Equipment Groups' Controls Requirements for LTI Tests

Axel Daneels (SL/DI)

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What (Scope), Who, When

- u **Scope**
  - u **LSS4, TT40 and TI8**
    - u An extension of SPS control system
      - u **Mostly "classical" SPS equipment (power converters, vacuum, …)**
    - u **However several novelties**
      - u **Extraction Kicker & Septa, Beam Obstacles (SPS 2001 compliant)**
      - u **New beam instruments e.g. BPM, …**
      - u **New magnets (especially in TI8: MBI, MQI, MCIA)**
- u **Who**
  - u Local equipment controls tests: by specialists
  - u Operational tests in PCR: by SL/BT and SL/OP
- u **When (present target dates)**
  - u **TT40 up to TED400354: Q2 or Q3/2003 (?)** (5-10/05/2003 ?)
  - u **TI8 up to TED87765 : Q4/2003 … Q2/2004 (?)** (20/10-7/11/2003?)

Equipment Groups requesting Control Facilities

Vacuum (R.Gavaggio)

Warm Magnet Surveillance(G.Mugnai, P.Dahlen)

Powering (MUGEF) (J-D.Hundzinger / Q.King)

Beam Instrumentation (J-J Gras)

SPS Extraction – Transfer Line Dumps (E.Carlier)

Radiation Monitoring (D.Perrin)

Interlocks (R.Schmidt, B. Puccio, R. Giachino, J.Wenninger)

PCR Application Software (V.Mertens, G.Arduini)

Fire Detection (Fl.Bonthond)
- u **Currently no requests for Fire Detection in the LHC tunnel, and thus also not in TT40 and TI8. Fire detection in BA4, ECA4, BA7, SR8, UA87 is already in place.**

Overview of Equipment Groups' Requirements (1)

- u **Controls 'Infrastructure" H/W and associated S/W**
  - u **Racks + VME Crates**
    - u **in BA4, ECA4, HCA4, BA7, SR8, UA87**
  - u **Control cables**
  - u **Ethernet**
  - u **Fieldbus (WorldFIP, Profibus, also MIL1553)**
  - u **FEC in VME crates**
    - u **Front-End CPU with RTOS (LynxOS), drivers, libraries, SOFNET-S7**
    - u **Machine Timing**
    - u **Remote Reboot**
    - u **Remote Terminal**
  - u **PLC (S7/400, S7/300) with synchronisation**
  - u **GSM Communication: in construction in TT40, planned for TI8**

Overview of Equipment Groups' Requirements (2)

- Software
  - Oracle database infrastructure
    - Configuration, calibration, measurement
  - Timing
    - Machine Timing, Time stamping, Beam Description, Pre-pulse, Revolution freq., 40 MHz (BST)
  - Middleware
    - In particular API to equipment Control, S/W Interlocks, Error handling
  - Logging
  - Alarms
  - Interlock
    - Fast Extraction Interlock, Access Interlock
  - Analog signals
  - Post-Mortem (to be discussed)
  - Back ends / Operational Platforms in Equipment Buildings (BA4, ECA4, HCA421, SR8, UA87)

Overview of Equipment Groups' Requirements (3)

- When:
  - Controls 'Infrastructure" H/W and associated S/W
    - Vacuum: Dec 2002 (TT40); Apr 2003 (TI8)
    - Warm Magnet Surveillance: Dec 2002 (TT40); Apr 2003 (TI8)
    - Powering: Dec 2002 (TT40 and TI8)
    - Beam Instrumentation: Dec 2002 (TT40); Apr 2003 (TI8)
    - SPS Extraction Transfer Line Dumps: Dec 2002 (TT40); Apr 2003 (TI8)
    - Radiation Monitoring: beginning of SPS/SD 2002-2003
    - Interlocks: if prototype of new system, then: Dec 2002
  - Software
    - Most all: Dec 2002 (TT40); Apr 2003 (TI8)
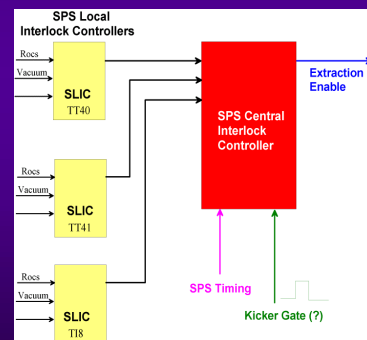   - PCR Application Software: cold check out 2003

