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^{70}**Zn(^{7}Li,α2nγ)**   **2021Zh44**

History

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Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 188,1 (2023)	17-Jan-2023

2021Zh44: E(^{7}Li)=30,35 MeV from HI-13 tandem accelerator of China Institute of Atomic Energy (CIAE). Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(ADO) ratios. Deduced high-spin levels, J^{π}, band-like structures, configurations, and wave function amplitudes using shell model calculations.

All data are from 2021Zh44.

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^{71}Ga Levels

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E(level)[†]	J^{π}[‡]	Comments
0.0[@]	3/2$^-$	
390.5	1/2$^{(-)}$	J^{π}: from level-scheme Fig. 1 in 2021Zh44, 1/2$^-$ in authors' Table 1.
487.5[@]	5/2$^-$	J^{π}: from level-scheme Fig. 1 in 2021Zh44, 1/2$^-$ as J^{π} of initial level in authors' Table 1 for 487.5γ, 5/2$^-$ as J^{π} of final level for 620γ and 1010γ.
511.5	3/2$^-$	
964.1[a]	7/2$^{(-)}$	
1107.5[@]	7/2$^-$	
1494.3[#]	9/2$^+$	
1497.5[&]	9/2$^-$	
1941.0[a]	11/2$^{(-)}$	
2069.5[@]	11/2$^{(-)}$	
2083.1[#]	13/2$^+$	
2683.1[&]	13/2$^-$	
2942.1[#]	17/2$^+$	
3034.0[a]	15/2$^{(-)}$	
3153.5[@]	15/2$^{(-)}$	
3694.6[&]	17/2$^-$	
3839.1	(17/2$^-$)	J^{π}: from level-scheme Fig. 1 in 2021Zh44, 17/2$^{(-)}$ in authors' Table 1.
3909.1[a]	19/2$^{(-)}$	
4028.2[#]	21/2$^{(+)}$	
4165.1[&]	21/2$^{(-)}$	
4199.5[@]	19/2$^{(-)}$	
4873.1?[a]	(23/2$^-$)	
5227.9[#]	25/2$^{(+)}$	
6573.4[#]	(29/2$^+$)	

[†] From 2021Zh44. A least-squares fit gives χ^2=0, implying that some of the listed Eγ values are probably level-energy differences.

[‡] As given in 2021Zh44 based on previous assignments for low-lying levels and angular distributions and band structures for higher levels.

[#] Band(A): Band based on 9/2$^+$.

[@] Seq.(B): γ cascade based on 3/2$^-$, g.s.

[&] Seq.(C): γ cascade based on 9/2$^-$.

[a] Seq.(D): γ cascade based on 7/2$^{(-)}$.

$^{70}\text{Zn}(^{7}\text{Li},\alpha 2n\gamma)$ **2021Zh44 (continued)**

$\gamma(^{71}\text{Ga})$

Expected R_{ADO} ratios are ≈ 1.1 for stretched quadrupoles and ≈ 0.5 stretched dipoles.

