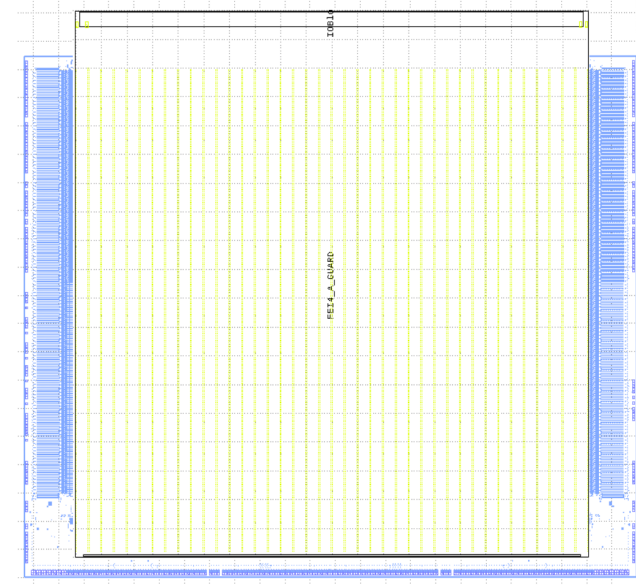
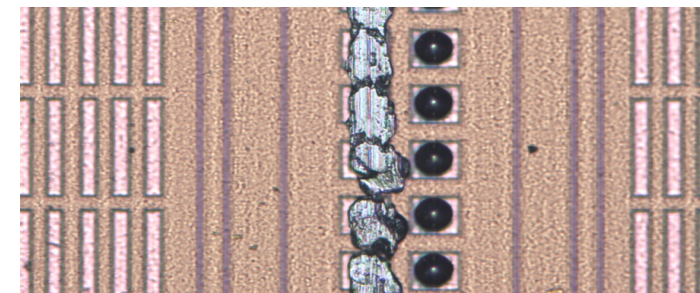


Update on IFAE Hybridization Activities

- IFAE working on DC coupled Depleted CMOS hybridization
 - HVCMOS H35demo chip studies done
 - Hybrid readout through FE-I4
 - Problem with shorted wire-bond pads
 - Plan to protect wirebond pads
 - LFCPIX studies on-going
- DC coupled to FEI4, procedure:
 - Deposit UBM on H35demo
 - Electroless Ni/Au deposition
 - Inspect UBM
 - Flip-chip to SnAg bumped FEI4B
 - Reflow
 - X-ray inspection
 - Ship bare assembly for further tests
- *If tests successful*
 - *Investigate DC and AC coupled pixels in single device*
 - *Remove bumps from bumped FEI4B*
 - *Can tune chip to chip distance?*
 - *H35demo nMOS matrix has digital signal routed to bump pad, could be testes in AC coupling mode!*
 - *Single bump deposition on FEI4*
 - *In-house (PacTech SB2 SM bumper): investigating 30um balls?*
 - *No lithography needed (cost reduction)*

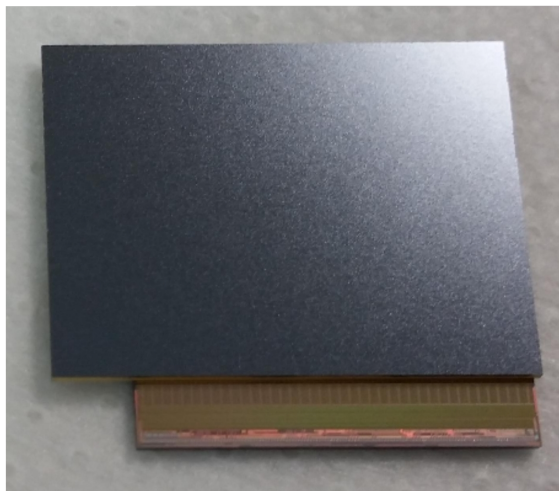
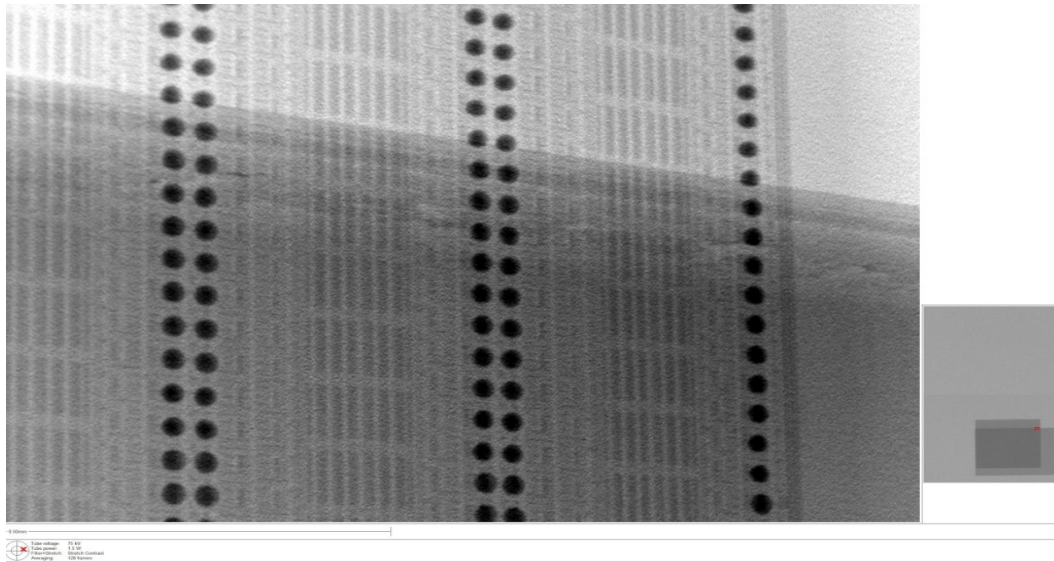


