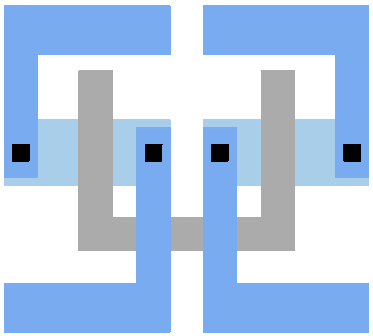
UNIVERSITÄT
HEIDELBERG

Flip Chip Results & Adapter Design



Christian Kreidl

christian.kreidl@ziti.uni-heidelberg.de

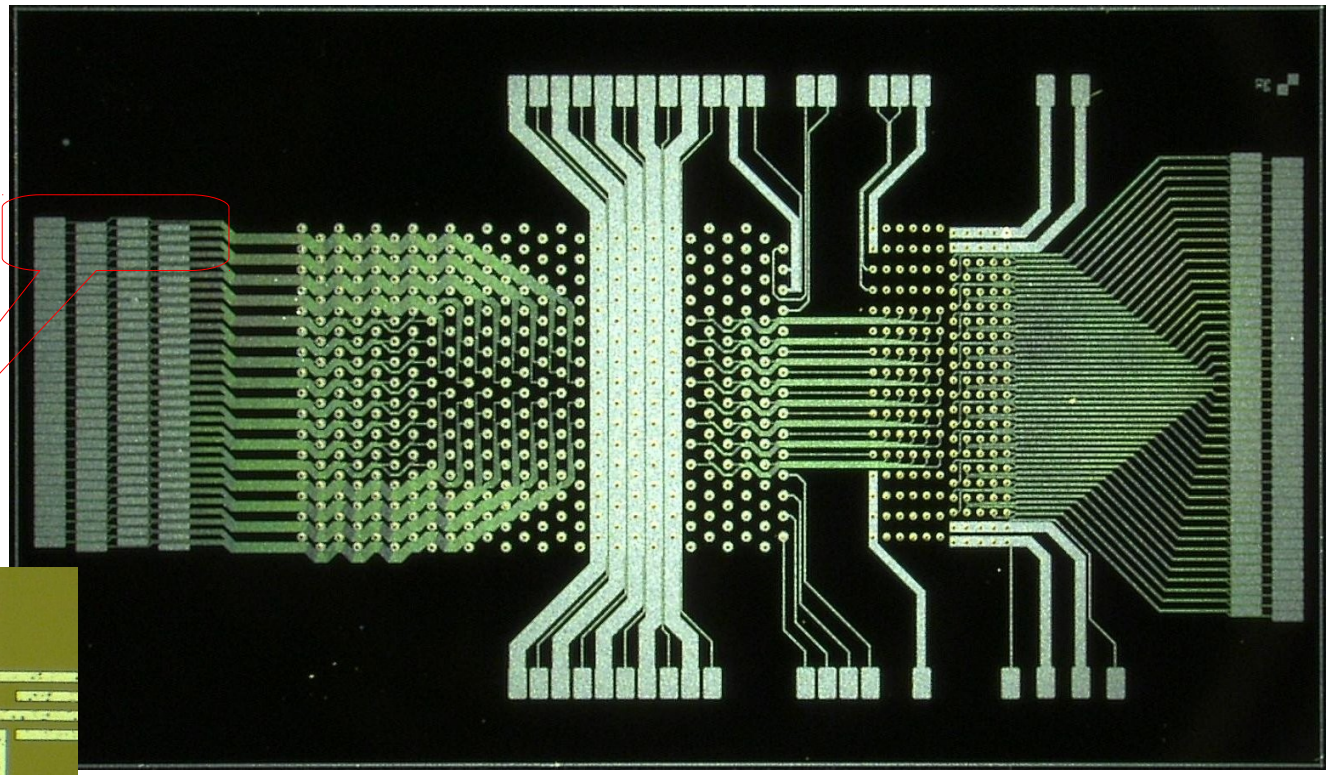
4th International Workshop on DEPFET detectors and applications

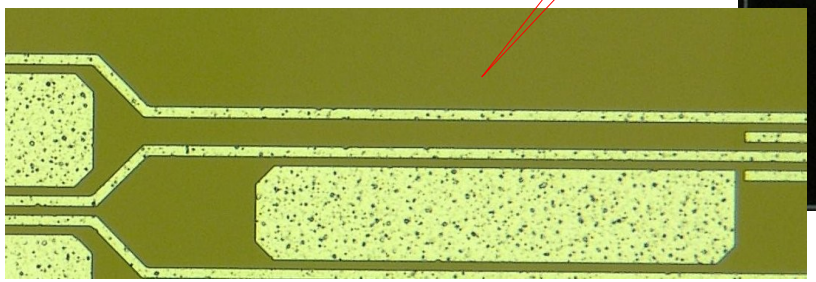
Ringberg Castle

03. - 05.05.2010

DCD-B + DC-RO Wirebondadapter

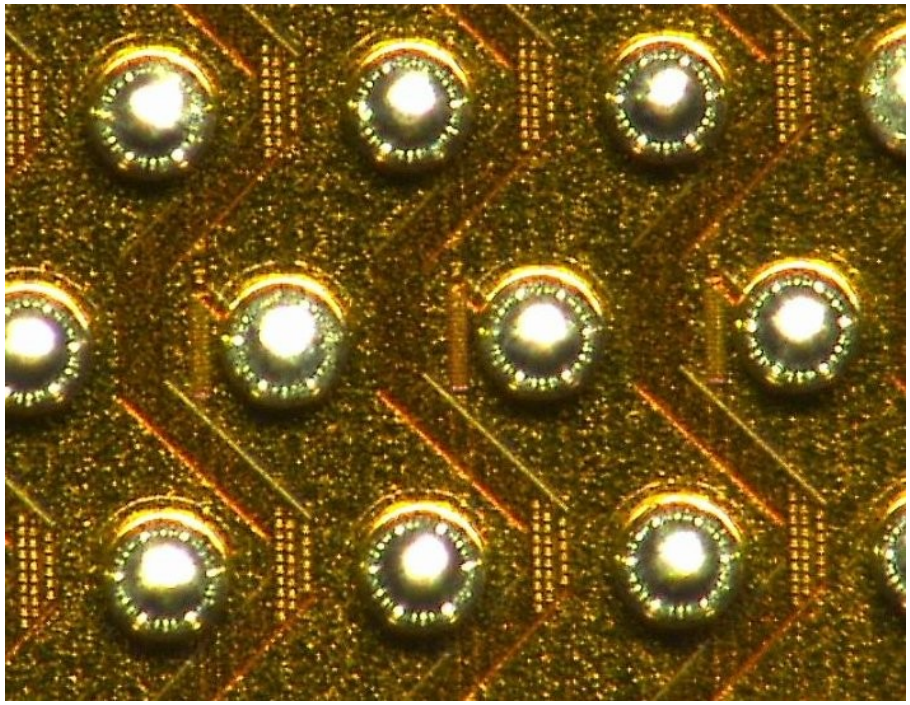
- a few wirebondadapter manufactured on flipchip-dummy wafer
- Wirebondpads not fully suitable for bonding to PCBs
- A minor bug: 2 drains not connected
  - no LVS check

