

Science & Technology Facilities Council  
Rutherford Appleton Laboratory

# Geometry Update

*Stefania Ricciardi, STFC RAL*

On behalf of the Geometry Task Force

MICE 37<sup>th</sup> Collaboration Meeting, RAL, 7/11/2013

# The Geometry Task Force

## People

- **S.R (Coordination and Validation)**
  - **Ryan Bayes (software development)**
  - **Jason Tarrant (CAD)**
  - **Chris Rogers**
  - Durga Rajaram(TOF )
  - Pavel Snopok (Absorber)
  - Chris Heidt (Tracker)
  - Ruslan (EMR)
  - Victoria Blackmore (magnetic filed maps)
- + Henry Nebrensky, Ian Taylor, Pierrick, and others participating in our meetings

## Meetings

Monday at 3pm UK time (biweekly)

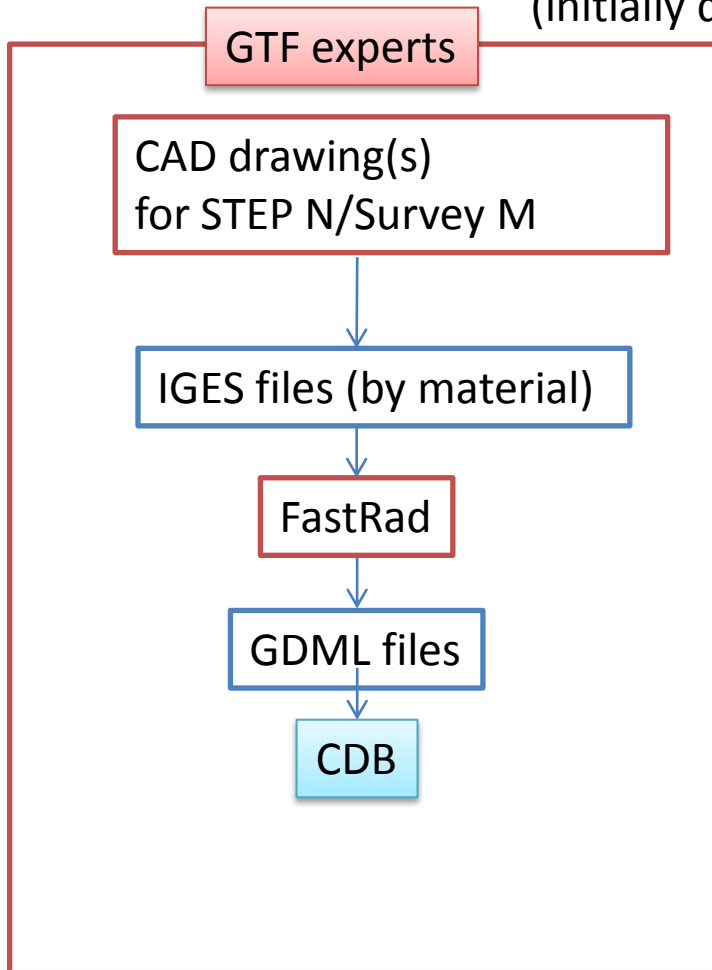
## Mission

Provide an accurate description for MAUS of the material and magnetic fields in the cooling channel\* for each MICE step/run configuration  
(October EMR run and future runs)

