Multinucleon transfer reactions studied with magnetic spectrometers

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Extensive studies of multinucleon transfer processes in different heavy-ion systems evidenced features of the reaction mechanism not clearly identified in the past (see Ref.[1] and references therein). An example is given in Fig.1 where the experimental and theoretical cross sections for pure neutron pick-up and pure proton stripping channels in ^{58}Ni+^{208}Pb are compared. By considering the transfer process as a succession of independent particles, neutron pick-up data are well reproduced (full line), while proton stripping data are strongly underestimated (dotted line). This different behaviour between neutrons and protons is presently not understood. The inclusion of a proton pair mode improves dramatically the situation (dashed line) but a microscopic description is still missing. Other complex mechanisms can play a significant (or even a dominant) role in the transfer process, for instance nucleon evaporation from primary fragments generated by large energy losses. Including this effect in calculations one obtains an even better agreement with proton data (full line on the left side). A presentation will be given on recent inclusive measurements done at LNL and on the possibilities offered by using the new large solid angle spectrometer PRISMA [2]. With this instrument, studies can be performed by selecting the population to specific final states of the transfer products, which allows a very detailed comparison between experiment and theory (cfr. e.g. [3]).

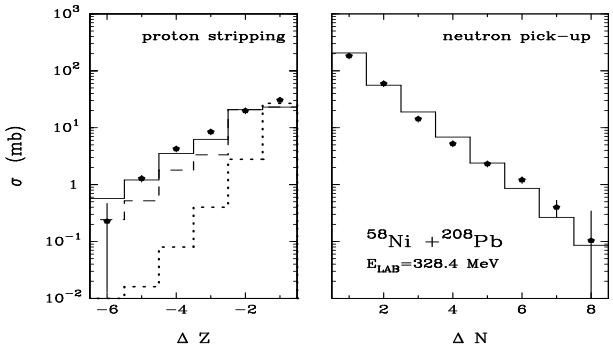

Figure 1: Total cross sections for pure proton stripping (left) and pure neutron pick-up (right). Points are the data, lines are Complex WKB calculations (see Ref. [1] for details).

[1] L.Corradi et al., Phys. Rev. C66, 024606 (2002)
[2] A.M.Stefanini et al., PRISMA, LNL-INFN (REP) 120/97; www.lnl.infn.it (Annual Report)
[3] L.Corradi et al., Phys. Rev. C61, 024609 (2000)