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How many interactions does it take to modify a jet?

This work aims to shed light on the puzzle of small systems constituted by the absence of jet quenching but the presence of a non-zero v_2 of high pt particles. This is done using the JEWEL event generator with a brick-like medium definition mimicking a small collision system. We concentrate on two observables: $R_A A$, which measures the energy loss of jets, and v_2 of high $p_\perp$ particles, which quantifies the azimuthal anisotropy of produced particles. By extracting R_{AA} and v_2 as a function of number of scatterings (N_{scat}) in the brick-like medium, we obtain answers that are largely independent of any assumptions about the medium evolution and expansion.

What we have found is that the observables do not depend only on the number of interactions but also on the screening mass (m_D), which controls how much energy and momentum are transferred at each interaction. In fact, $R_A A$ and v_2 scale with $m_D^2 \cdot N_{scat}$. The results also strongly indicate that more interactions (and thus more energy/momentum transfer) are required to create a visible $R_A A$ signal than a v_2 signal. This in turn helps appease the years long debate on how it is possible that no jet quenching signs have been seen in collisions of small systems while an azimuthal anisotropy of hard particles is observed and thus allows the community to move on to study the modification of jets in small systems using more suitable observables.

Category

Theory

Collaboration (if applicable)

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