



DCD-B Read-out System

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and Applications

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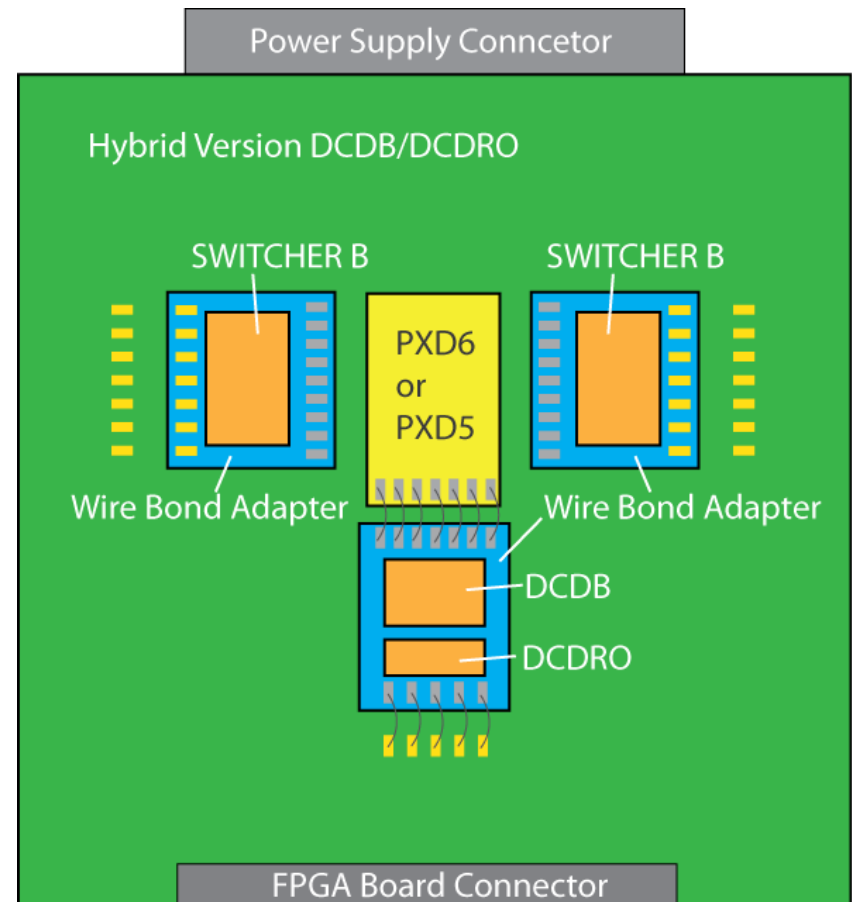
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● Overview

- Hybrid 4.1.x Concept and Assembly Technology
- Bring-up of DCD-B Read-out System
 - Failure Mechanisms
- Characterization of DCD-B
- Preparation for PXD-6 small Belle-II

● PXD6/PXD5 Hybrid Board H4.1

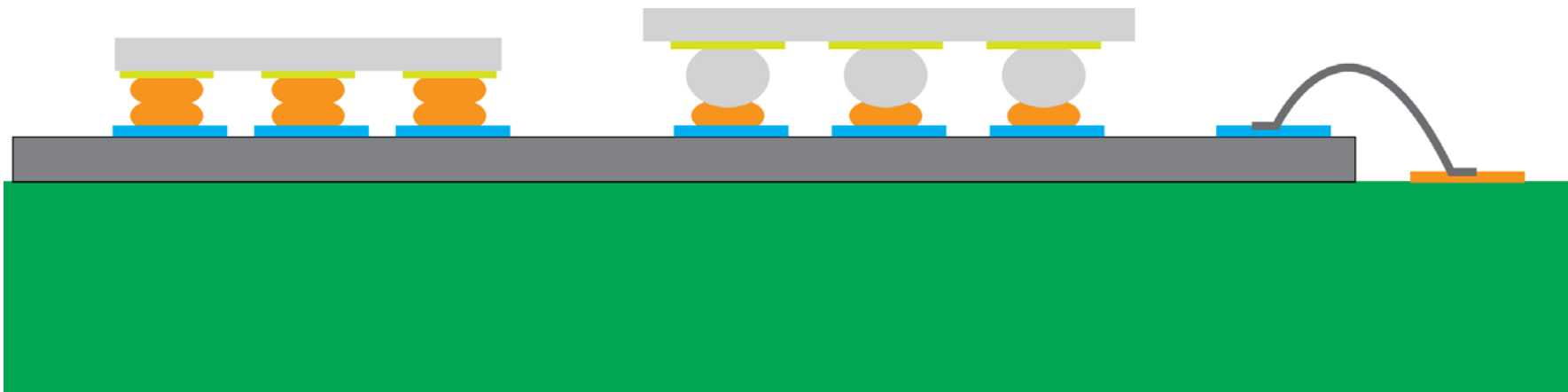
- 2 x **SwitcherB** to address
 - either a full PXD6 matrix (small matrix 128 x 16)
 - or a part of a PXD5 matrix (128 x 128)
- DCD-B/DCDRO read out
- DEPFET Matrix directly bonded to ASICs/wire bond adapters



