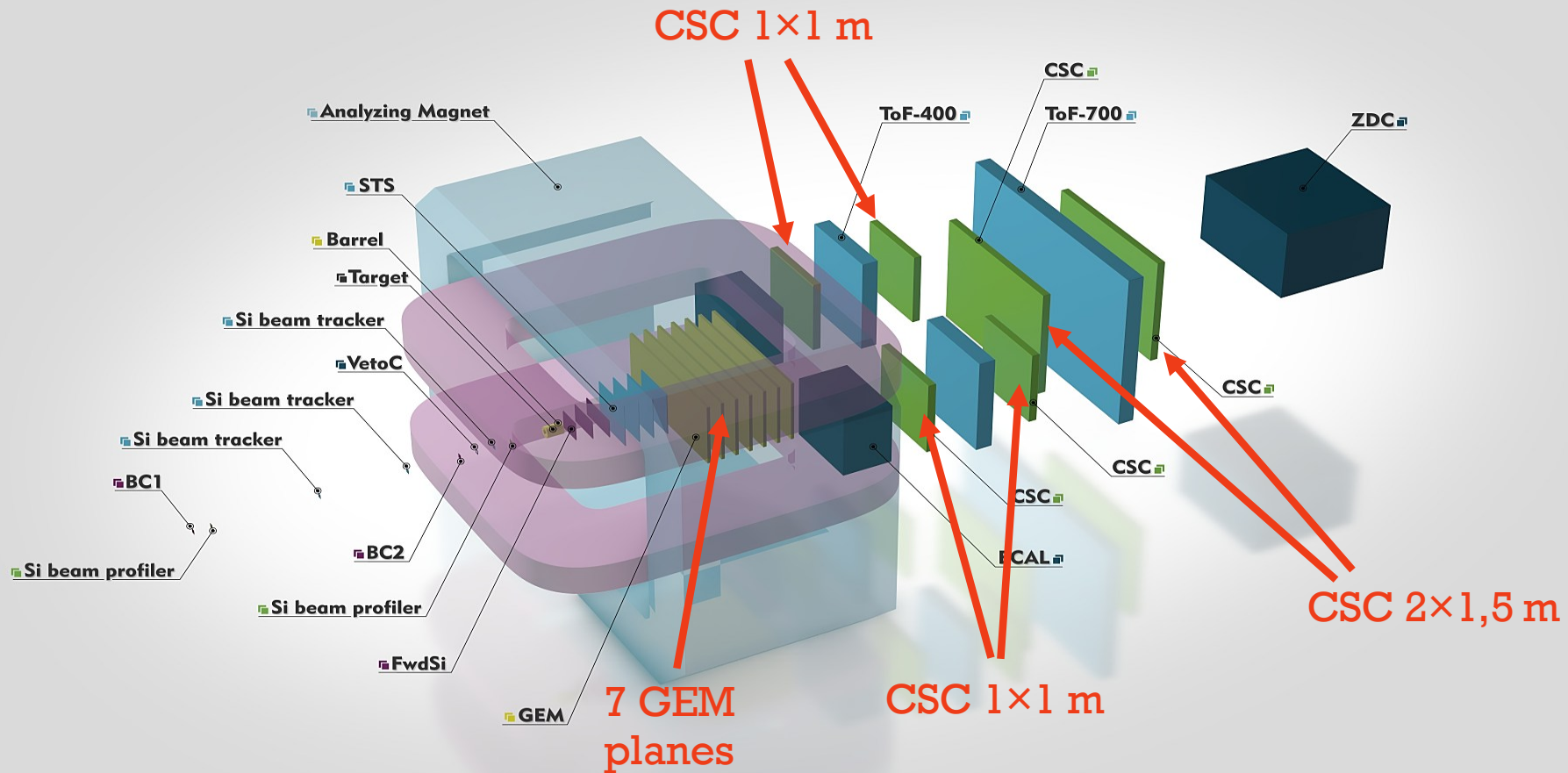




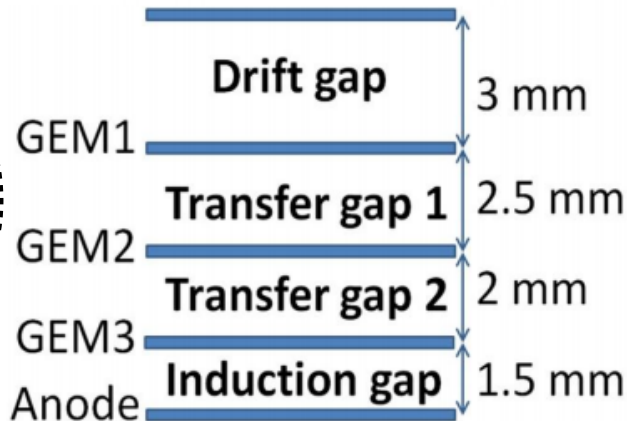
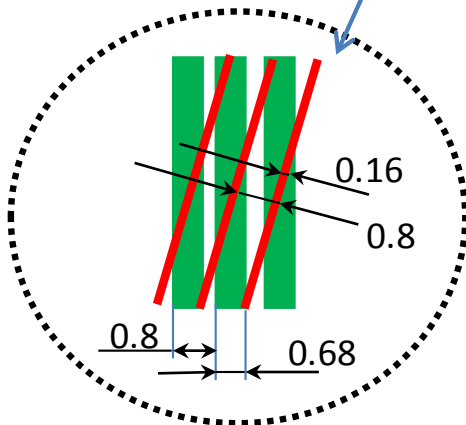
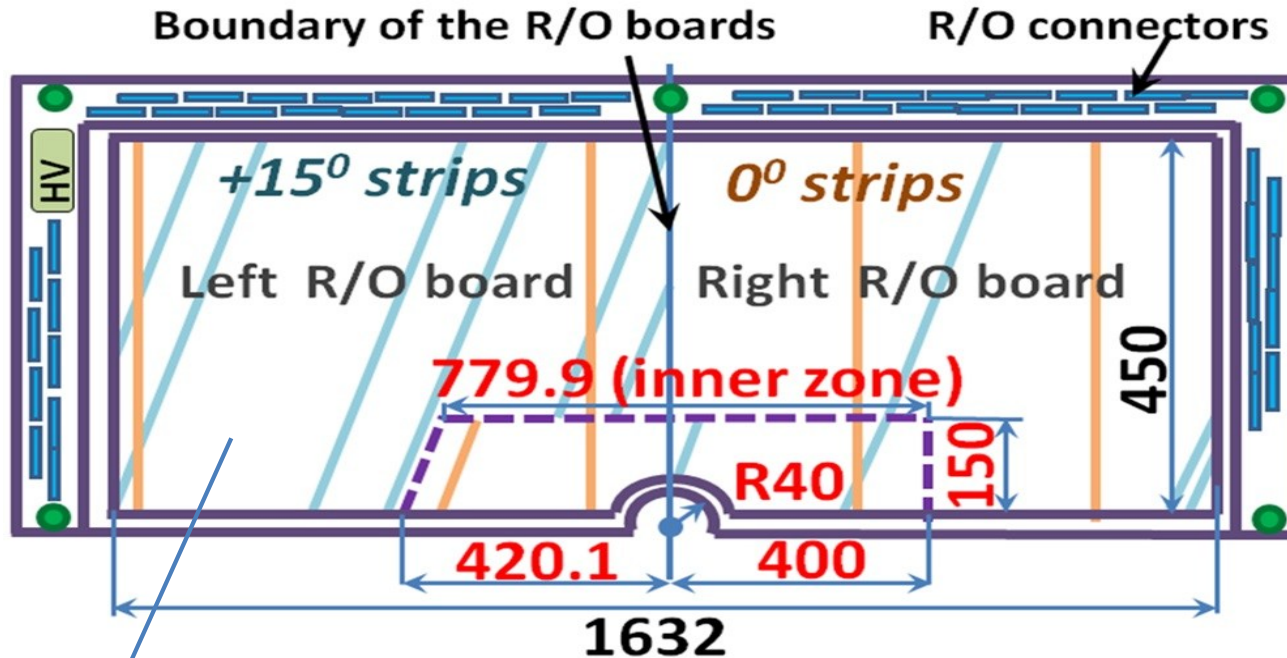
Status of the GEM/CSC tracking system

Andrei Galavanov on behalf of BM@N Collaboration

BM@N experiment



BM@N GEM detectors



Now we have:

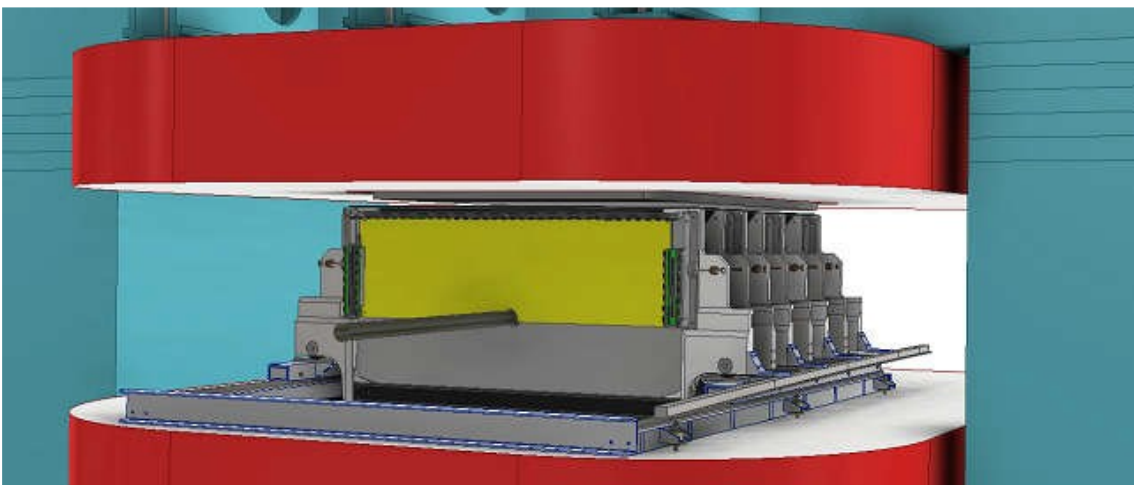
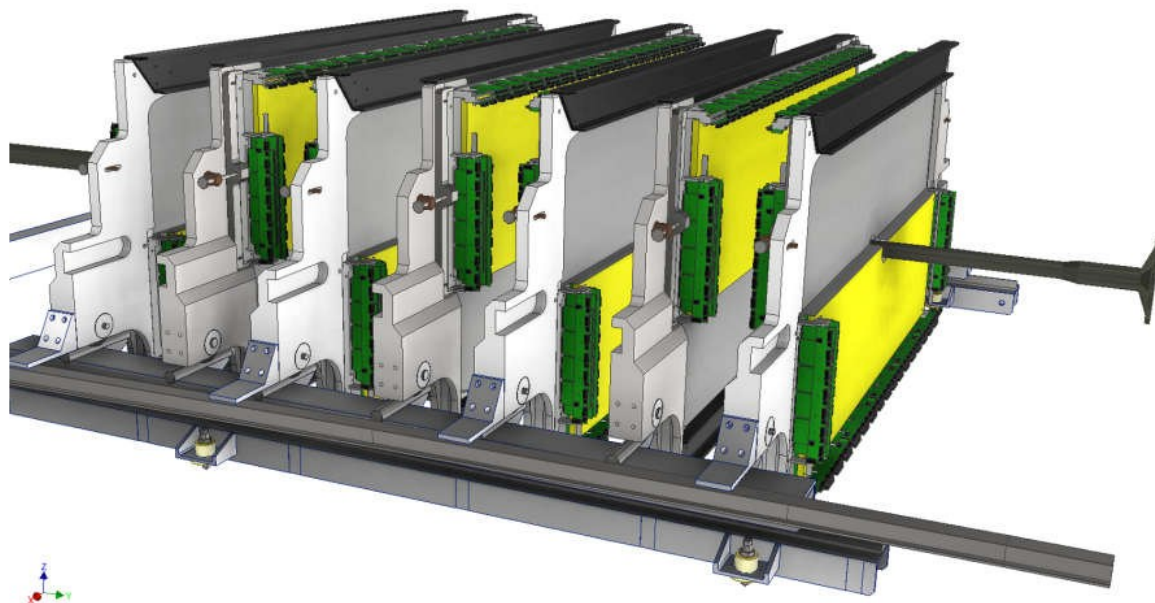
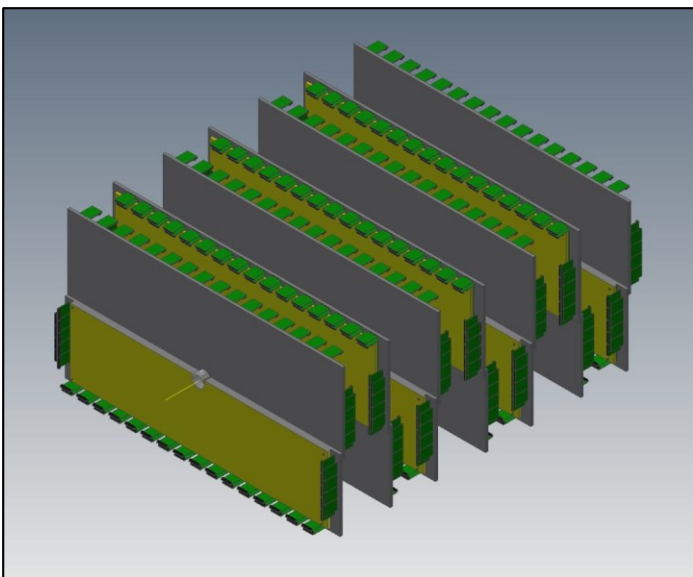
7 detectors $1632 \times 450 \text{ mm}^2$

7 detectors $1632 \times 390 \text{ mm}^2$

2 spare detectors will be produced in 2020 (hopefully)

Schematic cross section of the BM@N triple GEM detector

Preliminary full planes configuration inside the magnet



First half of 2020 – development of the mechanics for GEM planes precise installation inside the magnet.

End of 2020 – mechanics production, installation of the GEM planes.

Cosmic test stand



← Rack

Coincident
system - Ten
 $200 \times 10 \text{ cm}^2$
Scintillation
detectors →



Assembling the cosmic stand for long-term tests of GEM-detectors.

