

# Status of Event Reconstruction in Xe Run



Sergei Merts

on behalf of BERDS Group

16/09/22

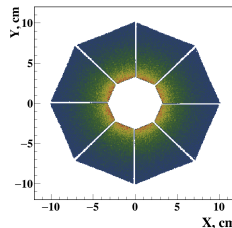
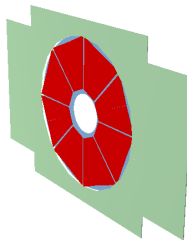
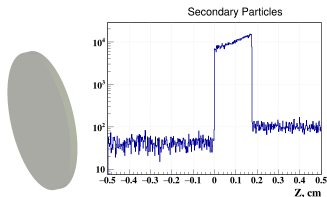
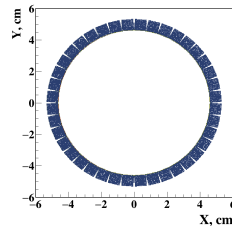
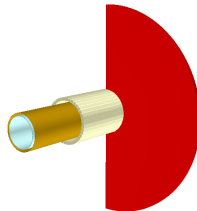
## Main goal of the report

Give you information about readiness of the BmnRoot to the first heavy ion run on the BM@N experiment

## Outline

- Simulation and reconstruction in subsystems
- Tracking
- News about system-independent tasks
- Readiness of decoding for subsystems

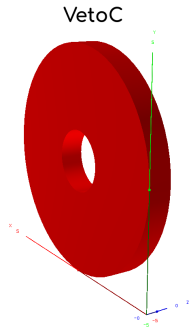
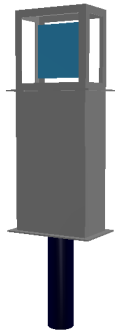
- Realistic geometry of **SiMD** and **BD** with **shielding** was added
- Simplified digitizers are added for both detectors
- Cylindric **CsI** target was added in simulation to produce additional **secondary particles**



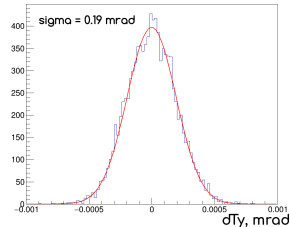
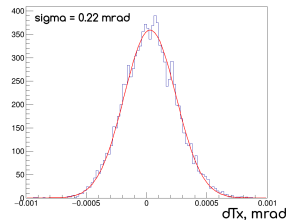
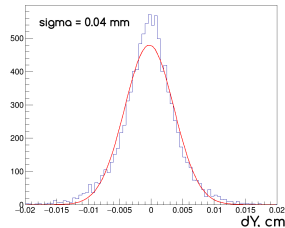
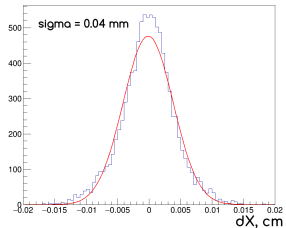
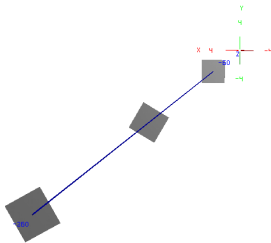
N.Lashmanov (JINR), I.Kozlov (SPSU),  
S.Merts (JINR)  
S. Merts

- Geometry prepared for BC, FD and VC
- Classes to produce MC points are presented for BC and FD
- Digitizers have to be developed

N.Lashmanov (JINR), S.Merts(JINR)

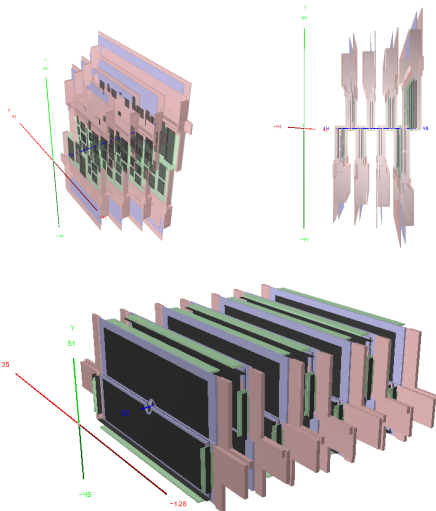


- Geometry was added
- Digitizer was added
- Hit finder was added
- Beam track finder was added



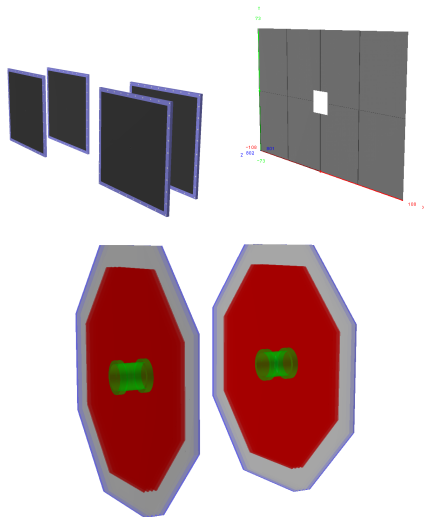
D.Baranov (JINR), S.Merts (JINR)

