

$^{23}\text{Na}(n,\gamma)$  E=thermal 2014Fi01,2004To03

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia, Anagha Chakraborty		NDS 186, 2 (2022)	31-Mar-2022

Others: 1984Ti01,2011Fi11,2012Sh06,2017Ub01 (measured  $^{23}\text{Na}(n,\gamma)$  cross section in astrophysical energy range  $KT=5.1-25$  keV).

2014Fi01: E(n)=guided cold neutron beams from the 10-MW Budapest reactor. Target >99.5% pure NaCl. Measured  $E_\gamma$ ,  $I_\gamma$ , using a Compton-suppressed HPGe detector at Budapest reactor facility. Deduced levels, spin, parity,  $S_n=6959.352$  keV  $18$ , and total radiative thermal neutron capture cross section  $\sigma_0$  as  $0.541$  b  $3$  for the ground state and  $0.501$  b  $3$  for 20.18-ms isomeric state at 472.2 keV.

2004To03: The  $^{23}\text{Na}(n,\gamma)$  reaction was studied with the placement of the target in the thermal column of the internal target facility at the 8-MW Los Alamos Omega West reactor. The gamma rays were detected using a HPGe detector. A value of  $S_n=6959.44$  keV  $5$  was deduced. Measured  $E_\gamma$ ,  $I_\gamma$ .

1983Hu11: Measured  $E_\gamma$ ,  $I_\gamma$  with curved crystal spectrometer and Ge(Li).

1983Ti02: Measured  $E_\gamma$ ,  $I_\gamma$  with Ge(Li)-NaI(Tl) and Ge(Li) pair spectrometer.

1984Ti01: pol  $^{23}\text{Na}(\text{pol } n,\gamma)$ , Ge(Li), measured primary  $\gamma$ ,  $I_\gamma$ ,  $I_\gamma(\theta)$ , deduced  $2^+$  capture state admixture. Same group as 1983Ti02.

1987Zh12: Measured  $E_\gamma$ ,  $I_\gamma$  with Ge(Li)-NaI(Tl).

2007ChZX (Database of Prompt Gamma Rays from Slow Neutron Capture for Elemental Analysis, 2007ChZX).

 $^{24}\text{Na}$  Levels

1983Hu11 proposed two excited levels at 1961 and 1977, not confirmed by 1983Ti02, 2004To03, and 2014Fi01. From 1961 the depopulating 614.26 and 1490.1  $\gamma$ s were not reported either. Many of the proposed 552.22, 2661.9, 2790.10, 3231.62, 4246.5  $\gamma$ s feeding the 1961 level are either not reported or placed from different levels. The depopulating 1504.8 $\gamma$  from 1977 keV level (1983Hu11) has been placed from other/capture state in 2004To03 and 2014Fi01. Some of the proposed 2587.7, 4245.69, 4981.79  $\gamma$ s feeding the 1977 level are either not reported or placed from different levels in other (n, $\gamma$ ) studies. Evaluators do not adopt these 1961 and 1977 keV levels.

E(level) <sup>†</sup>	$J^\pi$ <sup>‡</sup>	$T_{1/2}$	Comments
0.0	$4^+$		
472.2071 $14$	$1^+$	20.18 ms $10$	$T_{1/2}$ : from Adopted Levels.
563.1993 $20$	$2^+$		
1341.439 $14$	$2^+$		
1344.647 $10$	$3^{(+)}$		
1346.635 $11$	$1^+$		
1514.3 $4$	$5^+$		
1846.026 $10$	$2^+$		
1885.537 $12$	$3^+$		
2513.351 $24$	$3^+$		
2564.07 $23$	$4^+$		
2903.935 $22$	$3^+$		
2977.782 $17$	$2^+$		
3216.10 $19$	$(4)^+$		
3371.827 $21$	$2^-$		
3413.277 $22$	$1^+$		
3589.32 $3$	$1^+$		
3628.24 $6$	$3^+$		
3655.92 $4$	$(2^+, 1^+, 3^+)$		
3681.83 $4$	$0^+$		
3745.04 $4$	$3^-$		
3865.62 $8$			
3933.60 $5$	$(1^+, 2^+, 3)^{\#}$		
3943.64 $6$	$2^+$		

$J^\pi$ : from Table II of 2014Fi01; but no arguments were given.

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$^{23}\text{Na}(n,\gamma)$  E=thermal 2014Fi01,2004To03 (continued) $^{24}\text{Na}$  Levels (continued)

E(level) <sup>†</sup>	J <sup>π</sup> <sup>‡</sup>	Comments
3977.33 3	1 <sup>-</sup>	
4048.78 12	(0,1,2) <sup>-</sup>	J <sup>π</sup> : from weaker population of the level by primary transitions in 2014Fi01.
4143.28 16	(4 <sup>+</sup> ) <sup>#</sup>	
4185.6 4		
4196.21 7	(2 <sup>+</sup> ) <sup>#</sup>	J <sup>π</sup> : In Adopted Levels (2) <sup>-</sup> .
4207.145 16	2 <sup>-</sup> <sup>#</sup>	
4441.637 17	2 <sup>-</sup>	
4561.983 25	2 <sup>-</sup> <sup>#</sup>	J <sup>π</sup> : In Adopted Levels 3 <sup>-</sup> .
4621.43 9	(2 <sup>-</sup> ,1 <sup>+</sup> )	J <sup>π</sup> : (2) <sup>+</sup> in 2014Fi01 and no argument is provided.
4692.20 20	(3 <sup>-</sup> ) <sup>#</sup>	
4751.025 16	(2 <sup>-</sup> )	
4891.35 8		
4908.2 3	2 <sup>+</sup> ,3 <sup>#</sup>	E(level): The level is established based on the primary $\gamma$ feeding; due to the very weak population, no decay branching from the level could be established (2014Fi01).
4939.57 5	(1) <sup>-</sup>	
5030.62 15	(2,3,4) <sup>+</sup>	
5045.029 20	2 <sup>-</sup> <sup>#</sup>	
5059.632 22	(3) <sup>-</sup>	
5117.30 4	(2 <sup>-</sup> ) <sup>#</sup>	
5192.30 9	(3 <sup>-</sup> )	
5252.20 13	1 <sup>-</sup>	
5308.67 9	(2 <sup>+</sup> ) <sup>#</sup>	
5339.07 3	2 <sup>-</sup>	
5397.36 16	(3 <sup>-</sup> )	
5454.64 5	1 <sup>-</sup> ,2 <sup>-</sup> <sup>#</sup>	
5479.01 4	(1,2) <sup>-</sup>	J <sup>π</sup> : 1 <sup>-</sup> in 2014Fi01.
5571.66 9	(2 <sup>+</sup> ) <sup>#</sup>	E(level): The level is established based on the primary $\gamma$ feeding; due to the very weak population, no decay branching from the level could be established (2014Fi01).
5775.7 3	(2 <sup>+</sup> ) <sup>#</sup>	J <sup>π</sup> : (2 <sup>+</sup> ) in the text and (3 <sup>+</sup> ) in Table II (2014Fi01).
5809.506 19	2 <sup>-</sup> <sup>#</sup>	
5851.39 8	(2 <sup>+</sup> ) <sup>#</sup>	E(level): The level is established based on the primary feeding transitions by 2014Fi01; due to the very weak population of the level by primary gamma ray, no decay branching from the level could be established in 2014Fi01. J <sup>π</sup> : from table II of 2014Fi01; but no discussion in the text for this assignment.
5862.89 17	(2 <sup>+</sup> ) <sup>#</sup>	
5918.270 22	(2) <sup>#</sup>	J <sup>π</sup> : 2 <sup>+</sup> ,(1 <sup>+</sup> ) in 2004To03 and (2 <sup>-</sup> ) in 2014Fi01.
5953.30 5	(1 <sup>-</sup> ) <sup>#</sup>	
5966.74 11	(0 <sup>+</sup> )	
6072.768 17	(2 <sup>-</sup> ) <sup>#</sup>	J <sup>π</sup> : from text in 2014Fi01, listed as 1 <sup>+</sup> in Table II of 2014Fi01.
6111.56 18	(2 <sup>+</sup> ,3 <sup>+</sup> )	
6176.40 4	(1 <sup>-</sup> ,2 <sup>-</sup> )	
6222.32 4	(1 <sup>+</sup> ,2 <sup>+</sup> ) <sup>#</sup>	
6247.556 17	(2 <sup>+</sup> ,3 <sup>+</sup> )	J <sup>π</sup> : 2 <sup>-</sup> in 2014Fi01 probably a misprint, no discussion in the text. 2 <sup>+</sup> in earlier evaluation 2007Fi14.
6251.29 5	(2 <sup>-</sup> ) <sup>#</sup>	
6257.38 4	1 <sup>-</sup>	
6406.82 3	(2 <sup>-</sup> ) <sup>#</sup>	
6448.31 18		
(6959.537 13)	1 <sup>+</sup> ,2 <sup>+</sup>	E(level): Others: 6959.352 18 in 2014Fi01. S(n)=6959.37 2 (2021Wa16), S(n)=6959.44 5 (2004To03). J <sup>π</sup> : from s-wave neutron capture in 3/2 <sup>+</sup> g.s. of $^{23}\text{Na}$ . Admixture of 2 <sup>+</sup> estimated $\approx$ 3.5% by 2014Fi01, based on the average strength populating 1 <sup>-</sup> and 2 <sup>-</sup> states as compared to those populating 3 <sup>-</sup> . Other: 5.8(5)% admixture of 2 <sup>+</sup> (1984Ti01).

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$^{23}\text{Na}(n,\gamma) \text{E=thermal}$  **2014Fi01,2004To03 (continued)**

$^{24}\text{Na}$  Levels (continued)

† From a least-squares fit to  $E_\gamma$  values. Uncertainties were doubled for 1217.66 $\gamma$ , 3866.2 $\gamma$  from 2564.1, 3865.6 keV levels and tripled for 2016.3 $\gamma$ , 4187.39 $\gamma$  from 5953.3, 6072.7 keV levels, respectively.  $\chi^2=2.08$  vs.  $\chi^2_{\text{crit}}=1.2$  was obtained. Without the increase of uncertainty,  $\chi^2$  was 2.7, and all these  $\gamma$  differed by more than 4 standard deviation from the fitted values.

‡ From the Adopted Levels, unless otherwise noted.

# Assigned in 2014Fi01, based on stronger/weaker primary  $\gamma$ -ray feeding from  $1^+, 2^+$  capture state.

$\gamma(^{24}\text{Na})$						Comments
$E_\gamma$ †	$I_\gamma$ <sup>cd</sup>	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	
90.9922 14	45.4 5	563.1993	2 <sup>+</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
242.30 & 9	0.020 & 2	3655.92	(2 <sup>+</sup> , 1 <sup>+</sup> , 3 <sup>+</sup> )	3413.277	1 <sup>+</sup>	
373.11 # 15	0.014 1	3745.04	3 <sup>-</sup>	3371.827	2 <sup>-</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
387.98 b& 18	0.005 & 1	3977.33	1 <sup>-</sup>	3589.32	1 <sup>+</sup>	
390.51 & b 15	0.008 & 1	2903.935	3 <sup>+</sup>	2513.351	3 <sup>+</sup>	
<sup>x</sup> 417.08 ‡ 21						
<sup>x</sup> 440.10 ‡ 11						
464.47 b& 12	0.033 & 6	4441.637	2 <sup>-</sup>	3977.33	1 <sup>-</sup>	
472.2023 14	92.77 1	472.2071	1 <sup>+</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : weighted average of 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of 2014Fi01, 2004To03, 1983Ti02.
499.384 7	2.73 4	1846.026	2 <sup>+</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
501.45 9	0.58 2	1846.026	2 <sup>+</sup>	1344.647	3 <sup>(+)</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
504.59 4	0.277 10	1846.026	2 <sup>+</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
543.94 b& 13	0.008 & 1	4751.025	(2 <sup>-</sup> )	4207.145	2 <sup>-</sup>	
551.2 3	0.064 & 2	4207.145	2 <sup>-</sup>	3655.92	(2 <sup>+</sup> , 1 <sup>+</sup> , 3 <sup>+</sup> )	$E_\gamma$ : from 2004To03. Other: 551.21 4 (2014Fi01).
552.721 25	0.0112 3	(6959.537)	1 <sup>+</sup> , 2 <sup>+</sup>	6406.82	(2 <sup>-</sup> )	$E_\gamma, I_\gamma$ : from 2014Fi01. 1983Hu11 placed a comparable 552.44 $\gamma$ from 2531 keV level. Feeding level at 1961 has not been adopted. See general comments for level.
563.188 13	1.70 1	563.1993	2 <sup>+</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
<sup>x</sup> 592.67 # 15						
605.46 # 18	0.031 3	3977.33	1 <sup>-</sup>	3371.827	2 <sup>-</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
<sup>x</sup> 614.26 5	0.134 16					$E_\gamma, I_\gamma$ : From 1983Hu11. Placement from 1961 keV level. The level not reported by others and

