Competition between $^5\text{Li}$ and $^8\text{Be}$ Formation in the $^6\text{Li}(^3\text{He}, \alpha\text{p})$ Reaction at $E_{^3\text{He}} = 2.5$ MeV (*).

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The sequential mechanism exhibited by three-body final-state reactions is reclaimed as a validity test for the two-cluster model of light nuclei (*).

Furthermore, according to this model, the decay of a light excited nucleus with different two-cluster parents, is required to evolve mainly by the separation of the clusters with the lowest relative kinetic energy (*). Therefore, if the various excited states of the $^9\text{B}$ nucleus are describable by a mixture of the $\alpha + ^3\text{Li}$ and $\text{p} + ^8\text{Be}$ two-cluster configurations, when this nucleus is formed as a compound nucleus in the $^6\text{Li}(^3\text{He}, \alpha\text{p})$ reaction, the $\text{p} + ^8\text{Be}^*$ process should dominate the $\alpha + ^3\text{Li}$ (g.s.) one. Up to about 3 MeV bombarding energy the $^6\text{Li} + ^3\text{He} \rightarrow \text{p} + ^8\text{Be}$ (at 0 and 2.9 MeV states) reaction is interpreted to proceed essentially by compound-nucleus mechanism (*). However even at incident energy as low as 1 MeV, a direct mechanism appears a good description for the $^6\text{Li} + ^3\text{He} \rightarrow \alpha + ^3\text{Li}$ (g.s.) reaction (*). In this situation we have studied the $^6\text{Li}(^3\text{He}, \alpha\text{p})$ reaction at 2.5 MeV bombarding energy, with the aim to investigate how much the two-cluster model predictions are true when compound-nucleus mechanism is in the presence of the direct one.

A 100 $\mu$g/cm$^2$ LiF target 98% enriched in $^6\text{Li}$ was bombarded by 2.5 MeV $^3\text{He}$-beam of the Van de Graaf accelerator of the CSFN-SM laboratories in Catania. The bidimensional spectra were measured by detecting in coincidence the outgoing $\alpha$-particles. The 100 $\mu$m sensitive depth of the Si surface barrier detectors was able to stop the $\alpha$-particles, but not the protons.

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Fig. 1. — $^4$Li($^7$He, 2p) at 2.5 MeV a) $\theta_1 = 90^\circ$, $\theta_2 = 55^\circ$, b) $\theta_1 = 90^\circ$, $\theta_2 = 60^\circ$, c) $\theta_1 = 90^\circ$, $\theta_2 = 6.5^\circ$, d) $\theta_1 = 90^\circ$, $\theta_2 = 70^\circ$. Dashed lines: experimental data; shaded areas: estimated $^7$Li contribution.