Results of Expressline II TEC Modules and ARC Status

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Overview

- TEC Ring 6 Expressline II
  - Various Tests
  - Test with LEDs
  - Automated Pinhole Test
  - Result Table
- Some Comments on the new Frontend

Expressline II Tests

Expressline II

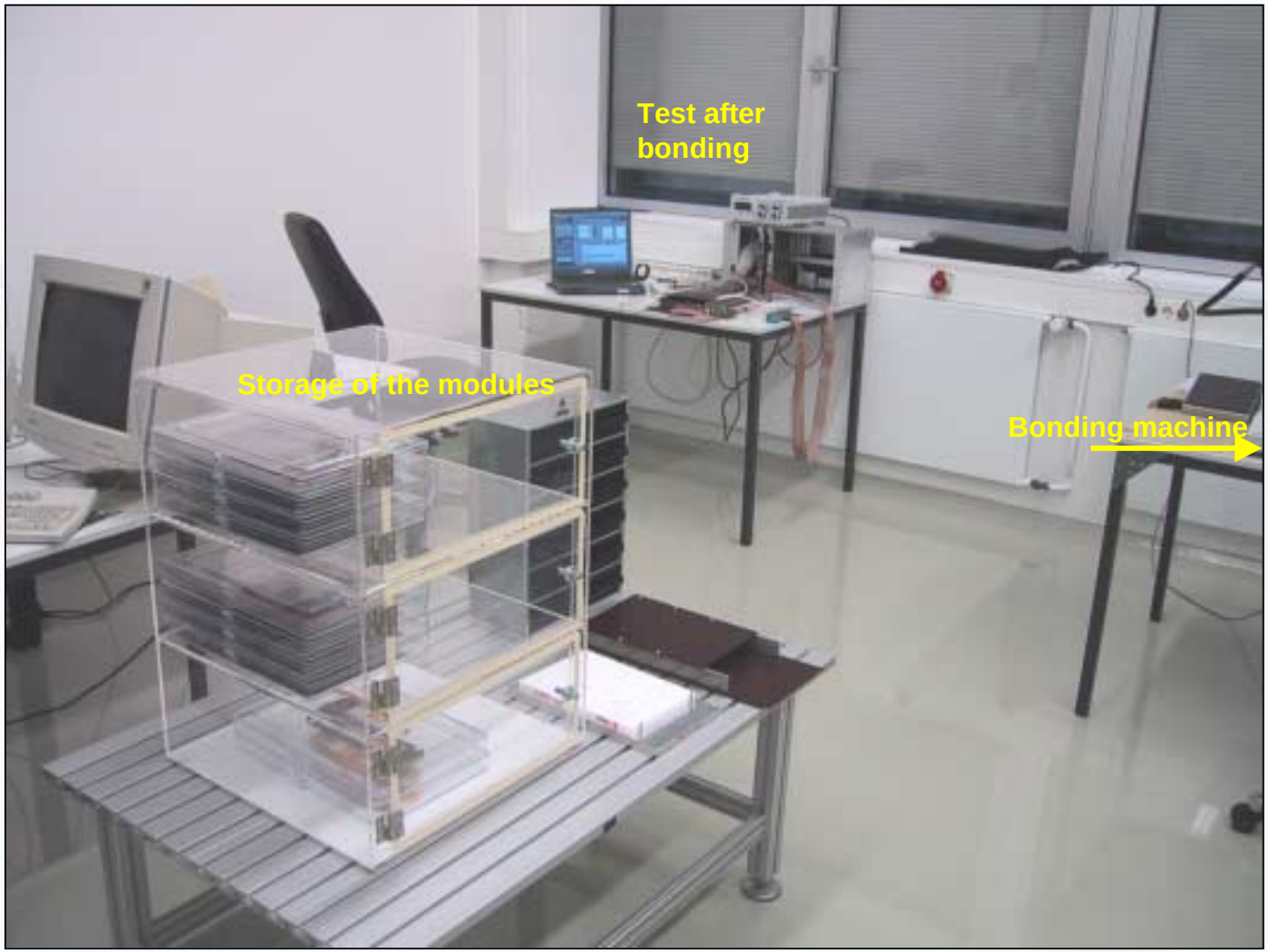
- 9 Modules
  - TEC Ring 6
  - Equipped with ceramic hybrids
  - Assembled on the gantry in Bruxelles
  - Bonded in Aachen (AC I)

- Tests done by Aachen I *(Jan Olzem, Katja Klein)*
  - Using ARC & ARC LED System

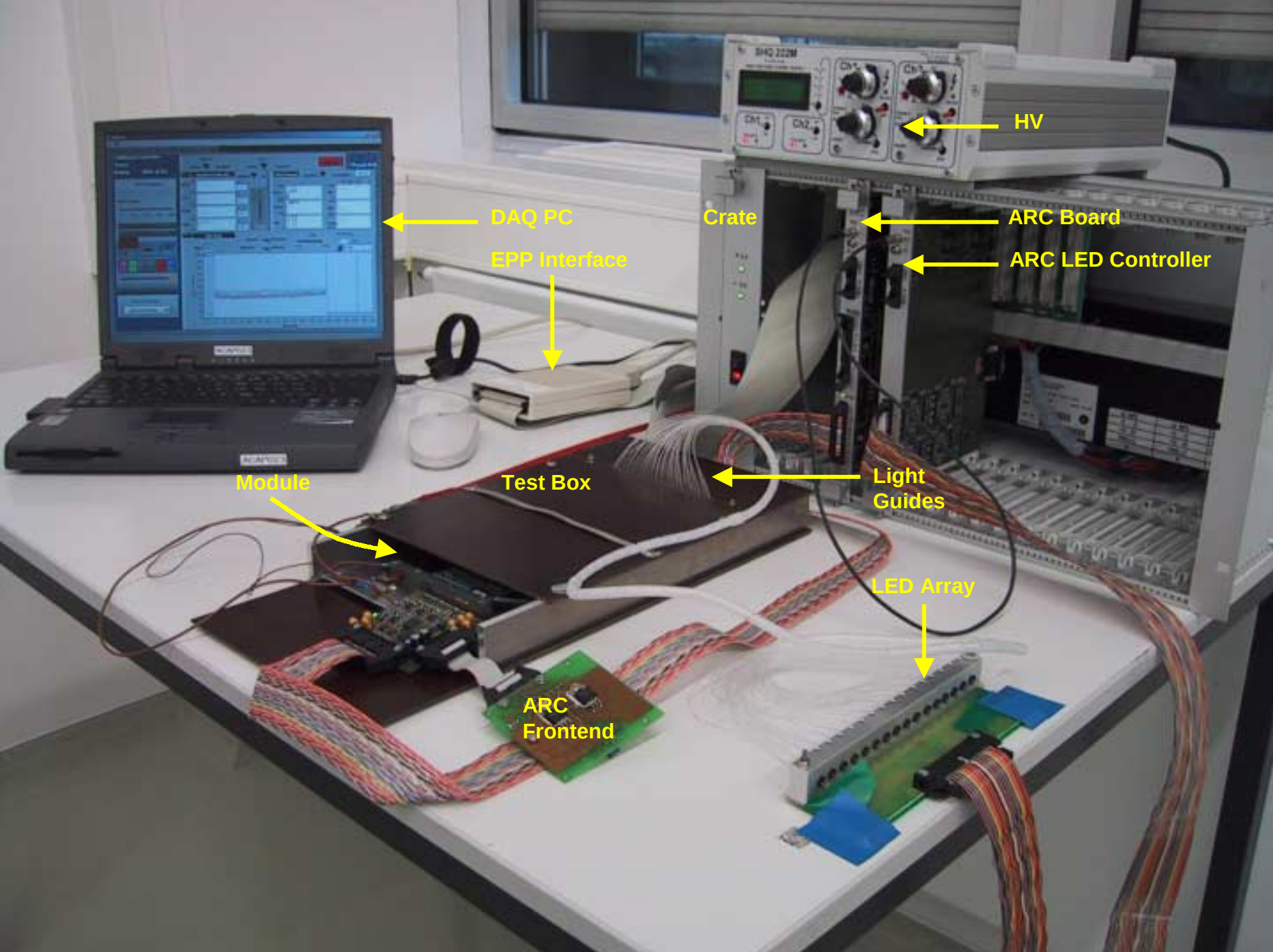
Test Procedure

- Expressline Tests consisted of
  - I^2C Test
  - Pedestal & Noise Test
  - Common Mode Test
  - Pulse Shape Test
  - Pipeline Test
  - IV Test
  - LED Tests
    - With Pulsed Light
    - With Continuous Light ⇒ Pinhole Test

