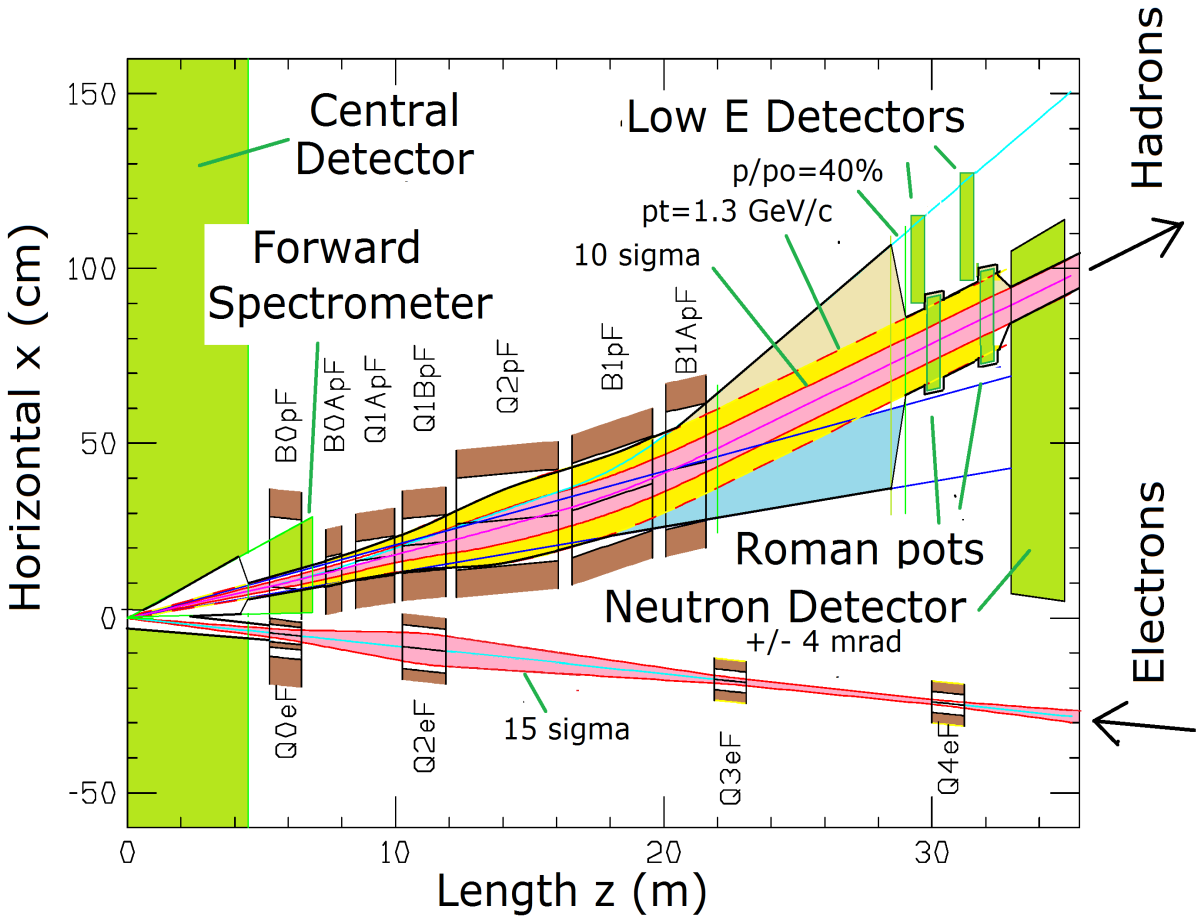
Preliminary BeAGLE e+D Simulation Results

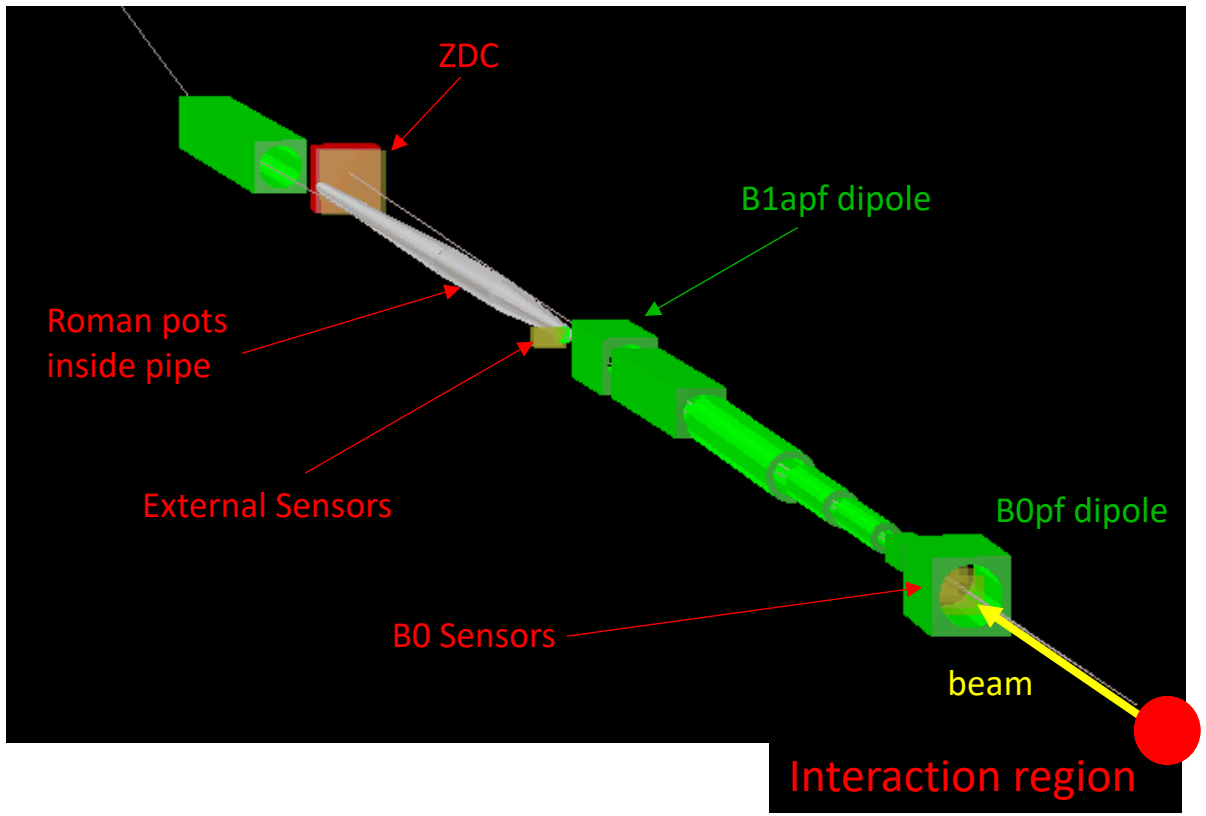
Alex Jentsch

3/6/2020

Simulation Apparatus

- EicRoot with GEANT4
- Includes ZDC, B0 sensors, Roman Pots, and External Silicon Sensors for particles with different rigidity.

