MULTIFRAGMENTATION OF ^{197}Au BY 5.0 – 14.6 GeV/c PROTON AND π^- BEAMS

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The reaction dynamics of GeV hadron projectiles incident on a ^{197}Au target have been studied with the ISiS 4π detector array at the Brookhaven AGS accelerator (E900). Excitation functions for charged ejectiles were measured for proton beams between 6.0 and 14.6 GeV/c and π^- beams from 5.0 to 9.2 GeV/c. In these experiments, the ISiS array[1] was supplemented with both inner and outer scintillator arrays to veto beam halo; in addition, a coincidence with a beam counter was required for event acceptance. In excess of 1×10^6 events with charged particle multiplicity $M \geq 6$ were taken for 5.0, 8.0 and 9.2-GeV/c $\pi^- + {}^{197}$Au and 10.0, 12.8 and 14.6-GeV/c p + ^{197}Au; and $\sim$ 300,000 events were taken for 6.0-GeV/c p + ^{197}Au.

On-line analysis has indicated two preliminary conclusions: (1) at the same total bombarding energy, the energy deposition in p- and π^--induced reactions appears to be nearly identical, and (2) above 5 GeV/c beam momentum, the deposition energy shows little sensitivity to an increase in bombarding energy. These results are illustrated in Figs. 1 and 2. Figure 1 compares the charged-particle multiplicity distributions for p and π^- beams at the same total energy (9.1 GeV). While the shapes of the distributions differ somewhat, the maximum multiplicities are nearly the same. This is also shown in Fig. 2, where the average IMF multiplicity (IMF: $3 \leq Z \lesssim 20$) is plotted as a function of beam momentum. The IMF multiplicity is considered to be a good gauge of excitation energy in the fragmenting system.[1] The results indicate that over the measured energy range, the average excitation energy of the excited residues is approximately constant. This observation is consistent with the quark-gluon string model calculations of Toneev[2]

and has been explained in terms of fundamental hadron scattering processes.[3] It is also of interest to note that the maximum multiplicities and average IMF multiplicities observed in these studies are similar to results obtained with 4.8 GeV/c ^{3}He beams incident on ^{197}Au .[1]

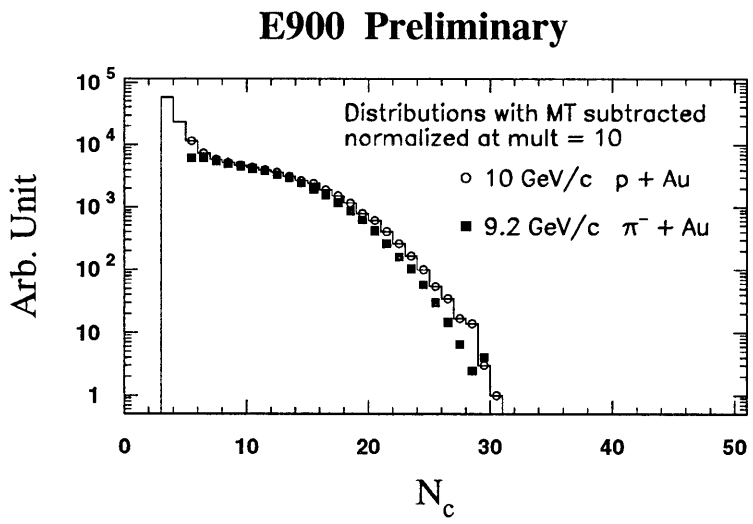

Figure 1. On-line charged-particle multiplicity distributions for 9.1 GeV total energy p and π^- beams. Blank target (MT) contributions have been subtracted out and distributions normalized at M = 10.

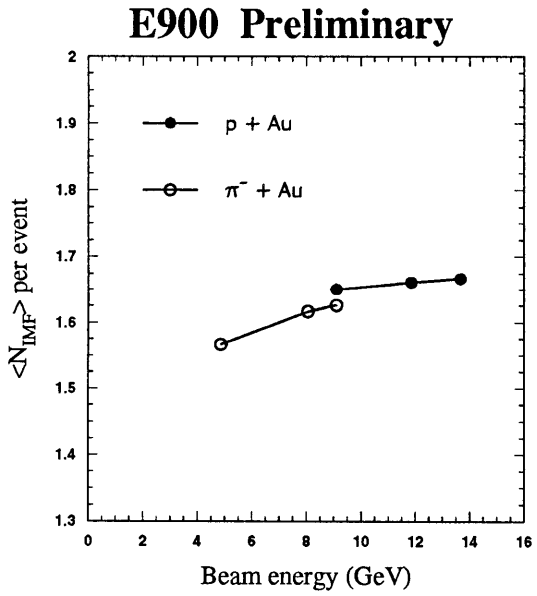

Figure 2. Average IMF multiplicity distribution observed on-line as a function of beam momentum for proton (•) and π^- (o) beams.

1. K. Kwiatkowski *et al.*, Phys. Rev. Lett. **74**, 3756 (1995); K. B. Morley *et al.*, Phys. Lett. **B355**, 25 (1995).
2. V. Toneev, private communication.
3. G. Wang *et al.*, Phys. Rev. C **53**, 1811 (1996).