Torino R&D

M. Alexeev & colleagues
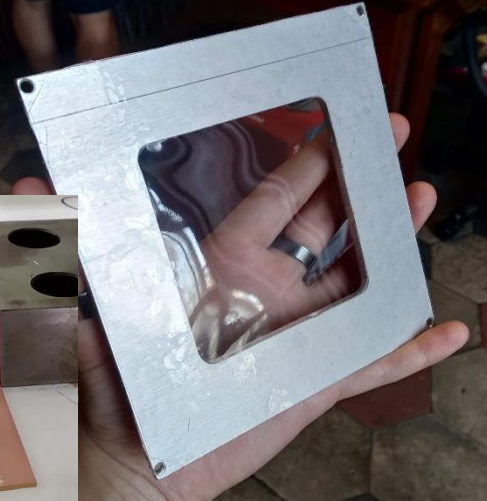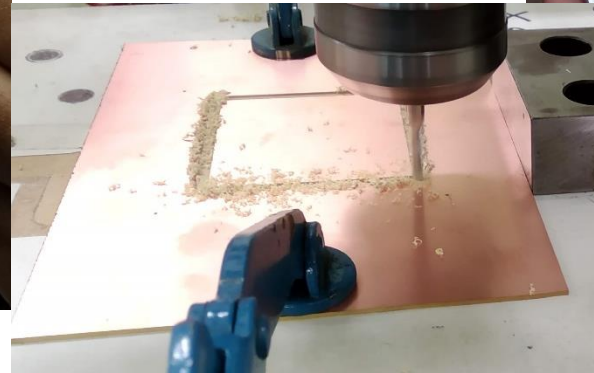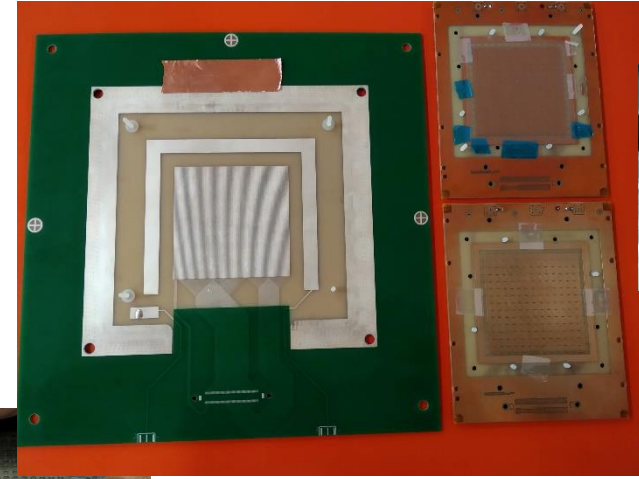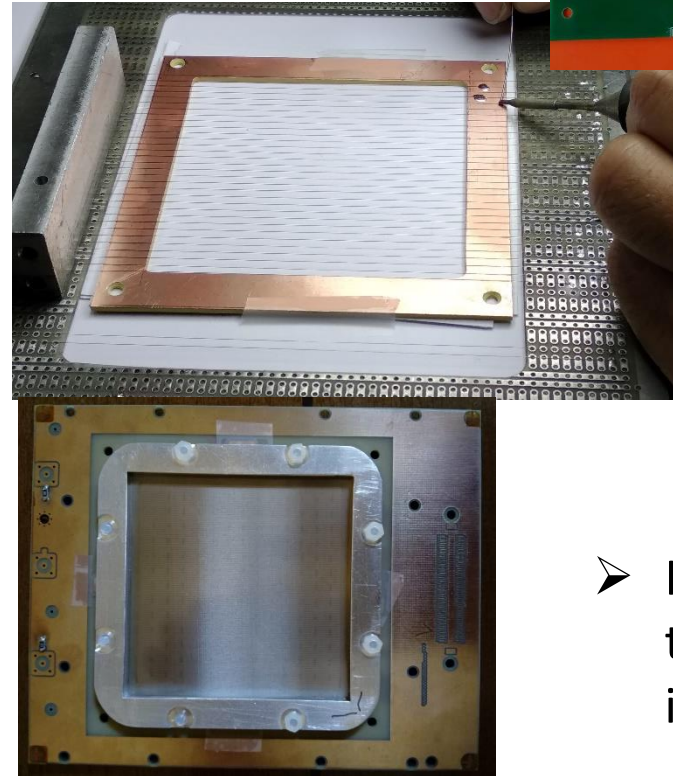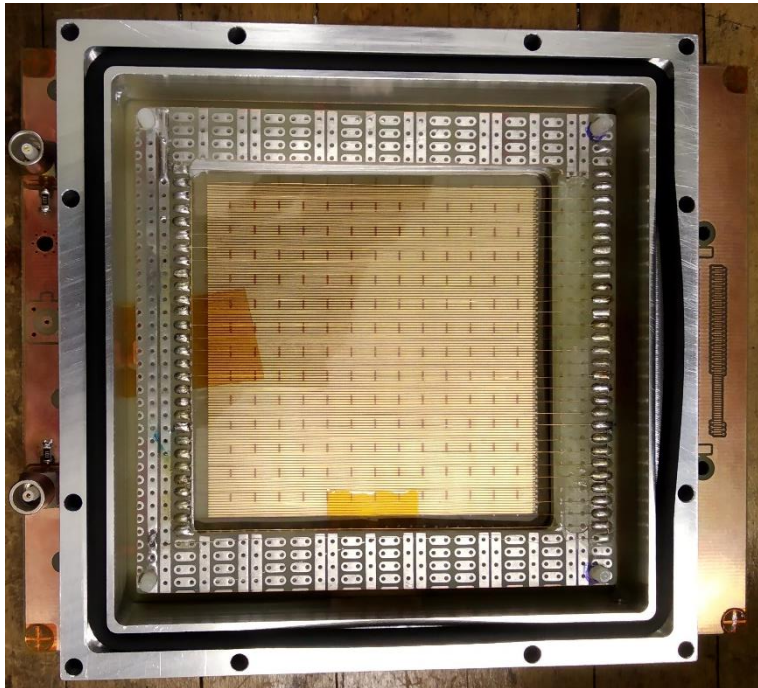
Università di Torino & INFN Torino