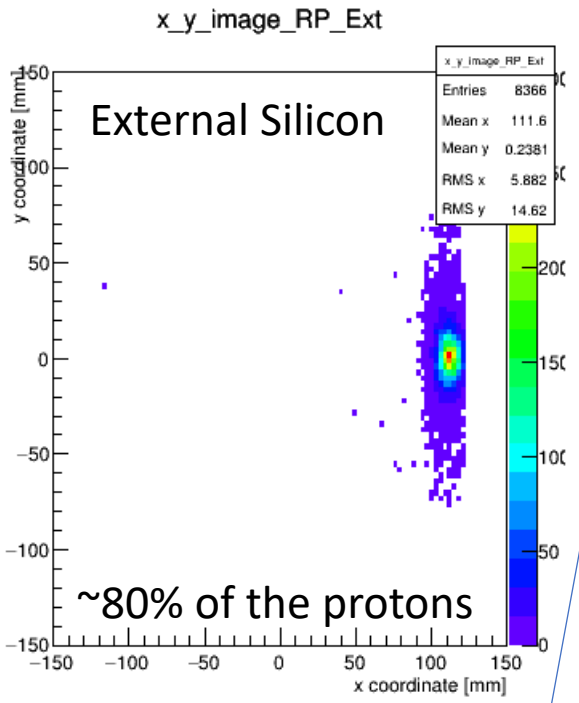


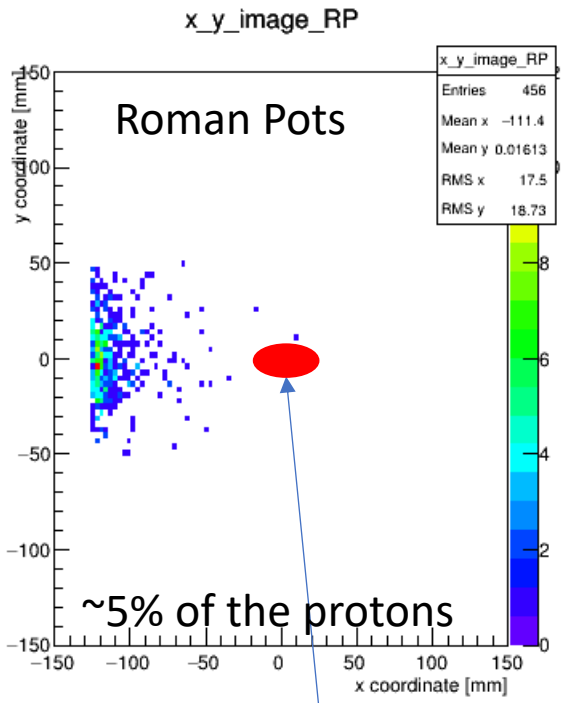


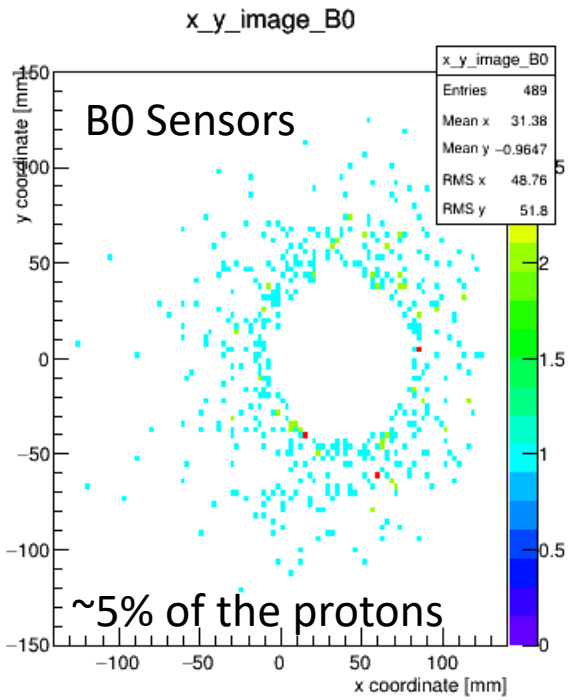
e+D 18x100 GeV
Neutron struck – proton spectator

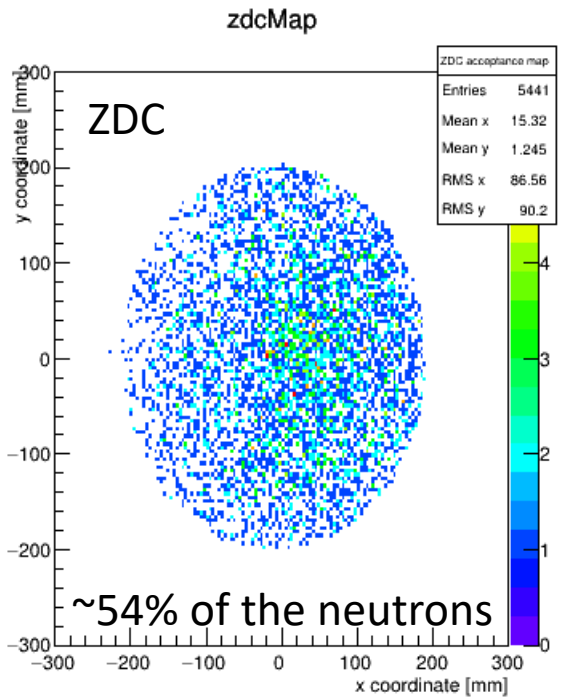
Acceptance Images (struck neutron, proton spectator)

- Just the hits showing on my GEANT detectors. (~50% p+n coincidence)
- Coordinates are *local* for each sensor – not a global system here.







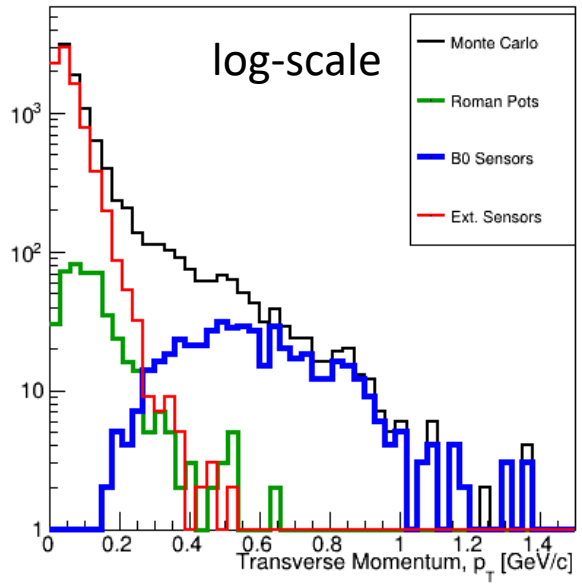


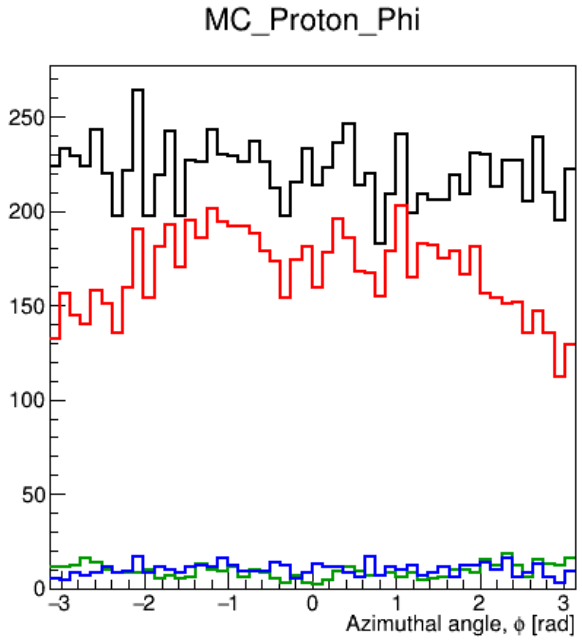
Beam pipe edge between these two detectors.

