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Jet tomography of fluctuating initial conditions and the opaqueness evolution from RHIC to LHC

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High energy jets, penetrating the hot QCD matter created in heavy ion collisions, provide unique probe of the medium property and the fluctuating initial conditions. Recently there has been a lot of interests in extracting the possibly nontrivial temperature dependence of the jet-medium coupling. Particularly sensitive to such T-dependence are two sets of observables: the anisotropy of jet energy loss via the azimuthal angle dependence of suppression $R_{aa}(\phi)$ (or equivalently the various harmonic coefficients v_n at high p_t), as well as the evolution of the overall suppression with beam energy, $R_{aa}(\sqrt{s})$. We report our systematic study of these observables using event-by-event simulations, and compare with available data from RHIC to LHC. The results strongly suggest a nontrivial temperature dependence of the jet-medium coupling and in particular its enhancement near the parton/hadron phase boundary. Recently emerging evidences for such a possibility from various other jet modelings, as well as efforts to understand such peculiar medium property from microscopic theories will also be discussed. Finally we also briefly discuss potentially final state jet attenuation effect in (possibly created) hot medium in the "mini-bang" (pPb and dAu collisions) and demonstrate that jet quenching anisotropy could provide a clean probe to tell whether there is substantial final state interaction in those collisions.

Author: LIAO, Jinfeng (Indiana University)

Presenter: LIAO, Jinfeng (Indiana University)

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