MAUS Geometry

A User Tutorial and Update

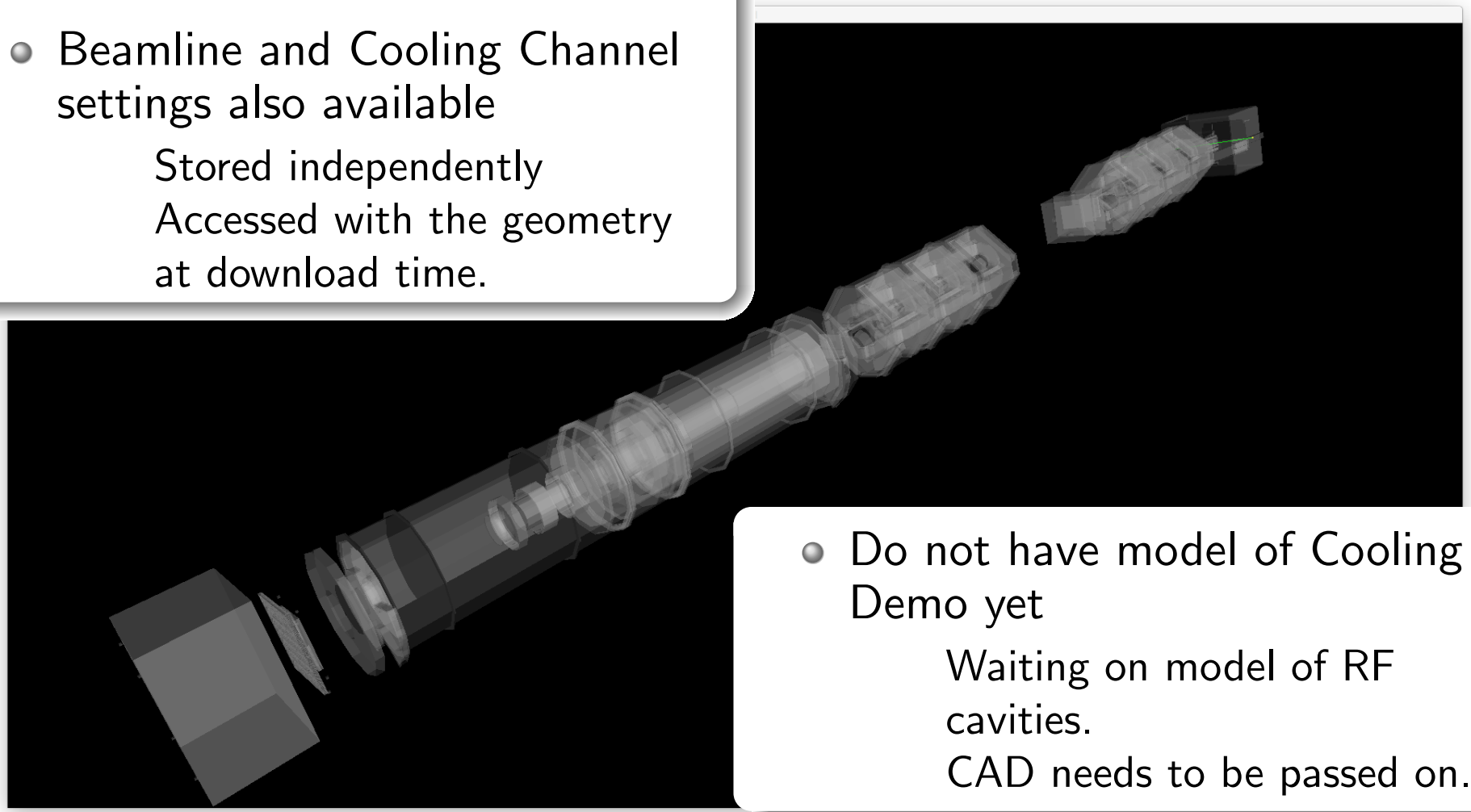
Ryan Bayes

University of Glasgow

July 28, 2016

MAUS Geometry

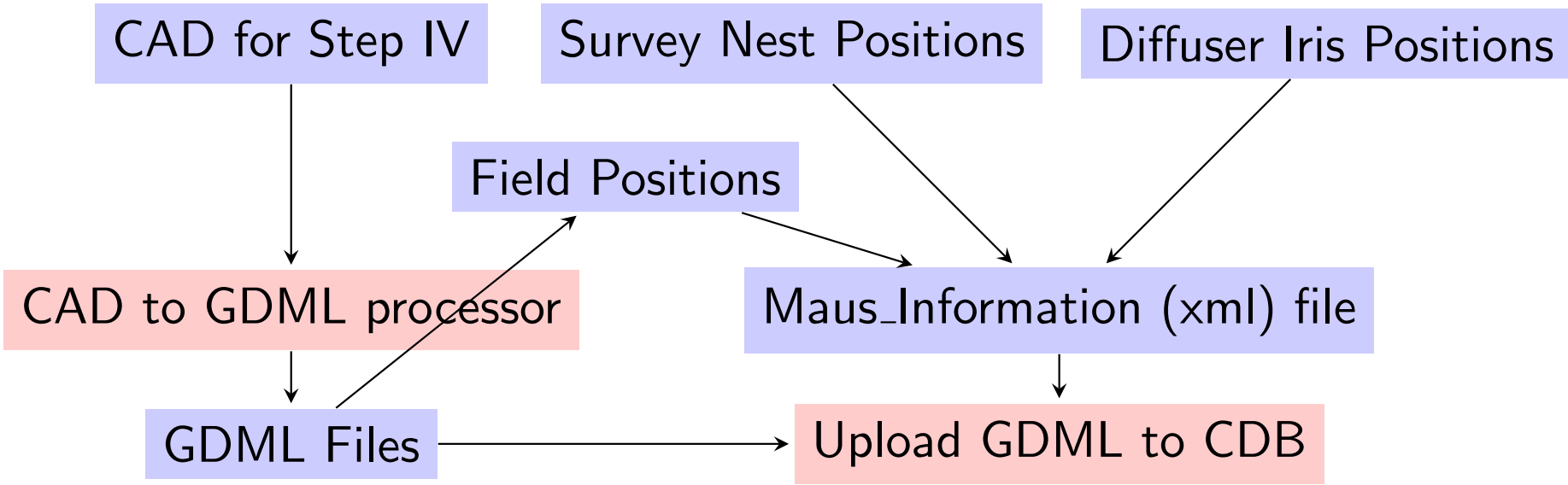
- Complete model of Step IV maintained in CDB
- Beamline and Cooling Channel settings also available
  - Stored independently
  - Accessed with the geometry at download time.



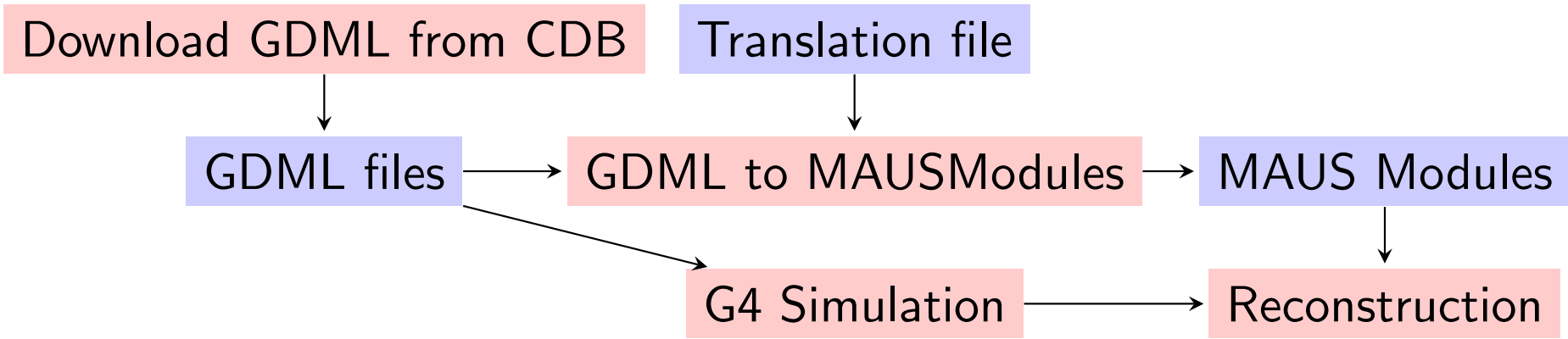
- Do not have model of Cooling Demo yet
  - Waiting on model of RF cavities.
  - CAD needs to be passed on.

Work Flow

File Preparation Workflow



User Workflow



Geometry Updates

Updates to Geometry Code

- Added capacity to introduce analysis driven corrections to the geometry.

  Practical testing has just started.

Updates to CDB files

- Corrected KL geometry
- Replaced polycarbonate vacuum window in diffuser with aluminium
- Removed overlap volumes in US and DS solenoids.
- Added new geometry consistent with current detector positions in the hall.
- Adjust quad field positions to a position more consistent with G4Beamline.
- Ensure that diffuser irises do appear in geometry as intended.

