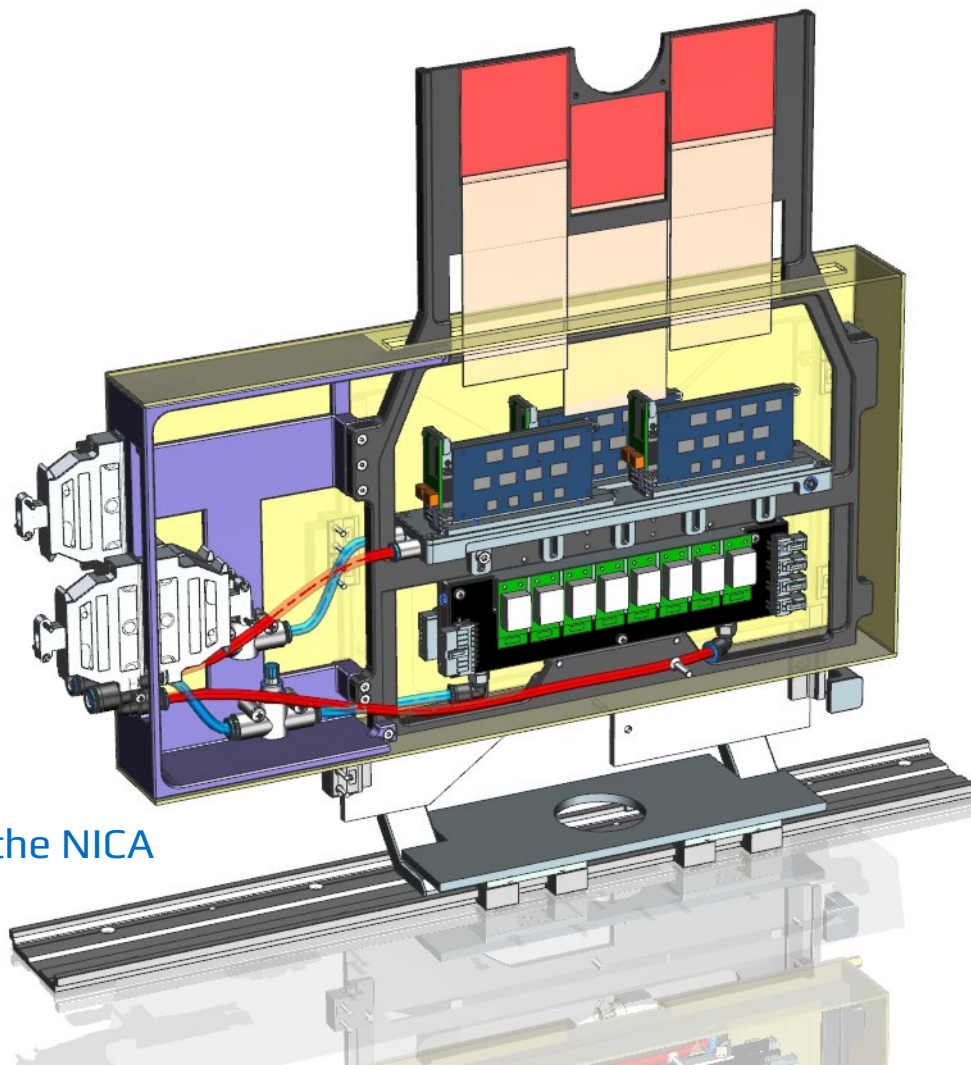


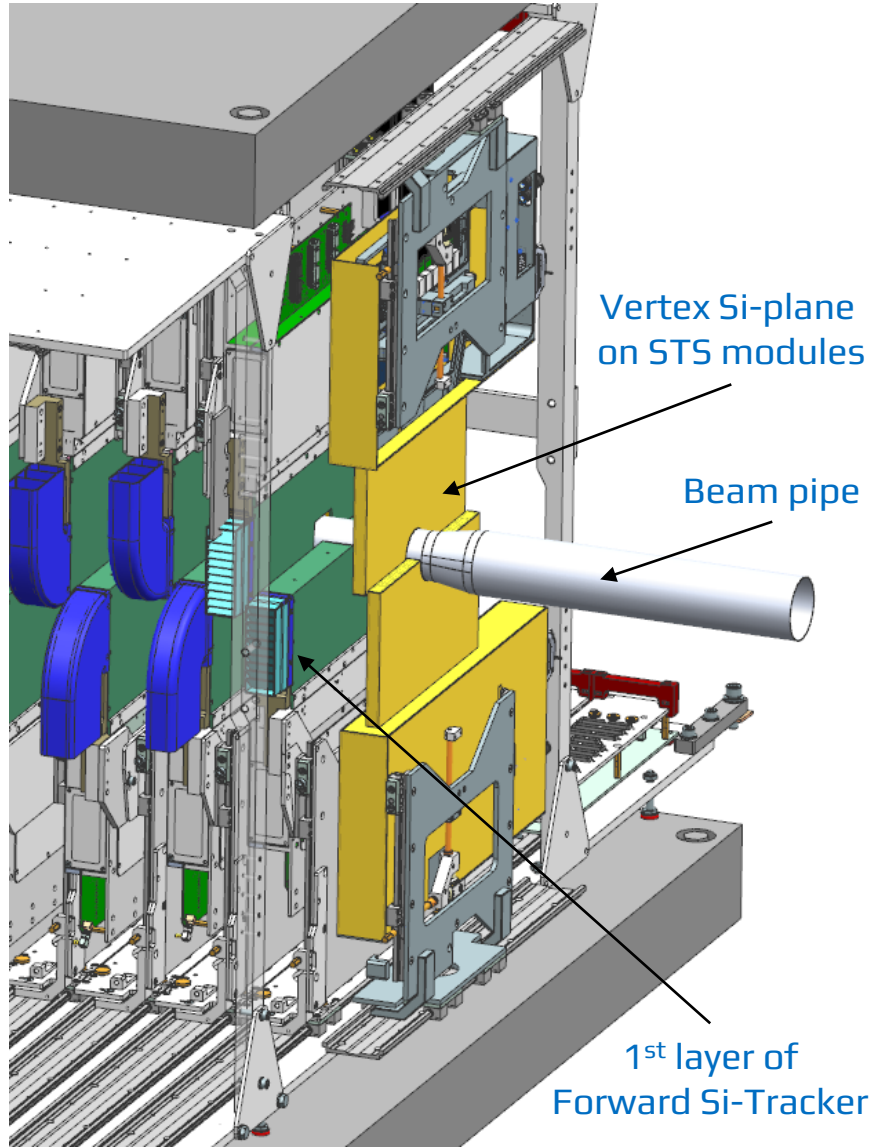
Vertex detector plane based on STS modules



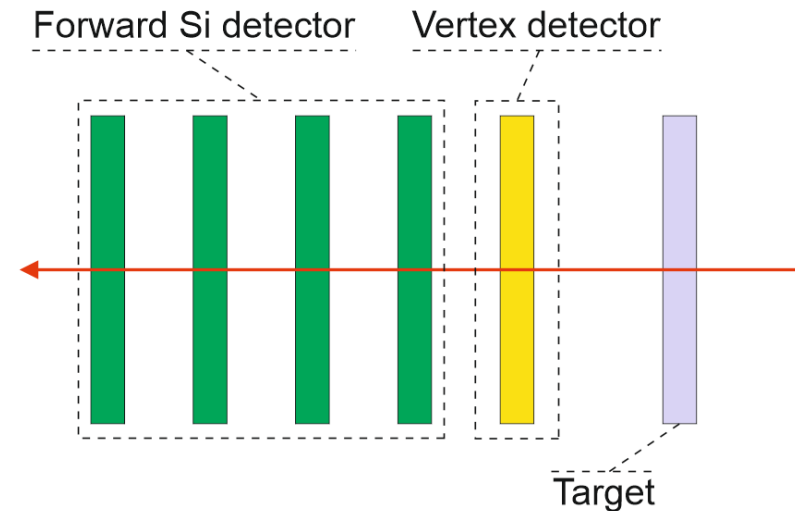
Sheremetev Aleksei for STS team
JINR LHEP



11th Collaboration Meeting of the BM@N Experiment at the NICA
Facility 28 – 30 November 2023

