SBS Monte Carlo Update

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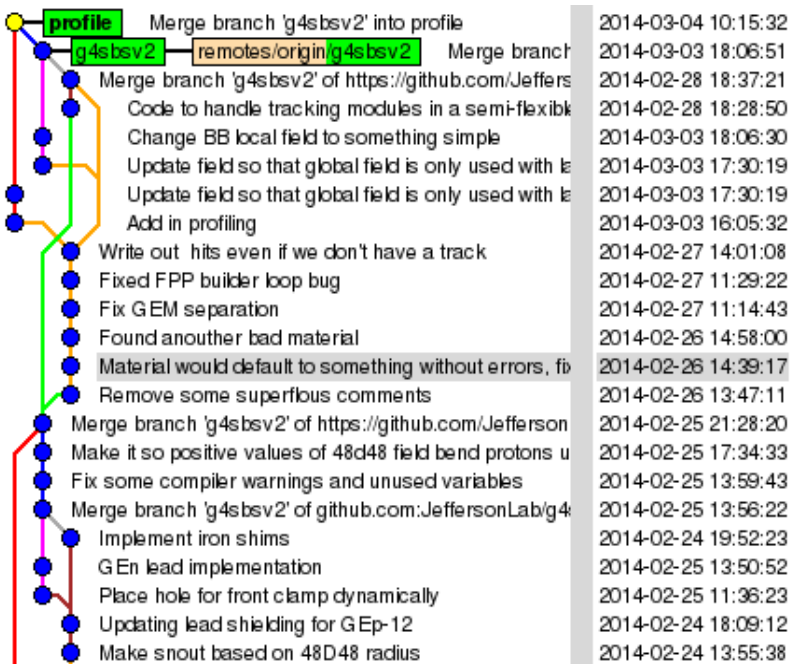
March 5, 2014

