Status of the BM@N Detector Simulation and Data Reconstruction

Sergei Merts

on behalf of BERDS Group

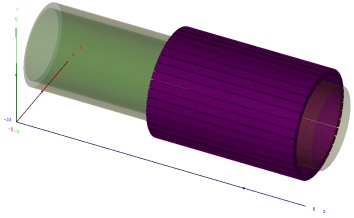
Detector simulation

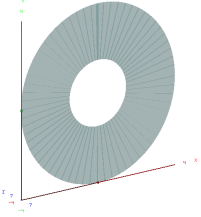
Main features of simulation

1. Type of geometry: realistic or simplified
2. Monte Carlo information production (presence of classes to produce MC points)
3. Realistic effects:
   - Avalanches/Smearing/Clustering production
   - Lorentz shifts for detectors in magnetic field
   - Detector misalignment
   - Channel inefficiency
   - Rest non-calibration (time for TDC, pedestals for ADC, ...)
4. Digitizer to convert MC data into detector format

Triggers: Barrel and Forward detectors UPDATED

- Realistic geometry
- Only for BM@N setup
- Monte Carlo points and tracks
- No realistic effects
- No digitizer

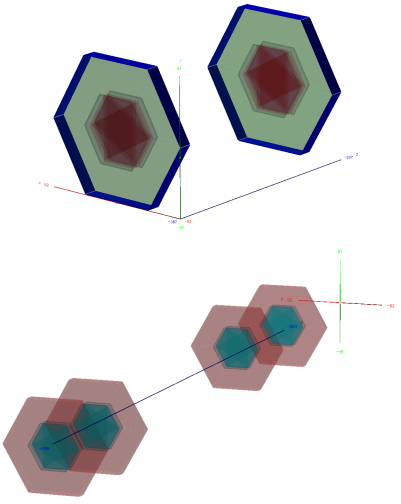




Nikita Lashmanov

MWPC UPDATED

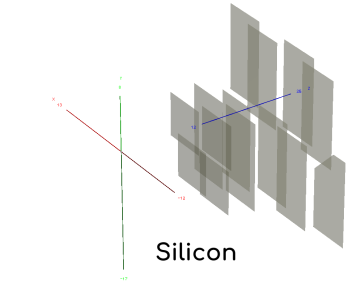
- Realistic geometry
- Monte Carlo points and tracks
- No realistic effects
- Digitizer is prepared



Silicon detector

- Realistic geometry
- Monte Carlo points and tracks
- Simplified simulation based on Gaussian smearing (no misalignment, no inefficiency)
- Digitizer is implemented

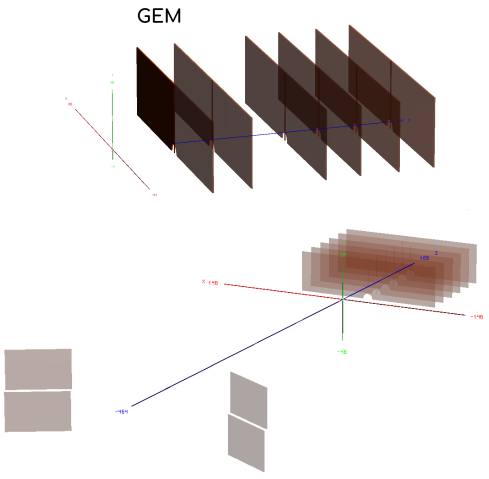
Dmitry Baranov



GEM

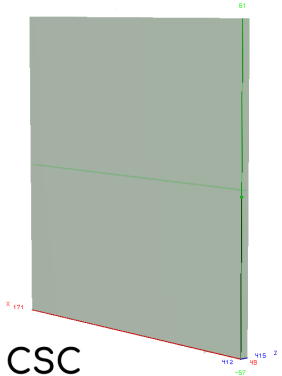
- Realistic geometry
- Monte Carlo points and tracks
- Realistic simulation based on Garfield+ (no misalignment, no inefficiency)
- Digitizer is implemented

Dmitry Baranov



- Realistic geometry
- Monte Carlo points and tracks
- Simplified simulation based on Gaussian smearing (no misalignment, no inefficiency)
- Digitizer is implemented