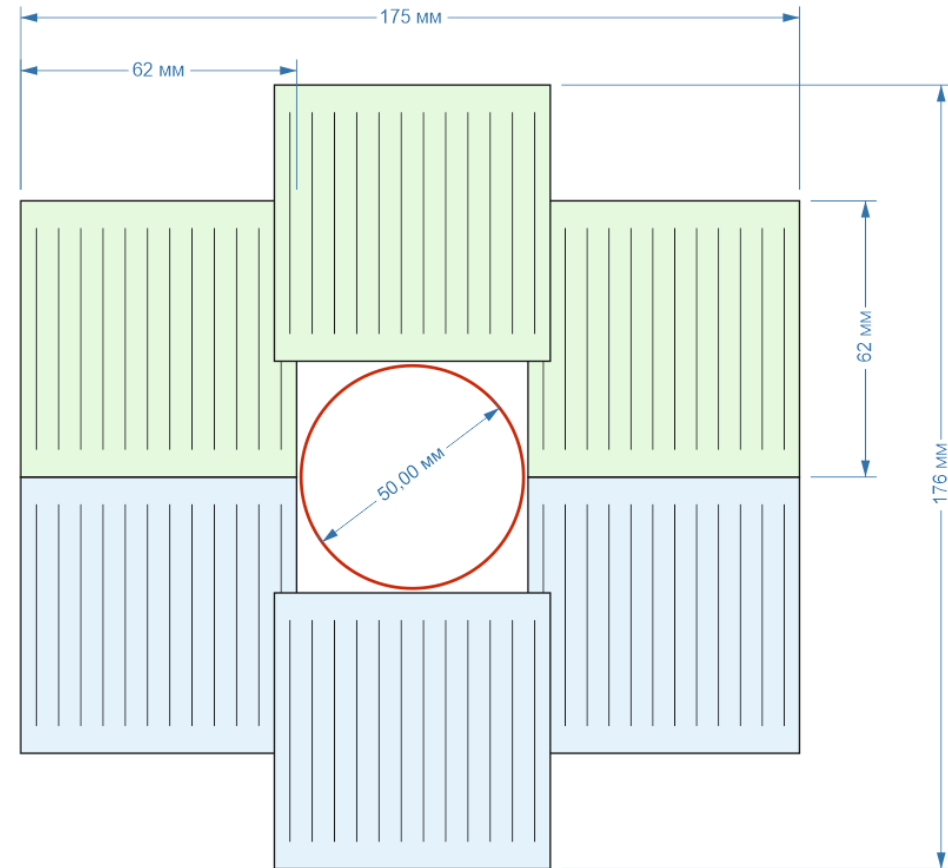
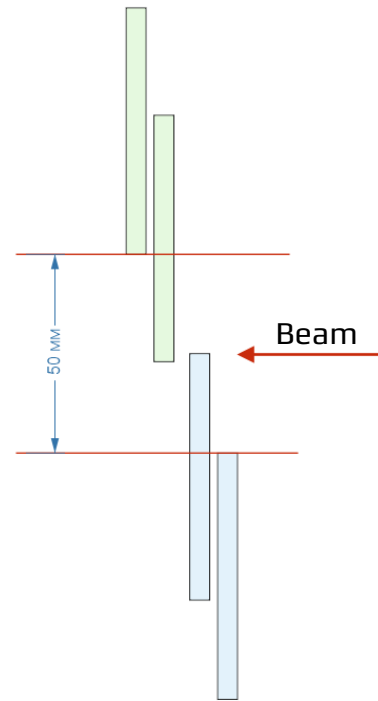


- Request from BM@N: to install a new small Si-plane based on STS modules between the **Target** and **Forward Si-Tracker**.
- Motivation: to improve track and momentum resolution for the low-momentum particles