FEI4 single column bump removal tests



Previous Work on H35demo

- First H35demo device was successfully assembled:
 - Good UBM deposition (4-5um Ni)
 - Flip chipped also with good yield

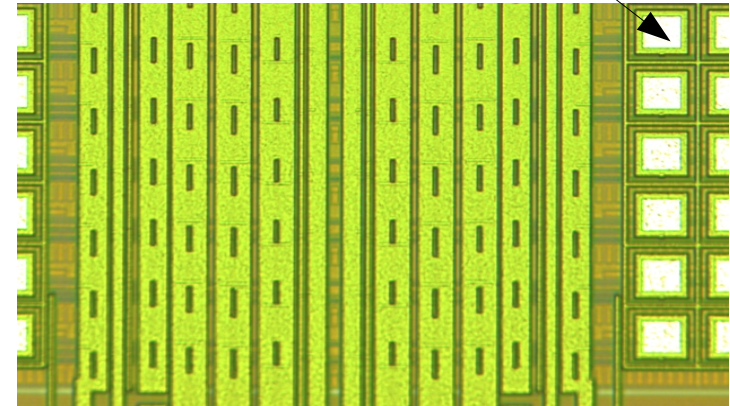


Unfortunately we chip placed off centered!

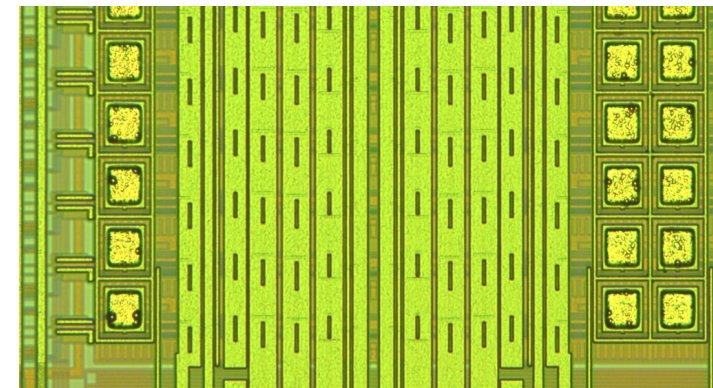
- Device sent to BNL for mounting
- But difficult wire-bonding

SG - AIDA hvcmos hybridization meeting

H35 demo pads



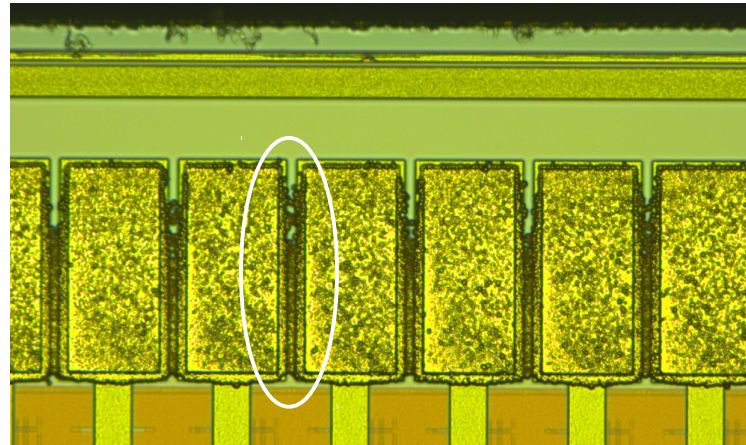
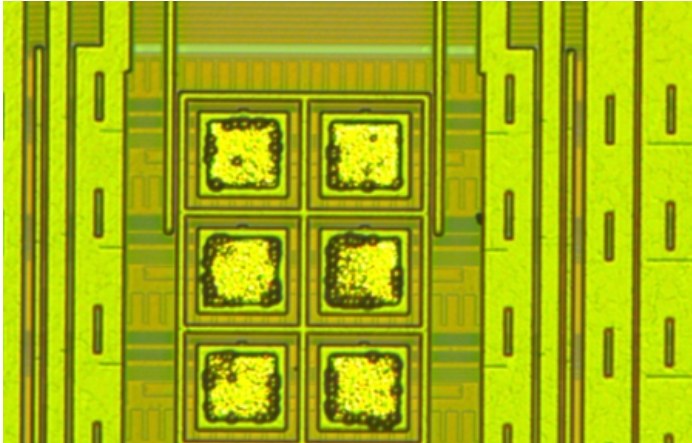
Successful UBM on first device!



