.33  | 4 <sup>+</sup>    |                    |             |            |                                                                                                                                    |
| 1791.71             | 7 <sup>-</sup>                      | 274.5 3                  | 23 7                | 1517.27 | 5 <sup>-</sup>    | E2 <sup>b</sup>    |             | 0.1113     | B(E2)(W.u.)=29 13                                                                                                                  |

**Adopted Levels, Gammas (continued)**

| $\gamma(^{170}\text{W})$ (continued) |           |                        |                    |         |           |                       |            |                                                                                                                                                                                                                                    |
|--------------------------------------|-----------|------------------------|--------------------|---------|-----------|-----------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $E_i(\text{level})$                  | $J_i^\pi$ | $E_\gamma$             | $I_\gamma^\dagger$ | $E_f$   | $J_f^\pi$ | Mult. <sup>‡</sup>    | $\alpha^c$ | Comments                                                                                                                                                                                                                           |
|                                      |           |                        |                    |         |           |                       |            | $I_\gamma$ : from ( $^{20}\text{Ne},4n\gamma$ ). Other: $I(275\gamma)/I(916\gamma)=0.76$ in ( $^{52}\text{Cr},4n\gamma$ ). Not observed in $\varepsilon$ decay.                                                                    |
| 1791.71                              | $7^-$     | 428.40 <sup>#</sup> 17 | 48 15              | 1363.40 | $8^+$     | (E1) <sup>&amp;</sup> |            | $B(E1)(\text{W.u.})=2.6\times 10^{-5}$ 12<br>Additional information 5.                                                                                                                                                             |
|                                      |           | 916.03 <sup>#</sup> 17 | 100 27             | 875.53  | $6^+$     | E1                    |            | $I_\gamma$ : from ( $^{20}\text{Ne},4n\gamma$ ). Other: $I(428\gamma)/I(916\gamma)=0.76$ in ( $^{52}\text{Cr},4n\gamma$ ), 2.5 9 in $\varepsilon$ decay.<br>$B(E1)(\text{W.u.})=5.5\times 10^{-6}$ 22<br>Additional information 6. |
| 1811.0                               | $(6^-)$   | 935.45 <sup>#</sup> 23 | 100                | 875.53  | $6^+$     |                       |            | Additional information 7.                                                                                                                                                                                                          |
| 1875.6                               |           | 1413.3 <sup>@</sup> 2  | 100 <sup>@</sup>   | 462.33  | $4^+$     |                       |            |                                                                                                                                                                                                                                    |
| 1901.5                               | $10^+$    | 538.1 2                | 100                | 1363.40 | $8^+$     | E2                    | 0.01753    | $B(E2)(\text{W.u.})=170$ 40                                                                                                                                                                                                        |
| 1974.7                               |           | 1099.2 <sup>@</sup> 2  | 100 <sup>@</sup>   | 875.53  | $6^+$     |                       |            |                                                                                                                                                                                                                                    |
| 2080.0                               |           | 1204.5 <sup>@</sup> 2  | 100 <sup>@</sup>   | 875.53  | $6^+$     |                       |            |                                                                                                                                                                                                                                    |
| 2153.6                               | $9^-$     | 252.1 3                | 19 6               | 1901.5  | $10^+$    | (E1) <sup>&amp;</sup> | 0.0350     | $B(E1)(\text{W.u.})=2.6\times 10^{-4}$ 11                                                                                                                                                                                          |
|                                      |           | 361.8 3                | 100 29             | 1791.71 | $7^-$     | E2 <sup>b</sup>       | 0.0494     | $I_\gamma$ : from ( $^{20}\text{Ne},4n\gamma$ ). Other: $I(252\gamma)/I(362\gamma)=0.13$ in ( $^{52}\text{Cr},4n\gamma$ ).<br>$B(E2)(\text{W.u.})=160$ 70                                                                          |
|                                      |           | 790.2 3                | 79 21              | 1363.40 | $8^+$     | E1                    |            | $B(E1)(\text{W.u.})=3.5\times 10^{-5}$ 14                                                                                                                                                                                          |
| 2203.5                               | $(8^-)$   | 392.6 3                | 100 29             | 1811.0  | $(6^-)$   | (E2) <sup>a</sup>     | 0.0394     | $I_\gamma$ : from ( $^{20}\text{Ne},4n\gamma$ ). Other: $I(790\gamma)/I(362\gamma)=0.32$ in ( $^{52}\text{Cr},4n\gamma$ ).                                                                                                         |
|                                      |           | 840.1 3                | 100 29             | 1363.40 | $8^+$     |                       |            |                                                                                                                                                                                                                                    |
| 2344.8                               |           | 1469.3 <sup>@</sup> 2  | 100 <sup>@</sup>   | 875.53  | $6^+$     |                       |            |                                                                                                                                                                                                                                    |
