U.S. Department of Energy and the National Science Foundation

U.S. LHC Joint Oversight Group

To: U.S. CMS, U.S. ATLAS Operations Program

Dear Colleagues:

On behalf of the U.S. Department of Energy (DOE) and the National Science Foundation (NSF), we thank you for your willingness to participate in the upcoming review of the U.S. CMS and U.S. ATLAS detector operations programs. The evaluation is scheduled to take place at Fermi National Accelerator Laboratory (FNAL) on March 9–12, 2015.

The Large Hadron Collider (LHC) is completing its two-year long maintenance period that will enable the collider to reach energies of 13 TeV in spring 2015 and ultimately ramp up to the design energy of 14 TeV. During this long shutdown (LS1), the CMS and ATLAS collaborations have been completing their detector maintenance, consolidation, and improvement program, while continuing to analyze the collected data from the LHC initial run (2009–2012), beginning to execute the Phase-1 detector upgrades, and are in their initial stages for planning the high-luminosity LHC (HL-LHC) upgrade program (Phase-2).

The goals of the U.S. LHC Detector Operations Program are to meet the international obligations for detector maintenance and operations and to provide the required software, networking, and computing infrastructure to enable U.S. researchers in CMS and ATLAS to participate effectively in all phases of physics analyses, and to conduct directed R&D aimed at improving long-term detector performance. U.S. researchers are also executing initial upgrades of the CMS and ATLAS detectors, which are to be ready for installation by the second LHC long shutdown (LS2) in 2018. Based on the 2014 Particle Physics Project Prioritization Panel (P5) strategic plan for HEP, U.S. collaborators have also begun working with the international CMS and ATLAS experiments and funding agencies to develop plans to contribute to both detector upgrades for operating at higher luminosities after the long shutdown (LS3) period scheduled for 2023–2025. This review provides an opportunity to examine the status of all efforts associated with these goals. While the U.S. LHC Operations Program does not provide support for execution of the upgrade projects, this review also offers an opportunity to examine the interplay between the planned U.S. upgrade projects, including enabling R&D and pre-construction planning, and the operations program.

The purpose of this review is to assess:

- the U.S. contributions to the operation of the LHC detectors and computing infrastructure for the fiscal years 2015–2016;
- the state of readiness to resume detector operations for Run 2 commencing in spring 2015;

- planning for U.S contributions to the HL-LHC detector upgrades and coordination with the international collaborations within the context of the unique assessment and approval processes of DOE and NSF.

Therefore, we ask you to evaluate the status of the U.S. LHC Operations Program including current commitments to the operations of the detectors, the computing facilities, the infrastructure developed for data analysis, the allocation of funds in FY 2015, and the proposed spending plans for FY 2016 – FY 2019.

In addition, you are asked to address the following issues:

1) **Management:** Assess the ability and recent performance of management to track program scope and assess outcomes relative to planned performance metrics for the prior year; prioritize activities and define appropriate deliverables; assess and manage risk; balance the manpower and funding of detector operations, computing, software operations, and upgrade R&D; and respond to unforeseen technical or funding challenges. Assess and comment on the appropriateness of planned performance metrics for the current year.

2) **Budget:** Are the costs and budget projections for operations consistent with the following funding guidance for FY 2015 – FY 2019 from DOE and NSF and with the current LHC program and schedule? Examine plans to expend carry-over funds accrued from previous years, which the experiments reported at the March 2014 review, report on whether they are appropriately developed, and recommend improvements where applicable.

Table I: U.S. ATLAS Guidance[a,b,c]

(in k$)		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Nominal	DOE	24,300	25,600	25,700	28,000	27,200
	NSF	9,000	9,000	9,000	9,000	9,000
	TOTAL	33,300	34,600	34,700	37,000	36,200
Low (-5%)	DOE		24,320	24,415	26,600	25,840
	NSF		8,550	8,550	8,550	8,550
	TOTAL		32,870	32,965	35,150	34,390

Table II: U.S. CMS Guidance[a,b,c]

(in k$)		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Nominal	DOE	25,000	26,600	26,600	27,200	27,800
	NSF	9,000	9,000	9,000	9,000	9,000
	TOTAL	34,000	35,600	35,600	36,200	36,800
Low (-5%)	DOE		25,270	25,270	25,840	26,410
	NSF		8,550	8,550	8,550	8,550
	TOTAL		33,820	33,820	34,390	34,960

[a] Does not include carry-over funds reported by U.S. ATLAS and U.S. CMS at the March 2014 Review.
[b] Does not include $2M currently provided to support international network service (LHCNet / ESnet) for both U.S. ATLAS and U.S. CMS.
[c] NSF budgets beyond FY 2016 are guidance only.

3) **Data Access and Analysis:** Are the tools and services for data access and analysis provided by U.S. CMS and U.S. ATLAS computing efforts adequate to support the planned research program and to respond to the increasing luminosity profile of the next 5 years? Review the experiment's data access and management plans and report on their adequacy and the effectiveness of their implementation.

4) **Preparations for LHC Detector Operations for Run 2:** Comment on the preparation of the experiments to resume and efficiently continue operations in Run 2 and discuss foreseen risks to the operation programs and the expected effectiveness of the mitigation plans in place. Report any overlooked risks and recommend strategies for their mitigation.

5) **Assessment of U.S. Contributions:** Assess the quality and appropriateness of U.S. contributions to the LHC experiments and report whether this is commensurate with the level of U.S. participation. Examine and report on the timeliness with which the U.S. responsibilities and financial obligations are being discharged.

6) **LHC [Phase-1] Detector Upgrades:** Do the Phase-1 detector upgrade plans include adequate estimates of future impacts on personnel, M&O obligations, and overlap with the operations program and the initial project period of the Phase-2 upgrades?

7) **HL-LHC [Phase-2] Detector Upgrades**: Are the experiments developing plans for the HL-LHC detector upgrades in coordination with the funding agencies while also coordinating with CERN LHCC and the international approval process? Do the upgrade plans include adequate estimates of future impacts on personnel, M&O obligations, and overlap with the Operations Program and the end of the construction and installation period of the Phase-1 upgrades?

8) **Response to Previous Reviews:** The previous year's reviews for the LHC Operations Programs were held in March 2014 at Columbia University. A Mini-Review was subsequently held in September 2014 at Rockville-Washington, D.C. to assess progress by the experiments on responses to the March 2014 comments and recommendations. Have the U.S. LHC Operations Programs responded satisfactorily to the comments, recommendations, and concerns made at these previous reviews?

The review will be chaired by Abid Patwa (DOE), U.S. LHC Operations Program Manager, with Simona Rolli, LHC Phase-1 Upgrade Program Manager (DOE), and other program staff members from the DOE, Mark Coles and Jim Shank from the NSF participating in the evaluation. The U.S. collaborations will post their presentations on the web one week prior to the meeting, and you will have access to supporting documentation prior to the start of the review.

We expect to receive preliminary indications of your assessment of the CMS and ATLAS detector operations programs by the end of the review. Your final written reports should be submitted as text documents (*e.g.,* Microsoft Word or equivalent) by April 5, 2015. This will provide valuable and timely input to the agencies, which is crucial for our continuing scrutiny and validation of needs of the U.S. LHC Operations Program and the LHC Upgrade Projects.

We truly appreciate your willingness to participate in this important review. Thank you.

Sincerely,

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U.S. Department of Energy

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