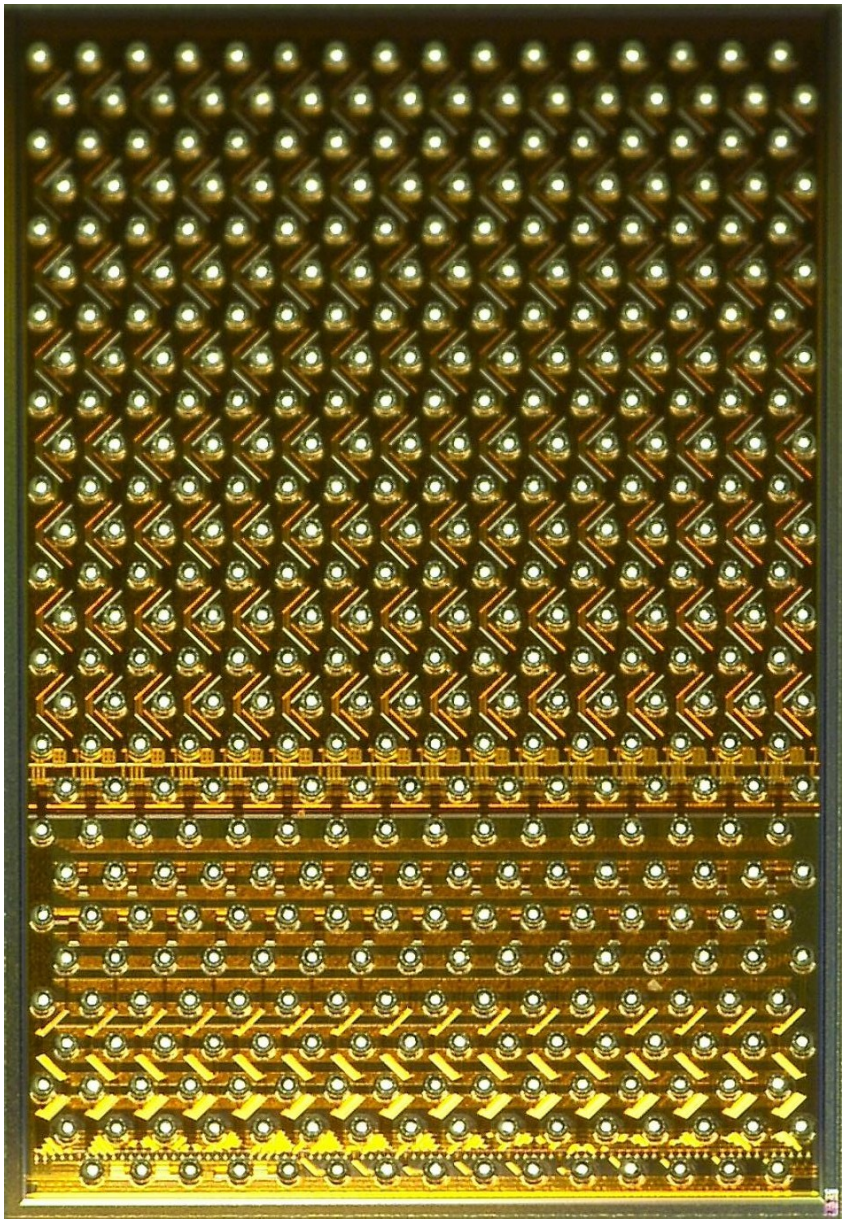




DCD-B

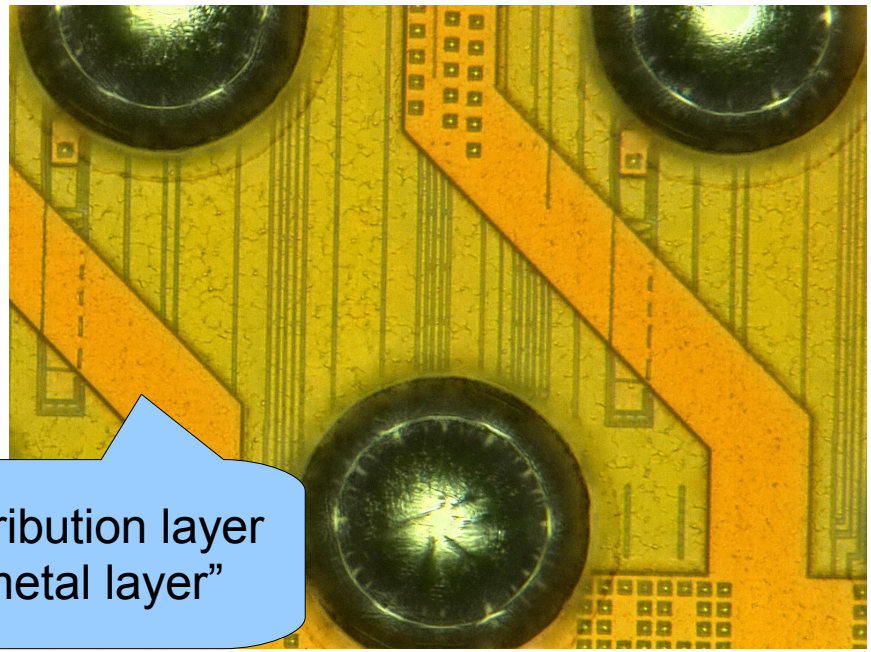
- finally DCD-B arrived
  - 2 additional months for bumping
  - ~10k€ chip
  - ~10k€ bumping

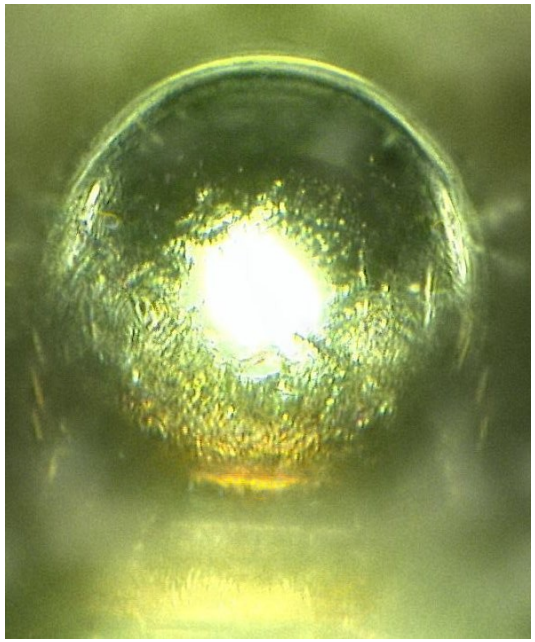




Bump Parameters

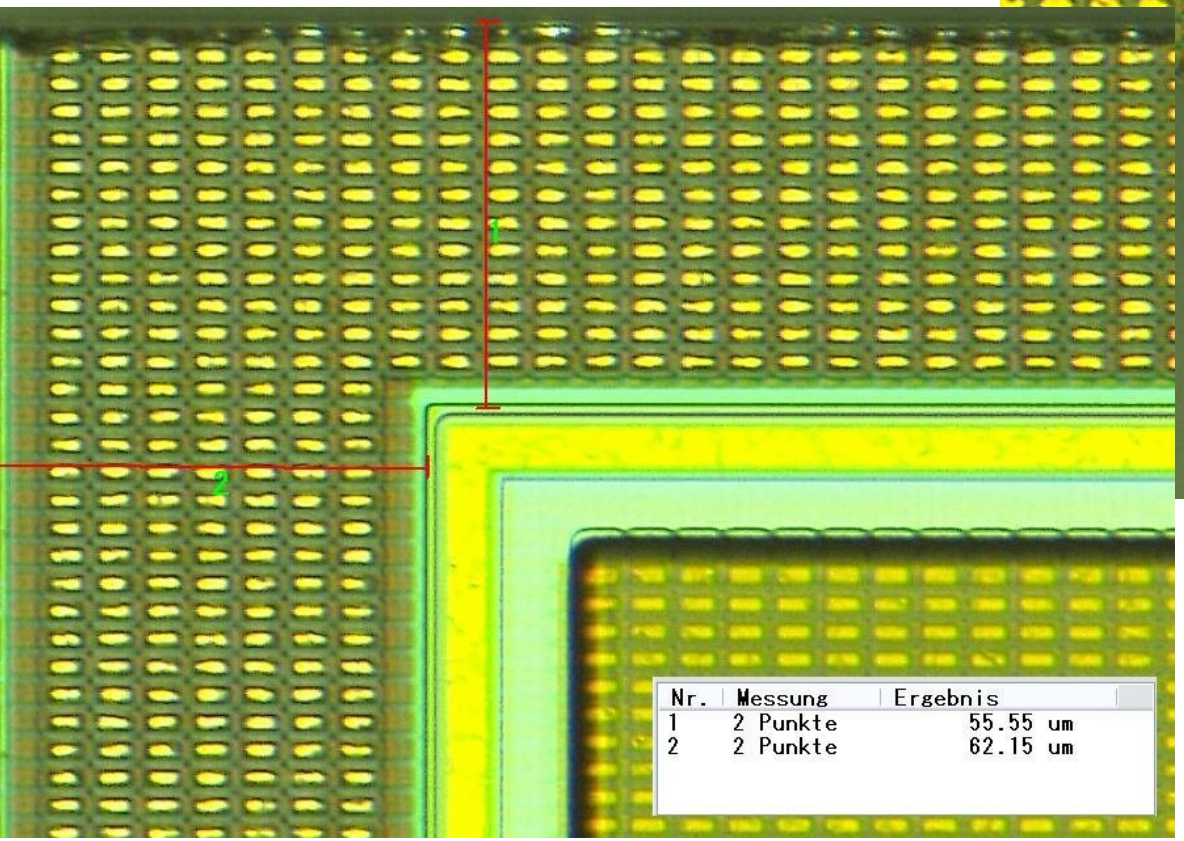
- ball diameter: 100µm
- lead free SAC305 (Sn / Ag 3.0% / 0.5% Cu), 220°C melting
- repassivation: polyimide
- screen printing
- bump masks are not reuseable
  - even unmodified bump positions and Al-layer need new bumping mask because of multi-project wafers.

