

# Direct nuclear cross section measures at Big Bang energies and the cosmological lithium problem

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The direct cross sections of four nuclear reactions of relevant interest for the two cosmological lithium problems at Big Bang Nucleosynthesis are presented and discussed. Two reactions have been measured at high precision and down to energy never reach before at LUNA Underground Laboratories:  $2\text{H}(\alpha,\gamma)6\text{Li}$  and  $3\text{He}(\alpha,\gamma)7\text{Li}$ . Two neutron induced reactions,  $7\text{Be}(n,p)7\text{Li}$  and  $7\text{Be}(n, \alpha \gamma)$ , have been studied at EAR2 experimental area of n\_TOF facility at CERN. There is no sign that  $7\text{Be}$ , parent nucleus of  $7\text{Li}$ , could be affected by a sensible production rate decrement by much smaller values of  $3\text{He}(\alpha, \gamma)7\text{Be}$  cross sections and/or an increase of its destruction rate by unknown or poorly measured resonance in  $7\text{Be}(n, \alpha \gamma)$  reaction, in order to match the standard Big Bang Nucleosynthesis predictions.  $2\text{He}(\alpha, \gamma)6\text{Li}$  latest data carries in only a slight corrections in the  $6\text{Li}$  abundance (second lithium problem) and in the wrong side too. From the obtained results nuclear physics solutions of both lithium problems have been pinned down, leaving all the alternative physics scenario still open, with the strict constraints that deuterium and  $4\text{He}$  cosmological abundance must remain unperturbed.