## Adopted Levels, Gammas

| Type | Author | History Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | F. G. Kondev | NDS 177, 509, 2021 | 4-Jul-2021 |

Q($\beta^-$)=−7725 *12*; S(n)=10296 *9*; S(p)=138 *19*; Q($\alpha$)=7275 *4* 2021Wa16

### $^{203}$Fr Levels

Cross Reference (XREF) Flags

A $^{207}$Ac $\alpha$ decay
B $^{169}$Tm($^{40}$Ar,6n$\gamma$)

| E(level)† | J$^\pi$ | T$_{1/2}$ | XREF | Comments |
|---|---|---|---|---|
| 0.0‡ | 9/2$^-$ | 0.55 s *1* | AB | %$\alpha$≤100<br>$\mu$=+3.74 *4*; Q=−0.47 *2*<br>J$^\pi$: from hyperfine structure in 2017Wi11; $\pi$ from $\mu$; systematics in neighboring odd-Z nuclei.<br>T$_{1/2}$: Weighted average of 0.55 s *2* (1980Ew03), 0.560 s *15* (2005De01) and 0.53 s *2* (2005Uu02). Others: 0.7 s *3* (1967Va20), 0.5 s *+9−2* (1994Le05).<br>E$\alpha$=7130 keV *5* (1967Va20), 7135 keV *10* (1980Ew03), 7120 keV *25* (1994Le05), 7130 keV *6* (2005Uu02), 7132 keV *5* (2005De01) and 7072 keV *27* (2015We13).<br>$\mu$,Q: Using high-resolution collinear resonance ionization spectroscopy technique (2017Wi11,2019StZV). Other (the same group): $\mu$=+3.73 *4* (2014Ly01,2013Fl09).<br>configuration: $\pi(h^{+1}_{9/2})$.<br>$\delta$<r$^2$>($^{203}$Fr,$^{221}$Fr)=−1.5302 fm$^2$ *2* (stat) *168* (syst) (2017Wi11). Other (the same group): −1.530 fm$^2$ *8* (stat) *16* (syst) (2013Fl09,2014Ly01). |
| 161.9? *4* | (7/2$^-$) | | B | J$^\pi$: 161.9$\gamma$ to 9/2$^-$; comparison with the neighboring $^{205}$Fr isotope.<br>configuration: Dominant $\pi(f^{+1}_{7/2})$. |
| ≈337? | (5/2$^-$) | | B | J$^\pi$: 175$\gamma$ to 9/2$^-$; comparison with the neighboring $^{205}$Fr isotope.<br>configuration: Dominant $\pi(h^{+1}_{9/2})\otimes 2^+$. |
| 361 *6* | 1/2$^+$ | 43 ms *4* | B | %$\alpha$=20 *4* (2013Ja06); %IT=80 *4*<br>E(level): From 2021Ko07, based on E$\alpha$ and E($^{199m}$At)=244 keV *1*.<br>J$^\pi$: Favored $\alpha$ decay to $^{199m}$At ($J^\pi$=1/2$^+$,2018Cu02) and subsequent favored $\alpha$ decay to to $^{195m}$Bi ($J^\pi$=1/2$^+$,2016Ba42); systematics of odd-A nuclei in this mass region.<br>T$_{1/2}$: Weighted average of 41 ms *+5−4*, deduced from 7256$\alpha$(t) time spectrum, when gating on E$\alpha$=6643 keV ($^{199}$At), and 45 ms *5* from recoil($^{203}$Fr)-ce($\Delta$t) (2013Ja06). Other: 60 ms *+30−20* (2005Uu02).<br>E$\alpha$=7246 keV *5* (2013Ja06), supersedes 7227 keV *8* (2005Uu02).<br>configuration: $\pi(s^{+1}_{1/2})$. |
| 426.0# *10* | 13/2$^+$ | 0.37 $\mu$s *5* | B | J$^\pi$: 426$\gamma$ M2 to 9/2$^-$; systematics of odd-A nuclei in this mass region.<br>T$_{1/2}$: From recoil($^{203}$Fr)-ce($\Delta$t) (2013Ja06).<br>configuration: $\pi(i^{+1}_{13/2})$. |
| 476.40‡ *10* | (13/2$^-$) | | B | J$^\pi$: 476.4$\gamma$ to 9/2$^-$.<br>configuration: Dominant $\pi(h^{+1}_{9/2})\otimes 4^+$. |
| 789.1?# *11* | (15/2$^+$) | | B | J$^\pi$: 362.5$\gamma$ to 13/2$^+$. |
| 1035.00‡ *23* | (17/2$^-$) | | B | J$^\pi$: 558.6$\gamma$ to (13/2$^-$). |
| 1035.6?# *11* | (17/2$^+$) | | B | J$^\pi$: 245.5$\gamma$ to (15/2$^+$), 611.1$\gamma$ to (13/2$^+$). |
| 1672.7?‡ *4* | (21/2$^-$) | | B | J$^\pi$: 637.7$\gamma$ to (17/2$^-$).<br>configuration: Dominant $\pi(h^{+1}_{9/2})\otimes 6^+$. |

