

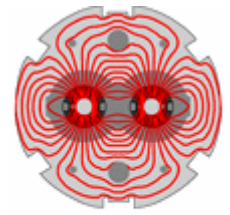
LHC@FNAL: Requirements for CMS

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LHC@FNAL: Goals for CMS



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Commissioning

- Provide access for experts in North America
- Participate in a diverse set of activities that may not all be at the same location at CERN. (For example, the Cosmic Challenge and test beam)

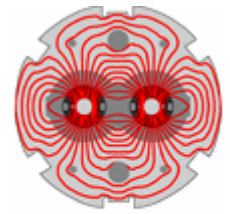
Operations

- Participate in shifts and studies (particularly useful during the nighttime hours at CERN)
- Provide access for detector experts
- Monitor data quality

Computing (requirements similar to operations)



CMS: Assumptions

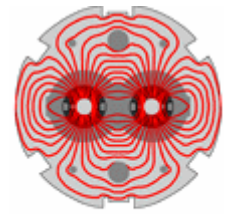


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- The CMS Collaboration will have a shift schedule, a run plan, and a protocol that defines the roles and responsibilities of shift personnel. We assume that a shift leader is responsible for CMS shift activities.
- LHC@FNAL will have shift operators who will be able to assist US-CMS collaborators with CMS activities during commissioning and operations.
- LHC@FNAL will participate in CMS shifts. Neither the duration nor the frequency of the LHC@FNAL shifts has been determined.
- The CMS Collaboration will have a protocol for access to the CMS control system (PVSS), and a policy for how access to the control system will vary depending on the physical location of an individual user.
- The CMS Collaboration will have a policy that defines how DAQ resources are allocated. This includes allocation of DAQ resources to various detector groups for calibration and testing.
- The CMS Collaboration will have a protocol that defines how always-on video conferencing will be used in CMS control rooms and [LHC@FNAL](#).
- The CMS Collaboration will provide web access to electronic logbook and monitoring information to collaborators worldwide.
- The CMS Collaboration will maintain a *call tree* that lists on-call experts worldwide for each CMS subsystem during commissioning and operations.



CMS General Requirements



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We will follow the policies established by the collaboration.

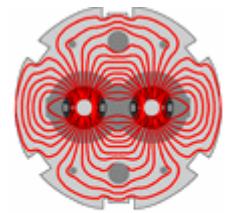
We plan to provide facilities for shift operators and experts during a variety of commissioning and operations activities for CMS. These activities could include debugging, test beam, and calibration for the various sub-components. There may be additional facilities needed for computing (production, network and grid monitoring).

1-1. CMS Confidentiality	Essential	Proposed-PM
Data, results, conclusions, and problem reports for CMS shall be kept confidential by all LHC@FNAL users according to CMS collaboration guidelines.		

1-2. CMS Space	Essential	Proposed-PM
<p>LHC@FNAL shall have the space that is needed to accommodate diverse US-CMS activities during commissioning and operations. These activities include, but are not limited to:</p> <ul style="list-style-type: none"> •Commissioning and operations activities for various detector groups •Data quality monitoring •US-CMS computing operations (optional) 		



Communications and Access



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LHC@FNAL will provide facilities and tools to allow participation in “global” CMS meetings related to commissioning and operations.

Some tools are easily available; others may require some development.

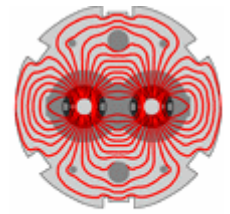
We have developed detailed scenarios that make use of these technologies.

Most have already been used in HCAL test beam remote operations.

<p>1 – 1-3. CMS Commissioning Meetings</p>	<p>Essential</p>	<p>Proposed–EG</p>
<p>CMS commissioning meetings shall have video conferencing capabilities that allow access to meetings by CMS collaborators located at LHC@FNAL.</p>		
<p>1 –1-4. CMS Tools to Improve Remote Participation</p>	<p>Essential</p>	<p>Proposed–PM</p>
<p>The LHC@FNAL Committee shall continue to explore tools that will improve remote participation in CMS commissioning activities at CERN.</p>		
<p>1 – 1-5. CMS Communications [280]</p>	<p>Essential</p>	<p>Proposed–PM</p>
<p>Several types of reliable communications shall exist between LHC@FNAL, CMS control rooms, and CMS collaborators worldwide. The types of communications shall include, but not be limited to:</p> <ul style="list-style-type: none"> •Telephone (wired and wireless) •On-demand video conferencing •On-demand screen sharing •Simple, prompt electronic messaging with audio alerts (for example, “instant messaging”) •E-mail •Electronic logbook 		



Communications and Access



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1-6. CMS Communications Channels for Commissioning	Essential	Proposed-EG
LHC@FNAL shall have the capability to simultaneously communicate with multiple CMS control rooms (located at CERN or in remote locations) and CMS collaborators involved in commissioning activities.		

