Motivation for studying multiplicity cumulants and cumulant ratios: C_1, C_2, C_3, C_4, $C_3/C_2=S\sigma$, $C_4/C_2=K\sigma^2$

...cumulants and ratios directly comparable to susceptibilities and ratios from Lattice QCD

　　direct connection between experiment and theory

...increasing order of cumulant increasingly sensitive to divergences of the correlation length

　　could be very sensitive to the possible presence of a QCD Critical Point

...To lowest order in LQCD Taylor expansions, C_1/C_2 directly gives μ_B/T, C_3/C_1 directly gives T

　　allows inferences of freeze-out (μ_B,T), complementary to SHM fits using C_1 ratios (*e.g.* THERMUS)

The new 14.5 GeV data is important - it is centered in a μ_B wide gap in the 2010&2011 BES data...

　　　　μ_B~316 MeV @ 11.5 GeV,　μ_B~266 MeV @ 14.5 GeV,　μ_B~206 MeV @ 19.6 GeV

Like the low $\sqrt{s_{NN}}$ data from 2010 and 2011 though, ~90% of the events are not useful

　　very careful bad-run and bad-event-in-good-run QA cuts are needed.

　　with these cuts, we have ~11M good events from the Run-14 14.5 GeV running.

refmult2 & refmult3
centrality looks fine

QA
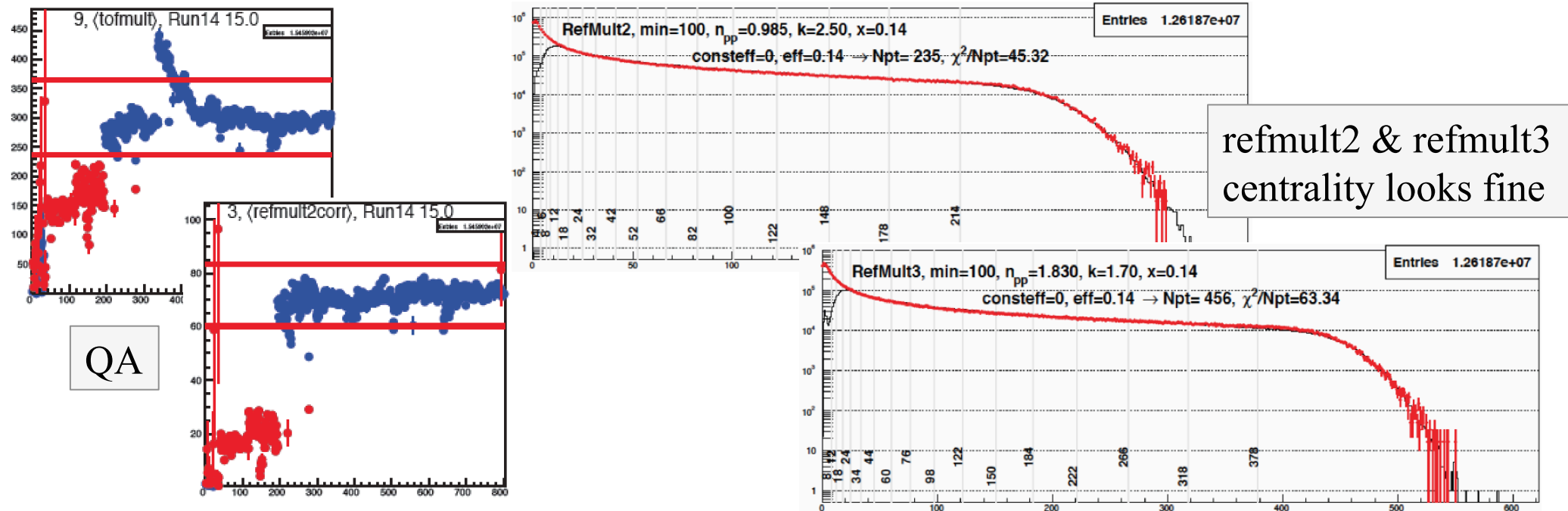
M. Stephanov, Rice Workshop,
May 23-25, 2012