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$^{23}\text{Na}(n,\gamma)$  E=thermal 2014Fi01,2004To03 (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
						not adopted. Evaluators list the $\gamma$ as unplaced. See general comments for levels.
617.84 <sup>b&amp;</sup> 5	0.027 <sup>&amp;</sup> 2	4207.145	2 <sup>-</sup>	3589.32	1 <sup>+</sup>	
685.54 <sup>b&amp;</sup> 12	0.042 <sup>&amp;</sup> 3	3589.32	1 <sup>+</sup>	2903.935	3 <sup>+</sup>	
696.69 <sup>#</sup> 19	0.040 <sup>#</sup> 3	4441.637	2 <sup>-</sup>	3745.04	3 <sup>-</sup>	
702.13 <sup>#</sup> 16	0.051 <sup>#</sup> 4	4751.025	(2 <sup>-</sup> )	4048.78	(0,1,2) <sup>-</sup>	$E_\gamma$ : Placement from 2004To03. In 2014Fi01, a comparable 702.14 $\gamma$ placed from the capture state.
702.14 <sup>&amp;</sup> 3	0.058 <sup>&amp;</sup> 2	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	6257.38	1 <sup>-</sup>	
708.20 <sup>#</sup> 5	0.235 3	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	6251.29	(2 <sup>-</sup> )	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
711.967 11	0.860 9	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
737.55 <sup>‡</sup> 13	0.019 <sup>‡</sup> 6	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	6222.32	(1 <sup>+</sup> ,2 <sup>+</sup> )	
773.86 14	0.095 11	4751.025	(2 <sup>-</sup> )	3977.33	1 <sup>-</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03.
778.23 4	1.134 12	1341.439	2 <sup>+</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
781.444 48	3.22 3	1344.647	3 <sup>(+)</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
783.14 4	0.057 7	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	6176.40	(1 <sup>-</sup> ,2 <sup>-</sup> )	$E_\gamma, I_\gamma$ : from 2014Fi01. Separated intensity in 2014Fi01 for multiple placement of 783.14 keV 4.
783.40 22	0.107 7	1346.635	1 <sup>+</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : from 2004To03. $I_\gamma$ : from 2014Fi01, divided intensity in 2014Fi01 for multiple placement of 783.14 keV 4.
785.8 3	0.038 6	4441.637	2 <sup>-</sup>	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	$E_\gamma, I_\gamma$ : from 2014Fi01. 2004To03 note the transition can be placed from 5479 level.
793.85 4	0.393 4	4207.145	2 <sup>-</sup>	3413.277	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
810.4 <sup>‡</sup> 3	0.018 <sup>‡</sup> 8	5252.20	1 <sup>-</sup>	4441.637	2 <sup>-</sup>	
813.0 <sup>#</sup> 5	0.015 2	4441.637	2 <sup>-</sup>	3628.24	3 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
820.27 <sup>@‡</sup> 21	0.032 <sup>‡</sup> 9	6072.768	(2 <sup>-</sup> )	5252.20	1 <sup>-</sup>	
835.31 3	2.15 2	4207.145	2 <sup>-</sup>	3371.827	2 <sup>-</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
852.32 <sup>#</sup> 7	0.088 <sup>‡</sup> 15	5059.632	(3 <sup>-</sup> )	4207.145	2 <sup>-</sup>	$E_\gamma$ : Other: 852.25 3 (2014Fi01).
852.33 7	0.088 <sup>‡</sup> 15	4441.637	2 <sup>-</sup>	3589.32	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
857.0 <sup>b</sup> 4	0.016 6	3371.827	2 <sup>-</sup>	2513.351	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11.
858.1 <sup>‡</sup> 5	0.13 <sup>‡</sup> 7	5918.270	(2)	5059.632	(3 <sup>-</sup> )	
863.37 <sup>#</sup> 20	0.053 <sup>‡</sup> 23	5059.632	(3 <sup>-</sup> )	4196.21	(2 <sup>+</sup> )	$E_\gamma$ : Other: 863.21 5 (2014Fi01).

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$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  **2014Fi01,2004To03 (continued)** $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
869.225 23	20.75 17	1341.439	2 <sup>+</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
874.420 30	14.63 12	1346.635	1 <sup>+</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
886.751 11	0.76 1	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	6072.768	(2 <sup>-</sup> )	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
906.20 <sup>‡</sup> 20	0.068 <sup>‡</sup> 17	4561.983	2 <sup>-</sup>	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	
943.4 <sup>&amp;b</sup> 5	0.009 <sup>&amp;</sup> 2	6251.29	(2 <sup>-</sup> )	5308.67	(2 <sup>+</sup> )	
992.40 14	0.016 3	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5966.74	(0 <sup>+</sup> )	$E_\gamma, I_\gamma$ : from 2014Fi01, divided intensity for multiple placement. 2004To03 place only from 4621 keV level.
992.6 <sup>#</sup> 5	0.002 2	4621.43	(2 <sup>-</sup> ,1 <sup>+</sup> )	3628.24	3 <sup>+</sup>	$I_\gamma$ : from 2014Fi01, divided intensity for multiple placement. Other: 0.014 3 (2004To03).
999.7 <sup>#</sup> 3	0.017 3	3977.33	1 <sup>-</sup>	2977.782	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
1005.969 41	0.185 6	4751.025	(2 <sup>-</sup> )	3745.04	3 <sup>-</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : from 2014Fi01, divided intensity for multiple placement of 1005.914 $\gamma$ .
1006.22 <sup>@</sup> 5	0.287 6	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5953.30	(1 <sup>-</sup> )	$I_\gamma$ : from 2014Fi01, divided intensity for multiple placement of 1005.914 $\gamma$ .
1012.5 <sup>#</sup> 5	0.012 <sup>#</sup> 3	5454.64	1 <sup>-</sup> ,2 <sup>-</sup>	4441.637	2 <sup>-</sup>	
1018.3 <sup>#</sup> 5	0.014 2	2903.935	3 <sup>+</sup>	1885.537	3 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
1028.33 11	0.066 2	4441.637	2 <sup>-</sup>	3413.277	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of 2014Fi01, 1983Hu11, 2004To03.
1035.3 <sup>‡</sup> 4	0.012 <sup>‡</sup> 6	4692.20	(3 <sup>-</sup> )	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	
1041.241 20	0.284 4	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5918.270	(2)	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1050.4 <sup>&amp;</sup> 5	0.06 <sup>&amp;</sup> 2	2564.07	4 <sup>+</sup>	1514.3	5 <sup>+</sup>	$I_\gamma$ : $I_\gamma$ in 2014Fi01 is from earlier evaluation (2007Fi14) appears to be smaller by an order. Evaluators list as 0.06 2 instead of 0.006 2 (based on (0.0032 10)/5.4).
1057.9 <sup>#</sup> 3	0.046 21	2903.935	3 <sup>+</sup>	1846.026	2 <sup>+</sup>	$I_\gamma$ : unweighted average of data from 2014Fi01, 2004To03.
1092.21 3	0.311 4	2977.782	2 <sup>+</sup>	1885.537	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1095.05 7	0.129 2	4751.025	(2 <sup>-</sup> )	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1097.2 <sup>‡</sup> 3	0.038 <sup>‡</sup> 16	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5862.89	(2 <sup>+</sup> )	

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$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  2014Fi01,2004To03 (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
1108.12 <sup>&amp;</sup> 7	0.029 <sup>&amp;</sup> 2	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5851.39	(2 <sup>+</sup> )	
<sup>x</sup> 1120.85 <sup>‡</sup> 24						
<sup>x</sup> 1124.69 <sup>‡</sup> 13						
<sup>x</sup> 1126.38 <sup>‡</sup> 12						
1131.31 12	0.029 <sup>&amp;</sup> 4	2977.782	2 <sup>+</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of 1131.35 12 (2014Fi01) and 1131.7 3 (2004To03). 2004To03 noted the transition can also be placed from 5479 level.
1143.09 <sup>&amp;</sup> 14	0.048 <sup>&amp;</sup> 6	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	2513.351	3 <sup>+</sup>	$E_\gamma$ : 2004To03 noted the transition can also be placed from 5339 (5338 in 2004To03) level.
1150.000 20	0.99 4	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5809.506	2 <sup>-</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1172.1 <sup>#</sup> 4	0.028 <sup>#</sup> 4	2513.351	3 <sup>+</sup>	1341.439	2 <sup>+</sup>	
1183.8 <sup>&amp;b</sup> 9	0.013 <sup>&amp;</sup> 2	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5775.7	(2 <sup>+</sup> )	
1208.3 <sup>‡</sup> 3	0.038 <sup>‡</sup> 17	4621.43	(2 <sup>-</sup> ,1 <sup>+</sup> )	3413.277	1 <sup>+</sup>	
1217.66 24	0.26 4	2564.07	4 <sup>+</sup>	1344.647	3 <sup>(+)</sup>	$E_\gamma, I_\gamma$ : from 1983Ti02. Fits poorly, an uncertainty of 0.48 was used for least-square fit.
1218.2 5	0.024 4	4196.21	(2 <sup>+</sup> )	2977.782	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
<sup>x</sup> 1220.9 <sup>#</sup> 5						
1225.0 <sup>#</sup> 6	0.016 4	5918.270	(2)	4692.20	(3 <sup>-</sup> )	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
1229.35 4	0.289 6	4207.145	2 <sup>-</sup>	2977.782	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1231.5 <sup>#</sup> 4	0.036 4	3745.04	3 <sup>-</sup>	2513.351	3 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
1247.504 23	0.221 4	5809.506	2 <sup>-</sup>	4561.983	2 <sup>-</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1282.812 13	1.023 9	1846.026	2 <sup>+</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
1292.4 <sup>b&amp;</sup> 3	0.007 <sup>&amp;</sup> 2	4196.21	(2 <sup>+</sup> )	2903.935	3 <sup>+</sup>	
1314.57 13	0.058 2	5059.632	(3 <sup>-</sup> )	3745.04	3 <sup>-</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1322.329 14	1.175 9	1885.537	3 <sup>+</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
1330.52 <sup>b&amp;</sup> 19	0.014 <sup>&amp;</sup> 2	3216.10	(4 <sup>+</sup> )	1885.537	3 <sup>+</sup>	
1337.80 4	0.615 23	4751.025	(2 <sup>-</sup> )	3413.277	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
1340.98 <sup>&amp;</sup> 22	0.018 <sup>&amp;</sup> 3	1341.439	2 <sup>+</sup>	0.0	4 <sup>+</sup>	
1344.604 10	4.00 4	1344.647	3 <sup>(+)</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11,

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$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  **2014Fi01,2004To03 (continued)** $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
						2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
1373.56 11	1.53 2	1846.026	2 <sup>+</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
1378.80 12	0.070 7	4751.025	(2 <sup>-</sup> )	3371.827	2 <sup>-</sup>	$E_\gamma, I_\gamma$ : from 2014Fi01. 2004To03 noted the transition can also be placed from 6072.762 (6072 in 2004To03) level.
1387.83 & 8	0.052 & 4	(6959.537)	1 <sup>+</sup> , 2 <sup>+</sup>	5571.66	(2 <sup>+</sup> )	
1412.4 & 8	0.014 & 3	1885.537	3 <sup>+</sup>	472.2071	1 <sup>+</sup>	
1415.8 & 10	0.008 & 3	5045.029	2 <sup>-</sup>	3628.24	3 <sup>+</sup>	
1420.00 b & 18	0.022 & 3	3933.60	(1 <sup>+</sup> , 2 <sup>+</sup> , 3)	2513.351	3 <sup>+</sup>	
1455.4 4	0.034 ‡ 19	5045.029	2 <sup>-</sup>	3589.32	1 <sup>+</sup>	$E_\gamma$ : from 2004To03. Other: 1455.65 3 (2014Fi01).
1470.0 b & 3	0.008 & 2	5059.632	(3 <sup>-</sup> )	3589.32	1 <sup>+</sup>	
1477.4 # 5	0.016 2	5454.64	1 <sup>-</sup> , 2 <sup>-</sup>	3977.33	1 <sup>-</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
1480.46 5	0.336 4	(6959.537)	1 <sup>+</sup> , 2 <sup>+</sup>	5479.01	(1, 2) <sup>-</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
1486.20 b 6	0.234 3	3371.827	2 <sup>-</sup>	1885.537	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
<sup>x</sup> 1490.1 6	0.021 8					$E_\gamma, I_\gamma$ : from 1983Hu11. Placement from 1961 keV level. The level not reported by others and not adopted. Evaluators list the $\gamma$ as unplaced. See general comments for levels.
1504.83 5	0.472 6	(6959.537)	1 <sup>+</sup> , 2 <sup>+</sup>	5454.64	1 <sup>-</sup> , 2 <sup>-</sup>	$E_\gamma$ : from 2004To03. 1983Hu11 placed a comparable 1504.90 $\gamma$ from from 1977, not reported by others. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
1514.7 & 4	0.019 & 4	1514.3	5 <sup>+</sup>	0.0	4 <sup>+</sup>	
1526.1 # g 6	0.017 # 5	3371.827	2 <sup>-</sup>	1846.026	2 <sup>+</sup>	
1526.1 # 6	0.017 # 5	4939.57	(1) <sup>-</sup>	3413.277	1 <sup>+</sup>	
<sup>x</sup> 1534.76 ‡ 24						
1559.28 7	0.281 5	2903.935	3 <sup>+</sup>	1344.647	3 <sup>(+)</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
1562.462 29	0.51 ‡ 5	2903.935	3 <sup>+</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. 1983Hu11 also placed the $\gamma$ from capture state, not by 2004To03 and 2014Fi01. Evaluators place from this level only.
1567.18 8	0.100 3	3413.277	1 <sup>+</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $E_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
1570.17 ‡ 17	0.014 ‡ 2	5252.20	1 <sup>-</sup>	3681.83	0 <sup>+</sup>	
1578.0 & 6	0.012 & 2	4143.28	(4 <sup>+</sup> )	2564.07	4 <sup>+</sup>	
1584.17 16	0.048 2	4561.983	2 <sup>-</sup>	2977.782	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.

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$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  2014Fi01,2004To03 (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
1620.43 4	0.583 24	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5339.07	2 <sup>-</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03. $E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
1631.04 <sup>b&amp;</sup> 15	0.159 <sup>&amp;</sup> 11	2977.782	2 <sup>+</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : 2004To03 note the transition can also be placed from 6072 level.
1631.54 8	0.19 <sup>‡</sup> 3	5045.029	2 <sup>-</sup>	3413.277	1 <sup>+</sup>	$E_\gamma$ : from 2004To03. Placement not reported in 2014Fi01.
1633.41 16	1.153 12	2977.782	2 <sup>+</sup>	1344.647	3 <sup>(+)</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
1636.34 6	4.73 5	2977.782	2 <sup>+</sup>	1341.439	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
1646.16 <sup>b&amp;</sup> 13	0.024 <sup>&amp;</sup> 2	5059.632	(3) <sup>-</sup>	3413.277	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
1651.08 <sup>&amp;b</sup> 12	0.252 <sup>&amp;</sup> 24	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5308.67	(2 <sup>+</sup> )	
1683.1 <sup>b&amp;</sup> 3	0.019 <sup>&amp;</sup> 3	4196.21	(2 <sup>+</sup> )	2513.351	3 <sup>+</sup>	
1685.7 <sup>&amp;b</sup> 3	0.015 <sup>&amp;</sup> 3	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	4561.983	2 <sup>-</sup>	
1693.83 <sup>‡</sup> 14	0.121 <sup>‡</sup> 16	4207.145	2 <sup>-</sup>	2513.351	3 <sup>+</sup>	
1711.16 <sup>b&amp;</sup> 16	0.052 <sup>&amp;</sup> 6	5918.270	(2)	4207.145	2 <sup>-</sup>	
<sup>x</sup> 1711.83 20	0.26 5					$E_\gamma, I_\gamma$ : from 1983Ti02, placed from capture state in 1983Ti02, not by others. Evaluators list as unplaced.
1714.2 <sup>‡</sup> 3	0.021 7	4692.20	(3) <sup>-</sup>	2977.782	2 <sup>+</sup>	$I_\gamma$ : from weighted average of data from 1983Hu11, 2004To03.
1741.48 <sup>‡</sup> 24	0.114 <sup>‡</sup> 23	5397.36	(3) <sup>-</sup>	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	
1743.25 16	0.080 3	3589.32	1 <sup>+</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
1767.25 14	0.059 2	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5192.30	(3) <sup>-</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03. $E_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
1770.25 16	0.062 2	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	1885.537	3 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03. $E_\gamma$ : weighted average of data from 1983Hu11 and 2004To03.
1773.15 6	0.189 4	4751.025	(2) <sup>-</sup>	2977.782	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03. $E_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
1809.8 <sup>#</sup> 4	0.036 3	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	1846.026	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1832.00 11	0.162 6	5809.506	2 <sup>-</sup>	3977.33	1 <sup>-</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
1842.18 4	0.460 10	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5117.30	(2) <sup>-</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03. $E_\gamma$ : weighted average of data from 1983Hu11, 2004To03.