● Assembly Technologies

Assembly Technologies used on Hybrid 4.1:

- DCDRO Au-Studs on Au-Studs
- SAC(Sn-Ag-Cu)-Balls on Au-Studs
- Wirebonds to connect Adapter to PCB



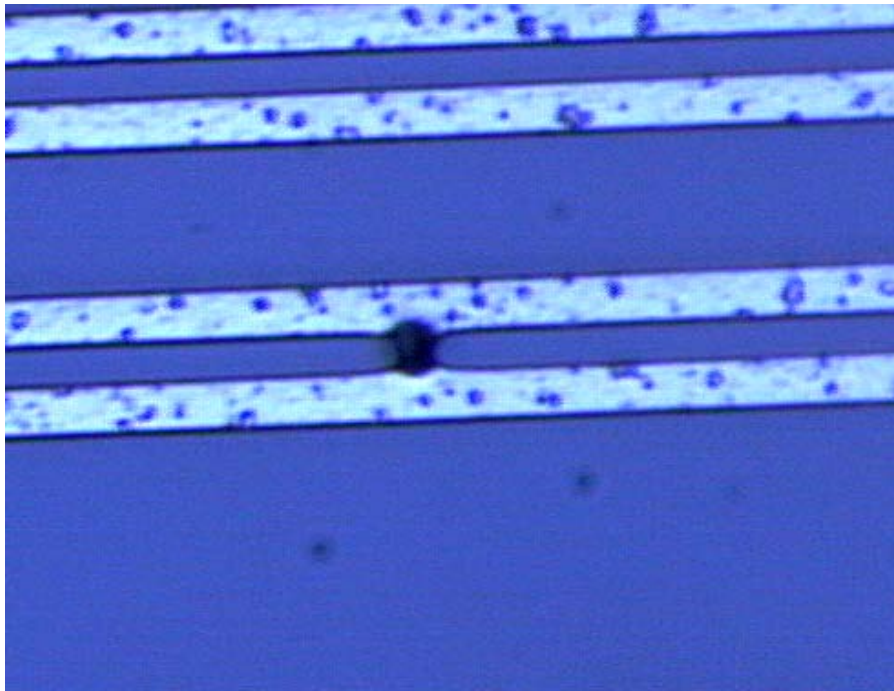
● DCD-B Read-out System Bring-up

Combined effort of the groups in Bonn, Mannheim and Munich:

- Switcher B, DCD-B and DCDRO Flip chip → Bonn, Mannheim
- PCB component assembly → Munich
- Bonding of wirebond adapters to PCB and DEPFET matrix → Bonn, Munich
- Software for testing DCD-B and DAQ → Bonn, Mannheim
- 7 Hybrids (with Switcher B and DCD-B) have been build:
 - Several DCD-B Wirebond Adapters (12) used
 - Yield: only two Hybrids are assembled with DEPFET Matrix
→ Rest did not pass either the tests of SwitcherB or DCD-B/DCDRO

