Memorandum of Understanding between Brookhaven National Laboratory and the SC Lattice QCD Computing Project Extension (LQCD-ext)

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Operated at
Brookhaven National Laboratory, Brookhaven, New York
Fermi National Accelerator Laboratory, Batavia, Illinois
Thomas Jefferson National Accelerator Facility, Newport News, Virginia

for the
U.S. Department of Energy
Office of Science
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Revision 0.0

Approved

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Change Log

Revision No.	Pages Affected	Effective Date
Revision 0.0	Entire Document	April 20, 2010

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1   Lattice QCD Project Goals

The Lattice Quantum ChromoDynamics (LQCD) Computing Investment Extension (LQCD-ext) provides for the acquisition and operation of computational systems that will serve as a principal computational resource for the national LQCD user community.   Using these computational resources, the LQCD theorists can better provide theoretical insight and guidance to the community of approximately 4,500 particle and nuclear physicists.

The numerical study of QCD requires very large computational resources, and has been recognized as one of the great challenges of computational science.   Recent advances in computer technology, coupled with major improvements in scientific algorithms, have brought the field to a new level.   A limited number of crucial quantities have been calculated to a level of accuracy comparable to their experimental determination. Moreover, the experience that has been gained allows confident predictions of the computing resources required for determinations of a broad range of fundamental quantities to an accuracy required for support of the experimental program and to provide guidance to the program in some areas.   As a result, there are opportunities to make major scientific advances.   In fact, this investment is crucial to advance scientific discovery in the QCD discipline.   Given the known computational requirements, configurable commercial off-the-shelf components will be acquired through fixed-price contracts as approved by the acquisition executive.

2   Purpose

This Memorandum of Understanding (MOU) describes the collaboration between Brookhaven National Laboratory (also referred herein as BNL or the Institution) and the OMB Exhibit 300 Investment project titled "SC Lattice Quantum ChromoDynamics Computing"[i].   The main objective is to achieve the scientific goals of the LQCD-ext project described above.   The project will be referred to as the LQCD-ext project throughout the rest of the document.   The full UPI code for the project is 019-20-01-21-01-1032-00).   The project will use the OMB 300 submission for the Budget Year 2011 as the initial baseline.   Other collaborating laboratories include the Fermi National Accelerator Laboratory (FNAL) and the Thomas Jefferson National Accelerator Facility (TJNAF).

On behalf of the LQCD-ext project, the existing QCDOC computer system located at BNL will be operated by BNL from October 2009 to September 2010.   The total project funding level at BNL is determined by the annual approved OMB Exhibit 300 submission document.   This present document outlines the general agreement between the project and the Laboratory regarding the use of laboratory personnel, infrastructure and facilities.   At the end of the third quarter of each fiscal year, the LQCD-ext Contract Project Manager (CPM) will present an acquisition plan for the upcoming year. The DOE LQCD-ext Project Manager will approve the final acquisition plan.   Details of the tasks and resources for this multi-laboratory collaboration will be covered in the annual OMB Exhibit 300 submissions.   The project begins on October 1, 2009 and finishes on March 30, 2011.

The MOU is a single document for each LQCD-ext project related institution.   It will remain effective throughout the life time of the LQCD-ext project.   Annual OMB Exhibit 300 submissions for upcoming budgeted years will detail annual scope of work for the site. This will

contain specific activities, deliverables and funding. The normal period of performance will be the US fiscal year (October 1 - September 30).

3   Project Scope and Work

As defined by the project's BY2010 OMB Exhibit 300 submission, the scope of the mixed life-cycle LQCD-ext investment project includes the operation of the QCDOC computer at BNL through FY2010; the operation through end-of-life of clusters at Fermilab and TJNAF purchased and deployed during FY2006-2009 using LQCD project funds; and the acquisition, deployment, and operation of new computing hardware in FY2010-2014. Full details of the project scope are defined in the LQCD-ext Project Execution Plan[ii] and the LQCD-ext Acquisition Strategy.

