Contribution ID: **71** Type: **not specified**

Probing nucleon-nucleon correlations in the 48Ca+208Pb system below the Coulomb barrier

Thursday, 6 October 2022 17:45 (25 minutes)

We propose to measure the transfer probability for multi-neutron and multi-proton transfer channels in the system ^{48}Ca+^{208}Pb at energies close to and below the Coulomb barrier. In the chosen system stripping and pick-up of both neutrons and protons are open with comparable cross sections. This gives the opportunity to investigate nucleon-nucleon correlations simultaneously for a complete set of transfer channels, involving both addition and removal of neutron and proton pairs.

The measurement will be performed in inverse kinematics by using a ^{208}Pb beam onto a ^{48}Ca target, employing the superconducting PIAVE-ALPI accelerator complex of LNL. We will determine the transfer probability P_{tr} for the open transfer channels, identifying the light partner of the reaction in PRISMA. We intend to measure an excitation function from above to below the Coulomb barrier in such a way to cover a wide range of distances of closest approach between the two interacting nuclei D, from $\sim$ 12 fm up to $\sim$ 17 fm. At selected energies, in longer runs, we will measure the fragment angular distribution (PRISMA), and the fragment-γ coincidences (PRISMA+AGATA).

At small D we will define the shape and the size of the form factors in the absorption region, important to consistently follow the evolution of quasi-elastic processes. At far distances we will define their exponential behaviour, in slope and absolute value.

In this measurement we will focus in particular on proton transfer channels in the energy region below the Coulomb barrier, where very few data are available.

We ask for a total of 10 days of beam time with PIAVE+ALPI.

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Session Classification: Session: LoI 5