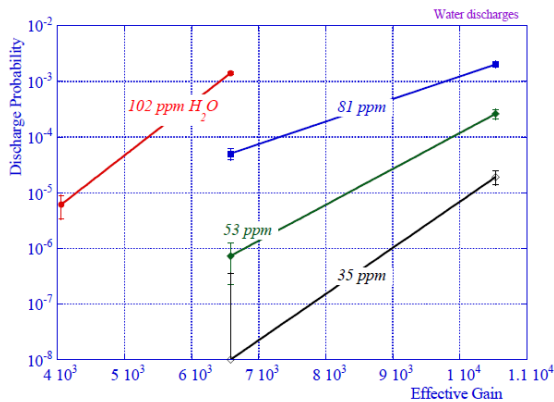
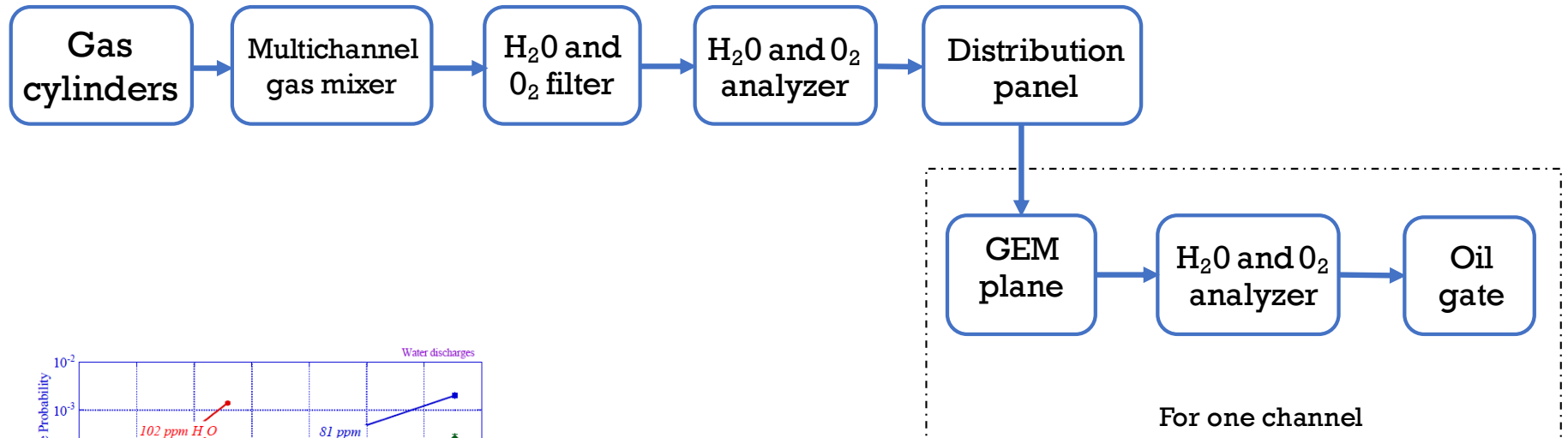
Main goals:

- Efficiency
- Spatial resolution
- Gas gain distribution

Gas system

Gas system requirements :

- stable flow and mixture parameters;
- 7 independent channels to each GEM-plane;
- reducing and control oxygen and moisture impurities in gas mixture;

