

Status of simulation and reconstruction in heavy ion program



Sergei Merts

on behalf of BERDS Group

05/10/2021

Our plans:

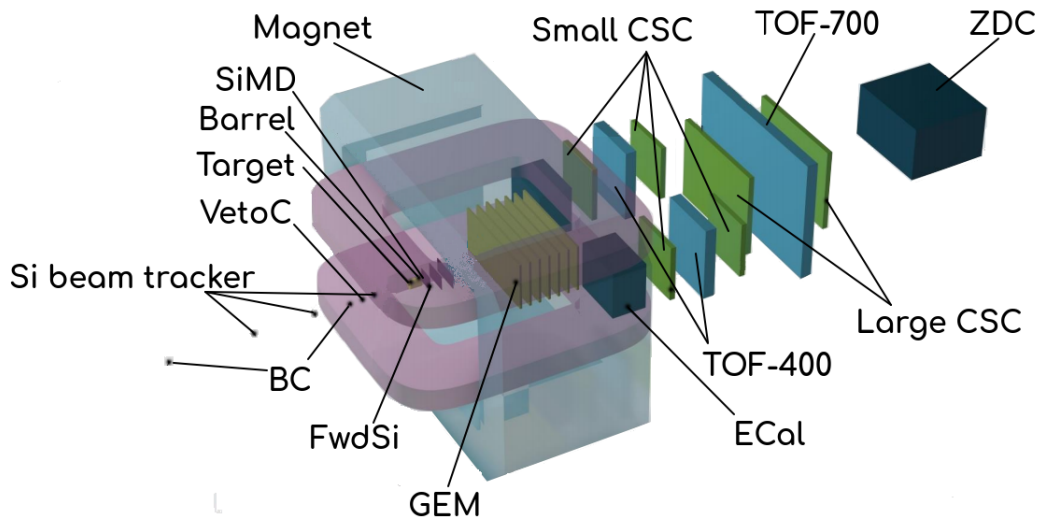
Sometime in 2022

~~May 2022~~

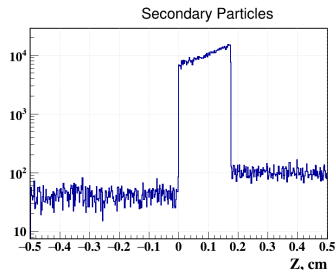
The first physics run: ~~March 2022~~

Main purpose:

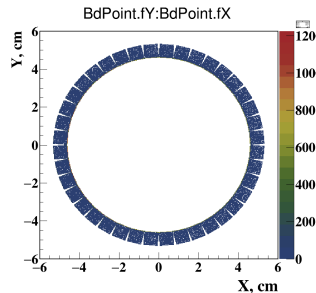
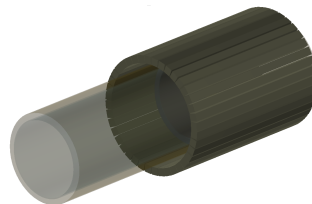
Give you information about state of affairs in BmnRoot



- Material of target is **CsI**. It is near to **Xe** by mass.
- Shape of target is cylinder.
Width = **1.75 mm**
Radius = **16 mm**
- We add it to produce additional **secondary particles** by transport package



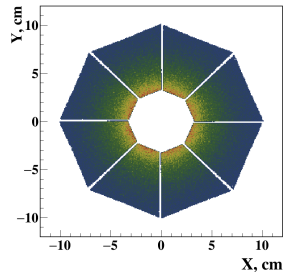
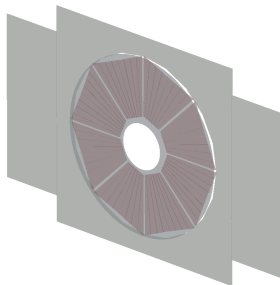
- Realistic geometry with **inner shielding** added into simulation
- Geometry of **outer shielding** is under preparation
- Initial version of digitizer is prepared



N.Lashmanov (JINR)