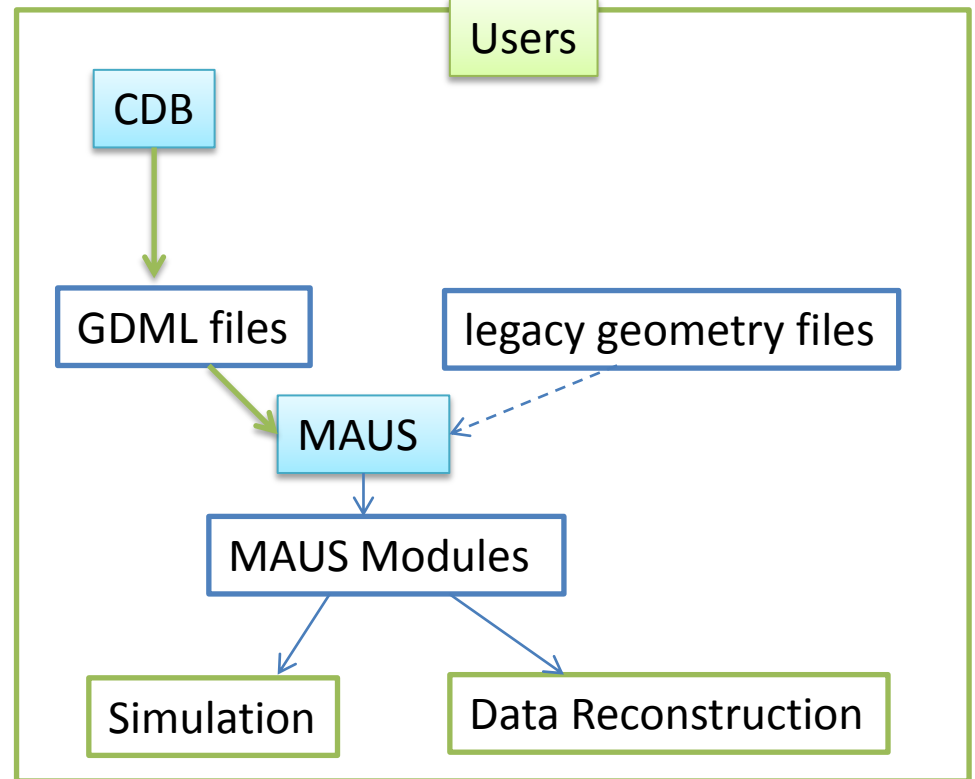
\* At present it extends to D2 and all beamline & detector elements downstream of D2

# Geometry Workflow

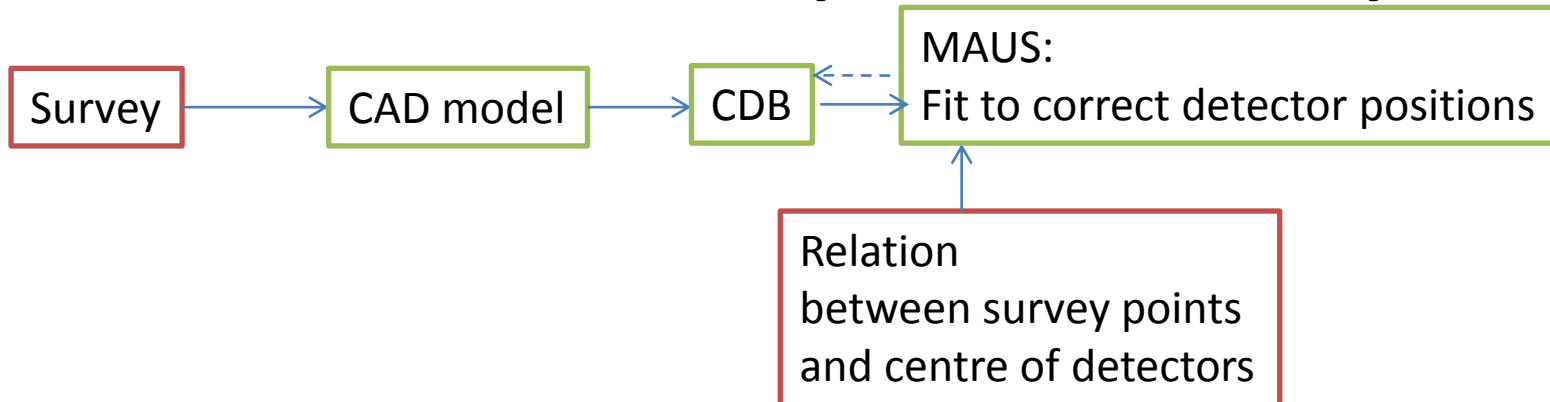
(initially developed by Matt Littlefield)



