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Azimuthally sensitive photon HBT interferometry at RHIC

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Azimuthally sensitive HBT interferometry can complement elliptic flow measurements by constraining the spatial deformation of the source and its time evolution. Performing these measurements on photons allows us to access the fireball evolution at earlier times than with hadrons. Using ideal hydrodynamics to model the space-time evolution of the collision fireball, we explore theoretically various aspects of 2-photon intensity interferometry with transverse momenta up to 2 GeV, in particular the azimuthal angle dependence of the HBT radii in non-central collisions. We find interesting differences in the structure of the photon correlation function when compared to that of hadrons, caused by the masslessness of the photon. We highlight the dual nature of thermal photon emission, in both central and non-central collisions, resulting from the superposition of QGP and hadron resonance gas photon production. This signature is present in both the thermal photon source function and the HBT radii extracted from Gaussian fits of the 2-photon correlation function. We find that the azimuthal oscillation amplitude of the sideward HBT radius for photons tracks the source eccentricity not only at KT=0 (as is the case for pions), but for all KT. This allows to reconstruct the time-evolution of the source eccentricity from the KT-dependence of the sideward oscillation amplitude.

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