



MicroMegas technology in Dubna

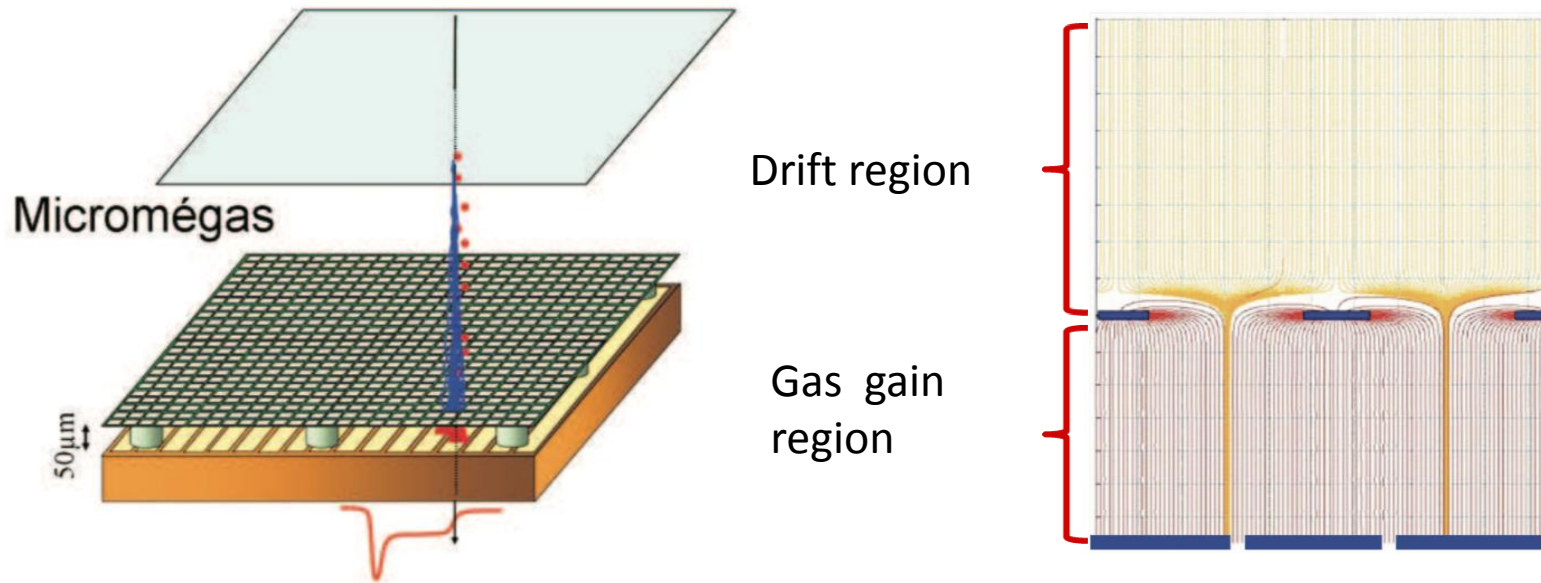
Dmitry Dedovich

- ATLAS MDT
- Compass
- BES III
- ATLAS MicroMegas
for New Small Wheel



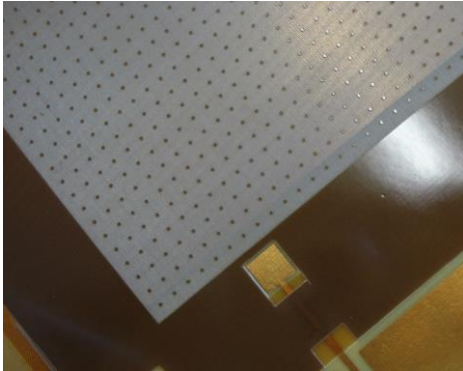
- To utilize ATLAS MM experience JINR build full-cycle bulk MicroMegas production line
- Now this line is fully operational, first MM chambers was built and tested end of April

MicroMegas detectors: principles



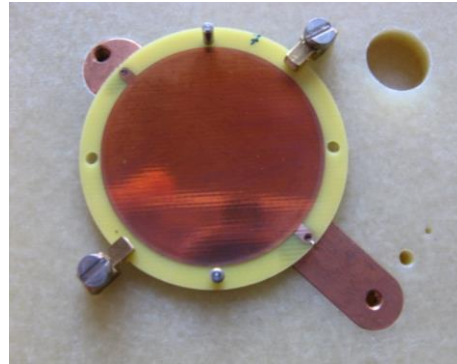
- Space resolution up to $\sim 1/5$ of strip pitch (charge weighting)
- Time resolution few nsec

