SSD – Status

ITS Upgrade meeting – 4 October 2010

1. Detector Status
2. Stability
3. SSD spare components
4. Mortality rate
5. High rate capabilities

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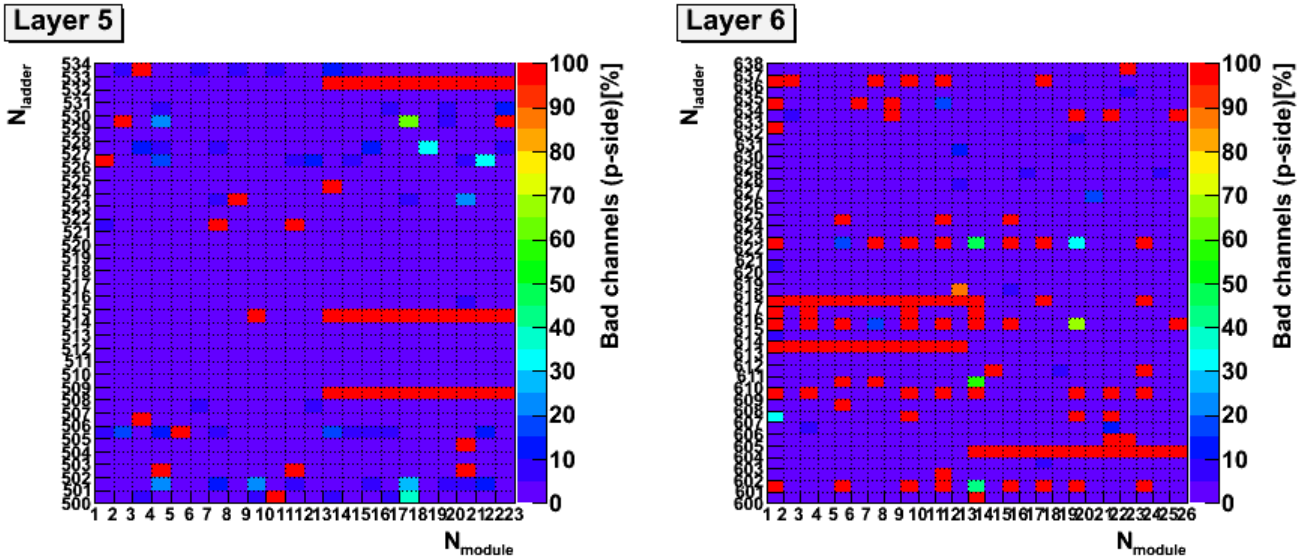
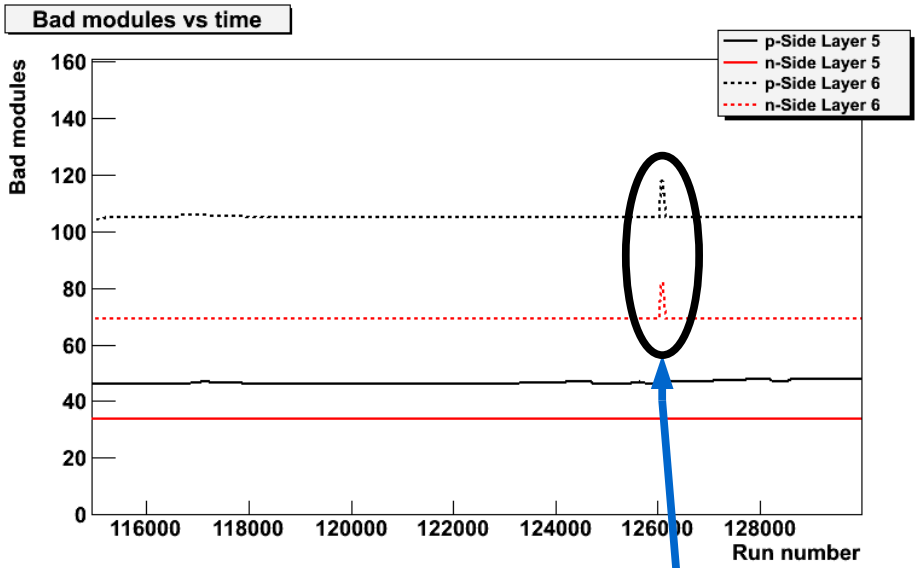
SSD status in 2010

