Astrophysical factors of the $^{18}O(p,\alpha)^{15}N$ through the Trojan Horse method in the vicinity of the interfering broad resonances

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^{19}F is one of the few naturally occurring isotopes whose nucleosynthesis is still uncertain. SNe, AGB and WR stars are its most likely sources. In particular fluorine abundances observed in AGB stars can constrain AGB star models since they are sensitive to the environmental conditions in the intershell region and to the dynamics of the mixing phenomena taking place in such stars. The $^{18}O(p,\alpha)^{15}N$ reaction can affect fluorine yield from AGB stars since it produces ^{15}N nuclei which are later burnt to ^{19}F through the $^{15}N(\alpha,\gamma)^{19}F$ capture reaction during a thermal pulse. Large uncertainties characterize ^{19}F nucleosynthesis since experimental ^{19}F abundances are not reproduced by current AGB models. A possible solution of these experimental problems can come from nuclear physics studies. Indeed the measurement of nuclear cross sections at ultra-low energies is a very difficult task because of the presence of the Coulomb barrier exponentially suppressing the cross section. Therefore extrapolation is necessary when data at astrophysical energies are unavailable. Even when measurements are available inside the Gamow window, electron screening makes the bare-nucleus cross section inaccessible. Thus indirect techniques such as the Trojan Horse Method (THM) have been developed to extract low-energy cross sections with no need of extrapolation. Previously we have determined the astrophysical S factors contributed by low-energy resonances in ^{19}F at 19.5, 96.6 and 145.5 keV. However, at higher energies the reaction rates for the $^{18}O(p,\alpha)^{15}N$ are governed by broad $½^+$ interfering resonances at 574 and 796 keV.

In this work we analyze the TH data at energies $E > 400$ keV using the generalized R matrix approach. Before, we reanalyzed the S factor for the $^{18}O(p,\alpha)^{15}N$ reaction obtained from direct measurements. In the analysis we used the two-channel, two-level R matrix and determined new resonance energies and partial widths. In particular, our determined α - particle partial width for the resonance at 574 is almost factor of two lower than previously obtained. Using these resonance and using the ratio of the amplitudes for the $^{18}O(d,n)^{19}F$ direct reaction populating 574 and 796 keV resonances as fitting parameter we are able to reproduce the TH data. The further analysis is still in progress.