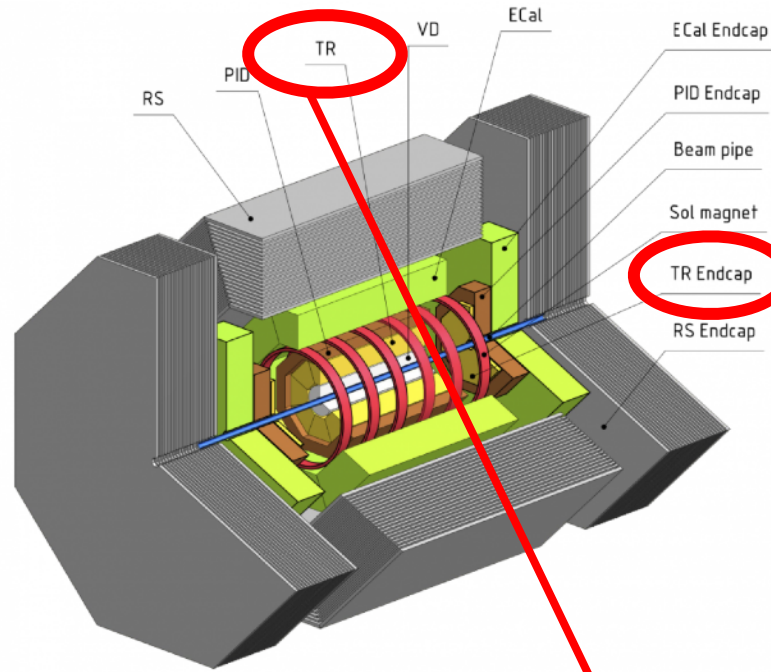
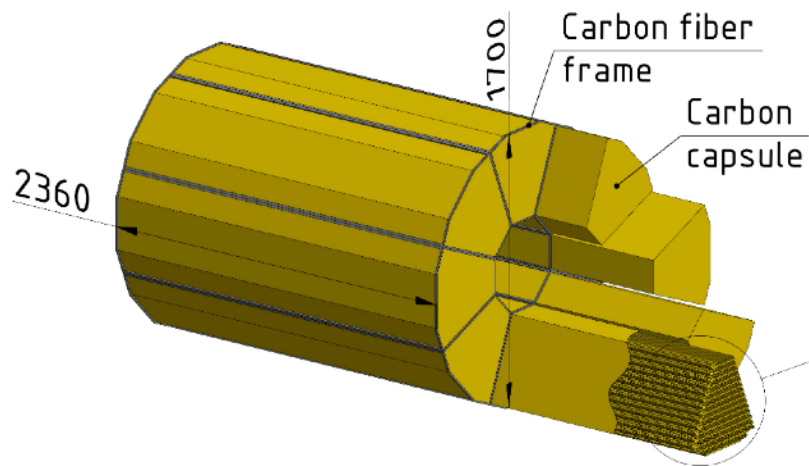


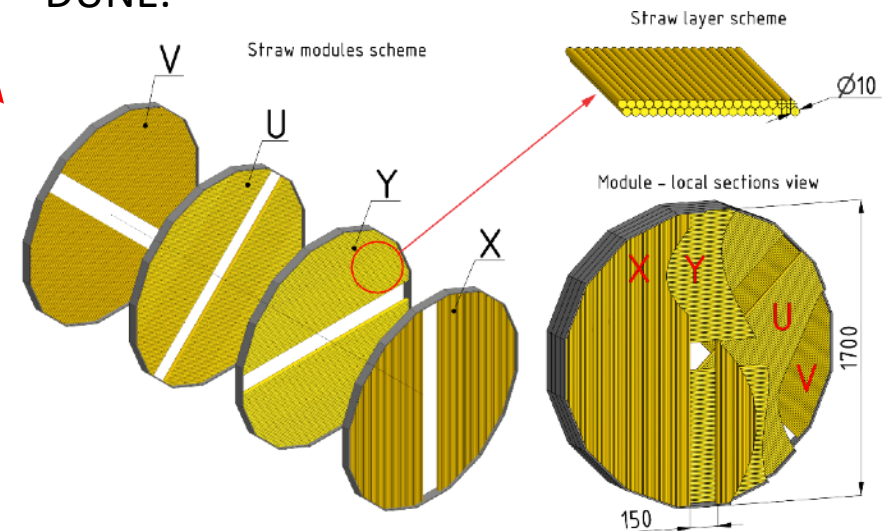
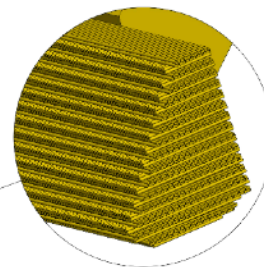
Straw tracker



- Main tracker system of SPD
- Straw diameter 10mm thickness 36mkm PET
- Spatial resolution of 150mkm
- Barrel is made of 8 modules with up to 30 double-layers, with the ZUV orientation
- Endcaps are made of 12 double-layers with the XYUV orientation
- Vast experience in straw production in JINR for several experiment: COMPASS, NA-62, NA-64, SVD-2; prototypes for: CREAM, SHiP, COMET, DUNE.

