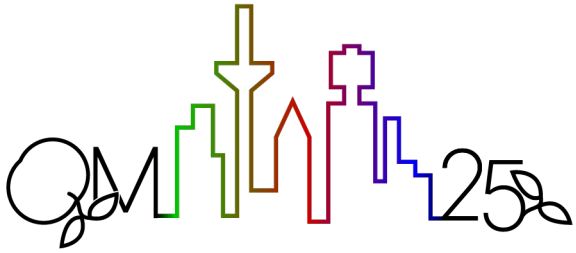

Contribution ID: **650** Type: **Poster**

Visualizing How the Structure of Jets Shapes the Structure of Their Wakes

We begin by using Hybrid Model calculations to reproduce experimental results published by ATLAS in 2023 on R_{AA} for $R = 1$ jets in Pb+Pb collisions. These jets are identified by first reconstructing anti-k_t $R = 0.2$ subjets and then re-clustering them. Following ATLAS, we investigate how R_{AA} for these large-radius jets depends on the angle between the two subjets involved in the final clustering step of the $R = 1$ jet. We also study the dependence of R_{AA} for these jets on the resolution length of quark-gluon plasma (QGP), defined such that the medium can only resolve partons in the jet shower that are separated by more than this length scale. Our investigation suggests that measurements like those pioneered by ATLAS can constrain the resolution length of QGP.

We also use this setup to analyze the response of the medium to the passage of large-radius $R = 2$ jets containing two $R = 0.2$ subjets, produced in gamma-jet events, and identified as above. We introduce novel jet-shape observables that allow us to visualize the angular shape of the soft hadrons originating from the wakes that wide jets with two skinny subjets excite in the droplet of QGP, as a function of the angular separation between the subjets. We find that even when two hard subjets are 0.8 to 1.0 radians apart, a single broad wake is produced. When the two subjets are even farther apart, the presence of two sub-wakes is revealed. In our Monte Carlo study, the new observables that we introduce allow us to visualize how jet structure shapes jet wakes unambiguously. We close by showing that similar clarity may be achieved experimentally by measuring the jet shape observables we have introduced using only those hadrons with low transverse momenta.

Category

Theory

Collaboration (if applicable)

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Session Classification: Poster session 1

Track Classification: Jets