

$^{161}\text{Lu}$  IT decay (7.3 ms) **1973An10**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 112,2497 (2011)	1-Jun-2011

Parent:  $^{161}\text{Lu}$ :  $E=166.5+x$ ;  $J^\pi=(9/2^-)$ ;  $T_{1/2}=7.3$  ms 4; %IT decay=100.0 SY

$^{161}\text{Lu}$ -%IT decay: evaluator assumes that the  $\varepsilon$  decay of the isomer is negligible.

**Additional information 1.**

$^{161}\text{Lu}$  isomer produced in the  $^{148}\text{Sm}(^{19}\text{F},6n)$  reaction,  $E(^{19}\text{F})=110-150$  MeV, on an enriched metallic target and in the  $\text{Eu}(^{16}\text{O},xn)$  reaction.  $\gamma$ 's measured in a multiscaled manner between beam pulses (2-ms wide, 2% duty cycle), using a Ge(Li) detector of volume 8 cm<sup>3</sup>. The mass assignment was deduced from excitation functions and the elemental assignment was made through observation of the decay of Lu K x-rays with the appropriate half-life. Measured  $T_{1/2}$ . Noted only one  $\gamma$  between 10 and 550 keV with the 7.3 ms half-life.

The problems in interpretation of the IT decay, noted in the previous evaluation (2000Re14), appear to have been resolved by recent heavy-ion studies (2006Br12). For a discussion of these problems, see (2000Re14).

 $^{161}\text{Lu}$  Levels

E(level)	$J^\pi$ †	$T_{1/2}$	Comments
0	$1/2^+$		Level not reported in the IT decay, but expected from the decay of the first excited state. $J^\pi$ : bandhead of $1/2[411]$ .
0+x	$(3/2^+)$		E(level): $x \approx 15$ keV based on systematics. See comment in the Adopted Levels.
135.8+x 2	$(5/2^+)$		
166.5+x	$(9/2^-)$	7.3 ms 4	E(level): from 'Adopted Levels' based on data from $^{139}\text{La}(^{28}\text{Si},6n\gamma)$ . $J^\pi$ : bandhead of $9/2[514]$ , the most likely candidate for the isomeric level.

† From the Adopted Levels.

 $\gamma(^{161}\text{Lu})$ 

$I_\gamma$  normalization: value assumes a transition intensity of 100% for 135.8 $\gamma$ .

$E_\gamma$	$I_\gamma$ †	$E_i(\text{level})$	$J^\pi_i$	$E_f$	$J^\pi_f$	Mult.	$\delta$	$\alpha^\ddagger$	Comments
(30.7)		166.5+x	$(9/2^-)$	135.8+x	$(5/2^+)$	[M2]		1767	$\alpha(\text{L})=1333$ 19; $\alpha(\text{M})=341$ 5; $\alpha(\text{N}+..)=93.3$ 13 $\alpha(\text{N})=81.4$ 12; $\alpha(\text{O})=11.34$ 16; $\alpha(\text{P})=0.533$ 8 $E_\gamma$ : the evaluator assumes that the isomer decays to 135.8+x, $(5/2^+)$ through an M2 transition. This energy is consistent with a low-energy transition, below the K-shell binding energy of 63 keV as postulated by 1973An10. Transitions to 0+x or g.s. would be higher than the K-shell binding energy.
135.8 2	100	135.8+x	$(5/2^+)$	0+x	$(3/2^+)$	M1(+E2)	0.6 6	1.41 16	$\alpha(\text{K})=1.1$ 3; $\alpha(\text{L})=0.26$ 9; $\alpha(\text{M})=0.062$ 22; $\alpha(\text{N}+..)=0.017$ 6 $\alpha(\text{N})=0.014$ 5; $\alpha(\text{O})=0.0020$ 6; $\alpha(\text{P})=7.7 \times 10^{-5}$ 23 Placement from 'Adopted Gammas', which is based on the work of 2006Br12 in $^{139}\text{La}(^{28}\text{Si},6n\gamma)$ . Mult.: 1973An10 report multipolarity

Continued on next page (footnotes at end of table)

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<u><math>E_\gamma</math></u>	<u><math>E_i(\text{level})</math></u>	Comments
		from $\alpha(K)\text{exp}=1.1\ 3$ , after rejecting the possibility of an E3 transition with a half-life of 7 ms. $\delta$ : evaluator's analysis of $\alpha(K)\text{exp}=1.1\ 3$ ( <b>1973An10</b> ); <b>1973An10</b> give $\approx 10\%$ E2 ( $\delta \approx 0.3$ ).

† For absolute intensity per 100 decays, multiply by syst 0.41.

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

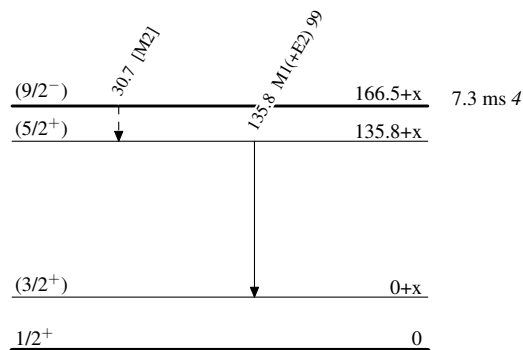
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Legend

Decay Scheme

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

-----►  $\gamma$  Decay (Uncertain)

 $^{161}_{71}\text{Lu}_{90}$