



Contribution ID : 80

Type : **not specified**

Soft physics observables in heavy ion experiments

Tuesday, 7 October 2008 18:30 (0:50)

Abstract content

Soft (i.e. low momentum) hadrons constitute the bulk of the particles produced in relativistic heavy ion collisions and they are therefore essential to characterize the system created in these reactions. For the more central (i.e. small impact parameter) collisions and/or at the higher center-of-mass energies, where the higher temperatures and energy densities are attained, it is expected on the basis of lattice QCD calculations that the produced matter can reach the conditions for deconfining quarks and gluons on volumes much larger than the hadronic size. The system in its early stages is therefore expected to be composed of deconfined partons which then hadronize into the observed particles when the critical temperature is reached during the expansion and cooling of the system. In this talk, few examples of experimental observables in the domain of soft particle production will be presented, showing the results obtained at the SPS and RHIC accelerators, together with their physical interpretation. In view of the forthcoming experiments at the LHC, particular attention is devoted to the observables which can be measured with the data collected in the first few hours of running of an heavy-ion experiment.

The first observable discussed in this talk is the pseudo-rapidity distribution of charged particles which is related to the energy density attained in the collision. The second example is the multiplicity of identified hadrons which in the framework of the statistical hadronization models allows to extract the temperature and the baryonic density of the system at the instant of the chemical freeze-out. Finally, the azimuthal distribution of produced particles is discussed: the presence of anisotropic patterns in the transverse plane indicates that the thermal equilibrium has been established at the early stages of the system evolution and that the produced particles undergo a collective motion (flow) until the moment of the thermal freeze-out.

Summary

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Session Classification : RHI