MM prototype progress
Mechanics

✓ We have prepared the revision of the very first prototype

✓ Adapted mechanical parts were designed and produced

➢ If the test of the detector are satisfying then the present mechanics can be used until the increase of size of the active area

MM prototype progress
Mechanics

We have now all the simplified tools needed for the operations available in the lab:

- ✓ pressure cleaning

- ✓ deionized water supply for the cleaning

- ✓ Specially designed container for water cleaning directly in the lab

- ✓ Mini storage for clean elements

MM prototype progress
Test stand

- In July all the main elements were prepared
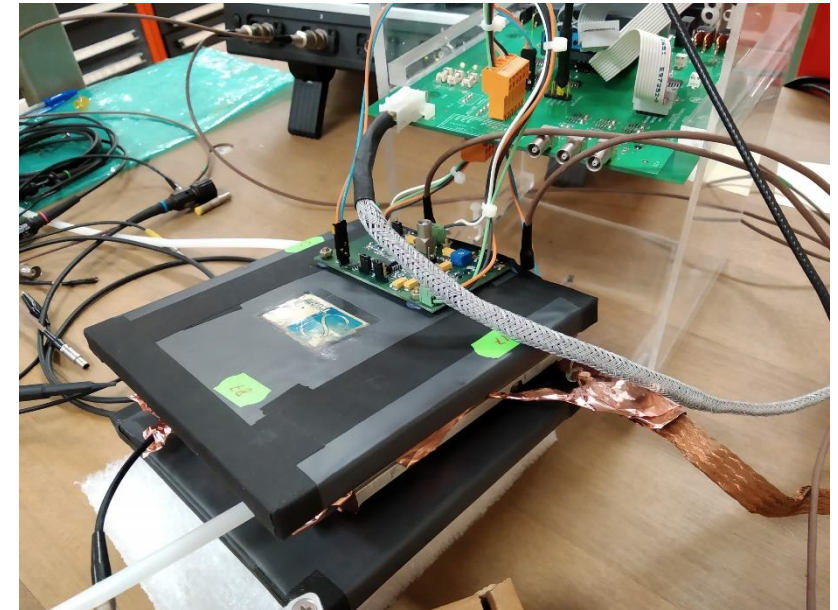
  ✓ We have now all the gas infrastructure

