Interface Electronics

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HELMHOLTZ ASSOCIATION

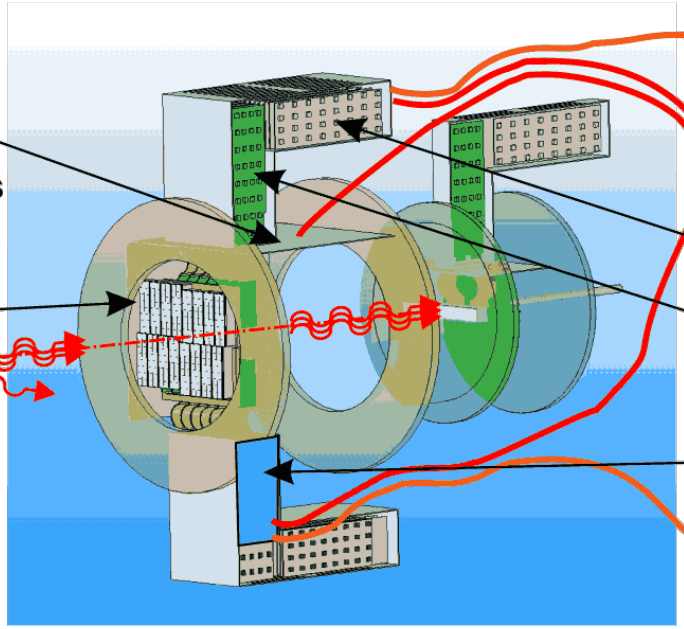
DESY

Outline

- General concept
- PCBs
  - Analogue boards
  - Digital boards
  - Backplane

VHDL see talk from I. Sheviakov

General Concept



PCB as Barrier
between secondary vacuum
and air stream cooled electronics

Focal plane:
4 quadrant
16 modules
with sensors, ASICs,
multilayer ceramics
and cooling

