Study of the reaction ^{22}Ne (131 MeV) + ^{208}Pb with a PIAVE-ALPI test beam and the PRISMA-CLARA set-up

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An opportunity to study the system ^{22}Ne+^{208}Pb in the proximity of the Coulomb barrier with the PRISMA-CLARA apparatus was given by a test of the PIAVE-ALPI accelerator [1] in mid-December 2005.

The ^{22}Ne projectiles, having the kinetic energy of 131 MeV, collided with a ^{208}Pb target 300 μg/cm^2 thick. (The beam was run for ~20 hours with a current of ~6 particle-nA). The reaction products, mainly originated by scattering or transfer processes, were detected by the PRISMA [2-6] spectrometer (positioned in the proximity of the grazing angle, ~70°), coupled to the CLARA [7,8] array of germanium detectors.

The PRISMA spectrometer enables the separation of charge and mass numbers through the reconstruction of individual trajectories, based on the position and time signals given by the entrance MCP detector [5] and the focal-plane PPAC detector [6], and the measurement of the energy released in each of the sections of the ionization chamber the ion passes through. The Bragg curve being sensitive to Z, one is able to single out different proton numbers selecting different traces in a plot of the path length inside the ionization chamber versus the total energy release in it. Moreover, with the reconstruction of the total distance D covered by the ion (and hence of its speed v=D/TOF) and the curvature radius R of its trajectory in PRISMA's dipole magnet it is possible to separate different charge states selecting different traces in a plot of R·v versus, again, the total energy release in the ionization chamber. With these two selections, a spectrum of the quantity R/v is in fact, aside from some calibration, a mass spectrum of the reaction products. The mass spectra for the five elements observed in this experiment are shown in Fig. 1.

(The reported results are to be regarded as preliminary).

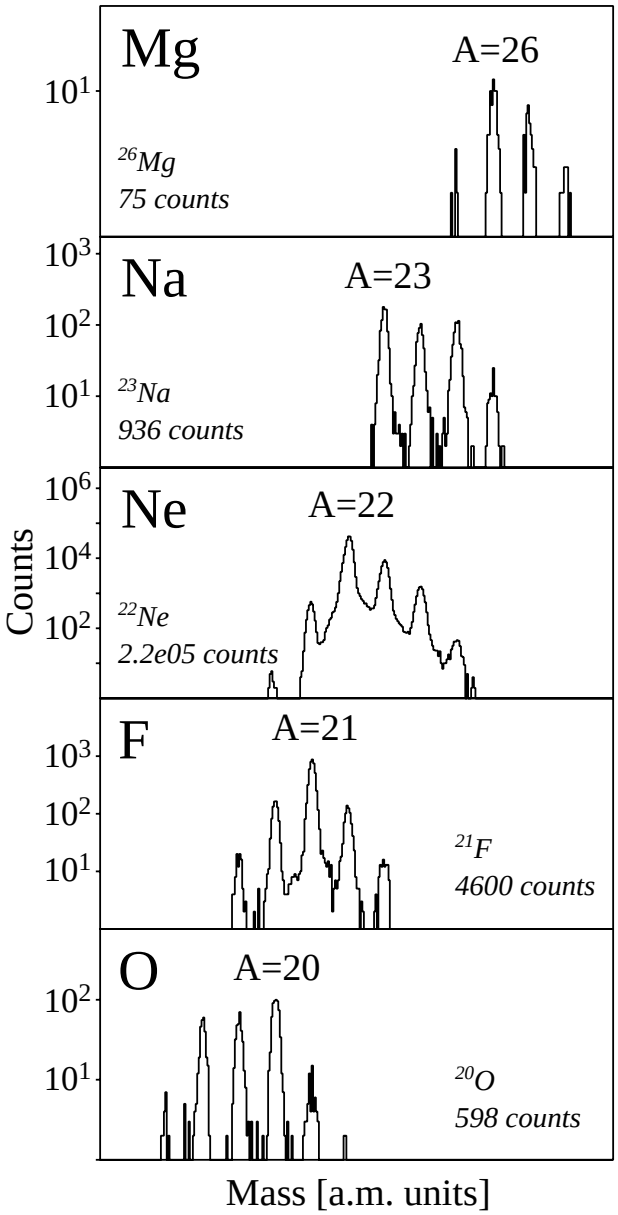

Figure 1: *Mass spectra of the elements observed in the reaction ^{22}Ne@131 MeV + ^{208}Pb. The reported results refer to the whole experiment statistics.*

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