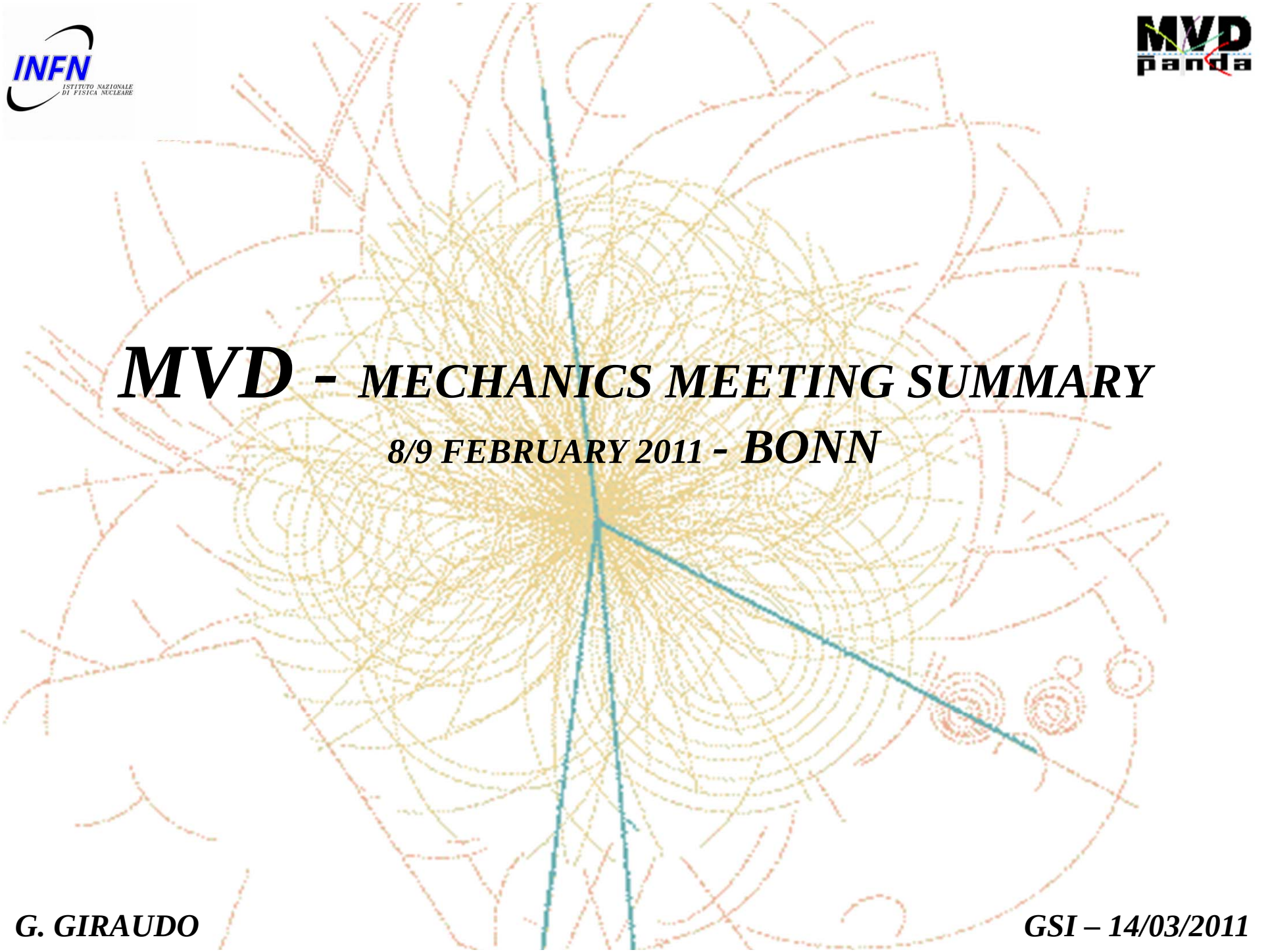


MVD - MECHANICS MEETING SUMMARY

8/9 FEBRUARY 2011 - BONN

G. GIRAUDO

GSI – 14/03/2011

SUPPORT FRAME

The *support frame* is the main structural element of the whole MVD's sub-structures.
The barrel and the disks *elements* must be suspended and kept in place.
The barrel and the disks *services* must be routed and supported.
A full prototype has been built following the guidelines from the FEA

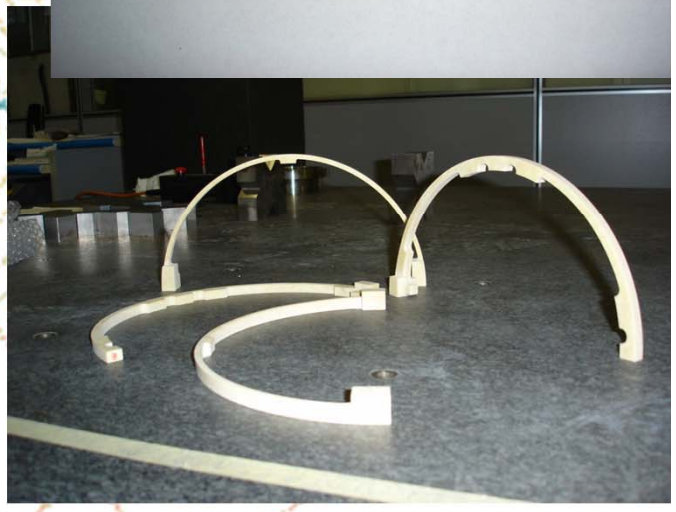
sandwich structure

- **1 skin → 4 plies of carbon fibre M55J/LTM110 (0°, 45°, 90°, 135°)**
- **core → Rohacell 51IG**
- **1 skin → 4 plies of carbon fibre M55J/LTM110 (0°, 45°, 90°, 135°)**