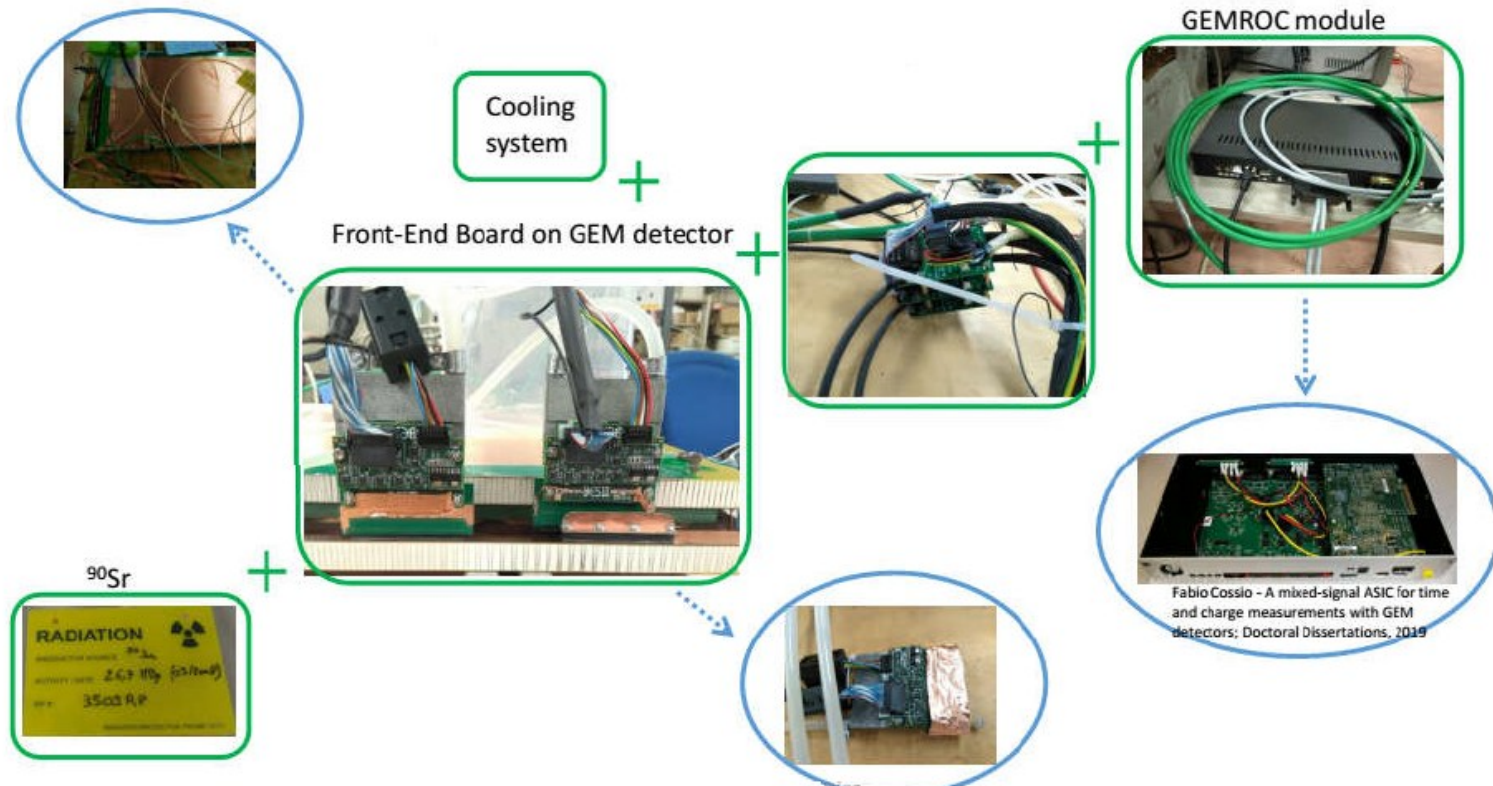


Discharge probability on alphas as a function of moisture level in the gas.
COMPASS

We tested GE oxy.IQ for oxygen analyze and GE dew.IQ+ GE IQ.probe for moisture analyze. Also was tested PTFE and polyamide tubes to use inside the magnet.

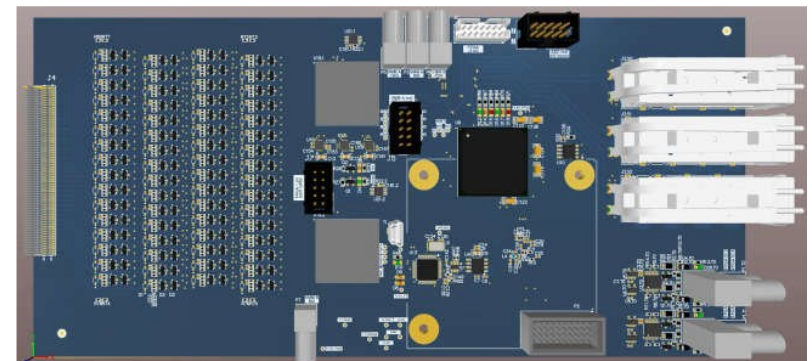
Development of new FEE based on TIGER/VMM3a

First run of TIGER FEE on the BM@N GEM detector was performed at CERN at the end of 2019. Next tests were planned on March 2020 at JINR, but were put forward.