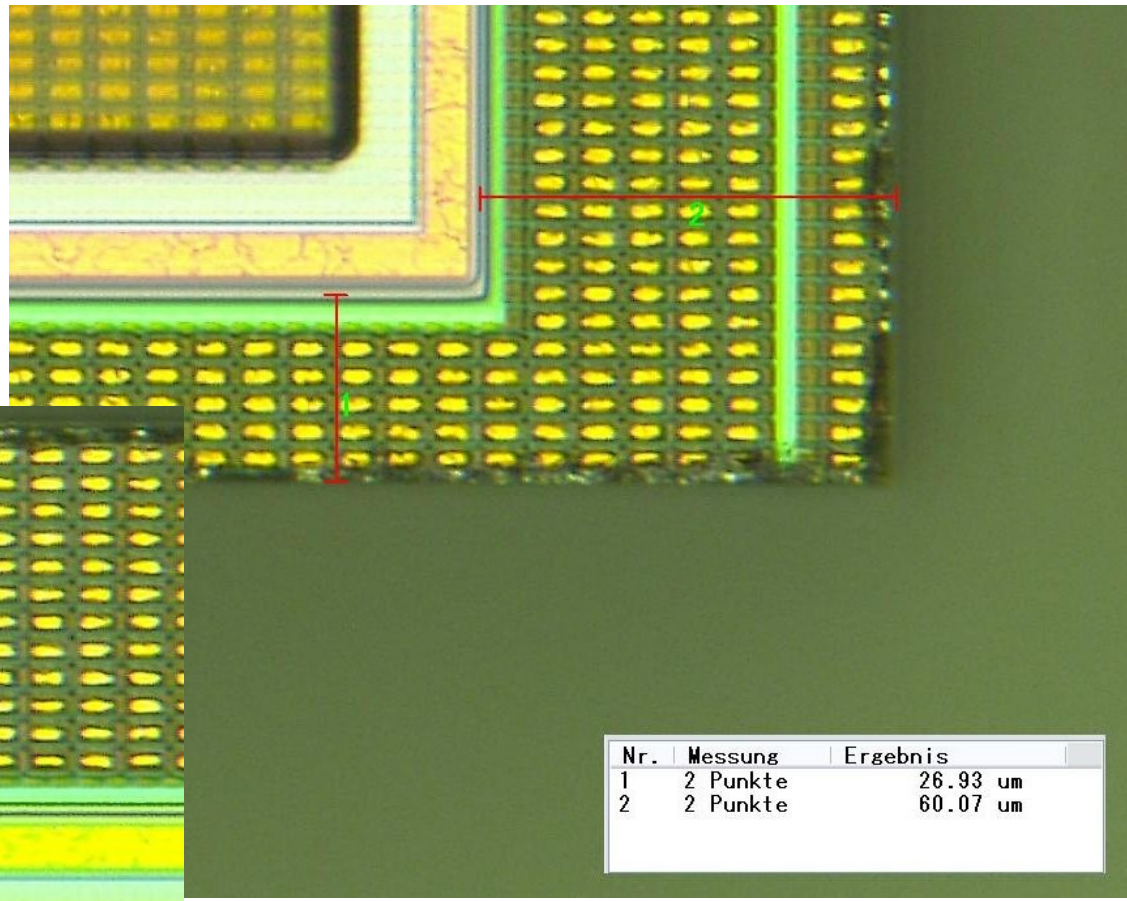




DCD-B Size

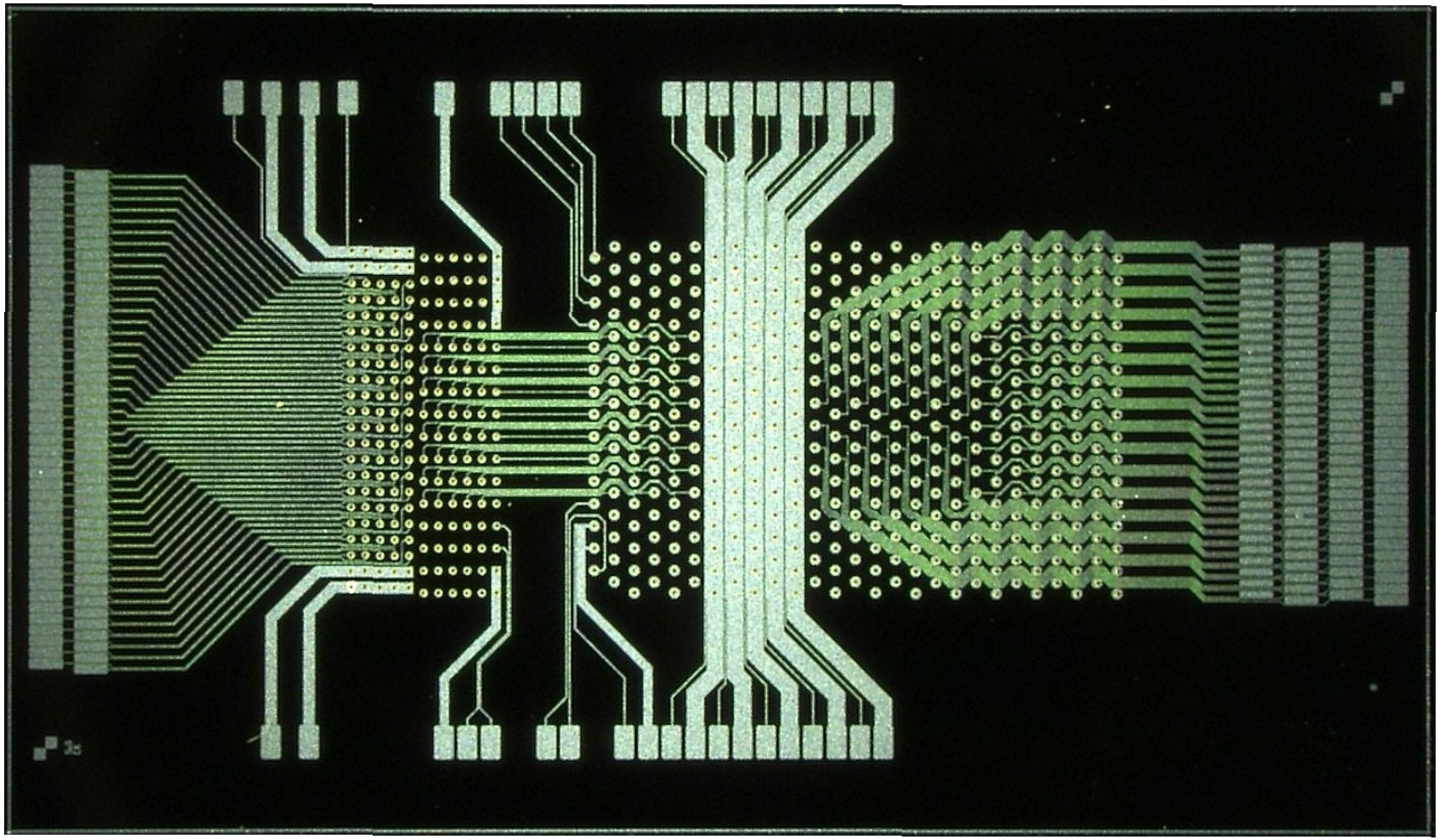
- Chip is larger due to cutting
- 25 .. 75µm/edge





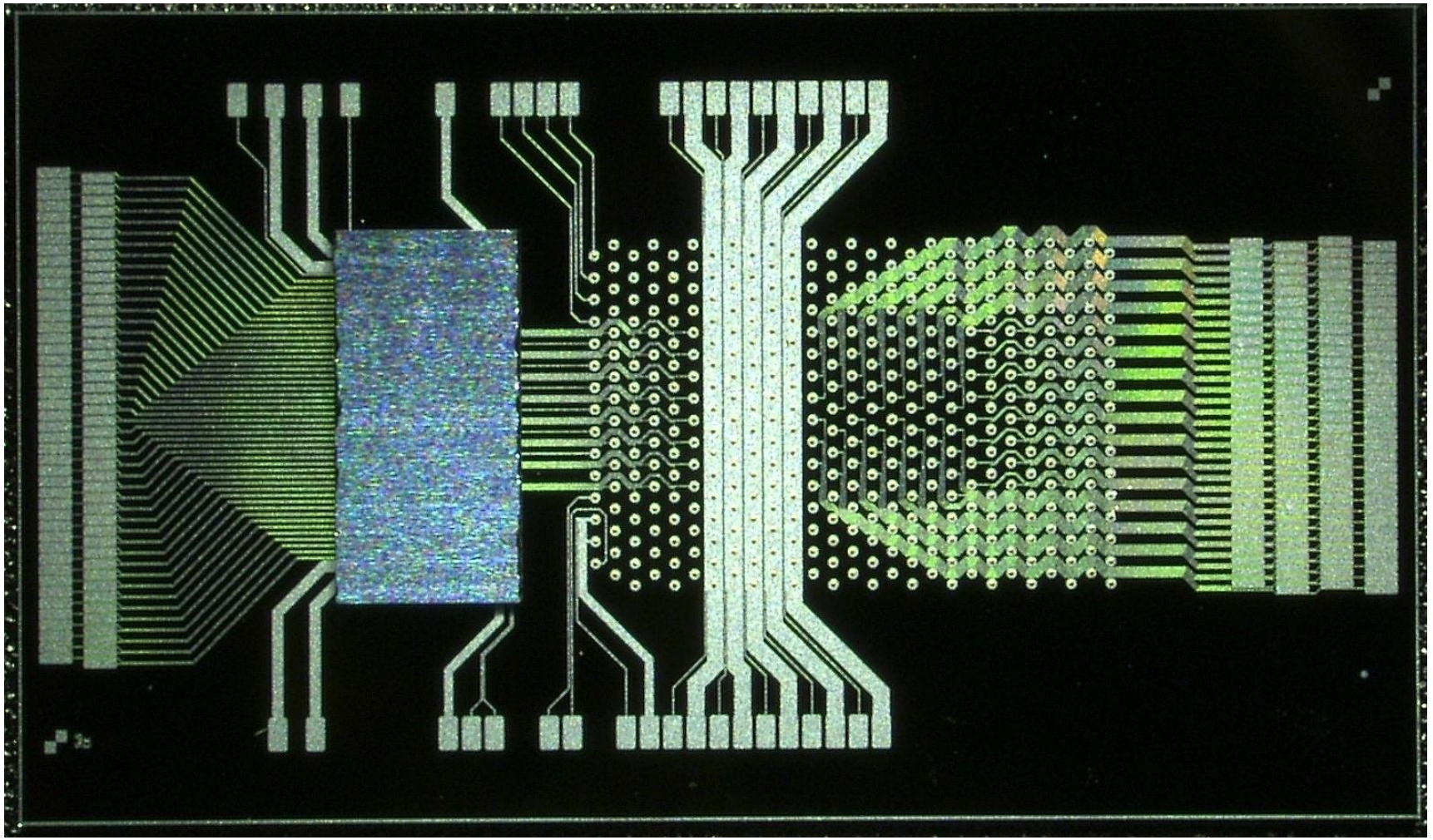
Adapter Assembly

- place goldstuds on adapter
  - use as under bump metallization for soldering DCD
  - use as spacer for DCD-RO flipchip



