

# Dilepton production from an anisotropic quark gluon plasma

A. Dumitru<sup>1</sup>   M. Martinez<sup>2</sup>   M. Strickland<sup>3</sup>

<sup>1</sup>Institute für Theoretische Physik  
Johann Wolfgang Goethe Universität-Frankfurt

<sup>2</sup>Helmholtz Research School  
Johann Wolfgang Goethe Universität-Frankfurt

<sup>3</sup>Frankfurt Institute for Advanced Studies  
Johann Wolfgang Goethe Universität-Frankfurt

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# Outline

- 1 Electromagnetic probes in heavy ion collision
  - Importance of electromagnetic probes
  - Longitudinal redshift of  $q, \bar{q}$  momenta
- 2 Calculation of the Dilepton rate
  - Dilepton rate at leading order
  - Anisotropy in the distribution function
- 3 Preliminary results
  - Dilepton rate vs.  $P_T$
  - Dilepton rate vs.  $M$
- 4 Future perspectives

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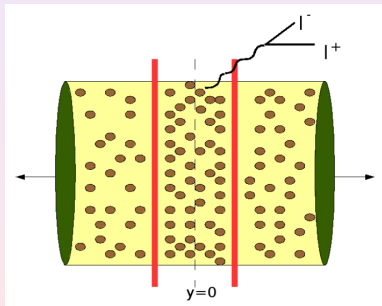
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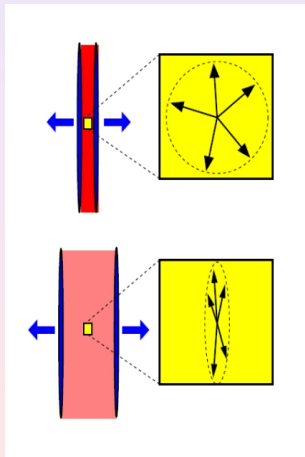
# Importance of electromagnetic probes



## Characteristics

- Electromagnetic probes **do not interact** with the dense medium.
- Provide information about  $q, \bar{q}$  distributions in the early stage of the collision.

# Origin of an Anisotropic distribution

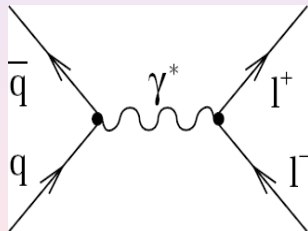


- In the prethermalization stage, **parton momentum distributions are anisotropic due to rapid longitudinal expansion.**
- $\langle p_T \rangle \sim Q_s$  (nuclear saturation scale)  
 $\langle p_L \rangle \sim 1/\tau$  (free streaming)

# Dilepton rate at leading order

Using relativistic kinetic theory, the dilepton rate production is given, to leading order by:

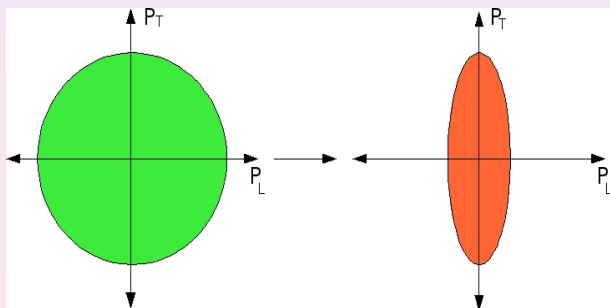
$$\frac{dN}{d^4x d^4p} = \frac{dR}{d^4P} = \int \frac{d^3\mathbf{p}_1}{(2\pi)^3} \frac{d^3\mathbf{p}_2}{(2\pi)^3} f_q(p_1, T) f_{\bar{q}}(p_2, T) \times v_{rel} \sigma_{q\bar{q} \rightarrow l+l-}^{LO} \delta^4(P - p_1 - p_2)$$

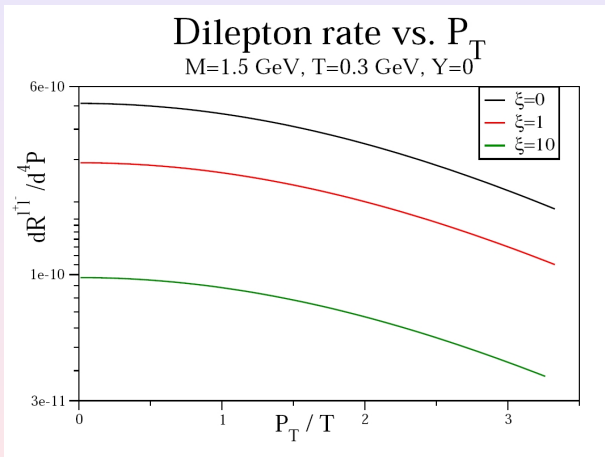


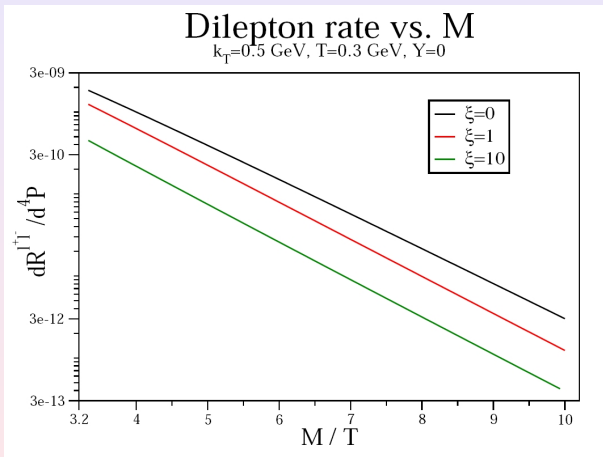
# Anisotropy in the distribution function

We assume that the anisotropic distribution function can be obtained from an arbitrary isotropic distribution function by a change of its argument

$$f(\vec{p}^2) \quad \longrightarrow \quad f(\vec{p}^2 + \xi(\vec{p} \cdot \hat{e}_z)^2)$$







# Future perspectives

- Consider dynamical evolution:  $\xi(\tau)$ .
- Integration over  $d^4x \rightarrow$  dilepton spectra  $\frac{dN}{dM}$ , etc.
- For small values of  $M$ , need NLO processes.