- Detailed geometry with passive elements was added
- A complete SIM-DIGI-RECO chain has been developed
- A conversion of digit signal to ADC counters was implemented
- Charge dependence of signal has to be implemented



D. Baranov (JINR)

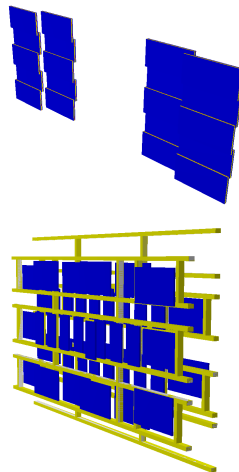
- Realistic geometry was added in simulation for each detector
- A complete **SIM-DIGI-RECO** chain has been developed for **CSC**
- A conversion of digit signal to **ADC counters** has to be implemented for **CSC**



D. Baranov (JINR)

- Realistic geometry of both detectors was implemented in simulation
- No need digitizers by internal reasons
- Hit finders were implemented

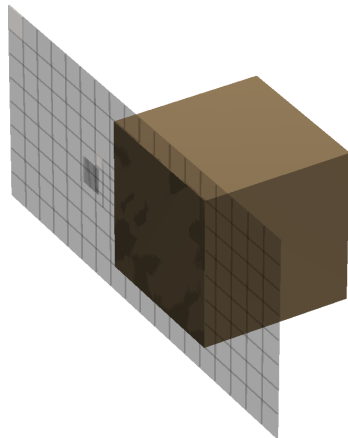
M.Rumyantsev (JINR), Yu.Petukhov (JINR)





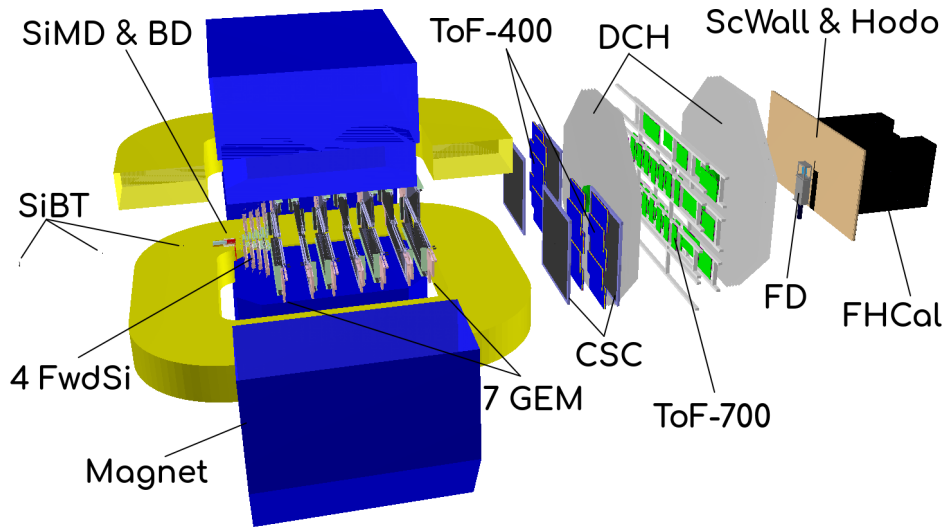
- Geometries for **FHCal**, **ScWall** and **Hodo** were implemented in simulation
- Digitizers for all three detectors were prepared
- Reconstructor for **FHCal** is ready
- Reconstructors for **Hodo** and **ScWall** will be ready **until October, 2022**

M.Golubeva, N.Karpushkin, S.Morozov (INR RAS)



We are waiting...

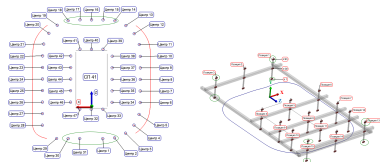
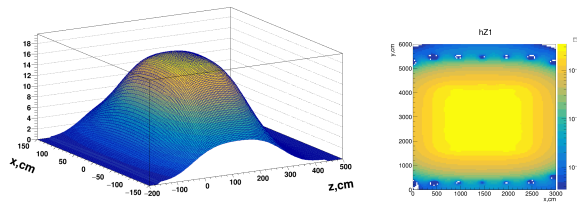




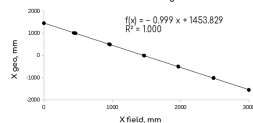
## Summary table to work with MC data

Detector	Geometry	MC classes	Digitizer	RECO	Comments
Beampipe	X	—	—	—	Need to create geometry
Target	✓	—	—	—	
BC	✓X	✓	X	—	Need to update geometry
VetoC	✓X	X	X	—	
SiMD	✓	✓	✓	—	
BD	✓	✓	✓	—	
FD	✓	✓	X	—	
FwdSi	✓	✓	✓	✓	Placed in upstream direction
GEM	✓	✓	✓	✓	
SiBT	✓	✓	✓	✓	
CSC	✓	✓	✓	✓	
LCSC	✓	✓	✓	✓	
DCH	✓	✓	✓	✓	
TOF-400	✓	✓	—	✓	
TOF-700	✓	✓	—	✓	
NeutDet	X	X	X	X	Will be ready until RUN-8
FHCal	✓	✓	✓	✓	RECO will be ready until RUN-8 RECO will be ready until RUN-8
HODO	✓	✓	✓	X	
ScWall	✓	✓	✓	X	

