Reaction dynamics and nuclear structure studies via deep inelastic collisions with heavy-ions: Search for particle-vibration couplings in ^{49}Ca.

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The population and gamma decay of neutron rich nuclei around ^{48}Ca was measured at LNL with the PRISMA-CLARA setup, using deep-inelastic collisions (DIC) on ^{64}Ni, at an energy ~2.5 times above the Coulomb barrier. The reaction properties of the main products will be presented, focusing on total cross sections and angular distributions energy integrated and associated to the population of specific excited states. The analysis provides information on basic physical quantities, such as potentials, spectroscopic factors, and pair transfer. Gamma spectroscopy studies based for the first time on angular distributions and polarization measurements will be also shown, allowing a firm spin and parity assignments for a number of excited states of one and two nucleons transfer channels. Special emphasis will be given to candidates for particle-vibration coupling in ^{49}Ca, for which lifetimes measurements are also performed. The excitation of these states provides a further test to the role of low lying collective states in the reaction dynamics. Both reaction and gamma spectroscopy studies therefore demonstrate the relevance of DIC with heavy ions for the investigation of neutron rich systems.