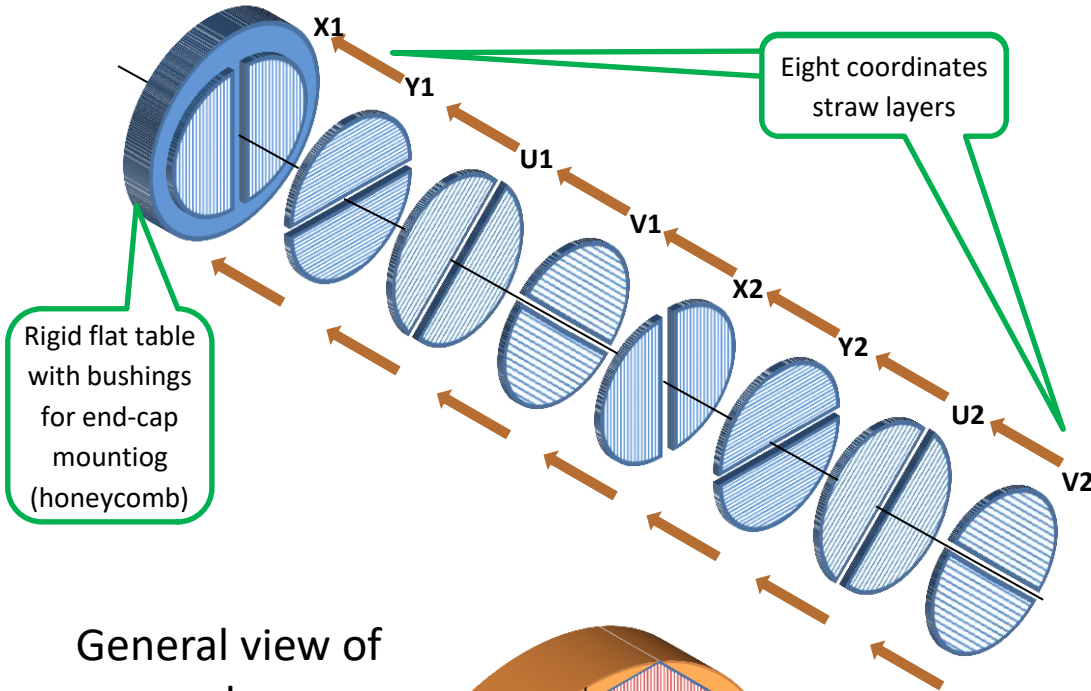


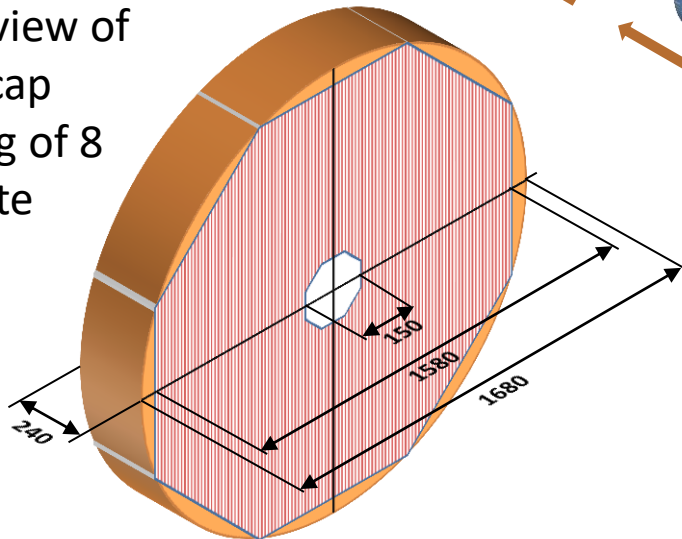
Straw endcap status report

K.Basharina, G.Kekelidze, V.Kramarenko, V.Lysan,
V.Pavlov, A.Shunko,

Principle design of Straw endcap

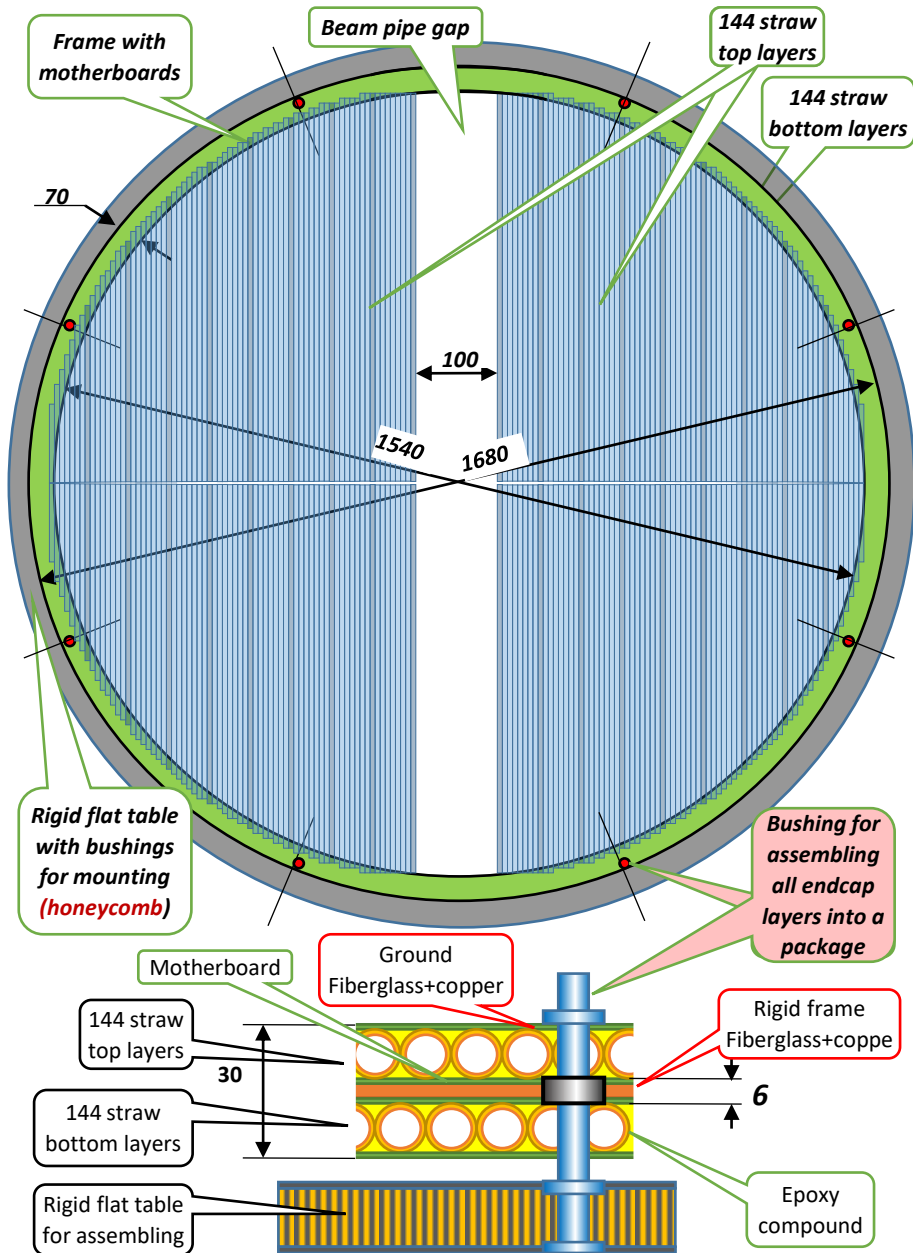


General view of one endcap consisting of 8 coordinate planes



- Detector arranged so - that they form an X, Y, U, V coordinate system at an angle of 45 degrees.
- Each coordinate plane consists of two halves separated by a distance for installation on a vacuum tube - the gap.
- The thickness of one coordinate plane is 30 mm
- Eight coordinate planes are mounted together on the rigid flat table, forming a rigid block, 240 mm thick.
- After assembling all eight planes, the flat table is removed
- In total , 4608 straw are contained in two endcaps with a diameter of tubes 9,68 mm.