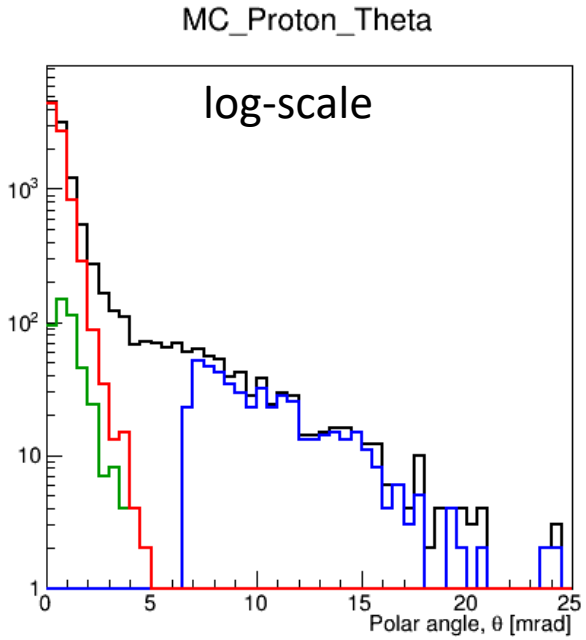
Deuteron beam (not to scale – just to guide the eye).

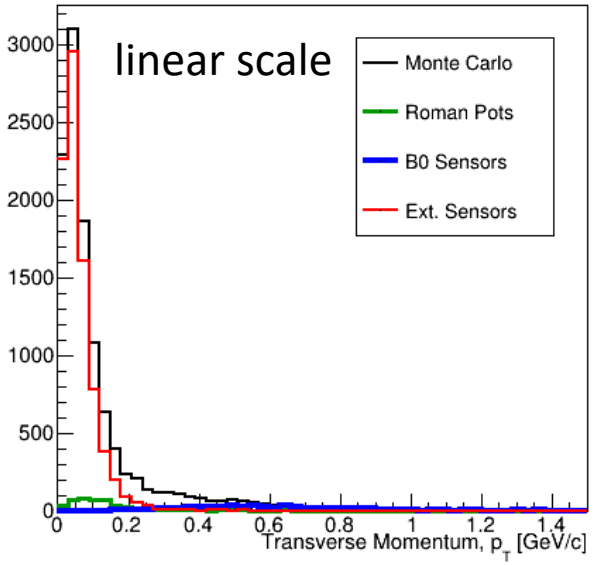
Last of the four sensors. The hole in the center is for the beam pipe.

Spectator Proton Acceptance (momentum, theta, phi)

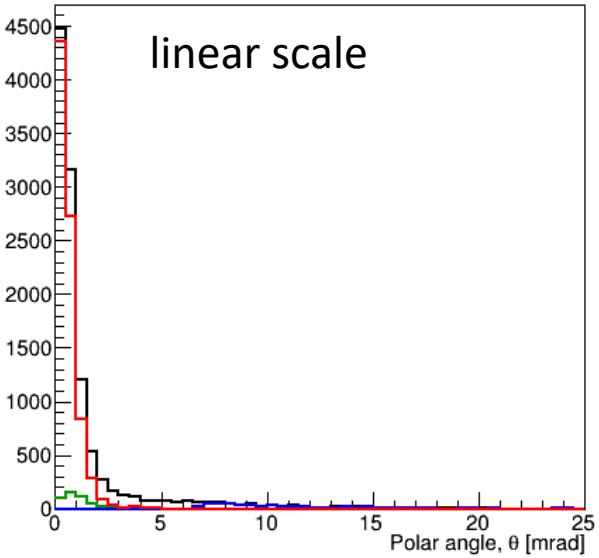








Spectator protons hardly affected from collision, as expected. Due to different rigidity compared to D, bent twice as much in the final dipole (B1apf). The external sensors do almost all of the work here.



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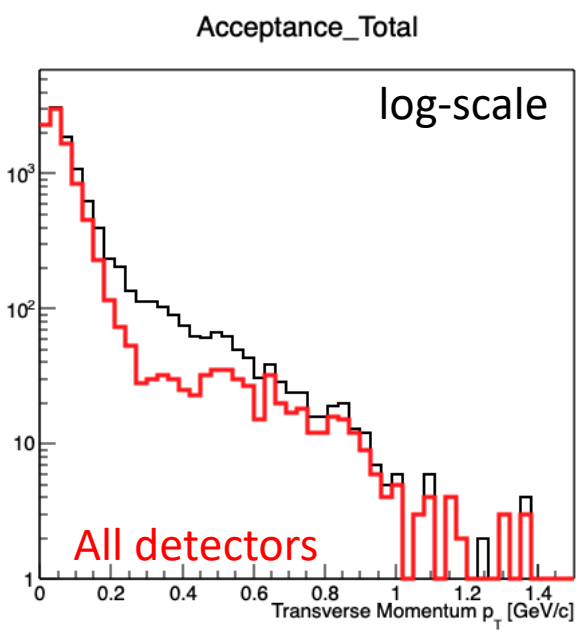

