SMD/Testing/Rework at IFIC

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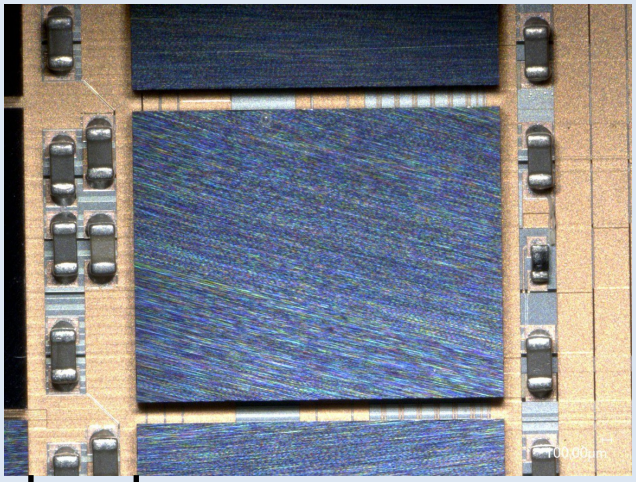
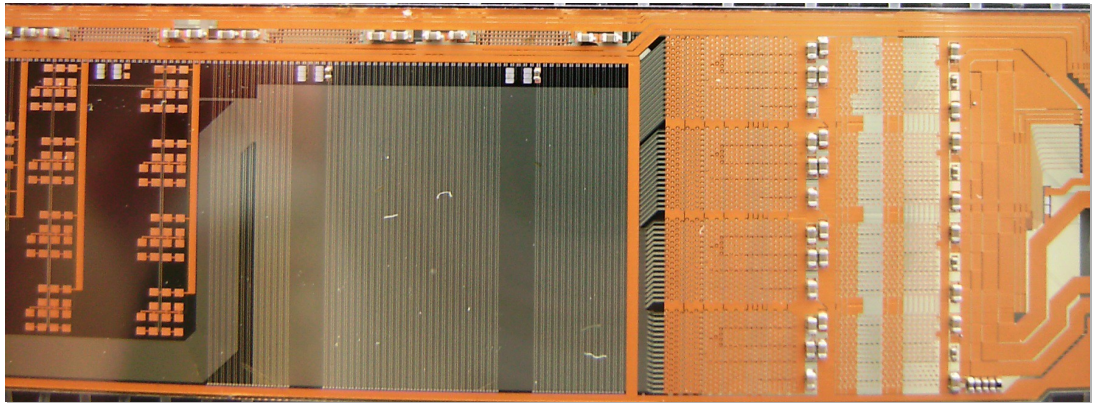
Outline

- ✓ SMD placement
- ✓ Rework
- ✓ Testing: probe needle card

SMD Placement: a bit of history

Finetech succeeded with some E-MCM



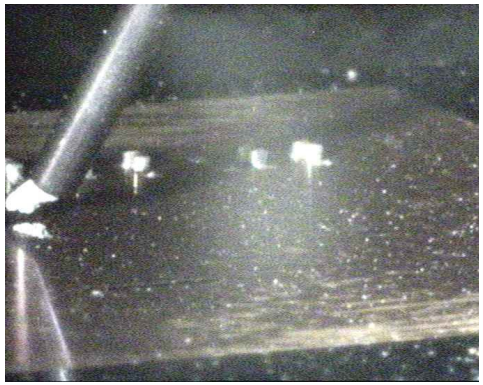


NTC: Nano-photonics Techonogy Center
They populated a whole E-MCM without chips

NTC method works but it is “manual”

We want to add some automation.

Main problem is dispensing uniformly the solder paste.



Problems with the solder dispenser since it hides the pad

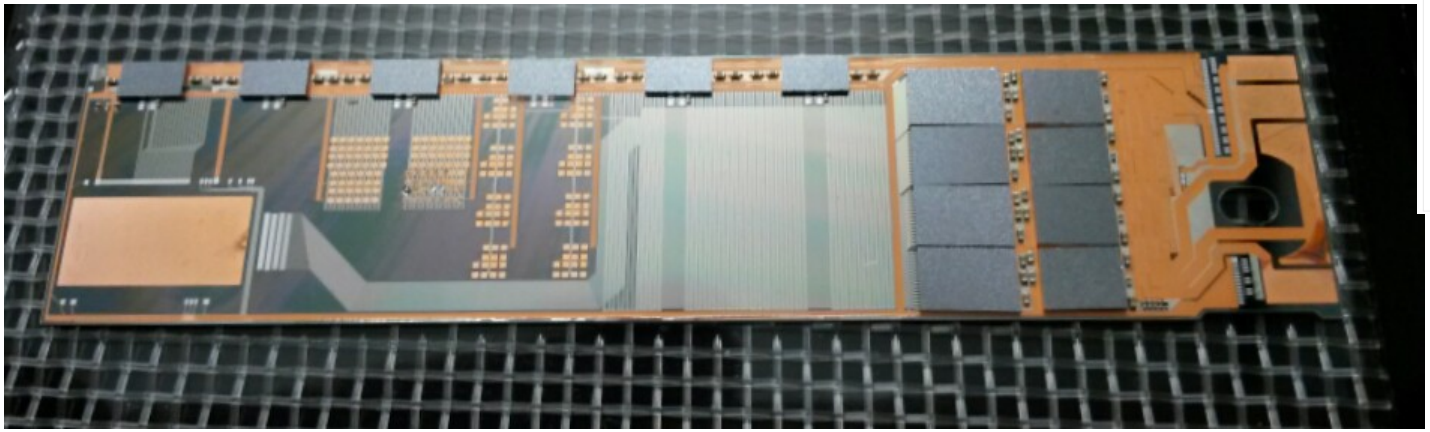
To remedy this, place a syringe on the flip-chip machine chip placing tool. Both pad and “solder ball” visible