  ✓ Grounding is available but unfortunately not very good due to the building architecture

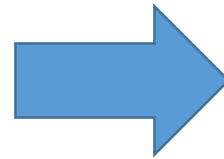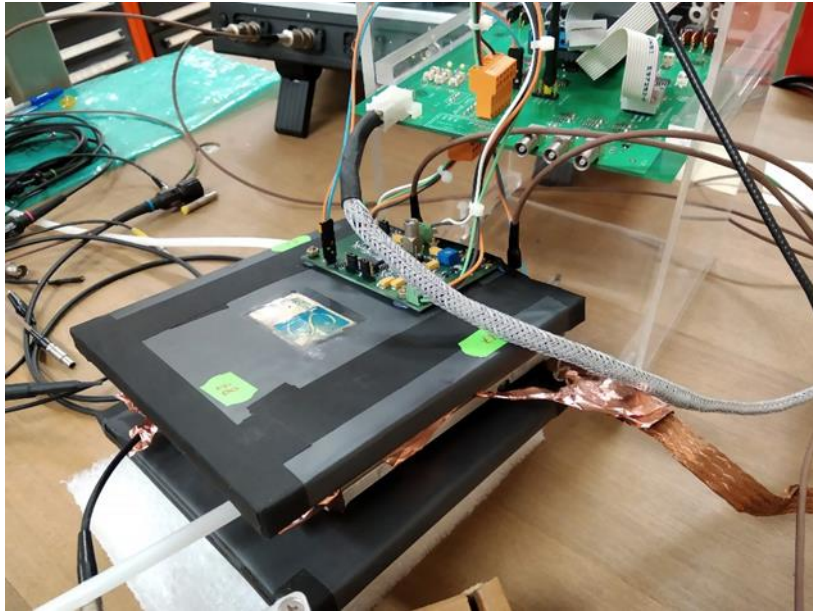 ✓ The acquisition (CREMAT based) is operational

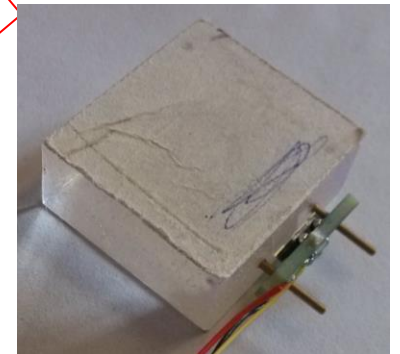 ✓ Remote HV control is being tested

MM prototype progress
Test stand

- We are presently preparing to conduct the initial test with cosmics


No foto today the lab was closed

➢ The the small scintillators and the SiPMs are being prepared. For the moment we temporarily use the usual trigger (bigger slabs)

MM prototype progress
FE preparation

- One option that we will test for the readout is the same FPGA based FE that is a possible candidate for the MWPC upgrade

- For that purpose we are setting up a laboratory scale single PC acquisition system that would use the direct data acquisition from the FE to the PC

- ✓ For that purpose we prepared 4 FE cards and all the needed infrastructure for the their R/O

- ✓ The RO was already tested during the summer and presently we are moving to the data analysis