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
121.0	2.9 *16*	511.5	$3/2^-$	390.5	$1/2^{(-)}$	(D)	R_{ADO}=0.79 *24*.
143.4	3.8 *31*	1107.5	$7/2^-$	964.1	$7/2^{(-)}$	D	R_{ADO}=1.26 *31*, ΔJ=0 transition.
^{x}166.0	<1						This γ not shown in level-scheme Fig. 1 of 2021Zh44. It is placed from 4165 level to 3909, $19^{(-)}$ level in authors' Table I, but it does not fit there as level-energy difference between the 4165 and 3909 levels is 256 keV.
386.8	81.2 *20*	1494.3	$9/2^+$	1107.5	$7/2^-$	D	I_γ: uncertainty of 0.2 in 2021Zh44 is too small to be realistic, increased to 2.0 by evaluators. R_{ADO}=0.59 *6*.
390.5	4.3 *5*	390.5	$1/2^{(-)}$	0.0	$3/2^-$	D	R_{ADO}=0.52 *16*.
452.6	3.3 *14*	964.1	$7/2^{(-)}$	511.5	$3/2^-$	Q	R_{ADO}=1.15 *9*.
470.4	1.4† *48*	3153.5	$15/2^{(-)}$	2683.1	$13/2^-$	(D)	R_{ADO}=0.70 *32*.
470.5	3.6 *26*	4165.1	$21/2^{(-)}$	3694.6	$17/2^-$	Q	R_{ADO}=1.12 *12*.
487.5	100 *5*	487.5	$5/2^-$	0.0	$3/2^-$	D	R_{ADO}=0.63 *4*.
511.5	33.1 *48*	511.5	$3/2^-$	0.0	$3/2^-$	D	R_{ADO}=0.86 *10*, ΔJ=0 transition.
541.1	1.1 *11*	3694.6	$17/2^-$	3153.5	$15/2^{(-)}$	D	R_{ADO}=0.54 *26*.
572.0	3.7 *31*	2069.5	$11/2^{(-)}$	1497.5	$9/2^-$	D	R_{ADO}=0.57 *11*.
588.8	39.1 *86*	2083.1	$13/2^+$	1494.3	$9/2^+$	Q	R_{ADO}=1.21 *8*.
596.0	31.7 *65*	1107.5	$7/2^-$	511.5	$3/2^-$	Q	R_{ADO}=1.13 *7*.
613.6	1.5† *19*	2683.1	$13/2^-$	2069.5	$11/2^{(-)}$	D	R_{ADO}=0.67 *14*.
620.0	63.9 *80*	1107.5	$7/2^-$	487.5	$5/2^-$	D	R_{ADO}=0.80 *20*.
859.0	19.0 *70*	2942.1	$17/2^+$	2083.1	$13/2^+$	Q	R_{ADO}=1.15 *9*.
875.1	1.2† *21*	3909.1	$19/2^{(-)}$	3034.0	$15/2^{(-)}$	(Q)	R_{ADO}=1.05 *33*.
962.0	11.1 *38*	2069.5	$11/2^{(-)}$	1107.5	$7/2^-$	Q	R_{ADO}=1.11 *10*.
964.0‡	<1	4873.1?	$(23/2^-)$	3909.1	$19/2^{(-)}$		
964.1	13.2 *3*	964.1	$7/2^{(-)}$	0.0	$3/2^-$	Q	R_{ADO}=1.22 *15*.
976.9	6.0 *35*	1941.0	$11/2^{(-)}$	964.1	$7/2^{(-)}$	Q	R_{ADO}=0.95 *13*.
1010.0	23.9 *30*	1497.5	$9/2^-$	487.5	$5/2^-$	Q	I_γ: uncertainty of 0.3 in 2021Zh44 is too small to be realistic, increased to 3.0 by evaluators. R_{ADO}=1.24 *9*.
1011.5	6.9 *22*	3694.6	$17/2^-$	2683.1	$13/2^-$	Q	R_{ADO}=1.09 *18*.
1046.0	1.4† *18*	4199.5	$19/2^{(-)}$	3153.5	$15/2^{(-)}$	(Q)	R_{ADO}=0.96 *24*.
1070.4	1.4 *14*	3153.5	$15/2^{(-)}$	2083.1	$13/2^+$	D	R_{ADO}=0.55 *12*.
1084.0	5.6† *75*	3153.5	$15/2^{(-)}$	2069.5	$11/2^{(-)}$	Q	R_{ADO}=1.25 *21*.
1086.1	5.6 *22*	4028.2	$21/2^{(+)}$	2942.1	$17/2^+$	Q	R_{ADO}=1.14 *19*.
1093.0	3.2 *24*	3034.0	$15/2^{(-)}$	1941.0	$11/2^{(-)}$	Q	R_{ADO}=1.13 *22*.
1156.0	2.2 *19*	3839.1	$(17/2^-)$	2683.1	$13/2^-$	(Q)	R_{ADO}=1.26 *32*.
1185.6	11.7 *9*	2683.1	$13/2^-$	1497.5	$9/2^-$	Q	R_{ADO}=1.22 *10*.
1199.7	2.5† *32*	5227.9	$25/2^{(+)}$	4028.2	$21/2^{(+)}$	Q	R_{ADO}=1.11 *27*.
1345.5	1.1† *24*	6573.4	$(29/2^+)$	5227.9	$25/2^{(+)}$	(Q)	R_{ADO}=1.03 *32*.

† $I\gamma$ value in 2021Zh44 has large uncertainty overlapping non-physical negative value.