Bulk Micromegas



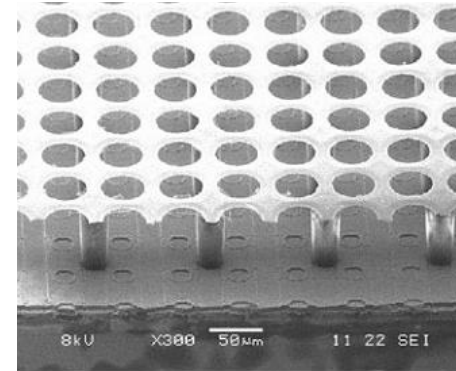
**COMPASS
CLAS12
T2K
ATLAS NSW**

Microbulk Micromegas



**CAST
NEXT
n_TOF**

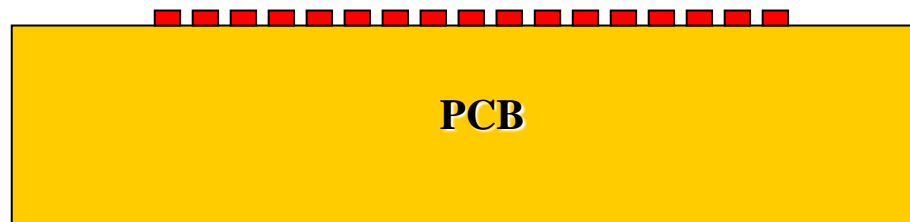
InGrid



**GOSSIP detector
(for ATLAS at future sLHC)**

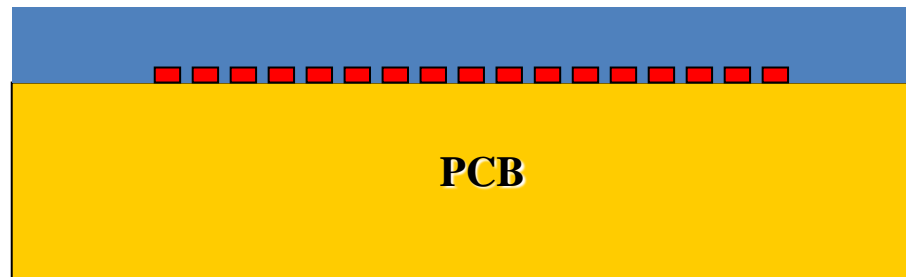
- Bulk MM is most studied and reliable technology now, suitable for large-scale detectors

- **PCB**



Bulk MicroMegas: production

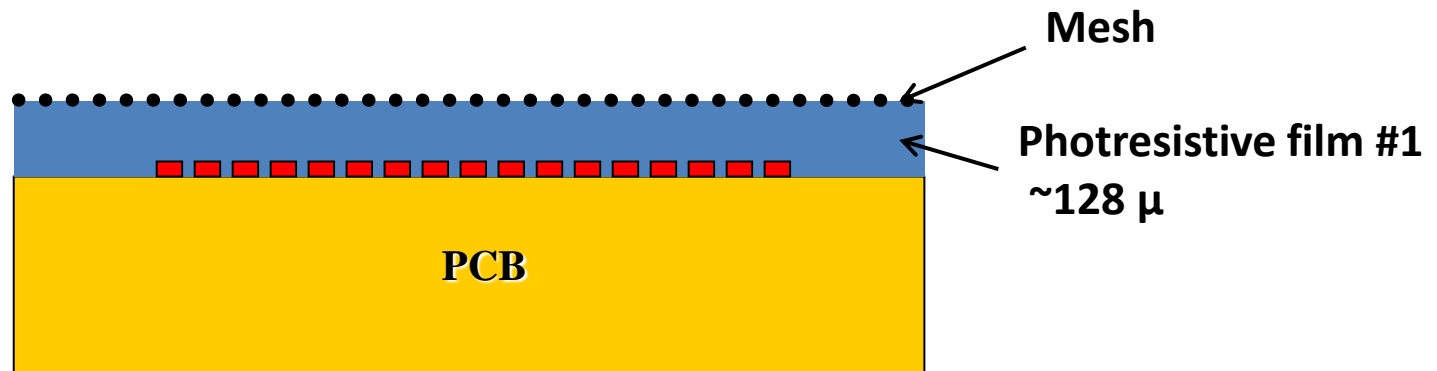
- PCB
- Photoresistive film (Pyradox PC, 64-128 μ)



