

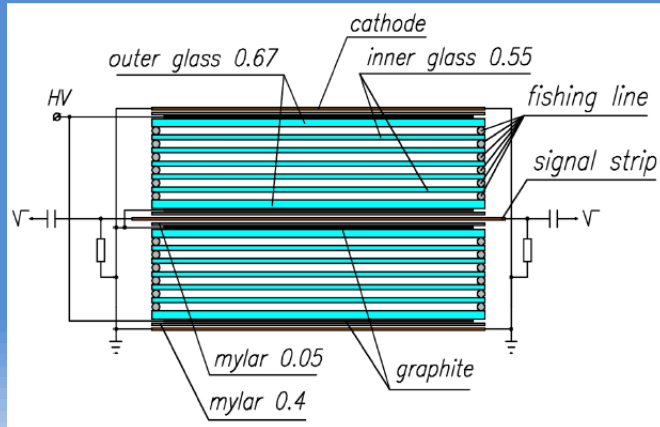
An experience of MRPCs research for a TOF system

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BM@N experience

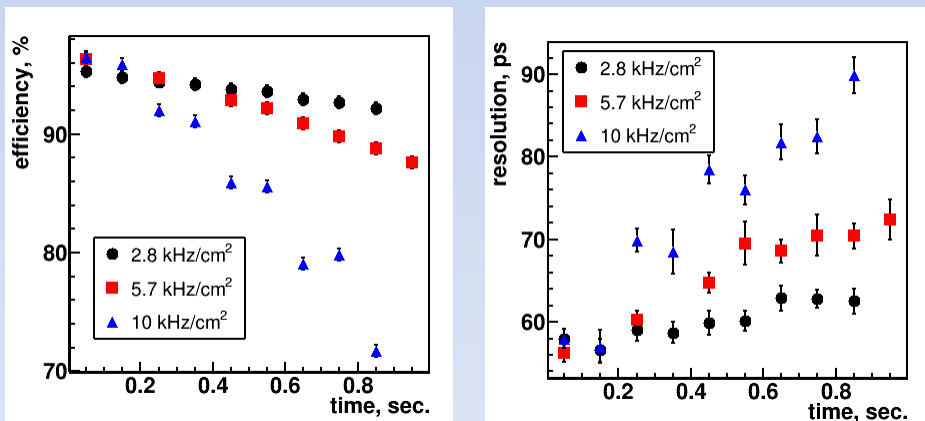
Chamber structure



Front end electronic based on NINO chips



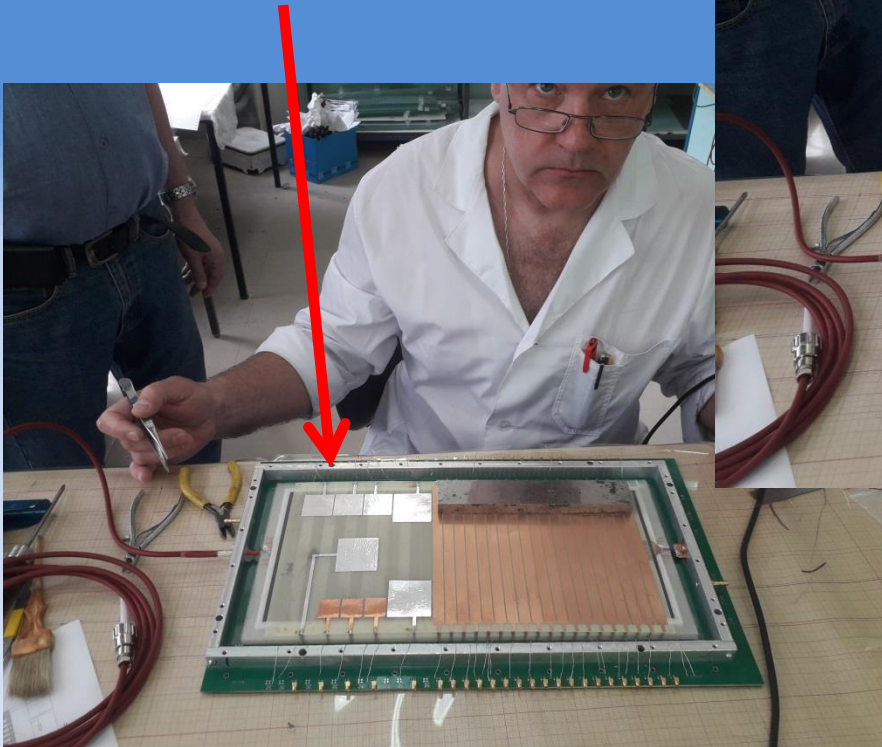
Experimental results on muon beam at U70 accelerator