Principle design of one coordinate plane Straw endcap



One coordinate layer consists of a frame with 288 straw tubes, 9 (32 ch) motherboard. Straw are glued on both sides



The straw planes are assembled on a rigid **honeycomb board** on a rotatable octagonal frame

- The detector must have the shape of a disk,
- have a relatively small central hole, which is defined by a beam pipe,
- have a small amount of matter in the sensitive region of the detector.
- The detection layers should be thin,
- The number of layers should be sufficient to identify particles via dE/dx measurement.

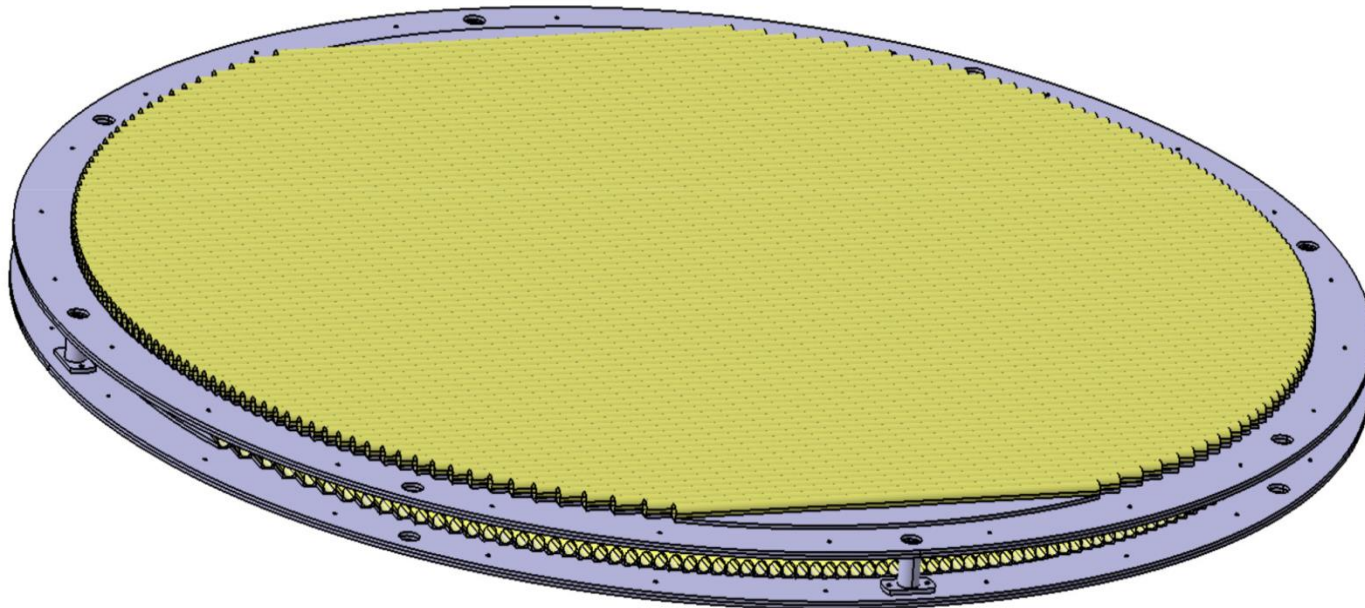
Creating a smaller scaled-down prototype Diameter of frame 1 meter

Straw endcap
1 meter Prototype

The **goal** is to develop an assembly technology and design of frontend electronics on a real wheel.

We are currently creating an endcap prototype.
The diameter of the prototype is 1 meter.

