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1-n neutron and 2-protons pick-up reactions to study the unbound nucleus ^{7}He

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The unbound nucleus ^{7}He has attracted the interest of several research groups in recent years. However, despite a significant number of experiments, an unambiguous information about ^{7}He excited states is still lacking, in particular for the first excited 1/2- state [1-5]. This state is considered the spin-orbit partner of ^{7}He ground state. The importance of the spin-orbit interaction in the vicinity of the neutron drip line for shell model calculation highlights the need of additional experimental investigations.

In this talk we will report a measurement performed at the LLN facility using a ^{6}He beam at 16.8 MeV impinging on a highly pure and self-supporting ^{9}Be target. The detection system consisted of two arrays of silicon-strip detectors covering 5-12 degrees and 22-70 degrees in the laboratory system. In these different angular ranges diverse mechanisms may be predominant. Indeed, the ^{7}He states can be populated via both 1-neutron (^{6}He,^{7}He) and 2-protons (^{6}He,^{8}Be) transfer reactions. In both cases, thanks to the signature provided by the decay of the outgoing ^{8}Be, the decay energy spectrum for ^{7}He was obtained via the resonant particle spectroscopy technique. The energy spectrum has been analysed combining an extended Monte Carlo simulation with the R-Matrix theory.

This work will present the spectroscopic information obtained from the decay energy spectrum for ^{7}He.

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