Integration and Installation of the CMS Electronics system

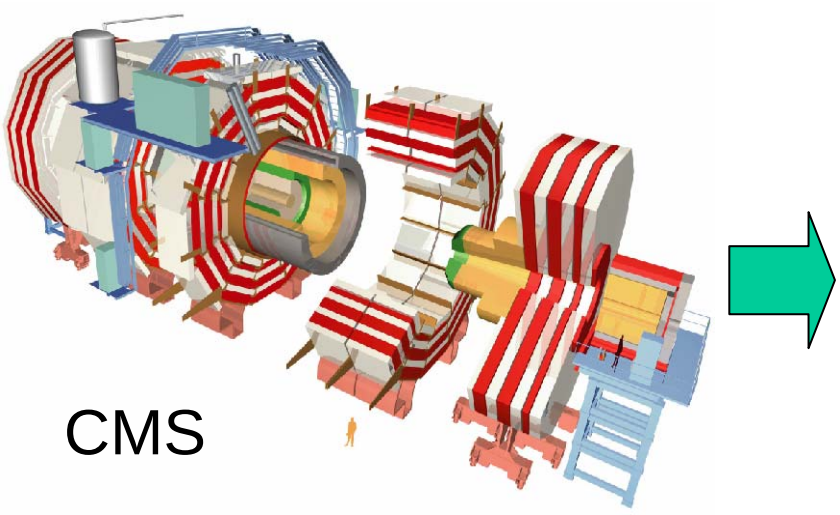
M. Hansen, CERN PH / CME

magnus.hansen@cern.ch

Agenda

- Introduction
- Electronics Integration Centre (IEC)
- CMS Magnet Test Cosmic Challenge (MTCC) outcome
- CMS Underground Counting room (USC55) installation status and plans
- Conclusion

Introduction



- CMS is a modular experiment
  - by construction suited to be fully assembled on the surface and then lowered in big compound pieces
    - Allows to install major parts of the sub-detectors on the surface and fully test in situ before installation in the experimental cavern (UXC55)

Situation for Electronics

- Late delivery of Point 5 underground area
- Need to test and integrate electronics sub-systems prior to installation under ground
  - Point 5 is far from CERN main sites
- An Electronics Integration centre was set up in building 904 on the CERN Prevessin site
  - Workspace attributed for each sub-system
  - Common integration area
    - 15 racks Integration tests
    - 15 + 15 racks for Burn-in of electronics and of low voltage power supplies