- Engineering elements: geometry is extracted from CAD drawings and written to CDB
- Physics elements: legacy geometry will be gradually replaced by CDB controlled files



# Geometry and Survey



## – Engineering elements integration

- Jason to get survey points from surveyor
- Jason to provide CAD drawing for each "engineering" element with survey points marked on it

## – Physics elements integration (e.g. detectors)

- Jason to get survey points from surveyor and include them in CAD drawing
- Detector group is responsible for providing data on relationship of sensitive detectors to survey points
- Where detectors are overconstrained, Ryan is to provide code which fits for the best detectors positions and throws an exception if the fit is out-of-range

# What is new since June

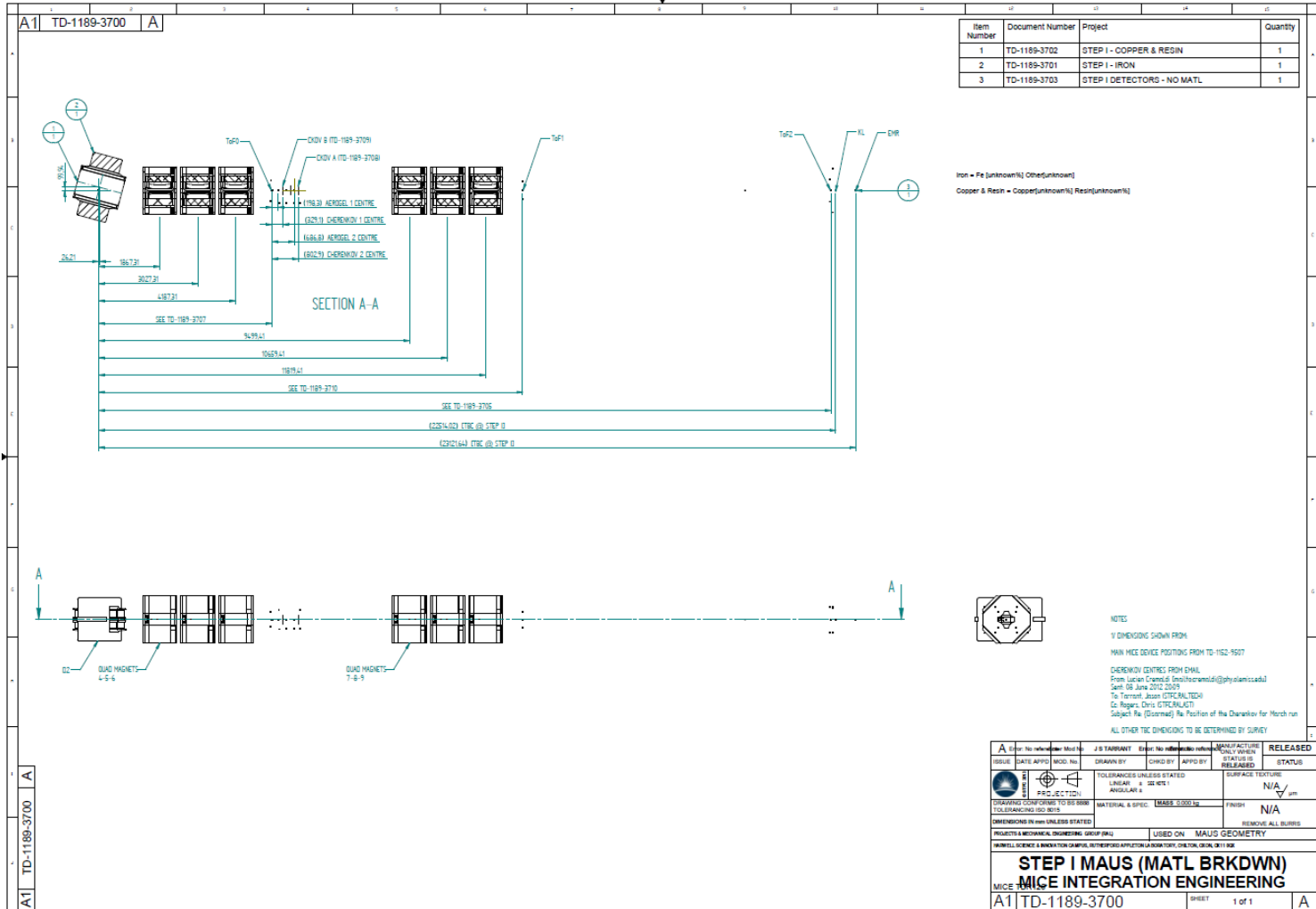
- Defined procedure to integrate survey into geometry (previous slide)
- Diffuser: CAD files by Jason to CDB (no blades)
- Simplification of CAD models
  - Less details for engineering elements not in beam acceptance
- Quads and D2 Magnetic fields
  - calculated within MAUS from hardwired currents; infrastructure exists to get currents from CDB, when Run Control writes them



