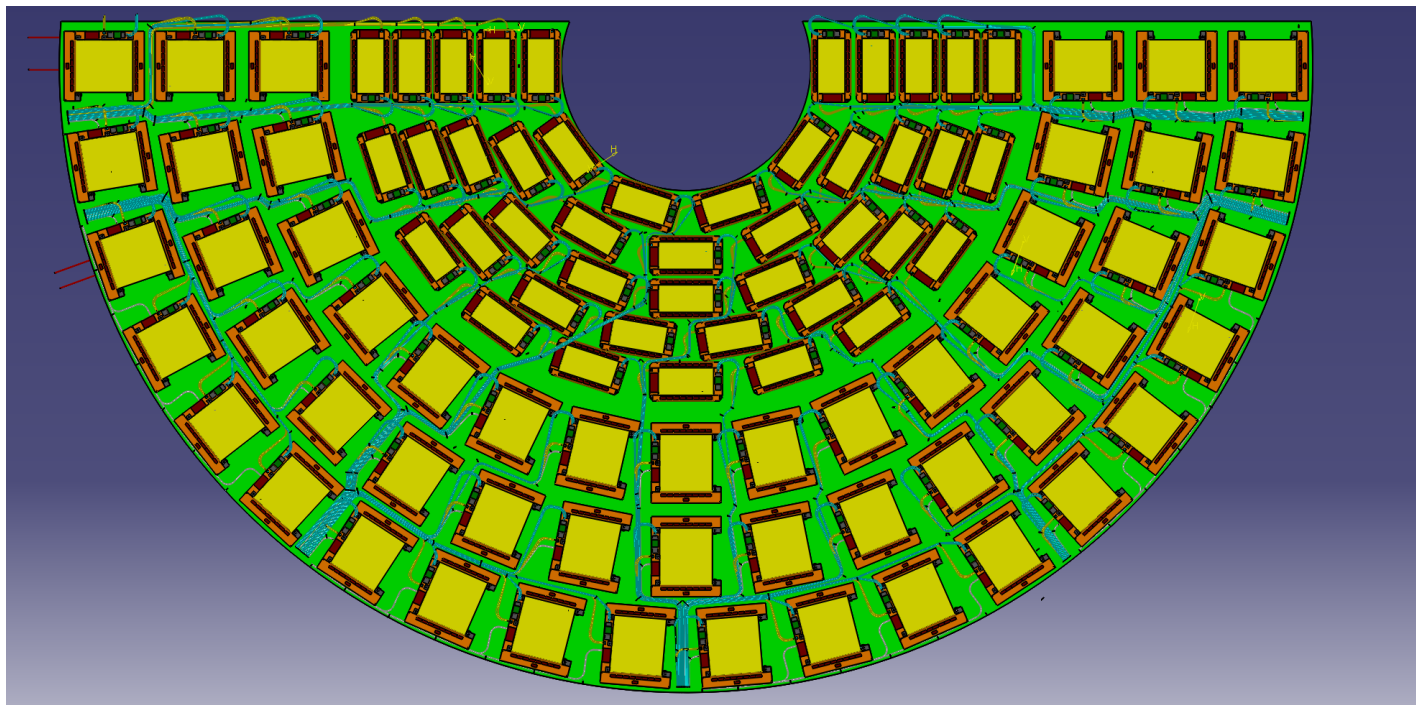


# TEDD cabling design



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- Nicolas developed over the last months a detailed CATIA model of one TEDD dee (two sides).
- The model is not final but shows the overall concept and limitations.
  - ❑ Not the only solution
  - ❑ Will be refined with further input.
- It also points to some critical items to be defined to go further.
- Overall strategy
  - ❑ Route services inside-out
  - ❑ Try to limit the number of exit points on the periphery
  - ❑ Try to navigate in between modules
- Once again:  
IT IS NOT a final design proposal.

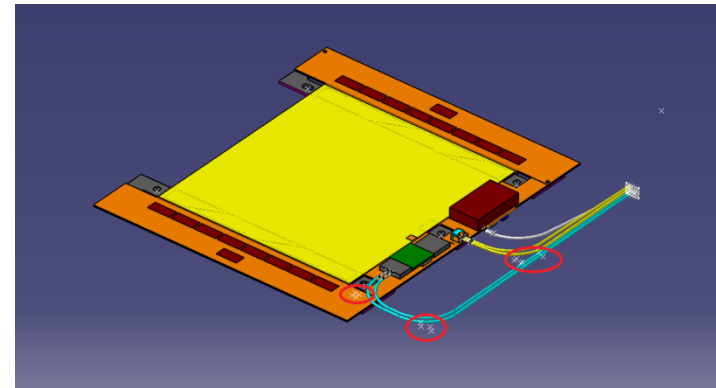
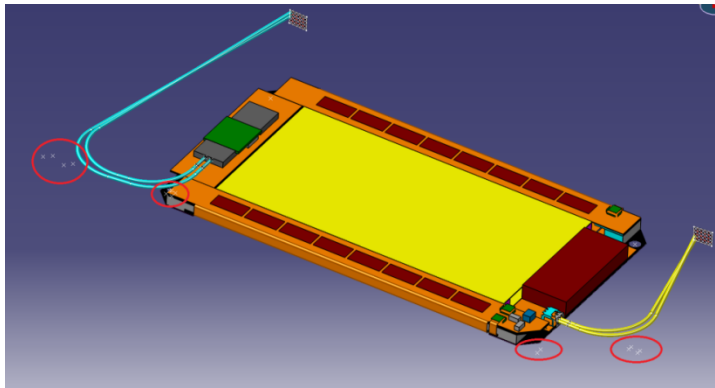
Plan of the talk:

1. Approach
2. Result
3. Issues
4. Next steps

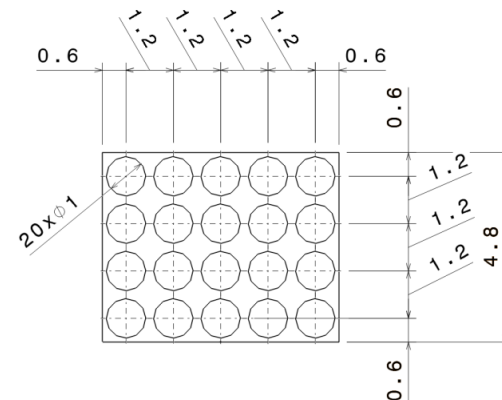
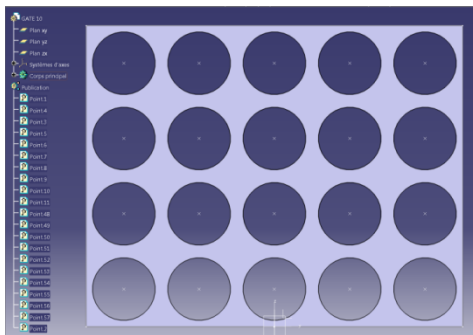
# Approach

The wires are modeled by a poly-line which starts from control points installed on the detectors module and passes through gates by other control points up to the edge of the dee .

