



LRP chapter 2: Properties of strongly interacting matter

(Phases of Strongly Interacting Matter, LRP2010)

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NuPECC meeting, ECT, Trento 11-12, 2016*

WG 2: composition and activities



NuPECC liaison members:

Eugenio Nappi, Christelle Roy, Raimond Snellings

WG2 conveners:

Francois Gelis (CEA Saclay), Silvia Masciocchi (GSI Darmstadt)

WG2 members:

Giuseppe Bruno (Bari), Peter Christiansen (Lund), Wojciech Florkowski (UJK Kielce and IFJ PAN Krakow), Volker Friese (GSI), Raphael Granier de Cassagnac (LLR Palaiseau), Norbert Hermann (Heidelberg), Boris Hippolyte (IPHC Strasbourg), Jean-Philippe Lansberg (IPN Orsay), Marco van Leeuwen (Utrecht), Gines Martinez (Subatech Nantes), Dirk Rischke (Frankfurt), Dieter Röhrich (Bergen), Piotr Salabura (Krakow), Eugenio Scapparone (Bologna), Hans Rudolf Schmidt (Tübingen), Alexander Sorin (Dubna), Vicente Vento (Valencia)

Meetings:

- February 4, 2016: kick-off
- March 1, 2016: discussion on the structure of LRP chapter 2
- **Next** May 11 and/or 12, 2016, at CERN: **written draft of all sections**

1. Introduction: Fundamental properties of strongly interacting matter

Coordinators: Giuseppe Bruno, Francois Gelis

2. Nuclear matter at high temperature and low μ_B

Coordinators: Wojciech Florkowski, Boris Hippolyte, Marco van Leeuwen

3. Nuclear matter at high μ_B and low temperature

Coordinators: Vicente Vento, Hans Rudolf Schmidt

4. Computing, facilities and instrumentation

Coordinators: Eugenio Scapparone, Silvia Masciocchi

Recommendations

Coordinators are responsible for the drafting of their respective section, with the help of group members, interacting with the whole WG2

About 20 pages as total allocation

- **Now:** detailed section content is being discussed in each subgroup
Writing is about to start.
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- **May 2:** first draft of each section will be available to WG2
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- **May 11 and/or 12:** face-to-face meeting, at CERN, to work on the first draft of the chapter
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- **End of May:** preliminary version of chapter 2 available, to be presented and discussed in Uppsala (June 17-18)

Introduction: fundamental properties of strongly interacting matter

- Basics of QCD
 - Strong coupling and asymptotic freedom
 - Confinement / deconfinement
- QCD phase diagram
 - Connections to neutron stars and early universe
- Equation of state and thermodynamics
 - Lattice QCD
 - Transport coefficients
- Heavy-ion collisions
 - Hydrodynamical evolution of the bulk
 - Thermalization
 - Dependence on initial geometry

Bruno, Gelis, Rischke, Florkowski, Vento, Schmidt, Sorin

Nuclear matter at high temperature and low μ_B

- Global description
 - HBT with global related volume and lifetime
 - Flow
- Light flavor yields
 - Particle yields
 - (Hyper-)nuclei production
- Jet production and quenching
 - Single particle R_{AA} , jet observables
 - JET Collaboration work
- Heavy quark production and quarkonia
- Transport coefficients

Florkowski, Hippolyte, van Leeuwen, Granier de Cassagnac,
Masciocchi, Martinez, Rischke, Roehrich, Christiansen, Lansberg,
Gelis, Vento, Scapparone

Nuclear matter at high μ_B and low temperature

- General questions at high μ_B
- Experimental facilities to explore the μ_B region
- Experimental observables to explore the μ_B region
- Models for the description of matter at “very” high μ_B : phase transition, signatures to identify the state of matter?

Vento, Schmidt, Friese, Hermann, Schmidt, Salabura, Sorin, van Leeuwen, Bruno, Hippolyte, Gelis, Rischke

Computing, facilities and instrumentation

- Computing
 - Resources for experimental data and lattice, common frameworks for experiments and for theory, new technological developments
- Facilities:
 - In the making: LHC run 3+4 and detector upgrades, CBM@SIS100, MPD@NICA, NA61
 - Further future: AFTER, 2nd ion source at CERN, NA60+, USA electron-ion collider, JPARC, SIS300 at FAIR, FCC
- Development of new instrumentation
 - Ultra fast silicon detectors, GEM TPC, compact RICH, advance tracking and vertexing, online processing

Scapparone, Masciocchi, Friese, Hermann, Schmidt, Lansberg, Sorin, Bruno, Granier de Cassagnac