Status of Detector Description

VIII SPD collaboration meeting

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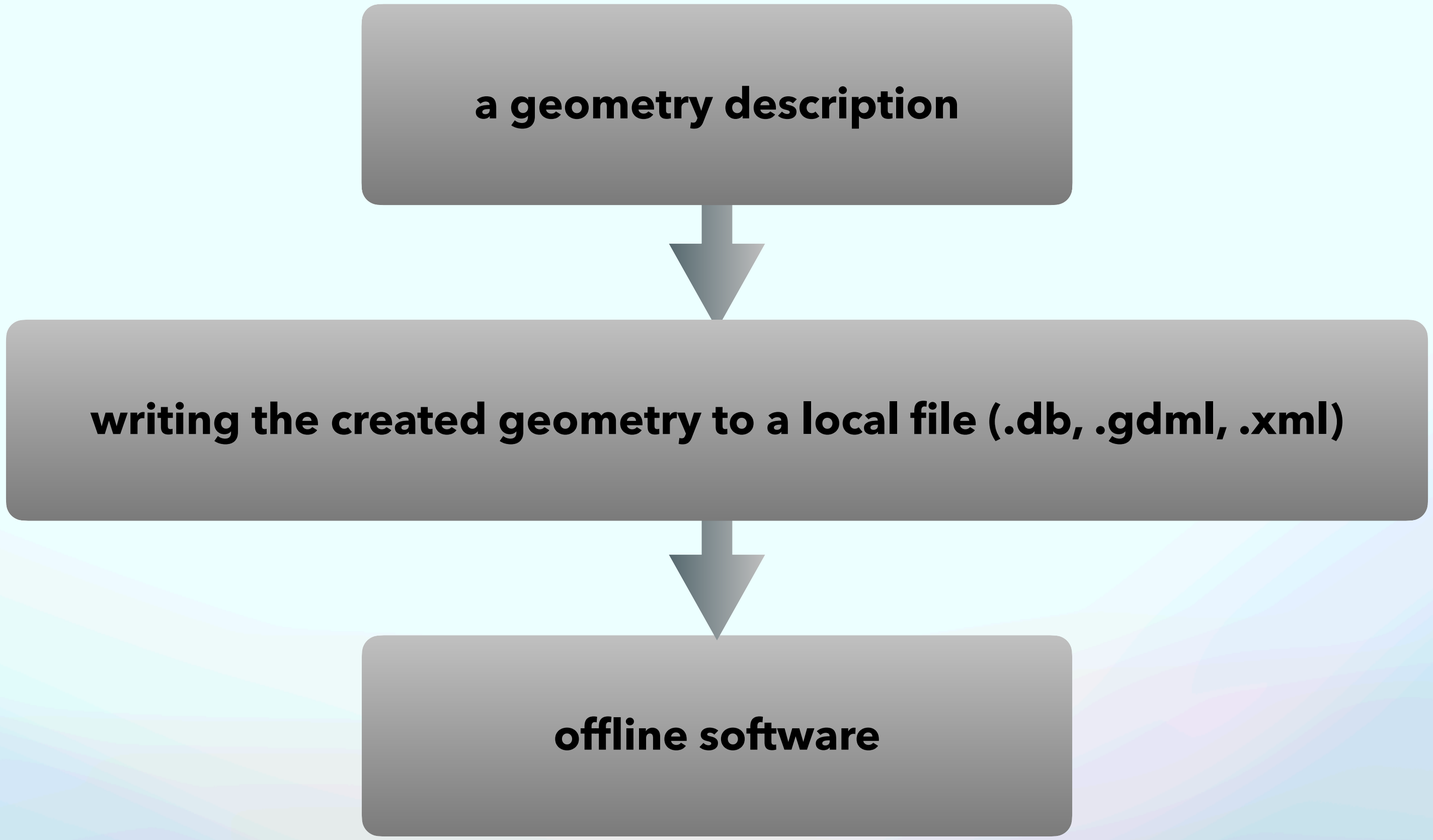
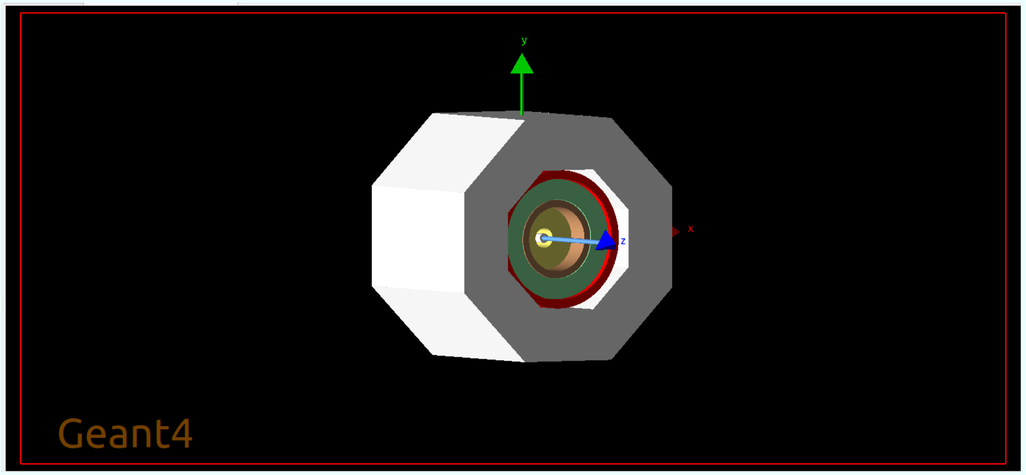
Detector description

