

# Status of the (current and future) DCD Hybrid Production

Carlos Mariñas,  
for the *Hybrid team*

Summary of the EVO meeting (the second about this topic) held on Friday 27<sup>th</sup> May

- Next generation of hybrids: PCB with connectors
- Status of the DCD-B/DCD-r/o adaptors for the current hybrid

Combined effort of the groups in Mannheim-Bonn-Munich

Main contents of this talk: Ivan Peric, Jochen Knopf, Christian Kreidl, Christian Koffmane, Florian Luetticke

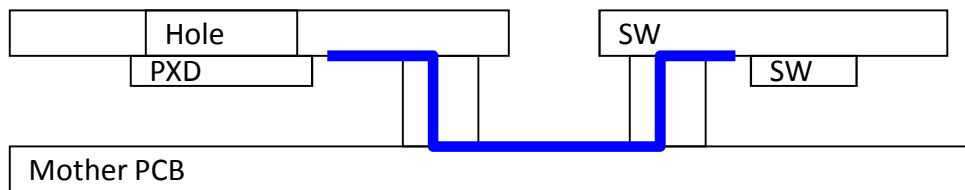
# New concept: next generation of hybrids

Following the discussion in the Ringberg meeting:

- Pluggable matrices: 40 matrices with different structures have to be tested from the PXD6 generation
- Pluggable DCD/SW: due to the low yield of the adaptors in the current version

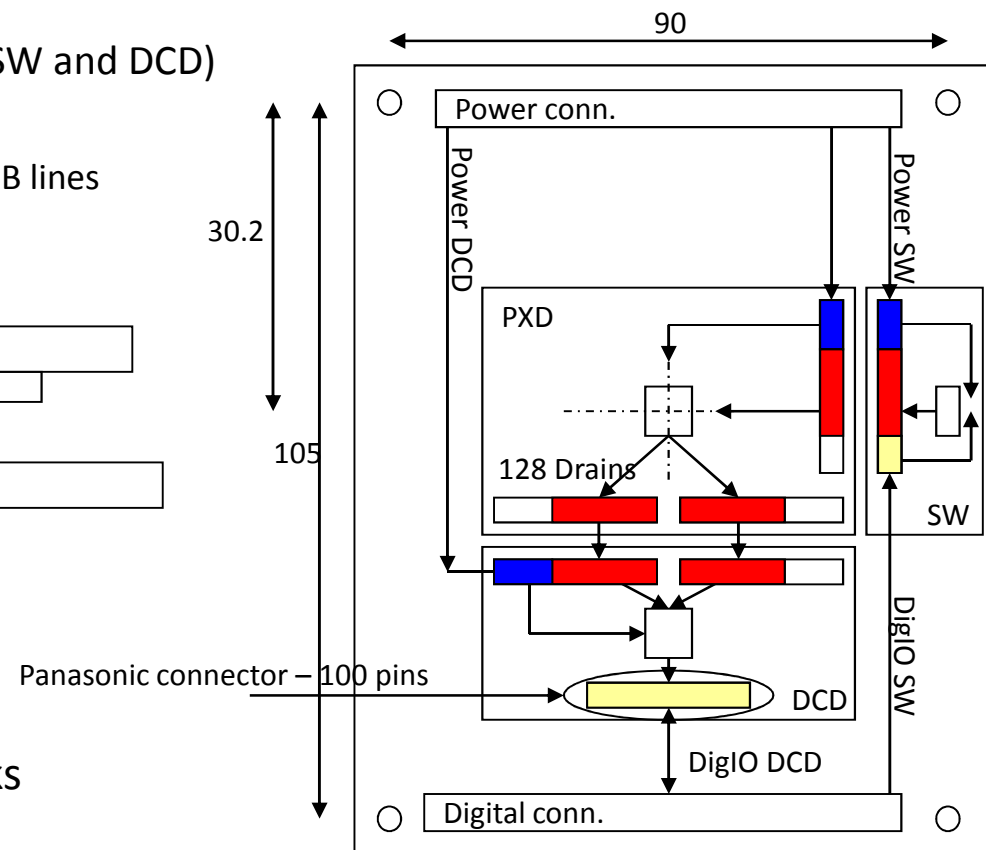
Motherboard + 3 pluggable PCB's (Matrix, SW and DCD)

Simplicity: Just top metal layer + some crucial DCD-B lines accessible from the backside through vias



Footprint compatible with the next DCD generation

Ivan Peric → Could be ready in 2 weeks



# Mass production of Hybrids 4.1

□ Ringberg: The priority is the PXD6 testing, to decide which flavour will be used in the final production

→ No more DCD-B debugging at this moment. Wait for the next 'DCD-B2.0'.