Code Base/Infrastructure

All code available at

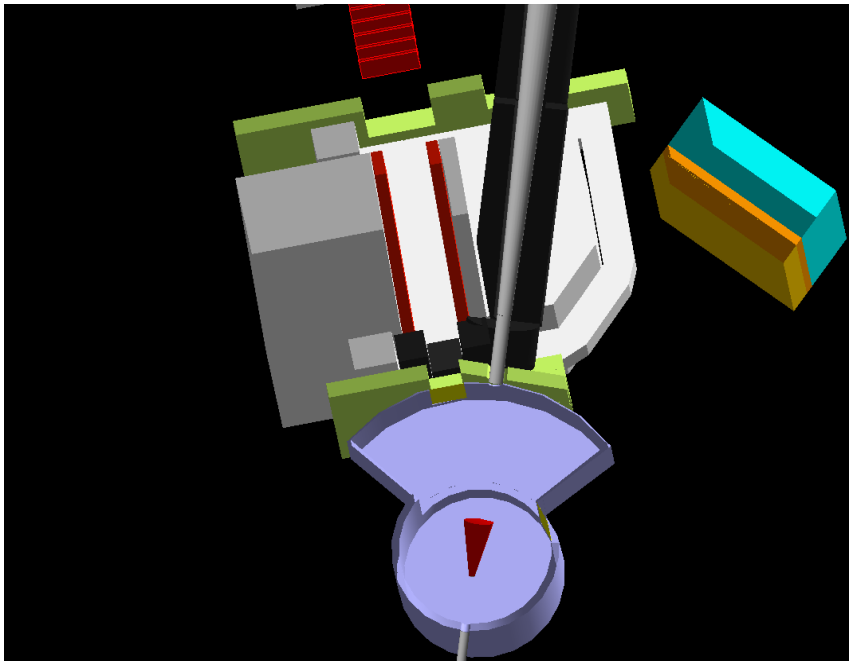
`https://github.com/JeffersonLab/g4sbs`

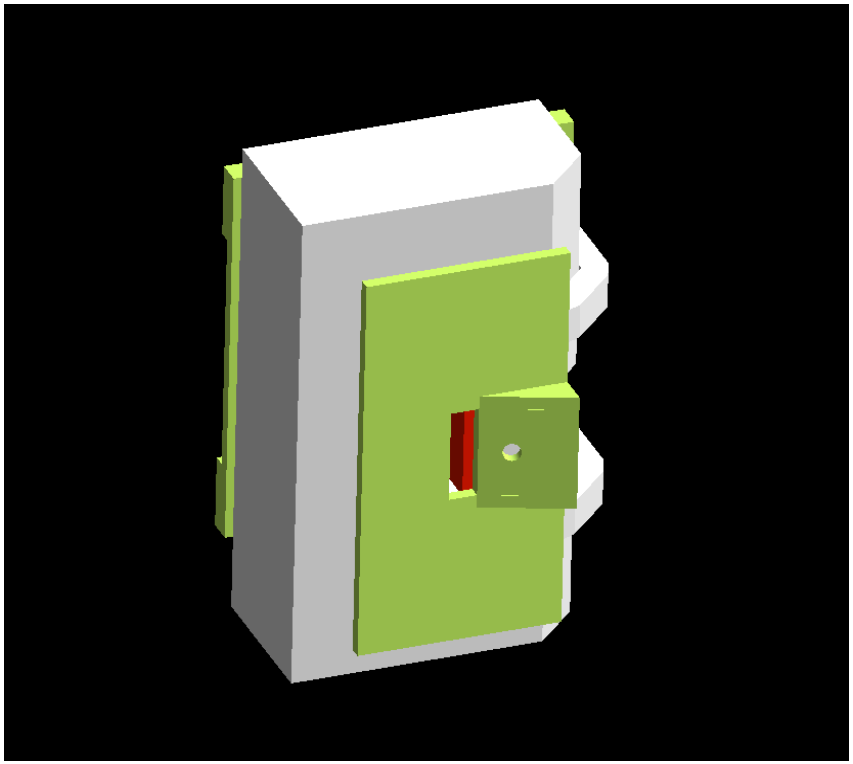
- Read access is openly available
- Migrated to repository to github, offers a lot of nice features
- Read/write access list managed by JLab staff (Ole)
- Latest code is in g4sbsv2 branch - will be merged with master once more stable
- Now have a-sbs group, SBS disk space, farm project



Software Work

- Andrew gave update on SIDIS progress last week
- Summary of my parts:
  - Cleaning up and restructuring code (mainly geometry)
  - Added in retrospection, diagnostics (next slide)
  - Implementing new field maps from Tosca
  - Updating geometry to reflect present magnets, lead shielding for G_E^p and G_E^n





Retrospection

- Ported over retrospection system from Moller simulation
- Can reconstruct how a simulation was run, including state of code

- Use git as respository base
- Information at build is hardcoded into binary:
  - git last revision log information
  - git commit hash
  - Entire run macro
  - Geant4 version built against
  - ROOT version built against
  - cmake version used
  - Build date
  - g4sbs source directory
  - build directory
- Separate library to be loaded with ROOT created at build

Retrospection

Say you want to recreate your Geant4 build results

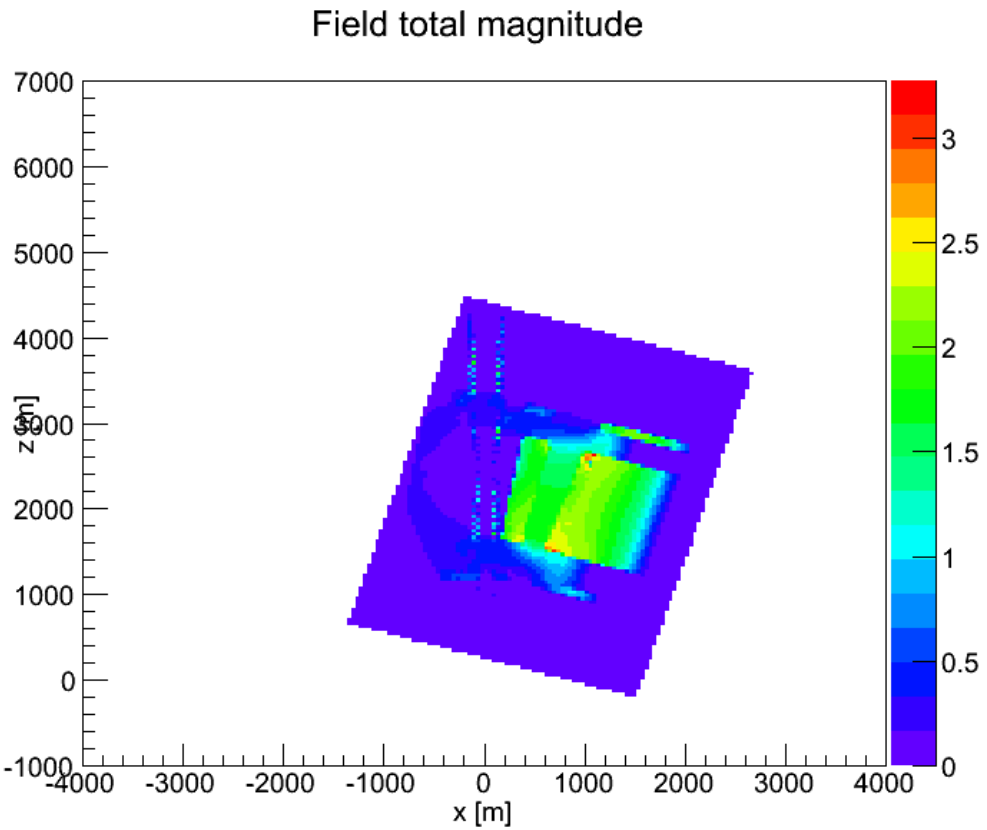
```
root [1] .ls
TFile** output.root
 TFile* output.root
  KEY: TTree T;1 Geant4 SBS Simulation
  KEY: G4SBSRunData run_data;1
  KEY: TH2F field_x;1 Field x component
  KEY: TH2F field_y;1 Field y component
  KEY: TH2F field_z;1 Field z component
  KEY: TH2F field;1 Field total magnitude
```