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$^{23}\text{Na}(n,\gamma)$  E=thermal **2014Fi01,2004To03 (continued)** $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma$ †	$I_\gamma$ <sup>cd</sup>	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
1847.06 17	0.086 5	4751.025	(2 <sup>-</sup> )	2903.935	3 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1859.4 3	0.067 6	3745.04	3 <sup>-</sup>	1885.537	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
1875.6 @ 4	0.028 ‡ 9	6072.768	(2 <sup>-</sup> )	4196.21	(2 <sup>+</sup> )	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
1885.44 5	0.668 27	1885.537	3 <sup>+</sup>	0.0	4 <sup>+</sup>	
1899.10 ‡ 10	0.80 10	3745.04	3 <sup>-</sup>	1846.026	2 <sup>+</sup>	$I_\gamma$ : from 2004To03 for doublet.
1899.69 12	0.80 10	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5059.632	(3) <sup>-</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 1983Ti02.
1914.44 6	1.12 1	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	5045.029	2 <sup>-</sup>	$I_\gamma$ : from 2004To03 for doublet. $E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
1928.23 <sup>b</sup> 4	0.907 19	4441.637	2 <sup>-</sup>	2513.351	3 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
1950.22 12	1.694 23	2513.351	3 <sup>+</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. A comparable $E_\gamma$ 1928.28 4 placed from capture state in 1983Ti02 and 1984Ti01. Evaluators only keep this placement, assuming it is the same $E_\gamma$ .
1964.3 & 4	0.005 & 2	6406.82	(2 <sup>-</sup> )	4441.637	2 <sup>-</sup>	$I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03.
2009.60 @ 17	0.179 @ 22	5953.30	(1 <sup>-</sup> )	3943.64	2 <sup>+</sup>	
2016.4 4	0.078 25	5953.30	(1 <sup>-</sup> )	3933.60	(1 <sup>+</sup> ,2 <sup>+</sup> ,3)	
2019.60 ‡ 14	0.17 4	3865.62		1846.026	2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $E_\gamma, I_\gamma$ : from 1983Ti02. Placement from 5953 in 1983Ti02 only. $E_\gamma$ not reported by others. Fits poorly, an uncertainty of 0.12 was used for least-square fit.
2019.91 6	0.43 4	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4939.57	(1) <sup>-</sup>	$E_\gamma$ : Other: 2019.74 3 (2014Fi01). $I_\gamma$ : from 2014Fi01. Divided intensity for multiply placed 2019.74 $\gamma$ in 2014Fi01.
2025.13 5	6.29 5	3371.827	2 <sup>-</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2004To03, 1983Ti02. $I_\gamma$ : from 2014Fi01. Divided intensity for multiply placed 2019.74 $\gamma$ in 2014Fi01.
2027.18 11	0.77 2	3371.827	2 <sup>-</sup>	1344.647	3 <sup>(+)</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
2030.26 7	4.08 5	3371.827	2 <sup>-</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
2040.9 & <sup>b</sup> 3	0.014 & 4	5454.64	1 <sup>-</sup> ,2 <sup>-</sup>	3413.277	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.

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$^{23}\text{Na}(n,\gamma) \text{E=thermal}$  **2014Fi01,2004To03** (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
2048.27 <sup>#</sup> 24	0.099 4	4561.983	2 <sup>-</sup>	2513.351	3 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
2051.29 <sup>&amp;</sup> 26	0.018 <sup>&amp;</sup> 3	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4908.2	2 <sup>+</sup> ,3	
2062.4 <sup>@</sup> 4	0.072 <sup>@</sup> 23	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	4185.6		
2066.55 10	0.242 4	3413.277	1 <sup>+</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
						$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
2071.69 10	1.134 41	3413.277	1 <sup>+</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
						$I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2087.48 <sup>#</sup> 14	0.131 <sup>&amp;</sup> 3	3933.60	(1 <sup>+</sup> ,2 <sup>+</sup> ,3)	1846.026	2 <sup>+</sup>	$E_\gamma$ : Other: 2087.44 4 (2014Fi01).
2106.5 <sup>e‡</sup> 5	0.022 <sup>e‡</sup> 7	4621.43	(2 <sup>-</sup> ,1 <sup>+</sup> )	2513.351	3 <sup>+</sup>	
2106.5 <sup>e‡</sup> 5	0.022 <sup>e‡</sup> 7	5479.01	(1,2) <sup>-</sup>	3371.827	2 <sup>-</sup>	
2118.0 <sup>‡</sup> 4	0.020 <sup>‡</sup> 7	5862.89	(2 <sup>+</sup> )	3745.04	3 <sup>-</sup>	
2131.35 5	0.038 4	3977.33	1 <sup>-</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11,2004To03.
						$I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03.
2139.4 4	0.034 7	5117.30	(2 <sup>-</sup> )	2977.782	2 <sup>+</sup>	$E_\gamma, I_\gamma$ : form 2004To03. 2004To03 noted the transition can also be placed 6072 keV level.
<sup>x</sup> 2163.6 <sup>‡</sup> 6						
<sup>x</sup> 2176.6 <sup>‡</sup> 4						
2208.47 6	5.29 15	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4751.025	(2 <sup>-</sup> )	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
						$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2220.00 <sup>‡</sup> 7	0.162 10	5809.506	2 <sup>-</sup>	3589.32	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
2237.46 12	0.196 23	4751.025	(2 <sup>-</sup> )	2513.351	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2004To03, 1983Ti02.
						$I_\gamma$ : unweighted average of data from 2014Fi01, 2004To03, 1983Ti02.
2242.44 20	0.143 20	3589.32	1 <sup>+</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
						$I_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
2247.84 15	0.104 8	3589.32	1 <sup>+</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
						$I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2266.6 5	0.047 6	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4692.20	(3 <sup>-</sup> )	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
						$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
2270.3 <sup>‡</sup> 6	0.022 6	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	3977.33	1 <sup>-</sup>	$I_\gamma$ : from 2014Fi01, divided intensity for multiply placed 2271.0 $\gamma$ .
2271.2 <sup>@</sup> 3	0.022 6	5953.30	(1 <sup>-</sup> )	3681.83	0 <sup>+</sup>	$I_\gamma$ : from 2014Fi01, divided intensity for multiply placed 2271.0 $\gamma$ .
2279.3 <sup>#</sup> 4	0.048 <sup>#</sup> 10	6257.38	1 <sup>-</sup>	3977.33	1 <sup>-</sup>	
2283.0 <sup>#</sup> 4	0.087 <sup>#</sup> 10	3628.24	3 <sup>+</sup>	1344.647	3 <sup>(+)</sup>	
2286.58 8	0.158 6	3628.24	3 <sup>+</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
						$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11.
2297.04 <sup>b&amp;</sup> 17	0.054 <sup>&amp;</sup> 5	4143.28	(4 <sup>+</sup> )	1846.026	2 <sup>+</sup>	

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$^{23}\text{Na}(n,\gamma)$  E=thermal **2014Fi01,2004To03** (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
2301.3@ 6	0.048@ 19	4185.6		1885.537	3 <sup>+</sup>	
2310.2 <sup>e</sup> 4	0.034 <sup>e</sup> 7	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	1344.647	3 <sup>(+)</sup>	$E_\gamma, I_\gamma$ : from 1983Hu11.
2310.2 <sup>e‡</sup> 4	0.034 <sup>e‡</sup> 7	4196.21	(2 <sup>+</sup> )	1885.537	3 <sup>+</sup>	
2314.3 3	0.030& 4	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
2334.9# 6	0.024 6	3681.83	0 <sup>+</sup>	1346.635	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
2337.91 10	0.131 15	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4621.43	(2 <sup>-</sup> ,1 <sup>+</sup> )	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2341.1# 6	0.026 8	2903.935	3 <sup>+</sup>	563.1993	2 <sup>+</sup>	$I_\gamma$ : unweighted average of data from 2014Fi01, 2004To03.
2349.9 3	0.053 4	4196.21	(2 <sup>+</sup> )	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2004To03,1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
2361.04 6	1.64 4	4207.145	2 <sup>-</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2378.0 8	0.002& 1	5966.74	(0 <sup>+</sup> )	3589.32	1 <sup>+</sup>	$E_\gamma$ : From 1983Ti02, 2014Fi01 quote the $E_\gamma=2376.3$ 13, most likely a calculated value in 2007Fi14 (evaluation). Appears to be the same $E_\gamma=2380.4$ 14 in ( $^3\text{He},p\gamma$ ). Placement in 1983Ti02 from 4939 keV level, however, in 1984Ti01 the proposed $J^\pi=1^-$ (4939) makes it a 1 <sup>-</sup> to 4 <sup>+</sup> transition. Evaluators accept the placement of ( $^3\text{He},p\gamma$ ).
2397.29 7	1.22 5	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4561.983	2 <sup>-</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2400.29 18	0.238 7	3745.04	3 <sup>-</sup>	1344.647	3 <sup>(+)</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2403.63 10	0.284 6	3745.04	3 <sup>-</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
2414.43 4	4.85 7	2977.782	2 <sup>+</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2426.44 <sup>b&amp;</sup> 22	0.027& 4	4939.57	(1) <sup>-</sup>	2513.351	3 <sup>+</sup>	
2431.9# 4	0.102 7	2903.935	3 <sup>+</sup>	472.2071	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
<sup>x</sup> 2448.4@ 8						
2482.9 <sup>b&amp;</sup> 5	0.019& 4	6072.768	(2) <sup>-</sup>	3589.32	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
2505.49 6	3.22 3	2977.782	2 <sup>+</sup>	472.2071	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.

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$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  2014Fi01,2004To03 (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
$^{*}2511.22@$ 18						$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2513.5# 4	0.142 57	2513.351	3 <sup>+</sup>	0.0	4 <sup>+</sup>	$I_\gamma$ : unweighted average of data from 2014Fi01, 2004To03.
2517.79 6	14.29 35	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4441.637	2 <sup>-</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2521.92& 21	0.126& 11	6111.56	(2 <sup>+</sup> ,3 <sup>+</sup> )	3589.32	1 <sup>+</sup>	
2523.88‡ 14	0.100‡ 7	3865.62		1341.439	2 <sup>+</sup>	
2545.9# 5	0.034# 6	5059.632	(3) <sup>-</sup>	2513.351	3 <sup>+</sup>	
2546.51‡ 21	0.034# 6	5918.270	(2)	3371.827	2 <sup>-</sup>	
2556.14 10	0.078 7	4441.637	2 <sup>-</sup>	1885.537	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
2565.2& 5	0.015& 6	2564.07	4 <sup>+</sup>	0.0	4 <sup>+</sup>	
2574.9&b 3	0.020& 5	6257.38	1 <sup>-</sup>	3681.83	0 <sup>+</sup>	
$^{*}2587.7$ 8	0.25 4					$E_\gamma, I_\gamma$ : from 1983Hu11, placement from 4562 keV level. Feeding level at 1977 has not been adopted. See general comments for levels. Evaluators list the $\gamma$ as unplaced.
2588.72 13	0.259 13	3933.60	(1 <sup>+</sup> ,2 <sup>+</sup> ,3)	1344.647	3 <sup>(+)</sup>	$E_\gamma$ : weighted average of data from 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 2004To03, 1983Ti02.
2591.71 20	0.41 4	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	$E_\gamma, I_\gamma$ : weighted average of data from 1983Hu11, 1983Ti02. A comparable 2592.10 $\gamma$ placed from 3933 keV level in 2004To03.
2592.10 12	0.355 20	3933.60	(1 <sup>+</sup> ,2 <sup>+</sup> ,3)	1341.439	2 <sup>+</sup>	$E_\gamma$ : from 2004To03. A comparable 2591.71 $\gamma$ placed from 6247 level in 1983Hu11 and 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 2004To03.
2595.49 5	0.964 11	4441.637	2 <sup>-</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2623.3&b 4	0.015& 4	6251.29	(2 <sup>-</sup> )	3628.24	3 <sup>+</sup>	
2630.56 6	0.554 7	3977.33	1 <sup>-</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2635.36b& 12	0.039& 3	3977.33	1 <sup>-</sup>	1341.439	2 <sup>+</sup>	
2657.6 3	0.029 3	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	3589.32	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
2661.55 <sup>b</sup> 14	0.039 3	6251.29	(2 <sup>-</sup> )	3589.32	1 <sup>+</sup>	$E_\gamma, I_\gamma$ : from 2014Fi01. 1983Hu11 place a comparable 2661.9 $\gamma$ from 4622 feeding the level at 1961. The latter level has not been adopted. See general comments for levels.
2701.4 4	0.037 5	4048.78	(0,1,2) <sup>-</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11,

