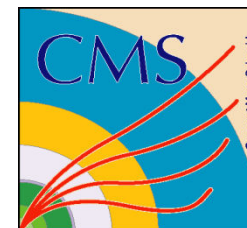




CMS Upgrades



Infrastructure Constraints

Magnus Hansen

CMS Upgrade Workshop at FNAL

20091028 - 20091030



Pre-amble



- **The current CMS has been in commission for the last two years**
- **CMS systems are generally ready for first beam but are we able to take high quality physics data?**
- **Stage 1 upgrades will be installed and commissioned in a running experiment in a highly competitive physics environment**
- **The cost for any CMS downtime due to upgrade activity is likely to dwarf the cost of the upgrade itself**
 - ◆ **Could have put some frightening numbers here**



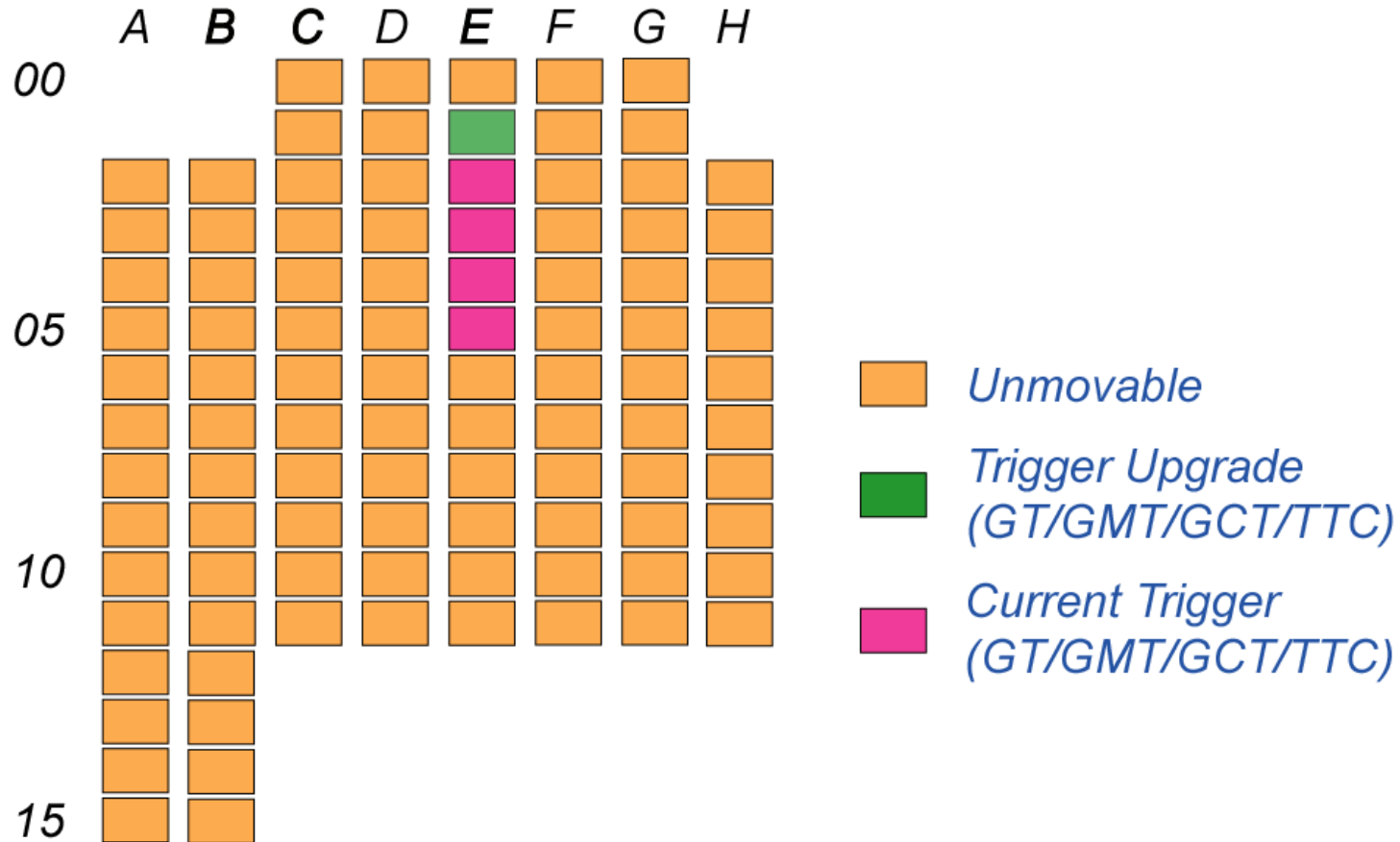
Pre-amble



- **Upgraded systems need to operate in parallel with the previous, still fully functional, system it replaces**
 - ◆ **Comparison as well as Roll-back possible**
 - ◆ **Any required modifications on infrastructure need to be addressed > 1 year in advance**
 - ◆ **Need to install replacement system in USC55 prior to removing the soon to be replaced, leading to space problems**

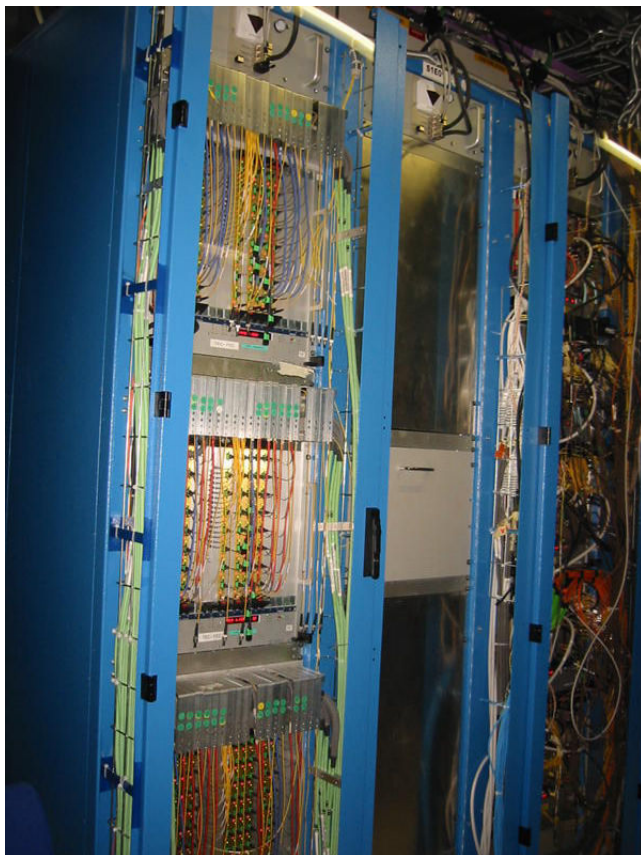


Potential Trigger Upgrade Racks in S1 (USC55)