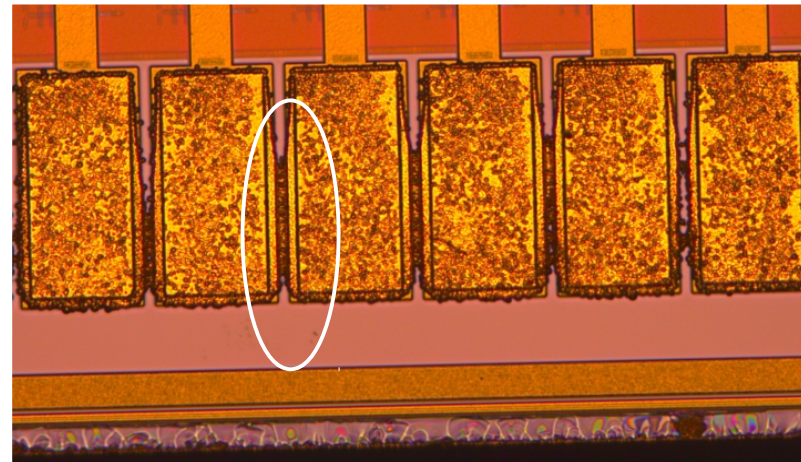
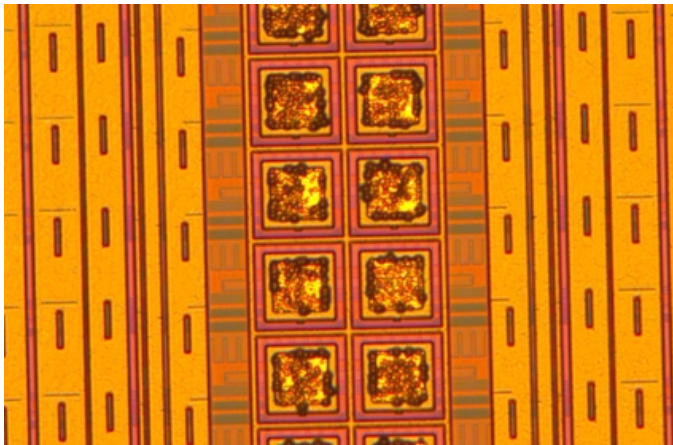
H35 demo pads after UBM (Collaboration with E. Cabruja, CNM)

Previous Work on H35demo

- Further UBM to produce a second device (centered) failed:
 - UBM shorts wire bond pads!



4.5um Ni



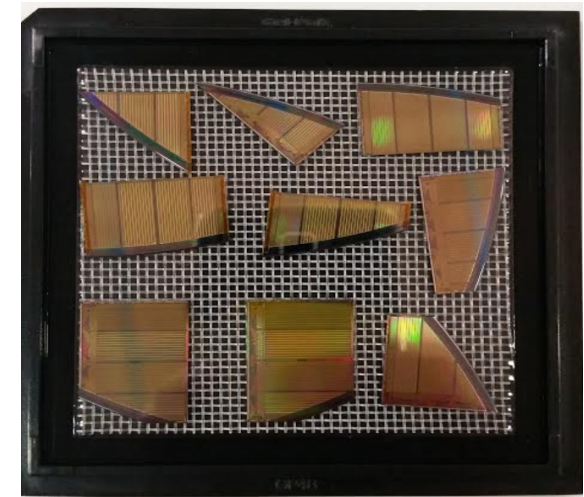
2.5um Ni

- Confirmed by probing that pads shorted
- Distance in H35demo wirebond pads 10um, between pixel pads 24um (TBC)
- Will try with 1.5um Ni, also can cover wirebond area

