



TPC prototype design

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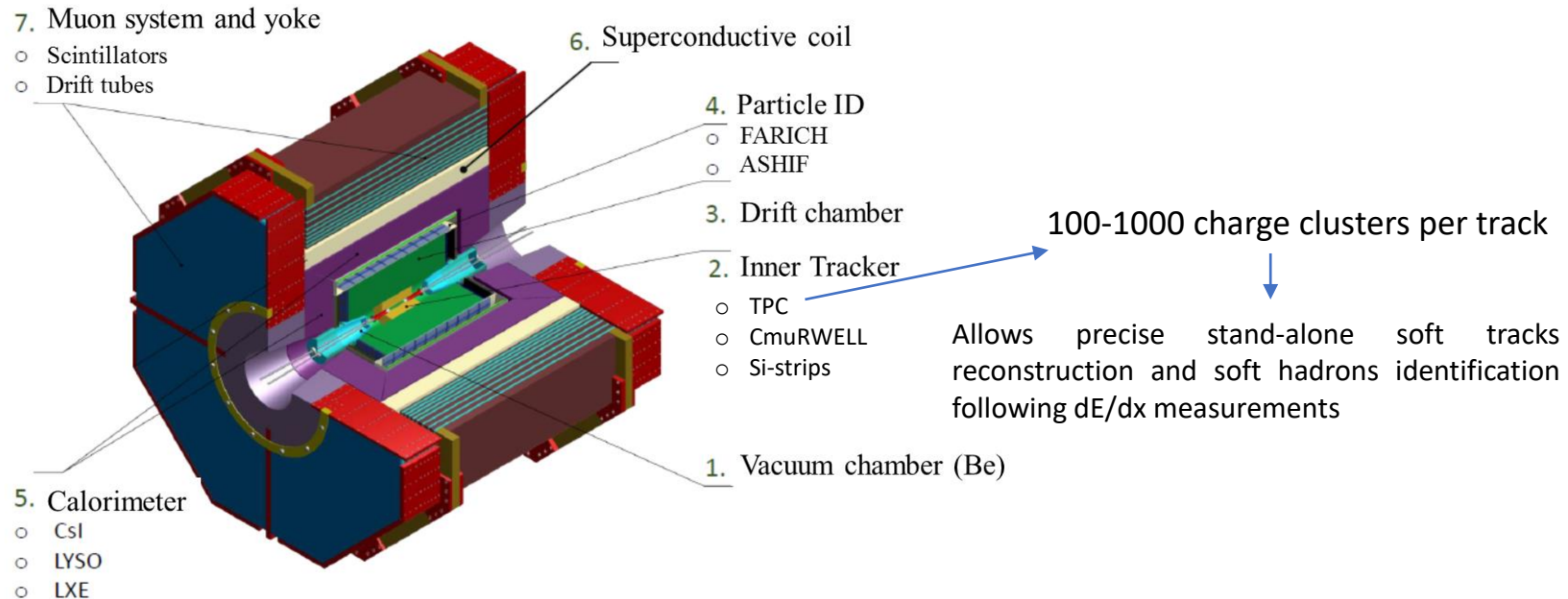
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Novosibirsk Super Charm-Tau Factory Detector





TPC dimensions: 40 cm in diameter, 60 cm long (two halves of 30 cm)

Main issues with TPC as Inner Tracker:

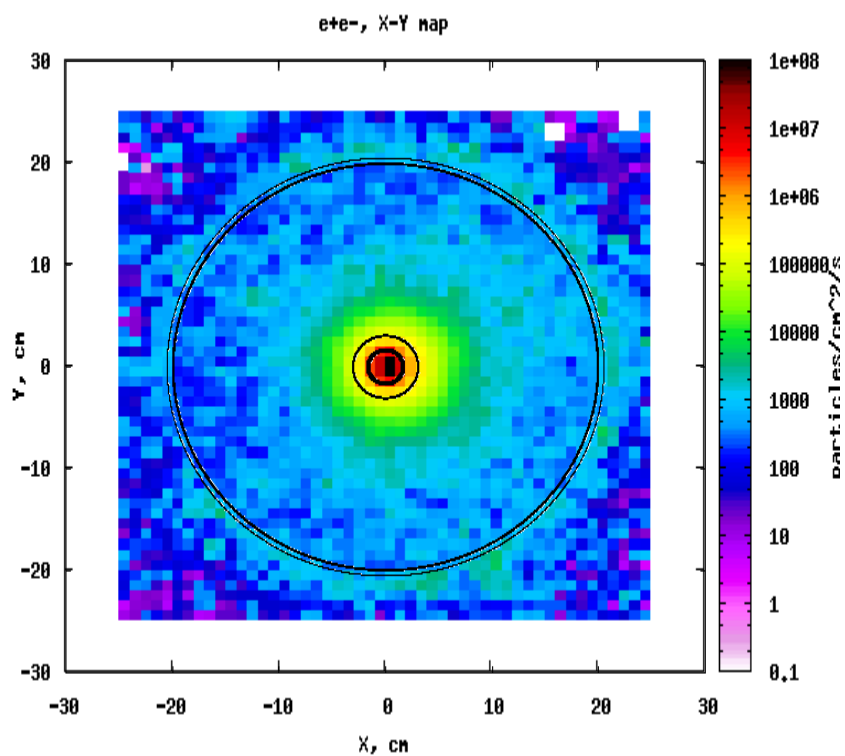
- Tracks from many bunch crossings are overlapping
electron drift time is $\sim 6 \mu\text{s}$ (Ar-10%CH₄), 1200 bunch-crossings,
 ~ 50 tracks in TPC acceptance ($\theta > 0.1$ rad). Specific reconstruction
algorithm is needed

- Ions from end-cap detectors drift back into the TPC volume and
build-up a space charge

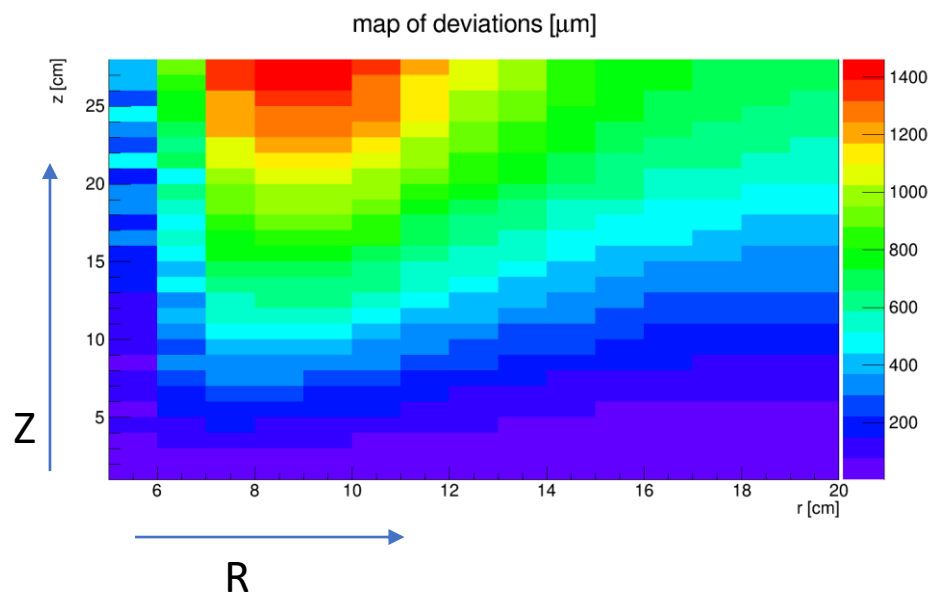


Simulations of background particle fluxes and ion space charge in TPC volume demonstrated feasibility of the TPC approach.

