

New WingLDA design

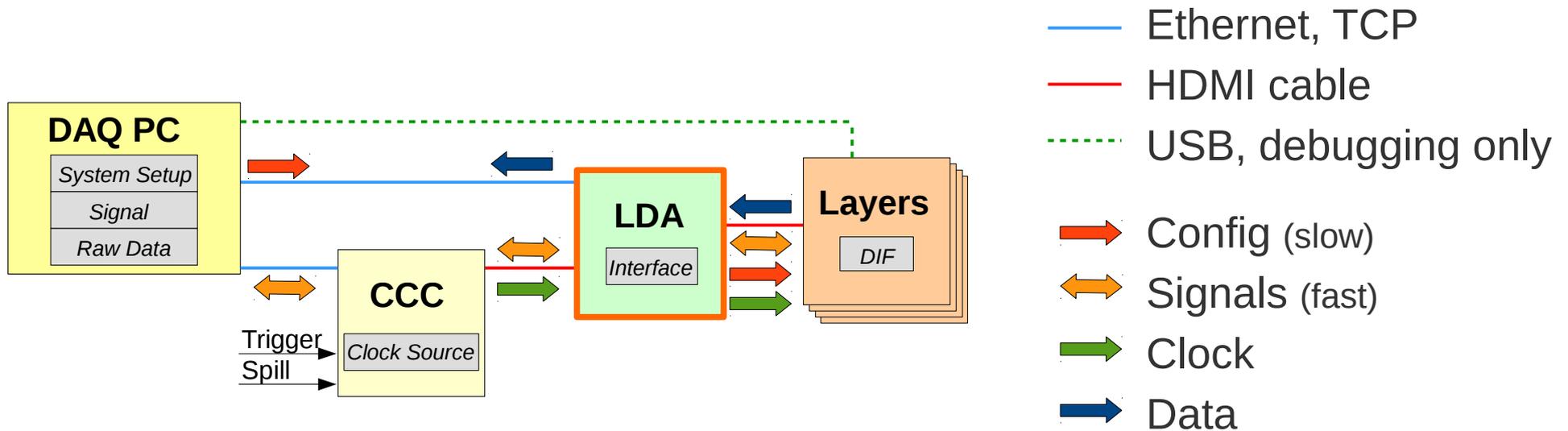
Julien Caudron

Norman Bhatti, Volker Büscher, Phi Chau, Reinhold Degele, Karl Heinz Geib, Sascha Krause, Yong Liu, Lucia Masetti, Anna Rosmanitz, Uli Schäfer, Stefan Tapprogge, Rainer Wanke

Johannes-Gutenberg Universität Mainz

Dec. 10th 2015

DAQ System:



- Link and Data Agregator:
- dispatch the clock and command signals to the layers
 - collect data from the layers and send it to storage PC

Goal of this presentation:

current wing-LDA is successful
 → system stays the same
 present our ideas for design improvements
 get feedbacks/wishes before the real
 production

Outlook:

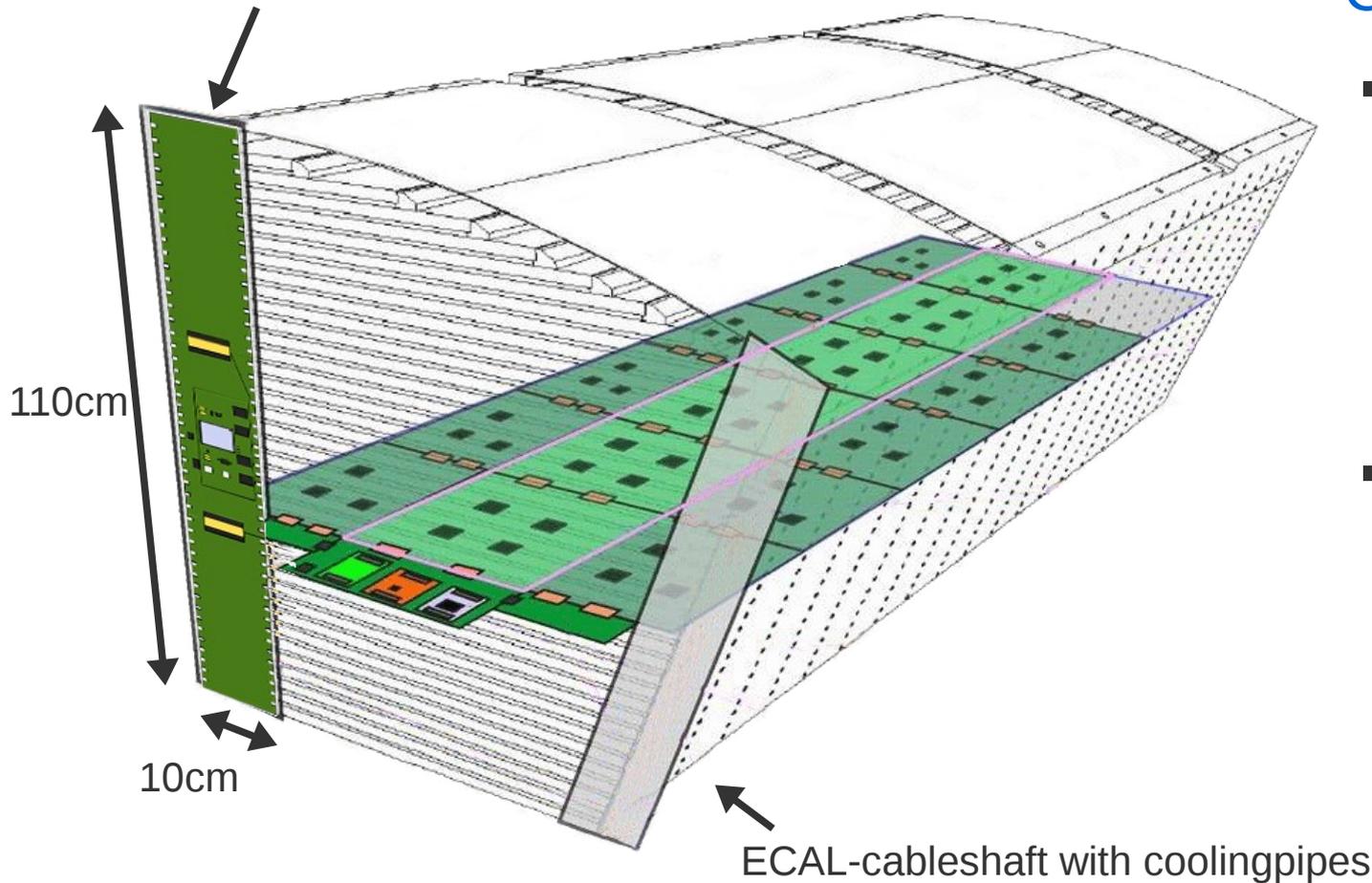
- LDA description
- Current design
- New design proposal
- Plans and conclusion

A lot of layers, small space

→ LDA collects and merges the **data** + transmits signals to the DIF

Integrated to the AHCAL geometry (wing-LDA):

HCAL-/TPC-cablesaft with coolingpipes



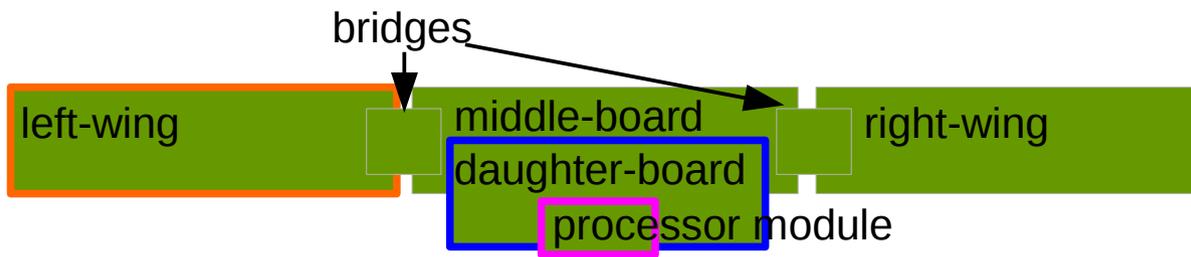
Challenges:

- Outside the detector
long PCB to avoid long cables
time delay regulated
by FPGA
- 48 layers
small space
→ currently:
micro-HDMI



Components:

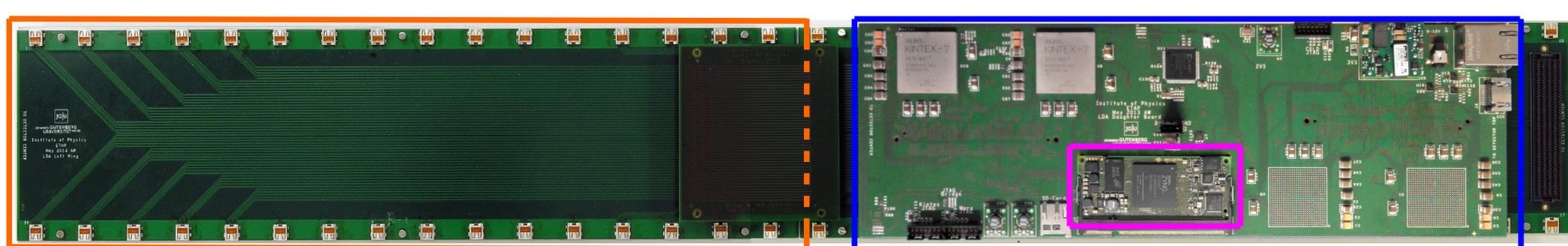
- 3 passive PCBs: left-wing, middle-board, right-wing → 96 micro-HDMI connectors
- 1 daughter module: Similar concept as CCC: FPGA + Processor Module (Mars)



FPGA: 4 on daughter-board (Kintex)
 1 on processor module (Zynq)
 ARM Linux on processor module

Used in TestBeams (July and August at CERN SPS) with ~15 layers

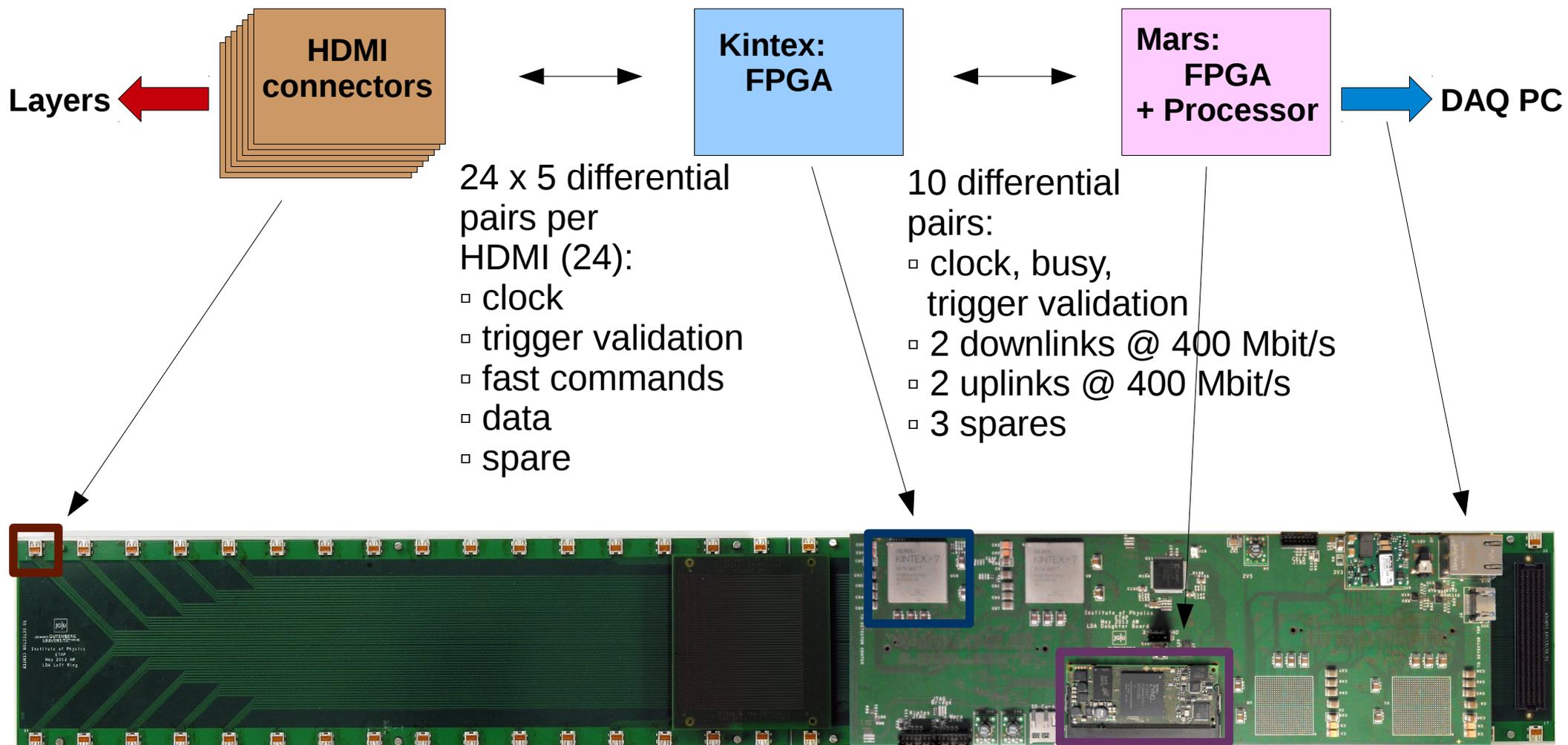
Functional, satisfies needs for TestBeams