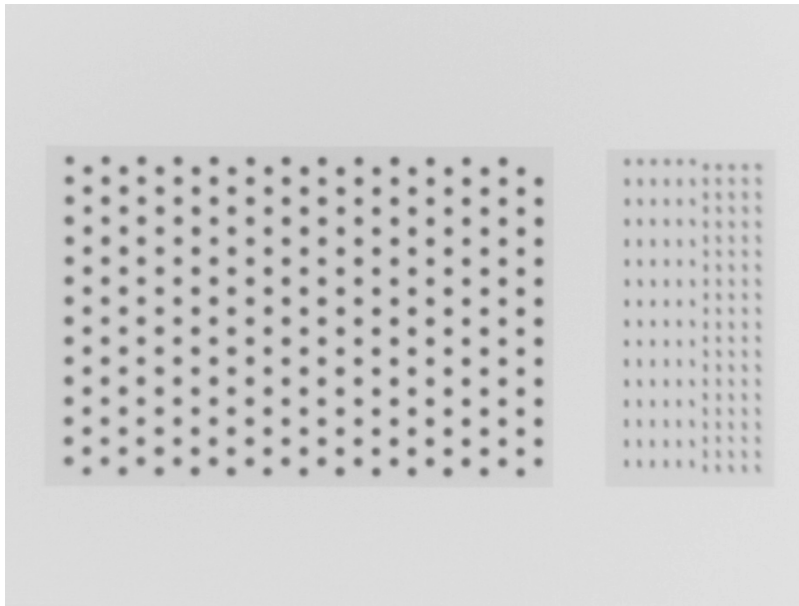
- Failure Mechanism

Short on Wirebond Adapter

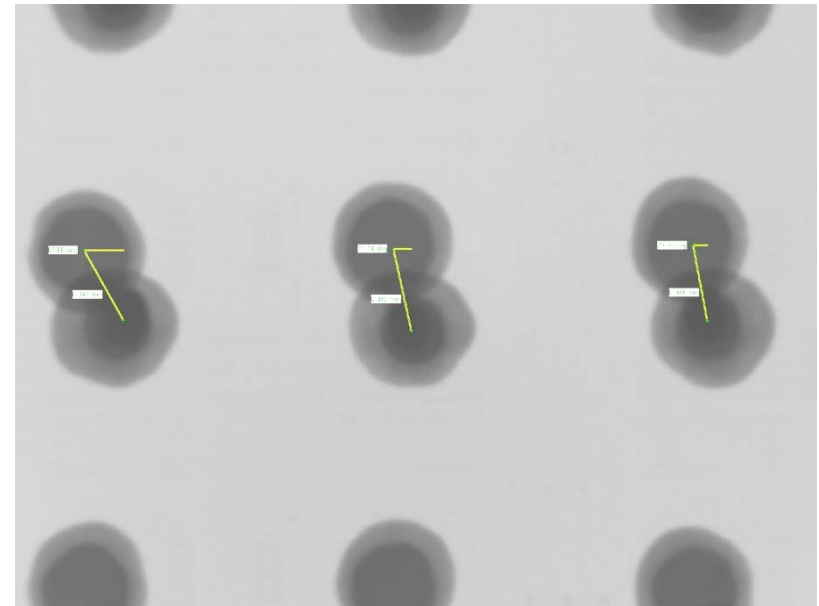


● Failure Mechanism

Assembly of DCDRO (Au-Studs on Au-Studs)



DCD-B and DCDRO
X-Ray Detector Position Chi 0, Phi 0

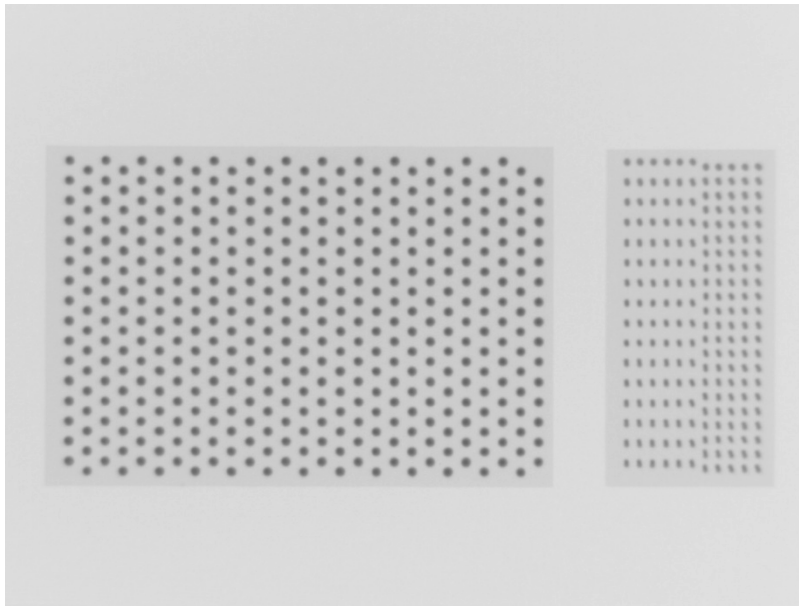


DCDRO Zoom-in (offset 40 μ m)
Detector Position Chi 0, Phi 0

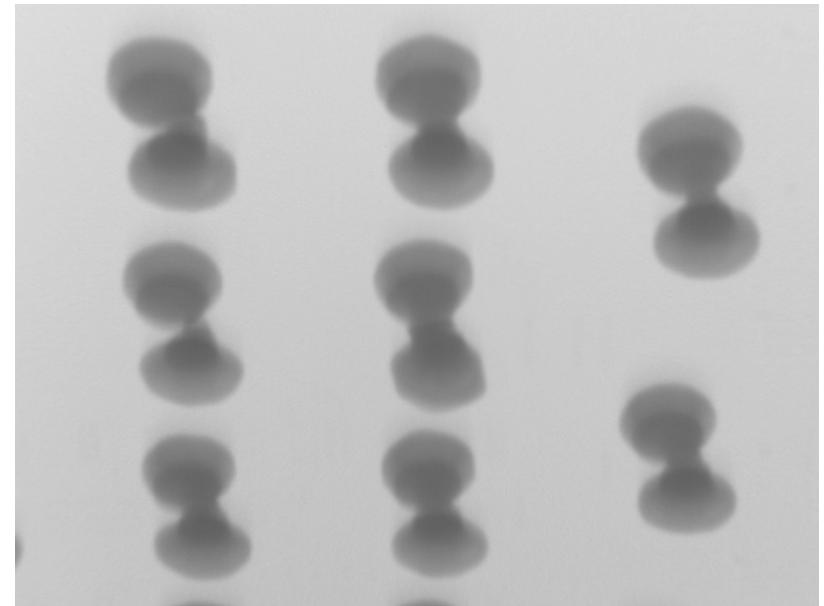
Measurements with X-Ray Inspection Tool Dage XD7600NT

● Failure Mechanism

Assembly of DCDRO (Au-Studs on Au-Studs)