Test Environment

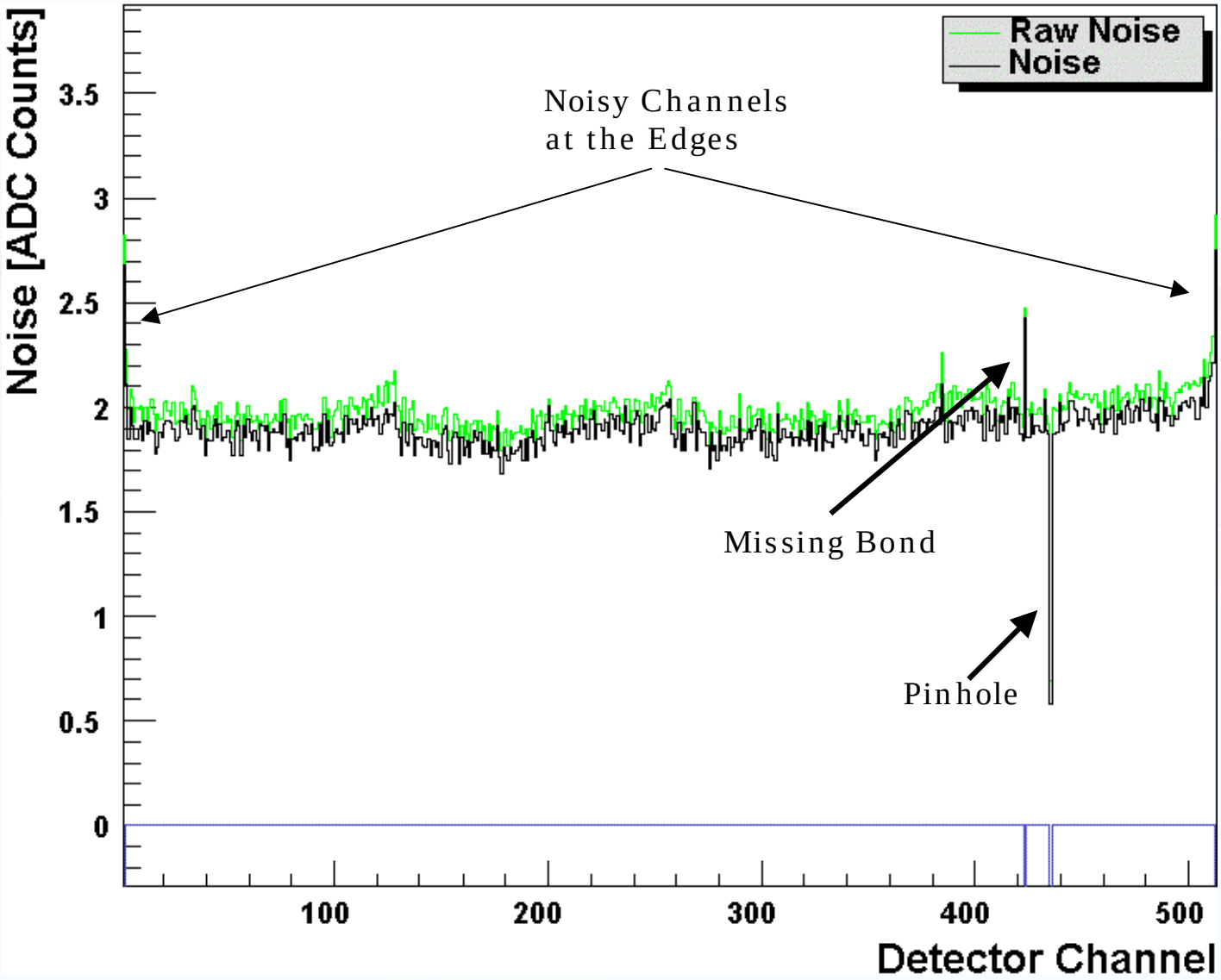


In the same clean room where the bonding was done


HV
DAQ PC
EPP Interface
Crate
ARC Board
ARC LED Controller
Module
Test Box
Light
Guides
LED Array
ARC
Frontend

