

¹⁶⁸Re ε decay ^{1992Me10}

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 111, 1807 (2010)	15-Jun-2010

Parent: ¹⁶⁸Re: E=0.0; J^π=(7⁺); T_{1/2}=4.4 s I; Q(ε)=9100 30; %ε+%β⁺ decay≈100.0

The tentative decay scheme and all data are from ^{1992Me10}. The largest ε+β⁺ imbalance occurs At the 6⁺ 1042 level, but significant imbalance occurs At 4⁺ and 8⁺ states As well, and implied log ft values to π=(-) levels are lower than expected for first-forbidden transitions. it is conceivable that the ¹⁶⁸Re parent has two isomeric states with similar half-life, resulting In mixed parentage for the reported decay, but there is No supporting evidence for this At present. given the large Q value for this decay, it is also likely that the present decay scheme is incomplete; ^{1992Me10} report No E_γ values above 1568 keV for any nuclide in their experiment, so there may exist higher energy transitions that were undetected In thair study. further experimental information concerning this decay is needed.

^{1992Me10}: sources from ¹⁴¹Pr(³²S,5n), E(³²S)≈178-190 MeV, helium-jet transport; monoisotopic ¹⁴¹Pr targets; measured excitation functions, E_γ, I_γ (Ge(Li), Ge γX detectors), γγ coin, γX coin.

¹⁶⁸W Levels

E(level) [†]	J ^π [‡]	T _{1/2}	Comments
0.0 [#]	0 ⁺	50.9 s 19	T _{1/2} : from Adopted Levels.
199.3 [#] 2	2 ⁺		
562.4 [#] 3	4 ⁺		
858.9 3			
1042.1 [#] 3	6 ⁺		
1117.5 3			
1278.9 3			
1536.4 3	5 ⁽⁻⁾		
1577.2 5	(4 ⁻ ,5 ⁻)		
1586.9 5			
1600.3 [#] 4	8 ⁺		
1698.6 4			
1760.8 3			
1834.2 4	7 ⁽⁻⁾		
2219.5 5			
2430.1 5			
2479.9 5			

[†] From least-squares fit to E_γ.

[‡] From Adopted Levels.

[#] Band(A): K^π=0⁺ g.s. band.

ε,β⁺ radiations

E(decay)	E(level)	Iβ ⁺ [‡]	Iε [‡]	Log ft	I(ε+β ⁺) ^{†‡}	Comments
(6.62×10 ³ [#] 3)	2479.9	1.7 2	0.48 7	5.88 6	2.2 3	av Eβ=2557 14; εK=0.1804 22; εL=0.0291 4; εM+=0.00897 11
(6.67×10 ³ 3)	2430.1	3.7 4	1.0 1	5.57 5	4.7 5	av Eβ=2581 15; εK=0.1769 21; εL=0.0286 4; εM+=0.00880 11
(6.88×10 ³ [#] 3)	2219.5	1.4 2	0.36 6	6.05 8	1.8 3	av Eβ=2680 15; εK=0.1629 20; εL=0.0263 4; εM+=0.00810 10
(7.27×10 ³ 3)	1834.2	4.3 4	0.89 9	5.70 5	5.2 5	av Eβ=2862 15; εK=0.1406 16; εL=0.0227 3; εM+=0.00698 8 Log ft: too low for a first-forbidden transition.

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¹⁶⁸Re ε decay **1992Me10 (continued)**

ε,β⁺ radiations (continued)