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$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  **2014Fi01,2004To03 (continued)** $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
						2004To03. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03.
$^{x}2704.0^{\ddagger} 4$ 2715.82 6	0.565 7	4561.983	2 <sup>-</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2752.16 10	11.01 20	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4207.145	2 <sup>-</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.
2762.93 17	0.44 1	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4196.21	(2 <sup>+</sup> )	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11. $E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
$^{x}2790.10 15$	0.104 8					$E_\gamma, I_\gamma$ : from 1983Hu11, placement from 4751 keV level. Feeding level at 1961 has not been adopted. See general comments for levels. Evaluators list the $\gamma$ as unplaced.
2808.45 6	3.07 4	3371.827	2 <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2833.7 <sup>&amp;b</sup> 3 2850.04 11	0.015 <sup>&amp;</sup> 2 0.277 15	6247.556 3413.277	(2 <sup>+</sup> ,3 <sup>+</sup> ) 1 <sup>+</sup>	3413.277 563.1993	1 <sup>+</sup> 2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2860.29 3	3.41 4	4207.145	2 <sup>-</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2865.41 3 2865.61 6 2875.6 4	0.53 <sup>#</sup> 7 2.23 <sup>#</sup> 10 0.021 2	4751.025 4207.145 6247.556	(2 <sup>-</sup> ) 2 <sup>-</sup> (2 <sup>+</sup> ,3 <sup>+</sup> )	1885.537 1341.439 3371.827	3 <sup>+</sup> 2 <sup>+</sup> 2 <sup>-</sup>	$E_\gamma$ : from 1983Ti02. Other: 2865.4 5 (2014Fi01). $E_\gamma$ : from 1983Hu11. Other: 2865.4 5 (2014Fi01). $E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
2898.9 <sup>#</sup> 6 2903.70 4	0.036 <sup>#</sup> 7 0.121 12	3371.827 2903.935	2 <sup>-</sup> 3 <sup>+</sup>	472.2071 0.0	1 <sup>+</sup> 4 <sup>+</sup>	$E_\gamma, I_\gamma$ : from 2004To03. Doublet and reported divided intensity. Consistent with the datum in 2014Fi01.
2904.74 6	1.07 2	4751.025	(2 <sup>-</sup> )	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 1983Ti02. $I_\gamma$ : from 2004To03. Doublet and reported divided intensity. Consistent with the datum in 2014Fi01.
2910.70 22	0.062 3	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	4048.78	(0,1,2) <sup>-</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2940.85 9	0.635 7	3413.277	1 <sup>+</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2977.28 23	0.105 5	2977.782	2 <sup>+</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
2982.06 9	2.60 3	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3977.33	1 <sup>-</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11,

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$^{23}\text{Na}(n,\gamma)$  E=thermal 2014Fi01,2004To03 (continued)

$\gamma(^{24}\text{Na})$ (continued)						
$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
						2004To03, 1983Ti02. I $_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
2993.62 <sup>&amp;</sup> 11	0.040 <sup>&amp;</sup> 2	6406.82	(2 <sup>-</sup> )	3413.277	1 <sup>+</sup>	
3016.0 <sup>#</sup> 3	0.074 7	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3943.64	2 <sup>+</sup>	I $_\gamma$ : unweighted average of data from 2014Fi01, 2004To03.
3025.69 <sup>f&amp;</sup> 8	1.74 <sup>f&amp;</sup> 7	3589.32	1 <sup>+</sup>	563.1993	2 <sup>+</sup>	
3025.69 <sup>f&amp;a</sup> 8	0.93 <sup>f&amp;</sup> 7	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3933.60	(1 <sup>+</sup> ,2 <sup>+</sup> ,3)	
<sup>x</sup> 3060.6 <sup>‡</sup> 5						
<sup>x</sup> 3088.9 <sup>#</sup> 4						
3093.08 31	0.14 1	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	563.1993	2 <sup>+</sup>	E $_\gamma$ : weighted average of data from 1983Hu11, 1983Ti02. I $_\gamma$ : from 2014Fi01, divided intensity for multiple placement (3092.64 $\gamma$ ).
3093.83 <sup>‡</sup> 12	0.17 2	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3865.62		I $_\gamma$ : from 2014Fi01, divided intensity for multiple placement (3092.64 $\gamma$ ).
3094.80 <sup>#</sup> 3	0.54 <sup>#</sup> 6	4441.637	2 <sup>-</sup>	1346.635	1 <sup>+</sup>	
3096.62 6	3.63 5	4441.637	2 <sup>-</sup>	1344.647	3 <sup>(+)</sup>	E $_\gamma$ : weighted average of data from 1983Hu11, 1983Ti02. I $_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3099.90 6	2.79 5	4441.637	2 <sup>-</sup>	1341.439	2 <sup>+</sup>	E $_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. I $_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
3116.86 <sup>b</sup> 6	0.917 32	3589.32	1 <sup>+</sup>	472.2071	1 <sup>+</sup>	E $_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. I $_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3168.3 3	0.044 3	6072.768	(2 <sup>-</sup> )	2903.935	3 <sup>+</sup>	E $_\gamma$ : weighted average of data from 2004To03, 1983Ti02. I $_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
3174.00 13	0.055 3	5059.632	(3 <sup>-</sup> )	1885.537	3 <sup>+</sup>	E $_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. I $_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3181.61 43	0.246 7	3745.04	3 <sup>-</sup>	563.1993	2 <sup>+</sup>	E $_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. I $_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
3184.1 6	0.054 <sup>&amp;</sup> 6	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	472.2071	1 <sup>+</sup>	E $_\gamma$ : weighted average of data from 1983Hu11, 1983Ti02.
3198.97 10	0.202 5	5045.029	2 <sup>-</sup>	1846.026	2 <sup>+</sup>	E $_\gamma$ : weighted average of data from 1983Hu11, 2004To03. I $_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
3209.32 5	0.708 8	3681.83	0 <sup>+</sup>	472.2071	1 <sup>+</sup>	E $_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. I $_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3214.29 12	1.016 13	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3745.04	3 <sup>-</sup>	E $_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02.

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$^{23}\text{Na}(n,\gamma)$  E=thermal 2014Fi01,2004To03 (continued)

$\gamma(^{24}\text{Na})$ (continued)						Comments
$E_\gamma$ †	$I_\gamma$ <sup>cd</sup>	$E_i$ (level)	$J_i^\pi$	$E_f$	$J_f^\pi$	
3231.6# 6	0.028 3	5117.30	(2 <sup>-</sup> )	1885.537	3 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02. $E_\gamma$ : Other: 3231.68 13 (2014Fi01). $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
<sup>x</sup> 3231.62 14	0.039 3					$E_\gamma, I_\gamma$ : from 1983Hu11, placement from 5192 keV level. Feeding level at 1961 has not been adopted. See general comments for levels. Evaluators list the $\gamma$ as unplaced.
3244.31& 7	0.005& 2	6222.32	(1 <sup>+</sup> ,2 <sup>+</sup> )	2977.782	2 <sup>+</sup>	$E_\gamma$ : Other: 3242.2 9 (1983Hu11).
3270.77 24	0.103 3	5117.30	(2 <sup>-</sup> )	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
3277.41 6	0.709 9	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3681.83	0 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3295.6‡ 8	0.005‡ 2	5809.506	2 <sup>-</sup>	2513.351	3 <sup>+</sup>	
3303.26 8	0.228 4	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3655.92	(2 <sup>+</sup> ,1 <sup>+</sup> ,3 <sup>+</sup> )	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3330.97 8	0.240 6	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3628.24	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 3340.1‡ 6						
3343.27 8	0.219 15	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	2903.935	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 3355.6‡ 4						
3370.12 8	0.148 74	3933.60	(1 <sup>+</sup> ,2 <sup>+</sup> ,3)	563.1993	2 <sup>+</sup>	$E_\gamma$ : from 2004To03. Other: 3369.84 6 (2014Fi01). $I_\gamma$ : from 2014Fi01, intensity divided for multiple placement.
3370.18 <sup>f</sup> 23	2.595 <sup>f&amp;</sup> 37	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3589.32	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 1983Ti02.
3409.23 7	0.443 7	4751.025	(2 <sup>-</sup> )	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3413.78 6	0.829 11	3977.33	1 <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 3430.0‡ 3						
<sup>x</sup> 3460.4‡ 8						
3471.27& 7	0.252& 11	3943.64	2 <sup>+</sup>	472.2071	1 <sup>+</sup>	
3492.93 12	0.084 2	5339.07	2 <sup>-</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
3504.82 10	1.33 1	3977.33	1 <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11,

Continued on next page (footnotes at end of table)

$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  **2014Fi01,2004To03 (continued)** $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
						2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3546.02 9	0.919 11	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3413.277	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3576.5 3	0.060 13	4048.78	(0,1,2) <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : unweighted average of 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3587.49 9	11.47 10	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	3371.827	2 <sup>-</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3594.2 <sup>#</sup> 5	0.056 <sup>#</sup> 7	4939.57	(1) <sup>-</sup>	1344.647	3 <sup>(+)</sup>	
<sup>*</sup> 3596.22 <sup>‡</sup> 11						
3597.4 <sup>#</sup> 4	0.070 <sup>#</sup> 7	4939.57	(1) <sup>-</sup>	1341.439	2 <sup>+</sup>	
3628.11 17	0.142 5	3628.24	3 <sup>+</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3632.64 <sup>fa</sup> 13	0.102 <sup>f#</sup> 10	4196.21	(2 <sup>+</sup> )	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 1983Ti02.
3632.70 <sup>f‡</sup> 13	0.102 <sup>f#</sup> 10	5479.01	(1,2) <sup>-</sup>	1846.026	2 <sup>+</sup>	
3643.56 4	1.332 2	4207.145	2 <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3698.08 10	0.182 6	5045.029	2 <sup>-</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3703.29 7	0.411 7	5045.029	2 <sup>-</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3712.79 <sup>‡</sup> 14	0.043 6	5059.632	(3) <sup>-</sup>	1346.635	1 <sup>+</sup>	$I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11.
3723.59 10	0.303 6	4196.21	(2 <sup>+</sup> )	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
3734.58 12	0.083 10	4207.145	2 <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03.
3744.30 15	0.035 2	3745.04	3 <sup>-</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
3770.77 16	0.097 3	5117.30	(2 <sup>-</sup> )	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.

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$^{23}\text{Na}(n,\gamma)$  E=thermal 2014Fi01,2004To03 (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
3776.7 4	0.016 2	5117.30	(2 <sup>-</sup> )	1341.439	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03. $E_\gamma$ : from 1983Hu11. Other: 3770.51 17 (2014Fi01). $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11.
<sup>x</sup> 3785.93 <sup>‡</sup> 18						
3866.20 <sup>b&amp;</sup> 14	0.060 <sup>&amp;</sup> 3	3865.62		0.0	4 <sup>+</sup>	$E_\gamma, I_\gamma$ : Fits poorly, an uncertainty of 0.28 was used for least-square fit.
3878.08 4	4.29 5	4441.637	2 <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 3903.5 <sup>‡</sup> 3						
3934.34 <sup>&amp;</sup> 25	0.018 <sup>&amp;</sup> 2	6448.31		2513.351	3 <sup>+</sup>	
3942.80 17	0.081 4	3943.64	2 <sup>+</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
3964.13 <sup>b&amp;</sup> 15	0.038 <sup>&amp;</sup> 3	5308.67	(2 <sup>+</sup> )	1344.647	3 <sup>(+)</sup>	
3969.08 11	0.430 8	4441.637	2 <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
3981.34 5	13.37 12	(6959.537)	1 <sup>+,2+</sup>	2977.782	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
3997.61 9	0.314 5	5339.07	2 <sup>-</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
4055.29 8	0.666 33	(6959.537)	1 <sup>+,2+</sup>	2903.935	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
4055.49 <sup>‡</sup> 20	0.57 <sup>‡</sup> 11	5397.36	(3 <sup>-</sup> )	1341.439	2 <sup>+</sup>	$E_\gamma$ : Placement from 1983Hu11. In 2014Fi01, a comparable 4055.29 $\gamma$ placed from the capture state.
4057.7 4	0.060 7	4621.43	(2 <sup>-</sup> ,1 <sup>+</sup> )	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
4089.37 9	0.399 19	4561.983	2 <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
4107.3 <sup>@</sup> 3	0.029 <sup>@</sup> 4	5953.30	(1 <sup>-</sup> )	1846.026	2 <sup>+</sup>	
4107.6 <sup>#</sup> 7	0.013 4	5454.64	1 <sup>-</sup> ,2 <sup>-</sup>	1346.635	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
4131.7 <sup>#</sup> 9	0.031 2	5479.01	(1,2) <sup>-</sup>	1346.635	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
4137.14 12	0.151 4	5479.01	(1,2) <sup>-</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 4142.7 <sup>‡</sup> 3						
4144.5 <sup>@</sup> 5	0.012 2	4143.28	(4 <sup>+</sup> )	0.0	4 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Ti02.
<sup>x</sup> 4157.6 <sup>‡</sup> 8						
4187.35 3	1.47 2	4751.025	(2 <sup>-</sup> )	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03,

Continued on next page (footnotes at end of table)

$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  **2014Fi01,2004To03 (continued)** $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
						1983Ti02.
4187.39 6	0.03 1	6072.768	(2 <sup>-</sup> )	1885.537	3 <sup>+</sup>	$I_\gamma$ : from 2014Fi01. Divided intensity for multiple placement of 4187.39 $\gamma$ in 2014Fi01. $E_\gamma, I_\gamma$ : from 2014Fi01. Fits poorly, an uncertainty of 0.18 was used for least-square fit. For $I_\gamma$ intensity divided for multiple placement of 4187.39 $\gamma$ (4187.35 $\gamma$ in this dataset).
<sup>x</sup> 4210.93 <sup>‡</sup> 21 4226.32 14	0.032 2	6072.768	(2 <sup>-</sup> )	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
<sup>x</sup> 4245.69 23	0.014 2					$E_\gamma, I_\gamma$ : from 1983Hu11, placement from 6222 keV level. Feeding level at 1977 has not been adopted. See general comments for levels. Evaluators list the $\gamma$ as unplaced.
4278.76 23	0.014 1	4751.025	(2 <sup>-</sup> )	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
<sup>x</sup> 4286.5 6	0.004 1					$E_\gamma, I_\gamma$ : from 1983Hu11, placement from 6248 keV level. Feeding level at 1961 has not been adopted. See general comments for levels. Evaluators list the $\gamma$ as unplaced.
4361.57 17	0.020 1	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	1885.537	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
4376.00 11	0.106 6	4939.57	(1) <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2004To03,1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01,2004To03,1983Ti02.
4376.02 <sup>‡</sup> 13	0.098 <sup>‡</sup> 5	6222.32	(1 <sup>+</sup> ,2 <sup>+</sup> )	1846.026	2 <sup>+</sup>	
4394.9 <sup>&amp;</sup> 5	0.010 <sup>&amp;</sup> 2	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	2564.07	4 <sup>+</sup>	
4404.4 <sup>#</sup> 3	0.054 4	6251.29	(2 <sup>-</sup> )	1846.026	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
<sup>x</sup> 4409.4 <sup>‡</sup> 5						
<sup>x</sup> 4427.4 <sup>‡</sup> 6						
<sup>x</sup> 4431.4 <sup>‡</sup> 13						
4433.8 <sup>&amp;</sup> 3	0.013 <sup>&amp;</sup> 2	5775.7	(2 <sup>+</sup> )	1341.439	2 <sup>+</sup>	
4445.74 3	0.463 8	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	2513.351	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
4462.42 4	0.137 3	5809.506	2 <sup>-</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
4466.89 <sup>#</sup> 11	0.288 4	4939.57	(1) <sup>-</sup>	472.2071	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
4466.97 <sup>@</sup> 15	0.287 <sup>@</sup> 17	5030.62	(2,3,4) <sup>+</sup>	563.1993	2 <sup>+</sup>	
4481.41 3	0.178 9	5045.029	2 <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
4496.00 3	0.399 6	5059.632	(3) <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
4521.23 <sup>‡</sup> 22	0.013 1	5862.89	(2 <sup>+</sup> )	1341.439	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11.
4553.5 3	0.074 5	5117.30	(2 <sup>-</sup> )	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.

