Overview of the ToF400 BM@N

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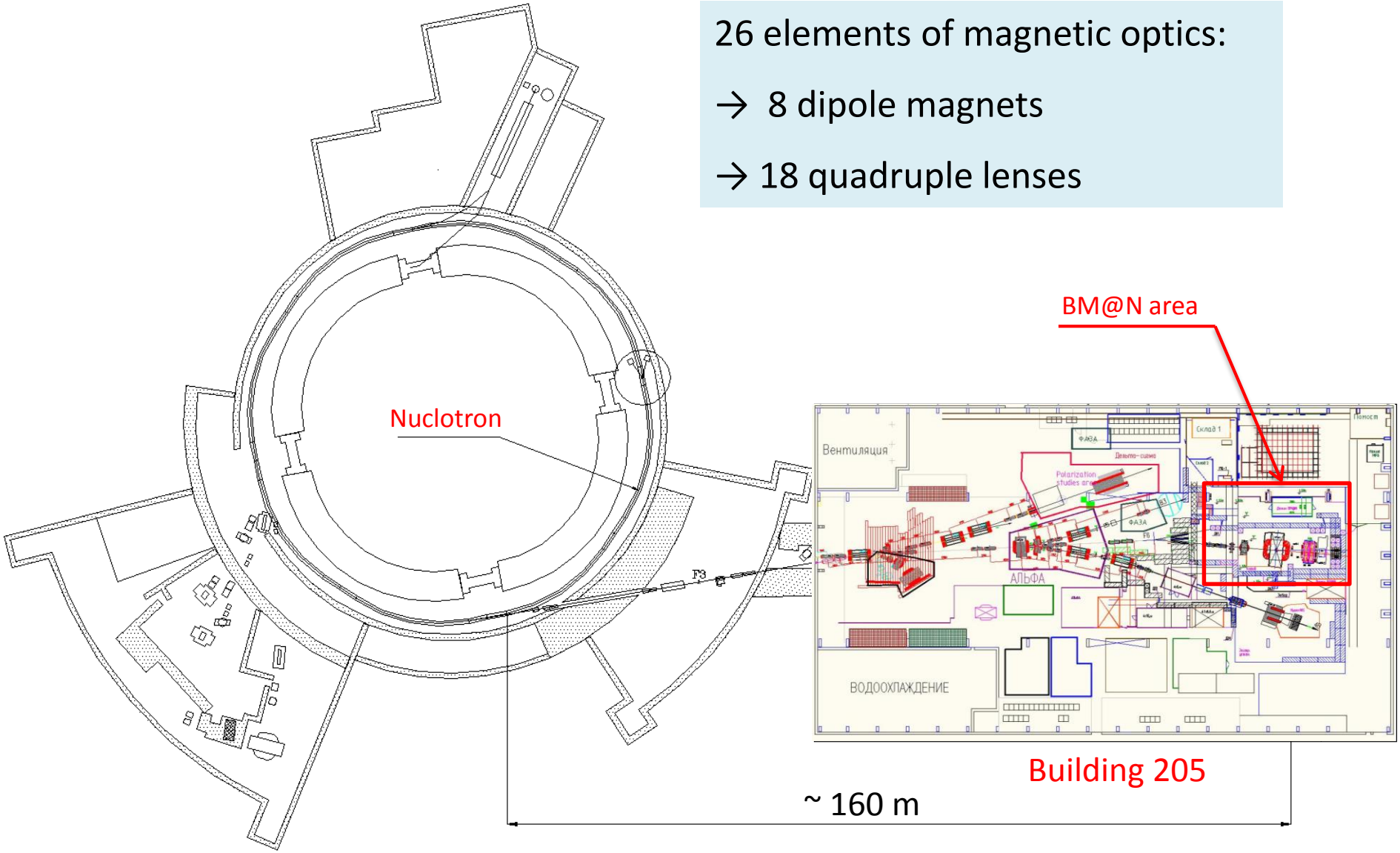
Veksler and Baldin Laboratory of High Energy Physics
Join Institute for Nuclear Research

BM@N beam line from the Nuclotron

26 elements of magnetic optics:

