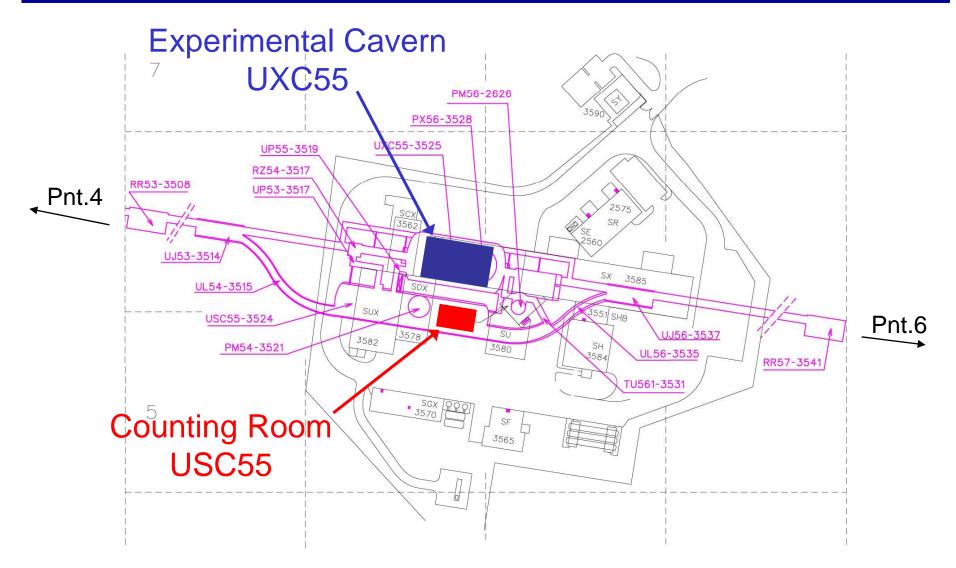
CMS - LHC Interfaces Overview and Status

- Hardware Systems
 - TTC
 - BST
 - GMT
 - Beam Interlock System
 - BPTX
- Software Systems
 - DIP Data
 - Software interlocks



Finding your way around LHC Point 5



SLHC Tracker Readout - 8 March 2007

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CMS Underground Counting Room

S1 - Lower floor

NAC Nation Nation <th>NAC Nation Nation<th></th><th>SICOO ES ULR RARNEYD SICOI DAQ FRL rack</th><th>S1D00 ES ULR RARNEYD S1D01 DT Track Inde</th><th>S1E00 TRK FEC TRACKER S1E01 TTC Source Park for</th><th>S1F00 TRK FEC TRACKER S1F01 RPC Trioner Sector (</th><th>S1G00 DT RO/SC RELLATO S1G01 PIX FEC</th><th></th><th></th><th>S2A02 TOTEM Spare</th><th>S2802 TOTEM Powrf</th></th>	NAC Nation Nation <th></th> <th>SICOO ES ULR RARNEYD SICOI DAQ FRL rack</th> <th>S1D00 ES ULR RARNEYD S1D01 DT Track Inde</th> <th>S1E00 TRK FEC TRACKER S1E01 TTC Source Park for</th> <th>S1F00 TRK FEC TRACKER S1F01 RPC Trioner Sector (</th> <th>S1G00 DT RO/SC RELLATO S1G01 PIX FEC</th> <th></th> <th></th> <th>S2A02 TOTEM Spare</th> <th>S2802 TOTEM Powrf</th>		SICOO ES ULR RARNEYD SICOI DAQ FRL rack	S1D00 ES ULR RARNEYD S1D01 DT Track Inde	S1E00 TRK FEC TRACKER S1E01 TTC Source Park for	S1F00 TRK FEC TRACKER S1F01 RPC Trioner Sector (S1G00 DT RO/SC RELLATO S1G01 PIX FEC			S2A02 TOTEM Spare	S2802 TOTEM Powrf
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	Fire detection TC brief Reads PC TC pro- brief Reads PC TC pro- SEAL7 SEAL7 SEAL7 Fire detection TC pro- Fire detection TC PC	SC TRK IV Therma ME Power (TA15 51015 SCS TRK	Supplies							Sniffer	DCS Rack power

S2 - Upper floor



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TTC Signals - CMS use

- RF2TTC-based system to be installed in Rack S1E03
- Distribution to Detector via modules in Racks S1E02 & S1E03
- Successful initial testing of RF2TTC protoypes, get modules back again for two weeks to finish s/w interface to CMS systems
- Ready for interconnection test with SR4 as soon as production hardware becomes available
 - PH/ESS estimate is May.
 - Also need estimate for Signal Generation in SR4





TTC Signals - Cabling Status

- Cable path defined
 - SR4 LHC Tunnel UJ56 USC55
 - Long distance fibres installed
 - Missing patch connections at above locations
 - TS/EL/OF in process of scheduling this operation
- Signals required by CMS:
 - LHC beam start -3 months



