## $^{116}$Ag $\beta^-$ decay (9.3 s)

| Type | Author | History Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Jean Blachot | NDS 111, 717 (2010) | 1-Dec-2009 |

Parent: $^{116}$Ag: E=128.8 *1*; J$^\pi$=(6$^-$); T$_{1/2}$=9.3 s *1*; Q($\beta^-$)=6176 *4*; %$\beta^-$ decay=92 *4*

$^{116}$Ag-E,J$^\pi$,T$_{1/2}$: From 2005Ba94. This isomer decays ≈8 *4* % by an isomeric E3 transition of 80.9 keV to 47.9, (3$^+$) level of $^{116}$Ag. Likely configuration=$\pi$5/2[422]⊗$\nu$7/2[523] or $\pi$3/2[431]⊗$\nu$9/2[514].

$^{116}$Ag-Q($\beta^-$): From 2009AuZZ.

$^{116}$Ag-%$\beta^-$ decay: %IT=8 *4* from 2005Ba94.

2009Ba52: $^{116}$Ag activity was produced by the 40-MeV protons bombarding a $^{238}UC_x$ target installed at the On-Line Test Facility (oltf) at the Holifield Radioactive Ion Beam Facility (hribf). Fission products was separated and deposited on a moving tape collector (mtc).

First measurements : 1973FoZF,1974Bj01,1975BrYN.

Measured E$\gamma$, I$\gamma$, $\gamma\gamma$, conversion electron-$\gamma$ with the (cards) detector array, composed of the three segmented-clover Ge detectors, plastic scintillators and a high-resolution Si conversion-electron spectrometer (besca).

Transitions arising from the respective short-lived isomers were separated by their half-lives.

The $\gamma$-$\gamma$ and conversion electron-$\gamma$ coincidences were used to construct the decay scheme in $^{116}$Cd after the $\beta$ decay of 9.8-s isomer of $^{116}$Ag.

### $^{116}$Cd Levels

| E(level)[†] | J$^\pi$[‡] | Comments |
|---|---|---|
| 0.0 | 0$^+$ | |
| 513.50 *8* | 2$^+$ | |
| 1213.11 *8* | 2$^+$ | |
| 1219.50 *10* | 4$^+$ | |
| 1642.61 *10* | 2$^+$ | |
| 1869.82 *13* | 4$^+$ | |
| 1916.04 *11* | 3$^+$ | |
| 1921.70 *11* | 3$^-$ | |
| 2026.72 *12* | 6$^+$ | |
| 2042.29 *12* | 4$^+$ | |
| 2249.11 *11* | 5$^-$ | |
| 2303.00 *22* | | |
| 2340.12 *12* | (4$^-$) | J$^\pi$: 4$^-$ from Fig.5 and Table ii (2009Ba52). |
| 2493.71 *22* | | |
| 2504.04 *13* | (5$^-$) | J$^\pi$: 5$^-$ in Fig.5 and Table ii (2009Ba52). |
| 2565.0 *3* | | |
| 2691.16 *14* | (5$^-$) | |
| 2693.23 *14* | (7$^-$) | |
| 2699.30 *23* | (5$^-$) | |
| 2828.91 *23* | (6$^-$) | |
| 2865.70 *16* | (5$^-$) | |
| 2877.74 *16* | (6$^-$) | |
| 2920.5 *10* | | E(level): from Fig.7 and listed in Table iv ( $^{116}$Ag$^{m1,m2}$) not in Table ii ($^{116}$Ag$^{m2}$ (2009Ba52). |
| 2958.63 *14* | (6$^-$) | |
| 3013.55 *14* | (5$^-$,6$^-$) | |
| 3088.00 *13* | (7$^-$) | |
| 3130.36 *25* | | |
| 3162.52 *23* | | |
| 3212.72 *23* | | |
| 3213.70 *22* | (6$^+$) | |
| 3360.11 *17* | | |
| 3372.0 *3* | | |
| 3373.3 *5* | | |
| 3388.0 *3* | | |

Continued on next page (footnotes at end of table)

## $^{116}$Ag $\beta^-$ decay (9.3 s) (continued)

### $^{116}$Cd Levels (continued)

| E(level)† | Comments |
|---|---|
| 3486.22 *24* | E(level): 3468.1 listed in Table ii of 2009Ba52 is a misprint. |
| 3549.75 *24* | |
| 3632.7 *5* | |
| 3665.02 *23* | |

† From least-squares fit to Eγ′s.
‡ From Table iv (2009Ba52).