DCD-B and DCDRO
X-Ray Detector Position Chi 0, Phi 0

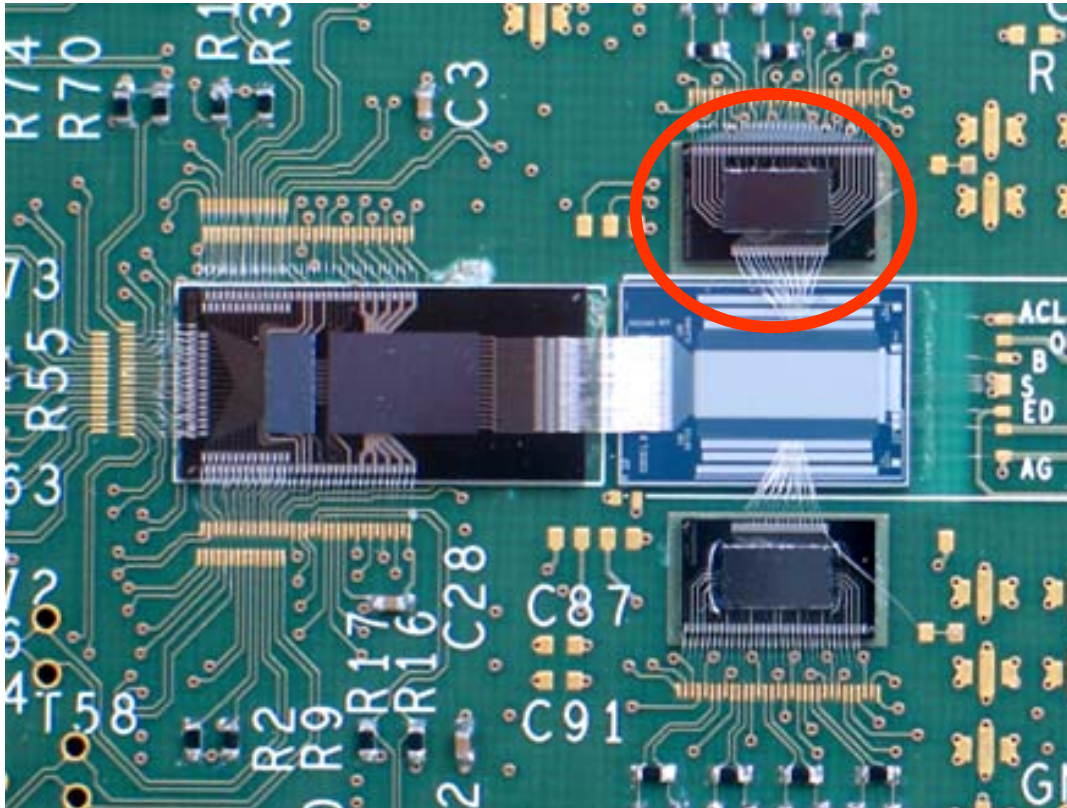


DCDRO Zoom-in
Detector Position Chi 0, Phi 270

Measurements with X-Ray Inspection Tool Dage XD7600NT

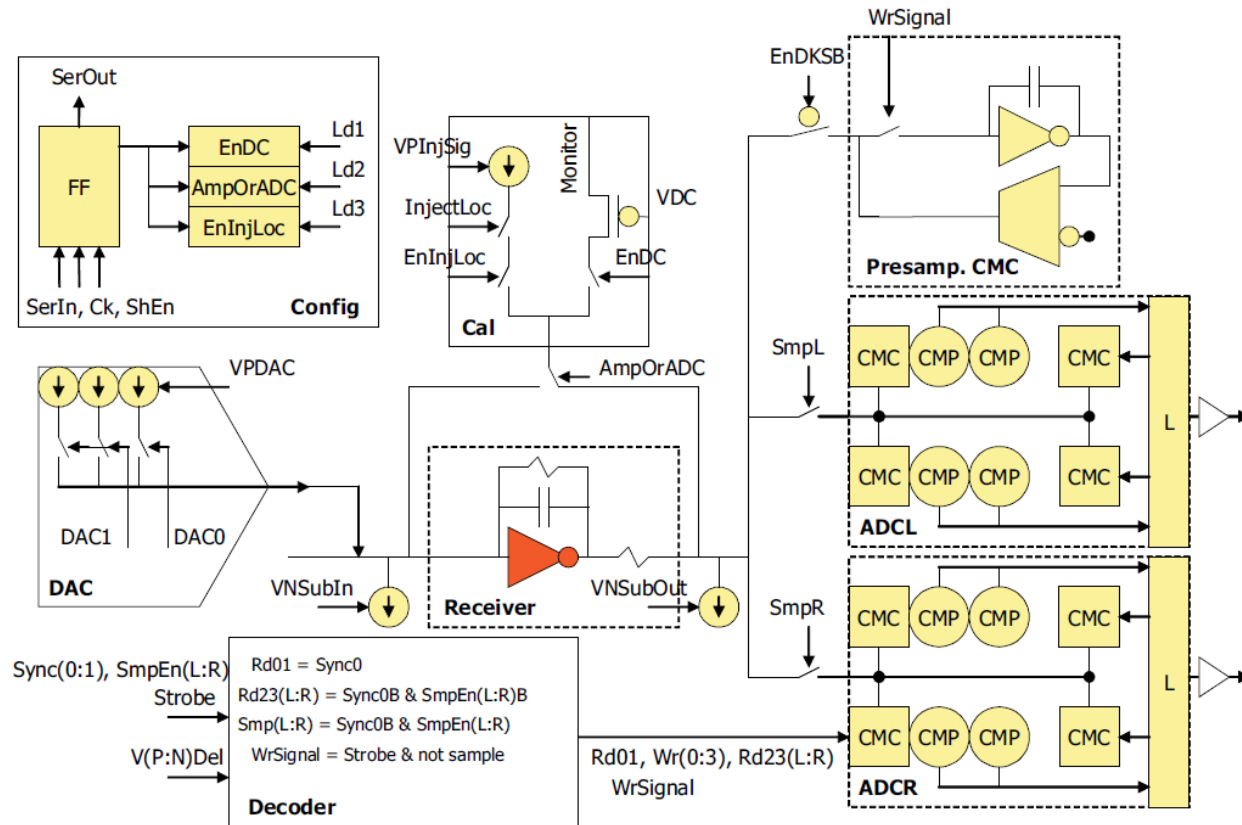
● Failure Mechanism

