

MAUS Geometry:

A User's Tutorial

Ryan Bayes

University of Glasgow

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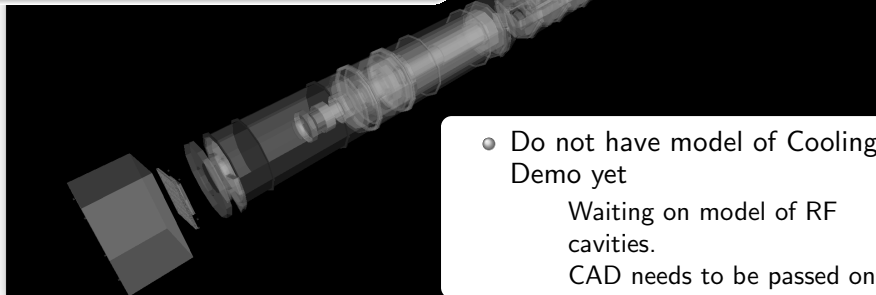
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Experimental
Particle Physics

MAUS Geometry

- Complete model of Step IV maintained in CDB
- Beamline and Cooling Channel settings also available

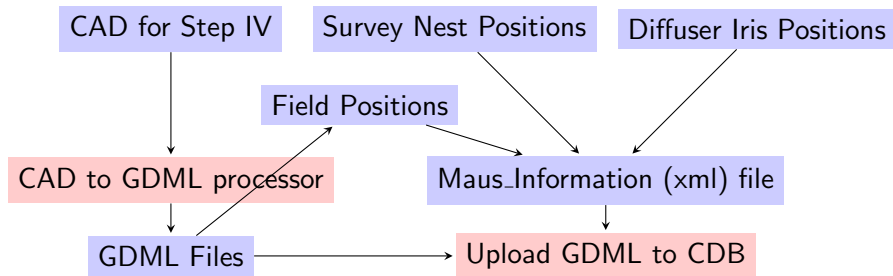
Stored independently
Accessed with the geometry
at download time.



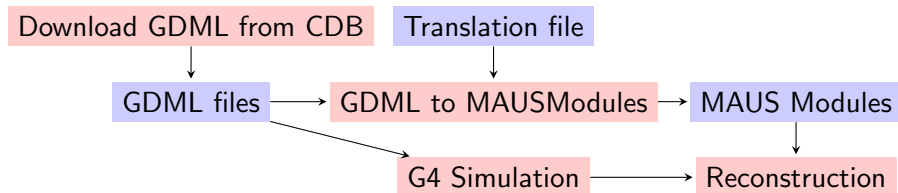
- Do not have model of Cooling Demo yet
Waiting on model of RF cavities.
CAD needs to be passed on.

Work Flow

File Preparation Workflow



User Workflow

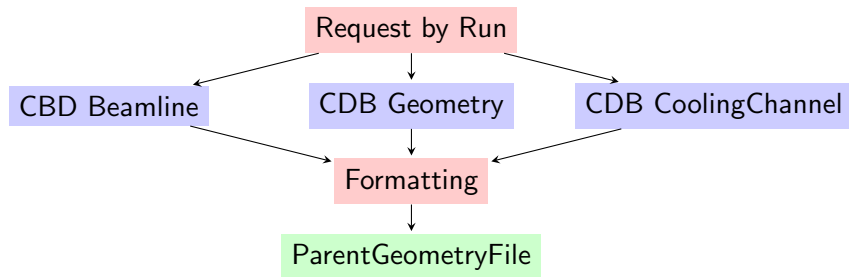


Reproducing an Extant Run

- Simplest implementation

Recommended Command

```
`${MAUS_ROOT_DIR}/bin/utilities/download_geometry.py  
-geometry_download_by run_number  
-geometry_download_run_number XXXX
```

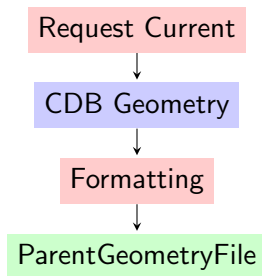


Download the Current Geometry

- Produces the current geometry (by time) in the CDB.
- Uses the default fields (currently a $6\pi 200$ MeV/c beam)

Recommended Command

```
${MAUS_ROOT_DIR}/bin/utilities/download_geometry.py  
-geometry_download_by current
```



Simulate a Future Configuration

- Must know the numerical ID of required geometry.
- Must know required beam line and cooling channel tags.