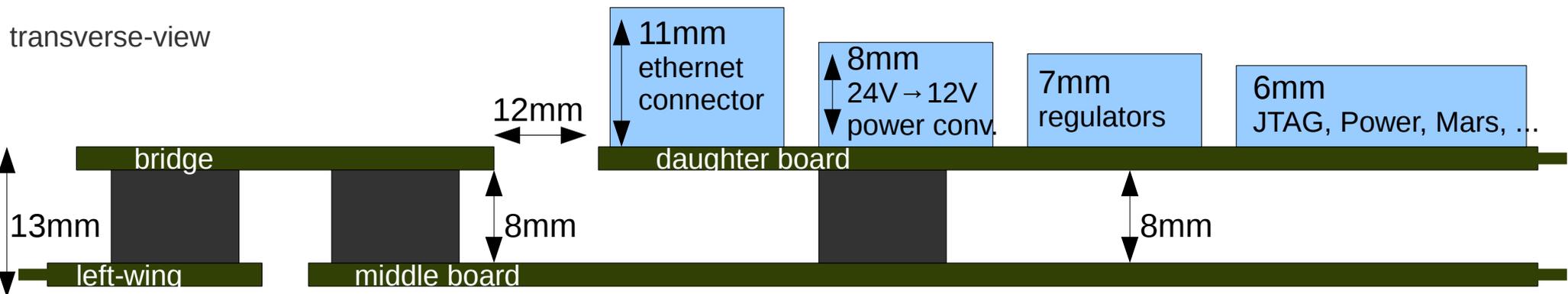
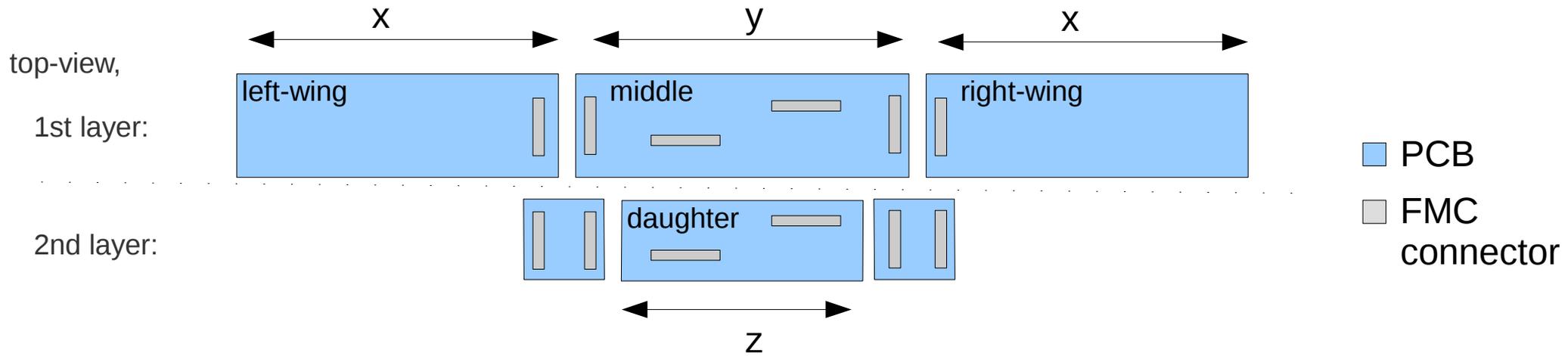


Current status:

2 functional copies, equipped with 2 FPGAs (instead of 4)

