SPD ST end-cap

Straw Tubes end-cap

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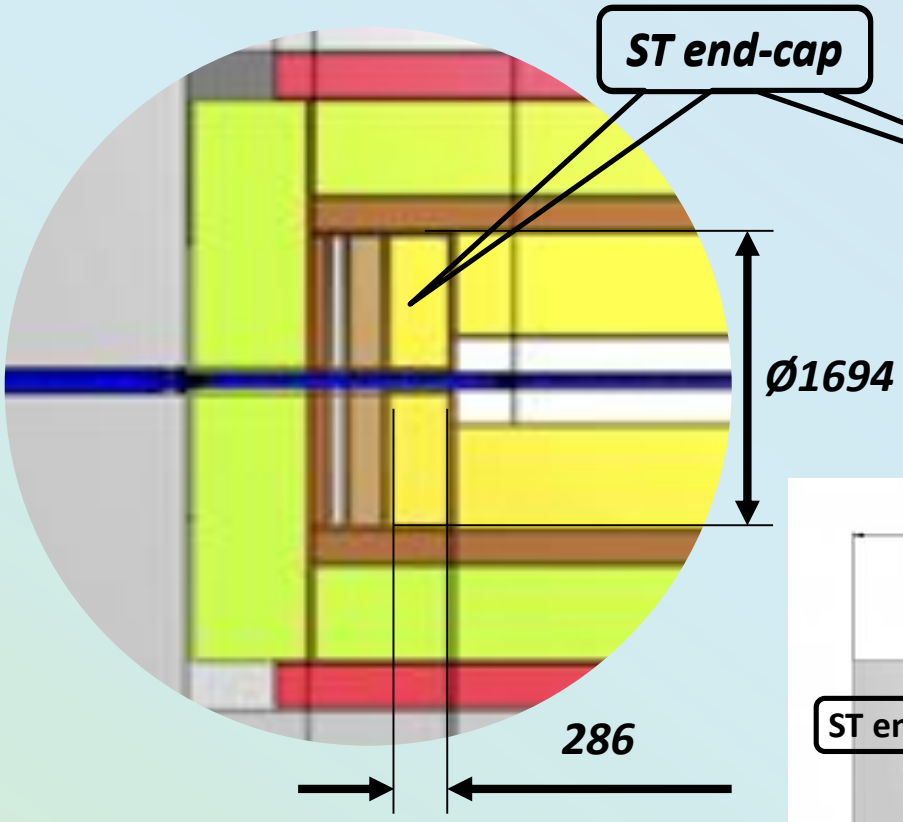
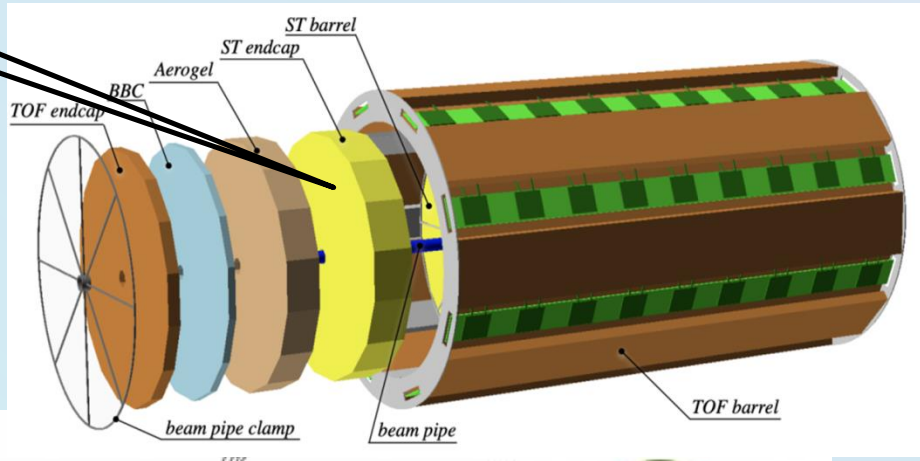
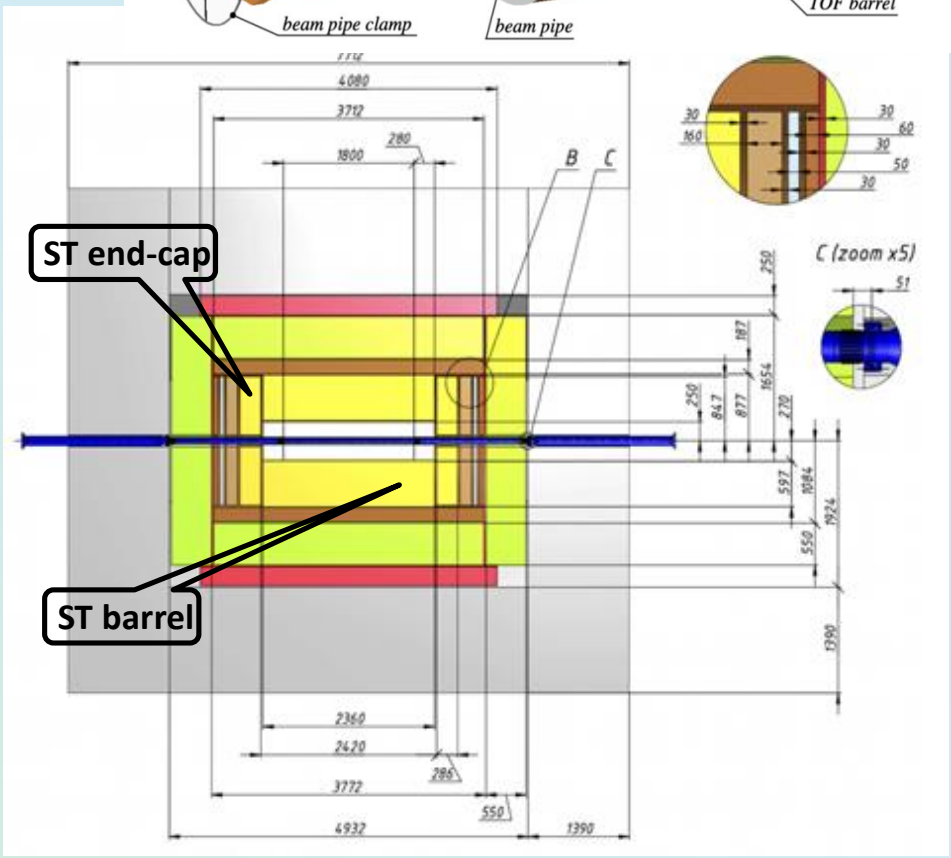
- *Straw Tubes end-cap*