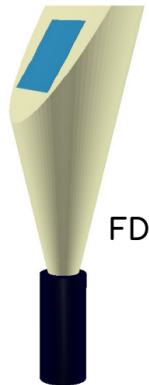
- Realistic geometry added into repository
- Initial version of digitizer is prepared

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

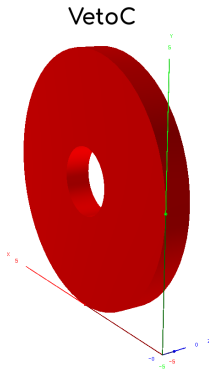


- Initial version of geometry prepared for BC, FD and VC
- Classes to produce MC points are presented only for BC
- Digitizers have to be developed

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

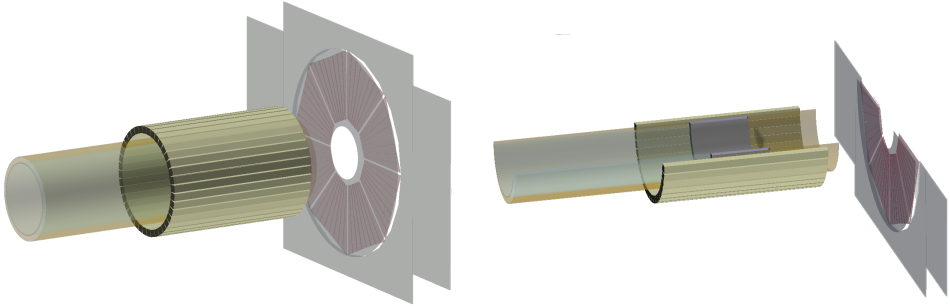


FD

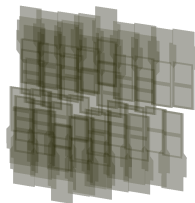


VetoC

View of triggers in the **target area**

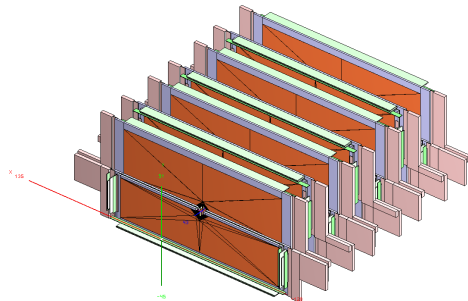


- Detailed geometry with passive elements was added into repository
- Two types of geometries: 3 planes (2022) and 4 planes (202...)
- A complete SIM-DIGI-RECO chain has been developed
- A conversion of digit signal to ADC counters has to be implemented



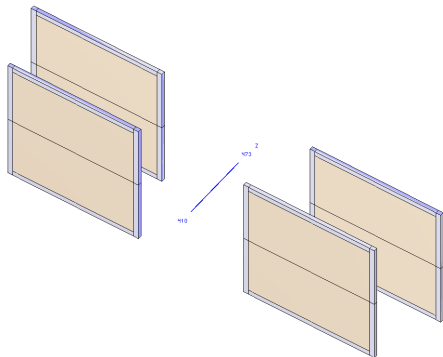
D. Baranov (JINR)

- Detailed geometry with passive elements is added into repository
- A complete **SIM-DIGI-RECO** chain has been developed



D. Baranov (JINR)

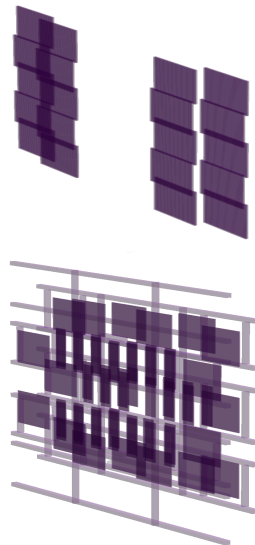
- Only geometry for **small CSC** is presented in simulation
- Geometry for **large CSC** will be ready **until 2022**
- A complete **SIM-DIGI-RECO** chain has been developed
- A conversion of digit signal to **ADC counters** has to be implemented



