

News from Aachen

**Module Test Meeting
Tracker Week
10th February 2004**

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III. Physikalisches Institut B

RWTH Aachen

1. ARC Test Results from TEC Pilot Run Ring 6 Modules
2. X – Cal TEC ARC Teststands
3. Test of first TEC Ring6 Modules produced by UCSB
4. Recent Developments in ARCS

1. ARC Test Results from TEC Pilot Run Ring 6 Modules

Received 10 Ring 6 Modules from Brussels on
15th October

Procedure:

1. Add **Powerbonds** to unbonded Module
2. Make a **Full Test of the Hybrid with Pitch Adapter** including **I-V curve of the Sensors**
3. Add **Bonds** between **Pitch Adapter – Sensor – Sensor**
4. Make a **Full Test of the Module** including an I-V Curve
5. Do active **Thermal Cycle Tests**

Plots on I-V Curves & Cooling Test Results will be presented here

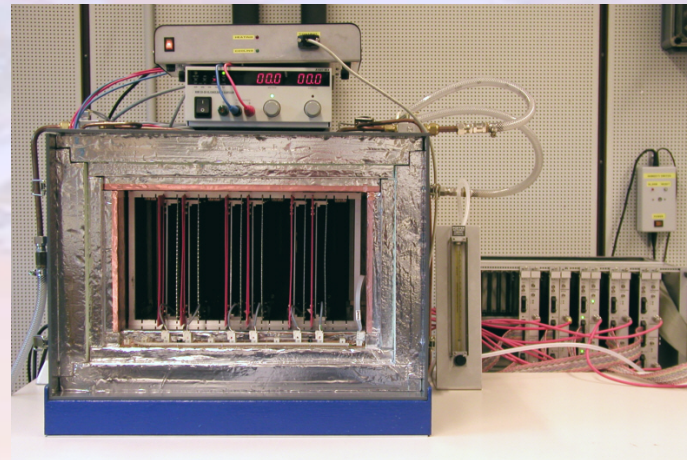


Single Module Test Box

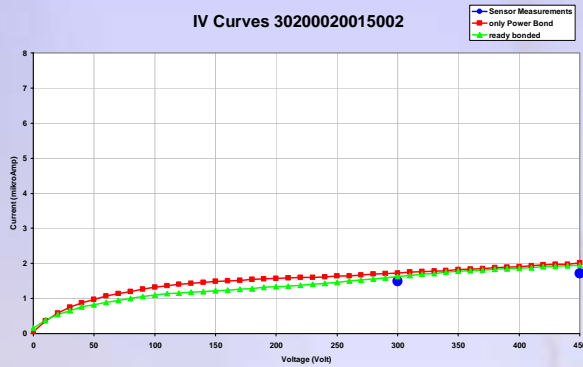
- Pedestals & Noise
- Pulse Shape
- Pipeline
- Gain
- I-V Curve
- LED
- Pinhole

Aachen Cold Box

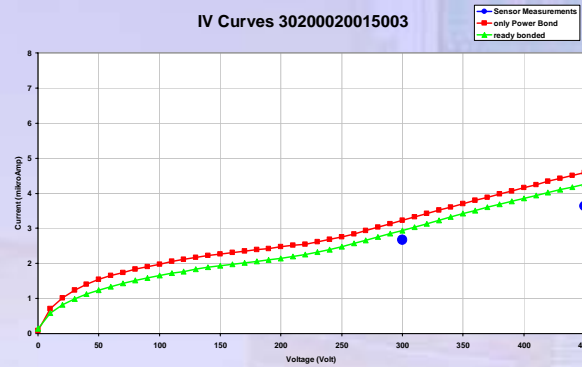
- Pedestals & Noise
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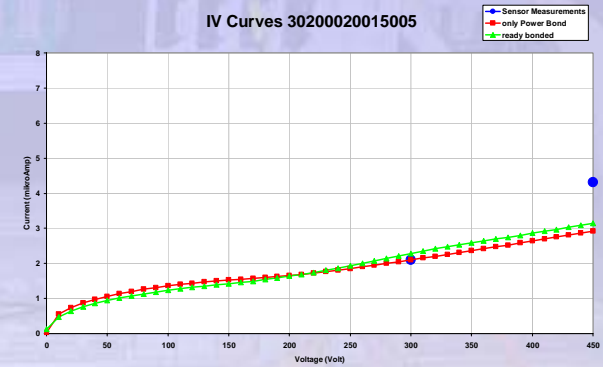
IV Curves 30200020015002