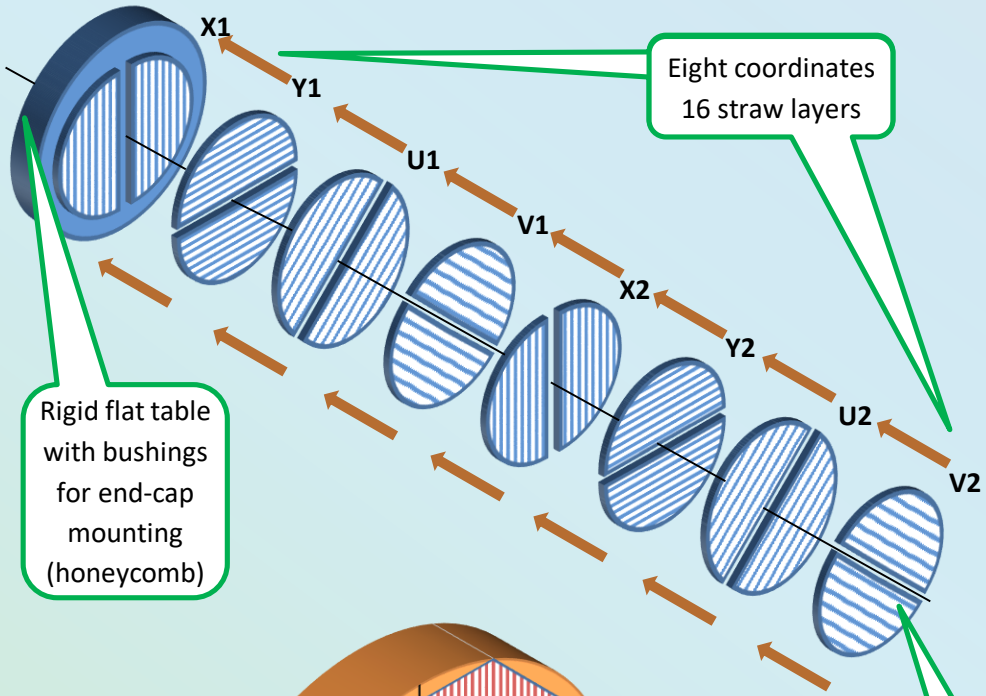


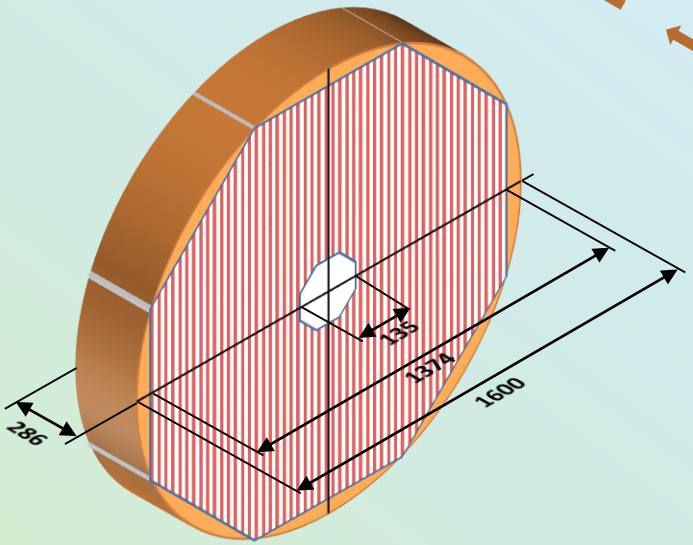




The dimensions of the end-cap space are limited to Ø1694 mm and a thickness of 286 mm (16 layers)

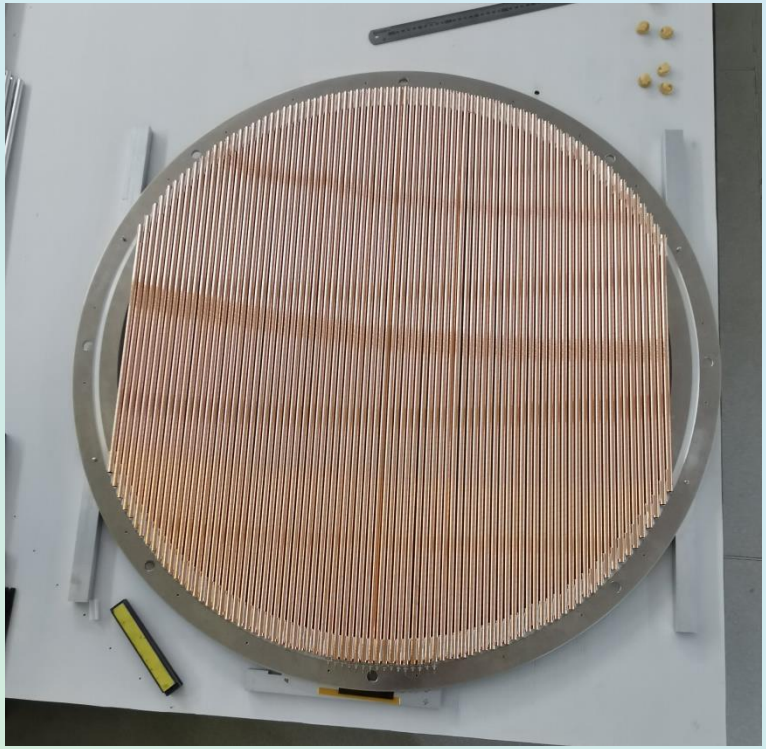
Principle design of ST end-cap





- The detector layers form four coordinate systems an X, Y, U, V at an angle of 45 degrees.
- Each layer has a diameter of 1600 mm and a thickness of 17,8 mm.
- Eight coordinate planes are mounted together on the rigid flat table, forming a rigid block, 286 mm thick.
- Each plane has a slot 135 mm wide for a beam pipe.

