

Major Milestones of the AB/CO Group for the Period 2004-2007

Overview of the forthcoming PS, SPS and LHC Operational Milestones

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This document is the outcome of the contribution of several AB/CO Members and serves as key milestone reference for the organization and planning of the technical activities inside the AB/CO group

DOCUMENT HISTORY

- 03/02/2004 : Magnet Test benches milestones added
- 02/02/2003 : part II added as Excel table
- 16/01/2004 : technical aspects of the LEIR commissioning revisited (Marine)
- 12/01/2004 : clarifications for the TI8 beam test milestone (OASIS, PM, Multi cycling)
- 12/01/2004 : New AB Central Timing Deployment milestone : completely revisited
- 12/01/2004 : QRL commissioning milestone: clarification for W2K/Linux PVSS servers, VDSL added
- 12/01/2004 : SM18 Magnet Test Bench added as operational milestone
- 17/12/2003 : add BIC CTR requirements (CBCM milestone)
- 17/12/2003 : corrected type of HW and supervision for PIC (LHC hardware commissioning milestone)
- 25/11/2003 : Added/modified operational milestone dates (Axel)
- 18/11/2003 : More precisions concerning LEIR planning (Marine)
- 17/11/2003 : More information about LASER throughout the document (Mark)
- 17/11/2003 : Add "Machine Mode" comment for TI8 test (Mark)
- 17/11/2003 : More information about the LEIR commissioning (Marine)
- 15/11/2003 : First Version based on 3 consecutive AB/CO planning meetings

INTRODUCTION

This document provides an overview of the forthcoming operational milestones for the AB/CO group, for the period 2004-2007.

Important Notice: at this stage, this document is accurate ONLY for the period 2004-2005 (SPS-LHC transfer lines, the LEIR machine and the LHC Hardware Commissioning). More information about the objectives for the period 2006-2007 (LHC beam test in 2006, LHC full commissioning in 2007) will be included in due time.

The information provided in this document has been gathered from different sources in order to fulfill the two following objectives:

1. provide a clear description of the major forthcoming PS, SPS and LHC operational milestones
2. provide a detailed list of the AB/CO deliverables required for attaining these objectives, with procurement dates and responsibilities

In practice, this document will serve as the **BASELINE** for:

- **driving the efforts of the AB/CO Technical Committee** in order to fix the remaining technical choices to be made and to clarify technical concepts or interfaces
- **organizing and following-up the procurement of hardware and software components** required for attaining these operational objectives (installation, commissioning, operation and maintenance)
- **giving each AB/CO section leader a detailed list of the deliverables his section is responsible for**

Therefore, **this document will constantly be updated** in order to provide the most possible accurate view of the objectives to be attained and the deliverables to be produced.

STRUCTURE OF THIS DOCUMENT

This document is organized in two parts:

PART I contains the following information:

- a clear **definition of the operational objectives** such as the SPS-LHC transfer lines commissioning, the LEIR commissioning, the LHC hardware commissioning, etc
- for each objective, a **list of the systems concerned** and the services required, with a particular emphasis on the role of the AB/CO group

- for each objective, the **technical aspects still requiring clarification** and/or decision (in red)

PART II is the practical organization of the work required to fulfill the objectives as described in PART I. It is provided in the form of an Excel table and contains the following information:

- the detailed hardware and software **deliverables** expected by the equipment groups in order to test, install, commission and run their systems
- the **procurement dates** for these deliverables, along with a distribution of **responsibilities** amongst the different AB/CO sections

PART I

**PS, SPS and LHC OPERATIONAL OBJECTIVES FOR THE
PERIOD 2004 - 2007**

MAJOR LHC OPERATIONAL MILESTONES

The following table gives an overview of the major milestones for the AB/CO group. It covers both the LHC machine, the complete chain of injectors (including LEIR), the transfer lines and the future CERN Control Center (CCC).

OPERATIONAL MILESTONES	DATES
New AB Central Timing System	April 2004
QRL (7-8) Commissioning	April 2004
SM18 Magnet Test Bench Ready	May 2004
SM18 DAQ and MMP Ready	August 2004
TI8 Beam Test	Sept 2004
Commissioning LEIR	May 2005
Commissioning Sector 7-8	April (>25) 2005
Commissioning Sector 2-3	June 2005
New CCC	April 2006
Beam Commissioning Sector 7-8	May 2006
CNGS	May 2006
Commissioning Sector 6-7	October 2006
CCO	April 2007

APRIL 2004 – NEW AB CENTRAL TIMING

Operational Objective:

To have the new Central Beam and Cycle Management (CBCM) system deployed and capable of distributing the new SPS timing information.