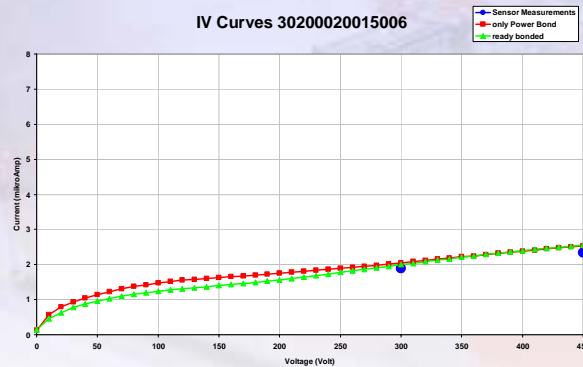
IV Curves 30200020015003



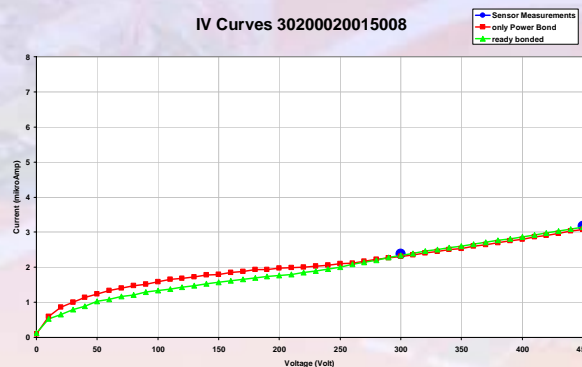
IV Curves 30200020015005



IV Curves 30200020015006

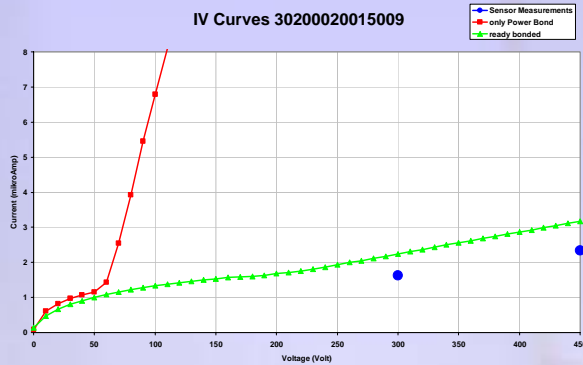


IV Curves 30200020015008

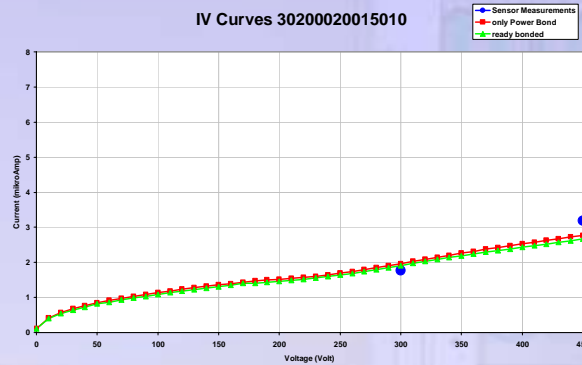


- From database (300V & 450 V)
- With Powerbonds only
- ◆ Fully bonded

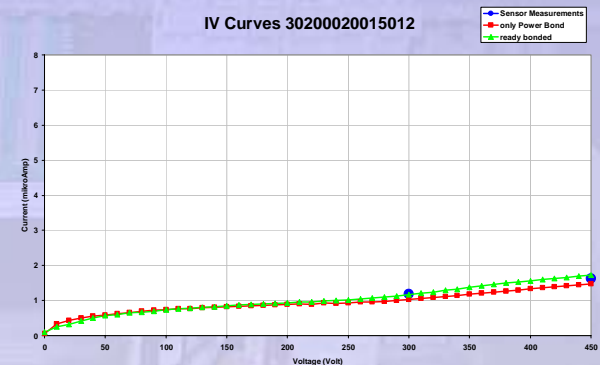
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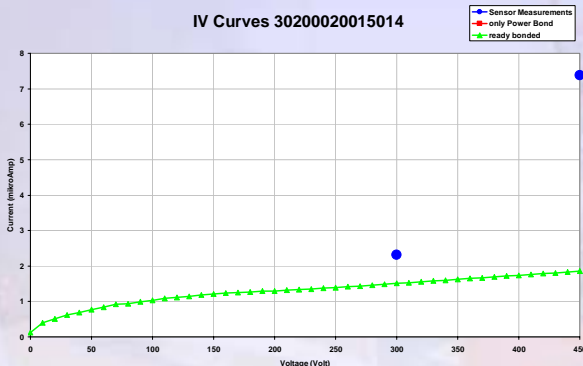
IV Curves 30200020015010



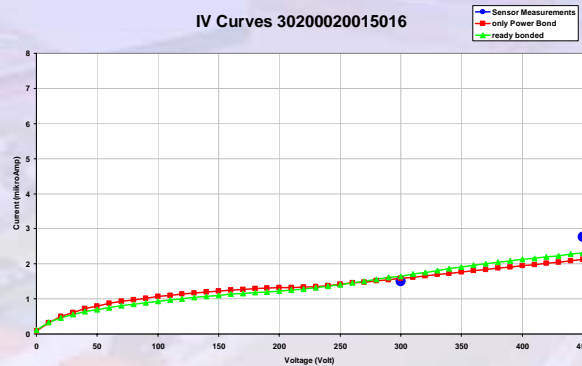
IV Curves 30200020015012



IV Curves 30200020015014



IV Curves 30200020015016



- From database (300V & 450 V)
- With Powerbonds only
- ◆ Fully bonded

Comments:

Module 30200020015009 showed Microdischarge Effect time by time

Module 30200020015014 was completely bonded in one go

- 9 Modules show Leakage Current as expected from Sensor Tests
- 1 Module showed higher leakage current after bias bonding seemed to have recovered after strip bonding
 - This module showed Microdischarge Effect from time to time
- Leakage Current does not change after Strip bonding
 - Can we skip first I-V Test and thus bond in one go?
(This would speed up the testing procedure a lot!)

