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Long-range azimuthal correlations arising with HBT suppressions in partially coherent pion emissions in AA and pp collisions

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The presence of coherence in pion emission will suppress the strength of the final-state pion HBT correlations. The recently observed significant pion HBT suppressions in both Pb-Pb and pp collisions at the LHC indicate the pion emissions may be partially coherent in such violent collisions. In this talk we will show that the coherence in particle emission can give rise to a remarkable long-range azimuthal correlation.

In Ref [1], we study the pion transverse-momentum spectrum and elliptic anisotropy of an expanding coherent source with a classical current radiation model. It is found that the elliptic anisotropy of coherent emission is connected to the source initial geometry through an *interference* effect but is *not* sensitive to the source expansion (flow effect). We further construct a partially coherent source by adding an incoherent emission component described by a viscous hydrodynamic model. The partially coherent source model can successfully reproduce the experimental data on the pion p_T spectrum, $v_2(p_T)$ as well as 4-pion HBT correlations in Pb-Pb collisions at the LHC.

Furthermore, we focus on the coherence phenomena in pp collisions in Ref [2]. We extend the coherent pion source by incorporating a Bjorken longitudinal expansion and study the long-range two-particle angular correlations. A "*ridge*"structure is found to arise from the interferences in coherent emission and to be largely related to the source transverse shape and size at the initial time. From the 2-pion HBT measurement at the LHC, we extract a coherent fraction *increasing* with the charged-particle multiplicity, as an input of a partially coherent pion emission model, and the calculations suggest a more pronounced ridge effect from the coherent pion emission in high-multiplicity pp collisions.

Reference:
[1] Peng Ru, G. Bary and Wei-Ning Zhang, Pion transverse-momentum spectrum and elliptic anisotropy of partially coherent source, Physics Letters B, 777 (2018) 79-85.
[2] Peng Ru and Wei-Ning Zhang, Long-range azimuthal correlations arising with HBT correlation suppressions in partially coherent pion emissions in high-multiplicity pp collisions, in preparation.

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