

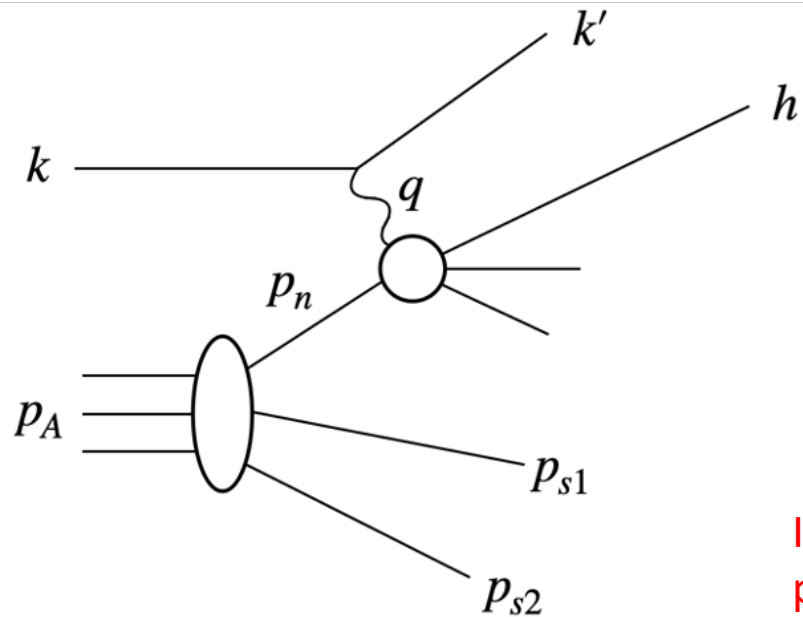
e^+He^3 Full Simulations

Alex Jentsch

9/18/2020

Preliminaries

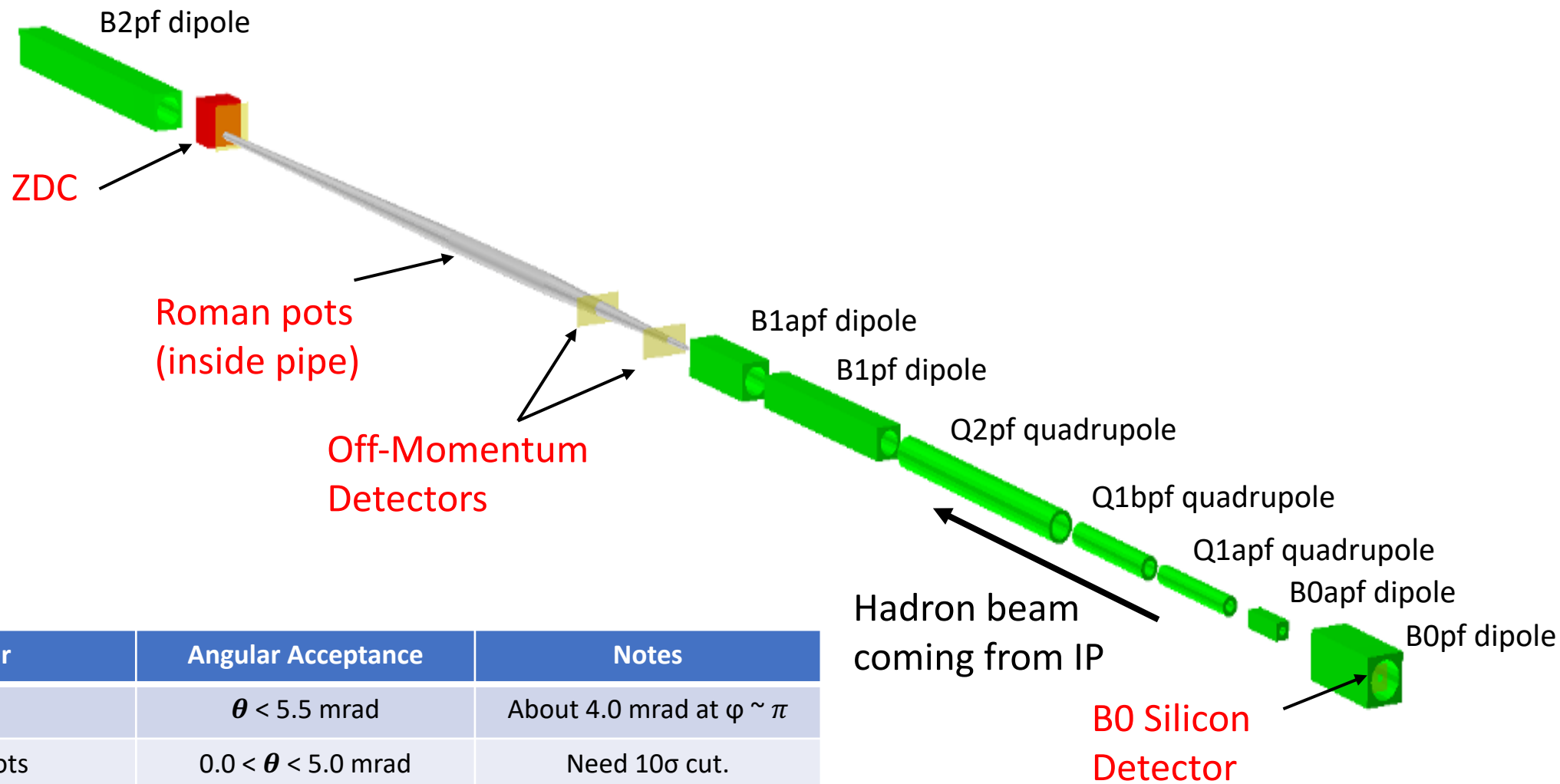
- Many physics channels with final state particles in the far-forward region have been studied.
 - e+p collisions with FF final proton
 - e+d collisions with FF proton and/or neutron (proton has different rigidity to beam!)
 - e+A (heavy nucleus) collisions with FF neutrons, photons, protons, etc.
- e+He3 is one of last major things left unstudied in the FF region
 - Important for studying polarized neutron structure, among other things.



Photon from electron hits the neutron in the nucleus, and neutron can provide various final states.

In the active neutron case, there are two proton spectators to tag! These protons have larger x_L than the the proton from the deuteron case (~ 0.6).