Target

10GbE-fibers to off-detector DAQ

Power for PCBs
Power for ASICs
Power for control

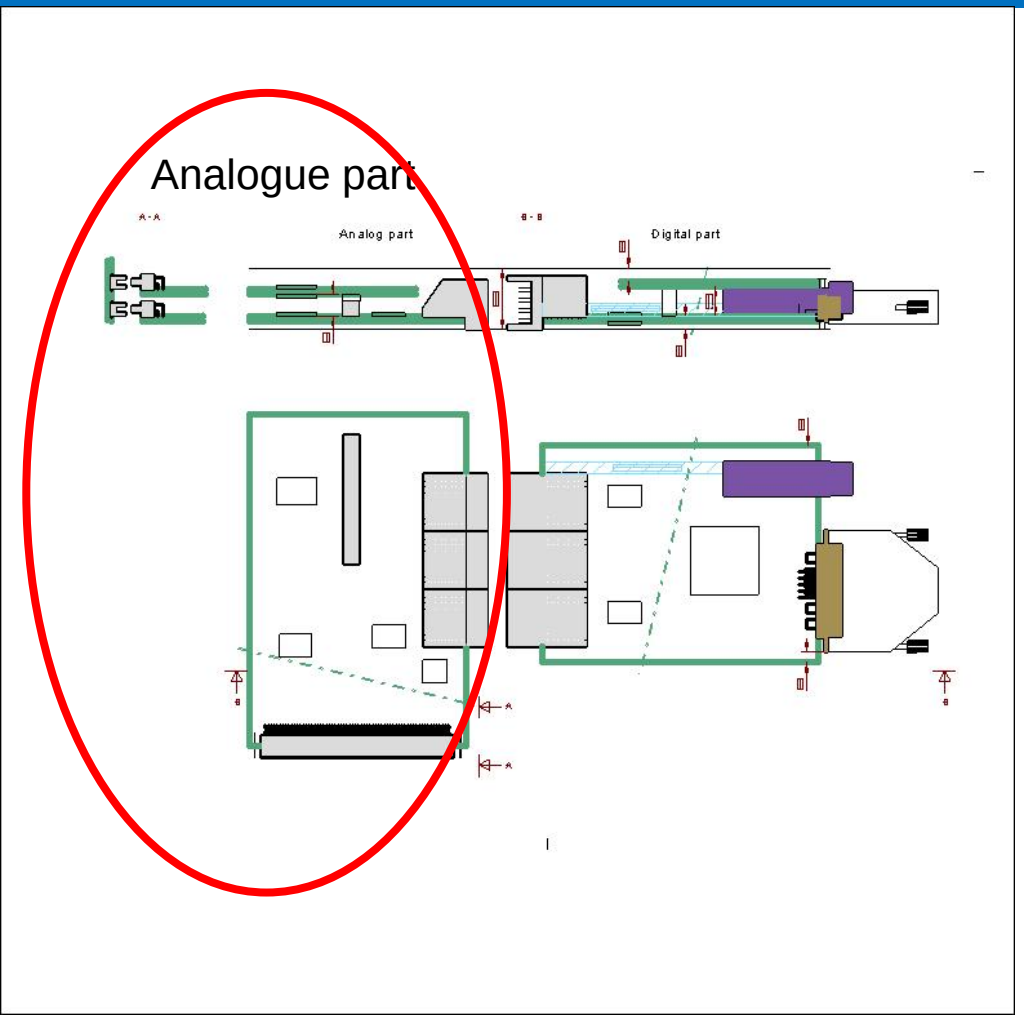
Digital PCBs
per module

Analogue PCBs
per module

Control electronics
µC+FPGA per quadrant

10/100MbE for the control

Analogue PCBs



Mother board for 32 inputs
Daughterboard for 32 inputs

Mother board contains all controls.
Sufficient to get a row of 8 ASICs operational.

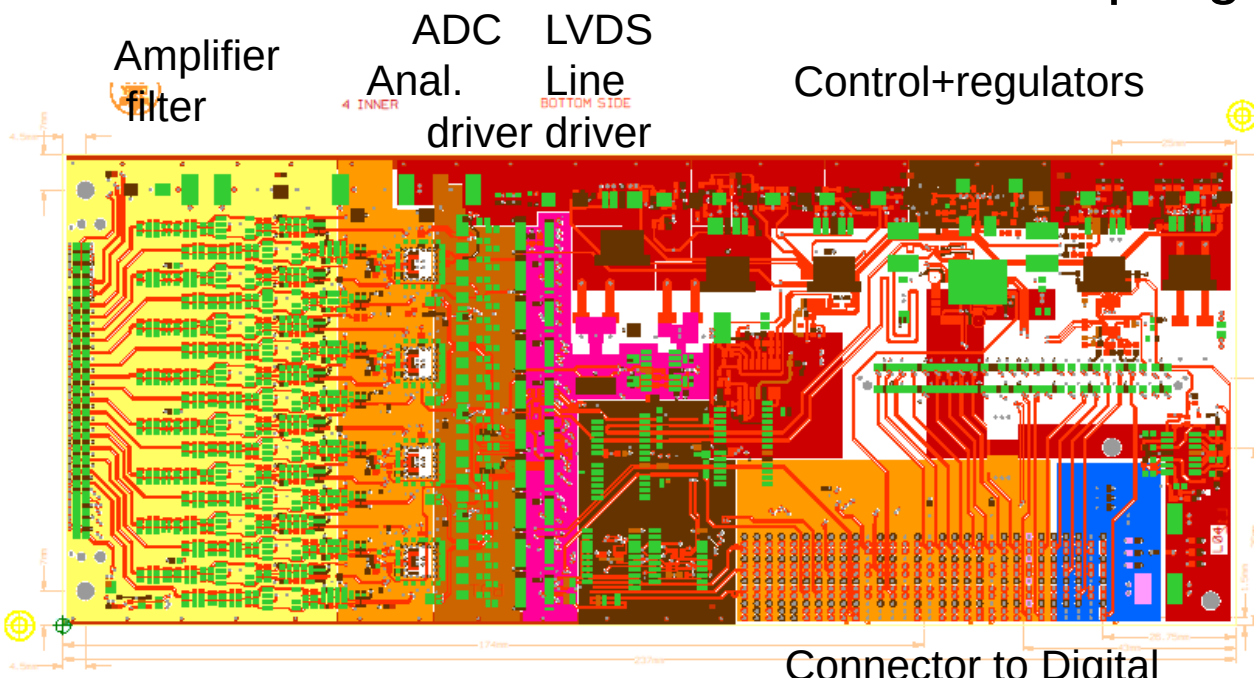
All controls received from backplane and transferred to digital part. Fro there may be back to analogue part.

Mechanically:

- Fits fully behind a sensor
  237mm x 95mm x 27mm
- Room for mechanical support like rails etc.