Interlocks

- Existing SPS H/W interlock system could be used
- However, it would be advisable to use a prototype of the new SPS interlock system for validation purposes
  - Specs: Jun 2002 and If YES, then requested by Dec 2002
    - 3 Racks (with VME Crate?)
      - 1 in central location (PCR?)
      - 1 near TT40
      - 1 near TI8
    - Control cables
    - Ethernet
    - Timing
      - Machine Timing, Beam Description
    - Middleware
    - Alarms
    - Post-Mortem

Proposal for the Architecture of the new SPS Interlock System

PCR Application Software

- Existing SPS Application Software could be adapted to include new equipment & facilities to prevent unsafe operation
- However, it would be advisable to use a prototype of the new LHC application software for validation purposes
  - Requested functionalities were specified at Work Shop on the LEP-SPS Performance (Chamonix IX, 25-29 Jan 99), namely:
    - Steering, beam measurement, sequencing, surveillance, etc.
    - Cf. V.Mertens, Beam & Control Requirements for TI2 and TI8, Chamonix IX Proceed. P.136
  - Need to be reviewed considering the short time given to the beam test
- Development: SL/CO & SL/OP groups
- Also: Technical Service Software (access, cooling, electricity, …)!
- Requested by cold check out 2003

Slide 1 (Appendix 1)

Vacuum

- TT40 cables installed this SD & equipment installed in SPS/SD 2002-2003
- TI8 VAC equipment & cables: installed in Q2/2003
- TT40 & TI8 Vac: controlled through the existing SPS system
  - Racks: SPS racks (3 in BA7; 3 in BA4): available
  - Mobile SPS VAC equipment: available
  - Ethernet
  - PLC Siemens S7/400 (SPS VAC Control system based on PLC)
  - Database (Oracle RDBMS for equipment management)
  - PVSS: available and already used for part of SPS VAC Controls
  - Logging
  - Alarms
  - Interlocks
- Note: TT40 & TI8 Vac controls are not concerned by:
  - Fieldbus (WorldFIP), Timing (UTC / Synchronisation of PLC), Analog signals

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Slide 2 (Appendix 2)

Warm Magnet Surveillance

- Requested by Dec 2002 for TT40, Apr. 2003 for TI8
  - Racks (1 in BA4)
  - Control cables:
    - SD 2001-2002 (for TT40)
    - SD 2002-2003 (for TI8)
  - Ethernet in Rack
  - Fieldbus (Profibus)
  - FEC (with RTOS, drivers and libraries) (1 in BA4)
    - Remote Reboot
    - Remote Terminal (1)
  - PLC Siemens S7/300
  - GSM Communication: in construction in TT40, planned for TI8
  - Middleware
  - Alarms
  - Back ends / Operational Platforms: 1 in BA4

Slide 3 (Appendix 3)

Powering (MUGEF) (1)

- Requested by Dec 2002 for TT40 and TI8
  - Racks + VME Crates in BA4 (TT40) and BA4 & SR8 (TI8)
    - Mil1553 for VME reset (Remote Reboot)
    - Terminal Concentrator for Remote Console
  - Control cables
    - BA4: started
    - SR8: Dec 2002
  - Ethernet: idem
  - FEC (with RTOS, ROCS, drivers and libraries)
    - Front-End CPU
    - Machine Timing
  - GSM Communication: in construction in TT40, planned for TI8

Slide 4 (Appendix 3.bis)

Powering (MUGEF) (2)

- Requested by Dec 2002 for TT40 and TI8
  - Oracle database infrastructure (Configuration and measurement)
  - Timing
    - Machine Timing
  - Middleware
  - Alarms
  - Interlock
    - Fast Extraction Interlocks

