^{64}Mn IT decay (440 ms) 2012Ka36,2011Li50,2005GaZR

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 178, 41 (2021).	12-Nov-2021

Parent: ^{64}Mn: E=175.5 *4*; J^π=(4$^+$); $T_{1/2}$=440 ms *49*; %IT decay=100.0

2012Ka36: ^{64}Mn isomer produced in ^{9}Be(^{238}U,F) reaction with E(^{238}U)=345 MeV/nucleon provided by the RIBF accelerator complex at RIKEN facility. Fission fragments were separated and analyzed by BigRIPS separator, transported to focal plane of ZeroDegree spectrometer and finally implanted in an aluminum stopper. Particle identification was achieved by ΔE-tof-Bρ method. Delayed gamma rays from microsecond isomers were detected by three clover-type HPGe detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, isomer half-life. Number of implanted fragments=1.6×10^5.

2011Li50: ^{64}Mn isotope produced in the fragmentation of 140 MeV/nucleon ^{76}Ge beam with ^{9}Be target. Fragments separated using A1900 Fragment separator at NSCL-MSU and identified by time-of-flight and energy loss. Delayed γ rays were detected using the SeGA array of 16 detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, and half-life of the isomer.

2005GaZR: ^{64}Mn produced in fragmentation of ^{76}Ge^{30+} beam on a ^{58}Ni target. The LISE3 achromatic spectrometer used to separate fragments. Transmitted nuclei were identified by three consecutive Si detectors where two served for energy loss and time-of-flight measurements while the last determined their residual energies. Measured E(ce), (^{64}Mn fragment)(ce)(t), γ(ce) coin, Si and Ge (Clover) detectors.

^{64}Mn Levels

E(level)	J^π[†]	$T_{1/2}$[†]	Comments
0.0	1$^{(+)}$	90 ms *4*	
40.2 *3*	(2$^-$)		
175.5 *4*	(4$^+$)	440 ms *49*	$T_{1/2}$: weighted average of 400 μs *40* (2011Li50, decay curves for γ rays); 0.50 ms *5* (2005GaZR, γ(t)). Other: >100 μs (1998Gr14). E(level): in the ce spectrum a line corresponding to Eγ=175 *10* seen and interpreted as sum line of 135+40.

[†] From the Adopted Levels, unless otherwise noted.

γ(^{64}Mn)

Eγ	Iγ[‡]	E$_i$(level)	J_i^π	E$_f$	J_f^π	Mult.	α[#]	I$_{(\gamma+ce)}$[†‡]	Comments
40.2 *3*	66 *16*	40.2	(2$^-$)	0.0	1$^{(+)}$	(E1)	0.6 *4*	100	α(exp)=1.6 *7* (2011Li50) Eγ: from 2011Li50. 2005GaZR cite a priv. comm. from an experiment by J.M. Daugas (2004) at GANIL facility where observation of a 40-keV transition was reported. Iγ: 63 *+20−13* deduced from I(γ+ce) and α. Mult.: from α(exp) and no observable half-life (2011Li50).
135.3 *3*	90 *3*	175.5	(4$^+$)	40.2	(2$^-$)	(M2)	0.11 *3*	100	Eγ: from 2011Li50. Others: 135.3 *5* (2012Ka36), 135 *10* (2005GaZR, ce spectrum). Iγ: 90 *+3−2* deduced from I(γ+ce) and α. Mult.: based on Weisskopf estimates and hindrance factor of 9 (2011Li50). Also M2-E1 cascade is consistent with expected intensity of 135.3γ in γ(ce) coin spectrum (2005GaZR).

[†] Assuming no other γ transitions from the 175.5-keV isomer.

[‡] Absolute intensity per 100 decays.

Continued on next page (footnotes at end of table)

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$\gamma(^{64}Mn)$ (continued)

[#] 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.

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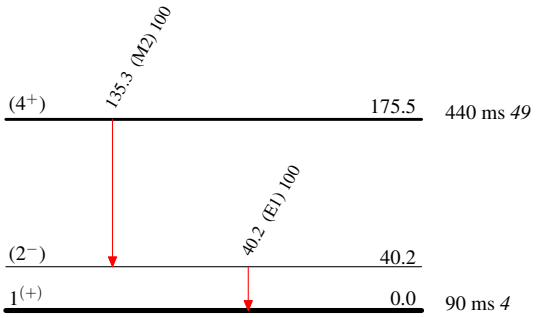
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays
%IT=100.0

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



$^{64}_{25}Mn_{39}$