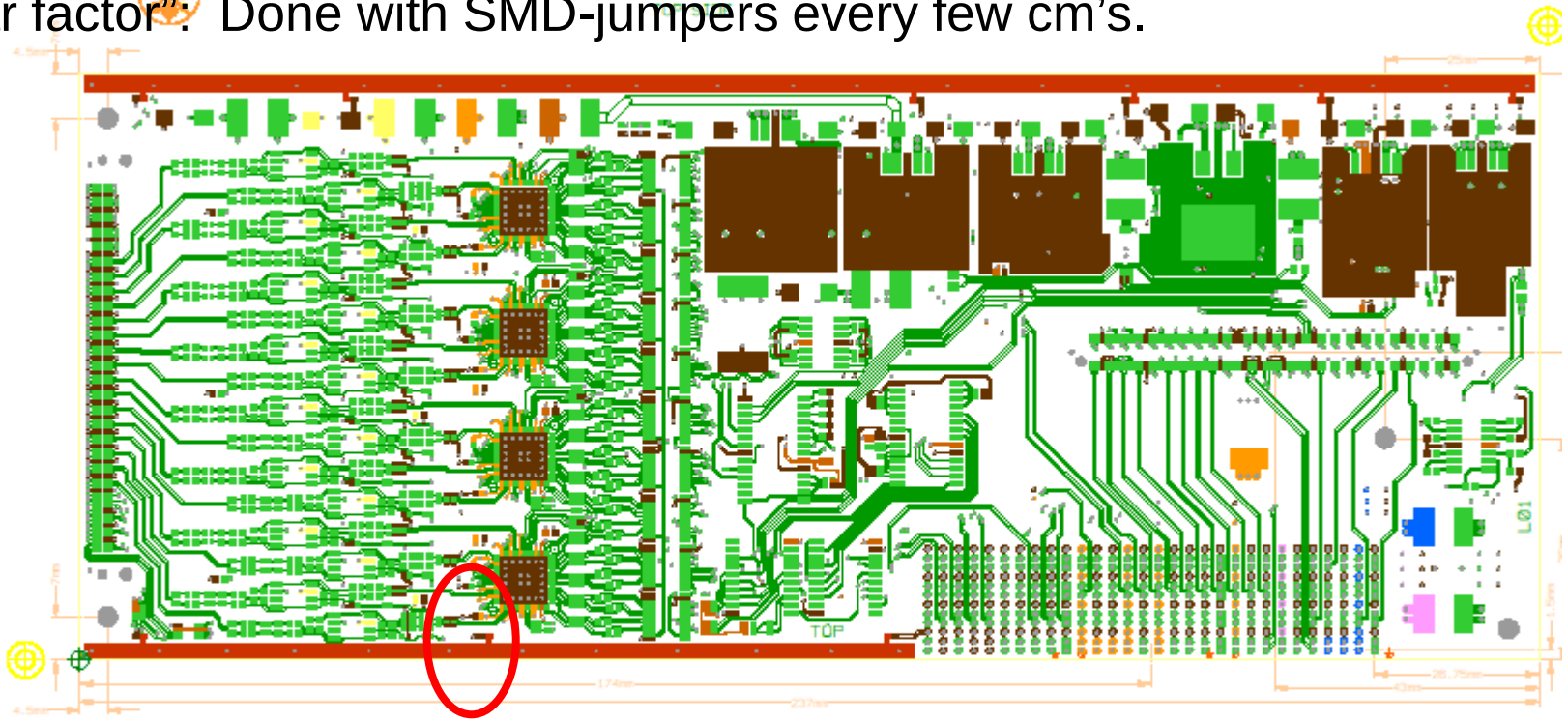
Analogue part: Structure of the PCB

Power islands with small antennas
Ferrit between supply and user
Where possible: R's in signal chain
limited transients, EMI-coupling



Analogue part: EMI to rail system

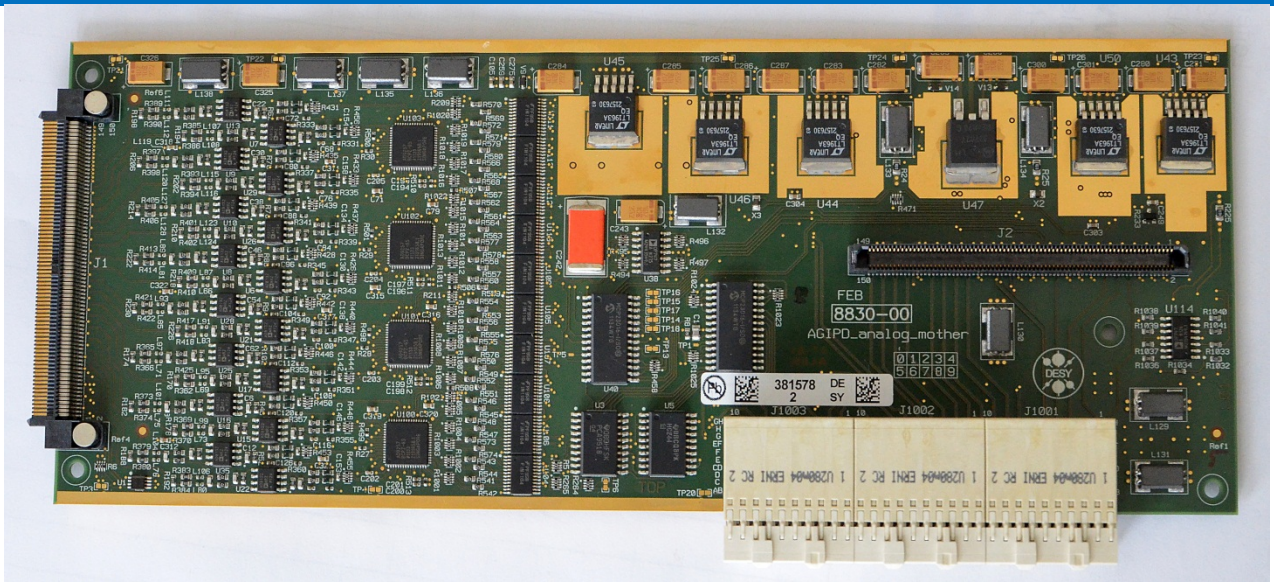
Allowance to guide induced currents into surroundings back to the board:
Best for RF : low impedance “closed connection”
“Fear factor”: Done with SMD-jumpers every few cm’s.



