LHC Cryogenics

Quick overview

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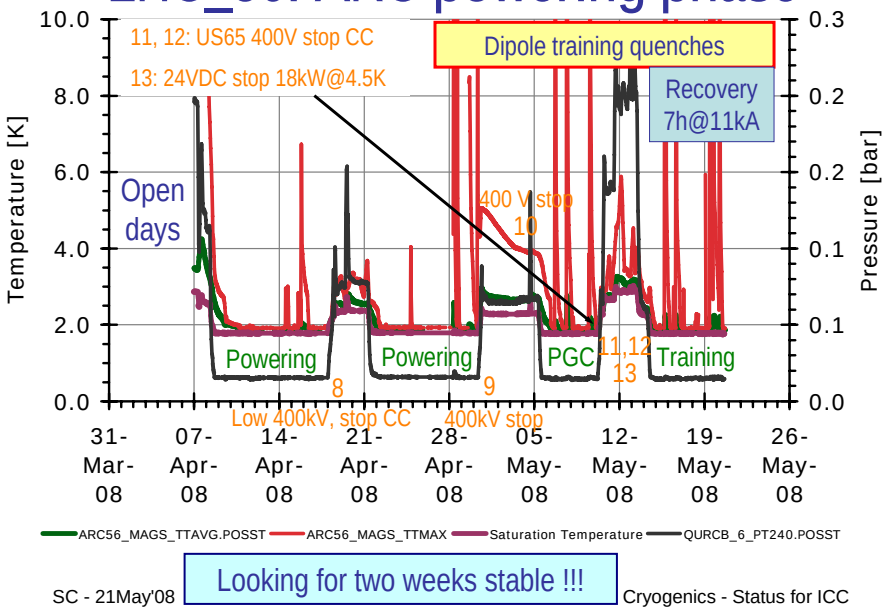
on behalf of LHC Cryogenics

LHC_56: ARC powering phase



Looking for two weeks stable !!!

LHC_56: History of stops 10May'08

- Saturday 10May'08-07h29'20'':
  - Stop of cold compressors, then all 1.8K unit and cooling of magnets <2K
  - It appears to be due to blocage of flow in cold-compressors, even if running conditions are within the operating range of the past days!
  - No visible electrical alarms for cryo nor AB/OP/Ti.
  - Fall-back operating conditions at 70mbar established established
- Saturday 10May'08≈16h30:
  - Stop of cold compressors, then all 1.8K unit and cooling of magnets "<2K"
  - AB/OP/Ti contacted, confirming an electrical stop of 400V for cryo in caverns US/UX65. Cryo request to call TS/EL piquet to implement prepared repair scenario (exchange of sepam chassis) as defined after similar stop 04May'08
  - Fall-back operating conditions at 130mbar established as lots of LHe in bayonet heat exchangers

• Good team work and efficient combined intervention

? Is this really treating the cause, as it appeared again after a warm afternoon, with similar failure profile alerting on too high temperature in transformer ?

=> Time will tell us, if not possible to confirm before !

Origin of Failure not confirmed

LHC_56: History of stops 11May'08

- Sunday 11May'08≈15h30:
  - Stop of compressor station (QSCB) of 18kW@4.5K, and then all S5-6
  - Temporary failure of 24VDC power supply module to cryo I/O channels found quickly, but all modules of the rack found warm and in service
  - Decision to restart machines while evaluating spares and possible scenarii
- Sunday 11May'08≈17h30:
  - Stop of compressor station (QSCB) of 18kW@4.5K and then all S5-6
  - Failure of 24VDC power supply module to cryo I/O channels again, but piquet at site found smoke when dismounting concerned module for replacement (piquet with valid electrical certification!)
  - Decision to restart machines to preserve helium inventory, with incentive to evaluate 24VDC rack configuration (see details after) for long term operation with high availability!
  - Fall-back operating conditions at 200mbar-3K established as lots of LHe in bayonet heat exchangers and many hours spent on site by piquet team

• Excellent reaction of piquets with ability to diagnose and treat correctly the problem

• Very difficult task for tired piquets to restart from scratch correct cool-down of a sector

=> Appropriate procedures and training to be foreseen in order to minimise LHC downtime while keeping motivated teams

SHM6: typical 24VDC distribution rack

Operating load: 60% installed

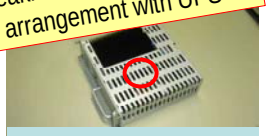
Short term ventilation started, to be continued ?

Lay-out of 24VDC Rack

Front view with replaced module

Back view

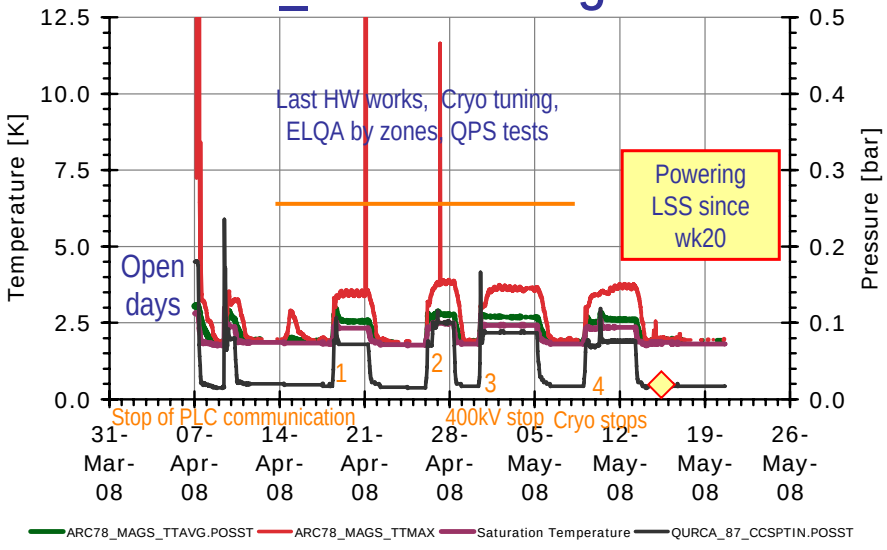
Weakness of a component ! + arrangement with UPS ?