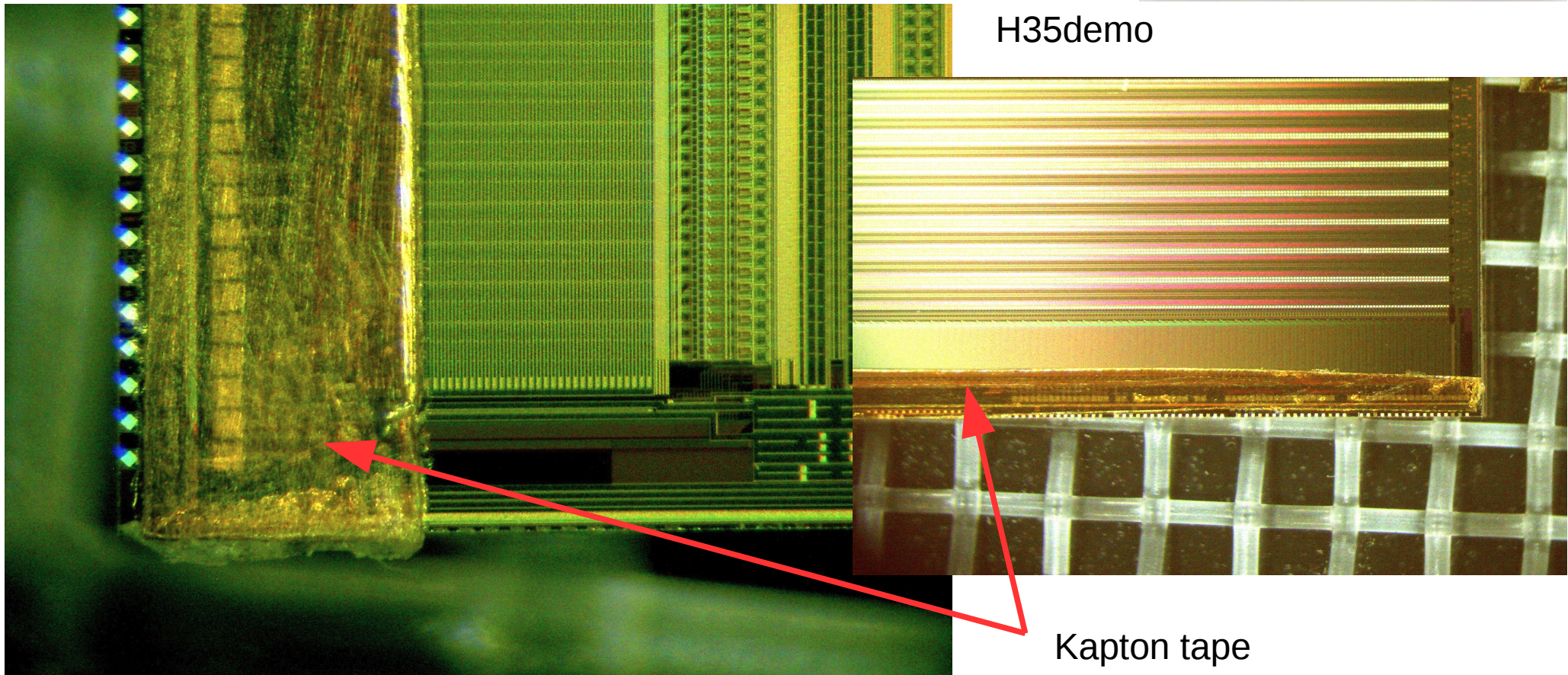
Update on IFAE Hybridization Activities: H35demo

Investigated protection of wire-bonding pads during UBM:

- Wax protection (still to be done)
- Kapton tape protection
 - Done on H35demo mechanical samples (diced chips)



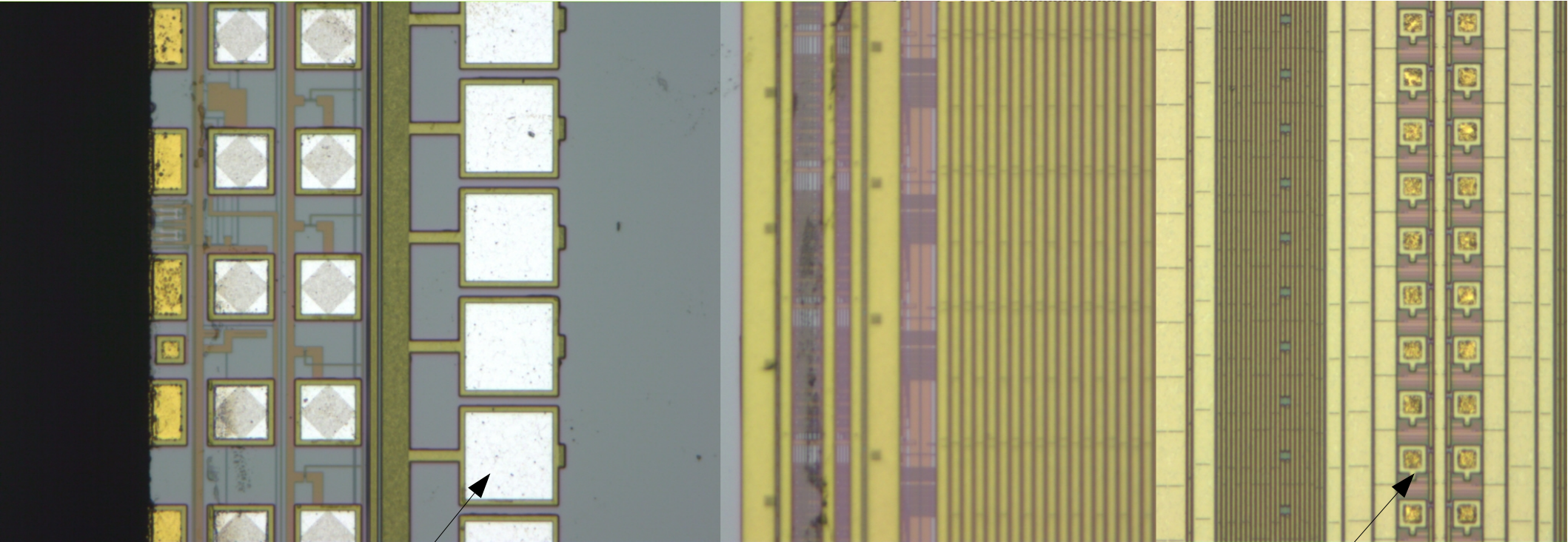
H35demo



Kapton tape

Update on IFAE Hybridization Activities: H35demo

After removal of Kapton tape, the wire-bond pad area was free of NiAu, while the pixel pads were correctly Ubm'ed.