Switcher B devices used as Clear Switcher on the Hybrid 4.1 the JTAG Control does not work on some hybrids – not on all.



● Failure Mechanism

DCD-B (digital block is working but analog block is not)

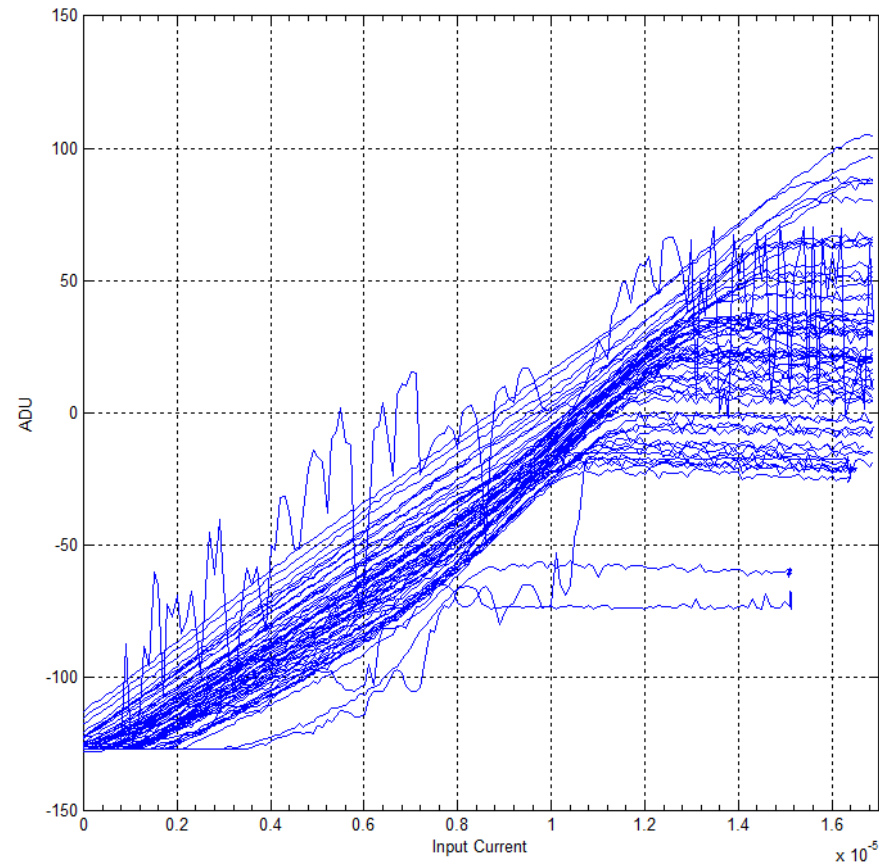


Only experts can do the analysis!