E(decay)	E(level)	Iβ ⁺ ‡	Iε ‡	Log ft	I(ε+β ⁺) †‡	Comments
(7.34×10 ³ 3)	1760.8	5.8 4	1.1 1	5.60 4	6.9 5	av Eβ=2896 15; εK=0.1367 16; εL=0.0220 3; εM+=0.00679 8
(7.40×10 ³ # 3)	1698.6	1.8 6	0.36 11	6.11 14	2.2 7	av Eβ=2926 15; εK=0.1336 15; εL=0.02153 25; εM+=0.00663 8
(7.50×10 ³ 3)	1600.3	8.4 6	1.5 1	5.49 4	9.9 7	av Eβ=2972 15; εK=0.1288 15; εL=0.02076 24; εM+=0.00639 8
(7.51×10 ³ 3)	1586.9	5.2 4	0.96 8	5.69 4	6.2 5	av Eβ=2979 15; εK=0.1282 15; εL=0.02066 23; εM+=0.00636 8
(7.52×10 ³ 3)	1577.2	3.6 3	0.67 6	5.85 5	4.3 4	av Eβ=2983 15; εK=0.1278 15; εL=0.02058 23; εM+=0.00634 7
(7.56×10 ³ 3)	1536.4	4.4 4	0.79 8	5.78 5	5.2 5	Log ft: too low for a (7 ⁺) to J≤5 transition. av Eβ=3003 15; εK=0.1259 14; εL=0.02027 23; εM+=0.00624 7
(7.82×10 ³ 3)	1278.9	3.8 4	0.61 7	5.93 5	4.4 5	Log ft: too low for a first-forbidden transition. av Eβ=3125 15; εK=0.1147 13; εL=0.01846 20; εM+=0.00569 7
(7.98×10 ³ 3)	1117.5	4.0 4	0.60 7	5.95 5	4.6 5	av Eβ=3202 15; εK=0.1083 12; εL=0.01743 19; εM+=0.00537 6
(8.06×10 ³ 3)	1042.1	25.0 13	3.66 20	5.17 3	28.7 15	av Eβ=3237 15; εK=0.1054 12; εL=0.01697 18; εM+=0.00523 6
(8.54×10 ³ 3)	562.4	12.6 11	1.53 13	5.60 4	14.1 12	av Eβ=3466 15; εK=0.0895 9; εL=0.01439 15; εM+=0.00443 5 Log ft: far too low for a transition from (7 ⁺).

† From I(γ+ce) imbalance At each level.

‡ For absolute intensity per 100 decays, multiply by ≈1.0.

Existence of this branch is questionable.

γ(¹⁶⁸W)

I_γ normalization: highly tentative value from from Σ (I(γ+ce) to 199)=100; No feeding to 2⁺ 199 would Be expected from a (7⁺) parent, but more than one ¹⁶⁸Re isomer could exist. Contamination of the only known g.s. transition (the 199γ) renders its use for normalization less reliable.

E _γ	I _γ †#	E _i (level)	J _i ^π	E _f	J _f ^π	Mult. ‡	a [@]	Comments
199.3 2	105 4	199.3	2 ⁺	0.0	0 ⁺	E2	0.312	α(K)=0.1703 25; α(L)=0.1076 16; α(M)=0.0268 4; α(N+..)=0.00723 11 α(N)=0.00633 10; α(O)=0.000892 13; α(P)=1.348×10 ⁻⁵ 20 I _γ : includes contaminant component (≈15%) from ¹⁶⁵ Ta.
297.7 2	1.9 2	1834.2	7 ⁽⁻⁾	1536.4	5 ⁽⁻⁾	E2	0.0870	α(K)=0.0582 9; α(L)=0.0220 4; α(M)=0.00537 8; α(N+..)=0.001464 21 α(N)=0.001274 19; α(O)=0.000185 3; α(P)=4.98×10 ⁻⁶ 7
^x 311.9 4	0.7 2							
^x 314.4 4	0.6 2							
363.2 2	100	562.4	4 ⁺	199.3	2 ⁺	E2	0.0489	α(K)=0.0348 5; α(L)=0.01074 16; α(M)=0.00260 4; α(N+..)=0.000711 10 α(N)=0.000617 9; α(O)=9.13×10 ⁻⁵ 13;

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^{168}Re ε decay **1992Me10** (continued) $\gamma(^{168}\text{W})$ (continued)