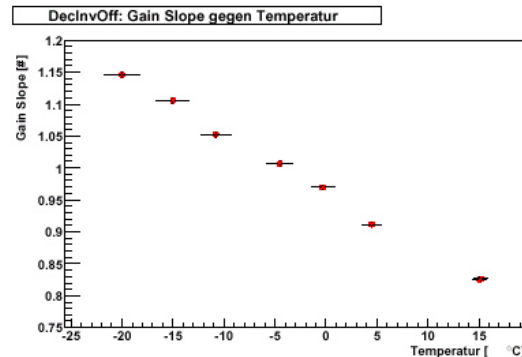
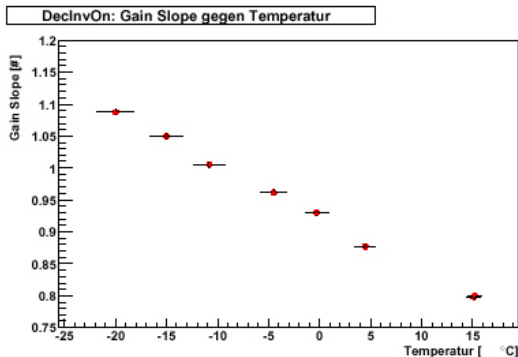
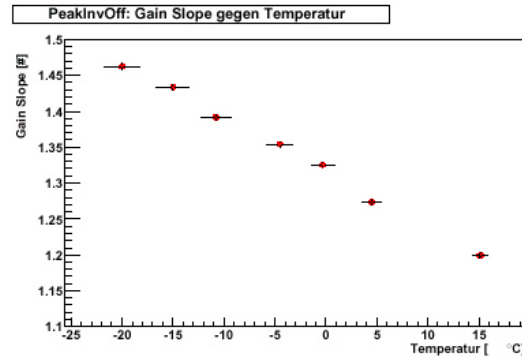
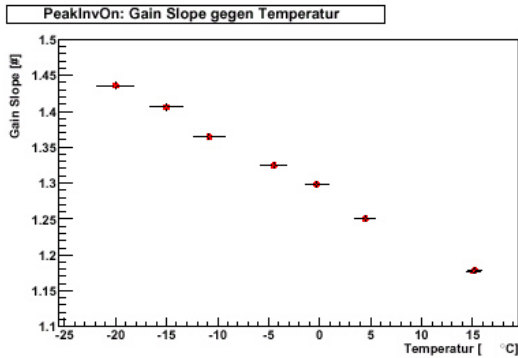
Start at 15°C and go down to -20°C in steps of 5°C

Procedure:

- Start at ambient Temperature
- Cool down to set Temperature
- **Make Measurements**
- Go back to ambient Temperature

Next day:

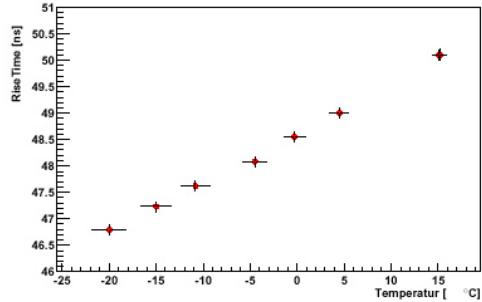
- Cool down to set Temperature
-
-



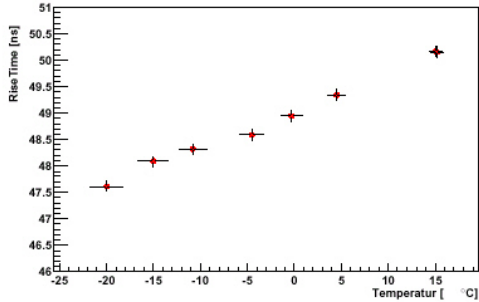
Gain slope rises with decreasing Temperature

- Gain Slope increases about 22% in Peak Mode and 38% in Deconvolution Mode
- Influence of Temperature on Charge Injection Circuit unknown