Retrospection

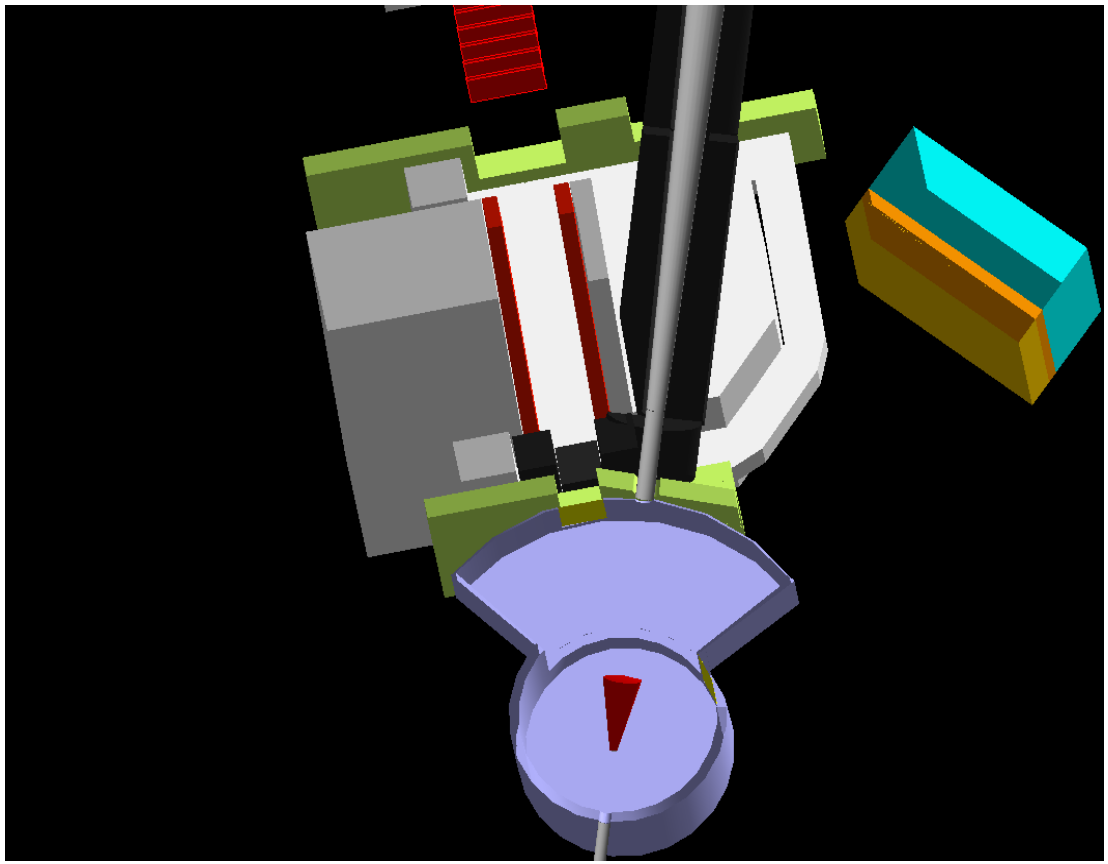
```
root [2] run_data->Print()
git repository info
-----------------------------------------------
commit 0a8d6f722bf76577618022ecc0b21e82c9fb3036
Merge: 946da58 5f1596c
Author: Seamus Riordan <sriordan@physics.umass.edu>
Date:   Tue Mar 4 10:15:32 2014 -0500

    Merge branch 'g4sbsv2' into profile

    Conflicts:
     src/G4SBSEArmBuilder.cc
## profile

...
```