- New model of STEP IV in CDB
- New model of STEP I EMR-runs – (NOTE: include survey info for all TOFs and Cherenkovs, no EMR survey yet)

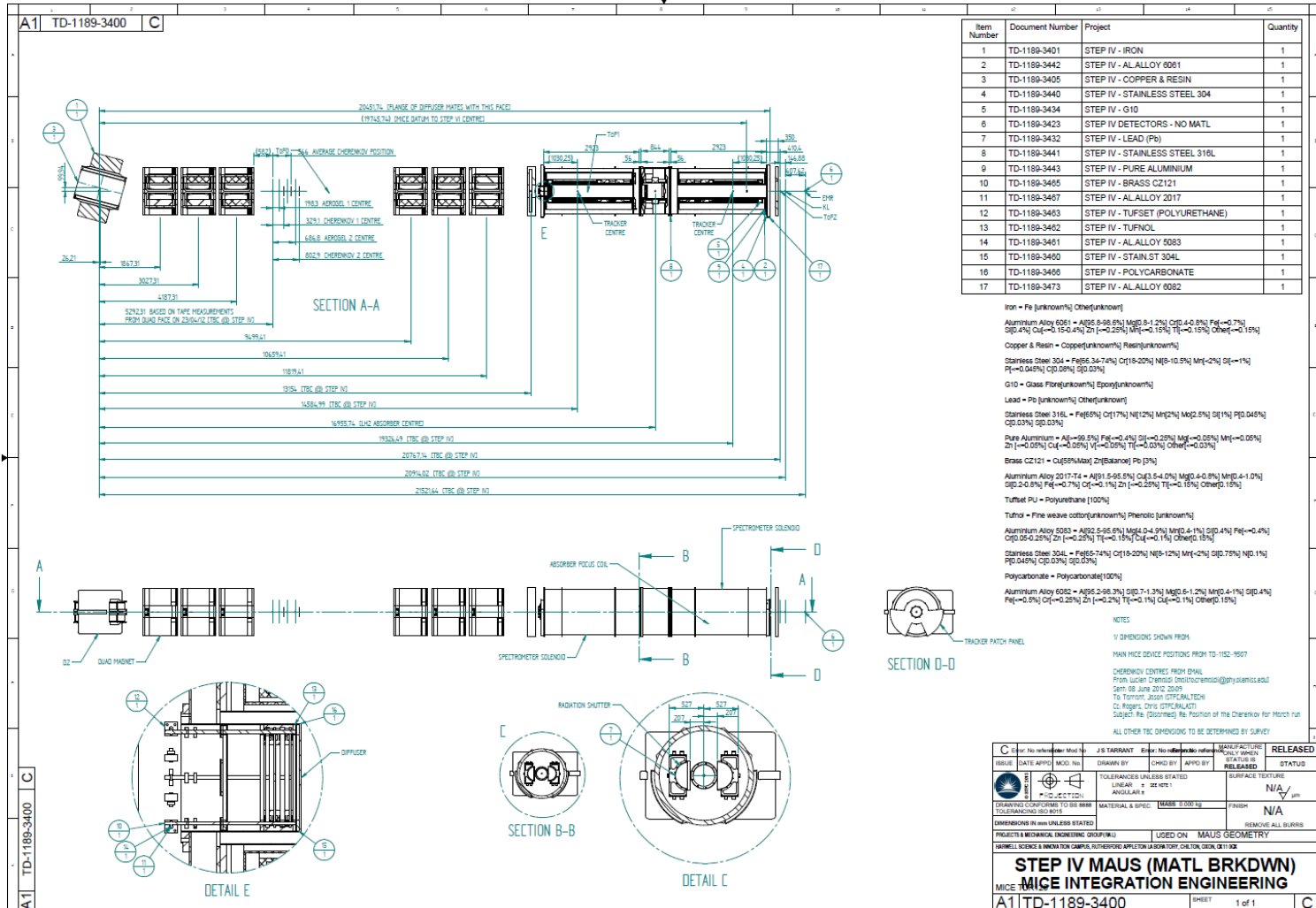
# CAD drawing of STEP I

J. Tarrant  
14/10/13



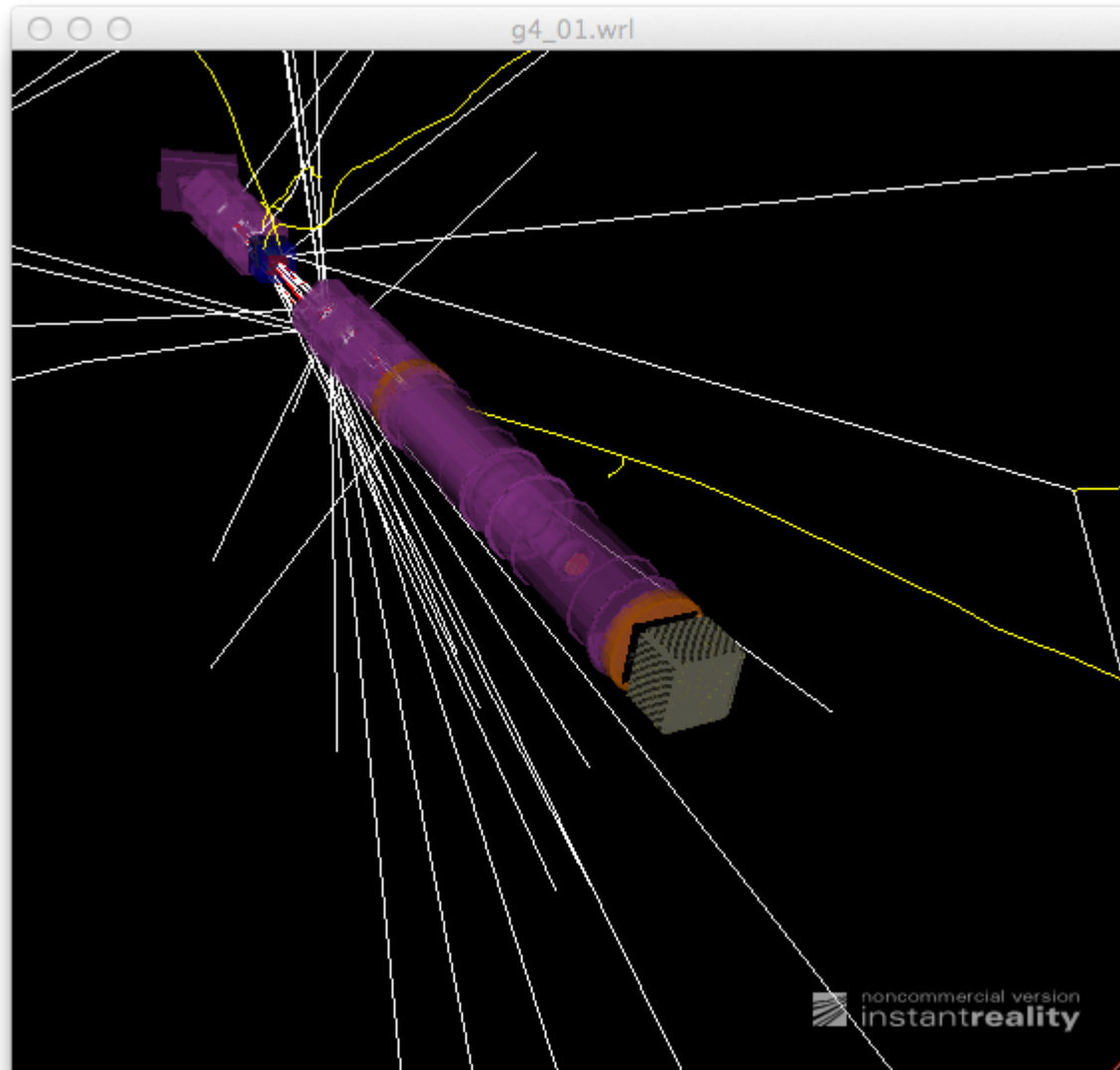
# CAD drawing of STEP IV

J. Tarrant  
9/7/13



# Step IV simulation

R. Bayes





# Detector elements status

- Ideally we would like GDML files to be uploaded to CDB
- Current situation is hybrid
  - TOF – legacy files have been updated in MAUS(Durga)
    - To be translated to GDML
  - Tracker- GDML files (Chris Heidt)
    - Does not run in current system
    - Using old legacy for time-being
  - Cherenkov- old legacy file (Lucien?)
  - KL – old legacy file (probably too detailed, Mariyan)
  - EMR – no GDML yet, but work ongoing to update legacy (Ruslan)