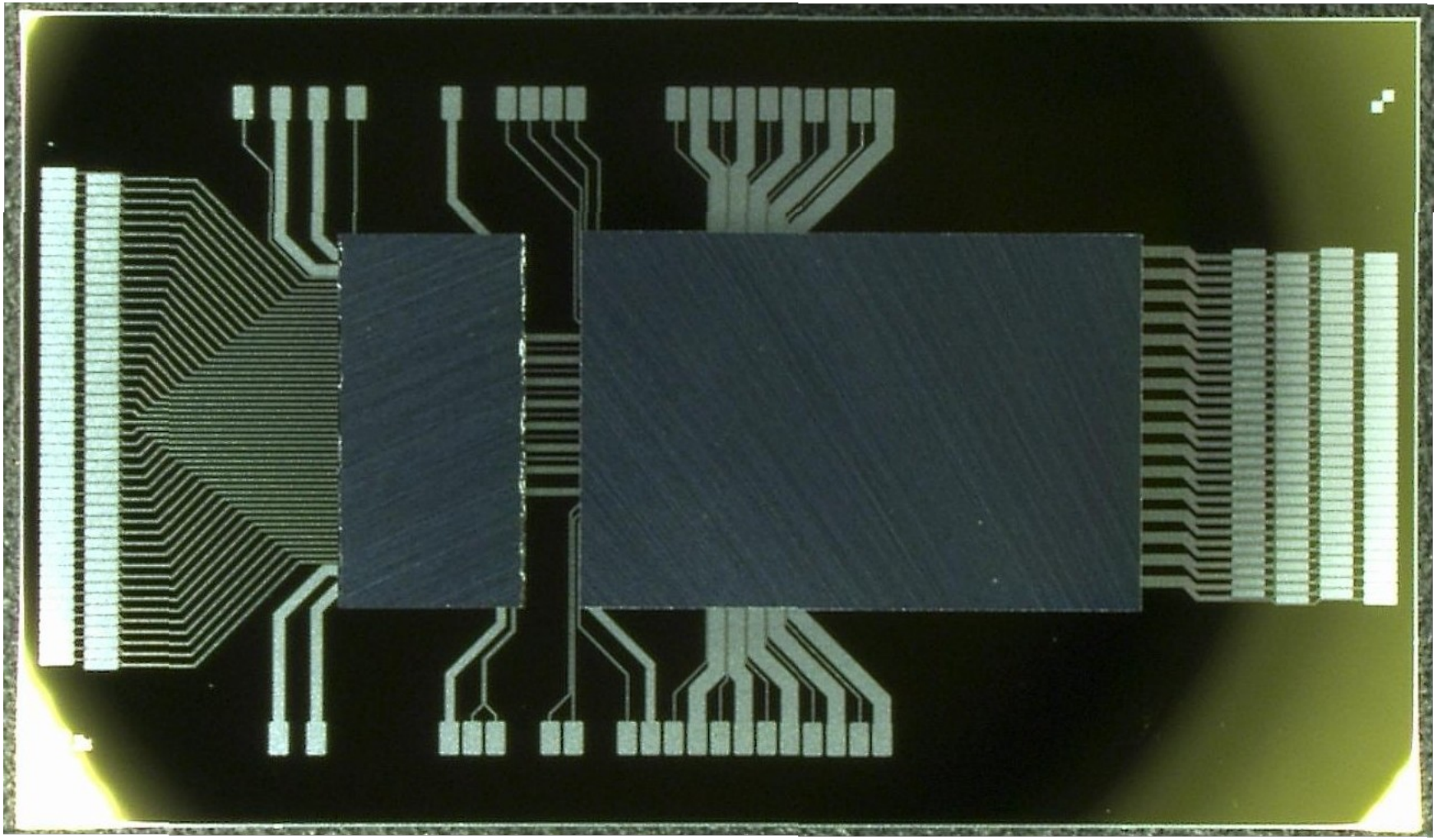
Adapter Assembly

- place goldstuds on DCD-RO chip
- flipchip DCD-RO with thermocompression (20gr/bump)



