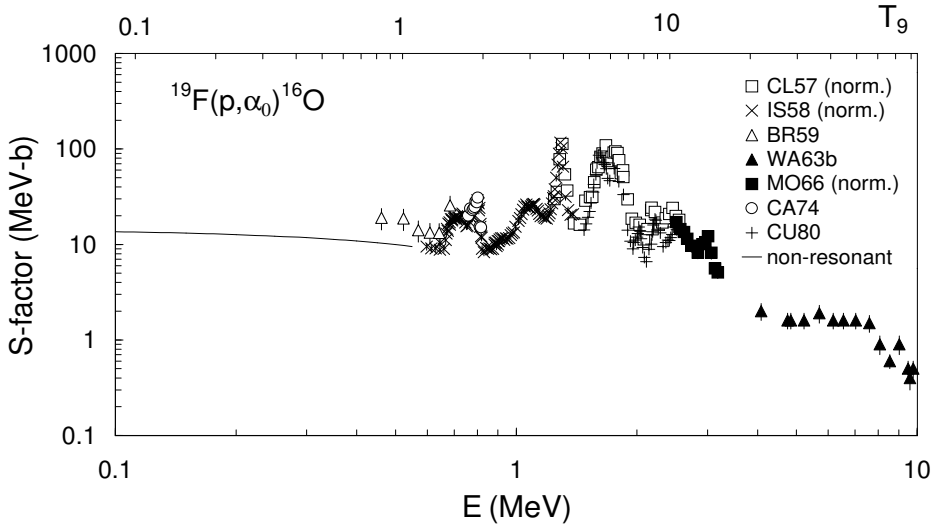
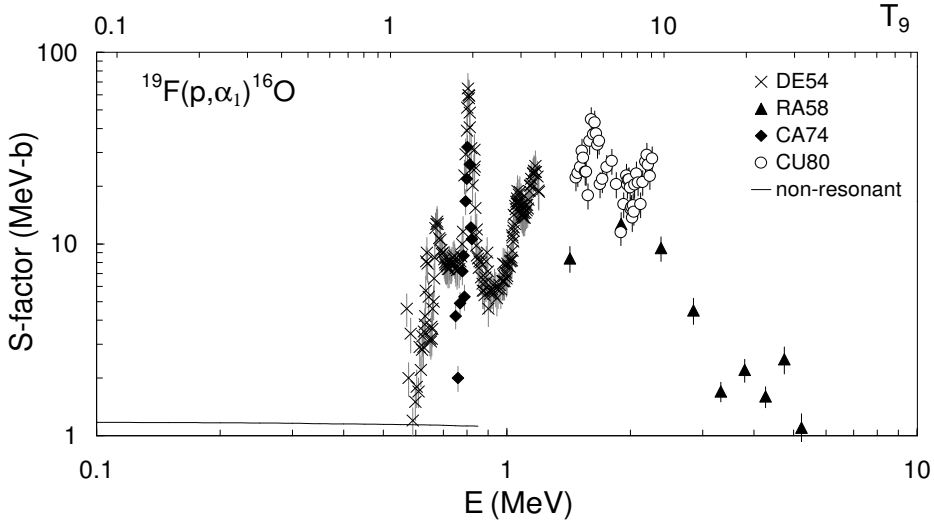
Reaction : ^{19}F(p,α)^{16}O

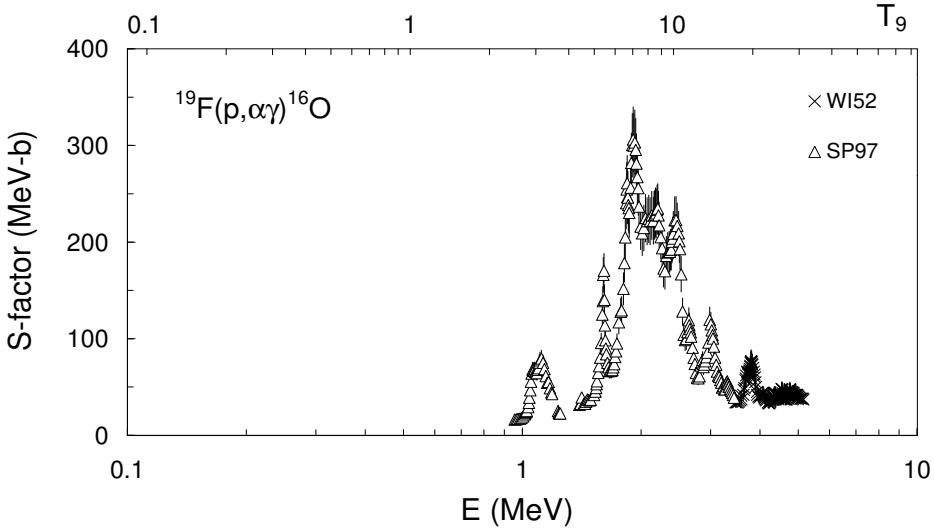
The S-factor for the (p,α_0) channel is obtained from BR59, WA63b, CA74 and CU80. The relative cross sections of CL57 and IS58 are normalized to $\sigma = 42$ mb at the 1.3 MeV resonance, while the data of MO66 are normalized to $\sigma = 28$ mb at 2.5 MeV. Below $E = 460$ keV, where no data exist in the (p,α_0) channel, a non-resonant contribution is calculated for s-wave capture. The theoretical S-factors for the (p,α_0) non-resonant contribution of HE91 and YA93 have been obtained using the unpublished data of LO78. The later work was focused mainly in the relative energy dependence of the cross section with no serious check on the absolute reported cross sections which may be underestimated by a factor of 2. Hence in the present compilation these data are not taken into account and the non-resonant contribution at the low energies is estimated with the procedure described in CH50 and adopted by CA88 as follows. The S-factor is adjusted to the lower experimental points in the $460 \leq E \leq 600$ keV range. The S-factor for the (p,α_1) channel is obtained from DE54, RA58, CA74 and CU80. A non-resonant extrapolation of the S-factor to lower energies is computed for the ground state channel. In the (p,$\alpha\gamma$) channel, the resonance strength data of BO48, CH50, AS65, BE82, GR84, CR91, ZA95a and SP97 