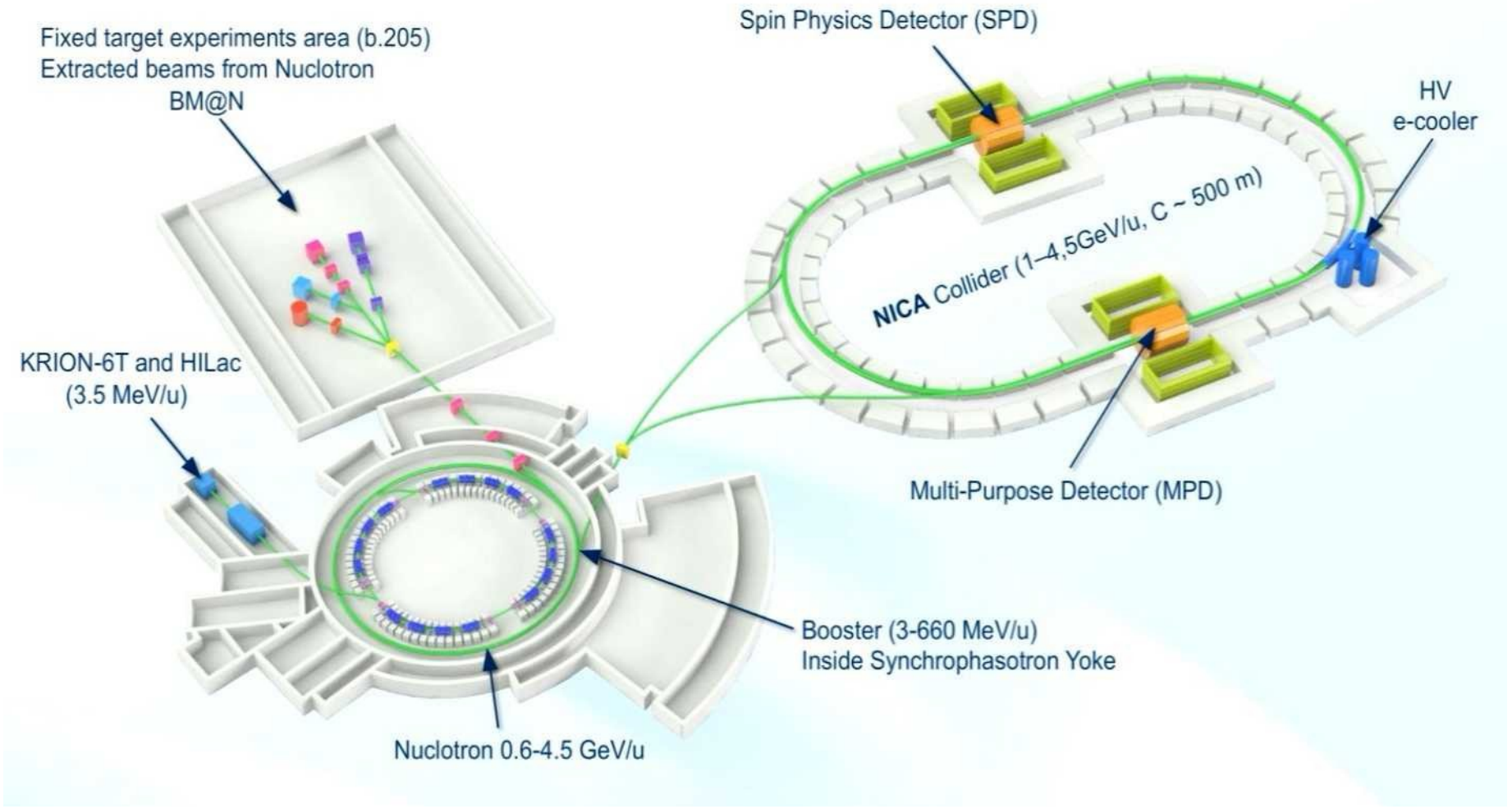
ROGACHEVSKY Oleg
for MPD collaboration

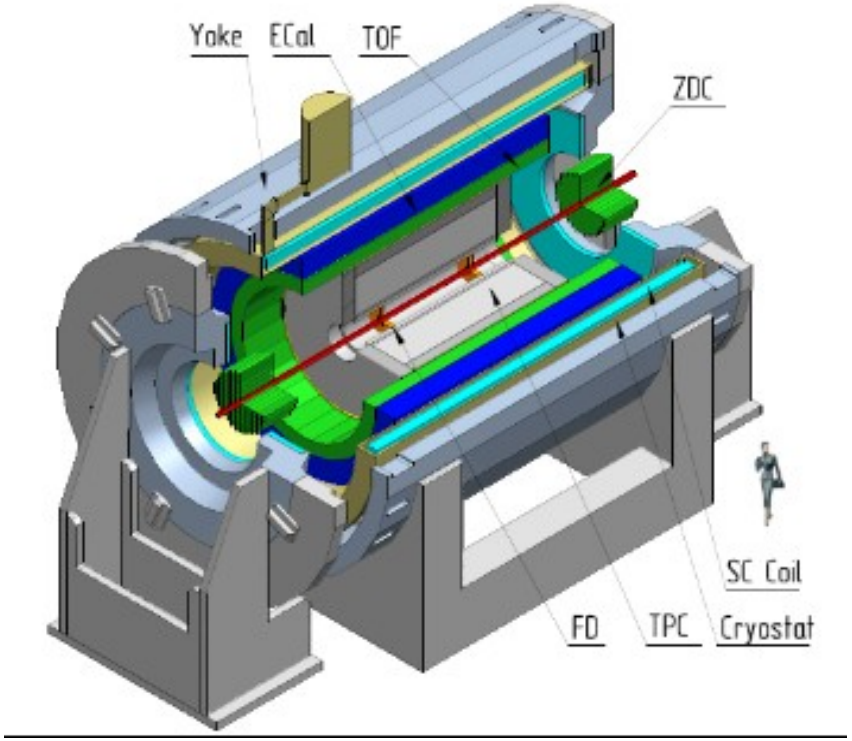
MPD Coll. meeting
April 24, 2020
Dubna

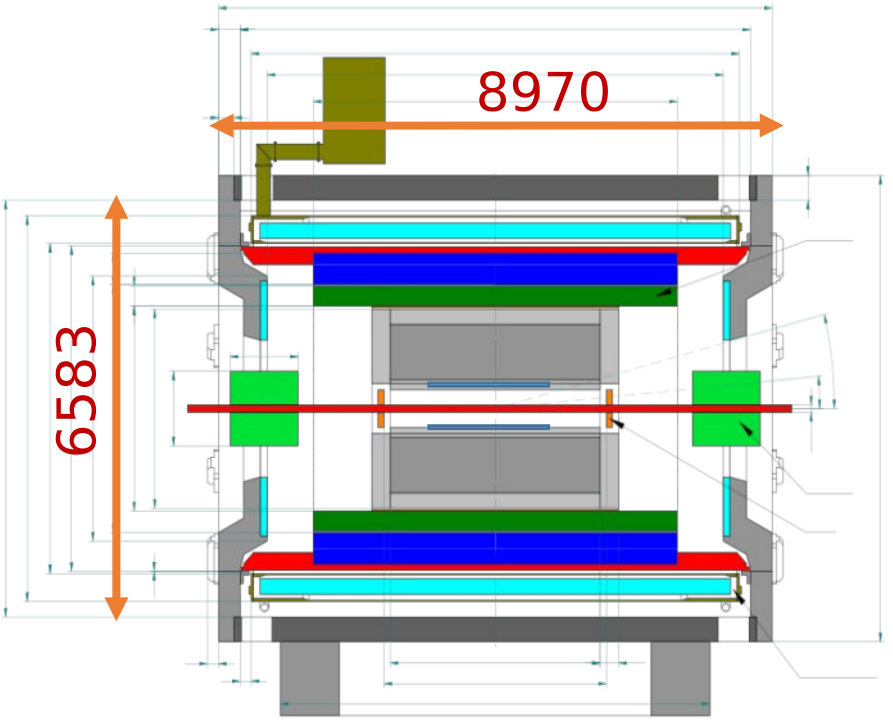
Nuclotron based Ion Collider fAcility



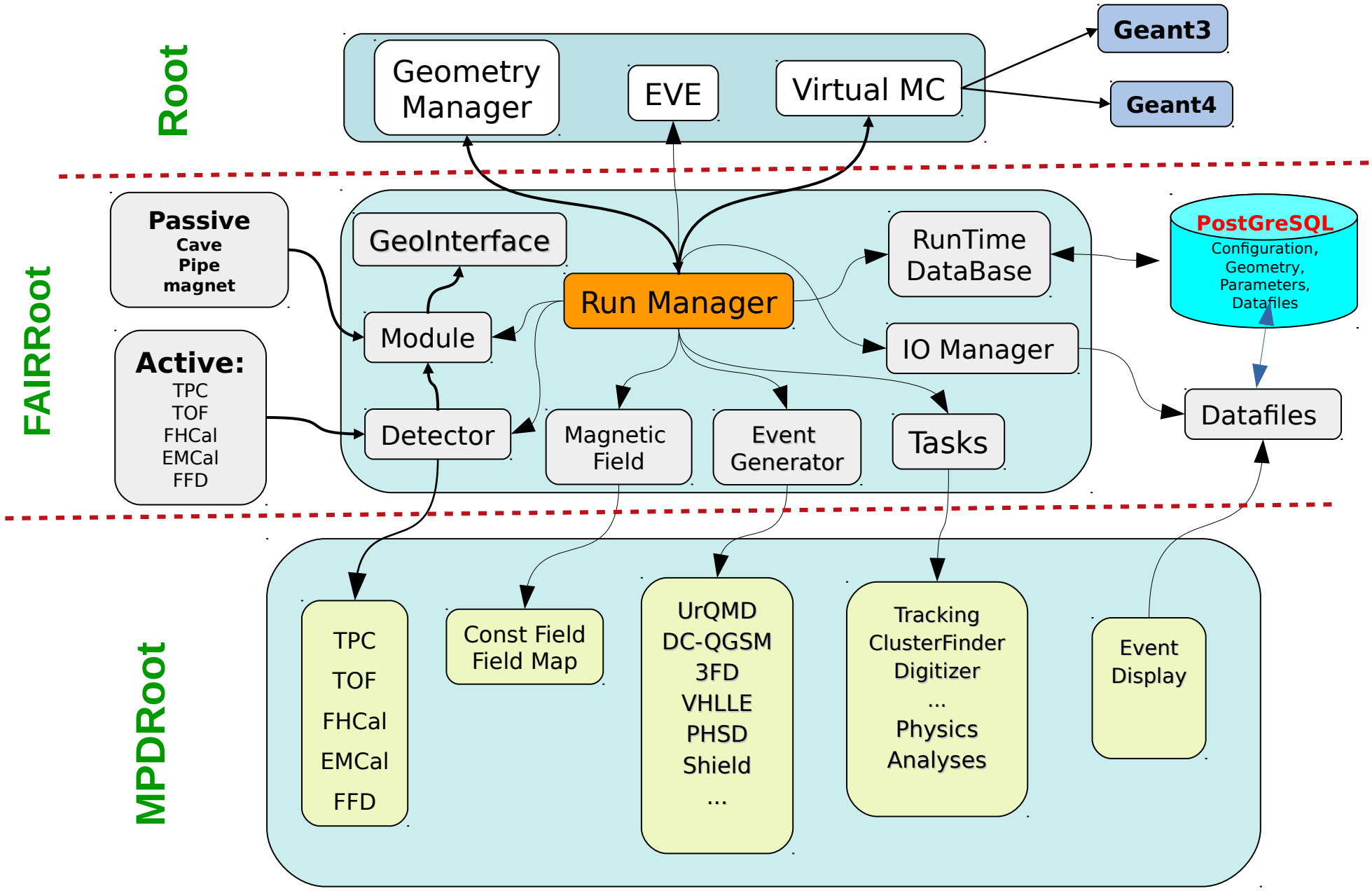
- Beams: from p to Au^{79+}
- Luminosity: $10^{27}\ cm^{-2}s^{-1}$ (Au), 10^{32} (p↑)
- Collision energy: $\sqrt{S_{NN}}$ = *4 – 11 Gev* E_{lab} = *1 – 6 AGev*