This center will most likely be part of a global system (CERN, FNAL and other CMS collaborating institutes.)

1-7. CMS Video/Audio Communications	Essential	Proposed-EG
CMS shift personnel shall have access to always-on video conferencing capabilities between control rooms, and multi-channel audio conferencing that can accommodate shift personnel in control rooms as well as detector experts with telephone access.		

Video access during critical operations may need to be “always-on.” These audio/video communications should be private to CMS collaborators. CMS will need to develop a policy.

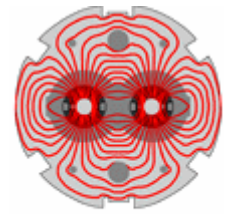
1-8. CMS Video/Audio Access	Essential	Proposed-EG
Always-on video/audio conferencing shall be secured (for example, by password protection) such that video/audio conferences are only accessible to CMS collaborators or LHC@FNAL users.		

1-9. CMS Video/Audio Monitoring	Essential	Proposed-EG
LHC@FNAL shall have access to monitoring that can be provided by video/audio hardware. Video images shall be accompanied by location, date and time information.		

It will be useful to monitor some CMS equipment by video/audio.



CMS Controls (PVSS)



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Remote access to the CMS control system is a critical issue for operations and commissioning:

**Will remote experts have access to the control system?
How is the system protected?**

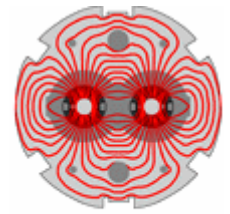
We examined several scenarios developed by local tracker experts and hcal experts. It is not yet clear what is the appropriate level of access. The spirit of the requirement is that access is restricted, but should be available when it is needed.

A policy will be needed for different activities/detectors.

1-10. CMS Control System Access [280] [286]	Essential	Proposed- PM
LHC@FNAL shall have access to the CMS control system (PVSS). The degree to which CMS shift operators who are at LHC@FNAL have access to the CMS control system shall be established by CMS management and the CMS commissioning coordinator.		



CMS Operations



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Requirements for CMS operations include the previous of requirements, plus the following:

1-11. CMS Communications Channels for Operations [130]	Essential	Proposed-EG
LHC@FNAL shall have the capability to simultaneously communicate with as many CMS control rooms (located at CERN or in remote locations) as are actively involved in shift operations at any given time.		

Shift operators at the LHC@FNAL facility will want access to monitoring data in a manner similar to shifters at the main CMS control room at CERN.

1-12. CMS Monitoring Data Access [280]	Essential	Proposed-PM
LHC@FNAL shall have access to the same network-accessible monitoring data that is available in the main CMS Control Room. This shall include, but not be limited to:		
<ul style="list-style-type: none"> •Data quality monitoring (DQM) information •Databases for CMS subsystems •Monitoring information provided by the CMS control system •LHC beam conditions and data logged by the LHC control system 		

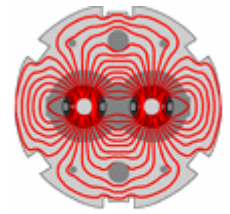
Some monitoring information should be viewable whenever shifters are present.

This does not mean that ALL data available in the CMS control rooms needs to be transferred to FNAL, but it should be available when needed by an expert or a shift operator.

1-13. CMS Calibration and Alignment Data	Essential	Proposed-PM
LHC@FNAL shall have access to data used for detector calibration and alignment.		



Operations planning



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Experts will want to initiate special runs and calibration runs for testing detector components. LHC@FNAL and CMS will need to coordinate operations so these requests can be honored with appropriate priority. We assume this coordination will be primarily done by the CMS shift leader.