Maximal resolution is reached ~56ps

MRPC assembling

Pads



Strips

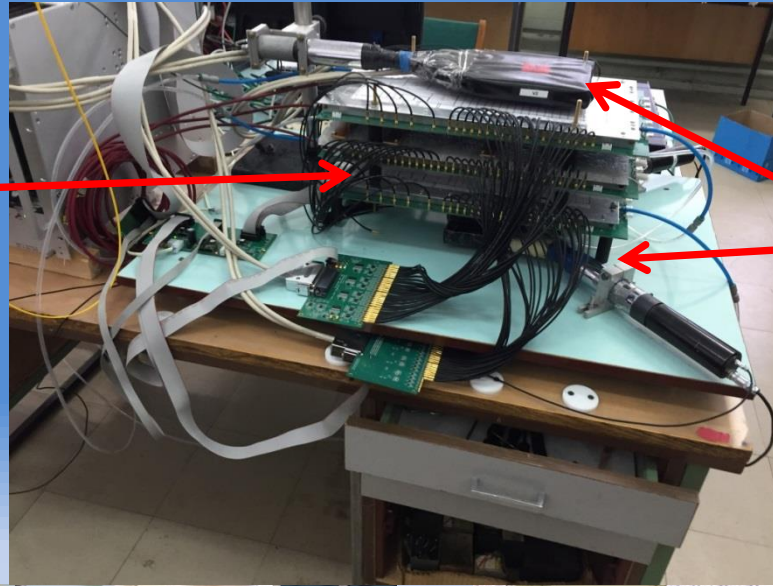
Goal

Goal of this work is to reach maximal resolution:

- Study of different stack structures and different readout electrodes
- Study of Gas mixture
 - *Due to U70 accelerator is still not available the cosmic setup was built for studying*
 - *Disadvantages of such setup:*
 - *Very slow rate of data taking*
 - *Not possibility to separate different particles*