New Field Maps

- Implemented new Tosca maps from Bogdan, need to work on speed optimization
- Field maps visualized in 2D histograms automatically generated and put in output ROOT file

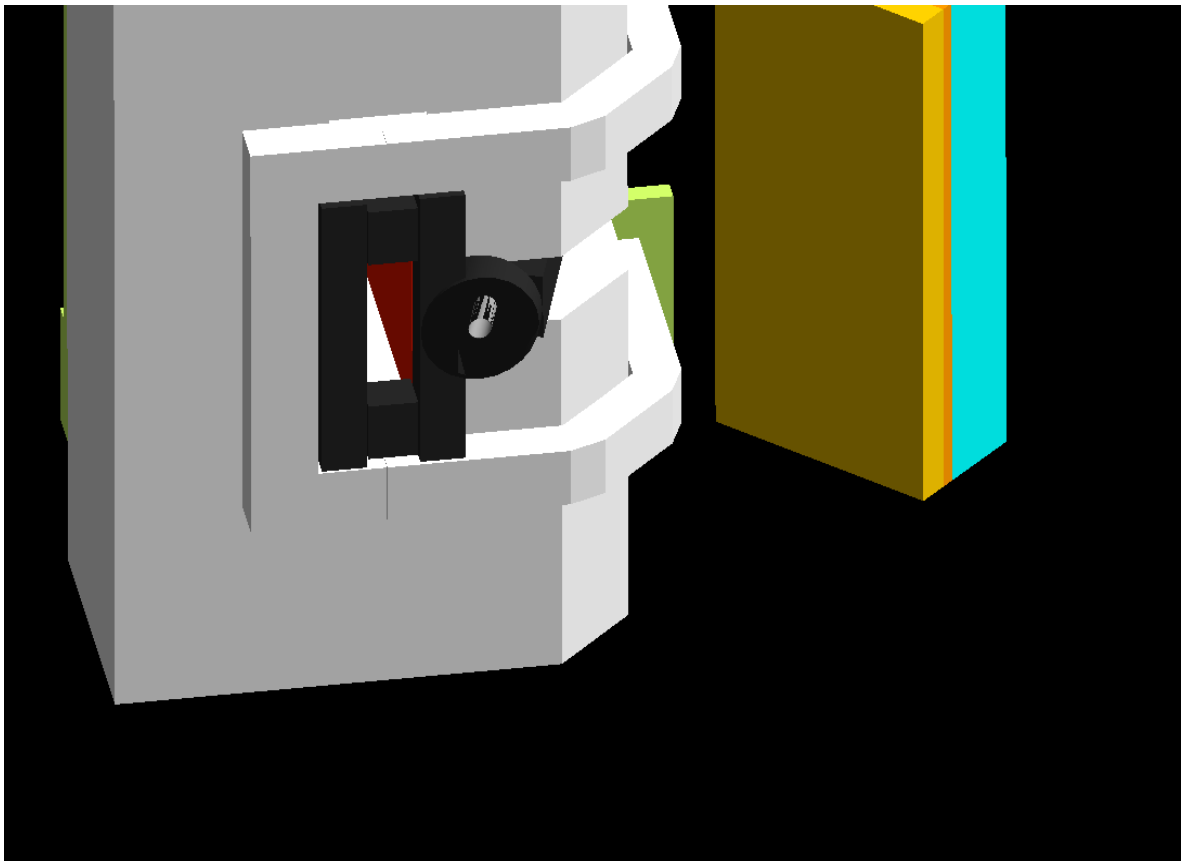


Target Chamber and Lead



- Scattering chamber updated with snout
- Need to add in snout exit window - spend time matching acceptance
- Lead added in around beamline and 48D48 aperture

