CEA-Direction des Sciences de la Matière

Institut de Physique Théorique

Unité de recherche associée au CNRS

Cours de Physique Théorique de l'IPhT, année 2010-2011

Organisés en collaboration avec

Ecole Doctorale de Physique de la Région Parisienne - ED 107

The dynamics of Quark-Gluon Plasma and AdS/CFT correspondence

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Les vendredis 26/11, 3/12, 10/12, 17/12/2010 à 10h00.

Experiments on high-energy heavy-ion collisions reveal the formation and intriguing properties of the Quark-Gluon Plasma, a new phase of matter predicted by Quantum Chromodynamics (QCD). The phenomenological relevance of relativistic hydrodynamics and the very weak observed viscosity indicate the presence of a strongly-coupled plasma expanding and cooling during the reaction. As a stimulating tool to relate these dynamical features to a microscopic gauge field theory at strong coupling, time-dependent realizations of the AdS/CFT correspondence provide a stimulating way to study these properties in a realistic kinematical configuration. Relating a Yang-Mills gauge field theory with four supersymmetries (which is a conformal field theory, CFT) with gravity in the Anti-de Sitter space in 5 dimensions (AdS_5), the AdS/CFT correspondence provides a useful ``laboratory'' for yet unknown strong coupling properties of QCD. Besides the interest of revealing new aspects of the AdS/CFT correspondence in a dynamical set-up, the application to plasma formation leads to striking theoretical properties which we will discuss in the lectures. The tentative plan of the lectures follows.

1. The emergence of an (almost) perfect hydrodynamic fluid at late proper-times after the collision

2. The duality between an expanding 4-dimensional plasma and a moving black hole escaping in the 5^{th} dimension

3. The intimate and general link between conformal hydrodynamics and the Einstein equations in the AdS_5 bulk

4.The unique possibility of studying the far-for-equilibrium stage of a gauge field theory at early proper-times

Horaires *: les vendredis de 10h00 à 12h15.*
Lieu *: IPhT, CEA Saclay, Orme des Merisiers, Bât. 774, p.1A Salle C. Itzykson.*
Accès *: Par lignes de bus publics (269.02 et 91.06) ou*
- navettes CEA: RER B Le Guichet vers CEA Orme Bât. 774, toutes les 15 min de 8h00 à 9h45;
- navette CEA: CEA Orme Bât. 774 vers RER B Le Guichet à 12h36.
Renseignements *:* ***http://ipht.cea.fr*** *ou* ***ipht-lectures@cea.fr***

(Mise à jour affiche: 2010-10-25)