Detector Control for the Insertable B-Layer

Susanne Kersten
Wuppertal University

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Outline

- Introduction
- Requirements
  - Power supplies
  - Monitoring crates at PP3
  - Interlock System
- summary

Guidelines

- **Power supplies and DCS as similar as possible to current detector**
- **Improve designs where obvious weak points**

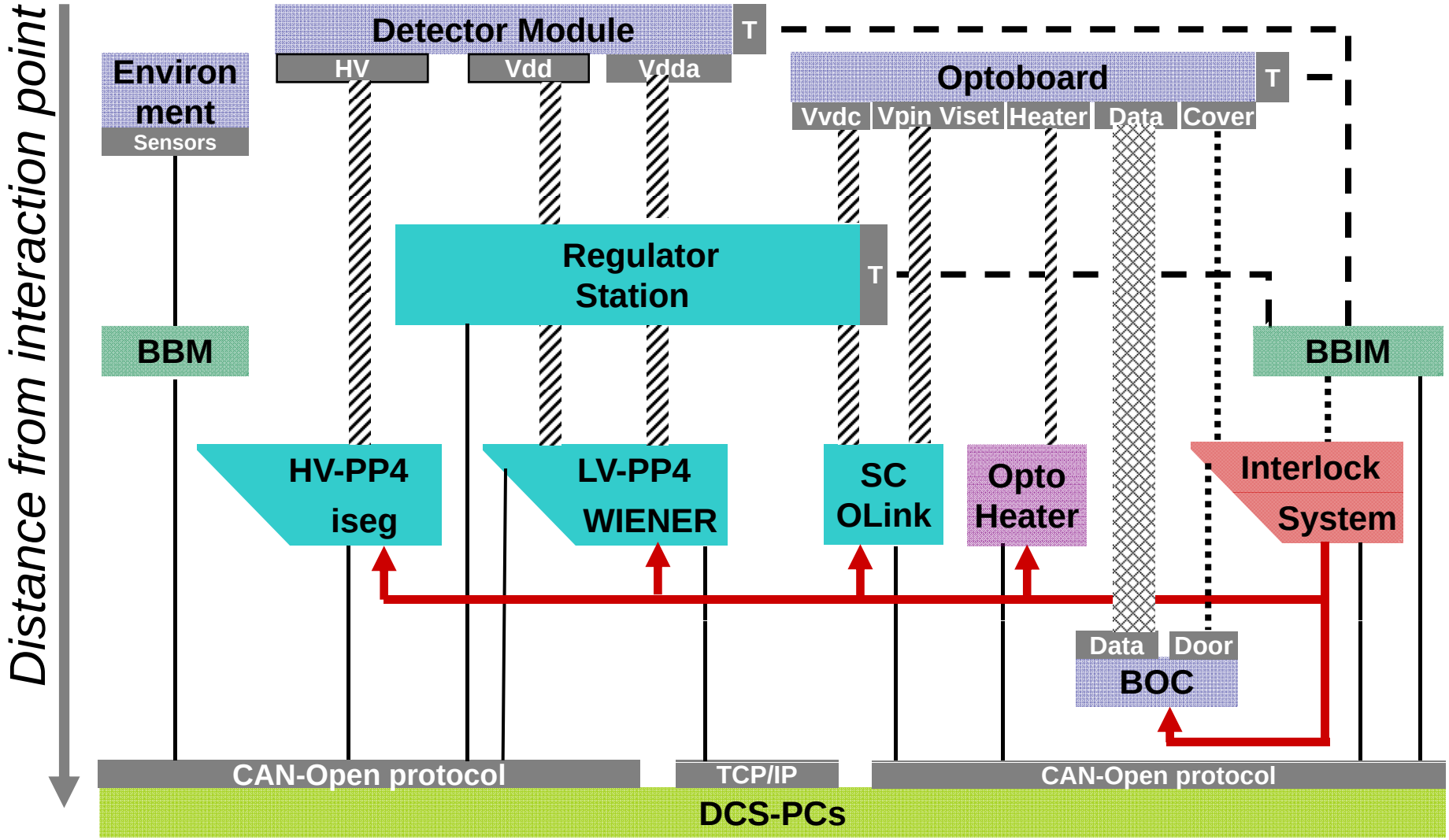
- **Installation in USA15 strongly preferred (better access)**
- **If installation split on US and USA side**
  - **rack space**
  - **Costs go up**

- **Numbers given in this talk (crate requirements and costs) assume USA15**

Basic assumptions

- **120 module a 1 LV, 2 HV**
- **15 staves**
- **4 module = 1 half stave**
- **4 LV/Wiener channel**
- **60 opto boards**

Current DCS system



HV (Iseg): depletion of sensors

- **Requirements strongly depend on the sensor technology**
- **actually we have iseg HV modules (700 V, 4 mA, 16 channels)**
- **HV module costs ca. 5 K€, crate 4k €**

