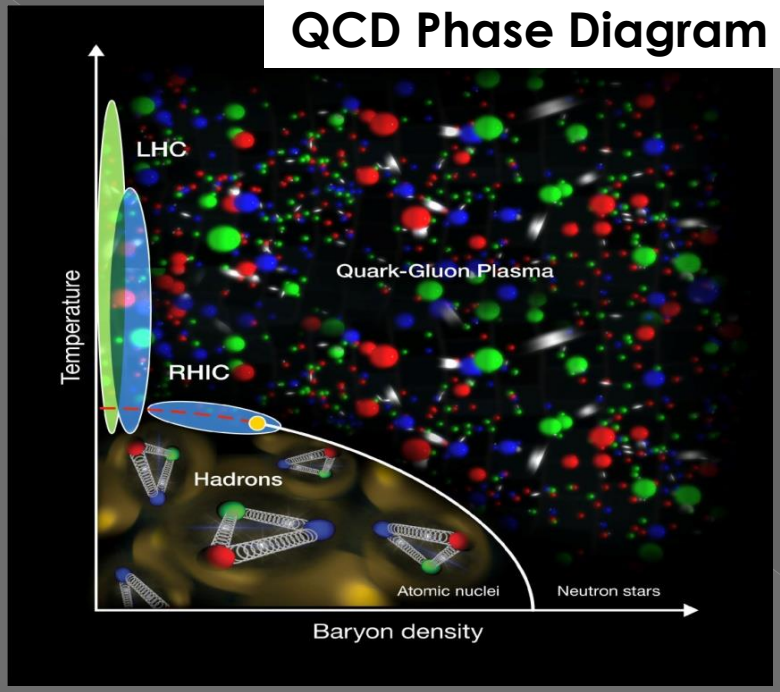
54th International Winter Meeting on Nuclear Physics
25-29 January 2016 Bormio (Italy)

Modelling EARLY TIME DYNAMICS of Relativistic Heavy Ion Collisions

Lucia Oliva

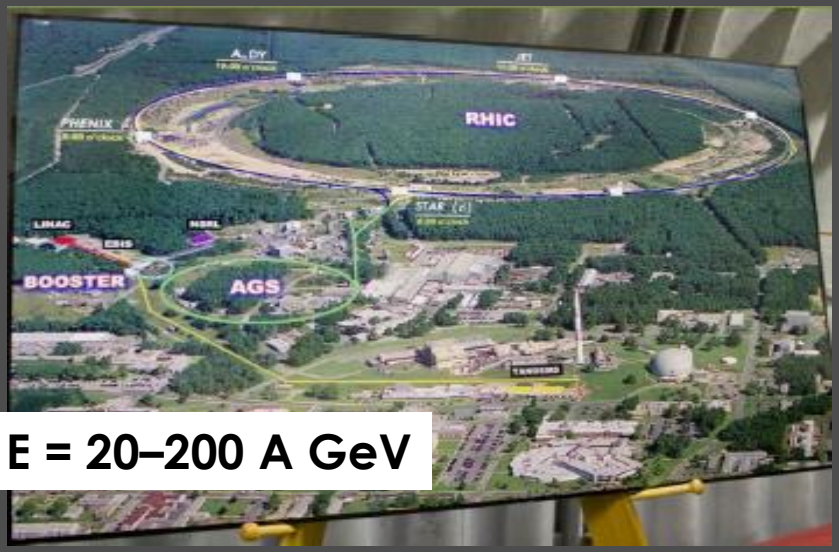
Collaborators:
Vincenzo Greco
Salvo Plumari
Armando Puglisi
Marco Ruggieri
Francesco Scardina

QCD Phase Diagram



High energy Heavy Ion Collisions

(HIC) allow to experimentally investigate the high temperature and small baryon density region of the nuclear matter phase diagram