Able to connect to ~48 layers



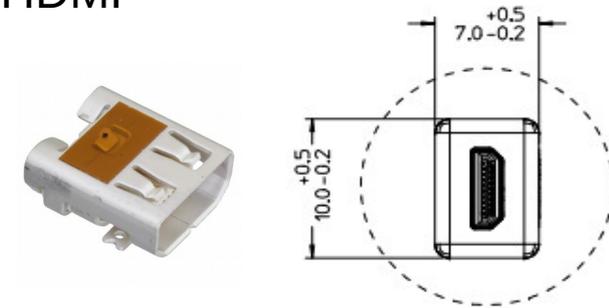


total height: 24mm

Connectors:

- μ HDMI: pros:
- can be used in a pitch lower than $\sim 2\text{cm}$
- cons:
- assembly is more difficult (it also means that it cannot be easily re-worked)
 - appear to be fragile

μ HDMI



Revisit our strategy: are μ HDMI really needed ?

Needed if the space between layers is lower than $\sim 2\text{cm}$ (depending on the cable plug used)
 Our reference design is the Eudet design, with a pitch of 22mm

- for now, we produce a wing-LDA based on Eudet design
 if the reference design changes, it requires anyway new PCB
- we can use **normal HDMI**

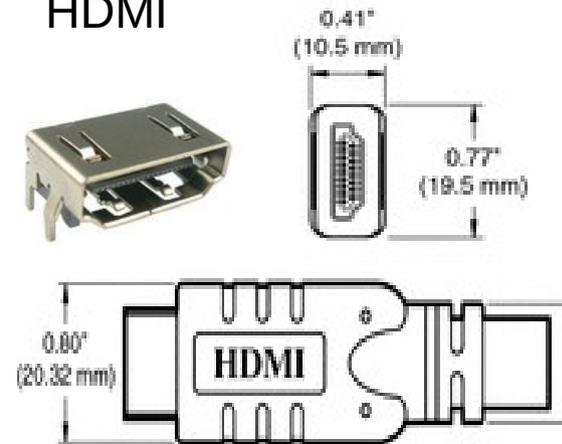
If in the future the reference changes, we can go back to μ HDMI, and we can reenforce them, for example with plastic support

For TestBeam: no need to integrate the WingLDA to the geometry

Eudet (steel): 22mm

tungsteen → can be smaller (18mm)

HDMI



Wish-list of things that we want to change on the current design:

- 1) connection problems:
in the current design, the bridge is in the way of the CCC HDMI connector
- 2) better way to connect to power (now: on top of electronic components)
- 3) height: as small as possible
- 4) cooling for kintex
- 5) lot of FMC in the current design, a solution with less FMC is better
- 6) correct 3.3V problem on kintex3: can be fixed on the daughter board

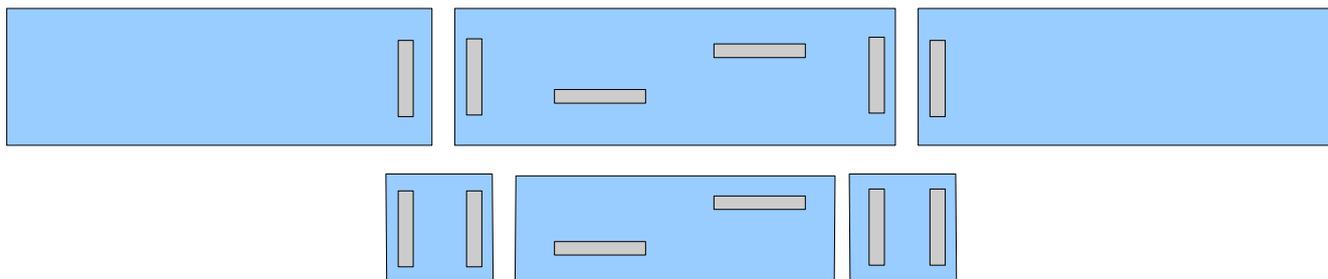
Constraints from constructor: collaboration with pro-design (also involved in HBU mass assembly)

- 1) blank PCB: maximum 540mm
- 2) automatic assembly on PCB: surface to assemble: maximum 400mm
- 3) by-hand assembly on PCB: no big constrains