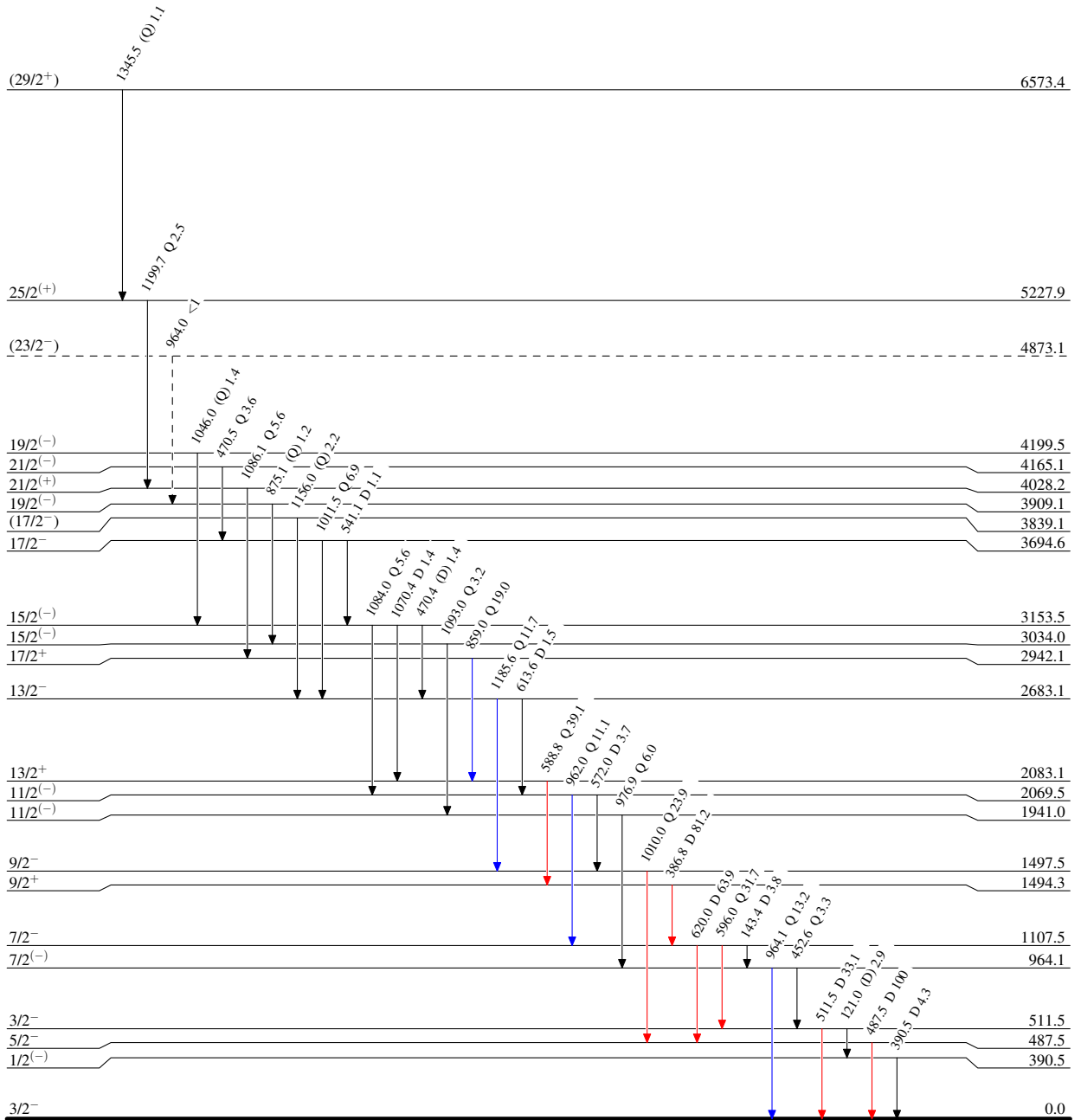‡ Placement of transition in the level scheme is uncertain.

^{x} γ ray not placed in level scheme.

^{70}Zn(^{7}Li,α2nγ)　　2021Zh44

Level Scheme

Intensities: Relative I$_\gamma$

Legend

→ I$_\gamma$ < 2%×I$_\gamma^{max}$
→ I$_\gamma$ < 10%×I$_\gamma^{max}$
→ I$_\gamma$ > 10%×I$_\gamma^{max}$
- - → γ Decay (Uncertain)

$^{71}_{31}$Ga$_{40}$

^{70}Zn(^{7}Li,α2nγ)   2021Zh44

Band(A): Band based on
9/2^{+}

(29/2^{+})   6573.4

1346

25/2$^{(+)}$ 5227.9

Seq.(D): γ cascade
based on 7/2$^{(-)}$

1200

(23/2^{-})   4873.1

964

Seq.(B): γ cascade   **Seq.(C): γ cascade**
based on 3/2^{-} , g.s   **based on 9/2^{-}**

21/2$^{(+)}$ 4028.2

19/2$^{(-)}$ 4199.5   21/2$^{(-)}$ 4165.1   19/2$^{(-)}$ 3909.1

470

17/2^{-} 3694.6   875

1046

1086

1012   15/2$^{(-)}$ 3034.0

15/2$^{(-)}$ 3153.5

17/2^{+} 2942.1

13/2^{-} 2683.1

1084

1093

859

1186

13/2^{+} 2083.1   11/2$^{(-)}$ 2069.5   11/2$^{(-)}$ 1941.0

962   9/2^{-} 1497.5

589

977

9/2^{+} 1494.3

7/2^{-} 1107.5

7/2$^{(-)}$ 964.1

620

5/2^{-} 487.5

488

3/2^{-} 0.0

$^{71}_{31}$Ga$_{40}$