Scope:

This objective requires:

- The HW building of the CBCM transmission chain:
 - The installation of All VMEBus systems required for the generation of the Timing information (CBCM, CTGs for all machines)
 - The cabling between MCR and PCR
- The cleaning up of the SPS timing information (new list of supported events)
- The training of the operators
- The development and installation of the necessary timing configuration tools under the console manager (including Java knobs)
- The surveillance and monitoring of the new timing machines (clic, LASER)

Technical aspects:

- Several software modifications will be required:
 - C-tree, timing settings generation for the CBCM
 - No access anymore to the old MTGs (sending of asynchronous events)
 - Check correct behavior of SSM and fixed displays
- knobs require:
 - ASC java knobs
 - CMW communication between the ASC beans and the CTIM data module
 - the CTIM data module in charge of sending the timing modifications to the MTGs

Note/Pending Questions

- *A clearer summary of the impact on the current SPS system should be communicated*

APRIL 2004 – QRL COMMISSIONING

Operational Objective:

To have the required controls facilities operational for the commissioning of the QRL, starting with sector 7-8, 2-3, etc

Scope:

This objective requires:

- Control of the QRL vacuum system through PVSS
- Control of the QRL Cryogenics system through PVSS
- The Alarm System (despite the fact that CRYO has his internal alarms handling)
- The Logging System

Technical aspects:

- The procurement of operational Cryogenics PVSS servers on LINUX (ProLiant)
- The procurement of operational Vacuum PVSS servers on LINUX or W2K
 - Use W2K servers for sector 7-8 commissioning
 - Move to Linux servers from sector 2-3 onwards (requires Siemens TSPP Fetch/Write driver)
- The following PVSS interfaces must be defined, tested and installed:
 - PVSS – Alarms
 - PVSS – Logging
- VDSL service for mobile operator consoles
- All remote monitoring and reboot facilities in place, including PLCs
- Operator GUIs
- Data exchange between the Cryogenics and Vacuum Systems
- Alarms for Vacuum : PVSS-LASER alarm interface + existing Alarm GUI (X11)

Note/Pending Questions

- *The Cryo/Vacuum data exchange should be clarified*
- *The practical procurement of VDSL enabled machines should be clarified*

MAY 2004 – SM18, ALL TEST BENCHES OPERATIONAL

Operational Objective:

TO HAVE CLUSTERS A AND B RE-INSTALLED, COMMISSIONED AND OPERATIONAL FOR MAGNET TESTS.

Scope:

This objective requires:

- The re-installation and commissioning of DAQ, MMP and PLC systems :
 - The DAQ (quench recording) system needs to be installed and upgraded with MXI-2 and with the new PPC processor
 - The MMP (magnetic meas.) system needs to be installed, upgraded to MXI-2 and commissioned
 - The PLC (power interlock) system needs to be installed and the new cabling tested

- Two new 3-screen operator consoles need to be installed in the bench control room (BCR) and configured for the respective clusters.

Note/Pending Questions

- *The deadlines for Cluster A and B in operation are dictated by AT/MTM and AT/ACR.*

AUGUST 2004 – SM18, INSTALLATION OF TEST SYSTEMS FOR DAQ AND MMP

Operational Objective:

TO HAVE A DAQ AND MMP TEST SYSTEM OPERATIONAL AT THE PLACE OF THE LHC STRING AS BACKUP FOR THE CLUSTERS

Scope:

This objective requires:

- The installation and commissioning of one DAQ and one MMP system for equipment test :
 - A DAQ system needs to be installed from spares of the String and Bench equipment at the place of the former LHC String.
 - An MMP system needs to be installed from spares of the Bench equipment.
 - A spare 3-screen operator console needs to be installed in the BCR.

In addition:

- The shaft calibration system needs to be relocated to a place close to the DAQ and MMP test systems and put back into operation.

