

$^{23}\text{Na}(n,\gamma)$ E=10-80 keV **2001Ho12**

| Type | Author | History | Citation | Literature Cutoff Date |
|-----------------|--|---------|-------------------|------------------------|
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Other: [1943Ma12](#).

2001Ho12: $^{23}\text{Na}(n,\gamma)$ reaction at the range neutron beam energies of 10 – 80 keV was used. The pulsed neutron beams were produced from the $^7\text{Li}(p,n)^7\text{Be}$ reaction. The sample used was a metallic disk of ^{23}Na with a diameter of 90 mm and thickness of 10 mm. The de-excited gamma rays were detected with a large anti-Compton shielded HPGe spectrometer employing the TOF method. Measured E_γ , I_γ . Deduced the features of 53 and 35 keV resonance states.

 ^{24}Na Levels

| E(level) [†] | Comments |
|-----------------------|--|
| 0 | |
| 471.9 5 | |
| 563.1 4 | |
| 1341.2 5 | |
| 1344.4 3 | |
| 1346.1 5 | |
| 1512.3 5 | |
| 1845.7 5 | |
| 1885.3 3 | |
| 2512.6 5 | |
| 2562.7 4 | |
| 2903.6 5 | |
| 3217 | |
| 3370.9 6 | |
| 3412.4 5 | |
| 3588.9 7 | |
| 3627.6 5 | |
| 3655.9 11 | |
| 3744.7 8 | |
| 3928.0 8 | |
| 3942.1 9 | |
| 4195.4 6 | |
| 4560.8 7 | |
| 4692.8 5 | |
| 4908.0 4 | |
| 5059.0 5 | |
| 5116.5 6 | |
| 5160 | |
| (692.3 3) | E(level): 35 keV neutron capture state. The derived value of the radiative width of the 35 keV resonance is 0.85 eV 14 in 2001Ho12 . J^π : 2^- assignment is made in 2001Ho12 . |

[†] From a least square fitting to E_γ data. $\gamma(^{24}\text{Na})$

| E_γ [†] | I_γ ^{†‡} | $E_i(\text{level})$ | E_f |
|-------------------------|--------------------------|---------------------|--------|
| 778.4 10 | 2.0 3 | 1341.2 | 563.1 |
| 781.4 5 | 12.0 19 | 1344.4 | 563.1 |
| 869.2 3 | 30.6 12 | 1341.2 | 471.9 |
| 874.3 3 | 37.0 14 | 1346.1 | 471.9 |
| 1218.2 4 | 4.49 54 | 2562.7 | 1344.4 |

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$^{23}\text{Na}(n,\gamma) E=10\text{-}80\text{ keV}$ **2001Ho12 (continued)** $\gamma(^{24}\text{Na})$ (continued)