Cosmic test setup

3 MRPC's



3 Counters

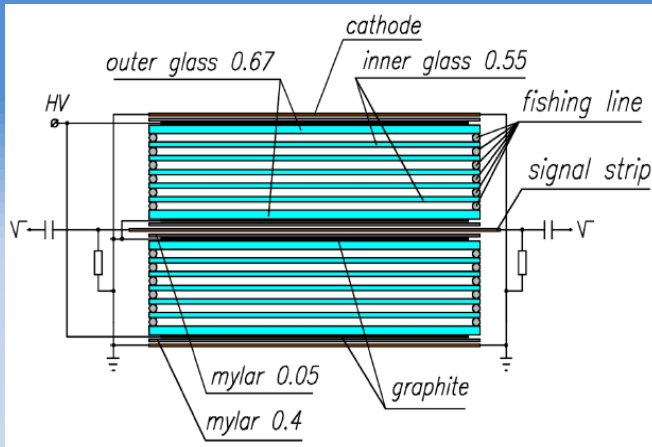


Setup description

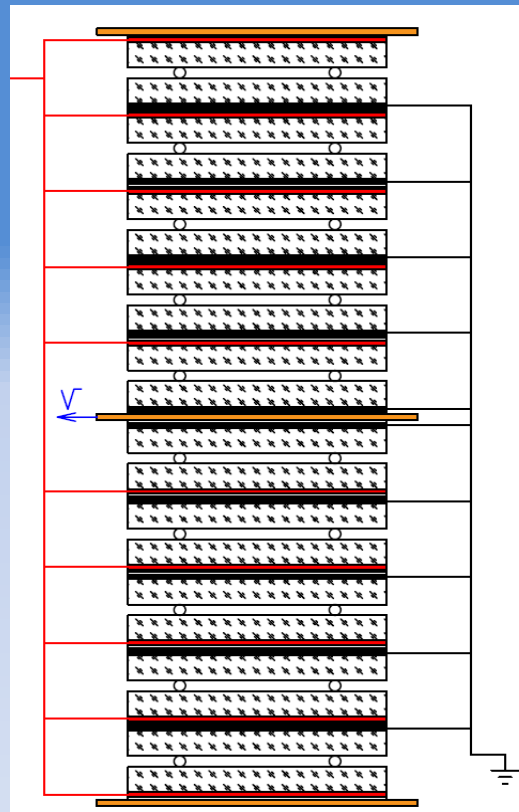
- Trigger system – 3 counters 160x160 mm²
- Trigger rate ~ 1 event/sec
- BM@N TOF front end electronics based on NINO chips
- Readout based on TDC-64V (afi.jinr.ru)
- Gas mixture => changeable
- We have used 16 strips in all MRPC's
- Strip size – 160x10 mm²
 - For the next studies the chambers are equipped by few pads with different dimensions (2x2 cm², 3x3 cm², 4x4 cm²)

MRPC structures (all gaps - 0.22mm)

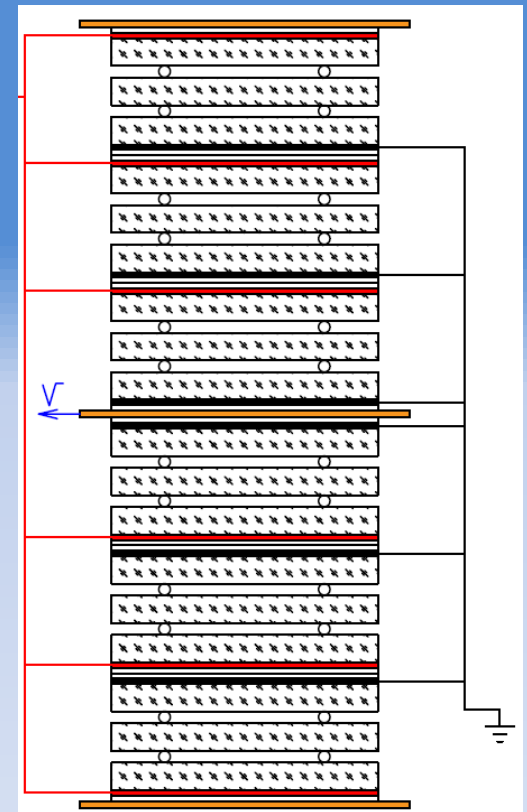
2 stacks x6 gaps
(BM@N)



