

Preface

The idea to organize a meeting about Hot and Cold Baryonic Matter arose end of 2009. Recent and continuing investigations of Quark and Hadron matter put an emphasis onto phenomena occurring at finite baryon density. The more since it was discovered that lattice QCD with light dynamical quarks does not show a first order deconfinement phase transition, but rather a crossover transition happens at vanishing baryon density. The endpoint of the first order transition line, conjectured on general arguments following from the idea of chiral symmetry breaking, re-appears at finite baryon density.

Huge, international experimental projects are devoted to the research of quark matter and elementary strong interaction. In particular the FAIR project (Facility for Antiproton and Ion Research) – being built at GSI Darmstadt, Germany - contains among other goals the objective to study this endpoint of the conjectured first order phase transition line experimentally. This goal is named CBM - Cold Baryonic Matter.

Since theoretical calculations are also developing new views and methods to model the expected circumstances at such experiments, the initiators of this Meeting, Carsten Greiner and Markus Bleicher from Frankfurt University, Tamas Biró from KFKI RMKI Research Institute in Budapest, realized that 2010 appears as a proper date to summarize the status of theoretical calculations and preparations for the future FAIR CBM experiments.

The HIC for FAIR (Helmholtz International Centre) and the LOEWE project of state Hesse (Landes-Offensive zur Entwicklung Wissenschaftlich-ökonomischer Exzellenz) occurred as main sponsors of this event. During the pre-organization phase further sponsors manifested: the European Physical Journal and the home institute of the Local Organizing Committee, the MTA KFKI RMKI in Budapest.

We had an overwhelming response to our call to prospective participants both from Europe and oversea. The meeting was organized in topical blocks. We have started with general review talks about cold baryonic matter and the order of phase transition. Then we continued with presentations of present and future experimental facilities and projects aiming at the research of the study of chiral and deconfinement phase transition. Statistical approaches to hadronization and observable particle spectra included both traditional and non-extensive perspectives. The highlight colloquium talk was given by Constantino Tsallis, the well-known initiator and promoter of the use of generalized thermodynamical and statistical concepts in physics.

In the second part of the meeting contained throughout presentations of new results on hydrodynamical and transport theoretical investigations. Finally the most elementary numerical approach to QCD, the lattice method was represented by a couple of contributions, aiming at understanding the equation of state of quark matter in stars, under extreme pressure, and in non-extensive thermodynamics, counting for a fluctuating temperature. The poster session, providing room for very young researchers to present their achievements, attracted successfully a huge number of interested colleagues.

In this Proceedings the respective contributions of the participants are collected following the main topics outlined above. We hope that this collection of reviews and novel specific contributions will be a useful basis and motivator for future research in this field.

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