| E_γ † | I_γ †‡ | $E_i(\text{level})$ | E_f | Comments |
|--------------|---------------|---------------------|--------|---|
| 1282.6 5 | 4.3 15 | 1845.7 | 563.1 | |
| 1322.1 4 | 19.2 10 | 1885.3 | 563.1 | |
| 1344.3 4 | 14.1 10 | 1344.4 | 0 | |
| 1373.8 4 | 3.0 15 | 1845.7 | 471.9 | |
| 1512.4 5 | 3.6 10 | 1512.3 | 0 | |
| 1561.1 @ 7 | 7.58 89 | 2903.6 | 1341.2 | E_γ : feeding state is not assigned properly (2001Ho12); the evaluators assume that the transition feeds 1341 keV level. |
| 1871.7 @ 8 | 1.30 36 | 3217 | 1344.4 | E_γ : assignment was performed only from the energy difference (2001Ho12). |
| 1875.8 6 | 1.36 38 | (6992.3) | 5116.5 | |
| 1885.2 4 | 11.0 8 | 1885.3 | 0 | |
| 1899.0 @ 7 | 1.06 37 | 3744.7 | 1845.7 | E_γ : assignment was performed only from the energy difference (2001Ho12). |
| 1933.2 5 | 1.01 42 | (6992.3) | 5059.0 | |
| 1942.6 @ 8 | 1.69 71 | 5160 | 3217 | E_γ : assignment was performed only from the energy difference (2001Ho12), not adopted. |
| 1949.5 3 | 7.3 12 | 2512.6 | 563.1 | |
| 2004.0 5 | 2.96 59 | 4908.0 | 2903.6 | |
| 2025.0 6 | 1.91 40 | 3370.9 | 1346.1 | |
| 2029.5 5 | 1.39 30 | 3370.9 | 1341.2 | |
| 2071.2 3 | 11.2 10 | 3412.4 | 1341.2 | E_γ : feeding state is not assigned properly (2001Ho12). |
| 2084.2 3 | 12.3 10 | (6992.3) | 4908.0 | |
| 2247.6 7 | 1.05 49 | 3588.9 | 1341.2 | |
| 2286.3 4 | 12.1 14 | 3627.6 | 1341.2 | |
| 2299.3 6 | 2.25 49 | (6992.3) | 4692.8 | |
| 2400.3 7 | 1.07 51 | 3744.7 | 1344.4 | E_γ : assignment was performed only from the energy difference (2001Ho12). |
| 2562.9 5 | 3.6 15 | 2562.7 | 0 | |
| 2715.1 6 | 1.95 44 | 4560.8 | 1845.7 | |
| 2796.9 5 | 3.64 55 | (6992.3) | 4195.4 | |
| 2806.3 12 | 1.71 70 | 4692.8 | 1885.3 | E_γ : A comparable 2808.45 γ has been placed from 3371.8 keV level in adopted dataset based on placements in (n, γ) E=thermal, (d,p),(d,p γ), and (α,γ),(pol d, α). |
| 2851.1 @ 7 | 2.9 13 | 3412.4 | 563.1 | I_γ : the quoted value may have contamination from the overlapped single-escape peak (2001Ho12). |
| 2903.0 6 | 2.56 40 | 2903.6 | 0 | |
| 2940.6 4 | 4.68 52 | 3412.4 | 471.9 | |
| 3025.8 8 | 2.82 52 | 3588.9 | 563.1 | |
| 3116.6 @ 8 | 2.28 68 | 3588.9 | 471.9 | I_γ : the quoted value may have contamination from the overlapped single-escape peak (2001Ho12). |
| 3184.0 10 | 0.95 39 | 3655.9 | 471.9 | |
| 3364.9 # 7 | 1.6 # 4 | 3928.0 | 563.1 | |
| 3364.9 # 7 | 20.6 # 15 | (6992.3) | 3627.6 | |
| 3395.9 8 | 3.76 50 | 4908.0 | 1512.3 | |
| 3563.7 8 | 1.88 70 | 4908.0 | 1344.4 | |
| 3628.0 7 | 14.1 12 | 3627.6 | 0 | |
| 3723.7 8 | 2.66 36 | 4195.4 | 471.9 | |
| 3942.1 9 | 2.00 35 | 3942.1 | 0 | E_γ : assignment was performed only from the energy difference (2001Ho12). |
| 4088.8 # 12 | 1.23 # 41 | 4560.8 | 471.9 | |
| 4088.8 # 12 | 1.71 # 58 | (6992.3) | 2903.6 | |
| 4429.9 8 | 6.84 78 | (6992.3) | 2562.7 | |
| 4495.6 8 | 1.68 35 | 5059.0 | 563.1 | |
| 4552.9 10 | 0.70 23 | 5116.5 | 563.1 | |
| 4645.2 10 | 0.66 26 | 5116.5 | 471.9 | |
| 4693.2 9 | 3.32 53 | 4692.8 | 0 | |
| 4908.2 9 | 4.17 53 | 4908.0 | 0 | E_γ : A comparable 4908.6 γ has been placed from 6251.1 keV level in adopted dataset based on placement in (n, γ) E=thermal. |

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$^{23}\text{Na}(n,\gamma)$ E=10-80 keV 2001Ho12 (continued) $\gamma(^{24}\text{Na})$ (continued)

| E_γ^\dagger | $I_\gamma^{\ddagger\#}$ | $E_i(\text{level})$ | E_f | Comments |
|--------------------|-------------------------|---------------------|--------|---|
| 5106.9 4 | 26.2 19 | (6992.3) | 1885.3 | |
| 5146.4 @ 6 | 5.56 99 | (6992.3) | 1845.7 | I_γ : the quoted value may have contamination from the overlapped single-escape peak (2001Ho12). |
| 5649.8 @ 10 | 12.8 14 | (6992.3) | 1344.4 | E_γ : feeding state is not assigned properly (2001Ho12); the evaluators assume that the transition feeds 1345 keV level. |
| 6429.2 4 | 37.6 30 | (6992.3) | 563.1 | |
| 6520.4 9 | 2.26 50 | (6992.3) | 471.9 | |

† From 2001Ho12. 2001Ho12 reports gamma transitions decaying from the 53 and 35 keV resonance states and the other low-lying levels. However, the gamma transitions decaying from the 53 keV resonance state are not reported by the evaluators in the present data set. The same have been incorporated separately in the $^{23}\text{Na}(n,\gamma)$ E=53 keV data set.