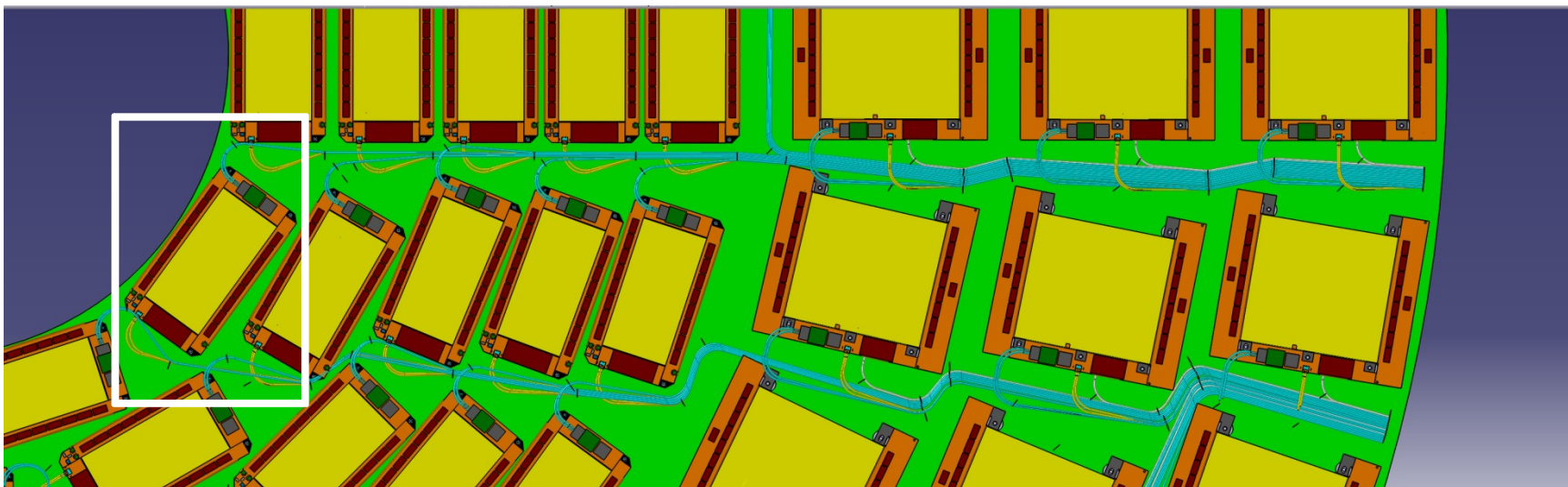
- CONTROL POINT ADDED ON DETECTORS



- CONTROL POINTS ON THE GATES



- 1MM DIAMETER CHOSEN FOR HIGH -LOW VOLTAGE CABLES AND ALSO FOR OPTICAL FIBERS.
- 15 MM BENDING RADIUS FOR ALL SERVICES

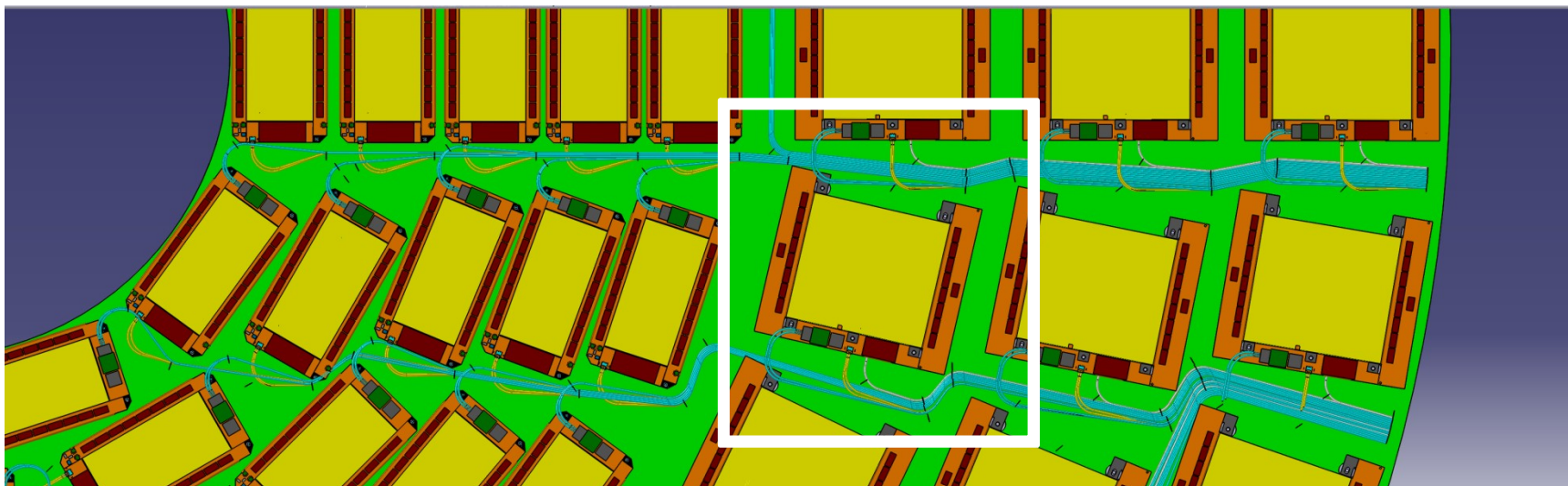


## PS DETECTOR

- SERVICES DISPATCHED ON BOTH SIDES
- Two optical fibers BLUE
- Two electrical Wires Lo voltage YELLOW

NO HV wire in this model!

- No information available at the time on the connector
- Assumed to have a small impact on the design

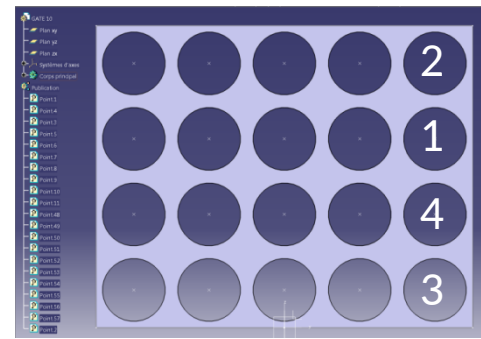
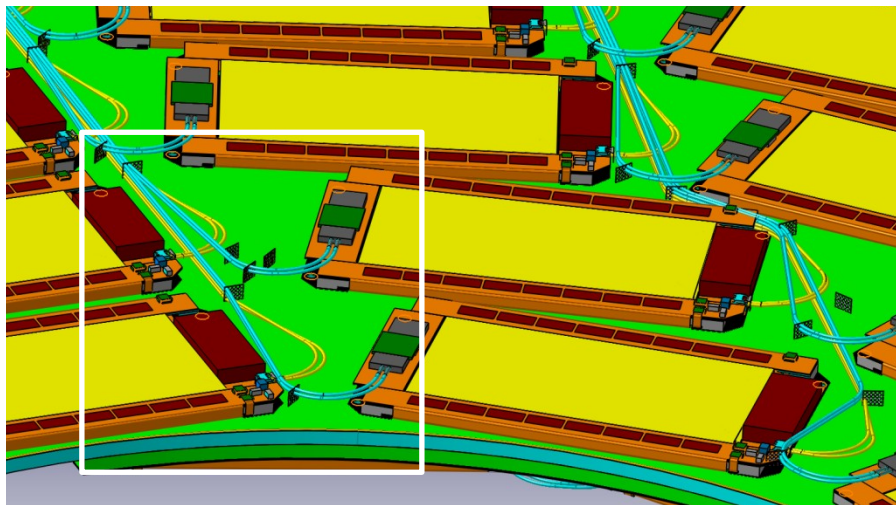


SERVICES DISPATCHED ON ONE SIDE

- Two optical fibers                      BLUE
- Two electrical Wires Lo voltage      YELLOW
- One electrical Wire High voltage      WHITE

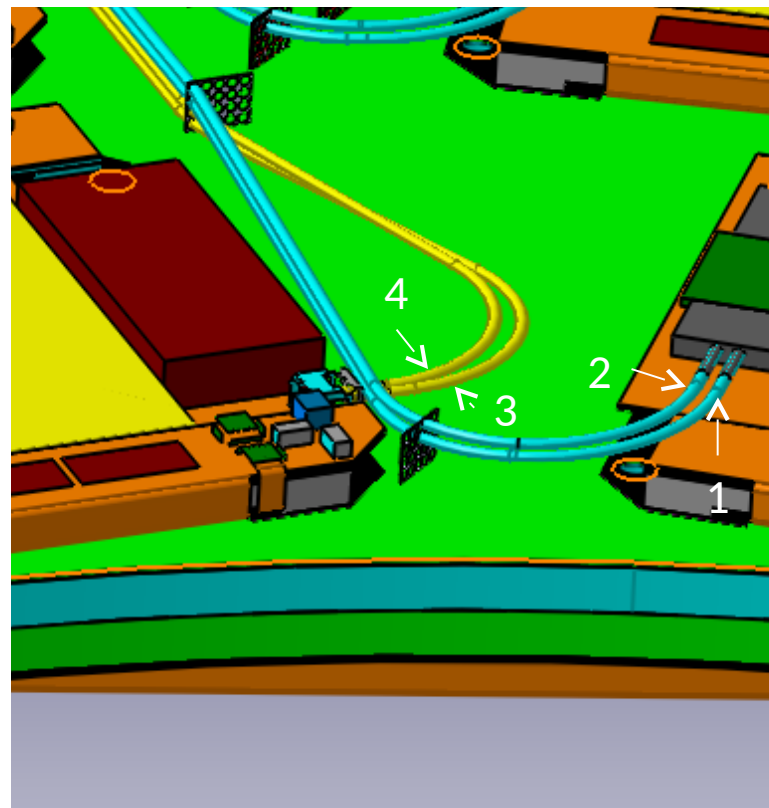
Conservative model:  
all wires are modeled with the same constraints  
as for the optical fibers.