  ➢ The R/O test is foreseen within 12.19 if the MM prototype is judged ready to the digital readout
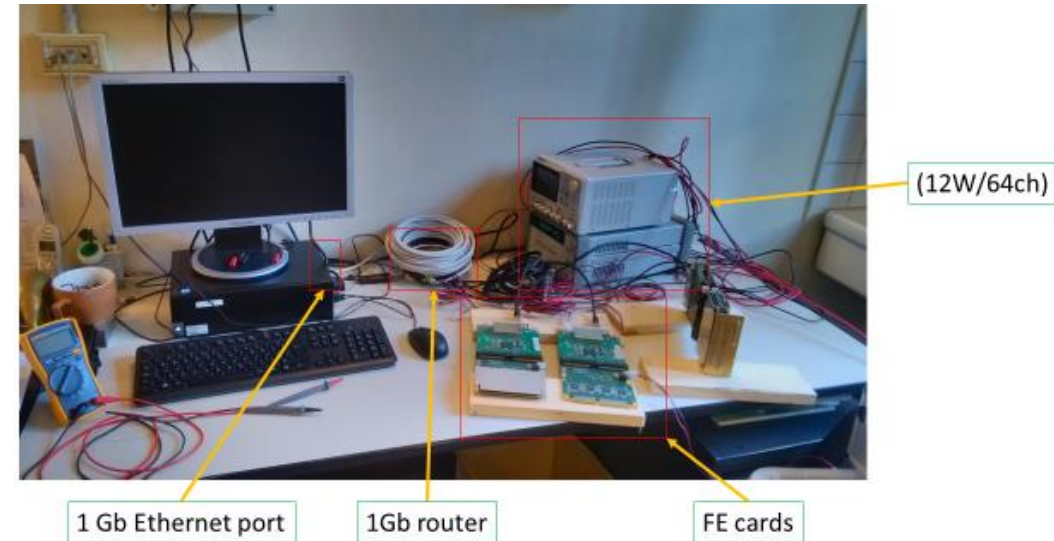
MM prototype progress
FE preparation

- The main option for the R/O of the prototype is the TIGER ASIC developed in Turin

- We need 4 FE boards to equip the DAQ

- For the boards a mixed 3D printed and machined copper coolers are being tested

✓ All the element for the test cooling system are available and now the mounting of a test circuit and the control software preparation are ongoing
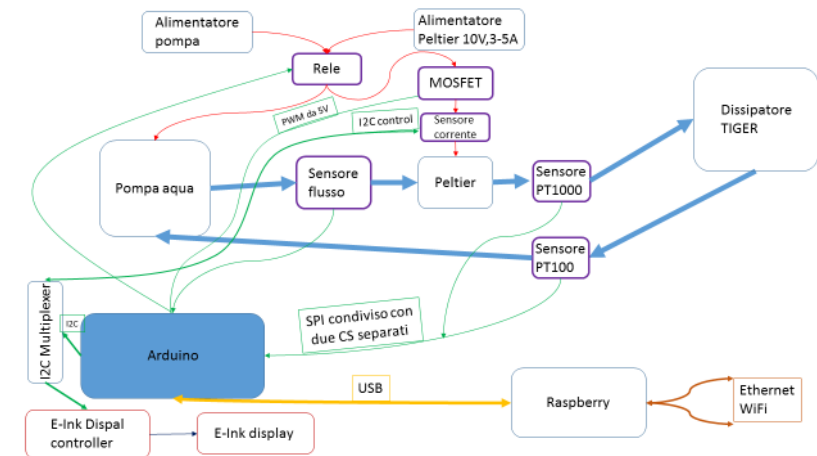
➢ The R/O test is foreseen within 10.19 if the MM prototype is ready for digital readout

