

# VTX structure - stitching technology based

## ■ 4 single layer of bent MAPS structure

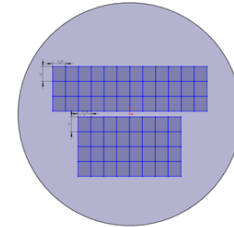
Many mechanical related issues being discussed and to be studied:

- Wafer thickness VS bent radius
- Wire bond and cable routing?
- shape retaining and connection in Z direction
- Ventilation of air cooling
- Layers integration on the beam

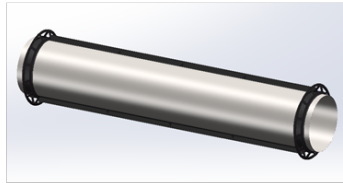
### Preliminary stitching layout

#### Layout optimization

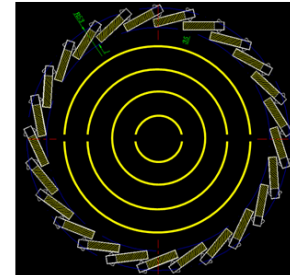
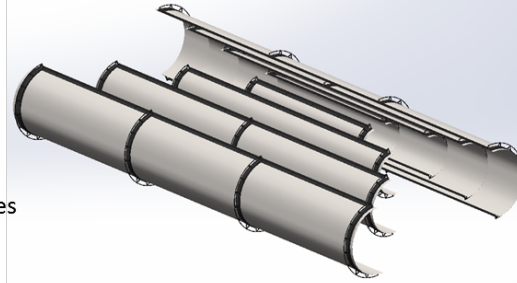
- R1=11mm, L1=160mm ;
  - Single chip dimension: 17.278\*20mm (X=8, Y=2)
- R2=16.5mm, L2=240mm ;
  - X=6, Y=3
- R3=22mm, L3= 320mm
  - X=8, Y=4
- R4= 27.5mm , L4 = 390
  - Difficult to fit into one wafer ?



### Preliminary structure design of the bent MAPS detector



- one layer has two hemicycles
- low support materials
- more area for ventilation

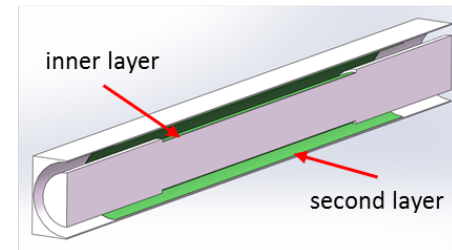


一些结构相关条件待进一步讨论

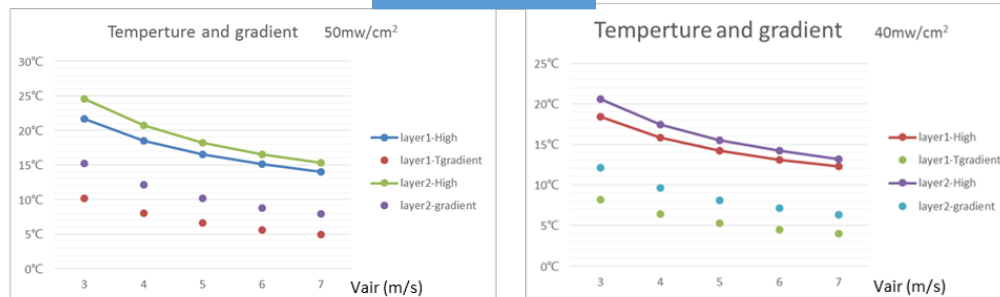
# Innermost layer cooling simulation

For the innermost layer (R=11mm), it is quite close to the beam pipe(R=10.7mm), the air cooling simulation has been conducted.

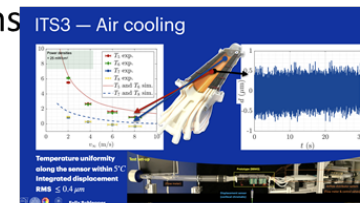
- Power dissipation: 50 mW/cm<sup>2</sup> , 40 mW/cm<sup>2</sup>
- Inlet air temperature 5 °C
- Inlet air velocity varies from 3 m/s to 7 m/s  
(Second layer involved, beam pipe temperature ignored)