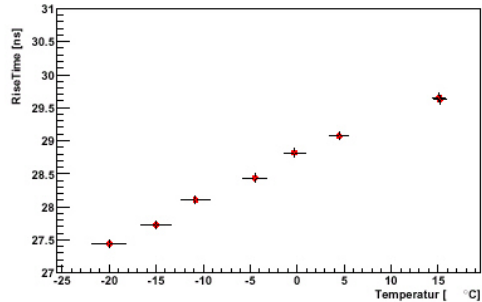
PeakInvOn: RiseTime gegen Temperatur



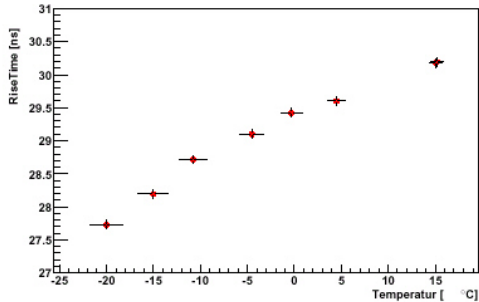
PeakInvOff: RiseTime gegen Temperatur



DeconvOn: RiseTime gegen Temperatur



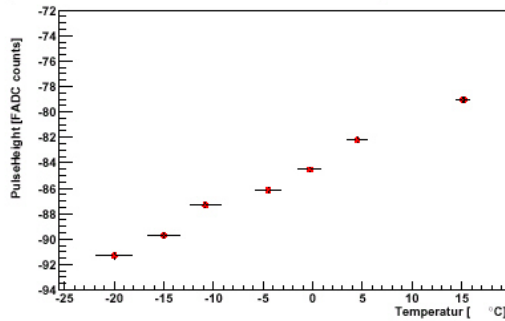
DeconvOff: RiseTime gegen Temperatur



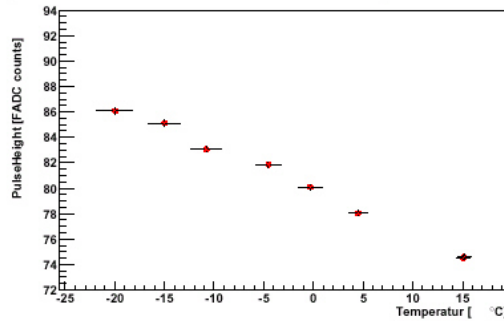
- Rise Time decreases in all Modes

- Decreases about 7% in Peak and 9% in Deconvolution Mode

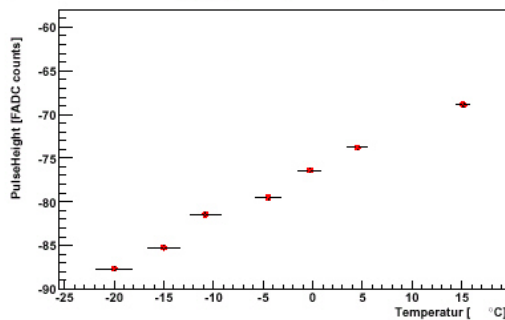
PeakInvOn: PulseHeight gegen Temperatur



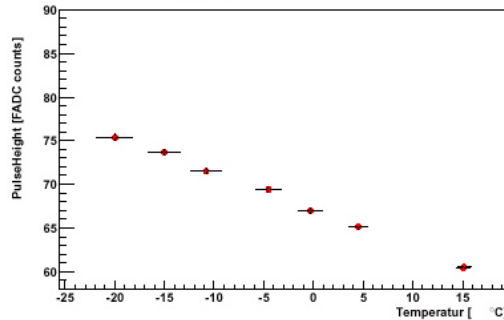
PeakInvOff: PulseHeight gegen Temperatur



