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

Unique Project (Investment) Identifier: 019-20-01-21-01-1032-00

Operated at
Brookhaven National Laboratory
Fermi National Accelerator Laboratory
Thomas Jefferson National Accelerator Facility

for the
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Offices of High Energy and Nuclear Physics

Version 0.0

Approved: (TBD)

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CONCURRENCES:

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William Boroski	Date	Vicky White	Date
LQCD-ext Contractor Project Manager		Associate Director, Computing Science & Technology, and CIO (Interim), Fermilab	

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Change Log

Revision No.	Description / Pages Affected	Effective Date
0.0	Entire document	April 28, 2010

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1 LATTICE QCD PROJECT GOALS

The Lattice Quantum ChromoDynamics 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 Lattice QCD 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 LIST OF ABBREVIATIONS

ACPM	Associate Contract Project Manager
ASCR	Advanced Scientific Computing Research
BNL	Brookhaven National Laboratory
CPM	Contract Project Manager
DME	Deployment, Modernization and Enhancement
EA	Enterprise Architecture
ES&H	Environment, Safety & Health
FEA	Federal Enterprise Architecture
Fermilab	Fermi National Accelerator Laboratory
FPM	Federal Project Director
IPT	Integrated Project Team
LQCD	Lattice Quantum ChromoDynamics
LQCD-ext	Lattice Quantum ChromoDynamics Extension
MOU	Memorandum of Understanding
QA	Quality Assurance
QAP	Quality Assurance Program
QCDOC	QCD on Chips
SC	Office of Science
SciDAC	Scientific Discovery through Advanced Computing
SS	Steady State
TJNAF	Thomas Jefferson National Accelerator Laboratory
WBS	Work Breakdown Structure

3 PURPOSE

This Memorandum of Understanding (MOU) describes the collaboration between Fermi National Accelerator Laboratory (FNAL) or Fermilab (also referred to as the Institution) and the OMB Exhibit 300 Investment project titled "SC Lattice Quantum ChromoDynamics Computing Project Extension (LQCD-ext)". 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 019-20-01-21-01-1032-00-109-026). The project will use the OMB 300 submission for the Budget Year 2010[i] as the initial baseline. Other collaborating laboratories include the Brookhaven National Laboratory (BNL) and the Thomas Jefferson National Accelerator Facility (TJNAF). This document outlines the general agreement between the project and Fermilab regarding the use of laboratory personnel, infrastructure and facilities.

On behalf of the LQCD-ext project, a computing system consisting of several tightly coupled clusters or equivalent computing hardware will be deployed and operated at the Fermilab site. The total project funding level is determined by the annual approved OMB Exhibit 300 submission document. Details of the tasks and resources for this multi-laboratory collaboration will be covered in the annual OMB documents. The project begins on October 1, 2009 and finishes on September 30, 2014.

This document describes agreements between the project and the institution and related procedures to be followed while executing the LQCD-ext project for the period FY2010 through FY2014. The project plan has been prepared in accordance with DOE Order O143.3A, *Program and Project Management for the Acquisition of Capital Assets* (dated 7-28-06) and DOE Guidance G 413.3-14, *Information Technology Project Guide* (dated 9-12-08).

This MOU will remain effective throughout the life time of the LQCD-ext project. The annual scope of the work for the site will be covered in the annual LQCD-ext OMB Exhibit 300 submissions for upcoming budgeted years. This will contain specific activities, deliverables and funding. The normal period of performance will be the US fiscal year (October 1 - September 30). Any previous MOUs related to the project were retired on October 1, 2009.

4 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 the 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[iii].

The portion of the project at the Fermilab site has three major components:

1. New hardware planning and deployment: This includes the acquisition of new hardware using the equipment fund allocated by the OMB 300 Investment during the period of

FY2010 to FY2014.This also includes the labor needed to plan and deploy new hardware described in the above mentioned plan. Full details of the deployment plan are found in the latest OMB submission document and Acquisition Strategy document.

2. Steady state operation: This includes continuous operation of:

    a. Newly deployed hardware at Fermilab during the current MOU period as described in item 1

    b. Existing LQCD computing facility, including the clusters in operation at Fermilab at the beginning of FY2010

3. Project management of the entire project.

The general rule for operational life for a LQCD-ext cluster is up to 4 years. However, historic data show that these machines can often be operated effectively beyond projected life. The LQCD-ext Integrated Project Team (IPT) will determine planned decommissioning dates after evaluating the cost effectiveness of continued operation. LQCD-ext site managers will work closely with computing facility managers at the host institution to ensure that LQCD-ext facility needs and project decommissioning timelines are understood and mutually agreeable.

Facility operations include routine software tools deployment at each site to facilitate the organization as well as searching and movement of Lattice QCD data among the facilities.

