

Adopted Levels, Gammas

| Type            | Author          | History<br>Citation | Literature Cutoff Date |
|-----------------|-----------------|---------------------|------------------------|
| Full Evaluation | E. A. Mccutchan | NDS 125, 201 (2015) | 31-Dec-2014            |

$Q(\beta^-) = -11724$  SY;  $S(n) = 14281$  SY;  $S(p) = 1757$  SY;  $Q(\alpha) = -2.5 \times 10^3$  5 [2012Wa38](#)  
 $\Delta Q(\beta^-) = 500$ ;  $\Delta S(n) = 423$ ;  $\Delta S(p) = 361$  ([2012Wa38](#)).  
 $S(2n) = 27606$  syst 500;  $S(2p) = 7.3 \times 10^3$  3;  $Q(\epsilon p) = 2.4 \times 10^3$  3 ([2012Wa38](#)).  
 $\alpha$ : [Additional information 1](#).

 $^{83}\text{Nb}$  LevelsCross Reference (XREF) Flags

**A**  $^{28}\text{Si}(^{58}\text{Ni}, p2n\gamma)$

| E(level) <sup>†</sup>      | $J^\pi$ <sup>‡</sup> | $T_{1/2}$ | XREF     | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|----------------------|-----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.0 <sup>#</sup>           | (5/2 <sup>+</sup> )  | 3.9 s 2   | <b>A</b> | $\% \epsilon + \% \beta^+ = 100$<br>$T_{1/2}$ : weighted average of 3.8 s 2 ( <a href="#">2009St04</a> ) and 4.1 s 3 ( <a href="#">1988Ku14</a> ).<br>$J^\pi$ : expected allowed $\beta^+$ transition to the 77-keV, $J^\pi = (7/2^+)$ level in $^{83}\text{Zr}$ is consistent with $J^\pi = (5/2^+, 7/2^+, 9/2^+)$ . Systematics of N=41 isotones and comparison of the observed rotational bands with projected shell model calculations suggests $J^\pi = (5/2^+)$ . |
| 129.52 <sup>@</sup> 16     | (7/2 <sup>+</sup> )  |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 229.03 <sup>a</sup> 19     | (3/2 <sup>-</sup> )  |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 251.15 <sup>#</sup> 16     | (9/2 <sup>+</sup> )  |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 379.94 <sup>&amp;</sup> 24 | (5/2 <sup>-</sup> )  |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 641.5 <sup>a</sup> 3       | (7/2 <sup>-</sup> )  |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 710.0 <sup>@</sup> 3       | (11/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 873.7 <sup>#</sup> 3       | (13/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 941.5 <sup>&amp;</sup> 4   | (9/2 <sup>-</sup> )  |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1325.2 <sup>a</sup> 5      | (11/2 <sup>-</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1441.4 <sup>@</sup> 6      | (15/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1720.9 <sup>#</sup> 5      | (17/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1721.1 <sup>&amp;</sup> 7  | (13/2 <sup>-</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2236.2 <sup>a</sup> 11     | (15/2 <sup>-</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2484.4 <sup>@</sup> 21     | (19/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2689.1 <sup>&amp;</sup> 12 | (17/2 <sup>-</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2777.3 <sup>#</sup> 7      | (21/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4009.3 <sup>#</sup> 21     | (25/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 5241 <sup>#</sup> 3        | (29/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 6664 <sup>#</sup> 4        | (33/2 <sup>+</sup> ) |           | <b>A</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

<sup>†</sup> From a least-squares fit to  $E\gamma$ , by evaluator.

<sup>‡</sup> Spin, parity, and single-particle configuration assignments are based on decay patterns, multipolarity assignments, comparison with projected shell model calculations and on the analogy with rotational band structures in  $^{77}\text{Kr}$  and  $^{79}\text{Sr}$ .

<sup>#</sup> Band(A):  $K^\pi = 5/2^+$ ,  $\alpha = +1/2$ . Configuration =  $\pi 5/2[422]$ .

<sup>@</sup> Band(a):  $K^\pi = 5/2^+$ ,  $\alpha = -1/2$ . Configuration =  $\pi 5/2[422]$ .

<sup>&</sup> Band(B):  $K^\pi = 3/2^-$ ,  $\alpha = +1/2$ . Configuration =  $\pi 3/2[301]$ .

<sup>a</sup> Band(b):  $K^\pi = 3/2^-$ ,  $\alpha = -1/2$ . Configuration =  $\pi 3/2[301]$ .