IR & Detector Layout



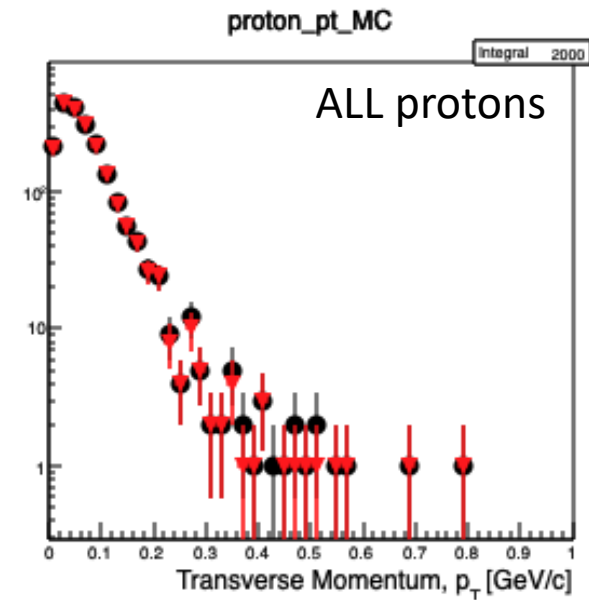
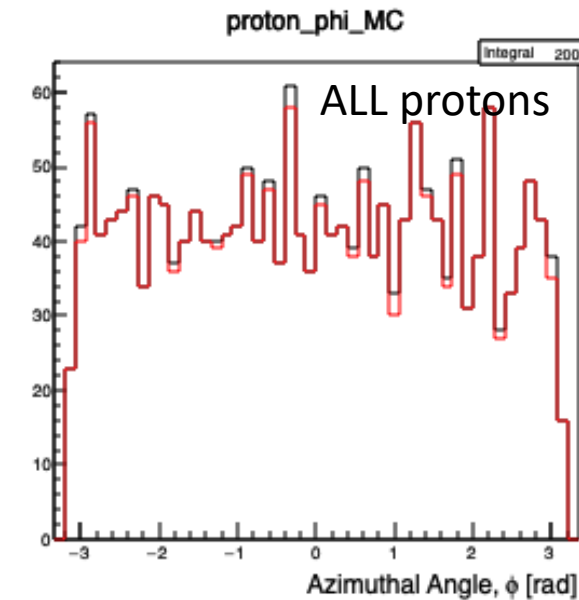
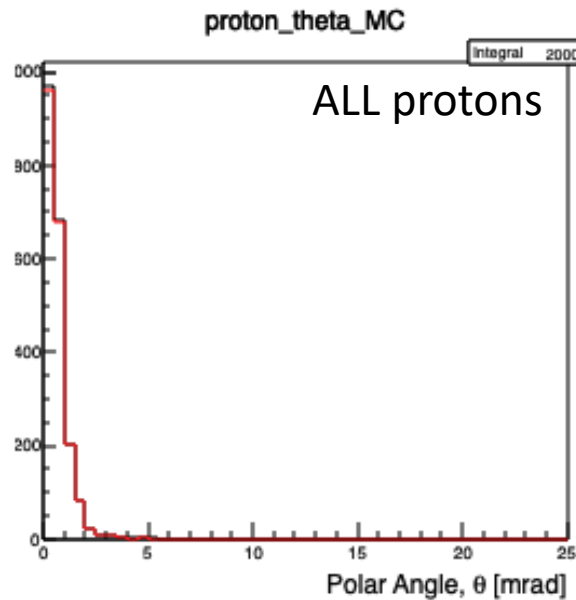
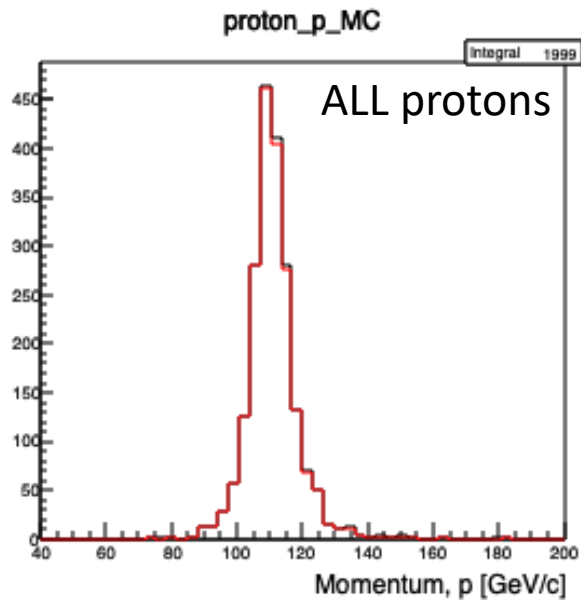
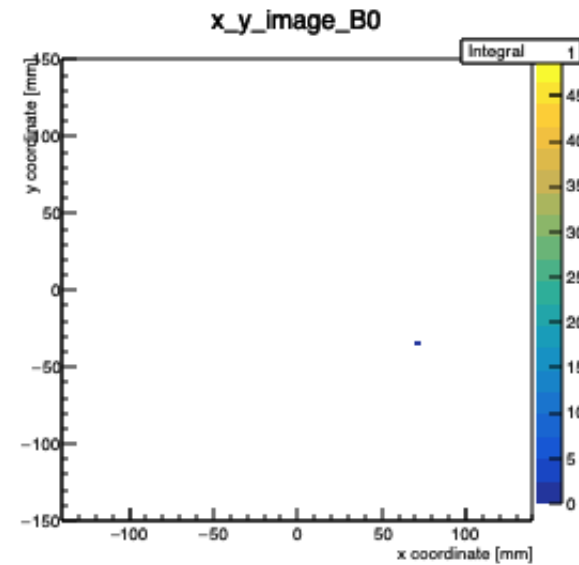
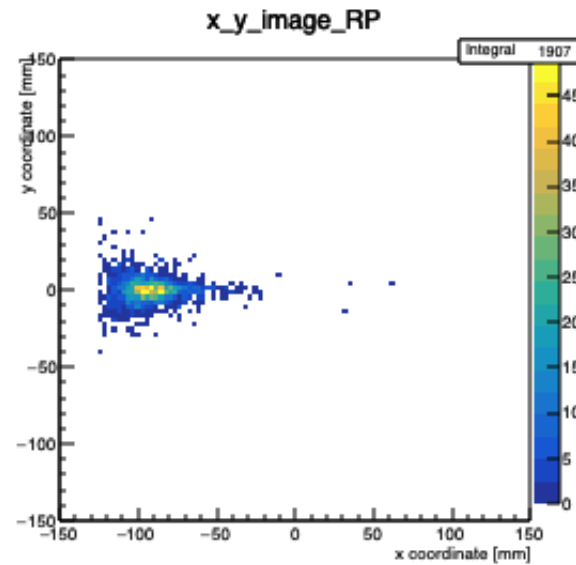
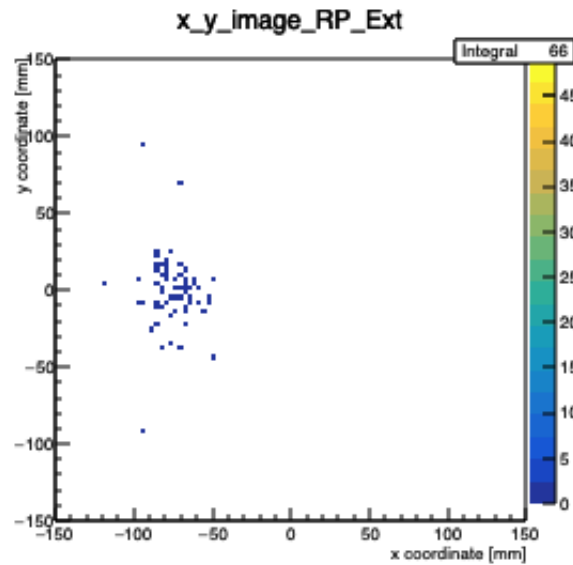
Detector	Angular Acceptance	Notes
ZDC	$\theta < 5.5$ mrad	About 4.0 mrad at $\varphi \sim \pi$
Roman Pots	$0.0 < \theta < 5.0$ mrad	Need 10σ cut.
Off-Momentum Detectors	$0.0 < \theta < 5.0$ mrad	Roughly $.4 < x_L < .6$
B0 Sensors	$5.5 < \theta < 13.0 - 20.0$ mrad	Still need to optimize.