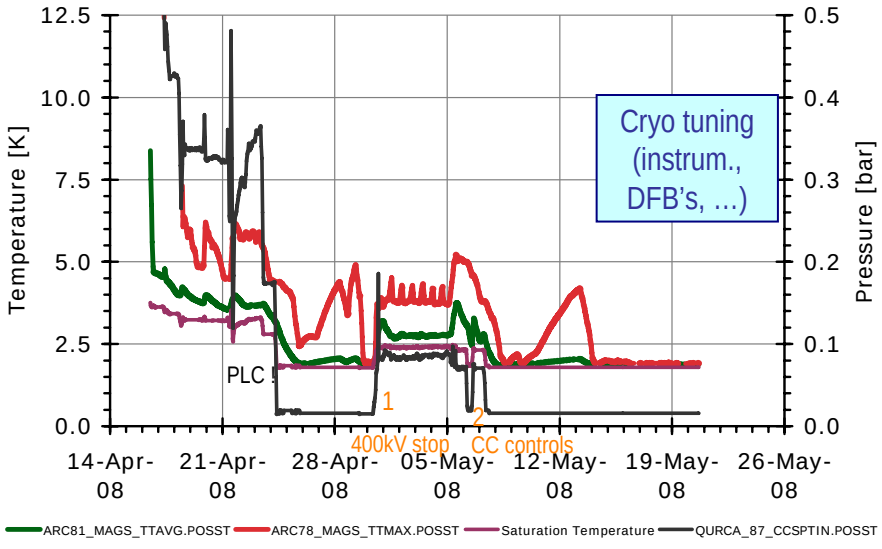
Faulty 24VDC power supply module, with ''burnt'' condensator

1. Is this type of arrangement conform to 24VDC power supply modules specifications ? => [EL]
2. For short term, measurements of operating currents to be made to evaluate situation => [Cryo]
3. Heat extraction of the rack to be evaluated, incl. possible short term (ventilation) or medium term (re-arrangement of rack) => [EL-CV-Cryo]

LHC_78: Powering LSS



LHC_81: Cooling below 2K



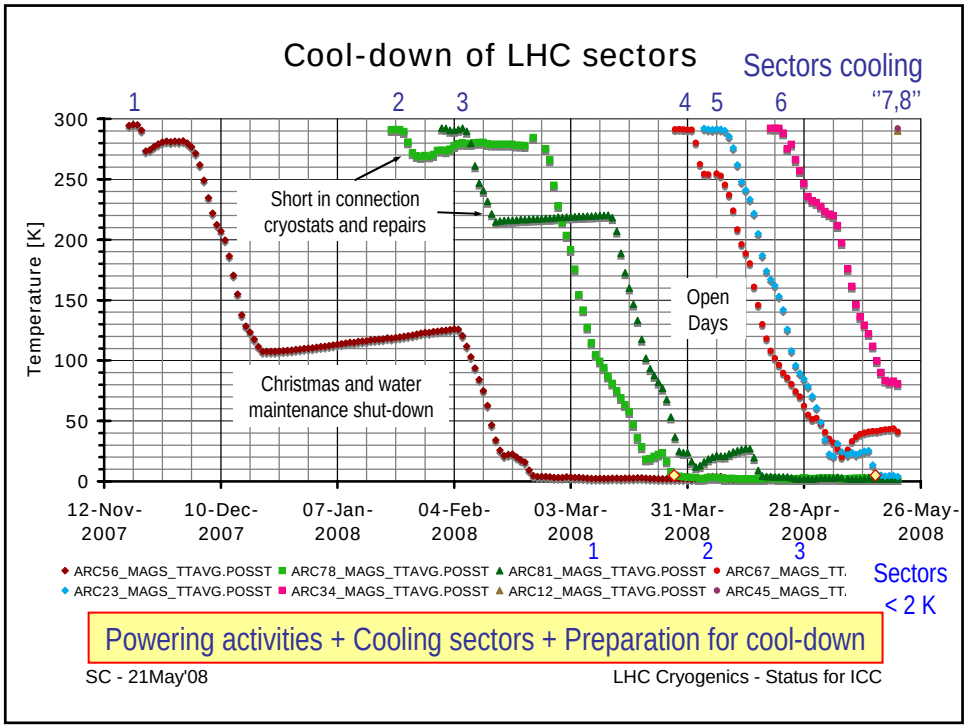
Other activities

- 6-7: Investigations with IT (stable com. inter PLC): OK 13May'08
  + consolidations (4 in 3 wks) on compressors and turbines
- 1-2: Flushing magnets and QRL done, ELQA underway
  Ready for starting cool-down (Thursday)
- 4-5: Purge - Leak test done, ELQA underway
  Ready for starting cool-down (Friday), depending on ELQA tests

+ Scheduled UPS maintenance to come wk19 to wk25

+ Static VAR Compensator to come wk20 to wk25 and wk24+wk28-wk30

- Water loops in caverns: *Consolidations made by TS/CV, to be foreseen as well at P6 rather quickly (July ?)*
- *UX85: "single event tolerance" being prepared for July*



Powering activities + Cooling sectors + Preparation for cool-down