Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 196,17 (2024)	30-Sep-2023

Q(β^-)=8749 *6*; S(n)=6434 *8*; S(p)=13323 *5*; Q(α)=−1.170×10^4 *14* 2021Wa16
S(2n)=11288 *4*, S(2p)=31290 *230*, Q(β^-n)=3920 *5* (2021Wa16).

Mass measurements: 2012Na15 (−46.8869 MeV *37*, ISOLTRAP at CERN), 1994Se12 (mass excess=−46.75 MeV *28*, TOFI at LAMPF), 1990Tu01 (M.E.=−45.9 MeV *4*, TOFI at LAMPF).

Other measurements:

2016Ba44: ^{63}Mn was produced by bombarding a uranium carbide target with 1.4 GeV proton beam at ISOLDE at CERN. Measured hyperfine spectra using the bunched-beam collinear laser spectroscopy technique. Deduced spectroscopic quadrupole moment and magnetic dipole moment of ^{63}Mn ground state. The spectroscopic quadrupole moment and the magnetic dipole moment of ^{55}Mn (Q=+0.33 *1* (from 1979De19) and μ=+3.46871790 *9* (from 1974Lu08, with corrections for diamagnetic shielding)) were used as reference values. See also 2015Ba49 for their previous measurement using atomic manganese.

2016He14: E=1.4 GeV proton beam was produced from the ISOLDE facility at CERN. Target was a thick uranium carbide. Recoiling ions were ionized using the resonance ionization laser ion source (RILIS), mass-separated, cooled and bunched in the gas-filled RFQ ISCOOL, re-accelerated and guided to the laser spectroscopy beam line COLLAPS. Measured hyperfine spectra using collinear laser spectroscopy on atomic and ionic transitions, respectively. Deduced changes in mean-square charge radii relative to ^{55}Mn.

Theoretical calculations:

2017Si17: calculated ground-state energy, S(2n), charge radius.

2016Ku21,1998Ka34,1988Be23: calculated β^- decay $T_{1/2}$.

1995Ri05: calculated binding energy.

1976Da02: calculated mass excess.

^{63}Mn Levels

Cross Reference (XREF) Flags

A	^{63}Cr β^- decay (129 ms)
B	^{1}H(^{68}Fe,2p4nγ)
C	^{9}Be(^{63}Mn,^{63}Mn′γ)
D	^{238}U(^{70}Zn,Xγ)

E(level)†	J$^\pi$‡	$T_{1/2}$#	XREF	Comments
0.0	5/2$^{(-)}$	0.276 s *6*	ABCD	%β^-=100; %β^-n=? μ=+3.439 *3* (2016Ba44,2019StZV) Q=+0.48 *4* (2016Ba44,2021StZZ) J$^\pi$: spin from analysis of hyperfine-structure spectrum in 2015Ba49; parity from systematic trends in Mn isotopes. $T_{1/2}$: weighted average of 0.275 s *4* (1999Ha05), 0.322 s *23* (1999Le67,1999So20), 0.24 s *3* (1997AmZZ), and 0.25 s *4* (1985Bo49). Other: 0.29 s *2* (1995AmZX, statistical uncertainty only). μ: from collinear laser spectroscopy, with μ(^{55}Mn)=+3.46871790 *9* from 1974Lu08 as reference (2016Ba44). Quoted value is the evaluated value from the 2019StZV evaluation, based on the original value of +3.441 *3* in 2016Ba44 and the evaluated μ(^{55}Mn)=+3.4669 *6* in 2019StZV. Other: +3.435 *4* (2015Ba49, previous measurement of 2016Ba44). Q: from collinear laser spectroscopy, with Q(^{55}Mn)=+0.33 *1* from 1979De19 as reference (2016Ba44). See also 2021StZZ compilation. δ<r^2>(^{55}Mn,^{63}Mn)=+0.706 fm^2 *13(stat)69(syst)* (atomic), and +0.704 fm^2 *10(stat)69(syst)* (ionic) (2016He14).
248.4 *5*	(7/2$^-$)	5.9 ps *4*	BCD	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{63}Mn Levels (continued)

E(level)†	J$^{\pi}$‡	$T_{1/2}$#	XREF
888 *5*	(9/2$^-$)	0.6 ps *4*	BC
1263 *7*	(11/2$^-$)	<0.7 ps	BC

† From Eγ data.
‡ Proposed in (^{68}Fe,2p4nγ) and (^{63}Mn,^{63}Mn′γ) based on shell-model predictions, unless otherwise noted.
# From DSAM using the line-shape analysis with GEANT4 simulation in (^{63}Mn,^{63}Mn′γ) (2016Ba04) for excited states.

γ(^{63}Mn)

Additional information 1.

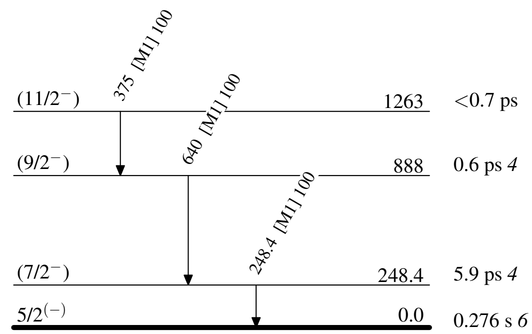
E$_i$(level)	J$^{\pi}_i$	E$_\gamma$	I$_\gamma$‡	E$_f$	J$^{\pi}_f$	Mult.	α†	Comments
248.4	(7/2$^-$)	248.4 *5*	100	0.0	5/2$^{(-)}$	[M1]	0.00300 *4*	α(K)=0.00271 *4*; α(L)=0.000259 *4*; α(M)=3.51×10^{-5} *5* α(N)=1.674×10^{-6} *25* B(M1)(W.u.)=0.243 *+18−16* E$_\gamma$: from (^{70}Zn,Xγ). Others: 249 *5* from (^{68}Fe,2p4nγ) and (^{63}Mn,^{63}Mn′γ).
888	(9/2$^-$)	640 *5*	100	248.4	(7/2$^-$)	[M1]	0.000346 *8*	α(K)=0.000312 *7*; α(L)=2.94×10^{-5} *6*; α(M)=3.99×10^{-6} *9* α(N)=1.92×10^{-7} *4* B(M1)(W.u.)=0.14 *+16−6* E$_\gamma$: weighted average of 645 *6* from (^{68}Fe,2p4nγ) and 637 *5* from (^{63}Mn,^{63}Mn′γ).
1263	(11/2$^-$)	375 *5*	100	888	(9/2$^-$)	[M1]	0.00113 *4*	α(K)=0.001023 *35*; α(L)=9.69×10^{-5} *34*; α(M)=1.32×10^{-5} *5* α(N)=6.31×10^{-7} *22* B(M1)(W.u.)>0.57 E$_\gamma$: from (^{63}Mn,^{63}Mn′γ). Other: 376 *7* from (^{68}Fe,2p4nγ).

† Additional information 2.
‡ From (^{68}Fe,2p4nγ).

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{63}_{25}Mn_{38}$