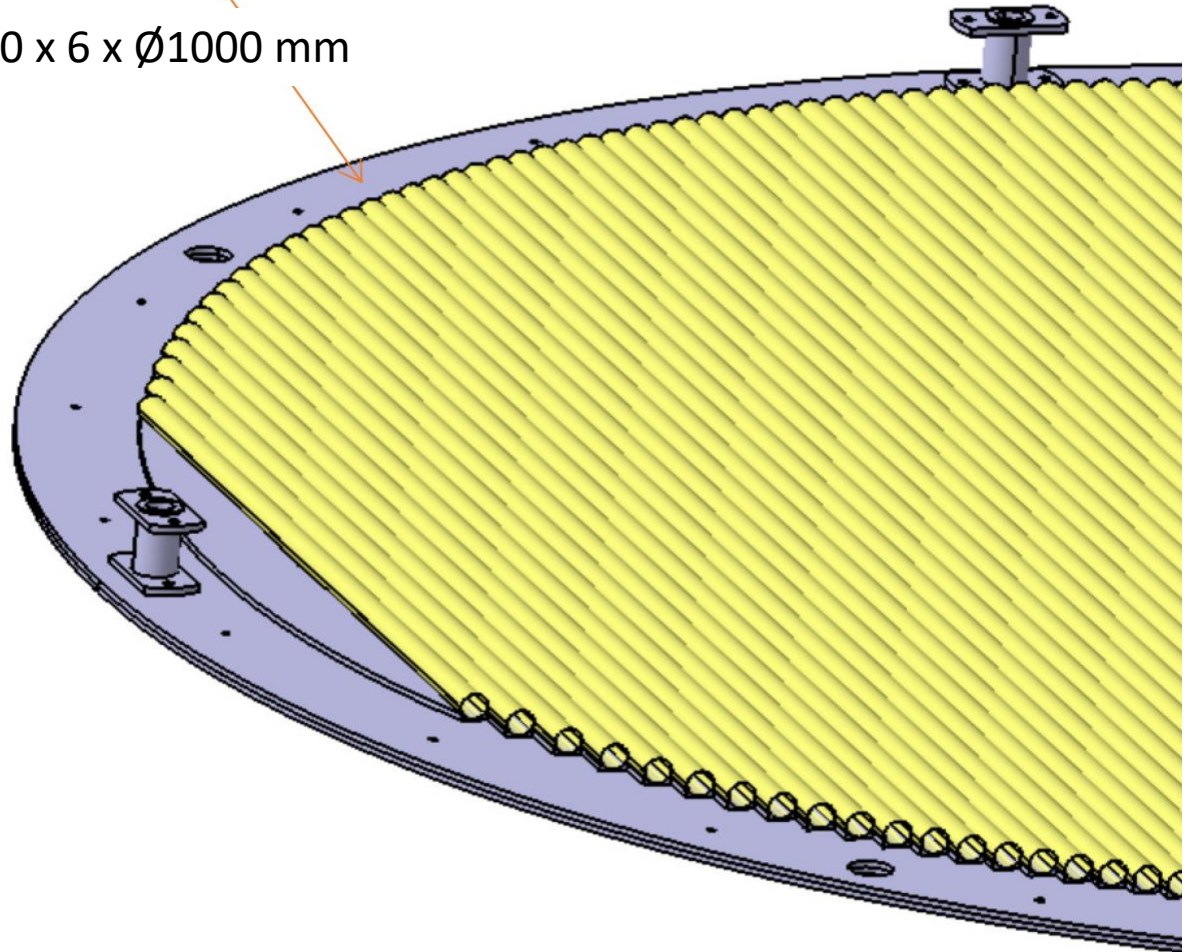
Prototype consists of 2 working planes rotated 90 degrees relative to each other.
Number of channels 320 straw tubes with 10 (32 ch) motherboard.