### $\beta^-$ radiations

| E(decay) | E(level) | I$\beta^-$‡ | Log *ft*† | Comments |
|---|---|---|---|---|
| (2640 *4*) | 3665.02 | 0.65 *9* | 6.26 *6* | av Eβ=1081.2 *19* |
| (2672 *4*) | 3632.7 | 0.23 *8* | 6.73 *16* | av Eβ=1096.2 *19* |
| (2755 *4*) | 3549.75 | 1.2 *3* | 6.07 *11* | av Eβ=1134.8 *19* |
| (2819 *4*) | 3486.22 | 0.5 *1* | 6.49 *9* | av Eβ=1164.5 *19* |
| (2917 *4*) | 3388.0 | 0.24 *5* | 6.87 *9* | av Eβ=1210.4 *19* |
| (2931 *4*) | 3373.3 | 0.4 *2* | 6.66 *22* | av Eβ=1217.3 *19* |
| (2933 *4*) | 3372.0 | 0.28 *7* | 6.82 *11* | av Eβ=1217.9 *19* |
| (2945 *4*) | 3360.11 | 4.2 *2* | 5.647 *22* | av Eβ=1223.5 *19* |
| (3091 *4*) | 3213.70 | 4.6 *5* | 5.70 *5* | av Eβ=1292.1 *19* |
| (3092 *4*) | 3212.72 | 0.40 *9* | 6.76 *10* | av Eβ=1292.6 *19* |
| (3142 *4*) | 3162.52 | 0.25 *6* | 6.99 *11* | av Eβ=1316.1 *19* |
| (3174 *4*) | 3130.36 | 0.4 *1* | 6.81 *11* | av Eβ=1331.2 *19* |
| (3217 *4*) | 3088.00 | 8.6 *7* | 5.50 *4* | av Eβ=1351.1 *19* |
| (3291 *4*) | 3013.55 | 6.3 *7* | 5.68 *5* | av Eβ=1386.2 *19* |
| (3346 *4*) | 2958.63 | 25 *1* | 5.108 *18* | av Eβ=1412.0 *19* |
| (3384 *4*) | 2920.5 | 0.17 *5* | 7.3 *2* | av Eβ=1430.0 *20*<br>I$\beta^-$: from Table iv (2009Ba52). |
| (3427 *4*) | 2877.74 | 3.9 *3* | 5.96 *4* | av Eβ=1450.1 *19* |
| (3439 *4*) | 2865.70 | 0.8 *3* | 6.65 *17* | av Eβ=1455.8 *19* |
| (3476 *4*) | 2828.91 | 1.1 *7* | 6.5 *3* | av Eβ=1473.2 *19* |
| (3605 *4*) | 2699.30 | 1.7 *4* | 6.41 *11* | av Eβ=1534.4 *19* |
| (3612 *4*) | 2693.23 | 10 *5* | 5.65 *22* | av Eβ=1537.2 *19* |
| (3614 *4*) | 2691.16 | 2.5 *5* | 6.25 *9* | av Eβ=1538.2 *19* |
| (3740 *4*) | 2565.0 | 0.13 *3* | 7.60 *10* | av Eβ=1597.8 *19* |
| (3801 *4*) | 2504.04 | 5.9 *9* | 5.97 *7* | av Eβ=1626.7 *19* |
| (3811 *4*) | 2493.71 | 0.17 *7* | 7.52 *18* | av Eβ=1631.6 *19* |
| (3965# *4*) | 2340.12 | 0.3 *2* | 7.3 *3* | av Eβ=1704.3 *19*<br>Log *ft*: 8.9 *3* from Table iv of 2009Ba52, assuming first-forbidden unique transition. Compilers note that $6^-$ to $4^-$ is not a transition of this nature. log *ft*=7.3 is too low to be realistic for a ΔJ=$^{2,}$Noβ transition. |
| (4002 *4*) | 2303.00 | 0.81 *6* | 6.93 *4* | av Eβ=1721.9 *19* |
| (4056 *4*) | 2249.11 | 15 *9* | 5.7 *3* | av Eβ=1747.4 *19* |
| (4263 *4*) | 2042.29 | 1.4 *1* | $8.5^{1u}$ *1* | av Eβ=1845.5 *19* |
| (4435 *4*) | 1869.82 | 3.9 *6* | $8.1^{1u}$ *1* | av Eβ=1927.4 *19* |