The scope of work specific to BNL includes:

- Operation and maintenance of the 12K node QCDOC system and associated front end hardware at the BNL site during FY 2010.
- Procurement of additional storage hardware as required to support user needs.
- Scientific software and user support activities are excluded from the scope of this project.

Work on the LQCD-ext project at BNL will be performed in accordance with the LQCD-ext Project Execution Plan (PEP) and the Work Breakdown Structure (WBS).

The LQCD-ext project management infrastructure and the project office reside at the Fermilab site. The LQCD-ext CPM is responsible for the LQCD-ext project management and reports to the DOE LQCD-ext Project Manager.

Detailed activities to be performed at the BNL site and the required resources for technical personnel are specified in the LQCD-ext project WBS document. It is understood that the project WBS will be modified annually to maximize scientific deliverable for the LQCD-ext project during the annual approval of the project acquisitions, and that WBS may later be modified or that additional responsibilities may be added.

4   Costs and Funding

It is anticipated that the DOE Office of Science, through the Offices of High Energy and Nuclear Physics, will provide funds for the LQCD-ext project during the period FY2010-2014. On an annual basis, the CPM will work with the BNL Site Manager for the LQCD-ext computing facility at BNL to develop the annual operating budget.

In particular, project funds will be made available to cover the following activities at BNL:

- Fully-loaded salary costs associated with steady-state system operation, including system administration, hardware support, and site management.
- Purchase of new hardware, including tapes, disks, etc. The size, makeup and location of the equipment are defined on an annual basis to optimize the cost and performance of the machines.

BNL agrees not to exceed the costs shown in the annual approved budget. Expenditures by BNL are to be covered by funds provided by DOE, following the allocation decisions described in the OMB Exhibit 300 submission for each budgeted year. Certain services (detailed in section 7) will be provided by the laboratory from its base budget or overhead charges as in-kind contributions to further the High Energy and Nuclear Physics programs of the laboratory.

5 Resources

5.1 Project Management Personnel

William Boroski is the LQCD-ext Contract Project Manager (CPM). Bakul Banerjee is the Associate Contract Project Manager (ACPM) for the project.

5.2 Site Management Personnel

Eric Blum is the Site Manager for the LQCD-ext BNL site.

5.3 Technical Personnel

The project work will be performed by staff members of BNL. Job categories required may include computer professionals, engineers, and engineering technologists.

5.4 Equipment

Existing QCDOC computing equipment deployed at the BNL site to carry out Lattice QCD computing work at the beginning of the fiscal year 2006 and computing equipment acquired as part of the SciDAC project during its final year (ends June 30, 2006) fall within the scope of the LQCD-ext computing system. Any new equipment for the computing system at the BNL site will be procured using DOE-HEP and/or DOE-NP funds made available to BNL.