Target Chamber and Lead



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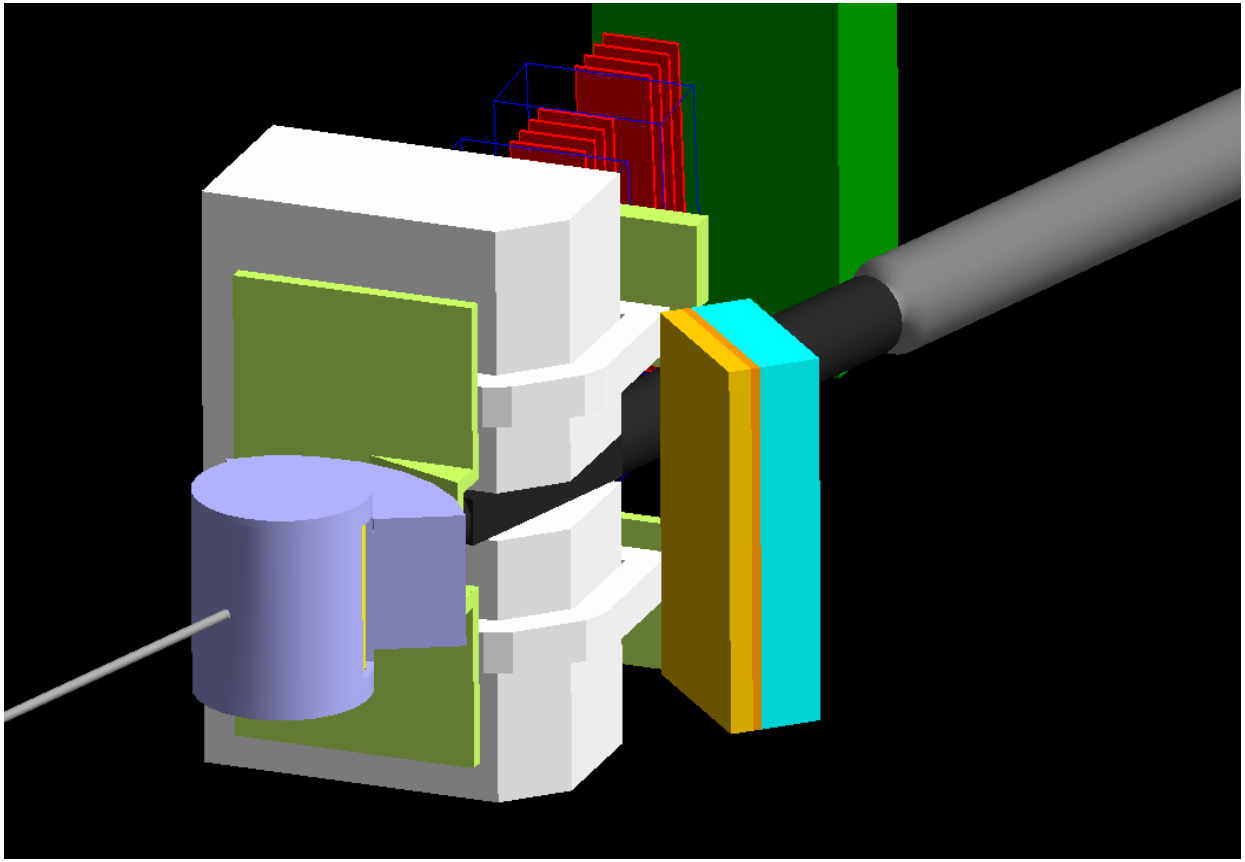