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$^{23}\text{Na}(n,\gamma)$  E=thermal 2014Fi01,2004To03 (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
4562.57& 25	0.023& 2	6448.31		1885.537	3 <sup>+</sup>	
4571.14# 5	0.138# 15	5918.270	(2)	1346.635	1 <sup>+</sup>	
4572.32# 4	0.087# 10	5045.029	2 <sup>-</sup>	472.2071	1 <sup>+</sup>	
4586.95 4	0.145 4	5059.632	(3) <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 1983Ti02.
4619.10& 18	0.002& 1	5966.74	(0 <sup>+</sup> )	1346.635	1 <sup>+</sup>	
4628.56 12	0.043 2	5192.30	(3) <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
4644.57 12	0.053 2	5117.30	(2) <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
<sup>x</sup> 4660.7‡ 8						$E_\gamma$ : from 4760.7 8 in Table 1 of 1983Hu11. Considering increasing order of the transition energy in the table, it appears that it was a misprint in 1983Hu11. The evaluators assume it would be 4660.7 keV 8.
4693.2 8	0.014 2	4692.20	(3) <sup>-</sup>	0.0	4 <sup>+</sup>	$E_\gamma, I_\gamma$ : weighted average of data from 1983Hu11, 2004To03.
4725.81 9	0.102 5	6072.768	(2) <sup>-</sup>	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
4727.58# 7	0.024# 7	6072.768	(2) <sup>-</sup>	1344.647	3 <sup>(+)</sup>	
4730.69@ 9	0.332 8	6072.768	(2) <sup>-</sup>	1341.439	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03, 1983Ti02.
<sup>x</sup> 4752.2‡ 10						
4775.23 6	0.167 4	5339.07	2 <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 4785.5‡ 10						
<sup>x</sup> 4804.21‡ 24						
4829.68& 18	0.028& 2	6176.40	(1 <sup>-</sup> ,2 <sup>-</sup> )	1346.635	1 <sup>+</sup>	
4836.06b& 24	0.021& 2	5308.67	(2 <sup>+</sup> )	472.2071	1 <sup>+</sup>	
<sup>x</sup> 4843.08‡ 23						
4866.27‡ 20	0.016 1	5339.07	2 <sup>-</sup>	472.2071	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11.
4875.18& 7	0.006& 1	6222.32	(1 <sup>+</sup> ,2 <sup>+</sup> )	1346.635	1 <sup>+</sup>	$E_\gamma$ : Other: 4872.9 7 (1983Hu11).
4890.82@ 8	0.292@ 17	4891.35		0.0	4 <sup>+</sup>	
4890.87# 15	0.305 17	5454.64	1 <sup>-</sup> ,2 <sup>-</sup>	563.1993	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
4900.46 13	0.143 9	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	1346.635	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
4902.0& 3	0.185& 74	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	1344.647	3 <sup>(+)</sup>	
4904.2 5	0.092 20	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	1341.439	2 <sup>+</sup>	$E_\gamma$ : from 1983Ti02. Others: 4905.517 13 (2014Fi01), 4909.7? 12 (1983Hu11). This placement adopted as proposed in 2014Fi01 and 1983Ti02. A comparable 4904.3 $\gamma$ is placed in 2004To03 from 6251 level. $I_\gamma$ : from unweighted average of data from 1983Hu11, 1983Ti02.
4908.6# 6	0.036# 10	6251.29	(2) <sup>-</sup>	1341.439	2 <sup>+</sup>	

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$^{23}\text{Na}(n,\gamma)$  E=thermal **2014Fi01,2004To03** (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma$ †	$I_\gamma$ <sup>cd</sup>	$E_i$ (level)	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
4915.00 16	0.057 3	5479.01	(1,2) <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 4961.5@ 5 4982.7 7	0.064 15	5454.64	1 <sup>-</sup> ,2 <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : from 2004To03. A comparable $E_\gamma$ 4981.79 13 placed from capture state only in 1983Hu11. Evaluators only keep this placement, assuming it is the same $E_\gamma$ . $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
5006.30 8	0.044 2	5479.01	(1,2) <sup>-</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 5017.67‡ 10 <sup>x</sup> 5024.5‡ 3 5058.7 7	0.021 2	5059.632	(3) <sup>-</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : from 2004To03. Other: 5059.75 20 (2014Fi01). $I_\gamma$ : weighted average of data from 2014Fi01, 2004To03.
5073.44 7	0.434 7	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	1885.537	3 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
5112.96 7	0.530 9	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	1846.026	2 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03, 1983Ti02.
<sup>x</sup> 5155.2‡ 4 5191.99‡ 19	0.008 1	5192.30	(3) <sup>-</sup>	0.0	4 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11.
<sup>x</sup> 5240.1‡ 8 5245.51 21	0.009 1	5809.506	2 <sup>-</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : from 1983Hu11. A comparable 5246.2 $\gamma$ reported in 1983Ti02 and placed from 5247 keV level to feed the g.s. Other comparable depopulating $E_\gamma$ 1832.19, 2219.70, 4462.84 also reported – but unplaced. Evaluators consider the reported level at 5247 is as spurious and do not list.
5336.64 17	0.014 1	5809.506	2 <sup>-</sup>	472.2071	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11. $E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
<sup>x</sup> 5372.9‡ 4 <sup>x</sup> 5381.7‡ 8 5396.6‡ 8	0.002‡ 1	5397.36	(3) <sup>-</sup>	0.0	4 <sup>+</sup>	
<sup>x</sup> 5423.4‡ 8 5445.49 16	0.156 3	5918.270	(2)	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from 1983Hu11, 2004To03. $I_\gamma$ : weighted average of data from 2014Fi01, 1983Hu11, 2004To03.
5492.8@ 7 5507.8‡ 8 5599.94 14	0.012 2 0.005 3 0.128 3	5966.74 6072.768 6072.768	(0 <sup>+</sup> ) (2) <sup>-</sup> (2) <sup>-</sup>	472.2071 563.1993 472.2071	1 <sup>+</sup> 2 <sup>+</sup> 1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 1983Ti02. $I_\gamma$ : unweighted average of data from 2014Fi01, 1983Hu11. $E_\gamma$ : weighted average of data from 1983Hu11, 2004To03, 1983Ti02.
5612.75 17	0.244 22	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	1346.635	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from 2014Fi01, 2004To03. $E_\gamma, I_\gamma$ : From 2014Fi01. Others report a doublet about this $E_\gamma$ and placed from the capture state. The one from 2014Fi01 is kept by the evaluators.
5617.46 34	4.19 8	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	1341.439	2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from 1983Hu11, 1983Ti02.

Continued on next page (footnotes at end of table)

$^{23}\text{Na}(n,\gamma)$  E=thermal **2014Fi01,2004To03** (continued) $\gamma(^{24}\text{Na})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{cd}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
5658.41 <sup>&amp; 7</sup>	0.006 <sup>&amp; 1</sup>	6222.32	(1 <sup>+</sup> ,2 <sup>+</sup> )	563.1993	2 <sup>+</sup>	$I_\gamma$ : weighted average of data from <a href="#">2014Fi01</a> , <a href="#">1983Hu11</a> , <a href="#">2004To03</a> , <a href="#">1983Ti02</a> .
5683.2 <sup>3</sup>	0.013 <sup>2</sup>	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	563.1993	2 <sup>+</sup>	$E_\gamma$ : Other: 5661.2 <sup>12</sup> ( <a href="#">1983Hu11</a> ). $E_\gamma$ : weighted average of data from <a href="#">1983Hu11</a> , <a href="#">2004To03</a> . $I_\gamma$ : weighted average of data from <a href="#">1983Hu11</a> , <a href="#">2004To03</a> .
<sup>x</sup> 5688.0 <sup>‡ 5</sup>						
<sup>x</sup> 5694.1 <sup>‡ 4</sup>						
5703.2 <sup># 3</sup>	0.030 <sup>2</sup>	6176.40	(1 <sup>-</sup> ,2 <sup>-</sup> )	472.2071	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from <a href="#">2014Fi01</a> , <a href="#">2004To03</a> .
<sup>x</sup> 5714.22 <sup>‡ 21</sup>						
5774.62 <sup>13</sup>	0.249 <sup>5</sup>	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	472.2071	1 <sup>+</sup>	$E_\gamma$ : unweighted average of data from <a href="#">1983Hu11</a> , <a href="#">2004To03</a> , <a href="#">1983Ti02</a> . $I_\gamma$ : weighted average of data from <a href="#">2014Fi01</a> , <a href="#">1983Hu11</a> , <a href="#">2004To03</a> , <a href="#">1983Ti02</a> .
5784.4 <sup># 5</sup>	0.023 <sup>2</sup>	6257.38	1 <sup>-</sup>	472.2071	1 <sup>+</sup>	$I_\gamma$ : weighted average of data from <a href="#">2014Fi01</a> , <a href="#">2004To03</a> .
6111.1 <sup>&amp; 3</sup>	0.015 <sup>&amp; 2</sup>	6111.56	(2 <sup>+</sup> ,3 <sup>+</sup> )	0.0	4 <sup>+</sup>	
<sup>x</sup> 6129.5 <sup>‡ 8</sup>						
<sup>x</sup> 6226.0 <sup>‡ 3</sup>						
6246.5 <sup>‡ 12</sup>	0.003 <sup>‡ 1</sup>	6247.556	(2 <sup>+</sup> ,3 <sup>+</sup> )	0.0	4 <sup>+</sup>	
6395.43 <sup>10</sup>	18.61 <sup>12</sup>	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	563.1993	2 <sup>+</sup>	$E_\gamma$ : unweighted average of data from <a href="#">1983Hu11</a> , <a href="#">2004To03</a> , <a href="#">1983Ti02</a> . $I_\gamma$ : weighted average of data from <a href="#">2014Fi01</a> , <a href="#">1983Hu11</a> , <a href="#">2004To03</a> , <a href="#">1983Ti02</a> .
6406.4 <sup>&amp; 7</sup>	0.008 <sup>&amp; 2</sup>	6406.82	(2 <sup>-</sup> )	0.0	4 <sup>+</sup>	
6486.41 <sup>9</sup>	0.430 <sup>6</sup>	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	472.2071	1 <sup>+</sup>	$E_\gamma$ : weighted average of data from <a href="#">1983Hu11</a> , <a href="#">2004To03</a> , <a href="#">1983Ti02</a> . $I_\gamma$ : weighted average of data from <a href="#">2014Fi01</a> , <a href="#">2004To03</a> , <a href="#">1983Ti02</a> .
6958.4 <sup>4</sup>	0.0028 <sup>5</sup>	(6959.537)	1 <sup>+</sup> ,2 <sup>+</sup>	0.0	4 <sup>+</sup>	$E_\gamma$ : weighted average of data from <a href="#">1983Hu11</a> , <a href="#">2004To03</a> . $I_\gamma$ : weighted average of data from <a href="#">2014Fi01</a> , <a href="#">1983Hu11</a> , <a href="#">2004To03</a> .

<sup>†</sup> [2014Fi01](#) report precise  $E_\gamma$ , most of which fit poorly. Source of the value is listed by footnote or in comments.

<sup>‡</sup> From [1983Hu11](#).

<sup>#</sup> From [2004To03](#).

<sup>@</sup> From [1983Ti02](#).

<sup>&</sup> From [2014Fi01](#).

<sup>a</sup> Transition multiply placed. Intensity divided on the basis of adopted  $\gamma$ -ray branching ratios in [2014Fi01](#).

<sup>b</sup> Placement proposed in [2014Fi01](#), based on the energy sum and consistency with the level scheme.

<sup>c</sup> Intensity per 100 neutron captures. Multiply by 5.4 to obtain partial  $\gamma$ -ray  $\sigma$  in mb. The  $I_\gamma$  for 100 neutron capture of [2014Fi01](#) was obtained dividing the partial  $\gamma$ -ray cross-sections by 540 based on the  $\Sigma I_\gamma$  (g.s.)=540 ( $\sigma_0$ =540 mb <sup>3</sup> from  $\Sigma I_\gamma$  (g.s.) and 542 mb <sup>3</sup> from activation  $\gamma$ -ray cross section data in [2014Fi01](#)).

<sup>d</sup> Intensity per 100 neutron captures.

<sup>e</sup> Multiply placed with undivided intensity.

<sup>f</sup> Multiply placed with intensity suitably divided.

<sup>g</sup> Placement of transition in the level scheme is uncertain.

<sup>x</sup>  $\gamma$  ray not placed in level scheme.