E_γ	$I_\gamma^{\dagger\#}$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ‡	$\alpha^{\text{@}}$	Comments
								$\alpha(\text{P})=3.07\times 10^{-6}$ 5 % $I_\gamma=95.34$ 14 assuming recommended decay scheme normalization.
419.8 2	1.5 2	1278.9		858.9				
479.8 2	65.9 10	1042.1	6 ⁺	562.4	4 ⁺	E2	0.0233	$\alpha(\text{K})=0.01766$ 25; $\alpha(\text{L})=0.00431$ 6; $\alpha(\text{M})=0.001025$ 15; $\alpha(\text{N}+..)=0.000283$ 4 $\alpha(\text{N})=0.000244$ 4; $\alpha(\text{O})=3.70\times 10^{-5}$ 6; $\alpha(\text{P})=1.607\times 10^{-6}$ 23
481.9 2	3.1 2	1760.8		1278.9				
494.1 2	5.1 4	1536.4	5 ⁽⁻⁾	1042.1	6 ⁺	(E1)	0.00729	$\alpha(\text{K})=0.00612$ 9; $\alpha(\text{L})=0.000907$ 13; $\alpha(\text{M})=0.000205$ 3; $\alpha(\text{N}+..)=5.74\times 10^{-5}$ 8 $\alpha(\text{N})=4.90\times 10^{-5}$ 7; $\alpha(\text{O})=7.87\times 10^{-6}$ 11; $\alpha(\text{P})=5.22\times 10^{-7}$ 8
558.2 2	11.1 7	1600.3	8 ⁺	1042.1	6 ⁺	E2	0.01604	$\alpha(\text{K})=0.01248$ 18; $\alpha(\text{L})=0.00274$ 4; $\alpha(\text{M})=0.000647$ 9; $\alpha(\text{N}+..)=0.000179$ 3 $\alpha(\text{N})=0.0001544$ 22; $\alpha(\text{O})=2.37\times 10^{-5}$ 4; $\alpha(\text{P})=1.147\times 10^{-6}$ 16
^x 581.0 2	1.0 3							I_γ : includes contaminant. E_γ matches that expected for a possible 1699 to 1117 transition.
659.5 2	3.6 9	858.9		199.3	2 ⁺			
716.6 2	6.6 5	1278.9		562.4	4 ⁺			
718.8 2	4.7 5	1760.8		1042.1	6 ⁺			
792.2 2	3.8 5	1834.2	7 ⁽⁻⁾	1042.1	6 ⁺	(E1)	0.00277	$\alpha(\text{K})=0.00234$ 4; $\alpha(\text{L})=0.000336$ 5; $\alpha(\text{M})=7.55\times 10^{-5}$ 11; $\alpha(\text{N}+..)=2.12\times 10^{-5}$ 3 $\alpha(\text{N})=1.81\times 10^{-5}$ 3; $\alpha(\text{O})=2.93\times 10^{-6}$ 5; $\alpha(\text{P})=2.04\times 10^{-7}$ 3
839.7 2	2.5 7	1698.6		858.9				
^x 868.7 4	0.6 2							
^x 870.9 4	1.2 3							
918.2 2	5.2 5	1117.5		199.3	2 ⁺			
974.0 2	2.8 3	1536.4	5 ⁽⁻⁾	562.4	4 ⁺	(E1)	0.00187	$\alpha(\text{K})=0.001585$ 23; $\alpha(\text{L})=0.000225$ 4; $\alpha(\text{M})=5.05\times 10^{-5}$ 7; $\alpha(\text{N}+..)=1.423\times 10^{-5}$ 20 $\alpha(\text{N})=1.212\times 10^{-5}$ 17; $\alpha(\text{O})=1.97\times 10^{-6}$ 3; $\alpha(\text{P})=1.391\times 10^{-7}$ 20
1014.8 4	4.9 4	1577.2	(4 ⁻ ,5 ⁻)	562.4	4 ⁺			
1024.5 4	7.1 5	1586.9		562.4	4 ⁺			
1177.4 4	2.1 3	2219.5		1042.1	6 ⁺			
^x 1217.7 4	1.4 2							
1388.0 4	5.3 5	2430.1		1042.1	6 ⁺			
1437.8 4	2.5 3	2479.9		1042.1	6 ⁺			

† Arbitrary units relative to $I_\gamma(363.2\gamma)=100$.

‡ From Adopted Gammas.

$^\#$ For absolute intensity per 100 decays, multiply by ≈ 0.88 .

$^\text{@}$ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

^x γ ray not placed in level scheme.