→ 8 dipole magnets

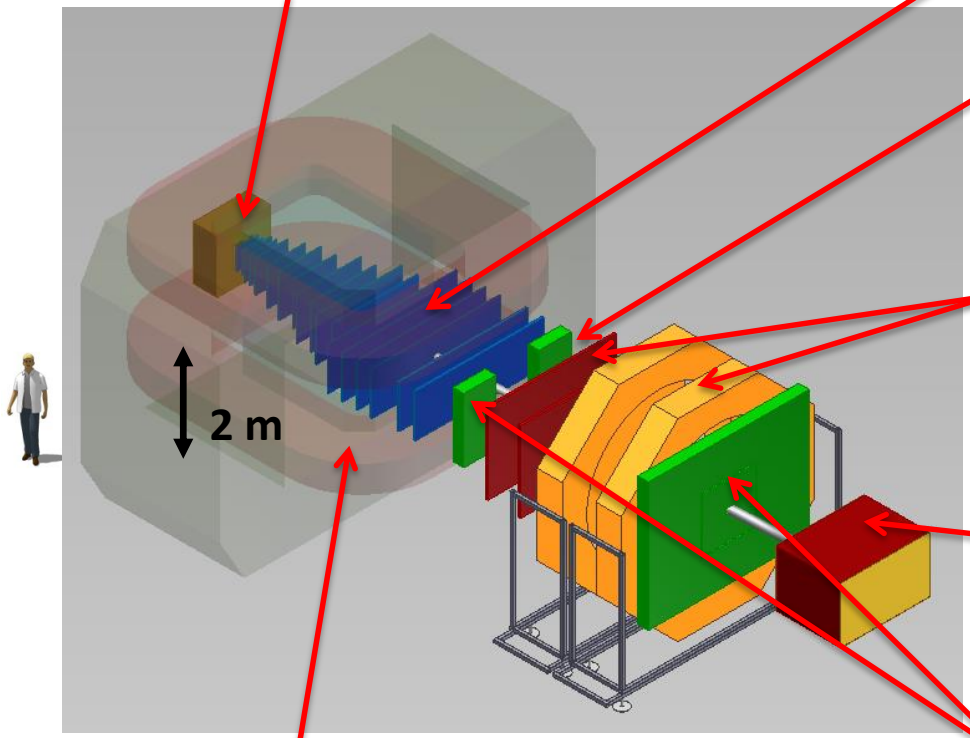
→ 18 quadruple lenses



Main systems of the BM@N setup

Target and detectors to form T0, L1 centrality trigger and beam monitors

Central tracker (GEM) inside analyzing magnet to reconstruct AA interactions



Electromagnetic calorimeter for γ, e+e- identification (optional)

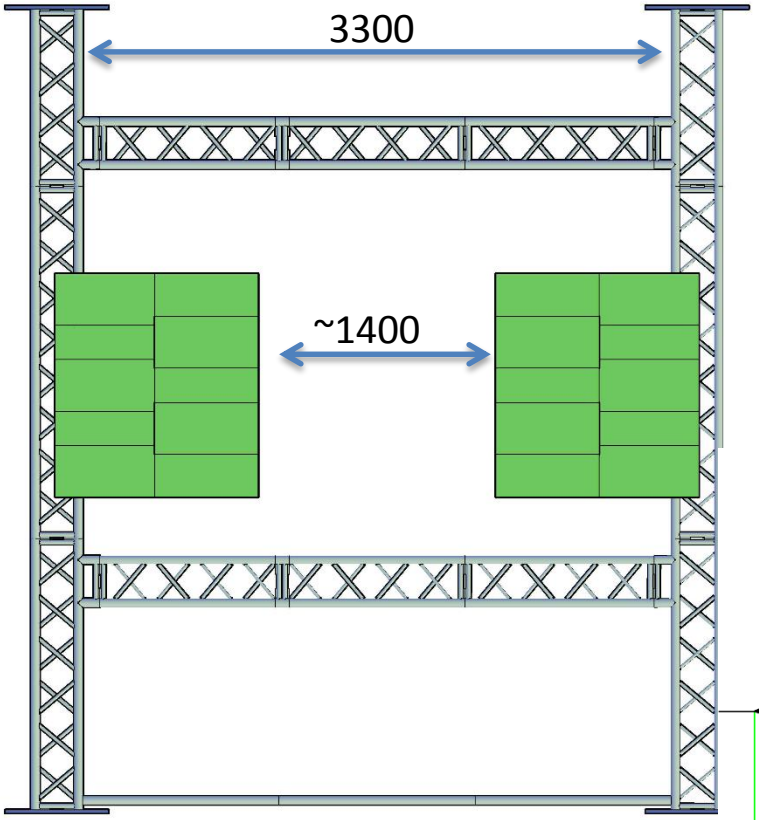
Outer tracker (DCH, Straw) behind magnet to link central tracks to ToF detectors

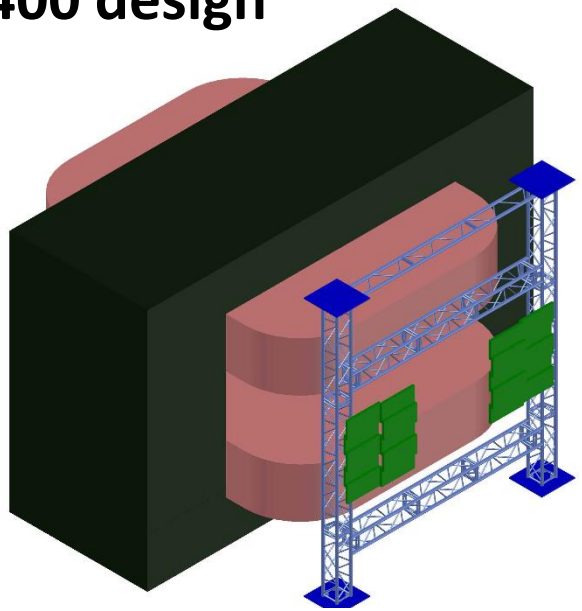
ZDC calorimeter to measure centrality of AA collisions and be used in a trigger

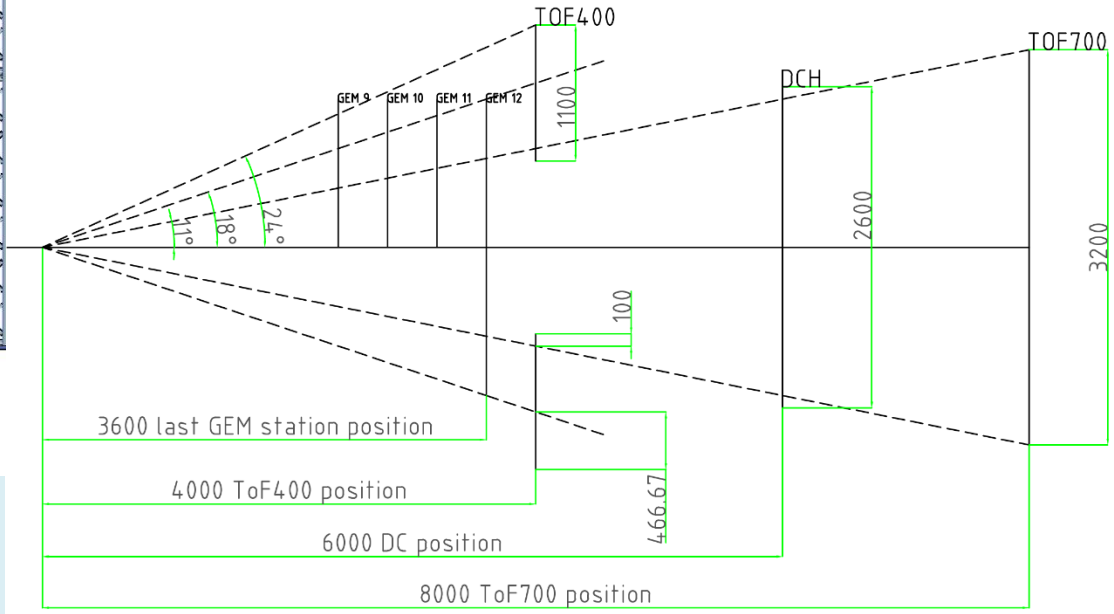
ToF system based on MRPC and T0 detectors to identify hadrons