Photoresistive film #1

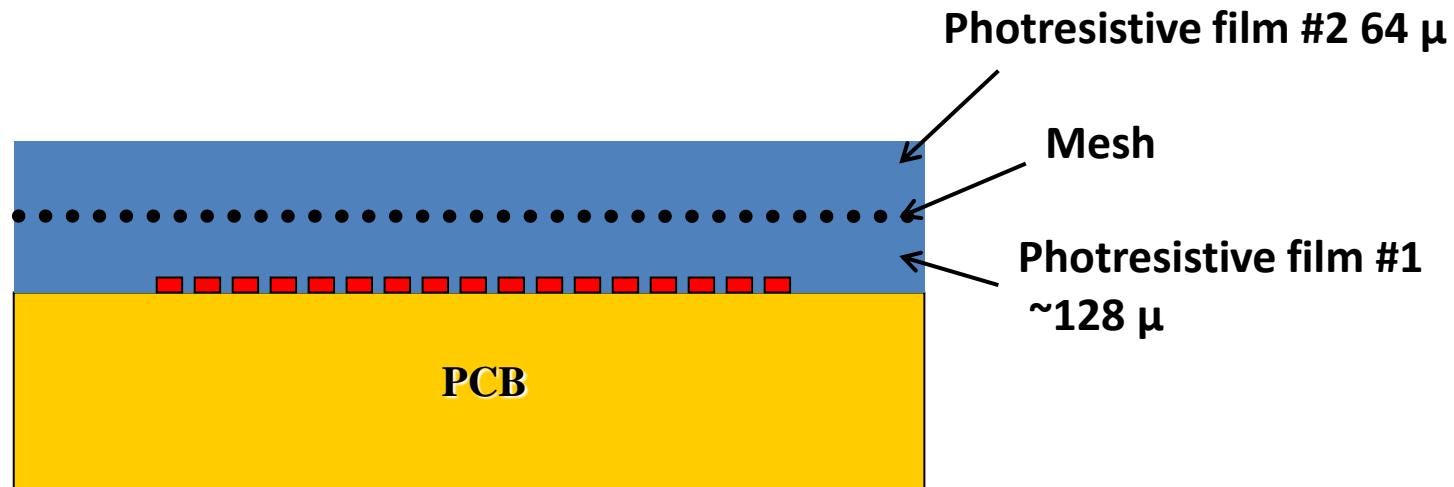
Bulk MicroMegs: production

- PCB
- Photoresistive film (Pyradox PC, 64-128 μ)
- Pre-tensioned mesh(18 μ , 60% transparency) applied