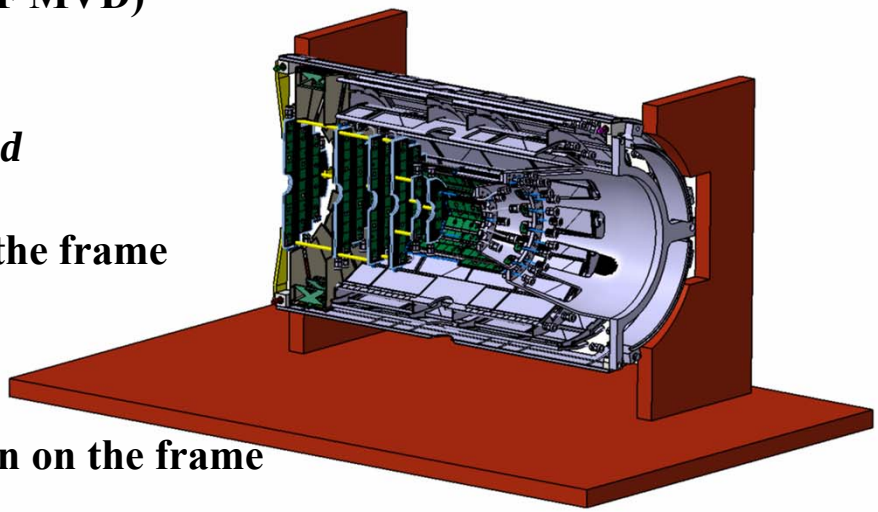
Total thickness → 4mm
inner radius = 137 mm
outer radius = 141 mm
Length = 460 mm
Radiation Length $X/X_0 \approx 0{,}4\%$

End rings (epoxy glass reinforced – Röchling EPM203) and ancillaries parts (Hokotol - aluminum hardened alloy) delivered in December / January.
Final assembly started.
Load test is in preparation.

Two half frame has been delivered in June 2010.
Geometrical properties has been surveyed.
Overall dimensions are in line with the tolerances requested.

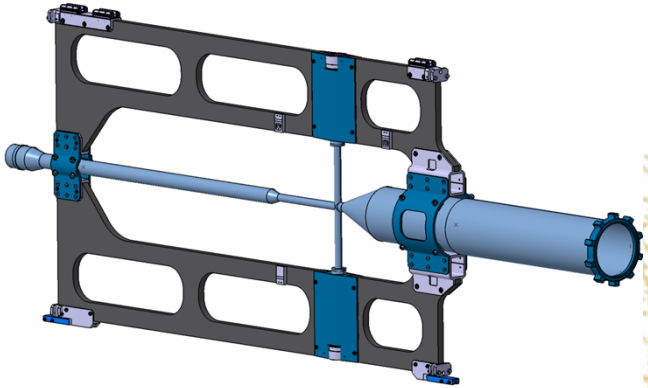


ASSEMBLY SEQUENCE (PROPOSAL – HALF MVD)



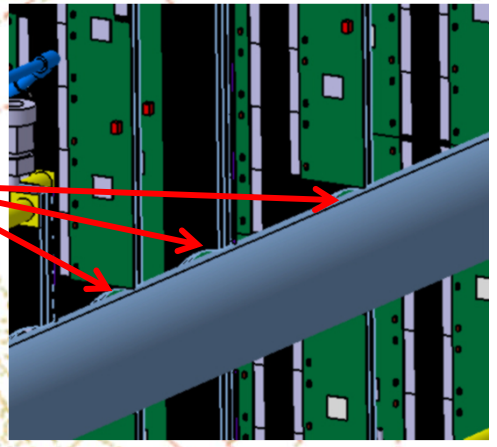
- **Frame**
  - ➢ Mechanical locking in position on a *stand*
  - **Barrel Strips**
    - ➢ Mechanical locking in position on the frame
    - ➢ Routing of the services
    - ➢ Tests (Electrical & Pressure)
    - **Disks Strips**
      - ➢ Mechanical locking in position on the frame
      - ➢ Routing of the services
      - ➢ Tests (Electrical & Pressure)
      - **Barrel Pixel**
        - ➢ Mechanical locking in position on the frame
        - ➢ Routing of the services
        - ➢ Tests (Electrical & Pressure)
        - **Disks Pixel**
          - ➢ Mechanical locking in position on the frame
          - ➢ Routing of the services
          - ➢ Tests (Electrical & Pressure)
          - **Survey (?)**

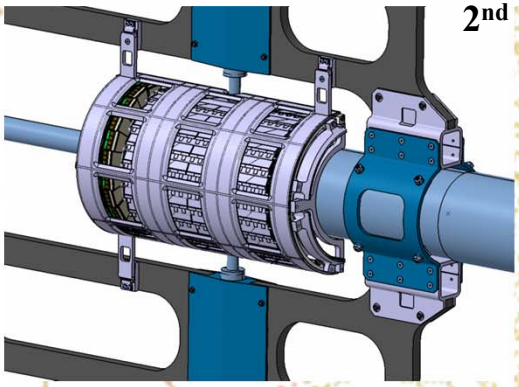
MVD INTEGRATION IN PANDA



1st step: cross pipe in position.

- Manufacturing tolerances.
- Assembly tolerances.
  - 0.8 mm clearance between beam pipe and disks





2nd step: Half MVD in position.