- Not operable half-ladders: 6/144
- Active modules: 1557/1698 ~ 91.7%
  - *The non-active modules:*
    - belong to disabled half-ladders
    - are not operable due to configuration problems
    - are masked due to noisy areas
- Active channels in active modules: ~ 98.5%
  - *The non-active channels:*
    - noisy
    - no gain
    - open
- **Overall efficiency ~ 90.3%**



SSD stability in 2010: Bad Modules

Time evolution: Mar-Sept 2010



Inactive modules

- very stable conditions
- exceptions:
  - 1 half-ladder excluded in 6 runs (126073 → 126093) due to temporary *high bias current* issue
- increase of noise causes the temporary masking of a few units

modules

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Bad p-Sides on Layer6:  105
Bad n-Sides on Layer6:   69
Bad p-Sides on Layer5:   48
Bad n-Sides on Layer5:   34

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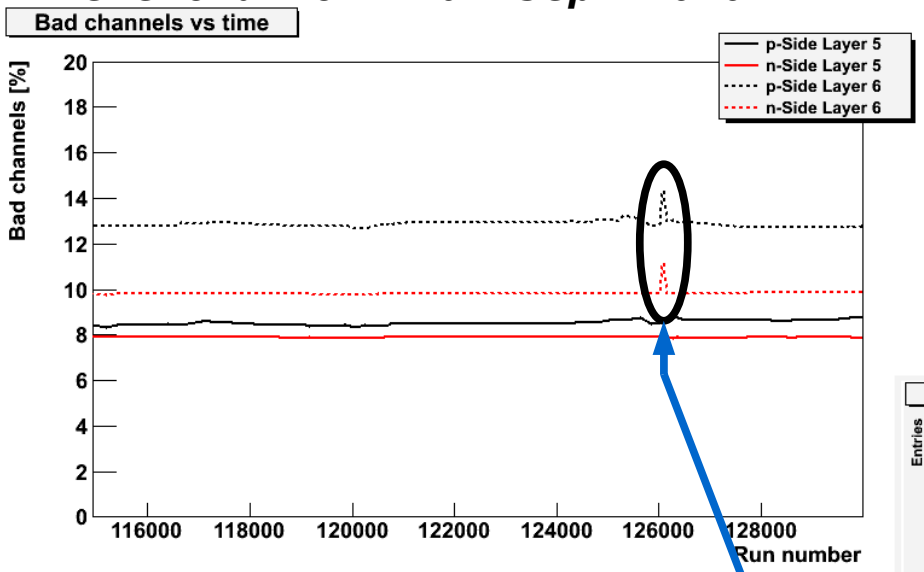
+ 4 half-modules not configurable anymore
→ excluded from acquisition