6 Project Management Responsibilities

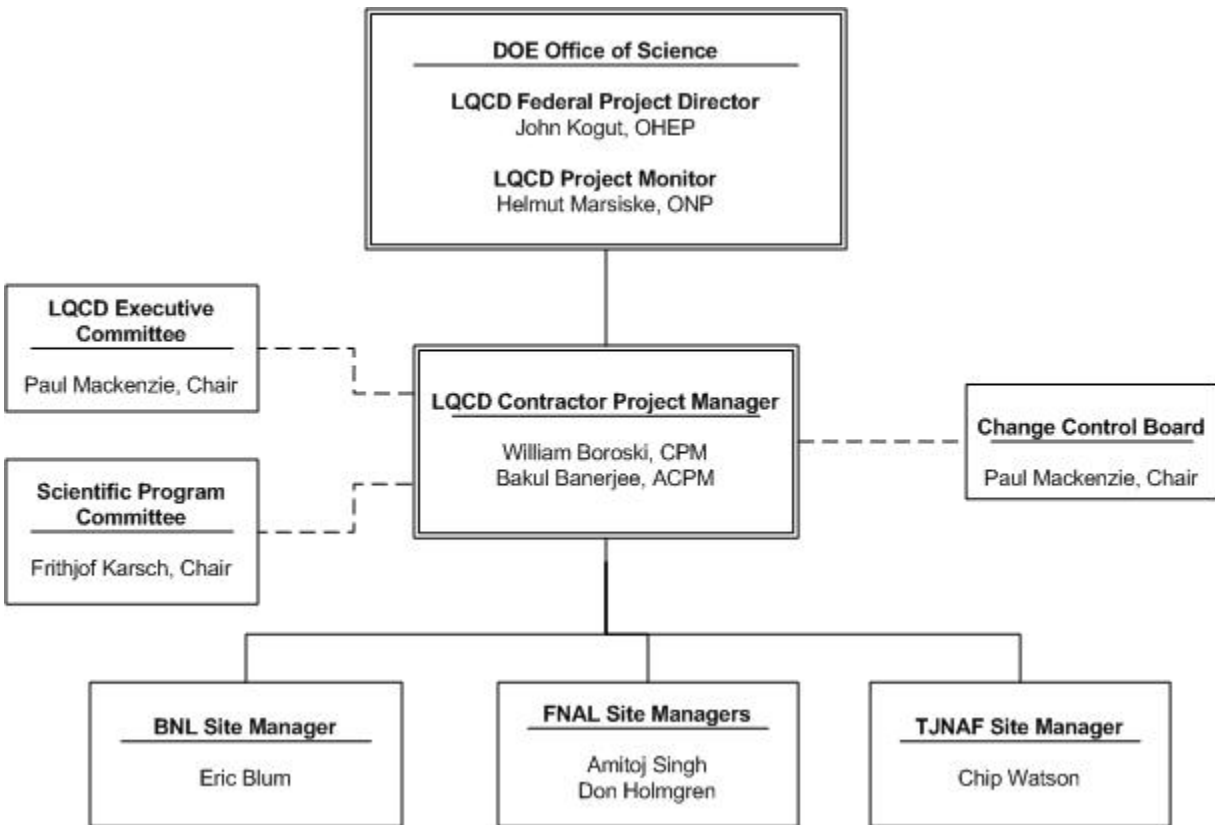### *6.1 Organization Chart of the LQCD-ext project*

Figure 1: Management Organization Chart for the LQCD-ext Computing Project. Vertical lines indicate reporting relationships. Horizontal lines indicate advisory relationships.

