Reaction: $^{20}\mathrm{Ne}(\alpha,\gamma)^{24}\mathrm{Mg}$

Experimental data concern resonances only. Twelve of them are observed by SC83 up to 1.4 MeV, but only the 0^+ states at $E_\mathrm{r} = 0.799$ MeV and 1.367 MeV play a significant role. Partial data above $E = 3$ MeV are available [HI68, FI78, FI79], but no data are reported in the $1.4 < E < 3$ MeV range. An estimate of the non-resonant contribution is made here in the potential model, using a Gaussian potential. The two parameters of this potential are selected in order to reproduce the energy $E_\mathrm{r} = 1.367$ MeV of the 0^+ resonance, which is known to have an $\alpha + {}^{20}\mathrm{Ne}$ structure, and the quadrupole moment of the 2^+ first excited state of ^{24}Mg. Only capture to that state is considered. The non-resonant S-factor is parametrized as $S(E) = (7.43 + 3.21E + 14.85E^2) \times 10^3$ MeV b (E in MeV). This term contributes for about 10% to the reaction rates at the lowest temperature ($T_9 = 0.15$), but is completely negligible above. The resonant data allow the calculation of the rates up to $T_9 = 1$. HF estimates are used above, using the prescription given in Sect. 2.5.

E_r (MeV)	J^π	adopted $\omega\gamma$ (eV)			E_r (MeV)	J^π	adopted $\omega\gamma$ (eV)		
0.203	4^+	$1.6^{+14}_{-1.6} \times 10^{-29}$	SC83	M	1.022	3^-	$(3.0 \pm 0.6) \times 10^{-4}$	SC83	M
0.216	6^+	$3.0^{+27}_{-3.0} \times 10^{-26}$	SC83	M	1.05	2^+	$(4.8 \pm 1.0) \times 10^{-4}$	SC83	M
0.714	5^-	$1.1^{+10}_{-1.1} \times 10^{-8}$	SC83	M	1.266	$(3,4)^+$	$0.2^{+1.8}_{-0.2} \times 10^{-4}$	SC83	M
0.747	2^+	$4.0^{+36}_{-4.0} \times 10^{-9}$	SC83	M	1.348	$(3,4)^+$	$0.2^{+1.8}_{-0.2} \times 10^{-4}$	SC83	M
0.799	0^+	$(2.9 \pm 0.6) \times 10^{-4}$	SC83	M	1.367	0^+	0.17 ± 0.02	SC83	M
0.849	$(0\text{-}3)^-$	$0.8^{+7.2}_{-0.8} \times 10^{-5}$	SC83	M	1.42	$2^+;1$	$(2.6 \pm 0.5) \times 10^{-3}$	SC83	M

T_9	low	adopt	high	exp	ratio	T_9	low	adopt	high	exp	ratio	T_9	low	adopt	high	exp	ratio
0.15	1.74	2.26	3.24	-25	0.7	0.6	2.52	3.21	4.15	-6	1.0	3	1.31	6.45	13.4	1	1.2
0.16	6.38	8.19	11.2	-24	0.7	0.7	1.93	2.45	3.18	-5	1.0	3.5	0.29	1.71	3.63	2	1.4
0.18	3.24	4.13	5.36	-21	0.7	0.8	0.93	1.17	1.51	-4	0.9	4	0.55	3.70	7.96	2	1.6
0.2	4.77	6.05	7.68	-19	0.8	0.9	3.45	4.26	5.42	-4	0.8	5	0.13	1.16	2.54	3	2.0
0.25	3.63	4.60	5.74	-15	0.9	1	1.08	1.31	1.62	-3	0.7	6	0.25	2.62	5.81	3	2.5
0.3	1.34	1.69	2.12	-12	0.9	1.25	1.38	2.32	3.58	-2	0.7	7	0.39	4.84	10.8	3	3.0
0.35	0.88	1.11	1.40	-10	1.0	1.5	0.84	1.81	3.10	-1	0.7	8	0.55	7.84	17.7	3	3.5
0.4	1.97	2.51	3.18	-9	1.0	1.75	3.27	8.52	15.6	-1	0.8	9	0.07	1.16	2.63	4	4.0
0.45	2.18	2.77	3.54	-8	1.0	2	0.94	2.89	5.51	0	0.8	10	0.09	1.61	3.65	4	4.5
0.5	1.47	1.87	2.40	-7	1.0	2.5	0.44	1.77	3.56	1	1.0						