| 2442.8                               |           | 1567.3 <sup>@</sup> 2  | 100 <sup>@</sup>   | 875.53  | $6^+$     |                       |            |                                                                                                                                                                                                                                    |
| 2464.3                               | $12^+$    | 562.8 2                | 100                | 1901.5  | $10^+$    | E2                    | 0.01573    | $B(E2)(\text{W.u.})=160$ 30                                                                                                                                                                                                        |
| 2481.1                               |           | 1605.6 <sup>@</sup> 2  | 100 <sup>@</sup>   | 875.53  | $6^+$     |                       |            |                                                                                                                                                                                                                                    |
| 2551.8                               | $(10^-)$  | 348.4 3                | 100 29             | 2203.5  | $(8^-)$   | (E2) <sup>a</sup>     | 0.0550     |                                                                                                                                                                                                                                    |
|                                      |           | 398.2 3                | 43 14              | 2153.6  | $9^-$     | (M1) <sup>&amp;</sup> | 0.1027     |                                                                                                                                                                                                                                    |
| 2552.8                               |           | 1677.3 <sup>@</sup> 2  | 100 <sup>@</sup>   | 875.53  | $6^+$     |                       |            |                                                                                                                                                                                                                                    |
| 2577.5                               | $11^-$    | 423.9 3                | 100 31             | 2153.6  | $9^-$     | E2 <sup>b</sup>       | 0.0321     | $B(E2)(\text{W.u.})=180$ 90                                                                                                                                                                                                        |
|                                      |           | 676.0 3                | 31 9               | 1901.5  | $10^+$    | (E1) <sup>&amp;</sup> |            | $B(E1)(\text{W.u.})=5\times 10^{-5}$ 3                                                                                                                                                                                             |
| 2610.1                               | $(10^-)$  | 406.6 3                | 100                | 2203.5  | $(8^-)$   |                       |            | $I_\gamma$ : from ( $^{20}\text{Ne},4n\gamma$ ). Other: $I(676\gamma)/I(424\gamma)=0.11$ in ( $^{52}\text{Cr},4n\gamma$ ).                                                                                                         |
| 2650.3                               |           | 1774.8 <sup>@</sup> 2  | 100 <sup>@</sup>   | 875.53  | $6^+$     |                       |            |                                                                                                                                                                                                                                    |
| 2898.4                               | $(12^-)$  | 346.6 3                | 100                | 2551.8  | $(10^-)$  | E2 <sup>b</sup>       | 0.0558     | $B(E2)(\text{W.u.})=130$ 30                                                                                                                                                                                                        |
| 2910.9                               | $(14)^+$  | 446.6 2                | 100                | 2464.3  | $12^+$    | E2                    | 0.0280     | $B(E2)(\text{W.u.})=150$ 30                                                                                                                                                                                                        |
| 3036.1                               | $(13)^-$  | 458.6 3                | 100                | 2577.5  | $11^-$    | E2 <sup>b</sup>       | 0.0261     | $B(E2)(\text{W.u.})=240$ 60                                                                                                                                                                                                        |
| 3094.5                               | $(12^-)$  | 484.4 3                | 100                | 2610.1  | $(10^-)$  | (E2) <sup>a</sup>     | 0.0227     |                                                                                                                                                                                                                                    |
| 3118.0                               | $14^+$    | 653.7 3                | 100                | 2464.3  | $12^+$    | (E2) <sup>a</sup>     | 0.01111    |                                                                                                                                                                                                                                    |
| 3343.8                               | $(16)^+$  | 432.9 2                | 100                | 2910.9  | $(14)^+$  | E2                    | 0.0303     | $B(E2)(\text{W.u.})=250$ 30                                                                                                                                                                                                        |
| 3354.6                               | $(14^-)$  | 456.1 3                | 100                | 2898.4  | $(12^-)$  | (E2) <sup>a</sup>     | 0.0265     |                                                                                                                                                                                                                                    |