$$x_L = \frac{p_{z,nucleon}}{p_{z,beam}}$$

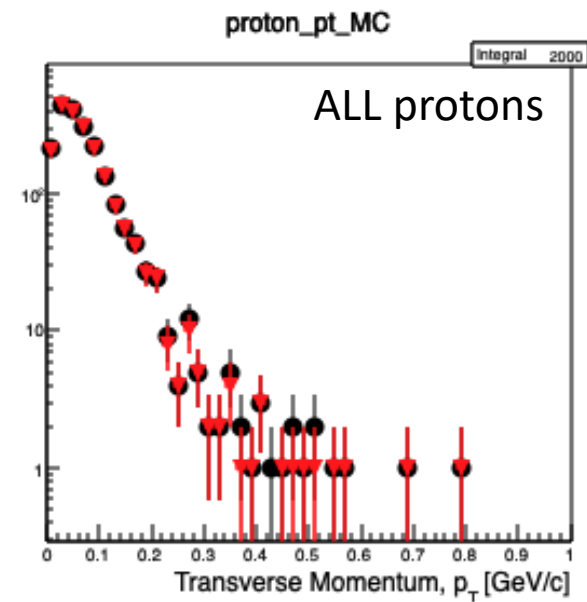
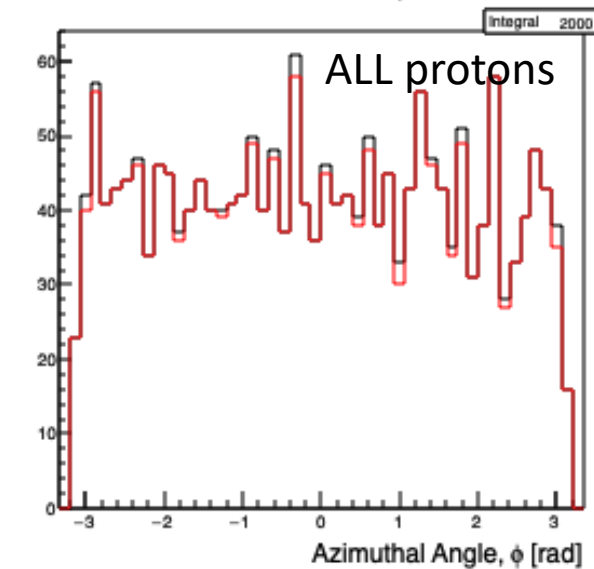
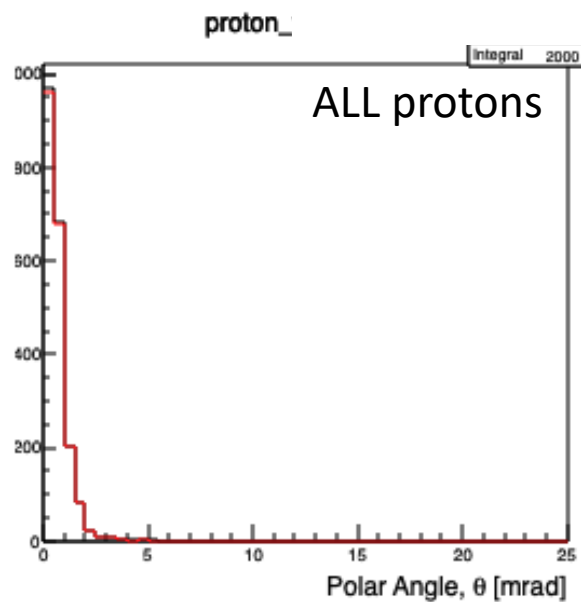
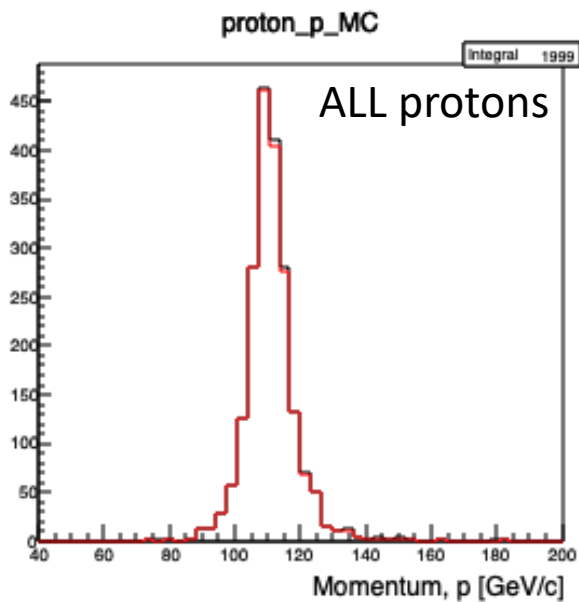
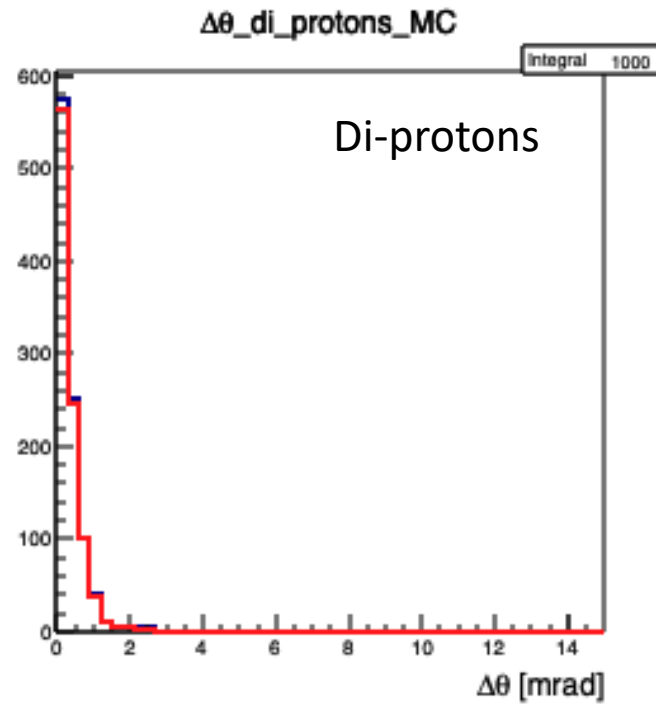
BeAGLE 10x110 GeV/n DIS

In general, the "DIS" case here means the final protons have *similar* kinematics.

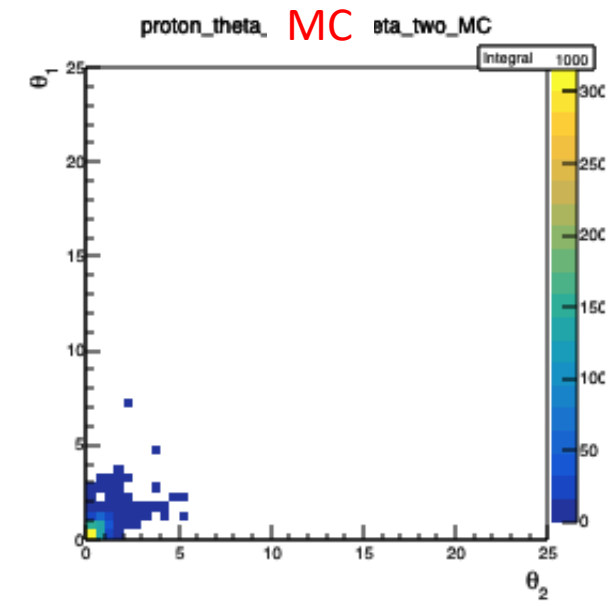
BeAGLE 10x110 results – spectator protons – DIS



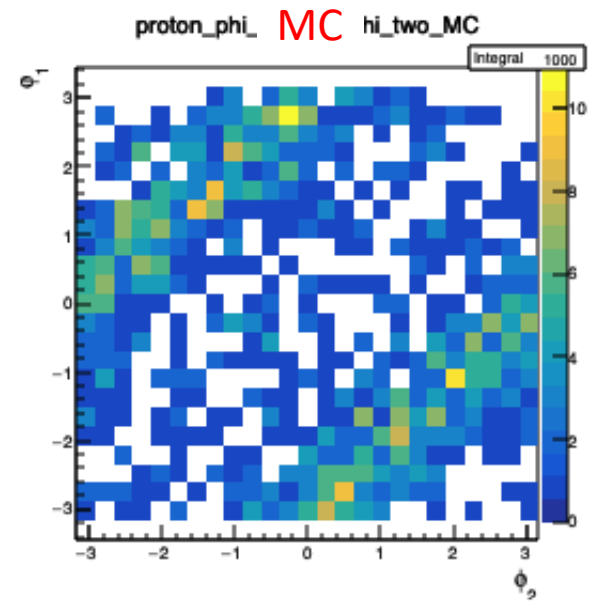
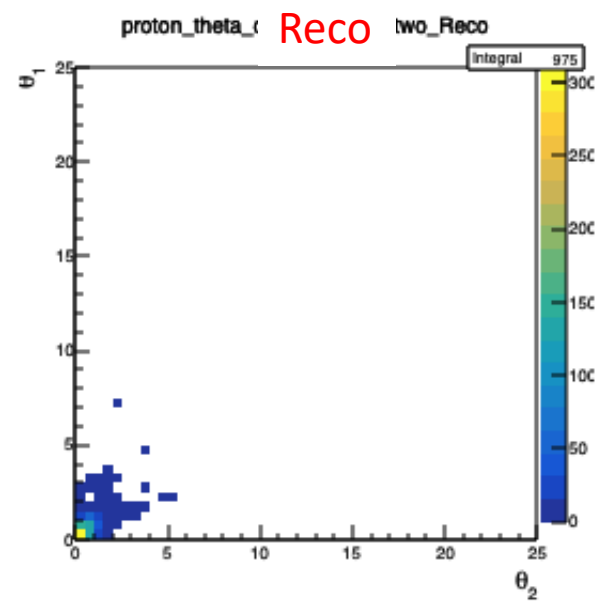
BeAGLE 10x110 results – spectator protons – DIS



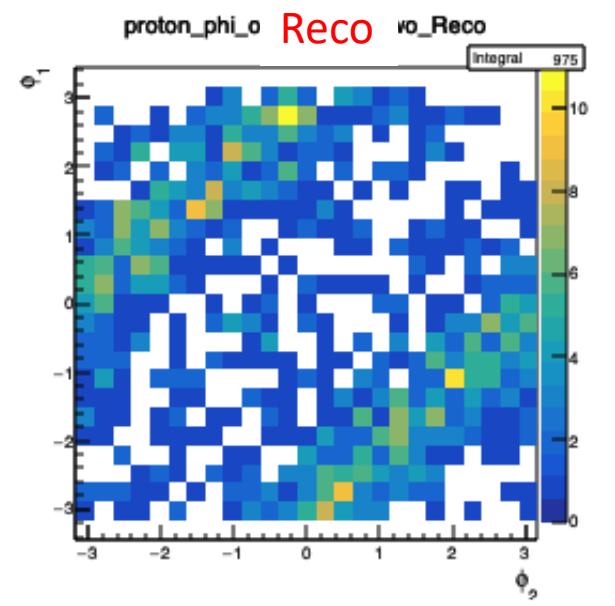
BeAGLE 10x110 results – spectator protons – DIS