No UBM deposited on wire-bond pads

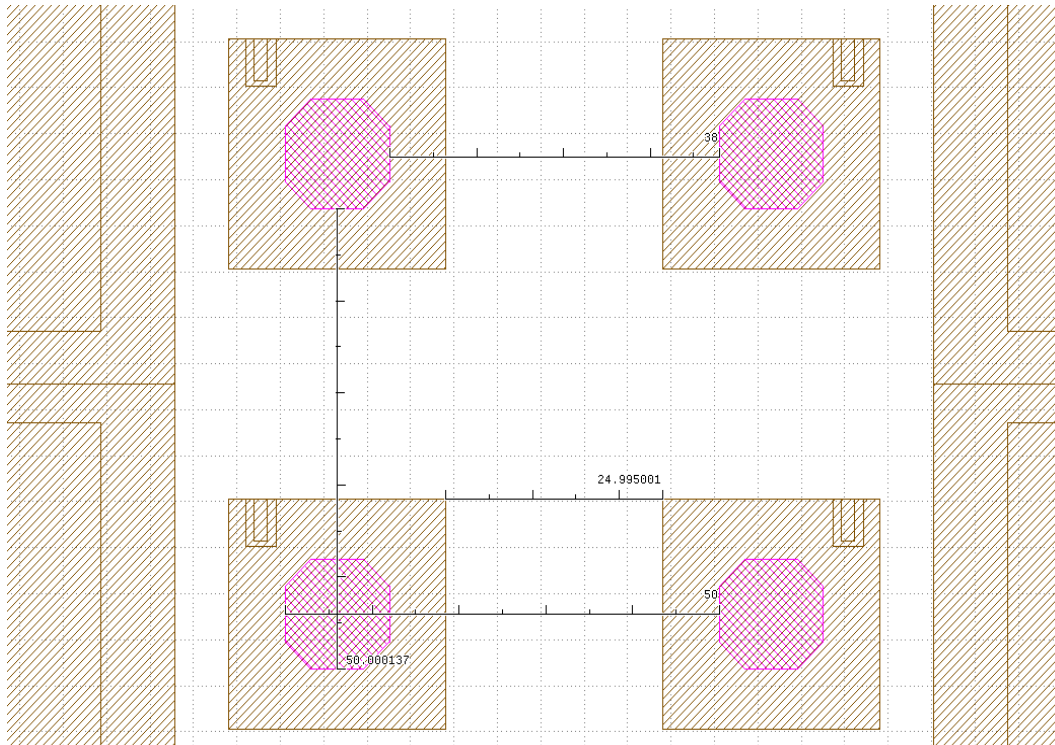
UBM on pixel pads

- Plan to UBM two full H35demo chips
- If UBM is good, flip-chip to FEI4
 - Idea is to center FEI4 on H35demo (covers central analog matrices)
- Schedule: late August (tentative... unavailability of UBM in “summer vacation”)