- To boost the production, the activities are coordinate as follows:

- Mannheim: Switcher B, DCD-B and DCDRO Flip chip

→ 20 Unbumped Switchers (prior tests), 9 DCDRO, 7 DCD and 10 naked Adaptors.

- Bonn: Bonding of wirebond adapters to PCB

→ 3 more hybrids repaired yesterday.

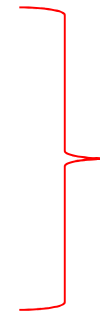
- Bonn: Testing DCD-B, SW and DAQ

→ Funcionality tests on the 3 hybrids above are ongoing

- Munich: Matrix assembly and wirebond to PCB, and optimization

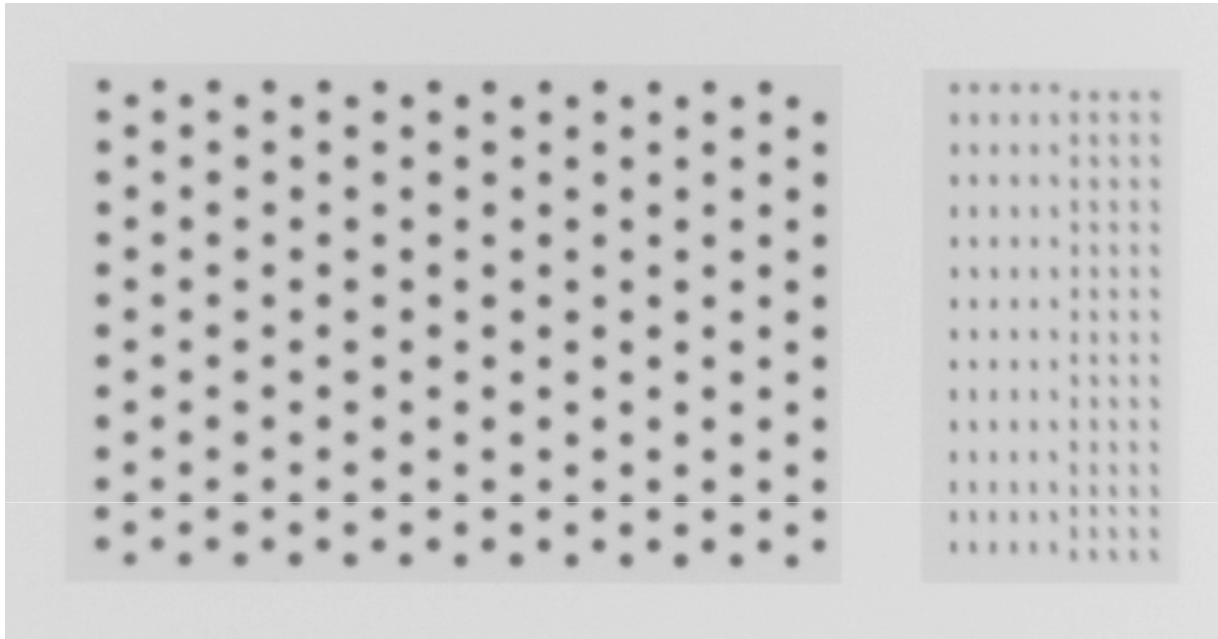
# Low yield

- Clear Switcher infant mortality
- Analog block of DCD-B is not responding
- Not all the ADCs work
- Bump bonding problems!!  
→ See next slides