**Adopted Levels, Gammas (continued)**

$\gamma(^{170}\text{W})$  (continued)

| $E_i(\text{level})$ | $J_i^\pi$          | $E_\gamma$            | $I_\gamma^\dagger$ | $E_f$    | $J_f^\pi$          | Mult. <sup>‡</sup> | $\alpha^c$ | Comments                                                                                                   |
|---------------------|--------------------|-----------------------|--------------------|----------|--------------------|--------------------|------------|------------------------------------------------------------------------------------------------------------|
| 3537.6              | (15 <sup>-</sup> ) | 501.5 3               | 100                | 3036.1   | (13 <sup>-</sup> ) | (E2) <sup>a</sup>  | 0.0208     |                                                                                                            |
| 3652.3              | (14 <sup>-</sup> ) | 557.8 6               | 100                | 3094.5   | (12 <sup>-</sup> ) |                    |            |                                                                                                            |
| 3815.9              | 16 <sup>+</sup>    | 697.9 3               | 100                | 3118.0   | 14 <sup>+</sup>    | (E2) <sup>a</sup>  | 0.00960    |                                                                                                            |
| 3874.0              | (18 <sup>+</sup> ) | 530.2 2               | 100                | 3343.8   | (16 <sup>+</sup> ) | E2                 | 0.0182     | B(E2)(W.u.)=180 40                                                                                         |
| 3886.9              | (16 <sup>-</sup> ) | 532.3 3               | 100                | 3354.6   | (14 <sup>-</sup> ) | (E2) <sup>a</sup>  | 0.0180     |                                                                                                            |
| 4094.7              | (17 <sup>-</sup> ) | 557.1 6               | 100                | 3537.6   | (15 <sup>-</sup> ) | (E2) <sup>a</sup>  | 0.01612    |                                                                                                            |
| 4230.6              | (16 <sup>-</sup> ) | 578.3 3               | 100                | 3652.3   | (14 <sup>-</sup> ) | (E2) <sup>a</sup>  | 0.01475    |                                                                                                            |
| 4460.4              | (18 <sup>-</sup> ) | 573.5 3               | 100                | 3886.9   | (16 <sup>-</sup> ) | (E2) <sup>a</sup>  | 0.01505    |                                                                                                            |
| 4490.5              | (20 <sup>+</sup> ) | 616.5 6               | 100                | 3874.0   | (18 <sup>+</sup> ) | E2                 | 0.01271    | B(E2)(W.u.)=300 40                                                                                         |
| 4684.6              | (19 <sup>-</sup> ) | 589.9 6               | 100                | 4094.7   | (17 <sup>-</sup> ) |                    |            |                                                                                                            |
| 5056.8              | (20 <sup>-</sup> ) | 596.4 3               | 100                | 4460.4   | (18 <sup>-</sup> ) | (E2) <sup>a</sup>  | 0.01372    |                                                                                                            |
| 5176.1              | (22 <sup>+</sup> ) | 685.6 3               | 100                | 4490.5   | (20 <sup>+</sup> ) | (E2) <sup>a</sup>  | 0.00999    | B(E2)(W.u.)=390 100                                                                                        |
| 5276.3              | (21 <sup>-</sup> ) | 591.7 6               | 100                | 4684.6   | (19 <sup>-</sup> ) |                    |            |                                                                                                            |
| 5671.5              | (22 <sup>-</sup> ) | 614.7 6               | 100                | 5056.8   | (20 <sup>-</sup> ) |                    |            |                                                                                                            |
| 5894.7              | (23 <sup>-</sup> ) | 618.4 6               | 100                | 5276.3   | (21 <sup>-</sup> ) |                    |            |                                                                                                            |
| 5918.1              | (24 <sup>+</sup> ) | 742.0 3               | 100                | 5176.1   | (22 <sup>+</sup> ) | (E2) <sup>a</sup>  |            | B(E2)(W.u.)=170 40                                                                                         |
| 6334.2              | (24 <sup>-</sup> ) | 662.7 3               | 100                | 5671.5   | (22 <sup>-</sup> ) | (E2) <sup>a</sup>  | 0.01078    |                                                                                                            |
| 6587.7              | (25 <sup>-</sup> ) | 693.0 3               | 100                | 5894.7   | (23 <sup>-</sup> ) | (E2) <sup>a</sup>  |            |                                                                                                            |
| 6713.8              | (26 <sup>+</sup> ) | 795.7 3               | 100                | 5918.1   | (24 <sup>+</sup> ) | (E2) <sup>a</sup>  |            |                                                                                                            |
| 7086.2?             | (26 <sup>-</sup> ) | 752 <sup>d</sup> 1    | 100                | 6334.2   | (24 <sup>-</sup> ) | (E2) <sup>a</sup>  |            |                                                                                                            |
| 7359.3              | (27 <sup>-</sup> ) | 771.6 3               | 100                | 6587.7   | (25 <sup>-</sup> ) | (E2)               |            | Mult.: (Q) from $\gamma(\theta)$ in ( <sup>20</sup> Ne,xn $\gamma$ ); $\Delta\pi$ =no from band structure. |
| 7568.9              | (28 <sup>+</sup> ) | 855.1 3               | 100                | 6713.8   | (26 <sup>+</sup> ) | (E2) <sup>a</sup>  |            |                                                                                                            |
| 8202.3?             | (29 <sup>-</sup> ) | 843 <sup>d</sup> 1    | 100                | 7359.3   | (27 <sup>-</sup> ) |                    |            |                                                                                                            |
| 8487.8              | (30 <sup>+</sup> ) | 918.9 3               | 100                | 7568.9   | (28 <sup>+</sup> ) | (E2)               |            | Mult.: (Q) from $\gamma(\theta)$ in ( <sup>20</sup> Ne,xn $\gamma$ ); $\Delta\pi$ =no from band structure. |
| 9431.3              | (32 <sup>+</sup> ) | 943.5 6               | 100                | 8487.8   | (30 <sup>+</sup> ) |                    |            |                                                                                                            |
| 10390.0?            | (34 <sup>+</sup> ) | 958.7 <sup>d</sup> 10 | 100                | 9431.3   | (32 <sup>+</sup> ) |                    |            |                                                                                                            |
| 11369.6?            | (36 <sup>+</sup> ) | 979.6 <sup>d</sup> 10 | 100                | 10390.0? | (34 <sup>+</sup> ) |                    |            |                                                                                                            |

