



Contribution ID: 703

Type: Poster

## Lighting up the Photon Wigner Distribution via Dilepton Productions

We present a systematic investigation of lepton pair production through photon-photon fusion processes in heavy-ion collisions. It is demonstrated that the dilepton production at a given impact parameter ( $b_{\perp}$ ) with a fixed transverse momentum imbalance ( $q_{\perp}$ ) can be factorized into a unified formula in terms of the Wigner photon distribution of heavy nuclei. We show that this framework provides a comprehensive description of all the relevant data from RHIC to the LHC, with a strong evidence that the quasi-real photon can be radiated not only from the nucleus as a whole, standing for the coherent contribution, but also from the sub-structures inside the nucleus, representing the incoherent contribution. Further predictions are made for the anisotropies in the correlations between  $q_{\perp}$ ,  $b_{\perp}$ , and the dilepton transverse momentum ( $P_{\perp}$ ). This will help us to constrain the photon Wigner distribution which plays a crucial role to study the gluonic matter of nucleus at small- $x$  through the diffractive photoproduction processes in heavy ion collision.

### Category

Theory

### Collaboration (if applicable)

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**Session Classification:** Poster session 1

**Track Classification:** Physics of ultraperipheral collisions