



Muon Detector Upgrade

# Muon Hardware ECS



# Hardware ECS: general information

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- 1. The ECS interfaces used in LHCb will be untouched on the Upgrade**
  - **No GBT interface is foreseen for the muon upgrade**
- 2. We use the ELMB on the ODE boards and on the SB and PDM board**
  - **For the ODE the current ELMB will be maintained**
  - **For the SB and PDM board a final decision not yet taken**
- 3. A modification of the HV communication system is foreseen already during the LHCb experiment**
- 4. No components mortality observed during the first year of data taking after the “infant mortality” registered during the commissioning**
- 5. The components dismantled from M1 will be considered as spares for the Upgrade**

# ECS → Hardware Implementation

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- **LV system (contact Paolo Ciambrone)**

1. *Which of the existing interfaces will you require to be maintained for the upgrade (eg ELMB, SPECS, CCPC, Wiener, CAEN, ISEG....)? And in what quantity (eg how many ELMBs)?*

- LV System untouched → RCM interface (ethernet)
- For M2 to M5 stations → a total of 10 RCM
  - 8 RCM for ODE/IB/SB crates
  - 6 RCM for FEE crates

2. *For the existing interfaces, do you have enough units to cover your requirements?*

- RCM → common pool

# ECS → Hardware Implementation

## ▪ Service Board and PDM system (contact Valerio Bocci)

1. Which of the existing interfaces will you require to be maintained for the upgrade (eg ELMB, SPECS, CCPC, Wiener, CAEN, ISEG....)? And in what quantity (eg how many ELMBs)?

- SB/PDM System untouched (?) →
  - ELMB interface and FPGA Actel proasicplus flash technology
  - For M2 to M5 stations →
    - ✓ 8 PDM boards; 8 TTCrx; 8 Actel proasic+ flash technology; 8 ELMB
    - ✓ 120 SB; 120x4=480 ELMBs; 120 Actel proasic + flasch technology

2. For the existing interfaces, do you have enough units to cover your requirements?

- **Spares SB:** LHCb 5% → Upgrade 37%
    - 8 SB; (plus the dismantled M1 → 36 SBs more)
  - **Spares PDM :** LHCb 20% → Upgrade 50%
    - 2 PDM; (plus the dismantled M1 → 2 PDMs more)
- ACTEL component will be obsolete

3. What new interfaces will you require? (eg GBT)

- Maybe the radiation hard ELMB (backward compatibility required)

# ECS → Hardware Implementation

- **ODE system (contact Maurizio Carletti)**

1. *Which of the existing interfaces will you require to be maintained for the upgrade (eg ELMB, SPECS, CCPC, Wiener, CAEN, ISEG....)? And in what quantity (eg how many ELMBs)?*

- ODE System untouched →
  - ELMB interface (1 ELMB for each ODE)
  - For M2 to M5 stations → 104 ODEs → 104 ELMBs

2. *For the existing interfaces, do you have enough units to cover your requirements?*

- **Spares ELMB** (already configured for ODE): LHCb 7% → Upgrade 57%
  - 11 ELMB (plus the dismantled M1 → 48 ELMB more)

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- For the ELMB component we have 100 ELMB as spares for the ODE, SB and PDM boards
    - total ELMB number LHCb  $152 + 624 + 10 = 786$  ; spares: LHCb 13%
    - total ELMB number Upgrade  $104 + 480 + 8 = 592$  ; spares: Upgrade 17%

# ECS → Hardware Implementation

- **HV system (contact Nicolay Bondar)**

1. *Which of the existing interfaces will you require to be maintained for the upgrade (eg ELMB, SPECS, CCPC, Wiener, CAEN, ISEG....)? And in what quantity (eg how many ELMBs)?*

- UF/PNPI →

- Special interface (12 line bus) implemented on a home made PCI card (2 devices)
- New interface almost ready: from PCI to USB
  - ✓ Base on OPAL-KELLY board 3010; ETHERNET to the local network

- CAEN →

- peripheral crate (EASY crate) controlled with the CAEN special "Easy Branch Controller" A1676A
  - ✓ 4 EASY crate for M2 to M5
- connected directly with ETHERNET to the local network

2. *For the existing interfaces, do you have enough units to cover your requirements?*

- UF/PNPI →

- 2 system units plus some number of spare components to be repaired

- CAEN

- 1 system unit