<sup>†</sup> From (<sup>20</sup>Ne,xn $\gamma$ ), except as noted. For several transitions, branching from (<sup>52</sup>Cr,4n $\gamma$ ) differs significantly from adopted value, and these cases are noted in comments on the relevant transitions. Those values would, of course, lead to significantly different reduced transition probabilities.

<sup>‡</sup> From  $\gamma(\theta)$  and/or  $\gamma$  linear polarization in (<sup>20</sup>Ne,xn $\gamma$ ), except as noted.

<sup>#</sup> Weighted average of data from <sup>170</sup>Re  $\varepsilon$  decay and from (<sup>20</sup>Ne,xn $\gamma$ ).

<sup>@</sup> From <sup>170</sup>Re  $\varepsilon$  decay.

<sup>&</sup> From mult=D (from  $\gamma(\theta)$  in (<sup>20</sup>Ne,xn $\gamma$ )), and adopted  $\Delta\pi$ .

<sup>a</sup> Q from  $\gamma(\theta)$  in (<sup>20</sup>Ne,xn $\gamma$ );  $\Delta\pi$ =no from band structure.

<sup>b</sup> Q from  $\gamma(\theta)$  in (<sup>20</sup>Ne,xn $\gamma$ ); not M2 from RUL.

<sup>c</sup> 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.

