

Title: Concluding Remarks

Date: 2007-05-25 17:40:00

Abstract:

Exotic States of Hot & Dense Matter and their Dual Description

Wrap-up

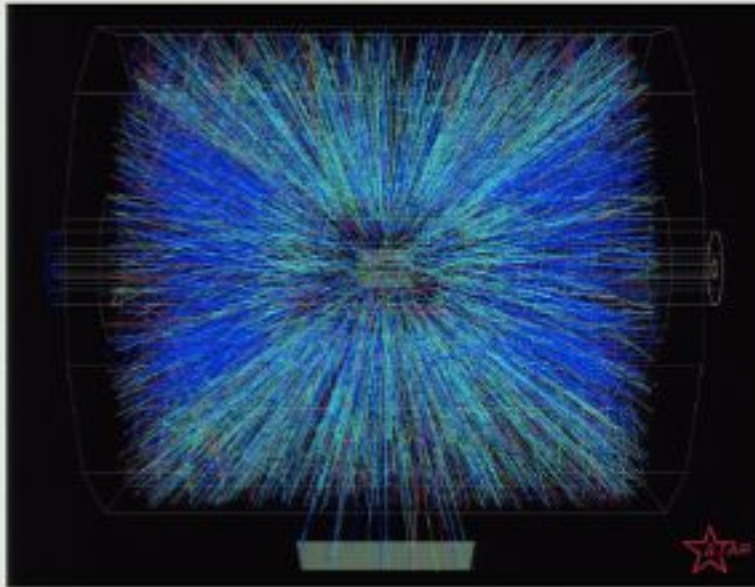
Laurence Yaffe

University of Washington



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Heavy ion collisions



QGP @ RHIC \neq weakly interacting gas
Important discovery.

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Lessons from the lattice

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Lessons from the lattice

Video games are good for science.

Z. Fodor

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Lessons from the lattice

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Extracting spectral functions tough, not hopeless.

G. Aarts

Lessons from the lattice

Video games are good for science.

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G. Aarts

Large N_c works! $3 \approx \infty$.

M. Teper

AdS/CFT for QCD

Bad name. Much Better: gauge/string duality.

AdS/CFT for QCD

Wonderful progress.

P. Argyres, J. Erdmenger, N. Evans, S. Gubser,
C. Herzog, R. Janik, K. Kajantie, Y. Kovchegov,
H. Liu, D. Mateos, R. Myers, L. Pando Zayas,
K. Rajagopal, D. Son, M. Stepahov, D. Teaney

AdS/CFT for QCD

Much more to do:

light quark dynamics, \hat{q} controversy

$\langle T^{\mu\nu}(x) \rangle$ interesting non-eq. states

$1/\lambda$ corrections,

$1/N_c$ corrections,

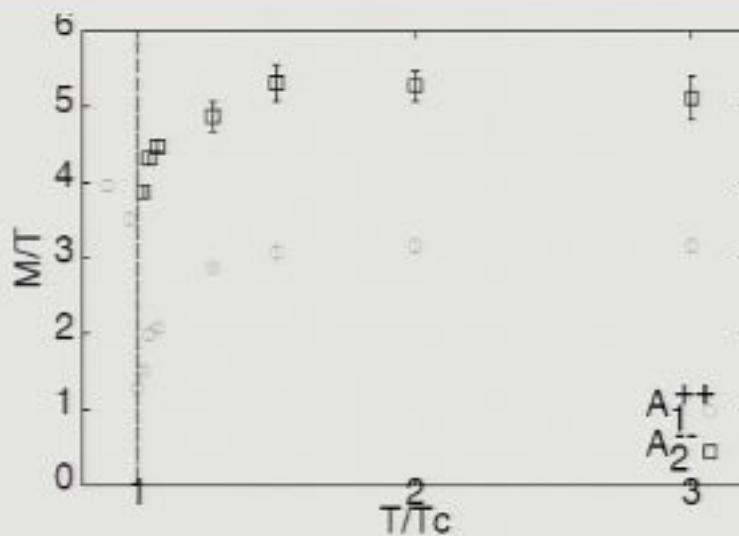
results for more QCD-like theories (with known gravity duals), ...

important!

