Probing nucleon-nucleon correlations via heavy ion transfer reactions

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Transfer reactions play an essential role in the study of collision dynamics and nuclear structure. They have an important impact in the understanding of correlations in the nuclear medium, and play a very important role for the study of the evolution from the quasi-elastic to the deep-inelastic and fusion regime [1]. In the heavy-ion induced transfer reactions, the constituents of the collision may exchange many nucleons, thus providing information on the contribution of single particle and correlated particle transfers, and on the contribution of surface vibrations (bosons) and their coupling with single particles (fermions).

The recent revival of transfer reaction studies greatly benefited from the construction of the new generation large solid angle spectrometers based on trajectory reconstruction that reached an unprecedented efficiency and selectivity. The coupling of these spectrometers with large γ arrays allowed the identification of individual excited states and their population pattern. In this work selected results obtained by using Prisma spectrometer [2] will be presented. Special emphasis will be placed on the major achievements of the last years, as was the extraction of absolute differential cross sections via a careful study the response function of the spectrometer [3,4]. This fact was of crucial value in the extraction of the pair-transfer stregths [5,6,7].

In addition, a new preliminary results of the test of pair-correlation properties in heavy ion induced reactions by populating at once $\pm(nn)$, $\pm(pp)$ and $\pm(np)$ channels will be dicussed [8]. Especially the role played by neutron-proton correlations. Nuclear models point out that such a correlation is expected to be strongest in $N \sim Z$ nuclei, where protons and neutrons occupy the same orbitals.

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