1 meter Prototype, first variant, *without pre-tensioning the tubes*

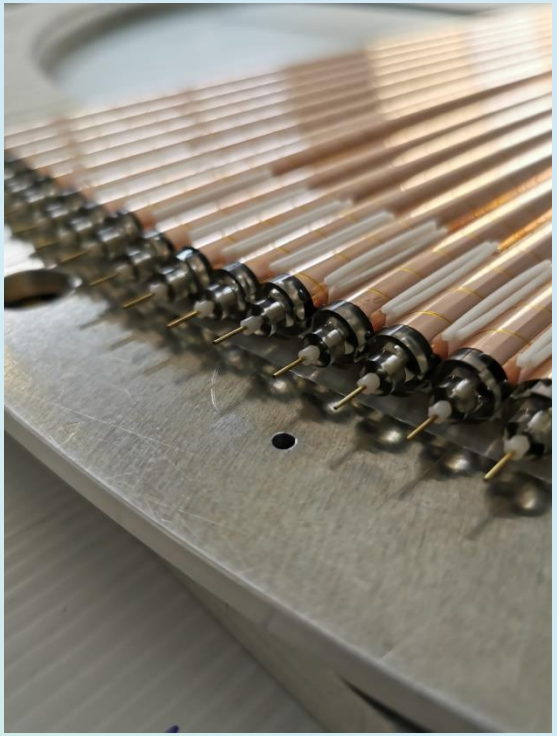


The prototype is assembled on an ring aluminum frame.

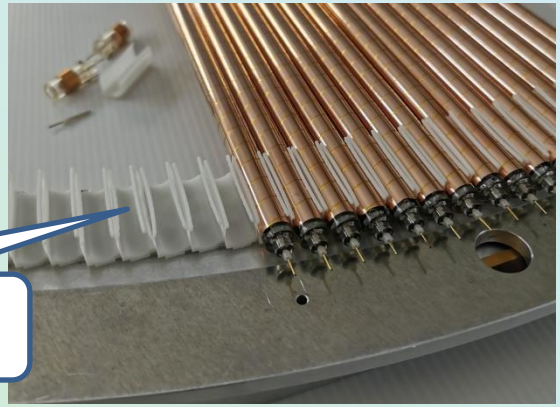
The slot for the vacuum beam pipe is not made.

The prototype was made to test the assembly technology

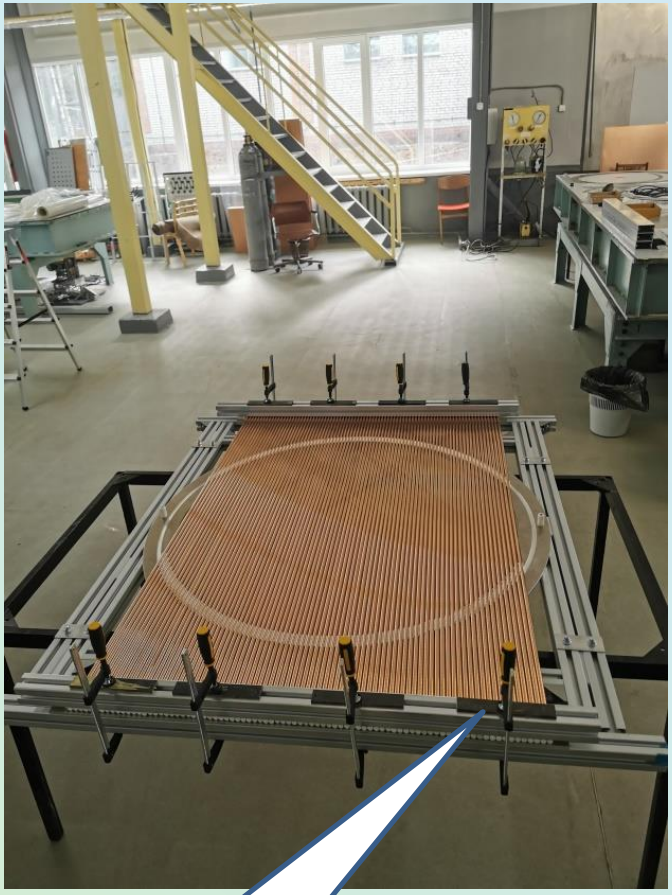
Straw tubes was glued into a frame without pre-tensioning the tubes

