Indirect study of the astrophysically relevant ^{6}Li(p,α)^{3}He reaction by means of the Trojan Horse Method

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The Trojan-horse Method is a powerful method to extract charged particle astrophysical cross sections extract low-energy cross sections of astrophysically relevant reactions between charged particles, free from Coulomb barrier and electron screening effects. [1, 2, 3, 4] . The Trojan-horse Method was applied to the three-body ^{2}H(^{6}Li,α^3He)n reaction in order to extract the bare nucleus cross section for the ^{6}Li(p,α)^{3}He reaction. The three-body reaction was performed in two kinematically complete experiments at beam energies of 25 [5] and 14 MeV. Coincidence spectra show the contribution of the quasi-free p+^{6}Li$\rightarrow\alpha+^3$He reaction in the energy range for the p+^{6}Li system going from 2.3 MeV down to astrophysical energies. The extracted quasi-free cross section was compared with the behaviour of the free reaction cross section below and above the p-^{6}Li Coulomb barrier, after correcting the quasi-free data for the penetration function through the Coulomb barrier [6, 7, 8]. A very good agreement between the two trends shows up throughout the energy range where the electron screening effects on the free reaction are negligible. This result represents the first validity test of the Trojan-Horse-Method below and above the Coulomb barrier at the same time, using the same normalization factor to the direct data. Since indirect data are not affected by the screening effects, the further step was to obtain from them an experimental estimate of the bare S(E)-factor and then of the screening potential from comparison with the screened direct data. This information was compared with the values extracted from direct data [7]. The results of this experimental work will be presented and the importance of the Trojan-horse Method to get an independent estimate of the screening potential will be stressed.

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