Nice, if mechanics supports that feature.

Finally: Decision on experience within ONE-mega pixel to close/ope.

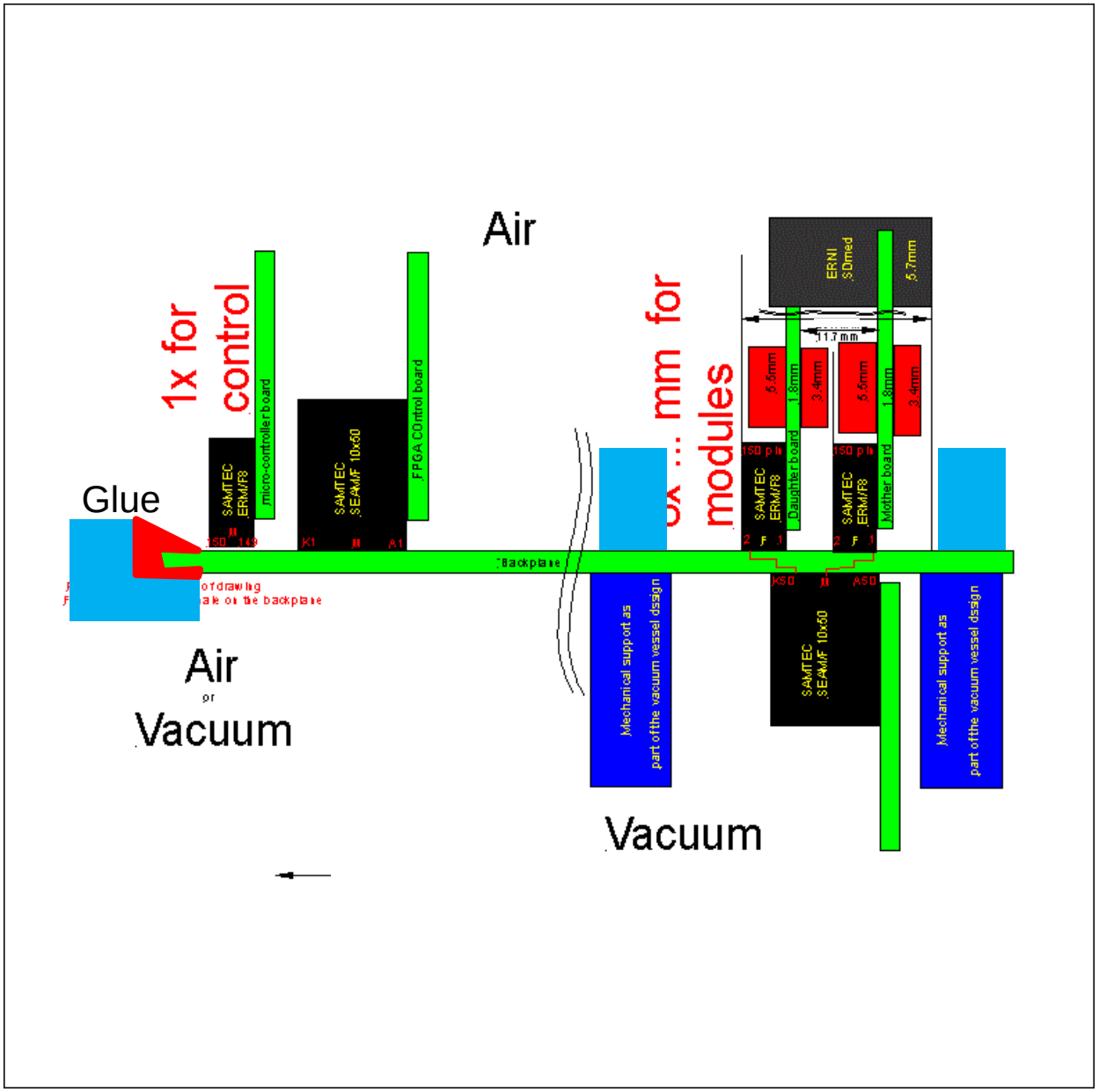
Analogue part: Status



- Mother board is in production:
  should have finished last week….. I was in vacation, may be ready.
  3 prototype boards

- Daughter board to follow layout phase, after first experience
  it is mainly identical
  Lonely mother board is operational for a row of 8 ASIC's
  Mechanically fully parallel to mother-board:
  Same size except conflicting corner for connector to digital.