‡ The values are to be multiplied by 10^6 (2001Ho12). Not clear presented intensities are relative or other type.

$\#$ Multiply placed with intensity suitably divided.

@ Placement of transition in the level scheme is uncertain.

$^{23}\text{Na}(n,\gamma) E=10-80 \text{ keV}$ 2001Ho12

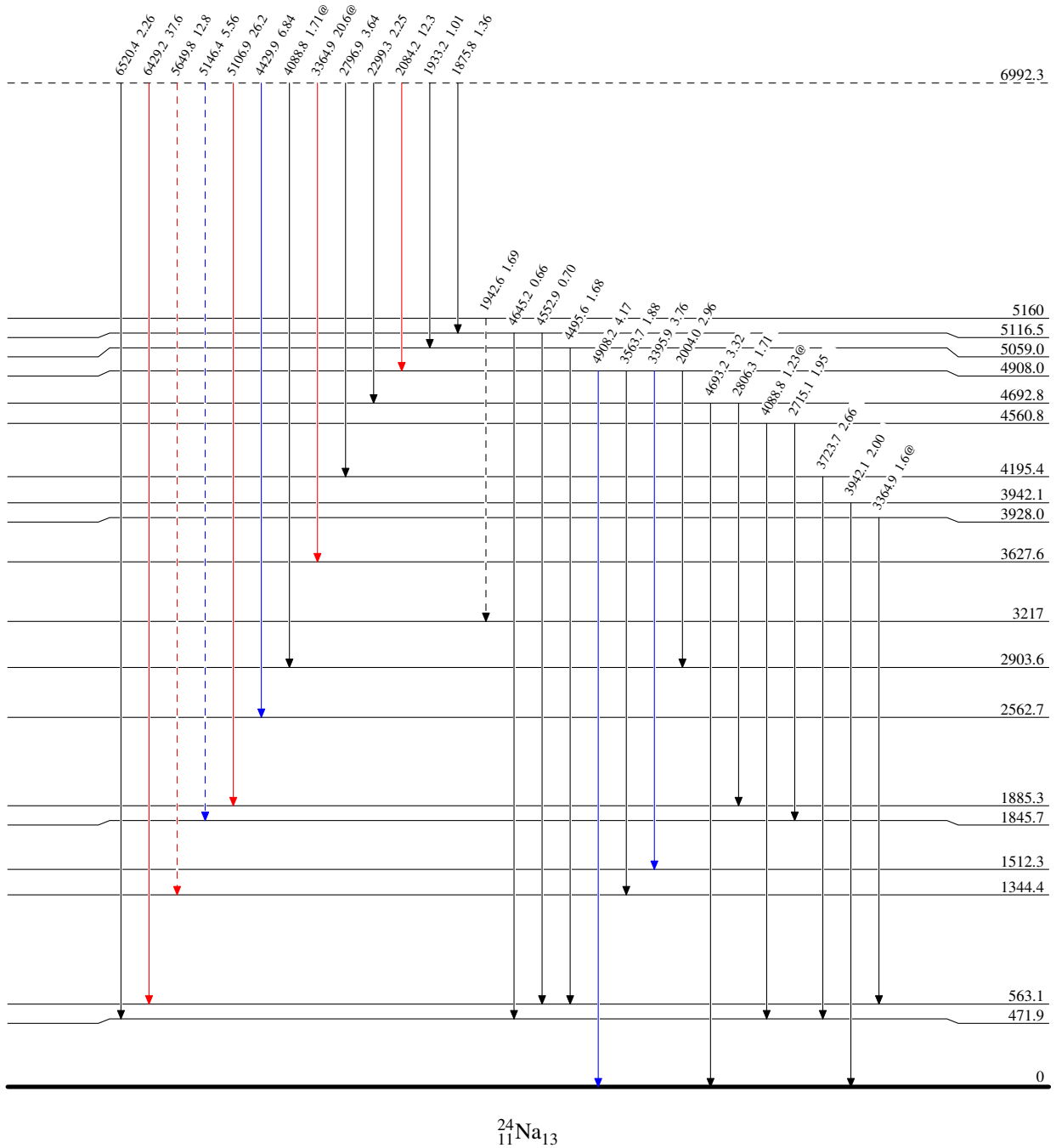
Level Scheme

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

Legend

