FY2014 Acquisition Plan
Supplement for FY2015
for the
SC Lattice QCD Computing Project Extension
(LQCD-ext II)

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

for the
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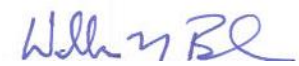
CONCURRENCE:



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Date

FY2014 Acquisition Plan Supplement for FY2015
Change Log

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Rev 1.0	Initial version.	4/20/2015

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In FY14, the LQCD-ext hardware project purchased and deployed a conventional (Pi0) and a GPU-accelerated (Pi0g) cluster at Fermilab. The follow-on project, LQCD-ext II, started Oct 1, 2014 and runs through FY19. Due to project budget uncertainties during the planning process for LQCD-ext II, the budget for FY14 hardware purchases under LQCD-ext was adjusted in mid-FY14 to cover possible labor expenses for running existing LQCD hardware at Fermilab, Jefferson Lab, and Brookhaven in FY15. Because the LQCD-ext II budget as approved provides sufficient funds for FY15 operations, these FY14 LQCD-ext funds plus additional carryover from lower than planned labor expenses during the LQCD-ext project were available to the LQCD-ext II project. The LQCD-ext II project created and executed a spend plan for these funds that directed $127K as contingency for operations during continuing budget resolutions, $60K for storage purchase at Jefferson Lab, and $495K for expansion of the clusters at Fermilab.

The project considered multiple scenarios for the $495K portion of the spend plan. The funds could be spent through a new procurement of equipment, following the standard RFI/RFP process. Alternatively, because the FY14 Pi0/Pi0g purchase contract at Fermilab included options for additional FY15 purchases of identical components, the funds could be spent through an expansion of either cluster. Exercising the FY15 purchase options had the benefit of minimizing labor overhead plus the added benefit of avoiding G&A costs (about 20% at Fermilab); further, the hardware would be available more quickly. The project elected to spend the funds through the exercise of purchase options.

The purchase contract allows Fermilab to procure either conventional or GPU-accelerated cluster nodes, or a combination of both, plus the additional requisite networking, cabling, and power distribution gear. Of the dedicated hardware operated by LQCD-ext II, the conventional clusters have been the most oversubscribed in the annual allocations process. Further, at Fermilab they have higher utilization compared to the GPU-accelerated clusters. The project therefore recommended to the USQCD Executive Committee that the funds be used to expand the Pi0 conventional cluster by 100 nodes.

The original Pi0 cluster consisted of 214 compute nodes. A major project running on Pi0 this allocation year is the "Muon" project ("Hadronic vacuum polarization and hadronic light-by-light contributions to the muon anomalous magnetic moment using statistical error reduction techniques"). "Muon" relies on the deflation algorithm, and at 214 nodes the largest job available to the project that matches their current lattice dimensions is 192 nodes. The next "good" size is 256 nodes; larger job sizes on deflation projects provide more memory, allowing a greater number of eigenvectors to be calculated and stored. Because utilizing a greater number of eigenvectors improves the performance of the inverter of the deflated Dirac operator, larger job sizes can lead to better than linear scaling in the decrease in job times. By expanding Pi0 to 314 nodes, not only can "Muon" use 256 nodes on their job stream, but other projects can also run simultaneously on the remaining nodes.

Paul Mackenzie, the chair of the USQCD Executive Committee, communicated the expansion plan recommendation on January 14 to the Committee. On January 21 he informed the LQCD-ext II project that the Committee concurred with the recommendation. The purchase order for the Pi0 expansion was issued to Koi Computers on Feb 9. Delivery and installation of all equipment was completed on Mar 20. Tests of the expansion started on Mar 23, including "friendly user" testing starting the week of Mar 30. The Pi0 cluster expansion was released to production at the end of a scheduled maintenance, April 10. The expansion took the Pi0 cluster from a USQCD computing capacity of 13.1 TFlops to 19.2 TFlops.