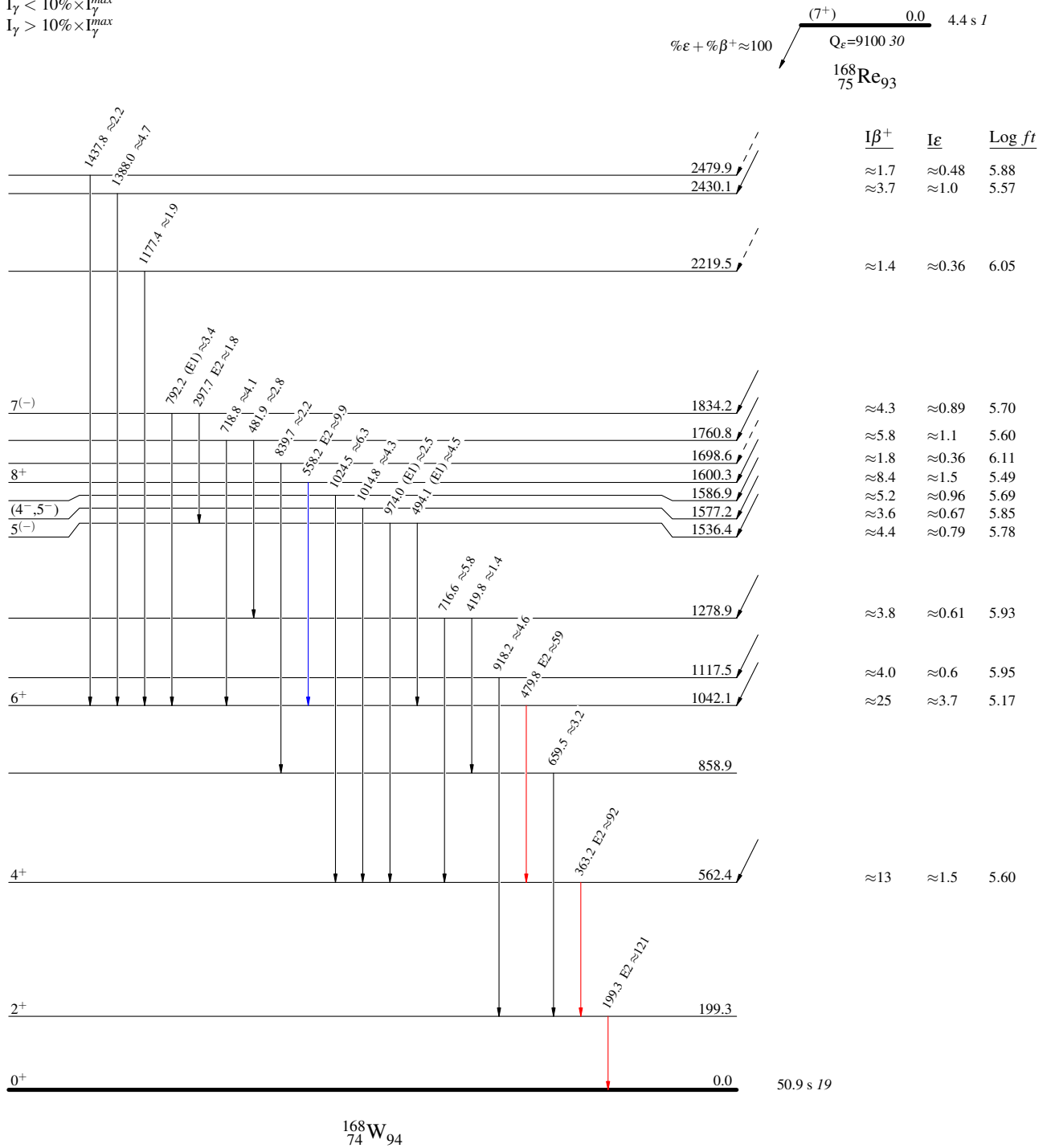
$^{168}\text{Re } \epsilon \text{ decay } 1992\text{Me}10$

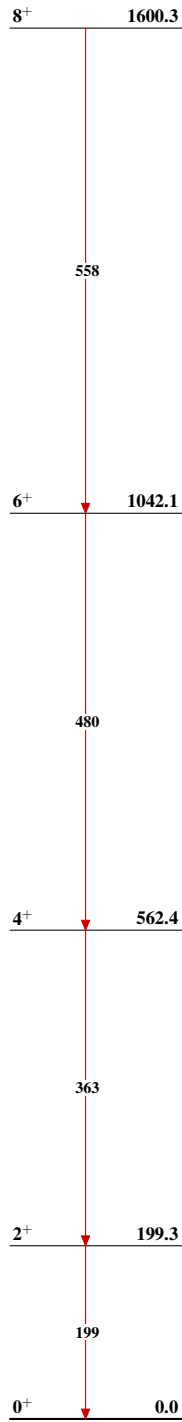
Decay Scheme

Legend

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

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



^{168}Re ε decay 1992Me10Band(A): $K^\pi=0^+$ g.s.
band $^{168}_{74}\text{W}_{94}$