Contribution ID: **8** Type: **oral**

Direct photon interferometry as tool to probe the space-time evolution of heavy-ion collisions

Wednesday 13 January 2021 16:10 (20 minutes)

We investigate the measurement of Hanbury Brown-Twiss (HBT) photon correlations [1] as an experimental tool to discriminate different sources of photon production. To showcase that HBT correlations can distinguish between such sources, we consider two different scenarios in which we enhance the yields from standard hydrodynamical simulations. In the first, additional photons are produced from the early pre-equilibrium stage computed from the "bottom-up" thermalization scenario [2-4]. In the second, the thermal rates are enhanced close to the pseudo-critical temperature $T_c \approx 155\,\mathrm{MeV}$ using a phenomenological ansatz [5]. We compute the correlators for relative momenta q_o, q_s and q_l for different transverse pair momenta, $K_\perp$, and find that the longitudinal correlation is the most sensitive to different photon sources. Our results also demonstrate that including anisotropic pre-equilibrium rates enhances non-Gaussianities in the correlators, which can be quantified using the kurtosis of the correlators. Finally, we study the feasibility of measuring a direct photon HBT signal in the upcoming high-luminosity LHC runs. Considering only statistical uncertainties, we find that with the projected $\sim 10^{10}$ heavy ion events a measurement of the HBT correlations for $K_\perp < 1\,\mathrm{GeV}$ is statistically significant.

References

[1] E. Frodermann and U. Heinz, Phys. Rev. C80, 044903 (2009), arXiv:0907.1292 [nucl-th]
[2] J. Berges, K. Reygers, N. Tanji, and R. Venugopalan, Phys. Rev. C95, 054904 (2017), arXiv:1701.05064 [nucl-th]
[3] R. Baier, A. H. Mueller, D. Schiff, and D. T. Son, Phys. Lett. B502, 51 (2001), arXiv:hep-ph/0009237 [hep-ph]
[4] O. Garcia-Montero, (2019), arXiv:1909.12294 [hep-ph]
[5] H. van Hees, M. He, and R. Rapp, Nucl. Phys. A933, 256 (2015), arXiv:1404.2846 [nucl-th]

Authors: GARCIA-MONTERO, Oscar (FIAS, Goethe Universität Frankfurt); LÖHER, Nicole (Ruprecht Karls Universitaet Heidelberg (DE)); Dr MAZELIAUSKAS, Aleksas (CERN); BERGES, Jürgen (Heidelberg University); REYGERS, Klaus (Ruprecht Karls Universitaet Heidelberg (DE))

Presenter: GARCIA-MONTERO, Oscar (FIAS, Goethe Universität Frankfurt)

Session Classification: IS

Track Classification: The initial stages of heavy-ion collisions