

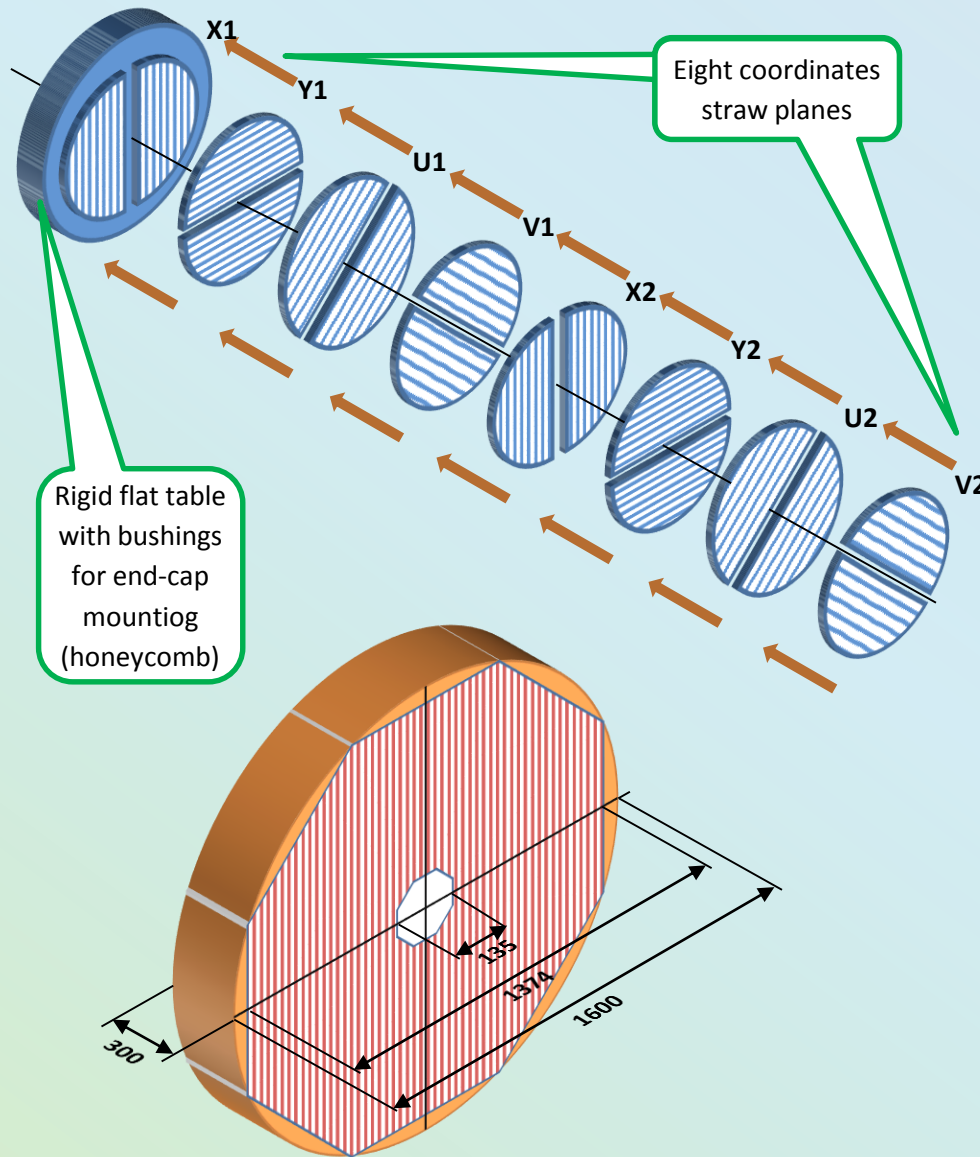
# SPD

## ST End-cap

*Straw Tubes end-cap*

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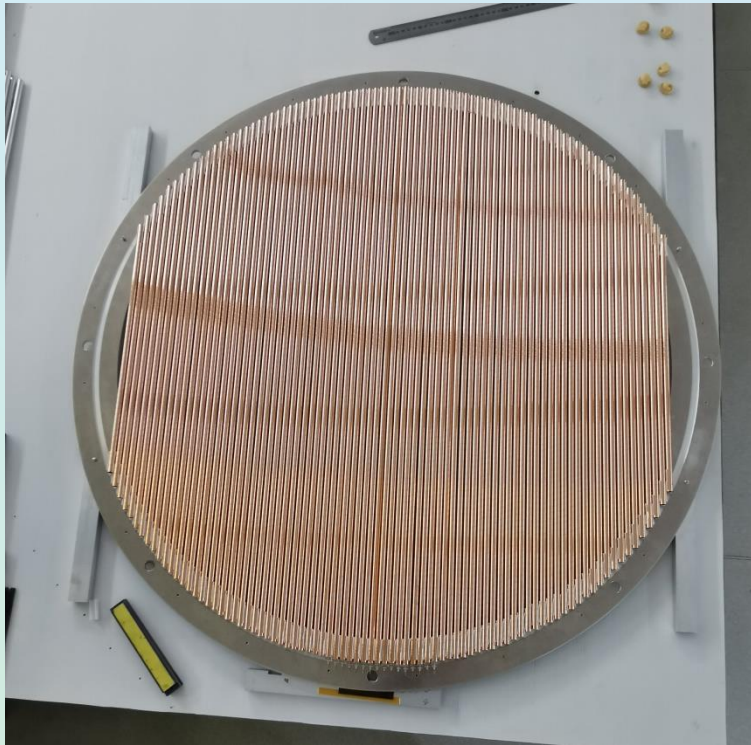
# Principle design of ST end-cap



## • *Straw Tubes End-cap*

- The diameter of the tubes is 9.64mm
- The detector layers form four coordinate systems an X, Y, U, V at an angle of 45 degrees.
- Each coordinate plane has a diameter of 1600 mm and a thickness of 30 mm.