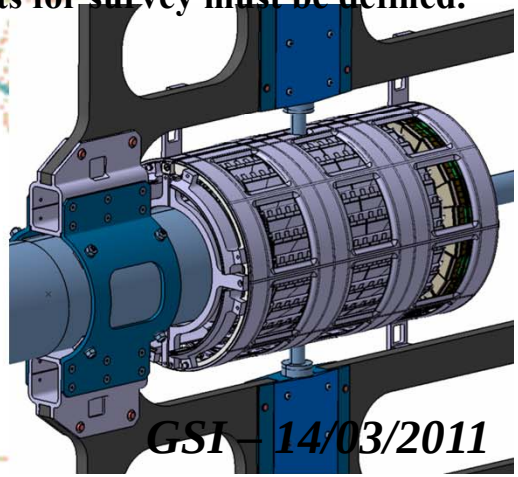
- Services: routing & connection.
- Tests
- Survey (?)

3rd step: 2nd Half MVD in position.

- Services: routing & connection.
- Tests
- Survey (?)

Services connection need dummy patch panels.

Key points for survey must be defined.



4th step: STT/TPC in position.

5th step: Frame inserted into magnet.

- Final services connection.
- Tests
- Final survey

Possible interaction with Backward EMC support.

MVD PIXELS MECHANICS

BARREL → Two Layers

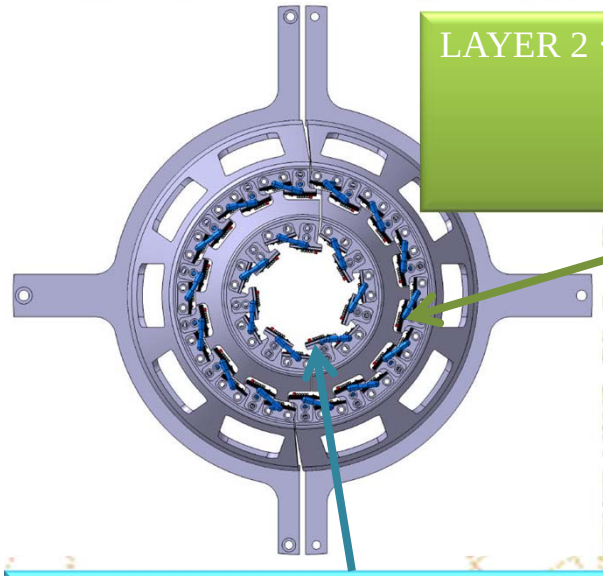
LAYER 1 → 14 super-modules

LAYER 2 → 28 super-modules

DISKS → Six Planar Disks

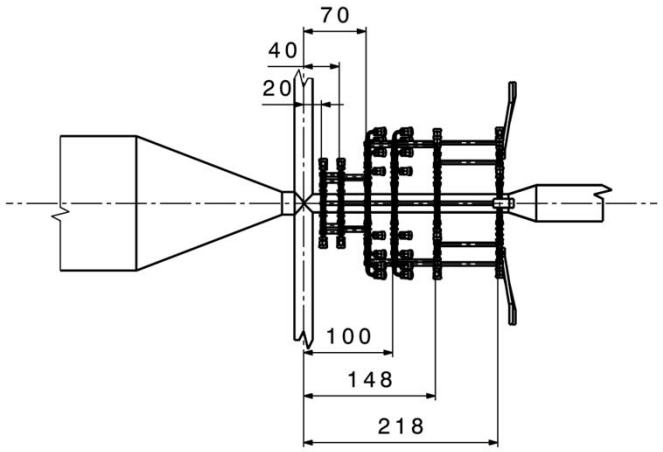
DISKS 1 & 2 → 16 modules

DISKS 3 to 6 → 96 modules



LAYER 2 → 14+14 super-modules
$ø_i$=95 mm
$ø_e$=105 mm
overlap ~ 0.3 mm

LAYER 1 → 8+6 super-modules
$ø_i$=44 mm
$ø_e$=56 mm
overlap ~ 0.3 mm



The full assembly of each sub-system requires dedicated tooling, needed also for reference holes and reference surface machining in order to reach the requested accuracy.

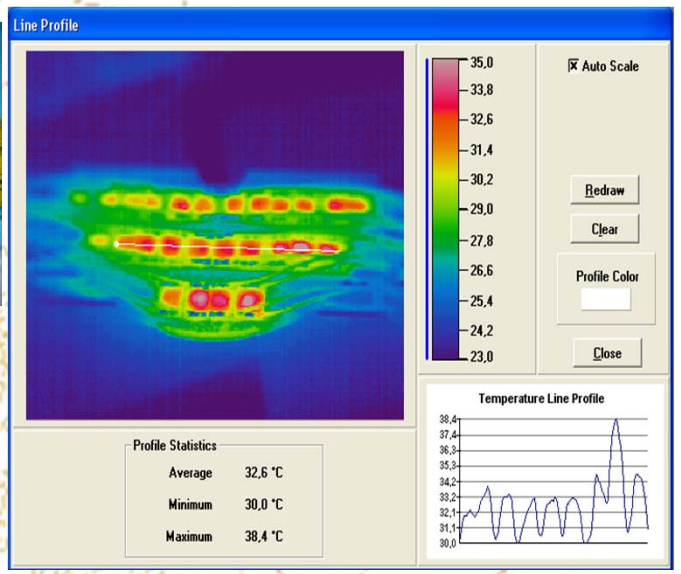
MVD PIXELS COOLING

DISKS 3, 4, 5, 6:

•**FEM** considering different parameters:

1. Different tube diameters
2. Different cooling tube numbers
3. Different carbon foam thickness

•**TEST** of 2 prototypes



DISKS 1-2 (analyses not concluded):

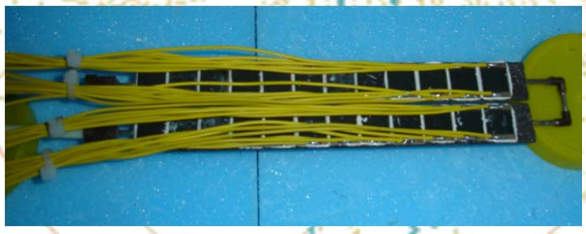
•**FEM** : first simulations

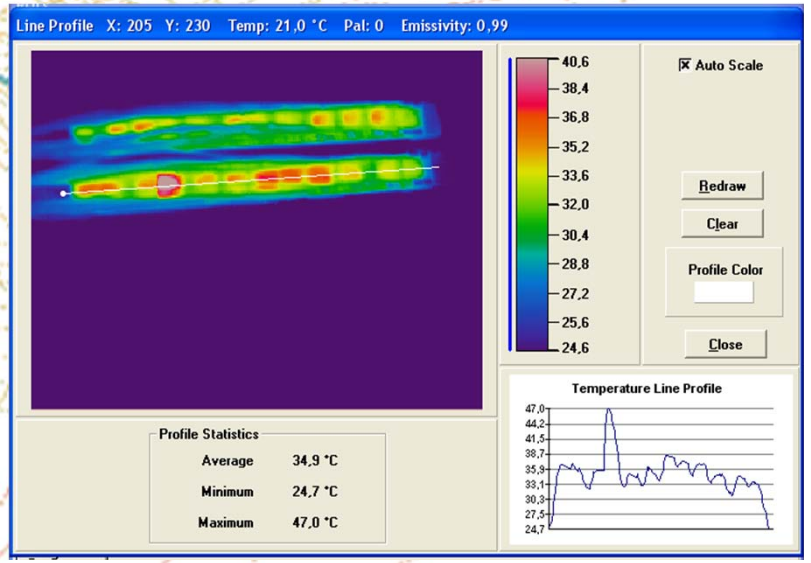
BARREL (analyses not concluded):

•**FEM** considering different parameters:

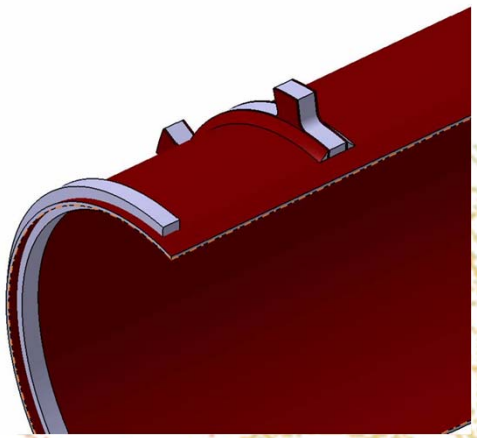
1. Different glues
2. Different carbon foam thickness
3. Different cooling tube numbers

•**TEST** of prototypes





MVD STRIPS MECHANICS

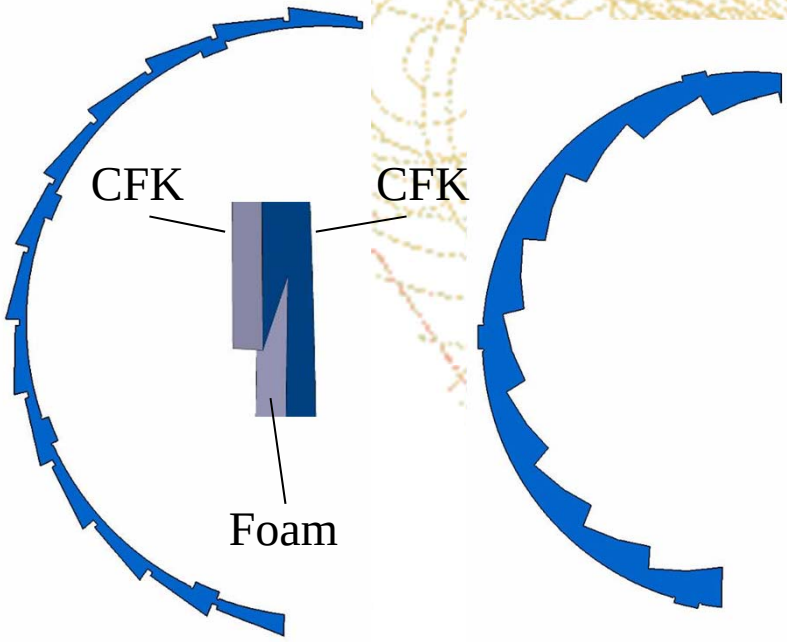


Strip Part - Support Cylinder

Dimension → Sv-3.3
Materials:
- CFK → Material with better performance
- Foam → Rohacell 51