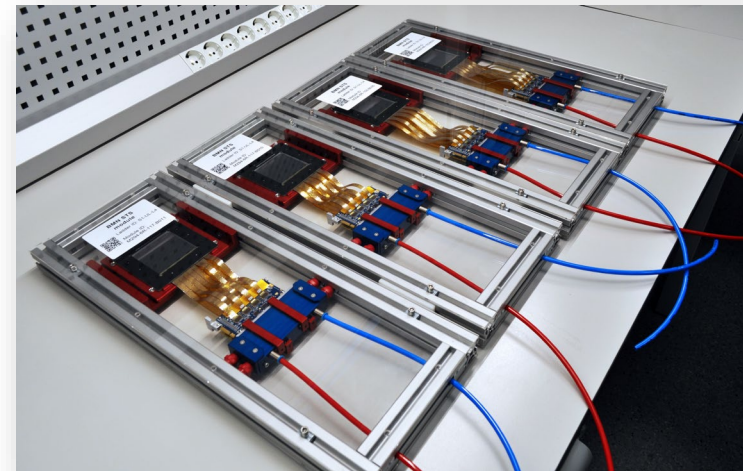
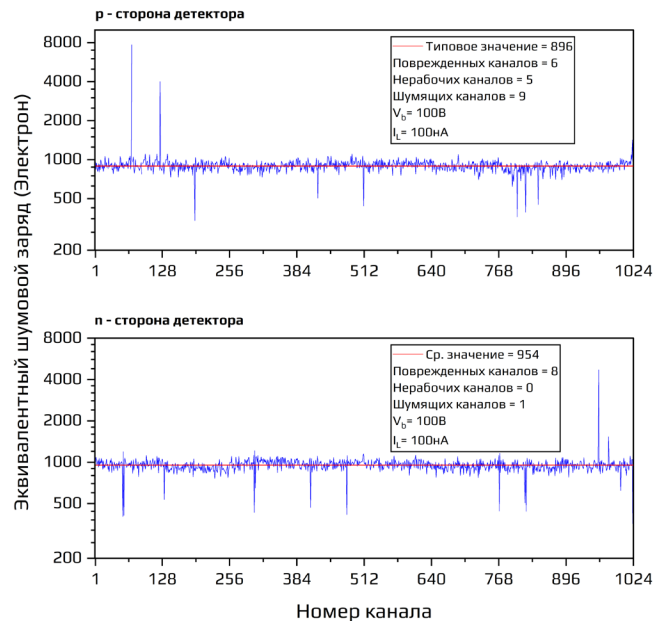
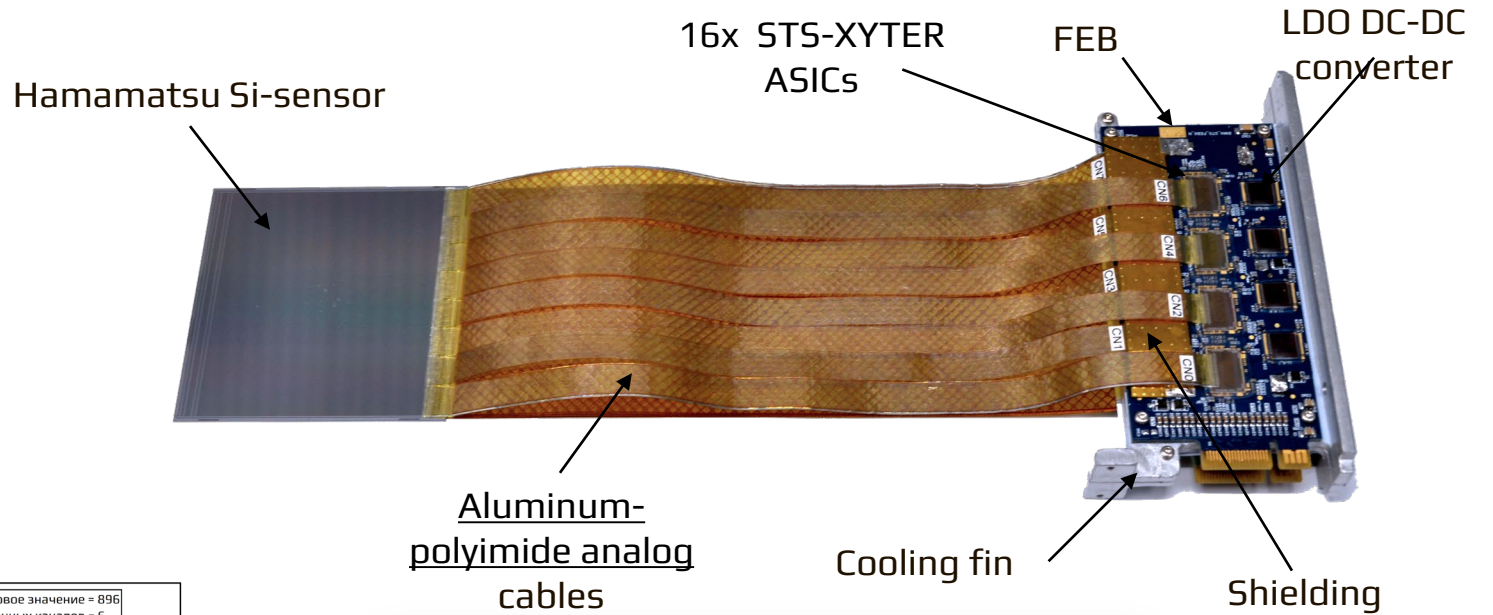