- Eight coordinate planes are mounted together on the rigid flat table, forming a rigid block, 300 mm thick.
- Each plane has a slot 135 mm wide for a beam pipe.
- The rigid flat table will be removed after installation on the beam tube.

- **1 meter Prototype**



- *Straw Tubes End-cap*

## 1 meter Prototype

**The prototype is assembled on an ring aluminum frame.**

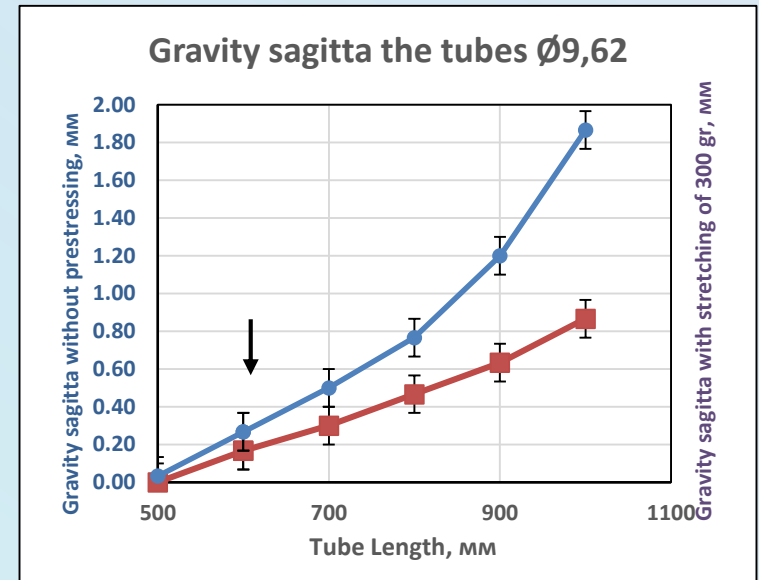
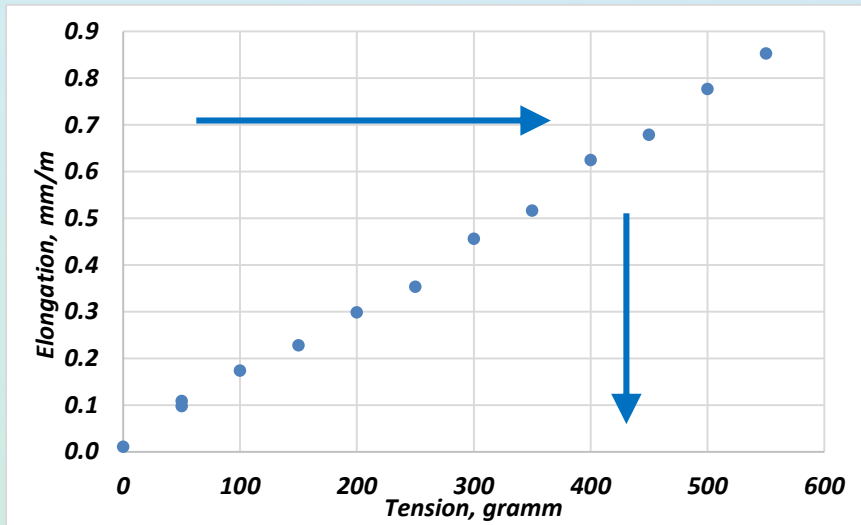
**The slot for the vacuum beam pipe is not made.**

