Charged Hadron Results from Au+Au Collisions at $\sqrt{s_{NN}} = 19.6$ GeV

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Results from a one day $\sqrt{s_{NN}} = 19.6$ GeV Au+Au test run at RHIC using the STAR detector are presented. The quality of these results from only 175,000 triggered events demonstrates some of STAR's physics capabilities for the upcoming beam energy scan at RHIC. From these 19.6 GeV Au+Au collisions, we have analyzed the transverse mass spectra of $\pi^{\pm}$, $K^{\pm}$, p, and $\bar{p}$ with $|y| < 0.5$ and $m_T - m_0 < 1.0$ GeV/c^2. The collision energy ($\sqrt{s_{NN}} = 19.6$ GeV) of this low energy Au+Au RHIC collider run is very close to that of the 158 AGeV fixed-target Pb+Pb runs at the SPS ($\sqrt{s_{NN}} = 17.2$ GeV). We present detailed comparisons between these STAR data and the spectra published by NA49 [1], NA44 [2], and WA98 [3]. Differences in rapidity, centrality, beam energy and beam size are taken into account. In most cases, the agreement is within the statistical and systematic errors of the measurements. We report radial flow parameters, multiplicity, particle ratios, and kinetic and chemical freeze-out conditions and compare these 19.6 GeV results to the energy systematics. There is agreement with the established trends. We have studied the very low p_T pion ratios and extract a Coulomb potential of the source to be 4.3 MeV. We have analyzed the directed and elliptic flow signals and we compare these results to the SPS results and the energy systematics. The RHIC program advisory committee has approved a fourteen week run to scan a series of energies ranging from $\sqrt{s_{NN}} = 4.6$ to 28 GeV in a search for the possible critical point and phase boundary in the QCD phase diagram. We will discuss the technical challenges faced during this test 19.6 GeV run and consider their solutions or ramifications for the upcoming energy scan in 2010, where we have proposed to measure at least five million events at each beam energy.

References

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