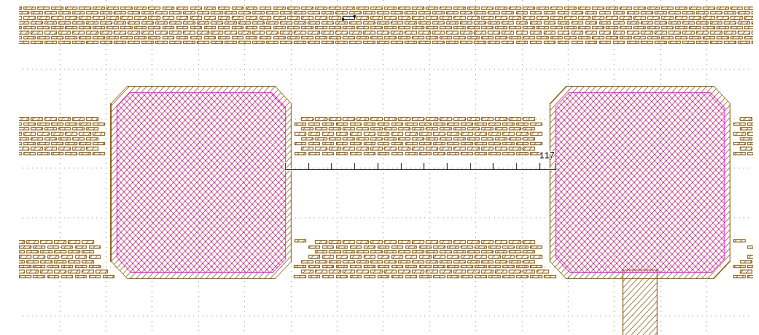
Older Results follow

Update on IFAE Hybridization Activities: LFCPIX

LFCPIX



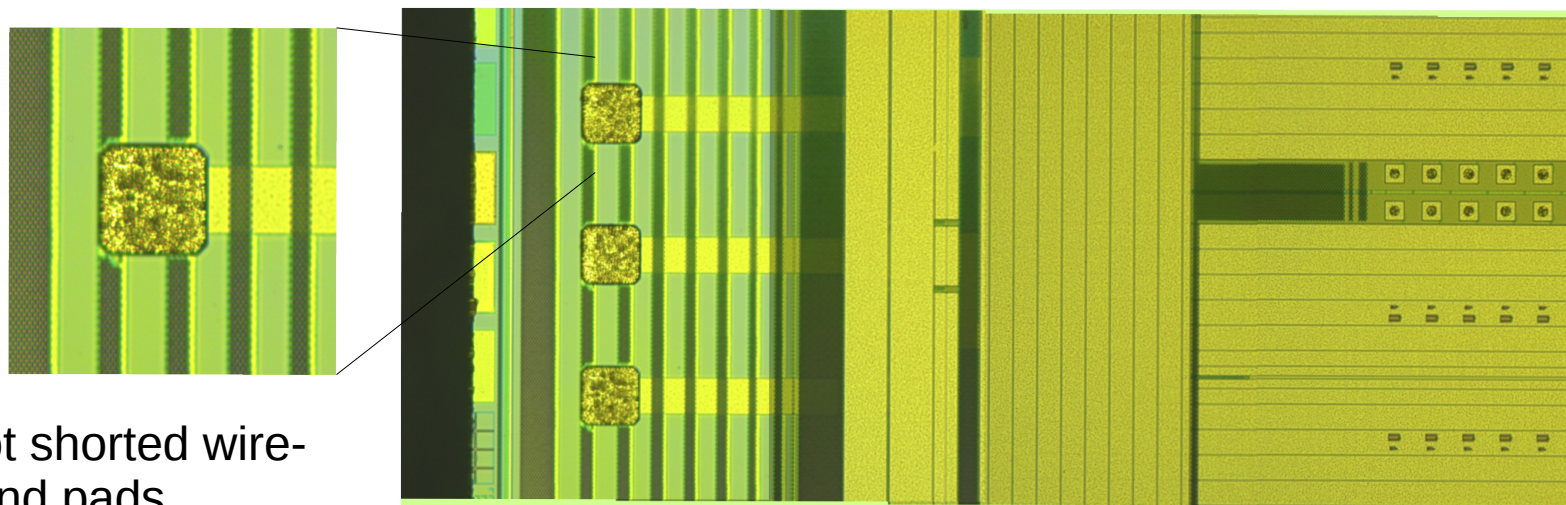
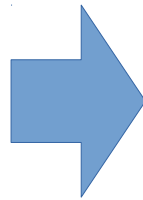
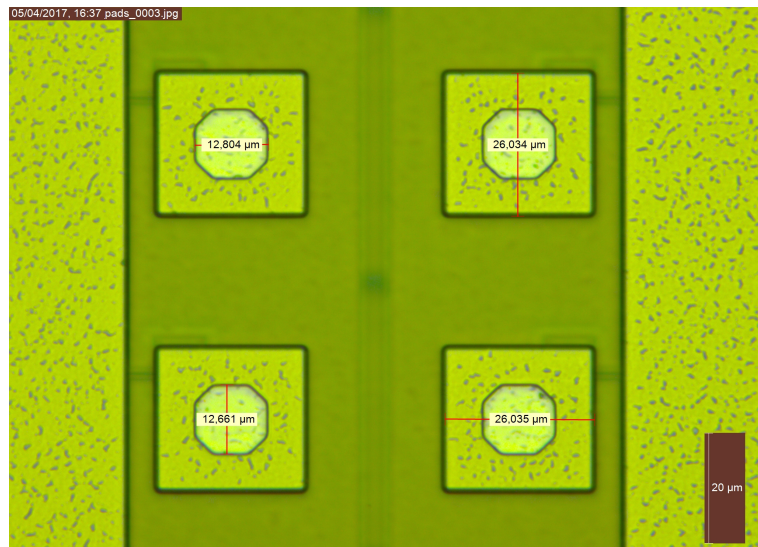
From Tomasz Hemperek (Bonn)



- Pixel bump separation ~37um
- Wirebond pad separation ~110um
- Do not expect short problems!
- Bonn sent to IFAE several (10) chips (V1 and V2)
 - 200 um thick