Electrons and positrons in the region of IT

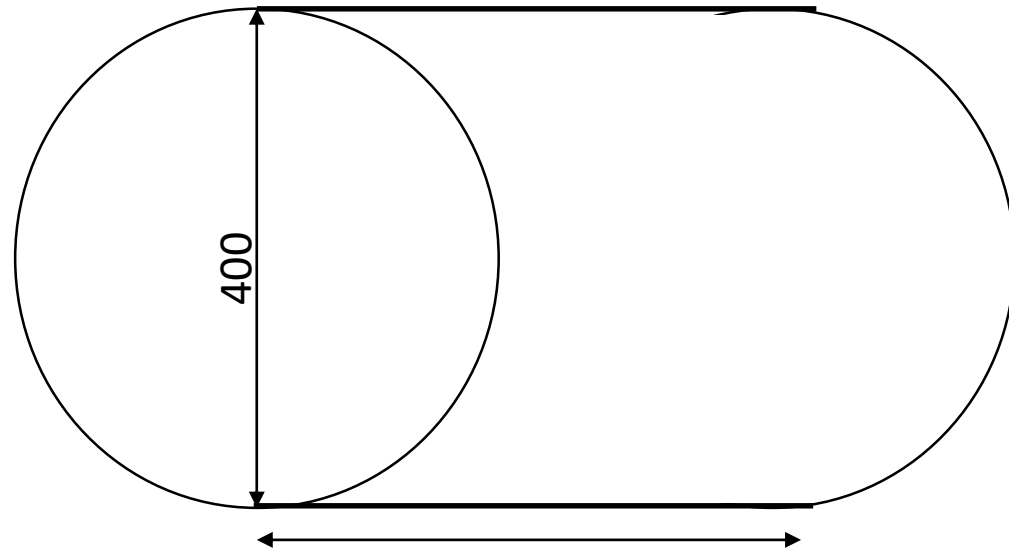


Distortions of electron drift trajectories due to ion space charge, $\text{IBF} = 1\%$, $\text{gain} = 10000$



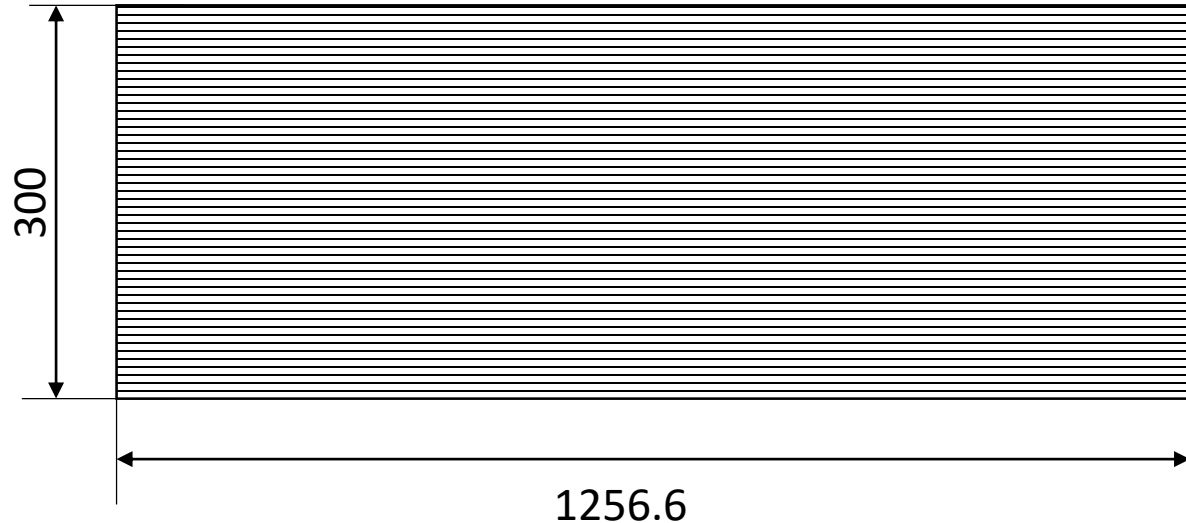


TPC dimensions



Dimensions of the plate for the cylinder

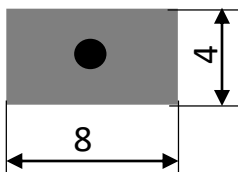
600 (300)