† The values are nearly the same as in Table iv of 2009Ba52, unless otherwise stated. 2009Ba52 state that log *ft* values should be considered as lower limits, especially, for weak β feedings, due to "pandemonium" effect.
‡ Absolute intensity per 100 decays.
\# Existence of this branch is questionable.

## $^{116}$Ag $\beta^-$ decay (9.3 s) (continued)

### $\gamma$($^{116}$Cd)

Unplaced $\gamma$ rays are from the decay of 20-s or the 9.8-s isomer.

| $E_\gamma$ | $I_\gamma$ [†@] | $E_i$(level) | $J^\pi_i$ | $E_f$ | $J^\pi_f$ | Mult. | Comments |
|---|---|---|---|---|---|---|---|
| 93.0 2 | 0.03 1 | 2958.63 | (6⁻) | 2865.70 | (5⁻) | M1 | α(K)exp=8×10⁻¹ 3 |
| 129.3 3 | 0.16 2 | 3088.00 | (7⁻) | 2958.63 | (6⁻) | M1 | α(K)exp=1.5×10⁻¹ 7 |
| 135.6 2 | 0.05[#] 2 | 3013.55 | (5⁻,6⁻) | 2877.74 | (6⁻) | M1 | α(K)exp=1.2×10⁻¹ 3 |
| 147.7 2 | 0.012 3 | 3013.55 | (5⁻,6⁻) | 2865.70 | (5⁻) | M1,E2 | α(K)exp=2.3×10⁻¹ 9 |
| [x]152.8 3 | 0.06 1 | | | | | | |
| 186.6 4 | 0.12 2 | 2877.74 | (6⁻) | 2691.16 | (5⁻) | M1 | α(K)exp=8×10⁻² 2 |
| [x]198.7 3 | 0.21 4 | | | | | | |
| [x]204.2 3 | 0.14 3 | | | | | | |
| 210.6 3 | 0.14 3 | 3088.00 | (7⁻) | 2877.74 | (6⁻) | M1 | α(K)exp=5×10⁻² 1 |
| 229.6 3 | 0.03[#] 1 | 3360.11 | | 3130.36 | | | α(K)exp=4×10⁻² 1 |
| 254.9 1 | 2.3 2 | 2504.04 | (5⁻) | 2249.11 | 5⁻ | M1,E2 | α(K)exp=3.5×10⁻² 5 |
| 259.3 2 | 0.20 8 | 2958.63 | (6⁻) | 2699.30 | (5⁻) | | α(K)exp=2×10⁻² 1 |
| 265.4 1 | 2.0 1 | 2958.63 | (6⁻) | 2693.23 | (7⁻) | M1 | α(K)exp=3.1×10⁻² 3 |
| [x]315.1 3 | 0.11 2 | | | | | | |
| 320.2 2 | 0.50 5 | 3013.55 | (5⁻,6⁻) | 2693.23 | (7⁻) | M1,E2 | α(K)exp=1.9×10⁻² 3 |
| 327.6 3 | 0.08 2 | 2249.11 | 5⁻ | 1921.70 | 3⁻ | | α(K)exp=2.4×10⁻² 12 |
| 351.2 2 | 0.09[#] 1 | 2691.16 | (5⁻) | 2340.12 | (4⁻) | M1 | α(K)exp=1.5×10⁻² 3 |
| 373.6 4 | 0.09[#] 1 | 2877.74 | (6⁻) | 2504.04 | (5⁻) | | |
| [x]374.3 3 | 0.04 3 | | | | | | |