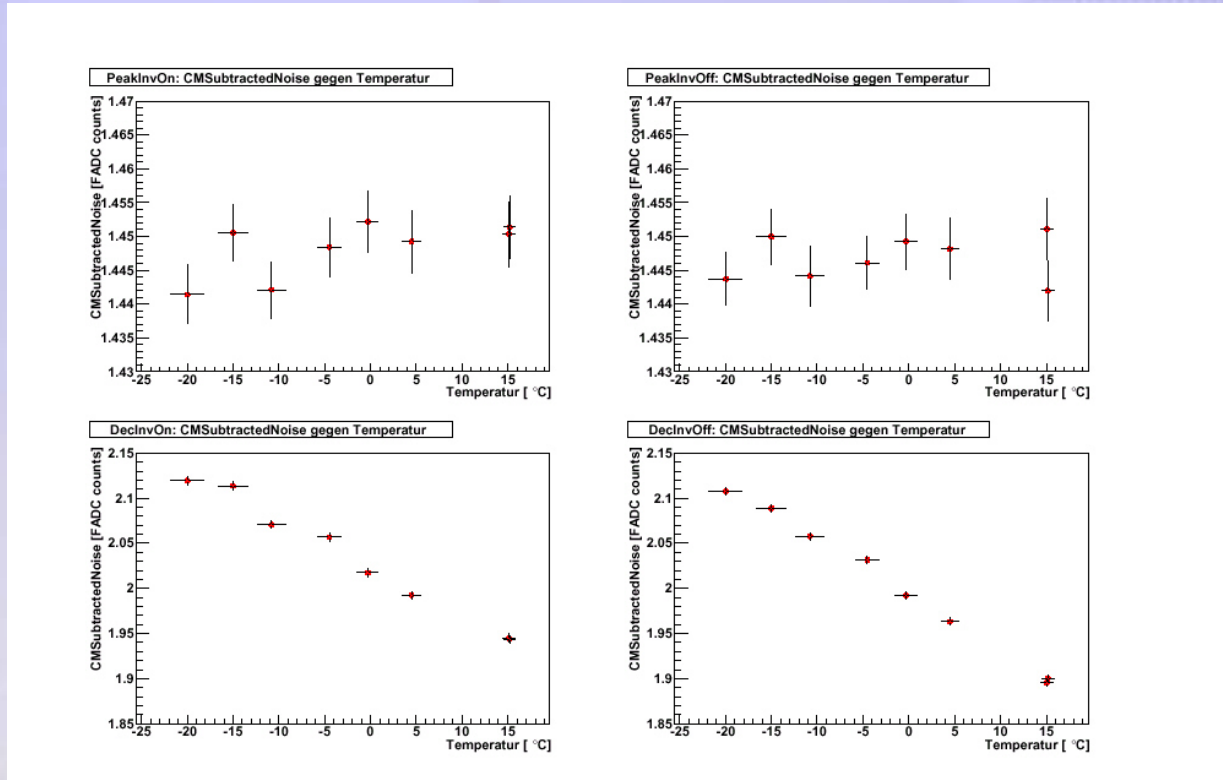
DeclInvOn: PulseHeight gegen Temperatur



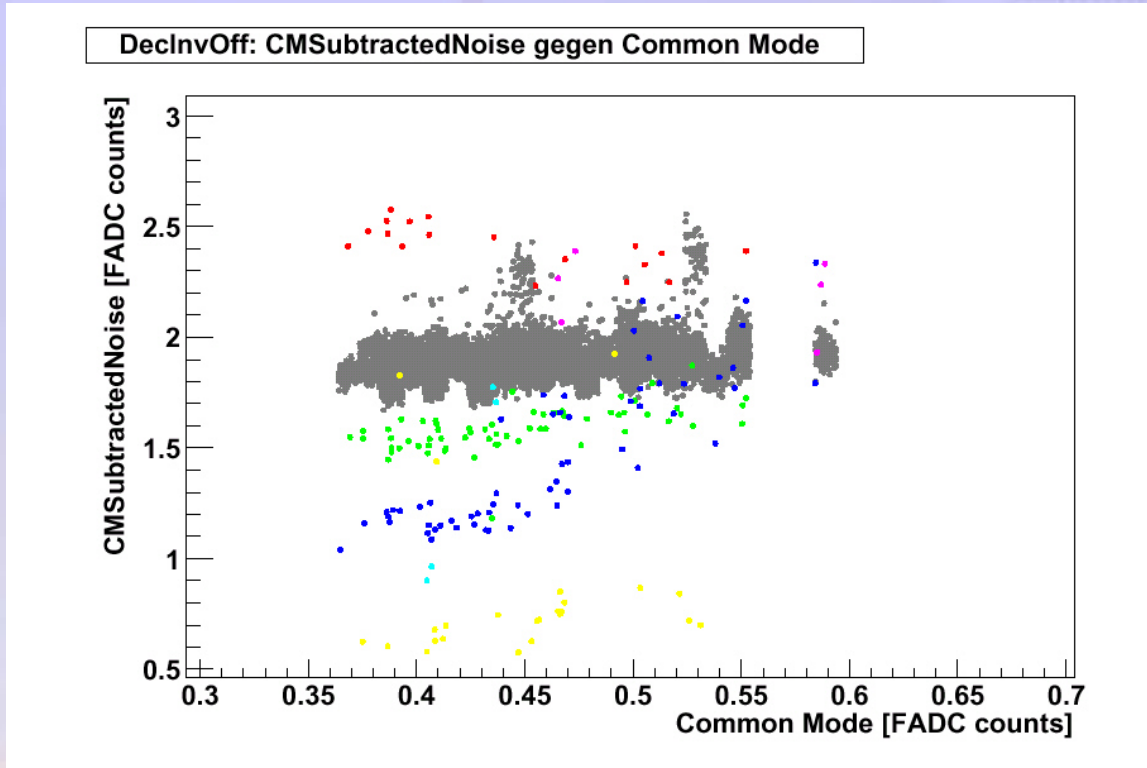
DeclInvOff: PulseHeight gegen Temperatur



- Pulse Height rises with decreasing Temperature
- Rises about 18% for Peak and 28% for Deconvolution Mode



- Common Mode Subtracted Noise does not change in Peak Mode
- Common Mode Subtracted Noise depends on Temperature in Deconvolution Mode
- Rises about 10% between 15°C and -20°C



Defects

- Noisy Strips
- Shorts
- Sensor – Sensor Open
- Pitch Adapter Sensor Opens
- Pinholes