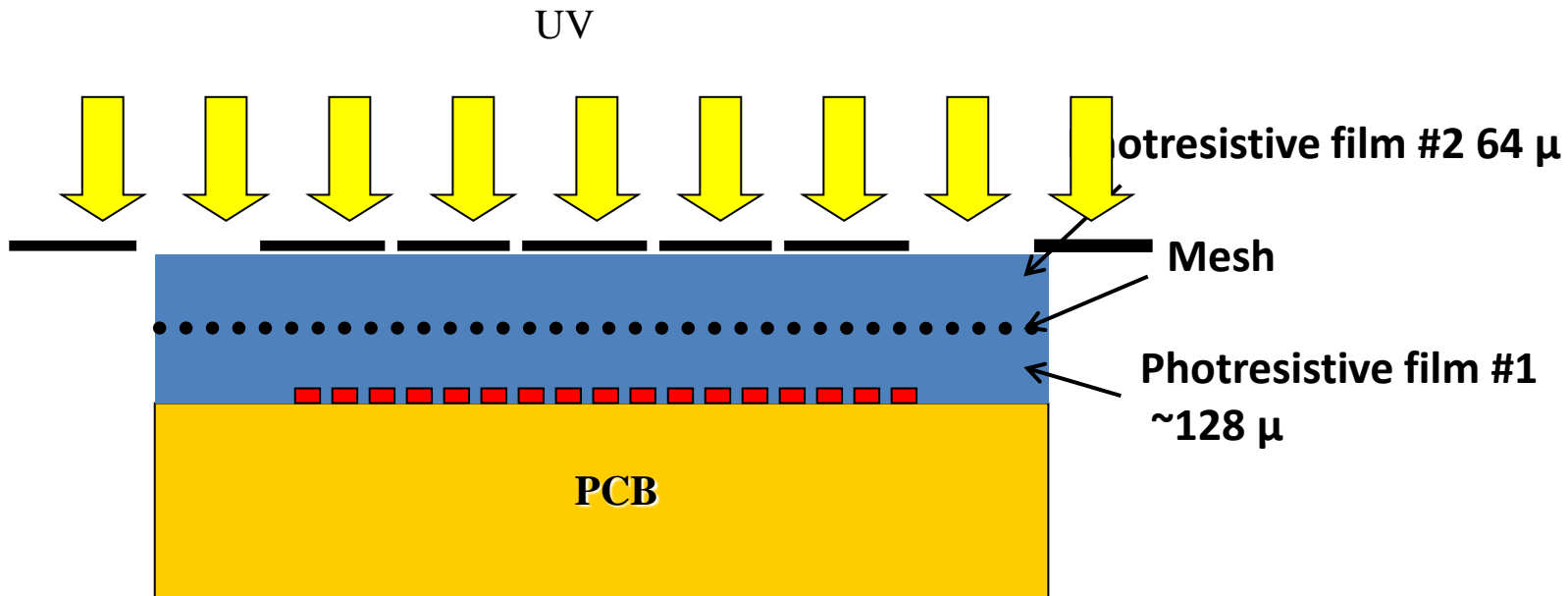


Bulk MicroMegas: production

- PCB
- Photoresistive film (Pyr lux PC, 64-128 μ)
- Pre-tensioned mesh(18 μ , 60% transparency) is applied
- Mesh fixation with 2-d photoresistive layer

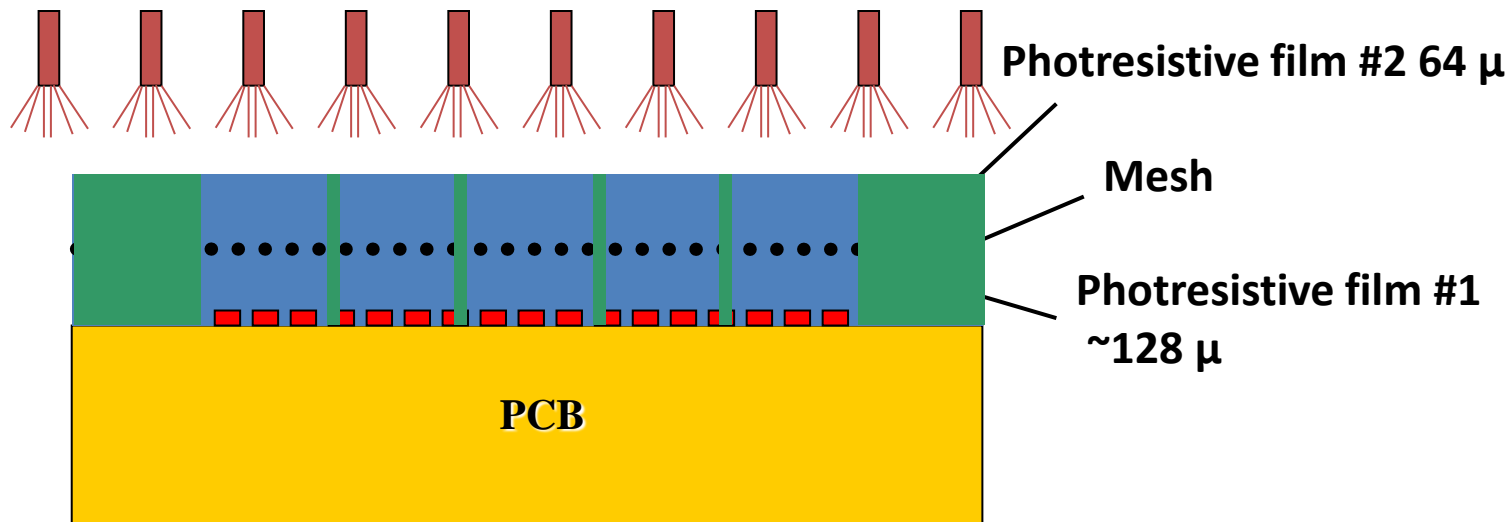


- PCB
- Photoresistive film (Pyralux PC, 64-128 μ)
- Pre-tensioned mesh(18 μ , 60% transparency) applied
- Mesh fixation with 2d photoresistive layer
- exposure with UV light through mask