**The prototype was made to test the assembly technology**

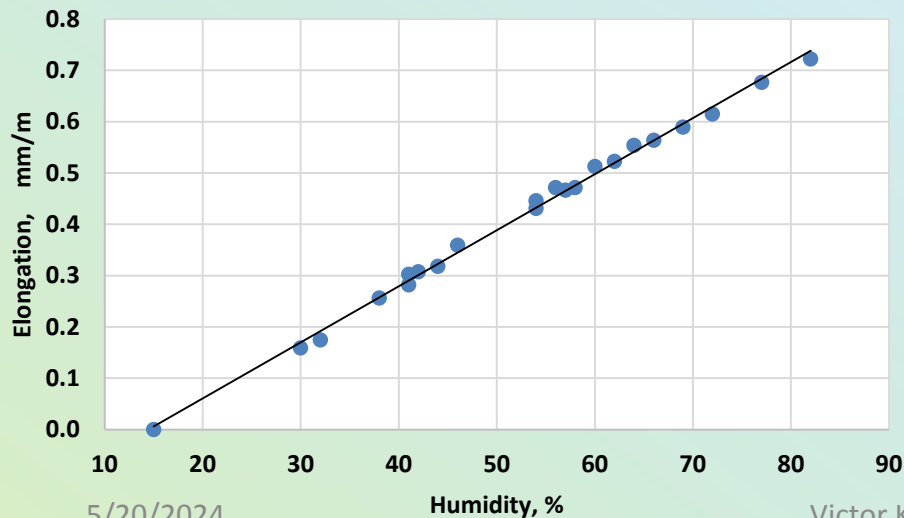
**The detector does not have front-end electronics**

**The prototype can be used in various experiments and in the test area 205.**

## Straw Ø9.68 mm



## 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  **$0.7 \pm 0.2$  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.

- **1 meter Prototype**

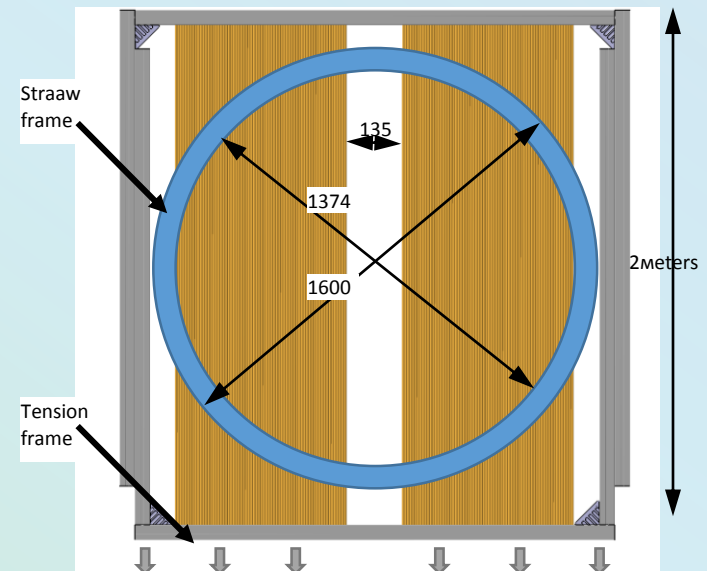
Special technological frame for stretching straw arrays.