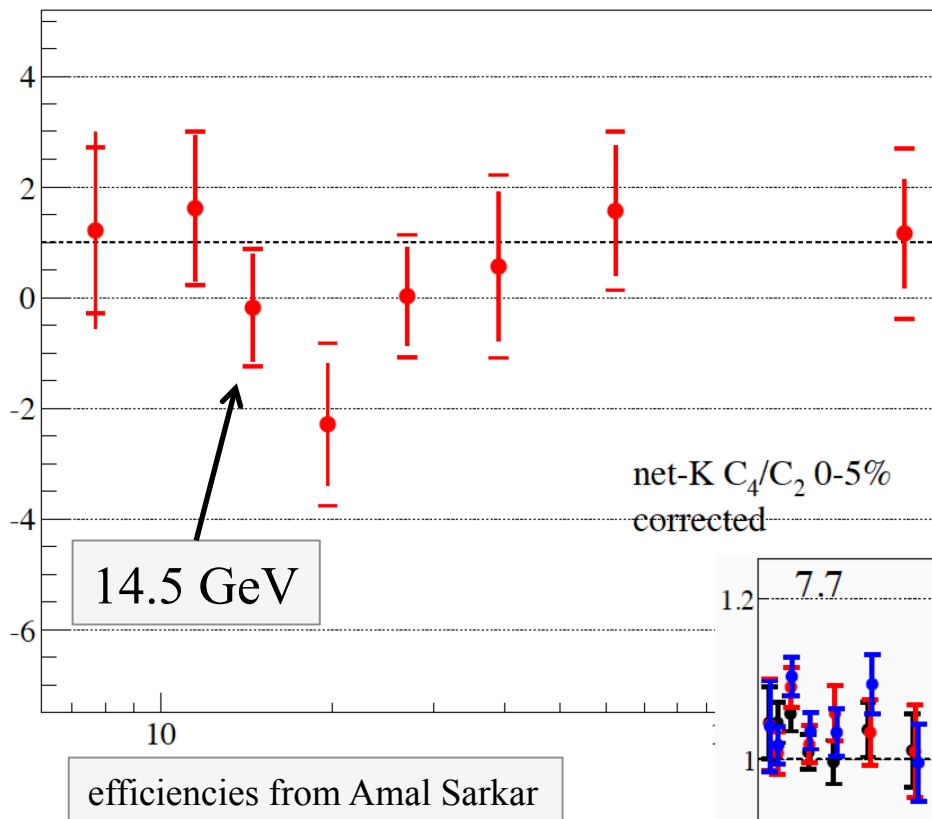Expectation of the Athanasiou, Stephanov, & Rajagopal non-linear sigma model...
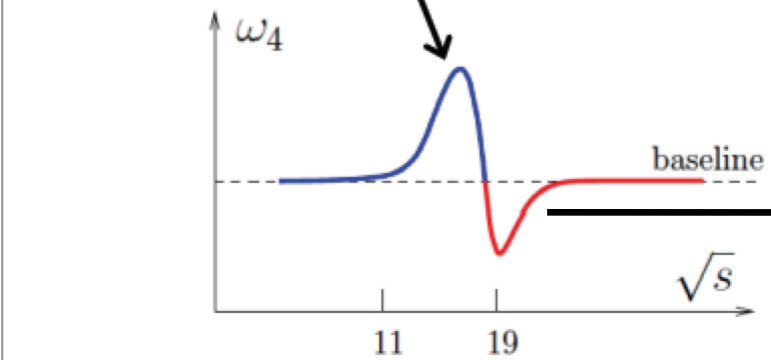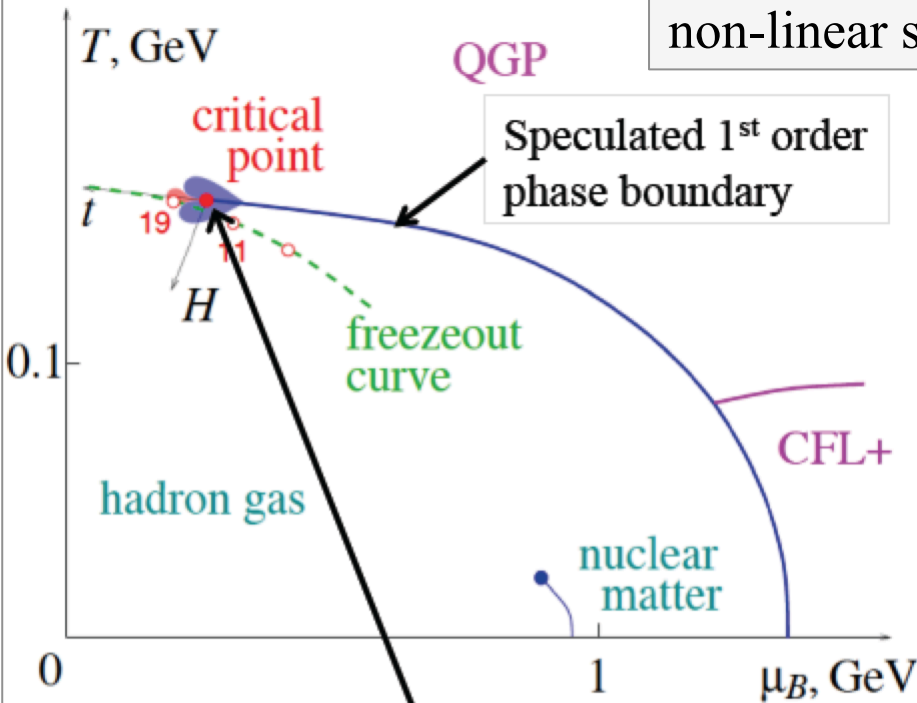
