HL-LHC YELLOW REPORT

OUTLINE OF WG5 VOLUME

Introduction

- Short Introduction written by the WG5 conveners: goals and structure of the report

Chapter 1: Physics opportunities in high-density QCD with HI and proton beams at the LHC

- Written by WG5 conveners
- Present key priorities along these four lines:
    a. QGP characterisation and precision physics
    b. QGP open questions and inner workings
    c. Small-x open questions and precision physics
    d. Small to larger systems: change of paradigm, implications for broader non-perturbative QCD context
- One Section for each of these four lines, in which the goals are mapped to experimental observables, to be done also with flow charts or schematic "phase-space" plots. Pointers to the following chapters of the YR
- Will probably be re-shaped once we know more of the content of the other chapters

Chapter 2: Accelerator performance with heavy-ion beams

Coordinator: John Jowett

- Baseline performance projections for pPb, PbPb, risks, John Jowett, Michaela Schaumann, H. Bartosik, ...
- Potential with lighter nuclei (e.g. Ar, Kr) R. Alemany-Fernandez, D. Kuchler, J. Jowett
- Possibility of short runs for e.g. p-O (input to cosmic-ray physics), J. Jowett

Order the following chapters to be re-adjusted

Jets observables

Coordinator: **Marta Verweij (CMS)**
Theory: G. Milhano, Korinna Zapp
Other experiments contributors: Peter Jacobs, Mateusz Ploskon, Leticia Cunqueiro (ALICE), Anne Sickles+Martin Spousta (ATLAS), Yen-Jie Lee (CMS)

Open Heavy Flavour

Coordinator: **Elena Bruna (ALICE)**
Theory: Andrea Beraudo, Vincenzo Greco, Steffen Bass?
Other experiment contributors: Gian-Michele Innocenti (CMS), Jiayin Sun (LHCb), Zvi Citron (ATLAS)

Quarkonia

Coordinator: **E Chapon (CMS) / Anton Andronic (ALICE)**
Theory: Ralf Rapp, M Strickland? someone from lattice QCD area?
Other experiment contributors: Shanzhen Chen (LHCb), Zvi Citron (ATLAS)

Chiral restoration via dileptons and thermal radiation via dileptons & photons

Coordinator: **Michael Weber** (**ALICE**)

Theory: Ralf Rapp
Other experiment contributors: D. Peressounko (ALICE), M. Winn (LHCb)

Flow/Correlations
Coordinator: **Soumya Mohapatra** (**ATLAS**)
Theory: Stefan Flörchinger (theory), Björn Schenke (already contacted for prev WS)
Other experiment contributors: A. Dobrin (ALICE), Wei Li (CMS)

Production of light nuclear states and net-particle fluctuations
Coordinator: **Francesca Bellini** (**ALICE**)
Theory: tbd
Other experiment contributors: M. Winn (LHCb)

Small systems - multiplicity dependence and implications of QGP-like effects in small systems
Coordinator: **Jan Fiete (ALICE**)
Theory: Christian Bierlich?
Other experiment contributors: Alexander Kalweit, Constantin Loizides (ALICE), Z. Citron (ATLAS), Y-J. Lee (CMS), M. Winn (LHCb)

nPDF/small-x
Coordinator: **Michael Winn (LHCb)**
Theory: T. Lappi, N Armesto; ask EPPS (Salgado?) + nCTEQ (Schienbein?) for reweithing with all experimental inputs; Cyrille Marquet (sat.), Francois Arléo (coll.) and e.g. starlight-author (UPC) or other theorists for conceptual input beyond pdfs
Other experiment contributors: M van Leeuwen, S Klein (ALICE), Z. Citron (ATLAS), Y.-J. Lee (CMS)

Lighter ion species → Maybe not in a stand-alone chapter? But mentioned in other chapters where relevant (mainly in jets and small systems?) To be decided after discussion/presentations in the WG.

Other opportunities chapter
- Physics with gamma-gamma collisions - Iwona Grabowska-Bold (ATLAS)
- Fixed-target with existing detectors (LHCb: Frédéric Fleuret and Emilie Maurice, ALICE?) -> to be presented briefly and then refer to: “Physics Beyond Colliders”
- Inputs to cosmic-ray physics from p-nucleus collisions at LHC - Hans Dembinski (LHCb)

HE-LHC
- Inherit from FCC documents (Andrea+Urs+John) + boosted tops (also covered in the Jets chapter).