MM prototype progress
FE preparation

- To allow for a fast calibration and to be able to readout the prototype with both possible FEs we have designed and produced a unified calibration charge injection card and an adaptor card with integrated charge injection/trigger inputs
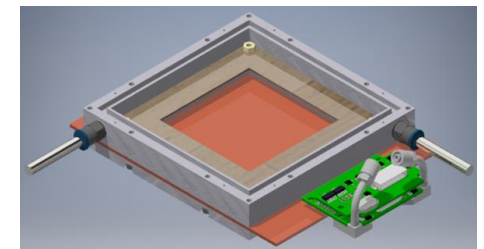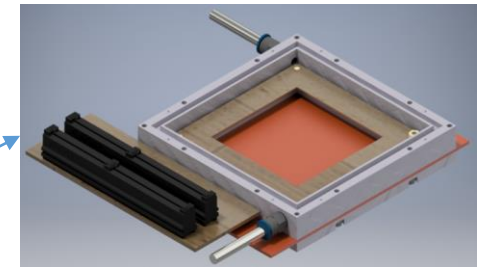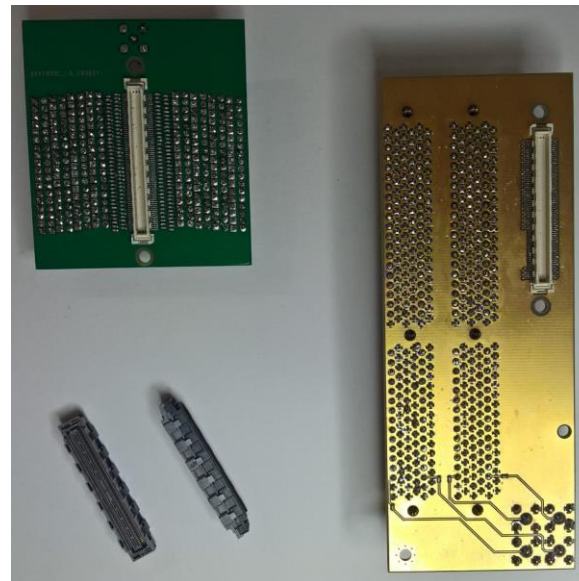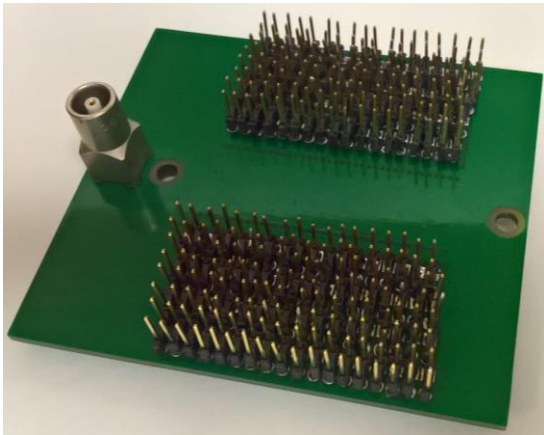
➢ Presently they have been assembled and we wait for the DAQ readiness/availability

MM prototype progress
FE preparation

The foreseen DAQ systems are the following:

BESIII based system adapted for laboratory scale
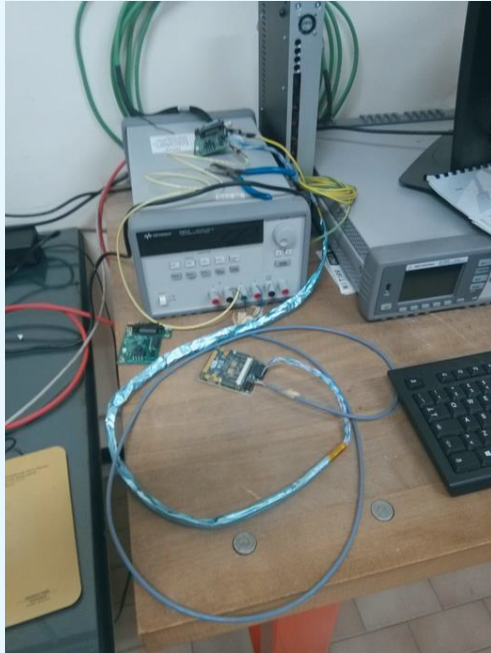
Waiting for the production of a sample for our needs

Our own software for the iFTDC R/O

(12W/64ch)

1 Gb Ethernet port   1Gb router   FE cards

Programming of the cards/ thresholds etc. and data acquisition were tested and working (in command line mode). Starting the GUI and analysis software preparation

MM prototype plans

- We have now a few days experience with the revised PCB based MM

    - ✓ No noticeable discharges up to 550V mesh field (55kV/cm)