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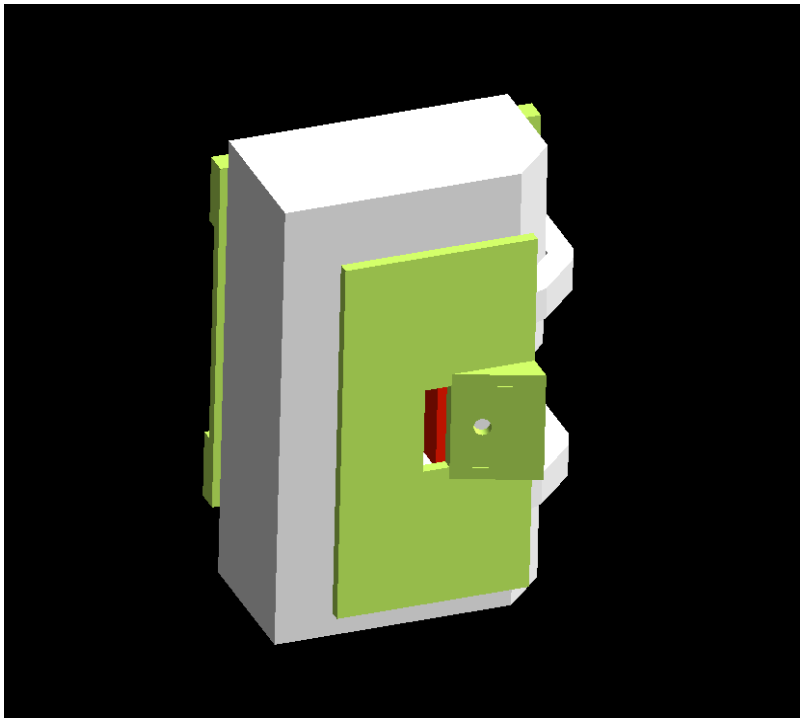
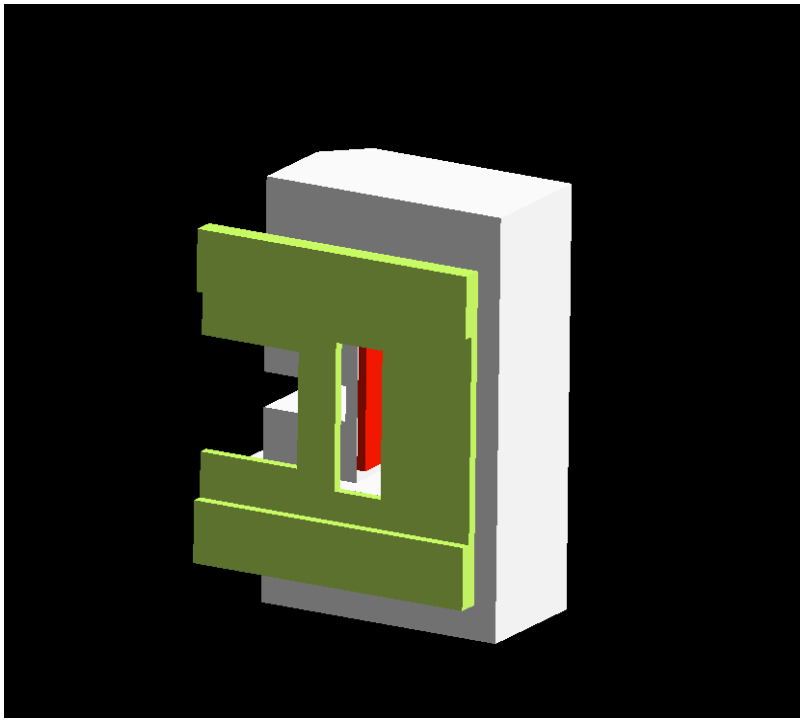
Magnetic Elements