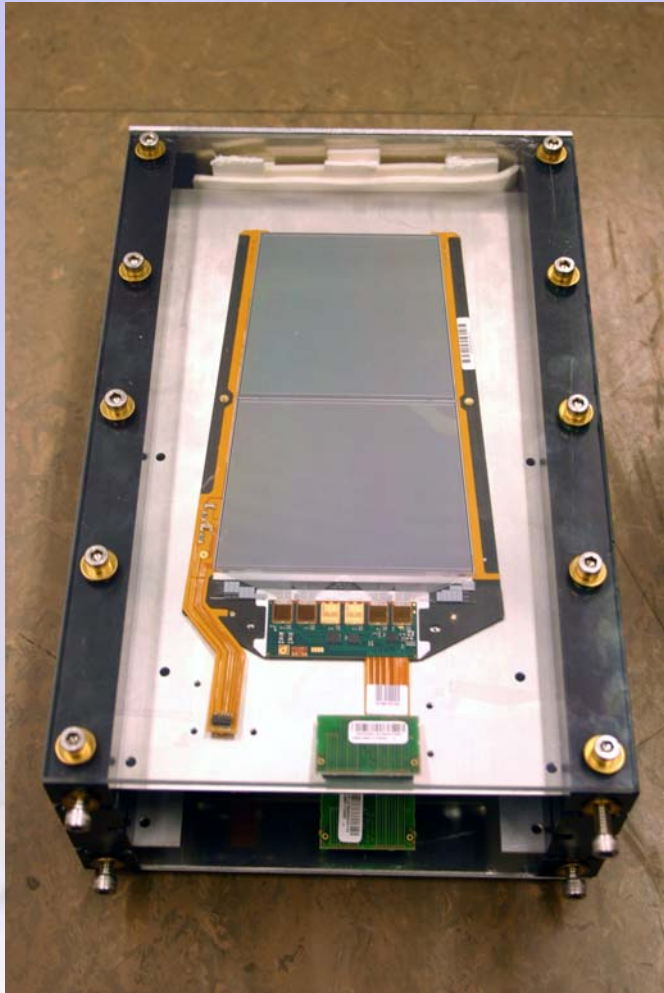
- Common Mode Noise has strong influence on Noise of Opens
- Situation starts to get bad at 0.5 ADC Counts CM Noise

2. X - Calibration

Now also Hamburgs Testbox has taken part in the TEC
ARC Teststand X - Calibration

Center	Mode	Peak Ioff	Peak Ion	Dec Ioff	Dec Ion
	1	0,3313	0,2844	0,5158	0,4122
	2	0,3261	0,2762	0,5126	0,4129
	3	0,4844	0,2751	0,8523	0,4177
	4	0,3559	0,2801	0,5435	0,4239
	5	0,3338	0,2821	0,5104	0,4179
	6	0,3324	0,2872	0,5131	0,4212
	7	0,3389	0,2863	0,5053	0,4244

3. Test of first TEC Ring 6 Modules produced by UCSB



Received 3 Ring 6 Modules last Friday:
(30200020020513, 30200020020514, 30200020020515)

- First TEC Ring 6 Modules produced by UCSB

Optical inspection by eye.

- Surface of Sensors looks very clean
- Bonds look good
- It was possible spot few missing Bonds

Made Measurements in Single Module Testbox

- Compare Data with Data from UCSB

Defects found in Aachen

Defects seen at UCSB

Module 30200020020513:

027 : OPEN between PA and Sensor
302 : OPEN between PA and Sensor
306 : likely OPEN (conflicting location results)
408 : OPEN between PA and Sensor

027: OPEN between PA and Sensor
302: OPEN between PA and Sensor
306: OPEN between Sensors
408: OPEN between PA and Sensor

Module 30200020020514:

012 : likely OPEN (conflicting location results)No Errors found
013 : likely OPEN (conflicting location results)

Module 30200020020515:

017 : OPEN between PA and Sensor
435 : OPEN between PA and Sensor

017 : OPEN between PA and Sensor
435 : OPEN between PA and Sensor

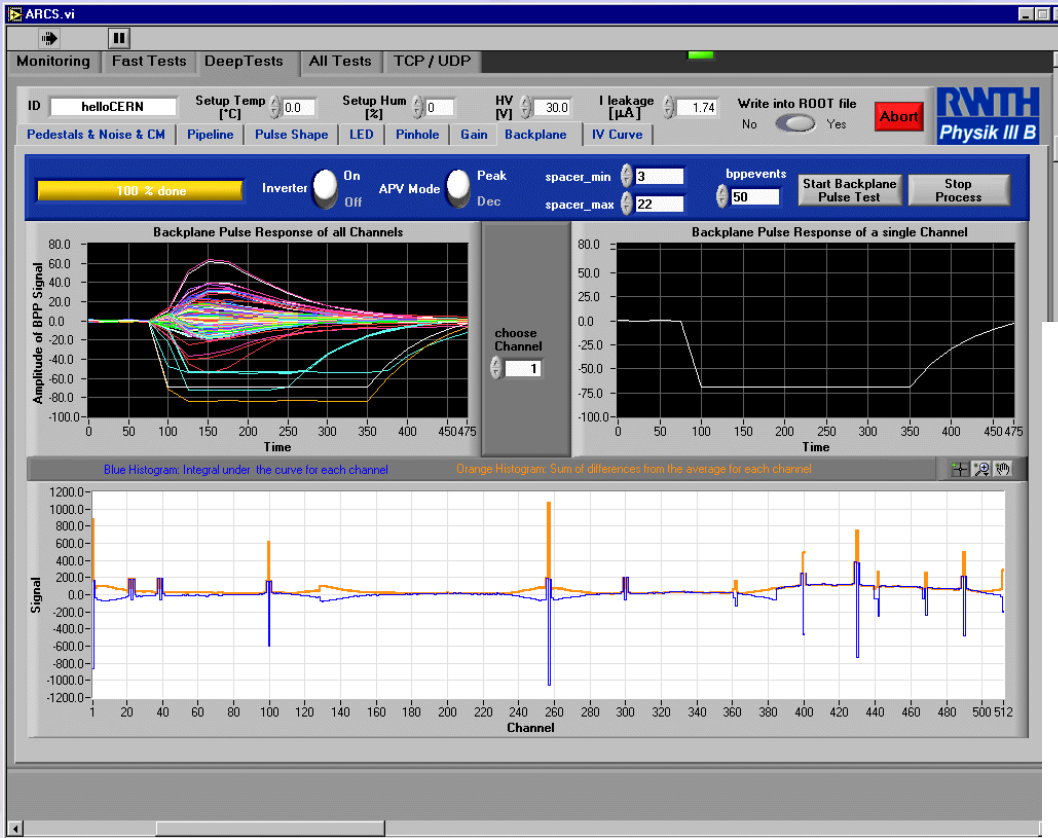
All Opens are on Purpose pulled Bonds because of Sensor Data