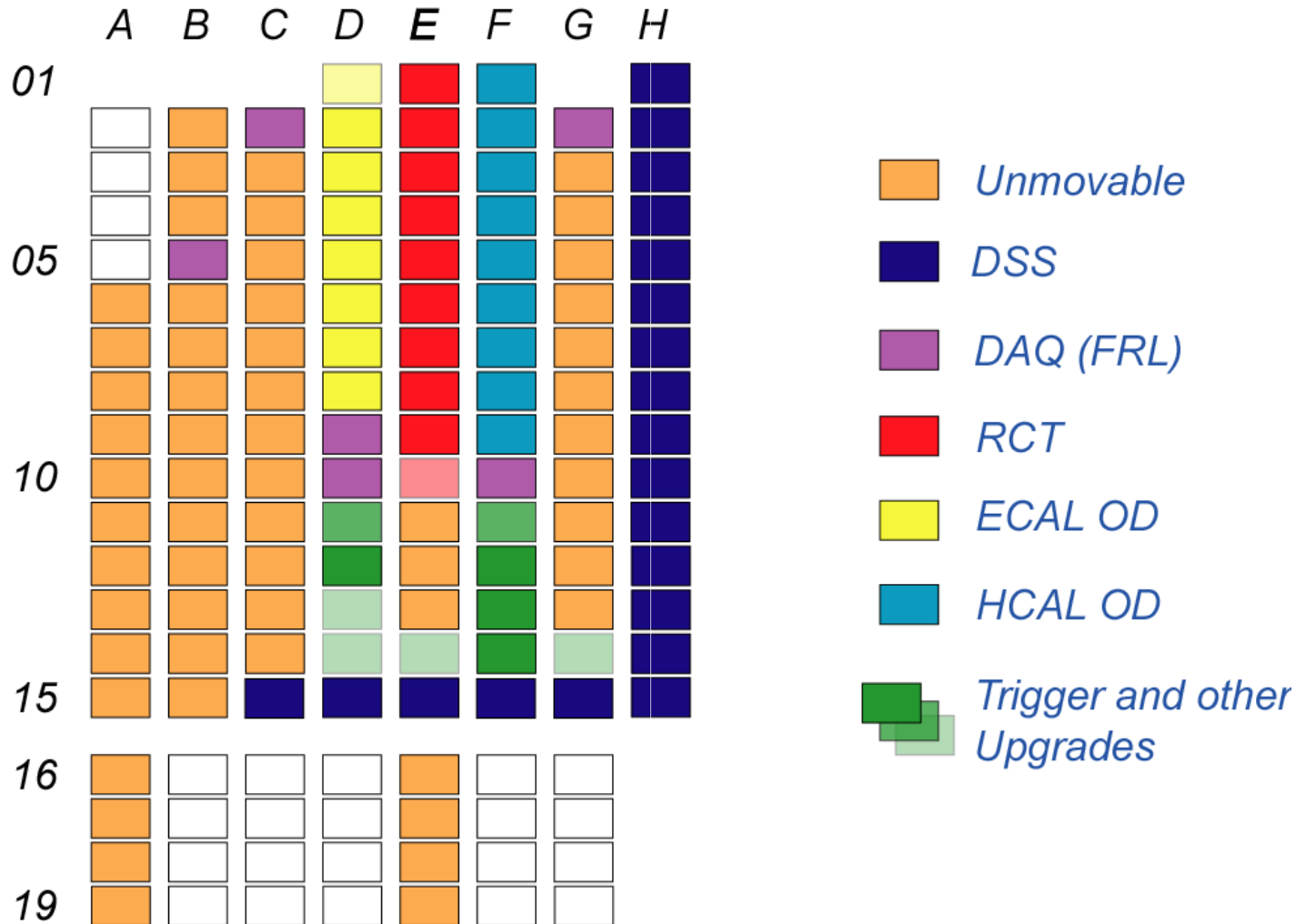
One rack available in S1



- **This rack is currently assigned to TTC**
 - ◆ **Empty and closed**



Potential Trigger Upgrade Racks in S1 (USC55)





S2D



- The racks in row D (ECAL) are empty and we should try to keep them that way



S2E



- The rack in row E (RCT) is empty and we should try to keep it that way
- The RCT spare rack could possibly be emptied too when the current system is stable



S2F



- The racks in row F (HCAL) are empty and we should try to keep them that way too



Real Estate Summary



- **S1**
 - ◆ One centrally placed rack available
- **S2**
 - ◆ One but potentially four racks available in row D
 - ◆ One but potentially two racks available in row E
 - ◆ Three and potentially four racks available in row F
 - Be aware that HCAL is planning to upgrade OD at the same time or perhaps one year ahead



Rack cooling



- **The current thinking is to develop a trigger upgrade based on electronics modules with the AMC form factor (uTCA)**
 - ◆ There are very cheap and handy bench top crates and controllers (MCH) available on the market
 - See for example G. Iles talk
- **The racks installed are equipped with vertical air flow cooling with air recycling and water-air heat exchangers**
 - ◆ Desirable to install crates suitable for vertical air flow
 - ◆ The bench top crates are generally not suitable for vertical air flow, thus some effort may be required



Rack cooling



- **The racks installed are one meter deep**
 - ◆ uTCA crates are about 30cm deep leading to a front – back air impedance mismatch and potentially inefficient cooling
 - ◆ Could profit from rear space to install optical patch panels and possibly remote power supply (only bulk 12V and 3V3 service power required)
- **Wish list**
 - ◆ Internal rack air filter
 - Issues with resistance to fire etc.
 - ◆ Drawer-like heat exchanger
 - Possible to pull out and clean



Summary



- **It is hard to pull off a successful upgrade**
- **The space available in USC55 is barely adequate provided that HCAL does not need any additional racks for the OD upgrade**
- **Space efficient rack layouts need to be developed and tested in b904 together with or prior to the electronics development**