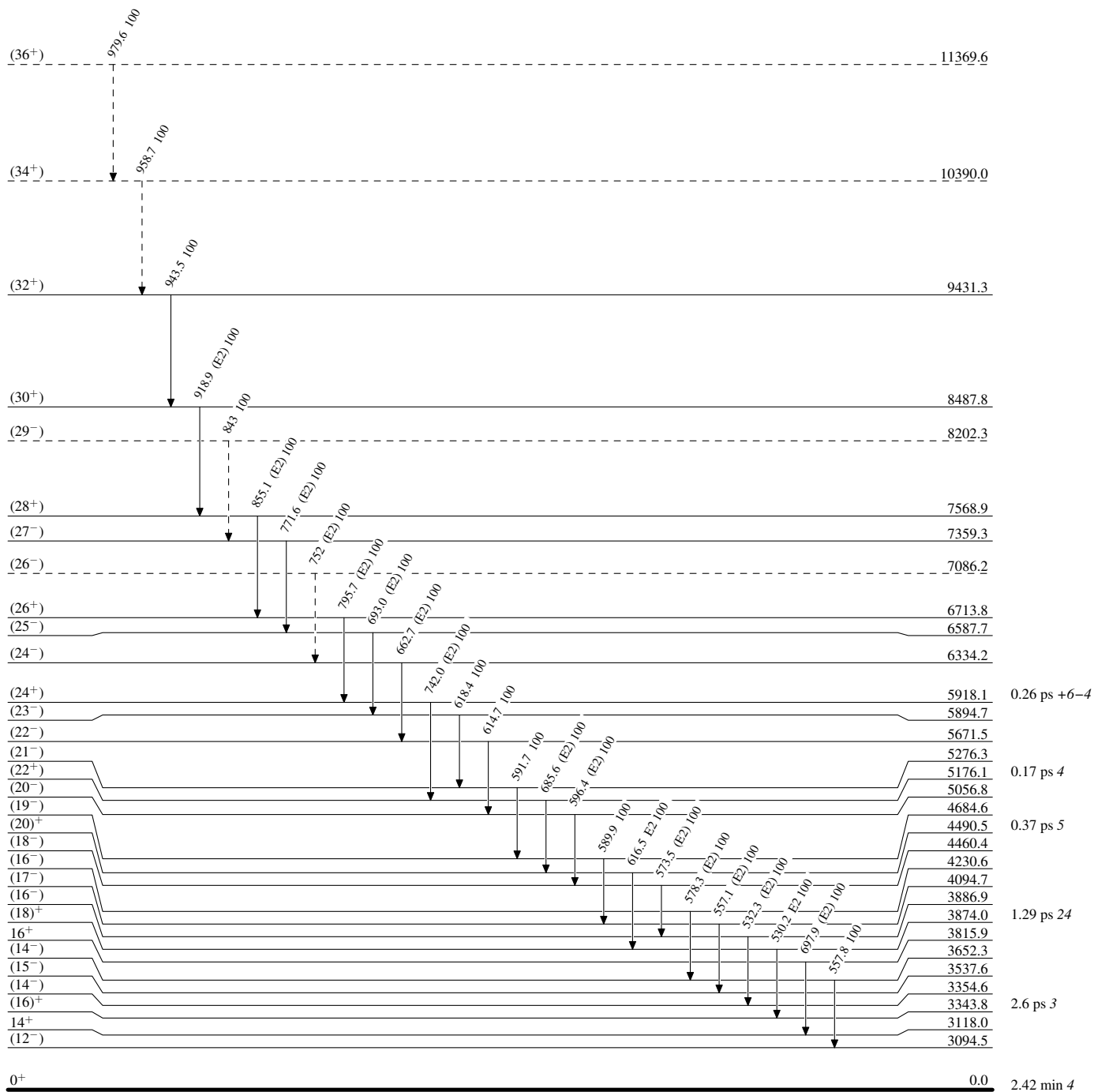
<sup>d</sup> Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