Manufacturing:
- in progres

? Support for the flexible tubes
? Load
? Cutouts



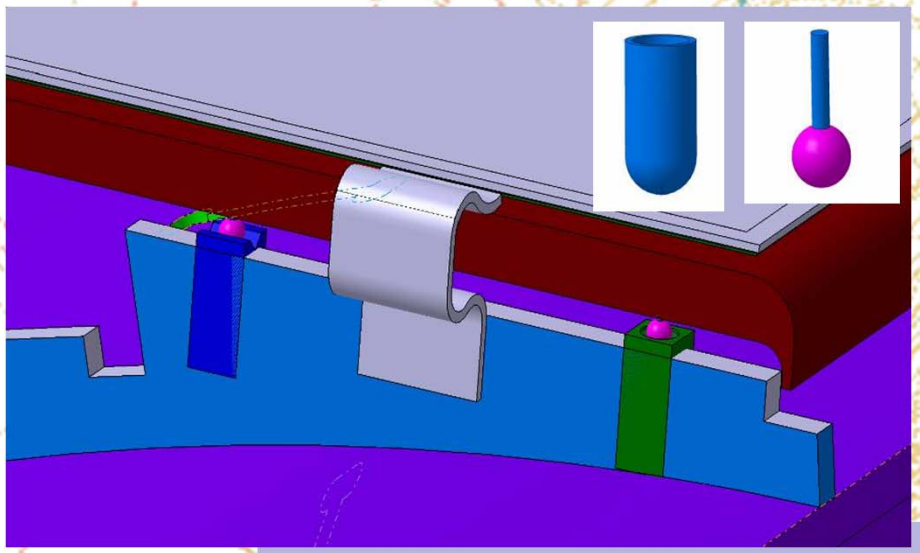
Strip Part – Shark Teeth

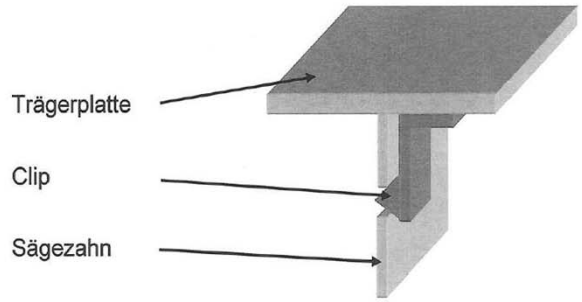
Dimension → Sv-3.3
Materials:
- CFK → Material with better performance
- Foam → Rohacell 51

Manufacturing:
- OK

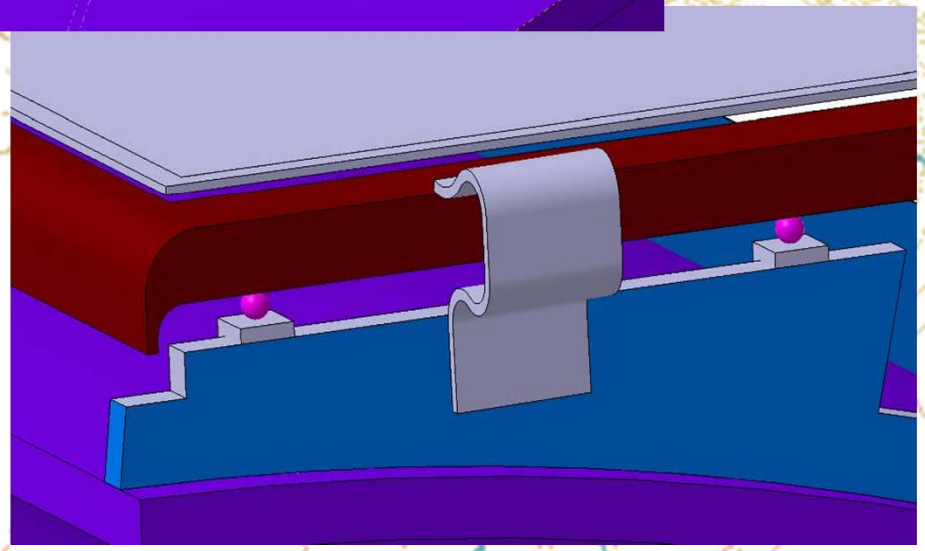
Exact positioning of the detectors.