L. Pando Zayas

A. Buchel, ...

AdS/CFT: Relavance to real QGP?



S. Datta & S. Gupta

Screening masses:

m/T temperature independent for $1.5 \leq T/T_c \leq 4$.

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AdS/CFT: Relevancy to real QGP?

A few comparisons, Gubser, 5-25-07

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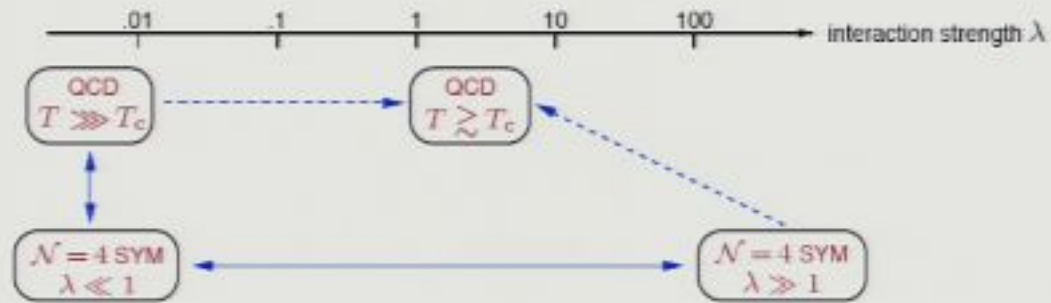
6 Comparing $N=4$ to the QGP

quantity	formula	obvious	alternative	QGP	comments
s/s_{free} [21, 22]	$\frac{3}{4} + \frac{45\zeta(3)}{32\pi^3\lambda^2}$	0.77	0.88	0.6 – 0.9	lattice e.g. [23] HTL [24, 25]
η/s [26, 27]	$\frac{1}{2\pi} + \frac{15\zeta(3)}{32\pi^3\lambda^2}$	0.10	0.2	0 – 0.3	
τ_{therm} [13]	$\frac{1}{2.2T_{peak}}$	0.3 fm	0.4 fm	0.6 – 1.0 fm	Also [28, 29] $T_{peak} \sim 300$ MeV
t_{charm} [1, 3, 3]	$\frac{2m_c}{\pi T^2 \sqrt{\lambda}}$	0.65 fm	2.1 fm	3 – 6 fm	[30, 31, 32] hadronization b -tagging
\hat{q} [33] \hat{q}_T [4, 5]	$\frac{e^{\lambda^2} \Gamma(3/4) \sqrt{3} T^3}{\Gamma(5/4)}$ $2\pi \sqrt{\lambda} \gamma T^3$	$2.6 \frac{\text{GeV}^2}{\text{fm}}$ $5.8 \frac{\text{GeV}^2}{\text{fm}}$	$0.61 \frac{\text{GeV}^2}{\text{fm}}$ $1.4 \frac{\text{GeV}^2}{\text{fm}}$	$1 - 15 \frac{\text{GeV}^2}{\text{fm}}$	\hat{q}_T for charm @ $E \sim 10$ GeV
m_D [18]	$(10.6 - \frac{6.7}{\lambda^{3/2}}) T$	3.6 GeV	2.6 GeV	~ 1.9 GeV	lattice [34] $T \sim 340$ MeV 6.7 conjectural

Table 1: A few comparisons between $N=4$ SYM and the QGP. QGP numbers are representative ranges. $T = 250$ MeV unless otherwise noted. $T_c = 170$ MeV, $m_c = 1.4$ GeV assumed.

Goal: "Extrapolate to Reality"

D. Teaney



G. Moore
E. Shuryak
A. Rebhan

Other directions

Cold and dense matter

No end of subtleties, need data!

V. Miranskyy
I. Shovkovy
T. Schaefer
T. Kunihiro
E. Ferrer

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Cosmological applications

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A. Zhitnitsky

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Quantum critical transport

P. Kovtun

Thanks...

to the organizers and the PI!

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