SSD stability in 2010: Bad Channels

Time evolution: Mar-Sept 2010

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==================================
Bad p-Side channels in Lay6: 11.1 %
Bad n-Side channels in Lay6:  9.9 %
Bad p-Side channels in Lay5:  8.6 %
Bad n-Side channels in Lay5:  7.9 %
==================================
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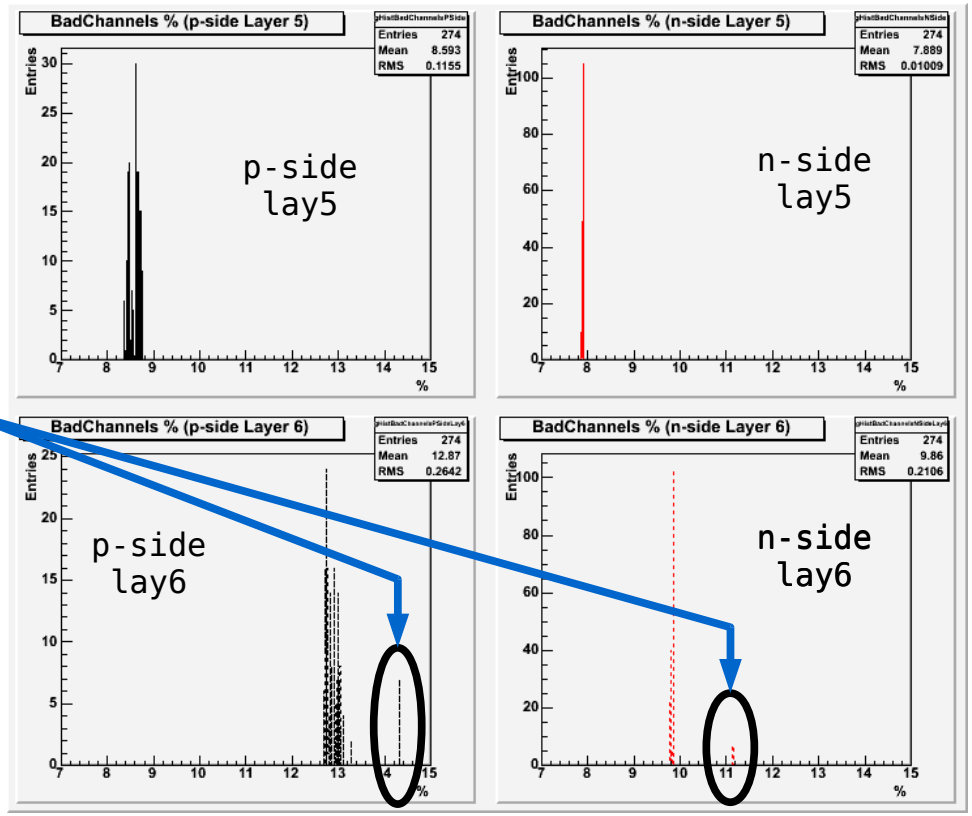
- Bad Channel % distribution