MPD experiment: 1 stage

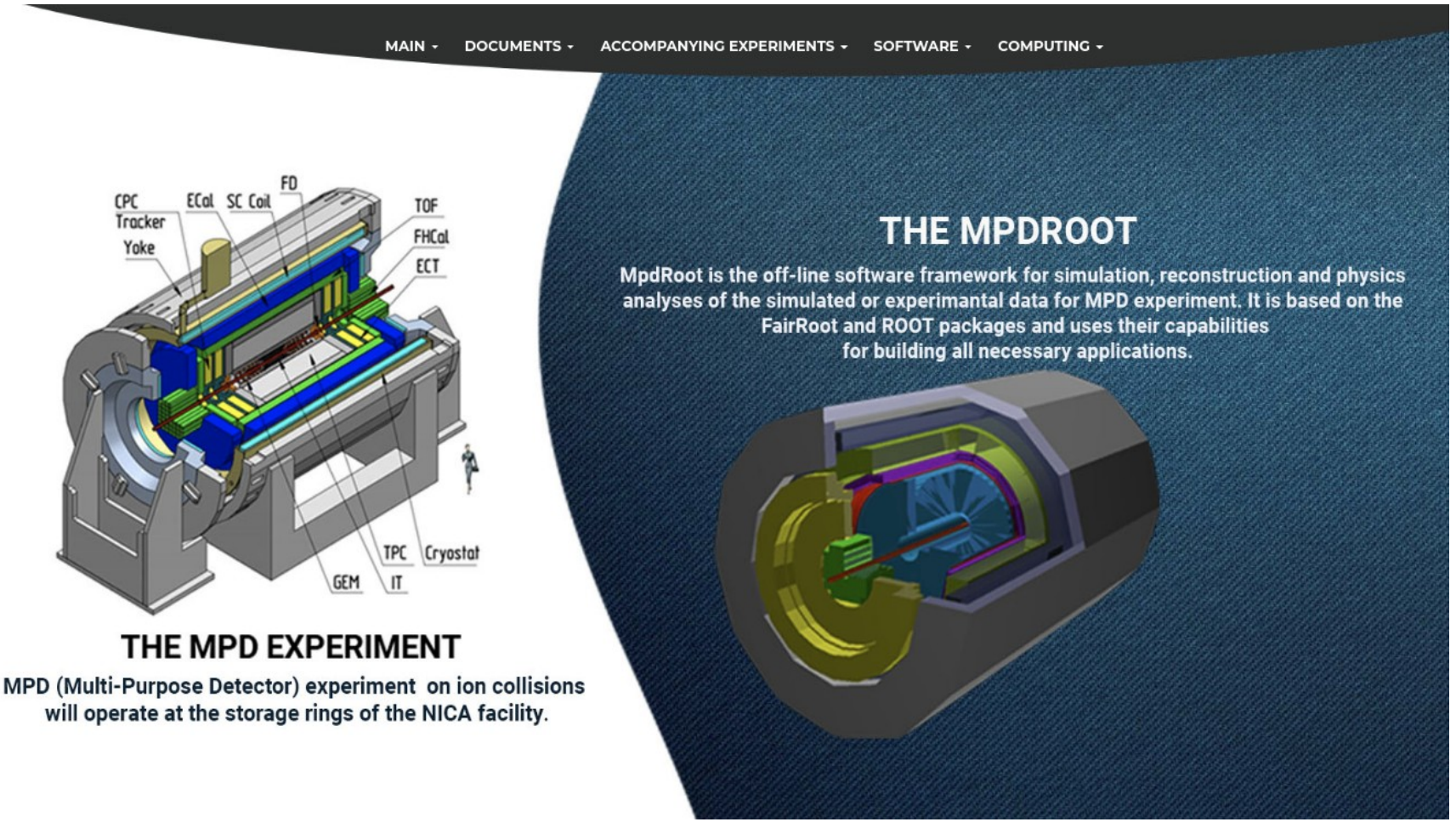




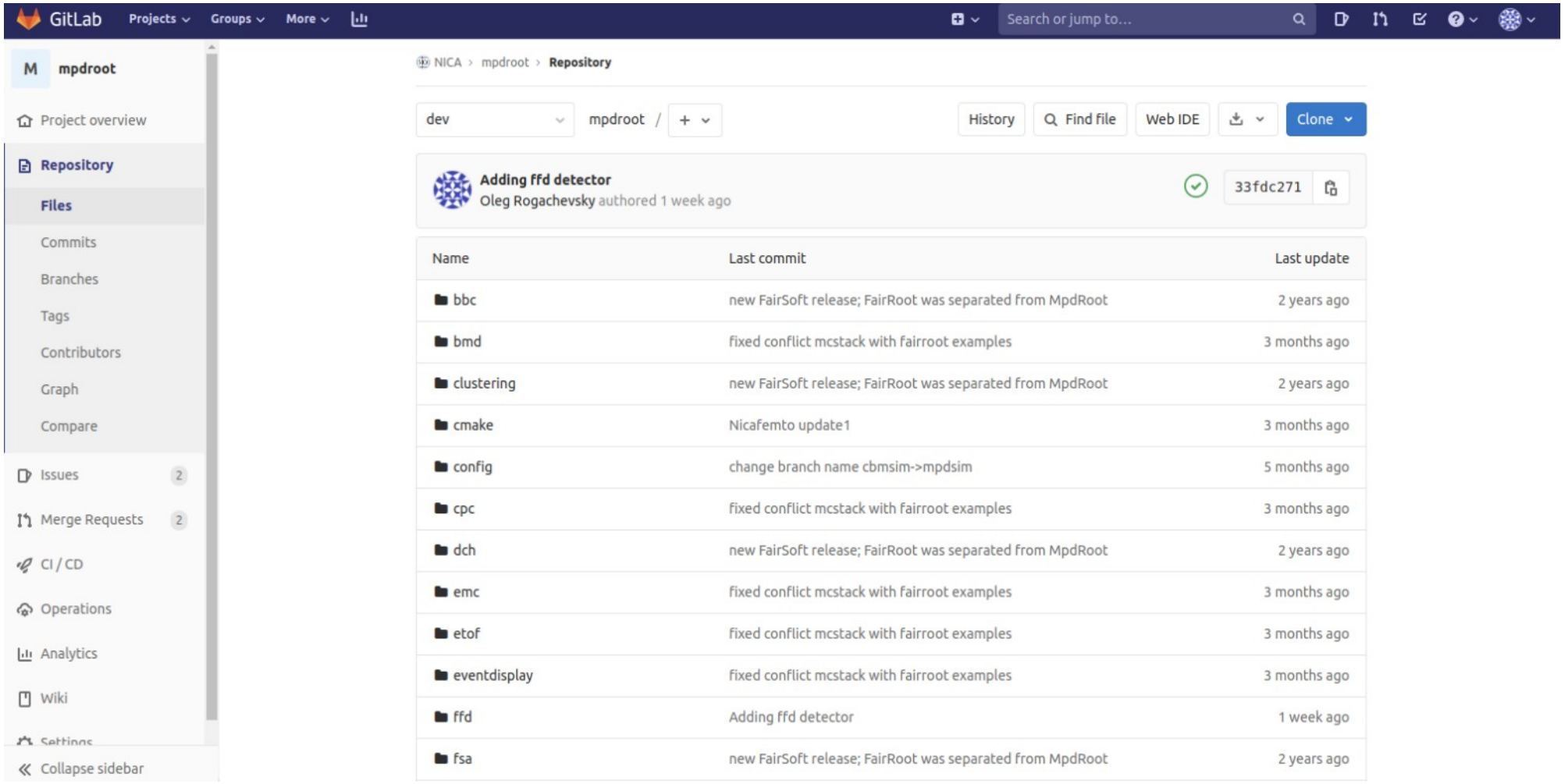
MpdRoot structure



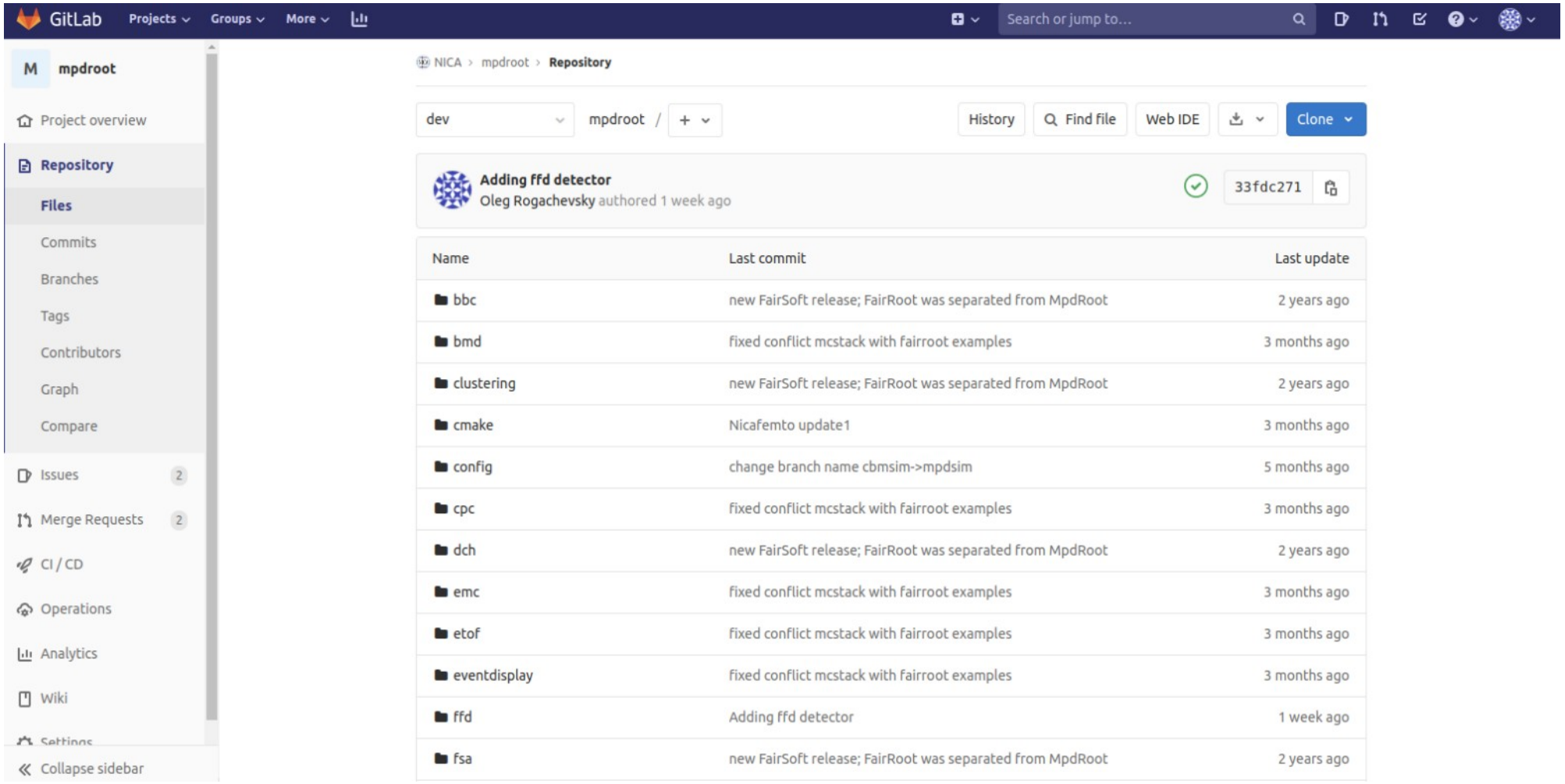
MPD.jinr.ru → mpdroot.jinr.ru



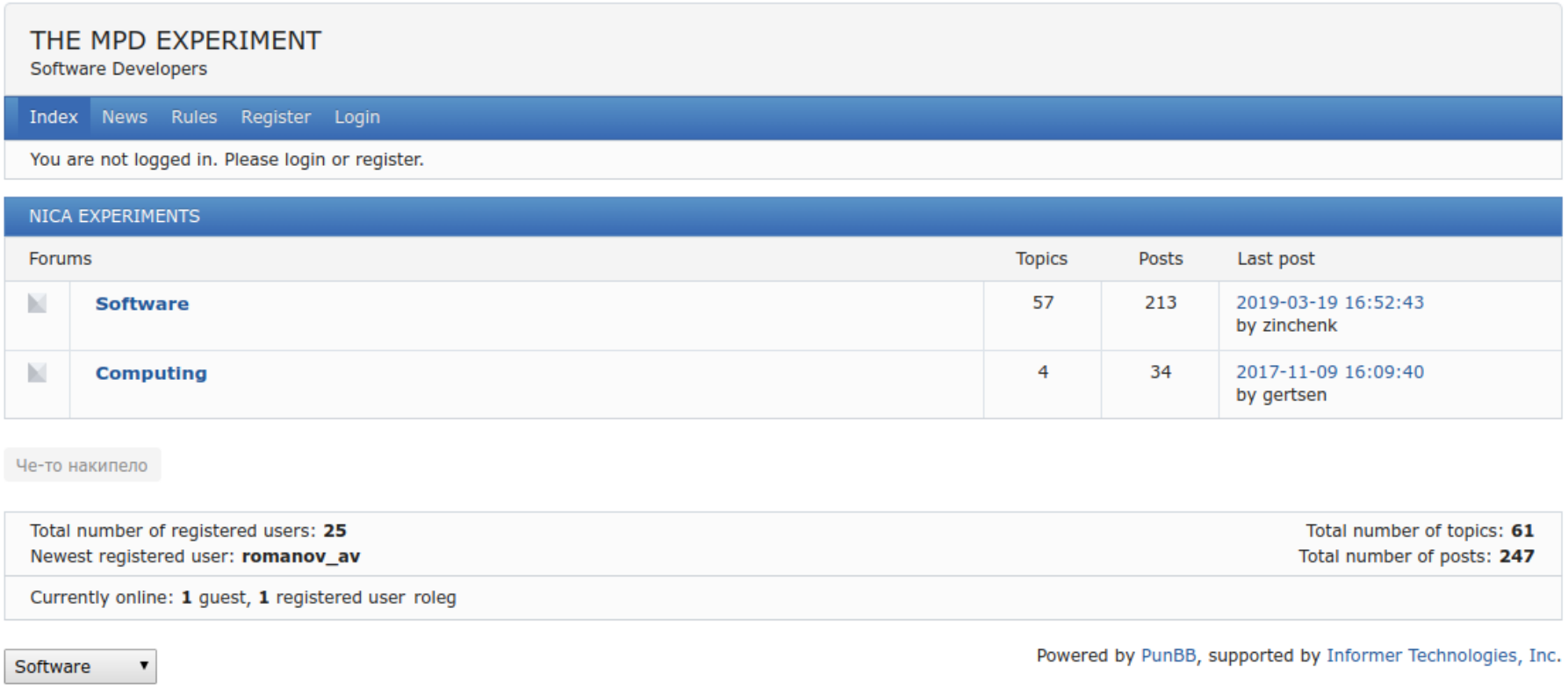
mpdroot.jinr.ru → Software → Mpdroot → Git access



mpdroot.jinr.ru → Software → Mpdroot → Git access



mpdroot.jinr.ru → Software → Users forum



THE MPD EXPERIMENT
Software Developers

Index | News | Rules | Register | Login

You are not logged in. Please login or register.