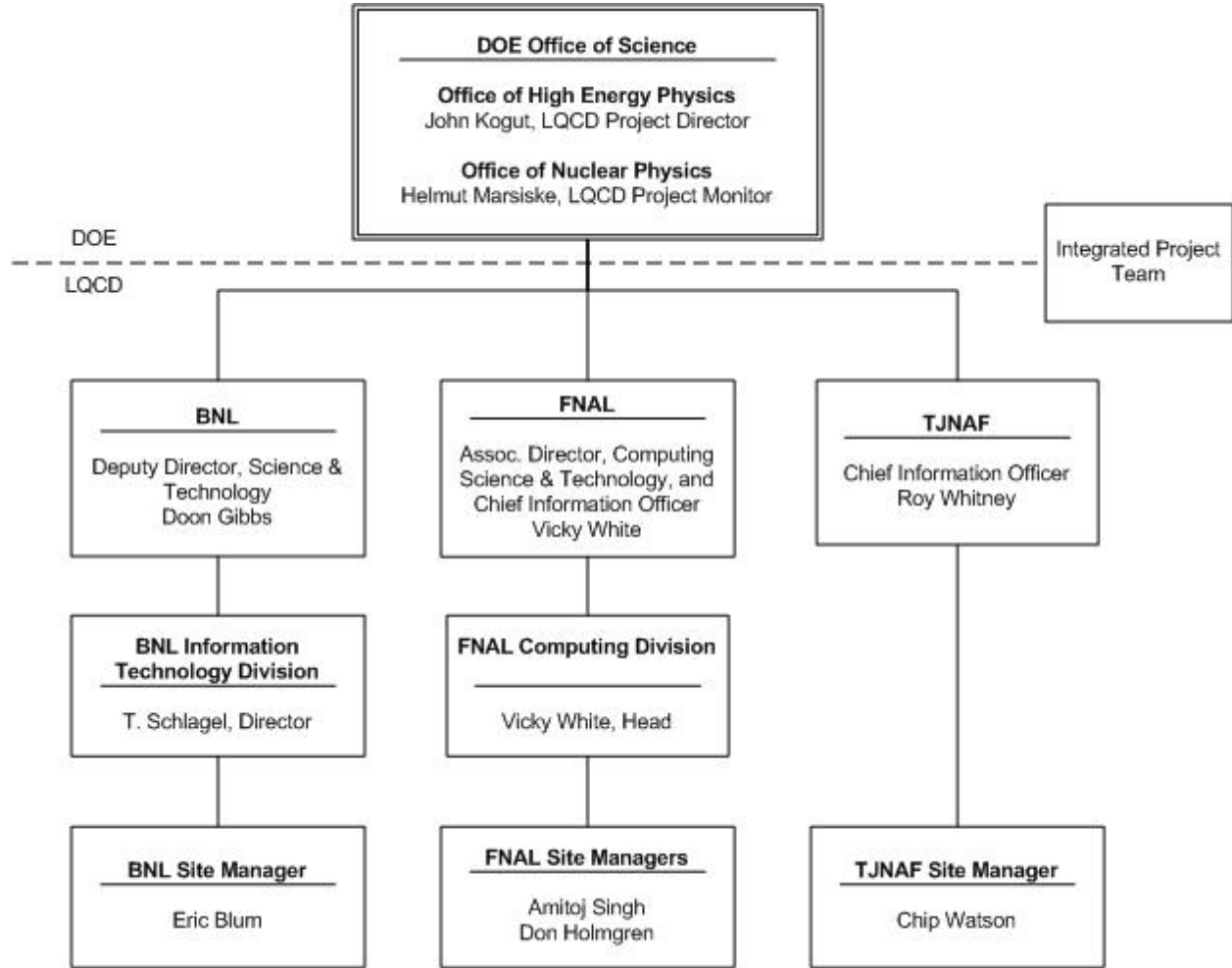### 6.2 Laboratory Management at LQCD-ext Sites

Figure 2: LQCD-ext and Laboratory management

6.3 Coordination and Reporting

The BNL Information Technology Division Director is a signatory to this MOU and represents the Institution to the LQCD-ext project. This person will carry out the coordination with the upper management of the Institution and possibly other institutions within the LQCD-ext collaboration.

Technical progress on the design, implementation, testing, and operation of computer equipment will be reported to the project office by the BNL Site Manager on a monthly basis. Reporting will be done by WBS element when appropriate. The BNL Site Manager is also responsible for reporting to the LQCD-ext CPM the progress on performance measures defined for the project. The LQCD-ext CPM will, in turn, report the consolidated progress report to LQCD-ext Federal Project Manager, as described in the PEP.

Any changes to the scope of the project and the associated cost and schedule must be documented in consultation with the LQCD-ext CPM and pre-approved using the change control mechanism established by the LQCD-ext project office.

6.4 Procurement Authorization

The LQCD-ext CPM approves procurement plans and delegates procurement obligation authority to the site manager and the financial officer at the site. The cost ceilings allowable at sites are documented in the LQCD-ext PEP and WBS. These cost ceilings cannot be exceeded without the authorization the CPM or invoking change control process as defined in the PEP.

6.5 Reporting to LQCD-ext Project Management

BNL will report all LQCD-ext project related expenditures and labor charges together with associated technical progress in each item of work by WBS category (cost element level). This detailed reporting will be done on a monthly basis through the Site Manager to the LQCD-ext CPM. Any request for variance from the base cost must be immediately reported to the Site Manager. Any significant variance in schedule from the base schedule must be immediately reported to the LQCD-ext CPM through the Site Manager.