Large aperture analyzing magnet SP-41

Preliminary ToF-400 design



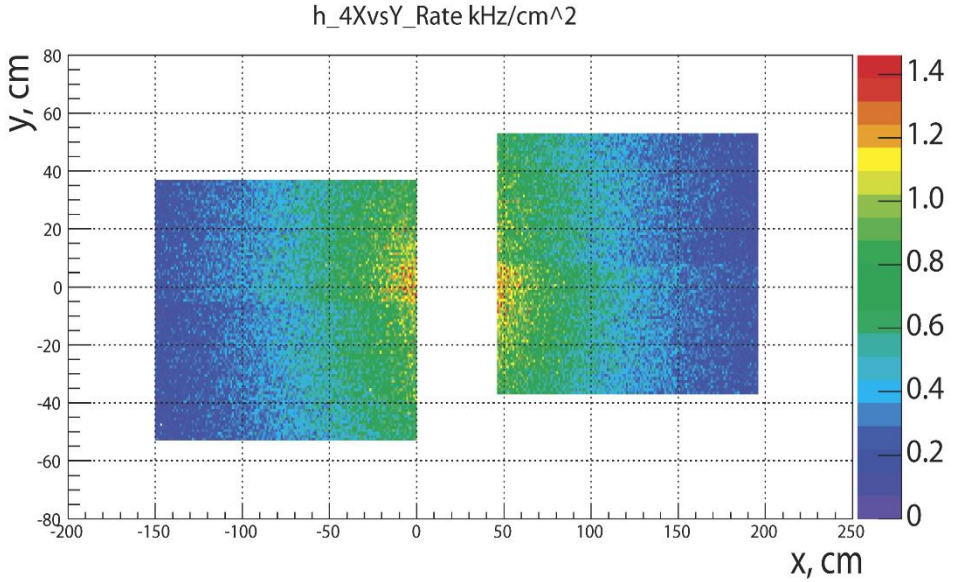


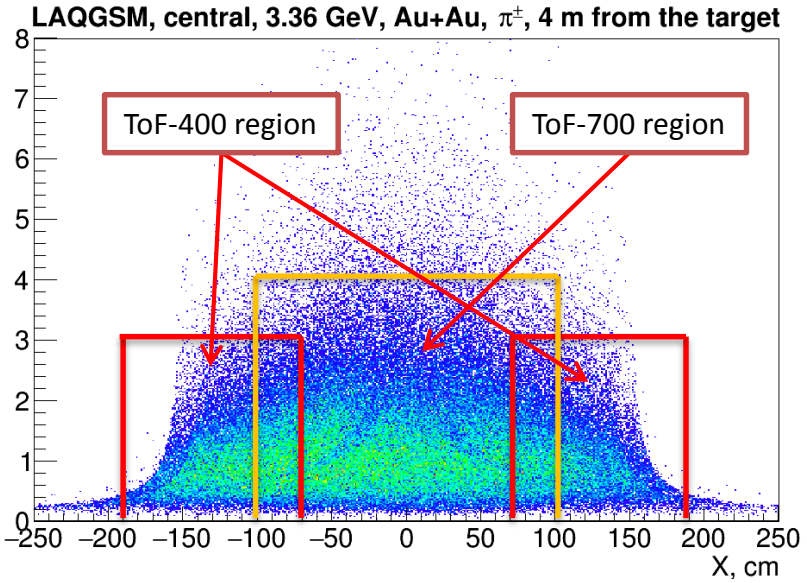


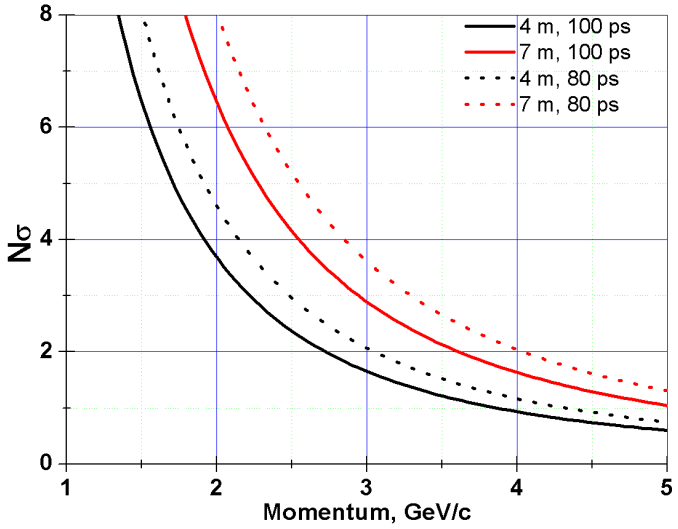
ToF-400 walls on the mounting frame

20 detectors (48 strips)
24 x 48 = 960 strips (300x12.5 mm^2)
960 x 2 = 1920 electronics channels