EIC in building 904

Private Sub-system Workspace

Common Integration area

EIC in building 904

Common integration area in the CMS Electronics integration centre

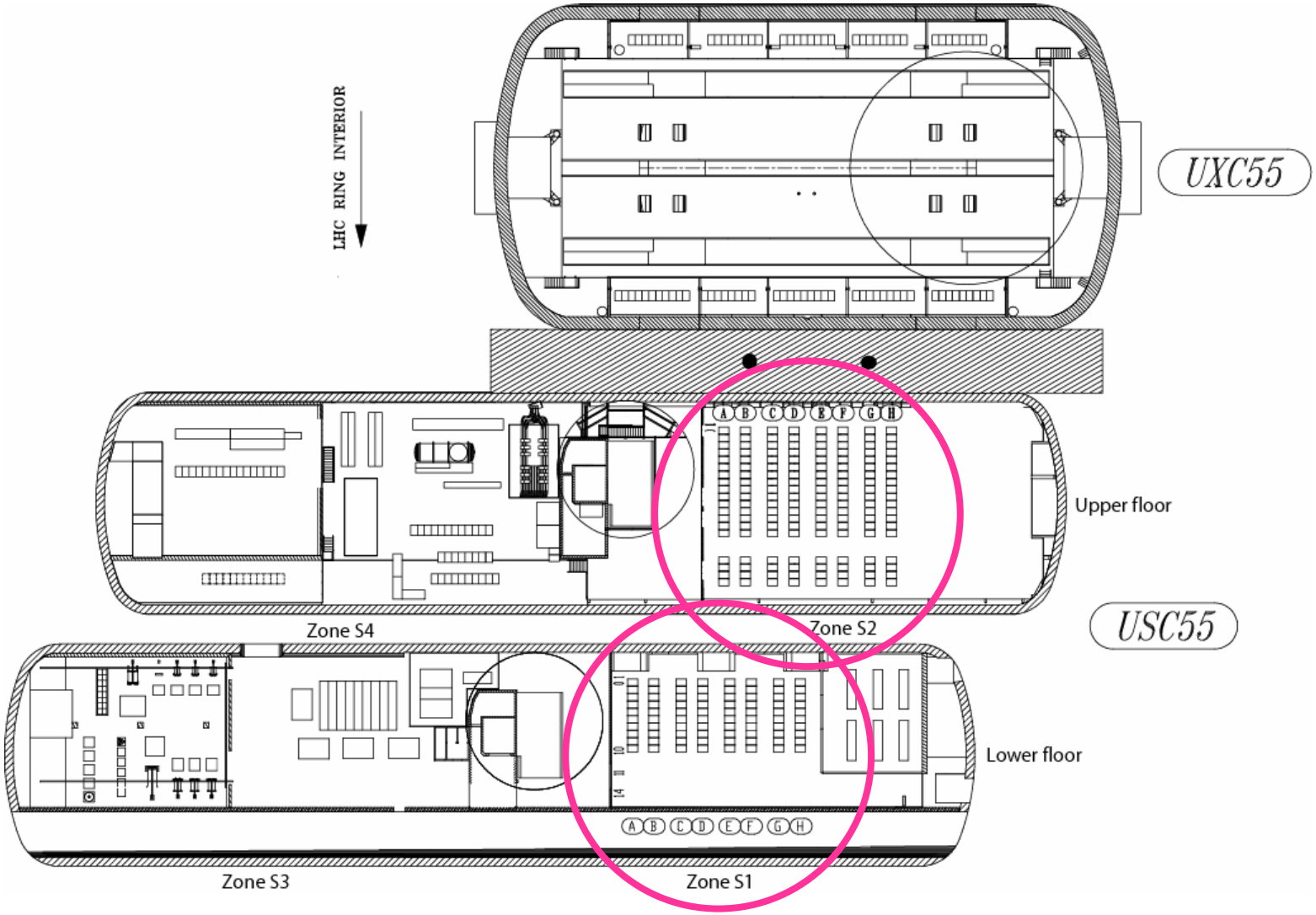
Magnet Test Cosmic Challenge (MTCC)

- Before the first part of the Magnet Test fractions of the sub-detectors were mounted inside the CMS solenoid
  - The whole HCAL
  - Two ECAL super-modules (2/36th of the barrel)
  - A fraction of the Tracker outer barrel
  - CSC end-cap muon detector (Outside Solenoid)
  - DT barrel muon detector (Outside Solenoid)
- The experiment was timed in and ran synchronously with a ~4T magnetic field for an extended time without major difficulties, transforming the MTCC into MTCS
  - Magnet Test Cosmic Success

MTCC outcome

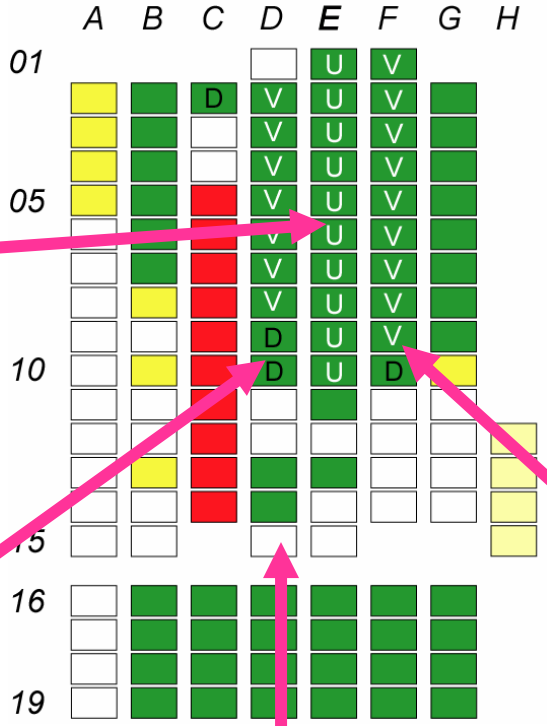
- The successful operation of the sub-systems in MTCC suggests that there are no non-curable design flaws in the subsystems involved in the low luminosity detector
- Some minor issues can be solved before the installation under ground
- CMS is likely to gain O(months) bringing the experiment into operation

