

# PANDA MUON SYSTEM PROTOTYPE MODELING

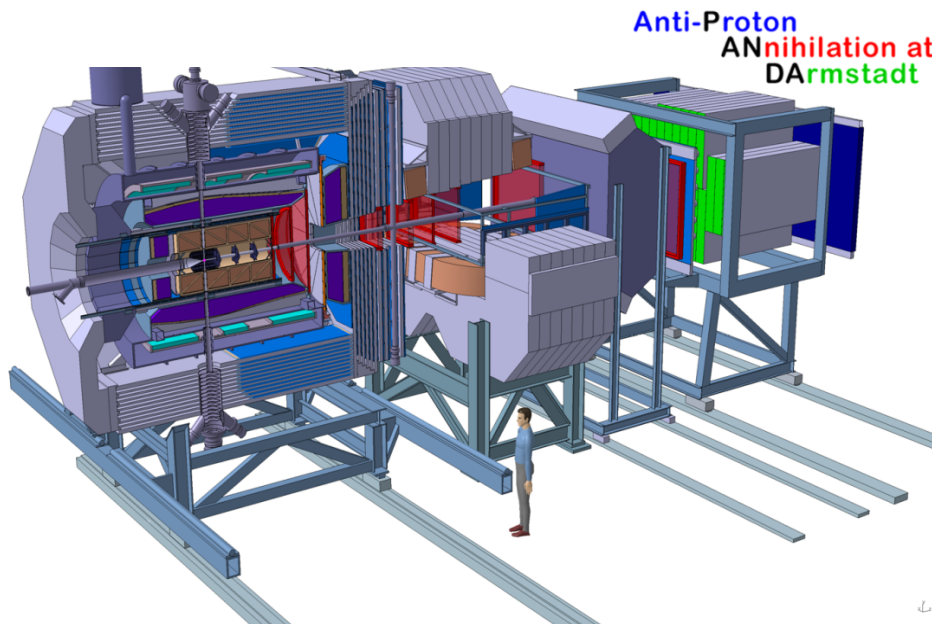
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# EXPERIMENT SETUP

Topics of research: hadron structure and spectroscopy, strange and charm physics, hypernuclear physics with anti-proton beams.



- ppbar, pbarA collisions  
 $p = 1.5 - 15 \text{ GeV}/c$ ,  
( $\sqrt{s}$  from 2.25 up to 5.46 GeV)
- Luminosity up to  
 $2 \cdot 10^{32} \text{ cm}^{-2}\text{s}^{-1}$
- Nearly  $4\pi$  solid angle for large acceptance
- Tracking :  $\sim 50 \mu\text{m}$  vertex resolution
- Different PID techniques for  $\pi^\pm$ ,  $K^\pm$ ,  $e^\pm$ ,  $\mu^\pm$ ,  $\gamma$  identification, good momentum resolution

