

PANDA BARREL MUON SYSTEM MODELING

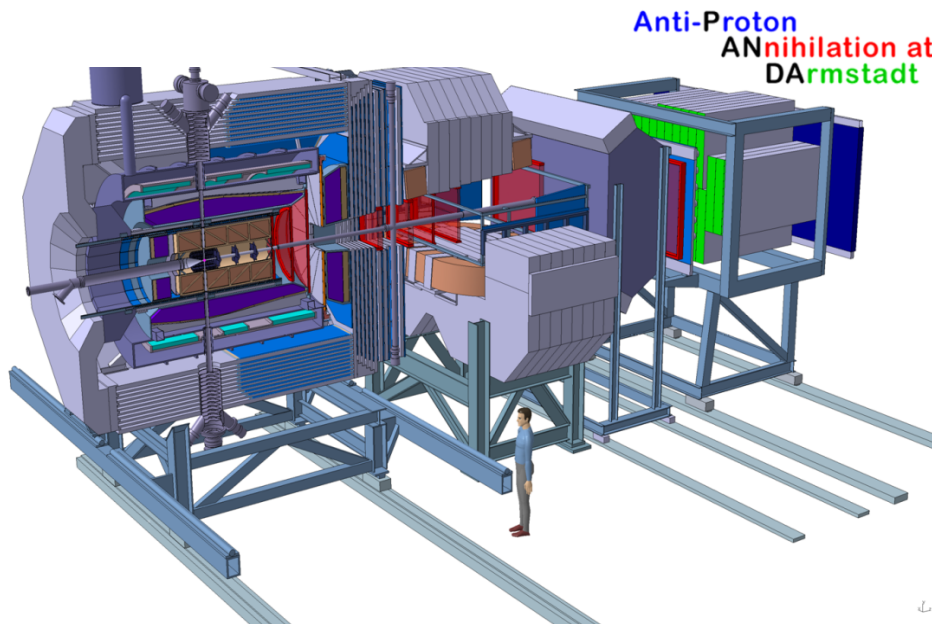
ALEXANDER VERKHEEV (DLNP, JINR)

V Conference of young scientists and specialists

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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 4π solid angle for large acceptance
- Tracking : $\sim 50 \mu\text{m}$ vertex resolution
- Different PID techniques for π^\pm , K^\pm , e^\pm , μ^\pm , γ identification, good momentum resolution

PANDA MUON SYSTEM CHARACTERISTICS

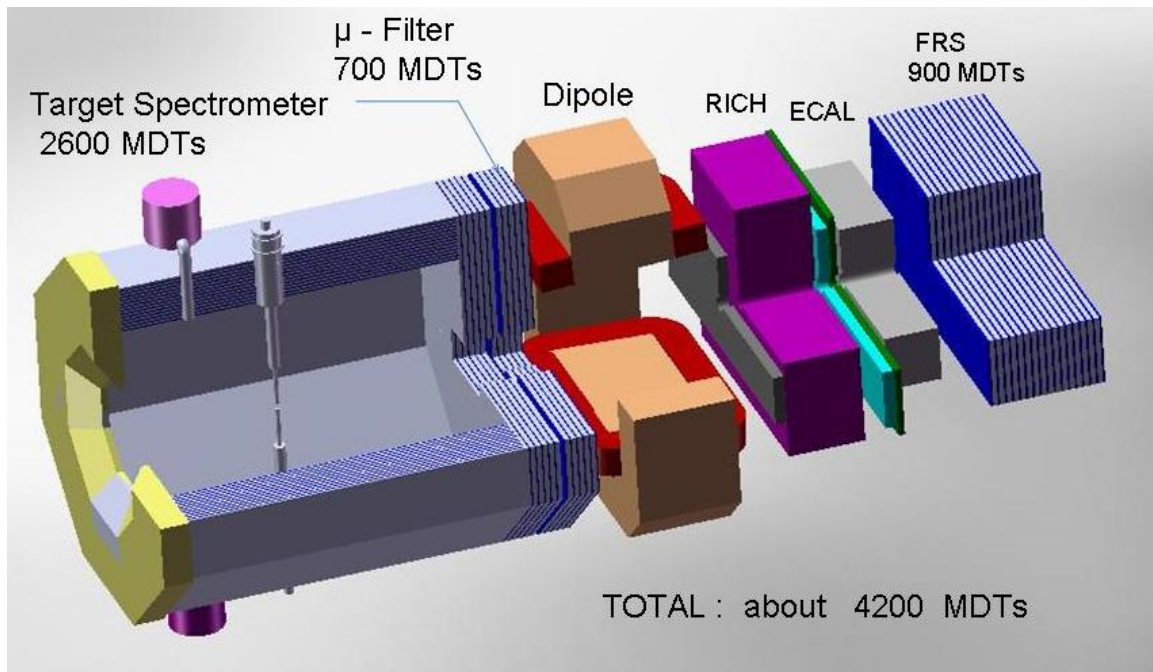
Purposes:

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

Sources of muons - J/Ψ ,
D-mesons, Drell-Yan pairs

Energy range - 0.3 – 10.0 GeV

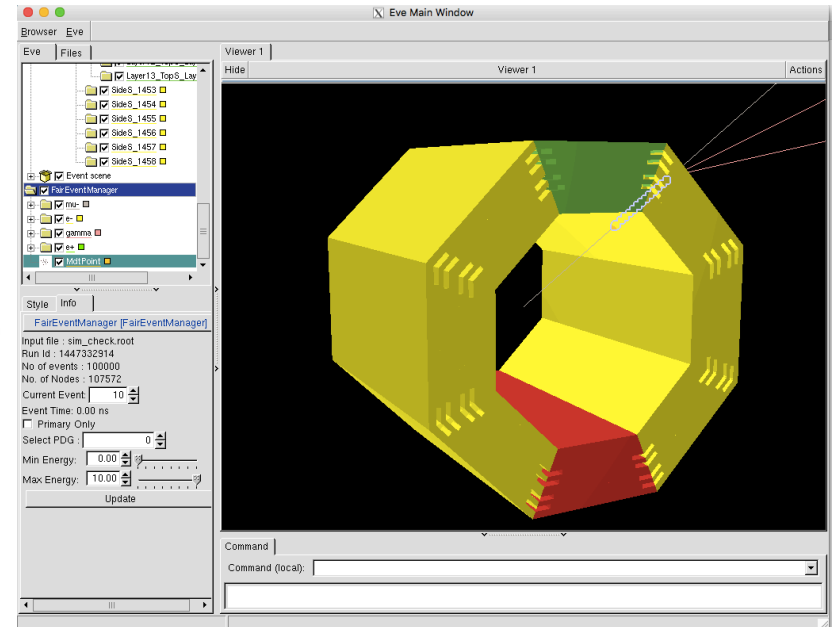
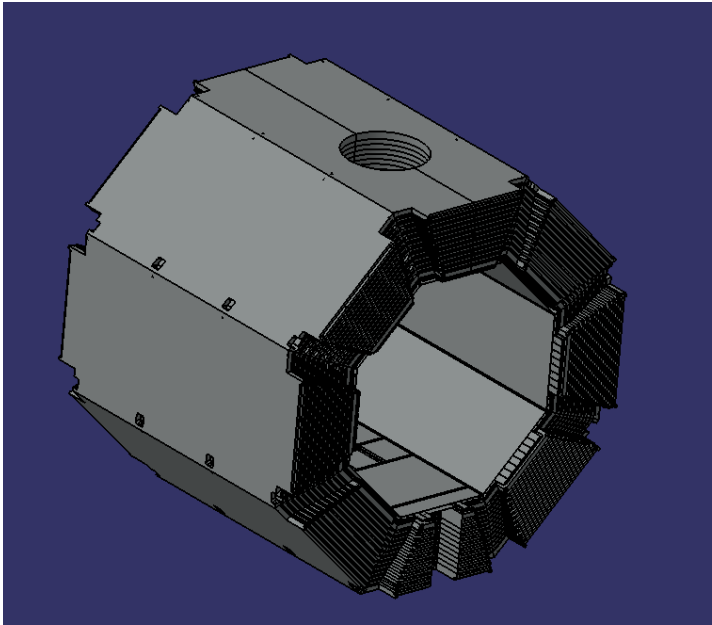
Detector technology - Mini-Drift Tubes (MDT) with wire and strip R/O