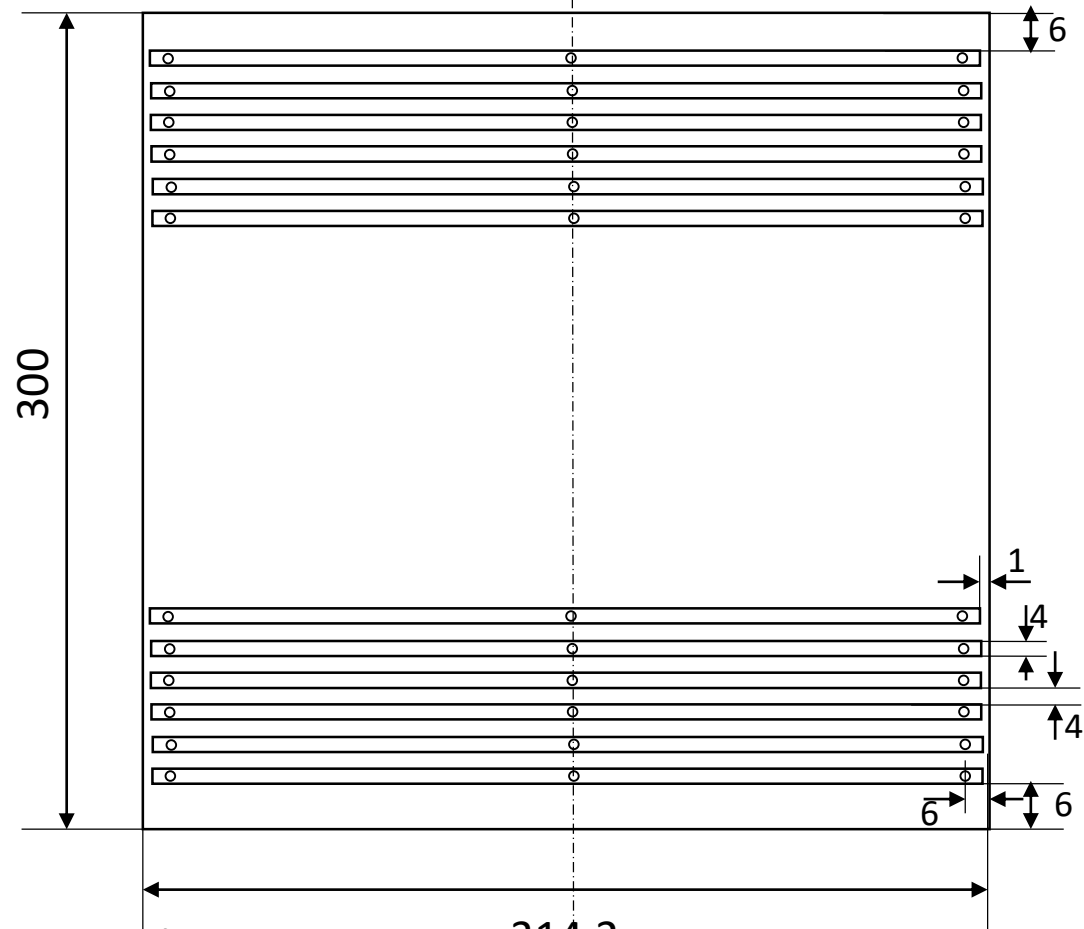


Design of the HV electrodes

These PCBs are produced

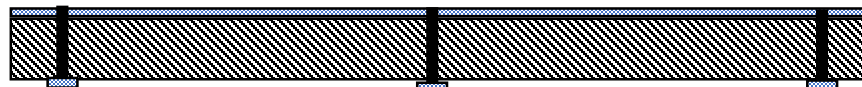


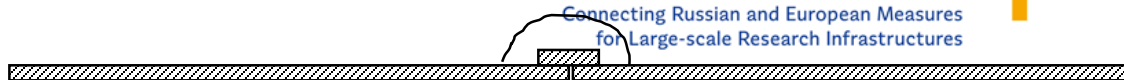
Contacts from the outer side