SMD placement: plans

- ✓ In Dec. 10th, 2013 we had a meeting at IFIC were we discussed some of this issues.
  - The procedure that we agreed is:
    - Dispense solder paste in a dedicated machine (uniformity and repeatability),
    - move module to the pick-and-place machine and, finally,
    - reflow in an oven reducing copper oxide
- ✓ We decided to explore two routes for the solder placement
  - PacTech machine @ NTC (solder ball placement + laser reflow in one step)
    - Unfortunately the laser was broken and the new one was received last Friday
    - This can place the solder balls with high precision and uniformity
    - Need to check that works on copper and with the ball sizes we need
  - Make tests with the Martin dotliner machine
    - A fully automatic solder paste and adhesive dispenser

Martin Dotliner

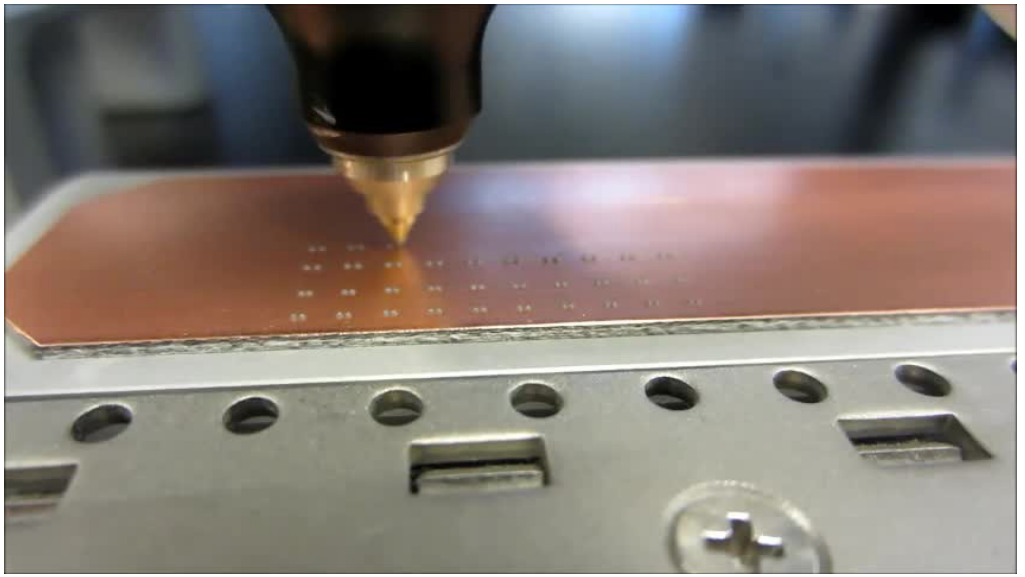
E-MCM module sent to Martin in Germany to see if they can do it.
The module has silicon slabs with the dimensions of the chips glued on it



First tests on a copper foil before jumping into the module.