*Somehow understood  
by the experts*

# X-ray inspection (MPI)

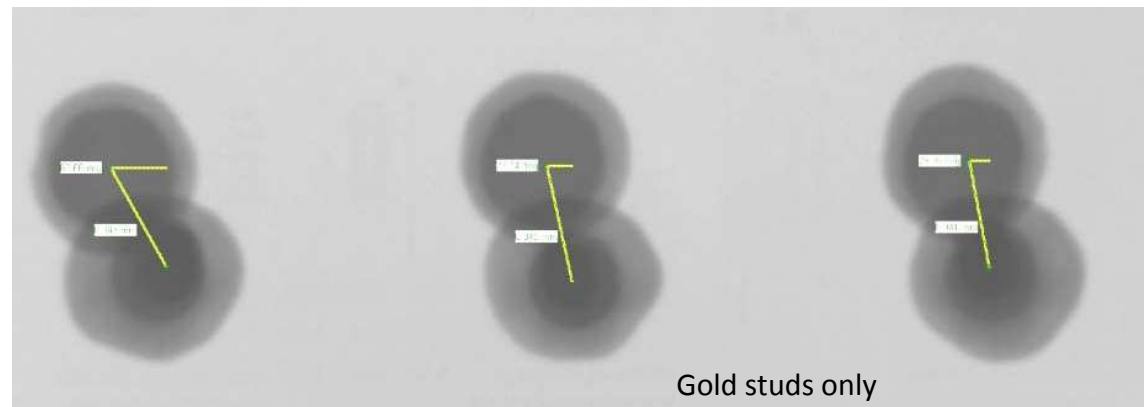


Observed in MPI inspection over an adaptor assembled in Bonn

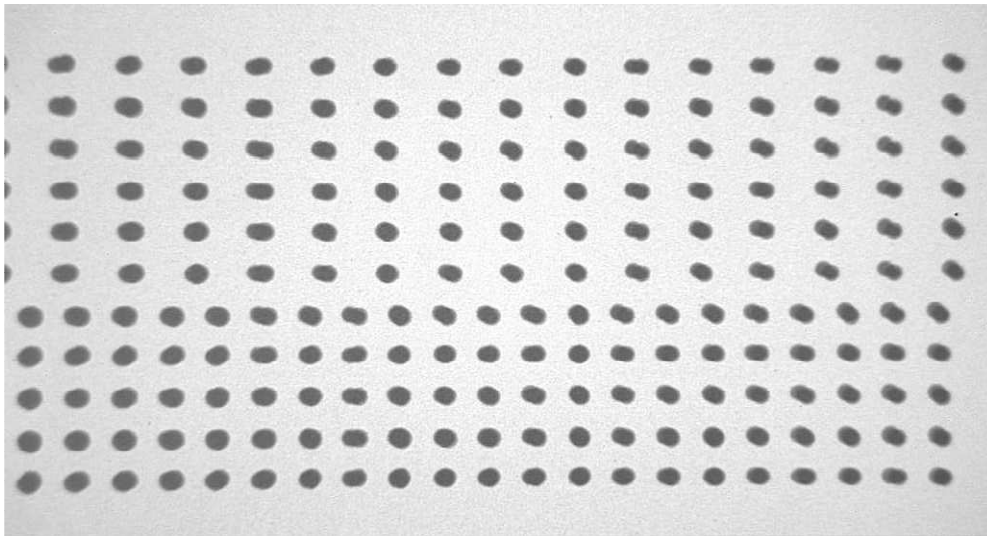
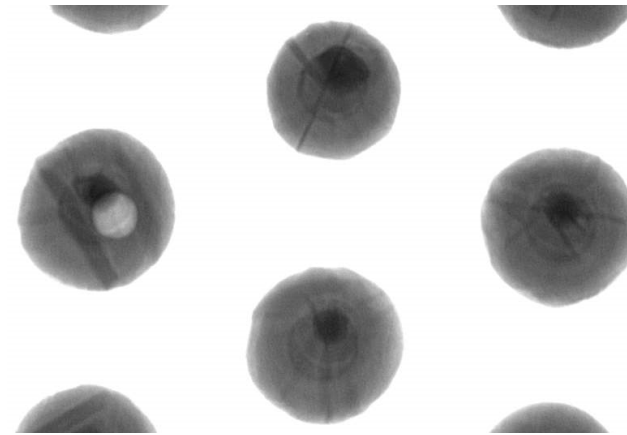
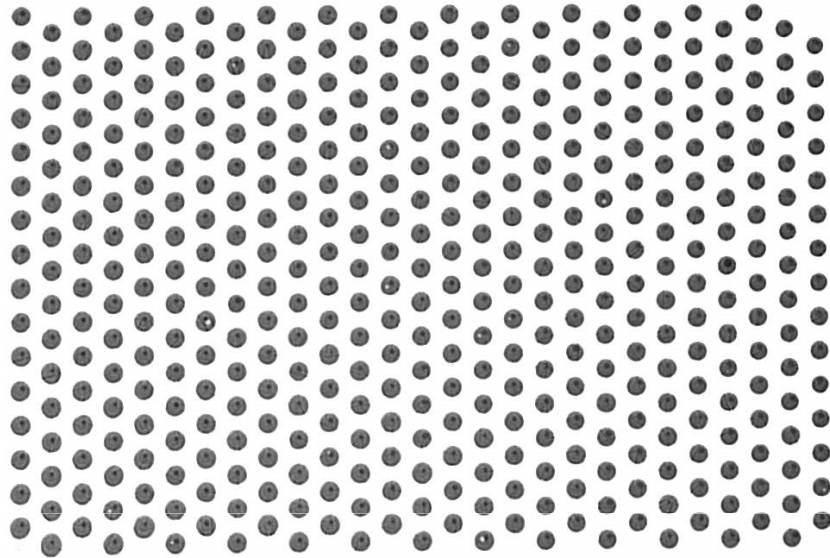
Offset of 40µm