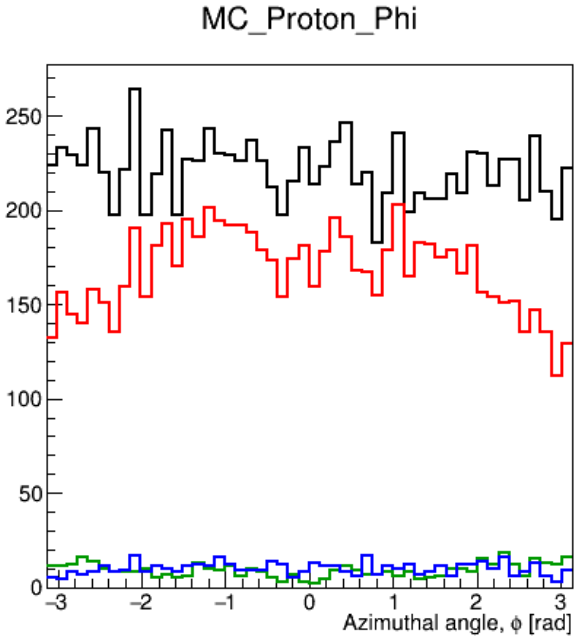

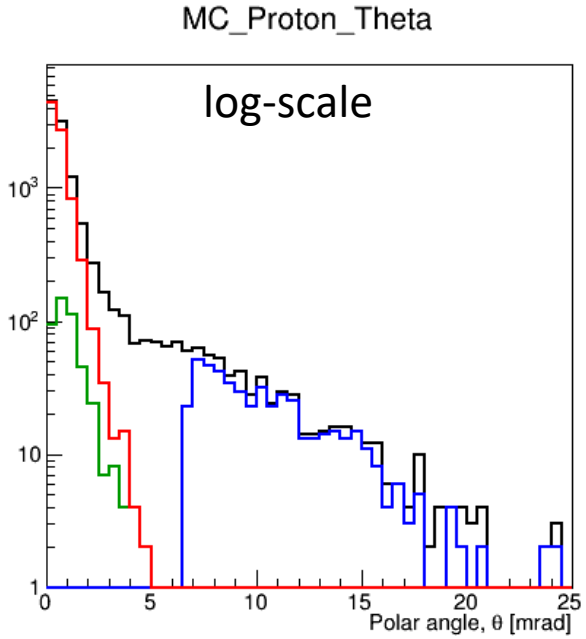

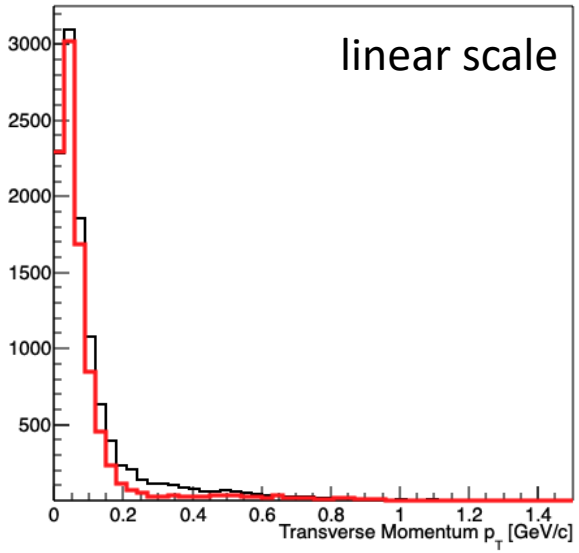

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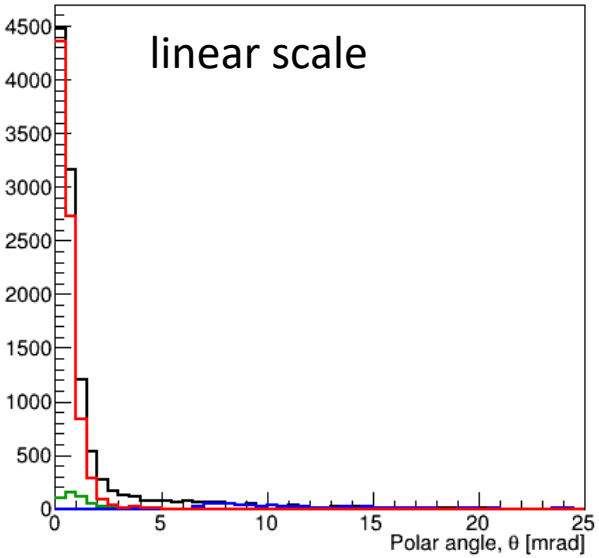
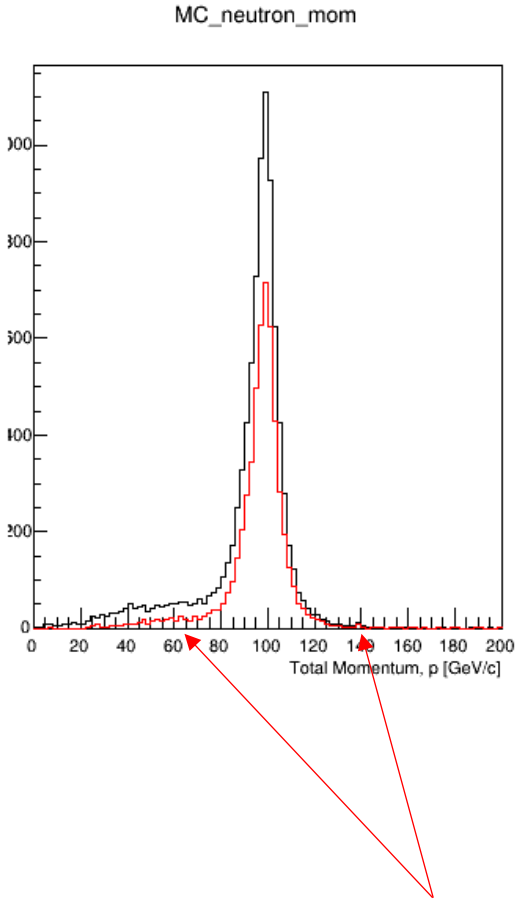
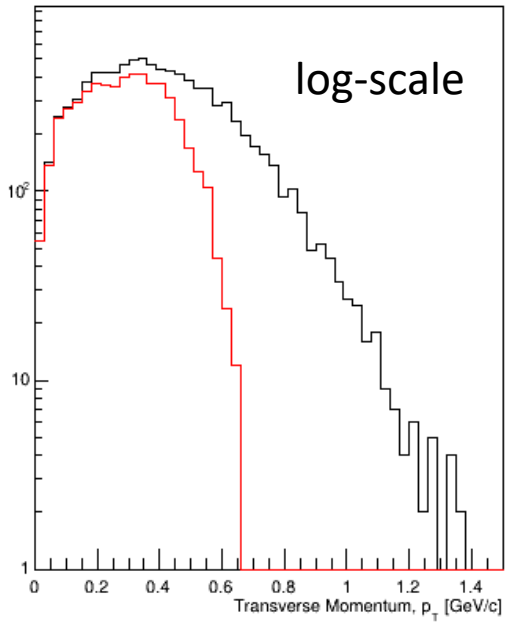
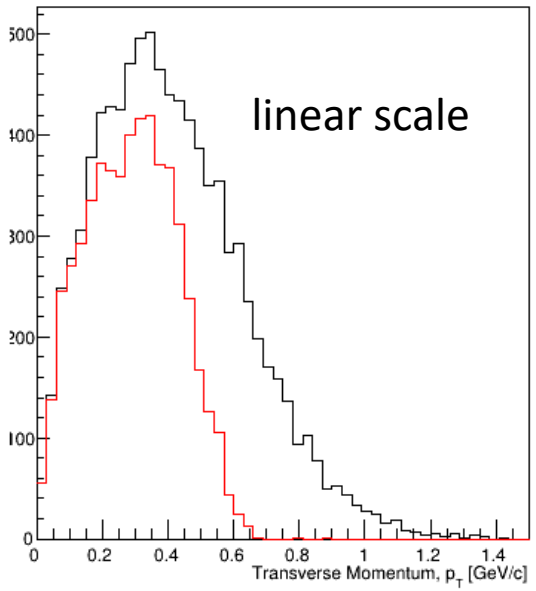