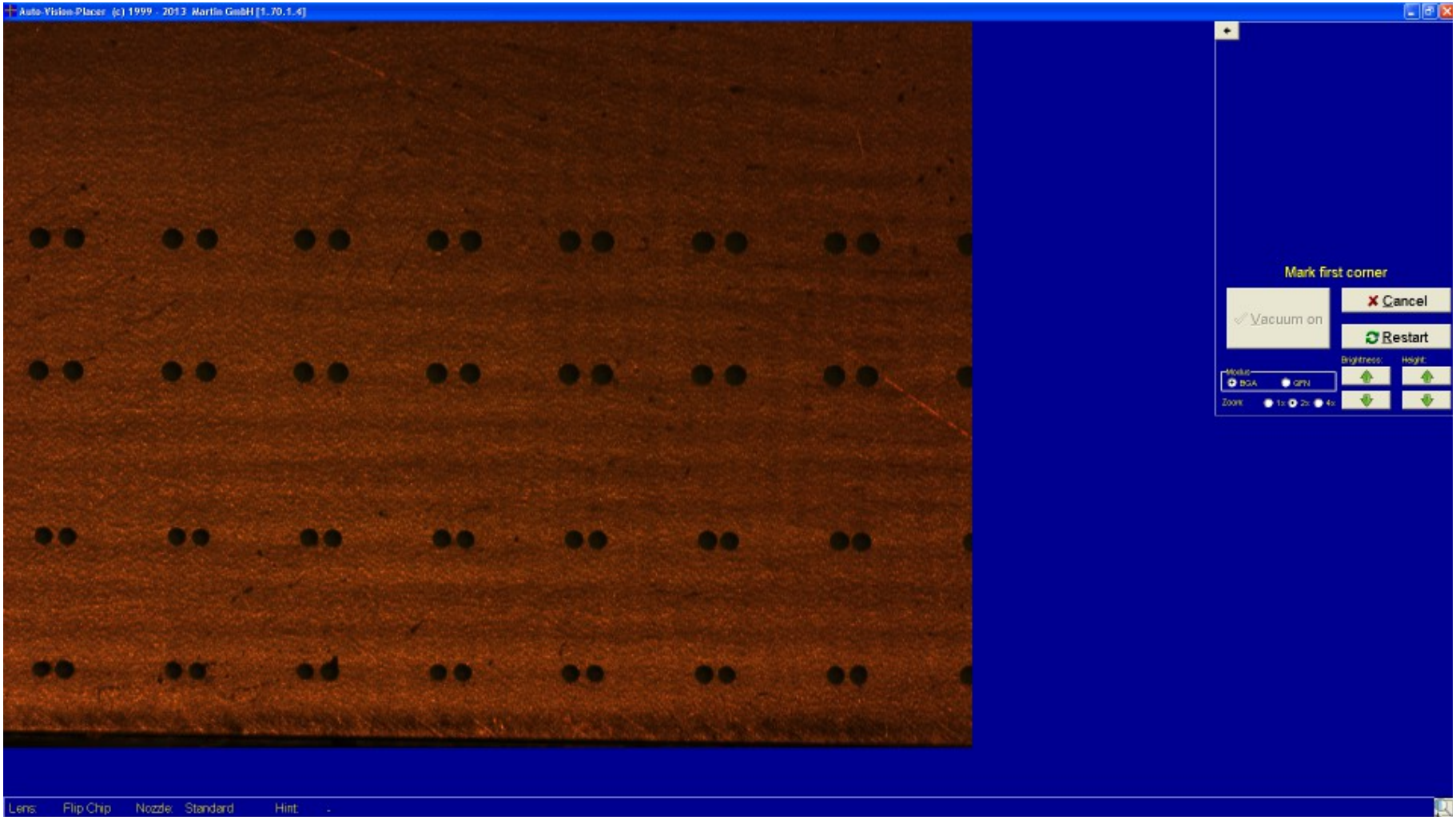
Small balls are on 01005 SMD pads

Have to check which parameters can we play with, like minimum separation between dispenser and module



See the video: https://www.dropbox.com/s/ncj2p4vaznm7o0w/martin-dotliner-en-accion.mp4

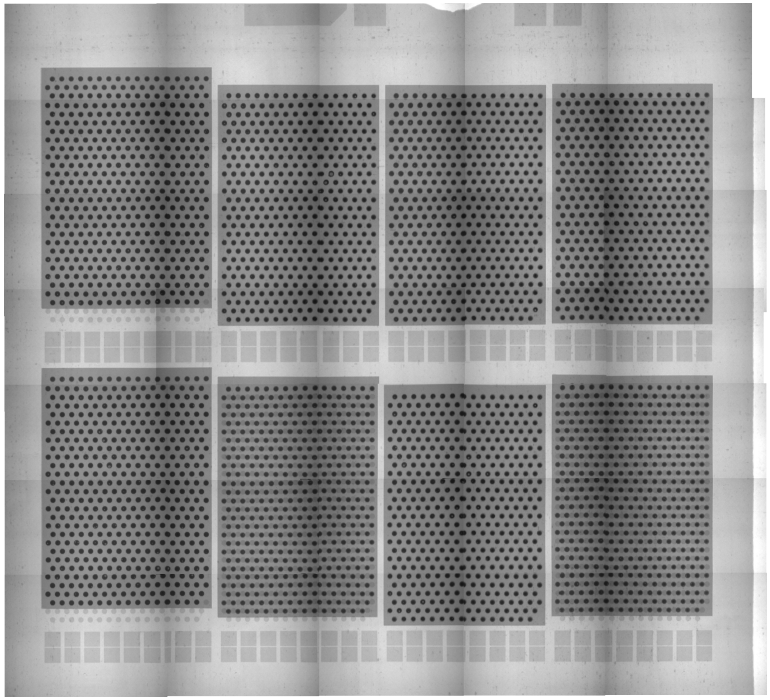
Dotliner



Distance between needle and surface is 100 µm.
It looks OK. Let's see how they manage with the e-mcm.

Rework

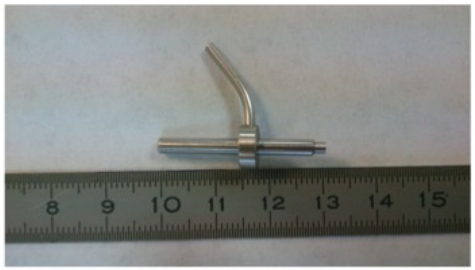
- ✓ Not much progress since we did not have flux-less samples with bump-bonded chips
  - Test chip removal and bonding a new one
- ✓ Have to see whether a cleaning of the surface is needed after chip removal
  - In preparation for the worst case a special tool is being designed to remove the remaining solder paste
- ✓ Now we have an end-of-module with 8 chips bump-bonded.
  - Should start setting up the procedure with this

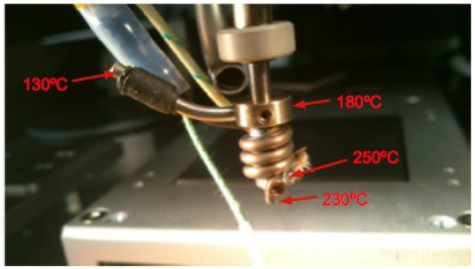


Rework

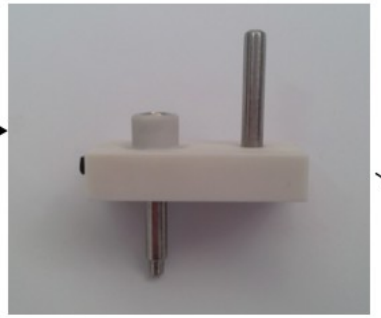
Test with old CNM end of module samples/Hopefully not needed

