Saturation of E_T/N_{ch} and Freeze-Out Criteria in Heavy-Ion Collisions

J. Cleymans[a], **R. Sahoo**[b], **D.P. Mahapatra**[c], **D.K. Srivastava**[d] and **S. Wheaton**[e]

[a,e]UCT-CERN Research Centre and Department of Physics,
University of Cape Town, Rondebosch 7701, South Africa
Jean.Cleymans@uct.ac.za, Spencer.Wheaton@uct.ac.za

[b,c] Institute of Physics, Sachivalaya Marg,
Bhubaneswar 751005, India, *raghu@mail.cern.ch, dpm@iopb.res.in*

[d] Variable Energy Cyclotron Centre,
1/AF Bidhan Nagar, Kolkata 700064, India, *dinesh@veccal.ernet.in*

The pseudorapidity densities of transverse energy, the charged particle multiplicity and their ratios, $(dE_T/d\eta)/(dN_{ch}/d\eta) \equiv E_T/N_{ch}$, are estimated at mid-rapidity, in a statistical-thermal model based on chemical freeze-out criteria, for a wide range of energies from GSI-AGS-SPS to RHIC. It has been observed that in nucleus-nucleus collisions, E_T/N_{ch} increases rapidly with beam energy and remains approximately constant at about a value of 800 MeV for beam energies from SPS to RHIC. E_T/N_{ch} has been observed to be almost independent of centrality at all measured energies [1]. The statistical-thermal model describes the energy dependence as well as the centrality independence, qualitatively well. The values of E_T/N_{ch} are related to the chemical freeze-out criterium, $E/N \approx 1\ GeV$ [2] valid for primordial hadrons. We have studied the variation of $< mass >, N_{decays}/N_{primordial}, N_{ch}/N_{decays}$ and E_T/N_{ch} with $\sqrt{s_{NN}}$ for all freeze-out criteria discussed in literature. These observables show saturation around SPS and higher $\sqrt{s_{NN}}$, like the chemical freeze-out temperature (T_{ch}) [3]. These observations along with the centrality independence of E_T/N_{ch} is consistent with the simultaneity of chemical and kinetic freeze-out at higher energies [4].

References

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