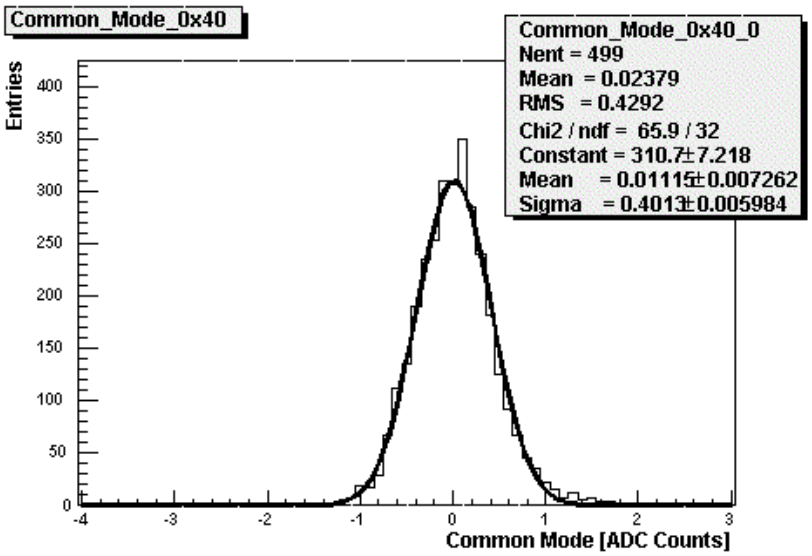
Noise Test

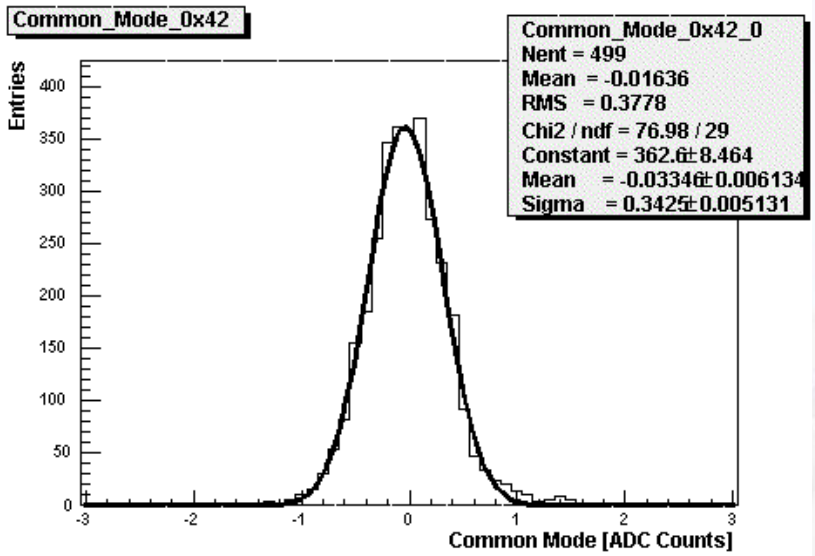
Noise Test Example

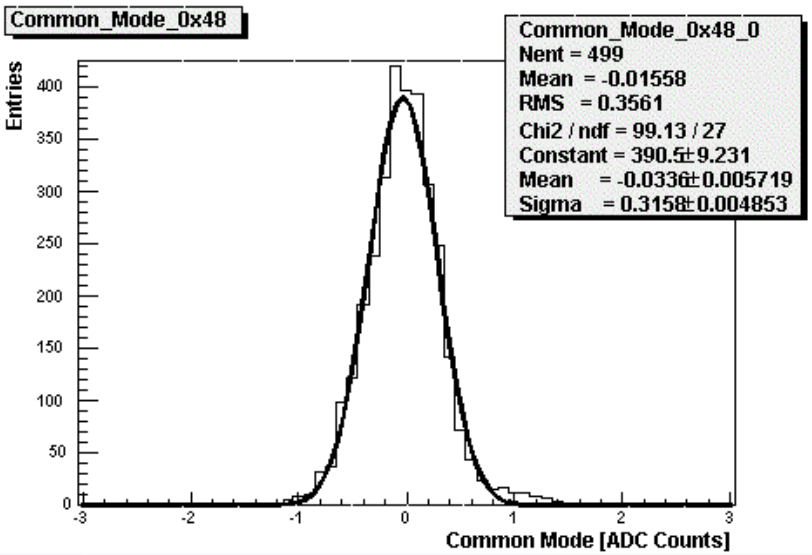


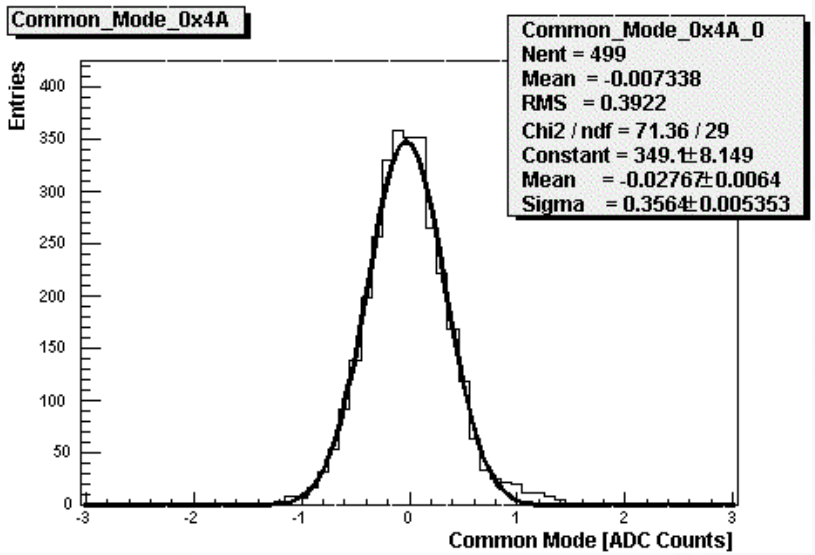
Common Mode Test

Common Mode Test

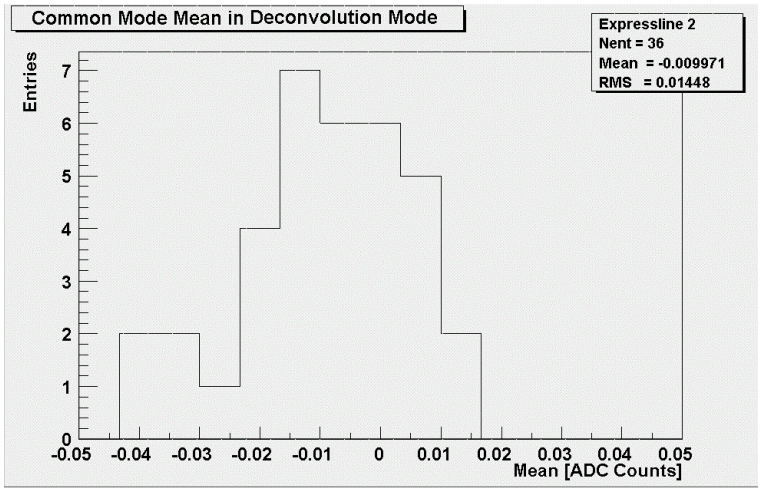


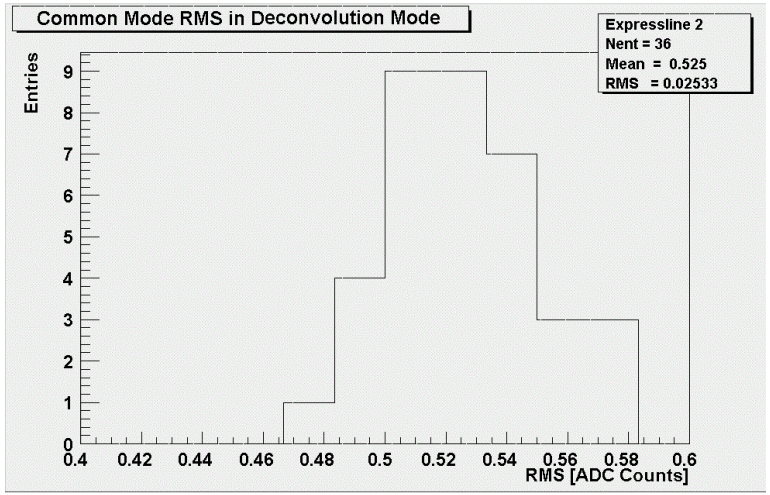


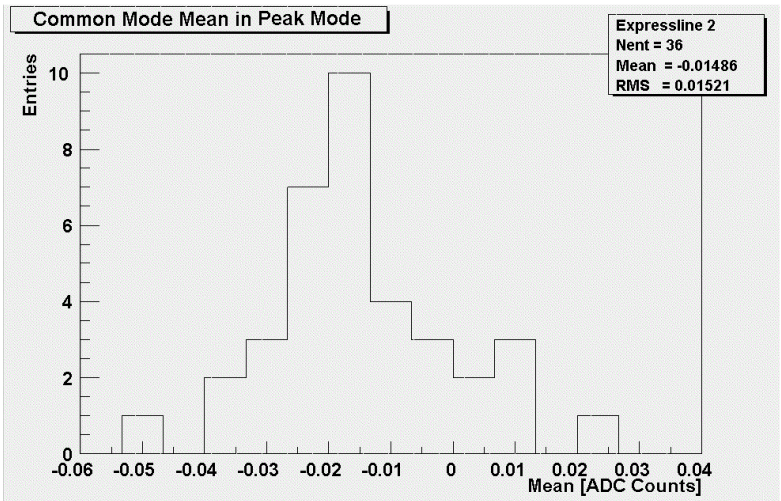


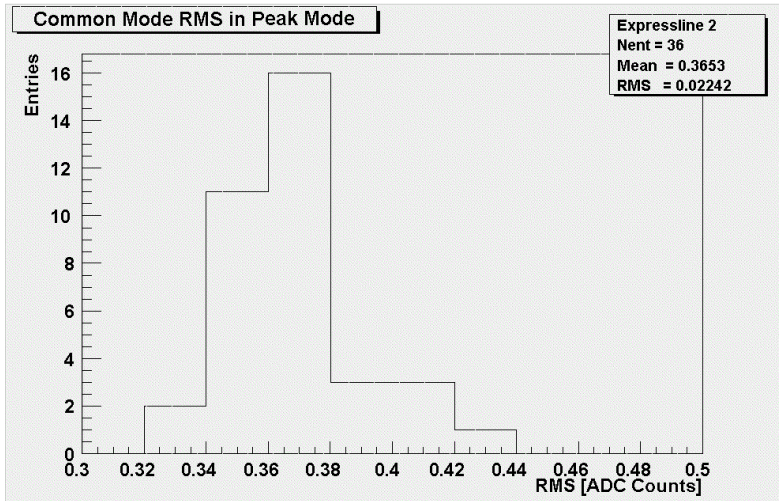


Common Mode Distribution



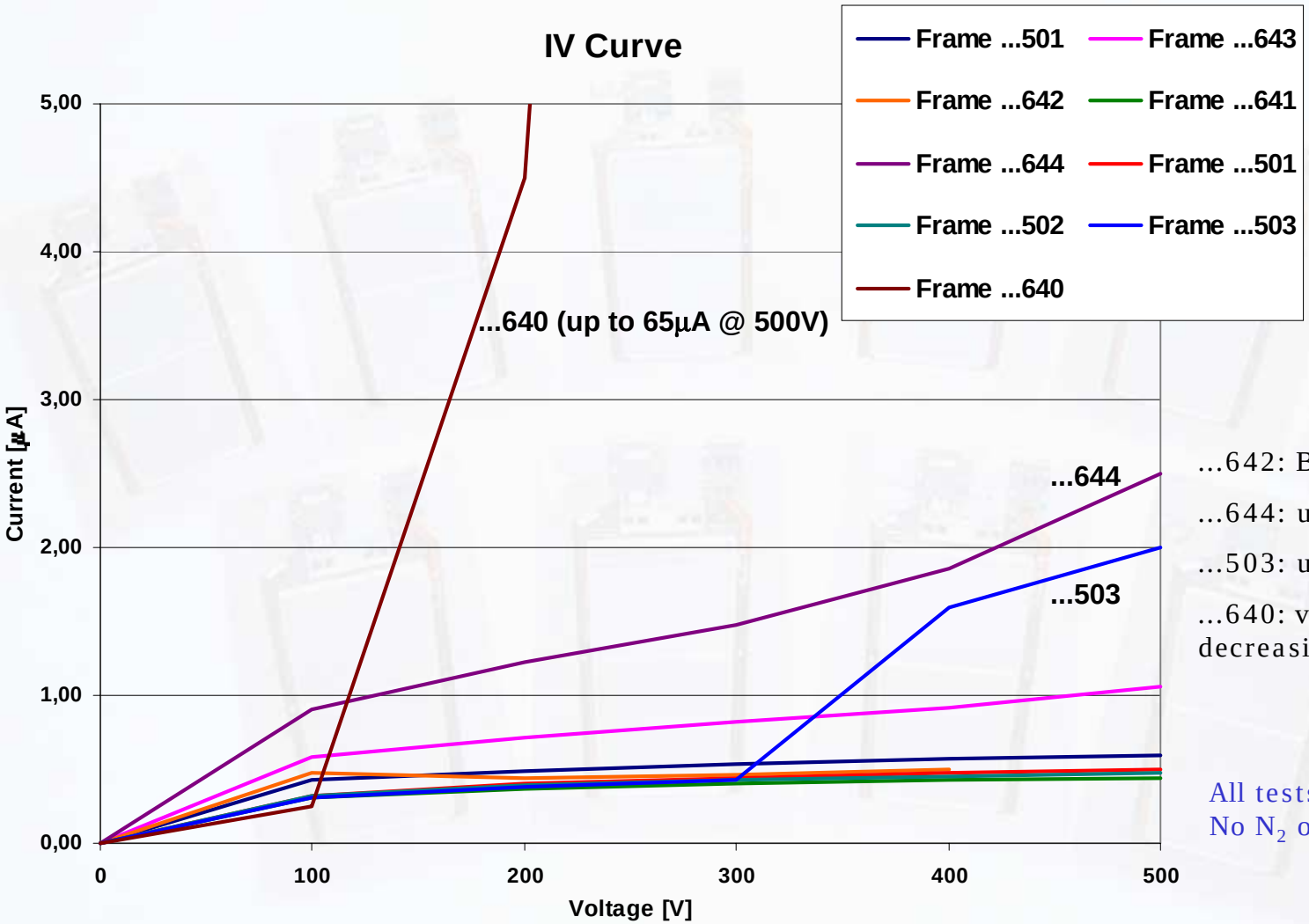






IV-Test

IV Curves



...642: Breakthrough at 450 V

...644: unstable > 400 V

...503: unstable > 300 V

...640: very high currents, fast decreasing

All tests at room temperature
No N_2 or dry air flushing

Tests with LEDs

LED Tests

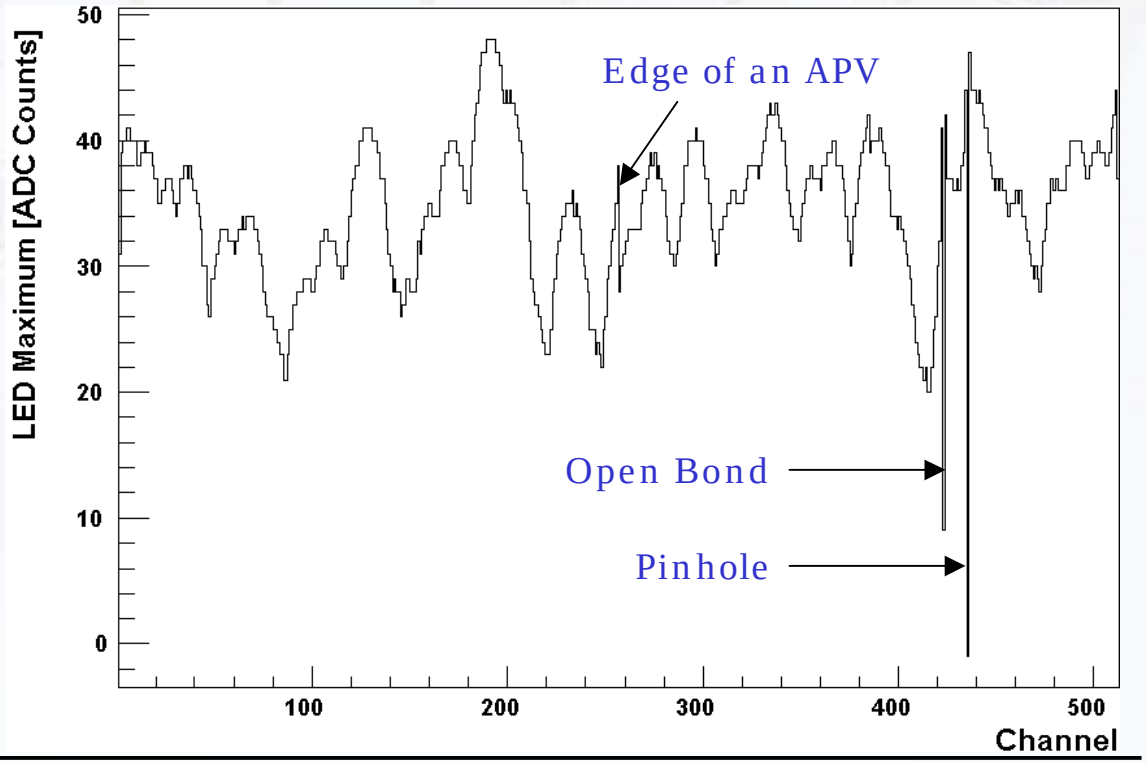
with Pulsed Light

Test with LED Array

- Applying pulsed light to the sensors
  - At low pulse rates
  - With short pulse length and medium intensity
  - Switching the LEDs one by one