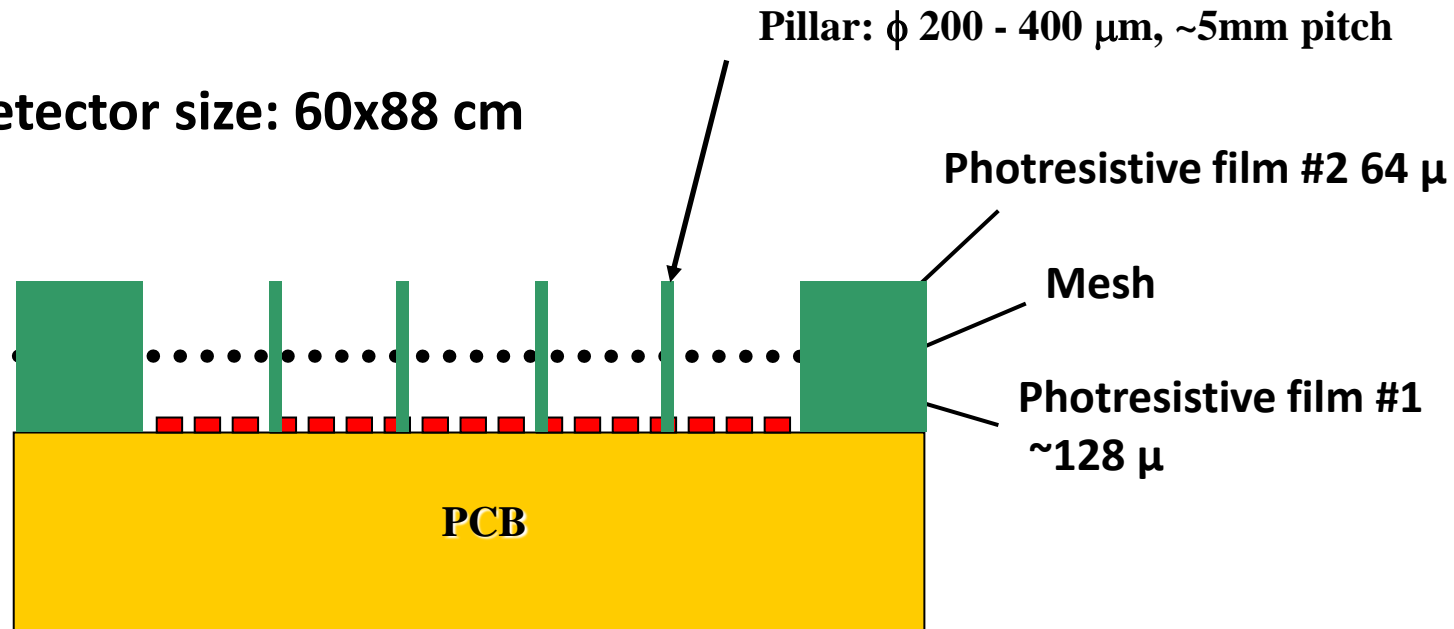
Bulk MicroMegas: production

- PCB
- Photoresistive film (Pyr lux PC, 64-128 μ)
- Pre-tensioned mesh(18 μ , 60% transparency) applied
- Mesh fixation with 2d photoresistive layer
- exposure with UV light through mask
- Chemical etching



