Coulomb excitation 2015Ga38

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Huang Xiaolong, and Wang Xianghan	NDS 204,1 (2025)	30-Jun-2023

2015Ga38: ^{62}Mn beam (mixed with ^{62}Fe) produced by bombarding a thick UC_x target with a 1.4 GeV proton beam at REX-ISOLDE-CERN facility. A 4.0 mg/cm^2 thick ^{109}Ag target was used for safe Coulomb excitation. The scattered projectiles and the recoiling target nuclei were detected using a DSSSD placed downstream from the target position. The γ rays were detected using HPGe detectors of Miniball array. Measured scattered particles, recoiling target nuclei, Eγ, Iγ, $\gamma\gamma$-coin, (particle)γ-coin, (particle)$\gamma\gamma$-coin, (particle)(particle)-coin. Data analyzed using GOSIA2 which allows a simultaneous least-squares fit of matrix elements in the target and projectile systems.

2015Ga38 stated that the 671-ms, (4^+) isomer in the ^{62}Mn beam was extracted with a much higher intensity than the 92-ms, (1^+) activity, as with a >700 ms trapping plus charge breeding time, only the long lived-state is expected to be present at the target position. Relative position of the two β-decaying states in ^{62}Mn ($1^{(+)}$ and $4^{(+)}$) was not known until this experiment.

The 418γ in 2015Ga38 is shown as deexciting a state of this energy, as it is not seen in coincidence with any other γ ray. Nearly independent of spin, such an assumption leads to a B(E2)(W.u.)≈30, more than double that of the 2^+ to 0^+ transition in ^{62}Fe, which is considered unlikely. 2015Ga38 thus propose that while the final state of the decay is the (1^+), 92-ms state proceeding via the excitation of an intermediate (2^+,3^+) level. Through GOSIA analysis, comparison of the observed γ-ray yield of 418γ as a function of level-energy difference between the newly-proposed state and the (4^+), 671-ms isomeric state plotted with B(E2)(W.u.) ranging from 1×10^{-10} W.u. to 5 W.u. suggests that the excitation of the intermediate level at an energy of 72 keV *+8−3*, above the energy of the 671-ms, (4^+) isomer, which fixes the relative ordering of the two β-decaying states in ^{62}Mn.

Sub-barrier Coulomb excitation using 2.86 MeV/nucleon ^{62}Mn beam and ^{109}Ag target.

^{62}Mn Levels

E(level)	J$^\pi$	T$_{1/2}$	Comments
0	1^+†	92† ms *13*	
343 *4*	4^+†	671† ms *5*	E(level): Based on 346 *+3−8* from analysis of Coulomb excitation data in 2015Ga38.
418 *2*	(2^+,3^+)		E(level): from Eγ. Other: 72 keV *+8−3* above the 671-ms, (4^+) isomer deduced in 2015Ga38 from GOSIA analysis, by plotting the observed yield of 418γ as a function of difference of energy of this level and that of the 671-ms isomeric state, for B(E2)(W.u.) values of 5.0 W.u. to 10^{-10} W.u. for the 418-keV transition, as shown in Fig. 8 of 2015Ga38. J$^\pi$: proposed by 2015Ga38 from the GOISA calculations and comparison with similar levels in the neighboring isotopes and isotones.

† From the Adopted Levels.

γ(^{62}Mn)

E$_\gamma$	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
418 *2*	418	(2^+,3^+)	0	1^+	I$_\gamma$: 970 *50* relative to Iγ=1520 *40* and 2300 *60* for 311γ and 415γ from ^{109}Ag target excitation, respectively. Uncertainties due to background subtraction, relative efficiency, and normalization to the ^{109}Ag target excitation are included. No γ rays were observed in coincidence with this transition.

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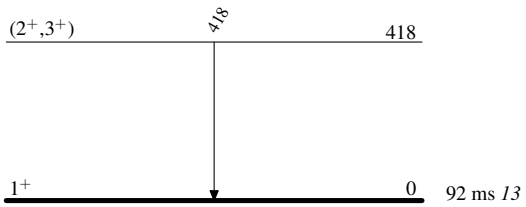
Level Scheme



$^{62}_{25}Mn_{37}$