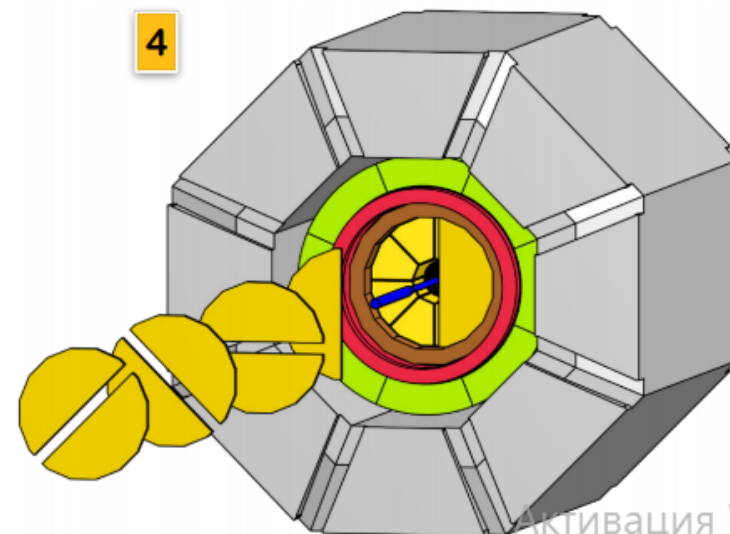
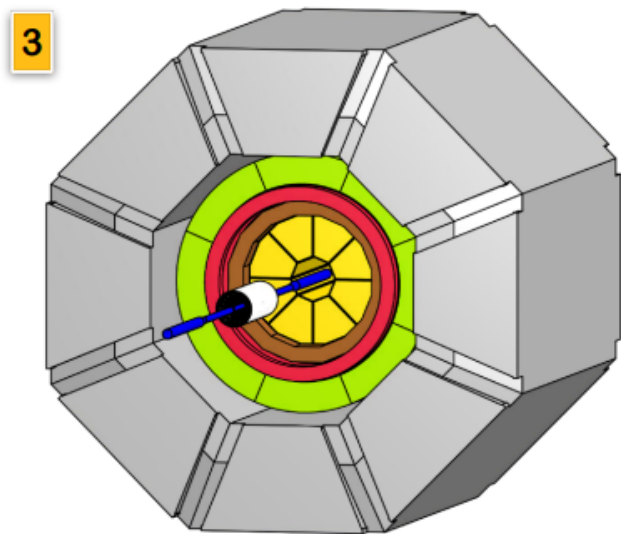
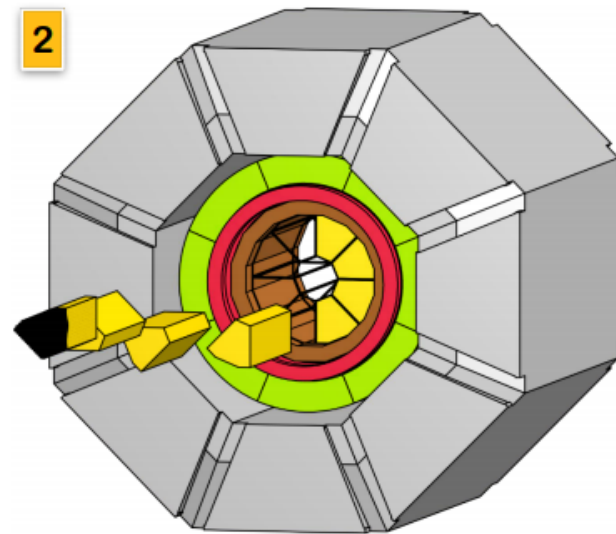
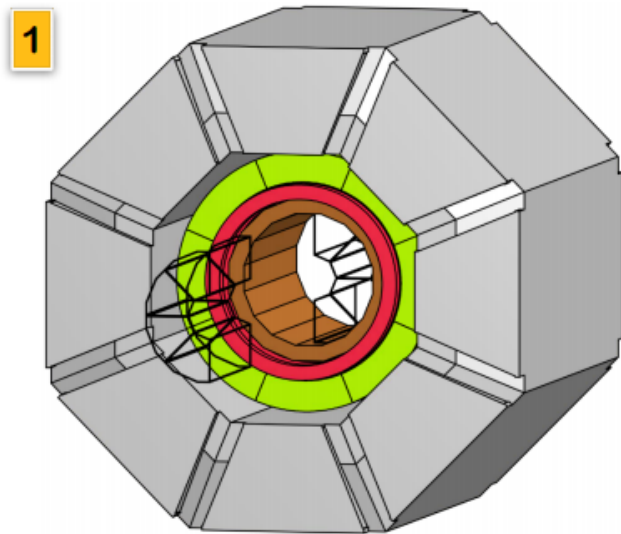


30 double layers of straw (x2 zoom)