| 379.4 2 | 0.6 1 | 2249.11 | 5⁻ | 1869.82 | 4⁺ | E1 | α(K)exp=4×10⁻³ 1 |
| 394.6 2 | 0.56 5 | 3088.00 | (7⁻) | 2693.23 | (7⁻) | M1,E2 | α(K)exp=1.1×10⁻² 2 |
| 399.5 4 | 0.06[#] 1 | 2042.29 | 4⁺ | 1642.61 | 2⁺ | | |
| 418.3 3 | 0.06[‡] 1 | 2340.12 | (4⁻) | 1921.70 | 3⁻ | | |
| 423.1 2 | 0.002 1 | 1642.61 | 2⁺ | 1219.50 | 4⁺ | | |
| 423.9 2 | 0.32 3 | 2340.12 | (4⁻) | 1916.04 | 3⁺ | | α(K)exp=7×10⁻³ 3 |
| 442.0 1 | 0.23[#] 5 | 2691.16 | (5⁻) | 2249.11 | 5⁻ | | |
| 443.8 3 | 1.8[#] 3 | 2693.23 | (7⁻) | 2249.11 | 5⁻ | | |
| 450.0 5 | 0.4 1 | 2699.30 | (5⁻) | 2249.11 | 5⁻ | M1,E2 | α(K)exp=7×10⁻³ 2 |
| 454.1 3 | 0.54[‡] 4 | 2958.63 | (6⁻) | 2504.04 | (5⁻) | | α(K)exp=6×10⁻³ 2 |
| 513.5 1 | 24[‡] 2 | 513.50 | 2⁺ | 0.0 | 0⁺ | E2 | α(K)exp=5.3×10⁻³ 1<br>α(K)exp: Uncertainty of 0.00001 in Table I of 2009Ba52 seems unrealistic, the compilers have increased the uncertainty by a factor of 10. |
| 522.5 5 | 0.62[#] 7 | 3213.70 | (6⁺) | 2691.16 | (5⁻) | E1 | α(K)exp=2.1×10⁻³ 7 |
| 537.6 6 | 0.29[#] 3 | 2877.74 | (6⁻) | 2340.12 | (4⁻) | | |
| 538.3 3 | 0.035[#] 7 | 2565.0 | | 2026.72 | 6⁺ | | |
| [x]552.1 3 | 0.03 1 | | | | | | |
| 559.1 2 | 0.06 1 | 3388.0 | | 2828.91 | (6⁻) | | |
| 579.8 2 | 0.3 2 | 2828.91 | (6⁻) | 2249.11 | 5⁻ | | α(K)exp=4×10⁻³ 2 |
| 583.9 2 | 0.86 8 | 3088.00 | (7⁻) | 2504.04 | (5⁻) | E2 | α(K)exp=3.8×10⁻³ 8 |
| 618.3 3 | 0.09 1 | 2958.63 | (6⁻) | 2340.12 | (4⁻) | | |
| 628.6 2 | 0.67 6 | 2877.74 | (6⁻) | 2249.11 | 5⁻ | | α(K)exp=3×10⁻³ 1 |
| 634.0 2 | 0.78 7 | 2504.04 | (5⁻) | 1869.82 | 4⁺ | | |
| 650.2 2 | 0.69 5 | 1869.82 | 4⁺ | 1219.50 | 4⁺ | M1,E2 | α(K)exp=3.3×10⁻³ 9 |
| 656.7 2 | 1.5 1 | 1869.82 | 4⁺ | 1213.11 | 2⁺ | M1,E2 | α(K)exp=2.9×10⁻³ 5 |
| 664.6 3 | 1.3[#] 3 | 2691.16 | (5⁻) | 2026.72 | 6⁺ | | |
| 666.4 2 | 3.8[#] 6 | 2693.23 | (7⁻) | 2026.72 | 6⁺ | | |
| 667.1 5 | 0.20[#] 7 | 3360.11 | | 2693.23 | (7⁻) | | |