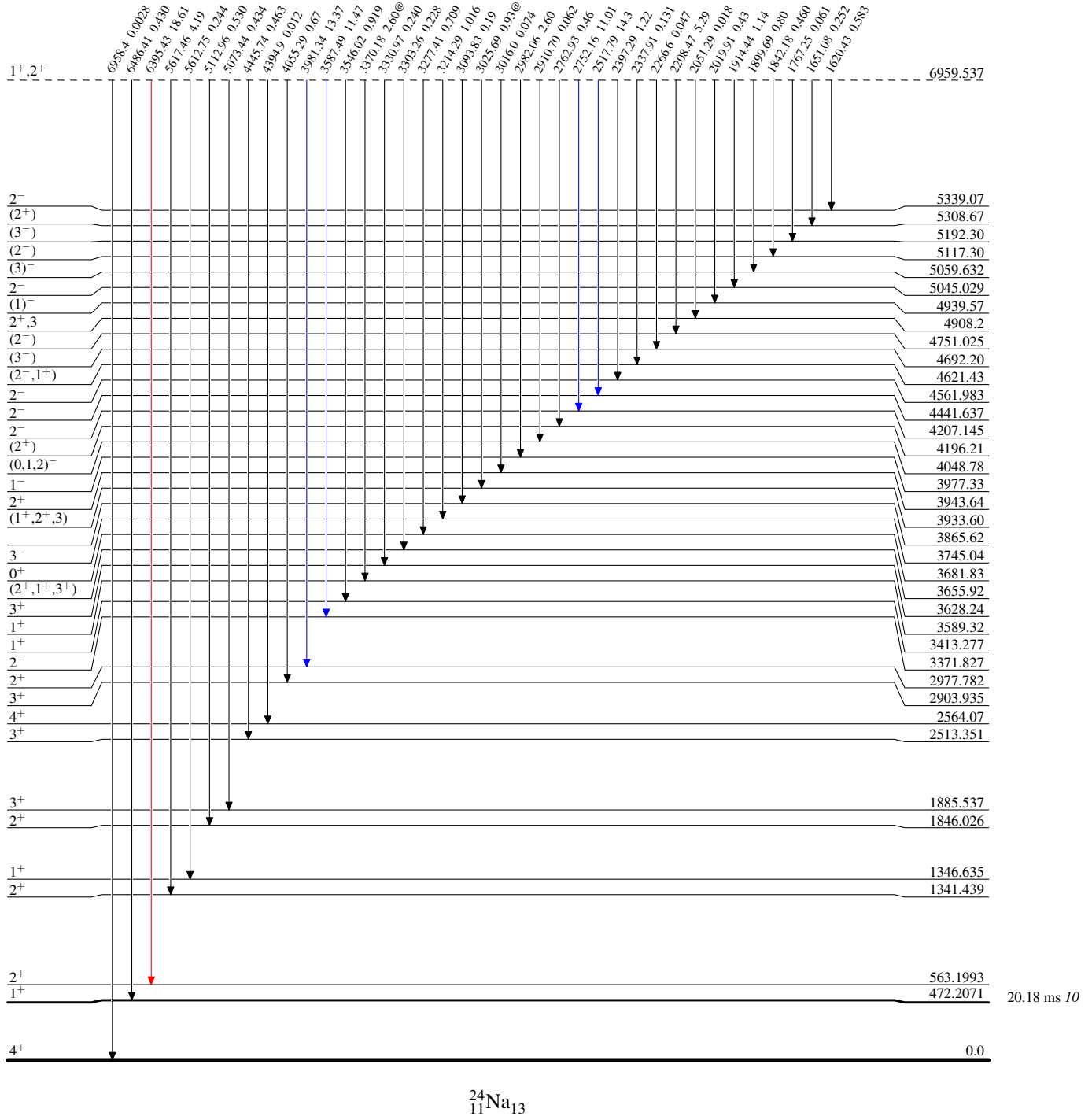
$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  2014Fi01,2004To03

Level Scheme

Legend

Intensities:  $I_{(\gamma+ce)}$  per 100 neutron captures  
@ Multiplied placed: intensity suitably divided

- $I_{\gamma} < 2\% \times I_{\gamma}^{\text{max}}$
- $I_{\gamma} < 10\% \times I_{\gamma}^{\text{max}}$
- $I_{\gamma} > 10\% \times I_{\gamma}^{\text{max}}$



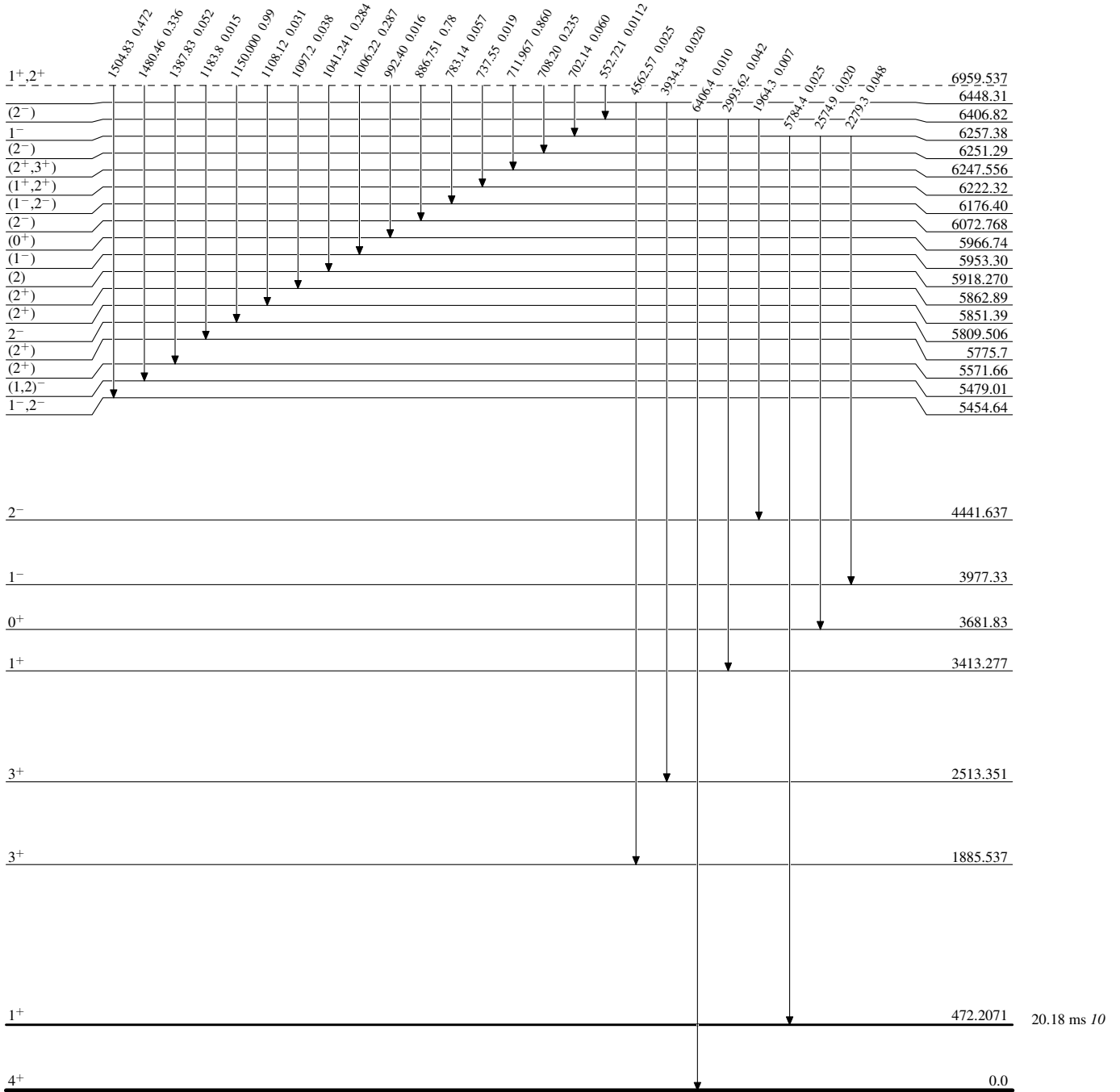
$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  2014Fi01,2004To03

Level Scheme (continued)

Legend

Intensities:  $I_{(\gamma+ce)}$  per 100 neutron captures  
@ Multiply placed: intensity suitably divided

- $I_{\gamma} < 2\% \times I_{\gamma}^{\text{max}}$
- $I_{\gamma} < 10\% \times I_{\gamma}^{\text{max}}$
- $I_{\gamma} > 10\% \times I_{\gamma}^{\text{max}}$



$^{24}_{11}\text{Na}_{13}$

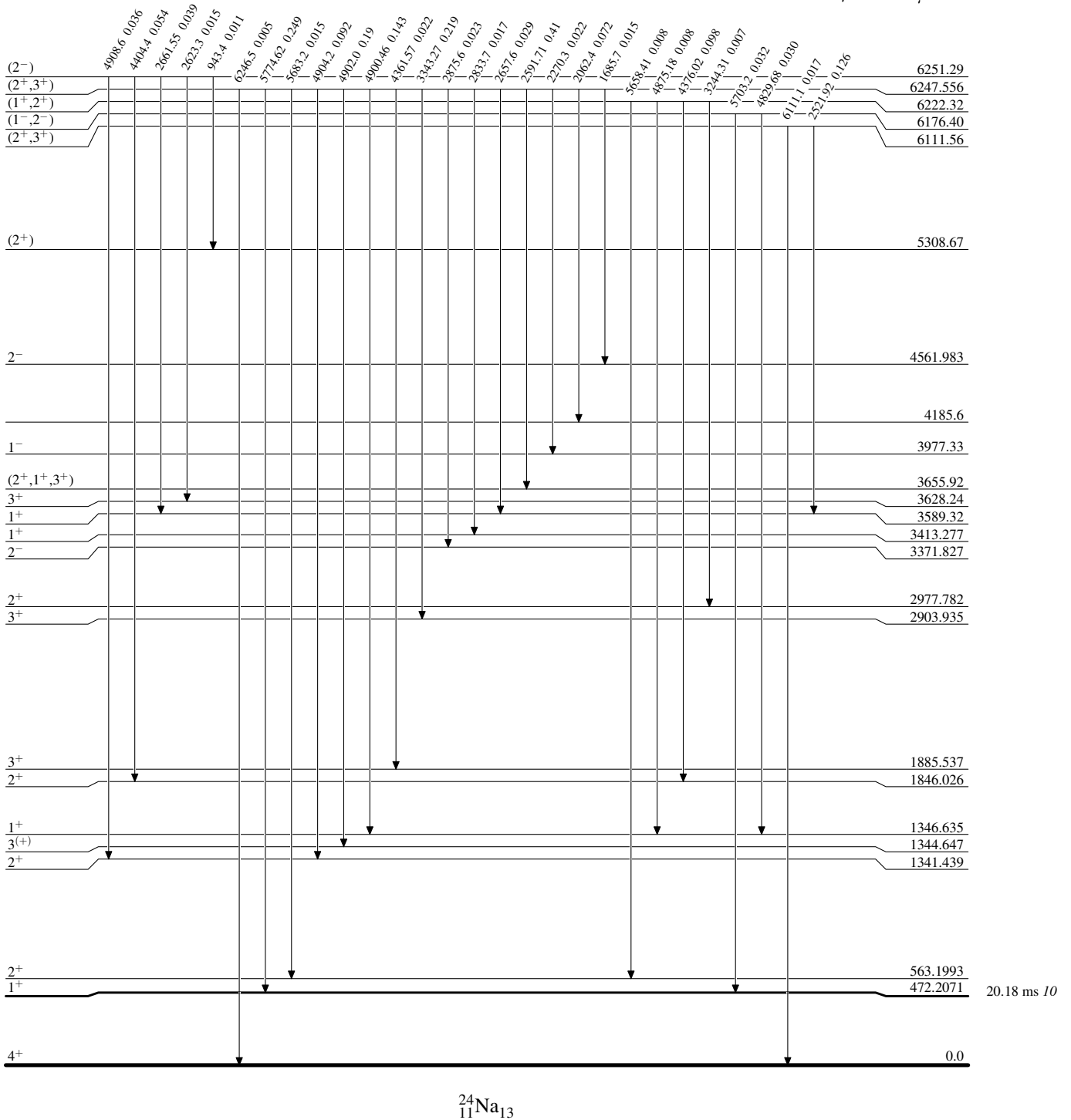
$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  2014Fi01,2004To03

Level Scheme (continued)

Intensities:  $I_{(\gamma+ce)}$  per 100 neutron captures  
@ Multiplied: intensity suitably divided

Legend

- $I_{\gamma} < 2\% \times I_{\gamma}^{\text{max}}$
- $I_{\gamma} < 10\% \times I_{\gamma}^{\text{max}}$
- $I_{\gamma} > 10\% \times I_{\gamma}^{\text{max}}$



$^{24}_{11}\text{Na}_{13}$



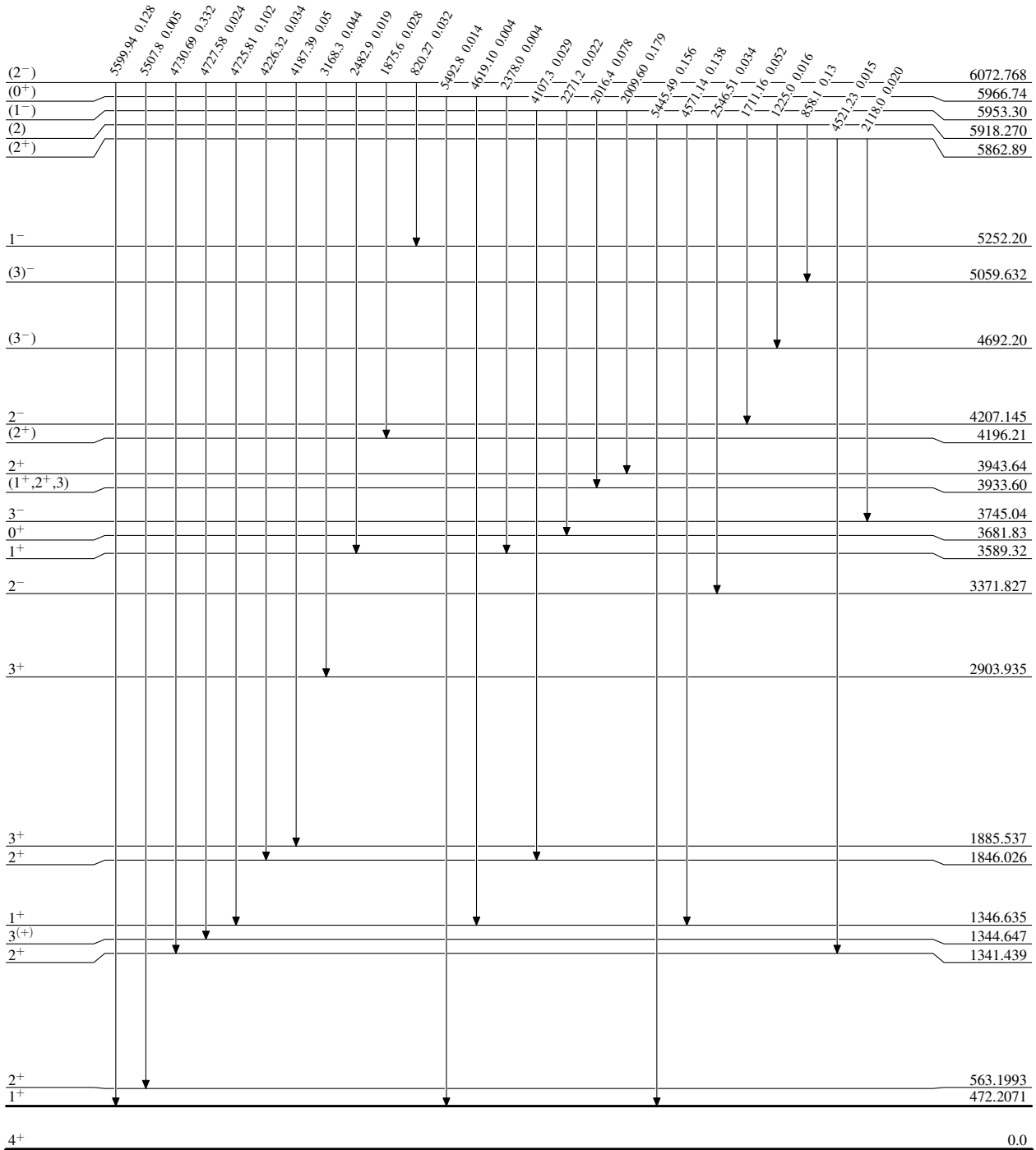
$^{23}\text{Na}(n,\gamma) \text{E=thermal}$  2014Fi01,2004To03