Cross section

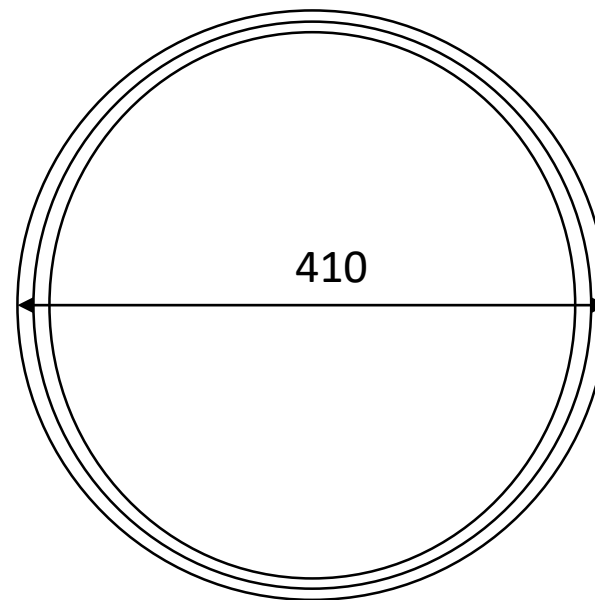
0.5 mm



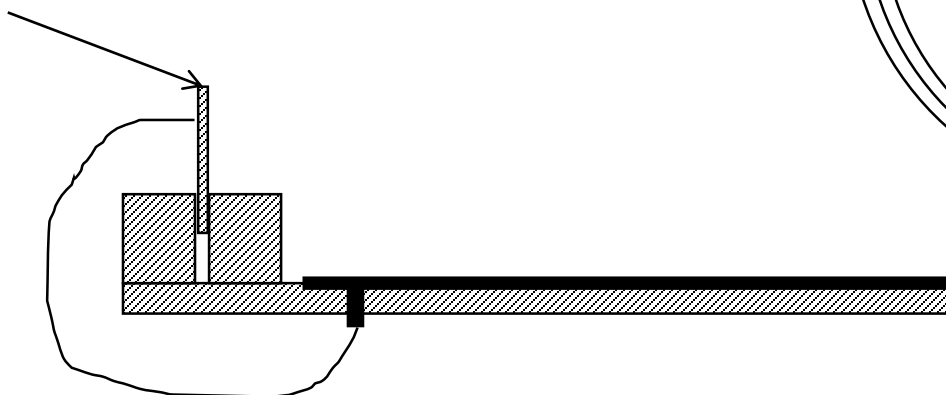


Glueing

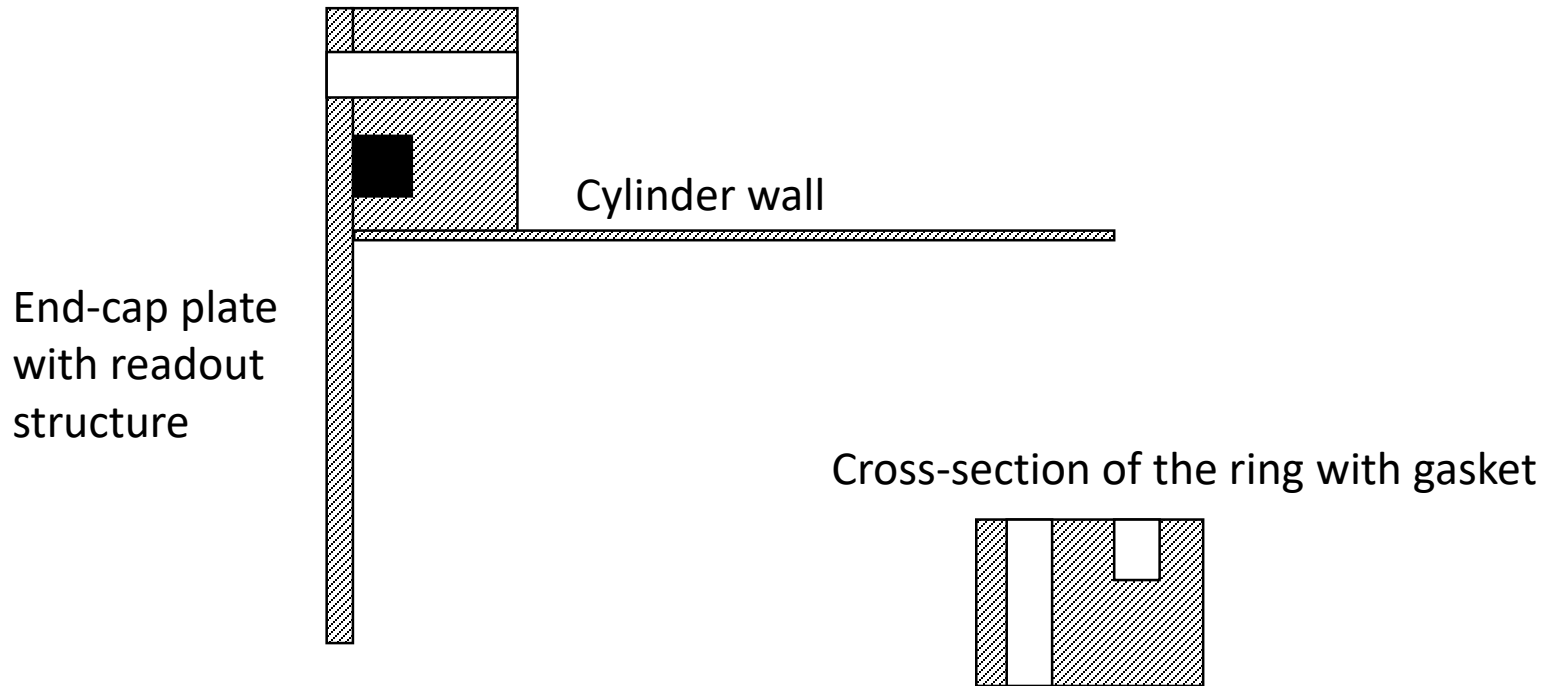
End-cap plate with HV electrode and rings