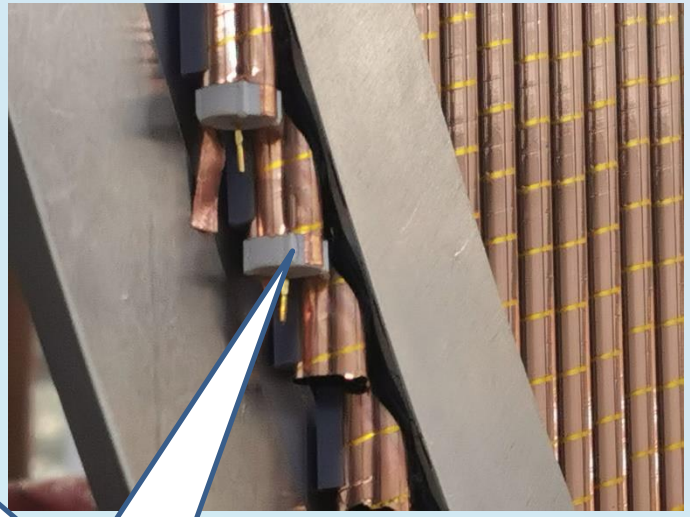


Plastic clamps for fix tubes



1 meter Prototype, variant with pre-tension



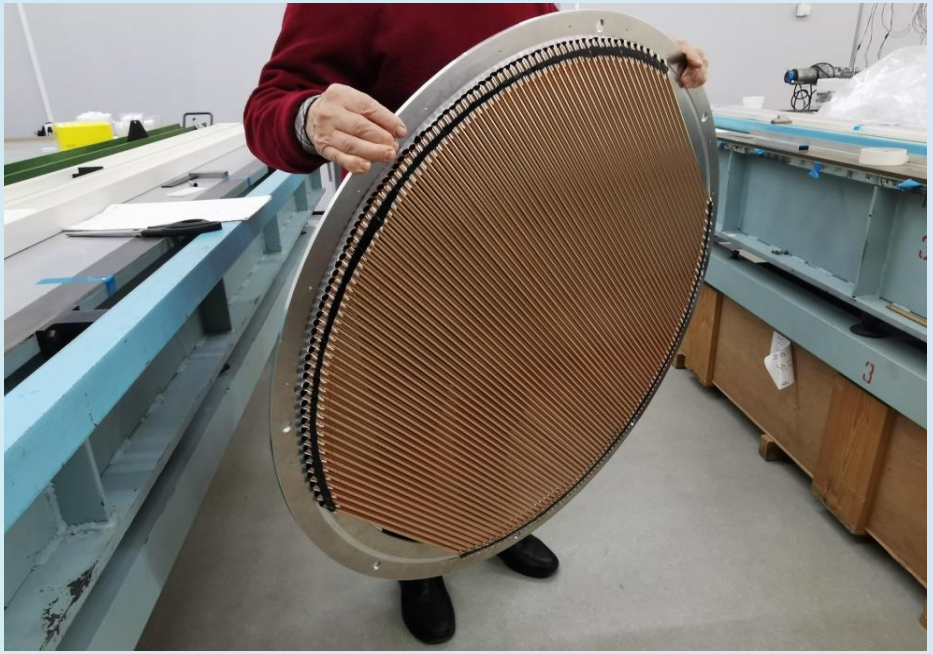


New end-plugs

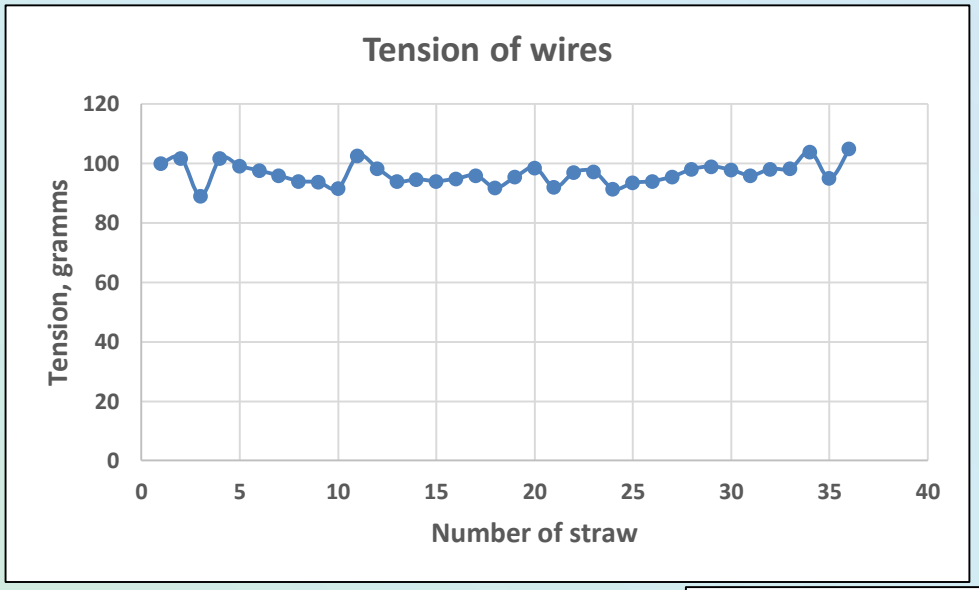
Frame for pre-tensioning of tubes

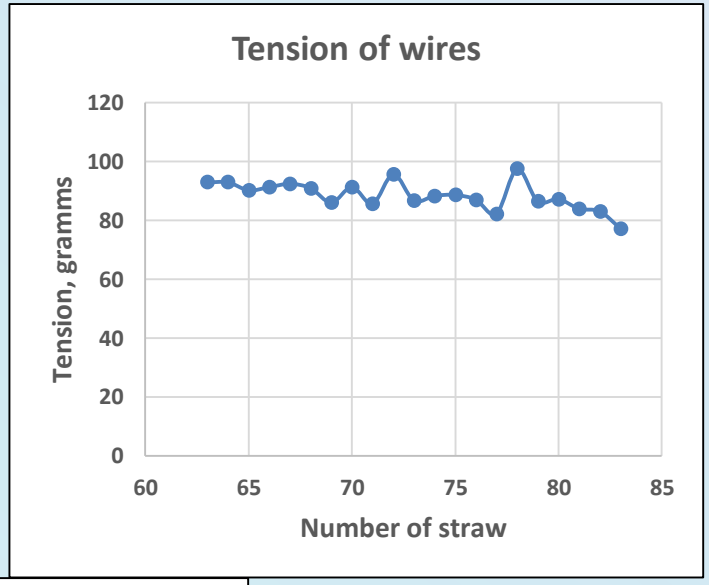
External carbon fiber support

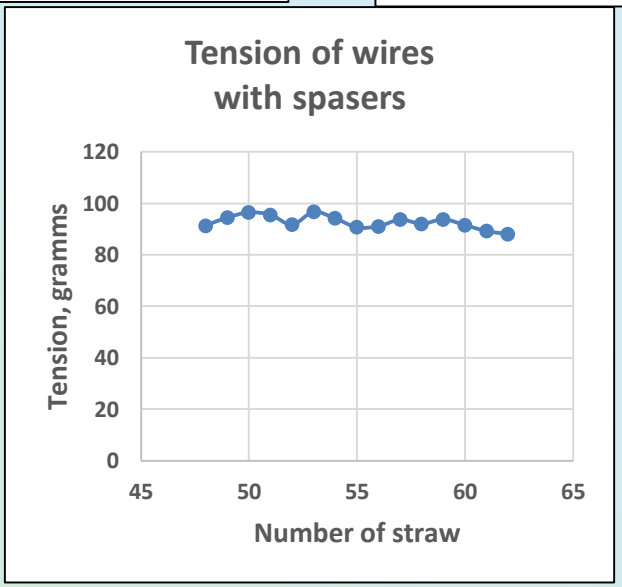
installation of anode wires



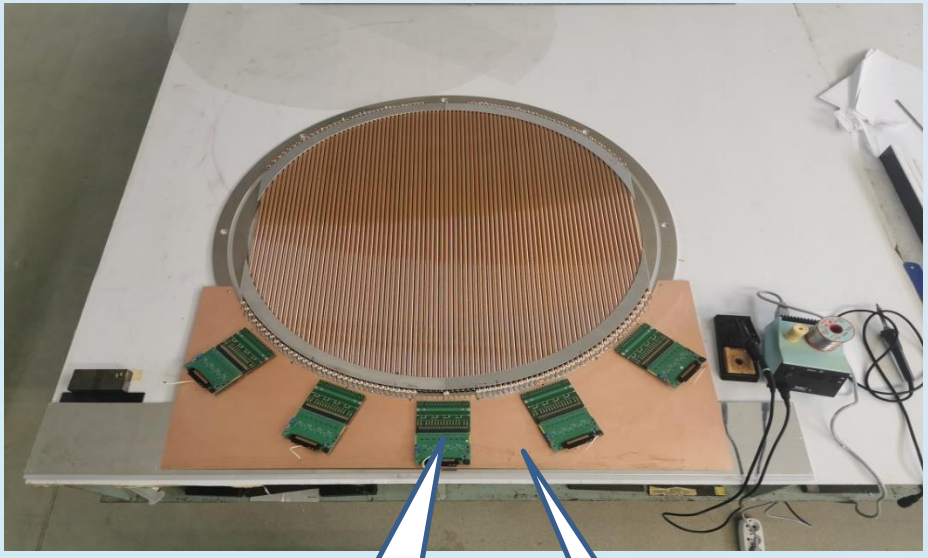
Spacer for internal support of the anode wire


Tension of wires
Tension, gramms
120
100
80
60
40
20
0
0
5
10
15
20
25
30
35
40
Number of straw


Tension of wires
Tension, gramms
120
100
80
60
40
20
0
60
65
70
75
80
85
Number of straw


Tension of wires
with spasers