Geometries on the Wiki

Geometry Descriptions

ID	Run number range	Valid Dates	Technical Drawing	MICE Notes	Comment
162	7066 - 7185	20 June 2015 - 12 July 2015	TD-1189-3752.pdf	436, 458, 464, 468, 469	June running. Tracker volumes filled with air. Evacuated LH2 vessel in AFC
161	7186 - 7468	13 July 2015 - 7 Oct 2015	TD-1189-3752.pdf	458, 464, 469, 470, 471, 472	Positions of EMR, TOF2, KL corrected after July move. Tracker volumes filled with air. Evacuated LH2 vessel in AFC.
160	7469 - 7496	7 Oct 2015 - 12 Nov 2015	TD-1189-3752.pdf	458, 464, 469, 470, 471, 472	Positions of EMR, TOF2, KL corrected after July move. Tracker volumes filled with air. Evacuated LH2 vessel in AFC. Opera field map for 4T field included in geometry download (for maus > v1.4.0).
148	7507 - 7547	24 Nov 2015 - 7 Dec 2015	TD-1189-3752.pdf	458, 464, 469, 470, 477, 472	Position of TOF1 altered after fix to upstream helium volume. Tracker volumes filled with helium.
166	7548 - 7583	12 Dec 2015 - 17 Dec 2015	TD-1189-3752.pdf	458, 464, 469, 470, 477, 472	Xenon at STP placed in LH2 vessel within the AFC. Tracker volumes filled with helium.
167	7584 - 7591	17 Dec 2015 - 17 Dec 2015	TD-1189-3752.pdf	458, 464, 469, 470, 477, 472	LH2 vessel filled with He in AFC. Tracker volumes filled with helium.
168	7622 - 7708	23 Feb 2016 - 8 March 2016	TD-1189-3752.pdf	458, 464, 469, 481, 483, 484, 485, 486	Empty AFC. Tracker volumes filled with helium. LiH in Mice Modules but not in GDML.
165	7709 - 7876	11 March 2016 - 14 April 2016	TD-1189-3752.pdf	458, 464, 469, 481, 483, 484, 485, 486	LiH Disk in AFC. Tracker volumes filled with helium.
172	7928 -	27 June 2016 -	TD-1189-3752.pdf	458, 464, 469, 483, 491, 490, 492, 494	Empty AFC. Detector, and AFC positions updated to match surveys.

Use Cases

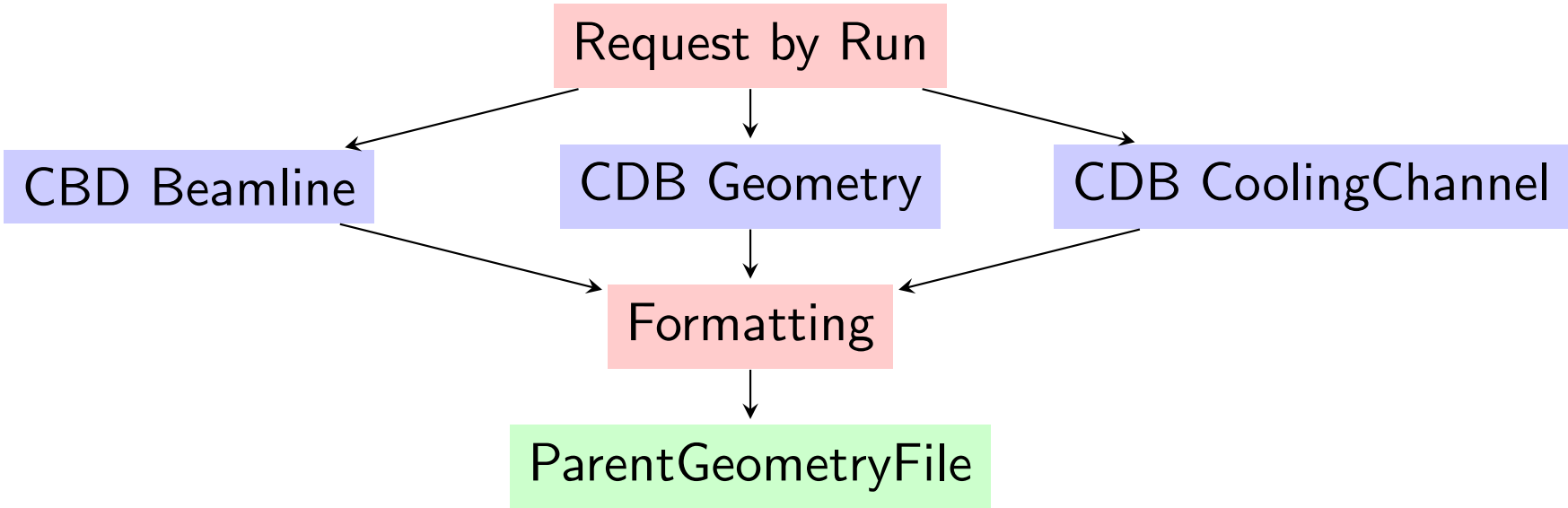
- Download geometry for a run
  - script extracts beamline and cooling channel settings from CDB
  - script loads currents and diffuser settings into geometry GDML files.
  - ParentGeometryFile is written with reference to top GDML (for MC) and detector MICE Module files (for reconstruction)
- Download geometry for a future run
  - download geometry by id.
  - download beamline by run (or tag).
  - download cooling channel by tag.
- Download current geometry
  - Only downloads the latest geometry ID.
  - Default (old) 6π 200 MeV/c settings used.
  - No facility to change beamline or cooling channel currents.

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



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.mice.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"
```

Work in Progress

- Test analysis corrections database
  - Applies the difference in position and rotations between an alignment and the geometry.
  - Have not yet field tested the code (was supposed to have been done this week).
- Full automation of CAD to GDML conversion
  - Have made do with applying changes to detector survey positions by hand.
  - May become a higher priority with new MICE demo implementation.