10 gaps



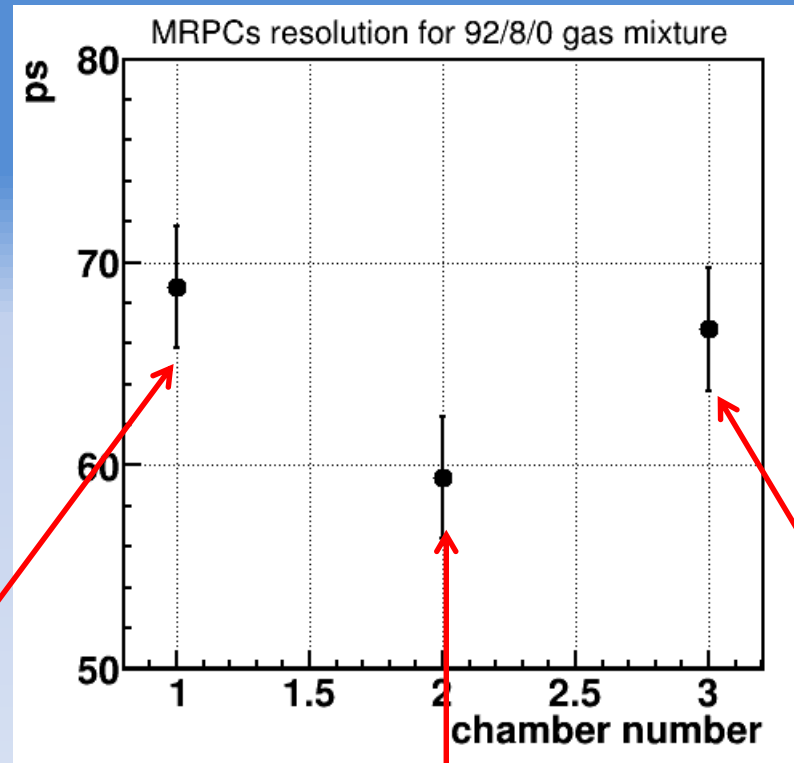
6 stacks x2 gaps



For the next studies two additional chambers have been produced with gaps 0.15 mm and 0.30 mm

First results: structure dependence

Resolution of chambers for the one of gas mixtures



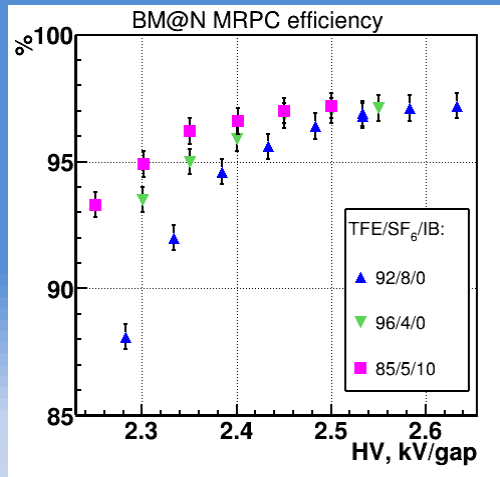
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10x1 gaps

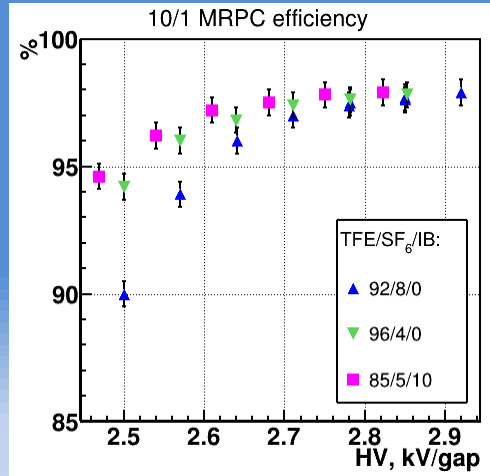
6x2 gaps

First results: gas mixture dependence

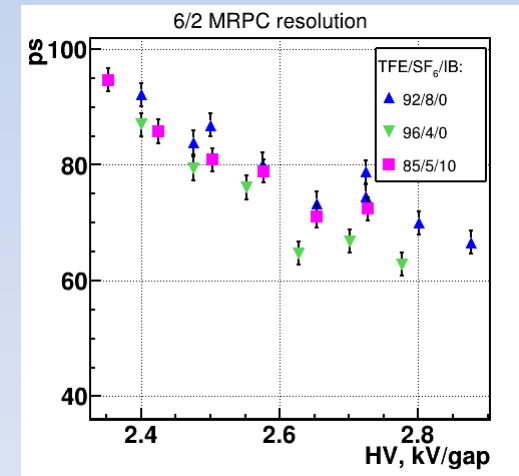
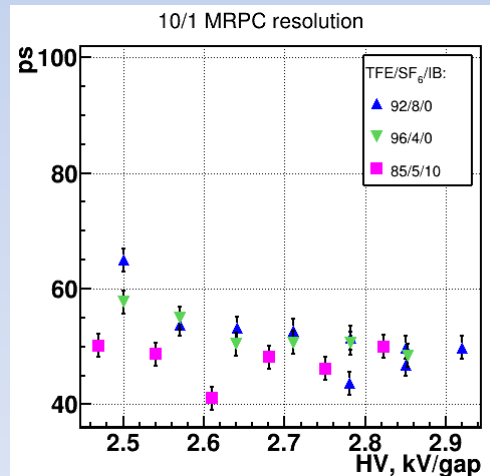
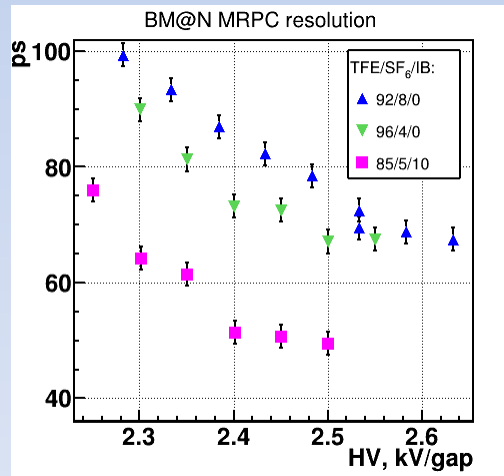
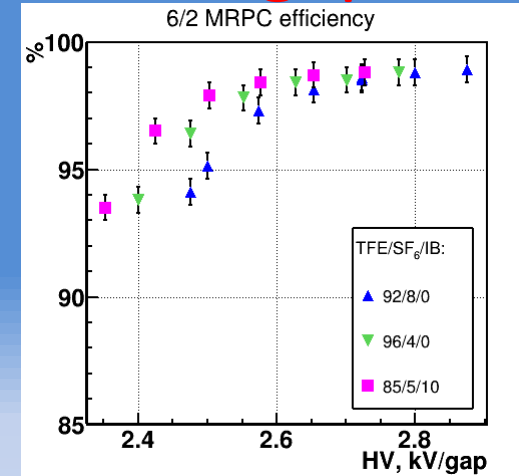
BM@N



