The Physics of RHIC (1) Introduction HUGS 2007

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Normal nuclear matter

Nucleons -- made of quarks and gluons -- are close together, but only overlap occasionally

High density matter



Expect individual hadrons to loose their identity. Quarks and gluons become deconfined.

QCD phase diagram



T >> Λ_{QCD} : weak coupling \Rightarrow deconfined phase (Quark-gluon plasma) T << Λ_{QCD} : strong coupling \Rightarrow confinement

 \Rightarrow phase transition at T ~ Λ_{QCD} ?

Lattice QCD at finite temperature



Ideal gas (Stefan-Boltzmann limit)

Time line of a relativistic heavy ion collision



RHIC: the Relativistic Heavy Ion Collider



RHIC at Brookhaven National Laboratory



RHIC: the Relativistic Heavy Ion Collider



BRAHMS





PHENIX



PHOBOS





STAR: the Solenoidal Tracker At RHIC



STAR Event from a Au+Au Collision





Pseudo-rapidity: $\eta = -\ln[\tan(\theta/2)]$

Transverse momentum (p_T) and pseudorapidity (η) provide a convenient description

Mid-rapidity: $\eta = 0$, perpendicular to the incident beams $\eta = 4$:Scattering at $\theta = 2.1^{\circ}$ in the CM (or lab) frame

Terminology that has become common at RHIC:

"Low" p_T : $p_T <~ 2 \text{ GeV/c}$ "Intermediate" p_T : $2 <~ p_T <~ 6 \text{ GeV/c}$ "High" p_T : $6 \text{ GeV/c} <~ p_T$