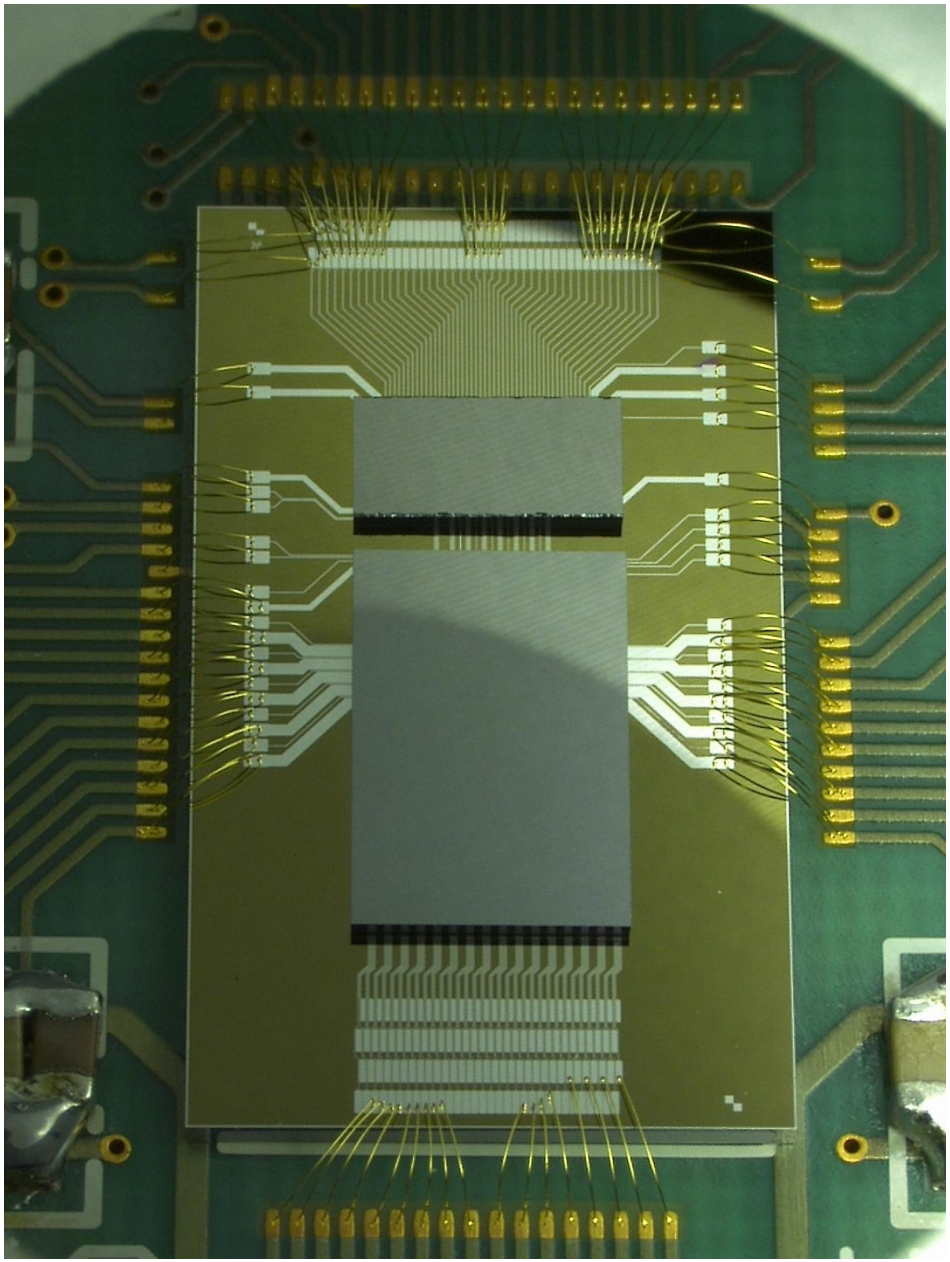
Adapter Assembly

- Solder DCD to adapter



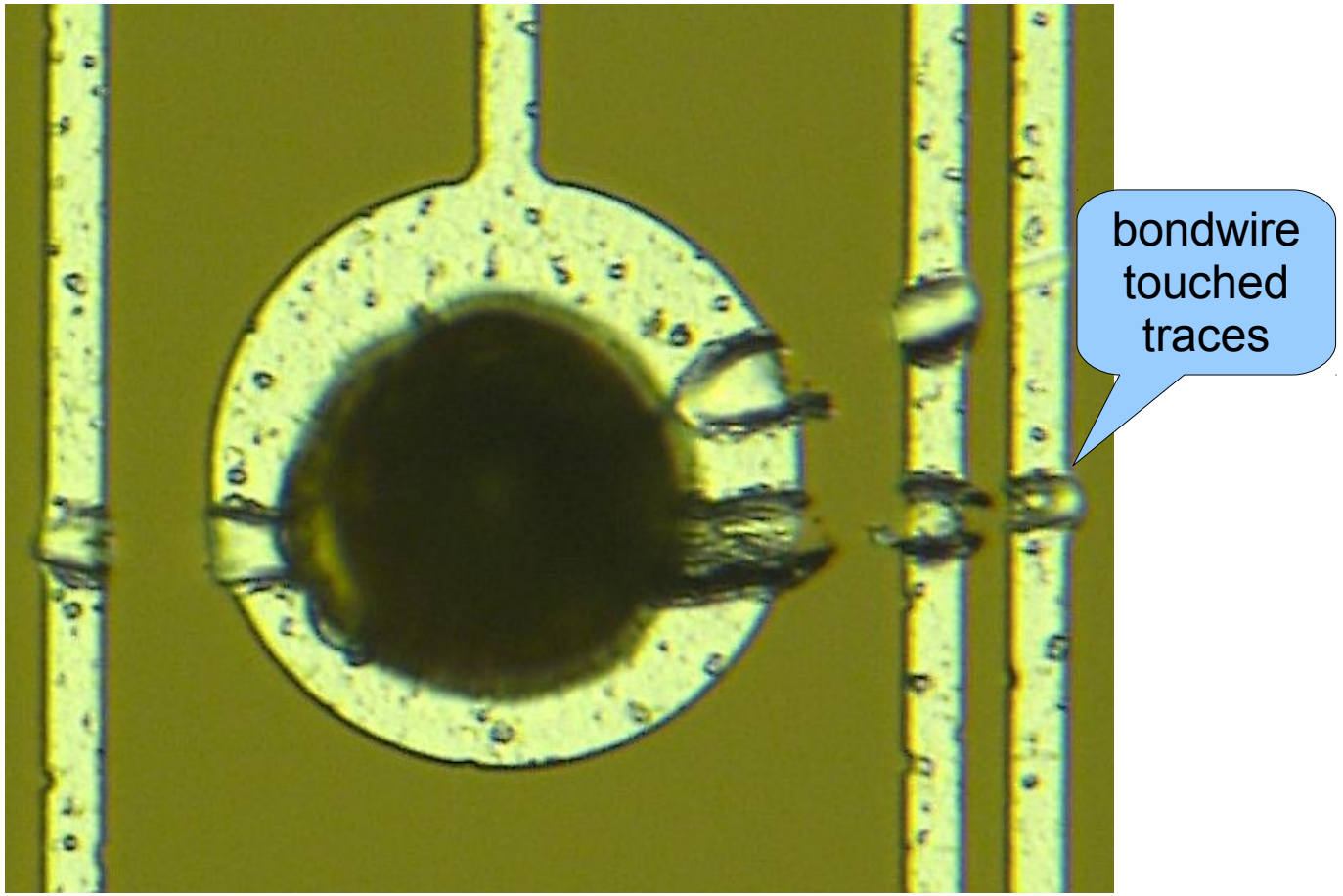
Wirebond Adapter

- Test PCB designed in Mannheim
  - for standalone tests
  - connect to Manuel's FPGA Board
  - digital outputs of 2 DCD columns and control signals bonded
  - a few drains bonded
- results
  - see Jochen Knopf's talk



Adapter Assembly Problems

- no passivation layer
  - bonder error can damage traces and create shorts
- next wirebond adapters should be covered by passivation



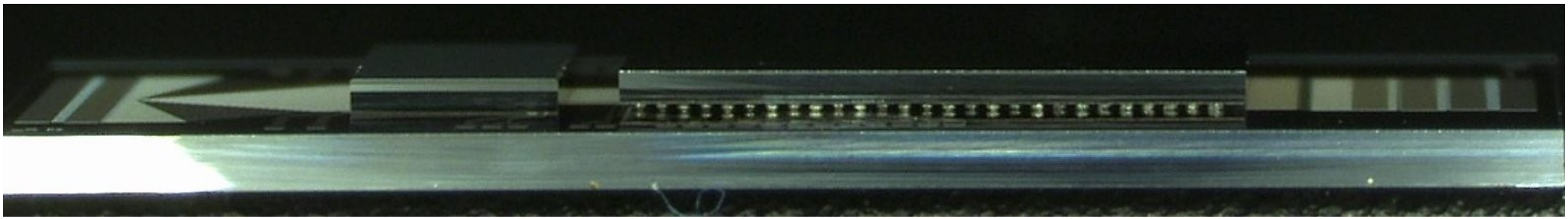
vacuum couldn't suck bump to capillery; wire touched traces;
ultrasonic vibrations on wire deformed traces

Adapter Assembly

- 1st assembly of DCD-RO
  - only bumps on adapter: gap too small
  - flipchip-head not in parallel to substrate

    → chip touched substrate and shorted lines
- flipchip head has been repaired
- 2nd assembly
  - bumps on substrate and DCD-RO
  - flat head

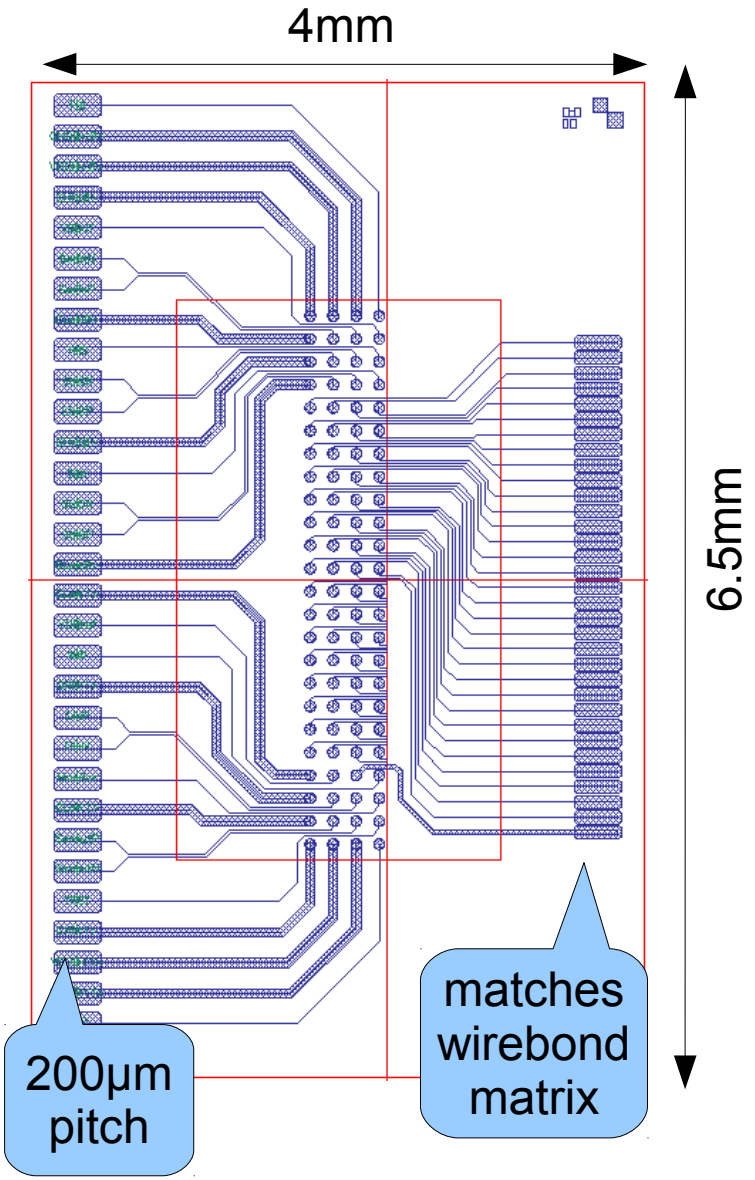
    → good assembly
- gap between DCD-B and substrate: ~110µm
- gap between DCD-RO and substrate: ~50µm