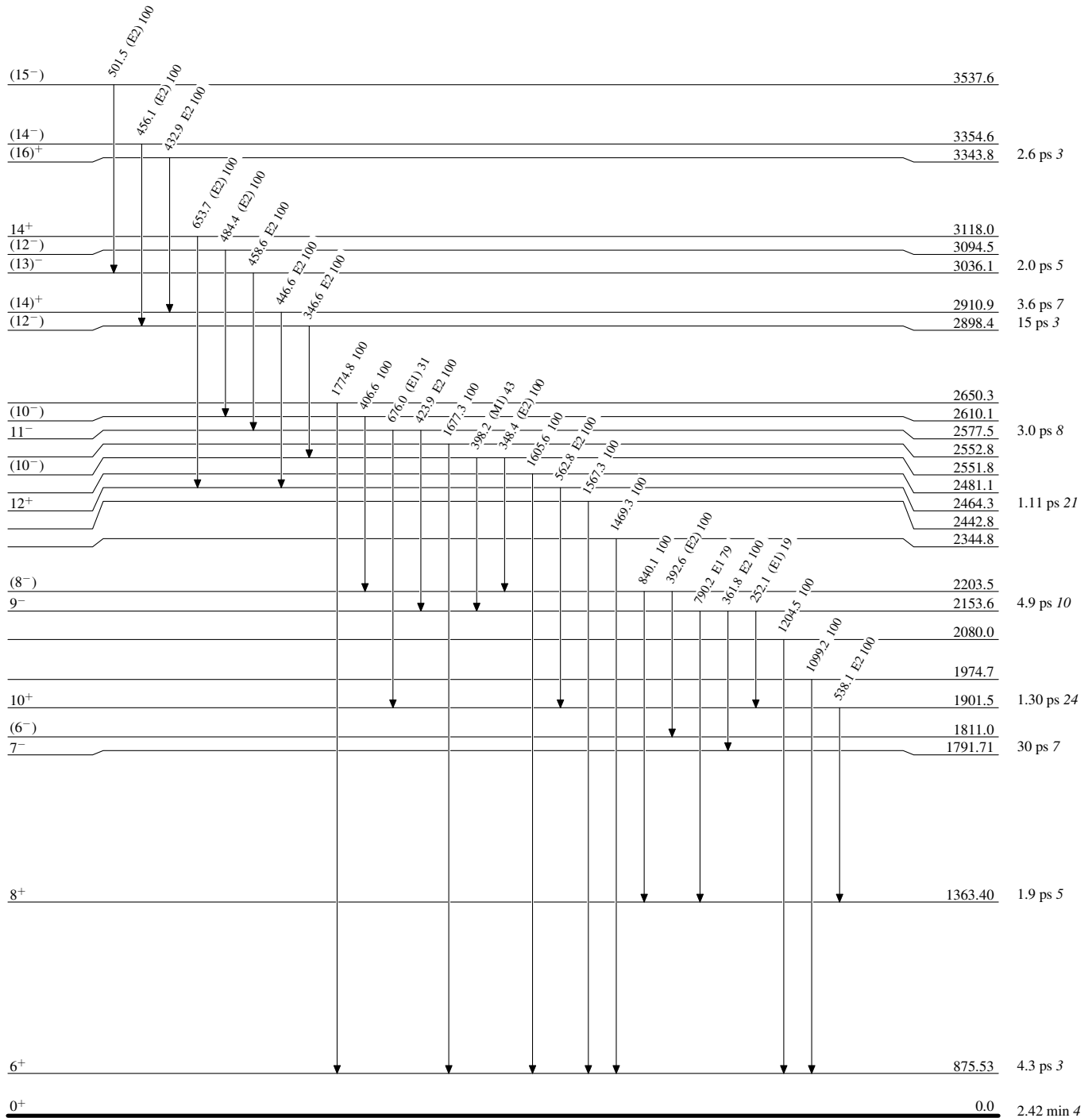
Level Scheme

Intensities: Relative photon branching from each level

-----►  $\gamma$  Decay (Uncertain)