Proposal for the plane build on STS modules

- **Size of sensor:** 62×62 mm²;
- **Pitch:** 58 μm, 7.5° stereo-angle;
- **Number of channels:** 12.288 channels;
- **Thickness of sensor:** 320 μm ±15 μm;

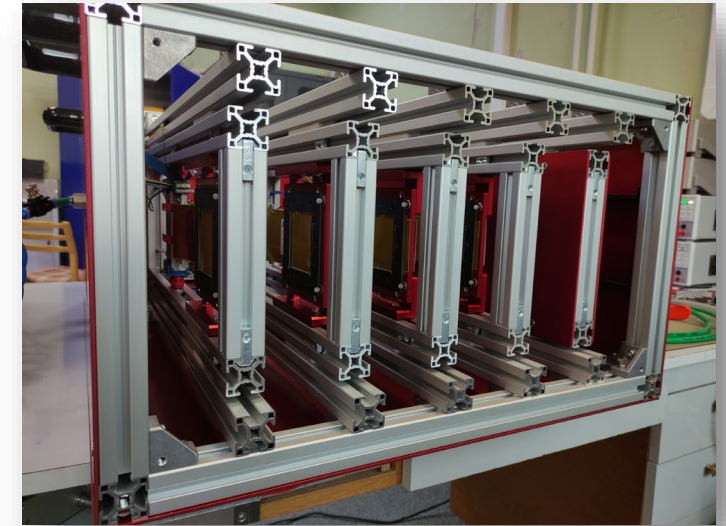


Module ID	Size of sensor	Cable length	Nb. of not-operable ch.
B033	62	155	26
B011	62	117	14
B008	62	117	10
B009	62	117	7
B032	62	155	56
B034	62	155	23

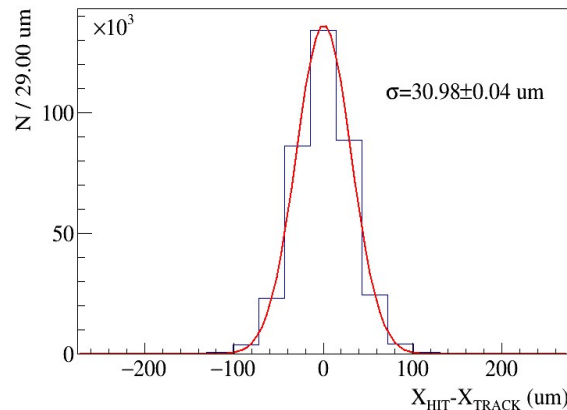


STS modules and readout electronics were tested at proton beam in Gatchina:

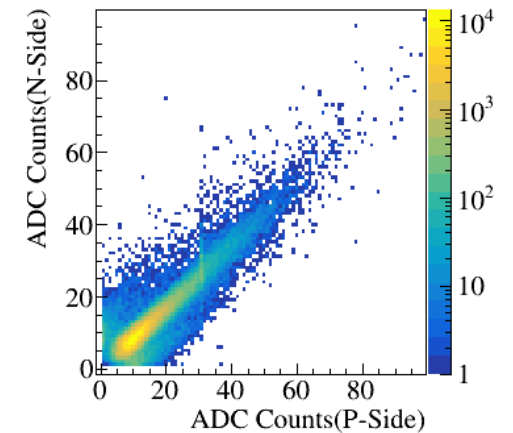
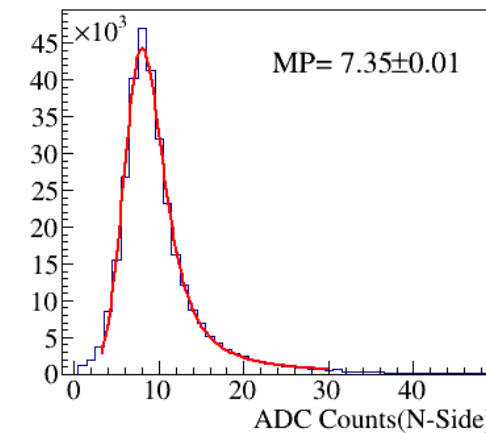
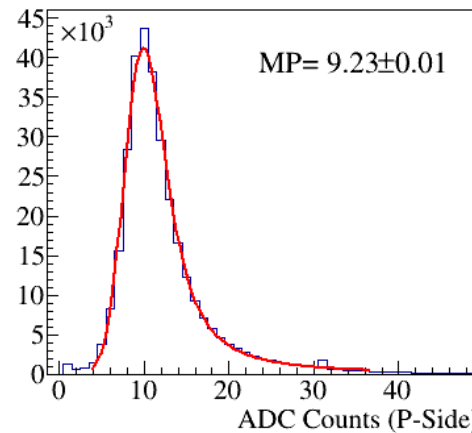
- Spatial resolution ~ 17 μm ,
- $S/N > 20$
- Efficiency $\sim 99\%$



