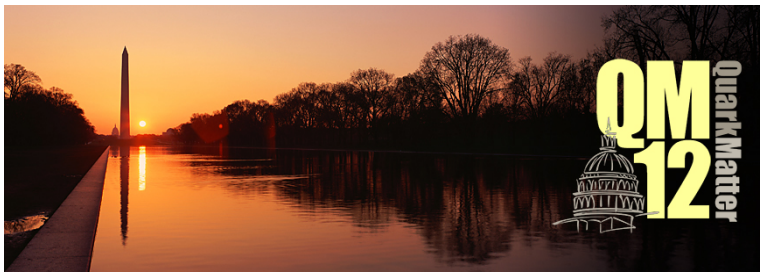

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Can baryon stopping explain the breakdown of constituent quark scaling and proposed signals of chiral magnetic waves at RHIC?

Thursday 16 August 2012 16:00 (2 hours)

Azimuthal emission spectra of various hadron species in ultra-relativistic heavy ion collisions at $\sqrt{s_{NN}} \approx$ 200 GeV exhibit a curious hierarchy at intermediate p_t ($\approx 2-3$ GeV). Rather than being ordered by mass, the spectra seem to be ordered by whether the species is a baryon or meson. It is seen that when the elliptic flow v_2 and transverse momentum p_T are both scaled by the number of quarks in each hadron, the spectra fall in line with each other [1]. This number of constituent quark (NCQ) scaling suggests a system where the relevant degrees of freedom are colored partons as opposed to hadrons: the quark-gluon plasma (QGP). Thus, a break down of this scaling as beam energy is reduced could be indicative of the QGP threshold. However, at lower energies, there is also an increase in the number of entrance-channel partons transported to mid-rapidity due to baryon stopping, which can also violate NCQ scaling, even above the QGP threshold [2]. We describe a specific pattern for the break down of the scaling that includes the observed difference in elliptic flow for positive and negative pions. \\
We also contrast baryon stopping with the Chiral Magnetic Effect (CME) [3]–an alternative model for π_+/π_- flow difference–and discuss results from tests that can distinguish between them.

[1] Rainer J. Fries, Vincenzo Greco, and Paul Sorensen, Coalescence Models For Hadron Formation From Quark Gluon Plasma, Ann.Rev.Nucl.Part.Sci. 58 (2008), 177–205.

[2] J.C. Dunlop, M.A. Lisa, and P. Sorensen, Constituent quark scaling violation due to baryon number transport, Phys.Rev. C84 (2011), 044914.

[3] Yannis Burnier, Dmitri E. Kharzeev, Jinfeng Liao, and Ho-Ung Yee, Chiral magnetic wave at finite baryon density and the electric quadrupole moment of quark-gluon plasma in heavy ion collisions, Phys.Rev.Lett. 107 (2011), 052303.

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