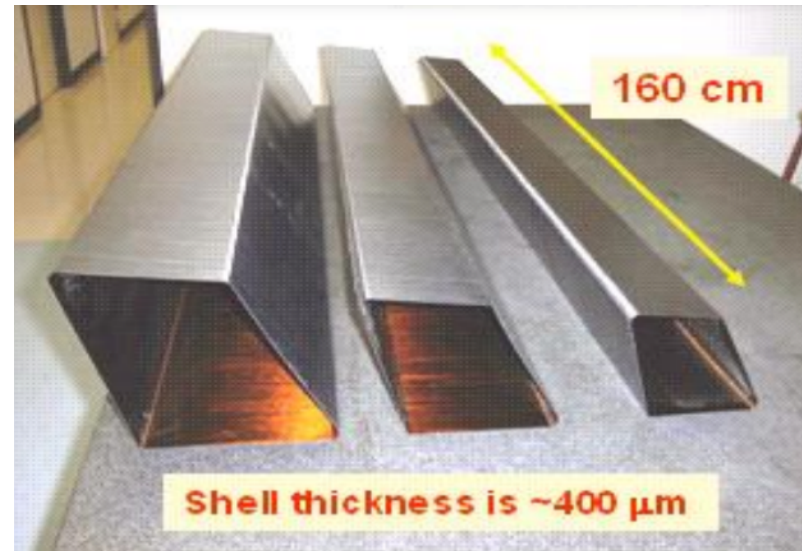
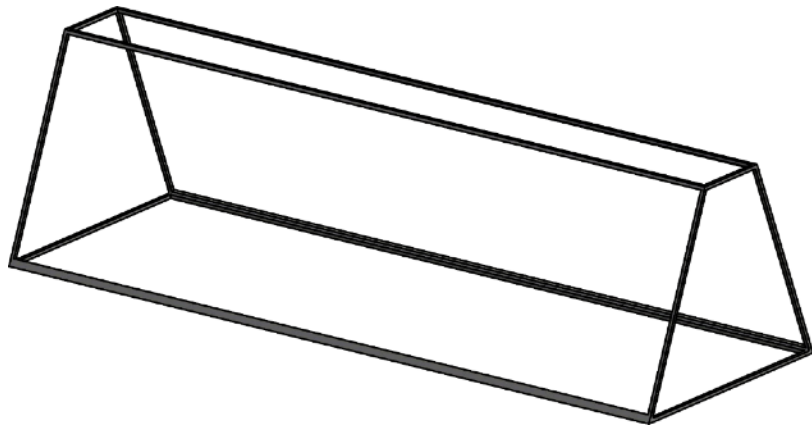
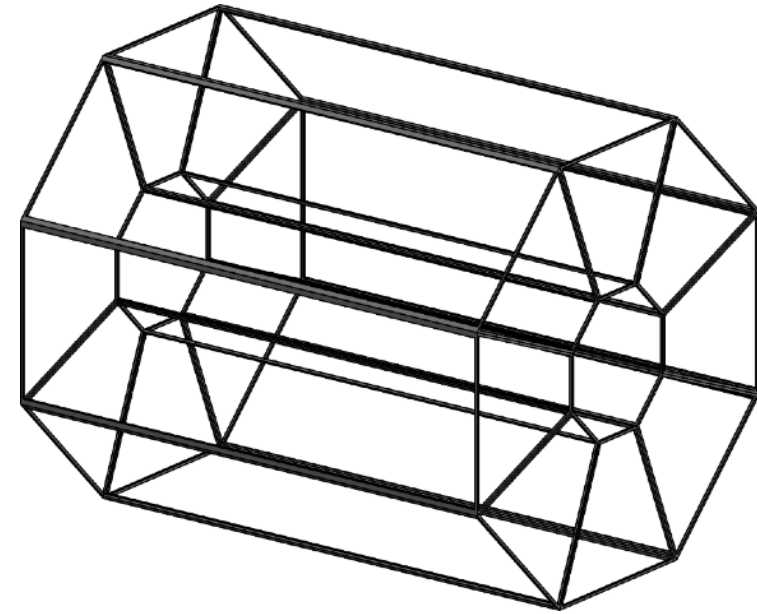