Note/Pending Questions

- *No strict deadline is required for having the test systems operational. Nevertheless it will be important to have these systems operational “soon” after all Clusters are in operation to be able to debug and test spare equipment.*
- *AT/MTM will need to supply the necessary equipment to make a complete set-up (Twin Rotating Unit, Programmable Gain Amplifier rack, Signal Switch Box and Power Control chassis).*

SEPTEMBER 28/29, OCTOBER 30/31 2004 – TI8 BEAM TEST

Operational Objectives:

- 1. To drive the LHC beam through the complete TI8 transfer line, at nominal intensity**
- 2. To test, to the largest possible extend (before the SPS stop in 2005) all new AB/CO controls solutions. In particular: the new timing system, the multi-cycling scheme, the extended BIC system, the Front End Software Architecture.**

Scope:

These objectives require the TT40 controls facilities with the following additions:

- High level SPS2001 software additions(as defined by people in charge of this test – B.Goddard)
- Distribution of SPS fundamental data (extraction scheme, nb of bunches, etc)
- The Beam Interlock System with extended functionality
- Operational timing distribution, hardware and software wise (generation, transmission and reception of timing events and telegrams)
- BST information, hardware and software wise (master, distribution, reception)
- Prototype of the new FESA solution, connected to the new timing for:
 - BIC
 - Beam Transfer equipment
- Prototype of the AB/CO standard VMEBus solution for local data archiving (part of the future Post Mortem architecture)
- Warm magnet interlock (PVSS)
- Multi-Cycling tests (see below)
- No Post Mortem facility required
- No additional OASIS functionality required

Technical aspects:

- New Timing CTR modules must be operational
- BIC system:
 - safe beam flag has to be decided
 - UTC reception required
- The distribution of SPS fundamental Data will be done via a dedicated CMW server connected to the new timing system
- Some OASIS GUI extensions must defined and targeted with BT and RF
- FESA activities have to be streamlined in partnership with BT and BIC teams

Note/Pending Questions

- *Multi-cycling:*
 - *NOT a requirement from OP*
 - *CO wants to test it. This raised the following points:*
 - *It involves the ROCs system, including the concerned front ends*
 - *It involves modifications in other systems such as the Alarm system (what will the machine mode concept be ?)*
 - *Time slot should be allocated for this test*
 - *Is beam needed during this test ?*
- *LASER: what is foreseen in terms of new/old system ?*
 - *Try out of new LASER infrastructure in parallel with existing one*
 - *Surveillance ? who ? from where ? Interlock facility of SPS2001 ?*

MAY (to NOVEMBER) 2005 – LEIR COMMISSIONING

Operational Objective:

To inject in, accelerate and extract from LEIR ions beam at low intensity (2.5 E8 Pb ions/cycle) and eventually nominal intensity (9 E8 Pb ions/Cycle)

Scope:

- This commissioning includes the ring, the injection and extraction lines, as well as the upgraded Linac3 pulsing at 5 Hz
- Instrumentation, powering, RF, vacuum, electron cooling (BI,PO), kickers, bumpers, septa
- Modifications in PS, TT2 and TT10 required for 2006

Technical aspects:

- The following building blocks must be available and deployed:
 - Timing & sequencing
 - CBCM (tested during TI8) with:
 - a decoupling of the LINAC3 from the Booster (currently same telegram for LINAC2,3 and Booster)
 - new telegram for LEIR
 - standard PPM
 - Timing receiver modules CTRP (PMC and VME form factors)
 - PLCs integration
 - RF cavities (Schneider) with IEPLC and Java applications
 - Electron Cooling power converters and septa displacement (Siemens) with IEPLC and Java applications
 - Vacuum (Siemens) with PVSS + Java applications combining info from vacuum and beam parameters
 - Front end software
 - some existing EM/RT
 - new EM/RT for BDI and kicker
 - new EM/RT and device driver for RF low level DSPs
 - CCC Java console manager prototype capable of starting Java, existing C XMotif and PVSS vacuum applications
 - Application SW:
 - Generic applic (working sets, knobs, ...)
 - Specific LEIR applications (see below)
 - OASIS with full nAos functionality
 - Shot by shot logging NOT needed
 - Transmission of video signals in the control room (standard VISTAR)
 - New complete LASER infrastructure + surveillance programs (including interface to PVSS for vacuum)
 - AB/CO monitoring chain operational (including PLCs, ...)