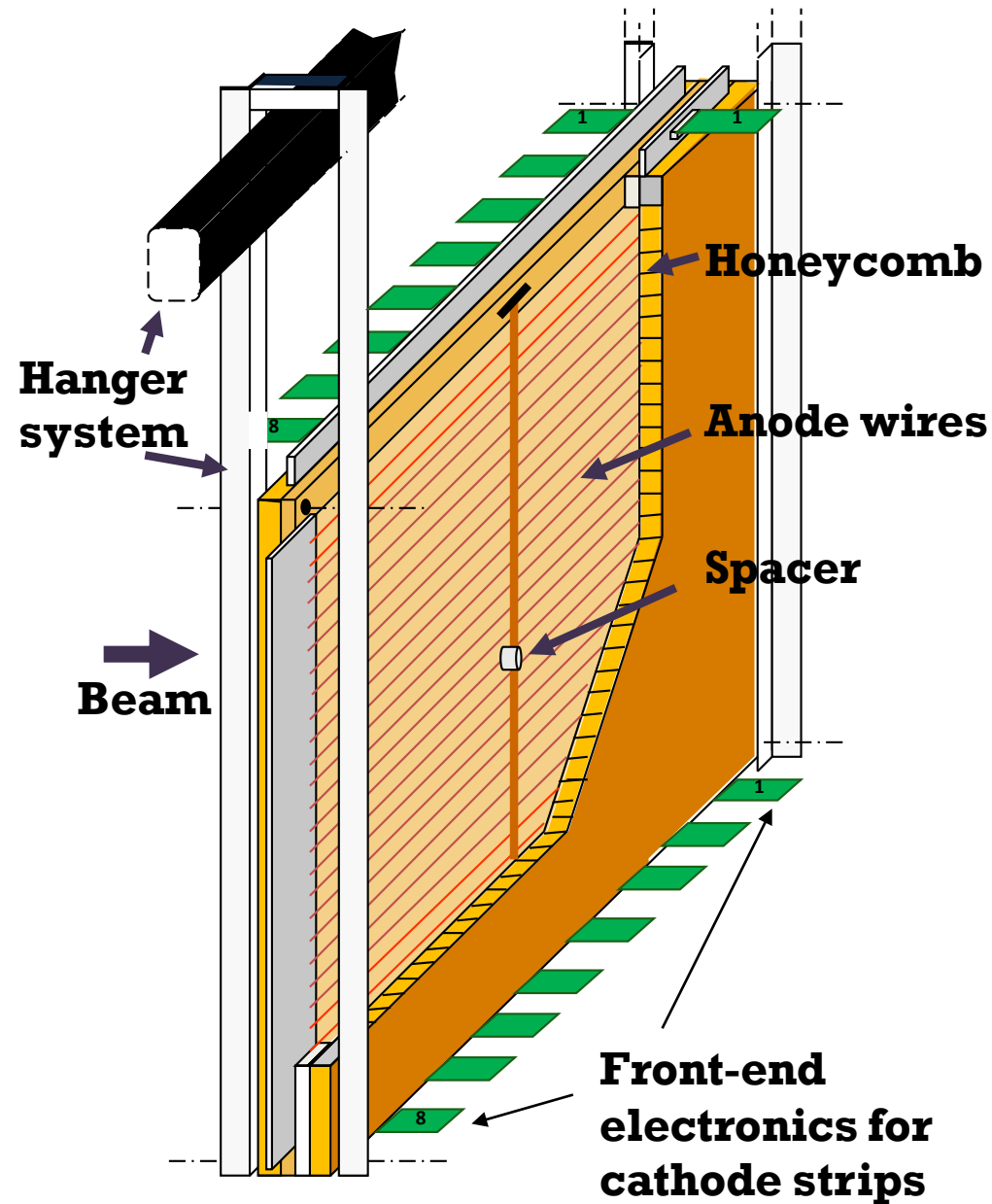


Kintex7 based 128ch GEM evaluation board was designed for VMM3a tests.

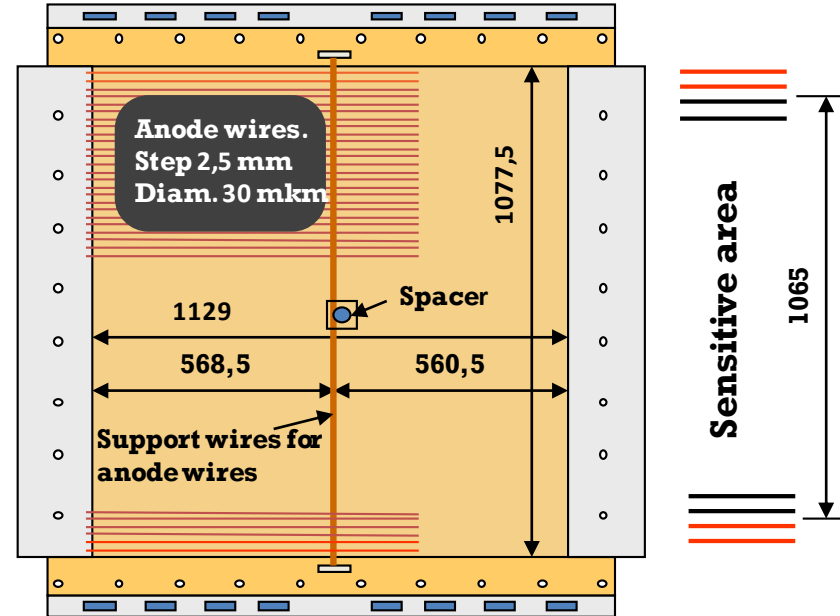
Tests with detectors have not been conduct.