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Beam Instrumentation (1)

- **Requested by Dec 2002 for TT40 and Apr 2003 for TI8**
  - **Racks + VME Crates in BA4, ECA4, BA7, UA87,**
  - **Control cables**
  - **Ethernet**
  - **Fieldbus (WorldFIP)**
    - **Support for 31.25 Kbps WorldFIP**
  - **FEC in VME crates**
    - **Front-End CPU with RTOS, drivers and libraries**
    - **Machine Timing**
    - **Remote Reboot**
    - **Remote Terminal**
  - **GSM Communication: in construction in TT40, planned for TI8**

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Beam Instrumentation (2)

- **Requested by Dec 2002 for TT40, Apr. 2003 for TI8**
  - **Oracle database infrastructure (Configuration and measurement)**
  - **Timing**
    - **Machine Timing, Time stamping available in BST crate in PCR, Beam Description, Pre-pulse, Revolution freq., 40 MHz (BST)**
  - **Middleware**
  - **Logging**
  - **Alarms**
  - **Interlock**
  - **Analog signals (… usage to be discussed within BI)**
  - **Back ends / Operational Platforms in**
    - **BA4, ECA4 (for TT40)**
    - **UA87 (for TI08)**

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SPS Extraction – Transfer Line Dumps (1)

- **Requested by Dec 2002 for TT40**
  - **Racks in HCA 421 & 422: In place**
  - **Control cables**
    - **between LSS4 – HCA 421 & 422: in place**
    - **between ECA 4 - HCA 421: end Jun 2002**
  - **Ethernet in HCA (421 & 422)**
  - **FEC**
    - **1 VME Crate in HCA 4**
    - **RTOS, drivers and libraries**
    - **Siemens SOFNET-S7 or PLC integration interface**
    - **Machine Timing**
    - **Remote Reboot**
    - **Remote Terminal**
  - **PLC Siemens S7/400**
    - **1 (Kicker), 1 (Septa) (+ synchro for Post Mortem), 1 (TED400354)**
  - **GSM Communication**
    - **LSS4 & TT40: in construction**

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SPS Extraction – Transfer Line Dumps (2)

- **Requested by Dec 2002 for TT40**
  - **Oracle database infrastructure (configuration, calibration, measurement)**
  - **Timing**
    - **Machine Timing, Pre-pulse, Revolution freq,**
  - **Middleware**
    - **in particular: API to Equipment Control, S/W Interlocks, Error handling**
  - **Logging**
  - **Alarms**
  - **Interlocks**
    - **Beam Interlock for Kicker; Access Interlock for TED 400354**
  - **Analog Signals: Apr. 2003**
  - **Post-Mortem (!)**
  - **Back ends / Operational Platforms in HCA 421**

SPS Extraction – Transfer Line Dumps (3)

- **Requested by Apr 2003 for TI8**
  - **Racks in HCA421 (for TBSE??) and SR 8 (for TED87765)**
  - **Control cables**
    - **between Ti8 – SR8**
  - **Ethernet in SR 8**
  - **PLC Siemens S7/300**
    - **1 TED87765 with synchronisation for Post Mortem**
  - **GSM Communication**
  - **Interlocks**
    - **Access Interlock**
  - **Back ends / Operational Platforms in SR 8**

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Radiation Monitoring

- **Requested at beginning of SD 2002-2003**
  - **Racks:**
    - **- 2 racks in the Radiation Protection (RP) room in ECA4 (or 1 additional rack close to the existing rack TIS RA0310)**
    - **- 1 rack in UA87 (already reserved)**
  - **Control cables: requirements are being evaluated**
  - **GSM Communication**
  - **Ethernet: in the RP room in ECA4 (or in rack TIS RA0310 + new one)**
  - **Fieldbus:**
    - **- MIL1553: in the RP room in ECA4 (or in rack TIS RA0310 + new one) and in UA87 (under discussion)**
  - **Alarms**
  - **Interlocks: being discussed**
  - **Post-Mortem: being discussed**

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