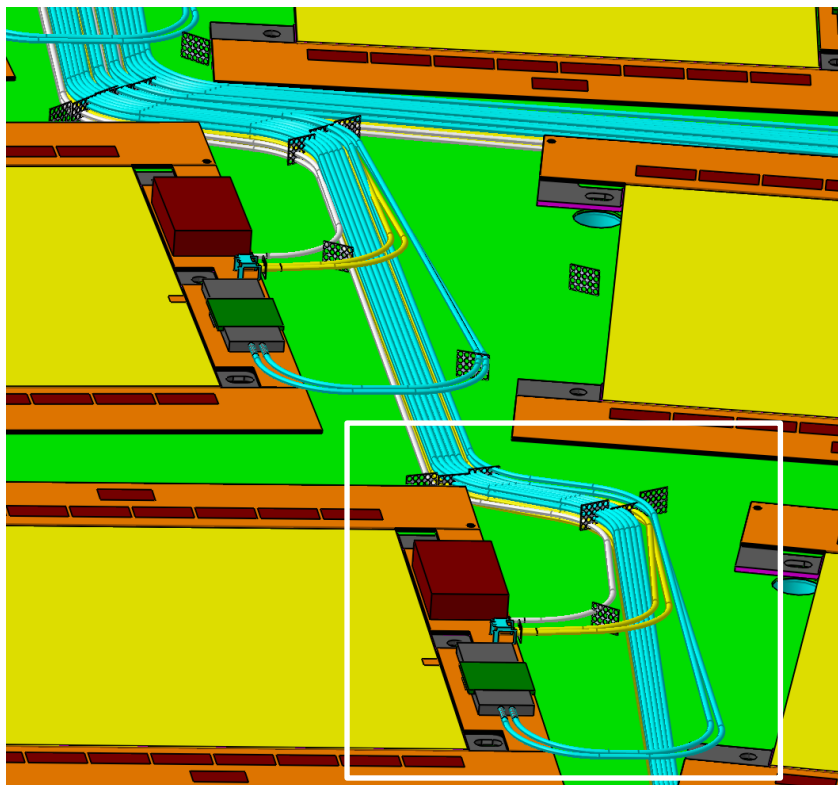




## WORKING BY PAIRS OF DETECTORS IN BETWEEN 2 ROWS

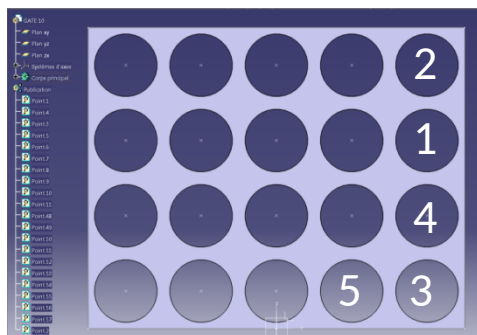
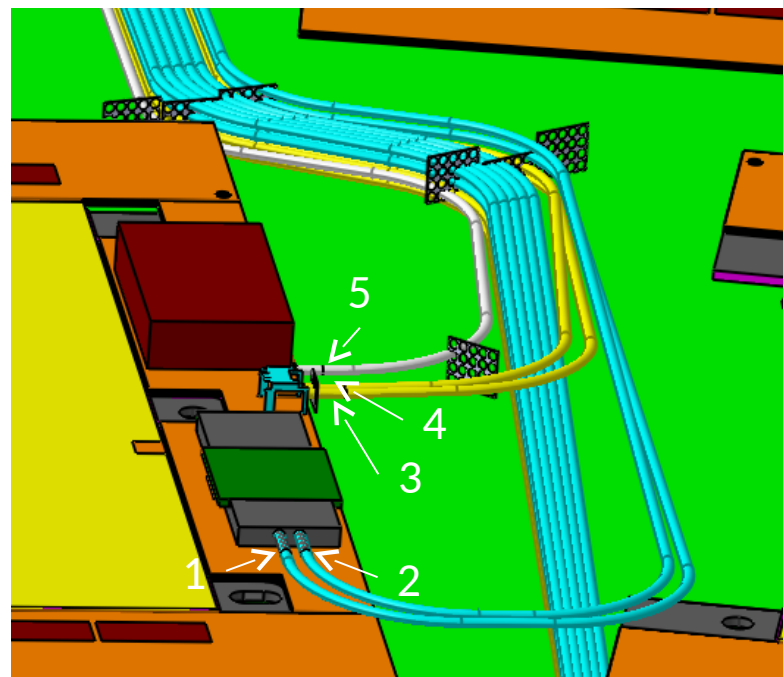
- Lines made from pairs of detectors using the low voltage cable for one and the optical fibers for the other.
- The building of this wiring is made by following the same order column by column.





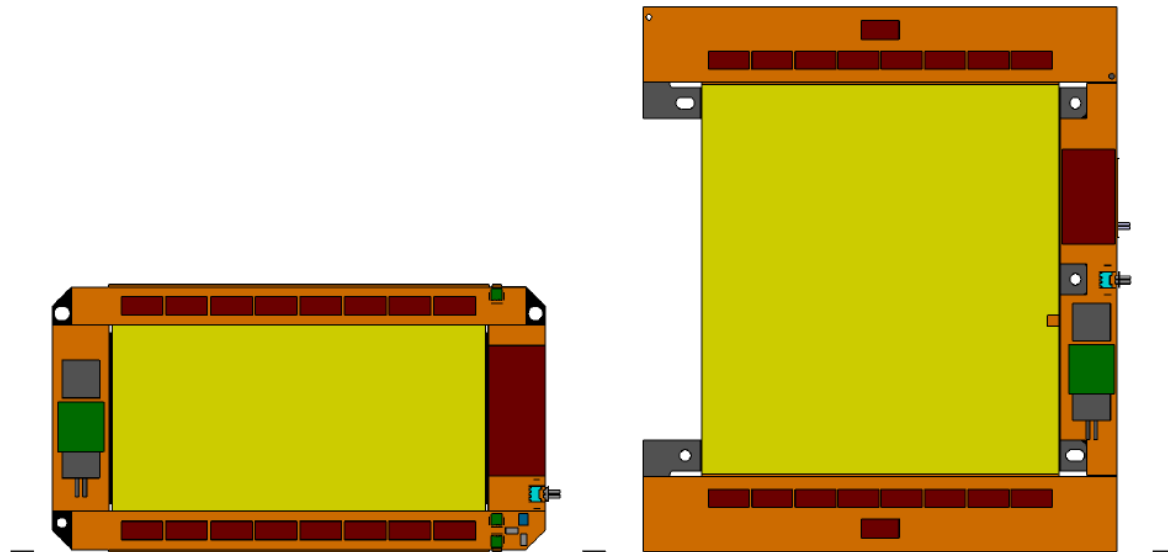
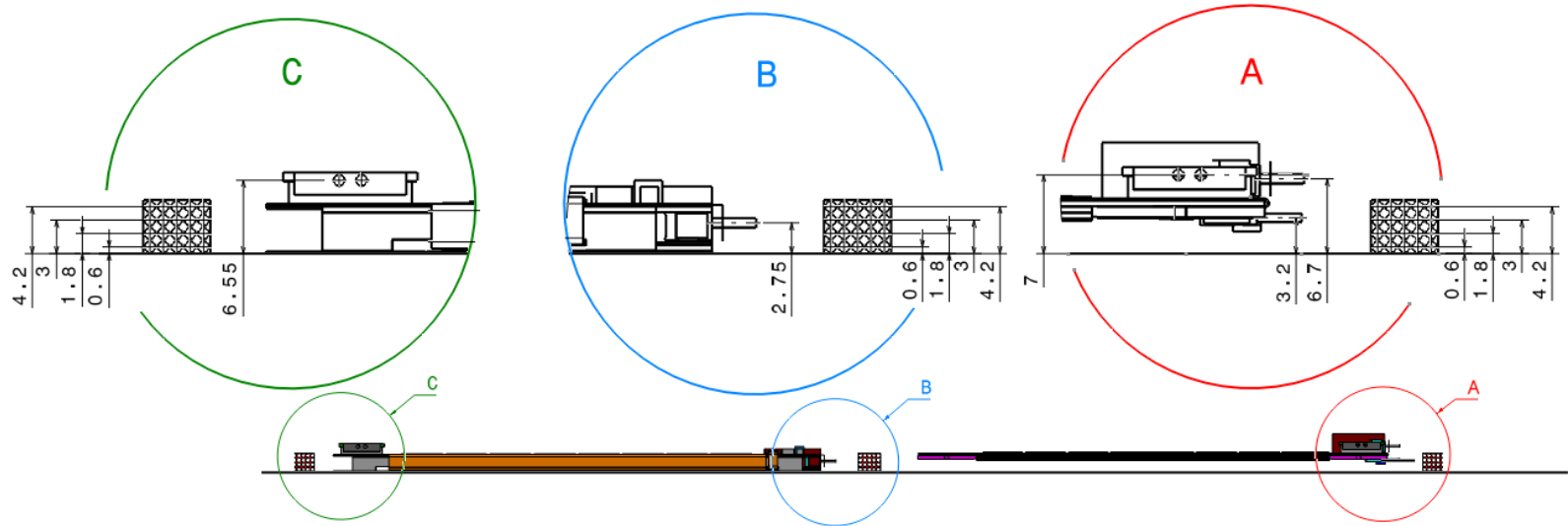
## WORKING BY SIMPLE ROWS

Line made from detectors close to the beamline up to the external diameter following the same order column by column.