NICA EXPERIMENTS

Forums	Topics	Posts	Last post
Software	57	213	2019-03-19 16:52:43 by zinchenk
Computing	4	34	2017-11-09 16:09:40 by gertsen

Че-то накипело

Total number of registered users: **25**
Newest registered user: **romanov_av**

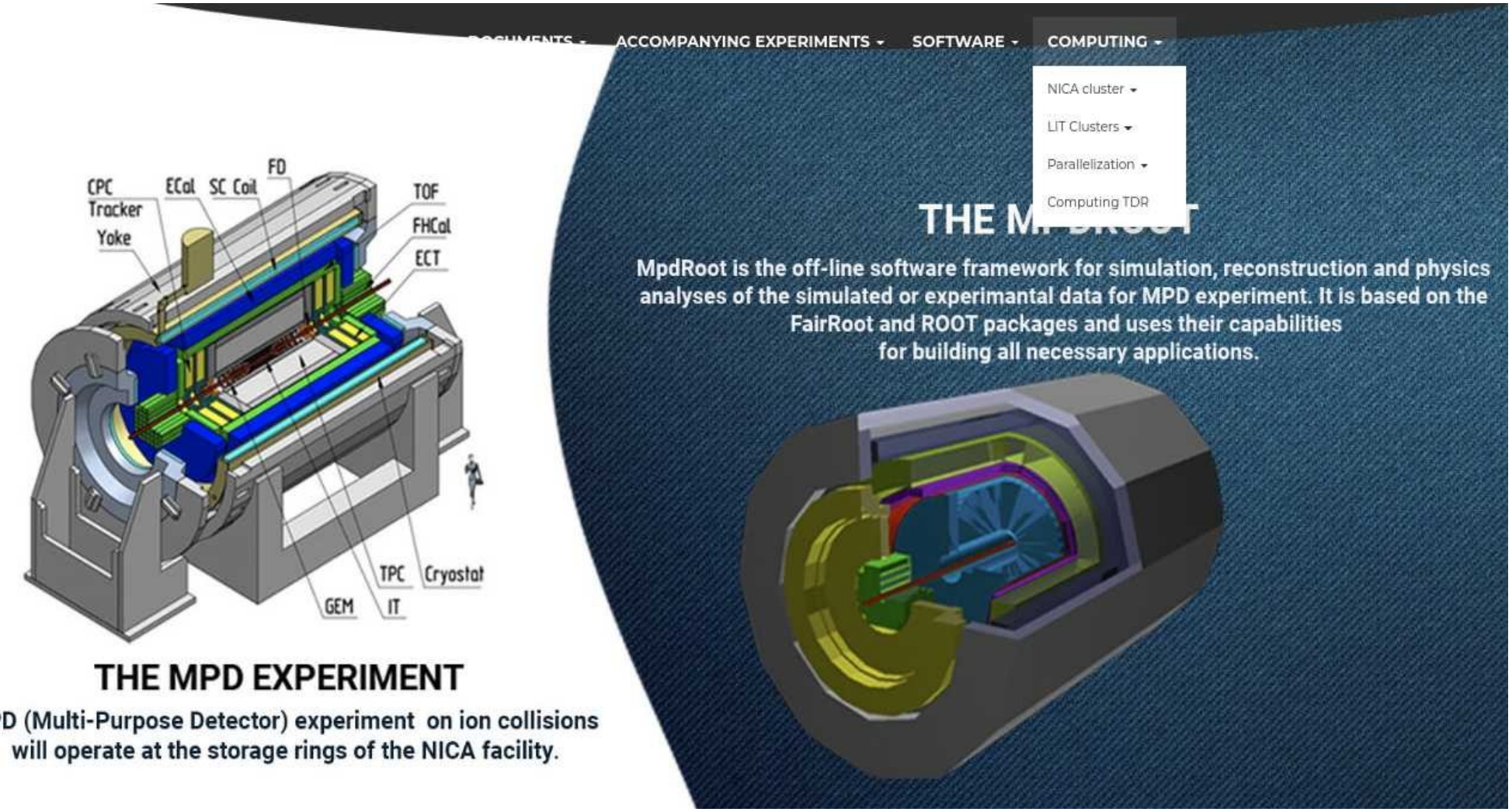
Total number of topics: **61**
Total number of posts: **247**

Currently online: **1** guest, **1** registered user roleg

Software

Powered by PunBB, supported by Informer Technologies, Inc.

mpdroot.jinr.ru → Computing

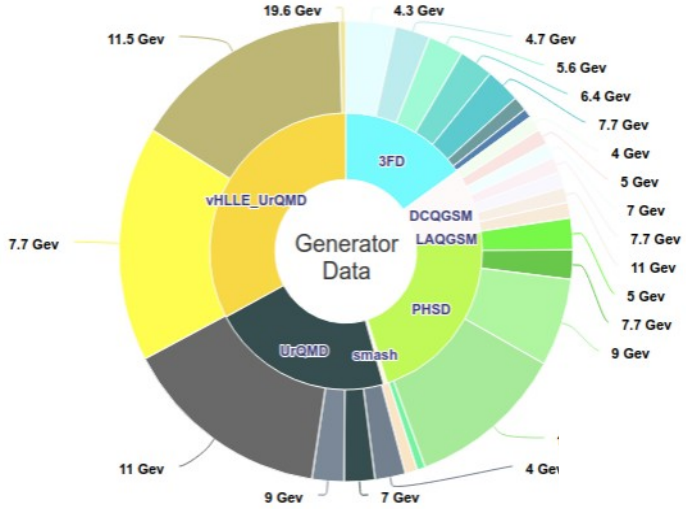


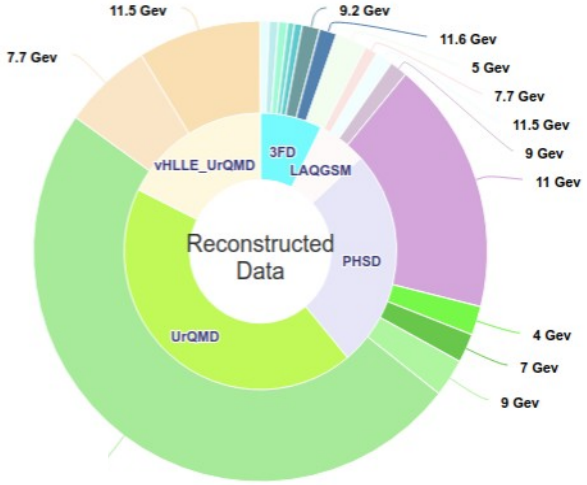
mpdroot.jinr.ru → Software → Databases → MPD database

MPD Monte-Carlo DB

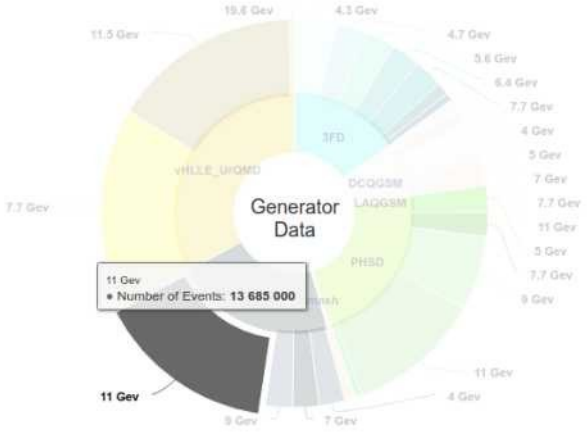
Logged in as

Records Statistic Find





LHEP NICA cluster
LIT EOS file system



Event generators & reco data databases in HybriLIT farm

MPD Monte-Carlo DB, Page 1 of 4

Home Find

1 2 3 4

Generator	Beam	Target	Energy, Gev	Centrality	Number of Events, Ev	Generator mod.	Reconstruction mod.	Generator comment	Path		
3FD	Au	Au	4.3	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-mix-urqmdOFF			/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/04.3GeV-02.0_02.0		
3FD	Au	Au	4.3	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-tph-urqmdOFF			/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/04.3GeV-02.0_02.		
3FD	Au	Au	4.7	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-mix-urqmdOFF			/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/04.7GeV-02.0_02.0		
3FD	Au	Au	4.7	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-tph-urqmdOFF			/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/04.7GeV-02.0_02.0fm/3fd-2018-03-17-bc2a06d-tph-urqmdOFF	Generator	View
3FD	Au	Au	5.6	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-mix-urqmdOFF			/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/05.6GeV-02.0_02.0fm/3fd-2018-03-17-bc2a06d-mix-urqmdOFF	Generator	View
3FD	Au	Au	5.6	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-tph-urqmdOFF			/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/05.6GeV-02.0_02.0fm/3fd-2018-03-17-bc2a06d-tph-urqmdOFF	Generator	View
3FD	Au	Au	6.4	02.0_02.0fm	505000	3fd-2018-03-17-bc2a06d-mix-urqmdOFF			/eos/hybrilit.jinr.ru/nica/models/3FD/AuAu/06.4GeV-02.0_02.0fm/3fd-2018-03-17-bc2a06d-mix-urqmdOFF	Generator	View
						3fd-2018-03-17-					

1 2 3 4

2018 - software team (contact e-mail: amoshkin@jinr.ru)

Generator	# of events M
QGSM	4
UrQMD	~ 15
PHSD	4
vHLLE_UrQMD	~ 4
3FD(Theseus)	5
Hybrid UrQMD	3