Dmitry Baranov

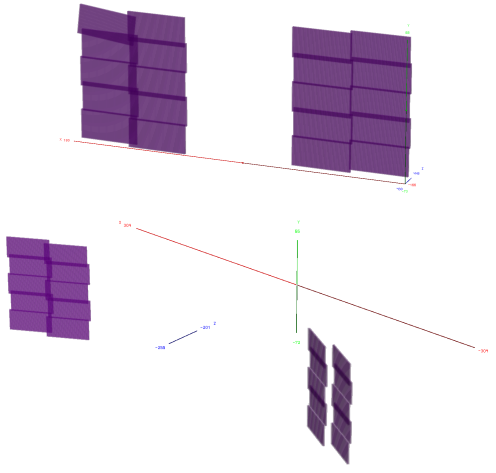


CSC

TOF-400 UPDATED

- Realistic geometry
- Monte Carlo points and tracks
- Simulation effects: strips inefficiency, multichannel activation (no misalignment)
- No digitizer

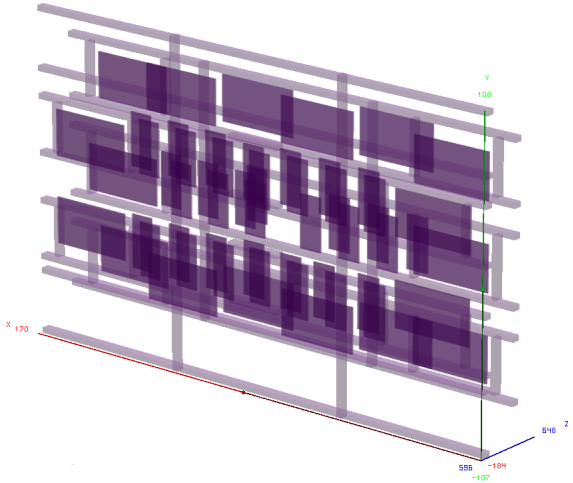
Mikhail Rumyantsev



TOF-700 UPDATED

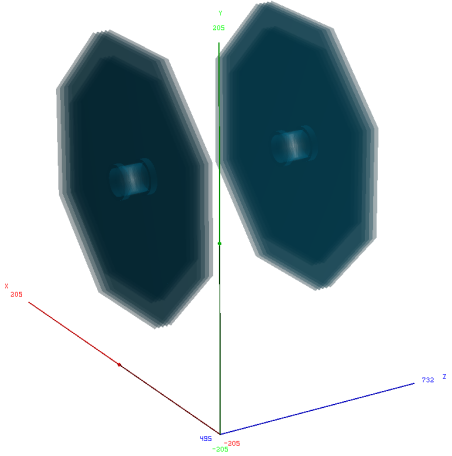
- Realistic geometry
- Monte Carlo points and tracks
- Simulation effects: strips inefficiency, multichannel activation (no misalignment)
- No digitizer

Yury Petukhov



DCH UPDATED

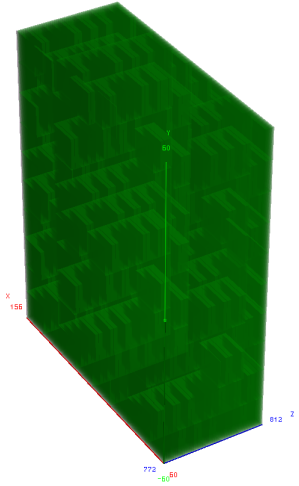
- Realistic geometry
- Monte Carlo points and tracks
- Simplified simulation based on Gaussian smearing with distance dependence (no misalignment, no inefficiency)
- No digitizer



ECAL

- Realistic geometry
- Monte Carlo points and tracks
- Simple hit producer (energy collecting in towers) (no misalignment, no inefficiency)
- No digitizer