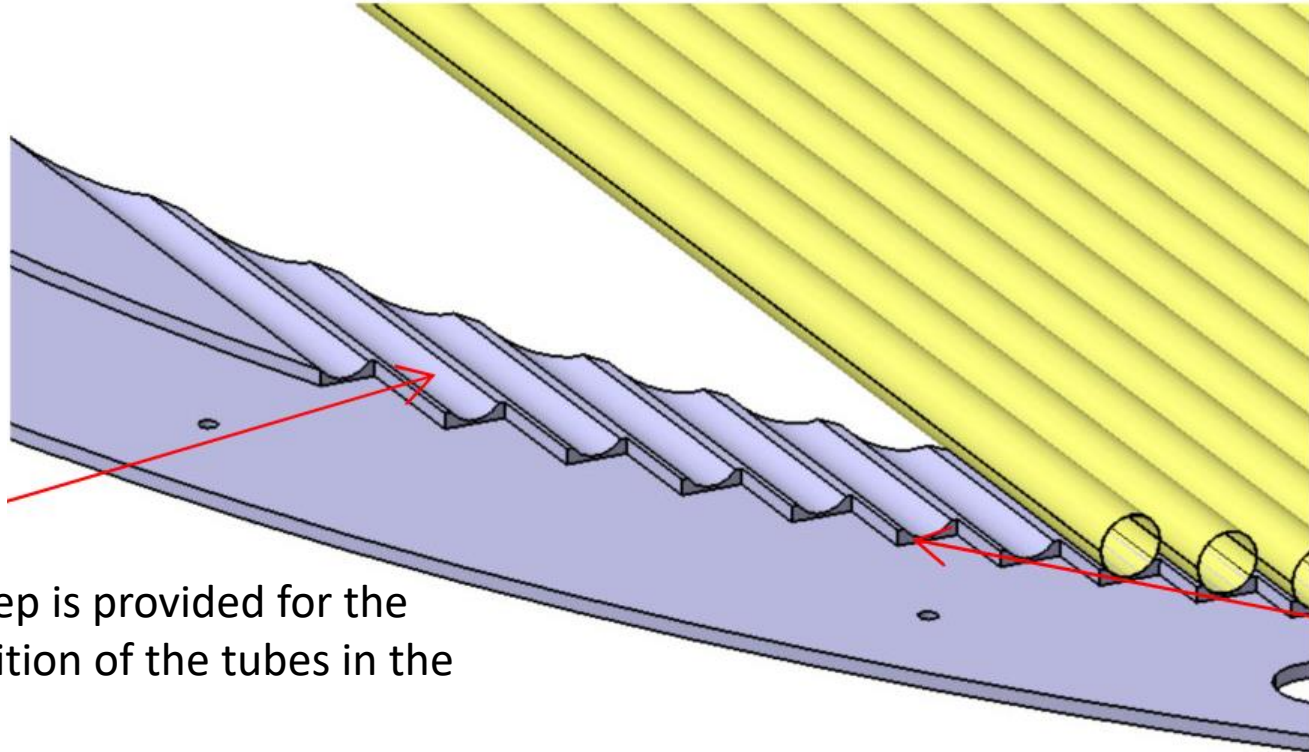
Now the drawings have been developed and transferred for manufacturing in LHEP

Frame dimensions 70 x 6 x \varnothing 1000 mm

Mounting sleeve between layers



- *Creation of a scaled-down detector prototype*

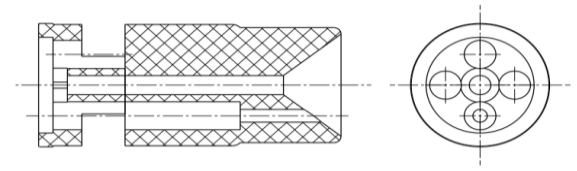


A special step is provided for the precise position of the tubes in the frame.
Also, It is convenient for trimming of tubes after gluing

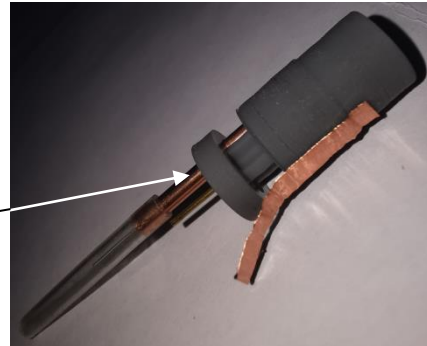
Straw end-plug

Straw endcap
1 meter Prototype

Developed and manufactured a 400 of end-plugs on a 3D printer



Gas inlet
2mm tube

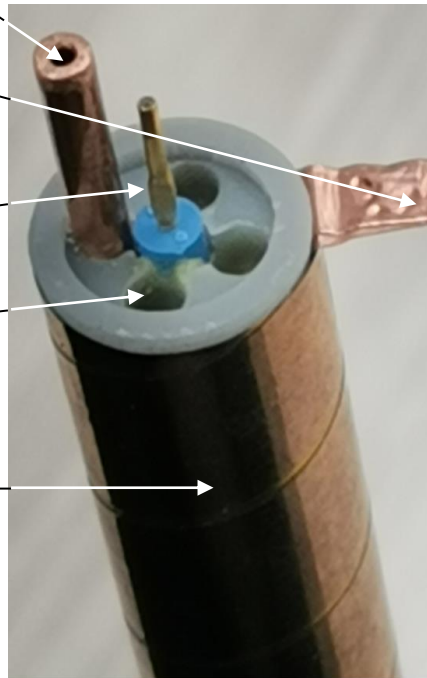


GRD
connector

Pin

Hole for
sealant

Straw tube



Deformation of the prototype frame

**Straw endcap
1 meter Prototype**

Preliminary calculations were performed in the “**Ansys**” program for the power frame of the SPD endcap straw detector.