Continued on next page (footnotes at end of table)

## $^{116}$Ag $\beta^-$ decay (9.3 s) (continued)

### $\gamma$($^{116}$Cd) (continued)

| $E_\gamma$ | $I_\gamma$ †@ | $E_i$(level) | $J^\pi_i$ | $E_f$ | $J^\pi_f$ | Mult. | Comments |
|---|---|---|---|---|---|---|---|
| 669.0 5 | 0.3# 1 | 3360.11 | | 2691.16 | (5⁻) | | |
| 673.5 2 | 0.6 1 | 3013.55 | (5⁻,6⁻) | 2340.12 | (4⁻) | | |
| x689.0 3 | 0.05 1 | | | | | | |
| 696.5 2 | 0.10# 1 | 1916.04 | 3⁺ | 1219.50 | 4⁺ | | |
| 699.6 2 | 1.4 1 | 1213.11 | 2⁺ | 513.50 | 2⁺ | M1,E2 | α(K)exp=2.4×10⁻³ 4 |
| 702.9 3 | 0.24# 5 | 1916.04 | 3⁺ | 1213.11 | 2⁺ | | |
| 706.0 1 | 22 2 | 1219.50 | 4⁺ | 513.50 | 2⁺ | E2 | α(K)exp=2.2×10⁻³ 2 |
| 708.6 2 | 0.05 2 | 1921.70 | 3⁻ | 1213.11 | 2⁺ | | |
| 709.7 5 | 2.6# 5 | 2958.63 | (6⁻) | 2249.11 | 5⁻ | | |
| x738.7 3 | 0.02 1 | | | | | | |
| x754.0 3 | 0.07 2 | | | | | | |
| 764.7 2 | 0.27# 3 | 3013.55 | (5⁻,6⁻) | 2249.11 | 5⁻ | | |
| x784.8 3 | 0.07 3 | | | | | | |
| 807.1 1 | 6.5 6 | 2026.72 | 6⁺ | 1219.50 | 4⁺ | E2 | α(K)exp=1.6×10⁻³ 1 |
| 822.6 4 | 0.06# 1 | 2042.29 | 4⁺ | 1219.50 | 4⁺ | | |
| 839.1 1 | 0.32 3 | 3088.00 | (7⁻) | 2249.11 | 5⁻ | | |
| x862.4 5 | 0.2 1 | | | | | | |
| x873.9 3 | 0.07 1 | | | | | | |
| 881.1 3 | 0.12 2 | 3130.36 | | 2249.11 | 5⁻ | | |
| x896.5 3 | 0.14 7 | | | | | | |
| x930.0 3 | 0.014 10 | | | | | | |
| 932.1 2 | 0.8 1 | 2958.63 | (6⁻) | 2026.72 | 6⁺ | | |
| x953.6 3 | 0.03 2 | | | | | | |
| 964.6 2 | 0.5 1 | 3213.70 | (6⁺) | 2249.11 | 5⁻ | | |
