Addendum to Expressline II
Database status
The new Frontend Adaptor

Torsten Franke
Markus Axer, Franz Beißel, Günter Flügge, Stefan Kasselmann,
Joachim Mnich, Andreas Nowack, Oliver Pooth

III. Physikalisches Institut B

RWTH Aachen
Overview

- Some additions to the Expressline II measurements
  (Comments to the last talk)

- Some comments to the database

- Measurements with the new Frontend
  - Comparison noise
  - Calibration pulse height
  - Backplane pulse
Some Additions to the Exressline II Measurements
Expressline II

9 Modules

- TEC Ring 6
- Equipped with ceramic hybrids
- Assembled on the gantry in Bruxelles
- Bonded in Aachen (AC I)

Tests done by Aachen I (*Jan Olzem, Katja Klein*)

- Using ARC & ARC LED System

- *All nine in IV tests under controlled conditions*
- *5 of 9 modules in cooling cycles*
## Result Table

<table>
<thead>
<tr>
<th>Frame</th>
<th>Hybrid</th>
<th>Channel (sensor numbering)</th>
<th>Pulse Shape (Inverter on)</th>
<th>Noise (Inverter on)</th>
<th>LED Test</th>
<th>Pinhole Test</th>
<th>Visual Inspection or (assumed) Error</th>
<th>Pinholes known on Sensor Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Peak Dec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Peak Dec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>rise time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>signal height</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>rise time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>signal height</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>signal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>suspi-cious</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.501</td>
<td>.106</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.502</td>
<td>.105</td>
<td>495</td>
<td>-</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>missing bond (SEN-SEN)</td>
</tr>
<tr>
<td>.503</td>
<td>.102</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.640</td>
<td>.098</td>
<td>435</td>
<td>x</td>
<td>x</td>
<td>(x)</td>
<td>(x)</td>
<td>x</td>
<td>yes</td>
</tr>
<tr>
<td>.640</td>
<td>.098</td>
<td>423</td>
<td>-</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>missing bond (APV-PA)</td>
</tr>
<tr>
<td>.641</td>
<td>.099</td>
<td>240</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>broken line on pitch adapter?</td>
</tr>
<tr>
<td>.642</td>
<td>.097</td>
<td>183</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.642</td>
<td>.097</td>
<td>512</td>
<td>(x)</td>
<td>(x)</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.643</td>
<td>.101</td>
<td>221</td>
<td>x</td>
<td>x</td>
<td>0</td>
<td>x</td>
<td>x</td>
<td>no</td>
</tr>
<tr>
<td>.643</td>
<td>.101</td>
<td>292</td>
<td>x</td>
<td>x</td>
<td>0</td>
<td>x</td>
<td>x</td>
<td>pinhole</td>
</tr>
<tr>
<td>.643</td>
<td>.101</td>
<td>448</td>
<td>x</td>
<td>x</td>
<td>0</td>
<td>x</td>
<td>x</td>
<td>yes</td>
</tr>
<tr>
<td>.643</td>
<td>.101</td>
<td>510</td>
<td>x</td>
<td>x</td>
<td>0</td>
<td>x</td>
<td>x</td>
<td>yes</td>
</tr>
<tr>
<td>.644</td>
<td>.104</td>
<td>155</td>
<td>x</td>
<td>x</td>
<td>(x)</td>
<td>(x)</td>
<td>0</td>
<td>high leakage current pinhole</td>
</tr>
<tr>
<td>.644</td>
<td>.104</td>
<td>358</td>
<td>x</td>
<td>x</td>
<td>(x)</td>
<td>(x)</td>
<td>0</td>
<td>high leakage current pinhole</td>
</tr>
<tr>
<td>.645</td>
<td>.100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Now "normal" pinhole
New "normal" pinhole
New: no signal at all
Some Comments on the Database
Writing XML Files

*No problem in principle...*

- Pedestal, noise, raw noise, calibration amplitude etc.
- Definition of some tags had/have to be clarified:
  - `val`
  - `tool_id`
- Reordering of XML file structure requires minor changes

...but still some work needed,

New ARCS Release next week
Writing XML files

- Up to now we assumed a fixed database definition where only some small things had to be clarified.
  
  *based our implementation on that fact*

  XML files were created during the testrun (not afterwards)

- Latest discussions about database definition (29/01/03) showed that many things are not clear and will become fixed by experience only
- Changes in DB and XML file structure are very probable
- Need possibility to extract data from older local data files to convert in the latest DB compatible XML file version
  
  *Requires a much more flexible concept*

  *We will try to profit from Valery Zhukovs XML parser which has that flexibility*

  *Will cost more time to finalize the new ARCS version need two weeks in optimistic scenario*
Measurements with the new ARC Frontend
The New ARC Frontend

- Status:
  - 25 PCBs assembled
  - All will be tested until end of this week

Setup for hybrid tests using the ERNI connector at the backside of the frontend

Setup for Module Tests
Comparison in Hybrid Tests
Noise nearly identical

Noise and Raw Noise in Deconvolution Mode, Inverter off

Old Frontend

New Frontend
Calibration pulse height nearly identical

Fitted height of calibration pulses

Old Frontend

New Frontend
Comparison in Module Tests
Setups

Old Frontend

New Frontend

NAIS-ERNI adaptor

HV

Common ground point on the carrier plate

FE Hybrid to UTRI adaptor card (TOB)

All measurements with TEC module 23 (1 open bond, 2 shorts, 3 pinholes)
Noise

- Old and new Frontend adaptor give the same results
  - Mean noise of a certain APV is identical
  - Noise of healthy channels within statistical variations
  - With new FE adaptor smaller at module edges if carrier plate is grounded

- Small differences for faulty channels due to slightly different common mode
Backplane Pulse

- Requires update of the ARC firmware
- Signal of 2V volts is “put on the HV line“ (Rise time of some ns

The picture shows the data of 10 consecutive pipeline entries representing the time evolution of the backplane pulse signal. The four different colours represent the four APVs. (APVs in three sample mode, Trigger 00000010 01001001)
Backplane Pulse

Closer look on one frame:
⇒ All faults are obvious

Faults have lower pedestal, fakes have higher pedestal
But will it always be that simple?
(APVMode : ?????)
Signature in Pedestal

- Measure difference of pedestals with and without backplane pulse
  - All faults can be found!
  - But huge edge effects

![Graph showing measurement results with and without backplane pulse. The graph depicts the differences in pedestal values across various channels. The x-axis represents channels, while the y-axis shows the pedestal values. Significant differences are marked with arrows and labels for edge, open bond, pinholes, and shorts. The plot shows Ped\text{normal} – Ped\text{backplane}. Measurement with Deconvolution Inverter on.]
Summary

- Pinhole test finds pinholes
  - But does it harm the detector?

- New ARCS release next week
  - Can generate DB compatible XML files

- New frontends are working and available
Oops ... a new pinhole

- Detected two new pinholes
- Not a high leakage current pinhole
- Channel has never been conspicuous in the first test run

result of the pinhole test (Frame ...643, Hybrid ...101, channel 292 resp. 221)
Change of pinhole Behaviour

- was detected as a high leakage current pinhole
- Now behaves like a “normal” pinhole (conspicuous at low currents already)

Fitted height of pulse shape in Dec. Mode / Inverter OFF (Frame ... 642, Hybrid ... 097, channel 183 resp. 330)

December 2002

Januar 2003