- **Straw Tubes End-cap**

Each straw needs to be stretched. It is necessary to compensate the effects of humidity and the tension of the signal wire.

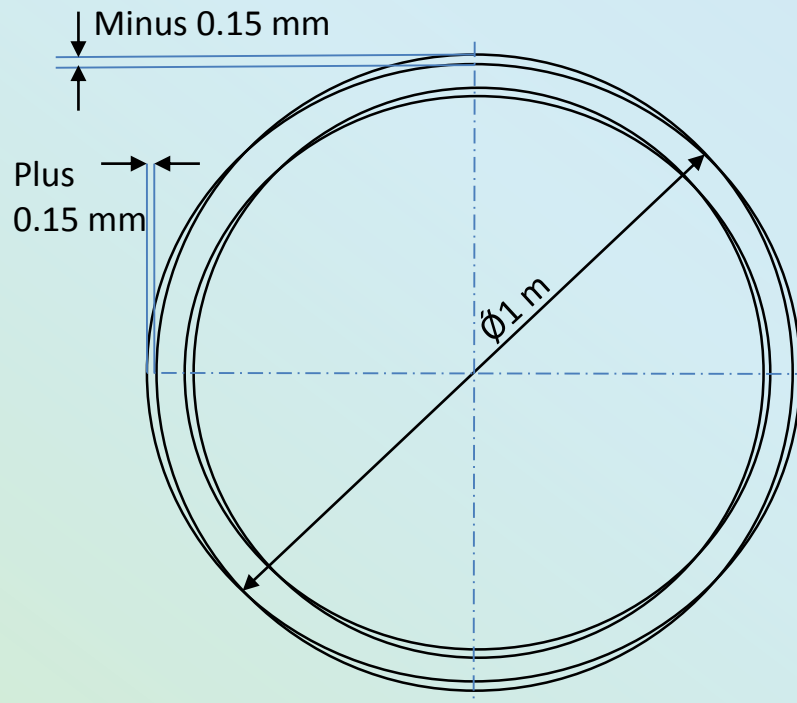
The technological frame must be stretched by about 3 mm. this will correspond to 400 grams of force for each straw.



- **1 meter Prototype**

- *Straw Tubes End-cap*

Deformation of the frame of the 1-meter prototype after stretching and gluing straw tubes into the frame.