BST Signals - CMS use

- BST Signals are used in CMS by the Trigger Controllers to time-stamp event fragments
 - Global Trigger (GT) x1 (choose beam 1 or 2 manually)
 - Local Trigger Controllers (LTC) x9 (choose beam 1 or 2 manually)
- Beam information is decoded and added to Online DB
 - BOBR in RF2TTC crate x1 (both beams)
- Beam information is required for the functioning of the Beam Condition Monitor (BCM) system
 - BOBR module x2 (S1, S4) (both beams)
- Will house optical splitters at reception point in S1E03
 - Route signals to destinations within CMS
- Ready to receive BST signals today
 - Trigger controllers already installed in USC55

J. Troska



BST Signals - Cabling Status

- Same Status as TTC
 - Long Cable runs mostly exist
 - Apart from a run between CCC and CCC-Telecom racks
 - Patching missing
- Signal generation equipment in place and operational in CCC
- Signals required by CMS:
 - LHC beam start -3 months



GMT Signals - CMS use

- Time-references and Triggers used by CMS Beam Conditions Monitor (BCM)
 - Clone of LHC Beam Loss Monitor (BLM) system
 - Crate-based system contains 1x CTRV
 - Located in S1 and S4.
- Single PCI receiver for telegram monitoring
 - Data to be stored in CMS Online DB
 - Housed in a PC Inside DCS rack thus on UPS

J. Troska / R. Hall-Wilton



GMT Signals - Cabling Status

- GMT cable arrives in S1E08
 - Installation complete
 - Patch panel to be defined
- Cabling within USC55 still TBD in discussion with AB/CO
 - Cables will be installed by CMS to AB/CO requirements



Beam Interlocks in CMS

- CMS Experiment CIBU driven by CMS Beam Condition Monitor
 - LHC-BLM standard system
 - CMS use was approved by AB/BI technical board
- CMS Magnet Control system maintains a CIBU in its design for future use
- Totem has no experiment CIBU any more
 - Roman pot motor control only

A. Macpherson / W. Snoeys



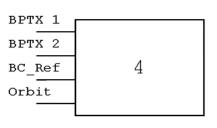
BIS - Cabling Status

- Interlock cables arrive in S1E08
 - Installed
 - Patch panel to be defined/installed
- CMS would be ready for testing in USC55
 - May/June



BPTX use in CMS

- CMS has adopted an Oscilloscope-based readout scheme
- SPS test beam targeted in June/July to validate readout and cable couplings
- Direct BPTX measurements:
 - Phase between each bunch and clock
 - Position of the bunch train with respect to orbit marker
- Offline Calculations:
 - Filling scheme of the bunch train
 - Individual bunch length
 - Bunch intensity and amplitude of BPTX signals
 - Location of interaction region
 - Fraction of current in the abort gap
 - Fraction of current migrated into adjacent RF buckets
 - Bunch shape













BPTX Signal - Cabling Status

- Cables installed
 - Termination to be done
- CMS is in process of designing patch panel for S1E08
 - Some concern about noise implications of the ground loop established between USC55, the two BPTX and the LHC machine
- Hardware signals required not later than 3 months before first beam



Powering of Machine I/f equipment

- CMS Detector requires that if LHC is running then the CMS Protection System (BCM) must be operational to ensure safety of the Detector Systems
 - Exact UPS/Diesel configuration remains to be defined
- Is there other equipment that the Machine requires to remain operational in the case of a loss of general power at CMS?



DIP Data Publishing in CMS

- Online Systems use CMS XDAQ s/w framework to send Data to CMS Central DCS System (PVSS-based)
- Data are simultaneously written into CMS Online Database and datapoint is published via DIP
 - Machine physically connected to both CMS private network and CERN GPN
- Data to be published as per Data exchange document
 - EDMS HC-DE-ES-0001
- Server is installed in USC55, not yet publishing anything



DIP Data use in CMS

- Central CMS DCS server will subscribe to relevant data
- Data will be stored in CMS Online DB
- Could test this anytime data becomes available





Software Interlocks

- All software interlocks
 - Ready for Injection
 - Handshaking for changing machine modes
- Will again be handled by CMS Central DCS
 - Will define a state machine for CMS, taking subsystem status into account.
 - Initially state changes will require CMS Control Room intervention
 - Could eventually be automated
 - Machine modes must be a reliable indicator of machine state
 - Timescale for implementation
 - May 2007
 - Ready for testing with LHC CR
 - TBC in discussion with LHC OPs June 2007?

F. Glege



DIP Issues

- Server Denial of Service
 - Easy to saturate single entry point with large number of Clients
 - Thus will limit (using network routing tables) access to CMS DIP Server to necessary consumers
 - LHC
 - Other experiments? Single machine each in this case.
- Should DIP communications be moved from GPN to TN?
 - DIP transfer must be ensured at all times
- Namespace definition
 - Agree on scheme proposed by D. Swoboda in LEADE



Summary

- Hardware interfaces now finalised
- Hardware signals required by CMS 3 months before beam in the LHC
 - Making reasonable progress on installation, but must not be forgotten!
- Software framework for Data communication now defined
- CMS Internal discussions ongoing regarding the generation of the data quantities
- Testing can start as soon as (Dummy) Data are available
 - Contact persons on LHC side for
 - DIP data availability?
 - S/W handshaking for interlocks and machine mode changes?