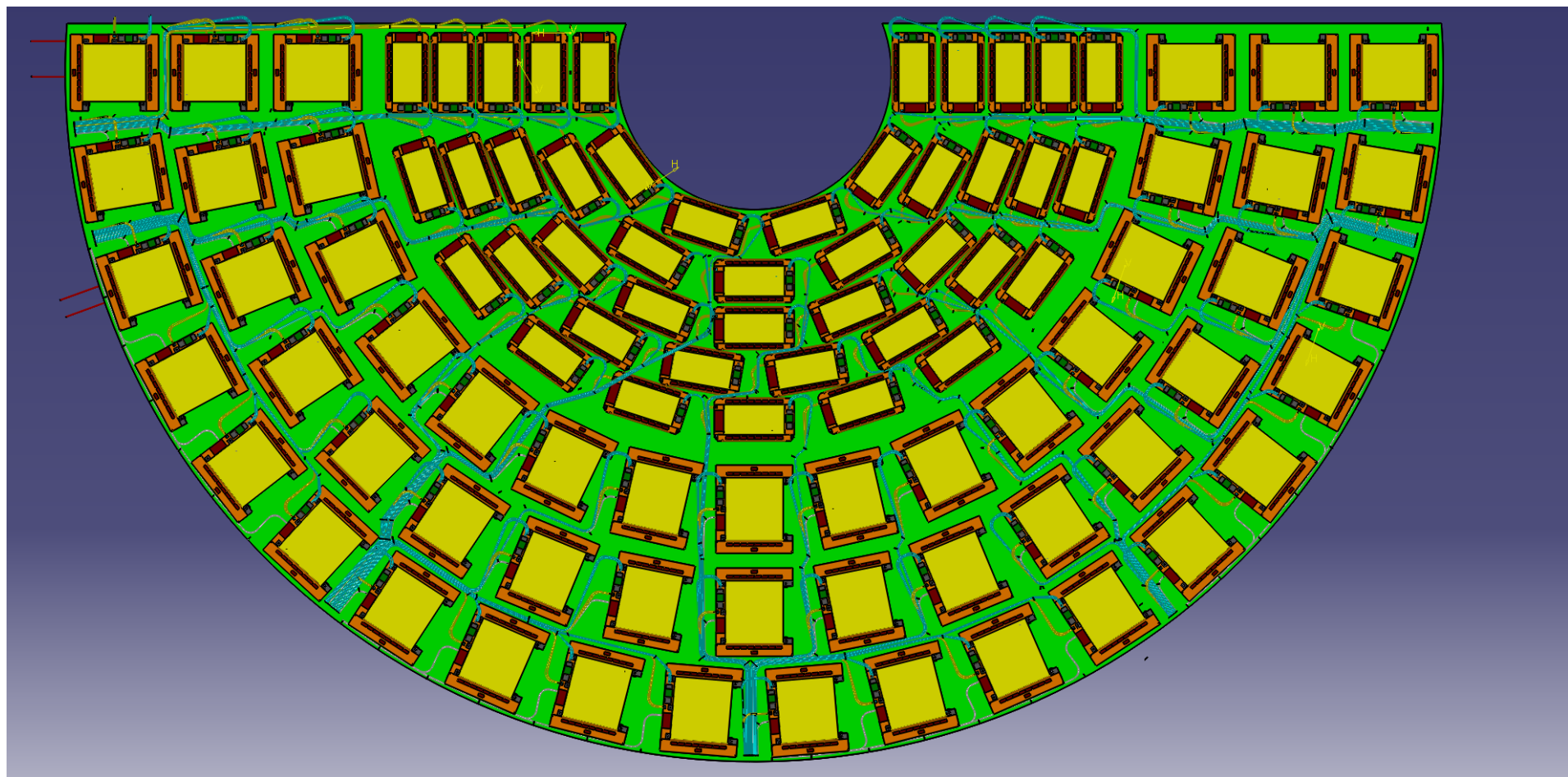


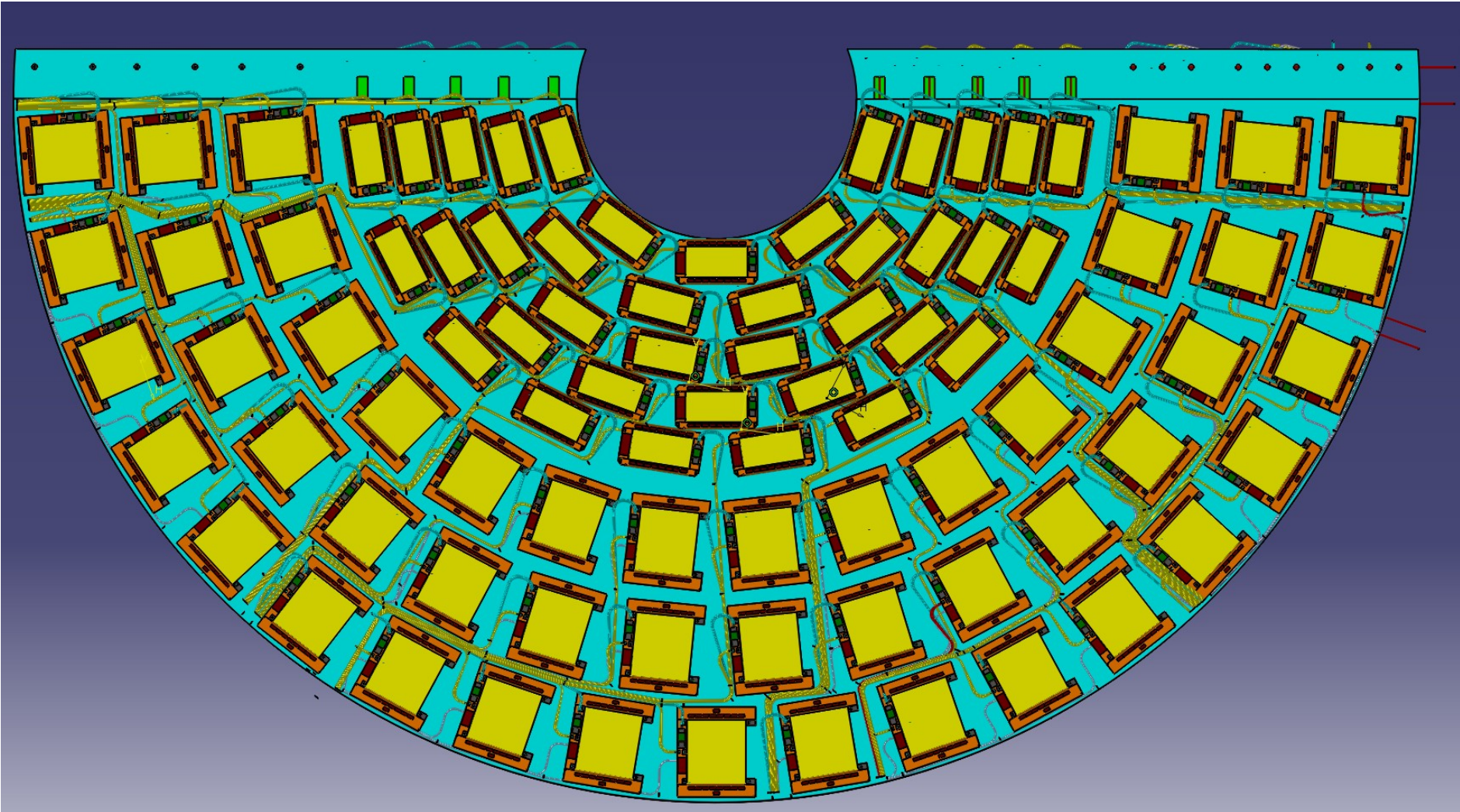
# Services levels



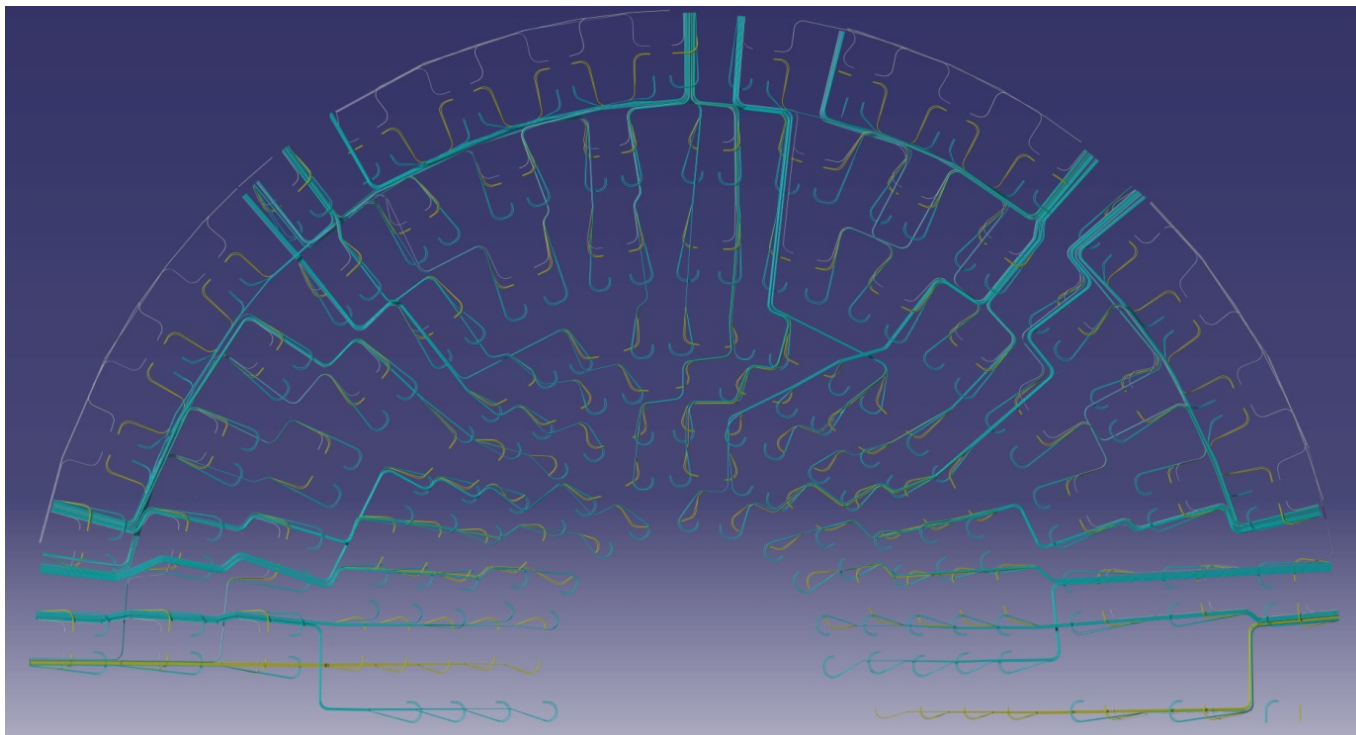
# Result

# One side...

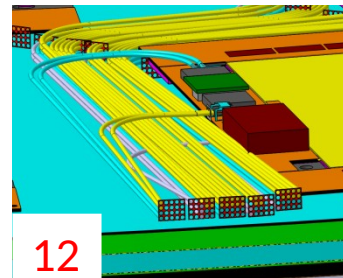
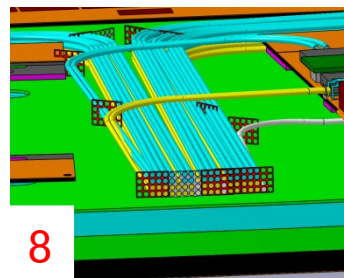
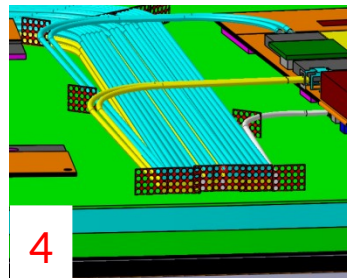
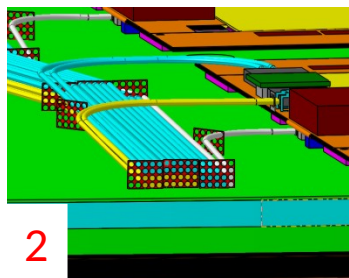
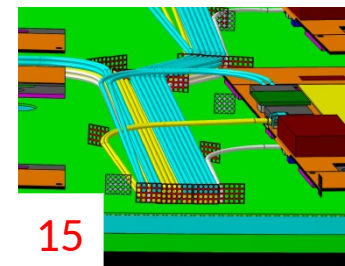
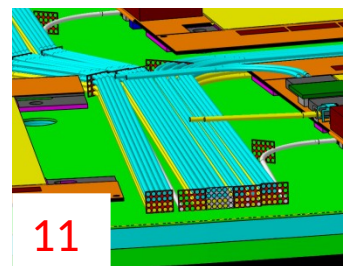