Telescope with 4 modules



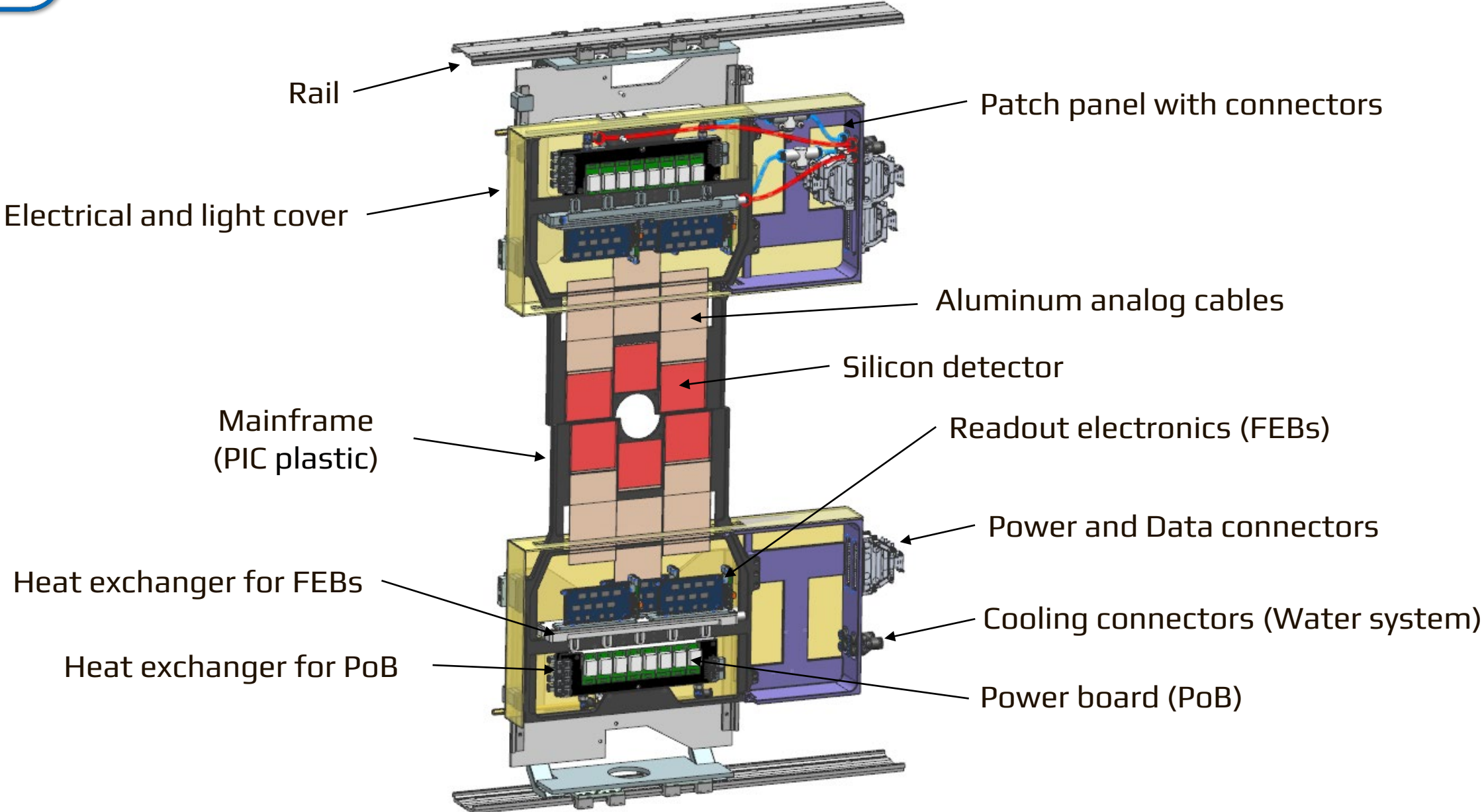
Residuals for 1-str. clusters