| x977.3 3 | 0.03 1 | | | | | | |
| 987.0 2 | 0.14 2 | 3013.55 | (5⁻,6⁻) | 2026.72 | 6⁺ | | |
| 1029.7 1 | 13 2 | 2249.11 | 5⁻ | 1219.50 | 4⁺ | E1 | α(K)exp=3.6×10⁻⁴ 9 |
| 1045.7 2 | 0.29 7 | 3549.75 | | 2504.04 | (5⁻) | | |
| 1061.1 1 | 0.13 1 | 3088.00 | (7⁻) | 2026.72 | 6⁺ | | |
| 1083.5 2 | 0.20# 2 | 2303.00 | | 1219.50 | 4⁺ | | |
| 1111.1 2 | 0.45 6 | 3360.11 | | 2249.11 | 5⁻ | | |
| 1120.7 1 | 0.77 6 | 2340.12 | (4⁻) | 1219.50 | 4⁺ | | |
| 1124.2 5 | 0.11# 3 | 3373.3 | | 2249.11 | 5⁻ | | |
| 1129.1 1 | 0.05 1 | 1642.61 | 2⁺ | 513.50 | 2⁺ | | |
| 1135.8 2 | 0.06 1 | 3162.52 | | 2026.72 | 6⁺ | | |
| x1180.6 4 | 0.03 1 | | | | | | |
| 1186.0 2 | 0.10 2 | 3212.72 | | 2026.72 | 6⁺ | | |
| 1213.1 1 | 0.70 5 | 1213.11 | 2⁺ | 0.0 | 0⁺ | | |
| 1237.1 3 | 0.05 1 | 3486.22 | | 2249.11 | 5⁻ | | |
| x1250.5 4 | 0.03 1 | | | | | | |
| x1269.5 5 | 0.014 9 | | | | | | |
| 1274.2 2 | 0.04# 1 | 2493.71 | | 1219.50 | 4⁺ | | |
| 1284.6 2 | 0.20 2 | 2504.04 | (5⁻) | 1219.50 | 4⁺ | | |
| 1333.3 2 | 0.11 1 | 3360.11 | | 2026.72 | 6⁺ | | |
| 1345.3 3 | 0.07‡ 1 | 3372.0 | | 2026.72 | 6⁺ | | |
| 1356.4 3 | 0.23 2 | 1869.82 | 4⁺ | 513.50 | 2⁺ | | |
| 1402.5 1 | 0.33 2 | 1916.04 | 3⁺ | 513.50 | 2⁺ | | |
| 1408.2 1 | 0.16 3 | 1921.70 | 3⁻ | 513.50 | 2⁺ | | |
| 1415.9 2 | 0.16# 2 | 3665.02 | | 2249.11 | 5⁻ | | |
| x1422.2 5 | 0.02 1 | | | | | | |
| 1459.5 3 | 0.08# 1 | 3486.22 | | 2026.72 | 6⁺ | | |
| x1517.2 3 | 0.13 3 | | | | | | |
| 1528.8 1 | 0.23 3 | 2042.29 | 4⁺ | 513.50 | 2⁺ | | |