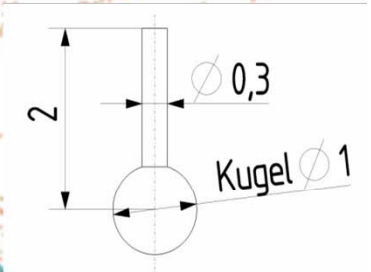
Exact positioning - Clips



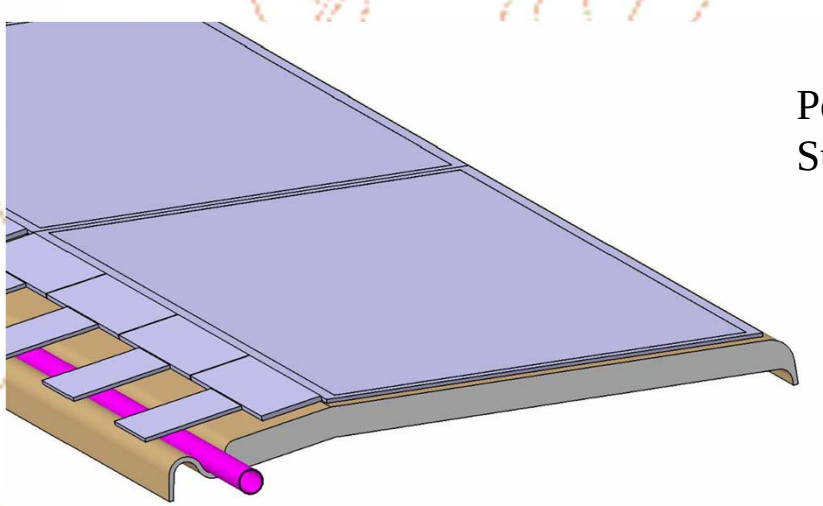


Source: Lars Lambecht IKV

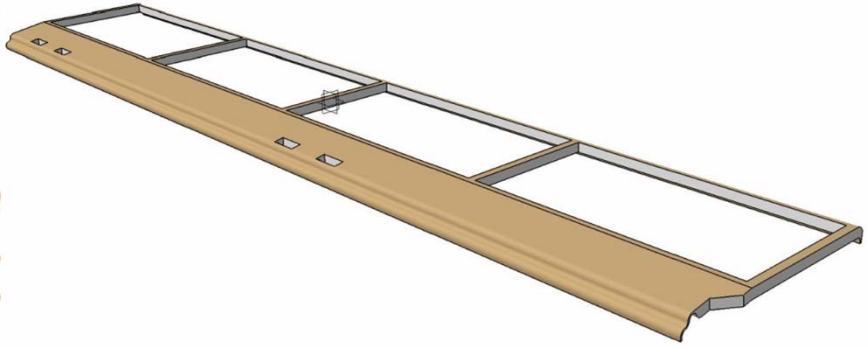




MVD STRIPS MECHANICS



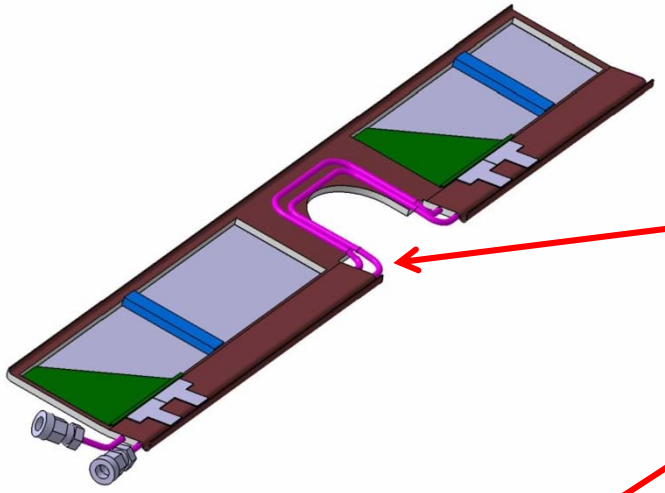
Position of the tube
Support for the electronic

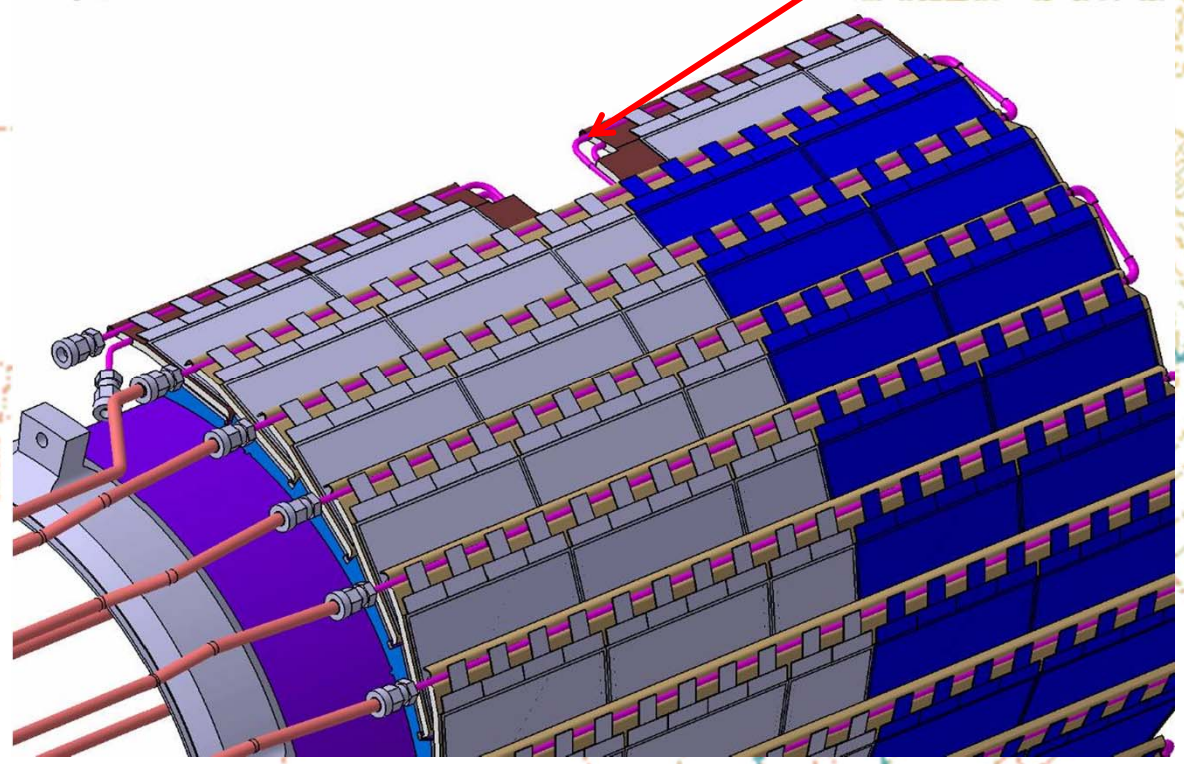


Dimension
Material
Manufacturing

Stiffness ?