# Validation: Time

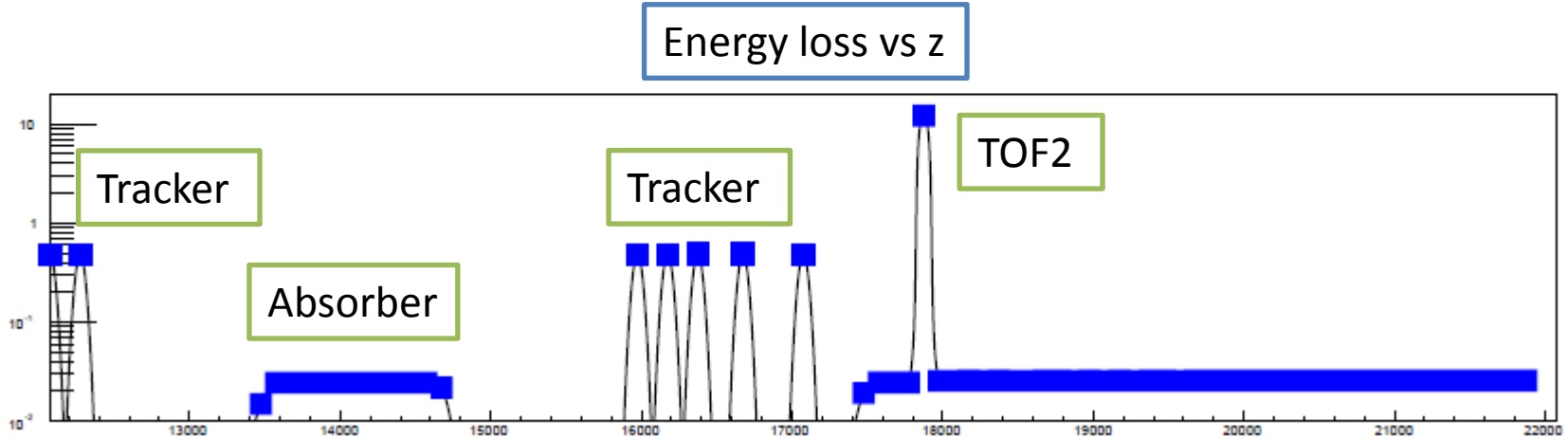
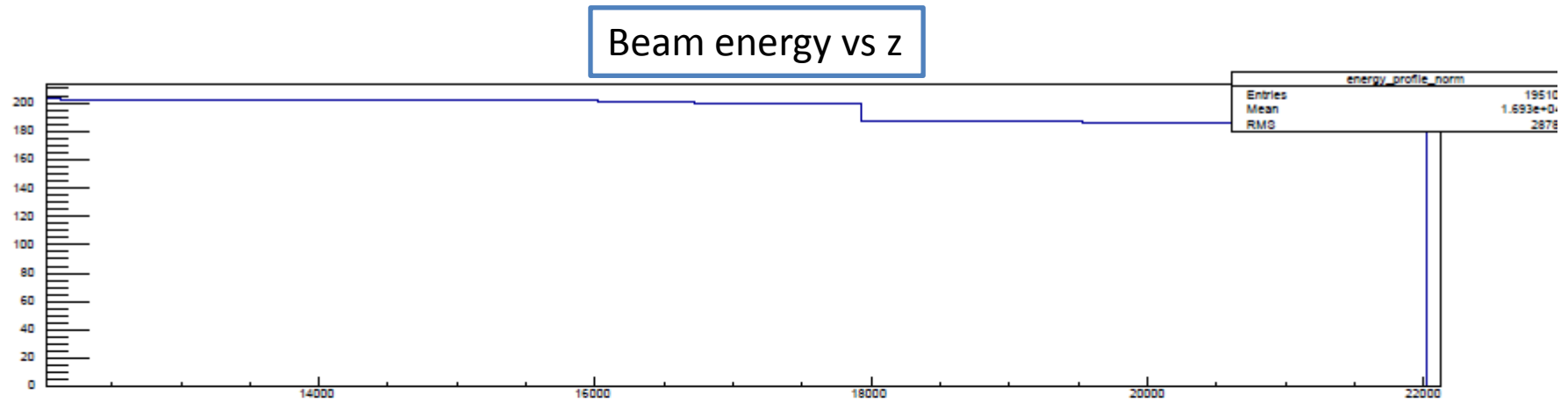
**Wall Clock Time** on PPD Linux machines

Using Ryan's branch code based on **MAUS 0.7.3** and **Geant4.9.6**  
**Muon beam of 226 MeV**