- First attempts to clean the solder were not very encouraging:





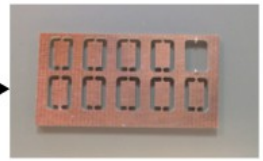
Thermal problems …



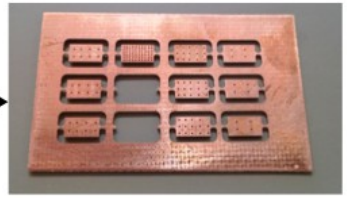
Adhesion of solder too high.
The nozzle hole too big …

Inserted an Hypodermic needle in the suction nozzle

We'll try a 3D printer nozzle, 0.2mm hole



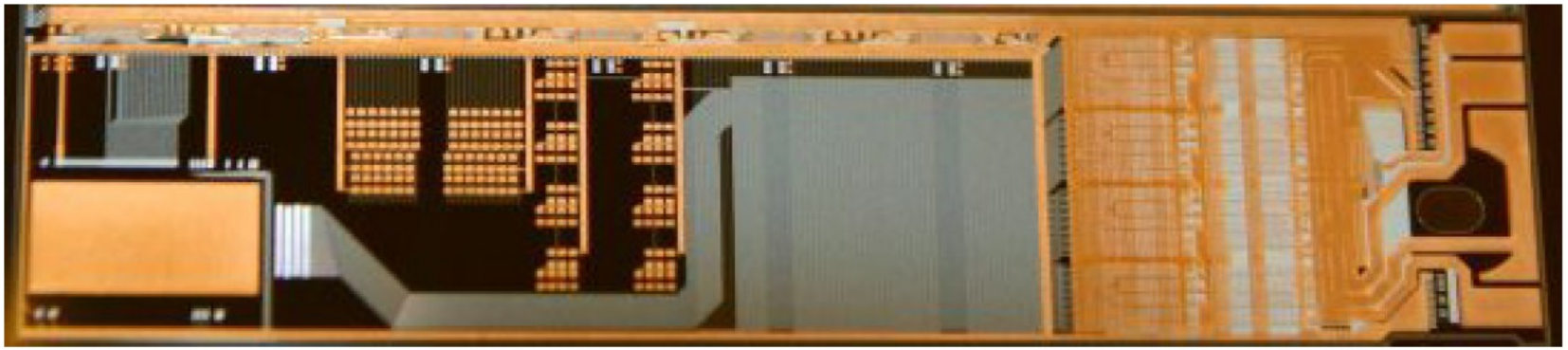
Desolder by capillarity: copper braid.
Together with flux, the best results up to now



Trying a copper surface with the same size of the device. We may try other metallization with better wetting performance