Measurements with X-Ray Inspection Tool DageXD7600NT

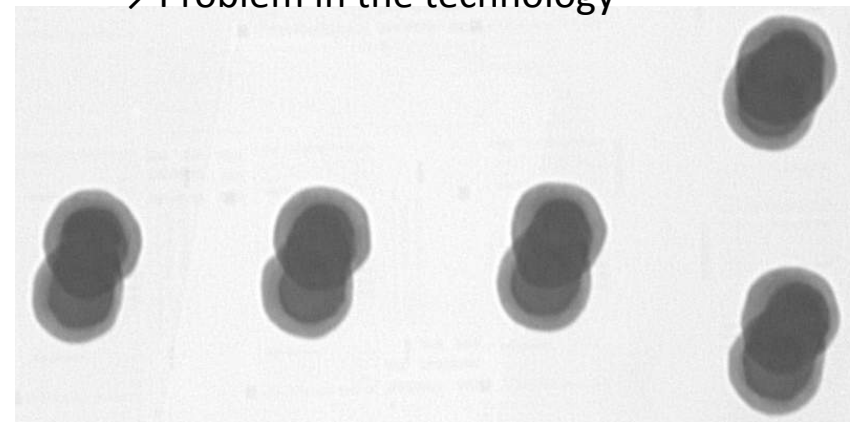
- DCD-B is perfectly bump bonded
- DCD r/o is displaced → Only Au-studs, no self-alignment technology



# X-ray inspection (Bonn)

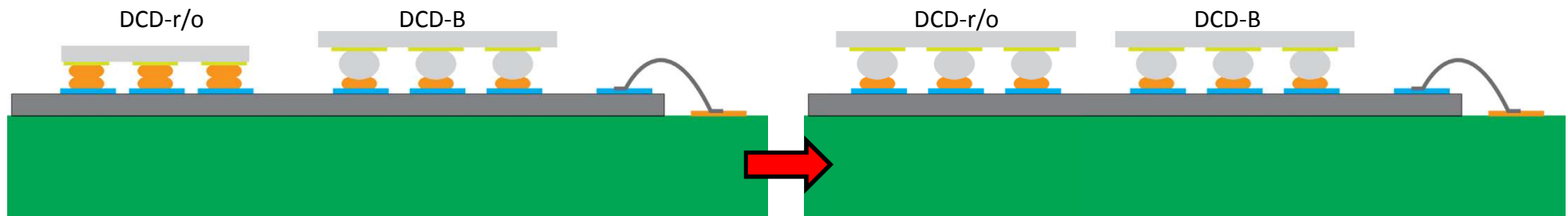


Reproduced behaviour in Bonn inspection  
over an adaptor assembled in Mannheim  
→ Problem in the technology



# Further improvements

- Extra solder balls will be added also in the DCDr/o to self align the chip



- Extra inspection in CNM: Gen5 C-SAM Acoustic Micro Imager  
To check whether the gold studs are connected or not



- Hybrid database in Twiki for traceability  
→ See next slide



# Results of the hybrid test protocol (sample)

## H4.1.00 **Hybrid label**

- Gate SWB is functional, reacts on JTAG, works with full speed
- Clear SWB is not functional at all
- DCDB:
  - Digital logic is functional
  - ADCs report badly shaped transfer curves, not adjustable
  - JTAG Pixel Chain does not seem to work, Monitor bus cannot be connected to internal nodes, debugging impossible

**Switchers status**

**DCD detailed report**

## H4.1.04

- Gate SWB is functional but does not react on JTAG commands.
- Clear SWB is not functional at all
- DCDB:
  - Digital logic is functional
  - ADCs report badly shaped transfer curves, not adjustable.
  - Debugging attempts led to a failure of the comparator circuits inside the ADCs. NOT understood!