Scientific software and user support activities are excluded from the scope of this project.

This work will be performed according to the LQCD-ext Project Execution Plan (PEP) and the project 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 LQCD-ext project management reporting to the DOE Federal Project Director for the LQCD-ext project.

Detailed activities to be performed at the Fermilab site and the required resources for technical personnel are specified in the LQCD-ext WBS document. It is understood that the project WBS will be modified annually to maximize scientific delivery for the LQCD-ext project during the annual approval of the project acquisitions.

5 COSTS AND FUNDING

It is anticipated that the DOE Office of Science will provide funds for the LQCD-ext project over the project lifetime in accordance with the approved baseline plan and funding profile. Fermilab expenditures will be covered by funds provided by DOE and allocated to the laboratory on an annual basis, following the allocation decisions described in the OMB Exhibit 300 submission for each budget year. Fermilab agrees not to exceed the site budget defined in the annual approved financial plan.

Project funds will be allocated to Fermilab to cover costs in the following categories:

- Labor support for the deployment of new LQCD-ext computing systems. This includes new hardware deployment planning and support.
- Labor support for the steady-state operation of the LQCD-ext system including system administration, hardware support, and site management. The budget also provides a modest amount of funds for travel and materials/services.
- Construction and purchase of new computing systems, including clusters or equivalent compute hardware, network switches, tapes, disks, etc. The size, makeup and location of the equipment will be defined on an annual basis to optimize the cost and performance of the machines. New system deployments also include a modest amount of hardware required for the near-line storage.
- Labor support for the project management of the LQCD-ext project and a modest budget for travel costs.

6 RESOURCES

6.1 Project Management Personnel

William Boroski is the LQCD-ext CPM. Bakul Banerjee is the Associate Contract Project Manager (ACPM) for the project. Both of them are Fermilab employees.

6.2 Site Management Personnel

Don Holmgren and Amitoj Singh are joint Site Managers for the LQCD-ext Fermilab site.

6.3 Technical Personnel

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

6.4 Equipment

New equipment for the computing system at the Fermilab site will be procured using DOE-HEP and/or DOE-NP funds made available to Fermilab. Existing computing equipment deployed at the Fermilab site to carry out Lattice QCD computing work at the beginning of the fiscal year 2010 falls within the scope of the LQCD-ext computing system.