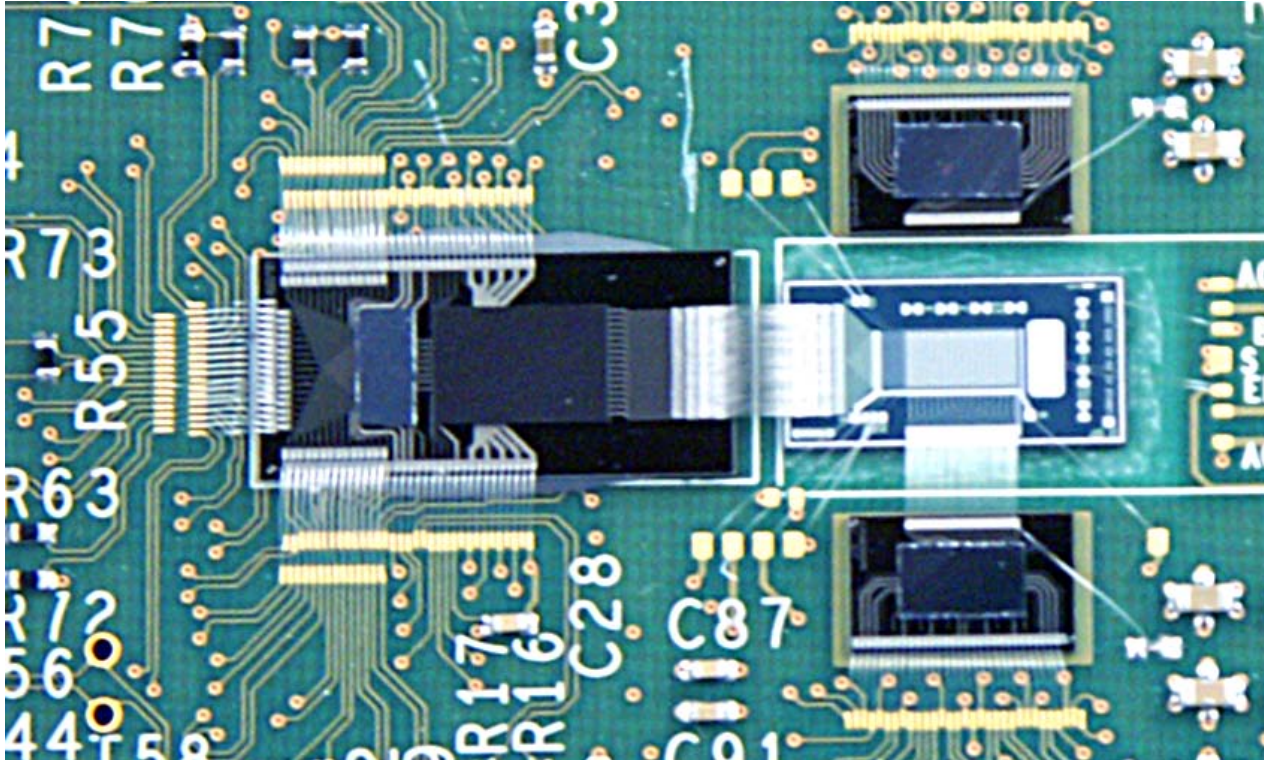
● DCD-B: ADCs Characteristic

ADCs show different characteristic depending on:

- DAC settings (VNSubIn)
- VRefIn
- AmpLow

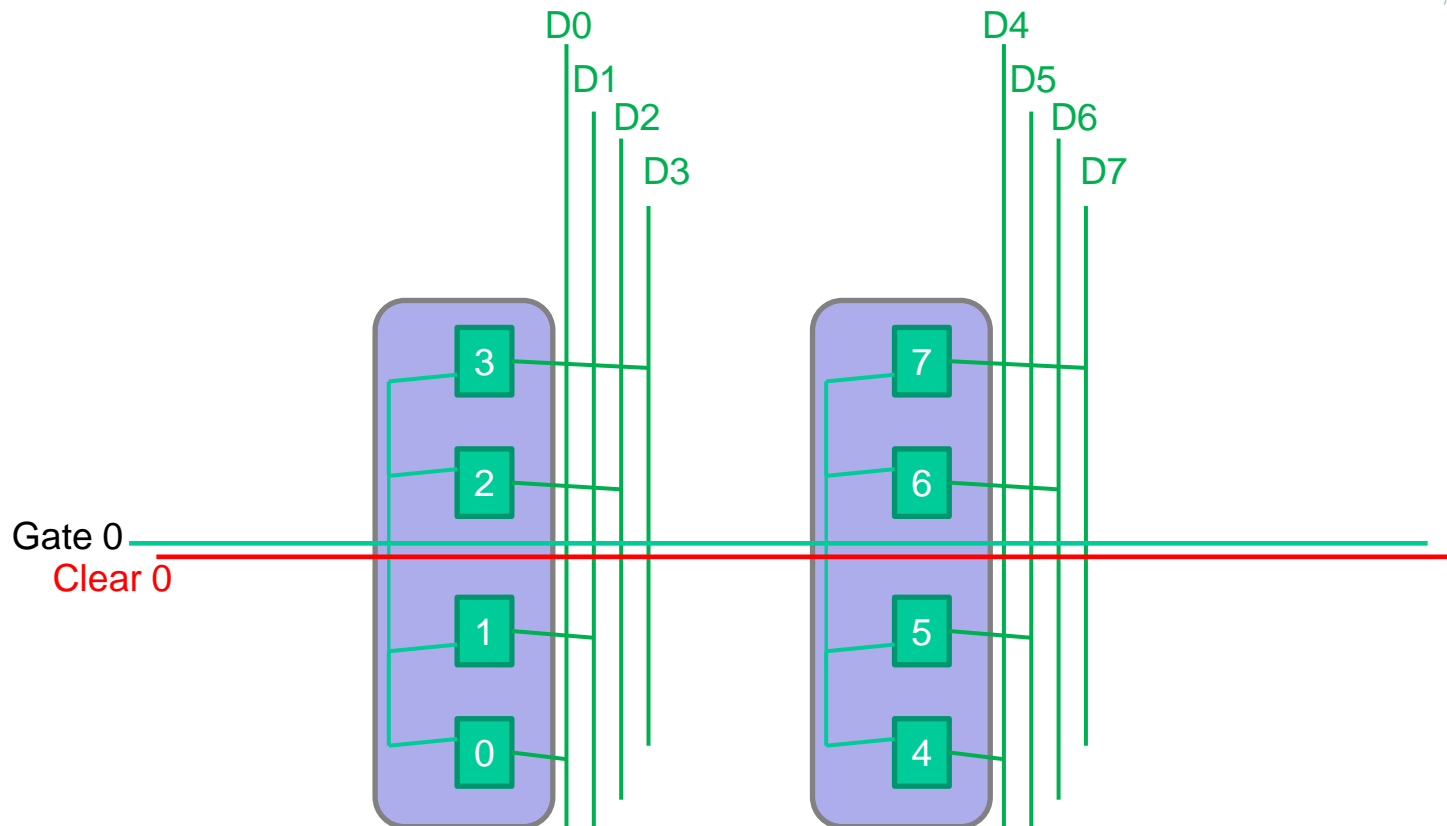


● Hybrid 4.1.05 with PXD6 Matrix



- Matrix is thinned to 50 μ m
- Assembly (electrical and mechanical) is fine
- DEPFET voltages and currents are all fine
- Characterization of DCD-B and PXD6 is ongoing

● Changes in DAQ



4-fold readout was implemented for the S3B and will be implemented Viretex 4 Board in near future -> discussion with July and Sergey already taking place during the meeting.

● Summary

- Progress of bringing up hybrids with is slow
- Hybrid with bump-bonded chips is not trivial
 - Assembly Technology
 - Optical Inspection of the connections not possible
- How to increase yield of DCD-B and SwitcherB on hybrid? -> Jelena's talk
- First PXD6 Matrix assembled and read-out by DCD-B!
 - Power-up of the matrix is fine!
 - DAQ – for 4-fold read-out is going to be available soon
 - Characterization of DCD-B is ongoing
 - Source and Laser measurements will follow