ARCS 7.0 was released on 22nd of December 2003

- Environment Variables are not written to Root File if first Test is Fast Test or I-V Test
- Flag on Pedestals caused many Channels to be flagged as bad
- HV Panel can't be used to shut down HV slowly
 - Do not use Lever HV OFF!! (does not ramp down)
 - Use „Abort ARCS“ Button
- Just Inverter On Modes are used to flag bad Channel
 - Will be changed
 - See also Talk from Wim
- DCU Test in Fast Test fails on one Sensor Modules
 - Has just one NTC Thermistor
 - ➡ DCU Channel 1 value too high, Test fails

ARCS 7.0 Bug Fix Version was released on 22nd of January 2004

- Just exchange of dll
- 2 Important Bugs fixed
 - Environment Variables are saved also if I-V Test is done first
 - Removed the Flag on Pedestals

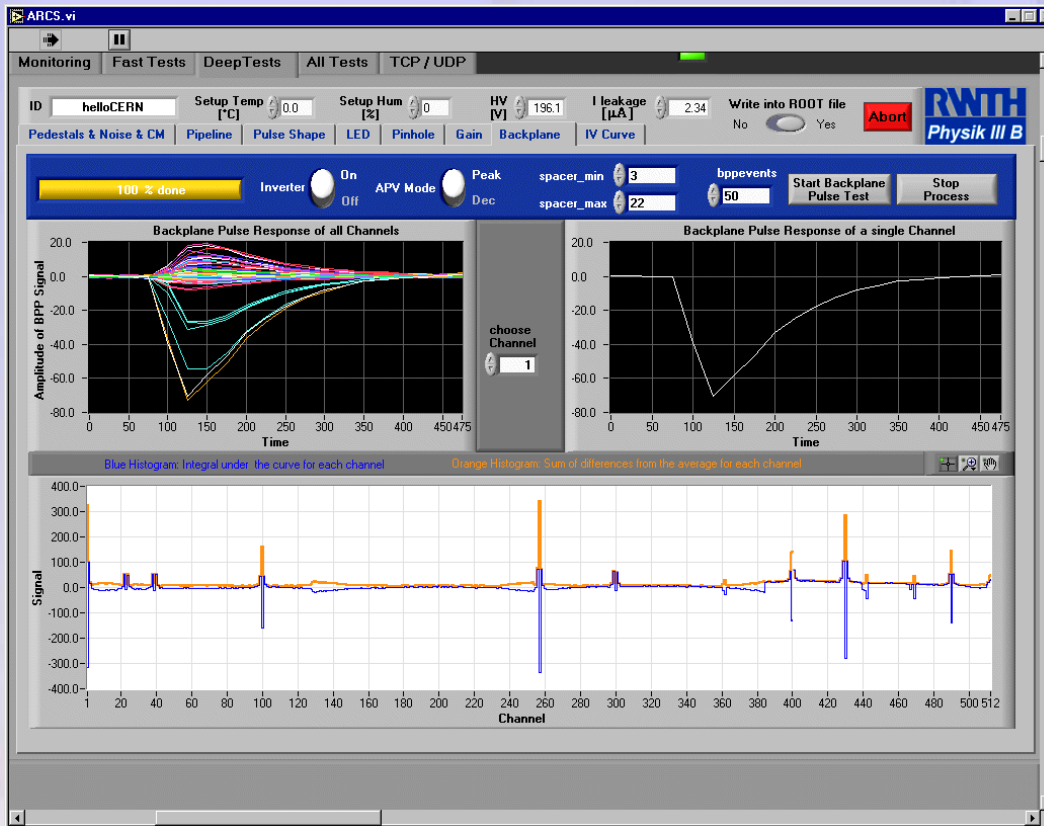


- 2V Pulse is applied to Module Backplane
- Signal vs. Time is monitored
- Charge is injected into all connected Channel

1	Pitch Adapter – Sensor Open
23	Pinhole
39	Pinhole
100	Sensor – Sensor Open
257	Pitch Adapter – Sensor Open
300	Pinhole
360-361	Short
400	Sensor – Sensor Open
430	Pitch Adapter – Sensor Open
440-442	Short
467&469	Short
490	Sensor – Sensor Open