- Included most recent field clamps
- Added in iron shims inside 48D48

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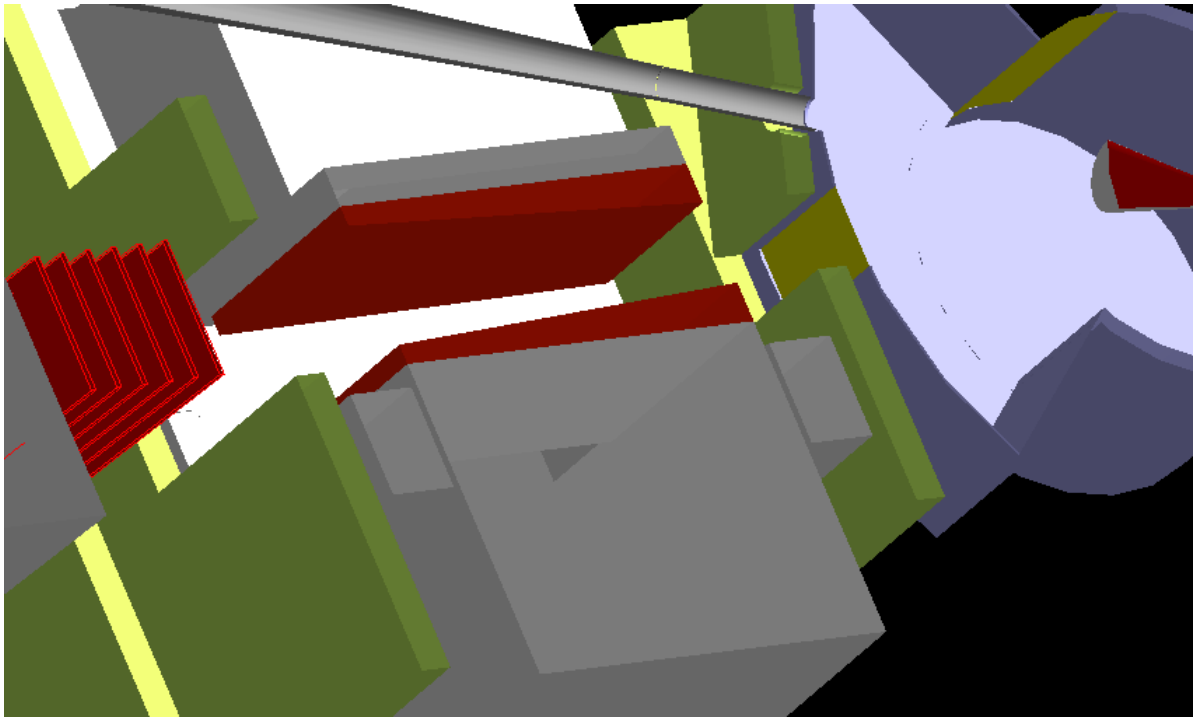

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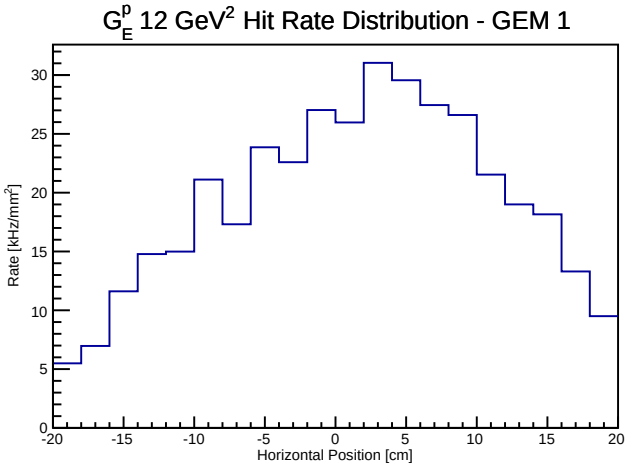
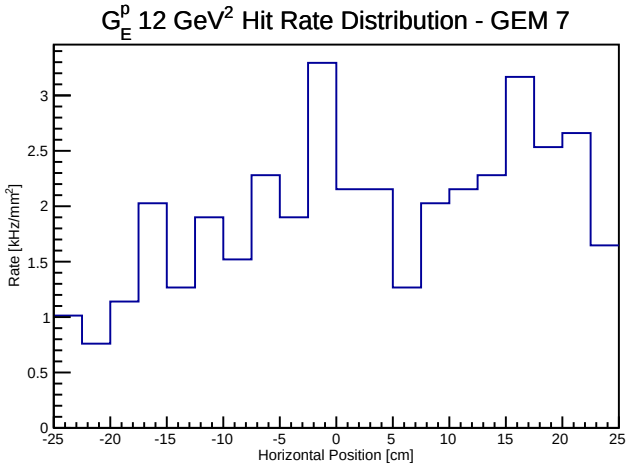
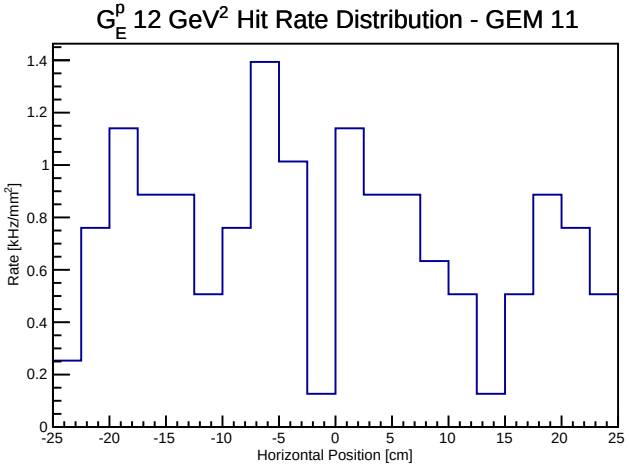
G_E^p GEM Backgrounds, $Q^2 = 12\ \mathrm{GeV}^2$

