## Reaction : $^{16}O(\alpha,\gamma)^{20}Ne$

The contribution of 23 resonances is considered, the parameters of which are taken from PE64, DI71c, RO71, AL72b, IN76b, ST78, FI80, HA87, KN94 and KU97. An upper limit for the non-resonant contribution is also available from experiments [KN94, KU97]. These data are complemented with many theoretical evaluations of the non-resonant cross section [DE83, LA83, DE86, BA88b, DU94]. The upper limits of the rates are derived from the upper limits of the experimental resonance parameters and of the non-resonant contribution of KN94. The lower limits of the rates are obtained from the use of the lower limits of the resonance parameters and of the non-resonant contribution reported by HA87. All resonance tails are found to have a negligible contribution to the rates. Compared to CA88, the present rates are enhanced at $T_9 < 0.25$ because our adopted $S$-factor is larger at 300 keV (here: $S(0) = 2$ MeV b; CA88: $S(0) = 0.7$ MeV b).

| $E_r$ (keV) | $J^\pi$ | $\omega\gamma$ (eV) | | | | |
|---|---|---|---|---|---|---|
| | | HA87 | KN94 | others | adopt | |
| $890 \pm 3$ | $3^-$ | | $(1.9 \pm 0.3) \times 10^{-3}$ | | $(1.9 \pm 0.3) \times 10^{-3}$ | I |
| $1054 \pm 3$ | $1^-$ | $(2.0 \pm 0.4) \times 10^{-2}$ | $(2.3 \pm 0.3) \times 10^{-2}$ | | $(2.3 \pm 0.3) \times 10^{-2}$ | I |
| $1991 \pm 3$ | $0^-$ | $(7.1 \pm 1.2) \times 10^{-2}$ | $(7.4 \pm 0.9) \times 10^{-2}$ | | $(7.4 \pm 0.9) \times 10^{-2}$ | M |
| $2424 \pm 3$ | $3^-$ | | $(1.08 \pm 0.15) \times 10^{-2}$ | | $(1.08 \pm 0.15) \times 10^{-2}$ | M |
| $2457 \pm 3$ | $0^-$ | | $(5.9 \pm 0.9) \times 10^{-2}$ | | $(5.9 \pm 0.9) \times 10^{-2}$ | M |
| $2688 \pm 3$ | $2^-$ | | $(1.6 \pm 0.2) \times 10^{-1}$ | | $(1.6 \pm 0.2) \times 10^{-1}$ | M |
| $3094 \pm 3$ | $2^-$ | | | $(3.4 \pm 0.4) \times 10^{-1}$ [AL72b] | $(3.4 \pm 0.4) \times 10^{-1}$ | M |
| | | PE64 | FI80 | | | |
| $3975 \pm 3$ | $1^-$ | | $(2.1 \pm 0.5) \times 10^{-1}$ | | $(2.1 \pm 0.5) \times 10^{-1}$ | M |
| $4040 \pm 10$ | $6^+$ | | | $1.8 \pm 0.4$ [LI67]<br>$1.4 \pm 0.7$ [DI71c]<br>$1.3 \pm 0.2$ [RO71] | $1.35 \pm 0.15$ | M |
| $4291 \pm 1$ | $4^+$ | $3.05 \pm 0.31$ | | $3.05 \pm 0.31$ [AL72b] | $3.05 \pm 0.31$ | M |
| $4382 \pm 4$ | $3^-$ | | $(1.8 \pm 0.2) \times 10^{-1}$ | | $(1.8 \pm 0.2) \times 10^{-1}$ | M |
| $4742 \pm 30$ | $3^-$ | $1.3 \pm 0.5$ | | | $1.3 \pm 0.5$ | M |
| $5288 \pm 30$ | $4^+$ | $8 \pm 3$ | | | $8 \pm 3$ | M |
| $5539 \pm 7$ | $2^+$ | $29 \pm 4$ | | $19.7 \pm 1.6$ [IN76b]<br>$19.7 \pm 2.0$ [FI77]<br>$19.2 \pm 1.9$ [ST78] | $19.5 \pm 1.5$ | M |
| | | ST78 | | | | |
| $6358 \pm 1$ | $4^+$ | $30 \pm 4$ | $30 \pm 4$ | | $30 \pm 4$ | M |
| $6544 \pm 5$ | $1^-$ | | $2.06 \pm 0.25$ | | $2.06 \pm 0.25$ | M |
| $6838 \pm 6$ | $0^-$ | $(4.1 \pm 0.5) \times 10^{-1}$ | $(4.1 \pm 0.5) \times 10^{-1}$ | | $(4.1 \pm 0.5) \times 10^{-1}$ | M |
| $7193 \pm 8$ | $4^+$ | | $(2.3 \pm 0.5) \times 10^{-1}$ | | $(2.3 \pm 0.5) \times 10^{-1}$ | M |
| $7210 \pm 10$ | $8^+$ | | | $(1.3 \pm 0.2) \times 10^{-1}$ [HU80] | $(1.3 \pm 0.2) \times 10^{-1}$ | M |
| $7480 \pm 5$ | $2^+$ | | $1.4 \pm 0.2$ | | $1.4 \pm 0.2$ | M |
| $7520 \pm 4$ | $3^-$ | | $6.6 \pm 0.8$ | | $6.6 \pm 0.8$ | M |
| $7656 \pm 10$ | $3^-$ | $1.94 \pm 0.15$ | | | $1.94 \pm 0.15$ | M |
| $7768 \pm 30$ | | $(1.7 \pm 0.5) \times 10^{-1}$ | | | $(1.7 \pm 0.5) \times 10^{-1}$ | M |