# PANDA MUON SYSTEM CHARACTERISTICS

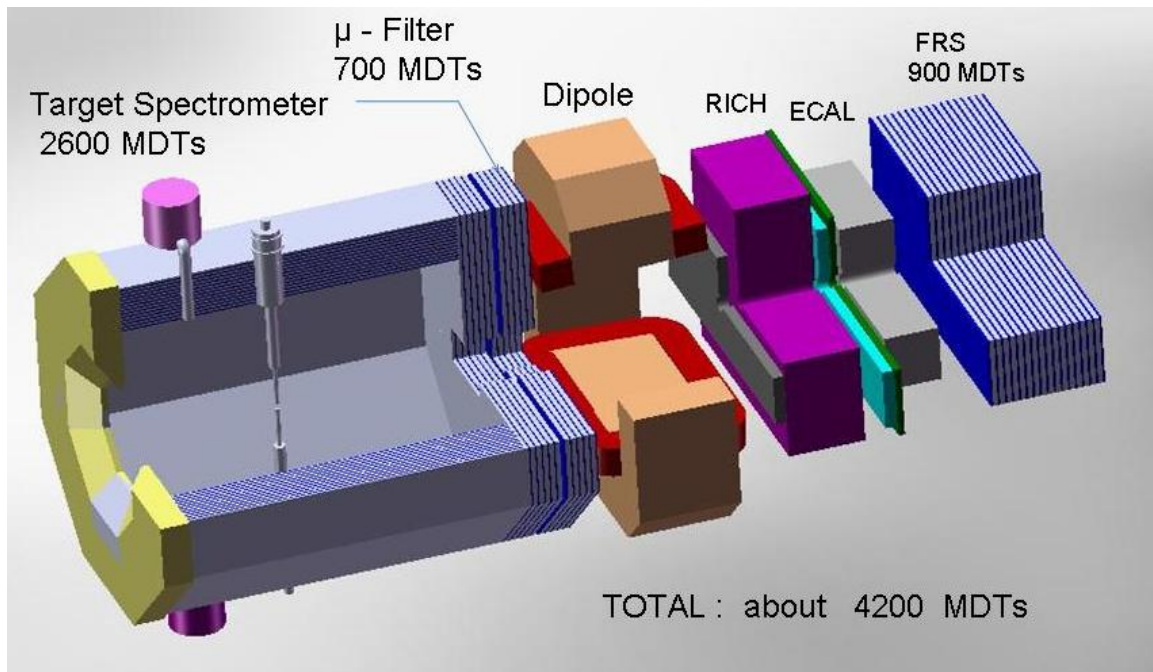
## Purposes:

- registration of muons over the whole PANDA acceptance at different energies;
- muon separation versus the hadrons (pions, kaons, protons)

Sources of muons -  $J/\Psi$ ,  
D-mesons, Drell-Yan pairs

Energy range - 0.3 – 10.0 GeV

Detector technology - Mini-Drift Tubes (MDT) with wire and strip R/O



# MAIN TASKS OF RANGE SYSTEM PROTOTYPE STUDY AT CERN

Obtaining and analyzing data from the Muon Range System Prototype is a crucial task for a PANDA Muon System – it permits a direct beam calibration of the system’s response to the different particles and energies.

Main tasks are:

- response to muons at different energies
- response to hadrons (pions, protons) at different energies
- test of algorithms for muon/pion separation
- use information from the prototype to tune digitization algorithm
- different technical issues

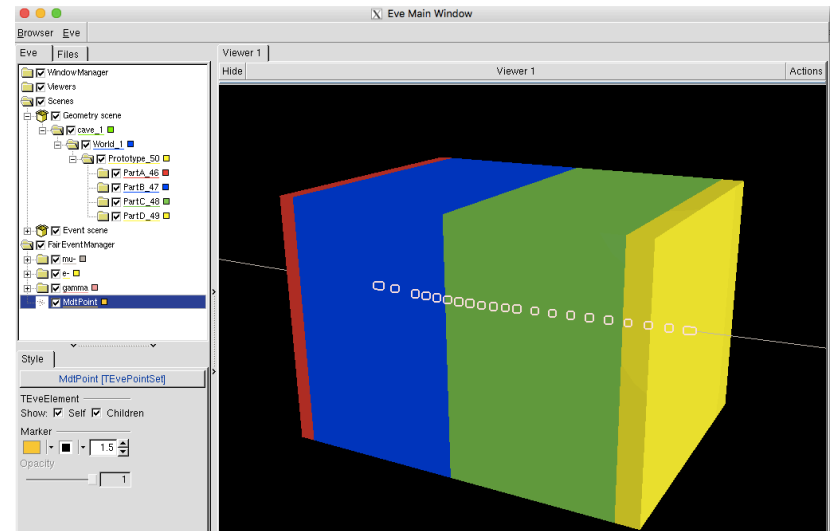
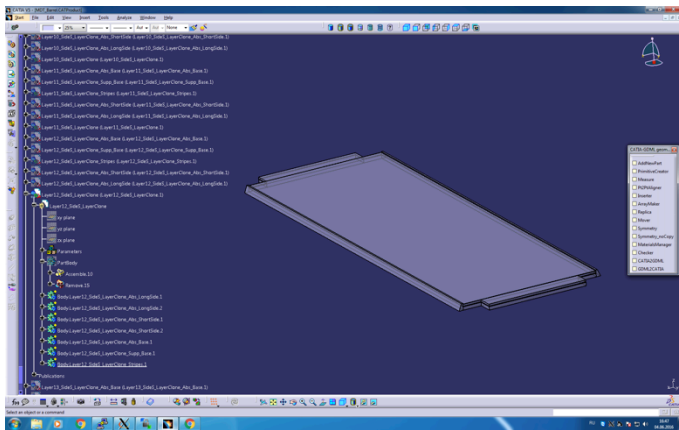