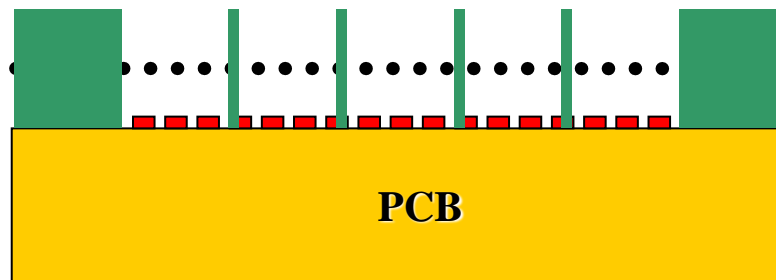
- PCB
- Photoresistive film (Pyradox PC, 64-128 μ)
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- exposure with UV light through mask
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- Maximum detector size: 60x88 cm



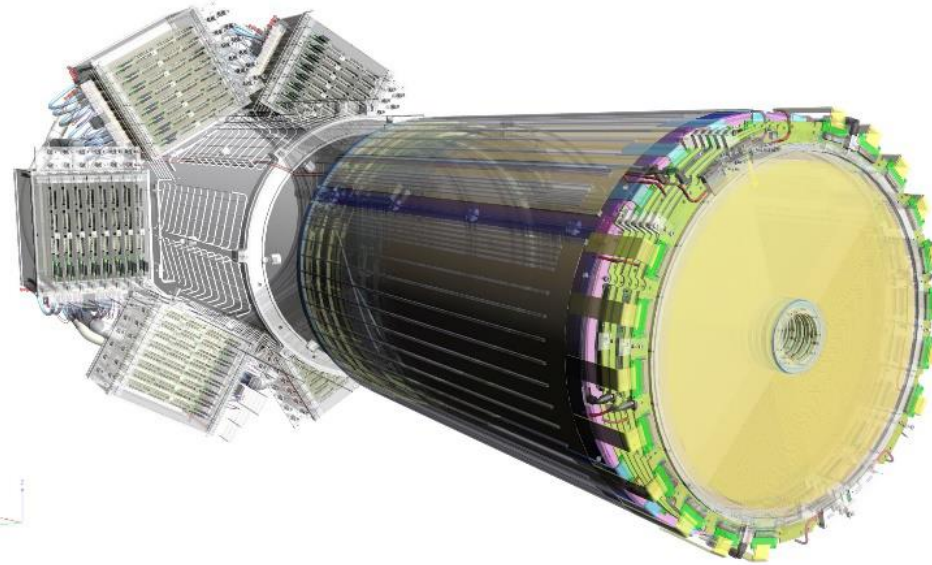
Bulk MicroMegas in experiments

- Can operate at high flux
 - Good space & time resolution
 - Very good double track resolution
 - Reasonable price
-
- T2K experiment: TPC readout with bulk MM chambers
 - COMPAS experiment: ~15 years experience of bulk MM
 - $\sigma_{x,y} \approx 80 - 90 \mu$ $\sigma_t = 9ns$ at high flux environment



- **MicroMegas Vs GEM**
 - Very similar detector performance in general
 - Same FE electronics and RO PCB may be used in most cases
- **Micromegas:**
 - **Is bit slower - larger full charge collection time(~150 ns)**
 - **Higher detector capacity**
 - **~1% ions is not collected by mesh**
 - Possible option with resistive coating – resistant to sparks
 - Cheaper, materials are commercially available
- **Can MM be used for common MM&GEM R&D?**

Cylindrical MM for vertex tracker



Vertex detector of
CLAS12 spectrometer

- **Now GEM looks much more attractive:**
 - Good experience with KLOE-2 detector, BESIII CGEM project
 - Easier to build small-radius detector
- **But**
 - MM have substantially smaller material budget: $0.11\% X_0/\text{layer}$ for CLAS12 cylindrical MicroMegas chamber

- Design of 32-channell ASD chip as well as ADC&TDC&RO buffering chip is under development in collaboration with Minsk INP team
 - Up to 200 pF detector capacity
 - 1-16 mv/fC
 - Shaping time 50/100/200 ns
 - ENR <2500e @ 100pF, 50ns
 - Power consumption 10 mW/channel
- Money for design & production is reserved
- We expect first batch production will started this summer, and chips will be available before end of this year



MicroMegas technology in Dubna

- There is have fully operational bulk Micromegas production line in Dubna
- We have some (quite limited) possibilities for R&D in frame of super c-tau factory program, including almost full-time available Linac for tests
- We are ready to produce Micromegas chambers for teams interested in R&D for super c-tau factory program