Point 5 Underground Area



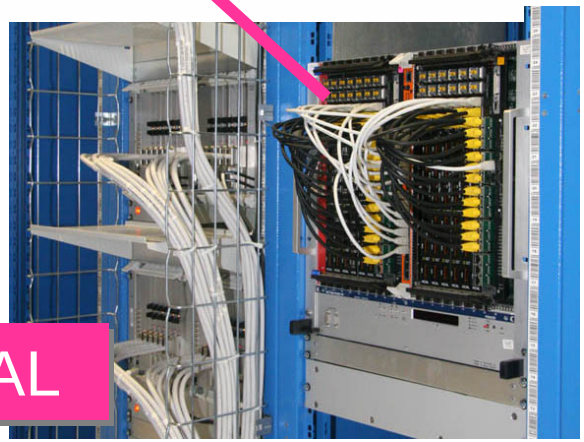
USC55 S2 (Top floor)

RCT infrastructure



DAQ

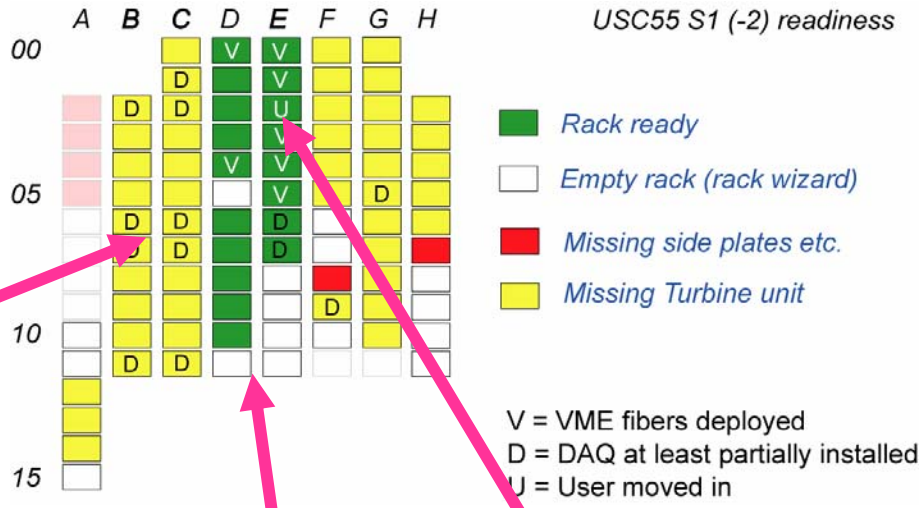
DSS



HCAL

USC55 S1 (bottom floor)

DAQ in Tk rows



DSS

TTC rack

Key Dates USC55

- Racks and Safety available
  - October 2006
- Electronics installation in the USC55 racks
  - Local mode (isolated) operation and tests
    - October-December 2006
- DAQ system integration and commissioning
  - Coordinated interaction with sub-systems
    - Jan-March 2007

CMS sub-systems Production Status and Installation Readiness

Subsystem	Production	Integration
Pixel	Preseries	No
Tracker	100%	MTCC OK
ECAL readout	75%	MTCC OK
Preshower	Prototype	No
HCAL	100%	MTCC OK
DT readout	75%	MTCC OK
DT Track Finder	75%	MTCC OK
RPC trigger	In production	MTCC OK
CSC readout	100%	MTCC OK
CSC Track finder	100%	MTCC OK
RCT	100%	MTCC II
GCT	Prototype	No
GT	100%	MTCC II
TTC	100%	MTCC OK
DAQ	100%	MTCC OK

Future of the CMS EIC

- After the commissioning of CMS the EIC is planned to continue to serve as the electronics system test bench for CMS
  - Firmware
    - Bug fixes
    - Upgrade development
    - System expert education
  - Software
    - Verification of new firmware builds
    - (re-) Integration tests

Conclusions

- The Electronics Integration Centre has been, is, and will continue to be of instrumental value
- The capacity of CMS to operate synchronously as a single experiment has been demonstrated during MTCC resulting in increased confidence concerning the installation and commissioning schedule
- Late delivery of Infrastructure adds stress to an already compressed schedule
  - The time contingency with respect to the official LHC schedule for the installation and commissioning of the CMS electronics system is very limited