ST assembling procedure

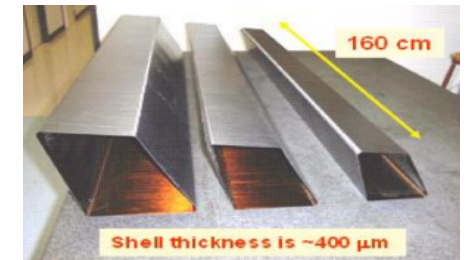
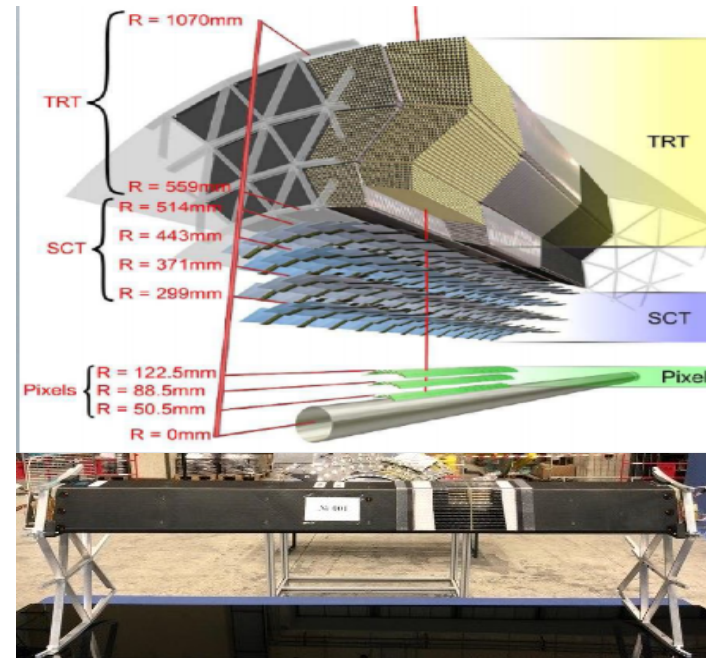
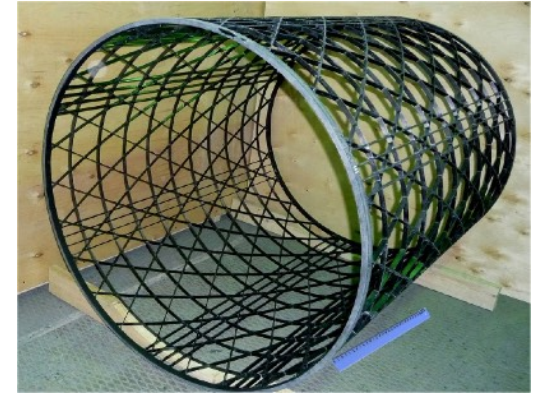
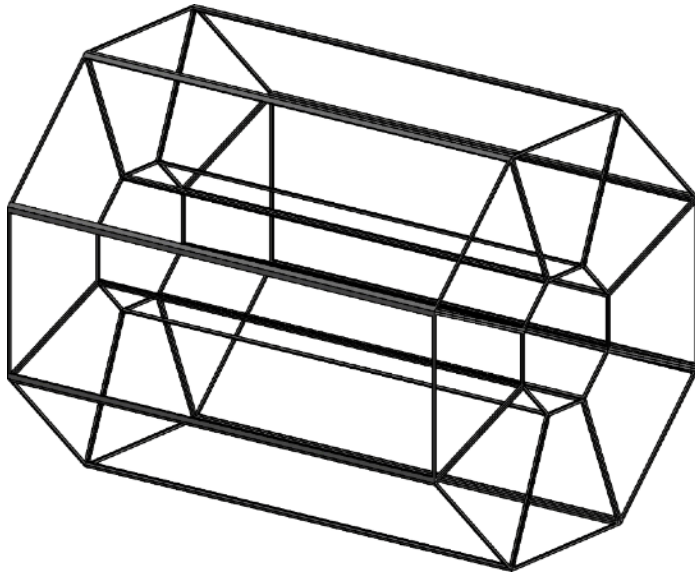
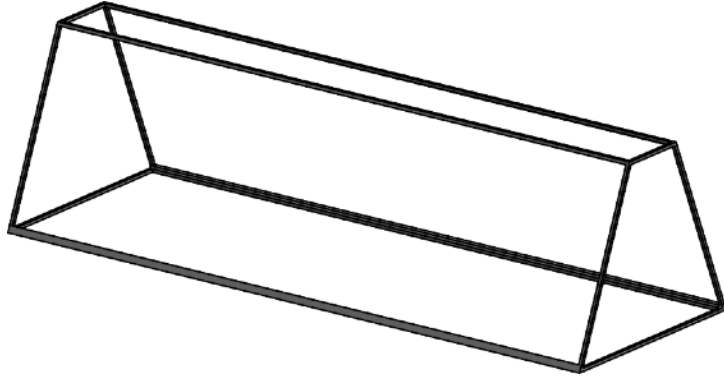
all will be done by hand