  ⇒ To avoid saturation effects of the APVs

- Intensity varying strongly
- But defects are clearly visible
- Problem to apply cuts



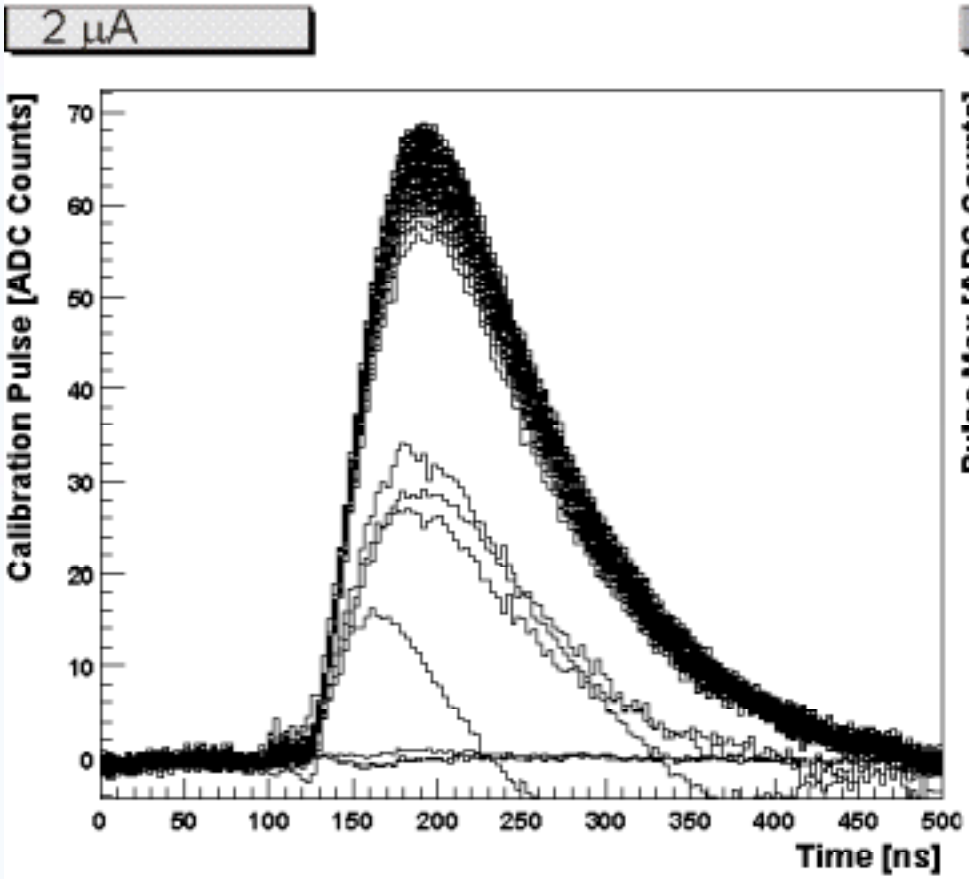
LED Tests

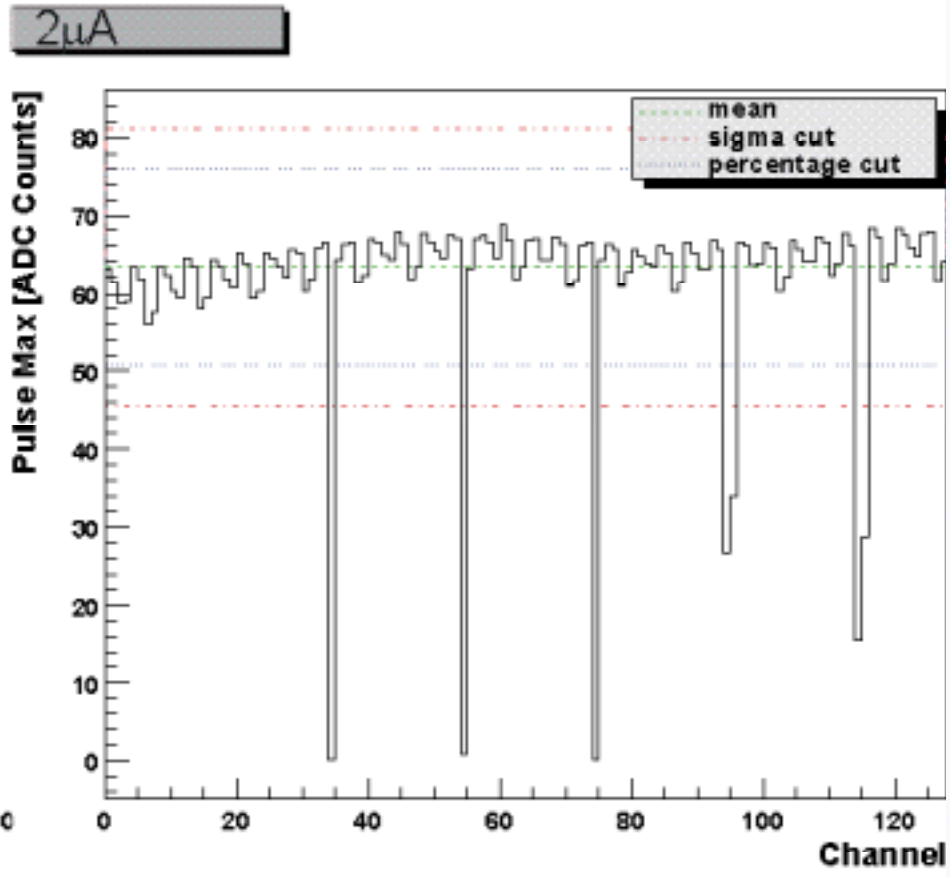
with Continuous Light

Pinhole Tests

Pinhole Test with LED Array

- Applying constant light of various intensities to the sensors
- Measure the height of calibration pulses at the maximum for each of the LED intensities





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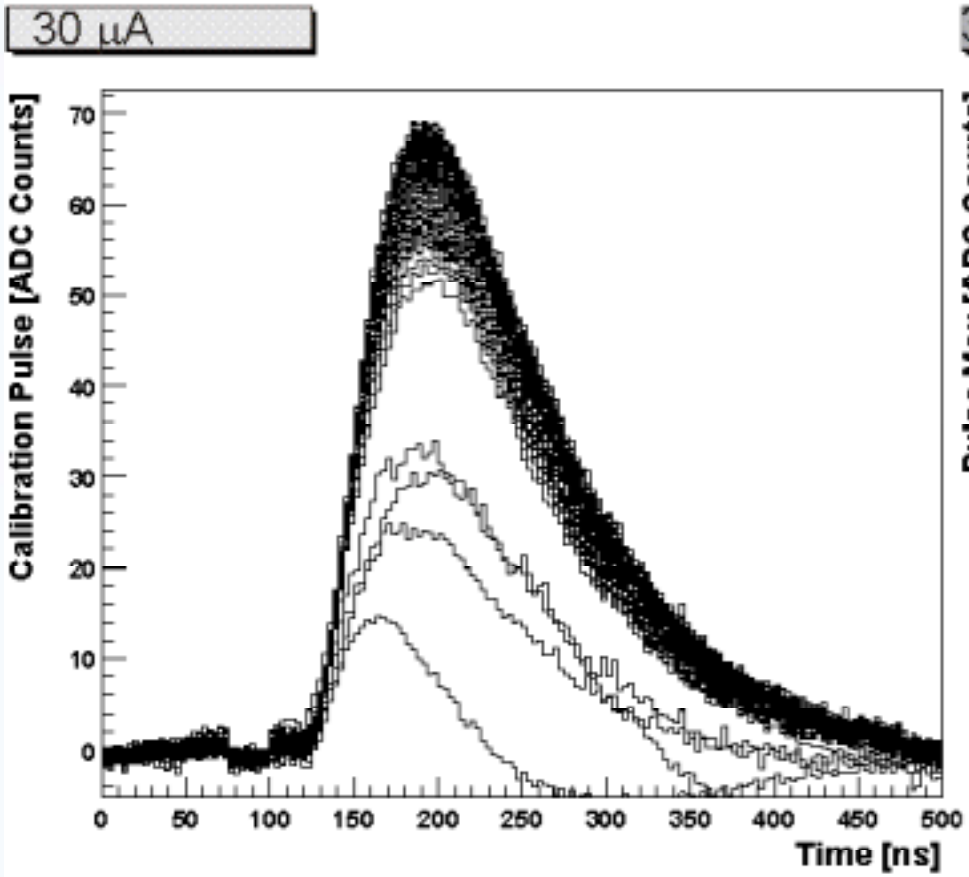