- Current version of SPD geometry description is based on ROOT's geometry system TGeo in SpdROOT.
- It was decided to use the GeoModel package to new SPD geometry description in SAMPO.
- GeoModel (https://geomodel.web.cern.ch/home/) meets all requirements for SPD geometry description.

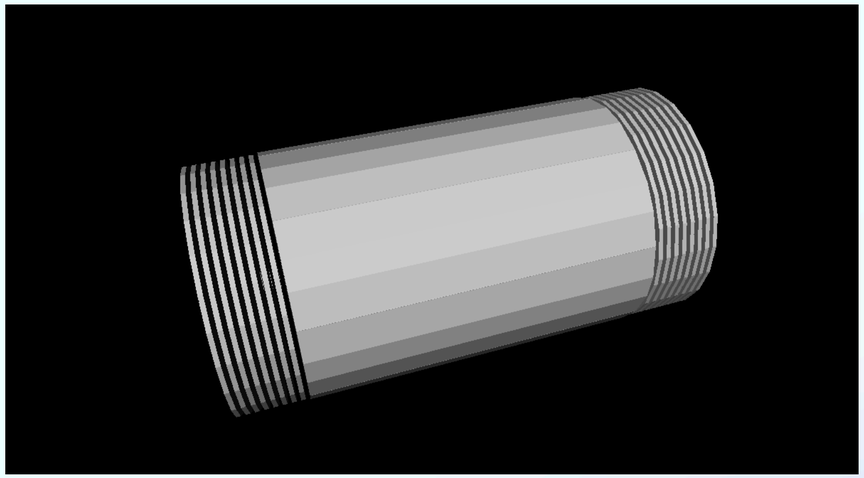
The mechanism of interaction with GeoModel



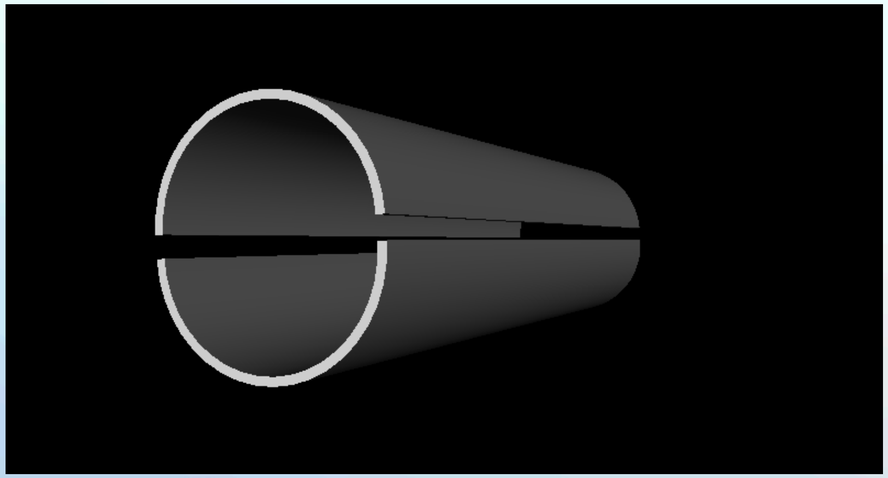
Previous steps to the full SPD geometry description