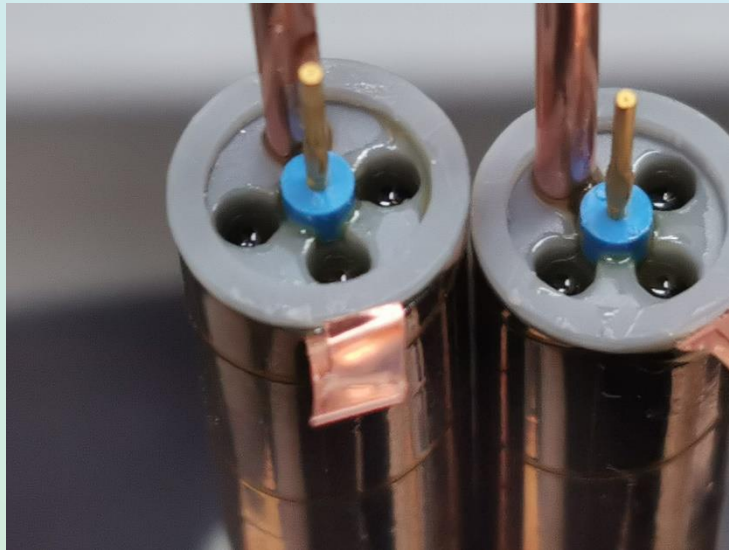


the deformation is within acceptable limits , does not exceed 0.15 mm

- **1 meter Prototype**

- **Straw Tubes End-cap**

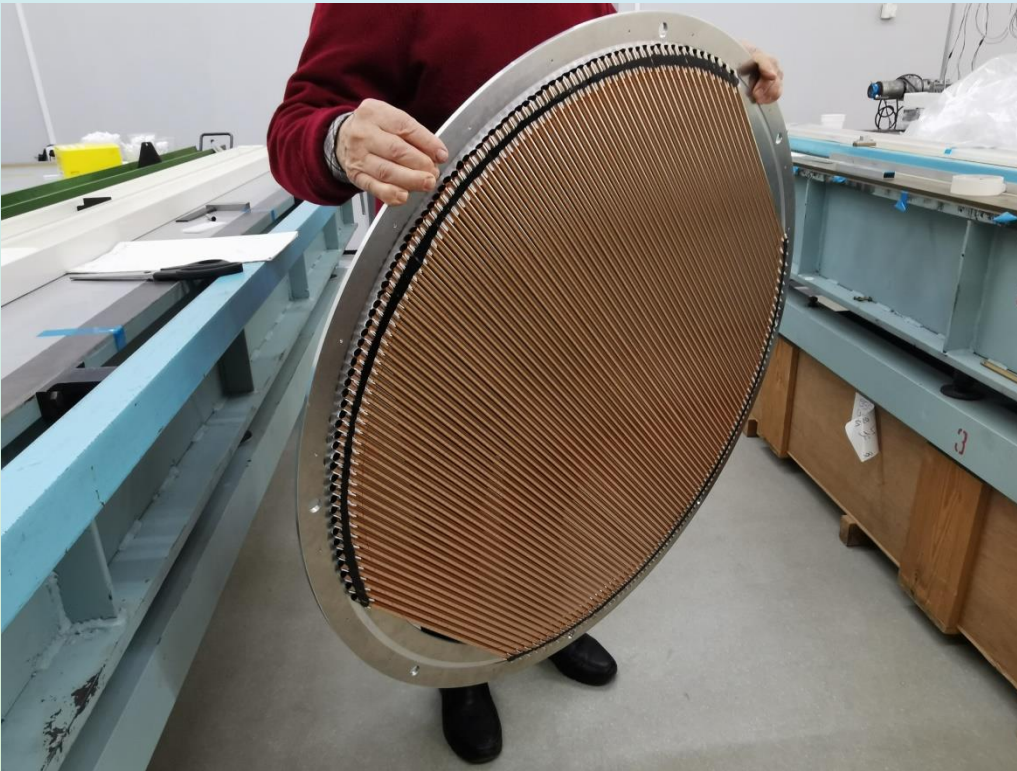
End plug



- **1 meter Prototype**

- *Straw Tubes End-cap*

Straw tubes glued to the frame,  
before and after cutting



## ***What needs to be done on a full-scale prototype and production of an End-cap***

- 1 ***Full-scale frame.*** Development of sketches and models of the frame for the manufacture of a full-scale prototype made of carbon fiber or fiberglass
2. ***Mounting table.*** Development of design documentation and manufacture.
3. ***Contract.*** Conclusion of a contract for the manufacture of End-cap frames in ARTMASH, Belarus. Prior agreement has been obtained  
Conclusion of a contract for the manufacture of Endplugs in Vladimir «UNIPLAST». Prior agreement has been obtained  
Development and production of a motherboard with amplifiers will be created by BELARUS for the ring configuration of the detector.
4. The general DAC system will be created and product by other specialists
5. Purchase of materials for the production of all elements of the End-cap
  - Kapton
  - Tungsten wire
  - Pins
  - Endplags
  - Adhesives.

Thanks

## Finances

40k\$ is enough to make a 1 meter prototype.  
All work is planned for this year

Table 9.9: Cost estimate for the end-cap part of ST.

Unit	Quantity	Unit cost, \$	Total cost, k\$
Straw tubes (3m/straw), m	15000	2.5	37.5
Anode wire (4m/straw), m	20000	2	40
Pins	10000	3	30
End plug	10000	2	20
Spring contact	10000	2	20
Spacers	5000	1	5
Glue, chemical materials, consumables			1
Straw frame	16	3000	48
Rigid flat mounting frame	2	6000	12
Covers for frames	80	100	8
Frame for tension	2	2000	4
Precision rulers for 16 straw, combos	3000	10	30
Measuring table for alignment	1	3000	3
Prototype	2	25000	50
Gas equipment			20
Tension control equipment	1	5000	5
Tooling for cutting	2	500	1
Motherboard plate and frontend	240	1000	240
Total			574.5