MVD STRIPS COOLING



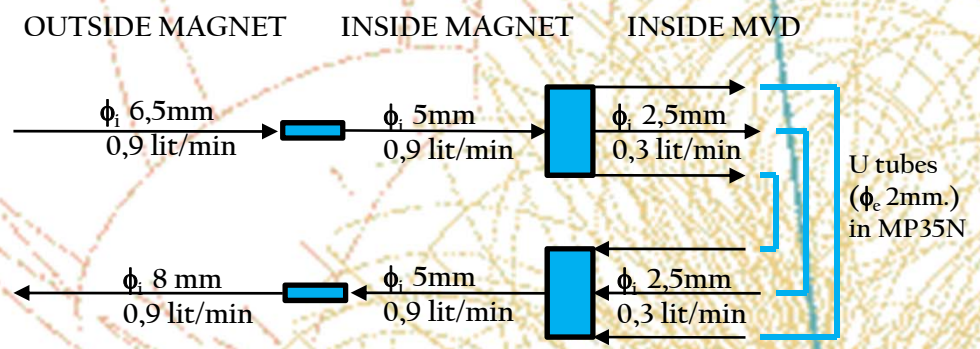


Strip – lenght :
~ 315 mm
Max. length of the tube:
~ 800 mm
Tube
- Material: MP35N alloy
- Diameter: 2 mm
- wall thickness: 0.08 mm

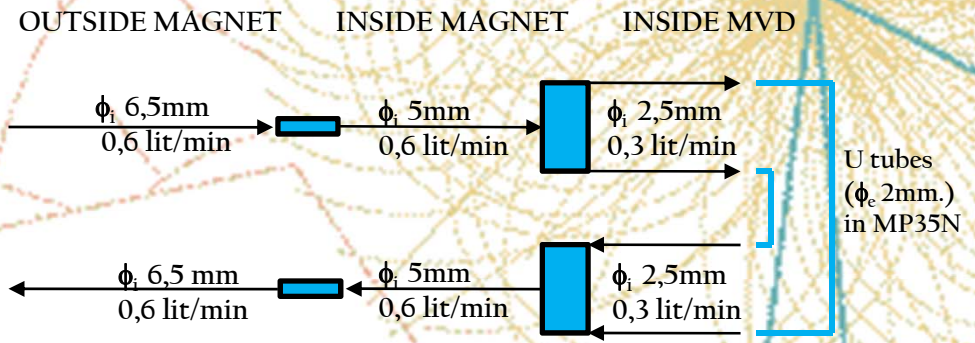
Thermal transfer
- ? Thermal power
- ? Temperature difference
- ? Thermal resistance
- ? Glue
- ? Grease
- ? Pressure drop
- ? Mass flow

HYDRAULIC CIRCUIT for MVD SYSTEM (PIXEL + STRIP): FIRST EVALUATIONS

COOLING CIRCUITS



N. 11 circuits for 3 U tubes



N. 10 circuits for 2 U tubes

HYDRAULIC CIRCUIT for MVD SYSTEM (PIXEL + STRIP): FIRST EVALUATIONS

PIXEL:

TUBE LENGHTS:

- **35 m INLET outside the magnet**
- **2 m INLET inside the magnet**
- **1 m in the MVD**
- **2 m RETURN inside the magnet**
- **35 m RETURN outside the magnet**

WATER VOLUME: about 55 liters

MASS FLOW RATE: about 15 lit/min

TUBE NUMBER: 20 INLET tubes + 20 RETURN tubes

TUBE MODULARITY: 11 circuits with 3 U tubes + 8 circuits with 2 U tubes (0,3 lit/min each)

STRIP:

TUBE LENGHTS:

- **35 m INLET outside the magnet**
- **2 m INLET inside the magnet**
- **1 m in the MVD**
- **2 m RETURN inside the magnet**
- **35 m RETURN outside the magnet**

WATER VOLUME: about 40 liters

MASS FLOW RATE: about 10 lit/min

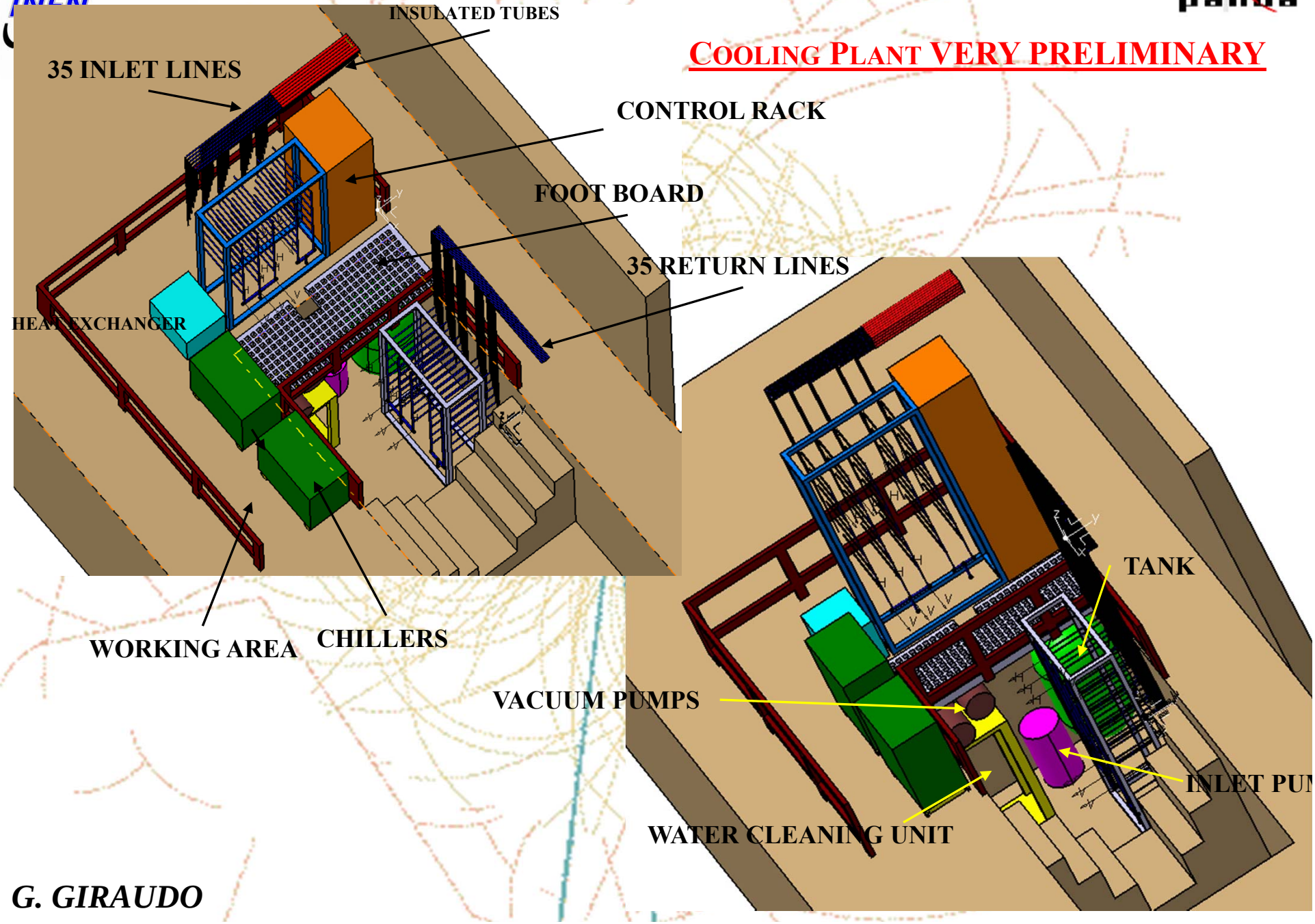
TUBE NUMBER: 15 INLET tubes + 15 RETURN tubes

