## Reaction : $^{23}$Na(p,$\alpha$)$^{20}$Ne

Resonance strengths of 75 resonances in the energy region between $E_r = 36$ and 3813 keV are adopted from the data reported by FL54, FI63, KU63, LU70, ME72, ZY81, VA87 and GÖ89b. For resonances above 880.4 keV, adopted strengths are from VA87. The non-resonant contribution is calculated using the $S$-factor from ZY81 for the tails of the broad resonances. Above $T_9 = 5$, HF estimates are used (see Sect. 2.5). The differences between the adopted rates and the CA88 ones arise from the contribution of the resonances at 138 keV and 217 keV that are not taken into account in CA88. Moreover, the contribution of resonances with energies above 2 MeV is neglected by CA88, which leads to their underestimate of the rates at high temperatures.

| $E_r$ (keV) | $J^\pi$ | $\omega\gamma$ (eV) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | FL54 | FI63 | KU63 | ZY81 | GÖ89b | adopt | |
| 36.2 | $0^+$ | | | | $\leq 1.9 \times 10^{-17}$ | | $1.9^{+17}_{-1.9} \times 10^{-18}$ | I |
| $138.0 \pm 2.9$ | | | | | | $\leq 5.0 \times 10^{-7}$ | $5.0^{+45}_{-5.0} \times 10^{-8}$ | I |
| $166.7 \pm 1.9$ | $(6^+, 7^-, 8^+)$ | | | | $(26 \pm 7) \times 10^{-6}$ | $(28 \pm 7) \times 10^{-6}$ | $(27 \pm 7) \times 10^{-6}$ | I |
| $217.5 \pm 1.9$ | | | | | | $(70 \pm 16) \times 10^{-6}$ | $(70 \pm 16) \times 10^{-6}$ | M |
| $240.3 \pm 0.2$ | (2-4) | | $\leq 10^{-3}$ | $\leq 0.08$ | | | $1^{+9}_{-1} \times 10^{-4}$ | M |
| $273.9 \pm 0.4$ | $2^+$ | $40 \times 10^{-3}$ | $(37 \pm 7) \times 10^{-3}$ | 0.08 | | $(40 \pm 8) \times 10^{-3}$ | $(40 \pm 8) \times 10^{-3}$ | M |
| $297.2 \pm 0.4$ | $2^+$ | $\leq 10^{-3}$ | | $\leq 0.06$ | | | $1^{+9}_{-1} \times 10^{-4}$ | M |
| $324.4 \pm 0.5$ | $3^-$ | $6.4 \times 10^{-2}$ | $8.7 \times 10^{-2}$ | 0.11 | | $(97 \pm 19) \times 10^{-3}$ | $(97 \pm 19) \times 10^{-3}$ | M |
| $358.2 \pm 0.3$ | $4^+$ | | $3.7 \times 10^{-3}$ | $\leq 0.01$ | | | $3.7 \pm 0.7 \times 10^{-3}$ | M |
| $426.3 \pm 0.1$ | $2^+$ | | $8.7 \times 10^{-3}$ | $\leq 0.03$ | | | $8.7 \pm 1.7 \times 10^{-3}$ | M |
| $490.0 \pm 0.3$ | $(1, 2^+)$ | $\leq 2.5 \times 10^{-2}$ | | $\leq 0.08$ | | | $2.5^{+27}_{-2.5} \times 10^{-3}$ | M |
| $566.8 \pm 0.4$ | $3^-$ | $40 \pm 8$ | | 40 | $40 \pm 3$ | | $40 \pm 3$ | M |
| $648.3 \pm 0.4$ | $3^+$ | | | $\leq 0.16$ | | | $1.6^{+14}_{-1.6} \times 10^{-2}$ | M |
| $692.6 \pm 0.3$ | $0^-$ | | | $\leq 0.26$ | | | $2.6^{+23}_{-2.6} \times 10^{-2}$ | M |
| $707.9 \pm 0.3$ | $3^+$ | | | $\leq 0.14$ | | | $1.4^{+13}_{-1.4} \times 10^{-2}$ | M |
| | | | | | LU70 | | | |
| $712.6 \pm 0.3$ | $2^+$ | | | 8.4 | 10.4 | | $9.4 \pm 1.9$ | M |
| $761.6 \pm 0.5$ | $1^-$ | | | 4 | 3.8 | | $3.9 \pm 0.8$ | M |
| $776.2 \pm 0.5$ | $2^+$ | | | 2.2 | 2.4 | | $2.3 \pm 0.5$ | M |
| $813.2 \pm 4.8$ | $4^+$ | | | 0.63 | | | $0.63 \pm 0.13$ | M |
| Res. 880 – 3813 keV | | see comments | | | | | | |