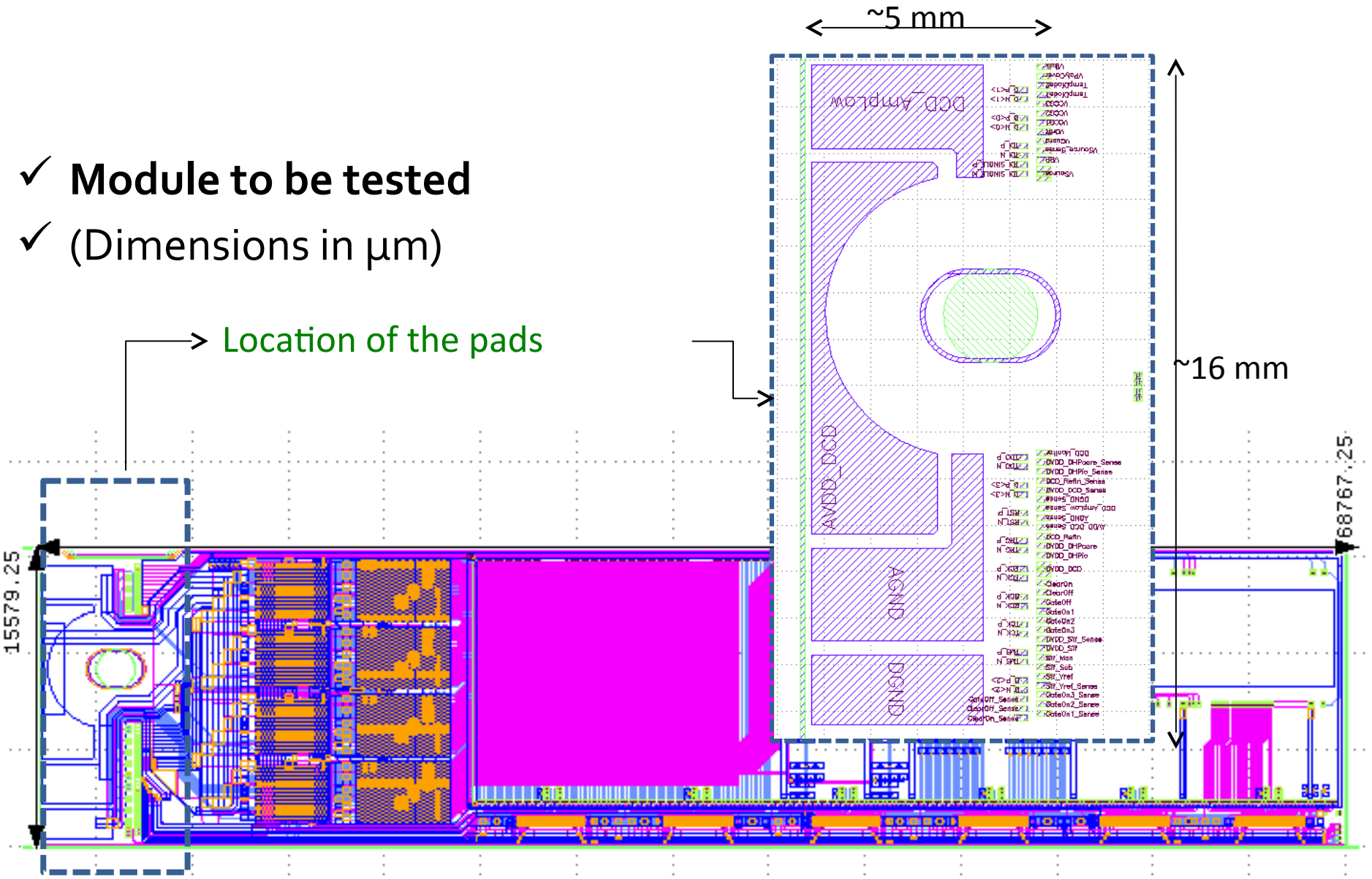
Probe needle card

- ✓ Electrical module (EMCM):
  - A probe-card for the EMCM is to be built in order to prove that testing with a probe-card is feasible
  - The pad layout is similar, but not equal to the final module. So this probe-card would just be a proof of testing concept.
  - A probe-card will be needed in a couple of months from now for the new e-mcm

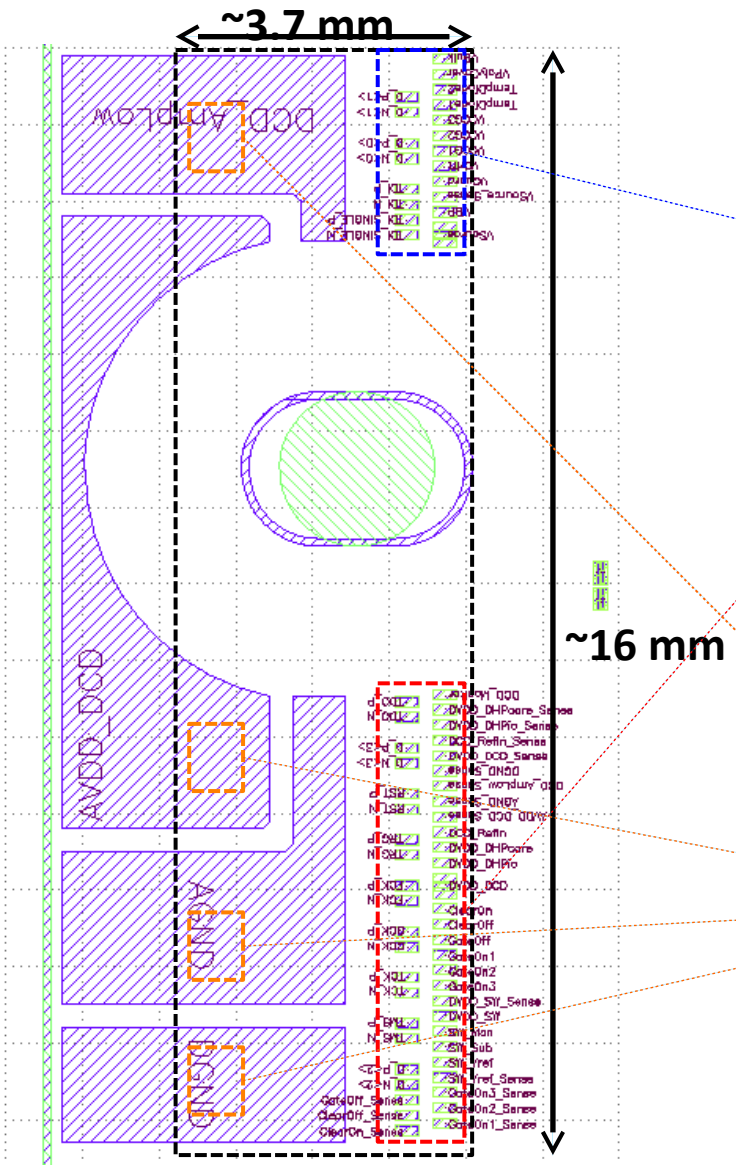


E-MCM

- ✓ **Module to be tested**
- ✓ (Dimensions in µm)

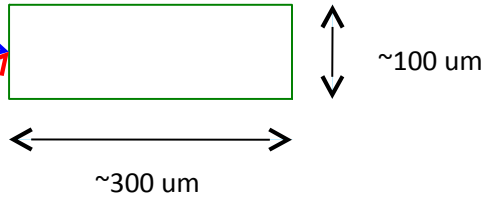


Dimensions: effective area for needles

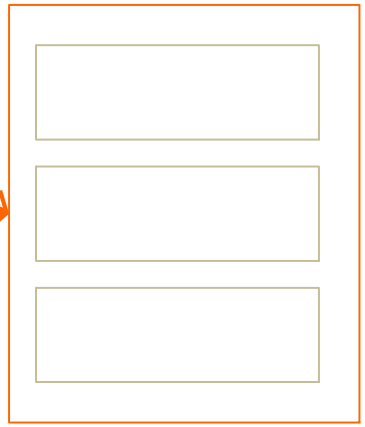


Pad size:

- In this two areas we have single Al pads:

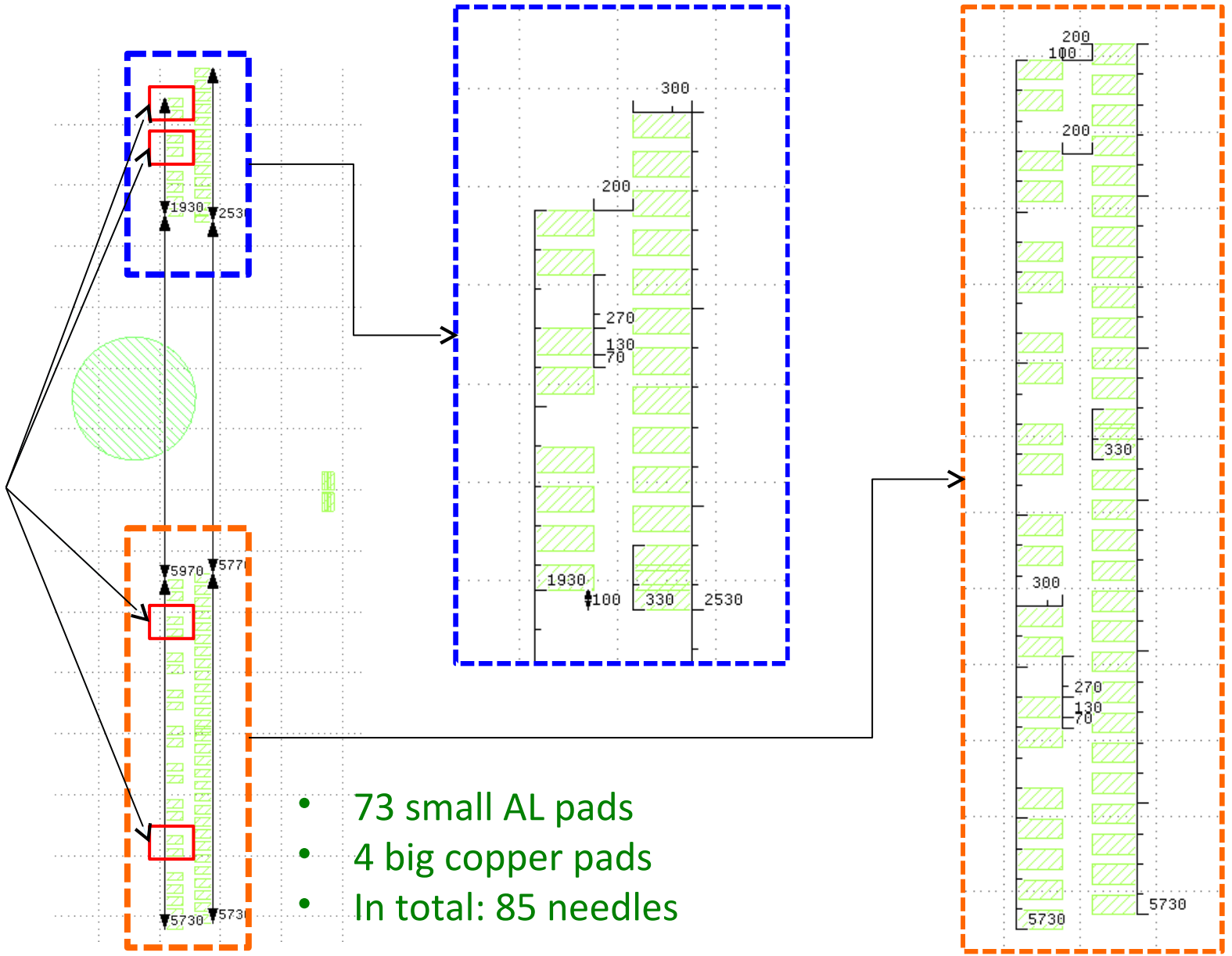


- In this areas we have big copper lands.
- We will put **>1 needles** in some pads to cope with high currents .