Blue Line shows the Integral of Signal

Orange Line shows the Integral of Absolute of Signal subtracted by mean Signal



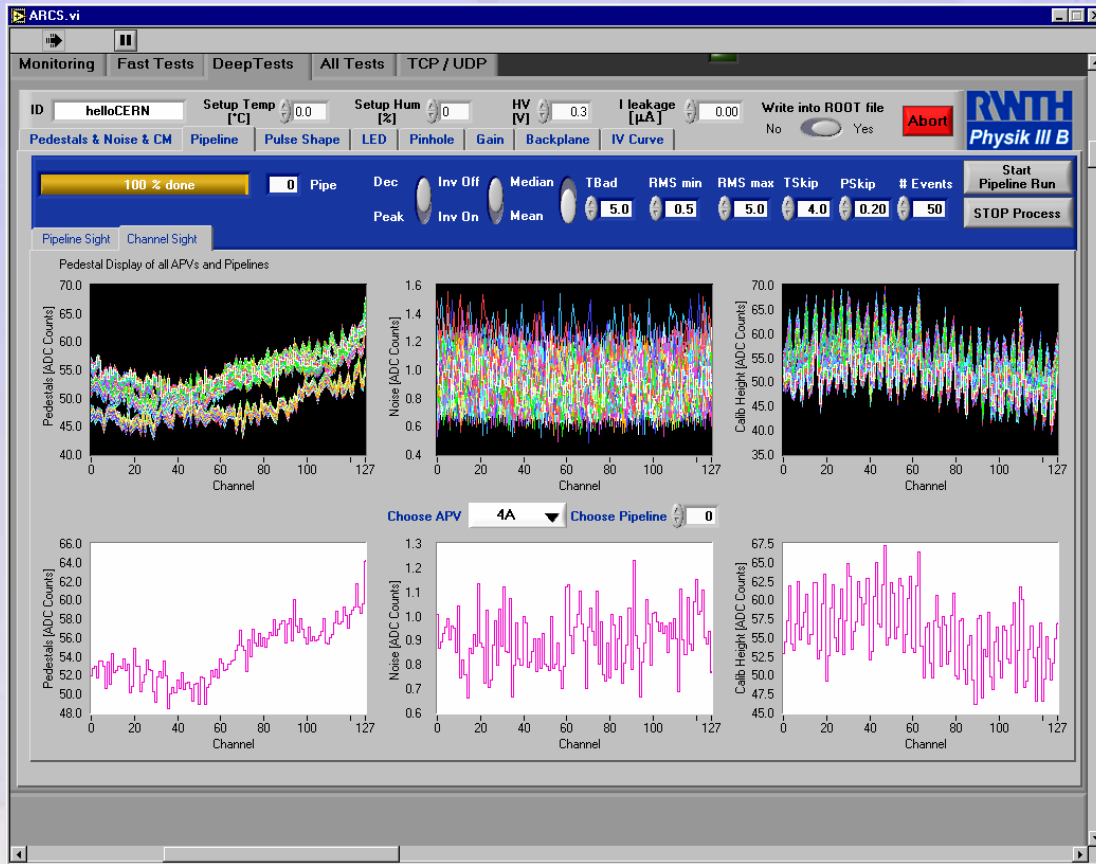
- 0.7V Pulse is applied to Module Backplane
- Signal vs. Time is monitored
- Charge is injected into all connected Channel

1	Pitch Adapter – Sensor Open
23	Pinhole
39	Pinhole
100	Sensor – Sensor Open
257	Pitch Adapter – Sensor Open
300	Pinhole
360-361	Short
400	Sensor – Sensor Open
430	Pitch Adapter – Sensor Open
440-442	Short
467&469	Short
490	Sensor – Sensor Open

Blue Line shows the Integral of Signal

Orange Line shows the Integral of Absolute of Signal subtracted by mean Signal

With reduced Pulse Amplitude it's easier to differ between Pitch Adapter – Sensor and Sensor – Sensor Opens



Retrospect:

- APV with bad Pipeline Locations managed to escape on Die APV Tests (per mill Level)
- There was no dedicated Test to spot these Errors

Modified Pipeline Test in ARCS:

- Normal Pipeline Test – Acquire Pedestal & Noise information for each Pipeline Location
- Apply Calibration Pulse to each Pipeline Location

- We see no differences in Leakage Current before and after Strip bonding
- With decreasing Temperature
 - **Gain Slope and Pulse Height rise**
 - **Rising Time decreases**
 - **Noise rises only in deconvolution Mode**
- CM Noise has influence on Noise of Defects
- X-Calibration of TEC ARC Teststands is making Progress - all Centers reached same Level of CM Noise
- Ring 6 Modules produced by UCSB are of very good Quality
- Some Bugs have been fixed in ARCS 7.0 Bug Fix Version
- Backplane Pulse Test is implemented in ARCS
 - **Nice Tool to find all Types of Errors**
- Test to find low Gain Pipeline Locations is implemented