Cylinder with HV divider

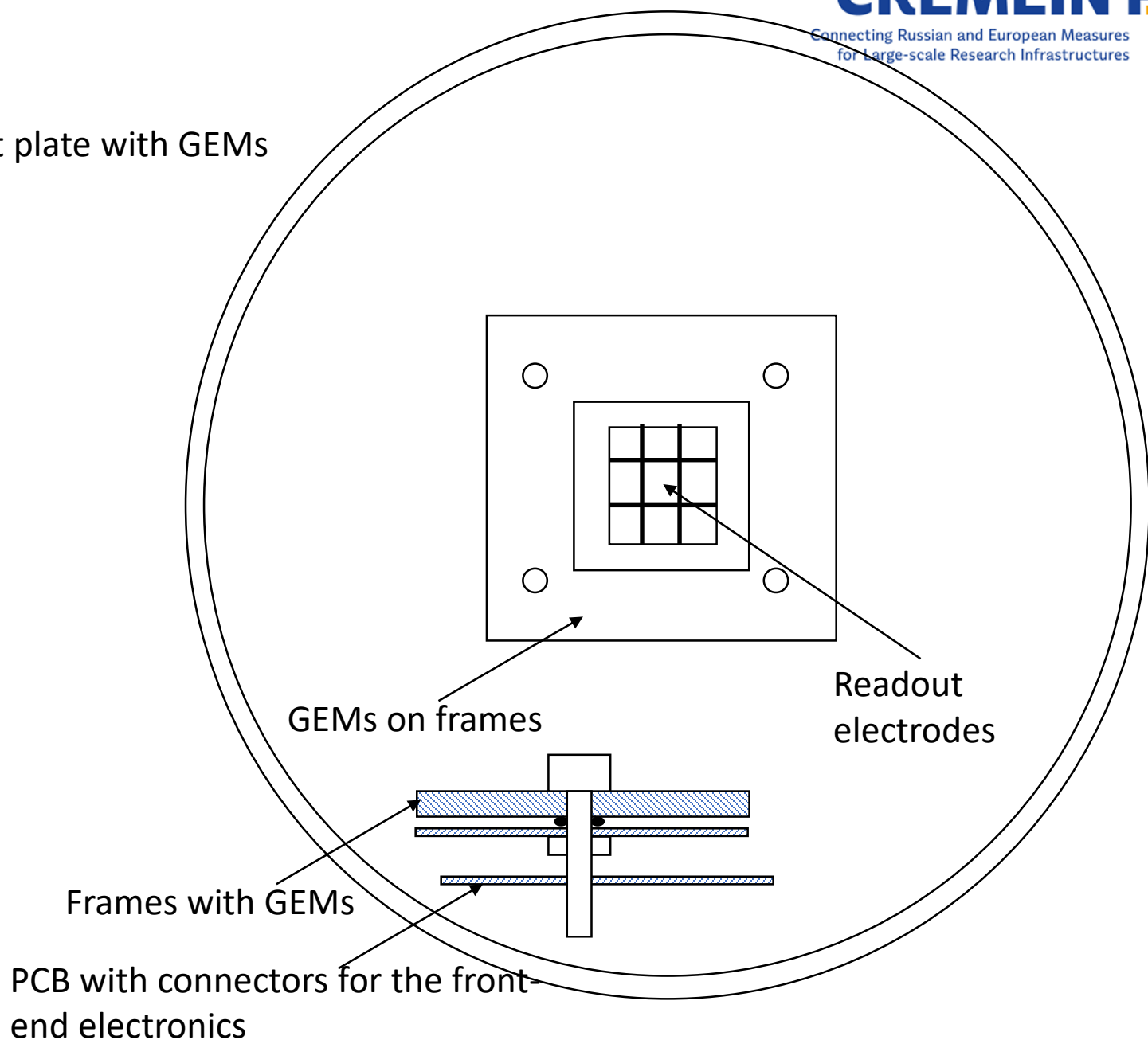


Cross-section of the edge of the end-cap plate





Readout plate with GEMs



GEMs on frames

Readout electrodes

Frames with GEMs

PCB with connectors for the front-end electronics



Current status:

- Sketches of the prototype parts are ready
- Simulations of space charge are performed
- Tooling for gluing of the cylinder is necessary
- Design of the first readout PCB?

Next steps for the end of the year:

- Design of the tooling
- Design of the PCB
- Write the TDR for the prototype
- Order parts

Activities for the next years:

- Assembly of the prototype
- First tests with cosmics and isotope (one analogue channel and scope)
- Tests with multichannel electronics (DMXG64B or VMM3)