7 PROJECT MANAGEMEBT RESPONSIBILITIES

7.1 Organization Chart of the LQCD-ext project

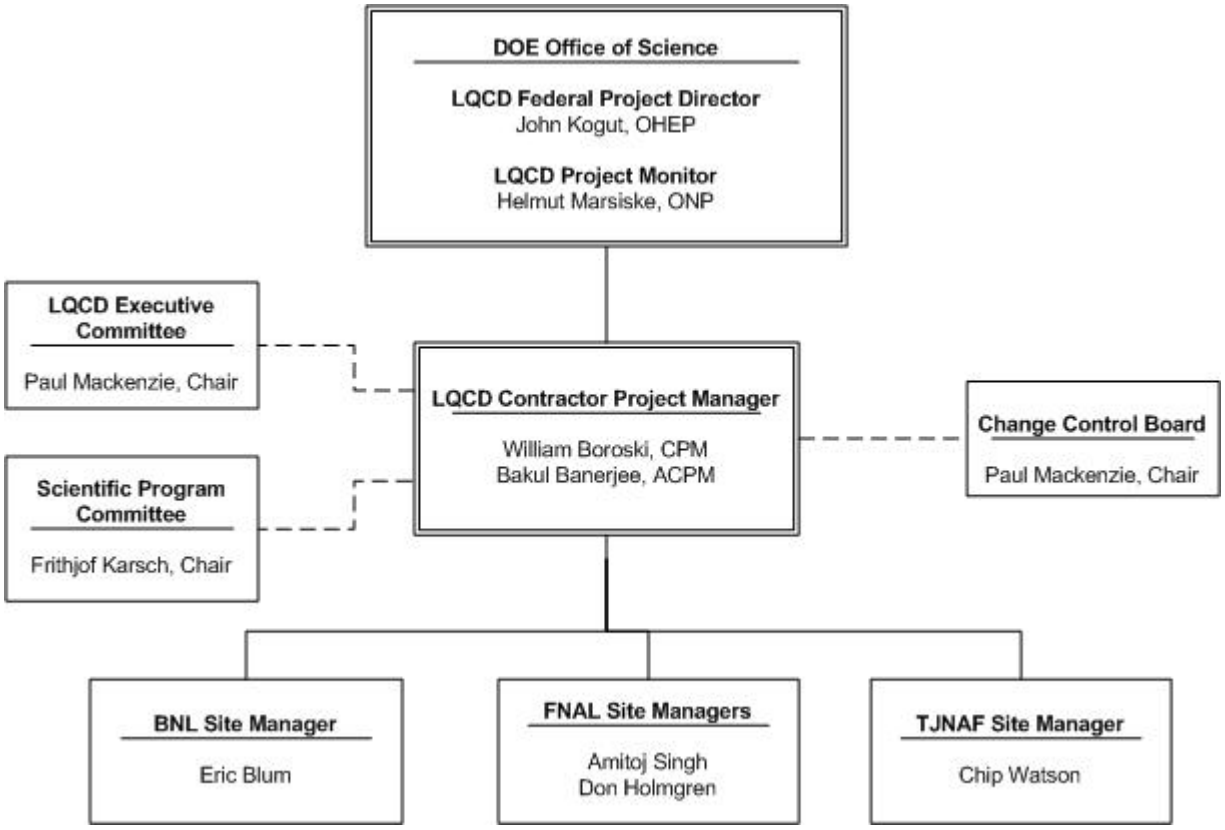

Figure 1. Management Organization Chart for the LQCD-ext Computing Project. Vertical lines indicate reporting relationships. Horizontal lines indicate advisory relationships.

7.2 Laboratory Management at LQCD-ext Sites

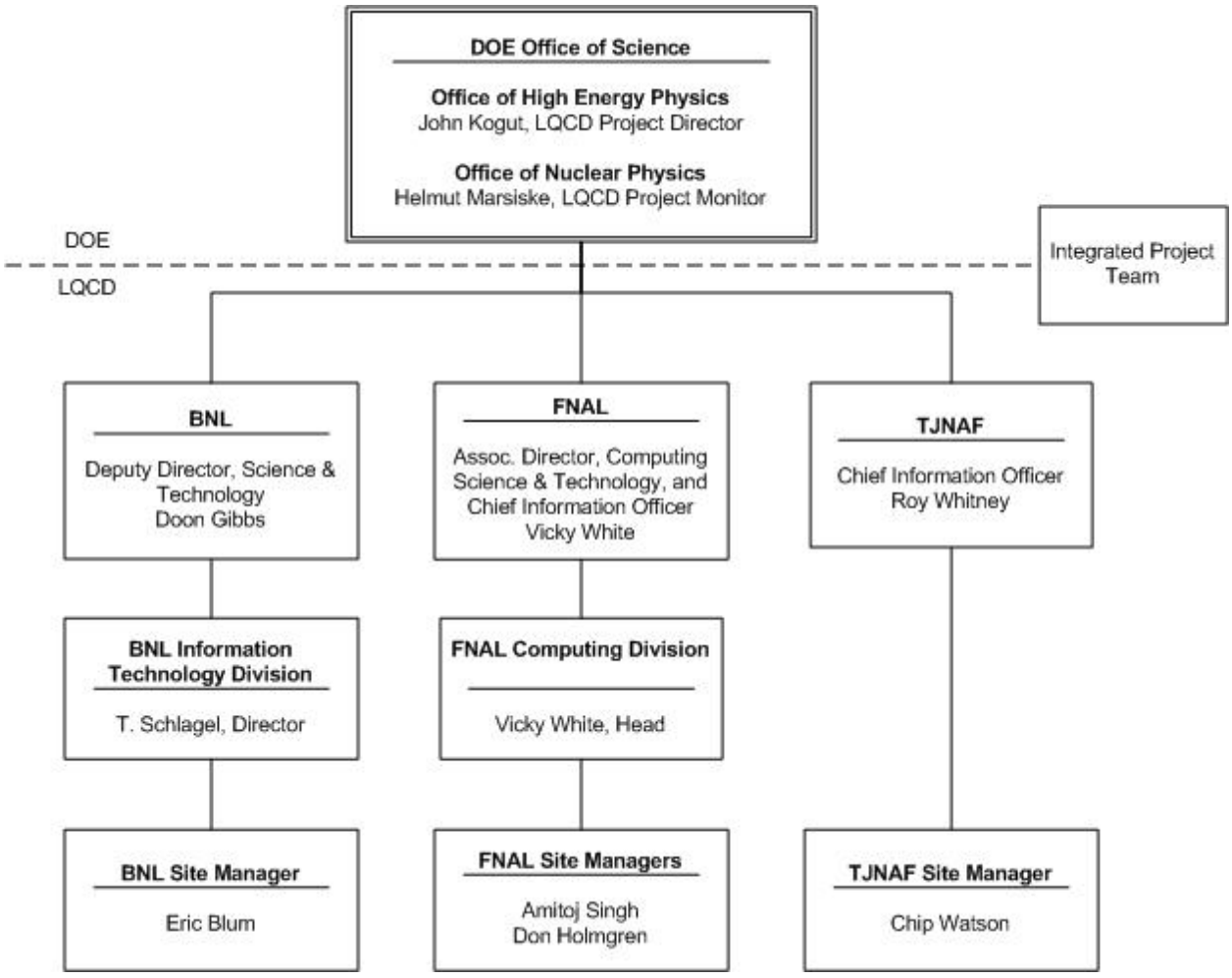

Figure 2: LQCD-ext and Laboratory management

7.3 Coordination and Reporting

The Fermilab Associate Director for Computing Science & Technology, and CIO, 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 USQCD collaboration, as necessary.