CAD AND GEANT4 MODELS OF MUON SYSTEM

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

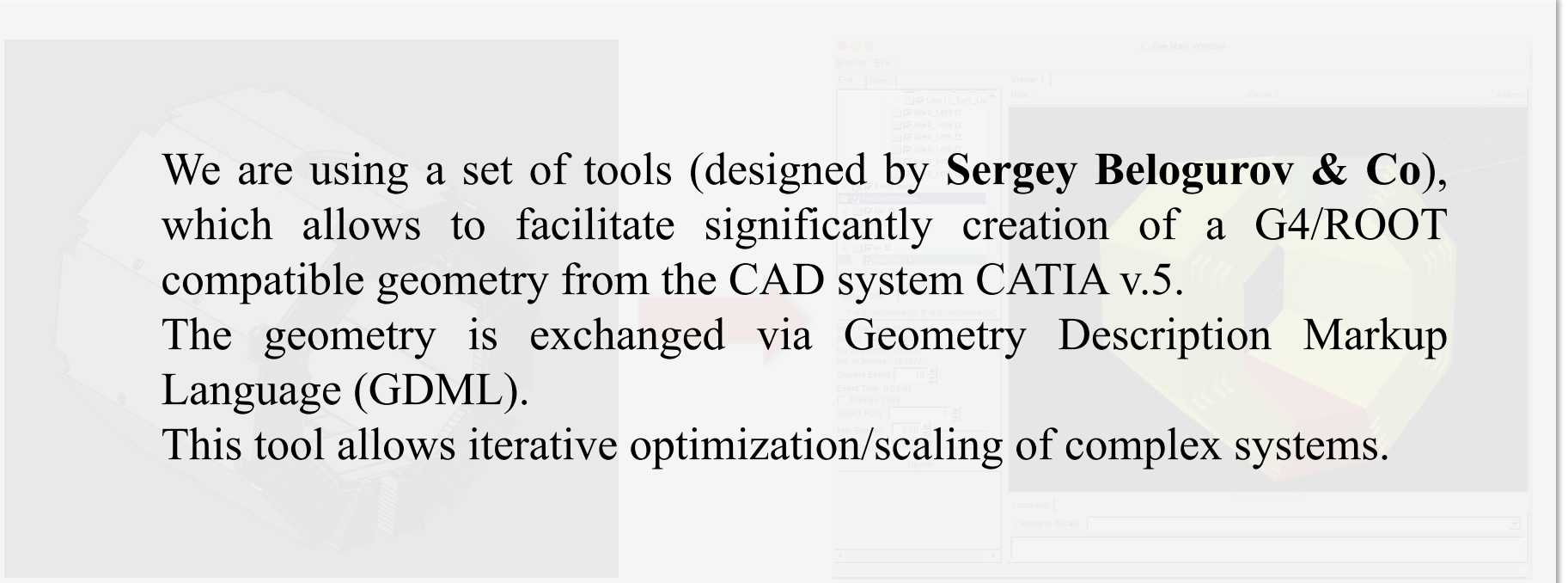
Transfer of the detector geometry from Computer-Aided Design (CAD) systems to particle transport Monte Carlo codes like GEANT4 and ROOT is always an issue due to geometry description incompatibility.



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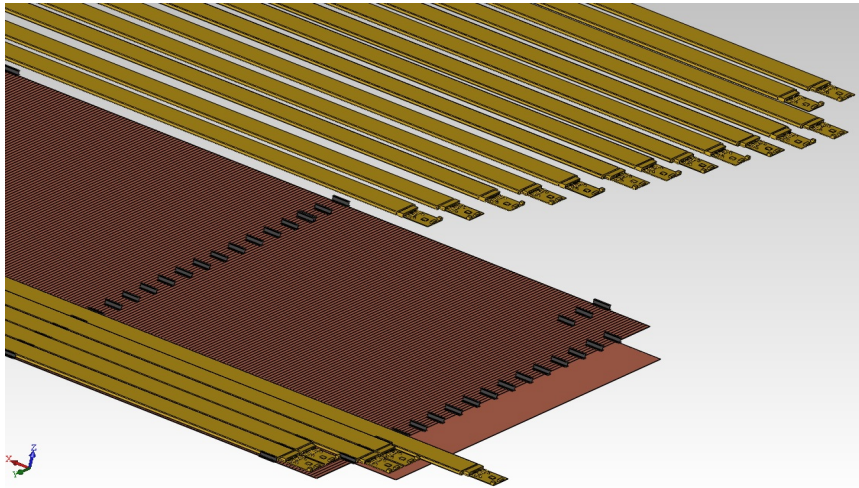
We are using a set of tools (designed by **Sergey Belogurov & Co**), which allows to facilitate significantly creation of a G4/ROOT compatible geometry from the CAD system CATIA v.5.

The geometry is exchanged via Geometry Description Markup Language (GDML).

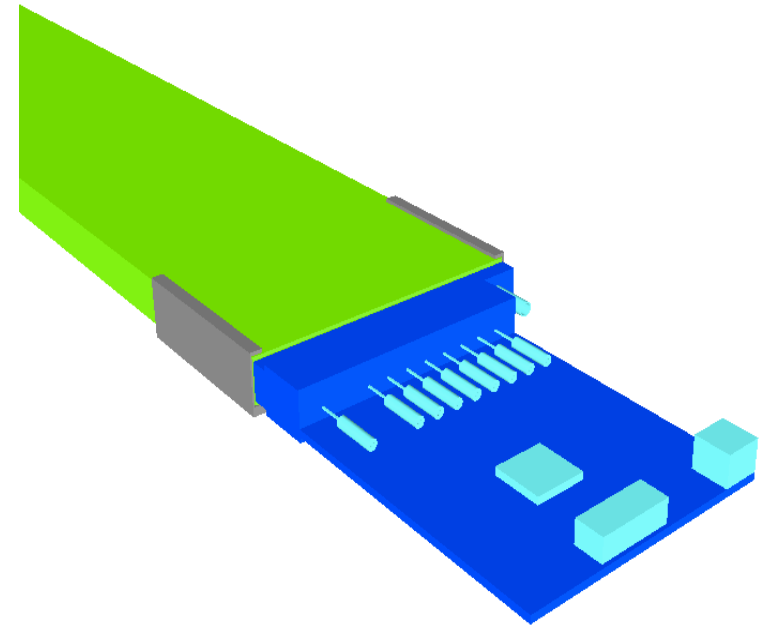
This tool allows iterative optimization/scaling of complex systems.

CAD AND GEANT4 MODELS OF MUON SYSTEM

Assembly of detecting plane (MDTs + strip board) of a Barrel Module

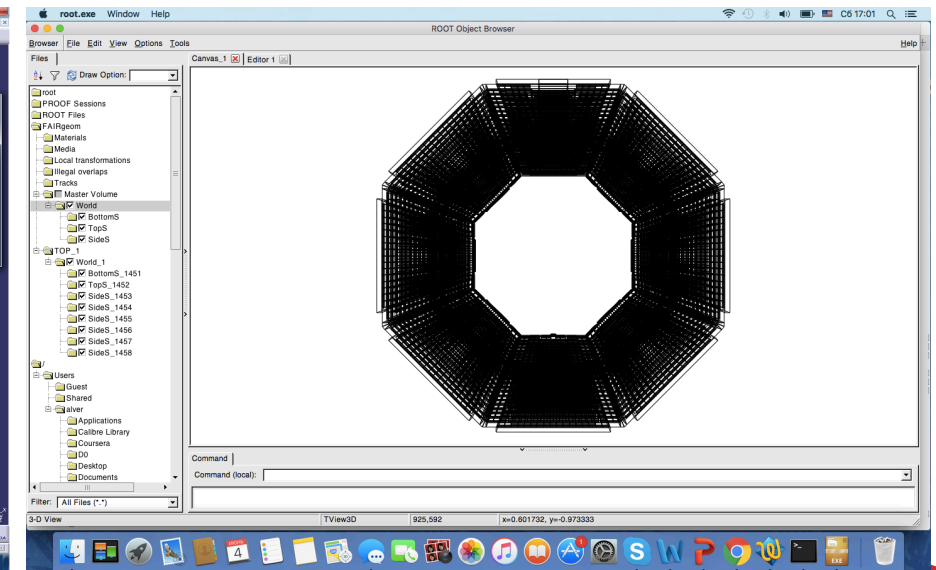
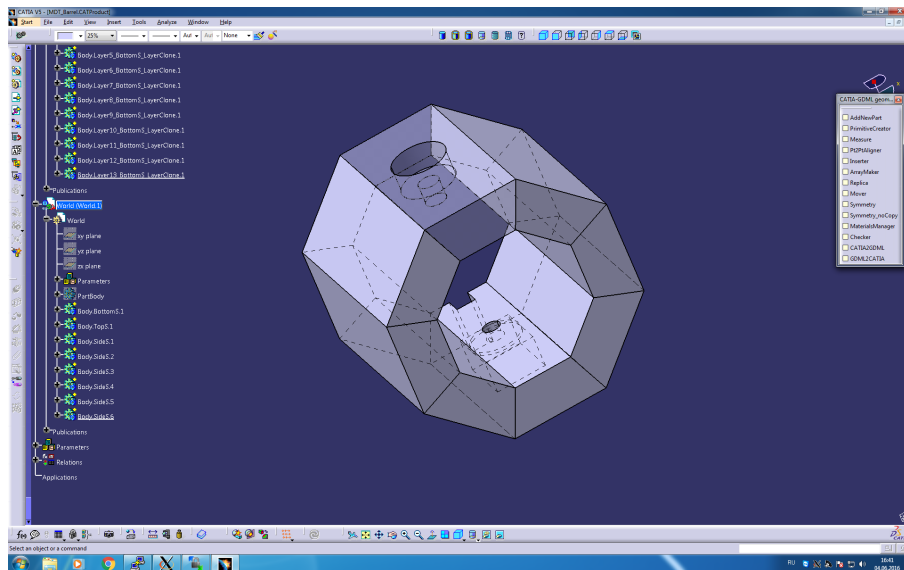
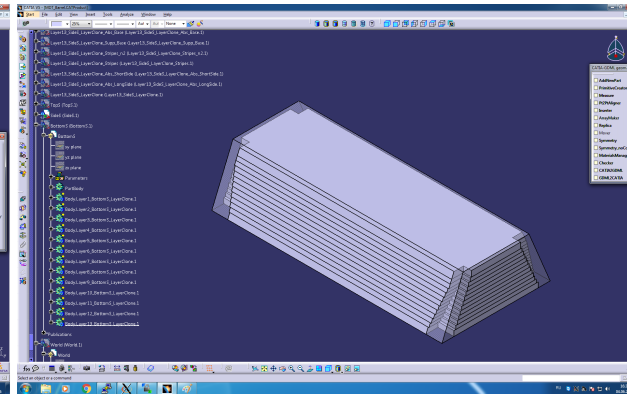
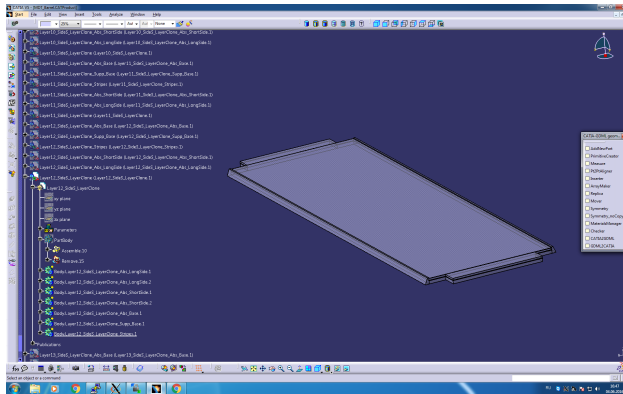


The model of MDT has built using CATIA-GDML geometry builder and transferred to PANDARoot package.



There are many types of MDT similar to each other but having different dimensions. **Egor Ovcharenko** developed within "CATIA_GDML Geometry Builder" a new tool able to generate automatically copies of GDML compatible assemblies with independent sets of the parameters.

STEPS OF MUON SYSTEM MODELING



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:

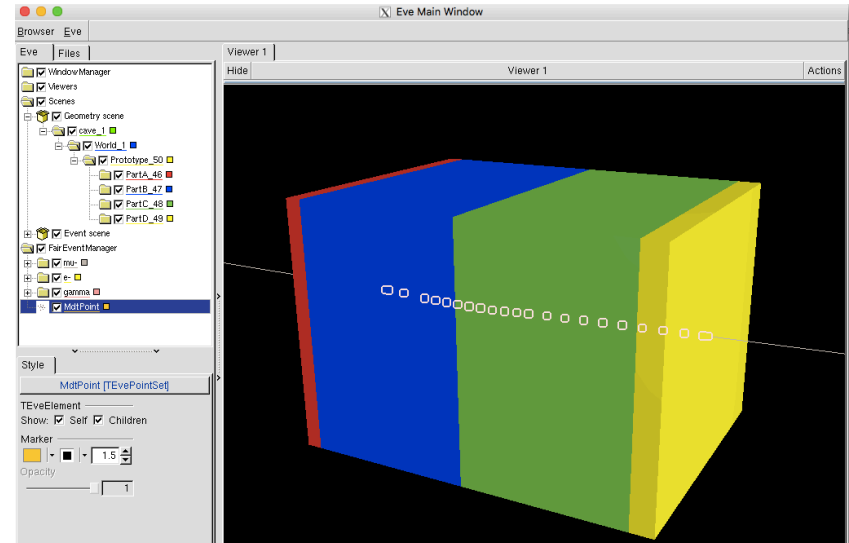
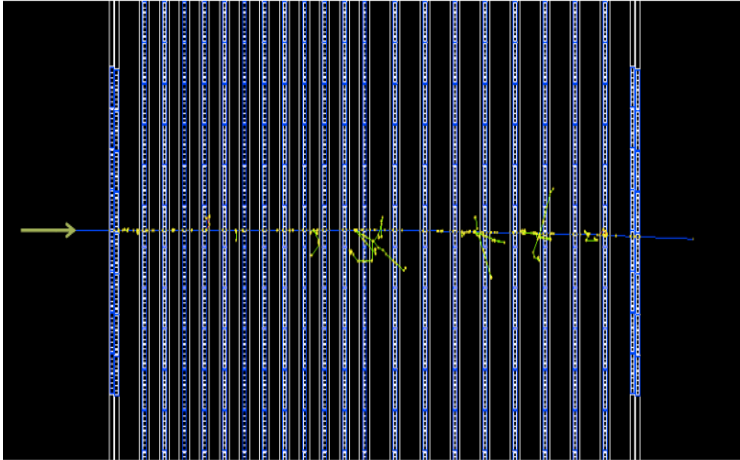
- response to muons at different energies
- response to hadrons (pions, protons) at different energies
- test of algorithms for muon/pion separation
- use information from the prototype to tune digitization algorithm
- different technical issues



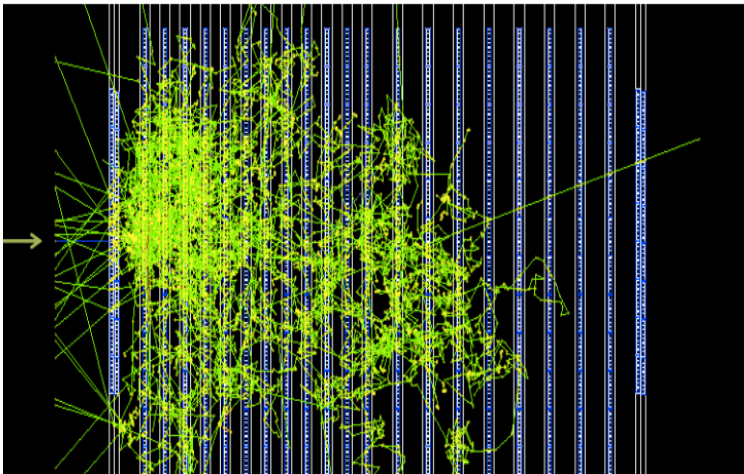
RS ‘3 in 1’ prototype: 30 mm and 60 mm absorber plates reproduce different parts of the Muon System; detecting layers of MDTs and strips are positioned in between the plates; two types of “zero” bi-layers are put outside the absorber.

RANGE SYSTEM PROTOTYPE

5 GeV muon



5 GeV pion



We are developing a class for Barrel and 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 2015-2016.

SUMMARY

1. The model of the Muon System (Barrel part) is ready to transfer to PANDARoot software (as well as a model of Prototype at CERN).
2. We have started performing simulation of events with muons and hadrons, digitization of signals and reconstruction of particle's type (PID).



Thanks for your attention.

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