| $T_9$ | low | adopt | high | exp | ratio | $T_9$ | low | adopt | high | exp | ratio | $T_9$ | low | adopt | high | exp | ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 1.59 | 7.96 | 13.4 | -27 | 2.9 | 0.4 | 1.06 | 1.36 | 1.72 | -9 | 0.8 | 2.5 | 1.23 | 1.43 | 1.64 | 0 | 1.1 |
| 0.11 | 0.22 | 1.09 | 1.83 | -25 | 2.9 | 0.45 | 1.68 | 2.14 | 2.67 | -8 | 0.8 | 3 | 2.19 | 2.54 | 2.91 | 0 | 1.1 |
| 0.12 | 0.22 | 1.10 | 1.85 | -24 | 2.9 | 0.5 | 1.55 | 1.96 | 2.42 | -7 | 0.8 | 3.5 | 3.33 | 3.86 | 4.40 | 0 | 1.1 |
| 0.13 | 1.74 | 8.68 | 14.6 | -24 | 2.9 | 0.6 | 4.45 | 5.53 | 6.73 | -6 | 0.9 | 4 | 4.66 | 5.40 | 6.14 | 0 | 1.1 |
| 0.14 | 1.12 | 5.60 | 9.43 | -23 | 2.9 | 0.7 | 4.99 | 6.12 | 7.36 | -5 | 0.9 | 5 | 8.32 | 9.62 | 11.0 | 0 | 0.9 |
| 0.15 | 0.61 | 3.04 | 5.13 | -22 | 2.9 | 0.8 | 3.07 | 3.74 | 4.46 | -4 | 0.9 | 6 | 1.46 | 1.70 | 1.94 | 1 | 0.8 |
| 0.16 | 0.29 | 1.43 | 2.41 | -21 | 2.9 | 0.9 | 1.26 | 1.52 | 1.81 | -3 | 1.0 | 7 | 2.56 | 2.99 | 3.45 | 1 | 0.7 |
| 0.18 | 0.45 | 2.22 | 3.74 | -20 | 2.9 | 1 | 3.89 | 4.67 | 5.51 | -3 | 1.0 | 8 | 4.34 | 5.12 | 5.92 | 1 | 0.7 |
| 0.2 | 0.62 | 2.55 | 4.22 | -19 | 2.3 | 1.25 | 2.88 | 3.43 | 4.00 | -2 | 1.0 | 9 | 6.96 | 8.24 | 9.56 | 1 | 0.7 |
| 0.25 | 3.49 | 4.96 | 6.69 | -16 | 0.8 | 1.5 | 1.06 | 1.25 | 1.45 | -1 | 1.0 | 10 | 1.05 | 1.24 | 1.44 | 2 | 0.7 |
| 0.3 | 2.66 | 3.56 | 4.63 | -13 | 0.7 | 1.75 | 2.61 | 3.07 | 3.55 | -1 | 1.1 | | | | | | |
| 0.35 | 3.03 | 3.97 | 5.07 | -11 | 0.8 | 2 | 5.04 | 5.91 | 6.81 | -1 | 1.1 | | | | | | |