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Charm v_2 is more hydrodynamic than light quark v_2

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Heavy quarks are produced by hard scatterings at early times and experience almost the entire history of the collision evolution in relativistic heavy ion collisions. Their azimuthal anisotropy v_2 is a very useful tool for the study of the properties of the quark-gluon plasma (QGP). Recent studies with transport models suggest that the majority of the light quark v_2 at RHIC energies comes from anisotropic escape of partons, not from the hydrodynamic flow [1-2]. So a natural question is whether the charm quark v_2 mainly comes from the anisotropic escape or hydrodynamics.

To address this question we report in this talk our recent study [3-4] using a multi-phase transport (AMPT) model, which has been very successful in describing experimental data for the bulk matter [5]. We study the charm v_2 in heavy ion as well as small system collisions by tracking the evolution history of quarks of different flavors at both RHIC and LHC energies. The charm quark v_2 is studied as a function of the number of collisions the charm quark suffers with other quarks and compared to the v_2 of lighter quarks. We find that the common escape mechanism is at work for both the charm and light quark v_2. However, contrary to the naive expectation, the hydrodynamics-type flow contributes much more to the charm v_2 than the light quark v_2. This could be explained by the smaller average deflection angle the heavier charm quark undergoes in each collision, thus charm quarks remember better the accumulative anisotropy than the light quarks. Our finding suggests that the charm v_2 is a better probe for studying the hydrodynamic properties of the quark-gluon plasma.

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Summary

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