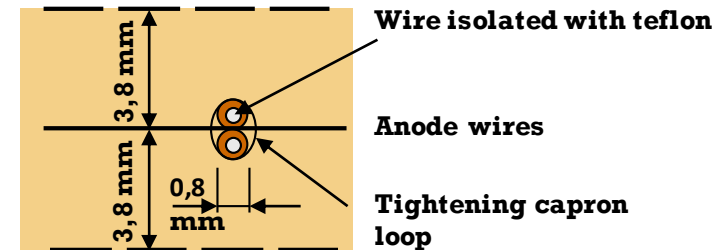
Schematic view of CSC



Anode wires geometry



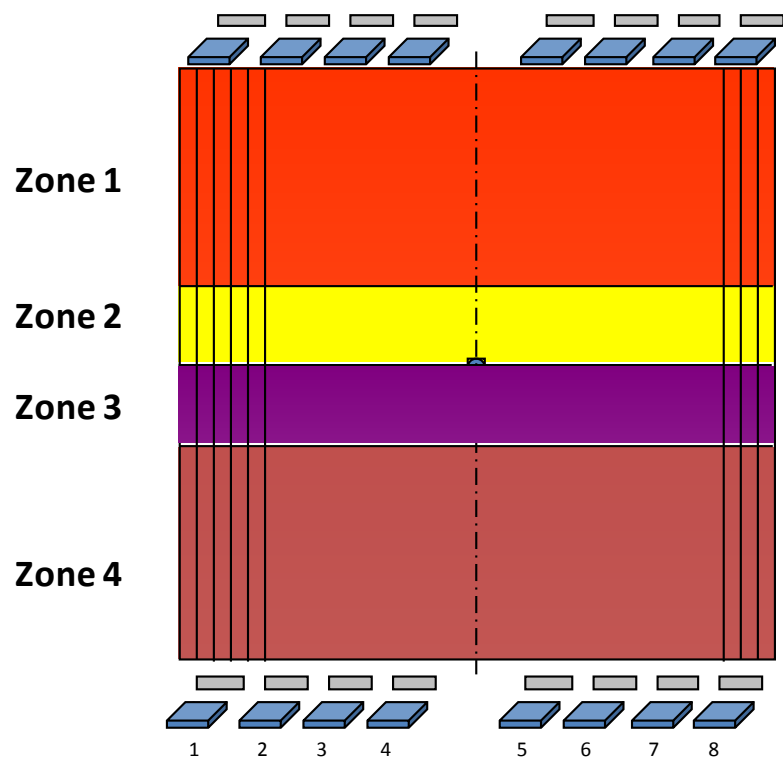
Cathode 1



Cathode 2

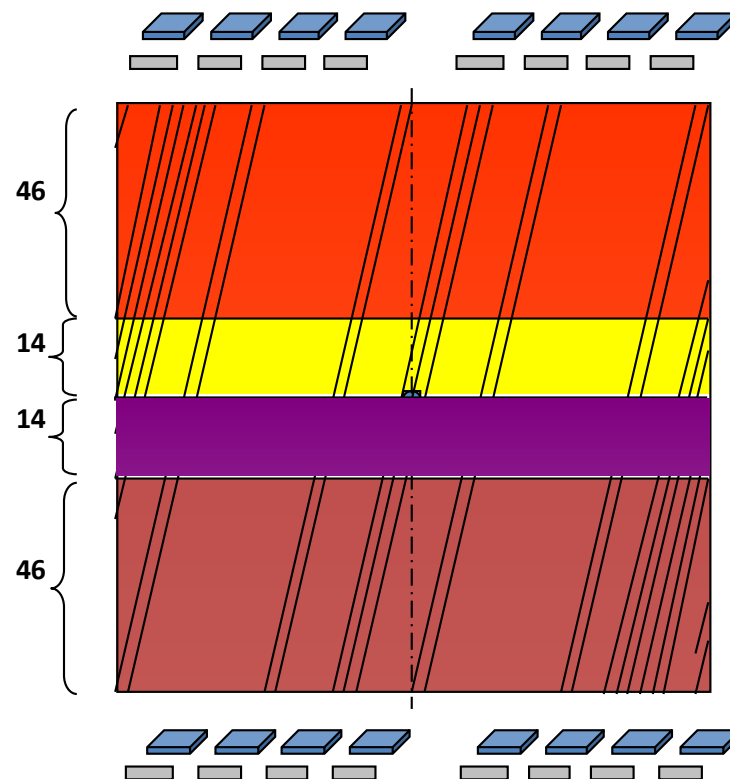
Readout cathode planes

Each cathode plane consists of two printed circuit boards. Each