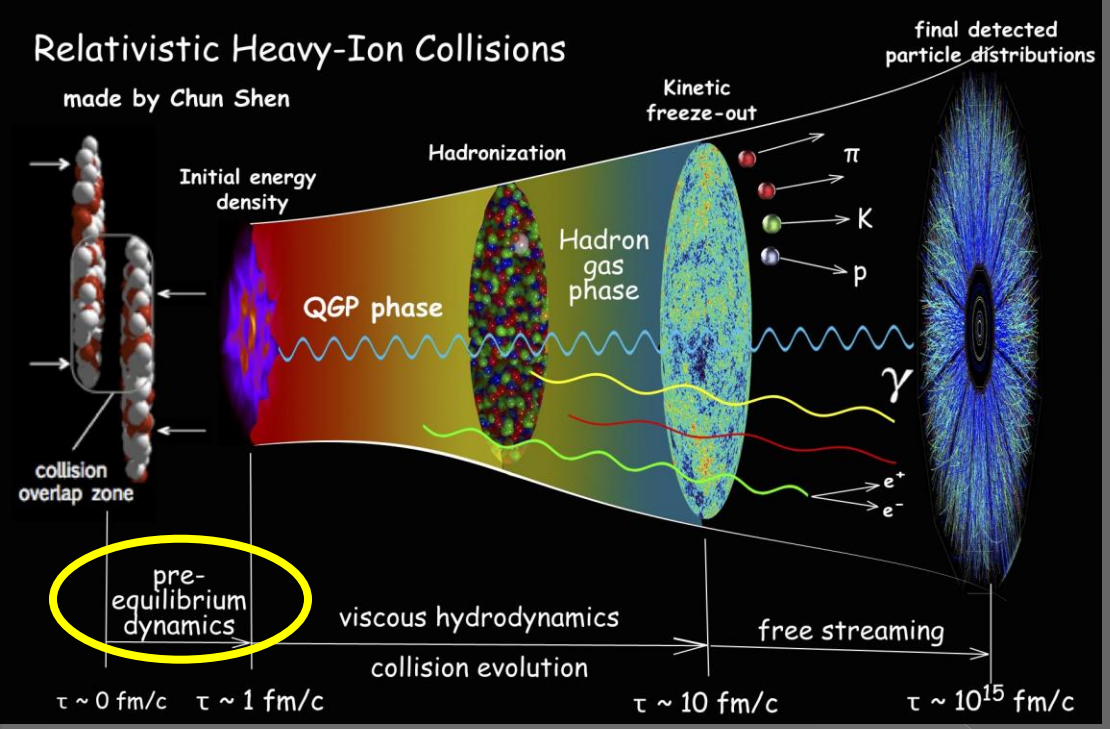
E = 20–200 A GeV

Relativistic Heavy Ion Collider (RHIC) at BNL

Large HadronCollider (LHC) at CERN

E = 1–5.5 A TeV

The study of QUARK-GLUON PLASMA (QGP) should cast light on Quantum Chromodynamics (QCD) and the problem of confinement



[Source: snelling.web.cern.ch/snelling/img/little_bang.jpg]

Quark-Gluon Plasma phase

hydrodynamical behaviour with very low viscosity and collective flows formation

IMPACT OF PRE-EQUILIBRIUM ON SEVERAL OBSERVABLES

We simulate the temporal evolution of the fireball solving the

Relativistic Boltzmann Transport Equation

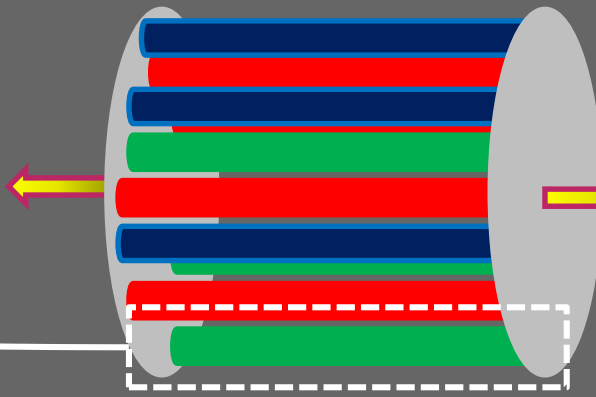
$$\left(p_\mu \partial^\mu + gQF^{\mu\nu} p_\mu \partial_\nu^p\right) f = \mathcal{C}[f]$$

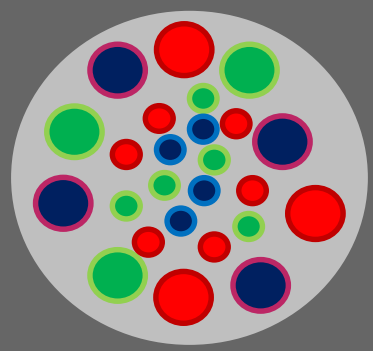
Free streaming | *Field interaction* | *Collision integral ($\eta/s \neq 0$)*

Within one single theoretical approach one can follow the entire dynamical evolution of system produced in relativistic HICs

Pre-equilibrium dynamics: GLASMA

Flux tubes with longitudinal chromo-electric and chromo-magnetic fields





focus on a single flux tube

From glasma to quark-gluon plasma: SCHWINGER MECHANISM

Classical fields decay to particles pairs via tunneling due to vacuum instability

ISOTROPIC AND THERMALIZED QGP?