RS ‘3 in 1’ prototype: 30 mm and 60 mm absorber plates reproduce different parts of the Muon System; detecting layers of MDTs and strips are positioned in between the plates; two types of “zero” bi-layers are put outside the absorber.

# CAD AND GEANT4 MODELS OF MUON PROTOTYPE

**It is important to have the model of the Muon System in PANDARoot software for full MC simulation of PANDA setup.**

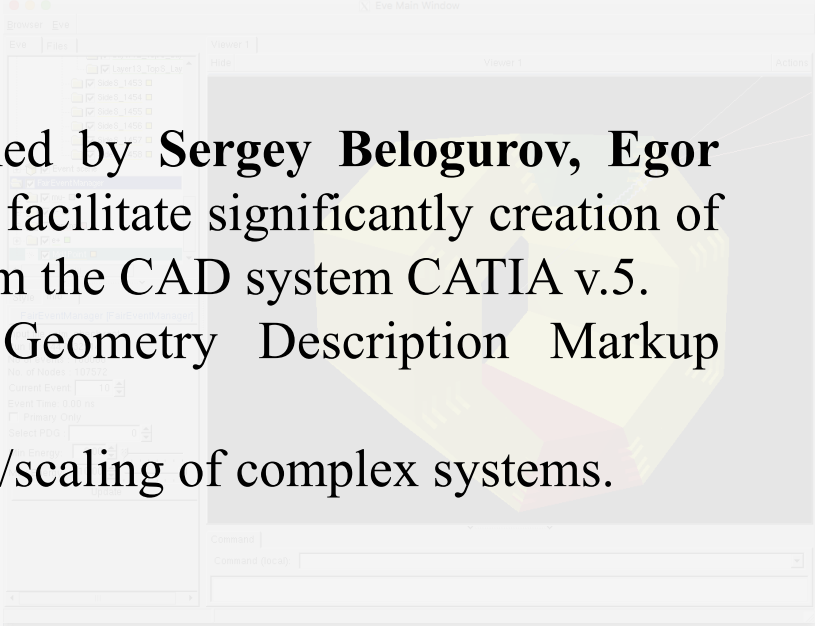
Transfer of the detector geometry from Computer-Aided Design (CAD) systems to particle transport Monte Carlo codes like GEANT4 and ROOT is always an issue due to geometry description incompatibility.