- LINAC3 upgrades:
 - (0.8Hz -> 5 Hz). Impact on RT tasks, timing, ...
 - new RF cavity and power converters (standard control)

Also Required for 2006 :

- PS Ring Modifications. Controls required for:
 - the new septum in SS26
 - the upgraded fast kicker in SS28
 - the new closed orbit bump at septum location (2 power supplies)
 - the new servo system for 200 MHz cavities
- TT2 Modifications. Controls required for:
 - the new optics (6 refurbished power supplies for quadrupoles)
 - the new stripper
- TT10 Modifications : No controls upgrade required (TBC)

Note/Pending Questions

- *FESA or not for new EQ modules ?*
- *OASIS with full functionality IS ABSOLUTELY CRITICAL !!!*
- *LASER MUST be ready, in particular with the integration of PS alarms*
 - *equipment groups HAVE TO BE aware of their responsibility for injecting alarms in LASER !!*
- *Procurement of LEIR infrastructure needs to be included in PART II of this document.*
- *Who is in charge of the Specification of the LEIR application software ?*

JUNE 2005 – LHC HARDWARE COMMISSIONING SECTOR 7-8, ...

Operational Objective:

Commissioning of each LHC sector as a whole (vacuum, cryogenics, quench protection, interlocks, powering, etc.), including interactions between systems and powering to nominal current

Scope:

- Powering
- Quench Protection
- Powering Interlock
- Vacuum and
- Cryogenics systems fully operational

Technical aspects:

The following additional AB/CO deliverables must be built, deployed and operational:

- Complete control chain for QPS
 - WordFIP Gateways
 - FEC SW
 - PVSS supervision
- Complete control chain for Cryogenics through UNICOS
- Complete control chain for Powering Interlock System
 - PLCs Hardware
 - PVSS supervision
- Complete control chain for Power Converters
 - AB/PO HW and SW
 - WorldFIP Gateways
 - Java Application SW for Machine Powering test (see below)
- Infrastructure in the Fields Control Rooms (FCRs) (consoles, sw, ...)
- Alarm system fully operational
- AB/CO monitoring chain operational (gateways, PLCs, ...)
- Post-mortem data logged and displayed in the FCRs

Note/Pending Questions

- *The scope and architecture of the application software for machine powering has still to be discussed with the AB/PO group (Q.King). This should be done in view of the final system and also according to the powering tests as they will be defined in the scope of the HCWG.*
- *The infrastructure needed for the FCRs are to be defined with the HCWG*
- *Post-Mortem : what is precisely needed for this commissioning ?*

APRIL 2006 – OPERATIONS FROM NEW CCC

Operational Objective:

To operate all CERN accelerators (except LEIR) from the new CERN Control Centre

Scope:

- New Hardware infrastructure
 - About 40 operator consoles capable of starting any application program
 - Backend servers
 - Displays (video, fixed displays such as page1, etc)
 - Video transport and digitalization (or analog transmission)
 - Intercom

Note/Pending Questions

- *Many aspects are still undefined. Clarification is expected by end January 2004*
- *The idea of having an operational “white book” for the new CCC operational needs has to be followed-up*

MAY 2006 – LHC SECTOR TEST WITH BEAM

Operational Objective:

To inject LHC beam in sector 7-8, test proper functioning of key systems (Timing, BPM, BLM, Correction elements, etc) and verify assumptions like Quench limits and BLM thresholds

Scope:

- Beam Instrumentation systems (BCT, BLM, etc)
- Beam Transfer Systems (Kickers, dumps, ...)
- Beam Interlock System
- Orbit and Trajectory control
- Feed-forward

MAY 2007 – LHC CIRCULATING BEAM

Operational Objective:

TO ALLOW THE LHC BEAM TO CIRCULATE IN THE COMPLETE LHC

Scope:

PART II

AB/CO DELIVERABLES, PLANNING AND RESPONSIBILITIES FOR THE PERIOD 2004-2007

This part presents a chronological view of the AB/CO deliverables for the period 2004-2007.

These deliverables were collected during meetings with representatives of the equipment groups and in the light of the forthcoming milestones described in PART I of this document.

Each deliverable as:

- a short description of its SW and/or HW component(s)
- the **procurement dates** for these deliverables, along with
- a distribution of **responsibilities** amongst the different AB/CO sections

CLICK HERE for accessing the Excel table of deliverables :

<http://ab-co-tech-committee.web.cern.ch/ab-co-tech-committee/STATUS-REPORTS/ABCO.xls>