Adopted Levels, Gammas (continued)

| $\gamma(^{83}\text{Nb})$ |                      |                             |                           |                                                                                        |                     |                   |                   |           |                                                                                                                                                                                        |
|--------------------------|----------------------|-----------------------------|---------------------------|----------------------------------------------------------------------------------------|---------------------|-------------------|-------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $E_i(\text{level})$      | $J_i^\pi$            | $E_\gamma^\dagger$          | $I_\gamma^\dagger$        | $E_f$                                                                                  | $J_f^\pi$           | Mult. $^\ddagger$ | $\delta^\ddagger$ | $\alpha$  | Comments                                                                                                                                                                               |
| 129.52                   | (7/2 <sup>+</sup> )  | 129.5 2                     | 100                       | 0.0                                                                                    | (5/2 <sup>+</sup> ) | (M1+E2)           | +0.20 7           | 0.124 11  | $\alpha(\text{K})=0.108$ 9; $\alpha(\text{L})=0.0133$ 15; $\alpha(\text{M})=0.0023$ 3; $\alpha(\text{N})=0.00034$ 4; $\alpha(\text{O})=1.81\times 10^{-5}$ 12                          |
| 229.03                   | (3/2 <sup>-</sup> )  | 229.0 2                     | 100                       | 0.0                                                                                    | (5/2 <sup>+</sup> ) | (E1) $^\#$        |                   | 0.01093   | $\alpha(\text{K})=0.00963$ 14; $\alpha(\text{L})=0.001080$ 16; $\alpha(\text{M})=0.000189$ 3; $\alpha(\text{N})=2.75\times 10^{-5}$ 4; $\alpha(\text{O})=1.523\times 10^{-6}$ 22       |
| 251.15                   | (9/2 <sup>+</sup> )  | 121.6 2                     | 100 4                     | 129.52 (7/2 <sup>+</sup> )                                                             | (M1+E2)             | +0.15 6           |                   | 0.141 10  | $\alpha(\text{K})=0.123$ 8; $\alpha(\text{L})=0.0149$ 14; $\alpha(\text{M})=0.00264$ 24; $\alpha(\text{N})=0.00038$ 4; $\alpha(\text{O})=2.08\times 10^{-5}$ 11                        |
|                          |                      | 251.2 2                     | 39 6                      | 0.0 (5/2 <sup>+</sup> )                                                                | (E2)                |                   |                   | 0.0422    | $\alpha(\text{K})=0.0365$ 6; $\alpha(\text{L})=0.00476$ 7; $\alpha(\text{M})=0.000841$ 12; $\alpha(\text{N})=0.0001193$ 17; $\alpha(\text{O})=5.65\times 10^{-6}$ 8                    |
| 379.94                   | (5/2 <sup>-</sup> )  | 150.9 2                     | 100 7                     | 229.03 (3/2 <sup>-</sup> )                                                             | (M1+E2)             | +0.14 9           |                   | 0.077 6   | $\alpha(\text{K})=0.067$ 5; $\alpha(\text{L})=0.0080$ 8; $\alpha(\text{M})=0.00141$ 15; $\alpha(\text{N})=0.000205$ 20; $\alpha(\text{O})=1.14\times 10^{-5}$ 7                        |
| 641.5                    | (7/2 <sup>-</sup> )  | 250.6 $\&$ 5<br>261.5 3     | <22<br>100 19             | 129.52 (7/2 <sup>+</sup> )<br>379.94 (5/2 <sup>-</sup> )                               | (M1+E2)             | +0.19 17          |                   | 0.0180 16 | $\alpha(\text{K})=0.0158$ 14; $\alpha(\text{L})=0.00182$ 20; $\alpha(\text{M})=0.00032$ 4; $\alpha(\text{N})=4.7\times 10^{-5}$ 5; $\alpha(\text{O})=2.67\times 10^{-6}$ 20            |
| 710.0                    | (11/2 <sup>+</sup> ) | 412.4 4<br>458.8 3<br>580 1 | 100 30<br>87 23<br>100 50 | 229.03 (3/2 <sup>-</sup> )<br>251.15 (9/2 <sup>+</sup> )<br>129.52 (7/2 <sup>+</sup> ) |                     |                   |                   |           |                                                                                                                                                                                        |
| 873.7                    | (13/2 <sup>+</sup> ) | 163.4 4<br>622.7 3          | 6 4<br>100 13             | 710.0 (11/2 <sup>+</sup> )<br>251.15 (9/2 <sup>+</sup> )                               | (E2)                |                   |                   | 0.00238   | $\alpha(\text{K})=0.00209$ 3; $\alpha(\text{L})=0.000242$ 4; $\alpha(\text{M})=4.26\times 10^{-5}$ 6; $\alpha(\text{N})=6.19\times 10^{-6}$ 9; $\alpha(\text{O})=3.42\times 10^{-7}$ 5 |
| 941.5                    | (9/2 <sup>-</sup> )  | 299.8 4<br>561.9 5          | 59 17<br>100 30           | 641.5 (7/2 <sup>-</sup> )<br>379.94 (5/2 <sup>-</sup> )                                |                     |                   |                   |           |                                                                                                                                                                                        |