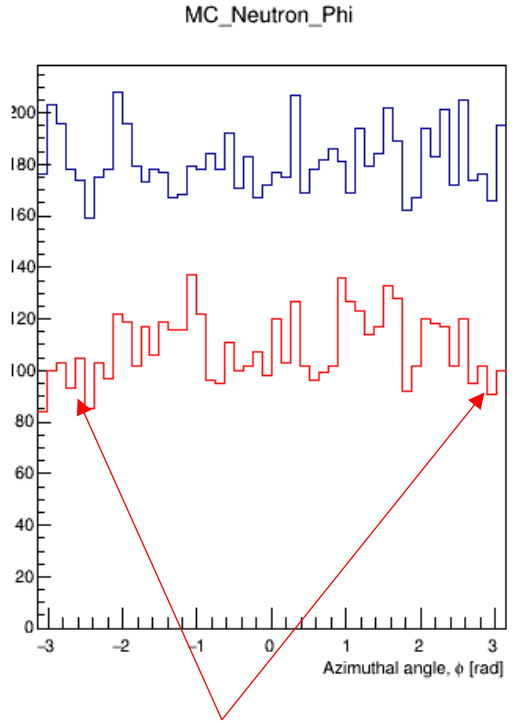
Struck Neutron Acceptance (momentum, theta, phi)



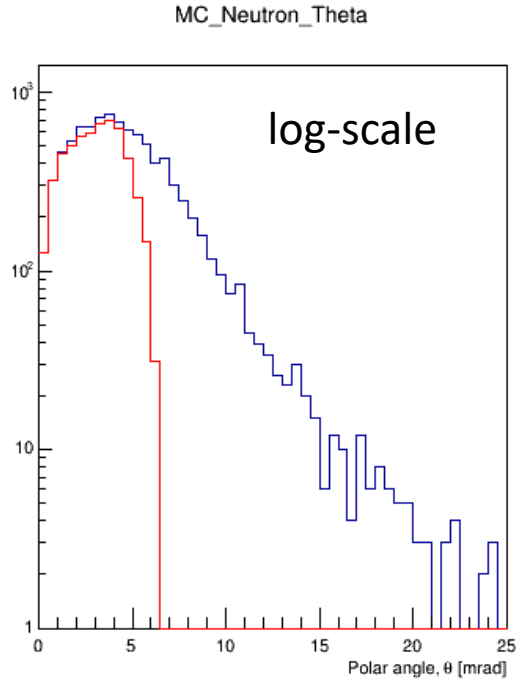


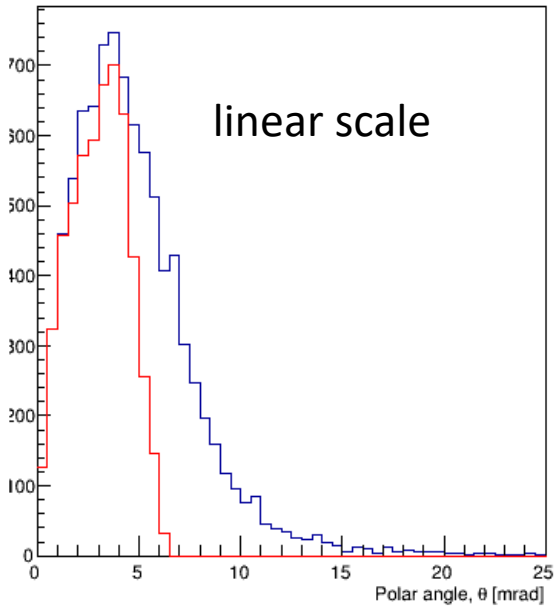


Asymmetrical tails, as it should be from the BeAGLE input (sanity check).



Neutrons hitting aperture. Currently setup to allow for roughly 5mrad cone (not perfectly uniform in phi).





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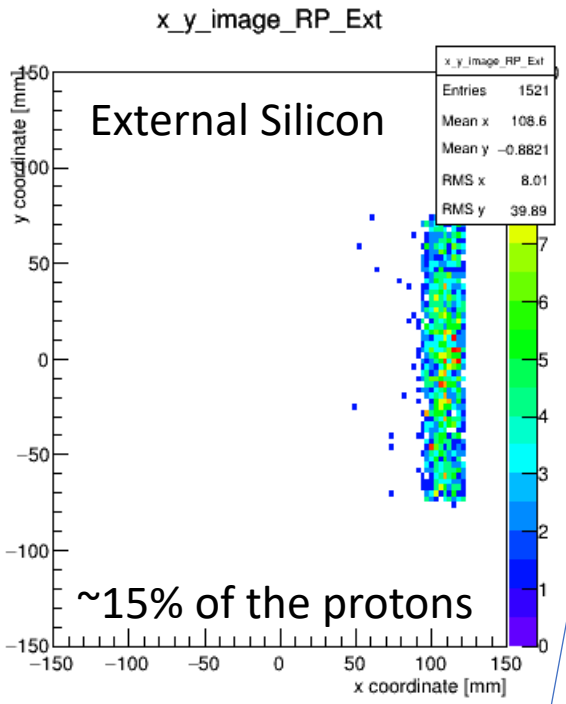