Proton 1 theta vs. proton 2 theta



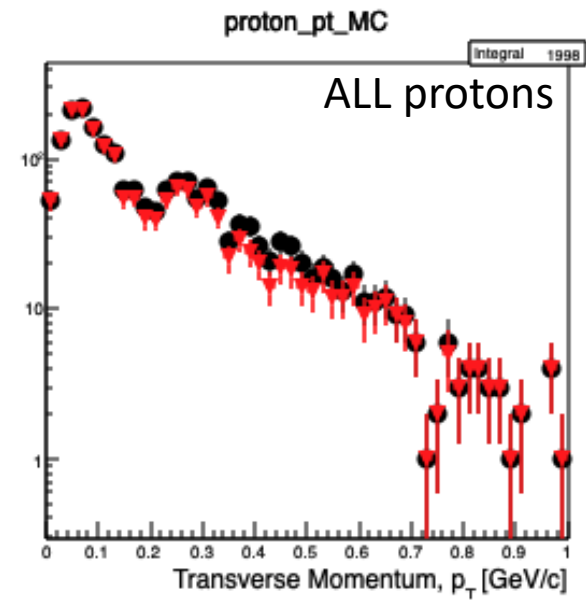
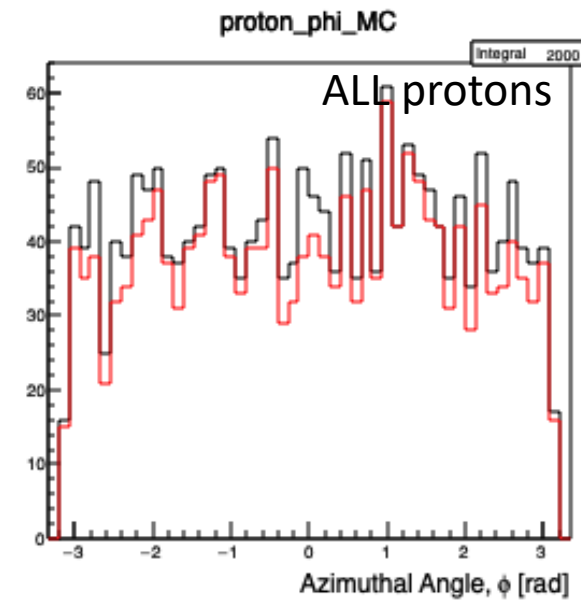
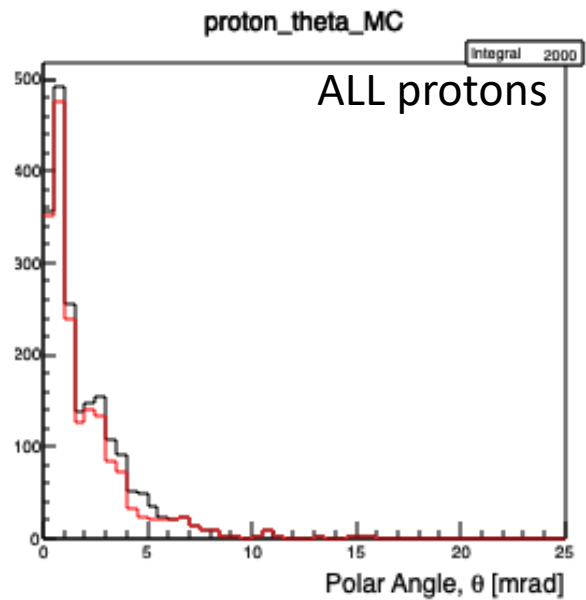
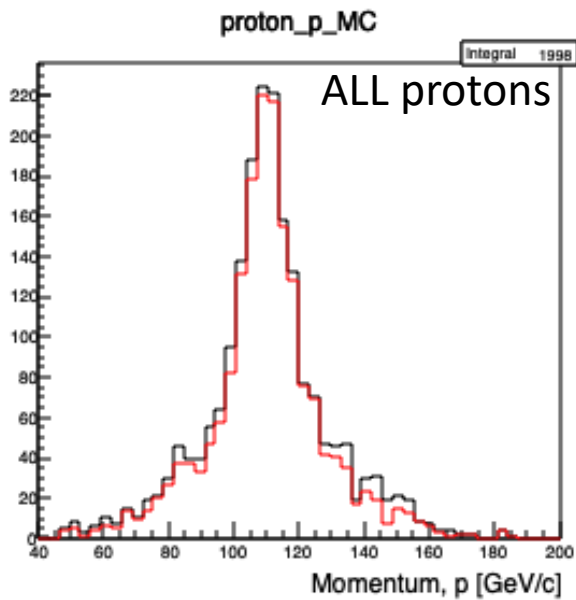
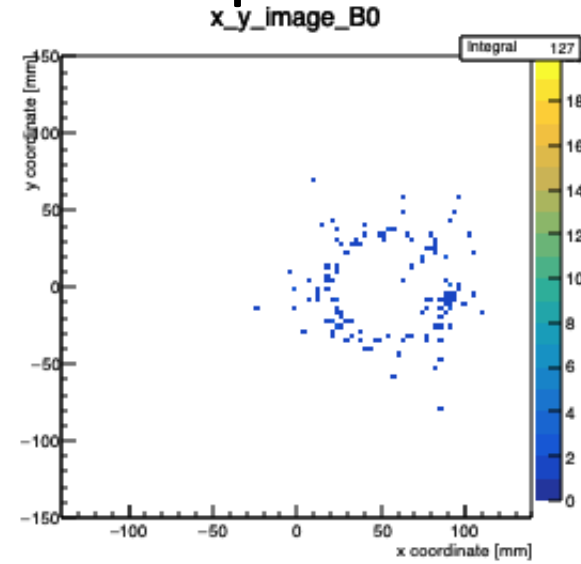
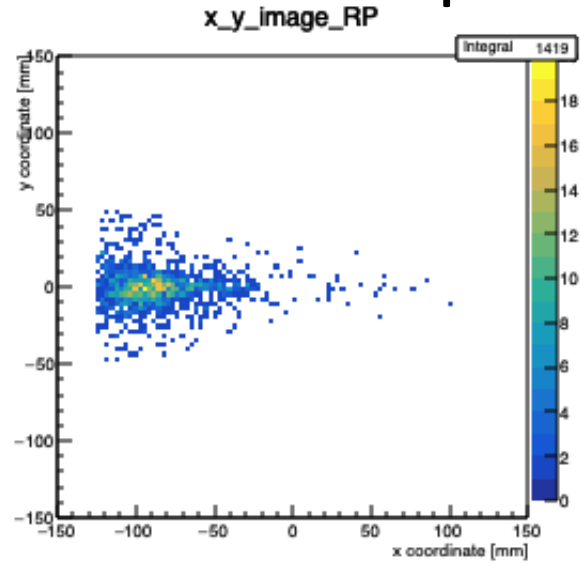
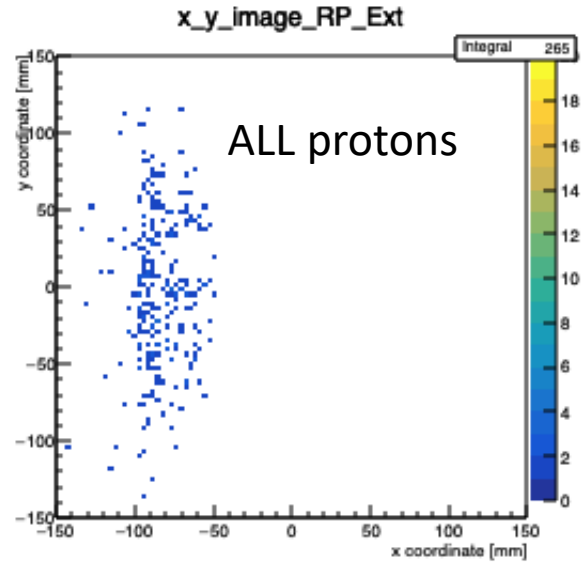
Proton 1 phi vs. proton 2 phi