Command with a beam line tag

```
#{MAUS_ROOT_DIR}/bin/utilities/download_geometry.py  
  -geometry_download_by id  
  -geometry_download_id XXX  
  -geometry_download_beamline_tag "example_bl_tag"  
  -geometry_download_coolingchannel_tag "example_cc_tag"
```

Use beam line settings from an existing run

```
#{MAUS_ROOT_DIR}/bin/utilities/download_geometry.py  
  -geometry_download_by id  
  -geometry_download_id XXX  
  -geometry_download_run NNNN  
  -geometry_download_coolingchannel_tag "example_cc_tag"
```

Testing Preproduction Geometries

- Want to use or evaluate a geometry before "official" use.
- Still use cooling channel and beam line settings from production database

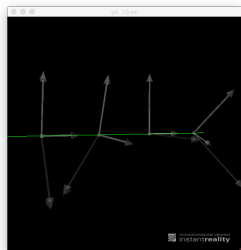
Command with a beam line tag

```
${MAUS_ROOT_DIR}/bin/utilities/download_geometry.py  
    -cdb_geometry_url "http://preprodcdb.rl.ac.uk/cdb/"  
-geometry_download_by id  
    -geometry_download_id XXX  
    -geometry_download_beamline_tag "example_bl_tag"  
    -geometry_download_coolingchannel_tag "example_cc_tag"
```

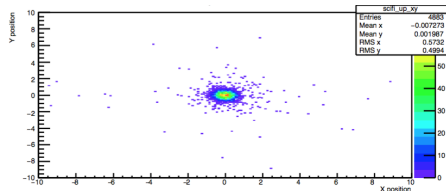
Tracker Rotations

- Flips and rotations observed in tracker simulation
- Causes include:
 - ▶ Reversal of fibres.
 - ▶ Mismatch between tracker and GEANT4 (and MICE Module) rotations.
- Geometry now corrected and tracker reconstruction uses GEANT4 convention.

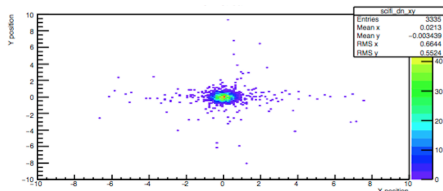
Rotations in G4



Upstream Tracker Residuals



Downstream Tracker Residuals



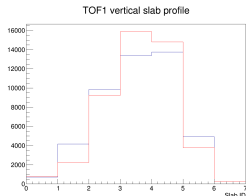
Analysis Corrections

- Instigated by Francois' tracker corrections.
- CDB table under development.
- Will apply corrections to positions of detectors at download time.
- Positions of all detectors then rewritten to information files to maintain consistency of derived MICE modules.
- Survey information still applied to geometry before upload.
 - ▶ Analysis based corrections should only be applied when survey information is not available
 - ▶ Trackers are primary use case examples.
- A similar approach might be appropriate for magnetic field alignments
 - ▶ Has not been implemented

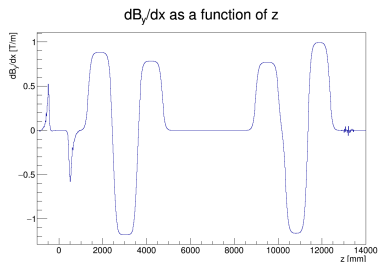
Quadrupole Corrections

- Instigated by Francois' quest to match TOF profiles.
- Quad fields found to be too short and in the wrong place.
- Reconstructed data: blue, MC: red

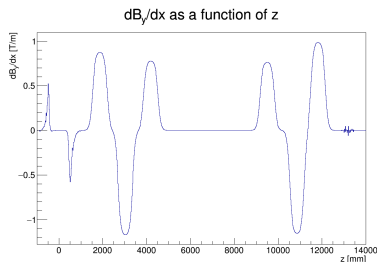
Francois' Profiles



Quad too wide



Fields after Correction



Summary

- Geometry is approaching a stable state.
- Several use cases are of interest to experimenters.
- Corrections are still appearing.
 - ▶ Correction of quad fields an important improvement.
 - ▶ CDB based analysis source geometry corrections an important step.
 - ▶ Refinements can only appear with use.
- Mostly keeping up with the state of the hall.