Coupling of various particles to the divergent sigma field is poorly known though....
...Thus, independent analyses of net-p, net-q, and net-K in progress by X. Luo and B. Llope...
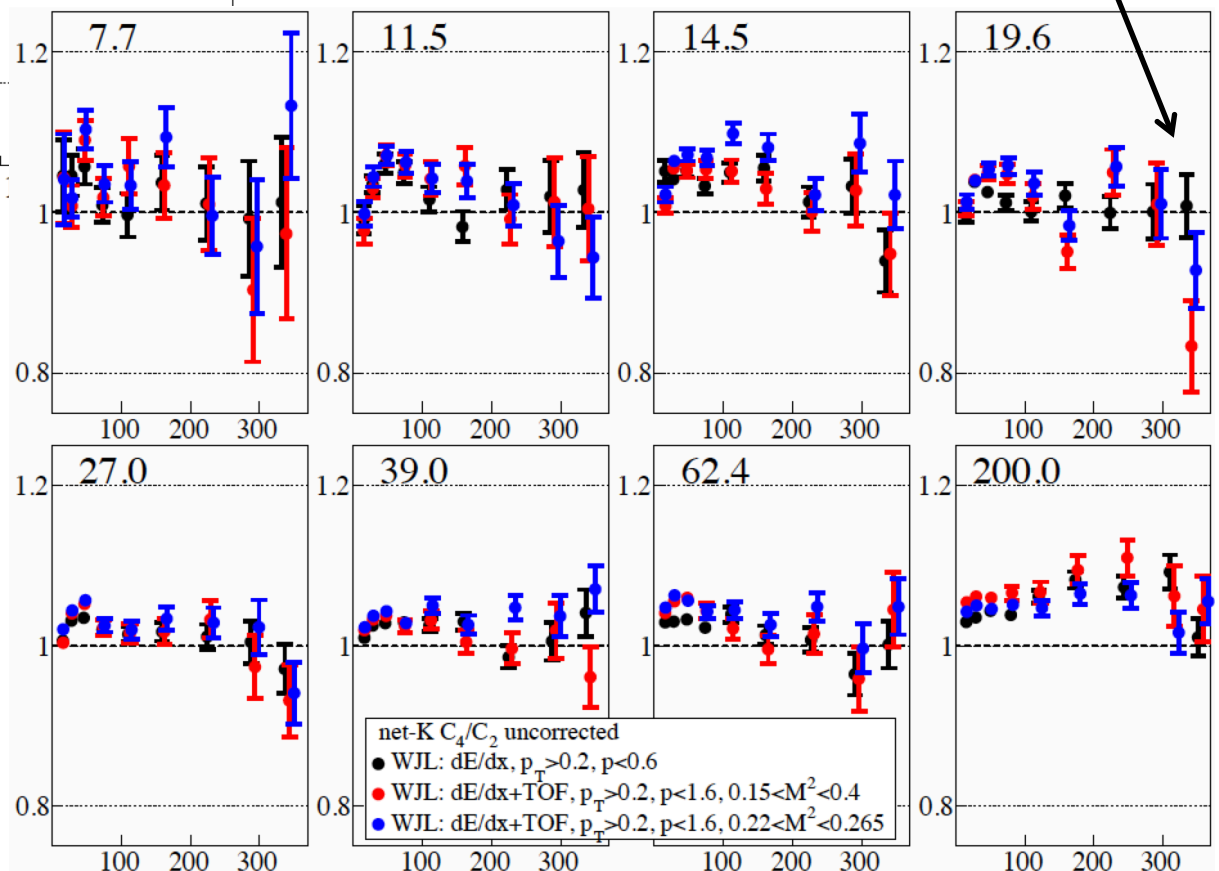...Generally good agreement