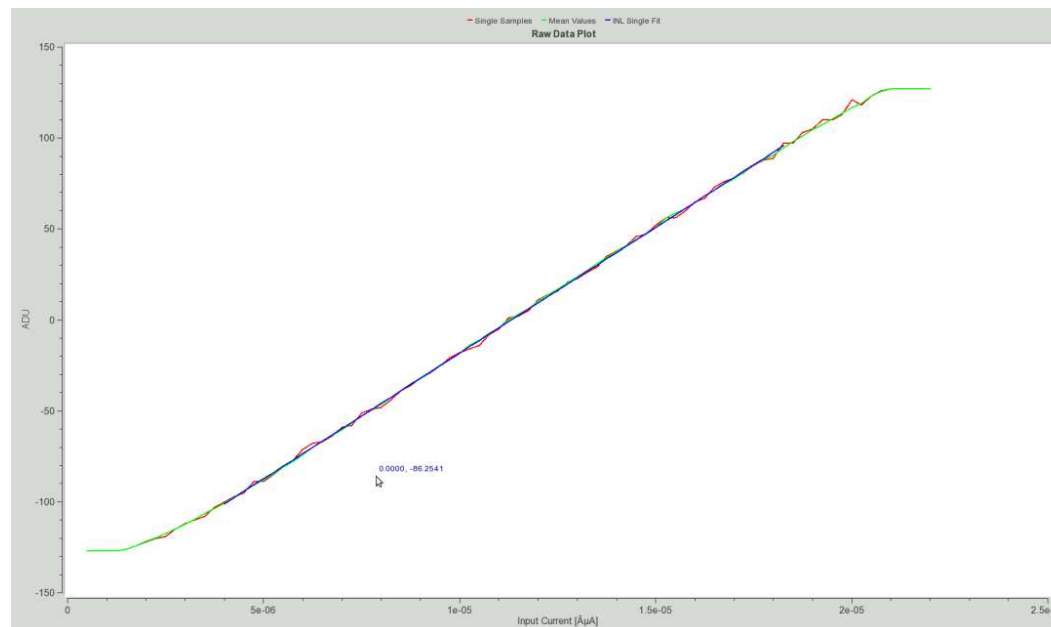
## TB2010 Spare Module

- Gate SWB is functional but does not react on JTAG commands.
- Clear SWB is not functional at all
- DCDB:
  - Digital logic is functional
  - ADCs show reasonable performance, adjustment possible
  - Digital output signal DO3[6] has short between its two differential signals.
  - Laci: „Can be repaired by scratching with a needle“

**Additional comments**

# Latest results on hybrid assembly

- The Hybrid **H4.1.01** (?) with the matrix does not work. It shows randomly jumping values - this needs further investigation. There is a very high current consumption on RefIn and AmpLow. The DAC does work and shows a negative slope - probably JTAG works -digital part still not checked.
  - The Hybrid **H4.1.04** does not work. It shows constant values on the output, one for each column. One of the columns gives values changing between two adjacent values. The current consumption is in tolerable limits, but VDD current is rather low. The DAC does work and shows a negative slope - probably JTAG works -digital part still not checked.
- The Hybrid **H4.1.00** does work. At the moment is only operated at 200 MHz. Currently taking a statistics run to check how many channels are operational. Switchers not tested yet.



ADC response in hybrid  
H4.1.00

- ✓ The concept of the next system platform is defined
  - Matrix, SW and DCD will be mounted on PCB and assembled into a motherboard by means of connectors
  - The design will be ready in ~2 weeks
  
- ✓ The production of more hybrids is boosted, being the PXD6 tests the central core
  
- ✓ Good news from today: Another hybrid seems to work. Characterization ongoing.

**Thank you very much!**