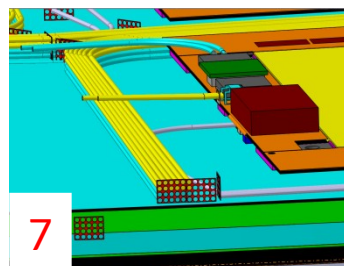
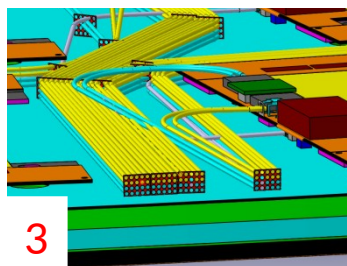
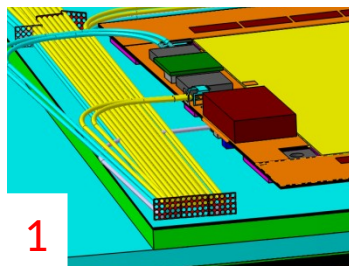
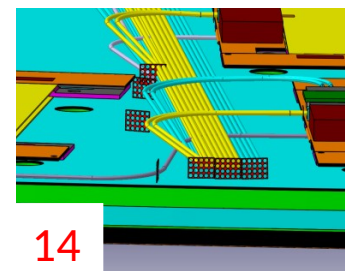
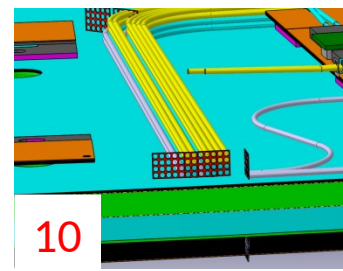
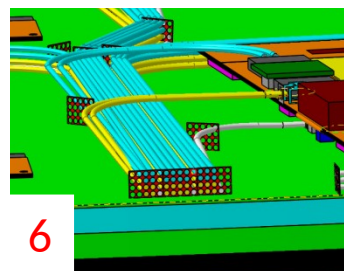
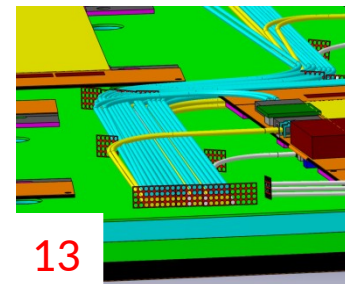
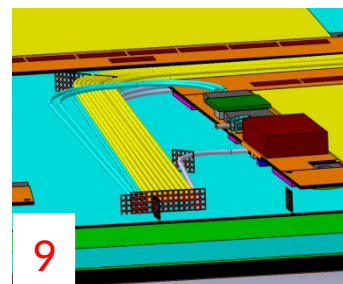
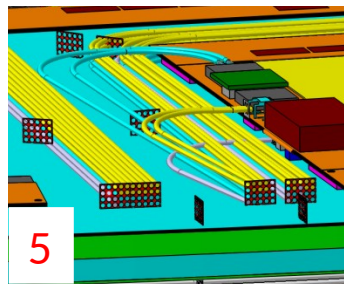
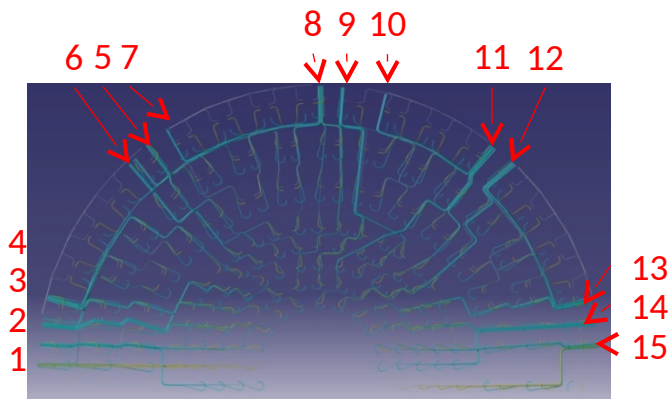