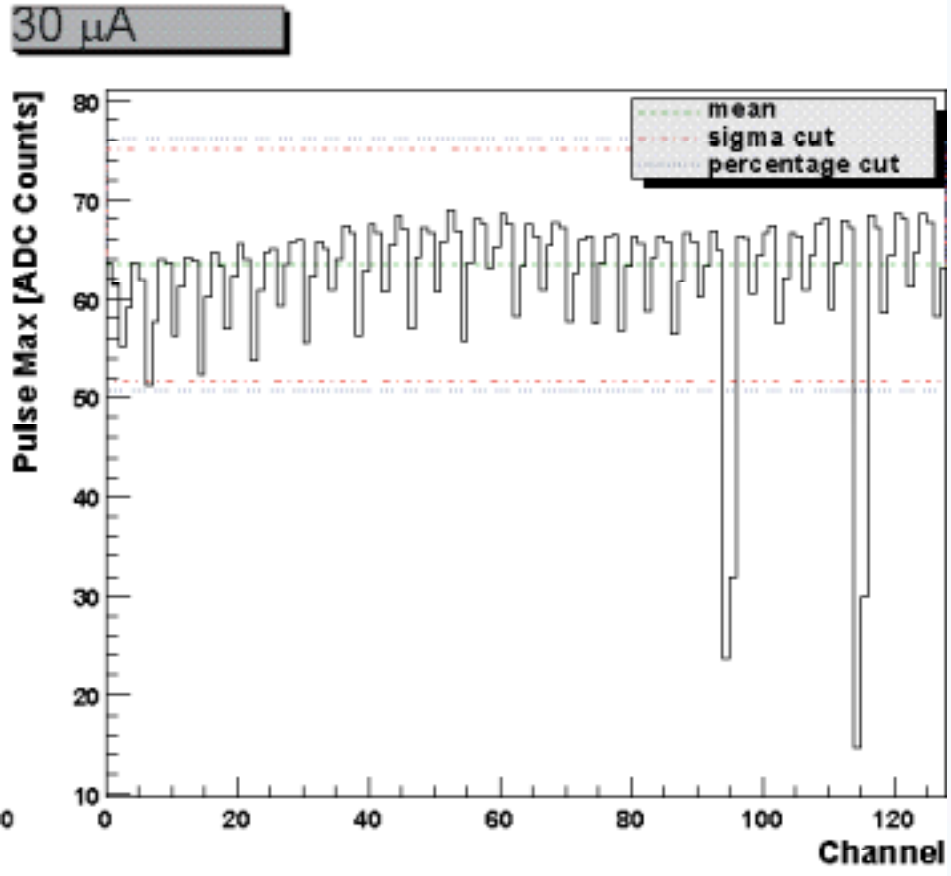

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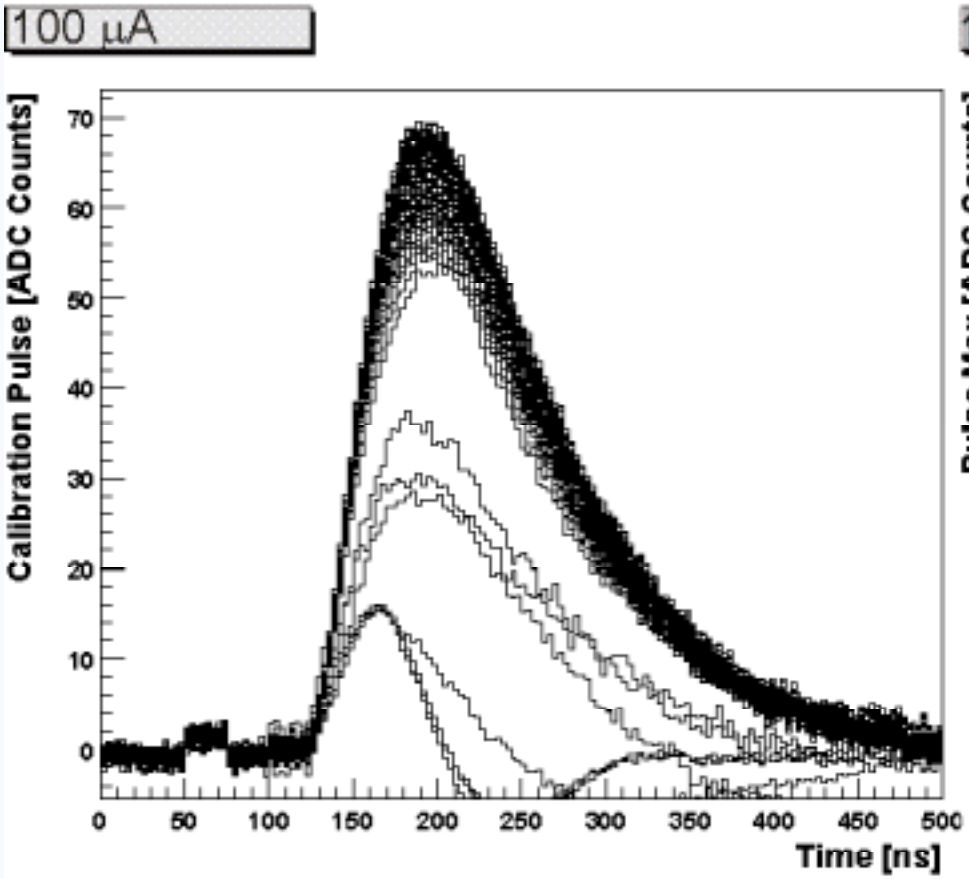