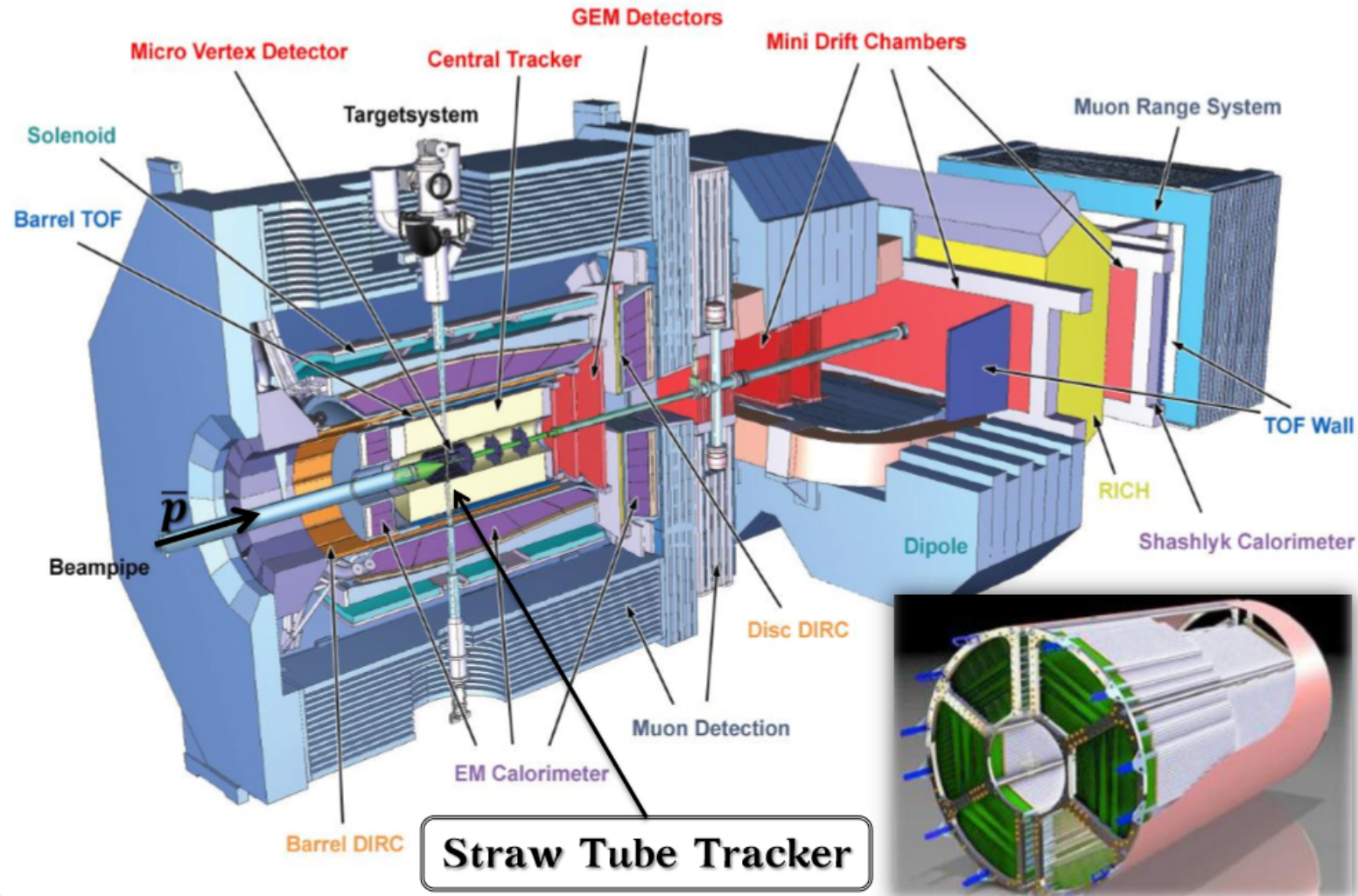
TRACKER MECHANICS



TRACKER MECHANICS

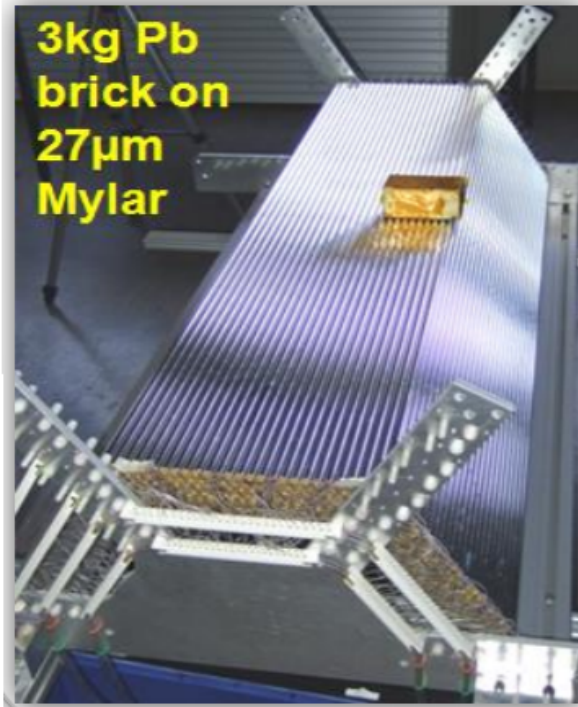


PANDA Detector Overview



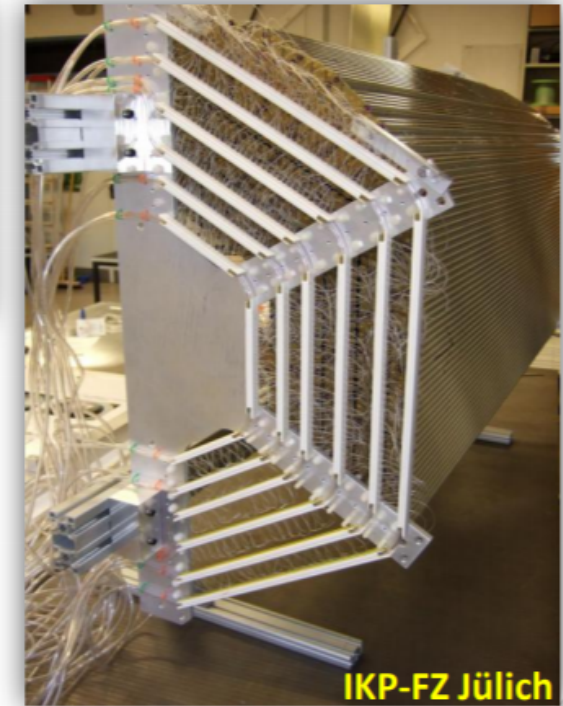
ADVANTAGES of self-supporting straws: lowest weight, precise geometry, maximal straw density

- Strong rigidity: pressurised, close-packed multi-layer straw modules are self-supporting
- Perfect and cylindrical tube shape thanks to inner gas overpressure
- Strong wire/tube stretching corresponding to 230 kg/3.6 t equiv.
 - No stretching of straw ends from mechanical frame are needed
 - No reinforcements structure are needed along the tube length
- “Light” mechanical support frame needed (STT: 2x 8.2 kg)



Material	Aluminum
Density	2.7 g/cm ³
Youngs modulus	70 GPa
Radiation length (X_0)	9 cm
Thermal expansion	24 ppm/°C