Continued on next page (footnotes at end of table)

## $^{116}$Ag $\beta^-$ decay (9.3 s) (continued)

### $\gamma(^{116}Cd)$ (continued)

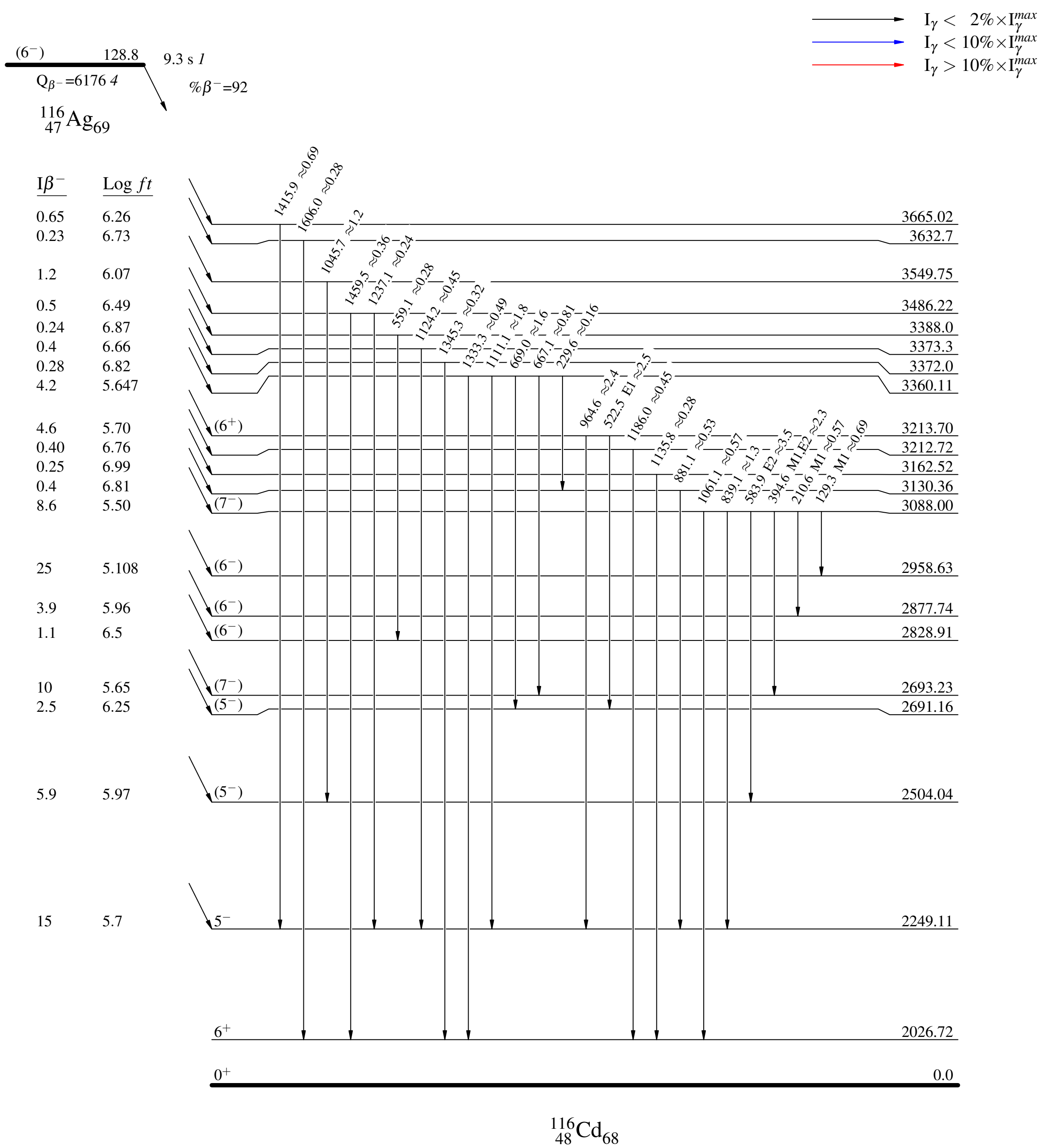
| $E_\gamma$ | $I_\gamma$ [†@] | $E_i$(level) | $J^\pi_i$ | $E_f$ | $J^\pi_f$ | Comments |
|---|---|---|---|---|---|---|
| [x]1549.5 *5* | 0.03 *1* | | | | | |
| 1606.0 *5* | 0.06[#] *2* | 3632.7 | | 2026.72 | $6^+$ | |
| [x]1630.9 *5* | 0.008 *6* | | | | | |
| 1642.6 *2* | 0.03 *1* | 1642.61 | $2^+$ | 0.0 | $0^+$ | |
| 1646.1 *2* | 0.24 *2* | 2865.70 | $(5^-)$ | 1219.50 | $4^+$ | |
| [x]1676.8 *4* | 0.04 *1* | | | | | |
| 1701.0 | | 2920.5 | | 1219.50 | $4^+$ | $E_\gamma$: from Fig.7 (2009Ba52). |
| [x]1858.2 *4* | 0.04 *1* | | | | | |
| [x]1918.0 *5* | 0.02 *1* | | | | | |
| [x]1922.4 *5* | 0.03 *1* | | | | | |
| [x]2012.8 *5* | 0.04 *1* | | | | | |

† From singles $\gamma$ and $\gamma\gamma$ coin spectra, unless otherwise stated.
‡ From singles $\gamma$ spectra.
# From $\gamma\gamma$ coin spectra.
@ For absolute intensity per 100 decays, multiply by ≈4.1.
x $\gamma$ ray not placed in level scheme.