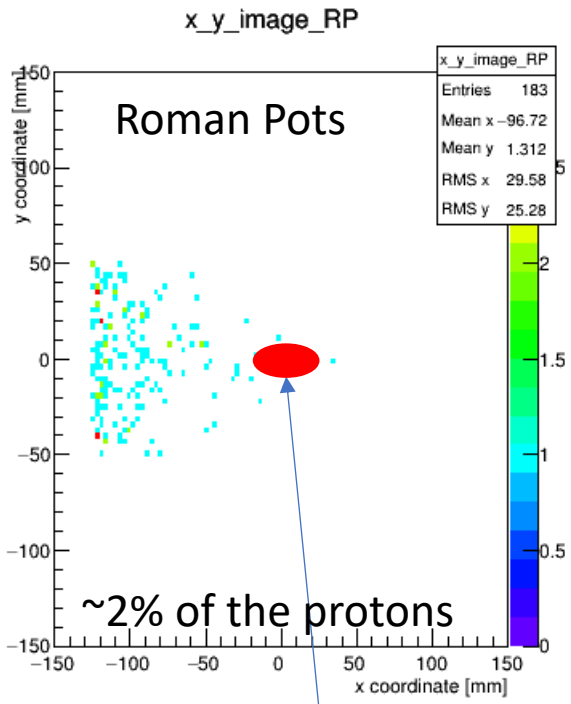

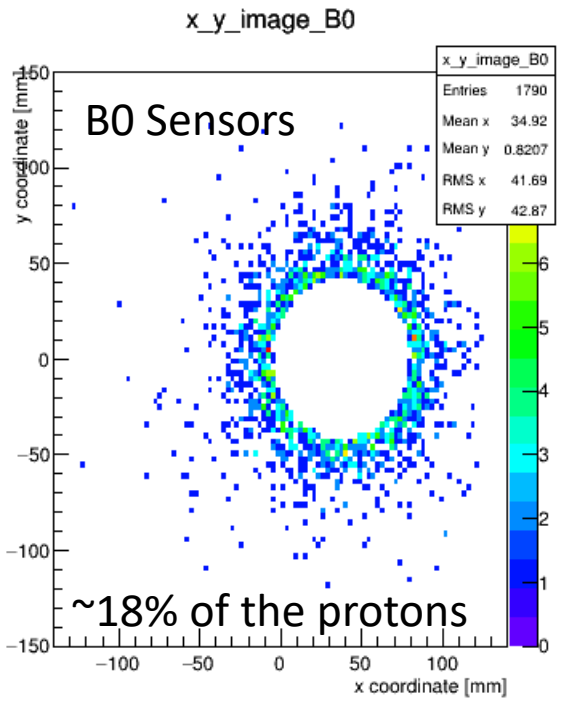

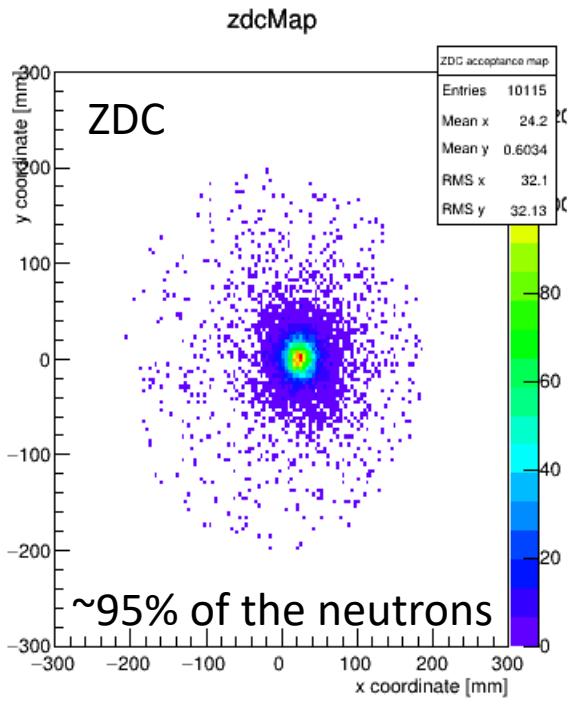

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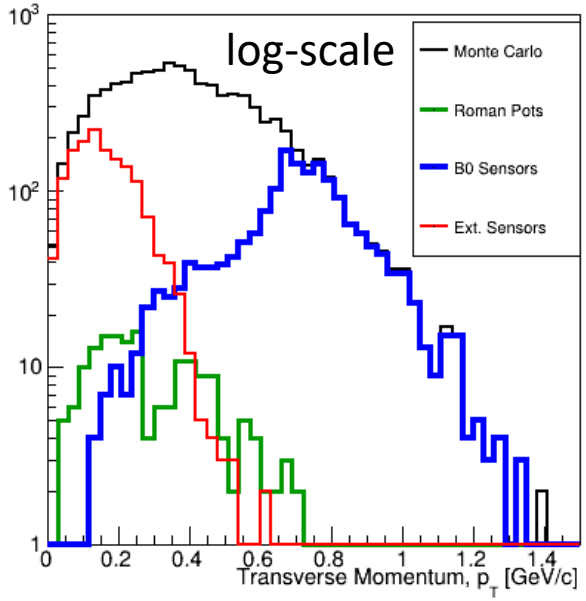