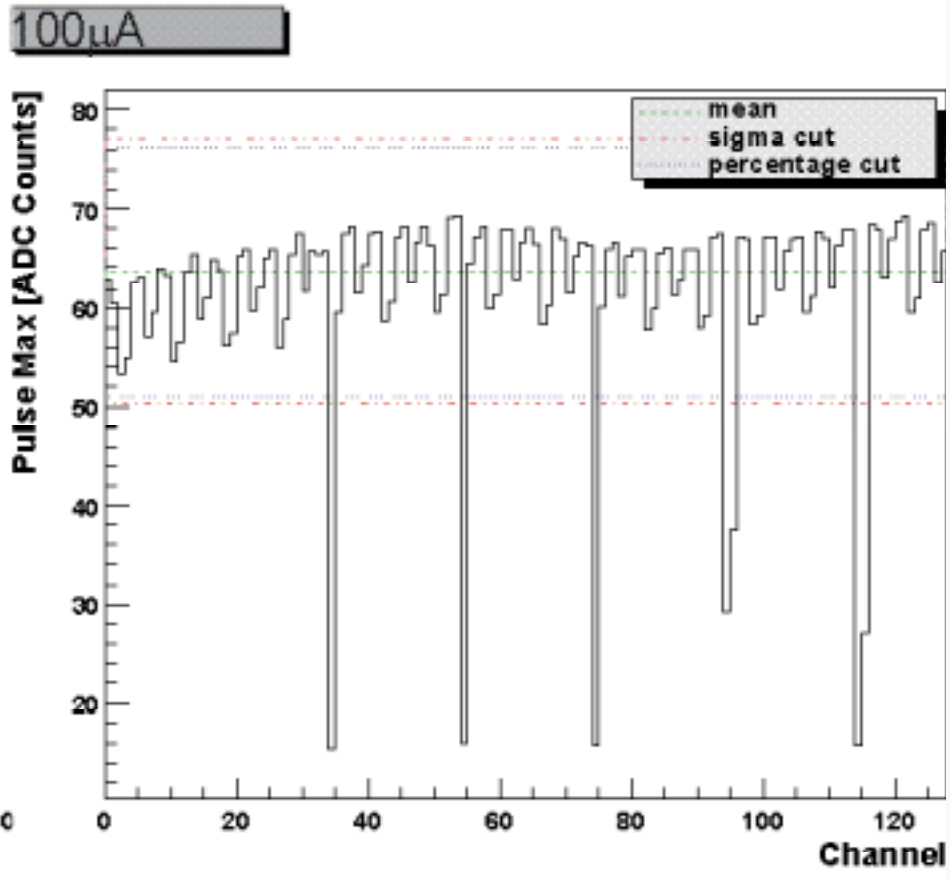

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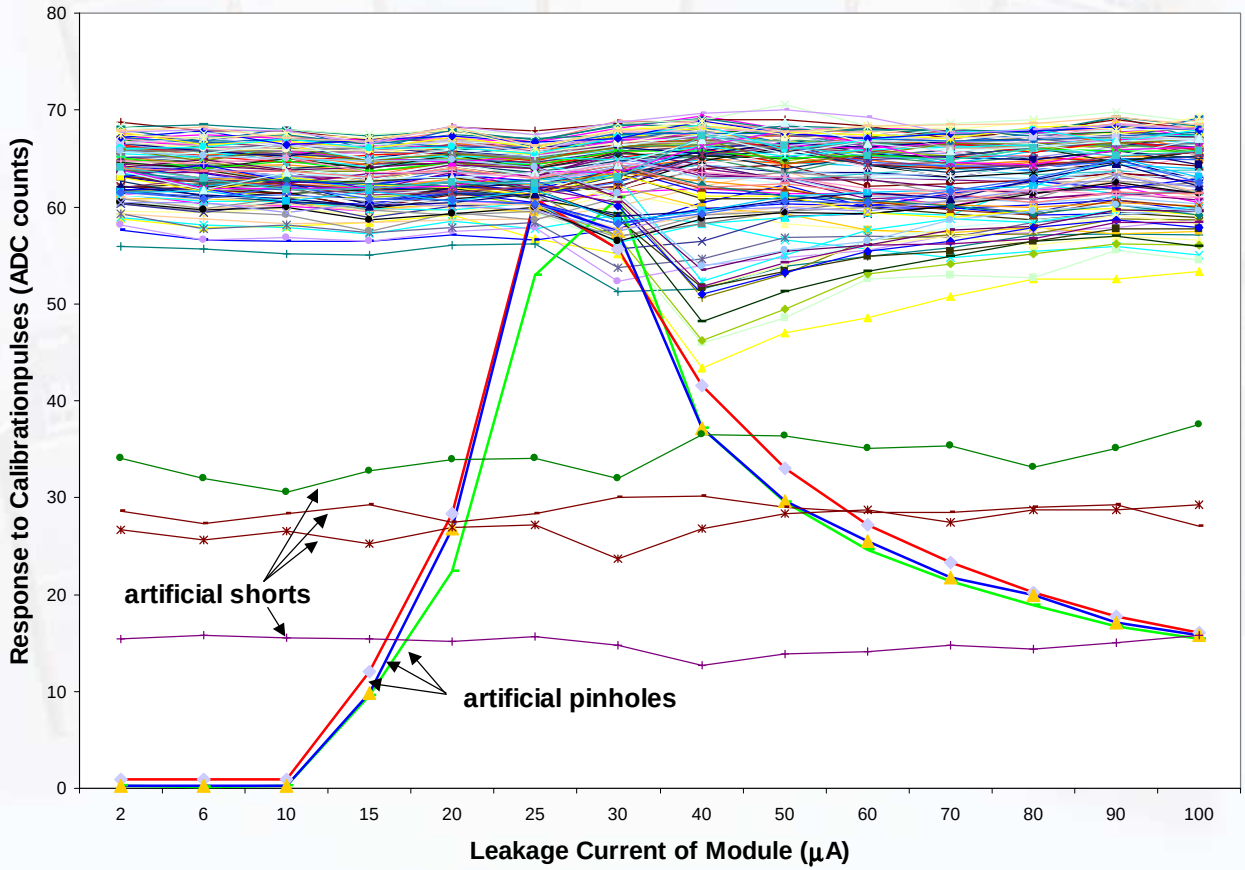
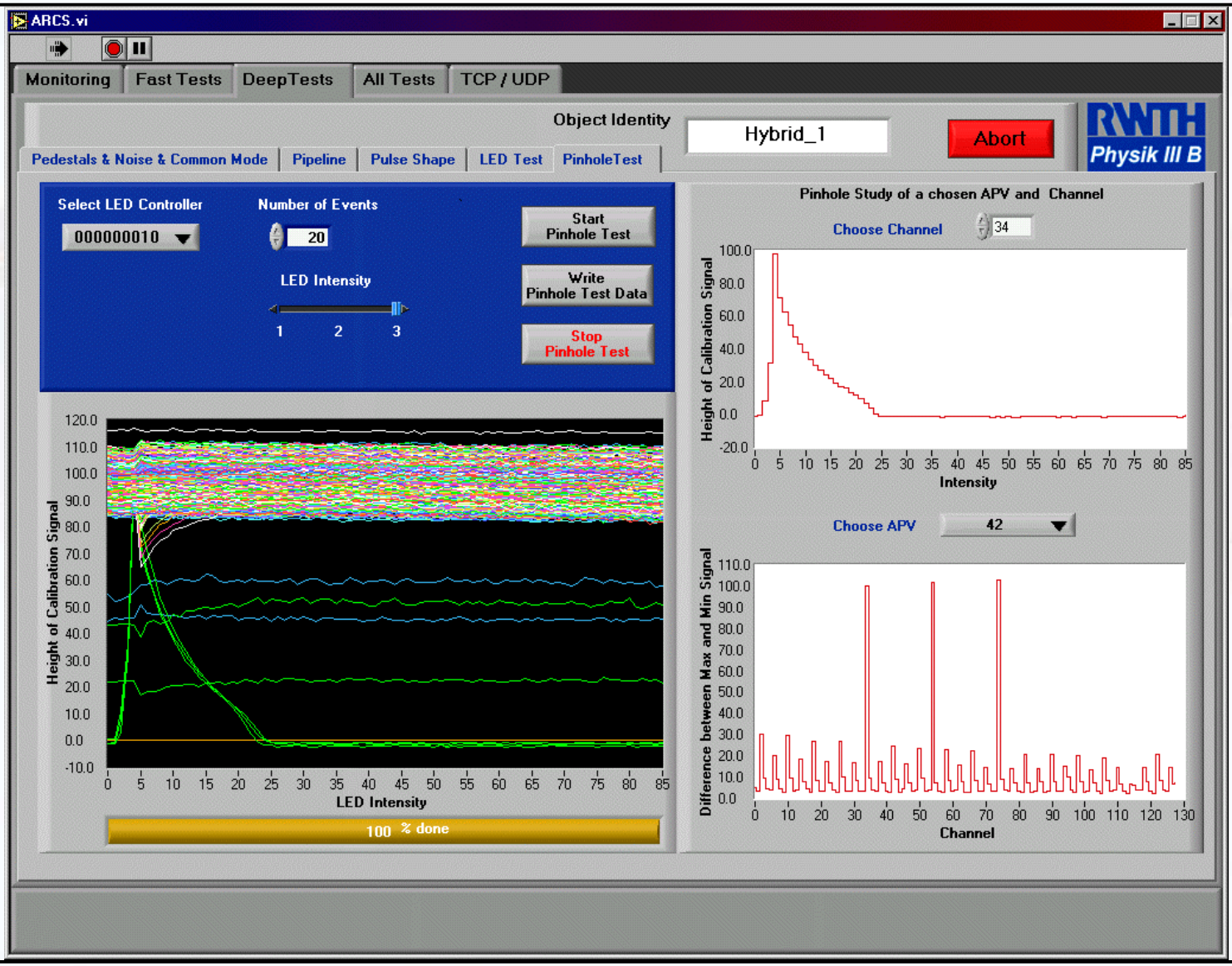


Automated Pinhole Test



Result Table

Frame 30200020000-xxx	Hybrid 30216630200-xxx	Channel (draft numbering)	Channel (sensor numbering)	Noise (Inverter on)				Pulse Shape (Inverter on)										LED Test		Pinhole-test	Visual Inspection or (assumed) Error
				Peak		Dec		Peak						Dec						signal			
								rise time		peak time		signal height		rise time		peak time		signal height					
				higher	lower	higher	lower	shorter	longer	shorter	longer	higher	lower	shorter	longer	shorter	longer	higher	lower	higher	lower	suspi-cious	
..501	..106	-	-	-		-		-		-		-		-		-		-		-		-	
..502	..105	495	18	-		-		-		x		x		(x)		(x)		x			x	-	missing bond (SEN-SEN)
..503	..102	-	-	-		-		-		-		-		-		-		-		-		-	
..640	..098	435	78		x		x		(x)		(x)		0		(x)		(x)		0		x	x	pinhole
		423	90	-		x		x		x		x		x		x		x			x	-	missing bond (APV-PA)
..641	..099	270	243	x		x		x		x		x		x		x		x			x	-	broken line on pitch adapter ?
..642	..097	183	330	-		-		-		-		-		-		-		-		-		x	high leakage current pinhole
		512	1	(x)		(x)		-		-		-		-		-		-		-		x	high leakage current pinhole
..643	..101	65	448		x		x		x		x		0		x		x		0		x	x	pinhole
		3	510		x		x		x		x		0		x		x		0		x	x	pinhole
..644	..104	155	358		x		x		(x)		(x)		0		(x)		(x)		0		x	(x)	high leakage current pinhole
..645	..100	-	-	-		-		-		-		-		-		-		-		-		-	

Only three bonding errors, but 6 pinholes

Remarks & Questions

- Still noise on the edges of the sensors
- Noise at the edges between two APVs became better

- How dangerous are these “high leakage current pinholes” ?
- Have these pinholes been caused by the bonding ?
- Does the test affect the sensors ?

Some Comments on the new Frontend

- Is intended to facilitate the use of ARC in module tests
  - Good grounding is a system independent problem

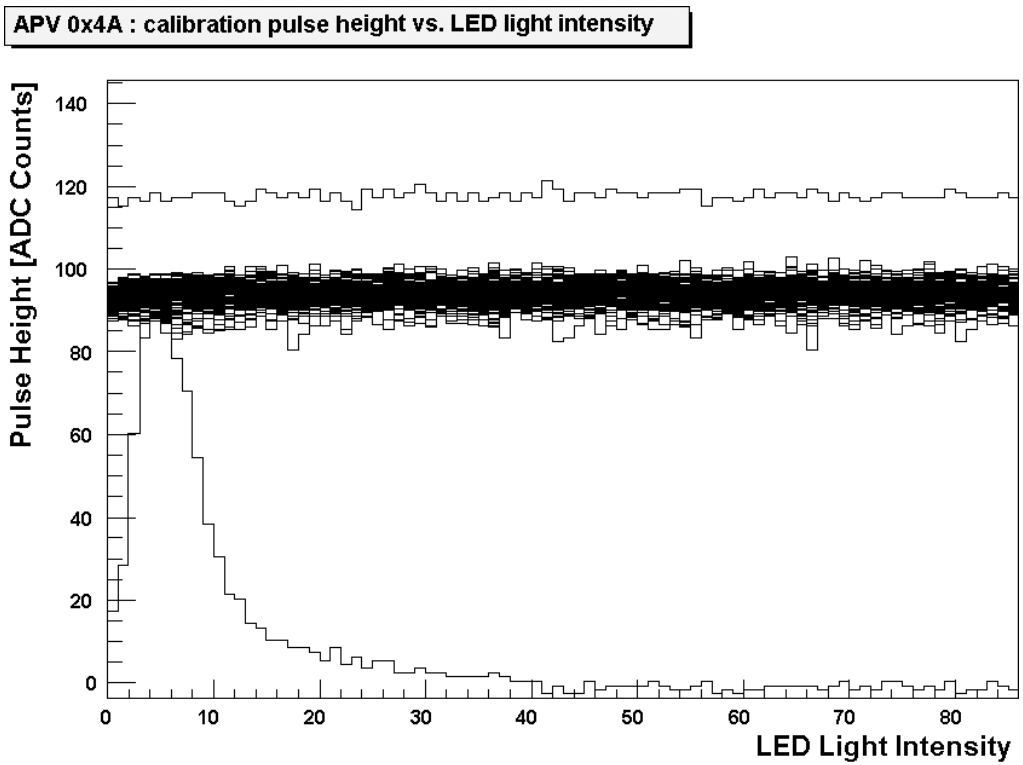
- The new ARC Frondend is not a new development
  - Is based on the previous one
    - Analogue part identical
  - But some additions:
    - Backplane pulse
    - External thermistor
    - Humidity sensor (optional)
    - HV