## Simulation results

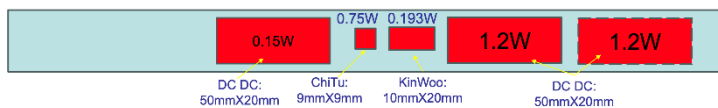
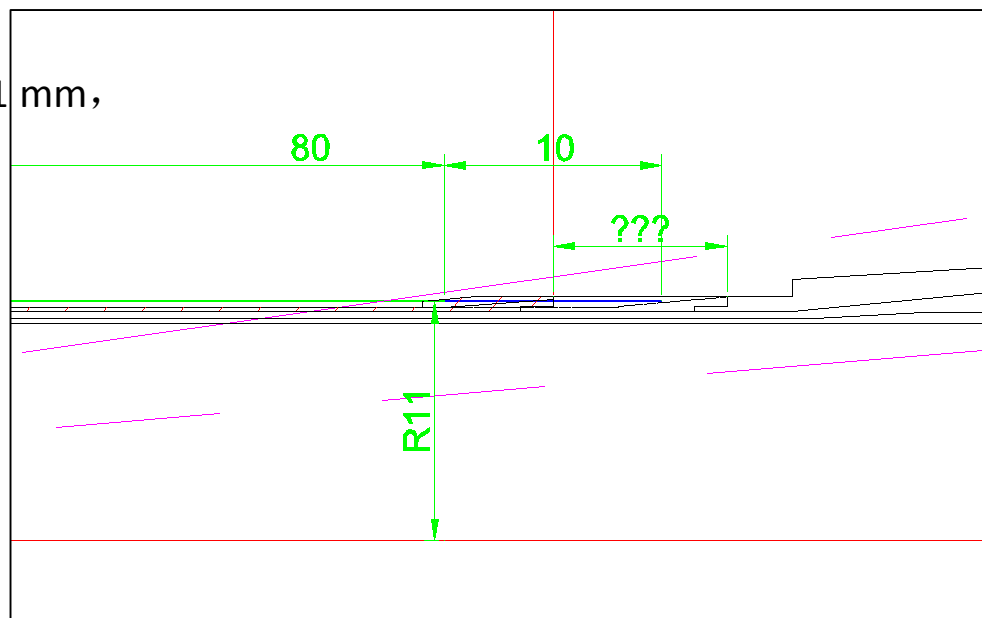


- To air cool the innermost layer detector within 20 °C seems feasible. *Temperature gradient should be controlled in a certain level from safety point view.*
- More to be studied !



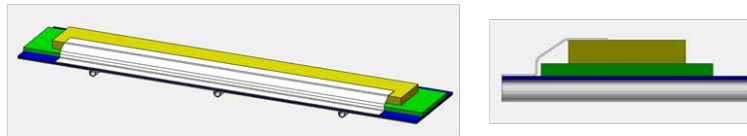
# VTX最内层尺寸与束流管对接？

按当前layout：最内层弯曲芯片R11 mm，  
与外铍管段干涉。  
外皮管可否适当延长？



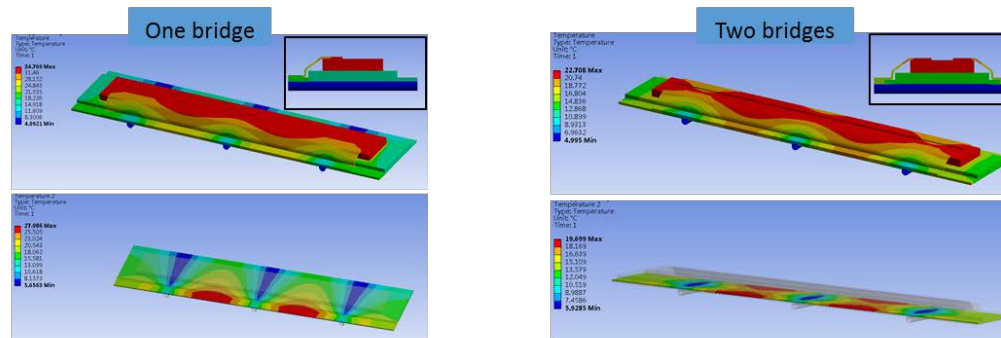
# Thermal analysis of OTK ladder

New optimized cooling scheme: add a thermal conductive bridge over the PCB to connect the ASIC and LGAD



One bridge, 0.5mm Cu: ASIC~ 35 °C, LGAD ~ 28 °C

Two bridges, 0.5mm Cu: ASIC~ 23 °C, LGAD ~ 20 °C



Better results but more materials. Candidate materials?

物理上优先考虑一个初步的热沉方案，进行中