    - ✓ We see a good correlation of the signal with the trigger pulse

- ❑ We need to implement a better HV current sensing to monitor the stability

- ❑ A test is foreseen with a Fe55 source at CERN as we do not have one in Turin
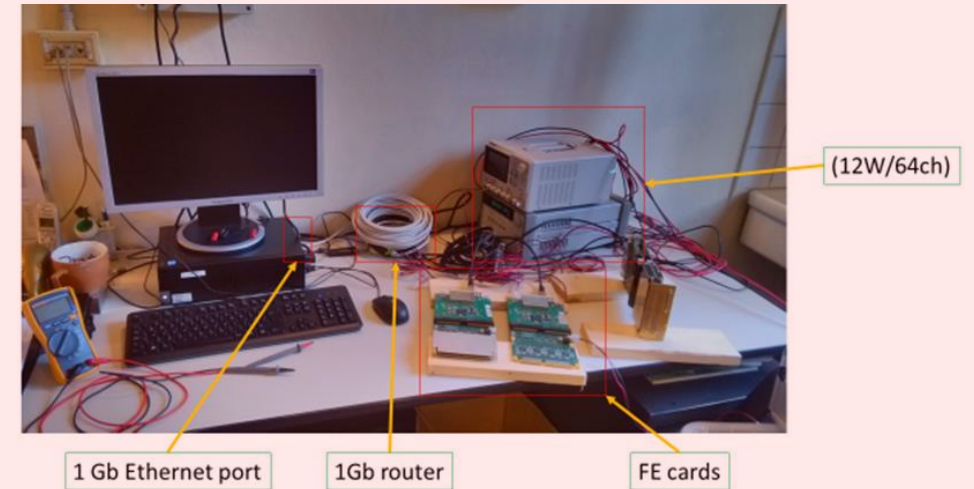
- ❑ The first prototype was assembled and started its tests at Turin and now our colleagues form Dubna are assembling another 2 prototypes to share the testing effort

    - ➢ If the noise and gain are under control we will plan to move to the "resistive" step
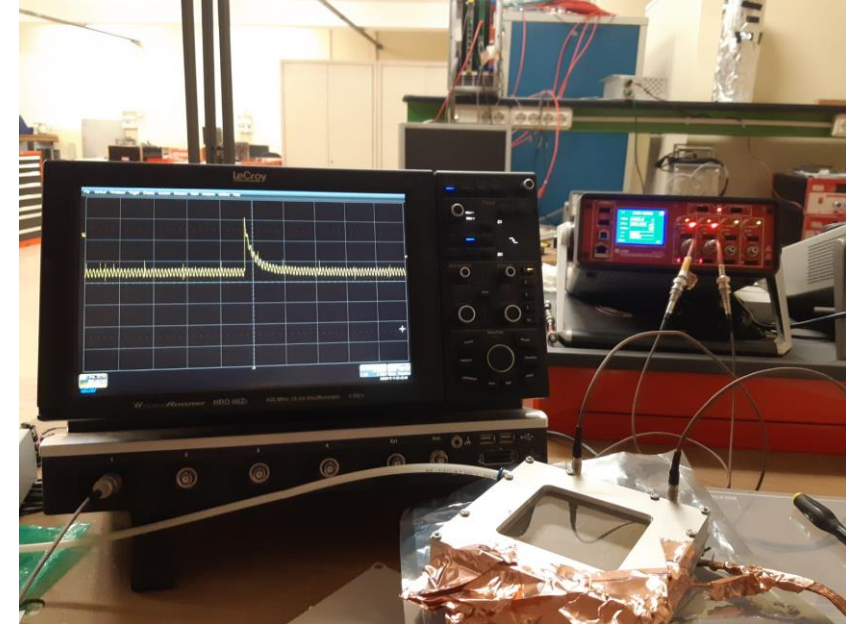
MM prototype plans

- The main goal is to pursue the question of the MM application for a 1,5x1,5 m^2 detector size using the available knowledge and infrastructure (as much as possible)

The presently planned steps:

- ❏ 09 – 10.19 finish testing the first prototype in "analog" mode

- ❏ 11.19 – 04.20 test the digital R/O with the available prototypes and choose the main solution

- ❏ 11.19 produce a resist ready variant of the prototype

- ❏ 11 – 12.19 produce a 30x30/50x50 cm^2 active area double coordinate PCB and mechanics