does the new 14.5 GeV point show the expected "wiggle"?!?

$C_4/C_2 = K\sigma^2$

Analyses and plots from B. Llope and X. Luo
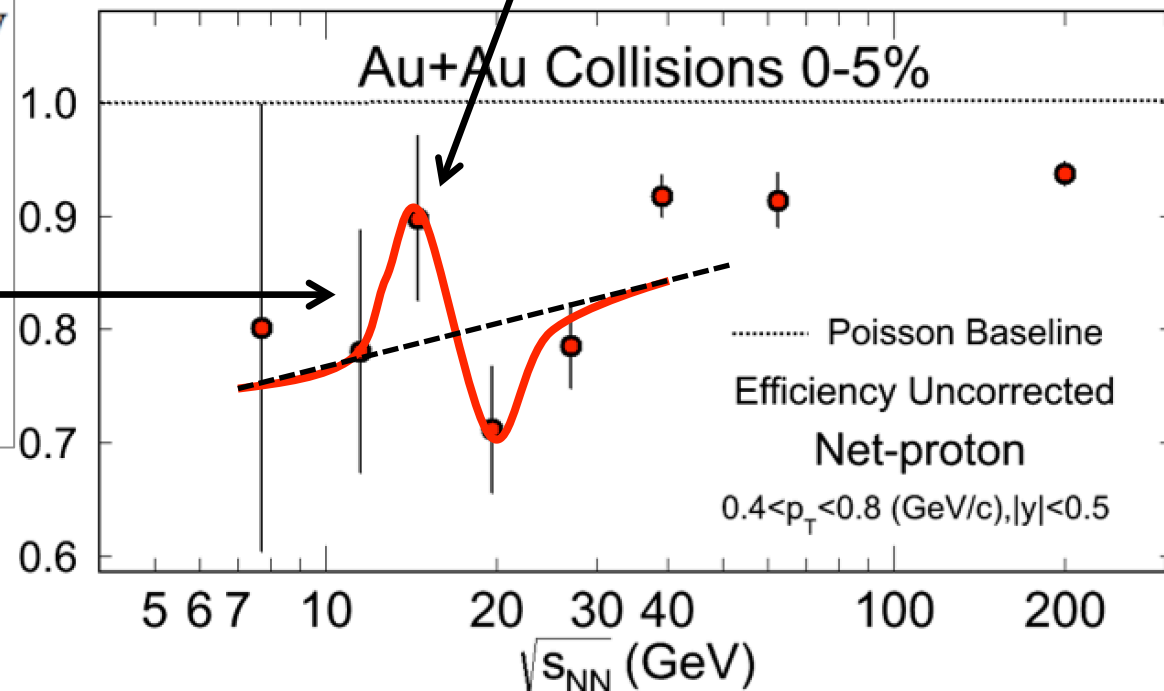
net-Kaons might also be showing a "dip" below the Poisson baseline @ 19.6

Rather strong dependence on the cuts set used though... Need more studies

net-K C_4/C_2 0-5% corrected

14.5 GeV

efficiencies from Amal Sarkar

See also Amal's talks at this meeting!

net-K C_4/C_2 uncorrected
- WJL: dE/dx, $p_T > 0.2$, $p < 0.6$
- WJL: dE/dx+TOF, $p_T > 0.2$, $p < 1.6$, $0.15 < M^2 < 0.4$
- WJL: dE/dx+TOF, $p_T > 0.2$, $p < 1.6$, $0.22 < M^2 < 0.265$

Analyses and plots from B. Llope and X. Luo

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An additional two weeks of 14.5 GeV running would ~double the available statistics...
TOF TF002 problem fixed, clock readout problem fixed, detectors in good shape

Would slightly decrease the uncertainties, but it is the last chance to solidify the possible "wiggle" in the net-proton C_4/C_2 before ~2018...

Analyses and plots from B. Llope and X. Luo