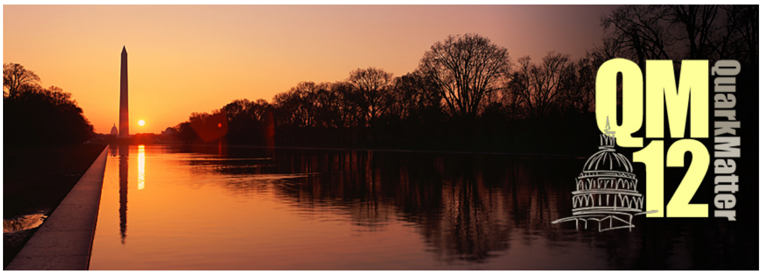

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The universality of eta/s

Thursday, 16 August 2012 16:00 (2 hours)

ALICE, ATLAS and CMS detectors at LHC and previously PHENIX and STAR detectors at RHIC have provided compelling evidence for higher order flow components apart from the elliptic flow v2. It is by now well established that
both RHIC and LHC have produced a "perfect fluid"of Quark Gluon Plasma with eta/s close to zero, as predicted by
AdS/CFT limit. One expects that higher order harmonics and in particular triangular flow v3 will constrain eta/s more
precisely. Although, the particle density per participant pair at 2.76 TEV (LHC) is a factor of 2.15 higher than at
RHIC, eta/s remain almost the same going from RHIC to LHC. It is known that [1] eta/s / 1/g4 and 1/g2 [ln(T/T)]2,
thus /s becomes and increasing function of the temperature. However, a simple [2] estimate indicates, that the initial
temperature for eta/s 0.08 changes from 360 MeV for RHIC to 530 MeV for LHC. Given the logarithmic dependence
of /s on the temperature, it is almost natural that /s at LHC (2.76 TeV) does not changes perceptibly going from
RHIC to LHC [3]. Our prediction is that even for the highest energy of LHC, eta/s will not change perceptably.
The second great puzzle is the universality of /s 1/4, applicable across a large number of phenomena, dramatically different from each other. Ultracold quantum degenerate strongly interacting atomic Fermi gas, Graphene,
even Giant resonances in finite nuclei exhibit the same behavior of /s 1/4. It is remarkable that both the coldest
and hottest matter on earth are rather similar. This universaility is a direct consequence of strong coupling due to
many body interaction leading to observable correlation. This observation will be presented.

References:
[1] J. I. Kaputs, J. of Phys. G34 (2007)S295-S303 and references therein.
[2] A.K. Chaudhuri and Bikash Sinha, to be

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