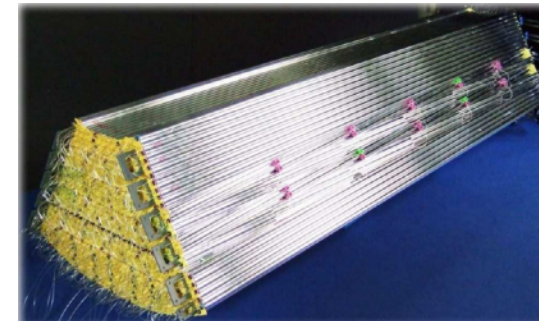
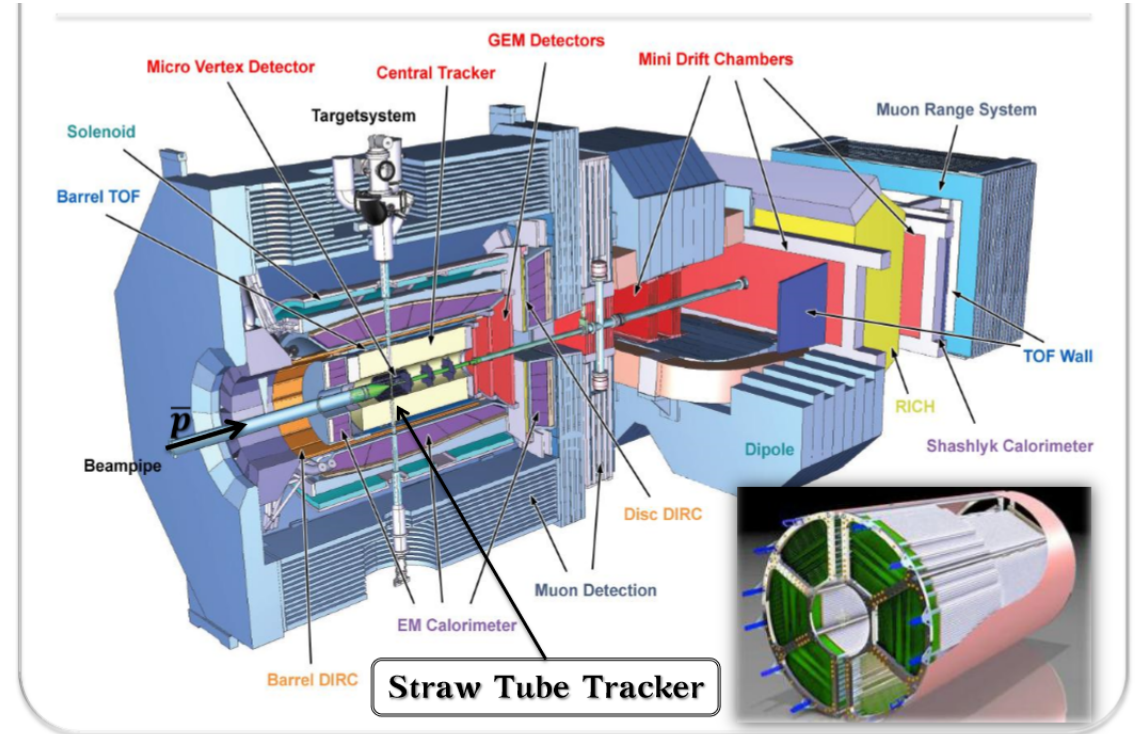
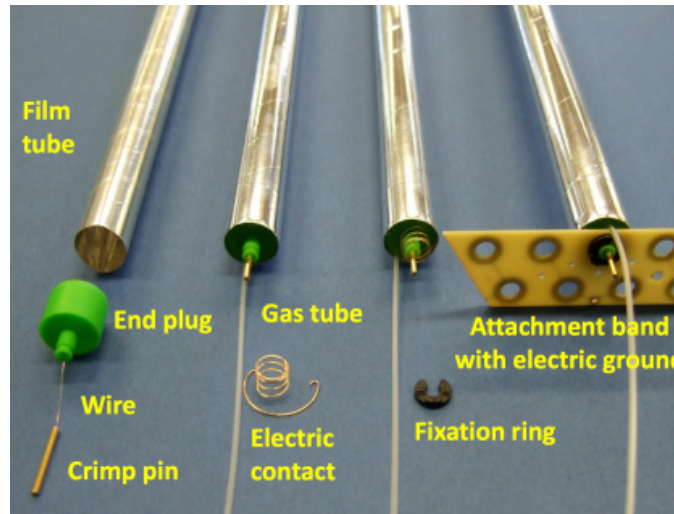
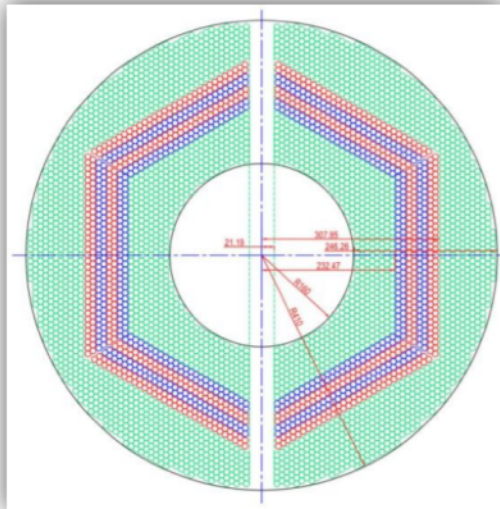
Full-scale prototype assembly
@ IKP-FZ Jülich



