

### E393: Target Multifragmentation by GeV Energy Proton

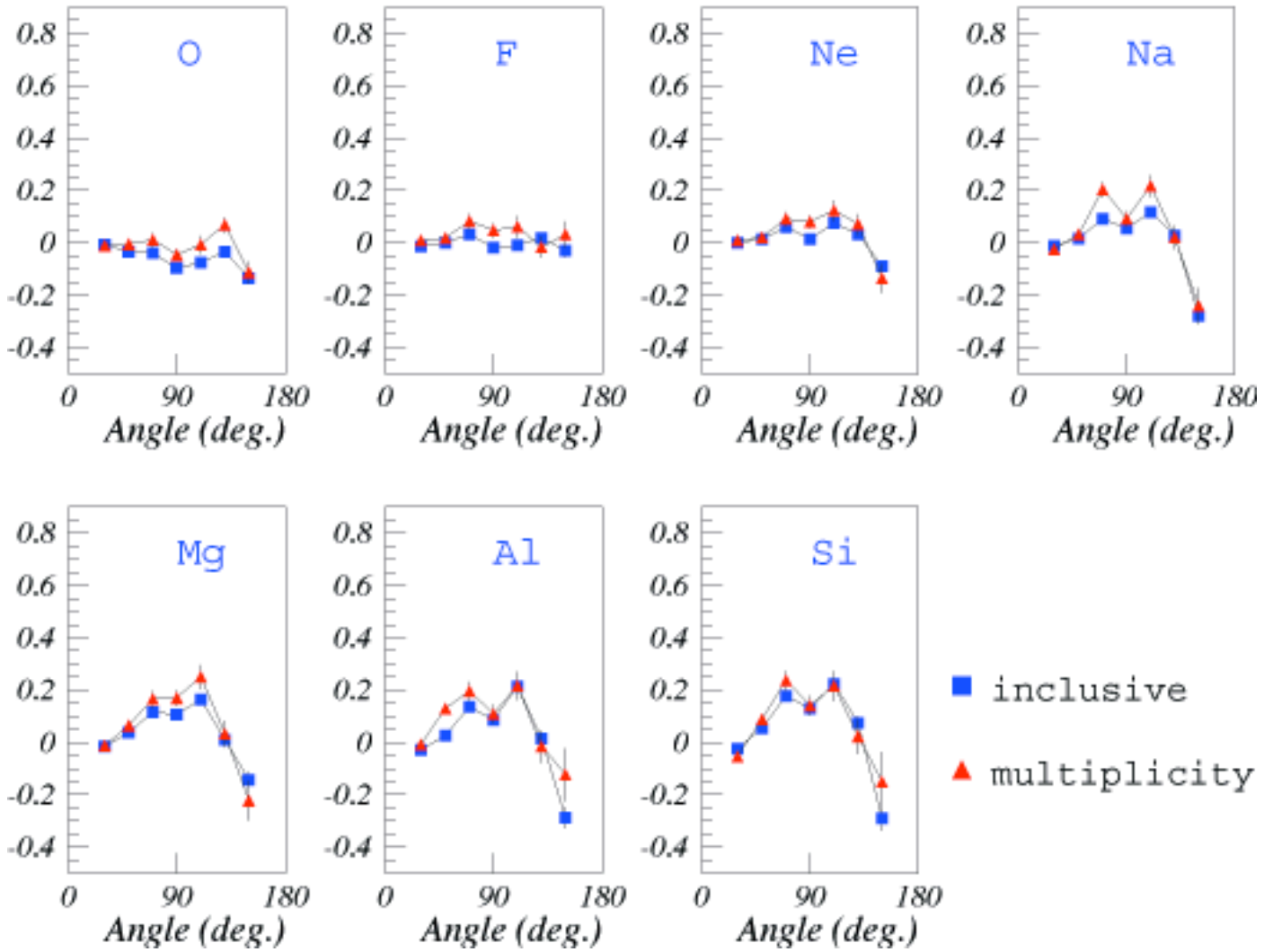
The E393 group has been exploring a thermodynamical nature of highly excited nuclear matter produced in nuclear reactions in the GeV energy region. In order to investigate a possible density effect in the target multifragmentation (TMF) reaction, the group started comparing the data obtained by using 8- or 12-GeV proton beams at KEK with the ones acquired by using 8- or 12-GeV light heavy-ion beams at the National Institute of Radiological Sciences (NIRS) in Chiba.

Inclusive IMF energy spectra for 8-GeV  $^{16}\text{O}$  and  $^{20}\text{Ne}$  induced TMF showed usual Maxwell-Boltzmann distribution-like shapes similar to the ones for the 8-GeV proton induced TMF, but absolute cross sections are about 4-5 times larger and Coulomb peaks are much wider than those for proton induced TMF. The results of a moving source analysis suggest that the velocity of the moving source increases as the mass of projectile increases. It was also found that the moving source model always underestimates yields at sideward angles even for the  $^{16}\text{O}$  and  $^{20}\text{Ne}$  induced TMFs, especially for heavy IMFs ( $Z \geq 10$ ). As shown in Fig. 1. the relative yield excesses to the moving source fits show evident peaks at around  $110^\circ$  in the laboratory system for the  $^{16}\text{O}$  and  $^{20}\text{Ne}$  induced TMFs, which is quite backward compared to the  $70^\circ$  for the proton induced TMFs. The relative excesses clearly increase as a function of a mass of IMF and decreases as a function of a projectile mass. These facts might indicate that though there is some effect from the nuclear density prior to the target multifragmentation, a total beam energy plays a decisive role to govern a reaction dynamics for the IMF emission.

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Figure 1: Relative yield excess observed in angular distributions of IMFs from 8, 12 GeV  $^{20}\text{Ne}$  induced TMFs on Au.

8GeV Ne Target=Au E/A 2-3 MeV



12GeV Ne Target=Au E/A 2-3 MeV

