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Probing early-time dynamics with charm balance functions (live)

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For a long time it was conjectured that the large azimuthal anisotropic flow observed in heavy-ion collisions implied early thermalization. After the discovery of azimuthal anisotropic flow in small systems, where it is unclear if there is time for the system to thermalize, it was realized that one can have hydrodynamization, a phenomena in which flow can build up out-of-equilibrium (chemical and thermal). Recent calculations in kinetic theory supports such a scenario where one starts out with a purely gluonic system and the light quarks first are produced when the system is already flowing. However, this also means that one cannot access early-time dynamics with light quarks.

In this talk we propose to use low p_{T} charm quarks to study the dynamics of the hydrodynamization process. The advantage with charm quarks is that:
- they are dominantly produced early in the collision with rates that should be calculable in pQCD
- they interact with the medium building up some amount of azimuthal anisotropic flow
- they do not thermalize (forget the past) as their final yields would then essentially be zero

We propose to go beyond flow measurements by measuring the balance function of hadrons with (anti)charm. By subtracting charm-charm and anticharm-anticharm correlations from charm-anticharm correlations we want to directly deduce how the charm and anticharm quarks interacts with the system after their production. By measuring the evolution of the charm-anticharm correlation function from small-to-large systems we hope to provide direct experimental insights into the early-time QCD dynamics.

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