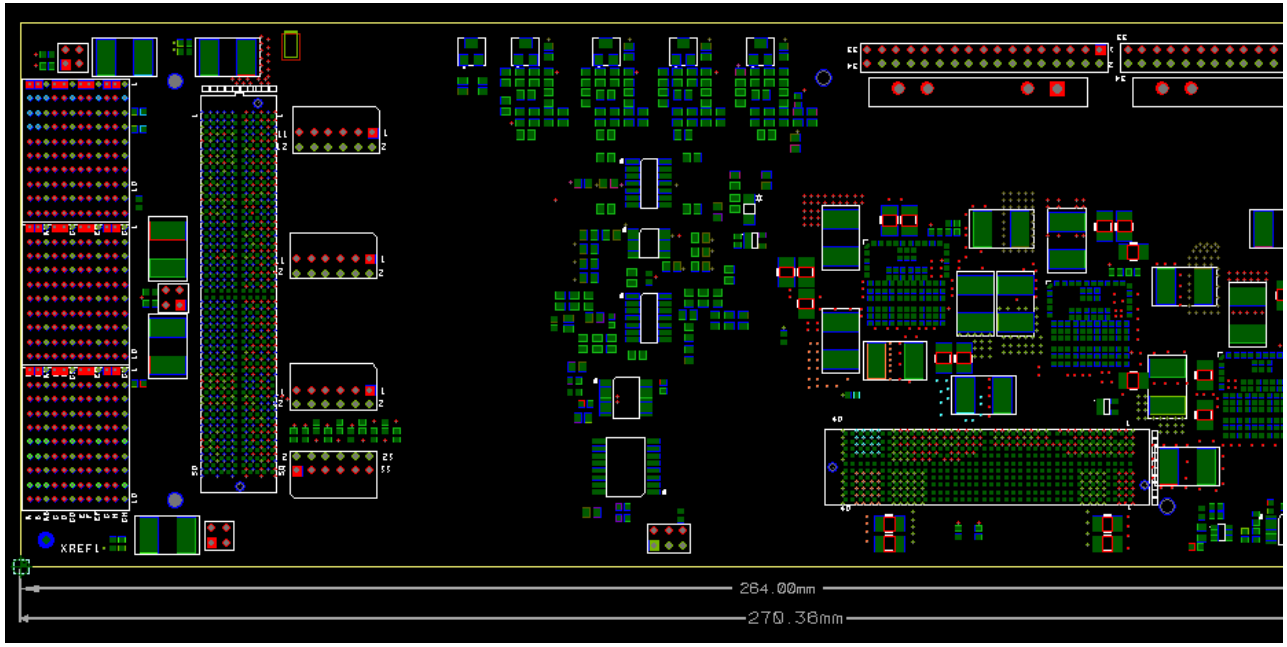
Backplane: Module connectivity



Sketched for
Discussion
With mechanics

Digital part

DESY-FEA, I.Sheviakov



Digital carrier: 270.4mm x 95 mm
same as
analogue

Digital mezzanine fits fully above and leaving space for rails.

Full height carrier+mezzanine fits to the actual 31mm of the sensor
The original smaller height sensor would need minor redesigns
(reason is : multi-project use: 4 x 10GbE in one of them).

Digital part: Status

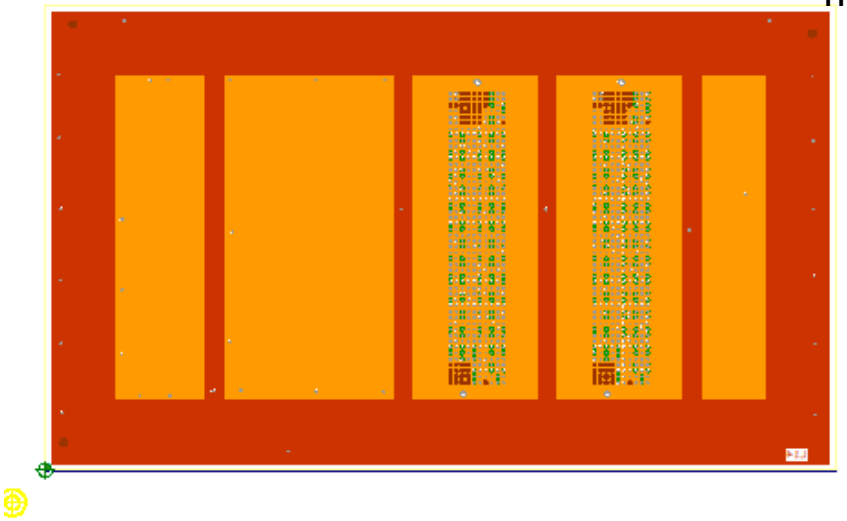
Carrier:

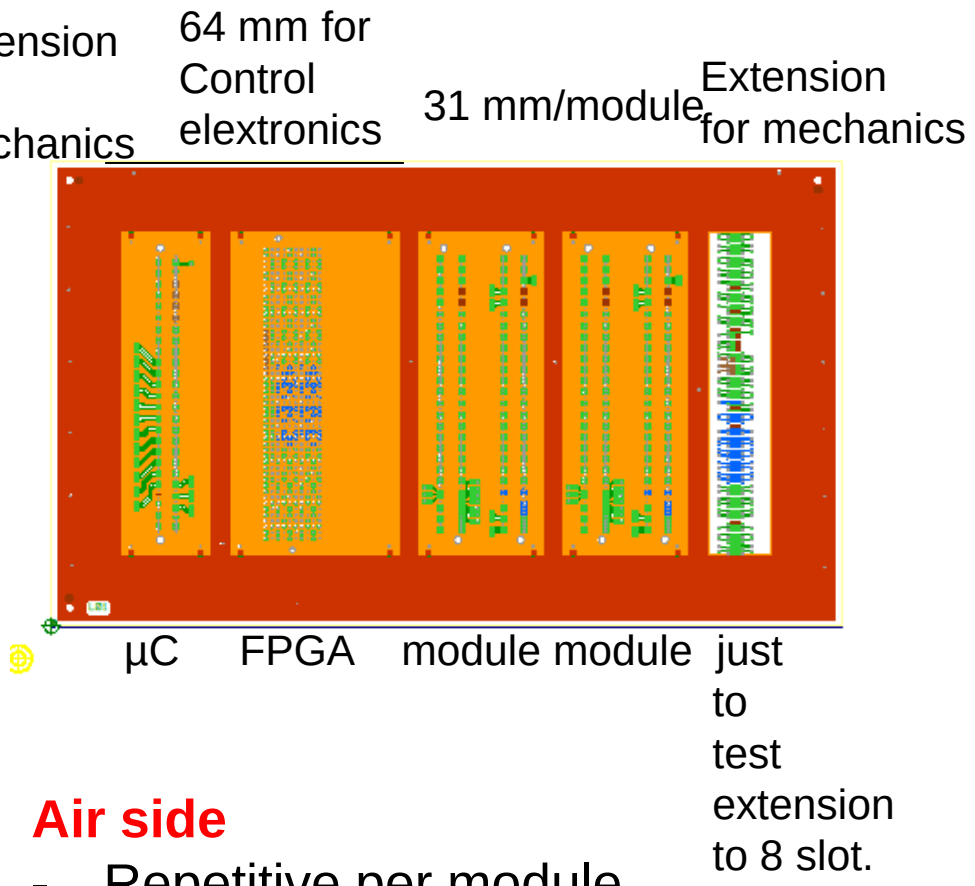
- Full ECAD data available
- Production in preparation

Mezzanine:

- In use for other projects and by that hardware extensively tested.

Backplane: Outer sides





Vacuum side

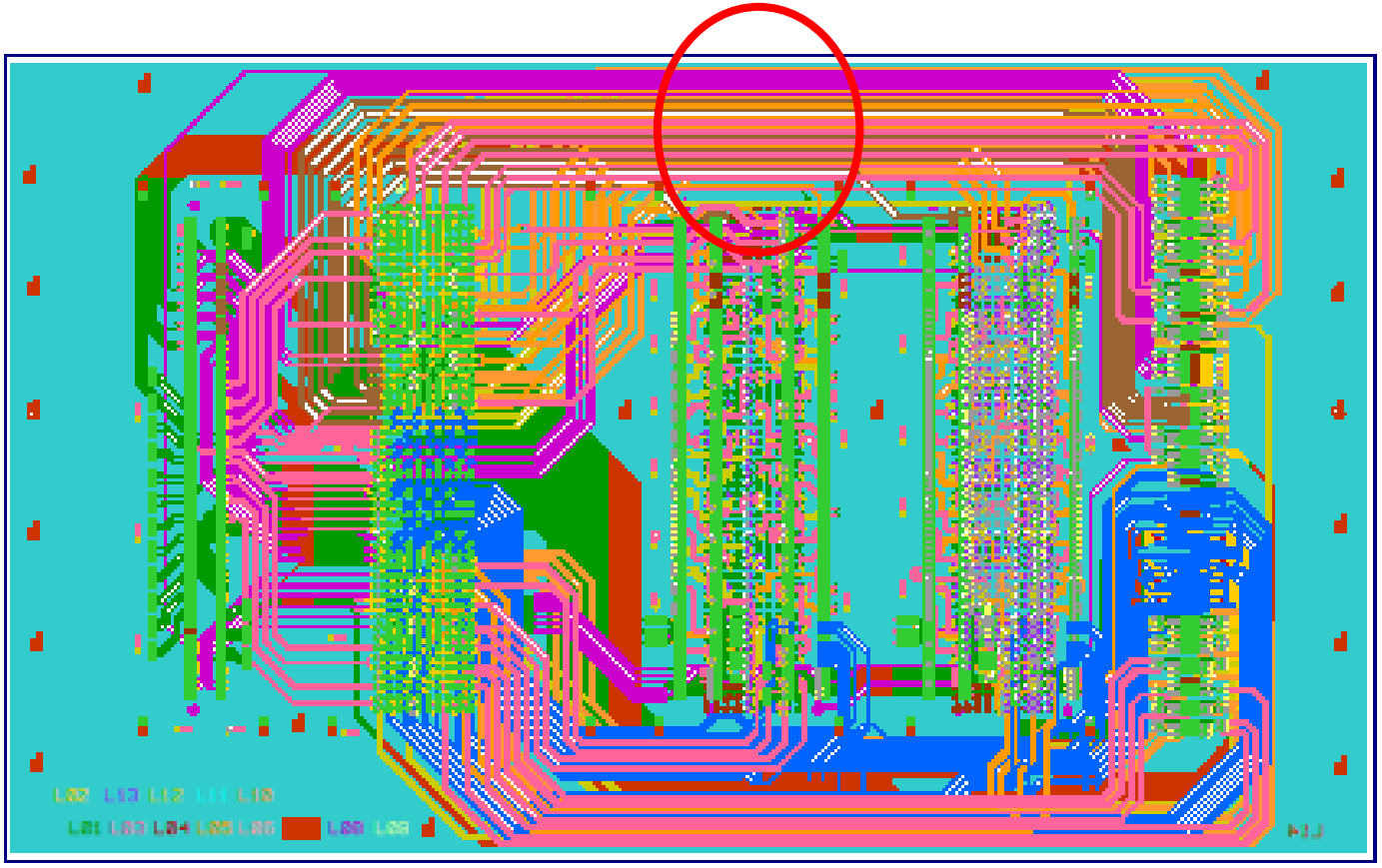
- Mainly copper with gold … limited air diffusion out
- GND-chassis for mechanical support
- GND around the connectors
- No components or jumpers