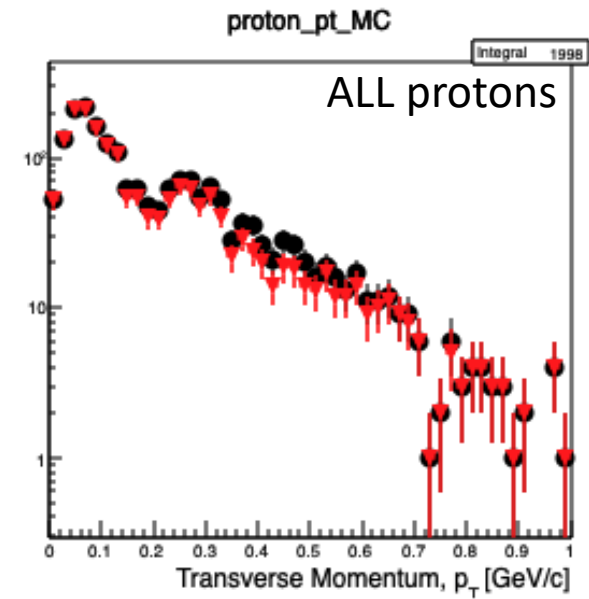
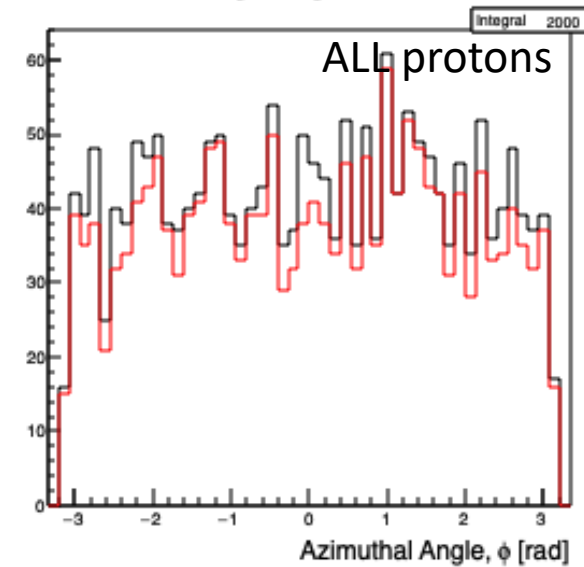
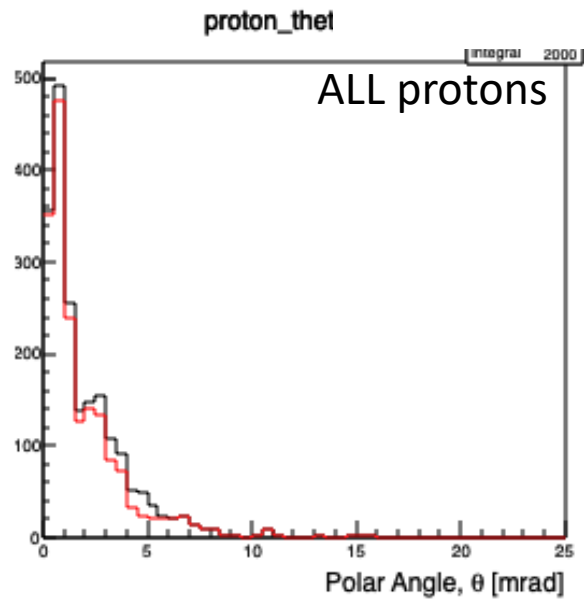
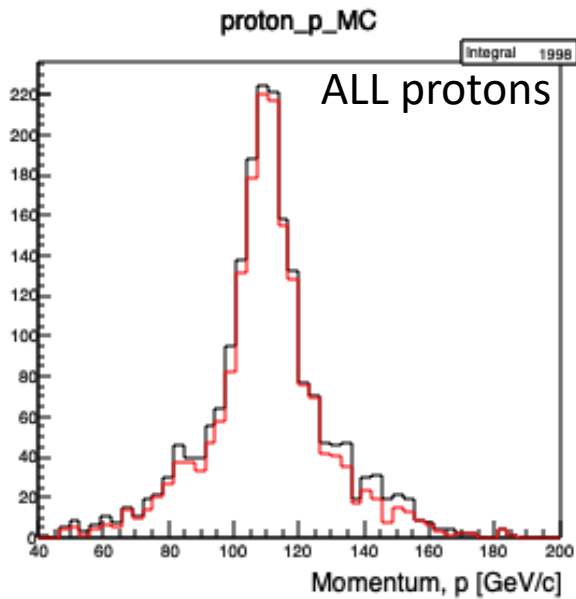
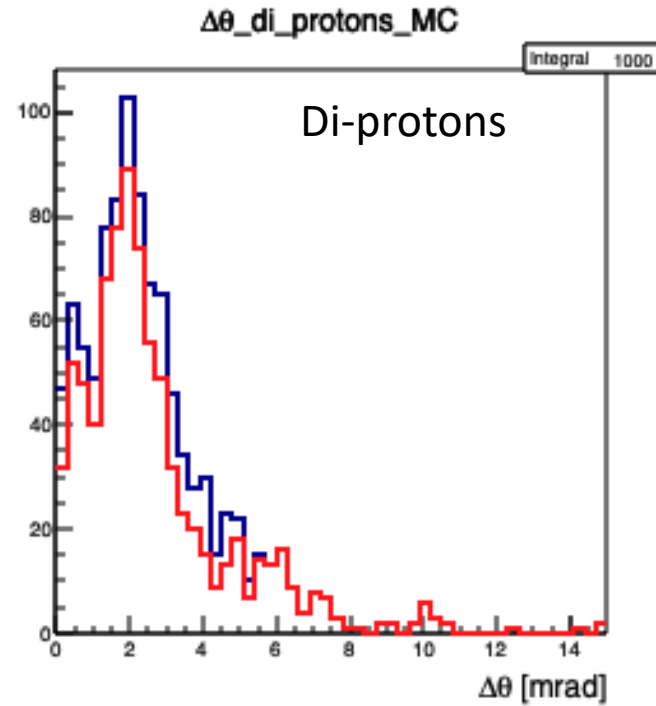
“Ivica” 18x110 GeV/n SRC

In general, the “SRC” case here means one proton has altered kinematics, while the other is truly a “spectator”.

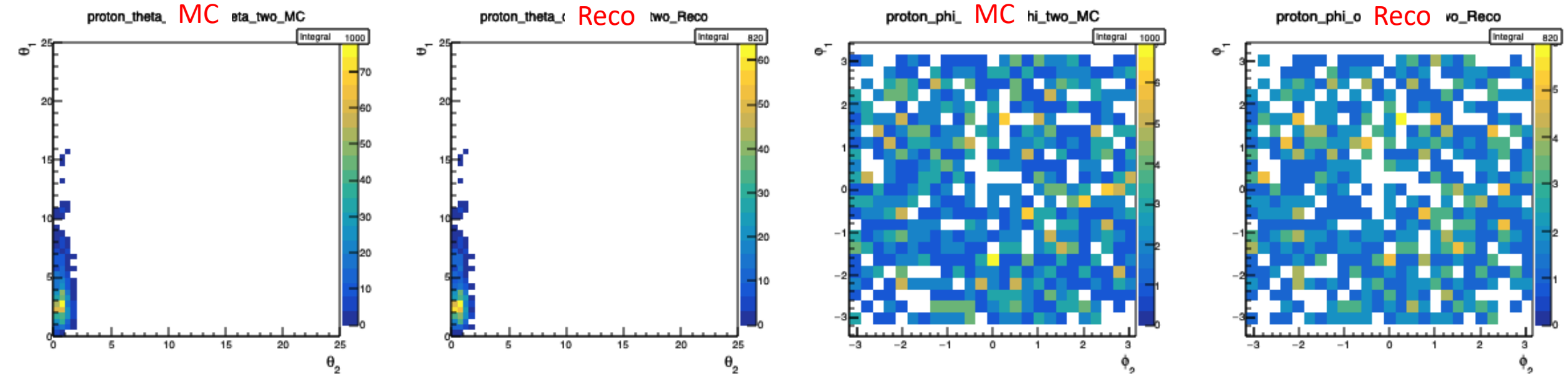
Ivica 18x110 results – spectator protons – SRC