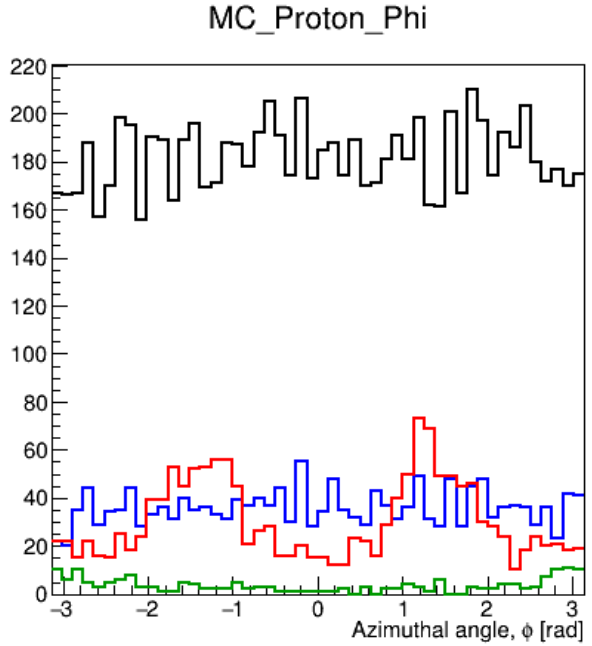

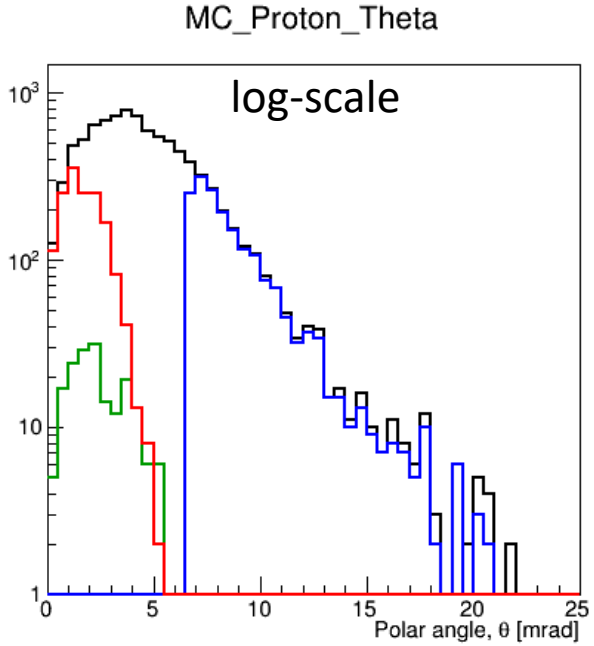

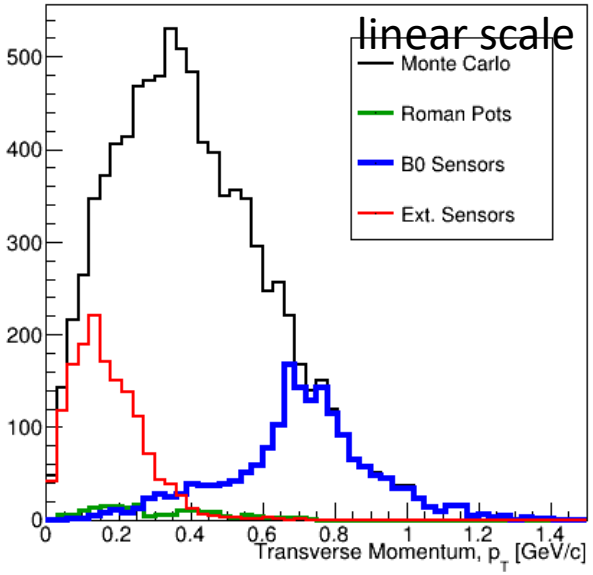

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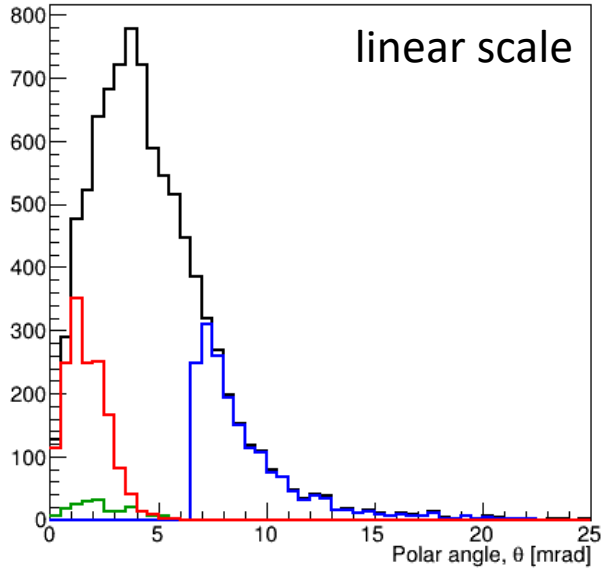

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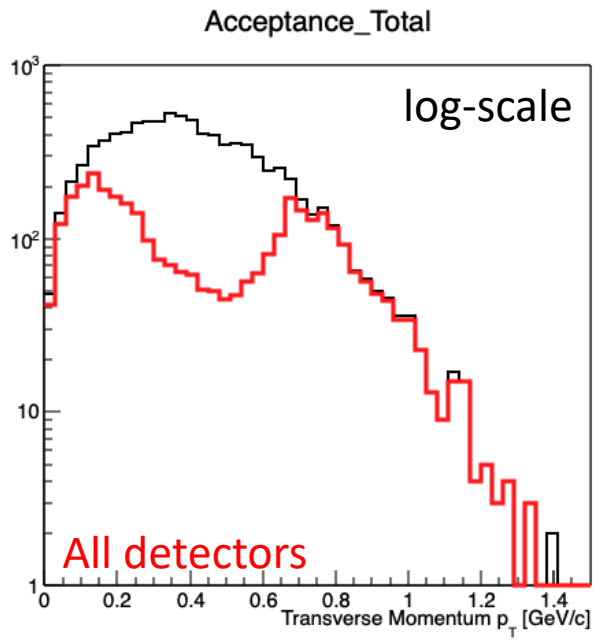