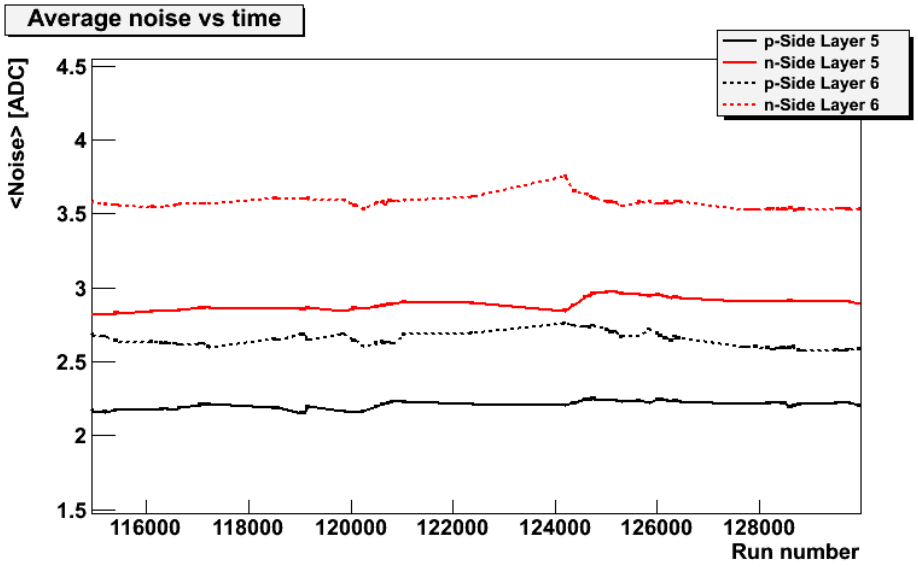


Bad Channel %

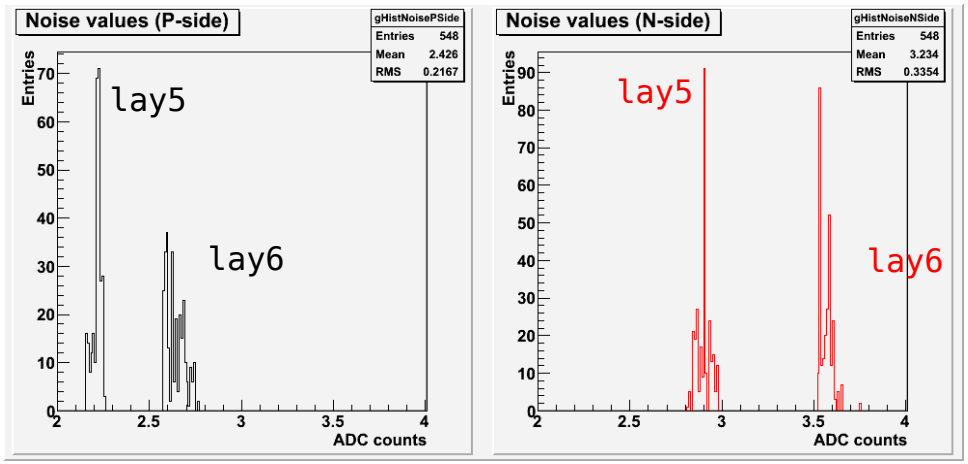
- good stability during 2010
  - except for 6 runs 126073 → 126093 *(1 ladder temporary off)*
- n-side very stable
  - deviations < 0.05 %
- p-side Lay6: *humidity dependence in* Sintef modules
  - *(relative humidity > 16% causes high noise on p-side)*
- p-side generally more variable due to the thresholds for *bad* tagging

SSD stability in 2010: ***average Noise***

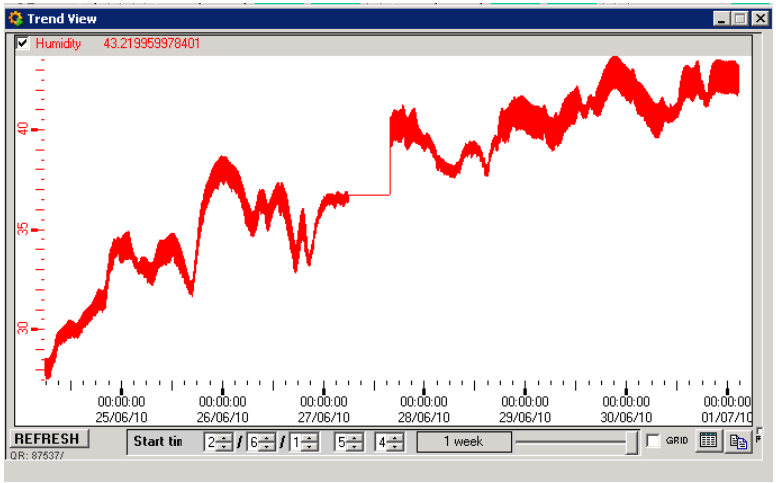
Time evolution: Mar-Sept 2010



- Average Noise distribution



R.H. > 40% ~0-15 June (from run 123500)



- p-side & n-side: *humidity effects (relative humidity > 30% causes high noise and* ***excess of bias current*** *–> dangerous for SSD)*
- *R.H. stably < 30% since end of July thanks to:*
  - *Geneva region weather conditions*
  - *some improvements in ventilation system*

Present SSD - mortality rate in 2010

- recovered half-ladders: **+ 1/144** (lower bias current)
- not operable half-ladders: **- 0/144**
- not configurable half-modules: **- 4/(1698*2)**
- CAEN PS channels:
  - HV: **- 2/(144*2)**
  - LV: **- 1/144**
- FEROM read-out electronics:
  - Link module (9ch): **- 1**

✔ **power cycling limited → system stability increased**

Present SSD - planned modifications

- new ITS ventilation machine *(define specs)*
- CAEN boards to reduce Common Mode *(under study)*
- review of the interlock chain in HV boards

Present SSD: spare components

- CAEN power-supplies:
  - Main Frame: 1 (1)
  - 48V: 4 (5)
  - LV boards (1ch): 8 (144)
  - HV-Positive (12ch): 2 (12)
  - HV-Negative (12ch): 2 (12)
  - branch-controller: 1
- FEROM read-out electronics:
  - 2 fully equipped half-FEROM sets (9AD+1Link)
  - 3 Link modules
  - 2 watercooled VMEcrate
- JTAG box: 1

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Not usable on present SSD

- 4 *layer6* ladders
- 2 *layer5* ladders

} replacement is risky!