Ivica 18x110 results – spectator protons – SRC



Ivica 18x110 results – spectator protons – SRC



Proton 1 theta vs. proton 2 theta

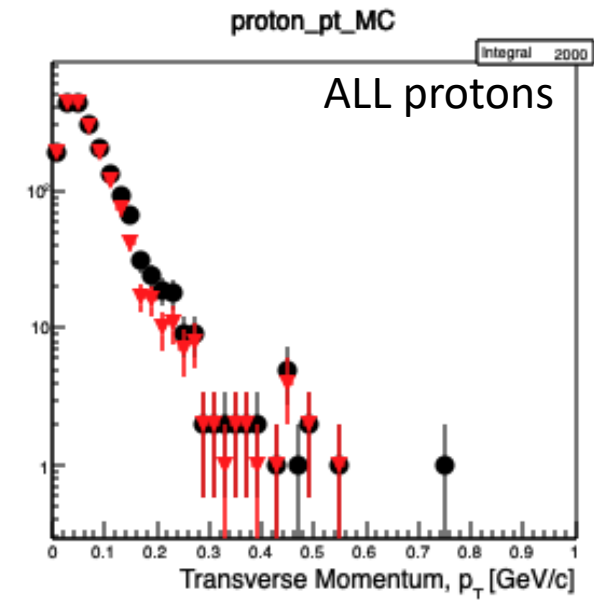
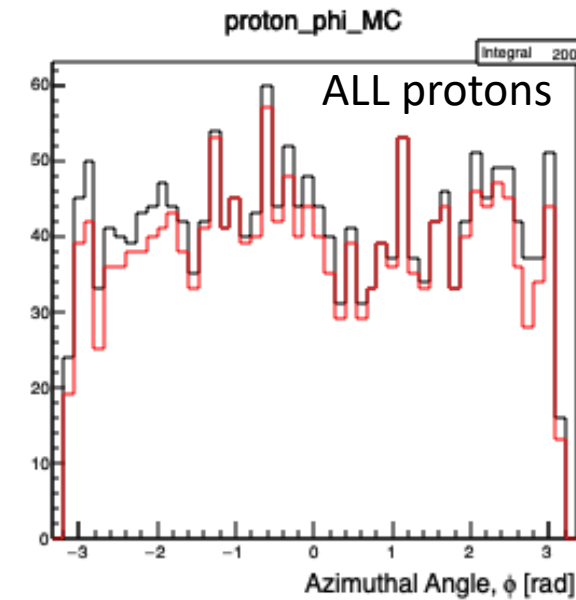
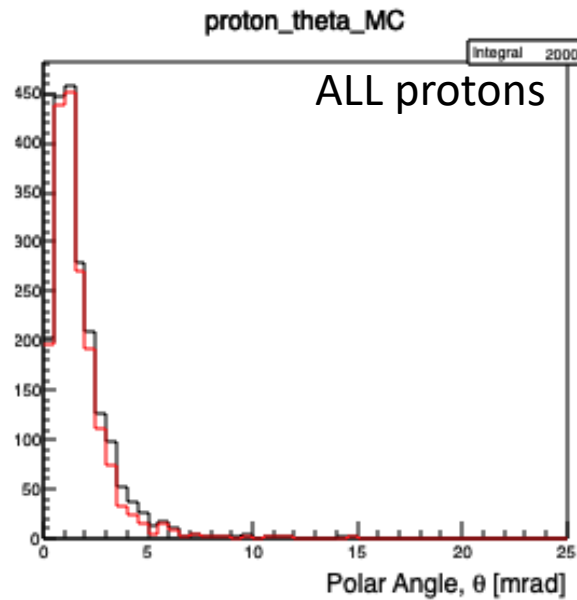
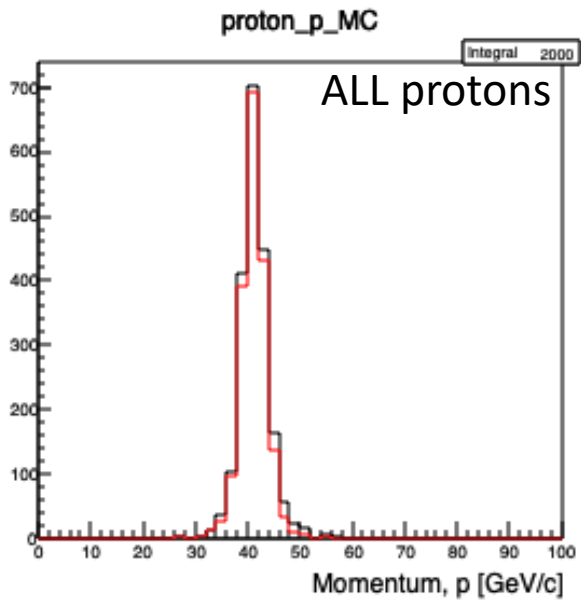
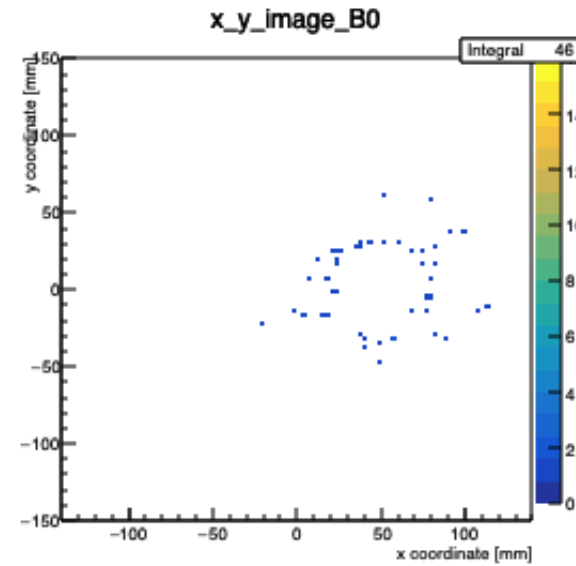
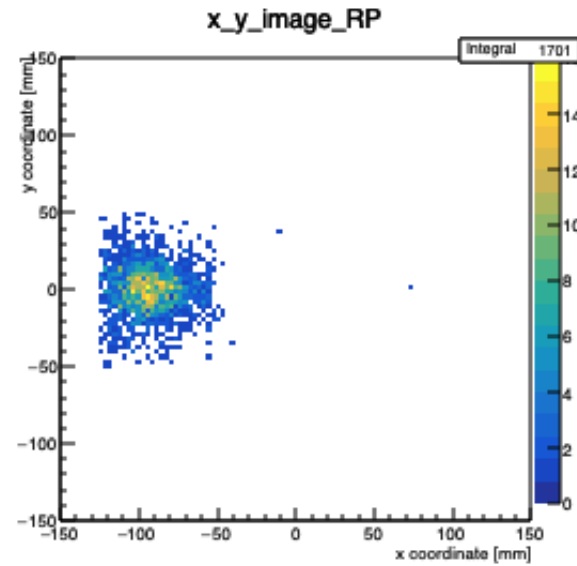
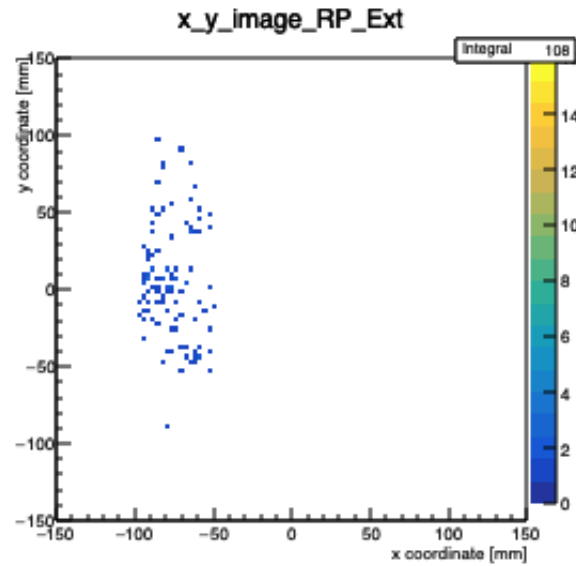
Proton 1 phi vs. proton 2 phi