are used. Usefull background information related to this reaction may be found in the unpublished work of KI90b. Between 0.957 and 3.438 MeV, the non-resonant data of SP97 are used, while above $E = 3.44$ MeV, the relative yields at 90° of WI52 are adopted, normalized to $\sigma = 300$ mb at $E = 2.2$ MeV from SP97. For the cases where resonance strengths are not quoted by the authors, we calculate them as follows. The cross sections, resonance energies and total widths quoted by BO48 are used, assuming a 15% error. Data are normalized to the adopted resonance strength for the 828 keV resonance. Resonance strengths are calculated from the thick target yield of CH50, assuming a 15% error and a 48.66% fluorine content for the CaF_2 target. The strengths are estimated in BE75 from the cross section data. For the 323 keV resonance, the quoted (p,α_2) strength in BE82 is divided by its branching ratio of 0.97 [CR91]. For the 828 keV resonance, a branching ratio of 0.73 is used [AJ87]. The available experimental data allow a computation of the rates at $T_9 > 0.3$. Below this temperature, the rates are determined mainly from the non-resonant (p,α_0) channel. Hence, uncertainties progressively increase to about 50% at the lowest temperatures. The differences between our rates and the CA88 ones can be explained by the effect of thermalization, which is estimated by CA88 to be a factor 2.4 at $T_9 = 0.5$ in comparison with the values obtained from our HF predictions.

