Improved information on the ^{7}Li+p→α+α reaction via the Trojan Horse Method applied to the ^{3}He break-up

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The ^{7}Li+p→α+α reaction is the main responsible for ^{7}Li destruction in astrophysical environment. It was already studied both in a direct way and via the Trojan Horse Method (THM) applied to the ^{2}H break-up [1-4]. In particular the indirect study has allowed to measure the bare nucleus S(E) factor and to get an estimate of the S(0) parameter as well as of the electron screening potential. Recently, the ^{7}Li+p→α+α two-body reaction was investigated via the THM by selecting the quasi-free contribution to the measured ^{3}He+^{7}Li →α+α+d three-body process. This further investigation is mainly aimed at testing the validity of the polar approximation in the THM against the bound structure of the Trojan-horse nucleus as well as the Coulomb distortion due to the spectator particle. The three-body experiment was performed at 33 MeV, corresponding to a ^{7}Li-p relative energy ranging from 0.2 to 7 MeV. Two resonances, associated with the group of ^{8}Be states between 19.9 and 20.2 MeV and that around 22.2 MeV of excitation energy, contribute in this relative energy region. These two resonances have already been observed in the indirect ^{7}Li+p excitation function extracted applying the THM to the ^{7}Li+d→α+α+n reaction [5]. The ^{7}Li+p quasi-free cross-section off the deuteron in ^{3}He was compared with the free reaction cross-section [6-9] below and above the Coulomb barrier, after correcting the quasi-free data for the penetration function through the Coulomb plus l=1 centrifugal barriers. A very good agreement between the two trends shows up throughout the energy range investigated, providing a very important validity test of the polar approximation for the THM below and above the Coulomb barrier at the same time, with the same normalization factor to the direct data within a 7 MeV wide ^{7}Li-p relative energy range. The results of this experimental work will be presented and compared also with the previous THM investigation on the ^{7}Li+p→α+α reaction off the neutron in ^{2}H.

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