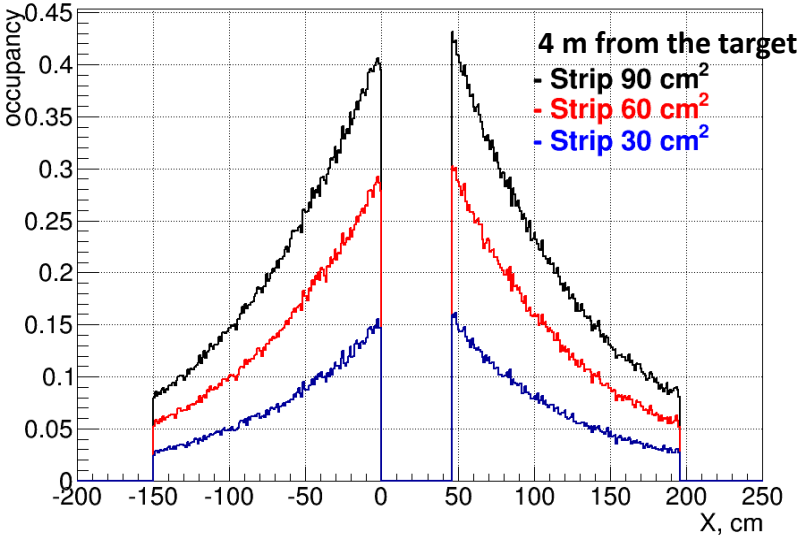
Simulation for the ToF-400 (by S. Lobastov)





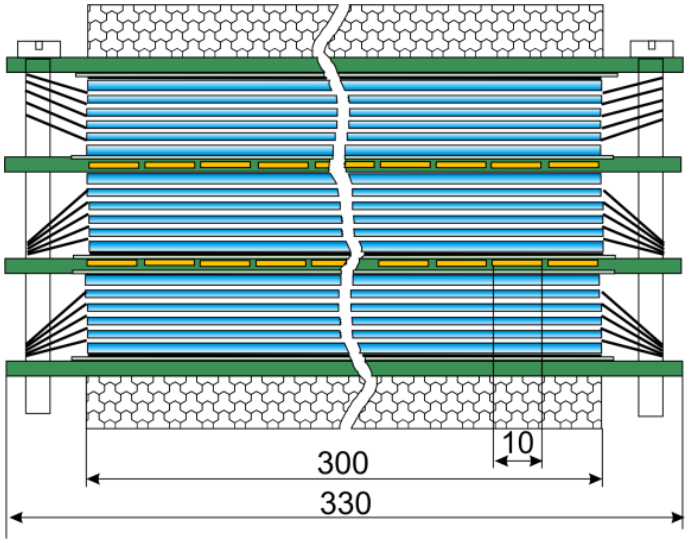


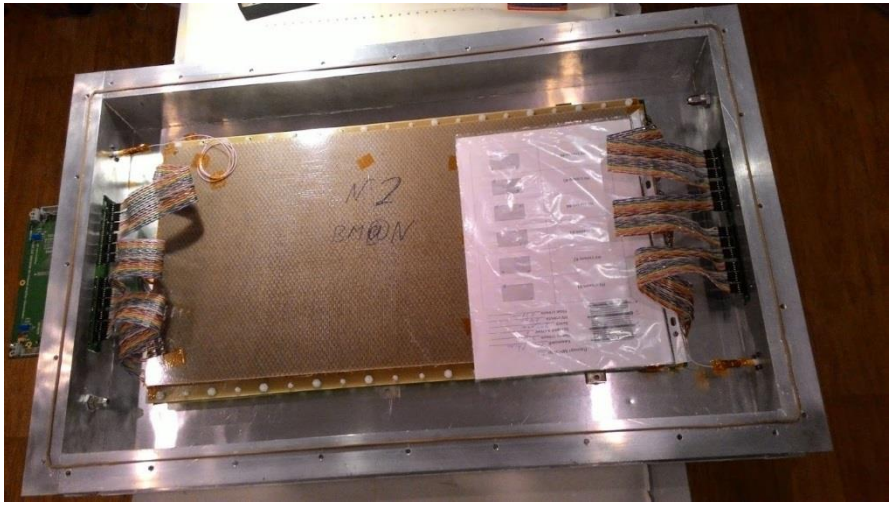
π/K separation possibility



Estimated occupancy for central 3.36 GeV/u Au-Au

MRPC for the ToF-400 (Dubna)