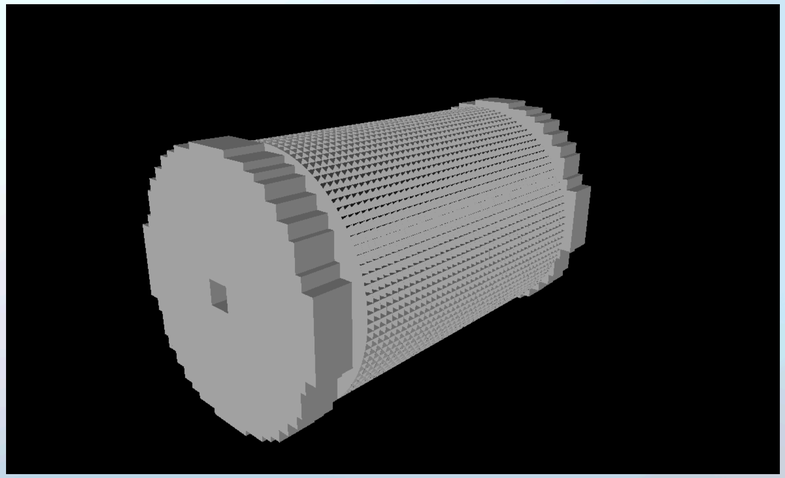
SPD geometry description on subsystems' level



Straw Tracker



Micromegas-based Central Tracker



Electromagnetic calorimeter

Updating of detector description

A number of issues is needed to be fixed:

- elimination of overlaps;
- optimization of volumes transformations description;
- elimination of discrepancies in subsystems parameters in the TDR.

Updating of detector description

Elimination of overlaps:

- unfortunately there are overlapping volumes in current version of SPD geometry description;
- overlapping volumes means that some locations in space belong to two different volumes simultaneously. In Geant4 this leads to wrong simulation result instead of program abort.

Updating of detector description

Elimination of overlaps:

- previous version of overlaps checking is based on using Geant4 built-in mechanism. –> **Overlaps checking occurs on mother-daughter level and daughter - daughter level!**

- current version of overlaps checking is based on using GeoModelClash application, which check the overlaps at all levels of volume hierarchies.

Updating of detector description

Optimization of volumes transformations description:

- previous version of volumes transformations description is based on using GeoAlignableTransform class;
- the usage of this class leads to the creation of bulky database with a detector description. This makes the usage of such detector model in simulation problematic.

Updating of detector description

Optimization of volumes transformations description:

- Example of using GeoAlignableTransform class for ECal barrel module transformation description:

  GeoAlignableTransform *ModuleTr = new GeoAlignableTransform(GeoTrf::Translate3D(translation*cos(3.75*i*deg), translation*sin(3.75*i*deg), 0.5*Length_ecalbar - y1moduleshelllength*j)*GeoTrf::RotateX3D(90.0*degree)*GeoTrf::RotateY3D((270.0+3.75*i)*deg));

Updating of detector description

Optimization of volumes transformations description:

- there has been an attempt to rewrite transformations using the GeoSerialTransformer class since the last meeting;
- the usage of this class decide the problem with bulky database with a detector description, but deprives us of the ability to assign unique identifiers to volumes. This makes the usage of such detector model in reconstruction problematic.

Updating of detector description

Optimization of volumes transformations description:

- Example of using GeoSerialTransformer class for ECal barrel module transformation description:

```
Variable l;
Sin sin;
Cos cos;
GENFUNCTION rot_angle = (360*deg / numofmodaroundOZ) * l;//rotation angle for module
GENFUNCTION g = sin(rot_angle);
GENFUNCTION e = cos(rot_angle);
GENFUNCTION i = 270.0*deg+rot_angle;

TRANSFUNCTION t1 = Pow(GeoTrf::TranslateX3D(translation),e)*Pow(GeoTrf::TranslateY3D(translation),
g)*GeoTrf::TranslateZ3D(0.5*Length_ecalbar -
(y1moduleshelllength+steelthickness)*j)*GeoTrf::RotateX3D(90.0*degree)*Pow(GeoTrf::RotateY3D(1.0),i);
GeoSerialTransformer *ModuleTr = new GeoSerialTransformer(ModulePhys,&t1,numofmodaroundOZ);
```

Updating of detector description

Optimization of volumes transformations description:

Plans:

- rewrite transformations directly through using GeoTransform class without using intermediary classes;
- eliminate overlaps;
- define a separate function for each geometry construction operation.

Next steps

- Update current geometry description version;
- Range system inner structure description;
- Development of methods that produce the necessary geometric parameters (for reconstruction).

Thank you for your attention!