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

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

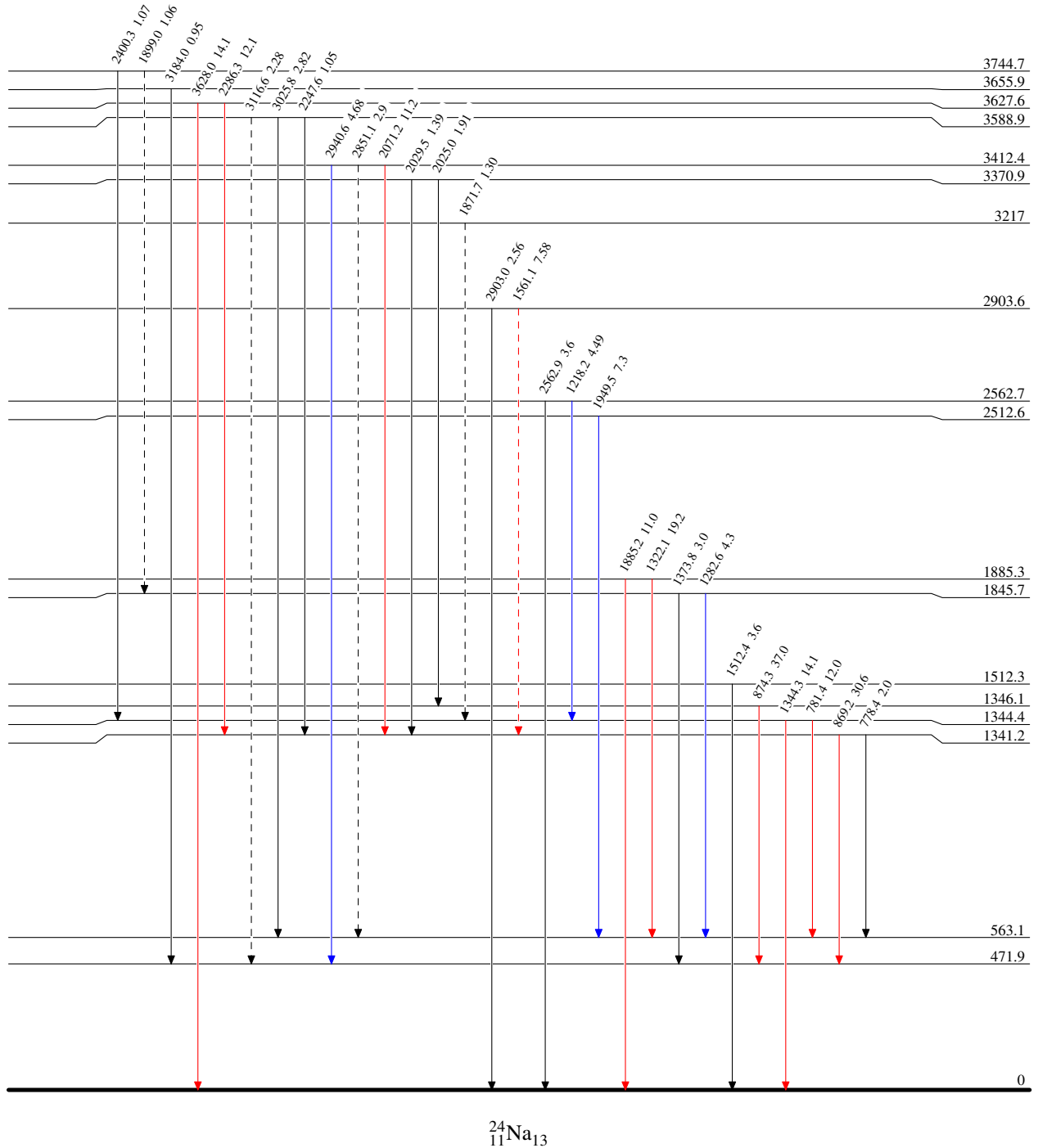
$^{23}\text{Na}(n,\gamma) E=10-80 \text{ keV}$ 2001Ho12

Level Scheme (continued)

Intensities: Relative I_γ
@ Multiply placed: intensity suitably divided

Legend

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

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