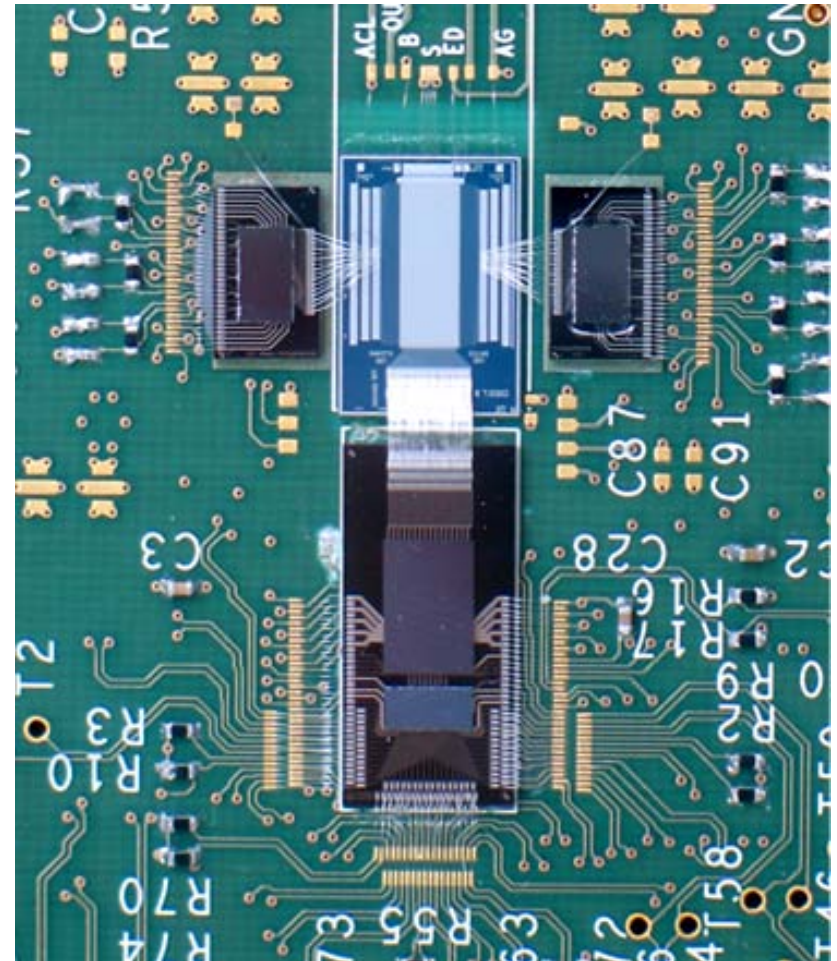


● Hybrid 4.1.x

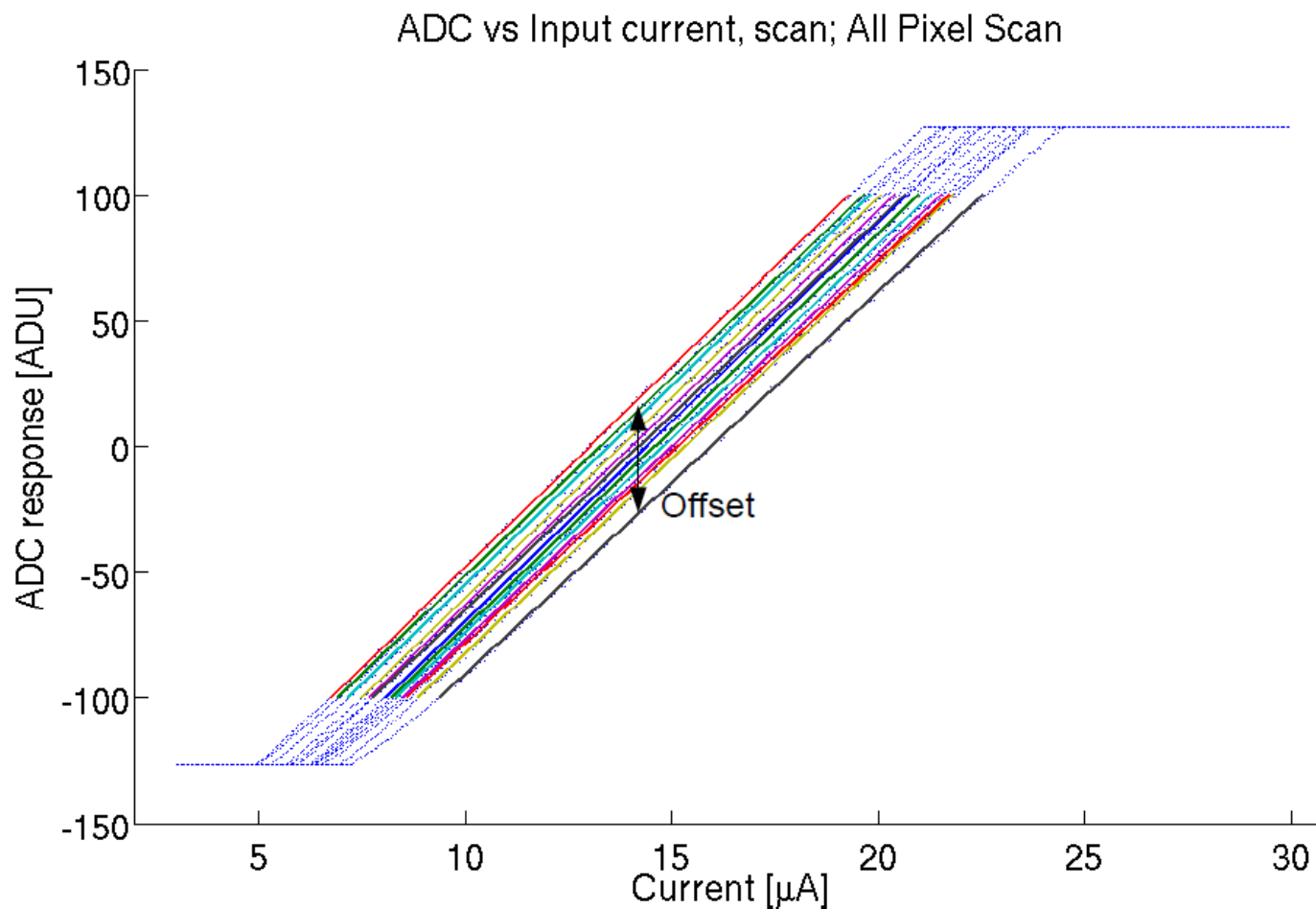
Hybrid Number	Components Mounted	Status	Location	DCD Wirebond Adapters
H4.1.00	DCDB/DCDRO, SWB x 2	DCDB not working	Mannheim	2 DCDBs - both not working
H4.1.01	DCDB/DCDRO, SWB x 2, PXD5 Matrix COCG LB	DUT Beam Test 2010	HLL	1 DCDB which is fine
H4.1.02	DCDB/DCDRO, SWB x 2, PXD5 Matrix COCG LB	Clear Switcher did not work right after assembly	Mannheim	1 DCDB which is fine; short on Wirebond Adapter
H4.1.03	DCDB/DCDRO, SWB x 2, assembled in Bonn	DCDB & SWB, no PXD yet	Bonn	1 DCDB which is fine, from Mannheim, before several assembled in Bonn failed
H4.1.04	DCDB/DCDRO, SWB x 2	DCDB & SWB, no PXD → DCDB broken – tested in Mannheim 24.02.2011 (digital part is ok, I(V) curve of current memory cell is ok -6 μ A to 10 μ A, → proposal Ivan: change DCD-B	HLL	DCDB #1 was tested in Mannheim - see comment DCDB #2 Analog Block does not work
H4.1.05	DCDB/DCDRO, SWB x 2	DCDB & SWB, no PXD → DCDB broken – tested in Mannheim 24.02.2011 (digital part is ok, I(V) curve of current memory shows strong asymmetric range 0 to 8 μ A,, this seems to be the reason → proposal Ivan: change DCD-B	HLL	DCDB #1 was tested in Mannheim - see comment DCDB #2 works fine
H4.1.06	DCDB/DCDRO, SWB x 2	DCDB/DCRO: Digital Injection Test failed - communication problem between FPAG and DCDB → tested in Mannheim 24.02.2011, DCDRO bumps not connected - slight pressure enables DCDRO – 50mA more current + syncout on scope	Mannheim	DCDB #1 DCDRO contact problem

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● ADC Measurement in Bonn



By Florian Lütticke