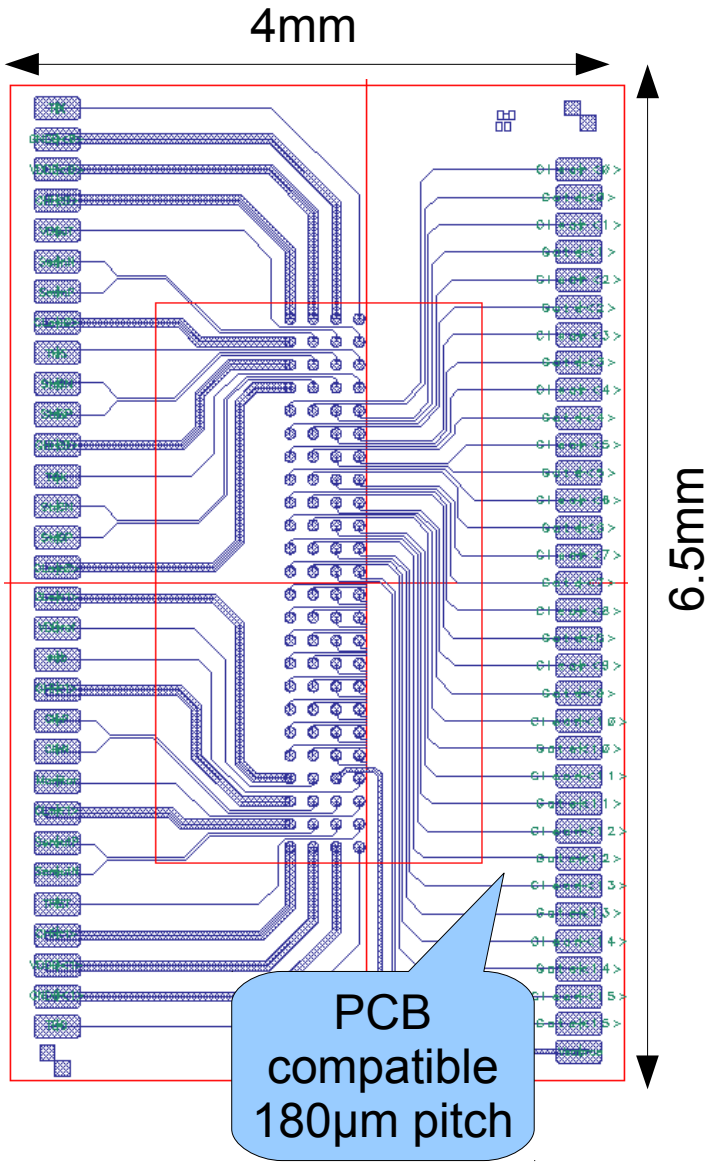


new Wirebond Adapter Designs

new Switcher WB-Adapter design

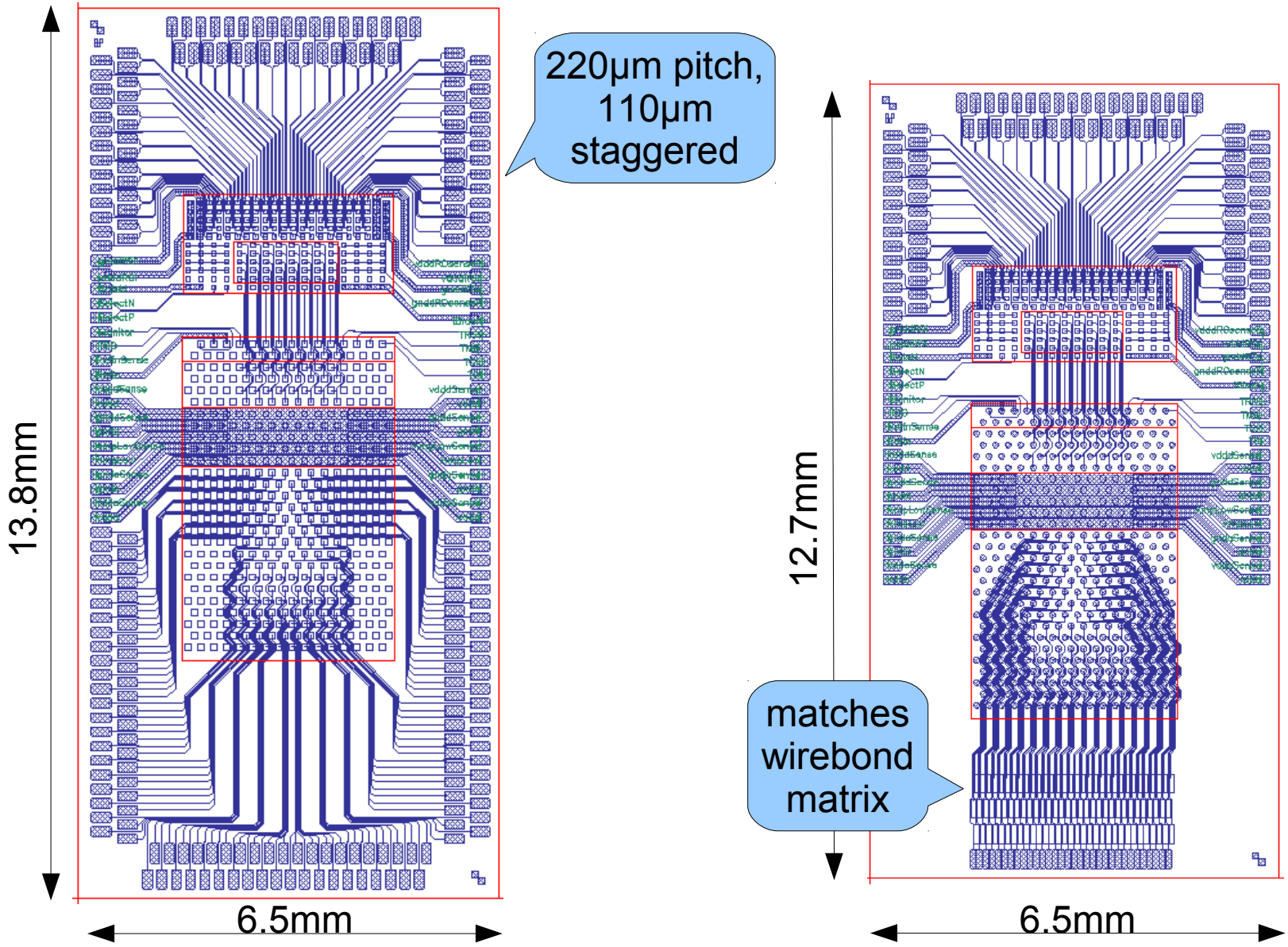
- PCB wirebond compatible pad pitch





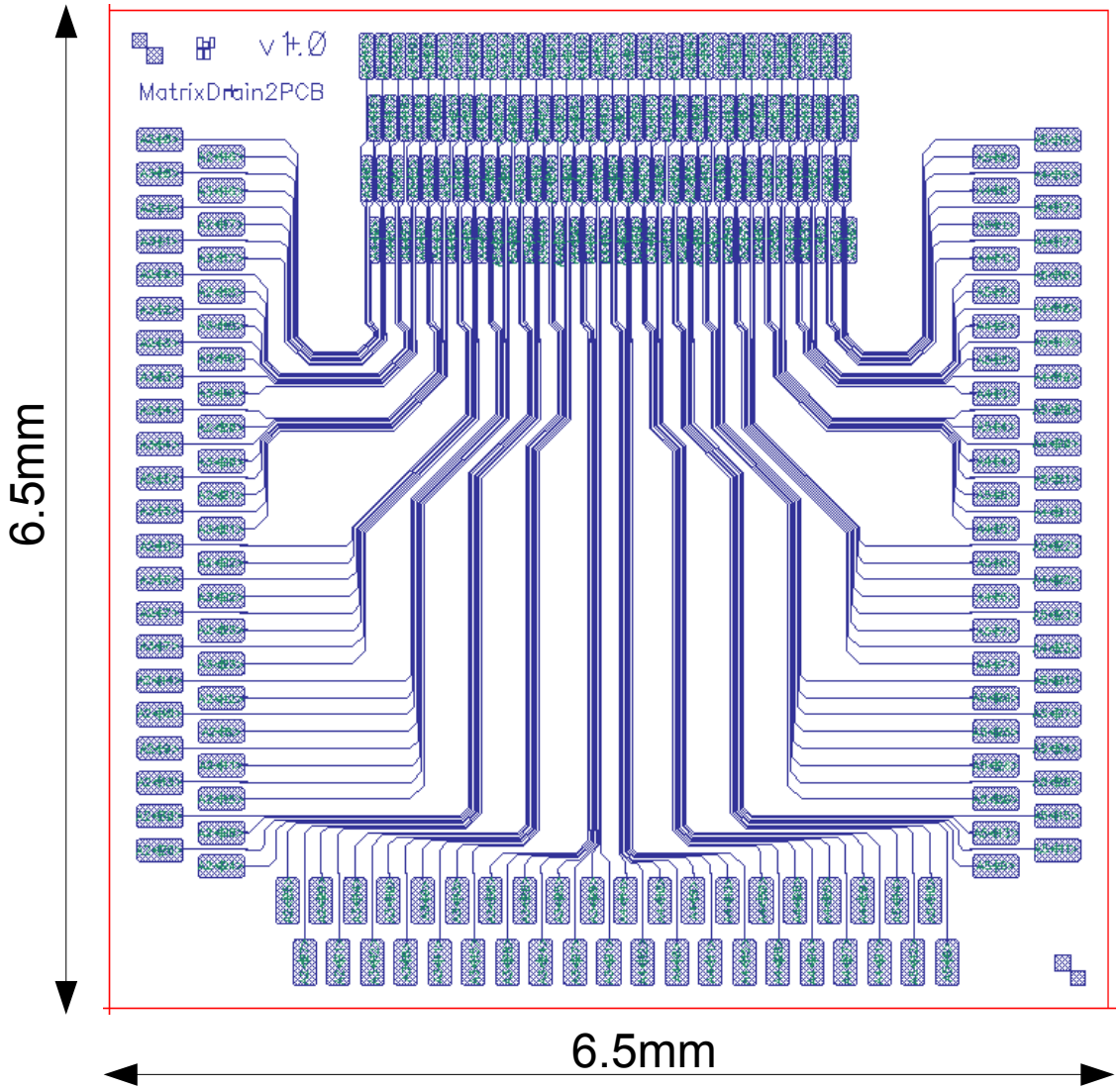
new DCD+DCD-RO WB-Adapter design

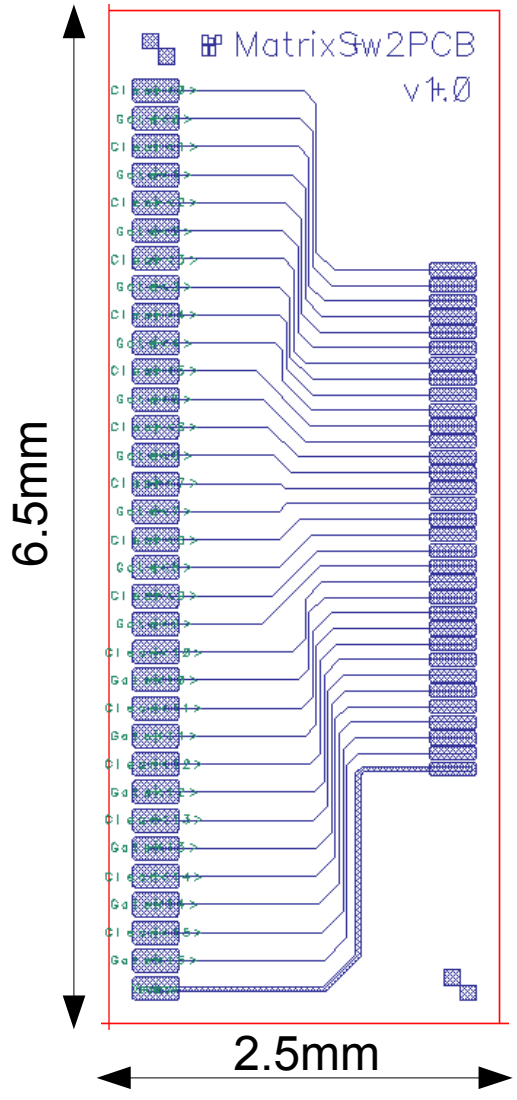
