



NTNU

Norwegian University of Science and Technology

Thermodynamics of the 2D nonlinear sigma model (Extreme QCD)

Erik Livermore

Motivation

- QCD at high $T \sim 10^{12} K$
- Quite early universe $t \sim 10^{-5} s$
- Asymptotic freedom \rightarrow quark-gluon plasma
- $Z = \int [d\phi] \exp \left[-\frac{1}{2} \int_0^\beta d\tau \int d^3x \phi \left(-\frac{\partial^2}{\partial \tau^2} - \nabla^2 + m^2 \right) \phi \right]$
- QCD: $2 \times 3 \times 3$ fermions + 8 gluons + polarization, in 4 dimensions, with temperature?!?!?

Toy model! Nonlinear sigma model

- $1 \ll 3$
- N identically behaving spin-0 types of particles
 - Doable