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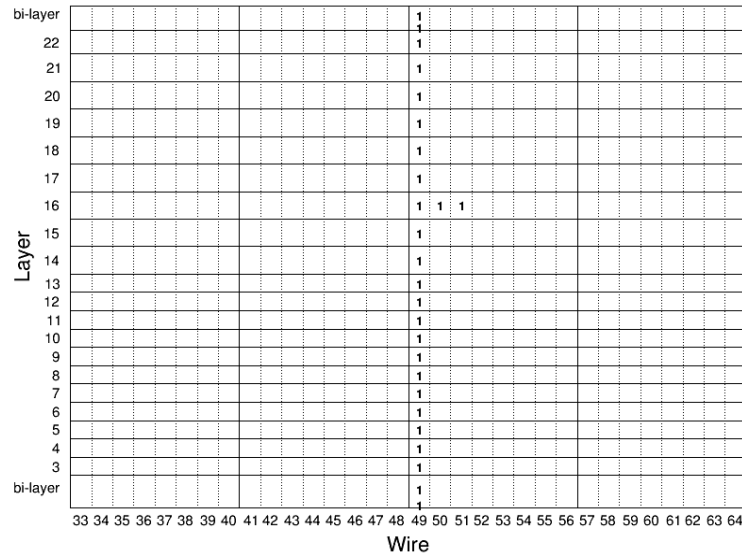


We are using a set of tools (designed by **Sergey Belogurov, Egor Ovcharenko & Co**), which allows to facilitate significantly creation of a G4/ROOT compatible geometry from the CAD system CATIA v.5. The geometry is exchanged via Geometry Description Markup Language (GDML). This tool allows iterative optimization/scaling of complex systems.