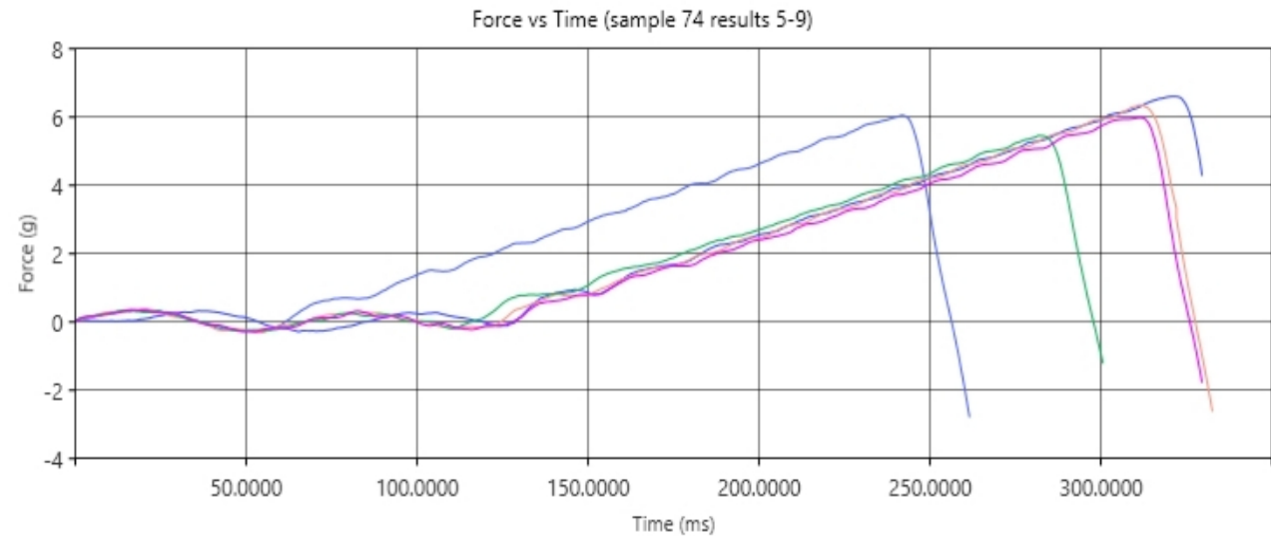
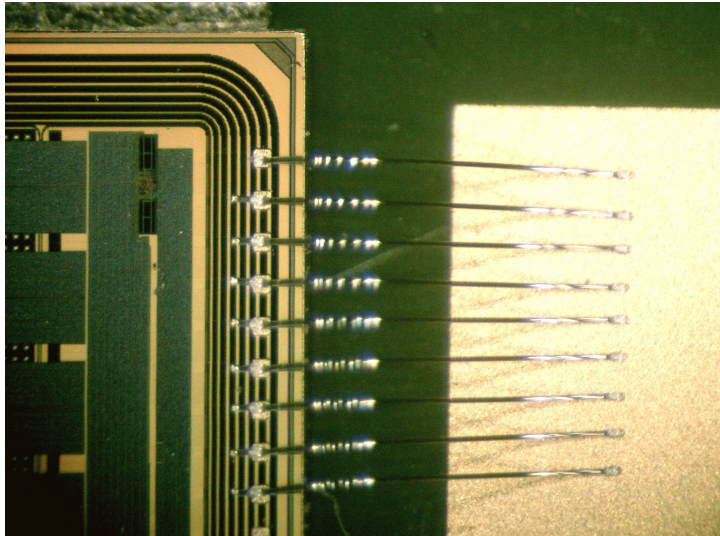
Update on IFAE Hybridization Activities: LFCPIX

LFCPIX Ni/Au electroless UBM results



Update on IFAE Hybridization Activities:LFCPIX

LFCPIX

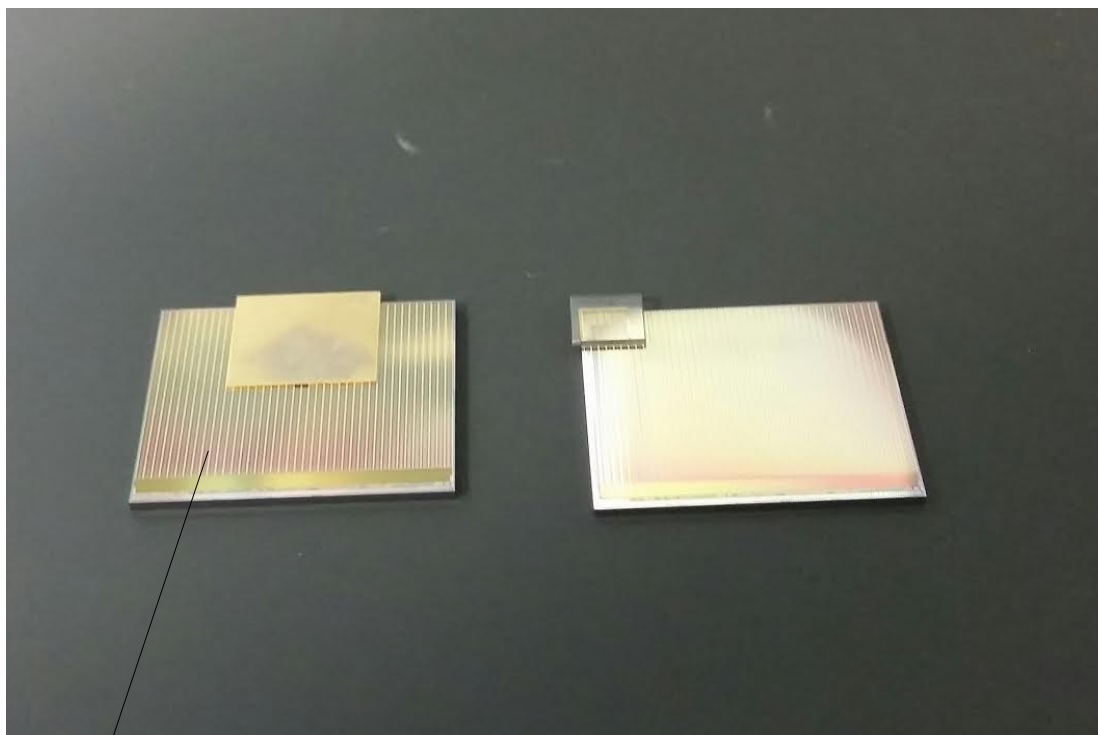


Since UBM deposits on wire-bond pads:

