Main MPE Activities during YETS/EYETS/LS2 and the Provision of Resources

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Outline

• ELQA during LS2
  • AVAILABLE MANPOWER VS QUANTITY OF WORK DURING LS2

• Upgrade of DQYPQ “Quadrupole Yellow Racks”

• Upgrade of QPS systems

• Maintenance of Energy Extraction Systems
  • 13 kA EE
  • 600 A EE

• Deployment of WIC interlocks in PS

• LHC magnet circuit re-commissioning, including powering tests
Scenario assumed for ELQA activities during LS2

- ELQA campaign at cold before warm up of magnets for LS2 activities
- ELQA campaign at warm before start of LS2 activities
- ELQA (AIV, MIC & DOC) for 5 to 10 magnets to be replaced and NC diagnostics
- ELQA campaign at warm before cool down after LS2
- Final ELQA campaign at cold before powering tests
ELQA during LS2 – external resources

ELQA HNINP human resources estimation during LS2

- W.P. 1: ELQA campaign (cold-warm // warm-cold)
- W.P. 2: Magnet replacement, AIV test, Consolidation
- W.P. 3: Software engineering, Hardware maintenance, Non Conformities treatment, Special Diagnostics

Human resources over the months from Nov-18 to Feb-21.
ELQA during LS2 – required resources (total)

Total ELQA human resources estimation, before, during and after LS2

- W.P. 1 ELQA campaign (cold-warm // warm-cold)
- W.P. 2 Magnet replacement, AIV test, Consolidation
- W.P. 3 Software engineering, Hardware maintenance, Non Conformities treatment, Special Diagnostics

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ELQA – external resources

• Three contacts with HNINP, Cracow for upgrading the ELQA test systems for LS2 are signed and running

• One additional contract with the same Institute for assistance during TS, YETS and EYETS is signed and also operational

• Contracts for the resources for LS2 ELQA activities are not yet signed, but preliminarily agreed with HNINP
  • Total cost nearing 3 MCHF
Upgrade of DQYPQ “Quadrupole Yellow Racks”

• Similar to DQYPB “Dipole Yellow Racs” performed during LS1.

• “HL-LHC ready” principle (i.e. no more changes required for covering the future needs)

• It concerns less equipment (396 units instead of 1232), but the required expert level resources are similar

• Includes replacement of the existing version of the QDS detection crate by a new - including next generation detection systems, enhanced quench heater supervision, fully redundant powering and advanced options for crate supervision and maintenance.

• Includes DQHDS pulse current measurement transformers and a re-designed electrical shuffling module (DQLIM).

• Similar number of contracts with industry as the DYPB upgrade of LS1.
Quench Protection Upgrades

• IPQ, IPD & IT protection
  • Upgrade of IPQ, IPD and IT systems to dedicated bus-bar splice protection and diagnostics, add enhanced quench heater circuits supervision, improve DQHDS trigger, elaborate a safe remote power cycle option.

• 600 A protection DAQ & current sensors
  • Upgrade of DAQ systems and crate supervision. Possible upgrade of current sensors for measuring directly the derivative of the current.

• HiLumi 11 T magnets
  • Deployment detection and supervision systems for the new 11T magnets, including a revised bus-bar protection.

• Monitoring and protection of conical joints
  • Installation of new detection electronics to monitor the resistance of conical joints used in the warm cabling of the LHC main circuits
Maintenance of Energy Extraction Systems

• 13 kA EE systems
  • Extensive maintenance campaign, similar to LS1
  • External resources are mandatory – contracts are not yet established, but underway

• 600 A EE systems
  • To some degree a less extensive maintenance campaign as compare to LS1
  • External resources are nevertheless mandatory – contracts are not yet established
Magnet Interlock consolidation in PS complex

• MPE is committed to continue deployment of generic, COTS based Warm Magnet Interlock System (WIC)
  • >33 instances already deployed in LHC, TI2, TI8, SPS, AWAKE, HighRadMat, TT10/20, PSB, LINAC4, HIE-ISOLDE, LINAC3 and LEIR
• 3 families of legacy interlock systems still remain today (PS, North Area + AD/TT2/East Area/...)

• Aiming for coherent consolidation plans in-line with EPC and MSC
  • complete main proton chain by end of LS2 (including PS, L4-PSB-PS transfer lines, TT2/nTOF/TT10, East Area?)
  • remaining EXP areas by LS3 (AD, North Area, BA80)
  • Detailed discussions ongoing in view of EYETS and LS2 activities
Magnet Interlock consolidation in PS complex (contd.)

WIC installation – generic solution

Standardized interlock system for normal conducting magnets based on Programmable Logic Controllers (PLC):

– Collects inputs from thermo-switches, flow switches and internal PC faults
– Provides Permits to the power converter and beam interlock system
LHC magnet circuit re-commissioning, including powering tests

• Similar campaign to LS1

• Will require external expert level resources with experience from previous LHC campaigns

• At present it is much less evident to find such resources