- some modules
- thousands of HAL25 front-end chips, untested
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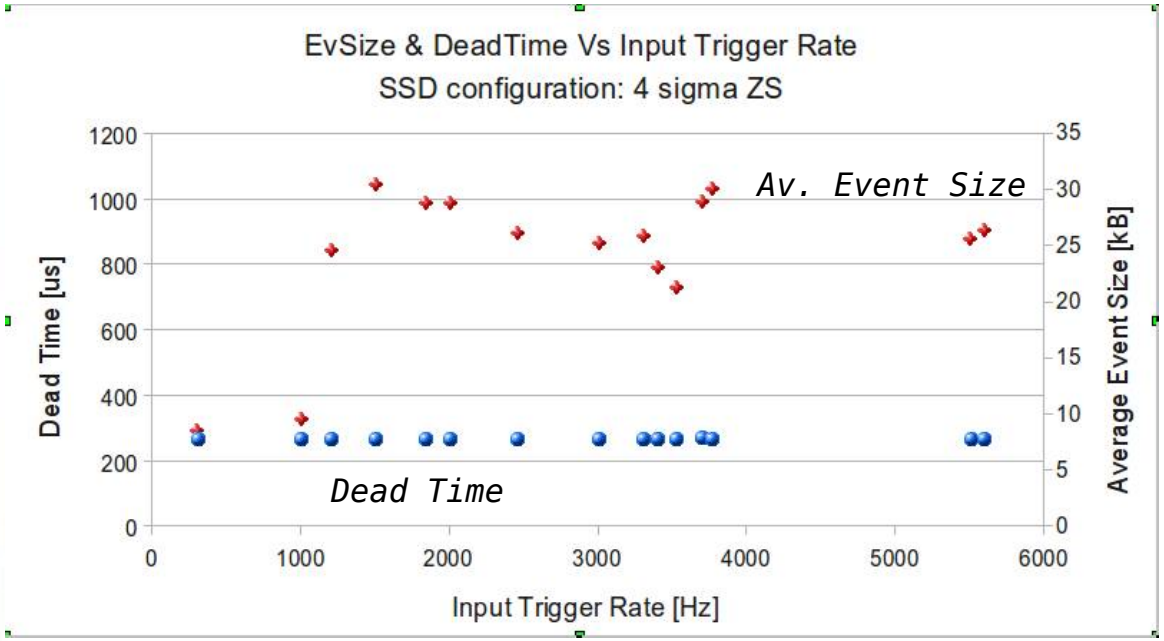
High rate acquisition performance

Main *Rate limitations:*

- Present firmware busy time = 265 µs
  - 100ns read-out clock → 160 µs for digitization
  - amplifier discharging time
  - FEROM data correction
- DDL/LDC back-pressure



Data Taking Conditions

- 4σ Zero Suppression
- empty events
- variable input trigger rate:
  0Hz → 11kHz

- **Dead Time** Vs Input Trigger Rate
  - constant @ 265 µs
    (FEROM busy time)
- **Av. Event Size** Vs Input Trigger
  - tolerable increase of the Average Data Size
    < 35kB = 3σ ZS DataSize

To be tested at HI-like occupancy

After a first look:

- HI high mult. → 1.5% occupancy → Dead time OK up to 800Hz

Conclusions

- SSD status:
  - overall efficiency: 90%
  - active fraction: 92%
  - good channels in active part: 98.5%
- Good stability: same configuration from March to October
  - except for 6 runs
- Lost components in 2010
  - 4 half-modules
  - 3 PS channels
  - 1 FEROM Link Module
- Spare components: full sets available
- Acquisition rate limitations

Backup

SSD General layout