Sergey Afanasev

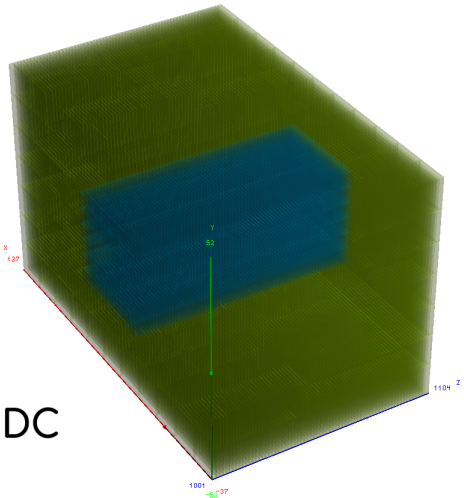


ECAL

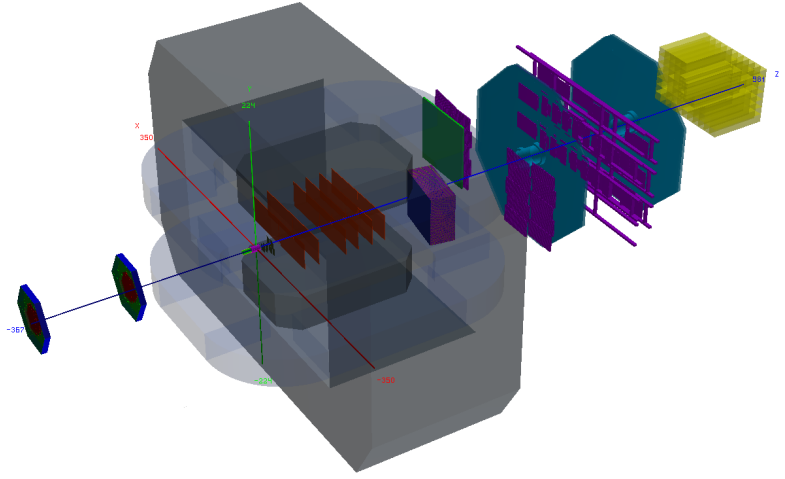
ZDC

- Realistic geometry
- Monte Carlo points and tracks
- Simple hit producer (energy collecting in towers) (no misalignment, no inefficiency)
- No digitizer

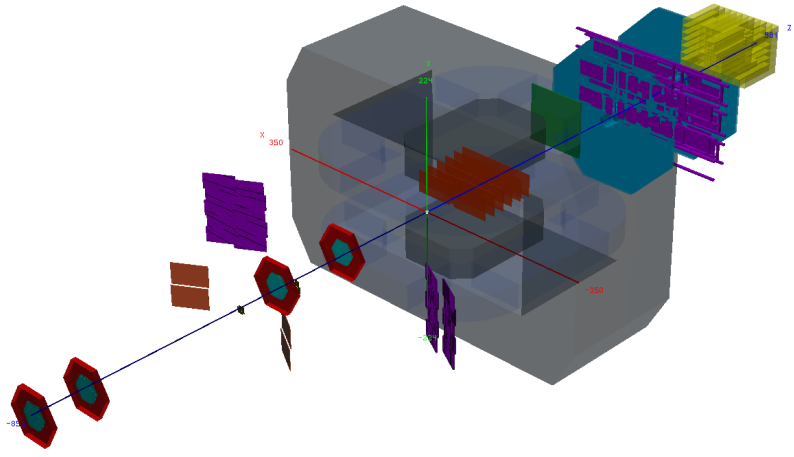
Mixed team



Current BM@N RUN-7 geometry



Current SRC geometry



Simulation in BmnRoot

- List of generators to use: URQMD, HSD, BOX, PART, ION, DQGSM
- For SRC specific physics the SrcGenerator is in stage of implementation
- Digitizers added for Silicon, GEM, CSC (for MWPC prepared, but not added yet)
  Attention: Add digitizers to your detectors in order to unify input data!

Reconstruction in BmnRoot

- Set of hit makers implemented: MWPC, Silicon, GEM, CSC, TOF-400, TOF-700
- Two tracking algorithms: CellAuto (default) and L1 (requires special format of digits)
- Vertex finder based on virtual planes approach
- MWPC and DCH track finders work only with experimental data (unified version is under implementation)
- Global tracking implemented only for downstream direction

Summary and next steps

- Full set of detectors has realistic geometry in ROOT-format
- Some set of detectors has full chain of simulations from MC-points to realistic digits
- Digitizers for each detector have to be added in BmnRoot
- All stand-alone data decoders moved into one unified decoding chain
- Monte Carlo simulation has to be as realistic as possible
- All common parameters of detectors have to be put in Unified Database