| 1325.2                   | (11/2 <sup>-</sup> ) | 384 1<br>683.6 5            | <32<br>100 40             | 941.5 (9/2 <sup>-</sup> )<br>641.5 (7/2 <sup>-</sup> )                                 |                     |                   |                   |           |                                                                                                                                                                                        |
| 1441.4                   | (15/2 <sup>+</sup> ) | 731.3 5                     | 100                       | 710.0 (11/2 <sup>+</sup> )                                                             |                     |                   |                   |           |                                                                                                                                                                                        |
| 1720.9                   | (17/2 <sup>+</sup> ) | 847.2 4                     | 100                       | 873.7 (13/2 <sup>+</sup> )                                                             |                     |                   |                   |           |                                                                                                                                                                                        |
| 1721.1                   | (13/2 <sup>-</sup> ) | 779.6 6                     | 100                       | 941.5 (9/2 <sup>-</sup> )                                                              |                     |                   |                   |           |                                                                                                                                                                                        |
| 2236.2?                  | (15/2 <sup>-</sup> ) | 911 $\&$ 1                  | 100                       | 1325.2 (11/2 <sup>-</sup> )                                                            |                     |                   |                   |           |                                                                                                                                                                                        |
| 2484.4                   | (19/2 <sup>+</sup> ) | 1043 2                      | 100                       | 1441.4 (15/2 <sup>+</sup> )                                                            |                     |                   |                   |           |                                                                                                                                                                                        |
| 2689.1?                  | (17/2 <sup>-</sup> ) | 968 $\&$ 1                  | 100                       | 1721.1 (13/2 <sup>-</sup> )                                                            |                     |                   |                   |           |                                                                                                                                                                                        |
| 2777.3                   | (21/2 <sup>+</sup> ) | 1056.4 5                    | 100                       | 1720.9 (17/2 <sup>+</sup> )                                                            |                     |                   |                   |           |                                                                                                                                                                                        |
| 4009.3                   | (25/2 <sup>+</sup> ) | 1232 $@$ 2                  | 100                       | 2777.3 (21/2 <sup>+</sup> )                                                            |                     |                   |                   |           |                                                                                                                                                                                        |
| 5241                     | (29/2 <sup>+</sup> ) | 1232 $@$ 2                  | 100                       | 4009.3 (25/2 <sup>+</sup> )                                                            |                     |                   |                   |           |                                                                                                                                                                                        |
| 6664                     | (33/2 <sup>+</sup> ) | 1423 2                      | 100                       | 5241 (29/2 <sup>+</sup> )                                                              |                     |                   |                   |           |                                                                                                                                                                                        |

