Photon yield and elliptic flow from gluon fusion and splitting induced by magnetic fields in relativistic heavy-ion collisions

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Overview

1. Direct Photon Puzzle
2. Magnetic Fields in Peripheral Heavy-Ion Collisions
3. Gluon Fusion/Splitting with Magnetic Fields
4. UrQMD Calculation of Field Strength and Reaction Volume
5. Results for Excess Photon Yield and Elliptic Flow
6. Conclusions

Direct photons

Excellent probe to understand the time evolution of the hot and dens matter created in ultrarelativistic heavy ion collisions.

Produced throughout the collision. Carry information about the medium at times when the photons were emitted, because their onl interaction is electromagnetic.

Produced via interactions at partonic and hadronic levels in either initial hard scatterings or thermal radiation from the medium.

By de nition, do not originate from hadron decays.

In particular, thermal photons, which contribute dominantly at low momentum, are one of the most important probes because they allo us direct access to the thermodynamic properties of the created medium.

Photon spetra

PHENIX, Phys. Rev. Lett.123 (2019).

high-p_T photons from hard scattering described by NLO pQCD

+

low-p_T photons from thermal emission of the QGP + hadronic phase

PHENIX, PRC98, 054902 (2018)

Enhanced yield of low-pT direct photons, unexplained by hard photon production and cold nuclear matter e ects, was observed in Au+Au collisions in central and semi-central events at $\sqrt{s_{NN}}$ = 200 GeV.

Direct photon puzzle

C. Shen, Nucl.Phys. A956 (2016)

Direct photons: prompt + thermal + non-cocktail

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Direct photons: yields + ow