Conclusions

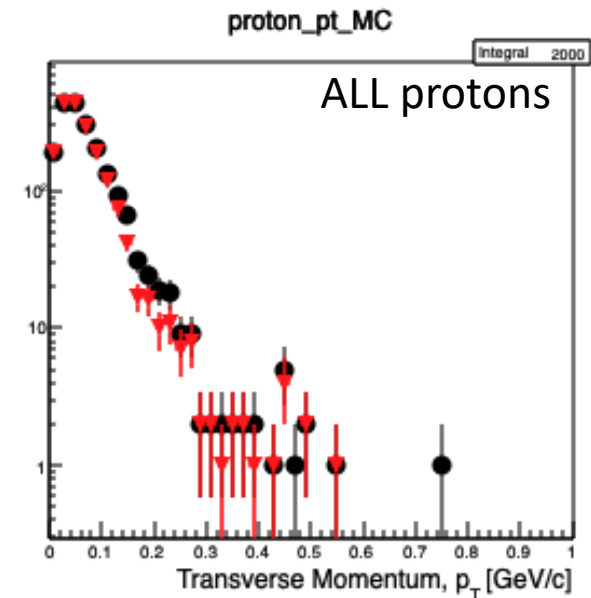
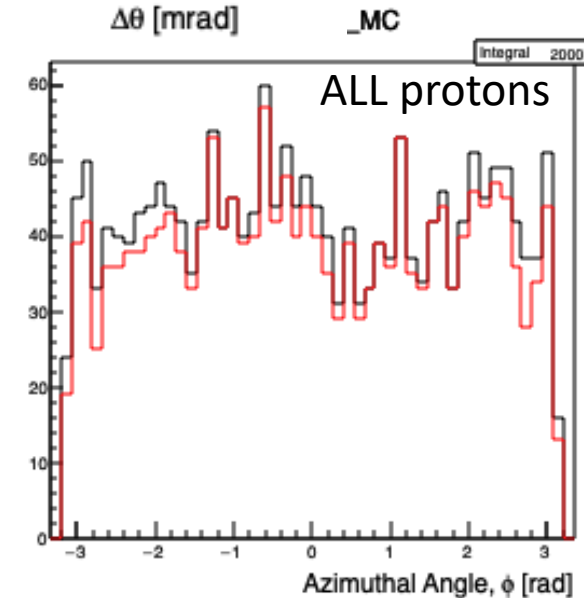
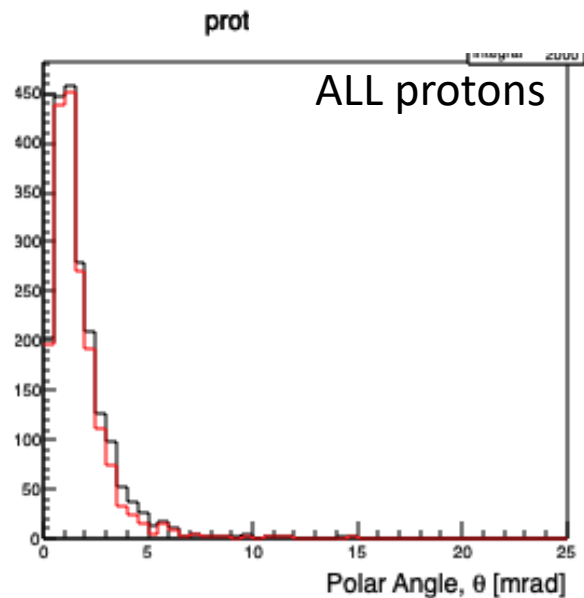
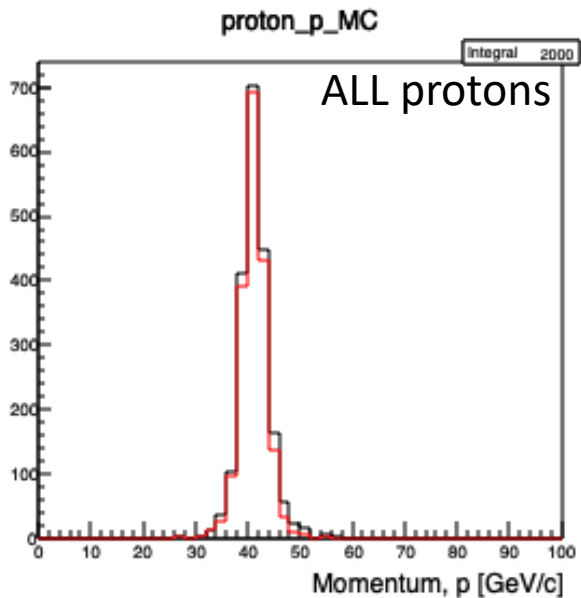
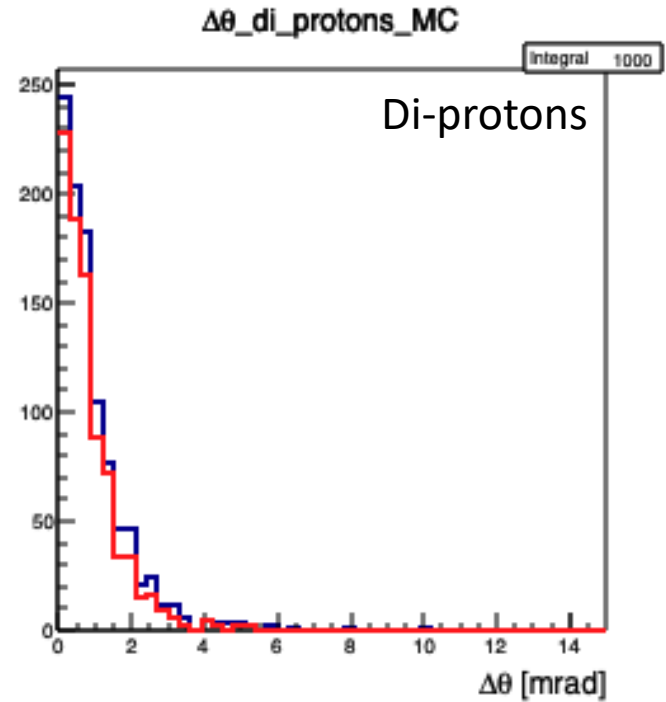
- The acceptance for spectator di-protons in He-3 breakup is quite good!
 - This acceptance will be dependent on the details of the RP layout especially.
 - Many of the hits are on the outer edge of the active area.
 - Further reinforces need for large sensors.
- Need to re-run these simulations with the shifted IR. Rotation of quads could have an impact.

BeAGLE 5x41 GeV/n DIS

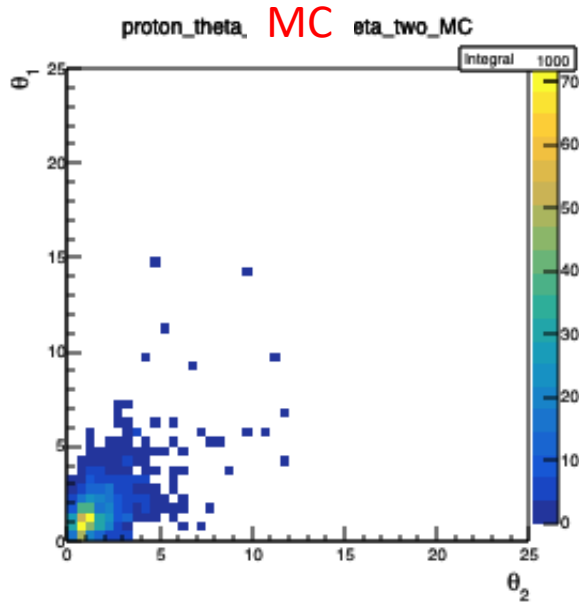
BeAGLE 5x41 results – spectator protons – DIS



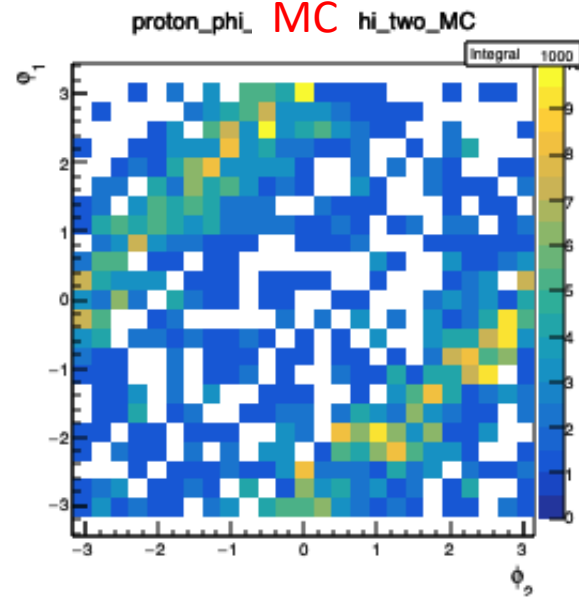
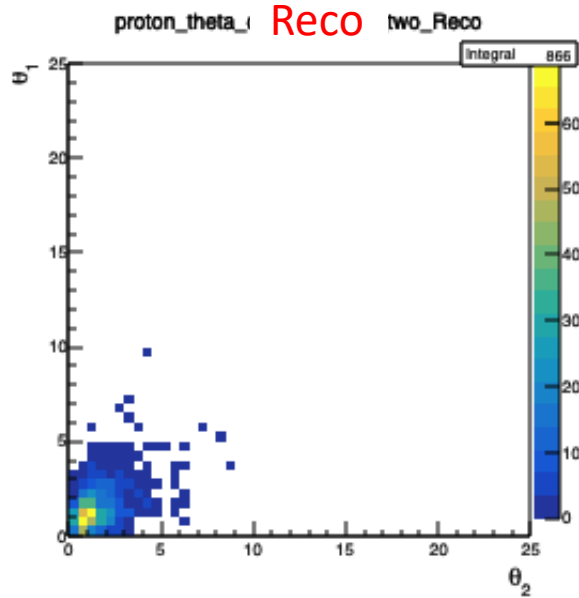
BeAGLE 5x41 results – spectator protons – DIS



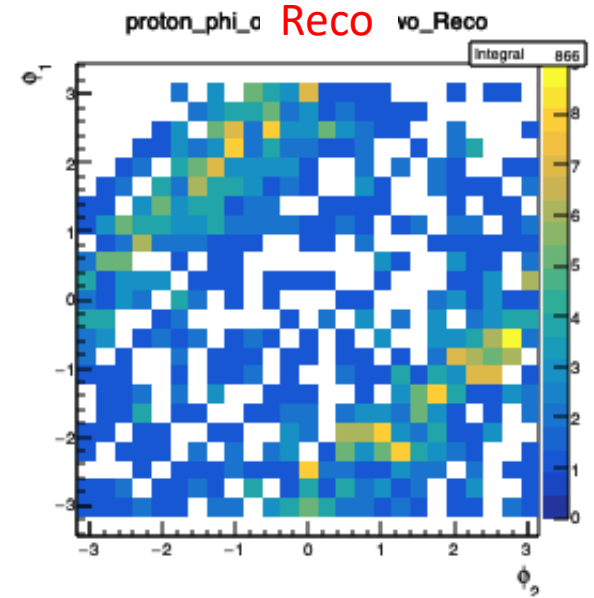
BeAGLE 5x41 results – spectator protons – DIS