We chose the frame thickness of **$A - 6 \text{ mm}$**

Calculations are performed for different materials and different values of the width - **B** , and diameters - **D** of the circle power frame

Distributed load 0,6 kg/cm.

Young's Module for AMГ – 71 GPa

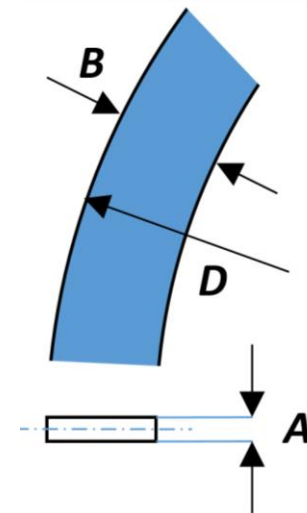
Young's Module for Carbon fiber – 200 Gpa

It can be seen from the calculations that when changing both the thickness of the power frame from 70 to 100 mm and the material from aluminum to Carbon fiber, the longitudinal and transverse deformation decreases by about 3 times.

The detector frame should be 100 mm wide (**B**) and will be made of carbon fiber

Frame D=1000mm				Frame D=1900mm				Frame D=1900mm	
AMГ		Carbon fiber		AMГ		Carbon fiber		Reinforced Carbon Fiber	
B=70	B=100	B=70	B=100	B=70	B=100	B=70	B=100	B=70	B=100
MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
3,58	1,21	1,37	0,48	6,8	2,3	2,6	0,91	1,8	0,63
3,58	1,21	1,37	0,48	6,8	2,3	2,6	0,91	1,8	0,63

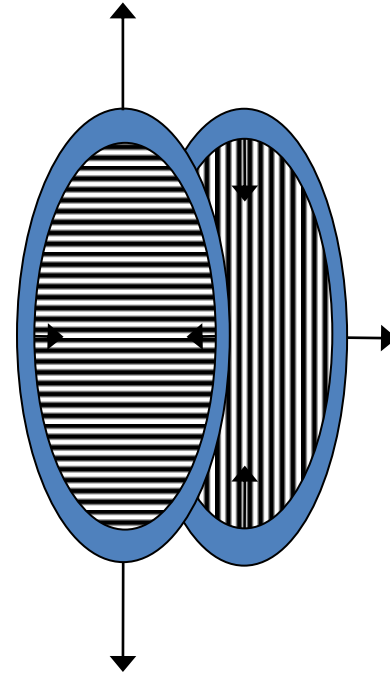
The maximum deformation is 0.9 mm. This value is slightly larger than required - 0.3 mm. However, we hope that the orthogonal arrangement of the layers will compensate for the longitudinal and transverse deformation.



Deformation of the prototype frame

**Straw endcap
1 meter Prototype**

The maximum deformation is 0.9 mm.
This value is slightly larger than
required - 0.3 mm.
However, when assembling planes,
we hope that the orthogonal
arrangement of the straw layers will
compensate for the longitudinal and
transverse deformation.



What's done

1. 400 Straw tubes with diameter of 9,54 mm. were made for 1 meter prototype.
2. Investigation of mechanical and humidity properties of straw tubes.
3. Development and manufacture of end plugs and pins for 1 meter prototype.
4. Development of drawing of frame is completed for 1 meters prototype
5. The calculation of the deformation of the prototype frame has been made.
6. A device for cutting tubes in specified sizes has been developed.

What needs to be done

1. Documentation for mass production End-plugs should be prepared, development of the Mold will be made on POLYPAK (Dubna).
2. The development of frontend electronics (motherboard) for prototype.
3. The frame for straw tubes tension must be designed and made.
4. Creation of technology and tooling for Prototype assembly.
5. Test parameters of 1 meter prototype should be investigated on the stand by radia source.

Thank you for your attention