- Tested quality of wire-bonding after UBM
- Measured 6g/wire (reasonably good)

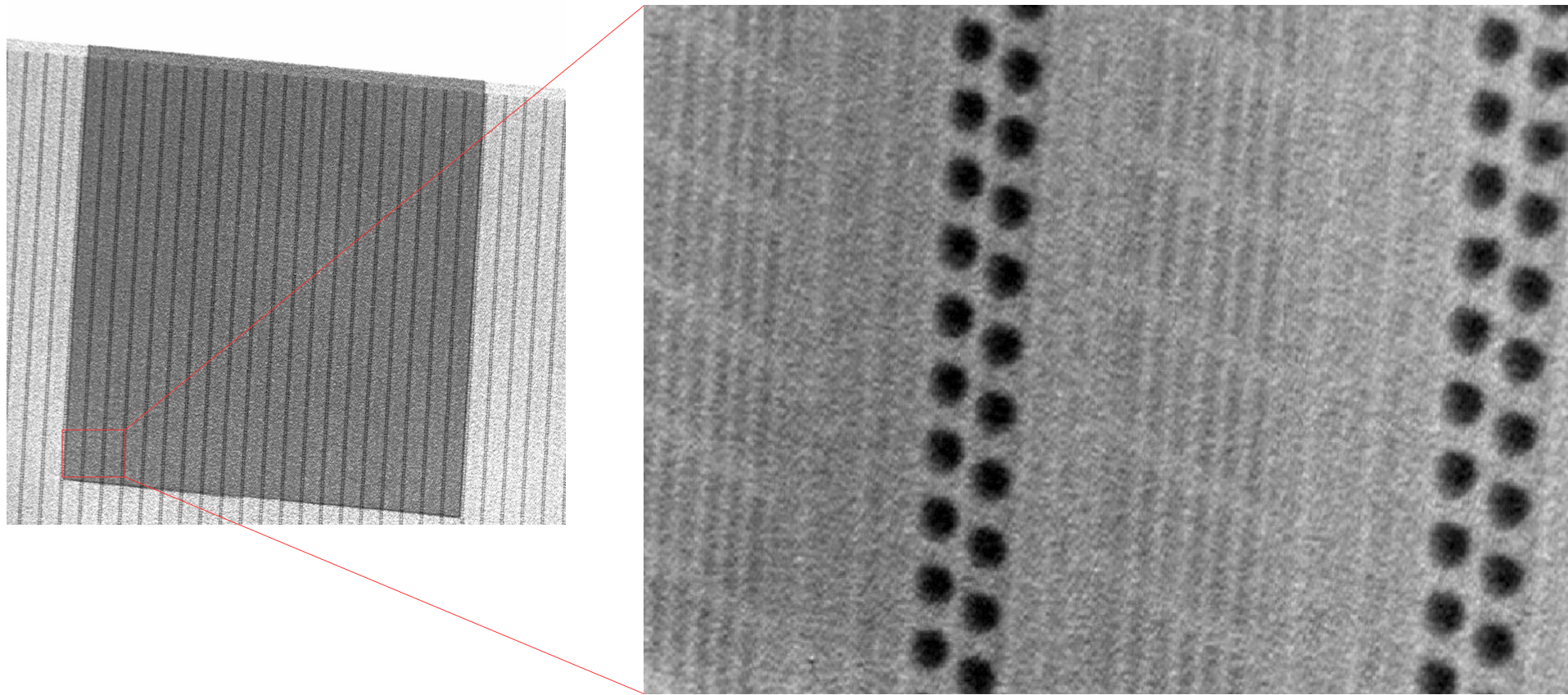
Update on IFAE Hybridization Activities: LFCPIX

- Flip-chipped on V1 LFCPIX sample
- Device centered to facilitate PCB mounting and wire-bonding



LFCPIX shipped to Bonn

Update on IFAE Hybridization Activities: LFCPIX



LFCPIX: X-ray inspection of 1st sample indicated good bump connection

Update on IFAE Hybridization Activities

- First bump bonded (DC coupled) of H35 demo to FEI4B ROC
 - Electroless UBM at CNM, flip-ship at IFAE
 - Good assembly process, but off center placement
 - Good first results difficult to reproduce
 - Problem with UBM
 - Will try covering the wire-bond pads
 - Have to double check that wire-bonding pads are not shorted in 1st prototype!
 - Expect to solve the problem by reducing UBM thickness or by covering wirebonds

- LFCPIX
 - Larger distances between pads/bumps should avoid short problem
 - Good UBM results
 - Flip-chip successful
 - Sample shipped to Bonn

- **Next steps:**
 - Investigate wire-bond pad protection during UBM of H35demo
 - Investigate AC and DC coupled devices (for H35demo target nMOS matrix)
 - Flip-chip more LFCPIX devices