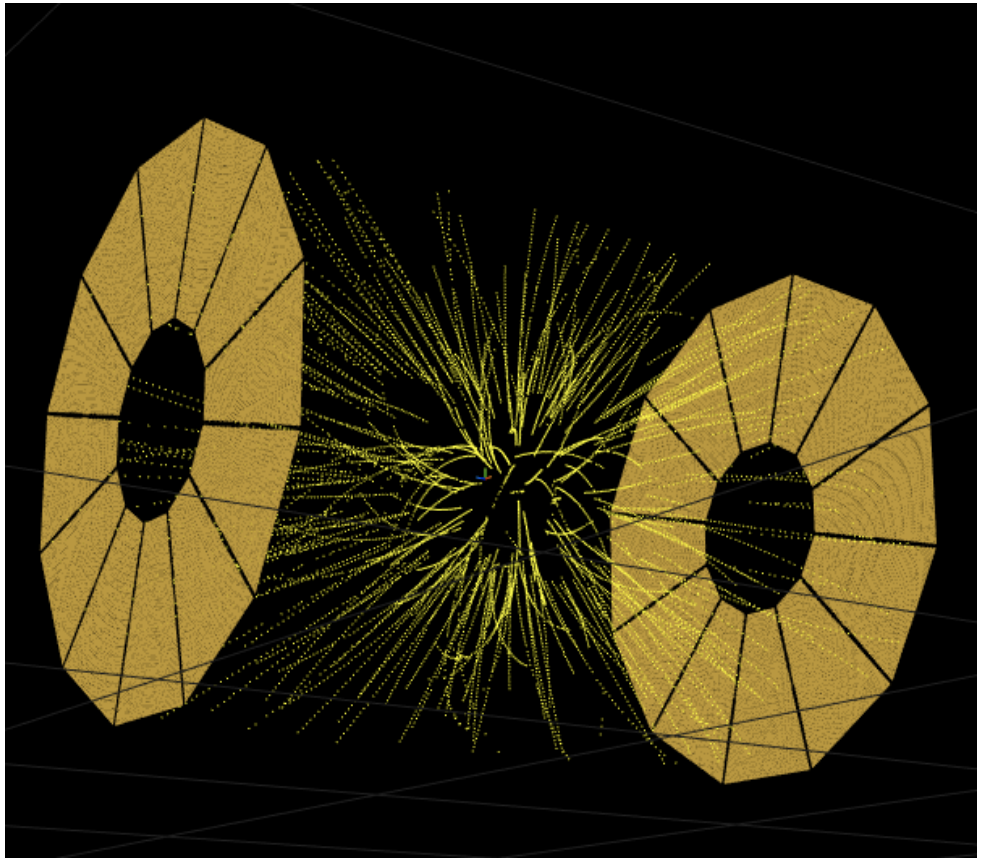
Detectors simulation status

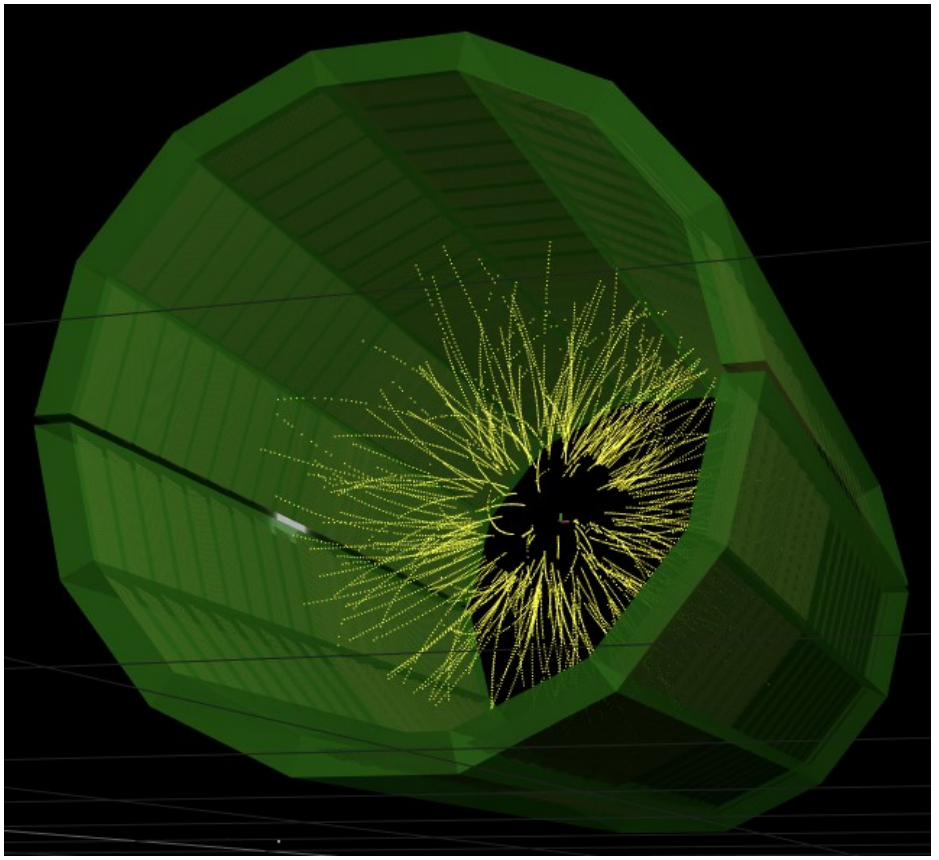
GitLab repository: https://git.jinr.ru/nica/mpdroot

Detector	MC Geometry	Hits/digits
TPC	Ver. 8 (2018)	hitproducer
TOF	Ver. 7 (2016)	hitproducer
ECAL	Ver. 8 (2018)	hitproducer
FHCal	Ver. 2 (2018)	hitproducer
ITS	Ver. 3 (2015)	hitproducer
FFD	Ver. 6 (2020)	hitproducer
BBC	Ver. 2 (2019)	MC points

mpdroot.jinr.ru → Software → Tasks → EventDisplay

Event Displays v.0.4
for Run Control System & Detectors Control System

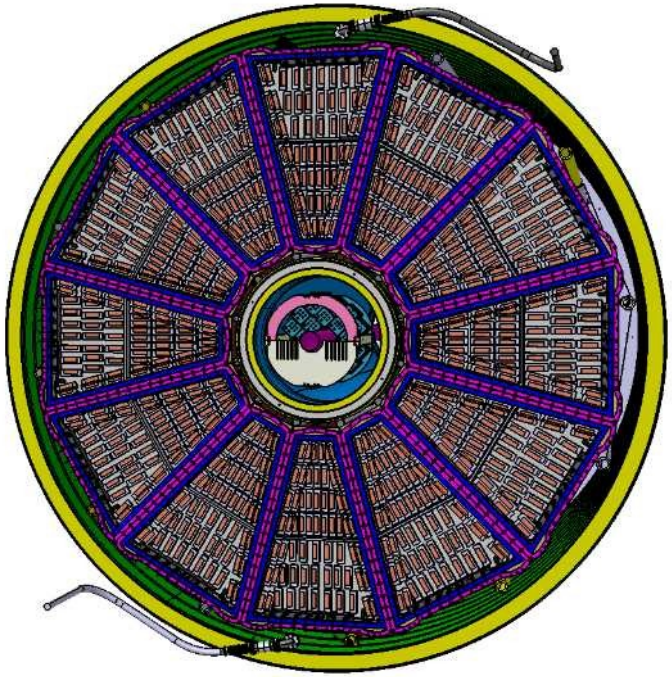




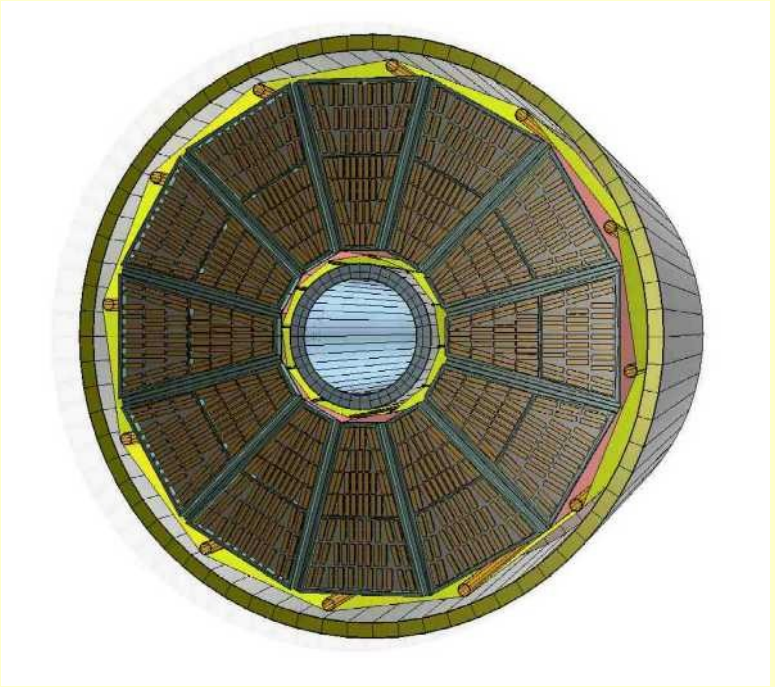
based on:

TPC geometry ver.8

- Drawing



- Root geometry



35 000 nodes

TPC Electronics Simulation

Each board:

2+1 mm Copper

3,5 mm Textolite

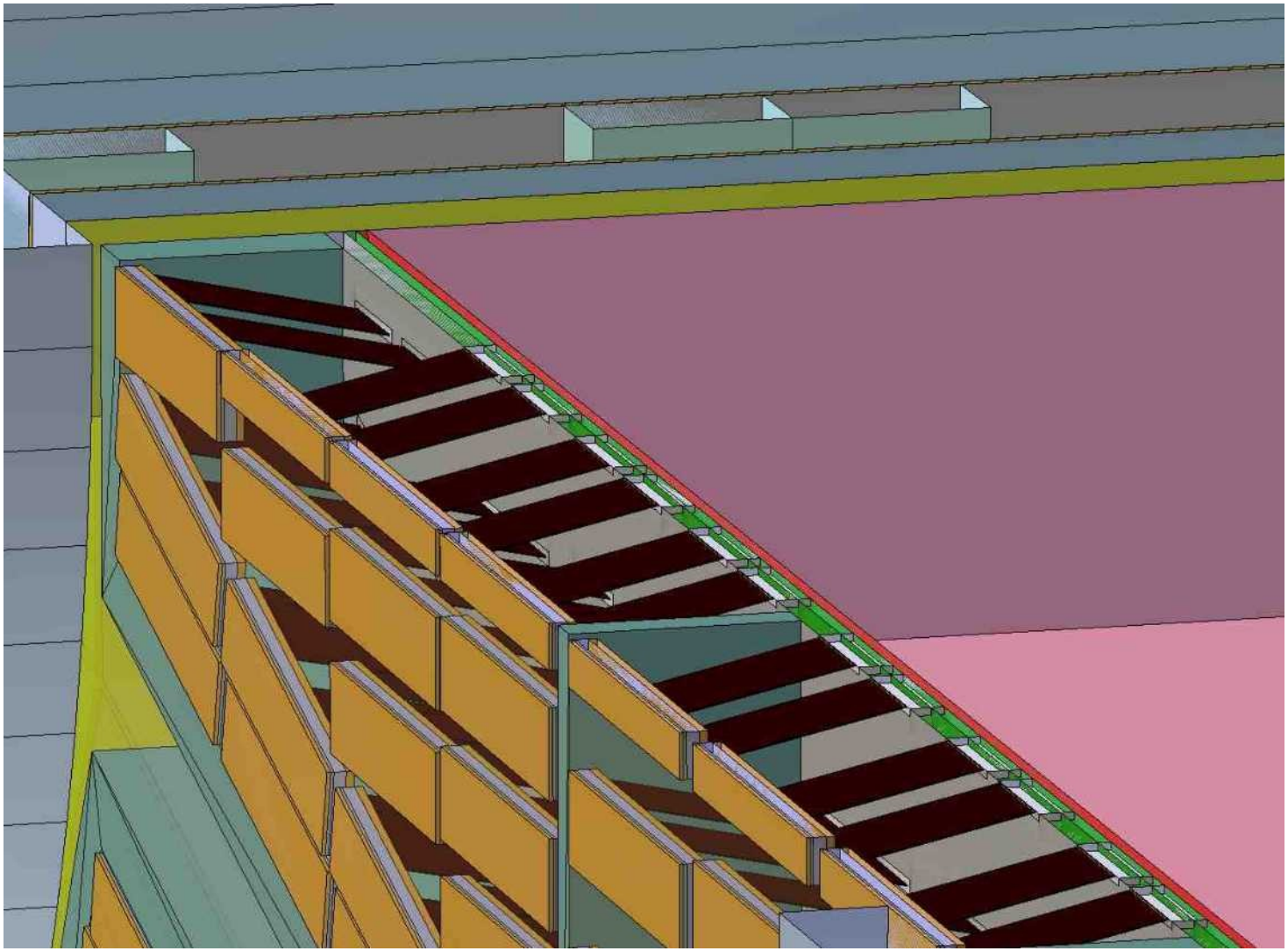
Flat cable:

0,1+0,1 mm
Polypropylene
Insulation

0,15 mm
Copper wire

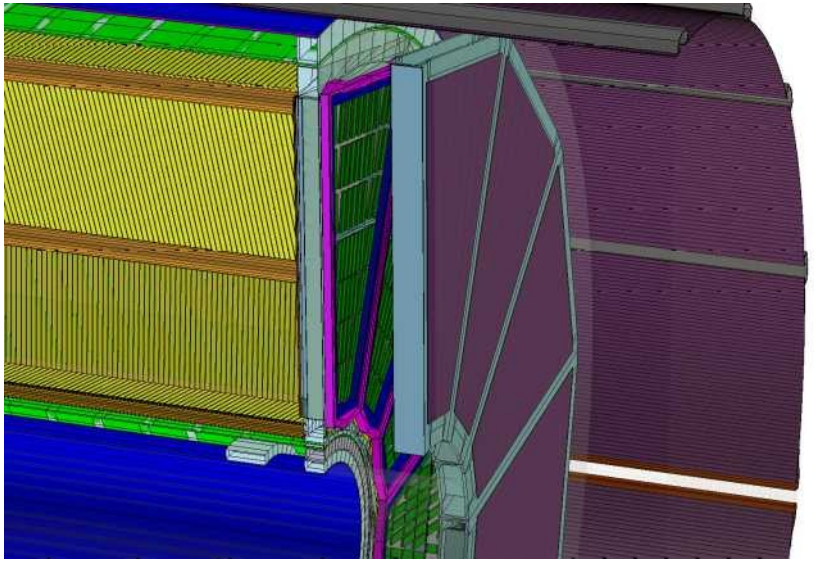
Connector to
Pads plane:

Plastic + Air gap

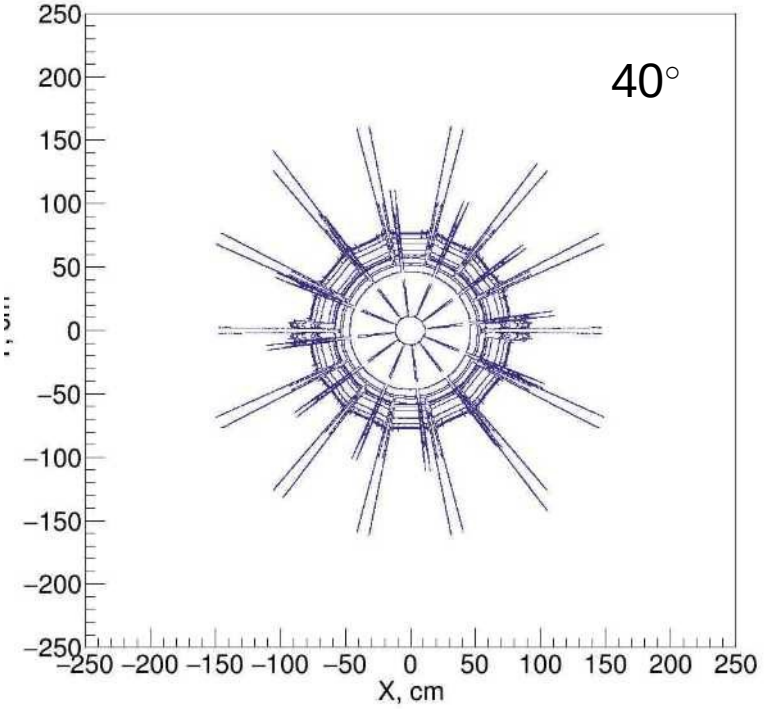


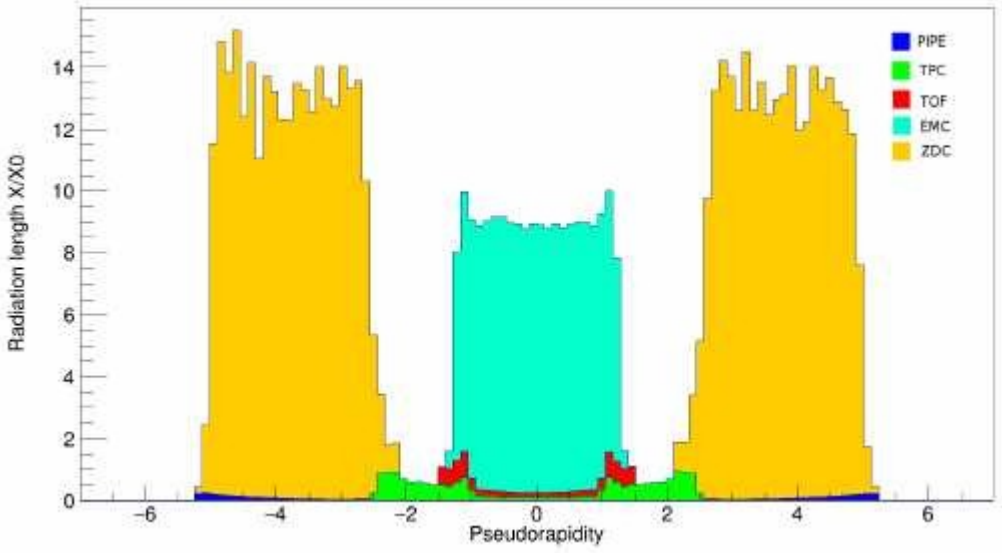
TPC material budget

Looking in TPC detector with geantino



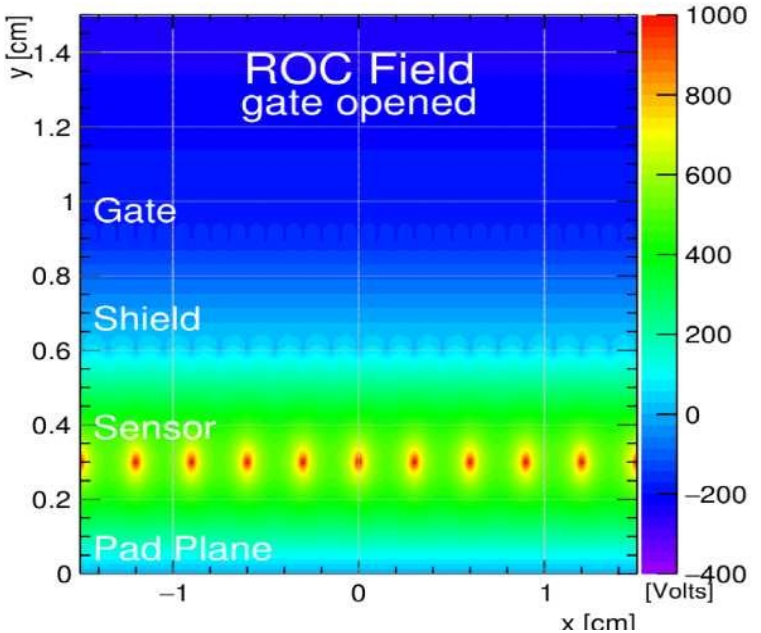
Material budget for TPC

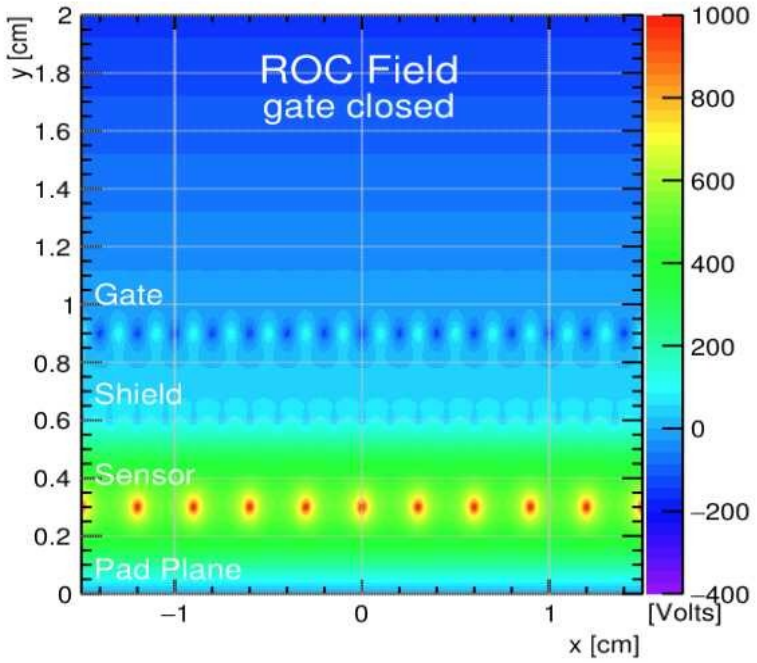




Material budget for all MPD detectors

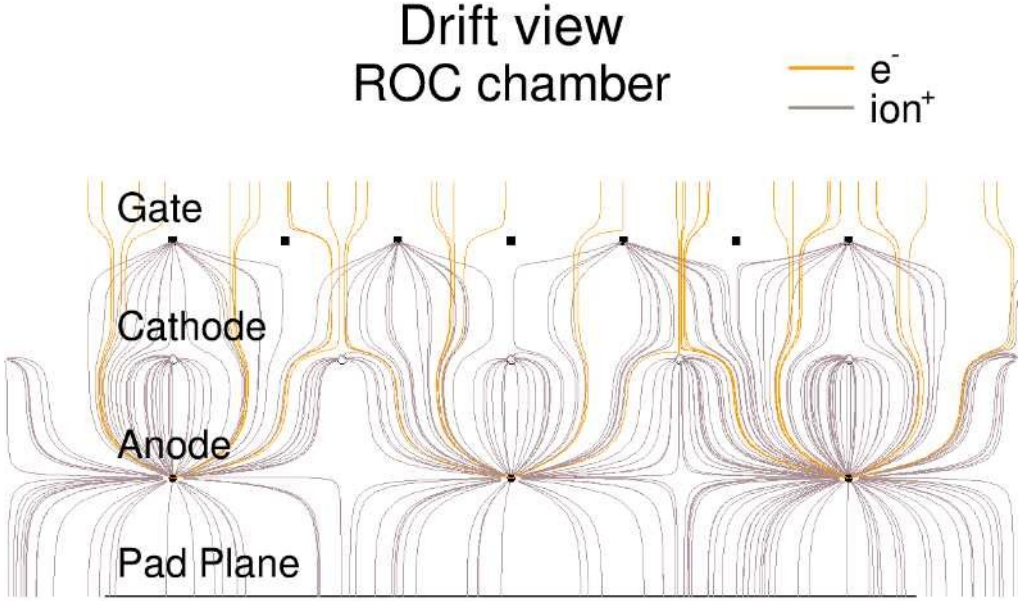
TPC gas and ROC properties



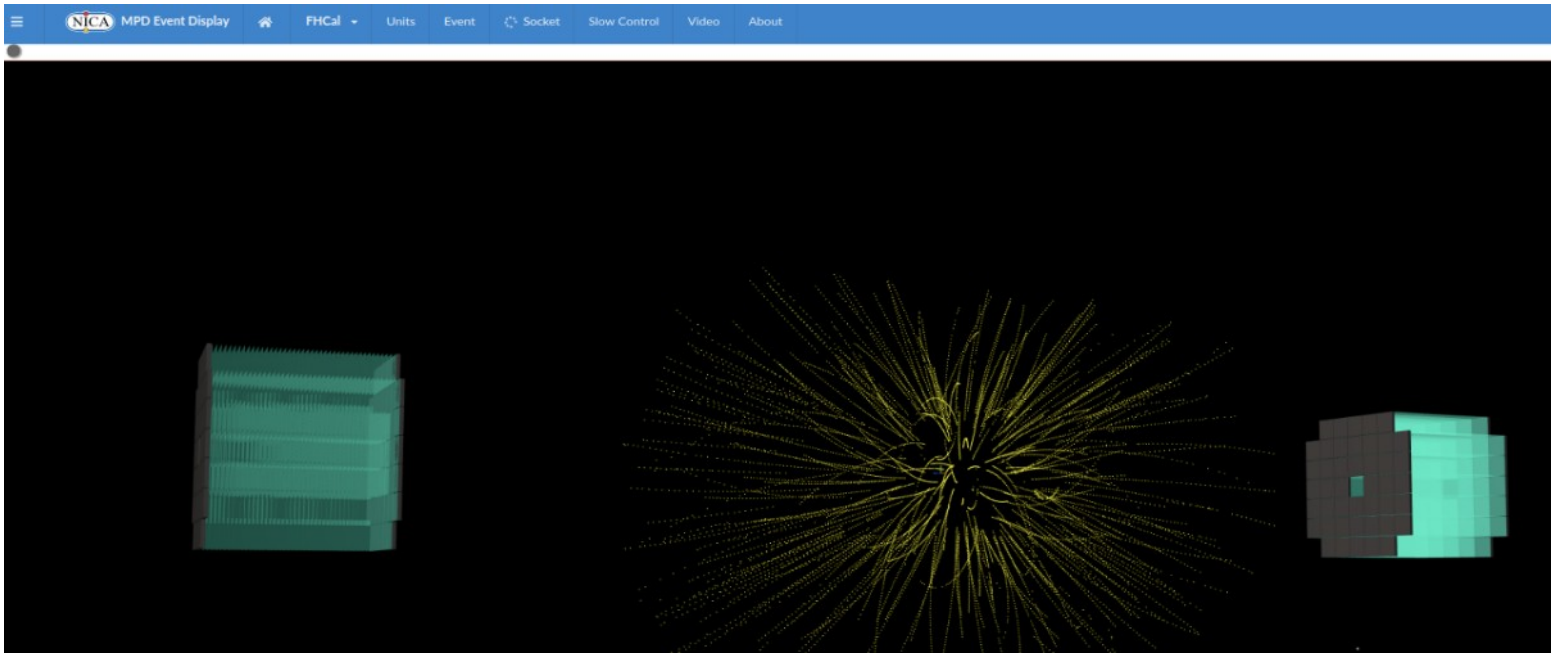


Garfield++

Version 2019.3



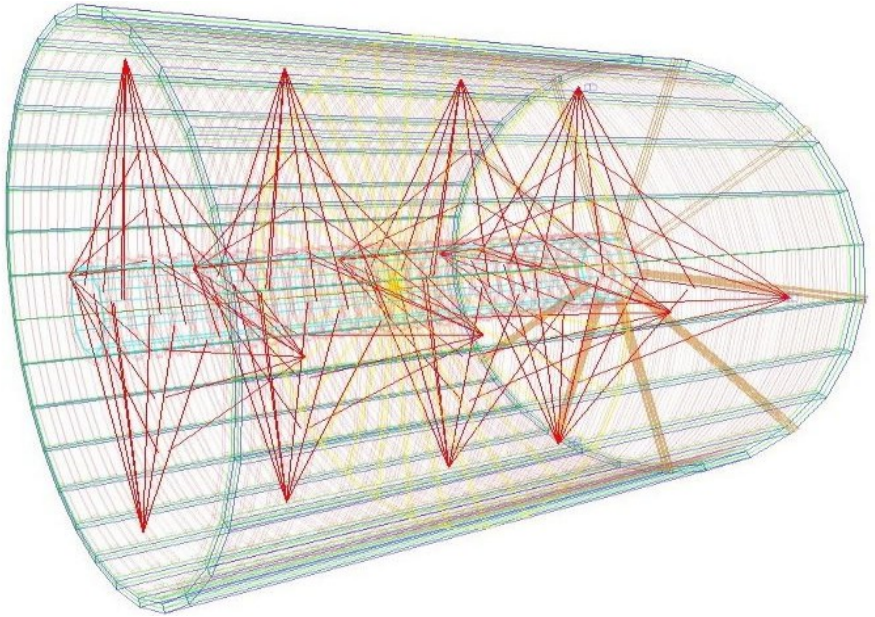
FHCal


MPD Event Display
FHCal
Units
Event
Socket
Slow Control
Video
About

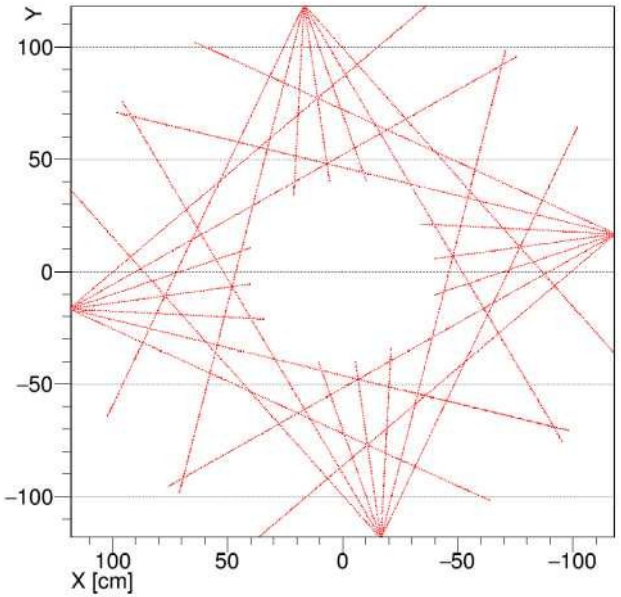
FFD

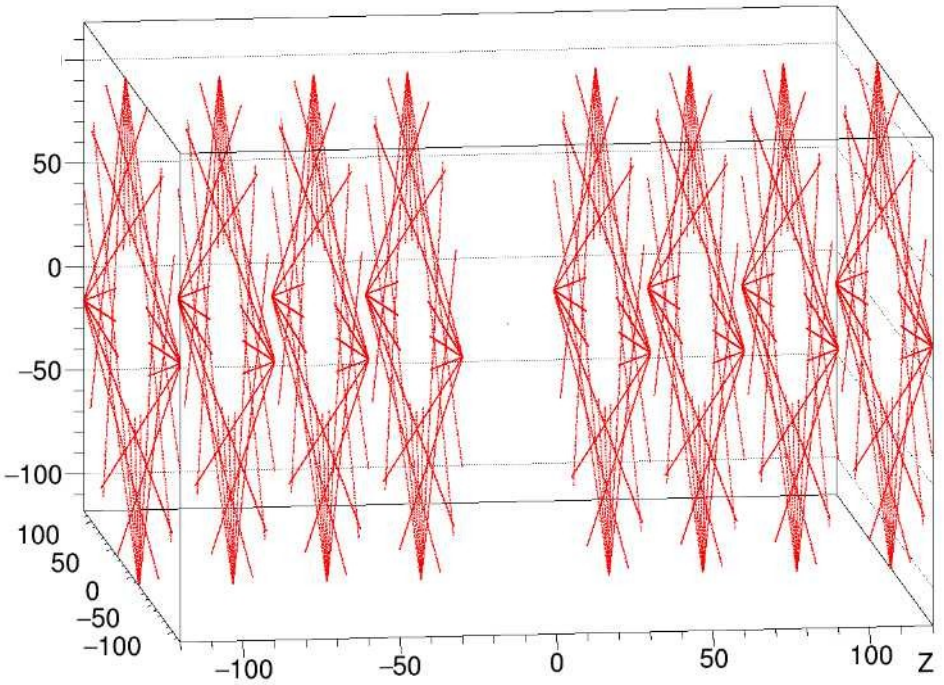
TPC laser calibration

Half of TPC



Laser “planes”	4
Micro-mirrors bundles per plane	4
Beams from micro-mirrors bundle	7
Laser “tracks”	224





TPC alignment (preliminary)

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Â   <TpcSector n="0">
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      <ShiftY unit="cm">0.0648</ShiftY>
      <ShiftZ unit="cm">-0.0096</ShiftZ>
      <RotationX unit="deg">-0.04505</RotationX>
      <RotationY unit="deg">0.0009</RotationY>
      <RotationZ unit="deg">0.03625</RotationZ>
    </TpcSector>
    <TpcSector n="1">
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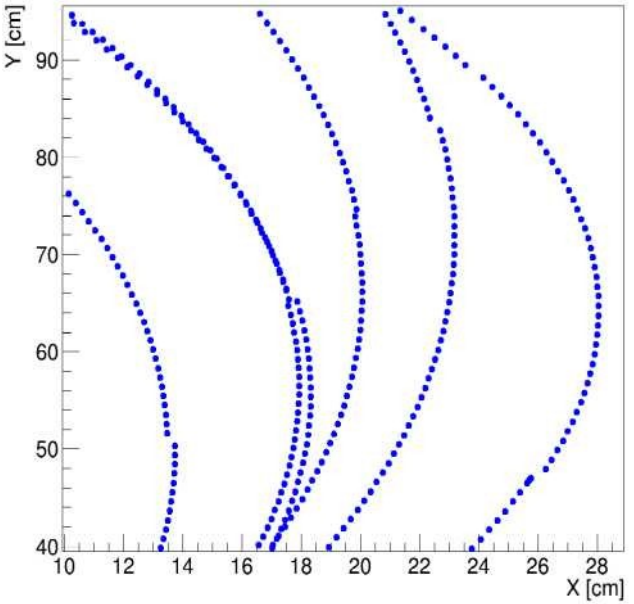
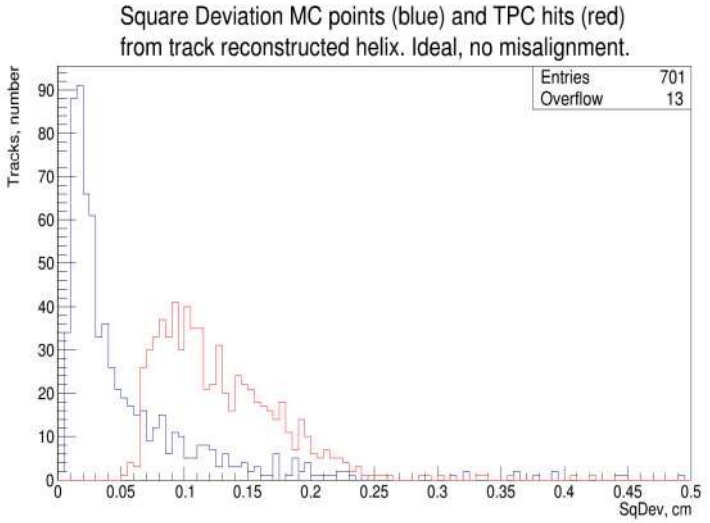
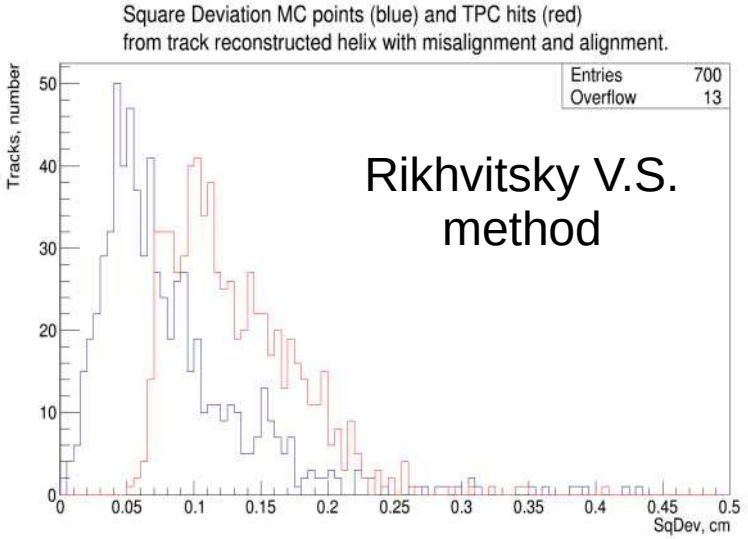
      <ShiftY unit="cm">-0.1194</ShiftY>
      <ShiftZ unit="cm">0.01785</ShiftZ>
      <RotationX unit="deg">0.03215</RotationX>
      <RotationY unit="deg">-0.04435</RotationY>
      <RotationZ unit="deg">0.0297</RotationZ>
    </TpcSector>
```

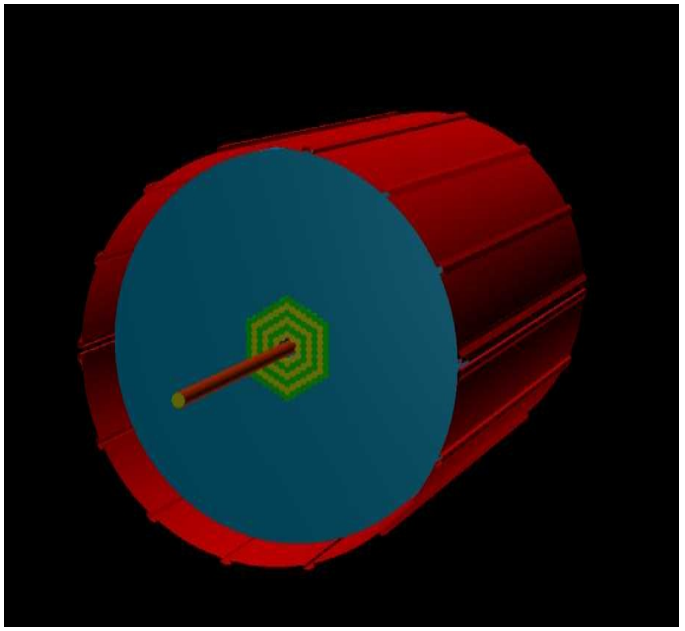
MC points on the border of sectors



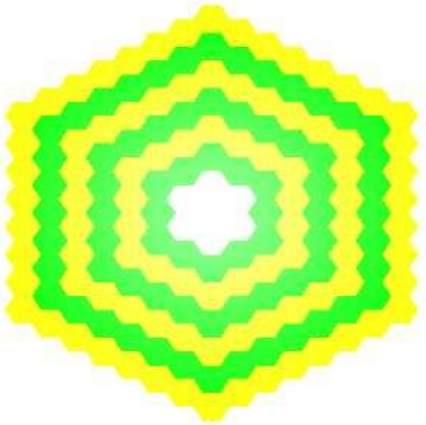


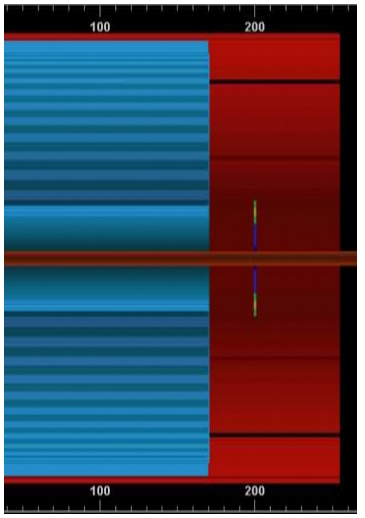


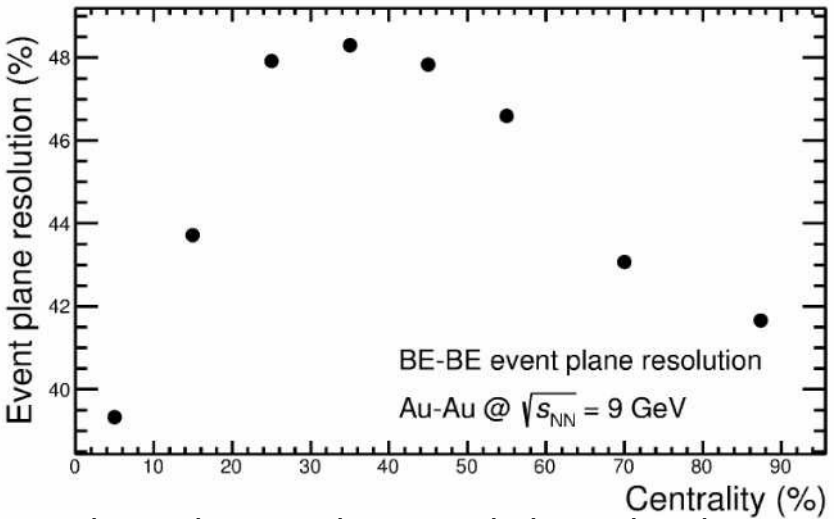
Beam Beam monitoring



ArXiv:1809.10553





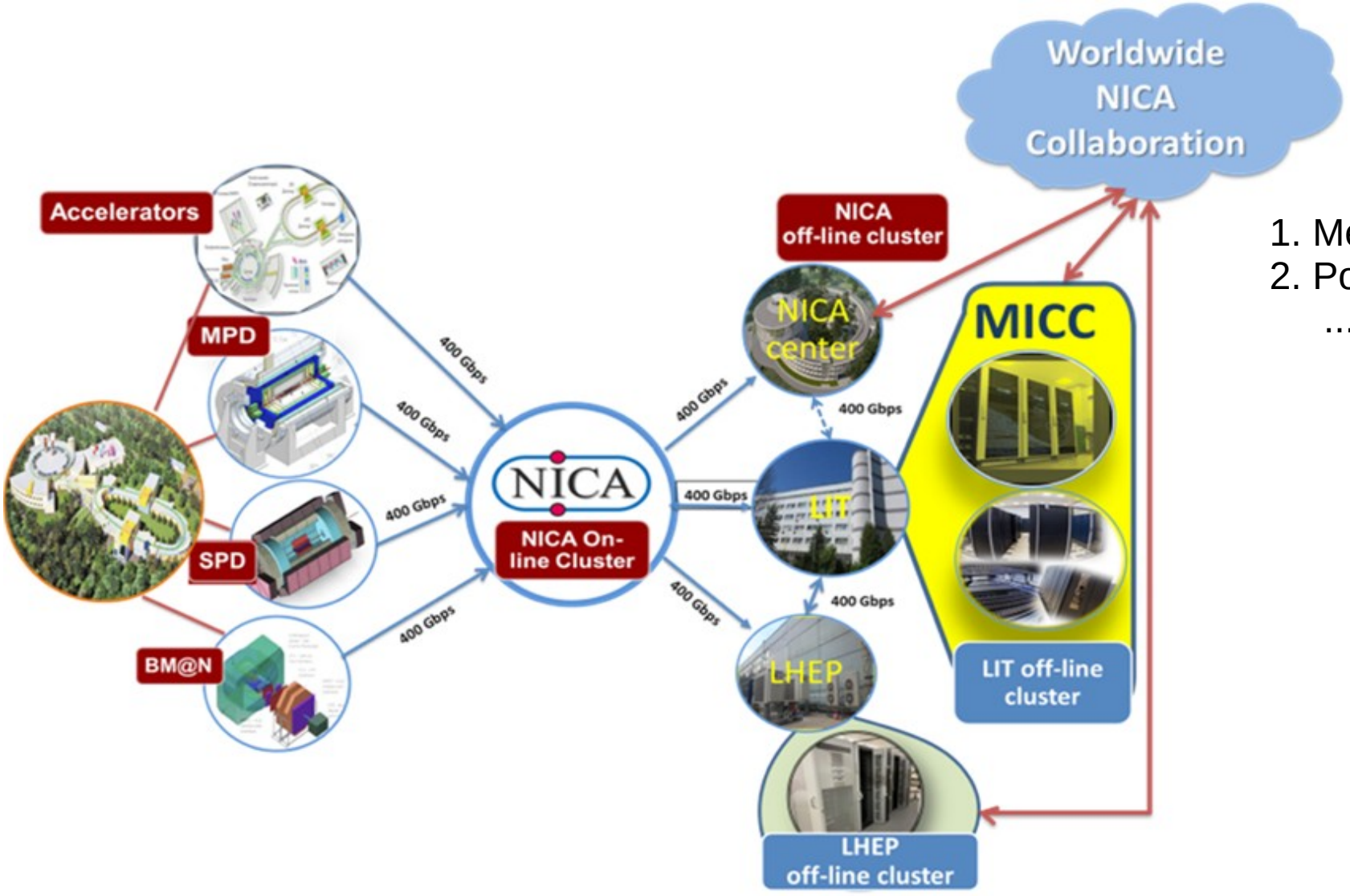


Estimated event plane resolution using the BE-BE

The MPD beam-beam monitoring system is considered as a part of level-0 trigger. Its time resolution is expected to be around 30 ps. To fulfill the trigger requirements the BE-BE geometry consists of two hodoscope detectors, each located 2 meters away from the interaction point, at opposite sides. Each detector consists of an array of 162 hexagonal plastic scintillator cells arranged in six concentric rings. It covers a pseudorapidity range of $1.9 < |\eta| < 3.97$.

The BE-BE's trigger signal will be useful to generate a trigger logic to identify and discriminate beam-beam events, either for minimum bias or with a given centrality, from background and beam-gas interactions.

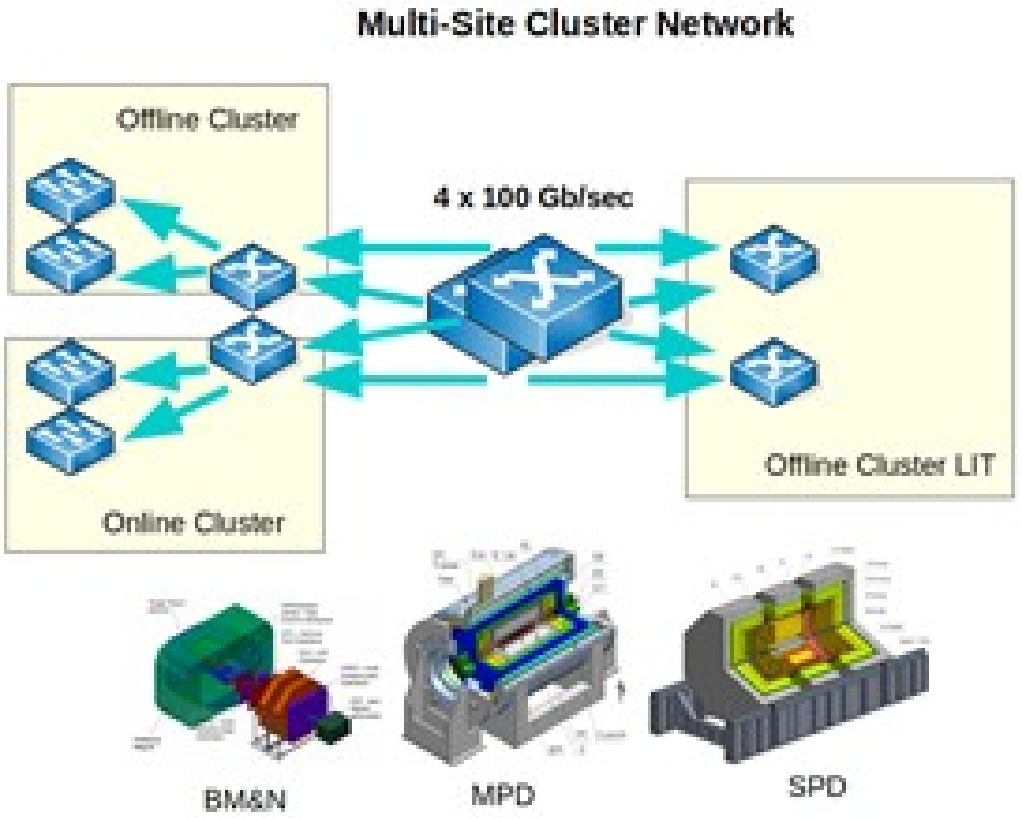
Computing structure of NICA complex



1. Mexica
2. Poland

...

Example communication LHEP and LIT sites of the NICA complex on two independent optical line

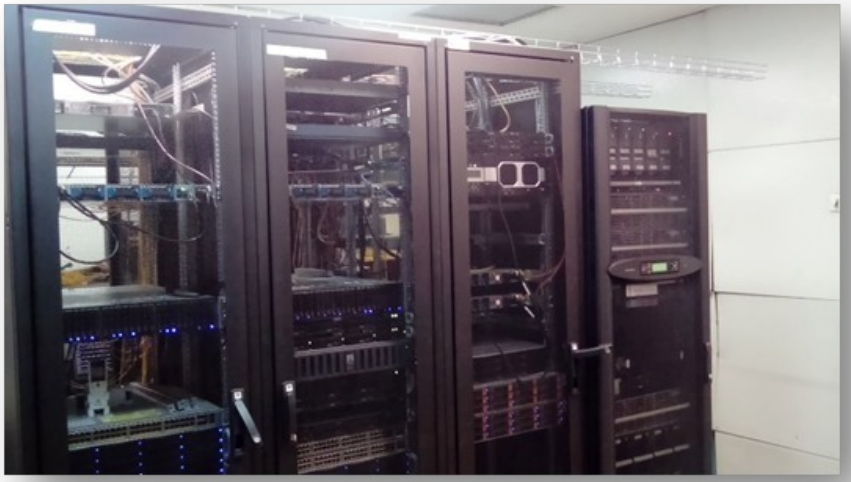


The core of the network system, switching will be performed on the

Cisco Nexus 9504

4 x 100Gbps

LHEP clusters



NICA on-line cluster

Mean data flow 10 Gb/c

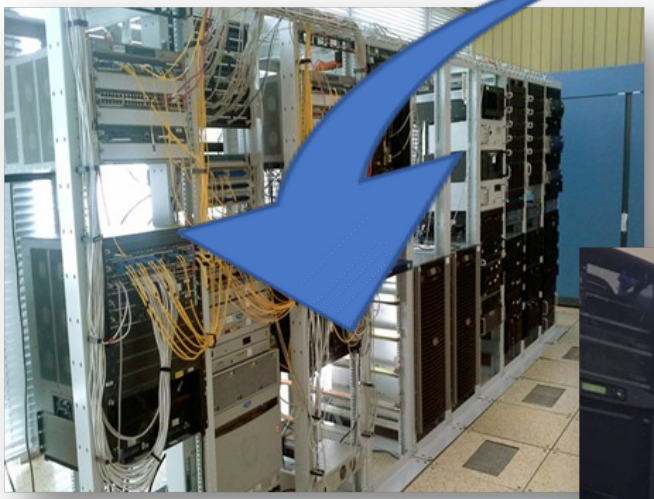
Disk space 0,5 PB for 24 h.

100 Gbps

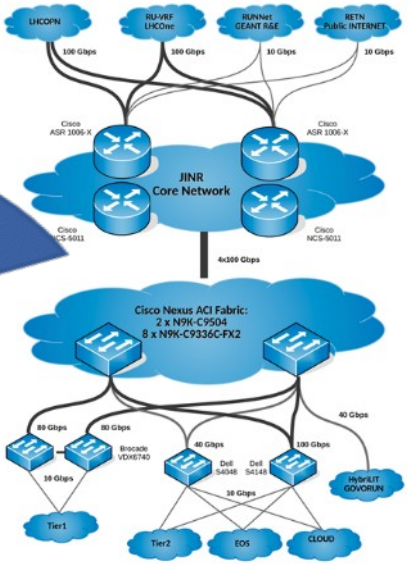
10 PB Disk space
5K CPU

LIT : off-line cluster for NICA

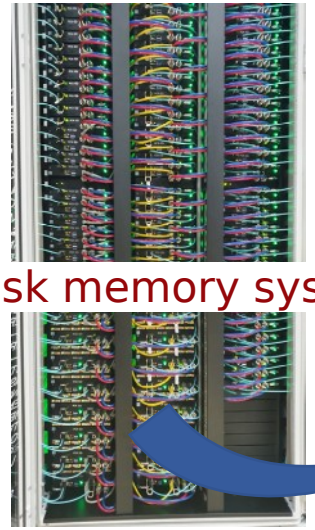
LIT Network center



Up to 10 PB /year



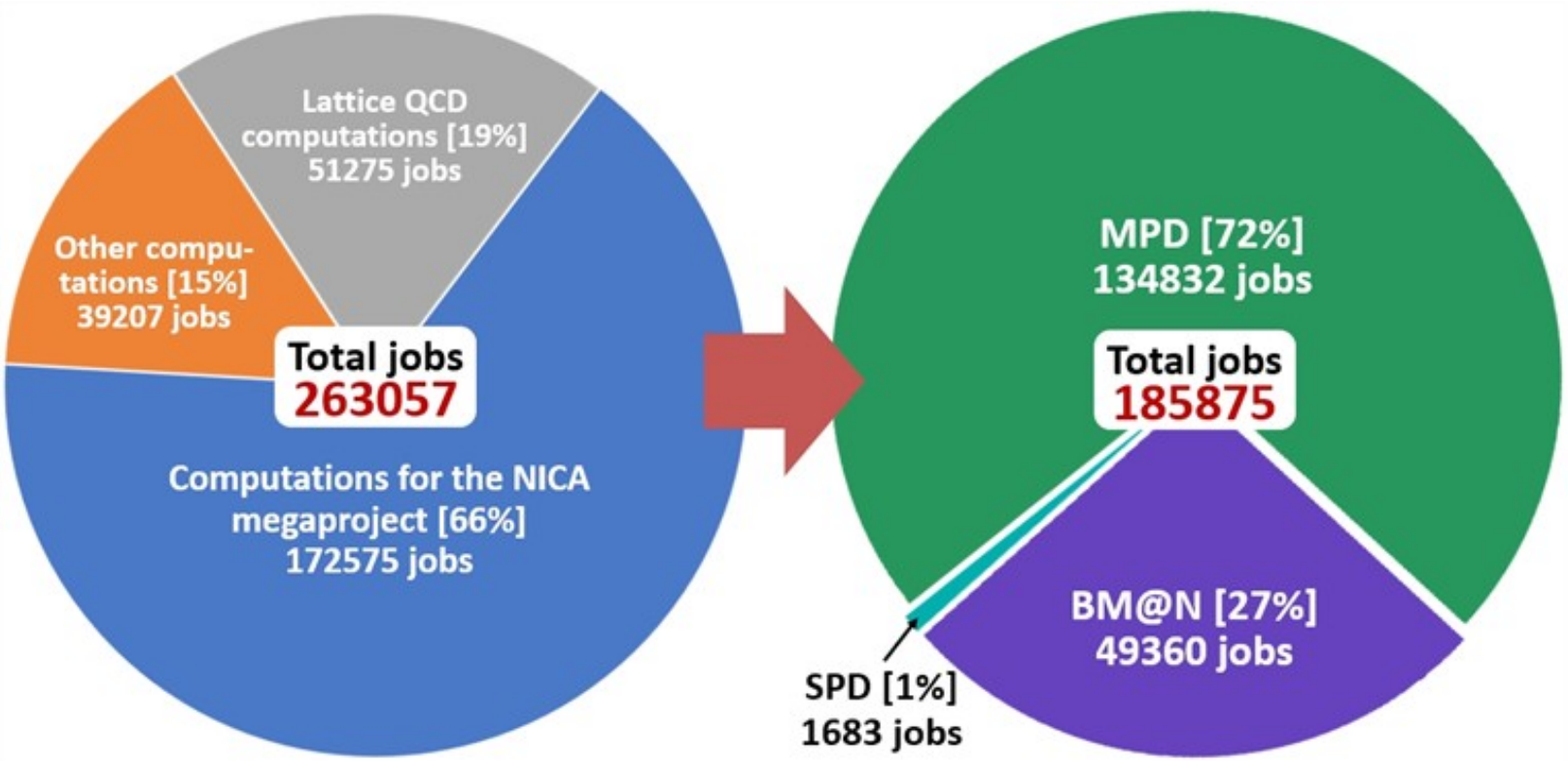
Supercomputer
“GOVORUN”



ultrafast disk memory system

LIT type robot

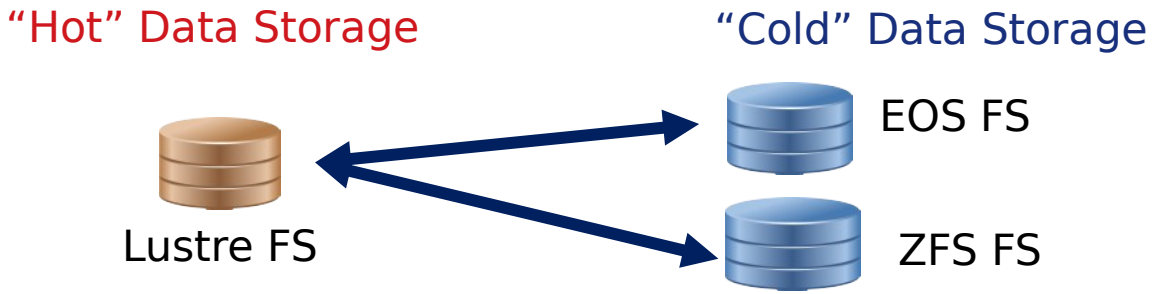
Super computer GOVORUN



GOVORUN tasks distributions for NICA

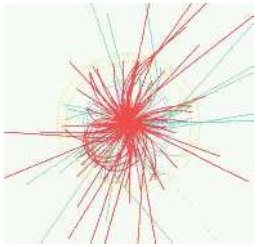
Computing for MPD in HybriLIT

Data storage organization



Data flow organization

Particles Generator
- internal
- external



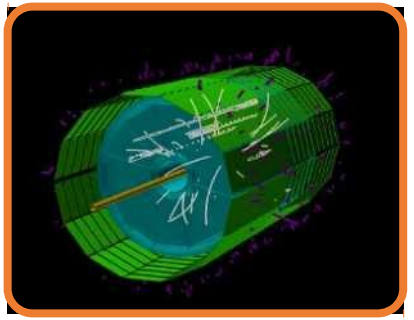
Experiment

MpdRoot

Simulation & reconstruction framework

DIRAC
THE INTERWARE

Data Management System



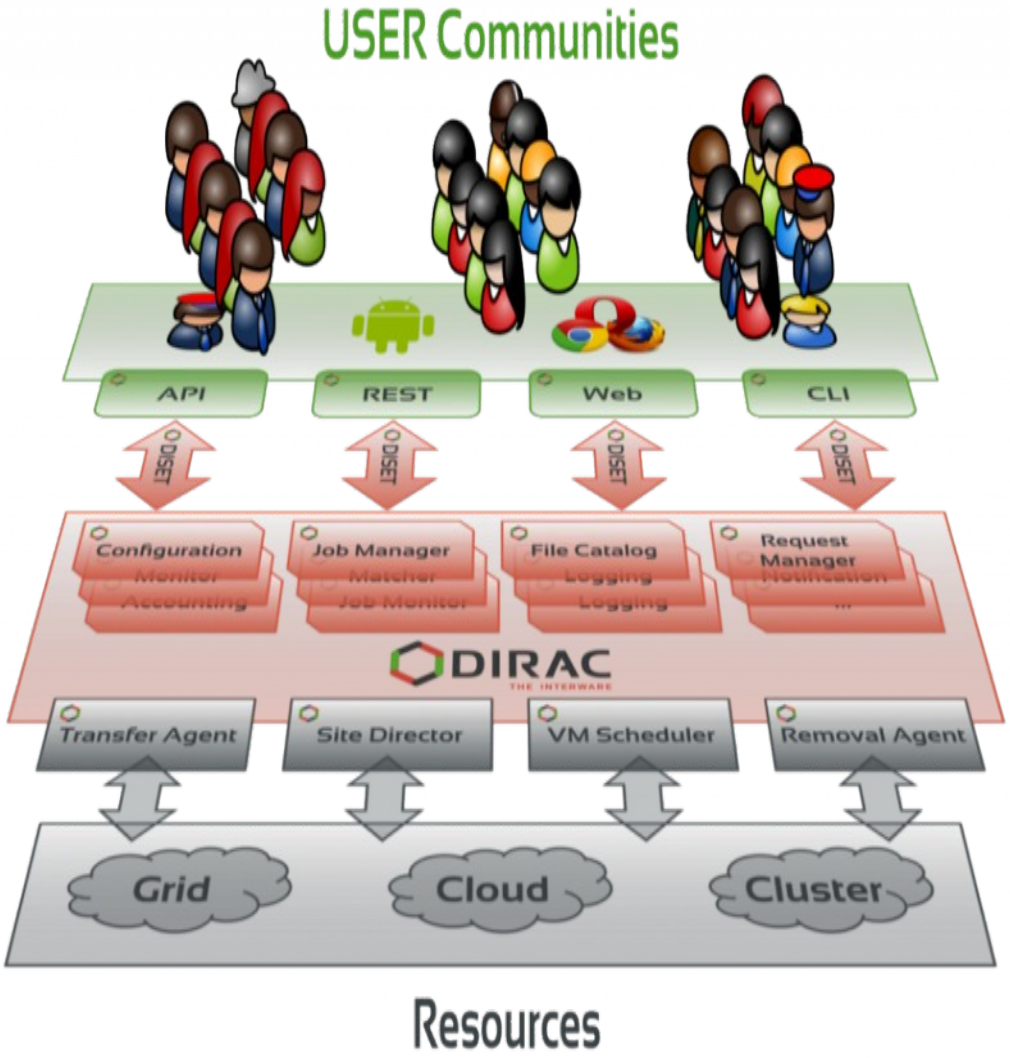
DIRAC Interware

The DIRAC Interware is an open source software which provides various interfaces, services and tools for the integration of distributed heterogeneous computing and storage resources.