TUBE MODULARITY: 3/6 circuits with 3U tubes + 11/6 circuits with 2 U tubes [+ 2 for 1U tube] (0,3 lit/min each)

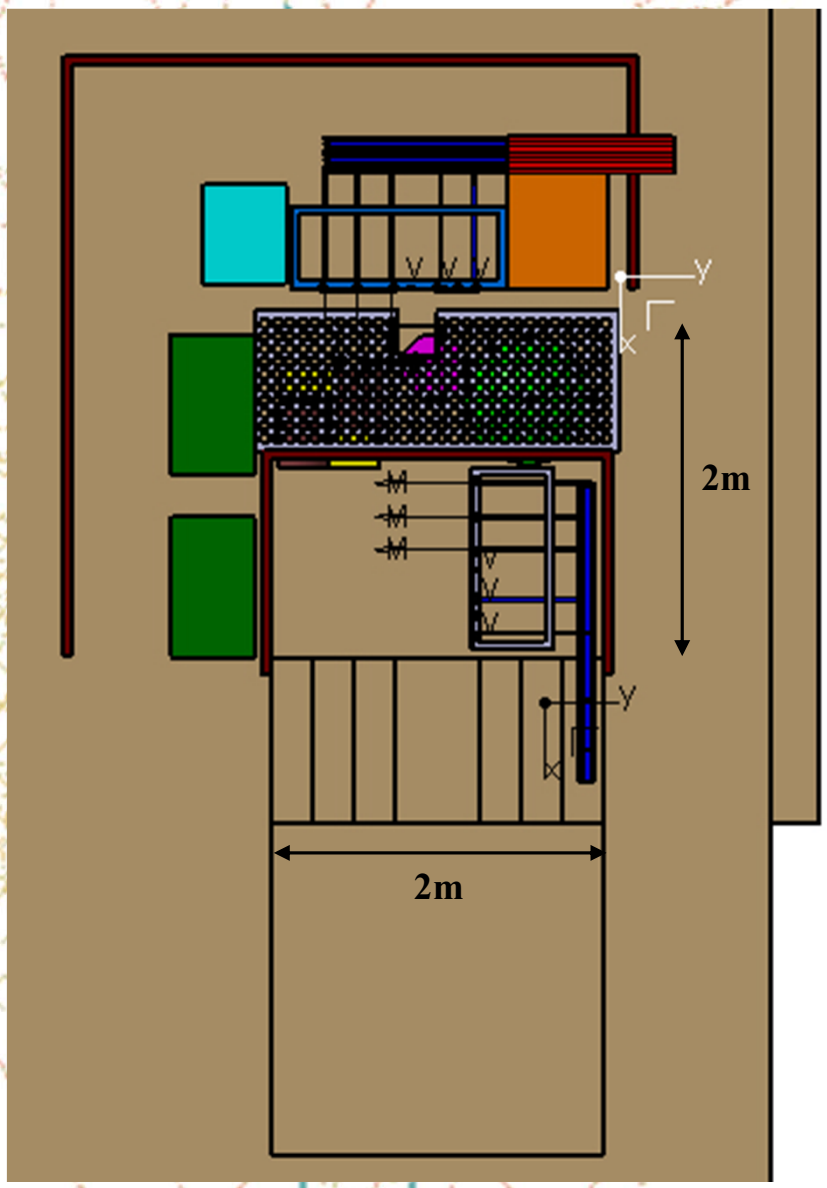
SUMMARING

- **About 100 lit (PIXEL + STRIP)**
- **About 30 lit/min (PIXEL + STRIP)**
- **70 Tubes (PIXEL + STRIP, INLET + RETURN)**

COOLING PLANT VERY PRELIMINARY



G. GIRAUDO


3,5m
4,2m
2m
2m