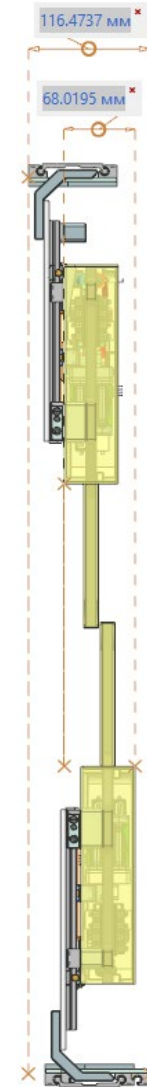
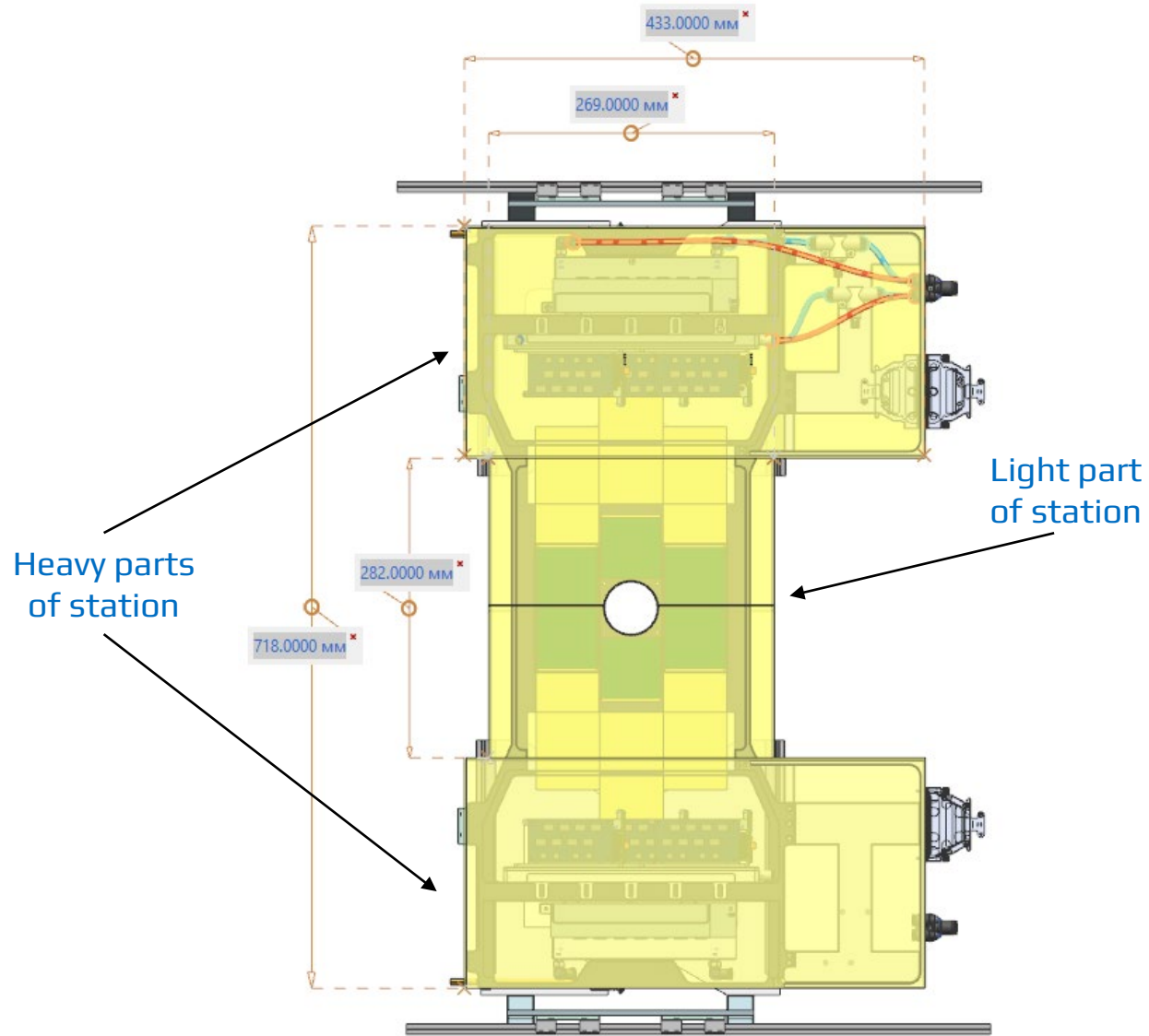
Cluster Amplitudes for P and N sides