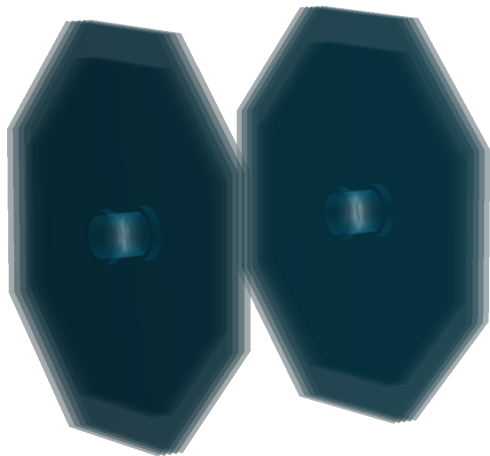
D. Baranov (JINR)

- Realistic geometry of both detectors is presented in simulation
- Positions of TOF-400 planes in X direction is still may be refined
- Step of digitization in simulation procedure has to be added to unify inputs for reconstruction

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

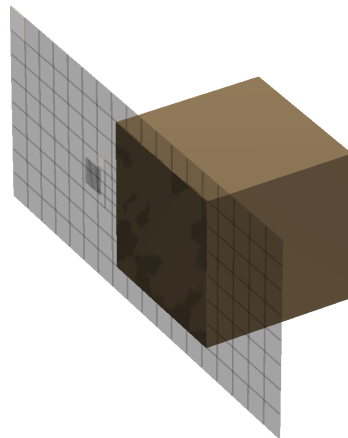


- Realistic geometry is presented in simulation
- Step of **digitization** in simulation procedure has to be added to unify inputs for reconstruction



D.Baranov (JINR), N.Voitishin (JINR)

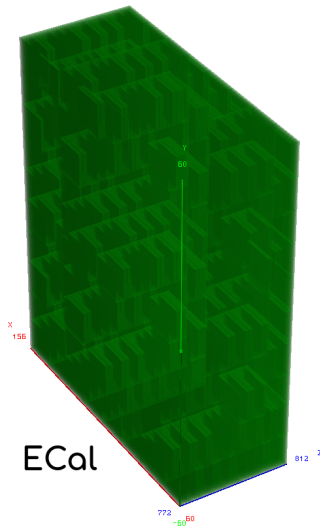
- Geometries for **FHCal**, **ScWall** and **Hodo** are presented in simulation
- Digitizer for **FHCal** is prepared
- Digitizers for **Hodo** and **ScWall** will be ready until December, 2021

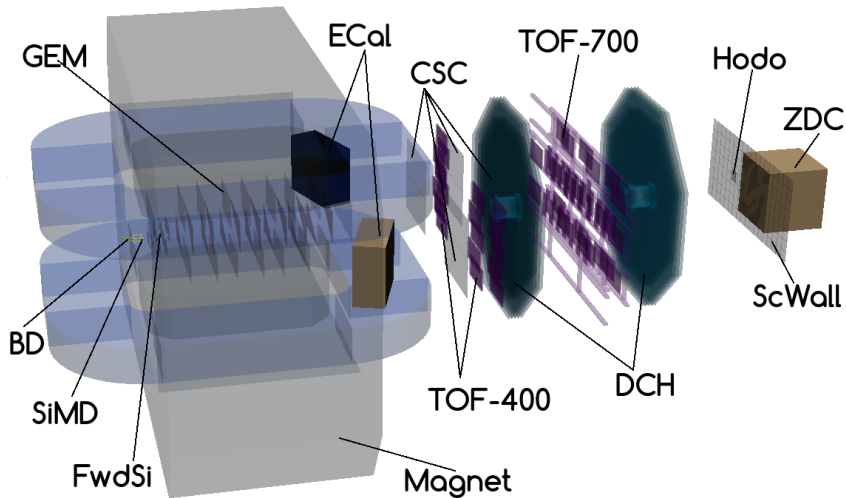


P.Alekseev (ITEP), S.Morozov (INR RAS)

- Geometries for **3 different positions** of ECal were prepared and uploaded in repository
- **Digitizer** was implemented into simulation procedure