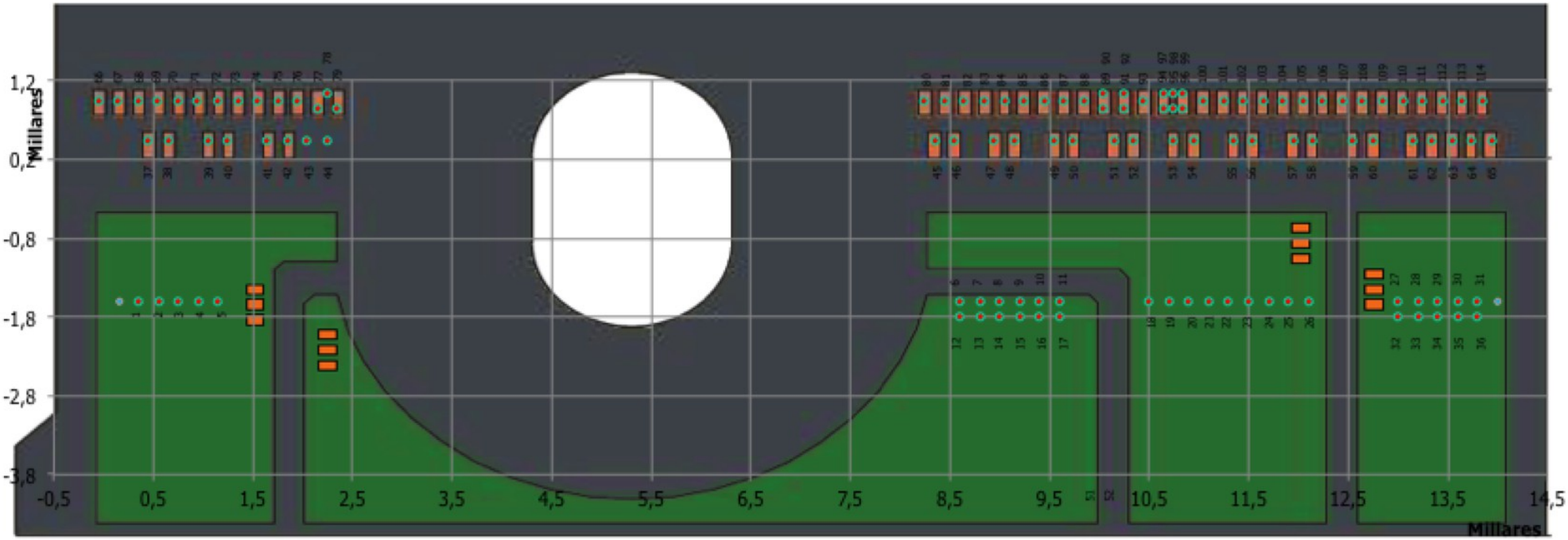
Dimensions (µm)