    …

- ❏ 07 – 12.20 integration of the TIGER ASIC R/O into the COMPASS

R/O card for MM prototype

- The integration of a new ASIC into the existing DAQ is related to the plans to have an "adaptor" card in the future COMPASS DAQ

- The goal of such a DAQ element would be to bridge the electrical and logical interface of the ASIC to the DAQ standards removing this task from the on detector FE cards

- Working on the integration of the TIGER ASIC into the COMPASS DAQ we could explore this option

- We have agreed to have support for the DAQ interface part of the development from our Munich colleagues and we will develop the TIGER data treatment part of the firmware and the relative layout of the board

- Presently we have started working with the standard Xilinx Ultrascale evaluation board and the interface cards to the TIGER FEs are in the works

MuPix8 mechanics design support

- For the Proton radius measurement the installation of a TPC chamber and of a specific vertex silicon telescope around it
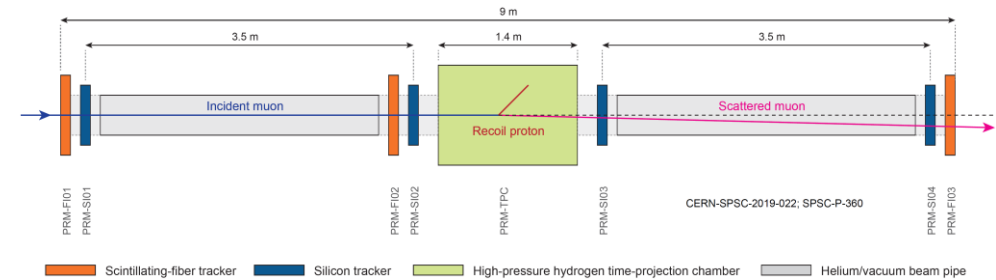
- The base option for the telescope is the MuPix8 monolithic silicon pixel "based" detector

- For a single plane we need to assemble together up to 16 separate 2x2 cm^2 silicons

- We have agreed with Munich to provide the expertise of our mechanical workshop and engineers for:

    ❑ The design of the single plane and whole station support

    ❑ The implementation of the cooling infrastructure in that support
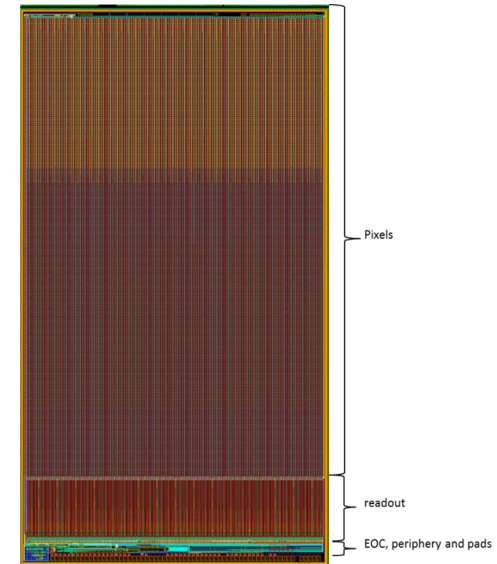
MuPix8 mechanical support

Plans:

09 – 10.19 we will start the preliminary design iterations

11 – 12.19 a very simplified design for a single 2x1 cm² detector shall be produced

01 – 03.20 a series of design approximations will be produced in CAD

04 – 06.20 final version with the production design and the production drawing to be produced

Manpower:

1 qualified technician

1 design engineer

Support from Munich and Torino colleagues

Conclusions

❖ We hope to have passed the initial mechanical and HV difficulties in the MM prototyping

❖ The testing equipment is mostly ready (some additional for on the trigger is needed)

❖ We think to be able to pass to the digital readout within 2019

MicroMegas
Simulation
Study

Jorge Berenguer Antequera
26/08/2019

❖ The simulation infrastructure has been migrated on the farm but we now transition the knowledge as the person that did the main work has left the group

❖ The R/O card development for the integration of TIGER FE into the COMPASS DAQ has started

❖ The work for the design of the MuPix8 support has started with few meetings