Level Scheme (continued)

Legend

Intensities:  $I_{(\gamma+ce)}$  per 100 neutron captures  
@ Multiply placed: intensity suitably divided

- $I_{\gamma} < 2\% \times I_{\gamma}^{max}$
- $I_{\gamma} < 10\% \times I_{\gamma}^{max}$
- $I_{\gamma} > 10\% \times I_{\gamma}^{max}$



20.18 ms 10

$^{24}_{11}\text{Na}_{13}$

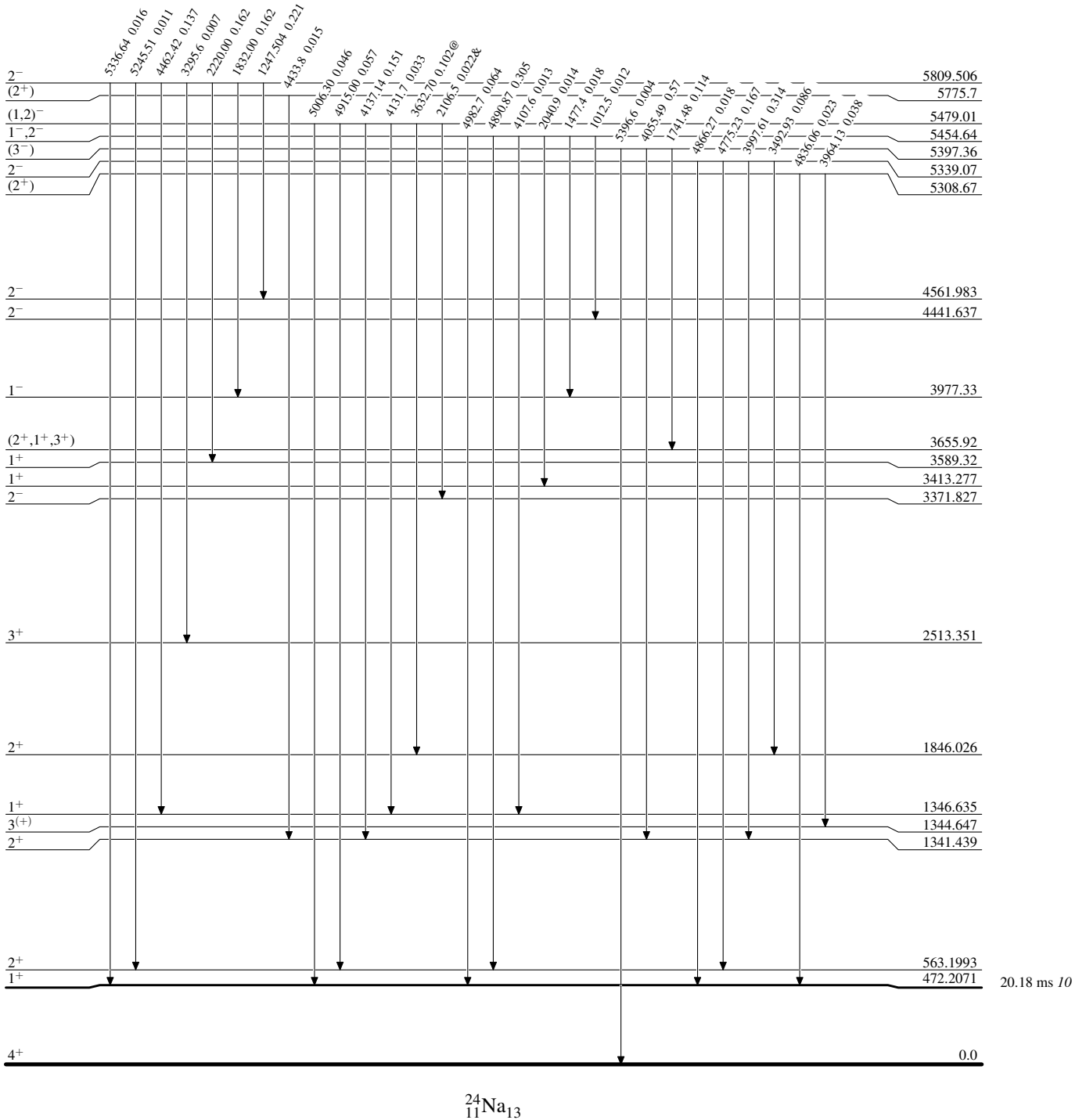
$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  2014Fi01,2004To03

Level Scheme (continued)

Intensities:  $I_{(\gamma+ce)}$  per 100 neutron captures  
& Multiply placed: undivided intensity given  
@ Multiply placed: intensity suitably divided

Legend

- $I_{\gamma} < 2\% \times I_{\gamma}^{\text{max}}$
- $I_{\gamma} < 10\% \times I_{\gamma}^{\text{max}}$
- $I_{\gamma} > 10\% \times I_{\gamma}^{\text{max}}$

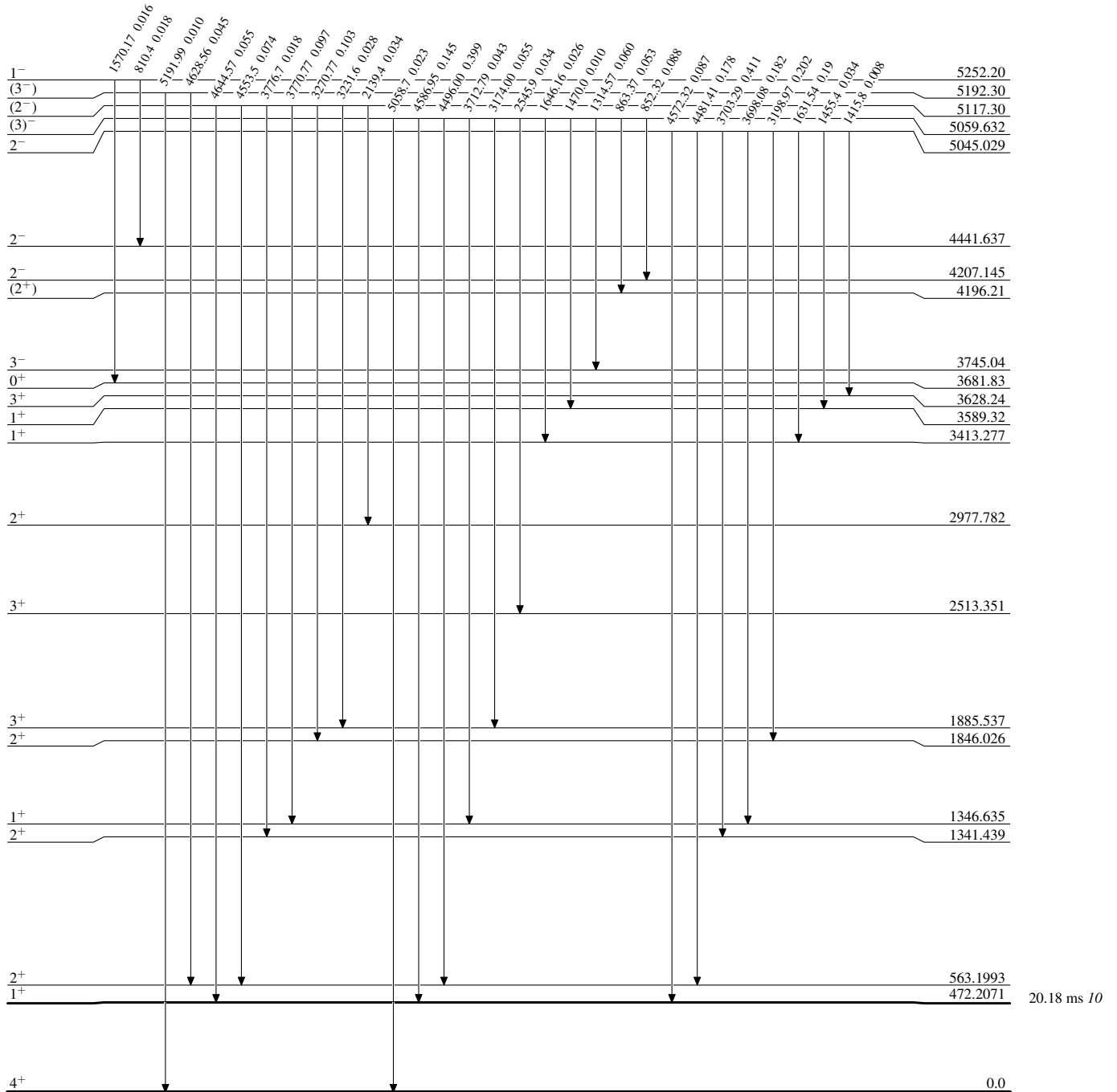
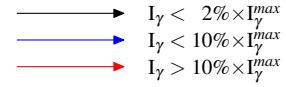


$^{23}\text{Na}(n,\gamma) E=\text{thermal}$  2014Fi01,2004To03

## Level Scheme (continued)

Intensities:  $I_{(\gamma+ce)}$  per 100 neutron captures  
 & Multiply placed: undivided intensity given  
 @ Multiply placed: intensity suitably divided

## Legend

 $^{24}_{11}\text{Na}_{13}$

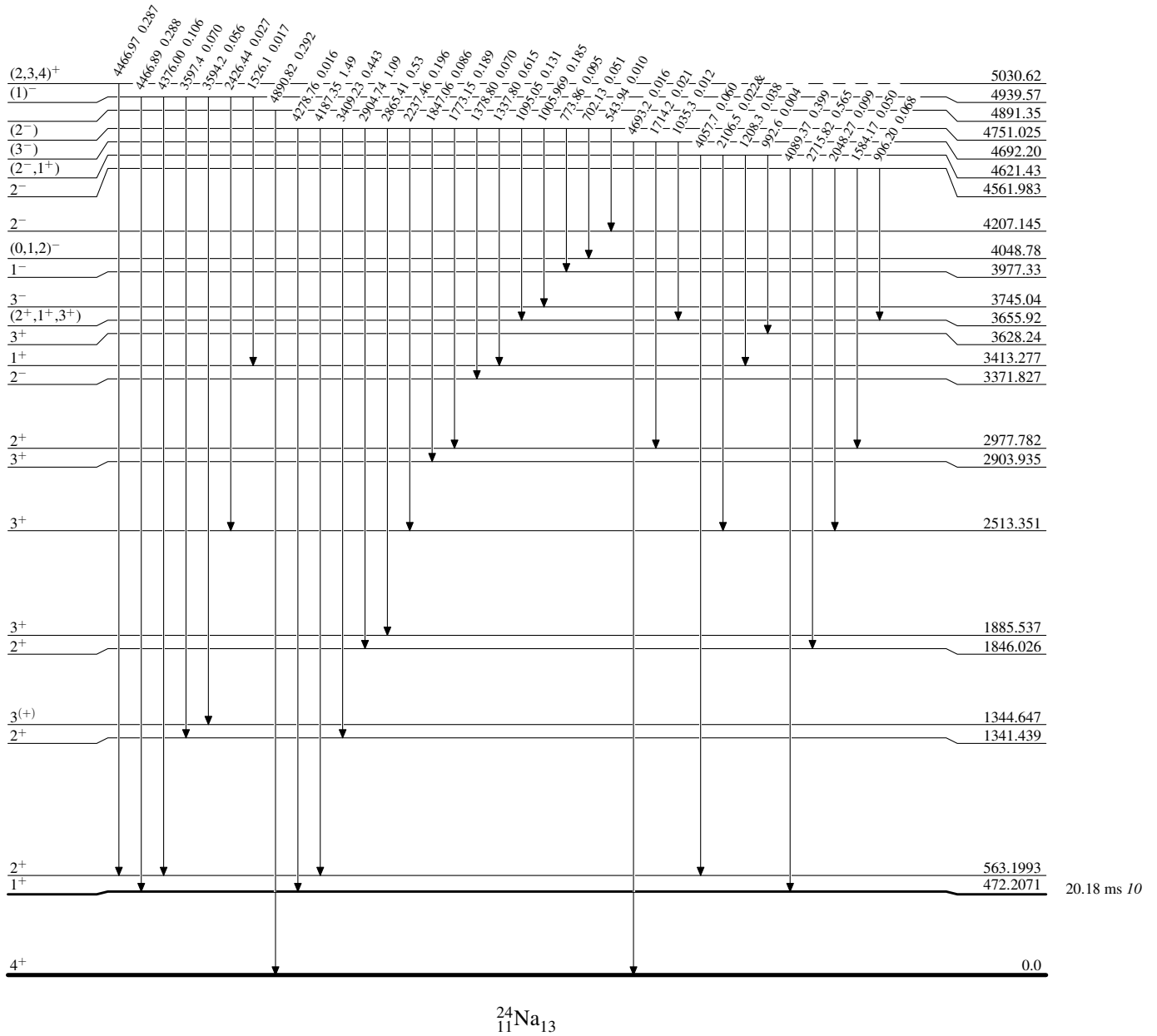
<sup>23</sup>Na(n,γ) E=thermal 2014Fi01,2004To03

Level Scheme (continued)

Intensities: I<sub>γ+ce</sub> per 100 neutron captures  
& Multiply placed: undivided intensity given  
@ Multiply placed: intensity suitably divided

Legend

- I<sub>γ</sub> < 2% × I<sub>γ</sub><sup>max</sup>
- I<sub>γ</sub> < 10% × I<sub>γ</sub><sup>max</sup>
- I<sub>γ</sub> > 10% × I<sub>γ</sub><sup>max</sup>