DIRAC is "All in one" tool. It provides:

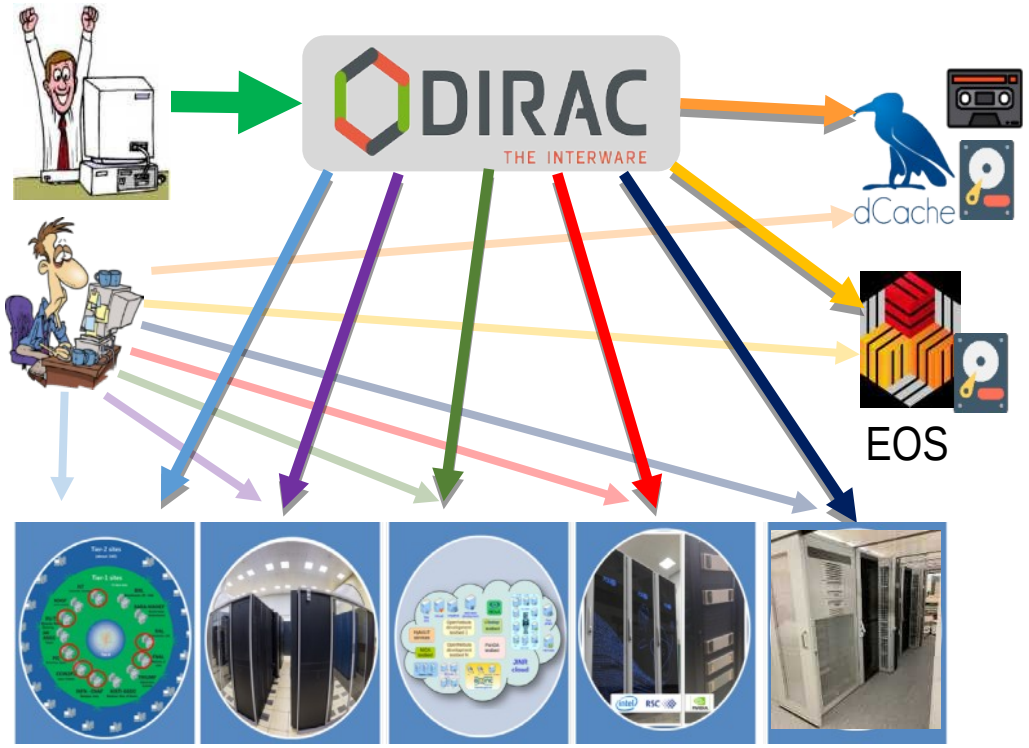
- Workload Management
- Data Management
- Workflow management
- Resource management
- Accounting
- Monitoring

DIRAC development was originally started by LHCb experiment. Later it became open source general purpose tool developed by international consortium of developers from: LHCb, Belle2, BES-III, CLIC, ILC, and others.



DIRAC is installed and studied in JINR since 2016

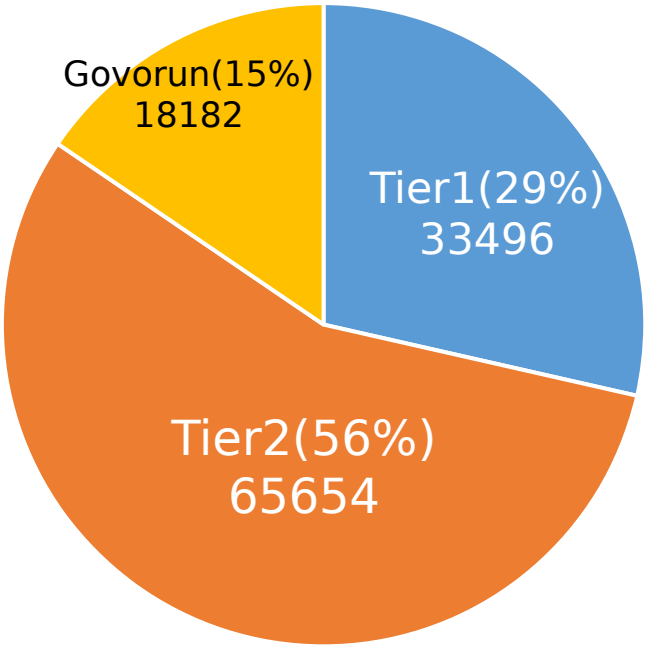
JINR computing resources integration



Monte-Carlo for MPD were successfully performed on the integrated system. It works right now. Jobs use Tier-1, Tier-2 and Govorun via DIRAC. Govorun was added recently to DIRAC. JINR and Member-States cloud resources have been tested and ready to accept jobs. NICA Cluster is the next on the list.

The DIRAC Interware is a software which provides various interfaces for the integration of distributed heterogeneous computing and storage resources.
Instead of using all JINR storage and computing resources individually, DIRAC allows processing of large amounts of data through unified single system.

~120000 MPD Jobs done using DIRAC



Current & Future Tasks

- Manpower
- Boost clustering in detectors,
- Boost tracking,
- Detectors alignment and calibrations,
- Cloud computing for the MPD experiment,
- Virtual organisation for MPD in GRID,
- ….

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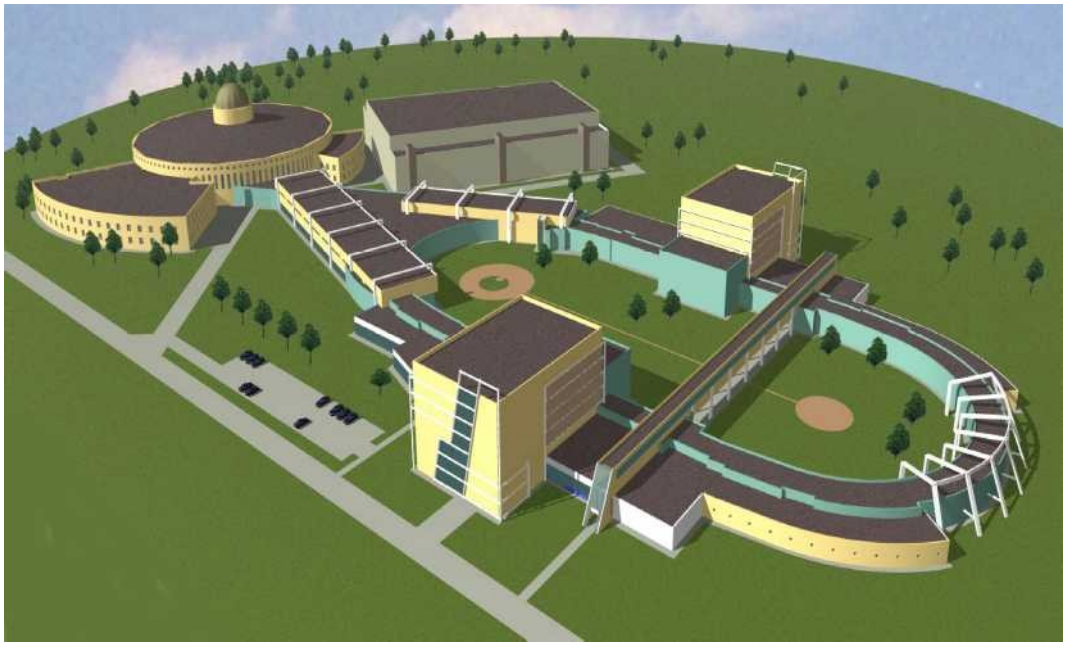
Thank for your attention



You are welcome