Tension, gramms
120
100
80
60
40
20
0
45
50
55
60
65
Number of straw

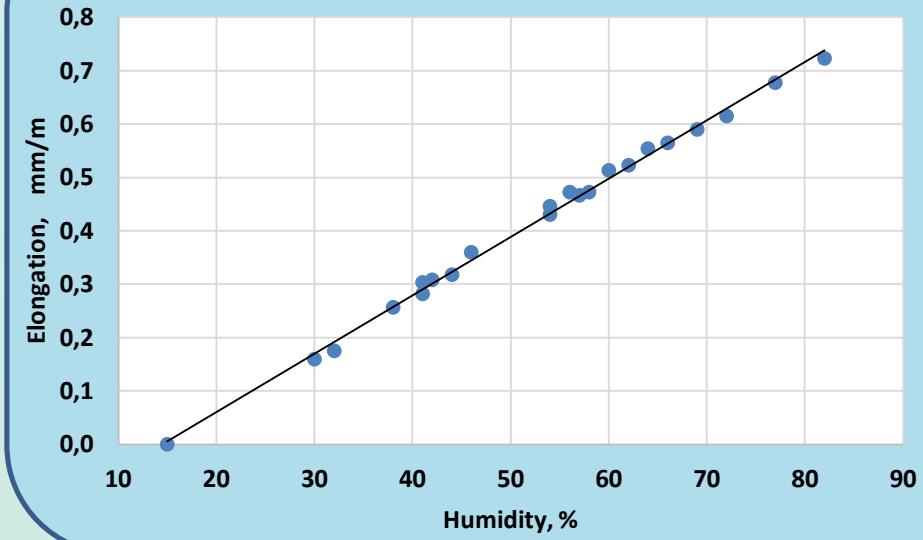
Installation of the frontend MB and amplifiers AST-1P



Thanks for your attention

Additional information

The effect of humidity

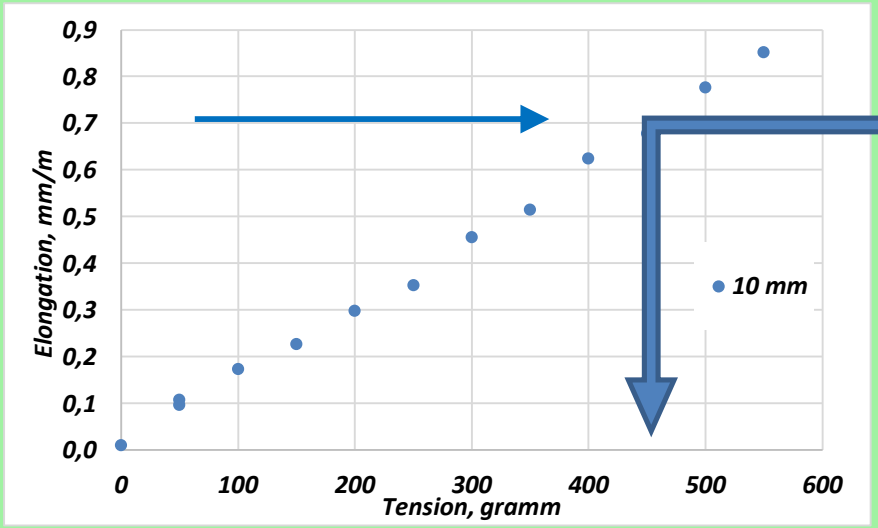


It is known that twisted straw tubes change their sizes under the influence of atmospheric humidity

The elongation value of the straw tubes was found to be ***0.7±0.2 mm/m*** for a range of 50% - 80% changes in relative humidity. The measurements were made with copper-coated tubes with 6 mm and 10 mm diameters

The test showed that the elongation has a range of elastic deformation. Straw size is returned after drying.