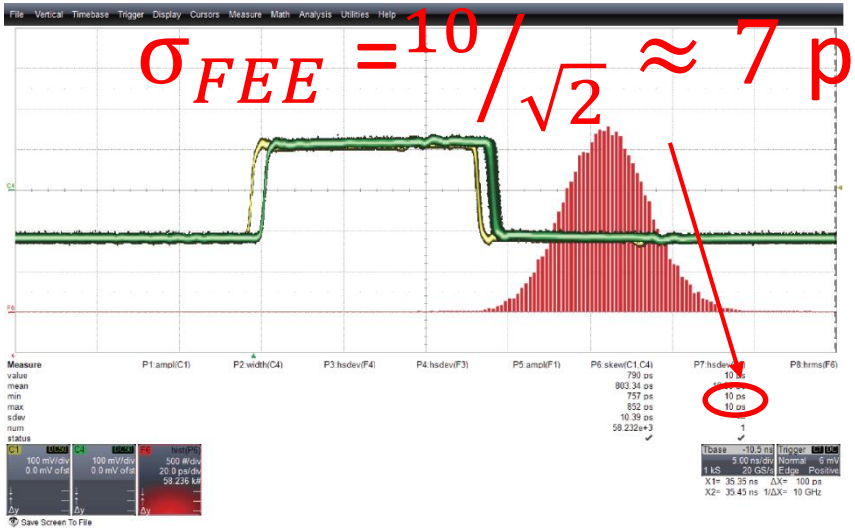


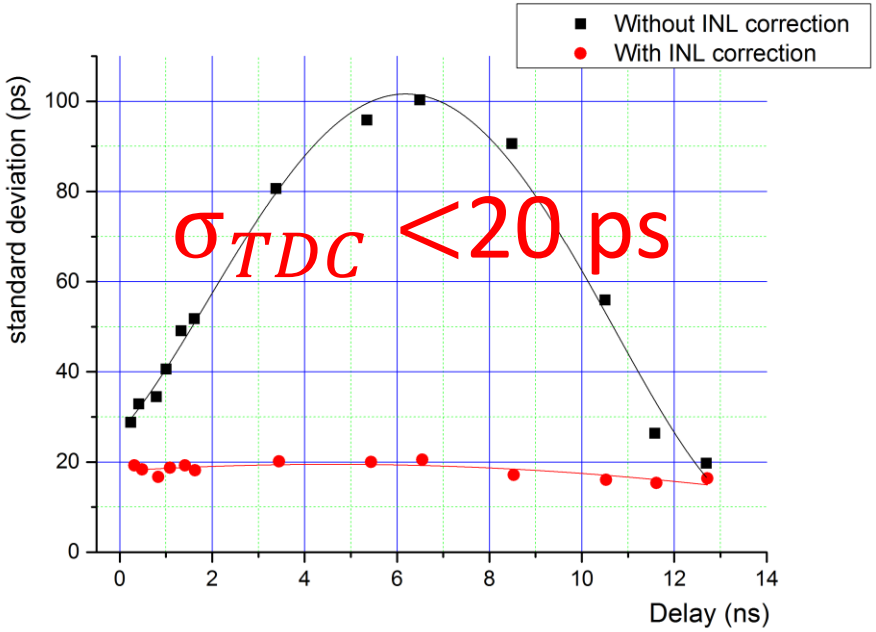
Glass – 280 μm
Gap width – 200 μm
Number of gaps – 15
Active area – 300*600 mm^2
Strip size – 10*600 mm^2, pitch 12.5 mm
Strip impedance – 50 Ohm
24 strips, 48 ch FFE.

FEE and Data acquisition system (DAQ)