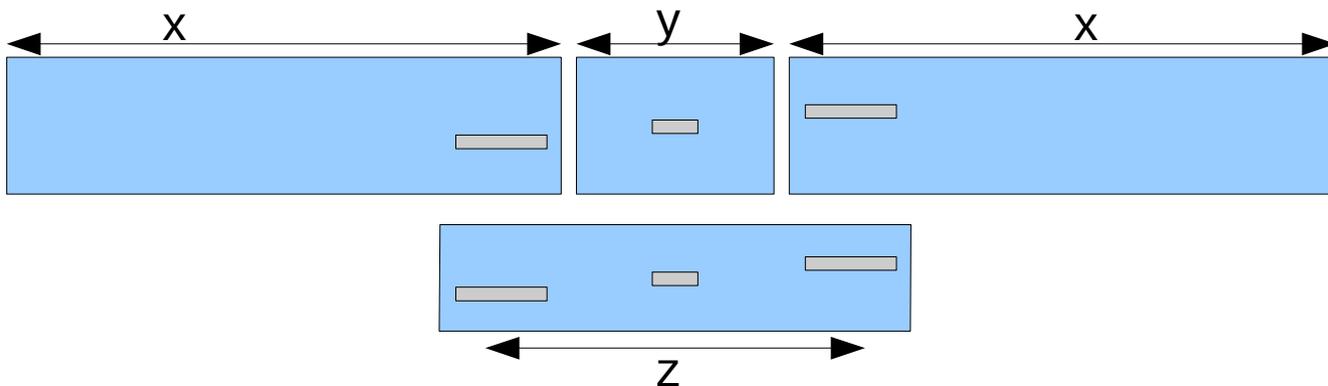
There are also constraints from components

(details in the following slides)

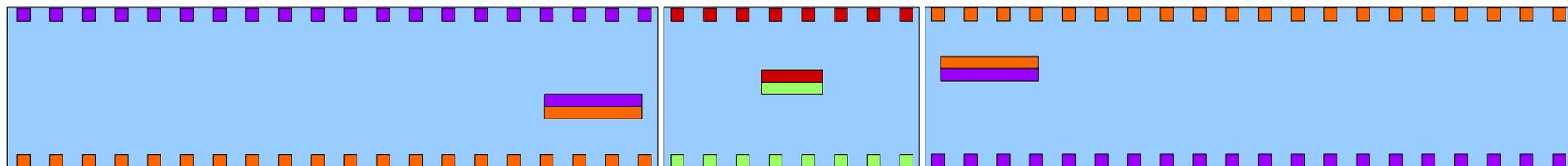
Old design:



New design:



$x = 440\text{mm}$, $y = 220\text{mm}$, $z = 390\text{mm}$



2 passive designs: wing board (symmetric)
middle board

FMC:

SEARAY from Samtec: need automatic assembly, can be done

Possibility to use Meg Array from FCI (520 pins), can be assembled by hand
less precise position but it's not a problem

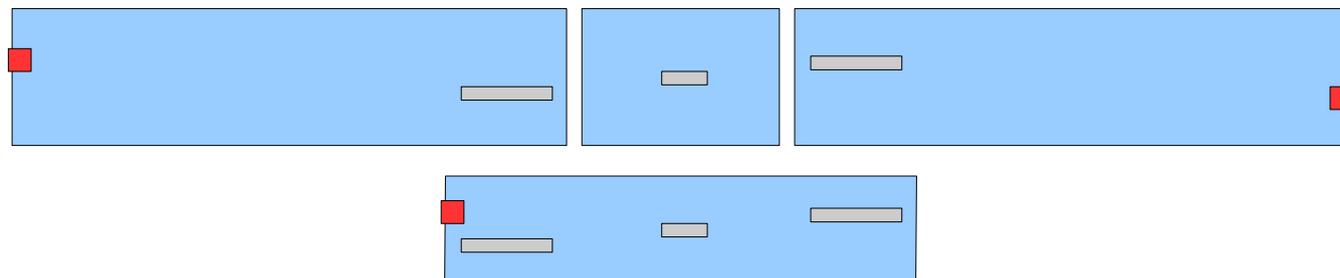
Connectors:

normal HDMI connectors: almost all automatically assembled + the rest by hand

Ethernet:

can be put on the active board or on the passive board (100 pins remaining)
to reduce the height

