

^{50}Mn ε decay (1.75 min) 1972Ra14,2013Su07

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh		NDS 157, 1 (2019)	15-Apr-2019

Parent: ^{50}Mn : $E=225.28$ 9; $J^\pi=5^+$; $T_{1/2}=1.75$ min 3; $Q(\varepsilon)=7634.48$ 7; $\% \varepsilon + \% \beta^+$ decay=100.0

^{50}Mn -E, J^π : From ^{50}Mn Adopted Levels.

^{50}Mn - $T_{1/2}$: weighted average of 1.74 min 10 (2013Su07, decay curve for γ -spectrum gated by β rays and ΔE -TOF); 1.76 min 3 (1972Ra14, decay curves for 783 γ and 1098 γ , 1 h counting period); 1.72 min 4 (1962Su10, β^+ decay curve). The same value is adopted in Adopted Levels of ^{50}Mn .

^{50}Mn - $Q(\varepsilon)$: From 2017Wa10.

1972Ra14: ^{50}Mn source was produced in $^{50}\text{Cr}(p,n)$ reaction at ORNL. Measured E_γ , I_γ with Ge(Li) detectors. Deduced levels, J, π , parent $T_{1/2}$.

2013Su07: ^{50}Mn produced in Ni(^{58}Ni),X) reaction. ^{58}Ni primary beam at $E=68.6$ MeV/nucleon provided by the Heavy Ion Research Facility in Lanzhou (HIRFL). Target= $147 \mu\text{g}/\text{cm}^2$ Ni at the Radioactive Ion Beam Line in Lanzhou (RIBLL). Measured β -delayed protons, (proton) γ -coin, E_γ , I_γ , time-of-flight, energy loss, $T_{1/2}$ using two plastic scintillator films, a thick silicon detector, a double-sided silicon strip detector (DSSSD) and five segmented clover detectors.

1974FiZi (conference paper): measured $T_{1/2}$.

Evaluators' note: 1976Au07 and 1984Al29 assigned states at 3595, 3875, and 3898 and associated gammas observed from these states by 1972Ra14 in (p,p' γ) experiment, but not in ε,β^+ decay. The evaluators consider this decay scheme as incomplete due to large number of possible states above 3.8 MeV which could be fed.

All data are from 1972Ra14, unless otherwise stated.

 ^{50}Cr Levels

E(level) [†]	J^π [‡]
0.0	0 ⁺
783.3 1	2 ⁺
1881.3 2	4 ⁺
3163.9 4	6 ⁺
3324.6 3	4 ⁺
3825.5 4	(6) ⁺

[†] From E_γ data. Level scheme in 2013Su07 is the same as in 1972Ra14.

[‡] From the Adopted Levels.

 ε,β^+ radiations

Coincidences shown on drawing are from 1962Su10.

E(decay)	E(level)	$I\beta^+$ [†]	$I\varepsilon$ [†]	Log ft	$I(\varepsilon+\beta^+)$ [†]	Comments
(4034.3 4)	3825.5	28.5 12	0.304 13	5.03 2	28.8 12	av $E\beta=1355$ 4; $\varepsilon K=0.00942$ 7; $\varepsilon L=0.000980$ 7; $\varepsilon M+=0.00017$
(4535.2 3)	3324.6	69 5	0.46 3	5.0 1	69 5	av $E\beta=1595$ 4; $\varepsilon K=0.00596$ 4; $\varepsilon L=0.000621$ 4; $\varepsilon M+=0.0001075$ 7
(4695.9 4)	3163.9	8.0 23	0.047 13	6.0 2	8.0 23	av $E\beta=1672$ 4; $\varepsilon K=0.00522$ 3; $\varepsilon L=0.000543$ 3; $\varepsilon M+=9.42\times 10^{-5}$ 6

[†] Absolute intensity per 100 decays.

^{50}Mn ε decay (1.75 min) 1972Ra14,2013Su07 (continued) $\gamma(^{50}\text{Cr})$

I γ normalization: From I γ =100 for 783 γ . Since J=5⁺ for ^{50}Mn , and J π =4,5,6 for levels in ^{50}Cr above the 783 level fed in ^{50}Mn β^+ decay, the 783 γ is probably the only g.s. transition. There can be no β^+ branch to the ^{50}Cr g.s.

Coincidences shown on drawing are from 1962Su10.