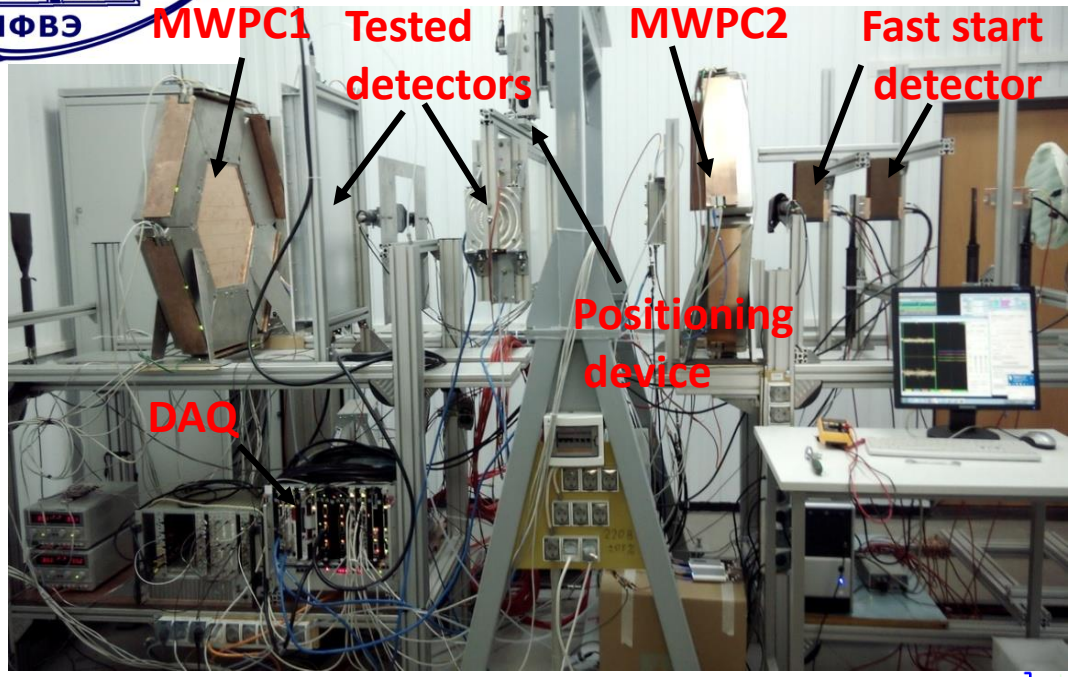
24 channels, base NINO FEE

TDC72VHL: 72 channel, 25 ps TDC



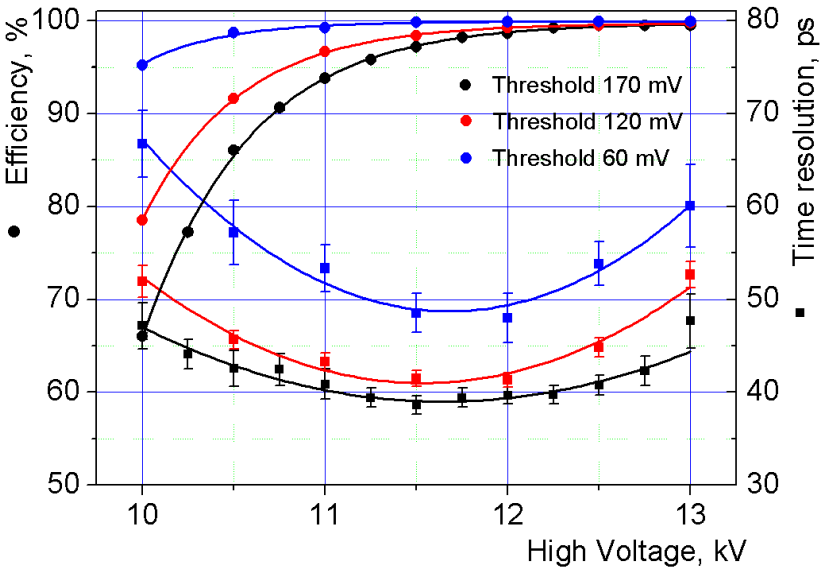


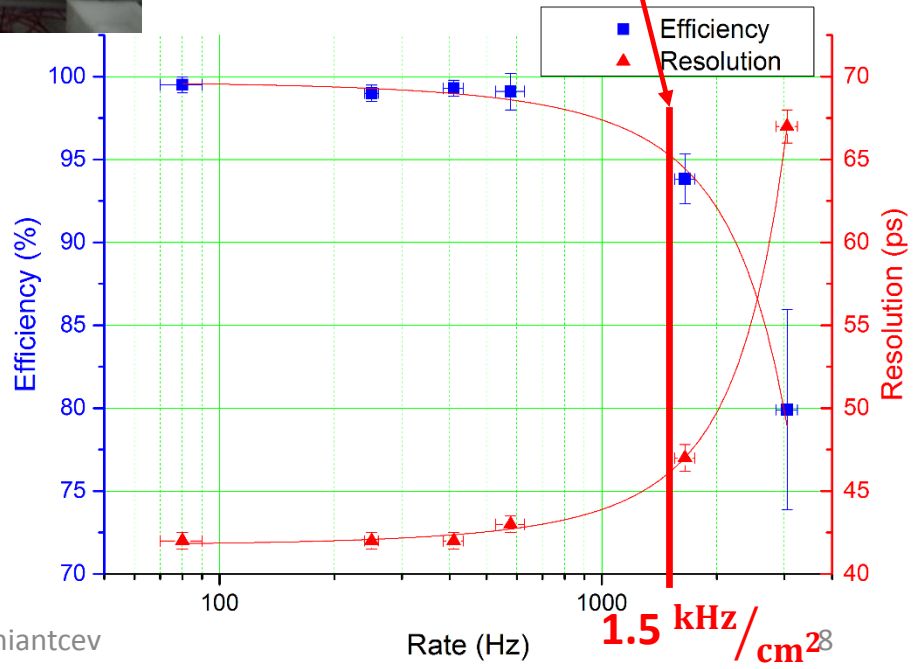
Beam test prototypes of MRPC



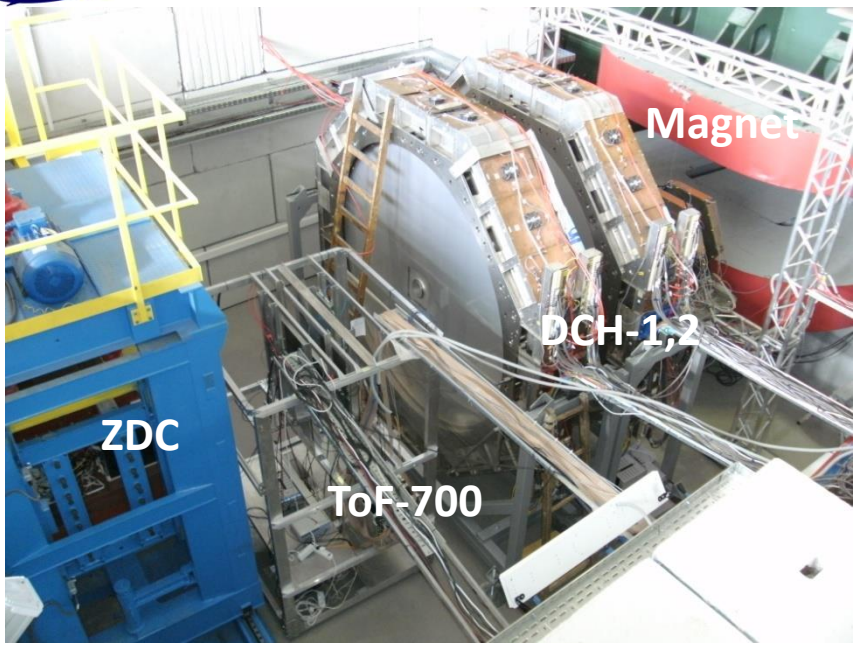
Two prototypes of MRPC were tested on deuteron beam of Nuclotron (JINR). Two MWPC station for tracking. Prototype T0 (FFD) for MPD are used like start detector.