- PCB wirebond compatible pad pitch



Adapter For Matrix

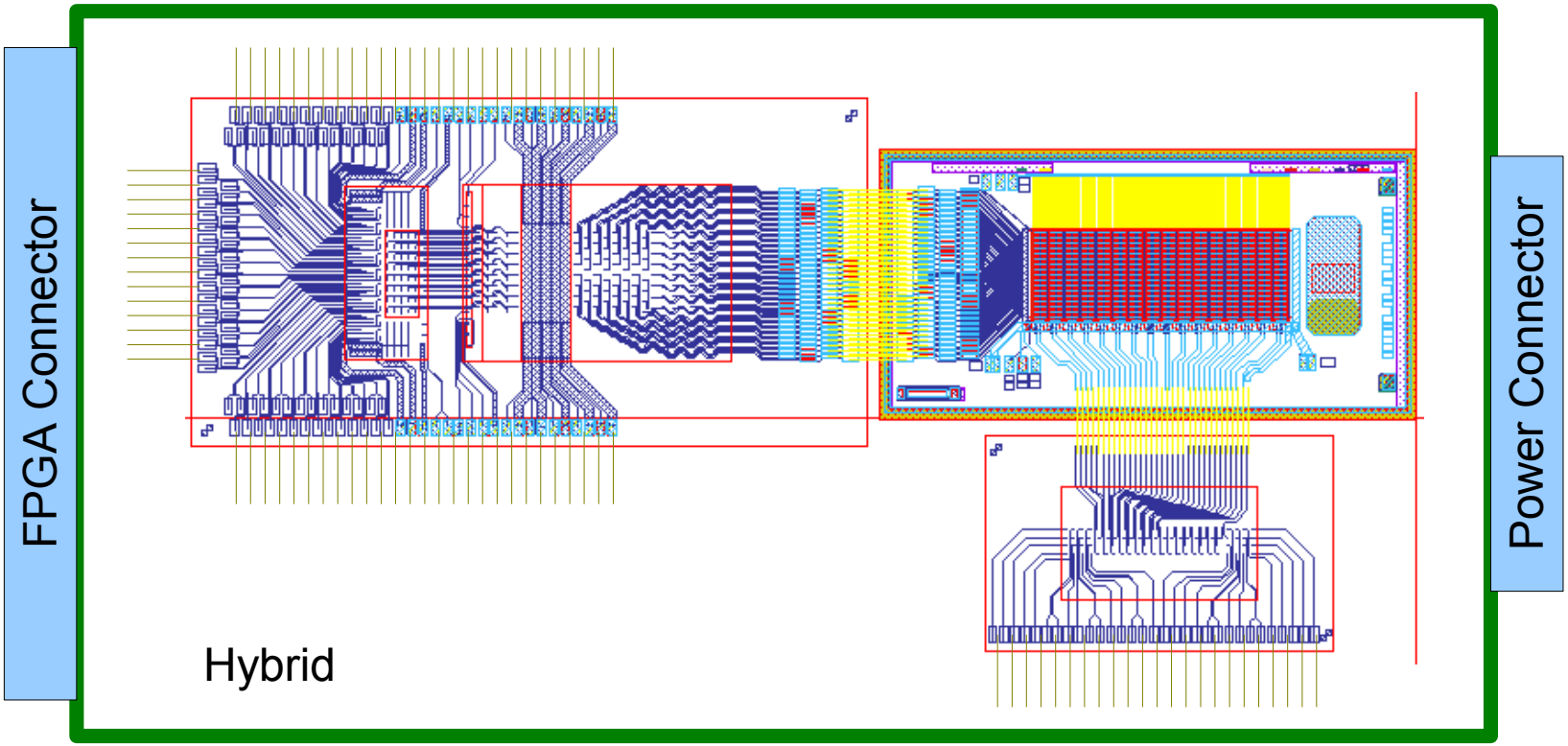
- PXD6 Matrices designed to be bonded to chips
  - pitch adapter to connect matrix to PCB





Adapter Usage Example

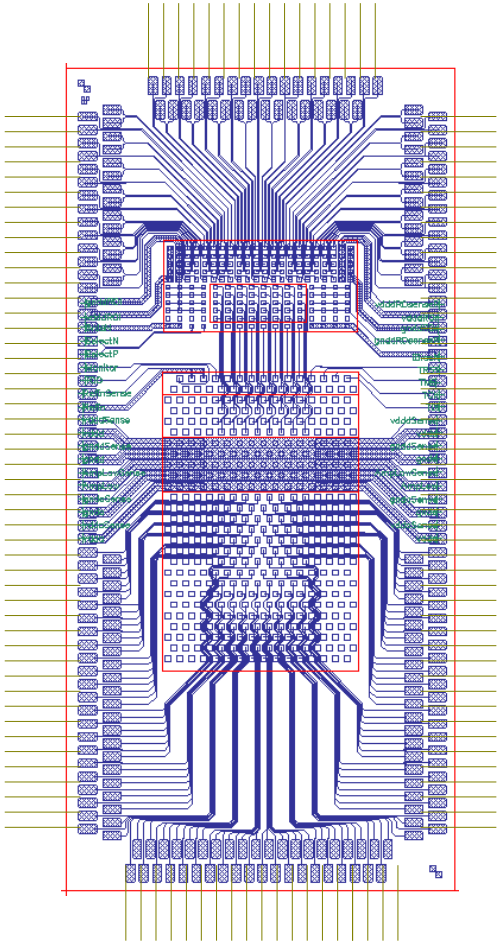
- if hybrid contains matrix, DCD-B and Switcher-B
  - like current hybrids