Air side

- Repetitive per module
- Connectors for control FPGA+µC.
- Jumpers to make GND-chassis = GND-electronics

Backplane: Test for 8 modules per backplane

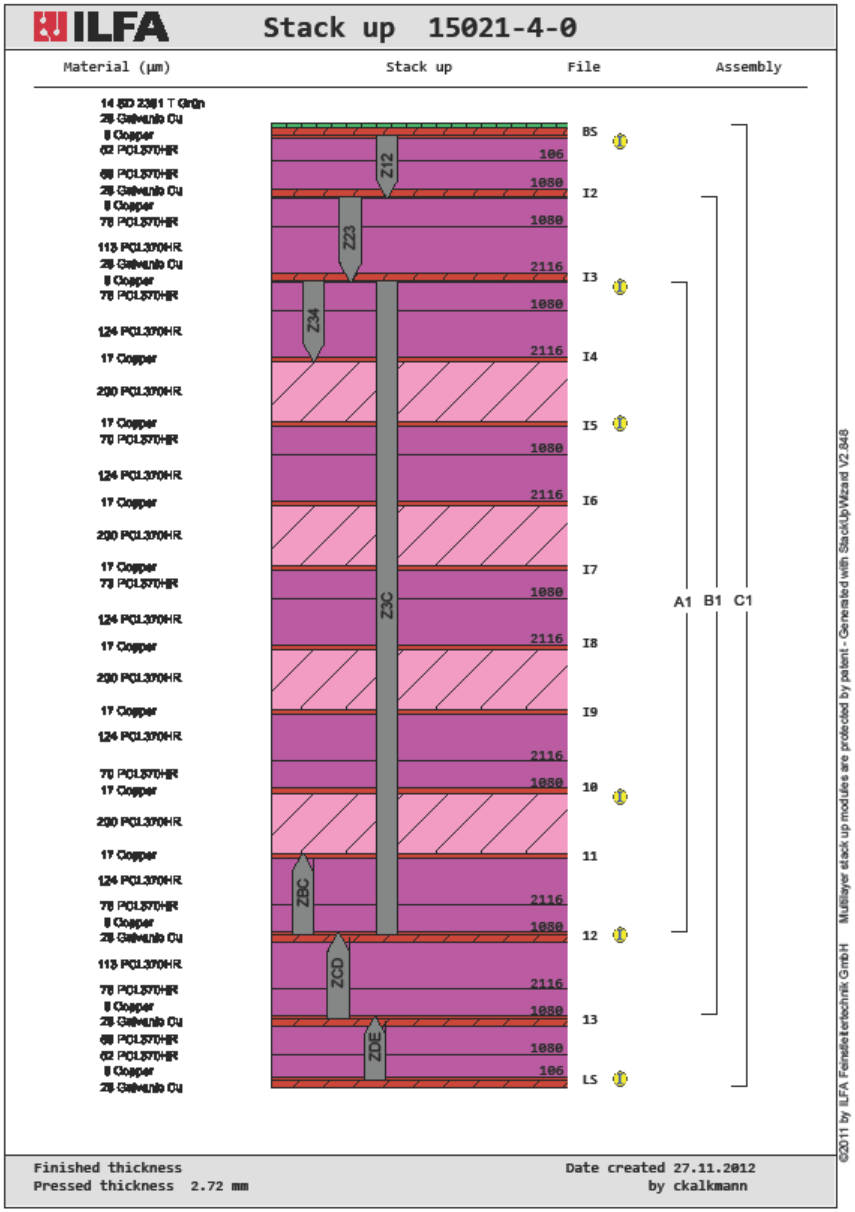
All lines for 8 modules
Dense , feasible → One backplane for ½ Mega-Pixel