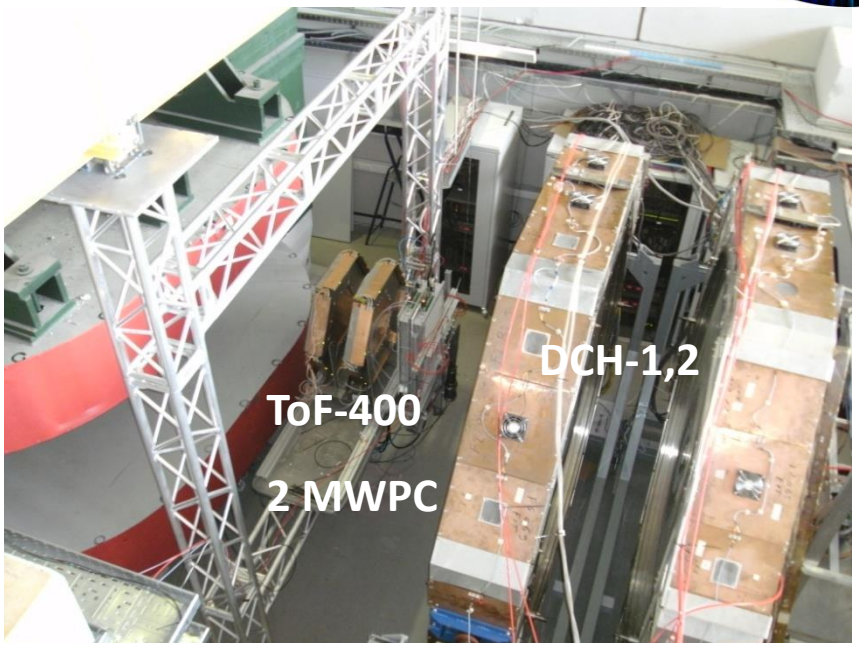
Efficiency > 95%
Time Resolution < 50 ps