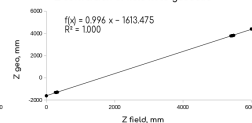
- Field measurements were made for 3 values of current on the magnet
- Current measurements were made in a wider coordinate range
- Magnetic field map is under preparation
- Geodetic measurements of the bolt positions helped align field inside the SP-41



X conversion of field fit to geodetic



Z conversion of field fit to geodetic



## AnalysisTree (GSI) - main candidate to be a format for physics analysis

- ✓ There are interfaces to perform list of analysis: FlowAnalysisFramework, KFParticleFinder, PID, Centrality
- ✓ No need to install BmnRoot
- ✓ Implemented for list of BM@N subsystems: TOF, Headers, GlobalTracks, FHCal, SCWall
- ✓ Current compression 100 times
- ✗ Works not on pure ROOT
- ✗ Not implemented in BmnRoot repository

Group of MEPHI

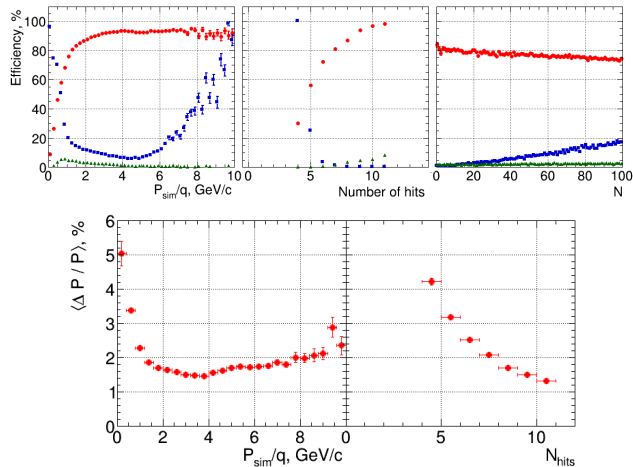
L1 was selected as an **official tracking** for RUN-8

- ✓ Very fast (16 ms/event)
- ✓ Adopted to work with “BmnHits”
- ✗ Still used as a “black box”
- ✗ Ghost level is high enough

New tracking **Vector Finder** was developed, but it is rather slow (3.6 sec/event)

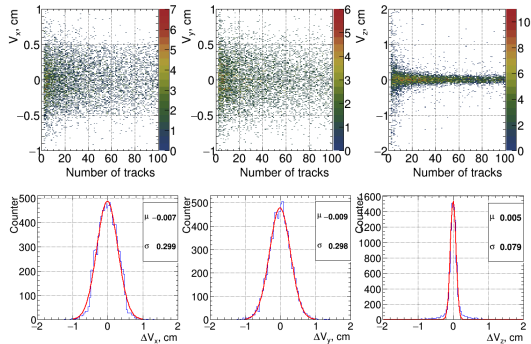
A.Zinchenko (JINR), S.Merts(JINR)

Quality assurance system was updated to work with CBM data format (L1 tracking output)





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Vertex resolution has to be improved by **SiBT**

We are going to reconstruct inner tracks by **L1** tracking during experimental data taking.

### List of items to monitor

- Basis distributions of digits for each subsystem
- Hit distributions for coordinate detectors
- Primary vertex distributions ( $PV_x$ ,  $PV_y$ ,  $PV_z$ , and 2D combinations)
- Hit multiplicity by subsystems
- Track multiplicity
- Momentum distribution
- ...

I.Gabdrakhmanov (JINR), S.Merts(JINR),  
K.Mashitsin (SPbSU), A.Driuk (SPbSU)

## Summary table to decode experimental data

Detector	Decoding	Mapping	Tests for RUN-8	Comments
BC	✓	✓X	X	based on previous experience
VetoC	✓	✓X	X	based on previous experience
SiMD	✓	✓X	X	based on previous experience
BD	✓	✓X	X	need to upload in BmnRoot
FD	X	X	X	new detector
Forward Silicon	✓	✓X	X	based on previous experience
GEM	✓	✓	✓	
Si beam tracker	X	X	X	new detector
Small CSC	✓	✓X	X	based on previous experience
Large CSC	✓	X	X	new detector
DCH	✓	✓X	X	based on previous experience
TOF-400	✓	✓X	X	based on previous experience
TOF-700	✓	✓X	X	based on previous experience
NeutDet	X	X	X	new detector
FHCal	✓	✓X	X	tested on SRC-2022
HODO	✓	✓X	X	tested on SRC-2022
ScWall	✓	✓X	X	tested on SRC-2022

- There is **realistic geometry** for most detector subsystems
- Geometrical parameters of detectors have to be updated after **geodetic measurments**
- **Quality assurance (QA)** system was updated to work with **L1** tracking
- Main efforts have to be done to prepare **mappings** and **decoding procedures** for upcoming run