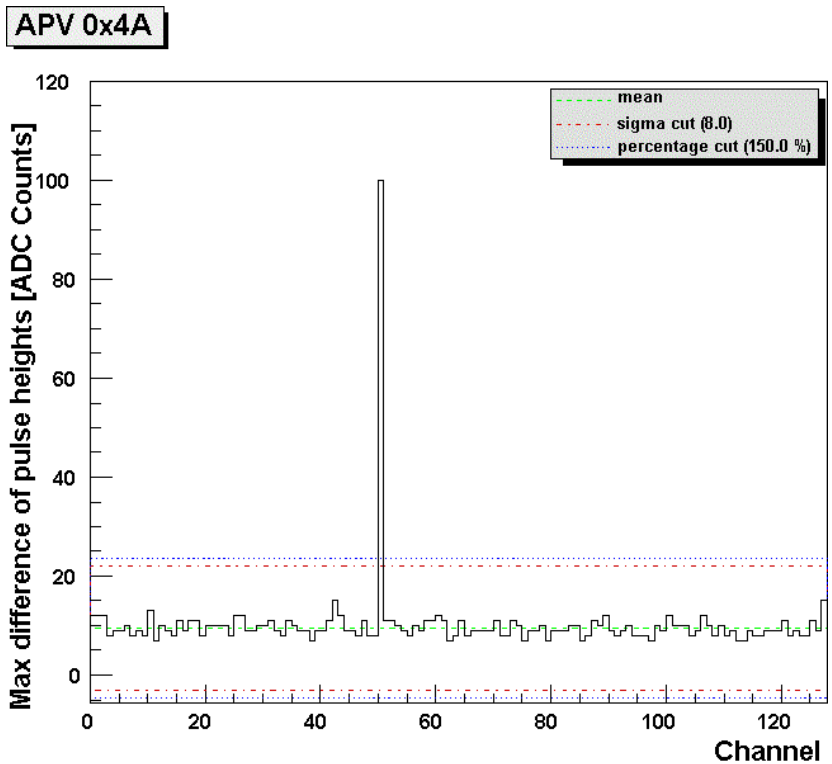
- Status:
  - PCBs received
  - 1 assembled and actually tested

End

...and Merry Christmas

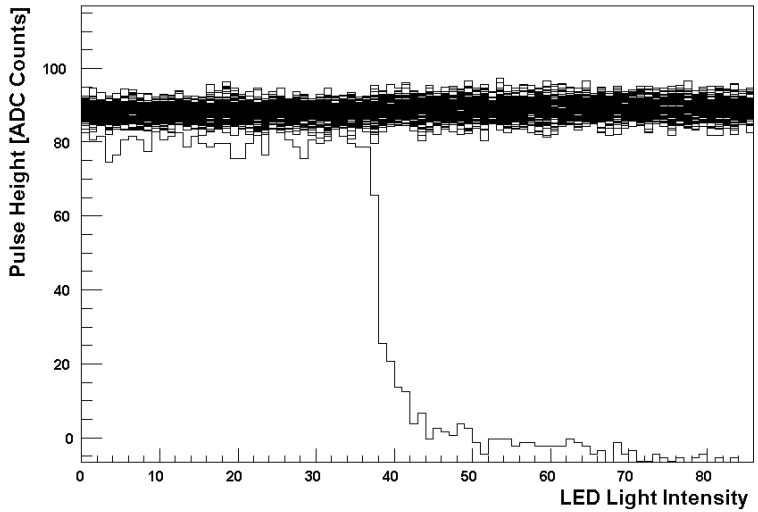
Pinhole
Module 30216630200098 , Channel 435



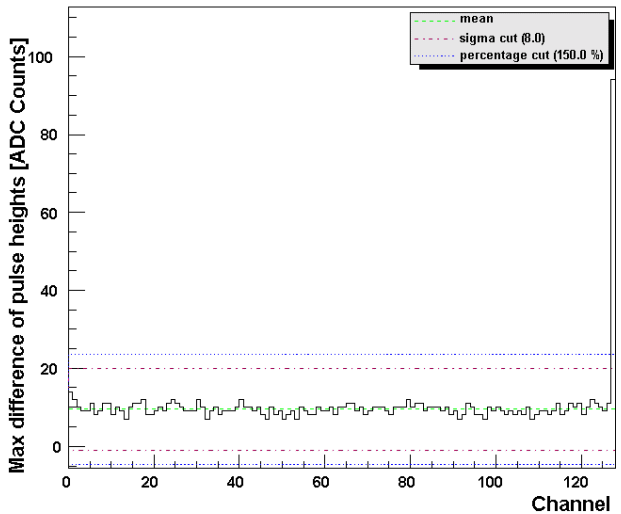


High Leakage Current Pinholes
Module 30216630200097 , Channel 183 & 512

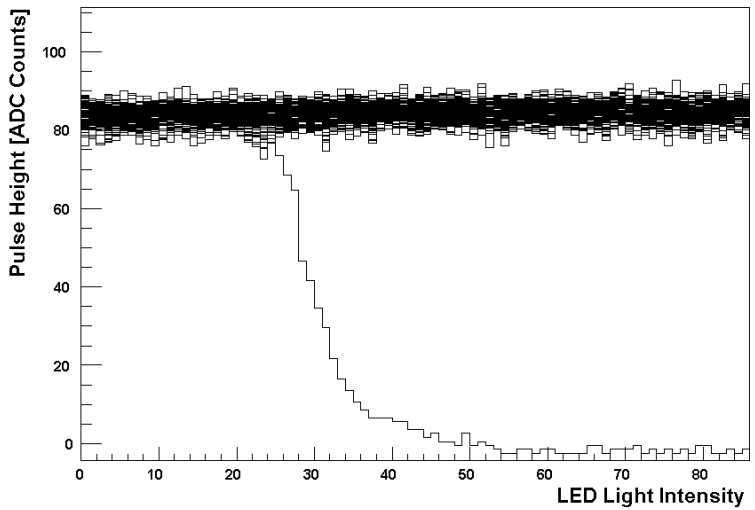
APV 0x4A : calibration pulse height vs. LED light intensity



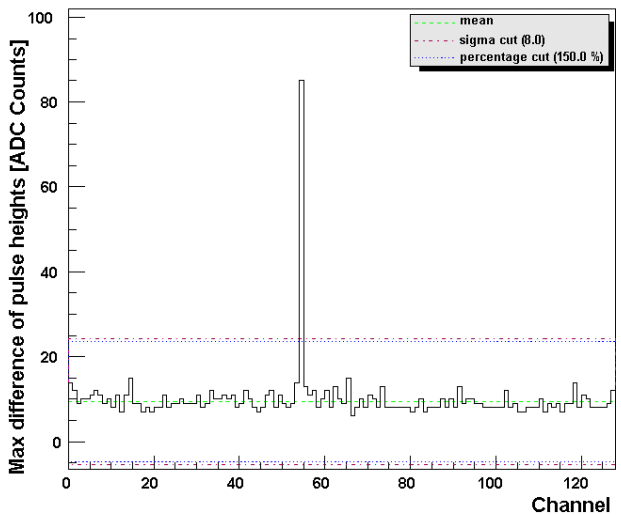
APV 0x4A



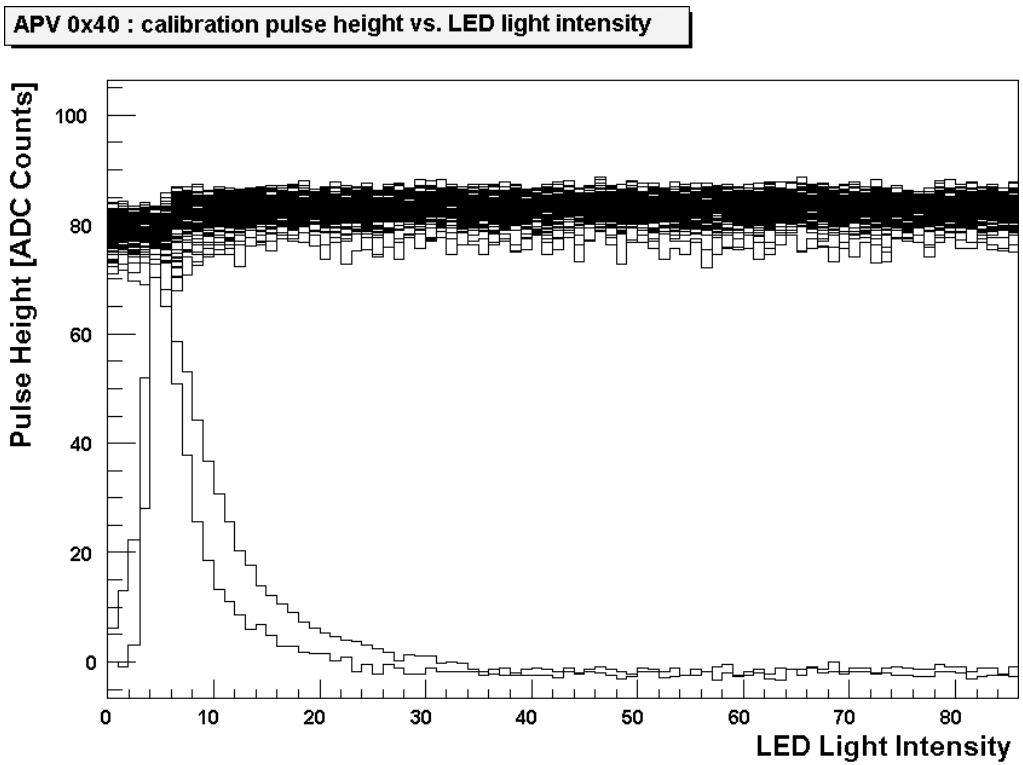
APV 0x42 : calibration pulse height vs. LED light intensity