## $^{116}$Ag $\beta^-$ decay (9.3 s)

### Decay Scheme

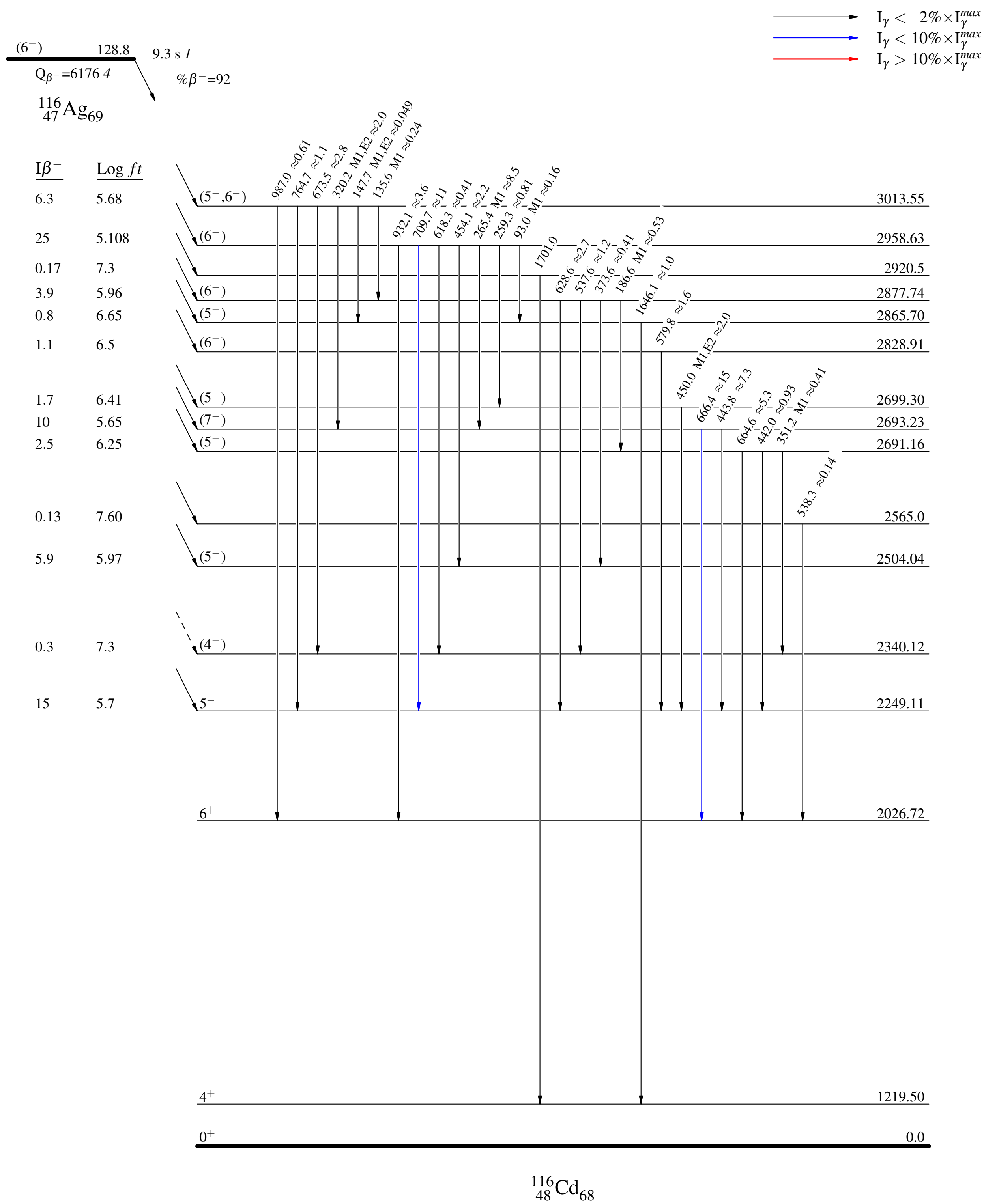
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



## $^{116}$Ag $\beta^-$ decay (9.3 s)

### Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



## $^{116}$Ag $\beta^-$ decay (9.3 s)

### Decay Scheme (continued)

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays