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Are jets narrowed or broadened in medium?

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We compute the in-medium jet broadening $\langle p_\perp^2 \rangle$ to leading order in energy in the opacity expansion. At leading order in α_s the elastic energy loss gives a jet broadening that grows with $\ln E$. The next-to-leading order in α_s result is a jet narrowing, due to destructive LPM interference effects, that grows with $\ln^2 E$. We find that in the opacity expansion the jet broadening asymptotics are—unlike for the mean energy loss—extremely sensitive to the correct treatment of the finite kinematics of the problem; integrating over all emitted gluon transverse momenta leads to a prediction of jet broadening rather than narrowing. We compare the asymptotics from the opacity expansion to a recent twist-4 derivation of $\langle p_\perp^2 \rangle$ and find a qualitative disagreement: the twist-4 derivation predicts a jet broadening while the opacity expansion method predicts a narrowing. Comparison with current jet measurements cannot distinguish between the broadening or narrowing predictions. We comment on the origin of the difference between the opacity expansion and twist-4 results.

Primary authors: SIEVERT, Matthew (University of Illinois at Urbana-Champaign); HOROWITZ, William (University of Cape Town)

Presenter: HOROWITZ, William (University of Cape Town)

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