Continued on next page (footnotes at end of table)

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**Adopted Levels, Gammas (continued)**

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 $\gamma(^{83}\text{Nb})$  (continued)

† From  $^{28}\text{Si}(^{58}\text{Ni},\text{p}2\text{n}\gamma)$ .

‡ From  $\gamma(\theta)$  in  $^{28}\text{Si}(^{58}\text{Ni},\text{p}2\text{n}\gamma)$ . Except where noted, Q and D+Q transitions are assumed E2 and M1+E2, respectively, based on the transitions being assigned to a rotational band and for the D+Q transitions, non-zero values for the mixing ratios.

# Based on analogy with negative parity levels in  $^{77}\text{Kr}$  and  $^{79}\text{Sr}$ , the 229-keV level is assumed to have  $\pi=-$  and thus, the D 229-keV transition is assumed (E1).

@ Multiply placed.

& Placement of transition in the level scheme is uncertain.

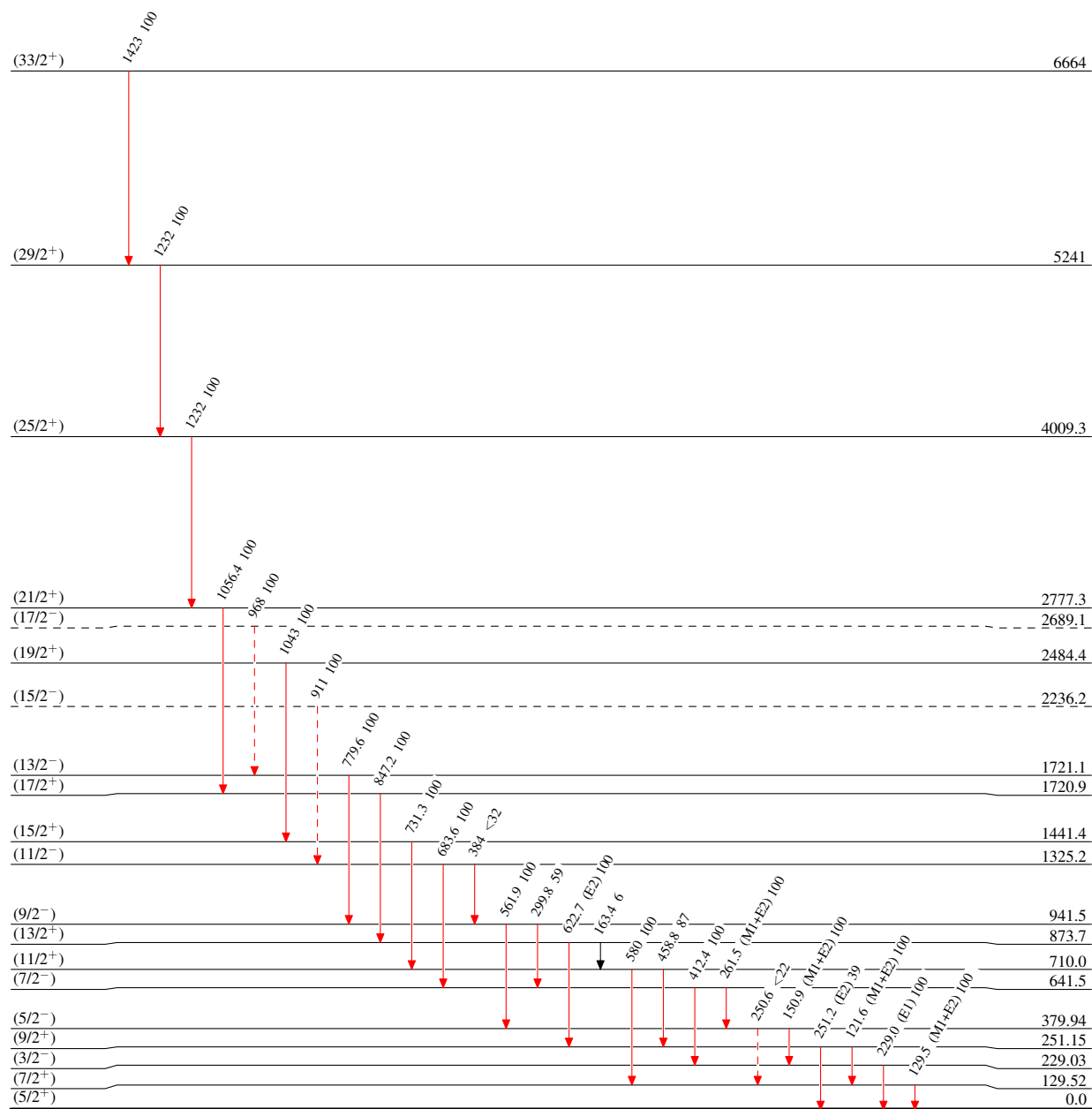
**Adopted Levels, Gammas**

## Legend

Level Scheme

Intensities: Type not specified

- ▶  $I_\gamma < 2\% \times I_\gamma^{\max}$   
 —————▶  $I_\gamma < 10\% \times I_\gamma^{\max}$   
 —————▶  $I_\gamma > 10\% \times I_\gamma^{\max}$   
 - - - - -▶  $\gamma$  Decay (Uncertain)



3.9 s 2

 $^{83}_{41}\text{Nb}_{42}$

Adopted Levels, Gammas