STRUCTURE OF ^{13}C EXCITED STATES WITH LOW ENERGY ELASTIC AND INELASTIC SCATTERING OF ALPHA PARTICLES ON ^{9}BE

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The study of ^{13}C structure can be important to understand the effects of clustering in light non-self-conjugated nuclei. The possible presence of rotational bands built on molecular states has been suggested in several papers [1,2]. Furthermore, in recent times, some theoretical papers [3,4] predicted the possible existence of states corresponding to the coupling of a valence neutrons to the ^{12}C Hoyle state.

To understand these aspects, we performed a comprehensive R-matrix fit of elastic (α_0) and inelastic (α_1 and α_2 channels) scattering data collected by studying α+^{9}Be collisions in the energy range E_α=3.5 – 10 MeV at several angles in direct kinematics [5]. This kind of analysis allows to refine the spectroscopy of excited states in ^{13}C in the excitation energy region between 13 and 17 MeV, where several ambiguities are persisting in the literature and members of molecular bands have been predicted [1,2]. In particular we found that the 13.41 MeV state could be assigned $7/2^+$, in agreement suggestions reported in Ref. [6] and possibly associated with the positive parity rotational band suggested in [1]. Further, a non-vanishing direct contribution is needed to reproduce the inelastic scattering cross section of the α_2 channel, that involves the second member of the ground state rotational band of ^{9}Be. The obtained results of this preliminary analysis will be discussed in the talk.

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