The study of $^6$Li(p, $\gamma$)$^7$Be reaction at LUNA

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The $^6$Li(p, $\gamma$)$^7$Be reaction is involved in several astrophysical scenarios such as the Big Bang Nucleosynthesis, $^6$Li destruction in pre-main and in main sequence stars and solar neutrino production.

A recent direct measurement of the $^6$Li(p, $\gamma$)$^7$Be cross section found a resonance-like structure at $E_{\text{c.m.}} = 195$ keV, corresponding to a $E_x \sim 5800$ keV excited state in $^7$Be [1]. This result has not been confirmed neither by other direct measurements nor by theoretical calculations [2, 3, 4, 5].

In order to clarify the existence of this resonance a new experiment was performed at the Laboratory for Underground Nuclear Astrophysics (LUNA), located under 1400 m of dolomite rocks of Gran Sasso. Thanks to the extremely low background environment the $^6$Li(p, $\gamma$)$^7$Be cross section can be measured down to low energies with unprecedented sensitivity.

The high intensity proton beam from the LUNA400kV accelerator was delivered to $^6$Li evaporated targets of different composition and thickness. To detect the gamma rays from the $^6$Li(p, $\gamma$)$^7$Be a HPGe detector was mounted in close geometry. A silicon detector was also used in order to have a simultaneous detection of charged particles from the $^6$Li(p, $\alpha$)$^3$He channel. Target characterization was performed at the Helmholtz Zentrum Dresden Rossendorf in Dresden using two independent Ion Beam Analysis techniques: Nuclear Reaction Analysis and Elastic Recoil Detection Analysis.

The talk will provide a detailed description of the experimental setup. In addition preliminary results will be reported.

References