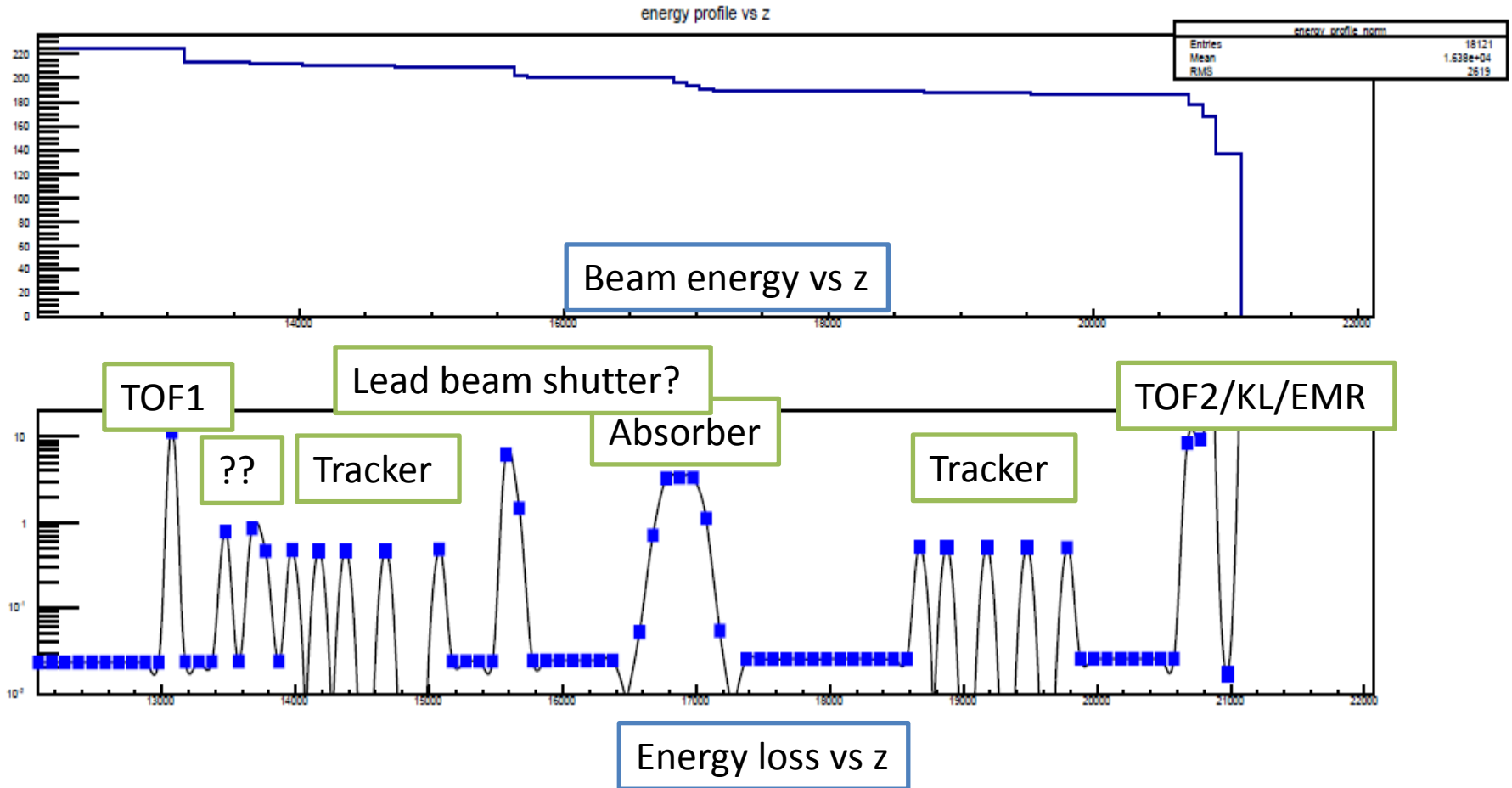
	OLD Initialisation (s)	OLD Time/event (s)	New 1 event (s)	New Time/event (s)
STEP I	40	0.4	1060	2.2
STEP IV	7	0.7	1925	2.2

- Known issue: “new” CAD-based geometry requires about 20 min to initialise
- Believed to be due to GEANT4 handling of Tessellated Solid volumes
- Will have to be investigated further – If no solution found, we will make available a simplified geometry for debug/reconstruction purposes

# Validation - STEPIV (“old simulation”)



# Validation – STEP IV (“new simulation”)



# Our next priorities/milestones

Soon:

- Fit interface to position detectors, given survey points (Ryan)
- CAD geometry for STEPI EMR RUN with full info from survey in CDB (survey team/EMR contact/Jason/Ryan)
- Make Ryan's geometry code available in a MAUS release (Ryan/Durga)
- More validation/debugging (Stefania)
- Documentation: Provide clear instructions on how to download and run the new geometry - TODO and NOT-TODO (Stefania)

More development (start of 2014):

- Translation of physical elements geometry (absorber, TOF, Tracker, etc..) to GDML and upload to CDB (Ryan + detector contacts)
- Magnetic field map interface (Victoria)