The technical progress of the design, implementation, and testing of computer equipment will be reported to the project office by the above-named site manager on a monthly basis, by WBS element, The 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 the DOE Federal Project Director.

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 in the LQCD-ext PEP.

7.4 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 procurement cost ceilings allowable at sites are documented in the LQCD-ext PEP and WBS. These cost ceilings cannot be exceeded without the authorization of the CPM and when necessary, by invoking change control process as defined in the PEP.

7.5 Reporting to LQCD-ext Project Management

Fermilab agrees to report all LQCD-ext related expenditures and labor charges in each item of work by LQCD-ext 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.

Fermilab agrees to furnish complete documentation of the quality assurance (as defined in the LQCD-ext Quality Assurance Plan[iv] and applicable Fermilab Integrated Quality Assurance program documents), risk management information (as defined in the LQCD-ext Risk Management Plan[v]) and performance testing that is carried out for LQCD. 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 the LQCD-ext project will be used whenever possible.

Fermilab agrees to set up and maintain ledger cost accounts in a manner 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. By this MOU, standard practices used at Fermilab for cost accounting will be applied to the LQCD-ext project activities by Fermilab.

7.6 Collaboration with Other Groups and Institutions

TJNAF and BNL are the two other institutions participating in the LQCD-ext computing project. The LQCD-ext CPM and ACPM will coordinate with these two institutions and present consolidated reports to the DOE Federal Project Director.

8 CONTRIBUTION OF FERMILAB

Subject to adequate funding by DOE, Fermilab will provide additional in-kind support to the project during this period of performance.

8.1 Effort

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

8.2 Services

Fermilab agrees to provide support services to the LQCD-ext project to the degree required to carry out relevant responsibilities. Some of these services are covered by the overhead paid by the LQCD-ext project. These may include:

- Services for generic computing infrastructure, including network
- Services for the lab-wide infrastructure for mass storage. This includes assistance with the local LQCD dCache instance, access to the lab-wide dCache, and access to the Enstore mass storage
- Services for remote backups (TiBS)
- Services for computer security infrastructure
- Services for the system disaster recovery
- Services of the responsible financial officer
- Services for building facilities
- Services for purchase of goods and services
- Services for administrative staff.

8.3 Facilities and Equipment

Adequate facility infrastructure will be made available to the LQCD-ext project to the degree necessary to carry out the implementation of LQCD-ext computing system at Fermilab site. Fermilab agrees to pay for all facility and utility costs, such as the power needed to support the computing and HVAC systems.

8.4 Operating Costs

Fermilab, subject to the availability of funds from DOE, will support the normal research operating expenses (such as physicists' salaries, travel expenses, miscellaneous supplies, administrative support, etc.) relevant to the LQCD-ext project.

9 GENERAL CONSIDERATIONS

9.1 System Engineering Practices

Fermilab management agrees to support the implementation of standard system engineering best practices. All major system components will undergo appropriate quality control and validation testing.

Fermilab 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 engineers for routine maintenance and upgrades.

9.2 Project Management Practices

Fermilab management agrees to support Performance Based Project Management (PBMS) practices and guidelines prescribed by DOE Office of the Chief Information Officer (OCIO). Note that during the initial approval of the project, it was determined by the DOE Federal Project Director that the LQCD-ext project is exempt from the implementation of the Earned Value Management System (EVMS).

All procurement documents must be transmitted to the LQCD-ext project office. All procurements must be accompanied by adequate backup documents, including the appropriate LQCD-ext charge codes established for the site. 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 be a part of the LQCD-ext computing system.

10 SCHEDULES AND MILESTONES

Fermilab will make every effort to carry out its institutional responsibilities consistent with the schedule and milestones for the LQCD-ext computing system. It is understood that these schedules may need to be adjusted as the project progresses. Fermilab agrees to 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] Budgeted Year FY2010 Exhibit 300: Capital Asset Plan and Business Case Summary, Date 9/18/2009

[ii] LQCD-ext Project Execution Plan

[iii] LQCD-ext Project Acquisition Strategy

[iv] LQCD-ext Quality Assurance Plan

[v] LQCD-ext Risk Management Plan