Charged Particle Multiplicities at BRAHMS

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Abstract. Charged particle pseudorapidity densities are presented for the
¹⁹⁷Au + ¹⁹⁷Au reaction at √s_{NN} = 130 GeV. These densities provide an
essential characterization of the underlying reactions mechanisms for ultra­
relativistic heavy-ion collisions. This talk details how the global charged par­
ticle yields are measured at BRAHMS and presents some preliminary results
from the analysis of data taken during the first year of the RHIC experimental
program.
1. Introduction

The number of particles emitted from a heavy-ion collision at RHIC energies provides one of the most basic characterizations of the collision process. On an event-by-event basis, this observable can be related to the centrality of the collision. By analyzing a large number of events, the dependence of the particle multiplicity on pseudorapidity and reaction centrality can be determined. This can further the study how the energy loss by the incident channel leads to particle production. Recent theoretical works have emphasized the importance of determining the particle densities over a range of pseudorapidities and centralities to better understand the relative contributions of "soft" hadronic and "hard" partonic processes and to search for gluon saturation effects [1, 2] in ultra-relativistic heavy-ion collisions.

In this talk, global charged particle measurements using complementary sub-systems of the BRAHMS experiment will be described. Differential charged particle distributions in $dN_{ch}/d\eta$ are presented as a function of pseudorapidity $\eta$ and of reaction centrality for the $^{197}$Au + $^{197}$Au reaction at $\sqrt{s_{NN}} = 130$ GeV. The BRAHMS results are compared to other recent results reported by the PHOBOS [3, 4] and PHENIX [5] Collaborations. Comparisons are also made with HIJING model calculations [6].

2. Experimental Arrangement

The BRAHMS detector system (see Fig. 1) consists of two magnetic spectrometers, which allow for the determination of charged particle properties over a wide rapidity and momentum range, and a number of global detectors employed to characterize the general features of the reaction, such as the overall charged particle multiplicity and the flux of spectator neutrons at small angles. The current analysis is based primarily on the global detectors, including the Multiplicity Array, the Beam-Beam Counter Arrays (BB), and the Zero-Degree Calorimeters (ZDC), but also uses data from the front time-projection chamber (TPM1) of the mid-rapidity spectrometer arm.

2.1. Multiplicity array

The multiplicity array provides a measure of charged particle production in the pseudorapidity range of $-3 \leq \eta \leq 3$. The quoted pseudorapidity coverage of the array is greater than the geometric coverage for reactions occurring at the nominal array center because of the extended range where collisions take place along the beam axis. The array consists of an inner barrel of Si strip detectors (SiMA) and