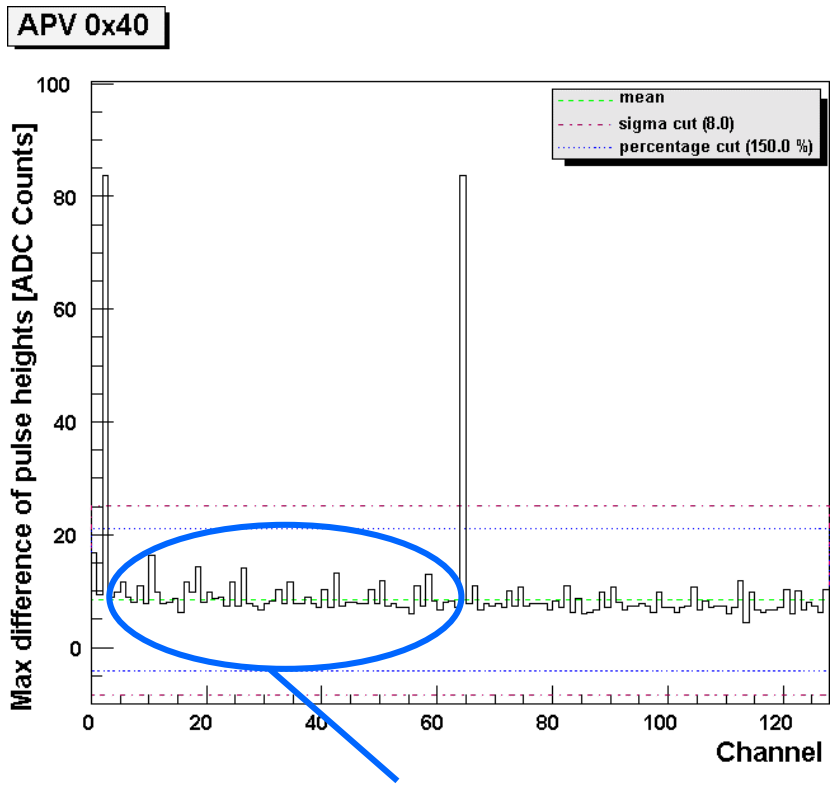


APV 0x42



Pinholes
Module 30216630200101 , Channel 65 & 3

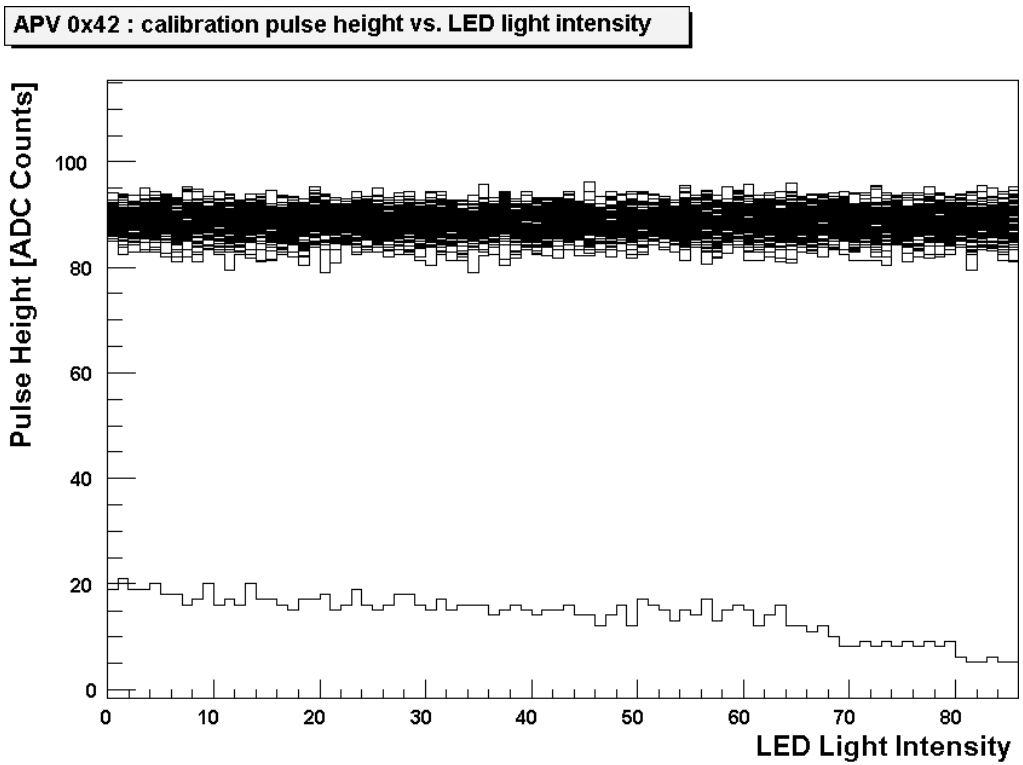


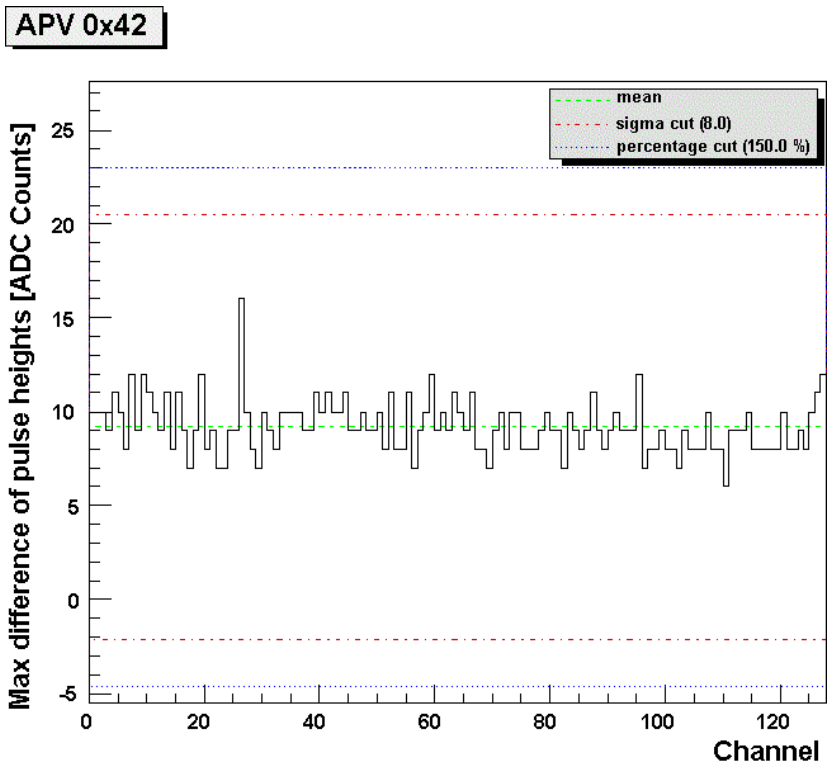


Calibration group neighbours are affected by these pinholes (as for the artificial pinholes)

Pinhole

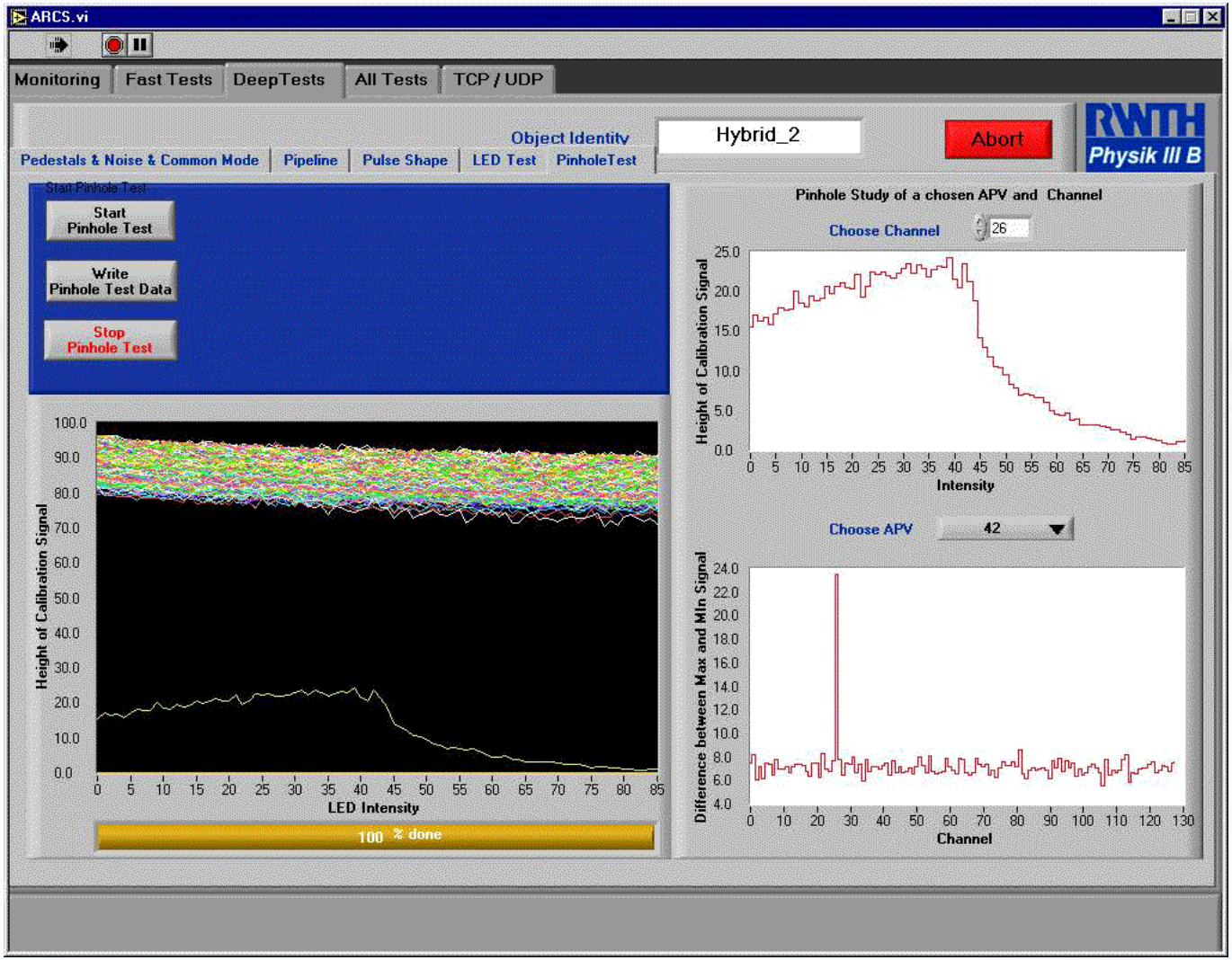
Module 30216630200104 , Channel 155





This Pinhole started to behave like a high Leakage current pinhole after several test runs

Behaviour of a High Leakage Current Pinhole during several Repetitions of the test



First trialversion of the pinhole test

Leakage Current vs. LED Intensity