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U N U S U A L S E M I N A R

Jet Momentum Broadening in Viscous QCD Matter: A Moment Expansion Approach

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ABSTRACT

Jets probe the quark–gluon plasma at its earliest, most far-from-equilibrium stages, when the medium is strongly flowing and highly anisotropic. Medium-induced broadening is typically encoded in a single scalar transport coefficient, the jet quenching parameter $\hat q$, defined in the medium's local rest frame.

This scalar description is tied to a specific rest frame and a single "transverse" plane, missing the rich directional structure and flow-induced anisotropies that appear in broadening in realistic, expanding QCD matter.

We formulate out-of-equilibrium jet momentum broadening in QCD effective kinetic theory through a moment expansion of the medium distribution function, a method traditionally used to derive relativistic viscous hydrodynamics from kinetic theory. We explicitly compute the leading near-equilibrium contribution to the spatial jet broadening tensor $ \hat q^ij$ within the 14-moment approximation, and show that it is controlled by the medium shear-stress tensor.

This provides a direct map from QCD effective kinetic theory to event-by-event viscous hydrodynamic simulations, converting local shear-stress fields into anisotropic corrections to jet broadening in heavy-ion collisions.

Dr Isabella Danhoni is a high-energy physics researcher who works as a Postdoctoral Research Associate at the University of Illinois Urbana-Champaign (UIUC).

Date:
Wednesday, 26 August 2026

Time:
16h00-17h00 SAST

Venues:

- Honours Presentation Room P213
  2nd floor, School of Physics
  East Campus
  University of the Witwatersrand
- Online

WHO SHOULD ATTEND?
All are welcome.

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