E_γ [†]	I γ ^{†b}	E $_i$ (level)	J $^\pi_i$	E $_f$	J $^\pi_f$	Mult. [‡]	δ [‡]	α [‡]	Comments
161 ^{#c}	≤ 2	3324.6	4 ⁺	3163.9	6 ⁺	[E2]		0.0674	$\alpha(\text{K})=0.0596$; $\alpha(\text{L})=0.00583$
661.5 ^{@ 3}	25 ^l	3825.5	(6) ⁺	3163.9	6 ⁺				E γ =661, I γ =27 2 (2013Su07).
783.3 ^{@ 1}	100 2	783.3	2 ⁺	0.0	0 ⁺	E2			E γ =783, I γ =100 5 (2013Su07).
1098.0 ^{@ 2}	98.5 ^{& 23}	1881.3	4 ⁺	783.3	2 ⁺	E2			E γ =1098, I γ =97 5 (2013Su07).
1282.4 ^{@ 3}	33 2	3163.9	6 ⁺	1881.3	4 ⁺	E2			E γ =1282, I γ =31 2 (2013Su07).
1443.3 ^{@ 2}	69 5	3324.6	4 ⁺	1881.3	4 ⁺	(M1(+E2))	-0.02 +16-52		E γ =1443, I γ =61 3 (2013Su07).
^x 1793.5 ^{c 6}	0.5 ^l								
1944.5 5	3.8 ^{a 5}	3825.5	(6) ⁺	1881.3	4 ⁺				E γ =1944, I γ =3.8 6 (2013Su07).
^x 2404.4 ^{c 8}	0.16 5								
2541 ^{#c}	≤ 1	3324.6	4 ⁺	783.3	2 ⁺				E γ : (6) ⁺ to 2 ⁺ transition is highly unlikely, γ not included in Adopted Levels, Gammas dataset. This γ may correspond to 3045 γ assigned to ^{50}Mn decay by 1994Ha43, and placed from a 3827,(0 ⁺) level.
3042 ^{#c}	≤ 2	3825.5	(6) ⁺	783.3	2 ⁺				

[†] From 1972Ra14. All the gamma rays are also reported by 2013Su07.

[‡] From the Adopted Gammas.

[#] Possible but unobserved transition.

[@] Also observed by 1973Mc11 ($\Delta E_\gamma=2$ keV).

[&] From intensity balancing at the 783 state. 103 4 measured (corrected for small contribution from ^{116}In 1097 γ).

^a Corrected for small contribution from 1434.2+ $\gamma^\pm$ summing.

^b Absolute intensity per 100 decays.

^c Placement of transition in the level scheme is uncertain.

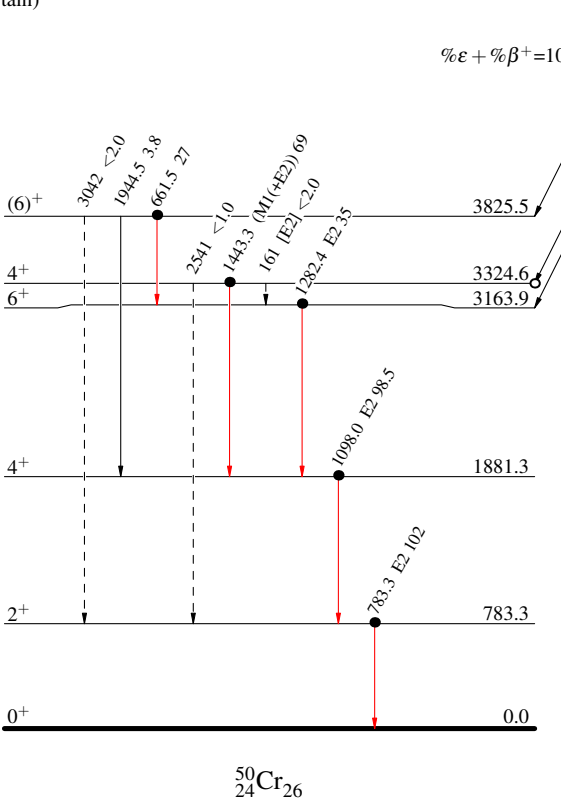
^x γ ray not placed in level scheme.

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- Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
 - $I_\gamma < 10\% \times I_\gamma^{max}$
 - $I_\gamma > 10\% \times I_\gamma^{max}$
 - - - - - γ Decay (Uncertain)
 - Coincidence

Decay Scheme

Intensities: I_γ per 100 parent decays



$I\beta^+$	$I\epsilon$	$\text{Log } ft$
28.5	0.304	5.03
69	0.46	5.0
8.0	0.047	6.0