

“Phases of QCD” Town Meeting Prioritized Recommendations

Draft January 29, 2007

1. Our central goal is a dramatic advance in our understanding of QCD Matter, through quantitative comparison of theory and experiment to determine the properties of the strongly interacting Quark-Gluon Plasma discovered in the initial phase of RHIC operations, and through further exploration of the QCD phase diagram at non-zero baryon density where a critical point has been predicted. The essential requirements for the success of this scientific program are therefore our highest priorities :

- Effective utilization of the RHIC facility and completion of the ongoing detector upgrade program;
- The RHIC II luminosity upgrade, which will enable quantitative study of rare processes;
- Strong support for the ongoing theoretical studies of QCD matter, including finite temperature and finite baryon density lattice QCD studies and phenomenological modeling, and an increase of funding to support new initiatives enabled by experimental and theoretical breakthroughs.

2. We strongly recommend significant and timely participation of U.S. groups in the LHC heavy ion program, which will study QCD matter at the highest energy densities and temperatures available in the laboratory. This program will test and extend the insights reached in the RHIC program, and has the potential to make important new discoveries about QCD Matter.

3. *(includes minor changes not yet finalized with Hadron Structure committee)* An Electron-Ion Collider (EIC) facility is the highest priority of the QCD community for new construction after the JLab 12 GeV and the RHIC II luminosity upgrades. EIC will address compelling physics questions essential for understanding the fundamental structure of matter:

- Precision imaging of sea-quarks and gluons to determine the spin, flavor and spatial structure of nucleons and nuclei;
- Definitive study of the universal nature of strong gluon fields manifest in nuclei.

This goal requires that R&D resources be allocated for expeditious development of collider and experimental design.

4. Common theory bullet (tbd)

5. Education and Outreach (tbd)

6. Accelerator R&D (tbd)