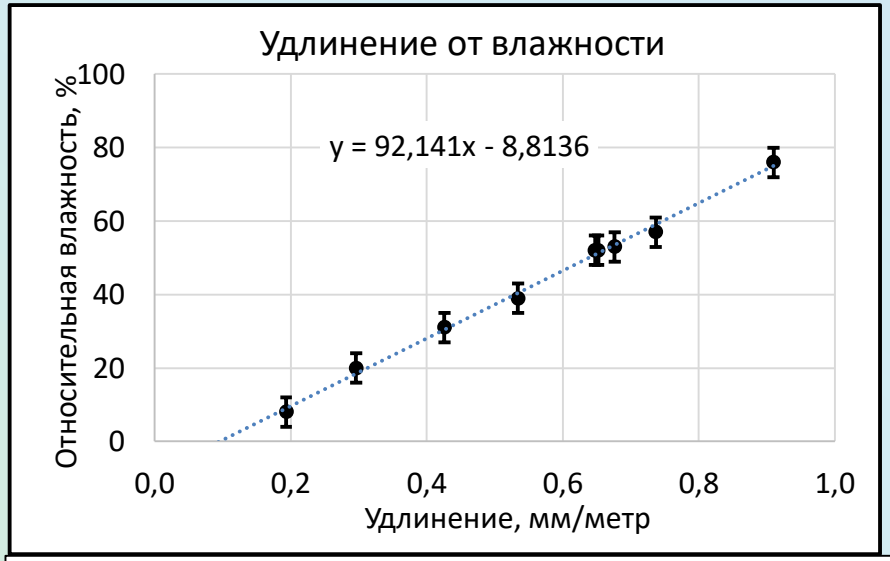
On the figure shows the elongation of straw tubes depending on humidity.

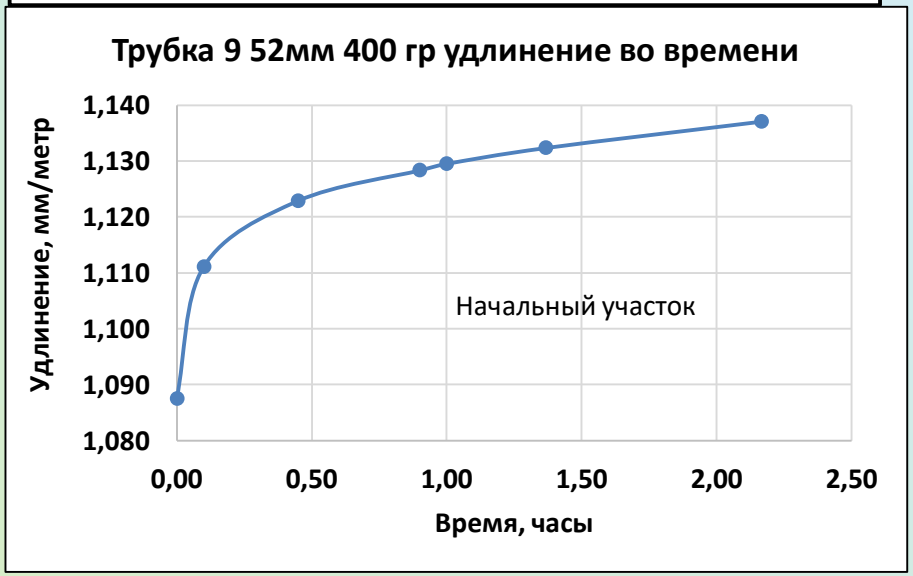


0.6 atm inside the straw compensates for changes in humidity

Straw Ø9.68 mm

Special technological frame for stretching straw arrays.



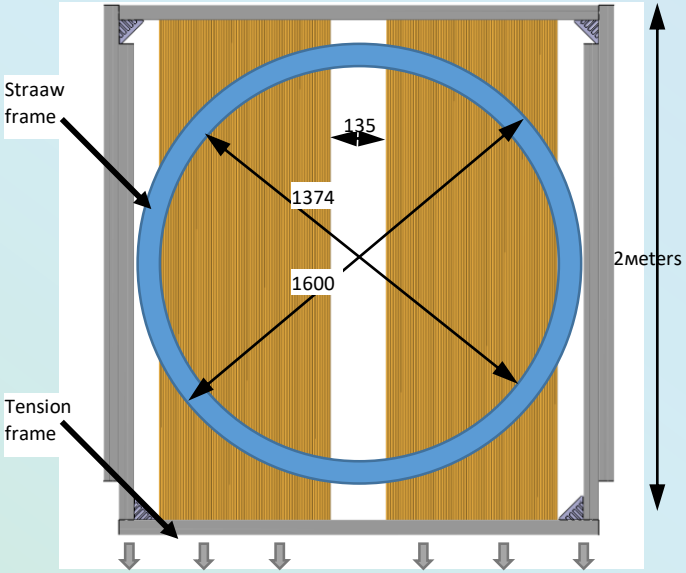


The tension of the tubes can be made up to 5 mm at a length of 2 meters or up to 800 grams of force per straw.