PANDA

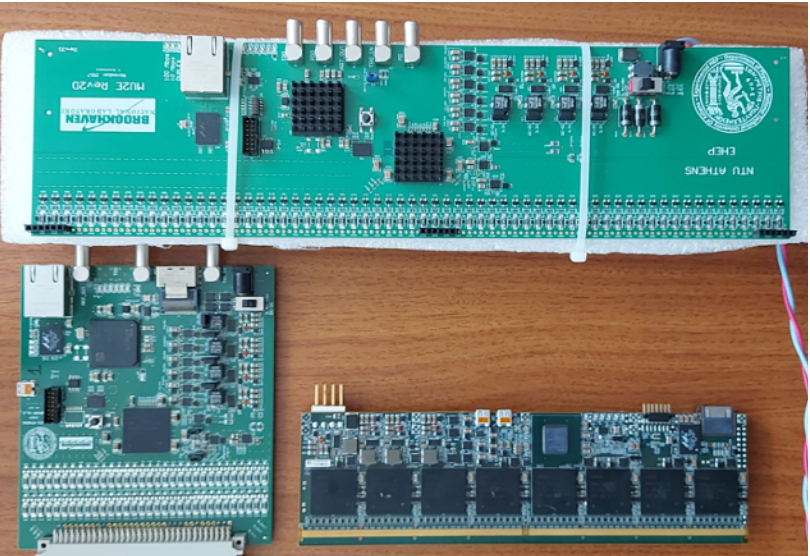
STT LAYOUT

- 4636 straw tubes in 2 semi-barrels around beam/target pipe
- 23-27 planar layers in 6 hexagonal sectors
 - 15-19 axial layers (green) parallel to the detector axis
 - 8 stereo layers ($\pm 2.89^\circ$) for 3D reconstruction (blue/red)
- Length: 1500mm + 150mm (RO upstream)
- R_{in}/R_{out} : 150 / 418 mm
- Angular acceptance: near 4π
- High momentum resolution: $\delta_p/p \sim 1\text{-}2\%$ at $B = 2$ Tesla
- High spatial resolution: $\sigma_{r\phi} \sim 150$ (100) μm , $\sigma_z \sim 3.0$ (2.0) mm (single hit)