E_r (keV)	J^π	$\omega\gamma$ (eV)					
		BO48	CH50	SP97	others	adopt	
11 ± 1	1^+				$(7.5 \pm 3.0) \times 10^{-29}$[BE75]	$(7.5 \pm 3.0) \times 10^{-29}$	N
212.71 ± 0.07	2^-		0.022 ± 0.004			0.022 ± 0.004	M
323.31 ± 0.04	1^+	37 ± 6	24 ± 4		23.0 ± 0.8[BE82] 22 ± 2 [CR91] 24 ± 3 [ZA95a]	23.1 ± 0.9	I
459.53 ± 0.09	1^+	10 ± 1	9 ± 1			9.5 ± 0.7	M
564.42 ± 0.90	2^-	52 ± 8	48 ± 10			50 ± 6	M
635.31 ± 0.62	1^+	86 ± 13	90 ± 14			88 ± 10	M
790.53 ± 0.29		27 ± 4	41 ± 6	17 ± 5		27 ± 6	M
828.17 ± 0.19	2^-		839 ± 125	760 ± 70	872 ± 130[AS65] 780 ± 40 [BE82]	785 ± 32	M
853.71 ± 0.71		28 ± 4	32 ± 5	27 ± 7		29 ± 3	M
887.14 ± 0.49	1^+	514 ± 77	429 ± 64	430 ± 50	472 ± 70[AS65]	452 ± 31	M
1032.24 ± 0.48	2^+	6 ± 1	6 ± 1	7.9 ± 1.0	8.2 ± 1.2 [GR84]	6.9 ± 0.6	M
1078.77 ± 0.88		20 ± 3	23 ± 4	29 ± 4		23 ± 3	M
1214.78 ± 0.48		298 ± 45	222 ± 33	202 ± 26		225 ± 24	M
1276.73 ± 0.54	2^-	415 ± 62	337 ± 50	280 ± 70	470 ± 70[AS65]	347 ± 35	M
1301.90 ± 0.51	2^-	2383 ± 357	2031 ± 305	1860 ± 230	1962 ± 295[BE82]	2005 ± 143	M
1522.03 ± 0.55				44 ± 12		44 ± 12	M





T_9	low	adopt	high	exp	ratio	T_9	low	adopt	high	exp	ratio	T_9	low	adopt	high	exp	ratio
0.009	0.69	1.03	1.37	-25	0.8	0.1	1.15	1.65	2.16	-5	0.6	0.8	5.65	5.96	6.27	4	0.4
0.01	1.23	1.78	2.34	-24	0.7	0.11	4.57	6.40	8.23	-5	0.7	0.9	8.73	9.25	9.76	4	0.3
0.011	1.57	2.28	2.98	-23	0.7	0.12	1.72	2.33	2.94	-4	0.8	1	1.27	1.35	1.43	5	0.3
0.012	1.52	2.20	2.89	-22	0.7	0.13	5.96	7.83	9.70	-4	1.0	1.25	2.72	2.92	3.11	5	0.2
0.013	1.16	1.68	2.20	-21	0.7	0.14	1.90	2.43	2.96	-3	1.3	1.5	5.09	5.48	5.87	5	0.2
0.014	0.72	1.05	1.37	-20	0.7	0.15	5.55	6.92	8.30	-3	1.5	1.75	8.61	9.31	10.0	5	0.3
0.015	3.81	5.52	7.23	-20	0.7	0.16	1.51	1.83	2.16	-2	1.7	2	1.36	1.47	1.58	6	0.3
0.016	1.74	2.53	3.31	-19	0.6	0.18	0.93	1.08	1.23	-1	1.6	2.5	2.87	3.13	3.39	6	0.4
0.018	2.56	3.72	4.87	-18	0.6	0.2	4.57	5.12	5.67	-1	1.4	3	5.25	5.77	6.28	6	0.5
0.02	2.60	3.76	4.93	-17	0.6	0.25	1.02	1.09	1.16	1	1.1	3.5	8.63	9.53	10.4	6	0.7
0.025	2.67	3.88	5.09	-15	0.6	0.3	8.79	9.26	9.73	1	1.1	4	1.30	1.44	1.58	7	0.9
0.03	0.91	1.33	1.74	-13	0.6	0.35	4.06	4.26	4.46	2	1.0	5	2.42	2.70	2.98	7	1.4
0.04	1.56	2.27	2.98	-11	0.6	0.4	1.26	1.32	1.38	3	1.0	6	3.74	4.19	4.64	7	1.9
0.05	5.97	8.72	11.5	-10	0.6	0.45	3.00	3.14	3.28	3	1.0	7	5.13	5.76	6.39	7	2.4
0.06	0.96	1.41	1.85	-8	0.5	0.5	5.94	6.21	6.48	3	0.9	8	6.49	7.30	8.11	7	2.9
0.07	0.88	1.30	1.71	-7	0.5	0.6	1.62	1.70	1.78	4	0.7	9	7.75	8.74	9.72	7	3.3
0.08	5.53	8.13	10.7	-7	0.5	0.7	3.30	3.47	3.63	4	0.5	10	0.89	1.00	1.12	8	3.7
0.09	2.70	3.95	5.20	-6	0.5												


0.1
1
10
T9
400
300
200
100
0
S-factor (MeV-b)
19F(p,αγ)16O
× WI52
△ SP97
0.1
1
10
E (MeV)