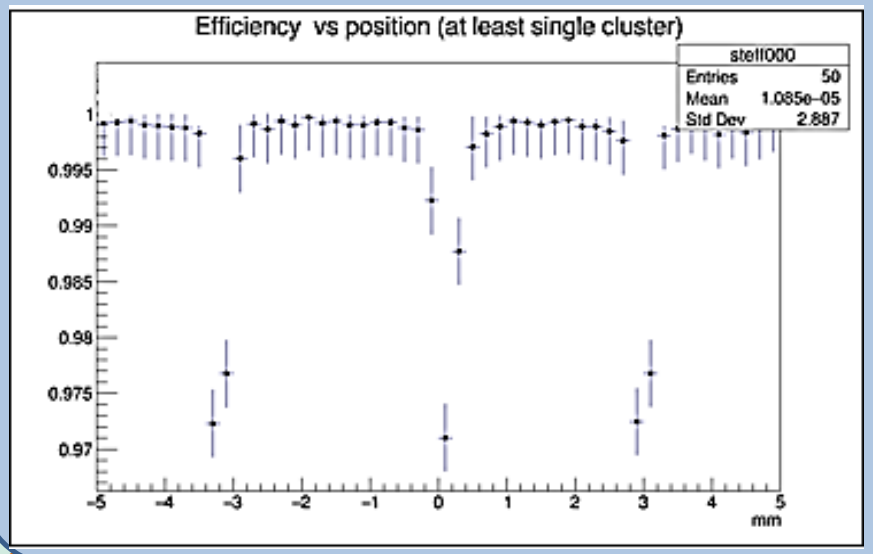
400 g of force per straw corresponds to 2,3mm/2m/straw

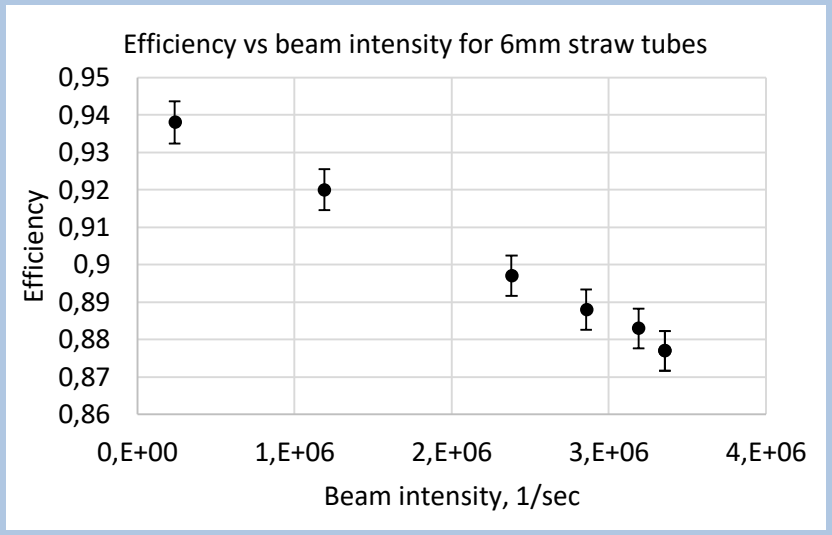
So

it is necessary to stretch the straw by 3 mm at 2 meters to compensate for the effect of humidity and plus the tension of the signal wire 90-100 gr

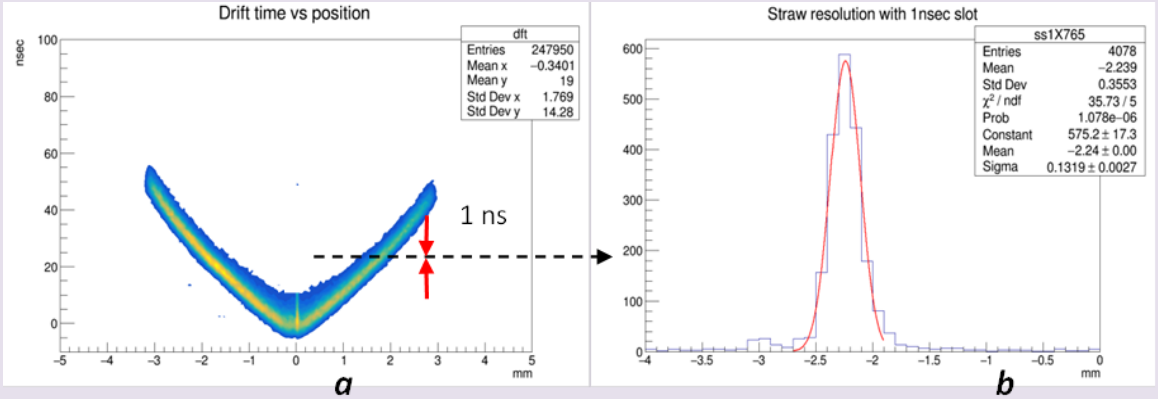


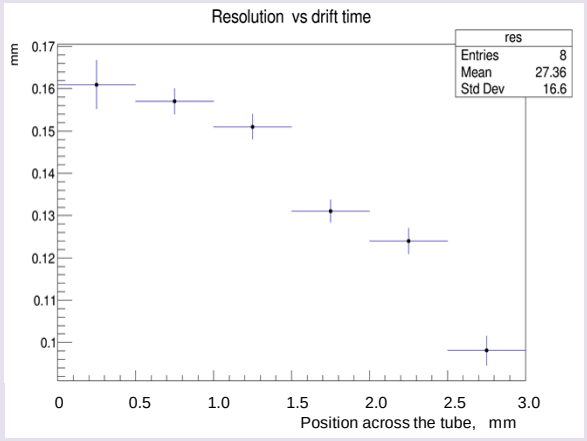
Efficiency and dependence of beam intensity

