

Adopted Levels, Gammas

| Type | Author | History | Citation | Literature Cutoff Date |
|-----------------|---------------------------|---------|-------------------|------------------------|
| Full Evaluation | Balraj Singh and Jun Chen | | NDS 158, 1 (2019) | 16-May-2019 |

$Q(\beta^-)=4105.9$ 25; $S(n)=5519.2$ 28; $S(p)=13099.4$ 23; $Q(\alpha)=-8040$ 4 [2017Wa10](#)
 $S(2n)=14407$ 3, $S(2p)=24765.1$ 29 ([2017Wa10](#)).
⁷³Zn produced and identified by [1972Er05](#), measured half-life.
[2018Ya11](#): E=1.4 GeV proton beam from ISOLDE-CERN facility. Measured and analyzed hyperfine spectra of ⁷³Zn isotopes. Deduced T_{1/2} and further support for spin assignment for the isomer. Comparison with large-scale shell-model calculations. Systematics of neighboring nuclei.
[2008Ba54](#): measured mass using the ISOLTRAP mass spectrometer.
[2017Wr01](#): measured hyperfine structure, spin, μ , Q of the ground state and isomer using collinear laser spectroscopy using COLLAPS setup at ISOLDE-CERN.
[Additional information 1](#).

⁷³Zn Levels

[2018Ya11](#) have observed no evidence of the existence of a 5.8-s isomer proposed from a β -decay study by [1985Ru05](#). A 5.8 s δ activity was reported by [1985Ru05](#) in the bombardment of natural tungsten target by ⁸²Se beam at 11.5 MeV/nucleon. In $E\gamma$ and $\beta\gamma$ coin measurements, [1985Ru05](#) reported two γ rays at 195.5 and 42.1. The 195.5 γ was proposed as an isomeric transition (E3 multipolarity suggested from $\alpha(K)\text{exp}=0.24$ 6, deduced from I(K-x ray)/I γ ratio) from a 195.5 level of 5.8 s half-life. Based on arguments of K-x ray intensity and its observation in $\gamma\beta$ coin data, 42.1 γ was suggested as a transition in ⁷³Ga from β -decay of the 5.8-s isomer of ⁷³Zn. [1998Hu20](#) did see a 195.5 γ from β -decay of ⁷³Cu and assigned this γ from a level of the same energy, however, its half-life was measured as 13.0 ms. The 42.1 γ could not have been seen by [1998Hu20](#) since it was outside their range of detection. From systematics, [1998Hu20](#) suggested that an expected low-energy 9/2⁺ level may correspond to the 5.8-s isomer with 42.1 γ feeding the 195.5 level. This suggestion is, however, inconsistent with the observation of (42.1 γ) β -coin reported by [1985Ru05](#). [2017Ve05](#) did not see any evidence for the 24-keV γ ray reported by [1985Ru05](#), in singles or in β -gated γ spectrum and 910 γ -gated γ spectrum. [2018Ya11](#) also found no evidence of the existence of a 5.8-s isomer.

Cross Reference (XREF) Flags

- A ⁷³Cu β^- decay (4.2 s)
- B ⁷⁴Cu β^-n decay (1.63 s):?
- C ⁷⁶Ge(¹⁴C, ¹⁷O)

| E(level) | J ^{π} | T _{1/2} | XREF | Comments |
|----------|-------------------------------|------------------|------|--|
| 0.0 | 1/2 ⁻ | 24.5 s 2 | A C | $\% \beta^- = 100$ $\mu = +0.5585$ 5 (2017Wr01) μ : from measurement of hyperfine structure by collinear laser spectroscopy at ISOLDE-CERN (2017Wr01). See also 2017Ne04 review article. J^π : 1/2 from measurement of hyperfine structure by collinear laser spectroscopy at ISOLDE-CERN. Parity from agreement of measured μ with theoretical values (2017Wr01). $T_{1/2}$: weighted average of values extracted from decay curves of 217.4 γ , 495.6 γ and 910.6 γ (2017Ve05). Other: 23.5 s 10 from β -decay curve in 1972Er05 . |
| 195.5 2 | 5/2 ⁺ | 13.0 ms 2 | A | $\%IT = 100$ $\mu = -0.8527$ 14 (2017Wr01) $Q = +0.43$ 4 (2017Wr01) μ, Q : from measurement of hyperfine structure by collinear laser spectroscopy at ISOLDE-CERN (2017Wr01). See also 2017Ne04 review article. J^π : 5/2 from measurement of hyperfine structure by collinear laser spectroscopy at ISOLDE-CERN. Parity from agreement of measured μ with theoretical values (2017Wr01). J=5/2 is further confirmed by 2018Ya11 in the analysis of the ratio of the |

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{73}Zn Levels (continued)

| <u>E(level)</u> | <u>J^π</u> | <u>XREF</u> | <u>Comments</u> |
|-----------------|---------------------------|-------------|---|
| | | | magnetic HFS constants for atomic states, in comparisons with those of neighboring Zn isotopes. |
| | | | $T_{1/2}$: from $\gamma(t)$ in ^{73}Cu β^- decay (1998Hu20). Others: 13.1 ms 18 (2017Ve05), ≈ 10 ms (2018Ya11). |
| 307.2 2 | (1/2,3/2,5/2 $^-$) | A C | XREF: C(280). J^π : γ to 1/2 $^-$. |
| 449.6 2 | (3/2 $^-$) | A | J^π : possible allowed β feeding from 3/2 $^-$; systematics. |
| 502.2 2 | (1/2,3/2,5/2 $^-$) | A C | J^π : γ to 1/2 $^-$. |
| 1124.0 3 | (1/2,3/2,5/2) † | A C | |
| 2008.9 3 | (1/2,3/2,5/2) † | A | |

† Possible β^- feeding from 3/2 $^-$.

 $\gamma(^{73}\text{Zn})$

| <u>$E_i(\text{level})$</u> | <u>J_i^π</u> | <u>E_γ^\dagger</u> | <u>I_γ</u> | <u>E_f</u> | <u>J_f^π</u> | <u>Mult.</u> | <u>α^\ddagger</u> | <u>Comments</u> |
|---------------------------------------|-----------------------------|--------------------------------------|------------------------------|-------------------------|-----------------------------|--------------|-------------------------------------|------------------------|
| 195.5 | 5/2 $^+$ | 195.5 2 | 100 | 0.0 | 1/2 $^-$ | [M2] | 0.065 | B(M2)(W.u.)=0.000449 7 |
| 307.2 | (1/2,3/2,5/2 $^-$) | 307.2 2 | 100 | 0.0 | 1/2 $^-$ | | | |
| 449.6 | (3/2 $^-$) | 449.6 2 | 100 | 0.0 | 1/2 $^-$ | | | |
| 502.2 | (1/2,3/2,5/2 $^-$) | 502.2 2 | 100 | 0.0 | 1/2 $^-$ | | | |
| 1124.0 | (1/2,3/2,5/2) | 674.4 2 | 100 | 449.6 | (3/2 $^-$) | | | |
| 2008.9 | (1/2,3/2,5/2) | 1559.3 2 | 100 | 449.6 | (3/2 $^-$) | | | |

† From ^{73}Cu β^- decay.

‡ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ -ray energies, assigned multiplicities, and mixing ratios, unless otherwise specified.

Adopted Levels, Gammas**Level Scheme**

Intensities: Relative photon branching from each level