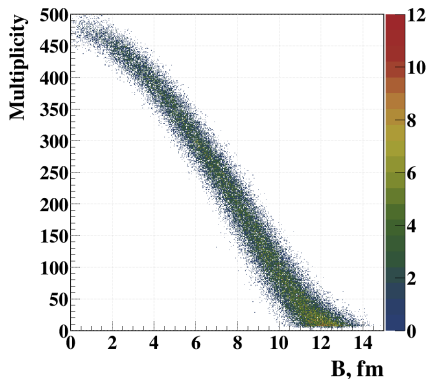
P.Alekseev (ITEP)





Detector	Geo	MC	Digi	Hits/tracks	Comments
BC	✓✗	✓	✓✗	No need	Need to update geometry
VetoC	✓✗	✗	✗	No need	Need to prepare classes
SiMD	✓	✓	✓✗	No need	
BD	✓✗	✓	✓✗	No need	Geo with shield will be added until November
FD	✓✗	✗	✗	No need	Will be ready until Spring 2022
Forward Silicon	✓	✓	✓	✓	
GEM	✓	✓	✓	✓	
Si beam tracker	✗	✗	✗	✗	Will be ready until 2022
Small CSC	✓	✓	✓	✓	
Large CSC	✗	✓	✗	✗	Will be ready until 2022
DCH	✓	✓	✗	✓	Need to add digitizer
TOF-400	✓	✓	✗	✓	Need to add digitizer
TOF-700	✓	✓	✗	✓	Need to add digitizer
ECal	✓	✓	✓	No need	
FHCal (ZDC)	✓	✓	✓	No need	
HODO	✓	✓	✗	No need	Will be ready until 2022
ScWall	✓	✓	✗	No need	Will be ready until 2022

- **Generator:** DCM-SMM
- **Energy:** 3.9 AGeV
- **System:** Xe + ScI
- **Statistics:**
 - 50M minimum bias events
 - 10M central events



Where to find them?

/eos/nica/bmn/sim/gen/DCMSMM/DCMSMM_XeCsI_3.9AGeV_mb_10k/

/eos/nica/bmn/sim/gen/DCMSMM/DCMSMM_XeCsI_3.9AGeV_0-2.77fm_3k/

G.Musulmanbekov (JINR)

- It was decided to use **only one tracking procedure** for heavy ion run
- **L1** tracking was chosen and adopted to work with BM@N hits
- **Global tracking** uses tracks from **L1 (StsTracks)** and matches hits and tracks from outer subsystems
- **Global tracking** is adopted now only to work with inner tracks and tof hits
- We plan **to finalize** matching global tracks to each tracking subsystem **until 2022**

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

- **Separate directory** is prepared to work with **RUN-8** MC data
\$VMCWORKDIR/macro/run8/
- **Current geometry** is collected in macro
\$VMCWORKDIR/macro/run/geometry_run/geometry_run8.C
- Macro to run **simulation** procedure:
\$VMCWORKDIR/macro/run8/run_sim_bmn.C
- **Important issues:**
User has to download **input generator file**

```
void run_sim_bmn(TString inFile = "INPUT_DCMSMM_FILE",  
                 TString outFile = "$VMCWORKDIR/macro/run/bmnsmim.root",  
                 Int_t nStartEvent = 0, Int_t nEvents = 10,  
                 enumGenerators generatorName = DCMSMM,  
                 Bool_t useRealEffects = kFALSE)
```

Primary vertex is smeared along the target

- Macro to run **reconstruction** procedure:
\$VMCWORKDIR/macro/run8/run_reco_bmn.C

- There is **realistic geometry** for most detector subsystems
- For the other subsystems the geometry will be ready **until 2022**
- We need to implement/update **digitizers** for TOF, ScWall, Hodo, DCH and triggers **until Spring 2022**
- **Quality assurance (QA)** system has to be updated to work with **L1** tracking and outer hit/track information
- We plan to create **QA** system for **experimental data until Spring 2022**
- Format of **MiniDST** is going to be developed **until Spring 2022**

**“Give me six hours
to chop down
a tree and I will
spend the first
four sharpening
the axe.”**

—Abraham Lincoln

