

Adopted Levels

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 192,1 (2023)	1-Aug-2023

S(n)=8710 30; S(p)=-400 30; Q(α)=7622 4 2021Wa16

2019Gh11: ²⁰⁰Fr produced in U(p,X),E=1.4 GeV at ISOLDE-CERN facility using UC_x target and pulsed proton beam. Francium atoms were ionized and accelerated to 30 keV, followed by mass separation using High-Resolution Separator (HRS). Measured: E_α, T_{1/2} using Si surface barrier detectors. FWHM≈33 keV for E_α=5-8 MeV range.

2014Ka23: ²⁰⁰Fr produced in ¹⁴⁷Sm(⁵⁶Fe,p2n) at GSI with E(⁵⁶Fe)=260-263 MeV. Target=370 μg/cm² thick enriched to 96.4% in ¹⁴⁷Sm, and backed with 40 μg/cm² thick carbon backing and covered with a 10 μg/cm² layer of carbon. It was mounted on a rotating wheel. Evaporation residues were separated using SHIP facility at GSI, and implanted into the detection system consisting of 16-strip position sensitive Si detectors (PSSD), a pack of six Si strip detectors (BOX) at the back to detect escaping α particles, and three time-of-flight detectors in front of PSSDs. Measured position and time correlations between evaporation residues (Er) and α events, E_α, half-lives of ground states of ²⁰⁰Fr and ¹⁹⁶At, (Er)γ-coin, αγ-coin, Er-α-α correlations.

2014Gh09: ²⁰⁰Fr produced in U(p,X),E=1.4 GeV at ISOLDE-CERN facility using UC_x target and pulsed proton beam. Francium atoms were ionized and accelerated to 30 keV, followed by mass separation. Purified ion beams were transported to the detection station and implanted into 20 μg/cm² thick carbon foils. Fission fragments and α particles were measured by two silicon detectors of 300 μm thickness and γ rays were detected by a high-purity germanium detectors. Measured E_γ, I_γ, E_α, I_α, fission fragments. Deduced β-delayed fission branching ratio.

2005De01: ²⁰⁰Fr produced in a bombardment with a 1.4 GeV pulsed proton beam on 51 g/cm² thorium/graphite target; Detectors: on-line mass separator, recoils were implanted on a carbon foil for 100 ms and subsequent α decays were detected using a 400 mm², 1 mm thick silicon detector for a 1100 ms time period; Measured: E_α, T_{1/2}.

1996En01: ²⁰⁰Fr produced using ¹⁷⁰Yb(³⁵Cl,4n), E(³⁵Cl)=205 and 213 MeV; Target: 72 % enriched in ¹⁷⁰Yb; Detectors: gas filled mass separator, position sensitive silicon detectors with a typical resolution (FWHM) of 35 keV; Measured: E_α, T_{1/2}. Assignment to ²⁰⁰Fr is based on the observed E_α-E_α correlation with the characteristic daughter α-decay.

1995Mo14: ²⁰⁰Fr produced using ¹⁶⁹Tm(³⁶Ar,5n), E(³⁶Ar)=186 MeV; Beam intensity: 1.3×10¹¹ ions/s; Target: self-supporting, 2 mg/cm² thick; Detectors: gas filled recoil separator, position sensitive Si detectors with a typical energy resolution (FWHM) of 70 keV and position resolution (FWHM) of 0.2 mm (horizontal direction) and 0.5 mm (vertical direction), microchannel plate assembly located about 60 cm upstream from the Si detectors; Measured: E_α, T_{1/2}. Assignment to ²⁰⁰Fr is based on the observed E_α-E_α correlation with the characteristic daughter (¹⁹⁶At) α-decay.

²⁰⁰Fr Levels

E(level)	J ^π	T _{1/2}	Comments
0	(3 ⁺)	49.6 ms 21	<p>%α≥97.5; %ε+%β⁺≤2.5 %εF=3.1 17. %ε+%β⁺ from 2014Ka23, based on the non-observation of E_α(²⁰⁰Rn). Non-observation of E_α(²⁰⁰Rn) also reported in 2005De01 and 2019Gh11,2015Gh03 (%ε+%β⁺ ≤ 2.1%). %εF from 2014Gh09. Other: ≥1.4% in 2014Ka23, where one fission event was observed with T_{1/2}=47 ms +220-20. J^π: Favored α-decay to the ¹⁹⁶At g.s. [J^π=(3⁺)] and systematics in neighboring nuclei. T_{1/2}: Weighted average of 52 ms 3 (α(t),2019Gh11), 46 ms 4 (α(t),2014Ka23), and 49 ms 4 (α(t),2005De01). Others: 37 ms +30-12 (2013Uu01), 19 ms +13-3 (1996En01) and 570 ms +270-140 (1995Mo14). E_{α1}=7461 keV 12 correlated with E_{α2}=7053 keV 5 (2019Gh11); E_{α1}=7470 keV 5 correlated with E_{α2}=7045 keV 5 (2014Ka23); E_{α1}=7468 keV 15 correlated with E_{α2}=7048 keV 12 (2013Uu01); E_{α1}=7473 keV 12 (2005De01); E_{α1}=7468 keV 9 correlated with E_{α2}=7044 keV 7 (1996En01); E_{α1}=7500 keV 30 correlated with E_{α2}=7053 keV 30 (1995Mo14). configuration: Possible π(h_{9/2}⁺)⊗ν(p_{3/2}⁻). The assignment is tentative. %α≈100</p>
<110?	(10 ⁻)	0.10 s +18-4	<p>E(level): From 50 60 keV in 2021Ko07. The assignment of this level to ²⁰⁰Fr is tentative. J^π: Tentative assignment based on the proposed configuration and systematics of similar structures in neighboring nuclei. T_{1/2}: From 2021Ko07, based on two α₁-α₂ correlated events in 1996En01 with</p>

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Adopted Levels (continued) ^{200}Fr Levels (continued)

<u>E(level)</u>	<u>T_{1/2}</u>	<u>Comments</u>
$\leq 253?$	$0.6 \mu\text{s} +5-2$	<p>T_{1/2}(α_1)=100 ms. $E\alpha_1=7550$ keV correlated with $E\alpha_2=6880$ keV in 1996En01. The assignment to ^{200}Fr is tentative. configuration: Possible $\pi(h_{9/2}^{+1})\otimes\nu(i_{13/2}^{-1})$. The assignment is tentative. %IT\approx100 T_{1/2}: From implant-γ(t) using a $5 \mu\text{s}$ coincidence time window in 2014Ka23. E(level): From the observed 75.5-keV (three counts), 77.1-keV (four counts) and 100.3-keV (two counts) γ rays in coincidence with $K\alpha_1$ and $K\alpha_2$ Fr X rays in 2014Ka23.</p>