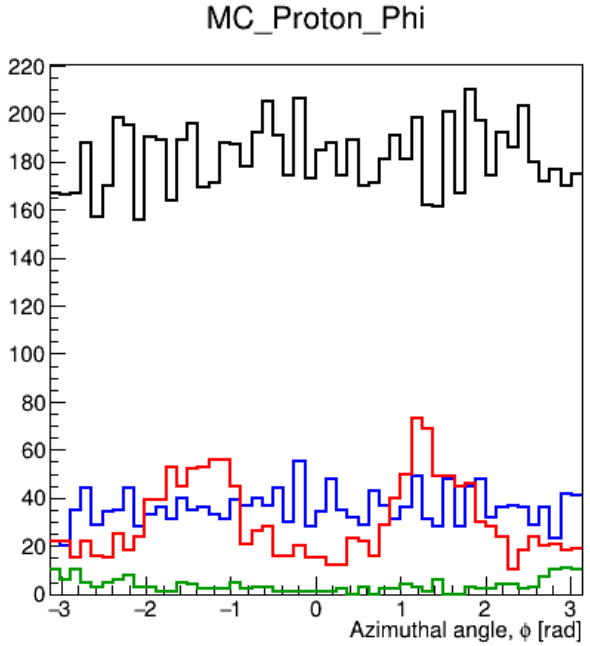

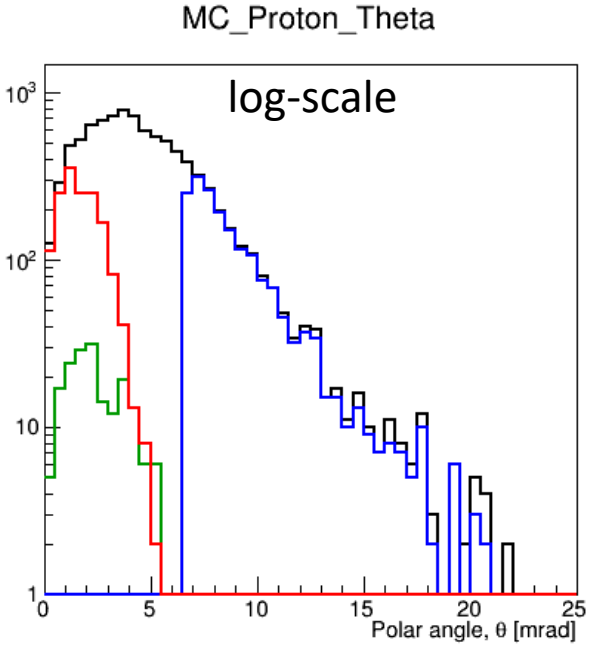

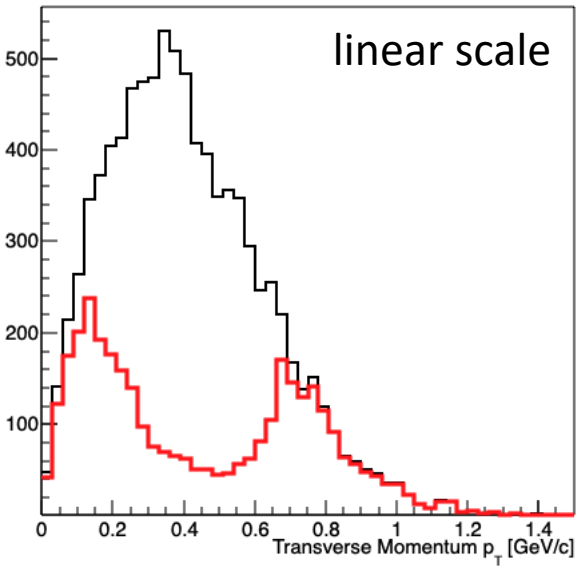

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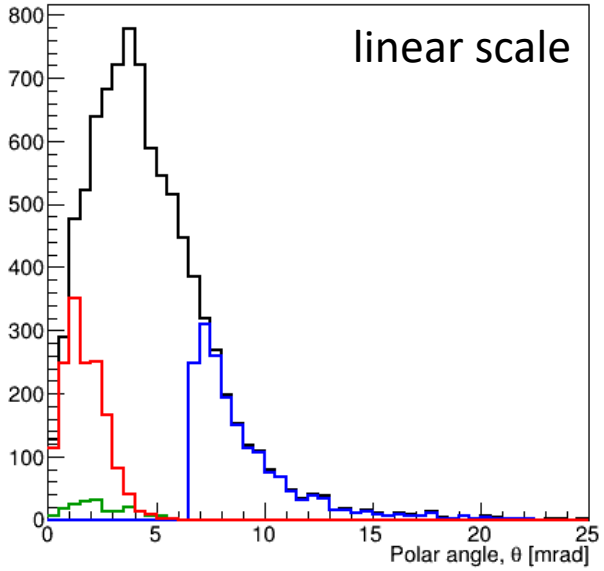
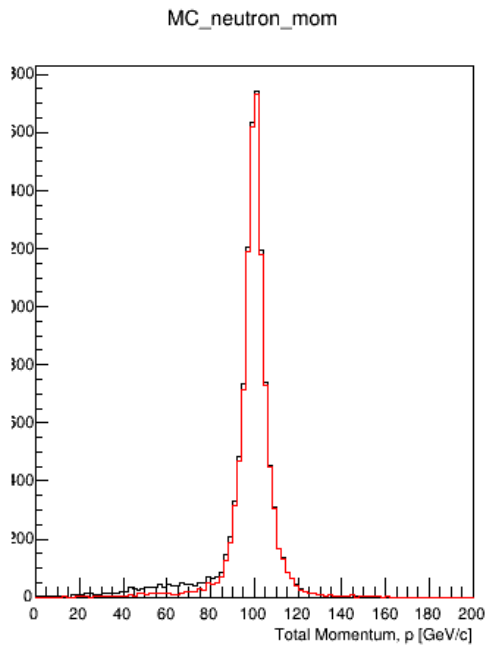
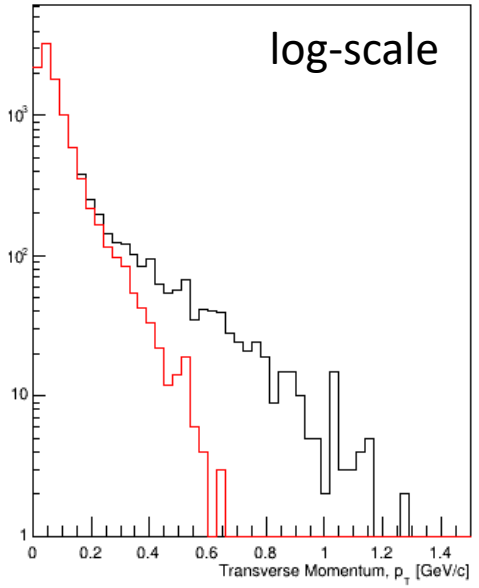
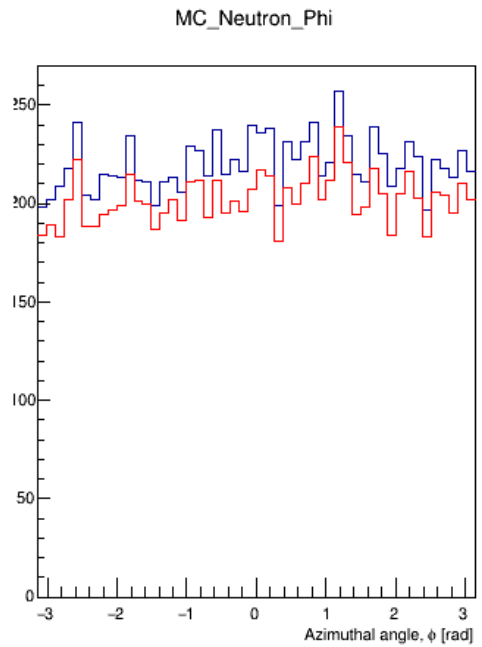
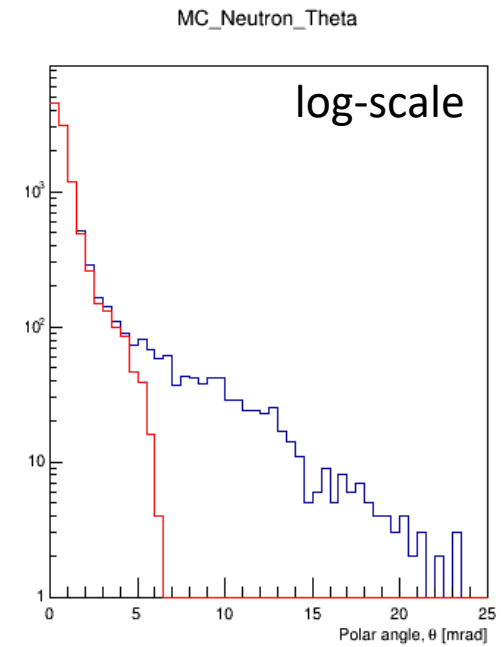


Spectator Neutron Acceptance (momentum, theta, phi)

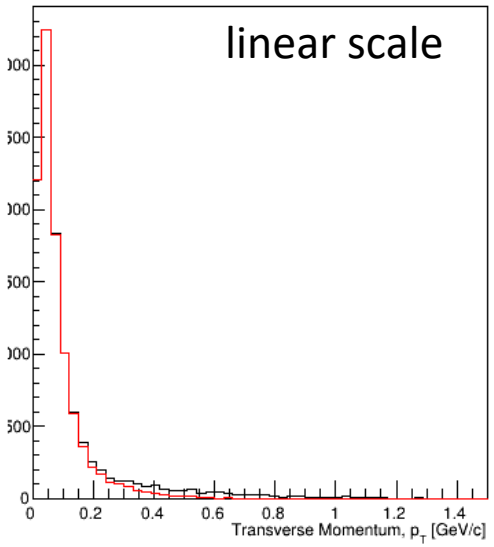


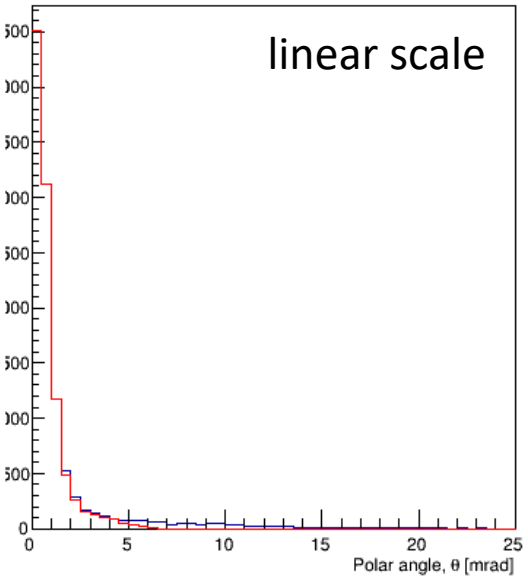






Spectator neutrons essentially unaffected by collision. Most of them fall into the ZDC acceptance and pass the aperture. The cone is much more tightly confined (generally within 2.5 mrad).





Takeaways/notes

- I now have a good understanding of the BeAGLE samples from Kong and how to differentiate the struck & spectator nucleons.
- Working now to optimize placement of sensors.
  - In flux a bit while the beam pipe design is finalized.
- Working on simulating measurements of physics observables (i.e. “T”).
  - I have a list from Kong that I will put plots together for.
- Will add realistic reconstruction smearing after optimization of detector placement.
  - Crab cavity rotation, angular divergences, etc.
  - This has all been done for DVCS, so we have a good starting point for e+D study.
  - e+He3 would be good to have (I understand there are technical kinks to work out).
- Aiming to have a number of these things ready for Temple meeting.