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The centrality dependence of multiplicity and of the spectra of identified particles is a core-corona effect

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To understand the centrality dependence of measured observables, like the multiplicity < pt^2 > and the elliptic flow of identified particles at midrapidity as well as the elliptic flow of charges hadrons, has been a challenge for theory since many years. Although the multiplicity of different particles in central collisions corresponds exactly to the expectation for a completely thermalized source the centrality dependence is incompatible with this assumption.

A while ago it has been realized that even in the most central collisions there remain particles (usually close to the surface of the interaction zone) which do not come to equilibrium (corona particles) whereas others come to a local equilibrium (core particles). Corona particles produce hadrons like pp collision. The relative fraction of corona particles can be calculated in the Glauber approach. It increases with decreasing centrality and this is the origin of the centrality dependence of the observables. In this core-corona model [1] there is no free parameter. Later this model has been extended to dynamical variables like the centrality dependence of < pt > of identified particles. Even more important, it has reproduced quantitatively the centrality dependence of the elliptic flow of charged particles without any new parameter [2].

Recently we have extended the core-corona model to describe the centrality dependence of spectra of identified particle from the low energy RHIC 7.7 AGeV to LHC energies. Surprisingly we find that all spectra are in good agreement with the core-corona model. This agreement includes the centrality dependence of the spectral slope which varies for some particles by a factor of two or more between central and peripheral collisions. In the presentation we will display the model and make comparisons with the EPOS event generator which is based as well on the distinction between core and corona particles and describes the rapidity dependence of many observables. Then we demonstrate that the centrality dependence of the spectra. The interpretation of the results in physical terms concludes the presentation.

[1] J. Aichelin and K. Werner, Phys. Rev. C 79 (2009) 064907 [Erratum-ibid. C 81 (2010) 029902] [arXiv:0810.4465 [nucl-th]].

[2] J. Aichelin and K. Werner, J. Phys. G 37 (2010) 094006 [arXiv:1008.5351 [nucl-th]].

Author: AICHELIN, Joerg (SUBATECH, University of Nantes)

Co-author: WERNER, Klaus (SUBATECH, University of Nantes)

Presenter: AICHELIN, Joerg (SUBATECH, University of Nantes)

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