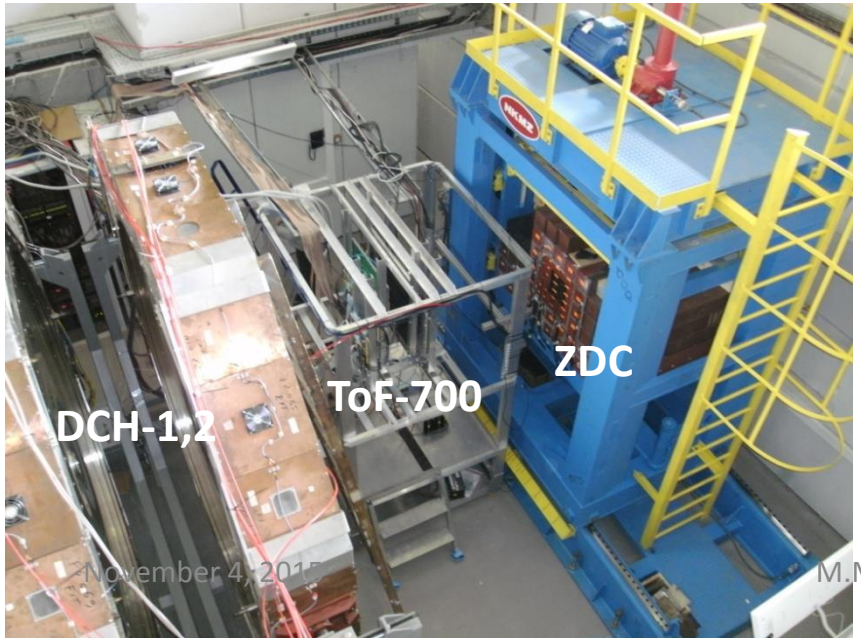




BM&N setup in the first technical run in February-March 2015



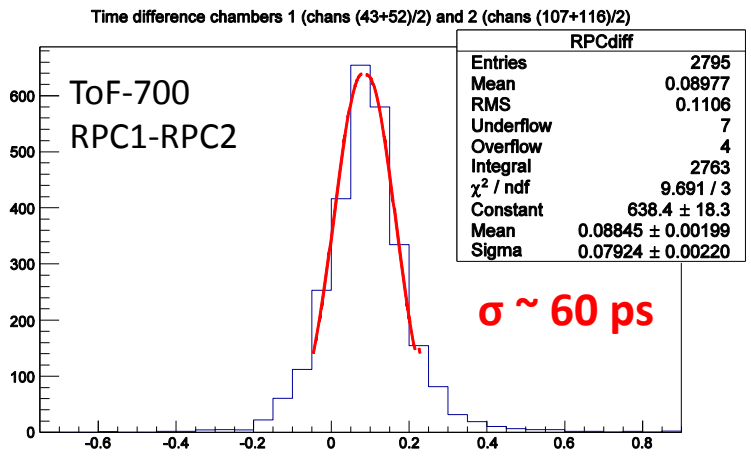


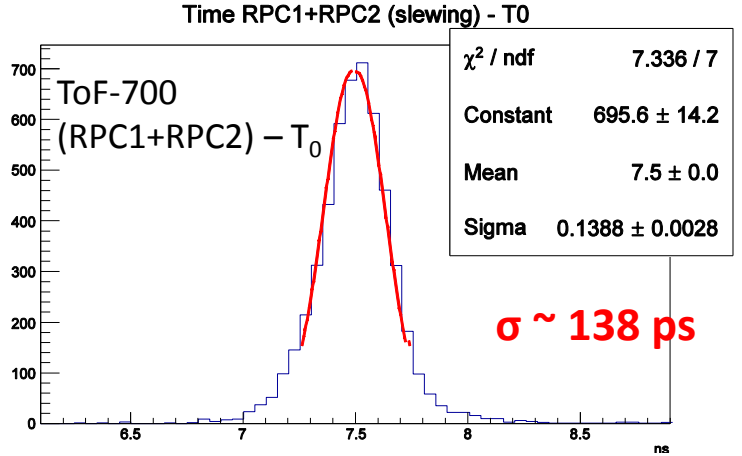


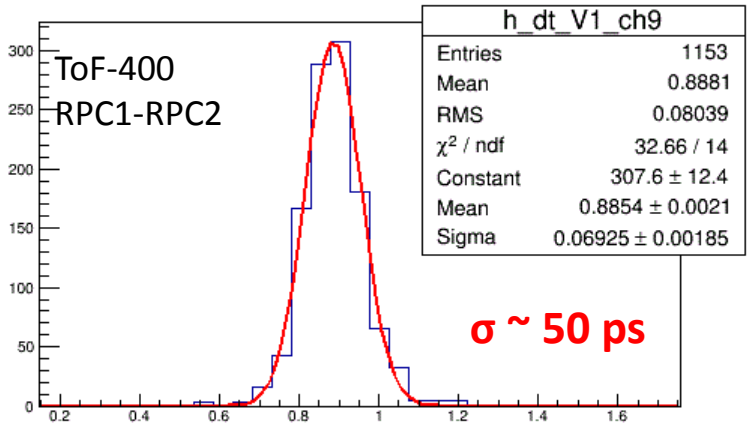
Tasks for BM@N technical run:

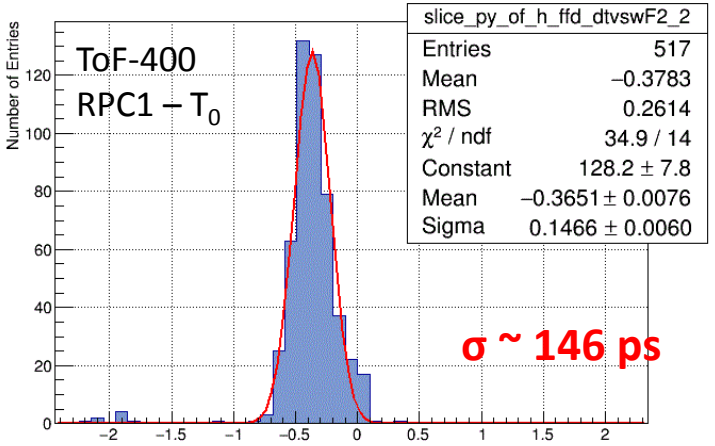
- deutron and C^{12} beams with T_0= 3.5 AGeV
- Trace beams, measure beam profile and time structure
- Test detector response: ToF-400, ToF-700, T0+Trigger, DCH-1,2, ZDC, ECAL modules, Beam monitors BM
- Test integrated DAQ and trigger system

ToF system performance in technical run









- Time resolution of TOF-700 chamber ~60 ps
- Time resolution of ToF-400 chamber ~50 ps
- Time resolution of ToF-400, ToF-700 relative to start CD detector (T0) → ~140 ps (d)

Serves systems of the TOF400

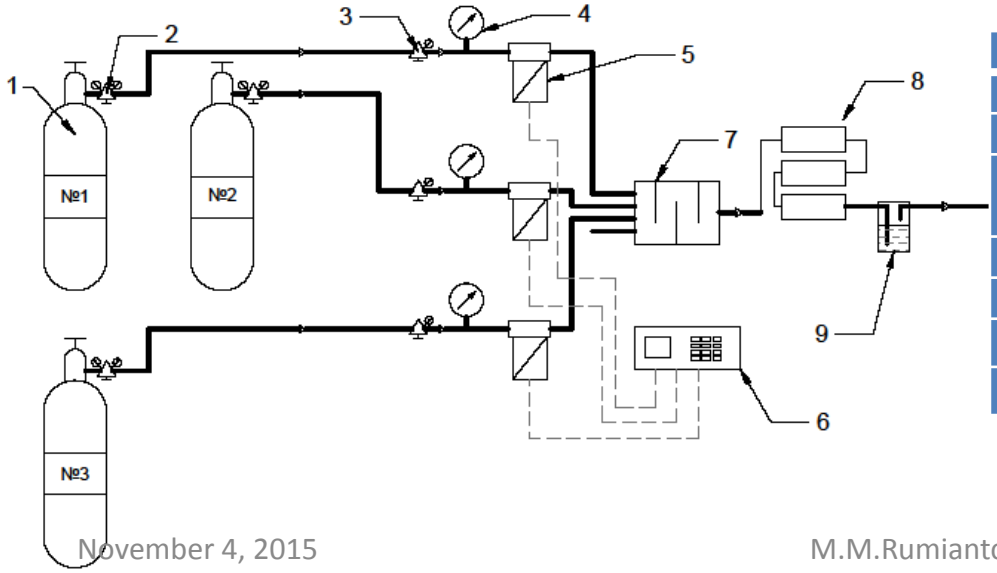
HV system with remote control by Ethernet will be ready to 2016.
LV system is under construction.
We have two ways to realize it:

- "Mpod" system by W-IE-NE-R

or "Mainframes" system by CAEN. Expensive way.

- Hand made system by industrially available solutions (for example Mean Well DR-4505 DIN). Chip way.

HV power supply designed by HVSys is under manufacturing



	For first run in 2015	In the future
Total volume	40 liters	400 liters
Gas mixture	C2H2F4, i-C4H10,SF6 (90%/5%/5%)	
Volume exchange/day	3.5	4
Total flow rate	6 l/hour	67 l/hour
Reflow system	No	Yes
Working pressure	<3 mbar	
Status	Ready	Under construction

Conclusions

- The construction of mRPC detectors and design of TOF400 wall are fixed.
- The first technical run is performed in February-March 2015 with aim to trace beam, test detector response, trigger and integrated DAQ system.
- Discussion on the choice of the LV system continues. Young engineers welcome!
- Reflow Gas system is under construction. Young engineers welcome!
- Design of gas box is under construction. Young engineers welcome!
- Research of limit time resolution of MRPC, construction High Rate MRPC. Young scientist welcome!

Thank you for attention!