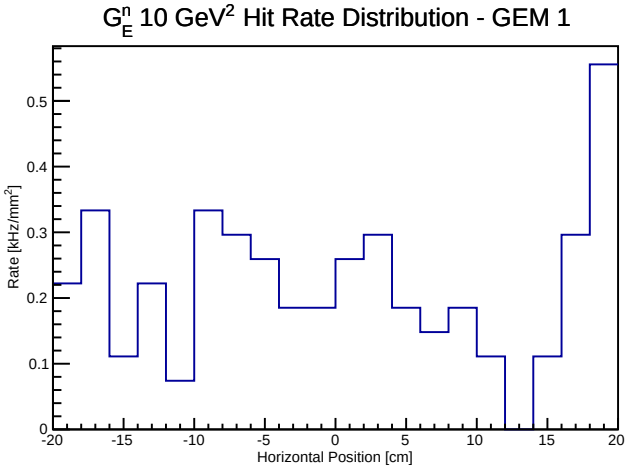


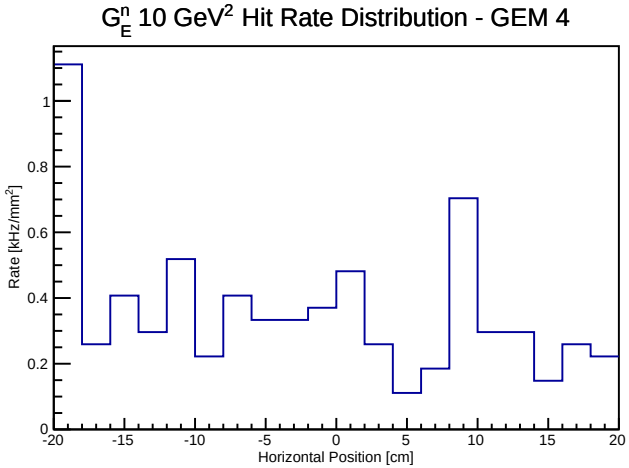


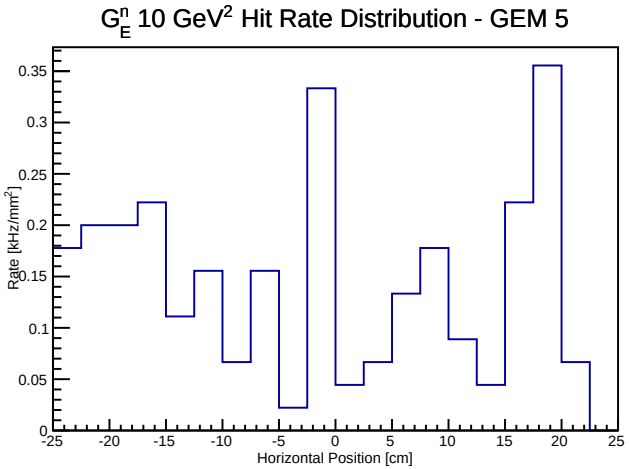


- Front tracker rates high - $\sim 2 - 3\ \mathrm{MHz/cm}^2$
- Factor 6 higher than CDR. Rear rates within factor 2

G_E^n GEM Backgrounds, $Q^2 = 10\ \mathrm{GeV}^2$







- BigBite GEM $\sim 30\ \mathrm{kHz/cm^2}$ (we estimated 50 in CDR)

Work To Do

- Continue to iterate geometries, analysis
  - Shielding
  - Clamps/48D48
  - Beamline/target chamber
- Ensure no overlapping geometries (passes simple grid tests)
- Maintain/improve codebase
  - Import remoll-style generators
  - Pre-vertex radiative effects and multiple scattering missing
  - Adapt so has output trees compatible with SBS GEM response code