Continued on next page (footnotes at end of table)

## Adopted Levels, Gammas (continued)

### $^{203}$Fr Levels (continued)

† From a least squares fit to Eγ.
‡ Seq.(A): Sequence based on the $J^{\pi}=9/2^{-}$ ground state.
# Seq.(B): Sequence based on the $J^{\pi}=13/2^{+}$ isomer.

### γ($^{203}$Fr)

| $E_i$(level) | $J_i^{\pi}$ | $E_\gamma$ † | $I_\gamma$ † | $E_f$ | $J_f^{\pi}$ | Mult. † | α ‡ | Comments |
|---|---|---|---|---|---|---|---|---|
| 161.9? | (7/2⁻) | 161.9 *4* | 7 *2* | 0.0 | 9/2⁻ | [M1] | 3.64 *6* | α(K)=2.93 *5*; α(L)=0.537 *9*; α(M)=0.1280 *20*<br>α(N)=0.0336 *6*; α(O)=0.00750 *12*; α(P)=0.001203 *19*; α(Q)=6.72×10$^{-5}$ *11* |
| ≈337? | (5/2⁻) | ≈175# | | 161.9? | (7/2⁻) | [M1] | 2.92 | α(K)≈2.35; α(L)≈0.431; α(M)≈0.1026<br>α(N)≈0.0269; α(O)≈0.00601; α(P)≈0.000965; α(Q)≈5.38×10$^{-5}$ |
| 361 | 1/2⁺ | ≈20# | | ≈337? | (5/2⁻) | [M2] | 6.78×10$^4$ | α(L)≈4.87×10$^4$; α(M)≈1.426×10$^4$<br>α(N)≈3.86×10$^3$; α(O)≈844; α(P)≈124.4; α(Q)≈5.32 |
| | | ≈195# | | 161.9? | (7/2⁻) | [E3] | 6.56 | α(K)≈0.400; α(L)≈4.48; α(M)≈1.269<br>α(N)≈0.336; α(O)≈0.0702; α(P)≈0.00921; α(Q)≈4.65×10$^{-5}$ |
| 426.0 | 13/2⁺ | 426 *1* | 100 | 0.0 | 9/2⁻ | M2 | 0.749 *12* | α(K)=0.567 *9*; α(L)=0.1374 *22*; α(M)=0.0341 *6*<br>α(N)=0.00901 *15*; α(O)=0.00201 *4*; α(P)=0.000317 *6*; α(Q)=1.67×10$^{-5}$ *3*<br>B(M2)(W.u.)=0.099 *+16−12*<br>Mult.: from K/(L+M+..)=3.3 *4* (2013Ja06). |
| 476.40 | (13/2⁻) | 476.4 *1* | 100 | 0.0 | 9/2⁻ | | | |
| 789.1? | (15/2⁺) | 362.5# *3* | 100 | 426.0 | 13/2⁺ | | | |
| 1035.00 | (17/2⁻) | 558.6 *2* | 100 | 476.40 | (13/2⁻) | | | |
| 1035.6? | (17/2⁺) | 245.5# *4* | 44 *13* | 789.1? | (15/2⁺) | | | |
| | | 611.1# *5* | 100 *41* | 426.0 | 13/2⁺ | | | |
| 1672.7? | (21/2⁻) | 637.7# *3* | 100 | 1035.00 | (17/2⁻) | | | |

† From 2013Ja06.
‡ Additional information 1.
# Placement of transition in the level scheme is uncertain.