PCB is divided into hot and cold zones.



Vertical (X) strips

Beam
⊙



Inclined (Y) strips

CSC $1 \times 1 \text{ m}^2$

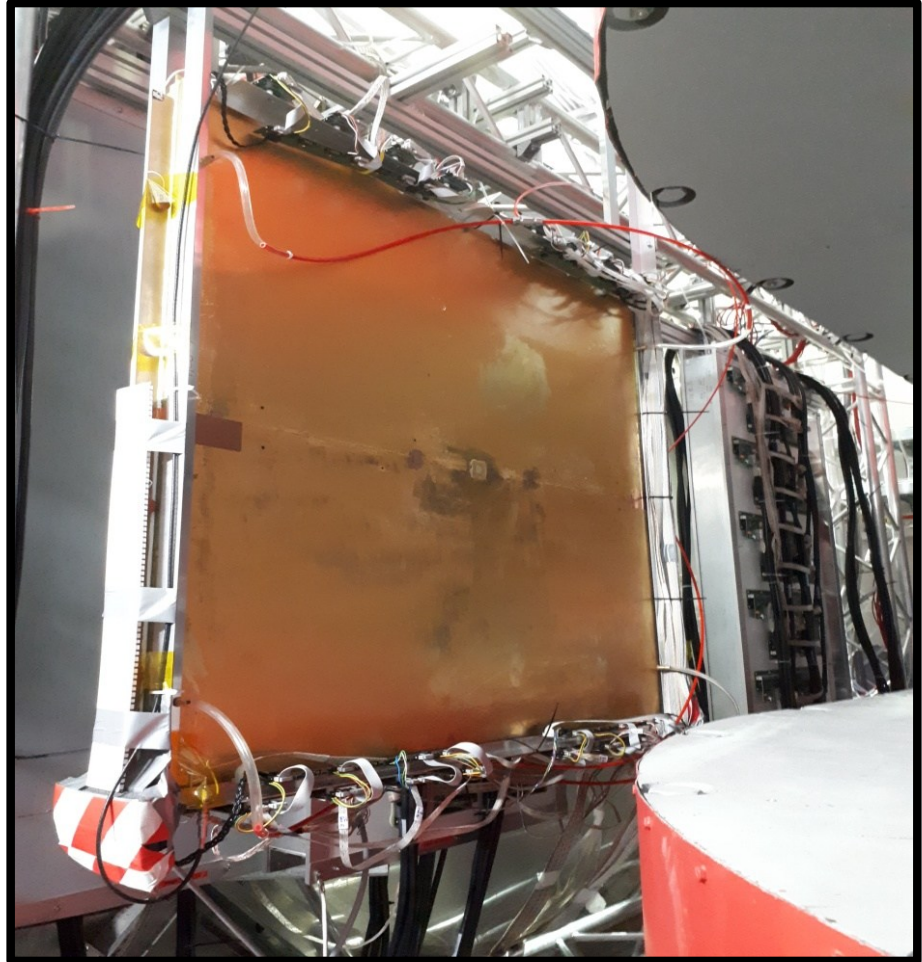
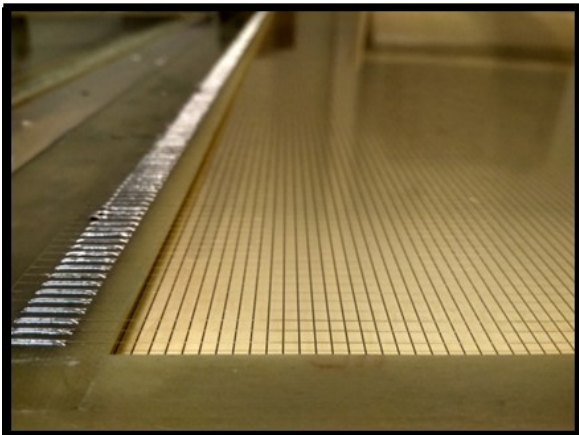
1 chamber was produced and integrated into the BM@N setup at 2018.