We can design so that we can choose where to assemble the ethernet plug

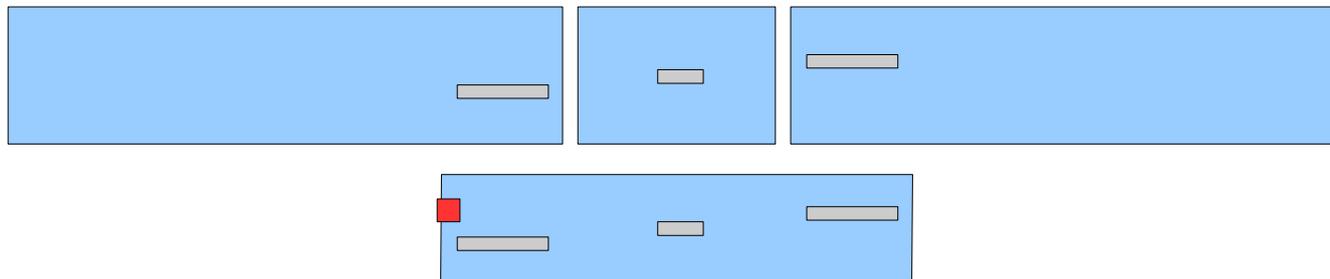


Not more complicated than the current design:

3 FMC instead of 2, but the PCB can be larger if needed

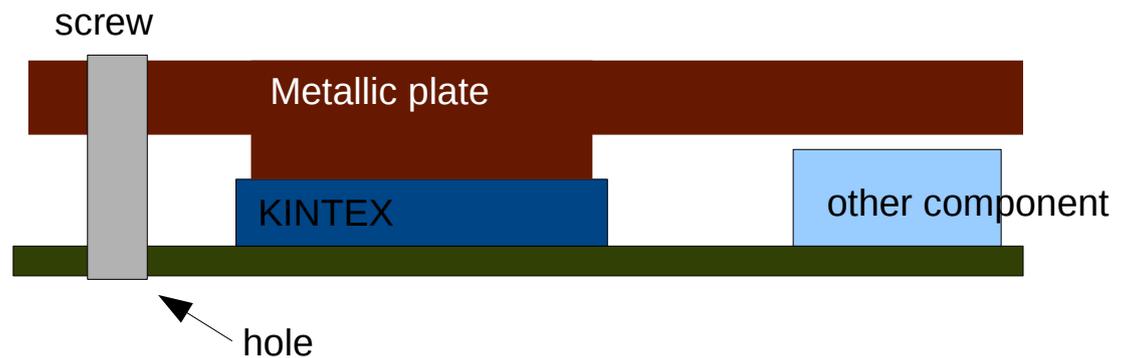
Power connector + CCC connector:

can be put on the left side of the active board



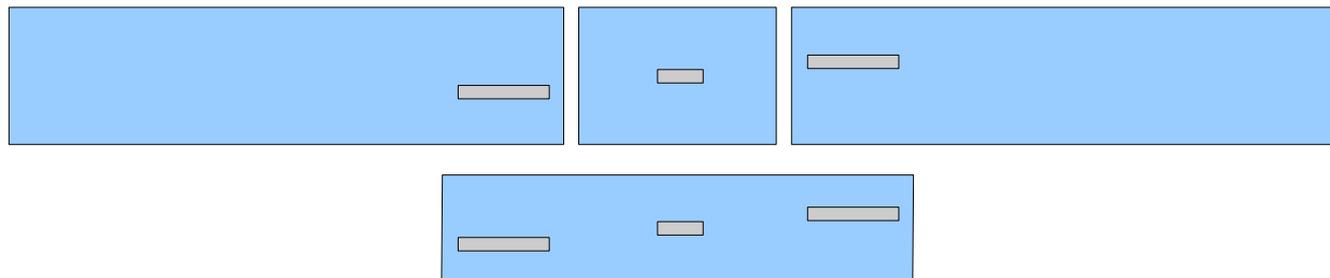
Cooling system:

holes for screws around the FPGA cooling via a metallic plate



Conclusion:

- Current WingLDA is functional and satisfies needs for TestBeam
- Several weak points / possible improvements on the current design have been studied:
 - μHDMI fragile, bridge PCB in the way of the CCC output, power plug on top of electronic component, ...
 - Reduce the number of FMC, height as small as possible, ...
- A new design that fixes those points has been presented



Plan:

- No urgent need for a new wing-LDA
 - but we don't want to wait until the last minute to think about it
- Production and tests take time
- → new production for middle/end of 2016 ?