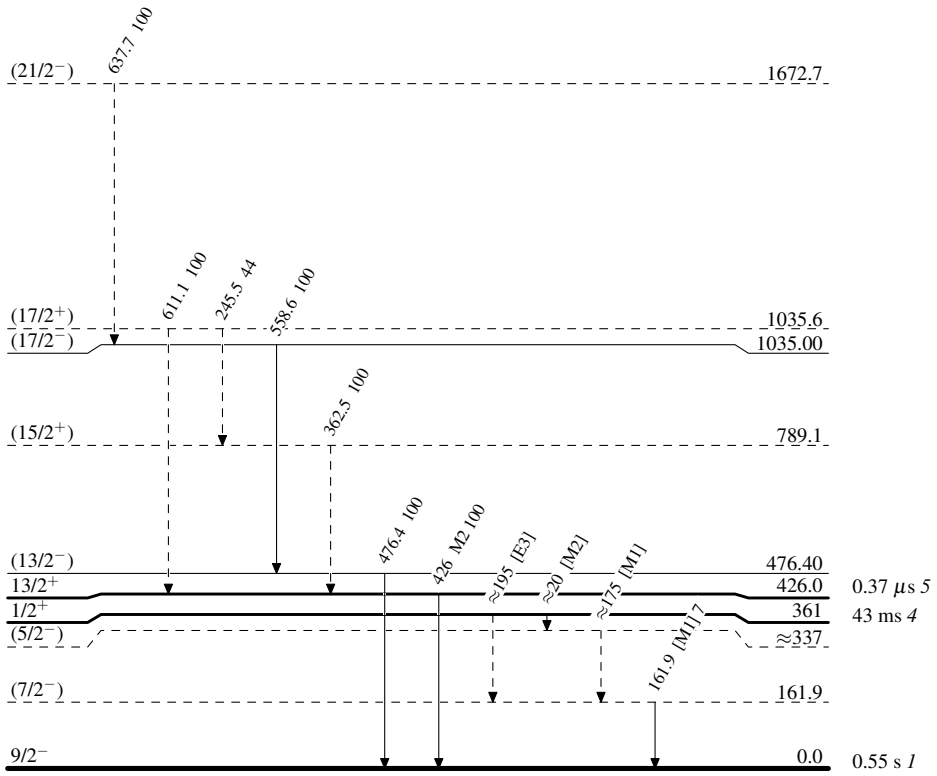
## Adopted Levels, Gammas

Legend

### Level Scheme

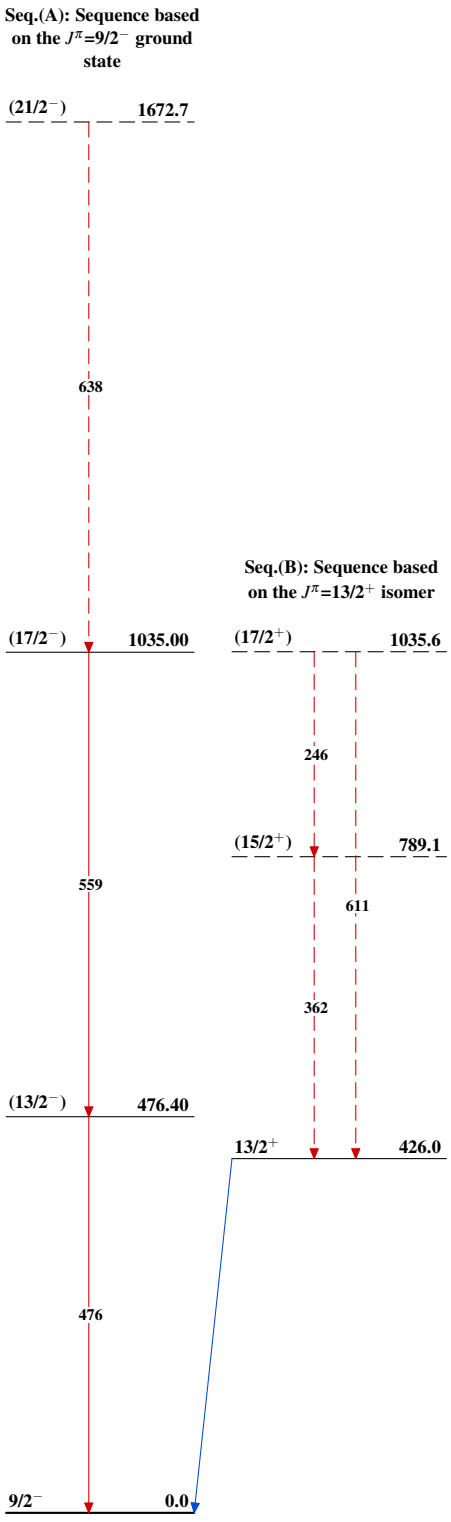
Intensities: Relative photon branching from each level

$\gamma$ Decay (Uncertain)




$^{203}_{87}Fr_{116}$

## Adopted Levels, Gammas




$^{203}_{87}Fr_{116}$