10 gaps



6 x 2 gaps



SPD purpose

- From the initial drawing of SPD the TOF system is ~ 2 m of radius
- Calculation shows that in this case the resolution should be about 20ps
- Such resolution can be reached with small ($2 \times 2 \text{cm}^2$) pads structure and very fast readout electronics (see Backup slide)

Conclusions and Plans

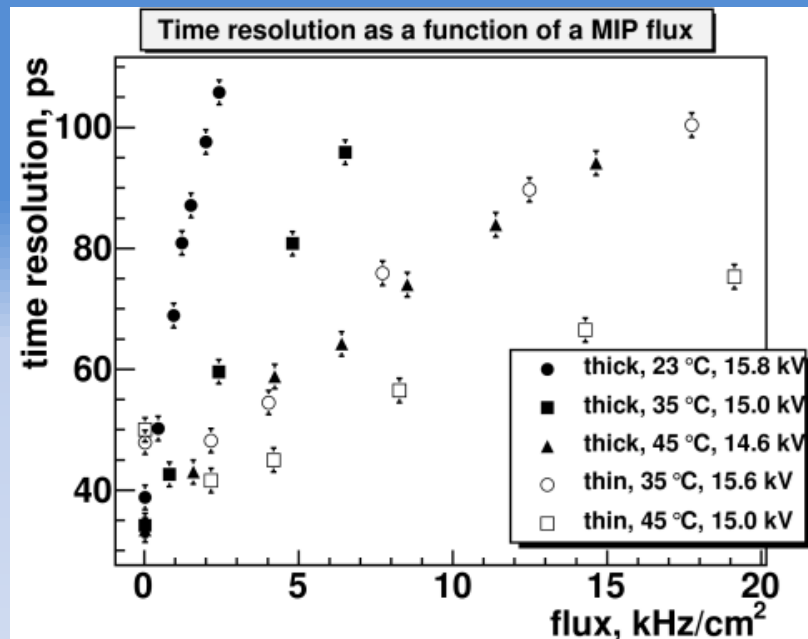
- Cosmic setup allows to study efficiency and resolution of different chambers
- Structure of **10 single gaps** is preferable. The resolution is reached **~40 ps**
- Investigation of different Gas Mixture is going on
- Investigation between Pads and Strips readout is in future
- Investigation in new Front-End electronic

Thank for you attention!

Backup slide

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(ПРИБОРЫ И ТЕХНИКА ЭКСПЕРИМЕНТА, 2013, № 3, с. 21-26)



Time resolution of 12 gaps MRPC cell. Gas gap is 0.23mm.

Pad size is 1.9 x 1.9 cm².