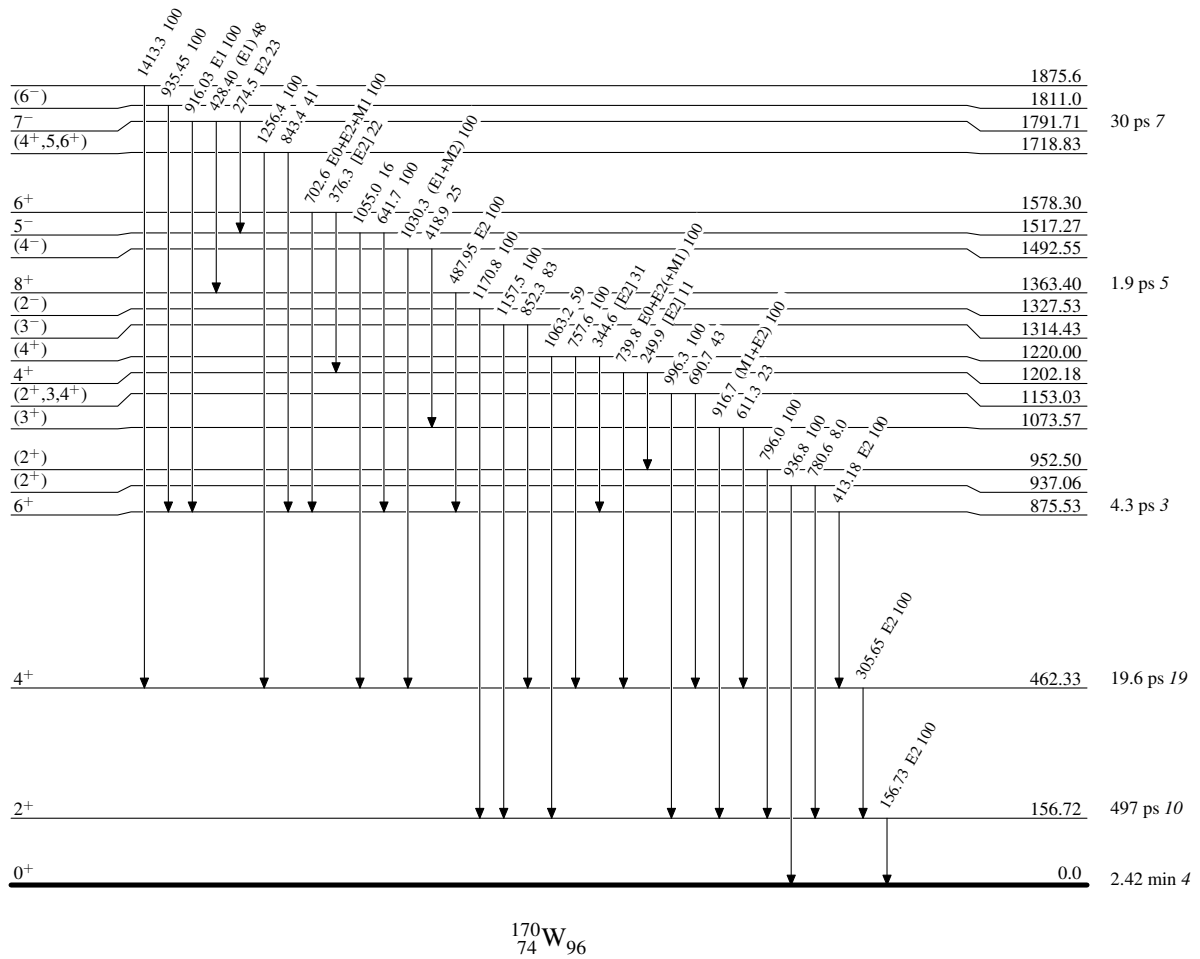
Adopted Levels, GammasLevel Scheme (continued)