# RANGE SYSTEM PROTOTYPE

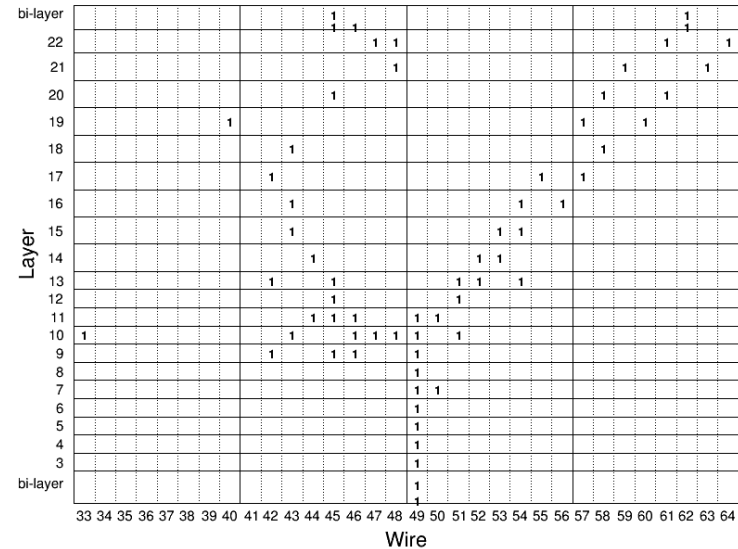
10 GeV muon

Event #10



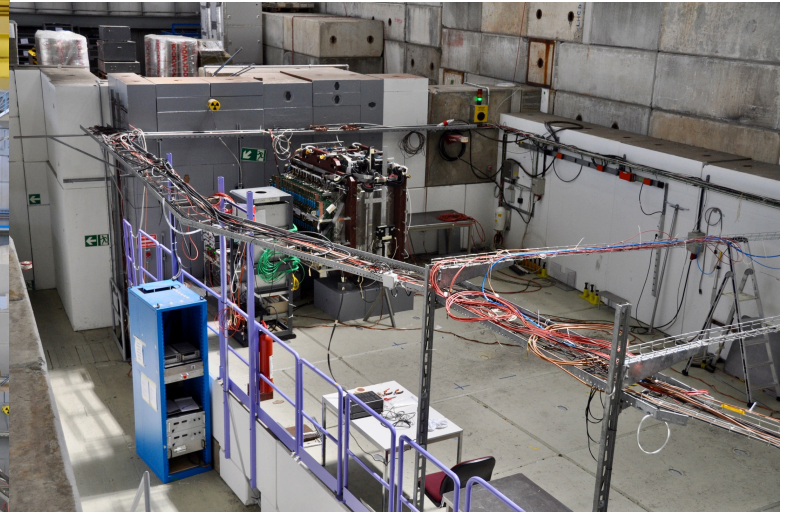
10 GeV pion

Event #2



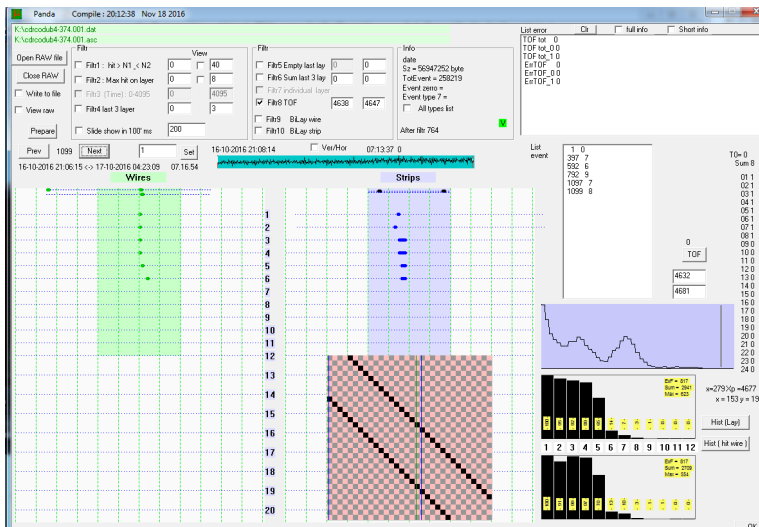
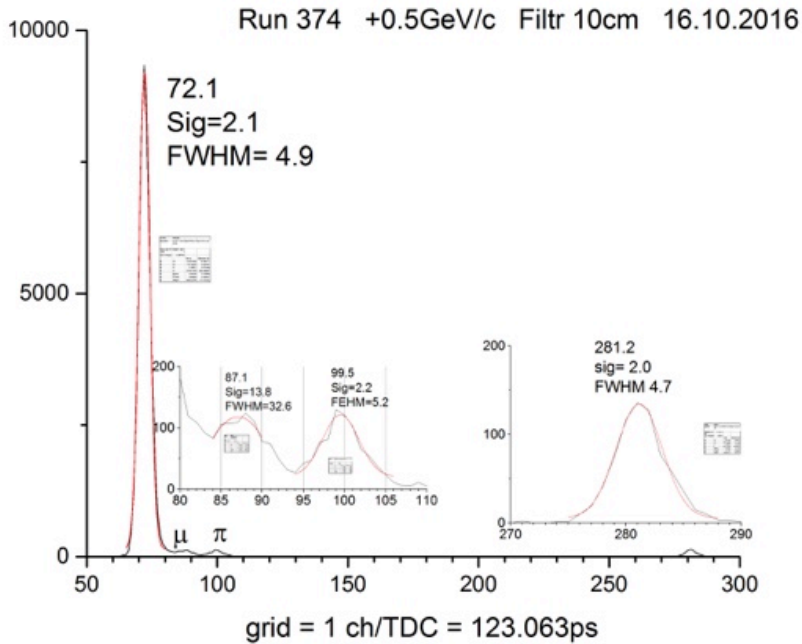
We are developing a class for Prototype in PANDARoot package which describes a prototype's geometry, transfers digital information into root format as well as ready to analyze new data of Run 2017.