Services on both sides are visible...



	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Optical fibre	10	24	50	30	26	18	12	28	20	14	36	28	28	26	20
L Voltage	20	24	50	30	26	18	12	28	20	14	36	28	28	26	28
H Voltage	3	3	9	7	6	6	4	8	3	7	10	10	8	2	5



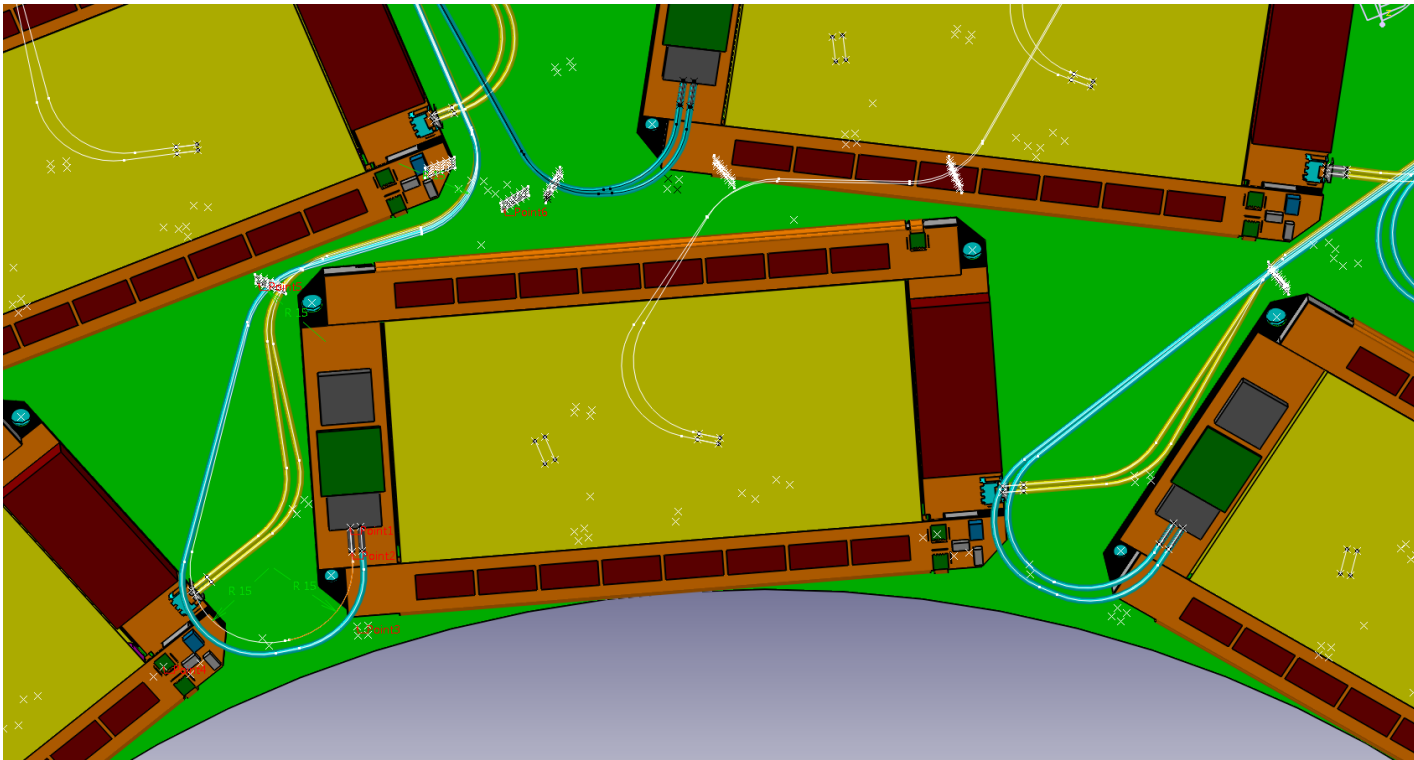
# Issues

- Double bending radius of 15mm for a lot of optical fibers connected on the detectors around the center don't allow freedom for their positions.

Options:

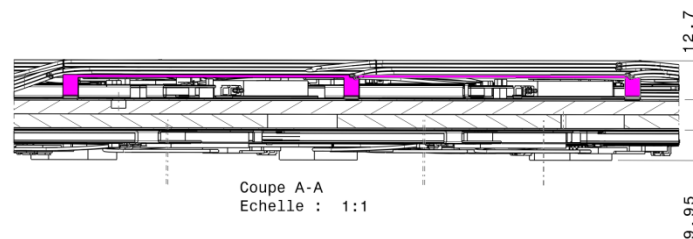
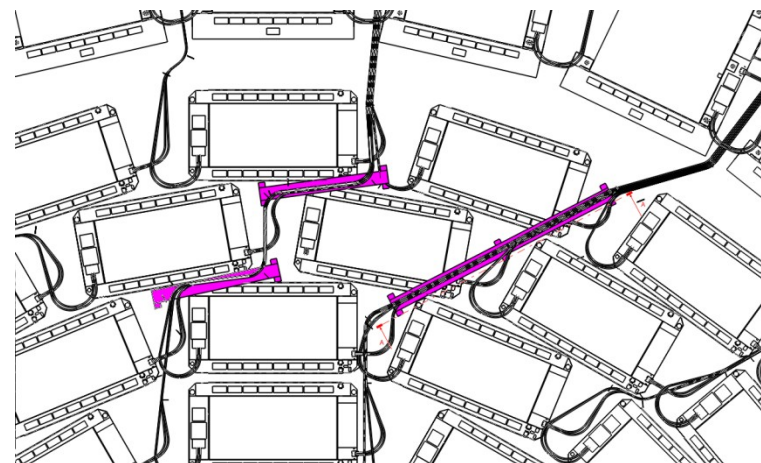
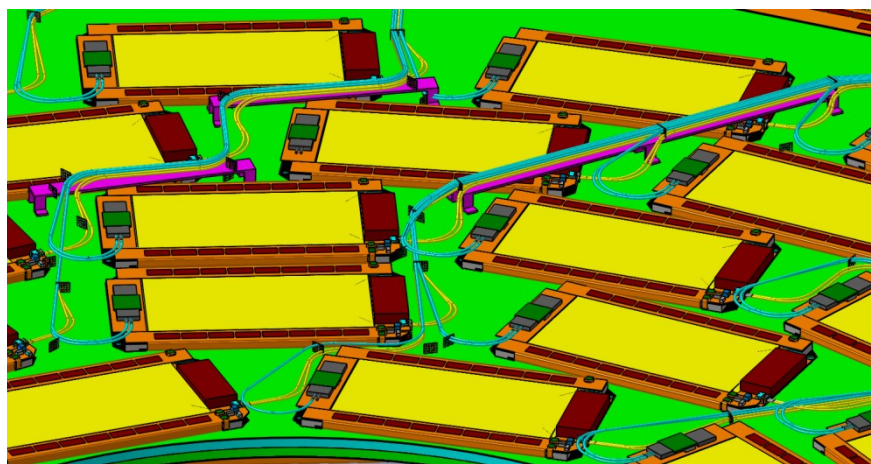
1° fixing the positions to have a model without detectors covered by fibers

2° Accept to cover the detectors by increasing the bending radius over 15mm.