- **If we need 2 HV channel/detector module**
  - **→ 15 HV module + 2 crates without HV-PP4 or**
  - **→ splitting factor 4: 4 HV module + 1 crate + 2 HV-PP4**

- **Attention: other requirements might require new design of HV modules!**
  - **time**
  - **money**

LV (Wiener) for front end electronics

- Actually we have PL512 from Wiener:
- 18V, 20 A, 12 channel
- Splitting factor of 4 → 3 PL512
- 1 PL512: 6 k€ + power bin (houses 2 PL512): 1k€
- Other LV power requirements no problem with PL512

- 1 LV-PP4 handles 1 PL512, splits + can measure up to 2A
- beyond that a re-design of the circuit itself necessary
- Happy with actual design
- Costs 3 k€/crate

- Use current design, equip boards just partly?
- Anyhow re-design of services between PP4 and PP2 necessary?

Supply and Control for the OptoLink

(LV + reset for opto boards)

- actually 16 complex channels/crate
- 1 complex channel
  - Vvdc 10 V, 800 mA
  - Vpin 20 V, 20 mA
  - Viset 5V, 20 mA
  - Reset
- Cost 4 k€/crate

- We would need 4 SC-OL crates
- Add interlock monitoring
  - ELMB channels available, routing tbd
- Can we use Vvcdc again for VCSEL and driver chips?
- Higher power need of opto board require modified design of power supply channels themselves

Regulator Station PP2

- **Actually 1 regulator station houses 12 regulator boards**
- **each regulator board handles**
  - **7 Vdd (front end electronics)**
  - **7 Vdda (front end electronics)**
  - **2 Vvdc (opto board)**
- **Alltogether 192 regulator channel/crate**
- **Cost 10 k€/crate, 1 k€/regulator board**

- **Current consumption of new LV up to 2 A**
- **Still inside LHC4913**
- **Regulators still available**

Regulator Station PP2

- **IBL requires different grouping of channels on regulator board**
- **We need 60 LVopto + 120 LVfrontend**

- **prefer 1 group: 4 LVfrontend + 2 LVopto**
- **a new regulator board could support 2 groups**
- **Gives 15 regulator boards + 2 PP2 crate**
- **If distributed over 2 PP2 crates, heat load should be acceptable for current cooling of PP2 crates**

In all cases:

- **New design of regulator/daughter board required**
- **Input and output board must be redesigned**
- **Gives overhead in cost**

- **1 PP2 aux PS required (PL512)**

PP3 crates

Actually

- **1 Building Block Interlock Monitoring =**
  - **4 Interlock boards**
  - **4 * 14 temp. signals**
- **BBM: 2 blocks temp + 1 block humidity readout**
- **Opto PP3 (3 U) up to 84 opto boards**
- **1 interlock board ca. 100 €; PP3 crates ca. 500 – 1000 €**

- **IBL will need:**
  - **60 temp module/side → 5 I-boards**
  - **30 opto boards/side → 3 I-boards**
  - **1 PP2 crate/side → 1 I-board**

PP3 crates

- **Solution A:**
  - **3 BBIM blocks/side + 1 Monitoring block/ side = 1 x 6U/side**
  - **All together 2 BBIM crate (a 6U) + 2 Opto PP3**

- **Solution B:**
  - **combine all services in one position**
  - **1 BBIM crate + 1 BBM crate could be sufficient + 2 Opto PP3**

- **Solution C:**
  - **As solution B, but**
  - **Place everything in USA15**
  - **Precision of temp. measurement acceptable?**
  - **No Rad-tolerance of Interlock board required!**

- **PP3 aux. PS: if more than one BBIM crate an additional PP3 auxPS crate is required**

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Interlock system

Actual design:

- **Logic Units (decision)**
- **3 interlock distribution boxes (mapping)**
- **on detector, off-detector laser interlock, DSS handling**
- **Several add-on crates due to later upcoming needs (e.g. Opto heater Interlock)**
- **Cost per interlock crate: ca 1 k€**

Keeping the actual structure:

- **LU + IDB: different ratio module/opto board – modifications necessary**
- **re-design of other interlock components (laser, bake-out, etc.) required**

recomment:

- **Keep basic concept and electrical circuits**
- **Reorganize LU, IDBs + further Interlock completely**
- **Clear grouping of services simplifies design!!**

What else?

- **Will we need another opto heater system?**
- **Foresee 2 separate Local control stations!**
- **…….**

Summary

- **Goal for power supply and DCS concept: use design of actual detector!**
- **Aim to have all DCS and power supplies in USA15**

- **possible to keep basic designs**
- **Different number of HV, LV, opto service per group (half stave) → most of patch panels, input output boards need re-design**
- **Availability of currently used components?**

- **Costs of various components given**
- **Whenever a re-design is necessary additional cost**