ELECTRONICS

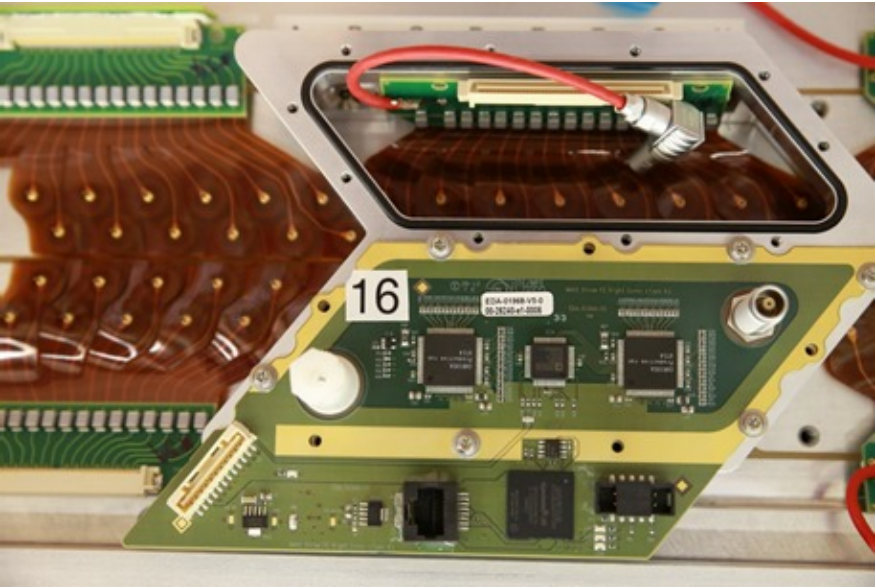
VMM3



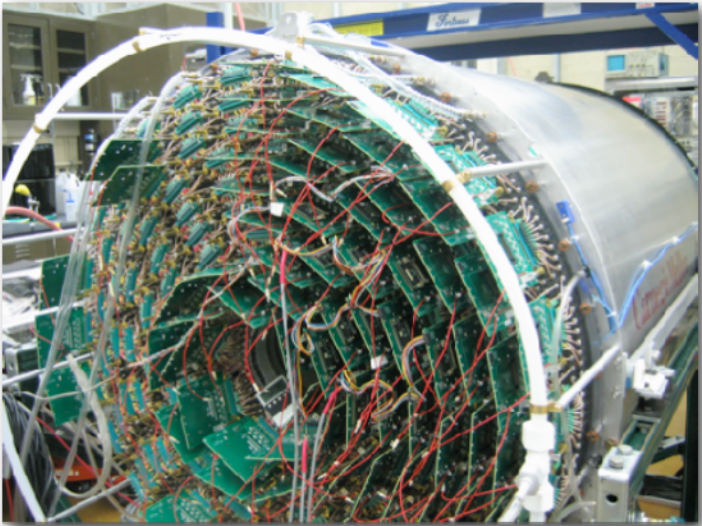
ATLAS

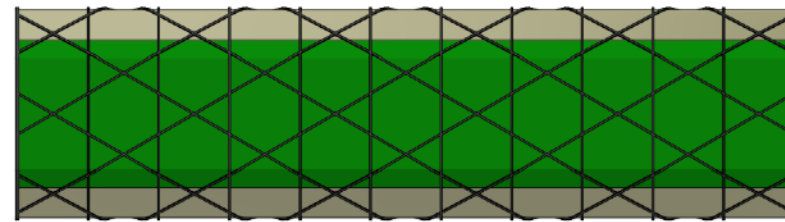
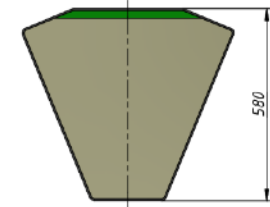
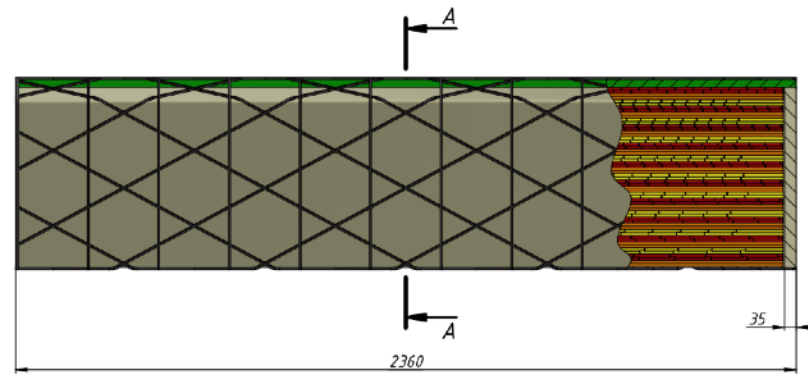
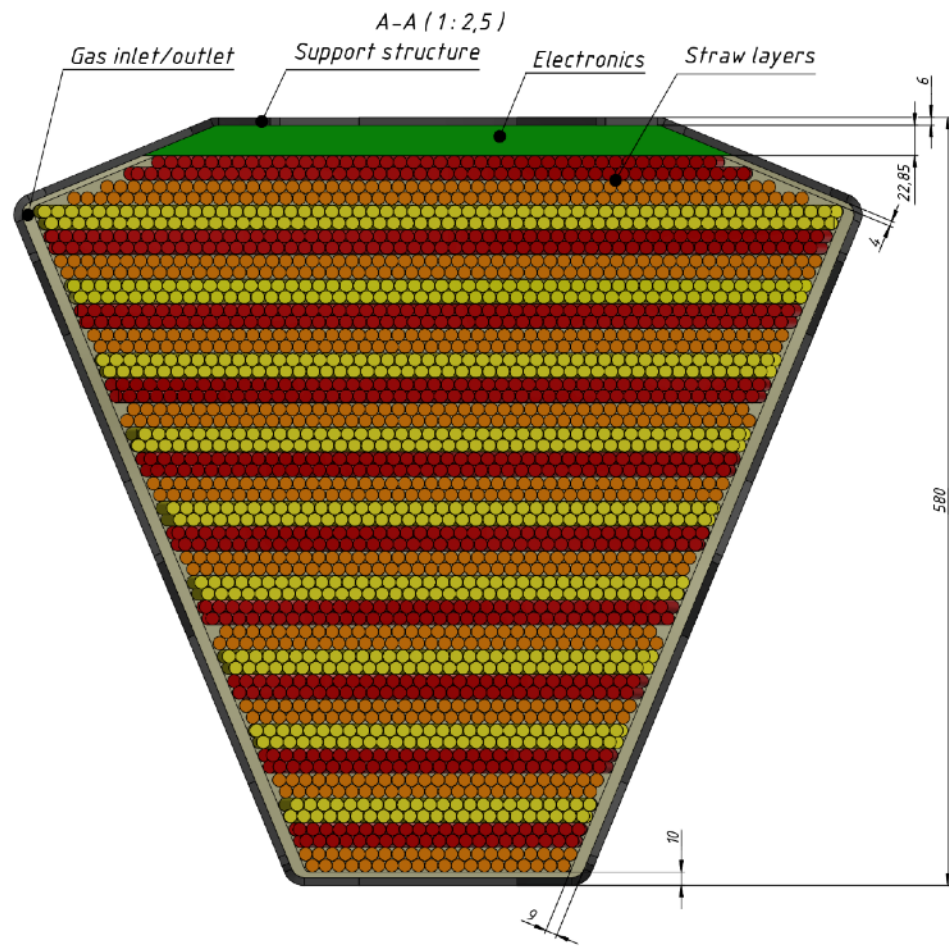


NA62



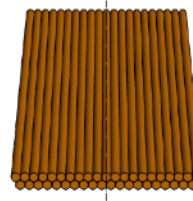
GLUE-X



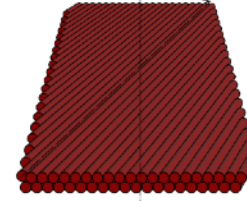


3700 channel

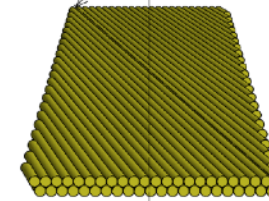
Layer X (1:4)



Layer U (1:4)



Layer V (1:4)



Layer, №	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Angel, deg.	0	5,27	-5,65	0	6,43	-6,82	0	7,59	-7,97	0	8,74	-9,12	0	9,88	-10,26	0	11,02	-11,4	0	12,15	-12,52	0	13,27	-13,64	0	14,38	-14,74	0	10,61
Straws, pcs.	47	79	87	49	99	103	59	115	119	67	137	139	77	149	155	87	167	171	95	183	186	105	199	203	115	215	219	107	80
Total straw L, m	92,7	95,5	102,7	110,7	116,7	123,5	133,3	137,5	144,3	151,4	158,3	165,5	174	179,3	186,3	196,6	200,4	207,2	214,7	221,2	228	237,3	242,1	248,9	259,9	263	269,8	241,8	200,4