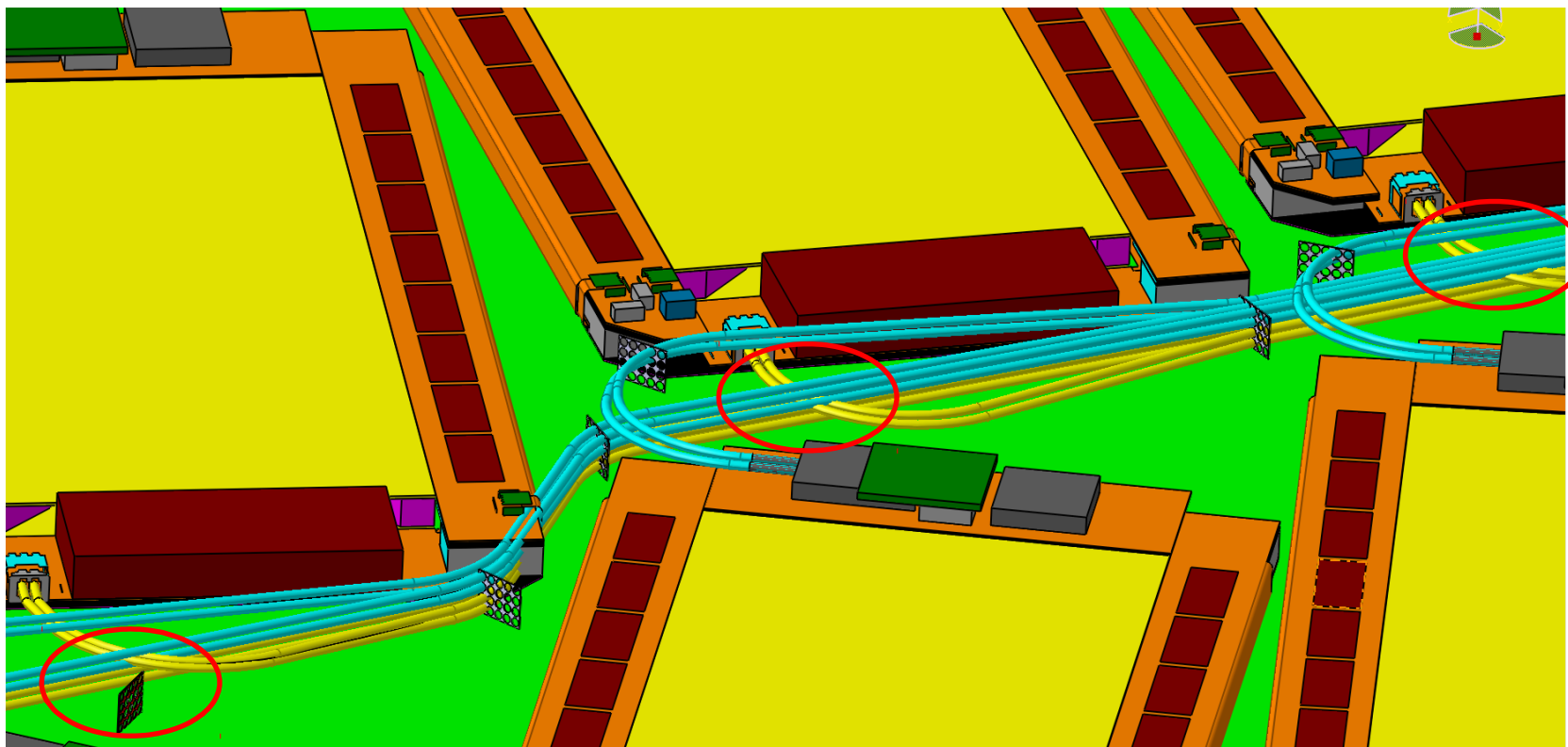




By missing space to pass between detectors at 3 Points on the face of the dee we need to install a bridge to pass over. The top level of the wiring (12,7 mm) is higher than the top level of the converter (9,95mm). For the external faces of the double dee like this one, it's not a problem but for the internal faces it's something to check.



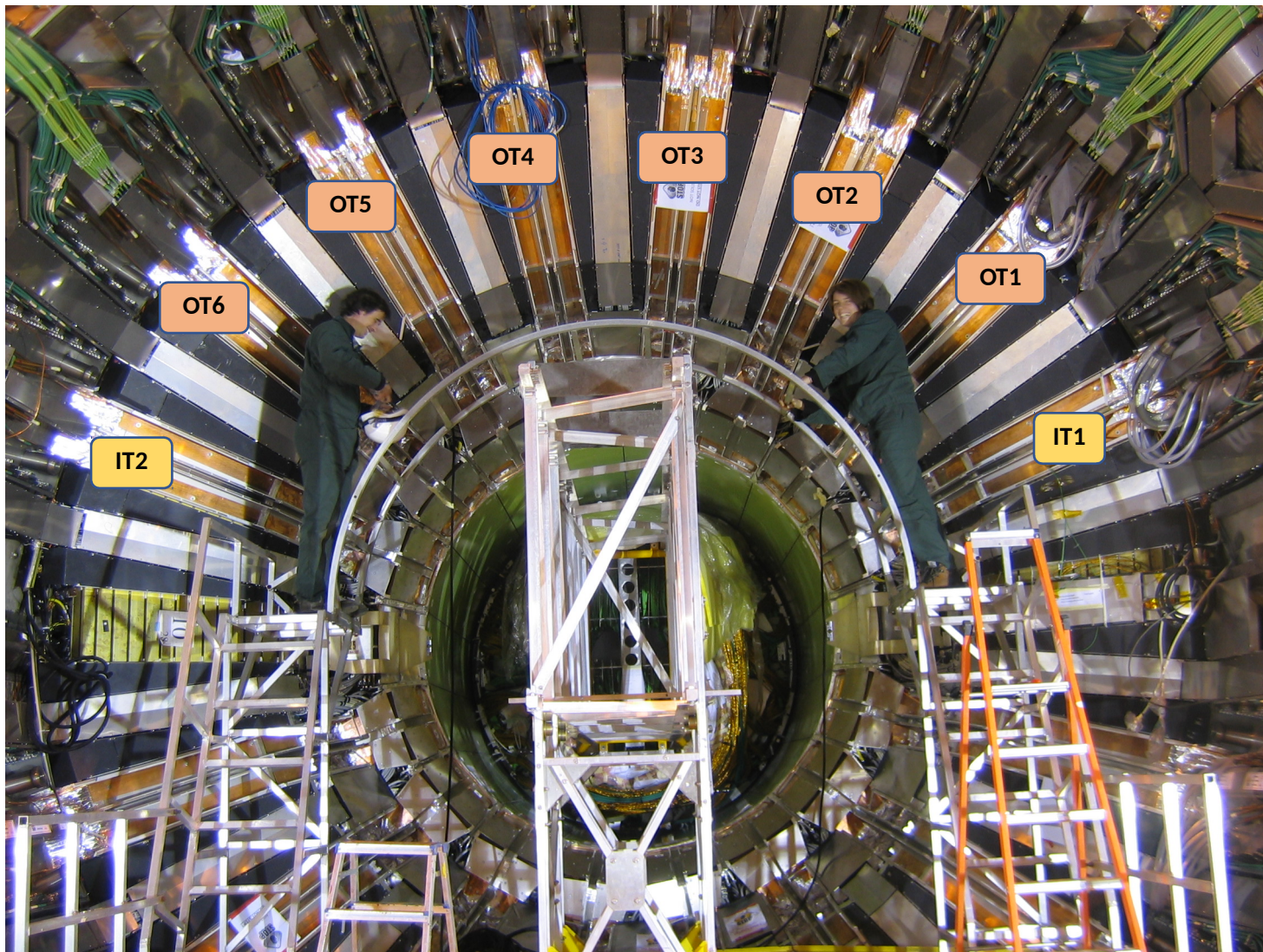
For the wiring of the PS detector, the LV cable crosses the line made by the optical fibers. It could become difficult to connect the cables on the detectors .



