

LARP – LHC Commissioning Issues



- Commissioning topics
- Upcoming events
- Next steps

Commissioning Topics



- **LHC Beam Milestones 2003-2007**
 - **TI8 Installation and Hardware Commissioning**
 - Installation of TI8 machine elements will begin as soon as the general services campaign is finished and is planned to continue until early July 2004. Working back from the beam test date of 25th September and allowing for 2 weeks of cold checkout, 2 months remain for the hardware commissioning phase.
 - **Sector Test with Beam in 2006**
 - Collimator Tests at the SPS with its LHC type of beam (450 GeV at LHC injection). A status of the preparations for the installation into the SPS and a schedule of the foreseen tests with the required MD times will be given.
 - **Carrying out the hardware commissioning: from where, with what resources**
 - **Cooling down a whole machine**
 - **Commissioning the Electrical Circuits: Powering, Protection, Interlocks**
 - **Getting ready for Beam**
 - The hardware commissioning phase is presently scheduled to start in mid-2005 and end in March 2007. At this point all 8 sectors will have been successively cooled down and powered to nominal current, and all special-function equipment (such as injection, extraction, RF) will have been exercised. Both transfer lines will have been tested, one of them with beam. There will then be a phase, the cold checkout, through which all accelerator systems will be restarted together and operated in a manner that is representative of commissioning with beam. The ultimate aim of the cold checkout is that by the time the first beam is injected, the LHC will have been driven at least once through all operational phases foreseen for year 1.
 - **What LHC Operation will look like**
 - First operation of the LHC will be with reduced beam current for a number of reasons. An outline of how the accelerator could be staged towards nominal performance over the following years will be given. On top of this the overall operation scenario will be considered, covering the breakdown of a year into shutdown and operational periods, of operational periods into beam and no-beam periods, and of beam periods into physics and other runs. This scheduling will in part be driven by the requirements of the equipment and service groups.
 - **Operating the LHC initially at a lower Energy**
 - The presentation is a follow-up from Chamonix 2003, where initial operation of the LHC at lower energy, say, 6 TeV, has been proposed. The consequences for the operation of the technical systems (mainly superconducting magnets, cryogenics, machine protection systems) will be discussed, taking into account realistic constraints. An outlook to operation with beam will be given, together with an estimation of the integrated luminosity compared to initial operation at 7 TeV.

Commissioning Topics

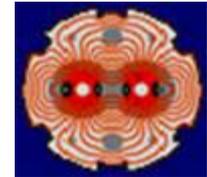


- **LHC Beam Milestones 2003-2007**
 - **Tuneability of the LHC Lattice, Brüning**
 - The common powering of the arc quadrupole circuits of the two LHC rings couples the optics of the two LHC beams in the arcs. Independent phase adjustments in the two rings can only be achieved via the arc trim and the insertion region quadrupole circuits which feature an independent powering for both beams. The talk discusses scenarios where the LHC operation might require independent optics adjustments for both LHC beams and summarizes the present limitations for such adjustments.
 - **The Beam Loss Monitoring System**
 - The calibration of the system is based on tertiary beam halo tracking and on lost proton initiated shower simulations. Some of the calculated calibration constants will be verified during the foreseen sector test. The change of the thresholds with the loss duration and the beam energy has to be tested during the commissioning phase of the LHC.
 - **Running in the Diagnostics**
 - **Getting and Maintaining a Reliable Beam Dump System**
 - **Making the Collimation System Collimate**
 - To avoid devoting most of the LHC running time to collimator adjustments, reasonably simple and reproducible procedures must be established for collimator tuning. Possible strategies for collimator settings management will be explored, with a particular emphasis on procedures that are simple and reliable - provided they exist !
 - **Finding a Faulty Element of the Machine**
- **US-defined opportunities**
 - **LBNL instrumentation**
 - **FNAL – tune tracker, etc.**
 - **BNL – electron cloud, vacuum**

Upcoming Events



**LHC Project Workshop
CHAMONIX XIII
19-23 January 2004**



The next workshop which will focus on the performance and operation of the LHC as well as the construction, installation and commissioning of the project, will be held at CHAMONIX, from :

Monday 19 January 2004 to Friday 23 January 2004.

The summing-up will be given at CERN on **Thursday 29 January 2004.**

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Next Steps



- Feedback from Chamonix
- Chamonix Summing-up & Follow-up meetings at CERN - 1/04
- LARP annual meeting near Fermilab – 2/04
- Possible mini-workshop on Beam commissioning (Peggs)
- Identify US involvement in
 - pre-LHC studies
 - TI8 commissioning?
 - ?

Summary



- Status of US involvement seems fuzzy beyond already defined projects:
 - magnets
 - instrumentation
- Clearer picture after Chamonix workshop
- Need to identify tasks