Reported at 10th BM@N CM

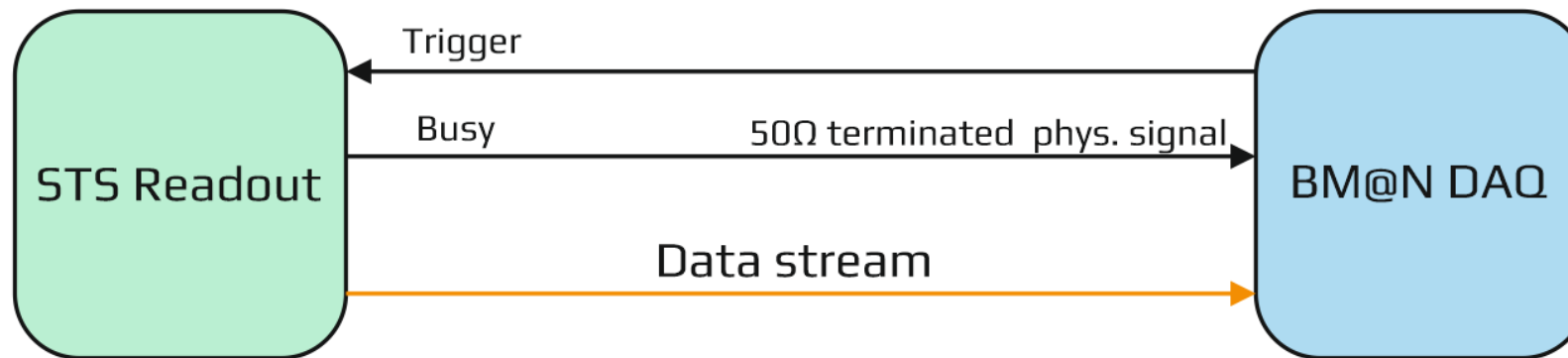
Conceptual design of vertex Si-plane



Dimensions of vertex Si-plane



- Size of the box: 718×433×68 mm
- Light part of the box: 282×269×3 mm
- Sensitive area: 216 mm²



- Independent readout system based on the solutions developed for STS;
- Data will be collected at STS server-node and then transferred to BM@N DAQ nodes through the Ethernet using M-Stream protocol;
- Timing system synchronous with WR clock and PPS signal ($\sigma \sim 200$ ps);
- Data stream filtered based on trigger signals from BM@N.

Components for assembly

- Modules – **already assembled**;
- Readout electronics blocks – **produced and tested during beam-time in Gatchina**;
- Power boards (PoB)– **produced**;
- Power units – **delivered and tested**;
- Chiller for the cooling system – **in the storage**;
- Cables – **to be delivered before the end of 2023**;
- Mechanical frame – **design in progress**.

Timelines

- End of station design – February 2024;
- Production of mechanical parts – Spring 2024;
- Laboratory tests- Summer 2024;
- Ready to integration to BM@N - Autumn 2024.