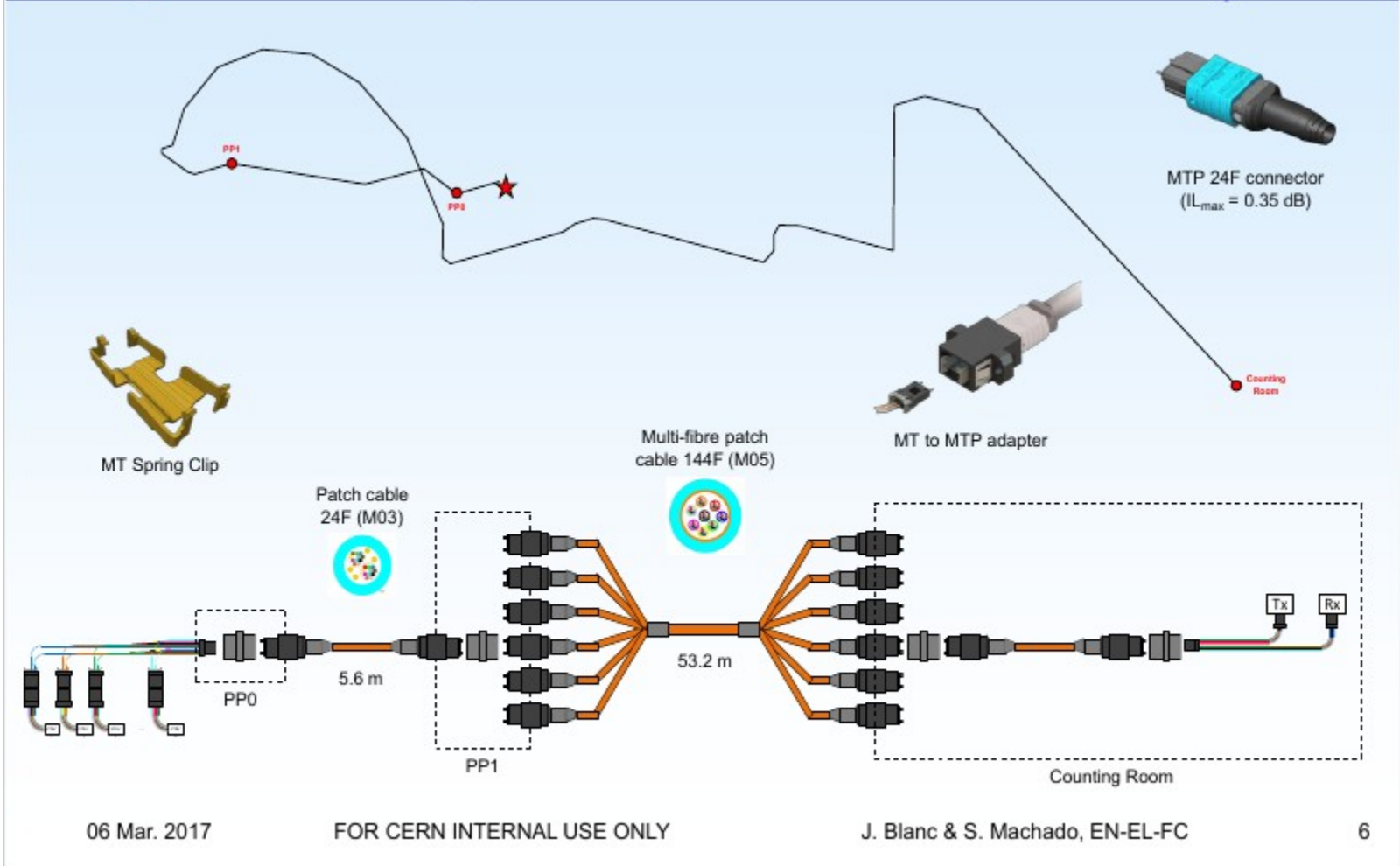
# Next steps

- The present design would naturally lead to 5 patch panels per dee.
  - ❑ PP1 114 fibers (10 ribbons) + 62 power lines (LV+, LV-, HV)
  - ❑ PP2 56 fibers (5 ribbons) + 28 power lines (LV+, LV-, HV)
  - ❑ PP3 62 fibers (6 ribbons) + 31 power lines (LV+, LV-, HV)
  - ❑ PP4 64 fibers (6 ribbons) + 32 power lines (LV+, LV-, HV)
  - ❑ PP5 102 fibers (9 ribbons) + 41 power lines (LV+, LV-, HV)
  
- This design will have to be modified to accommodate the more recent agreements on OT services at PP1.
  - ❑ Aim at 6 PP0s located away from the horizontal plane
  - ❑ Must also take into account L1 track trigger → phi groups
  
- Next step: study the space and propose an actual design for the patch panel + longitudinal cabling.

# At the PP1...



## Design of the passive optical cabling system Cabling Scheme of CMS optical link from Front-end to Back-end



06 Mar. 2017

FOR CERN INTERNAL USE ONLY

J. Blanc & S. Machado, EN-EL-FC

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Awaiting precise specs

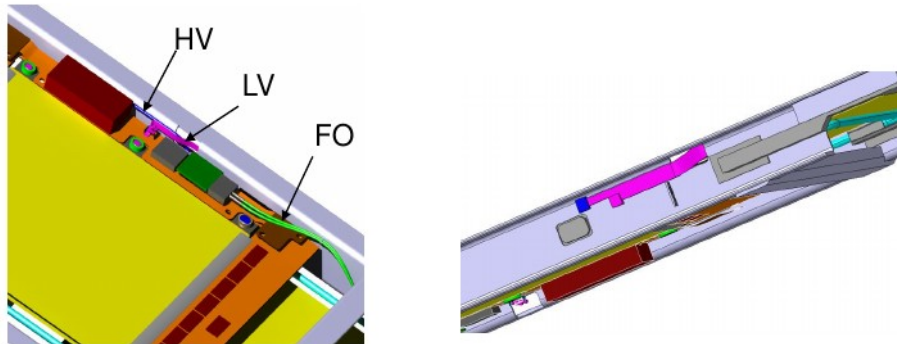


## Miscellaneous



- Received request to provide bias voltage circuits for prototype modules  
→ agreed to do so, number and timescale to be discussed
- Input voltage connector for HV was pointing towards sensor → changed
- HV connector should not be on backside (painful for assembly) → changed
- Request to put flex pig-tails for LV and bias input
  - Connector force not applied to module
  - Details are under discussion with Antti et al.

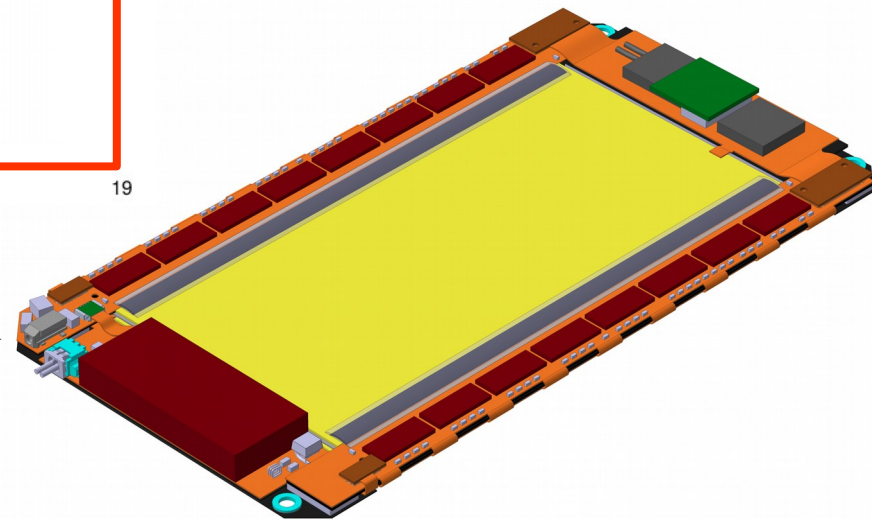
Proposal for 2S modules, driven by TB2S design.



Katja Klein

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HV connector for PS modules (new)



- The development of a realistic model for the services takes a lot of time/resources. Going further towards a final design first requires the final modules positions.
  - ❑ We cannot afford to repeat the exercise many times
- Similarly, the real sections for each wire and for the fibers is needed to optimize the bending radius.
- We need to know the position and type for the HV connectors on the PS modules
  - ❑ Last word from Katja: no space on the hybrid... small pigtail to bring a floating connector next to the LV connector. Still valid?
  - ❑ Any other change for OF and LV ?
- We believe that the design has to be validated by the construction of a mock-up, with samples of wires and connectors.