



Contribution ID: 204

Type: Oral Presentation

## Influence of initial state fluctuations on the production of thermal photons

Friday, 17 August 2012 15:40 (20 minutes)

Thermal emission of photons from relativistic heavy ion collisions is believed to have a very strong temperature dependence and the high  $p_T$  thermal photons are expected to provide a glimpse of the early part of the expansion history when the system is still in the plasma phase. Photons having  $p_T > 1$  GeV/c are thus specially suitable for probing fluctuations in the initial QCD matter density distributions. We present the  $p_T$  spectra, ratio of central to-peripheral yield and elliptic flow of thermal photons from an event-by-event ideal hydrodynamic calculation with fluctuating initial conditions (IC).

We show that fluctuations in the IC enhance the production of thermal photons significantly in the range  $2 < p_T < 4$  GeV/c compared to a smooth initial-state-averaged profile for Au+Au (Pb+Pb) collisions at RHIC (LHC) [1,2]. The relative effect of fluctuations in the IC is found to be stronger for peripheral collisions and for lower beam energies. Thermal photon  $p_T$  spectra are studied for different values of initial formation time  $\tau_0$  as well as for centrality dependent  $\tau_0$  values. We show that a suitably normalized ratio of central-to-peripheral yield as a function of collision centrality and  $p_T$  can be a useful measure of the fluctuation size scale [2].

PHENIX data for direct photon elliptic flow at RHIC is found to be significantly larger than the  $v_2$  results obtained using ideal hydrodynamics with smooth IC in the region  $1 < p_T < 6$  GeV/c. We show that fluctuations in the IC increase the elliptic flow for  $p_T > 2$  GeV/c for mid-central collisions compared to the results from a smooth initial-state-averaged profile [3]. We also show that these results depend strongly on the value of the fluctuation size scale as well as on the initial and final conditions of the hydrodynamic calculation [3].

[1] R. Chatterjee, H. Holopainen, T. Renk, and K. J. Eskola, Phys. Rev. C 83, 054908 (2011); R. Chatterjee, H. Holopainen, T. Renk, and K. J. Eskola, J. Phys. G 38, 124136 (2011).

[2] R. Chatterjee, H. Holopainen, T. Renk, and K. J. Eskola, arXiv:1204.2249 [nucl-th].

[3] R. Chatterjee, H. Holopainen, T. Renk, and K. J. Eskola [in preparation].

**Primary author:** Dr CHATTERJEE, Rupa (University of Jyväskylä)

**Co-authors:** Dr HOLOPAINEN, Hannu (Frankfurt Institute for Advanced Studies); Prof. ESKOLA, Kari J. (University of Jyväskylä); Dr RENK, Thorsten (University of Jyväskylä)

**Presenter:** Dr CHATTERJEE, Rupa (University of Jyväskylä)

**Session Classification:** Parallel 6E: Initial State and p-A (Chair E. Wang)

**Track Classification:** Electroweak probes