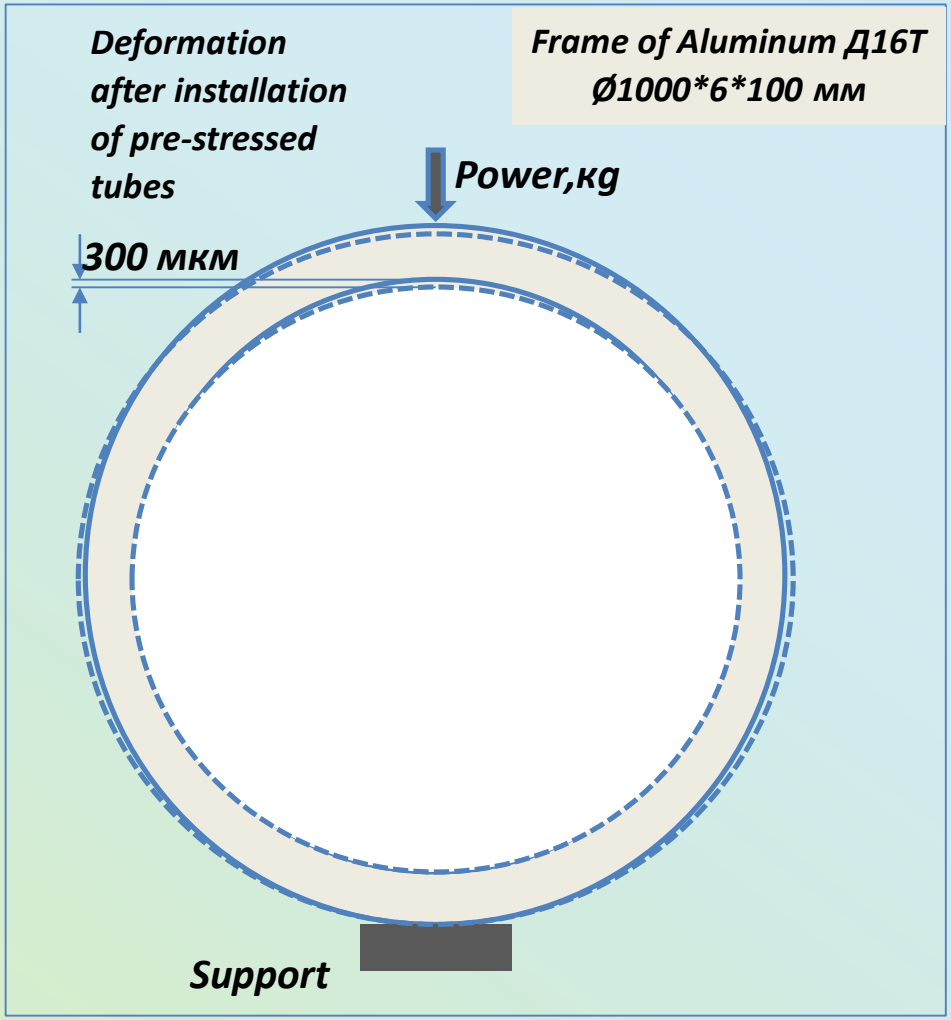




Coordinate accuracy

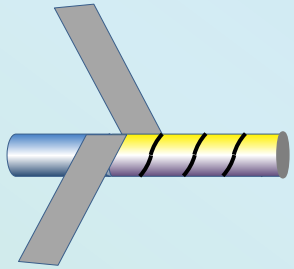
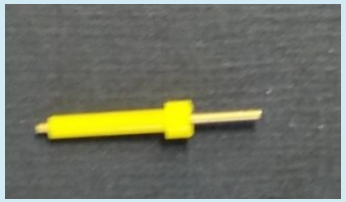
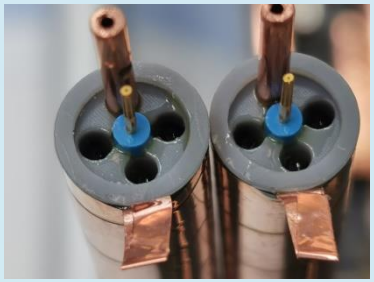


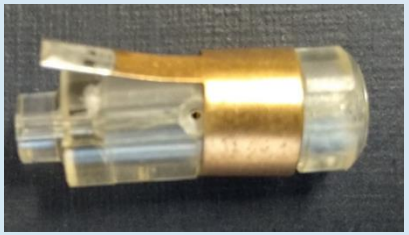



Deformation
after installation
of pre-stressed
tubes
Frame of Aluminum Д16Т
Ø1000*6*100 мм
Power,кg
300 мкм
Support

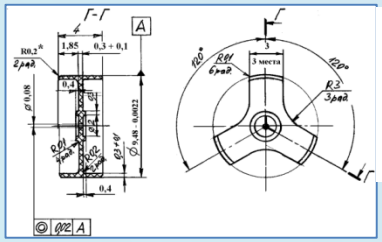
Elements of technology for straw assembling

- *Straw Tubes end-cap*



Twisted structure of the straw tube. The picture illustrates a winding on a precision rod. The end-plug and the crimping pin are used to fix the anode signal wire



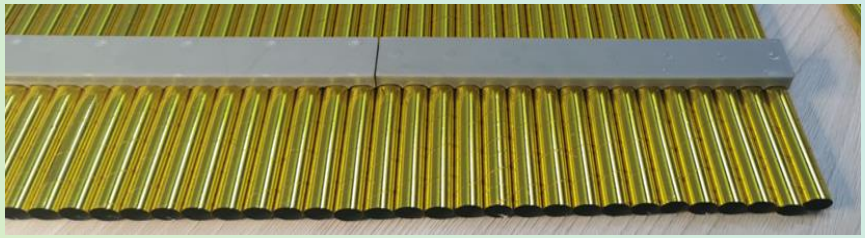
Spacer – internal anode wire support

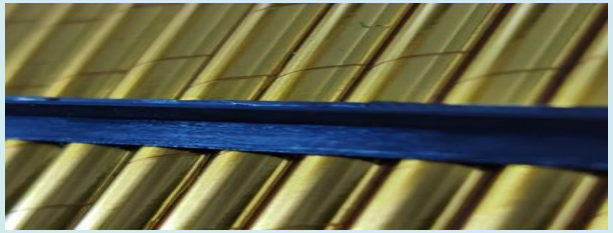
The outer layer of the straw tube consists of a polyimide tape with a thickness of 25 microns. A copper coating with a thickness of 100 nm on one side is applied. On the other side Polyurethane hot-glue coating with a thickness of 4 ± 1 μm is applied. The surface resistance is 1 ± 0.1 Ω/square.

The inner layer of the straw tube consists of a similar polyimide tape. The layer of hot glue is applied to one side, and on the other side – a layer of aluminum 0.2 μm thick. Graphite with a thickness of 6 μm and 2 μm of aluminum. The resistivity of this surface is about 10 Ω/square.

The outer and inner tapes are glued together on a calibrated rod. The rod heated to 170 ºC. The outer diameter of the tubes is 9.64 mm.

External precision combs to fix the position of the tube in the plane





Carbon fiber strips used as external support for the straw tubes.