Study of the energy flow in $^{16}$O-nucleus collisions at 60 and 200 GeV/nucleon*

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Abstract. We report a systematic study of mid-rapidity $E_T$ production and forward energy flow in the interaction of $^{16}$O projectiles on Al, Cu, Ag and Au at 60 and 200 GeV/nucleon. First results on $E_T$ production with $^{32}$S projectiles are presented.

1 Introduction

Forward energy flow and transverse energy production in ultrarelativistic nucleus-nucleus interactions depend on the centrality of the collision and on the degree of stopping that takes place in each collision. It appears that sufficient stopping occurs, making it possible to reach energy densities in central collisions high enough for matter to undergo a phase transition into an unconfined, chirally restored state as has been predicted by lattice QCD calculations [1].

A systematic study of the interactions induced by 60 and 200 GeV/nucleon $^{16}$O projectiles with Al, Cu, Ag, and Au nuclei has been performed by the NA35 collaboration at the CERN SPS. Here we present the results on the forward energy flow, on the transverse
energy production, and on the pseudorapidity distribution of transverse energy from peripheral up to the most central collisions. First results have been published in [2]. For the same reactions the cross sections and charged multiplicities have been reported in [3], rapidity and transverse momentum distributions for charged particles in [4], two pion interferometry and the space-time distribution of the pion emitting source in [5] and the strange particle production in [6]. We also present here first results for the interaction of 200 GeV/nucleon $^{32}$S with Au.

2 Experimental setup

The experiment was designed with the aim of doing a survey study of $^{16}$O and $^{32}$S induced reactions on a variety of targets. It consists of a Streamer Chamber in a superconducting Vertex Magnet followed by a set of calorimeters which covers the pseudorapidities forward of 2.0 [7]. A perspective view of the calorimeters in the experimental setup, without the Vertex Magnet and the Streamer Chamber, is shown in Fig. 1. The beam particles are selected by a 5 mm quartz Cherenkov counter 25 m upstream of the target. This counter has single charge resolution up to $^{32}$S. A series of scintillator veto counters downstream of it, the innermost one having a hole of 1 cm diameter, rejects events with halo particles or interactions in the quartz. The beam is then selected again with a 300 $\mu$m thin scintillator counter which is in coincidence with the quartz Cherenkov counter. The targets are placed at the entrance of the Streamer Chamber. A thickness of 1% of an interaction length for $^{16}$O has been used for Au, Ag, Cu and Al. Behind the Streamer Chamber, 4 m downstream of the target, a 3 cm diameter, 1 mm thick scintillator counter (S4) is used to provide an interaction trigger by selecting events which produce a pulse height that is less than that of the projectile. The forward angles are covered by a set of four calorimeters to measure the energy flux of the emitted reaction products. The angular domain $\theta < 0.3^\circ$, which corresponds to the projectile fragmentation region, is covered by a 4-segment "Veto" calorimeter. The subsequent interval, from $0.3^\circ - 2.2^\circ$, is seen by a single cell electromagnetic and hadronic Intermediate Calorimeter, with an outer diameter of 53 cm. The larger angle domain is covered by the Photon Position Detector (PPD), an electro-

![Fig. 1. Schematic view of the calorimetric part of the NA35 (Streamer Chamber and Vertex Magnet are not shown). The distance from the target to the front of the PPD was 5.00 m (6.40 m) for 60 (200) GeV/nucleon](image)

![Fig. 2a, b. Azimuthal acceptance of the midrapidity calorimeters for 60 and 200 GeV/nucleon. The quadratic shape of the front face of the PPD produces a gradual onset of its acceptance. Indicated by arrows are the rapidities of the participant center of mass for the different targets (see Tables 1 and 3)](image)