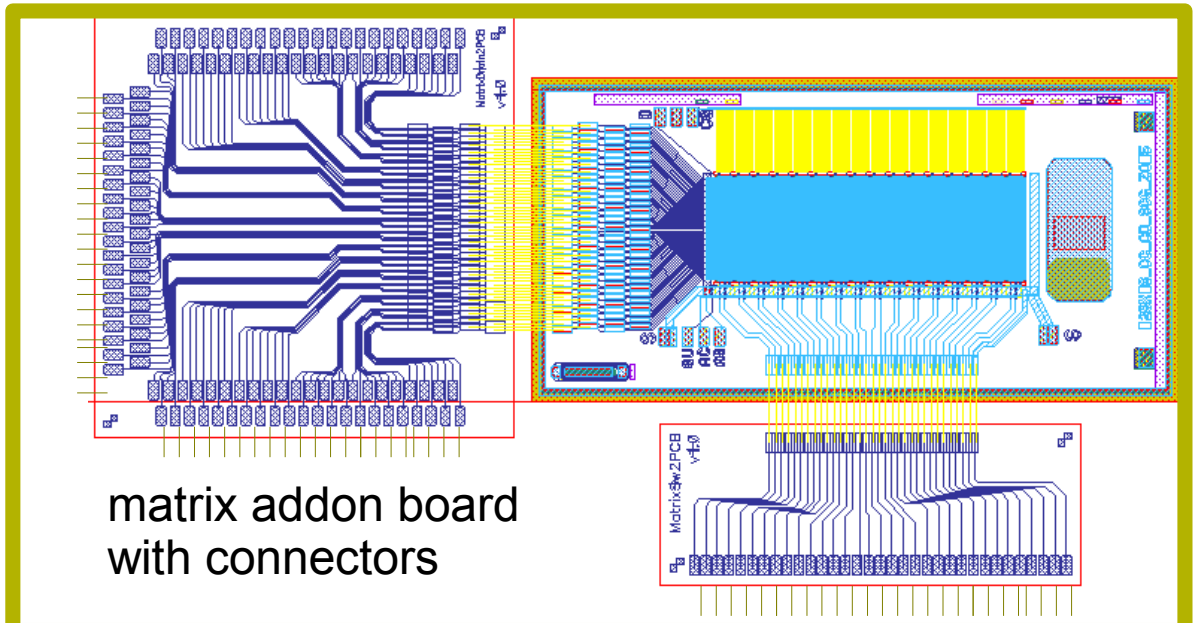


Adapter Usage Example

- if hybrid contains DCD-B and Switcher-B
- matrix addon board with connectors

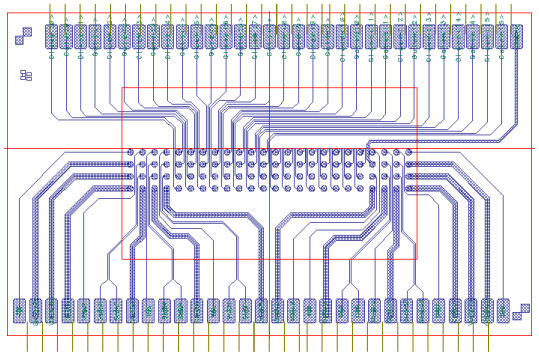
FPGA Connector





matrix addon board
with connectors

Power Connector



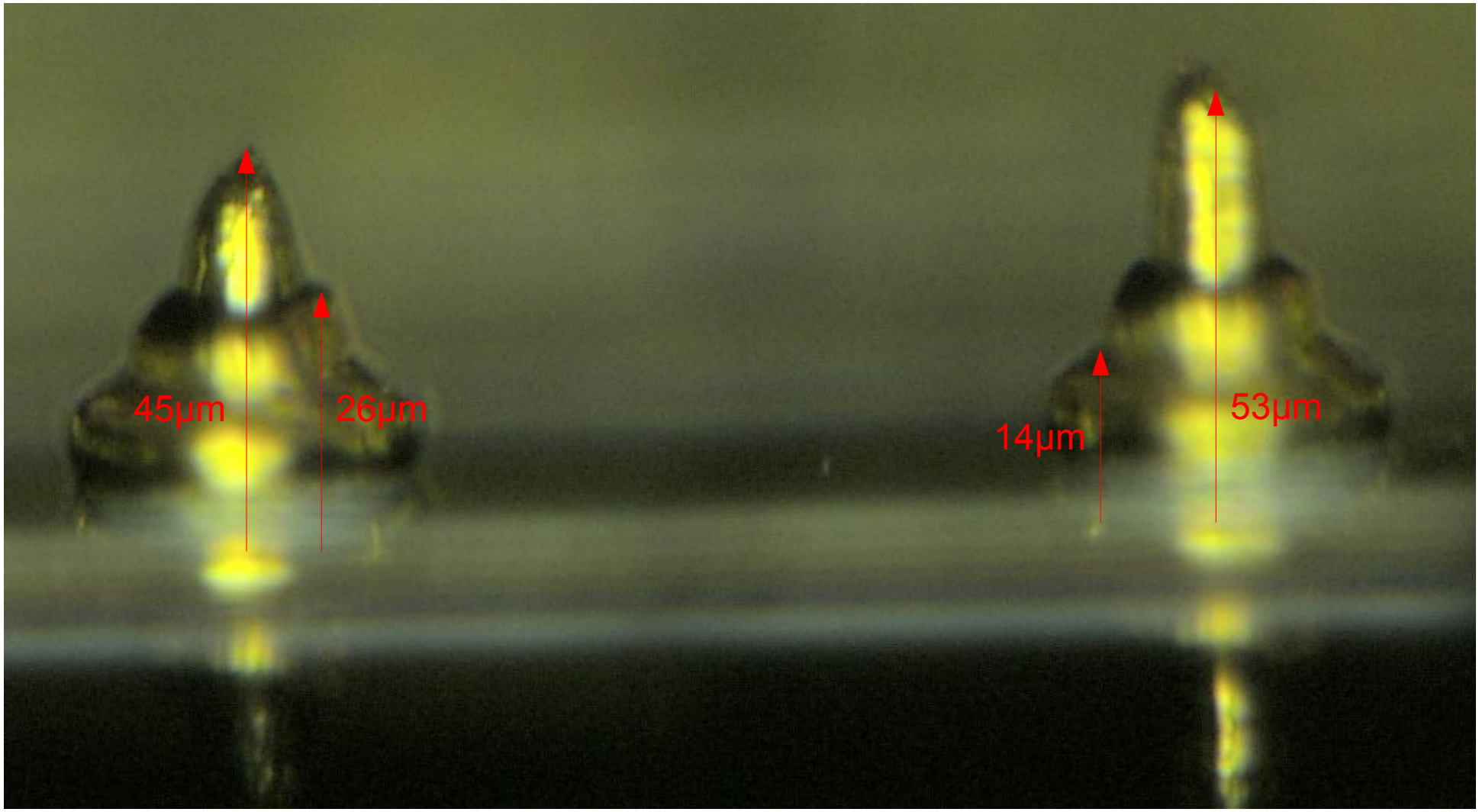
mainboard

WB-Adapter

- DCD and Switcher adapter checks
  - DRC-clean
  - LVS-check ok
- next wafer content
  - DCD+DCD-RO adapter PCB
  - DCD+DCD-RO adapter Matrix
  - Switcher adapter PCB
  - Switcher adapter Matrix
  - Matrix adapter PCB for Drain and Switcher
  - DHP standalone adapter
  - DHP + DCD adapter
  - DHP + DCD + kapton flex adapter

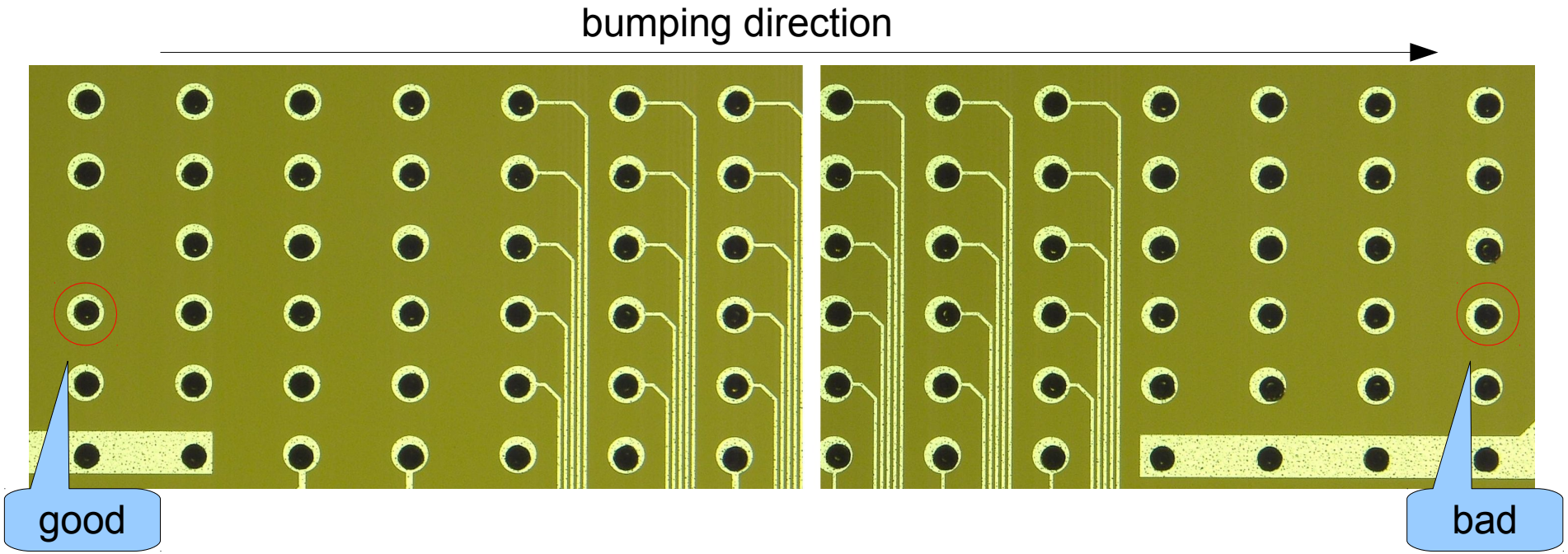
Goldstud Sizes

- Diameter: 46µm



Position Accuracy

- position accuracy of bonder limits minimum pad size
- current pad size optimal



Chip Inventory

- DCD-RO 48pcs.
- DCD-B 60pcs.
- Switcher-B 30pcs.
- WB_DCD_DCDRO v1.0 24pcs.

Thank You!