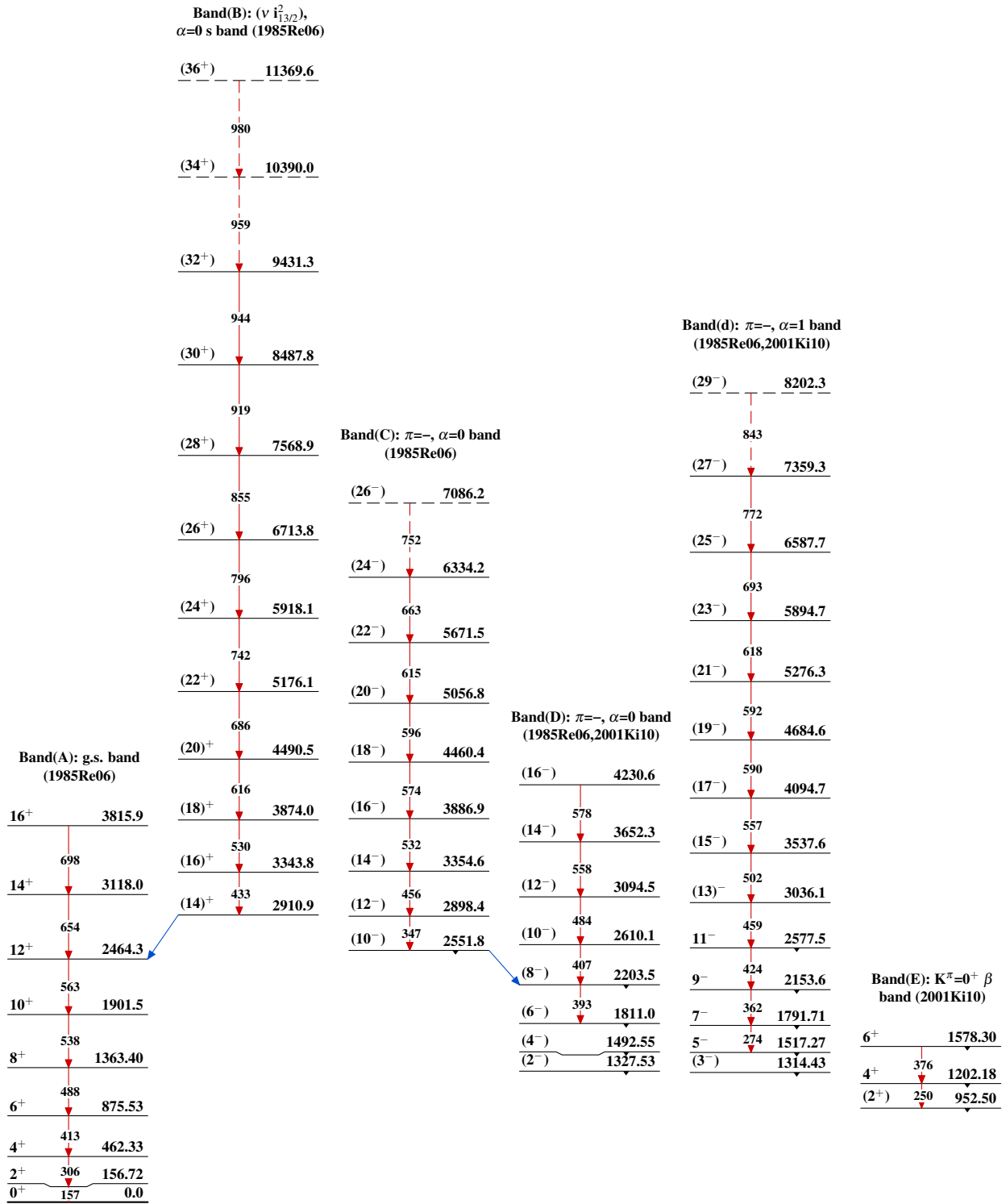
Intensities: Relative photon branching from each level



**Adopted Levels, Gammas****Level Scheme (continued)**

Intensities: Relative photon branching from each level



Adopted Levels, Gammas

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**Adopted Levels, Gammas (continued)**

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Band(F):  $\text{K}^{\pi}=2^{+} \gamma$   
band (2001Ki10)

|                        |                |
|------------------------|----------------|
| <u>(4<sup>+</sup>)</u> | <u>1220.00</u> |
|                        | ▼              |

|                        |                |
|------------------------|----------------|
| <u>(3<sup>+</sup>)</u> | <u>1073.57</u> |
|                        | ▼              |

|                        |               |
|------------------------|---------------|
| <u>(2<sup>+</sup>)</u> | <u>937.06</u> |
|                        | ▼             |

$^{170}_{74}\text{W}_{96}$