3 chambers are under production.

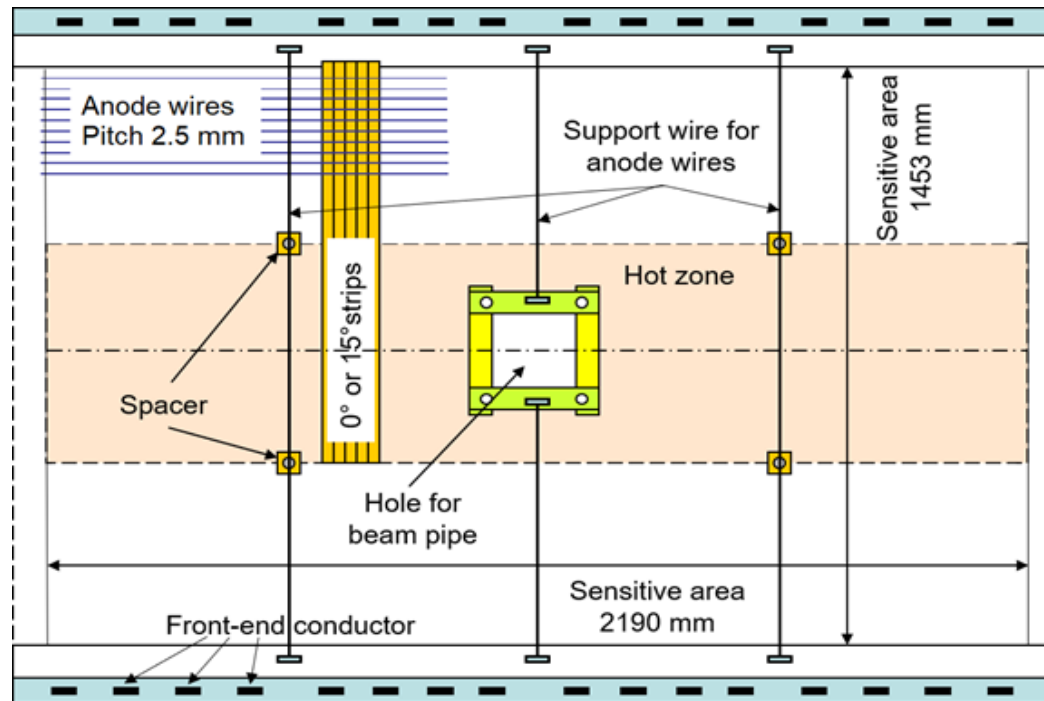
Remaining works:

- Soldering anode wires;
- Assembly and sealing chambers;
- Equip mount elements, HV system, FEE cards.
- Starting the tests.

Necessary timing is ~ 2.5 month.



CSC $2 \times 1.5 \text{ m}^2$



Start of the assembly is planned at 10.2020

Preparatory works are underway:

- Design cathode planes – the first cathode plane was finished; other will be finish to summer;
- Producing drilling conductor;
- Producing iron bars, needed to increase the width of the assembly table;
- Producing different implements for detectors assembly.

Conclusions

GEM:

- 7 detectors $1632 \times 450 \text{ mm}^2$ and 7 detector $1632 \times 390 \text{ mm}^2$ are produced;
- 2 spare detectors are waiting for the assembly at CERN;
- Mechanics for GEM-planes inside the magnet is under development;
- Assembling the stand for testing the GEM-detectors with cosmic rays is in progress;
- Gas system is under upgrade.

CSC:

- 1 chamber of the size $1 \times 1 \text{ m}^2$ is produced;
- 3 chamber of the size $1 \times 1 \text{ m}^2$ will be produced at the end of this summer;
- Preparatory work for $2 \times 1.5 \text{ m}^2$ chambers is underway. Start of the assembly is scheduled for autumn.