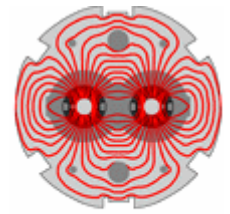
The details will need to be worked out in some other forum.

1-14. CMS Run Plan Requests [286]	Essential	Proposed-PM
LHC@FNAL shall be able to submit requests to include special runs (such as calibration runs) in the CMS run plan and be notified of the status of these requests.		

1-15. CMS DAQ Resources	Essential	Proposed-PM
LHC@FNAL shall be able to submit requests to use DAQ resources for CMS subsystem calibration and testing.		



Software requirements for CMS operations



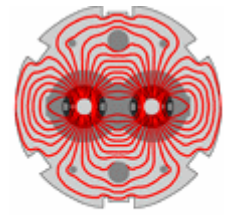
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For smooth operations, it will be important to have key elements of the CMS online, controls and monitoring software operational and up-to-date at LHC@FNAL. Some software development may be required for remote access, but this has not yet been specified.

1-16. CMS Control Room Software	Essential	Proposed-EG
LHC@FNAL shall have the same CMS experiment software installed as the software used in the CMS Control Room.		
1-17. CMS Software Maintenance	Essential	Proposed-EG
All CMS experiment software that is used for LHC@FNAL shall be maintained at the correct version.		
1-18. CMS Development Environment	Essential	Proposed-EG
LHC@FNAL shall have the software development environment that is needed to develop CMS experiment software.		



LHC@FNAL: Common Constraints



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Communications for LHC@FNAL: common requirement (CMS, LHC)

4-1. Communications	Essential	Incomplete- PM
Reliable communications shall be available to LHC@FNAL users. Additional work is needed to determine specifications for communications.		

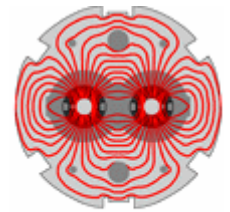
Computing and Networking for LHC@FNAL: Detailed requirements are not yet known - noted as an Incomplete Requirement.

4-2. Computing	Essential	Incomplete- PM
Computing resources shall be available to LHC@FNAL users. Additional work is needed to determine specifications for computing.		

4-3. Reliable Networking	Essential	Incomplete- PM
Reliable networking shall be available to LHC@FNAL users. Additional work is needed to determine specifications for networking.		



Common Software requirements



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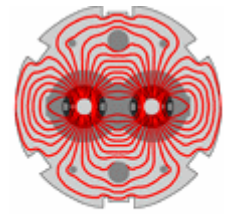
Common Requirements for all software developed for LHC@FNAL:

4-4. Software compliance	Essential	Proposed-EG
Software developed at the LHC@FNAL for CMS and LHC shall conform to rules and coding standards established by the CMS Collaboration and LHC Project, respectively.		
4-5. Software repository	Essential	Proposed-EG
LHC@FNAL software shall reside in a software repository that must be used to keep track of different versions of the software during development.		
4-6. Version control	Essential	Proposed-EG
The version numbers of LHC@FNAL software used to process data shall be managed in such a way that the particular version that was used to process data can always be identified and reproduced.		
4-7. Parameters database	Essential	Proposed-EG
Shared parameters and constants defined by LHC@FNAL software shall reside in a database so that the particular values used to process data can always be identified.		
4-8. Software testing	Essential	Proposed-EG
LHC@FNAL software shall include code for testing purposes as part of the development process, and must be used for testing the software after development has been completed.		

Most software will be developed by the collaborations and it is assumed that their software rules will be followed when LHC@FNAL work on software for the collaboration. These requirements apply to software development explicitly for LHC@FNAL.



Security and Safety



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Common Requirements for Security

4-1. Computing and Networking Security	Essential	Incomplete- PM
LHC@FNAL shall have secure computing and networking. Additional work is needed to determine specifications for the level of security that is needed.		

4-2. LHC@FNAL Space Security	Essential	Incomplete- PM
LHC@FNAL space shall be secured. Additional work is needed to determine level of security that is needed.		

Common Requirements for Safety

4-3. General safety	Essential	Proposed- EG
LHC@FNAL shall comply with all applicable CERN, CMS, and LHC safety standards.		
4-4. LHC@FNAL safety	Essential	Proposed- EG
LHC@FNAL shall comply with all applicable Fermilab ES&H safety standards.		