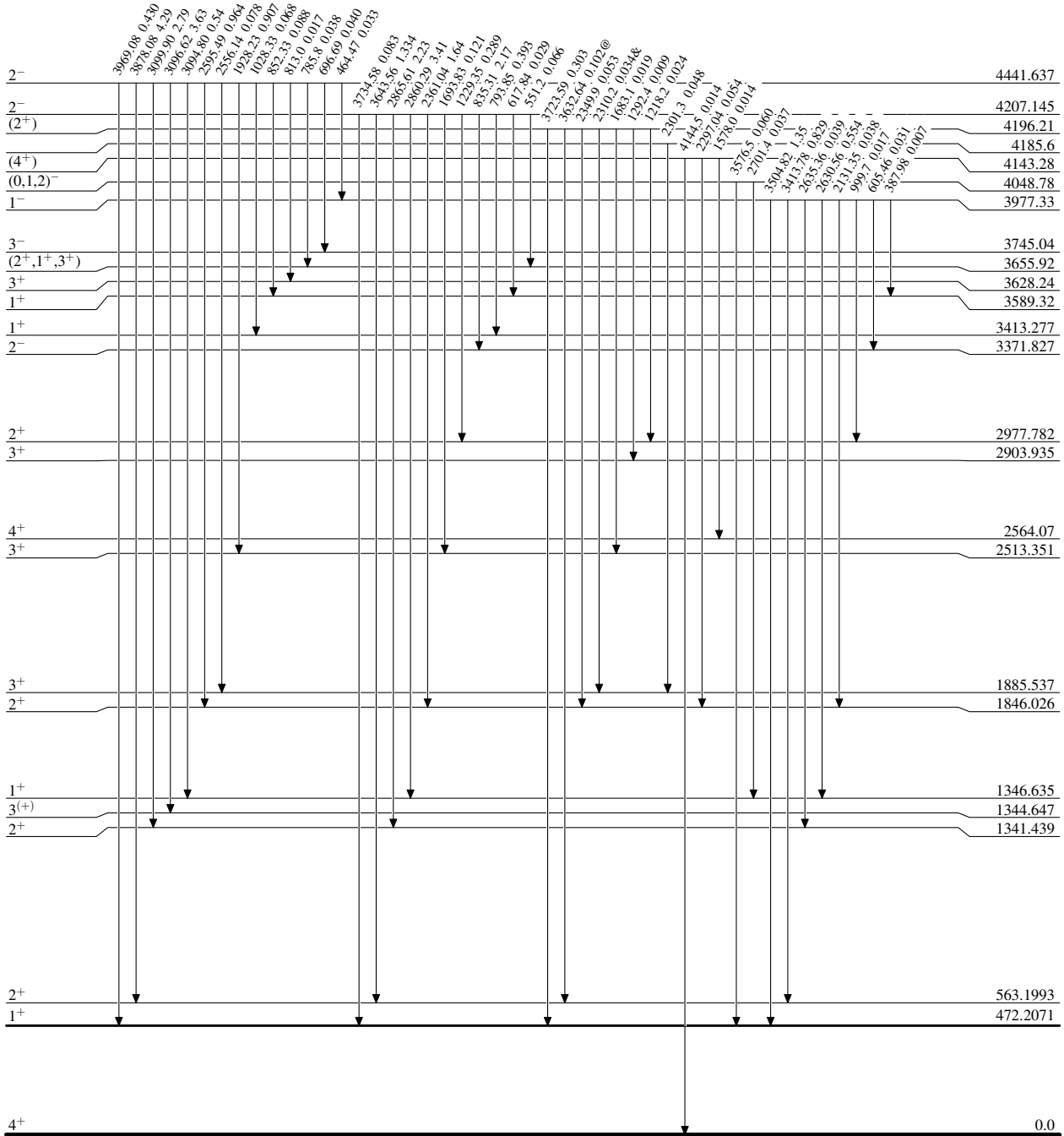
<sup>23</sup>Na(n,γ) E=thermal 2014Fi01,2004To03

Level Scheme (continued)

Intensities: I<sub>(γ+ce)</sub> per 100 neutron captures  
& Multiply placed: undivided intensity given  
@ Multiply placed: intensity suitably divided

Legend

- I<sub>γ</sub> < 2% × I<sub>γ</sub><sup>max</sup>
- I<sub>γ</sub> < 10% × I<sub>γ</sub><sup>max</sup>
- I<sub>γ</sub> > 10% × I<sub>γ</sub><sup>max</sup>



<sup>24</sup>Na<sub>13</sub>

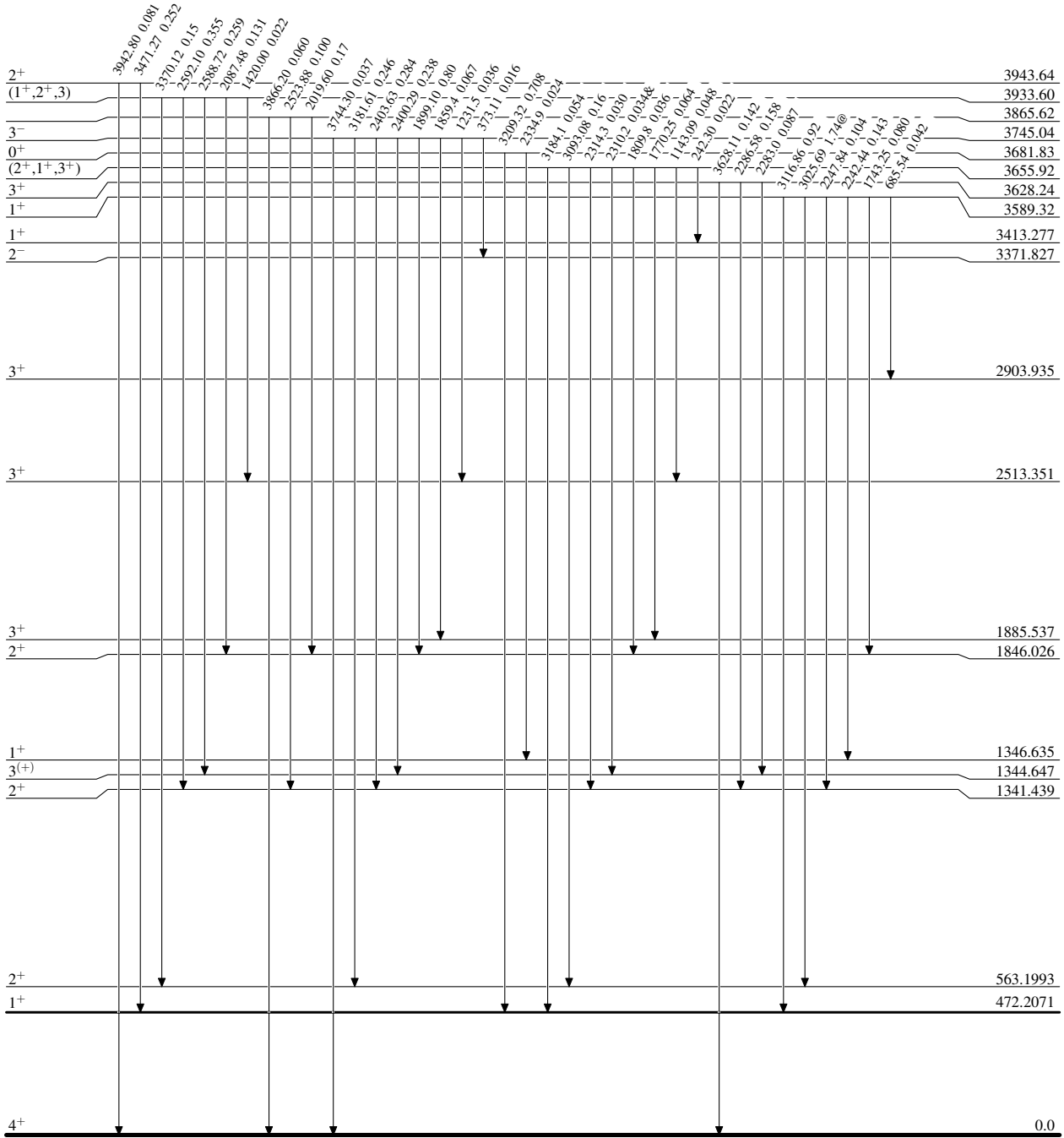
$^{23}\text{Na}(n,\gamma)$  E=thermal 2014Fi01,2004To03

Level Scheme (continued)

Intensities:  $I_{(\gamma+ce)}$  per 100 neutron captures  
& Multiply placed: undivided intensity given  
@ Multiply placed: intensity suitably divided

Legend

- $I_{\gamma} < 2\% \times I_{\gamma}^{max}$
- $I_{\gamma} < 10\% \times I_{\gamma}^{max}$
- $I_{\gamma} > 10\% \times I_{\gamma}^{max}$



$^{24}_{11}\text{Na}_{13}$

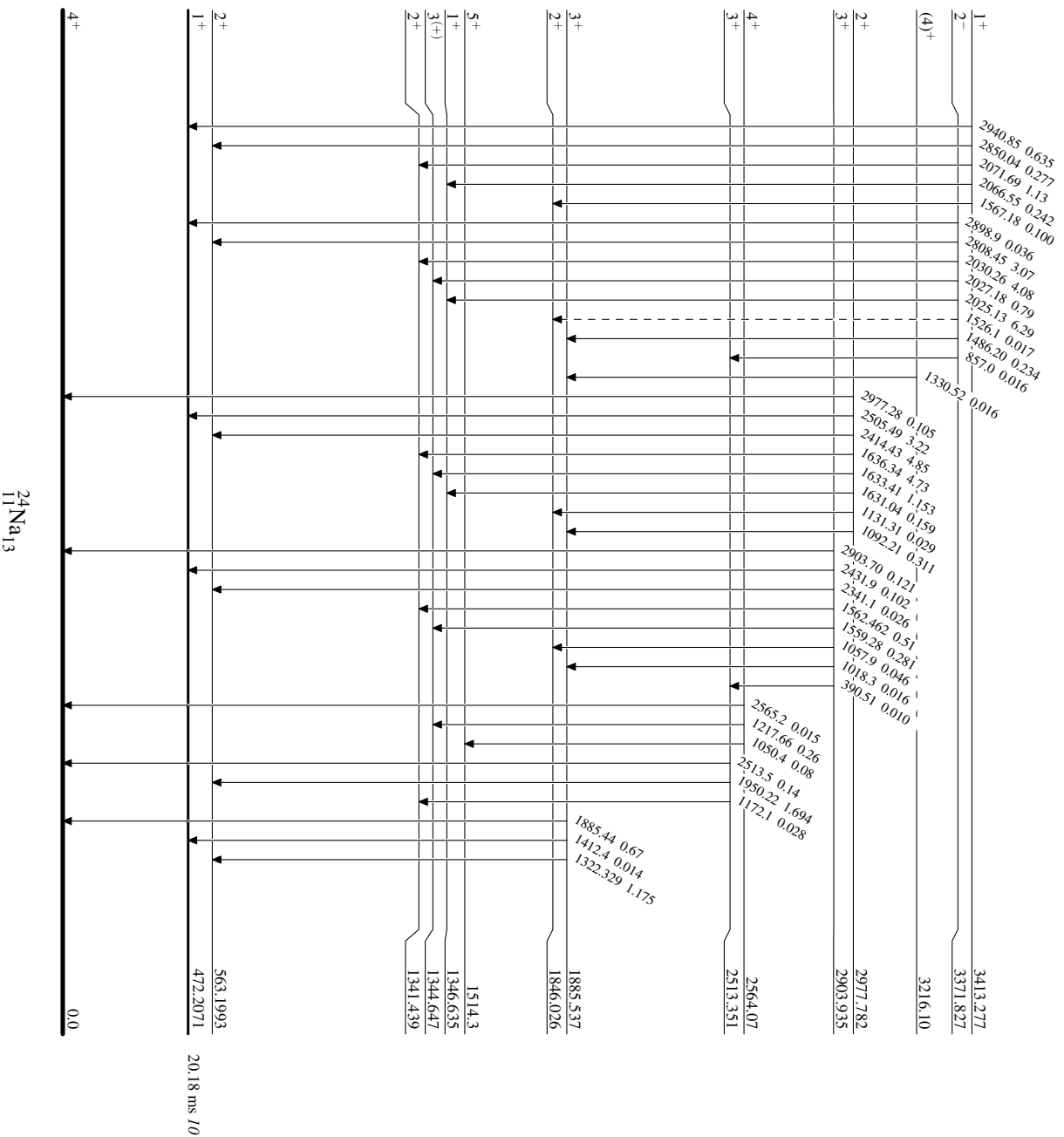
20.18 ms 10

<sup>23</sup>Na(n,γ) E=thermal 2014FI01,2004T003

Level Scheme (continued)

Intensities: I<sub>γ+ec</sub> per 100 neutron captures  
& Multiply placed: undivided intensity given  
@ Multiply placed: intensity suitably divided

Legend  
 —→ I<sub>γ</sub> < 2% × I<sub>γ<sup>max</sup></sub>  
 —→ I<sub>γ</sub> < 10% × I<sub>γ<sup>max</sup></sub>  
 —→ I<sub>γ</sub> > 10% × I<sub>γ<sup>max</sup></sub>  
 - - - - - γ Decay (Uncertain)



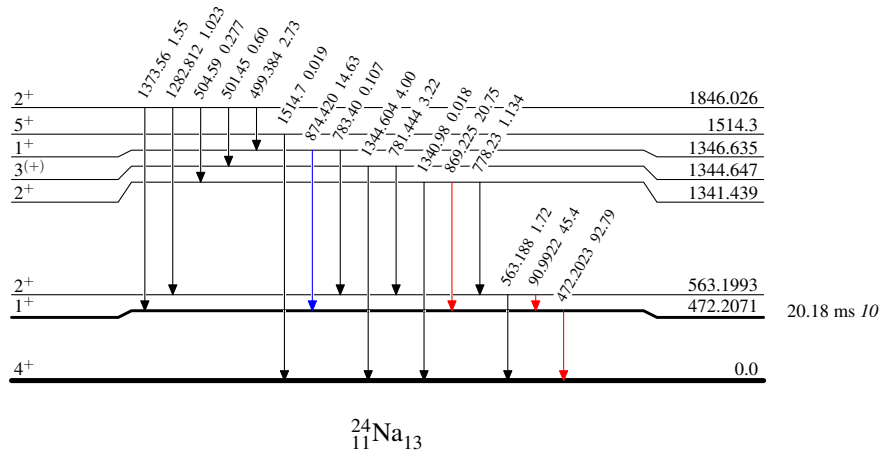
$^{23}\text{Na}(n,\gamma) \text{E=thermal}$  2014Fi01,2004To03

## Level Scheme (continued)

Intensities:  $I_{(\gamma+ce)}$  per 100 neutron captures  
 & Multiply placed: undivided intensity given  
 @ Multiply placed: intensity suitably divided

## Legend

- $\longrightarrow$   $I_{\gamma} < 2\% \times I_{\gamma}^{max}$   
 $\longrightarrow$   $I_{\gamma} < 10\% \times I_{\gamma}^{max}$   
 $\longrightarrow$   $I_{\gamma} > 10\% \times I_{\gamma}^{max}$

 $^{24}_{11}\text{Na}_{13}$