# TEST BEAM IN 2017

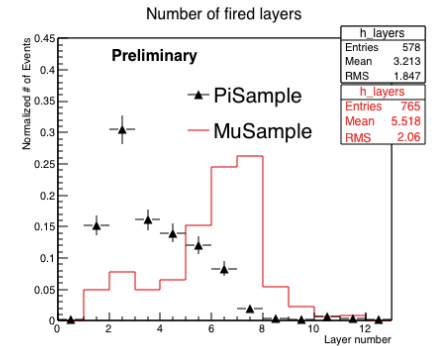
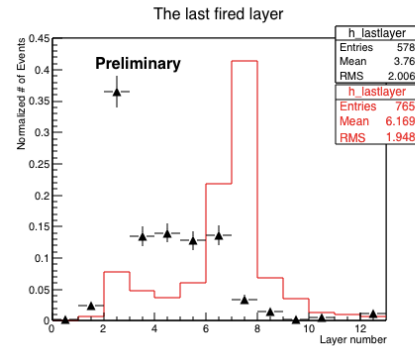
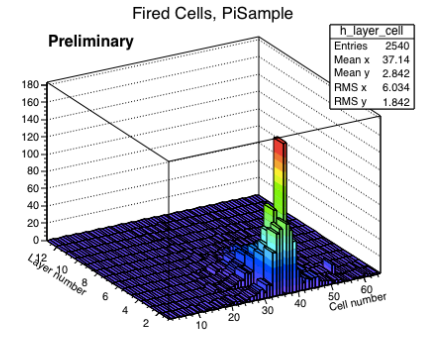
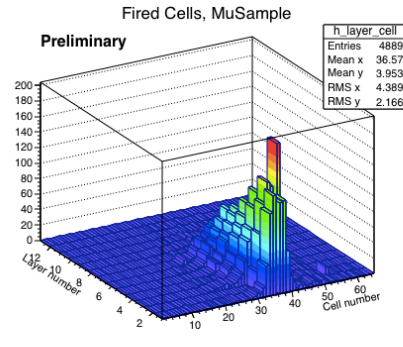
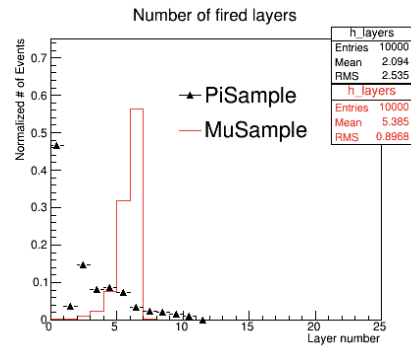
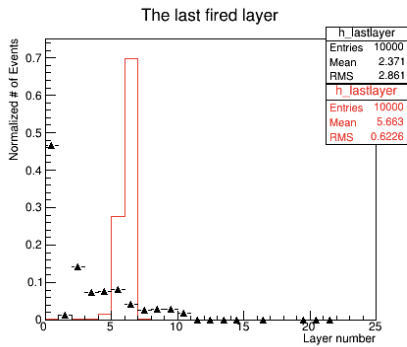
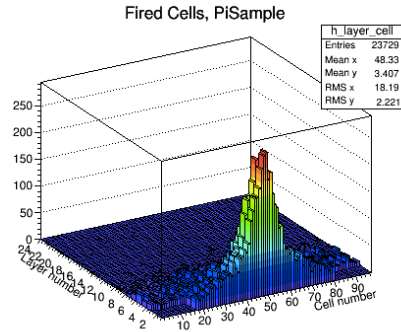
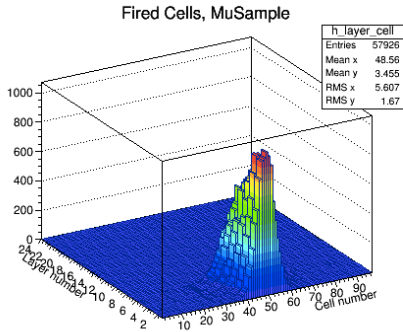




# DATA



# MC VS DATA



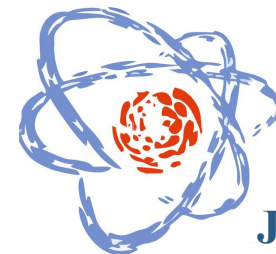
# SUMMARY

1. The model of the Panda Muon System Prototype is ready to transfer to PANDARoot software
2. We have performed simulation of events with muons and hadrons to get parameters for digitization of signals and reconstruction of particle's type (PID).
3. Prototype will be modified and new planes will be added.



**Thanks for your attention**

Supported by



**JINR AYSS**