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Jet-flow coupling in heavy-ion collisions and the jet-induced diffusion wake

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Diffusion wake accompanying jet-induced Mach-cone is a unique feature of jet-medium interaction in high-energy heavy-ion collisions. We explore the 3D structure of the diffusion wake induced by triggered jets in Pb+Pb collisions at the LHC energy within the coupled linear Boltzmann transport and hydro model. We identify a valley structure caused by the diffusion wake on top of a ridge from the initial multiple parton interaction (MPI) in jet-hadron correlation as a function of rapidity and azimuthal angle. This leads to a double-peak structure in the rapidity distribution of soft hadrons in the opposite direction of the jets as an unambiguous signal of the diffusion wake. The interaction between the jet and QGP fluid will also deflect partons associated with the jet from their initial direction. Such deflection depends on the energy of the jet constitutes and the velocity of the flow, leading to an angular intra-jet asymmetry of particle distribution inside the jet. We also study the intra-jet asymmetry and its dependence on jet path length and fluid viscosity in both transverse and longitudinal directions. Our methods can be further used to localize the initial production position of the jet without specified requirements of the jet direction.

Category

Theory

Collaboration (if applicable)

Primary authors: LUO, Tan (IGFAE); Dr HE, Yayun (South China Normal University); SALGADO LOPEZ, Carlos Albert (Universidade de Santiago de Compostela (ES)); Dr WANG, Xin-Nian (Lawrence Berkeley National Lab. (US)); YANG, Zhong (CCNU)

Presenter: YANG, Zhong (CCNU)

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