Hi speed (~2Gbps) differential lines

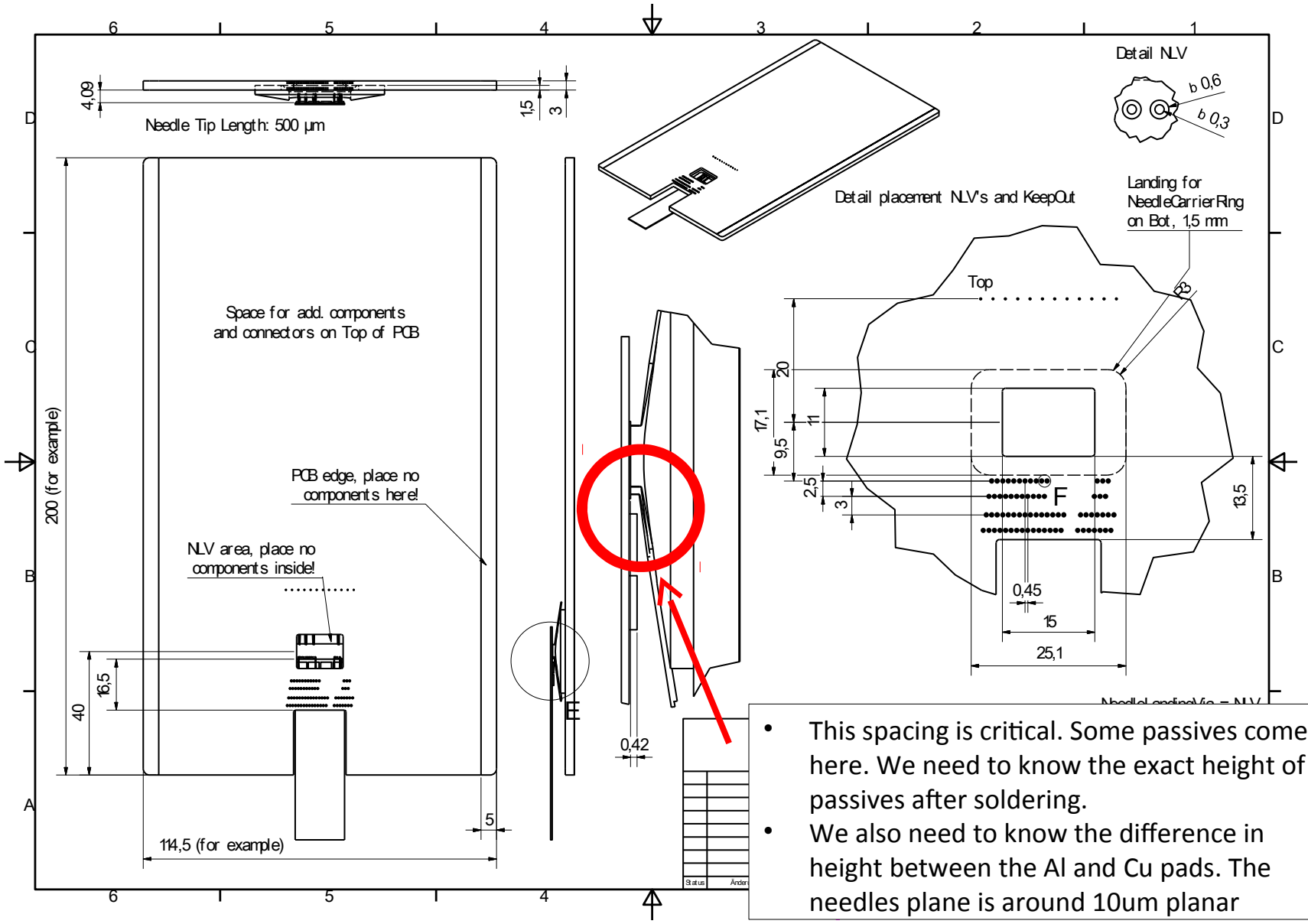


- 73 small AL pads
- 4 big copper pads
- In total: 85 needles

Needle location on pads



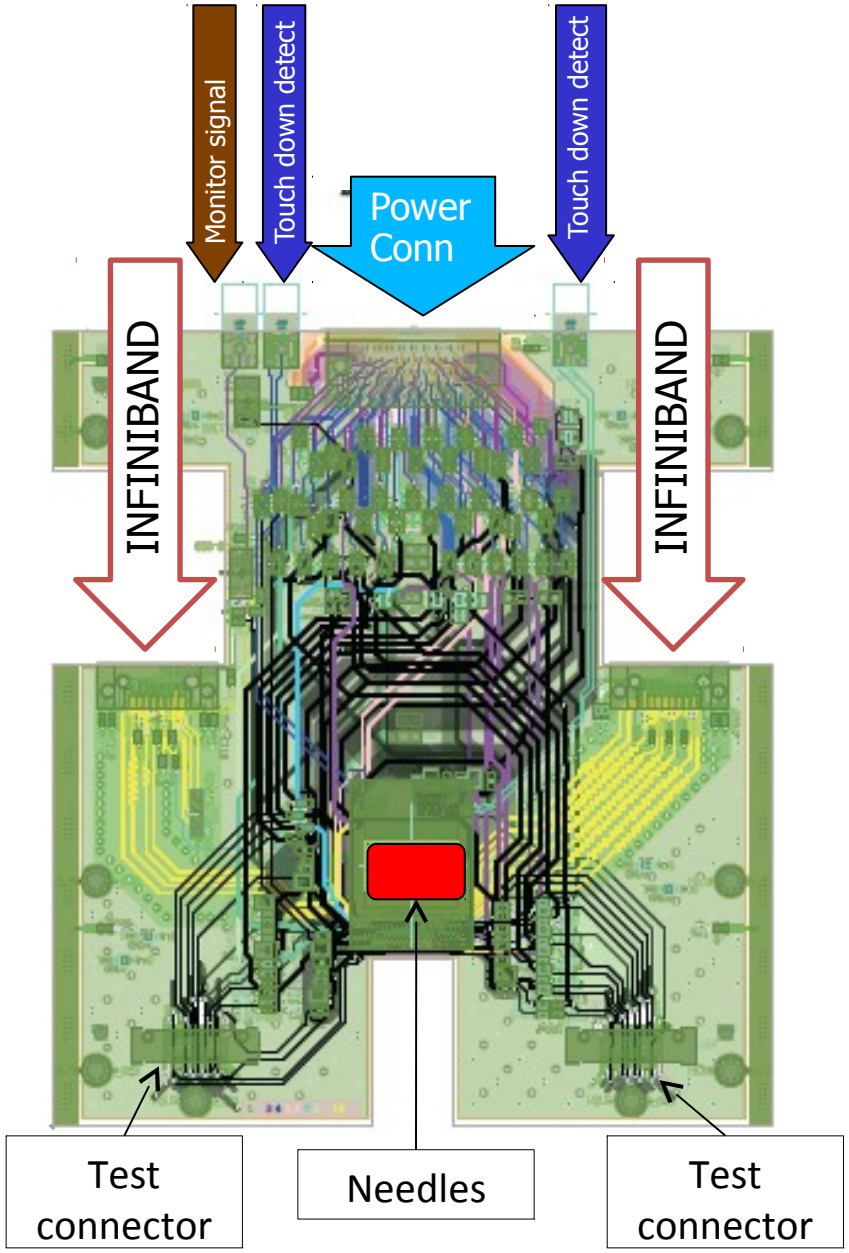
HTT V2



- This spacing is critical. Some passives come here. We need to know the exact height of passives after soldering.
- We also need to know the difference in height between the Al and Cu pads. The needles plane is around 10um planar

The probe card design

- ✓ Board design finished:
  - 10 Layers.
  - All components 1 side.
    A lot of decoupling and power filtering.
  - High speed signal routed internally between ground planes.
  - Holes along the sides in case planarity is an issue.
  - Holes to tight the cables.
  - Components fitting in HLL holder checked.
  - HTT's feedback: green light.
  - Components finally received and matching checked.
  - Waiting for third person's pinout cross-check.
  - Manufacturer contacted (Labcircuits, BCN):
    - 3.2 mm thickness (0,3 mm vias is not easy…)
    - High speed signals impedance control



Wrapping up

- ✓ SMD placement
  - Getting ready for dispensing solder paste automatically
  - SMD placement and futher reflows should not be an issue
- ✓ Rework: setting up the procedure
  - "Easy" unless chip removal messes up the module surface
    - Find a proper way of removing solder remainings
- ✓ Probe needle card
  - Design finished: will be sent for production soon.
  - HTT has to put the needles
  - Design and build a testing card for the probe card: make a list of tests
  - Test with e-mcm
- ✓ Testing: we have to start thinking on the tests to be made to determine if any rework is to be made.
  - Is this the right forum ?