BNL agrees to furnish complete documentation of the quality assurance (as defined in the LQCD-ext Quality Assurance Plan[iii] and applicable BNL Quality Assurance Program documents), risk management information (as defined in the LQCD-ext Risk Management Plan[iv] and performance testing that is carried out for the LQCD-ext project. Further, the institution agrees to furnish accurate documentation of all software that it provides to the LQCD-ext project in electronic format. Submission to the document server designated to LQCD-ext project will be used whenever possible.

BNL agrees, with this document, to set up and maintain a ledger of a form compatible with the one used by LQCD-ext project management. The Institution agrees to provide and maintain this ledger so as to provide timely information to the LQCD-ext project office.

6.6 Collaboration with Other Groups and Institutions

FNAL and TJNAF are two other institutions belonging to the LQCD-ext project. LQCD-ext CPM and Associate Contract Project Manager (ACPM) will coordinate with these two institutions and present consolidated reports to the DOE LQCD-ext Project Manager.

7 BNL In-kind Contributions

Subject to adequate funding by DOE, BNL will provide additional in-kind support to the project during this period of performance. By this MOU, standard practices used at BNL for cost accounting will be applied to the LQCD-ext project activities.

7.1 Effort

Subject to adequate funding by DOE, BNL will provide support for additional scientific and technical personnel as in-kind contribution. This contribution refers only to system and scientific software support provided outside of the scope of the LQCD-ext project.

7.2 Services

BNL agrees to provide support services to the LQCD-ext project to the degree required to carry out this project. These may include:
1. Services for generic computing infrastructure, including networking
2. Services for the lab-wide infrastructure for mass storage. This includes backups of operating systems and non-volatile data by the BNL Information Technology backup server.
3. Services for computer security infrastructure
4. Services of the responsible financial officer
5. Services for building facilities
6. Services for administrative staff.

7.3 Facilities and Equipment

Adequate facility infrastructure will be made available to the LQCD-ext project to the degree necessary to carry out the operation of the BNL site LQCD-ext computing system. BNL agrees to pay for the utilities costs, including the power needed for the computing system and HVAC system.

8 General Considerations

8.1 System Engineering Practices

BNL agrees to support implementation of standard system engineering best practices and to adhere to them. All major system components will undergo appropriate quality control and validation testing.

BNL agrees to provide a high level of reliability and availability for the system. Any outage or abrupt maintenance shutdown shall be recorded and analyzed to minimize future disruptions. Adequate notices must be given to the LQCD-ext facility users for routine maintenance and upgrades.

8.2 Project Management Practices

BNL agrees to support Performance Based Project Management (PBMS) practices and guidelines prescribed by DOE Office of the Chief Information Officer (OCIO). It is noted that the LQCD-ext project is exempt from the implementation of the Earned Value Management System (EVMS) in terms of OMB Exhibit 300 performance reporting.
Copies of procurement documents for all major procurements will be provided to the LQCD-ext project office. Using established templates, all labor costs must be reported to the appropriate charge codes and reported to the LQCD-ext project office on a monthly basis. All equipment

items bought using DOE funds will be properly marked as the property of DOE and identifiable to the BNL Property Officer as part of the LQCD-ext computing system.

9 Schedules and Milestones

BNL will make every effort to carry out their institutional responsibilities consistent with the schedule and milestones for the LQCD-ext computing system. These schedules may be changed as the project progresses. BNL will notify the LQCD-ext project office as soon as possible of any significant changes that would affect the scope, cost, performance, or schedule of the LQCD-ext project. These changes must be documented in writing and approved using the change control process described in the LQCD-ext PEP. Status of the project milestones for this site will be reported on a monthly basis to the LQCD-ext CPM over the life of the project.

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[i] SC Lattice Quantum Chromodynamics Computing – BY11 OMB Exhibit 300 Submission
[ii] LQCD-ext Project Execution Plan 2010
[iii] LQCD-ext Quality Assurance Plan
[iv] LQCD-extension Risk Management Plan