| $T_9$ | low | adopt | high | exp | ratio | $T_9$ | low | adopt | high | exp | ratio | $T_9$ | low | adopt | high | exp | ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.012 | 0.001 | 1.46 | 14.6 | -25 | 9.4 | 0.12 | 0.70 | 1.16 | 1.89 | -5 | 1.7 | 1 | 1.07 | 1.16 | 1.27 | 4 | 1.0 |
| 0.013 | 0.001 | 1.91 | 19.2 | -24 | 7.9 | 0.13 | 2.35 | 3.76 | 5.88 | -5 | 1.6 | 1.25 | 3.51 | 3.77 | 4.16 | 4 | 1.0 |
| 0.014 | 0.001 | 1.72 | 17.3 | -23 | 6.8 | 0.14 | 0.69 | 1.07 | 1.62 | -4 | 1.4 | 1.5 | 8.53 | 9.08 | 10.1 | 4 | 1.1 |
| 0.015 | 0.001 | 1.15 | 11.5 | -22 | 6.0 | 0.15 | 1.85 | 2.78 | 4.08 | -4 | 1.3 | 1.75 | 1.70 | 1.81 | 2.03 | 5 | 1.2 |
| 0.016 | 0.004 | 6.00 | 60.3 | -22 | 5.4 | 0.16 | 4.64 | 6.77 | 9.80 | -4 | 1.2 | 2 | 2.94 | 3.13 | 3.54 | 5 | 1.3 |
| 0.018 | 0.008 | 9.31 | 73.5 | -21 | 4.5 | 0.18 | 2.45 | 3.41 | 4.69 | -3 | 1.0 | 2.5 | 6.53 | 7.14 | 8.13 | 5 | 1.4 |
| 0.02 | 0.01 | 8.21 | 82.4 | -20 | 3.8 | 0.20 | 1.04 | 1.40 | 1.81 | -2 | 0.9 | 3 | 1.12 | 1.29 | 1.47 | 6 | 1.4 |
| 0.025 | 0.03 | 3.95 | 39.4 | -18 | 2.9 | 0.25 | 1.65 | 2.15 | 2.59 | -1 | 0.9 | 3.5 | 1.67 | 2.01 | 2.30 | 6 | 1.5 |
| 0.03 | 0.18 | 5.09 | 49.6 | -17 | 2.3 | 0.30 | 1.10 | 1.42 | 1.66 | 0 | 0.9 | 4 | 2.28 | 2.88 | 3.30 | 6 | 1.5 |
| 0.04 | 0.76 | 1.82 | 11.5 | -15 | 1.4 | 0.35 | 4.42 | 5.60 | 6.49 | 0 | 0.9 | 5 | 3.60 | 4.95 | 5.69 | 6 | 1.6 |
| 0.05 | 5.83 | 7.67 | 26.2 | -14 | 1.3 | 0.4 | 1.32 | 1.65 | 1.89 | 1 | 0.9 | 6 | 6.16 | 8.50 | 9.78 | 6 | 1.9 |
| 0.06 | 2.97 | 5.86 | 25.9 | -12 | 2.3 | 0.45 | 3.37 | 4.11 | 4.67 | 1 | 0.9 | 7 | 0.94 | 1.30 | 1.49 | 7 | 2.1 |
| 0.07 | 1.47 | 3.06 | 10.3 | -10 | 2.6 | 0.5 | 7.83 | 9.32 | 10.5 | 1 | 0.9 | 8 | 1.31 | 1.82 | 2.10 | 7 | 2.3 |
| 0.08 | 3.59 | 7.00 | 17.8 | -9 | 2.4 | 0.6 | 3.37 | 3.86 | 4.27 | 2 | 0.9 | 9 | 1.73 | 2.41 | 2.79 | 7 | 2.4 |
| 0.09 | 4.47 | 8.20 | 17.3 | -8 | 2.1 | 0.7 | 1.09 | 1.21 | 1.33 | 3 | 1.0 | 10 | 2.18 | 3.05 | 3.53 | 7 | 2.6 |
| 0.1 | 3.36 | 5.90 | 11.0 | -7 | 2.0 | 0.8 | 2.74 | 3.02 | 3.30 | 3 | 1.0 | | | | | | |
| 0.11 | 1.75 | 2.97 | 5.13 | -6 | 1.8 | 0.9 | 5.77 | 6.31 | 6.90 | 3 | 1.0 | | | | | | |