2 slot is now 170mm x 100 mm

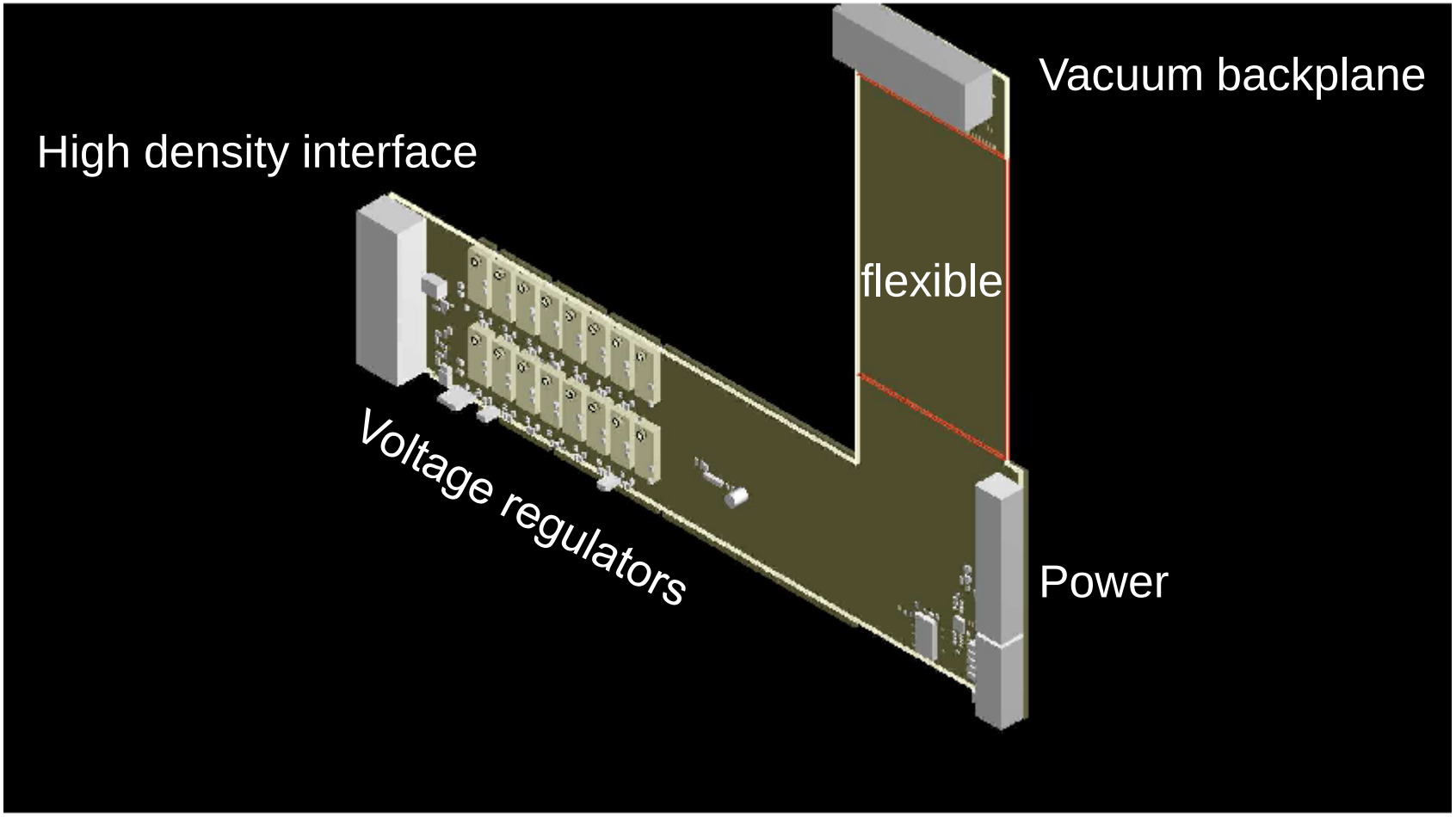
Jumpers etc., to let the
Lines for 6 slots end.

PCB: Vacuum tightness via burried vias



Board in the vacuum

DESY, S.Lange, FS-DS



Status: In preparation of production, layout done

Summary

- **Analogue part**

  Mother-board in production for row of 8 ASIC

  Design for daughter card after basic tests of mother card
  Mother board is stand alone, need no daughter but digital part

- **Digital part**

  Functional mezzanine in use for other projects.
  By that extensively tested

  Carrier: Connectivity and infrastructure
  ECAD done
  Preparation of production

- **Backplane**
  two slot backplane is designed: Easier for workbench tests
  Technology like 8 slot backplane: Full dimension and technology test.
  3 PCB's is in production

- **Control boards** first with evaluation boards.