Proton 1 theta vs. proton 2 theta

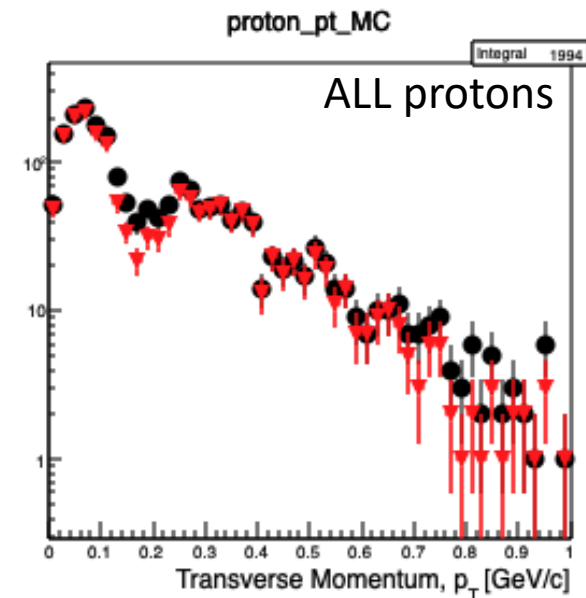
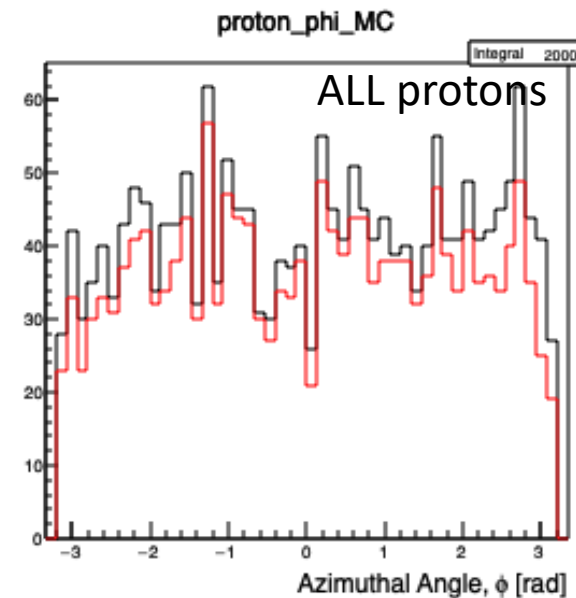
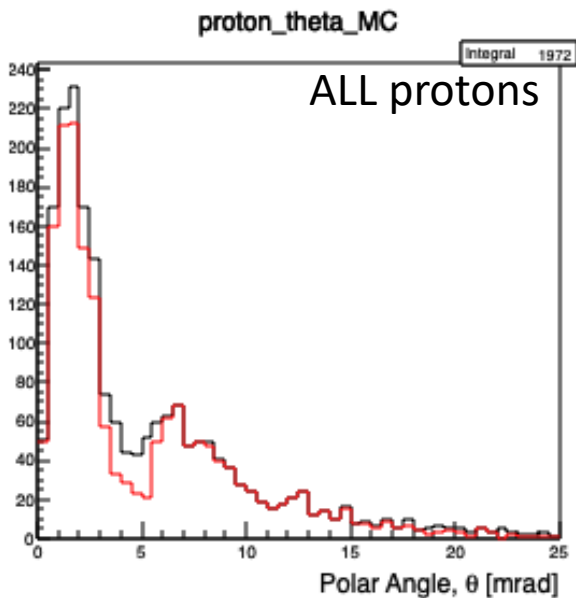
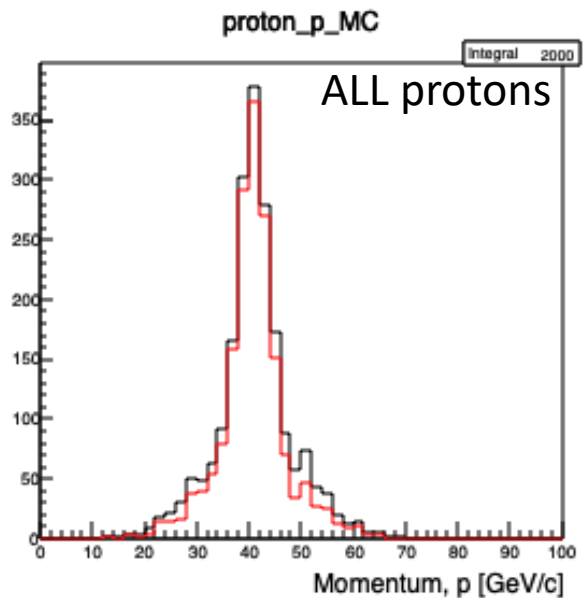
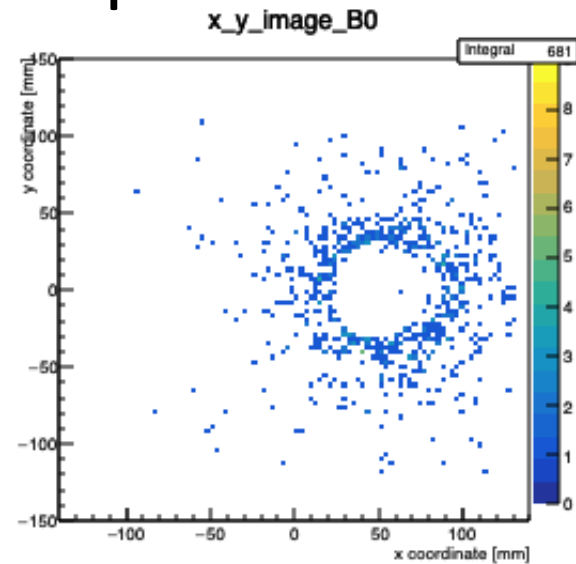
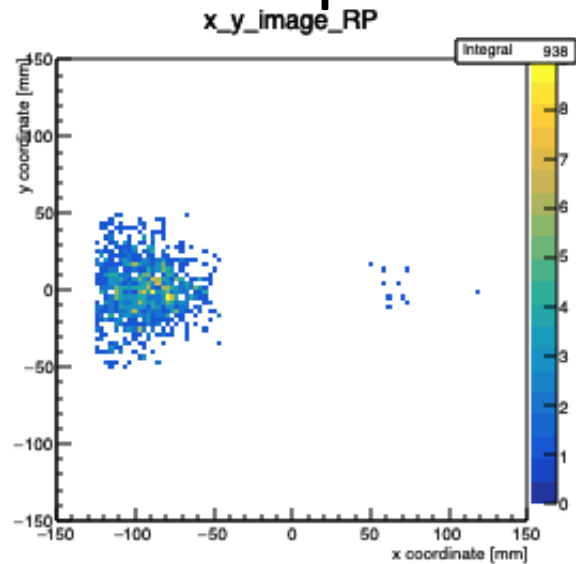
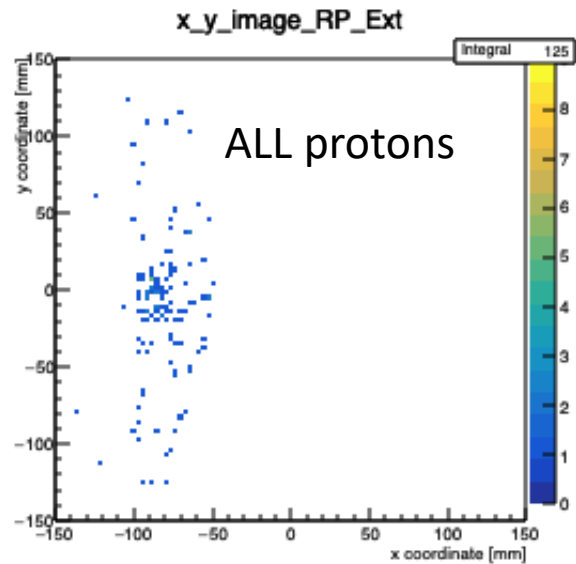


Proton 1 phi vs. proton 2 phi



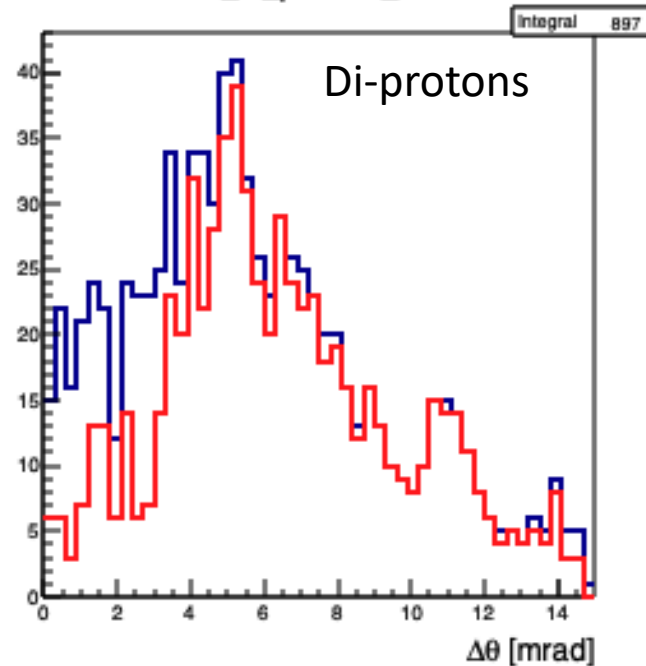
Ivica 5x41 GeV/n SRC

Ivica 5x41 results – spectator protons – SRC

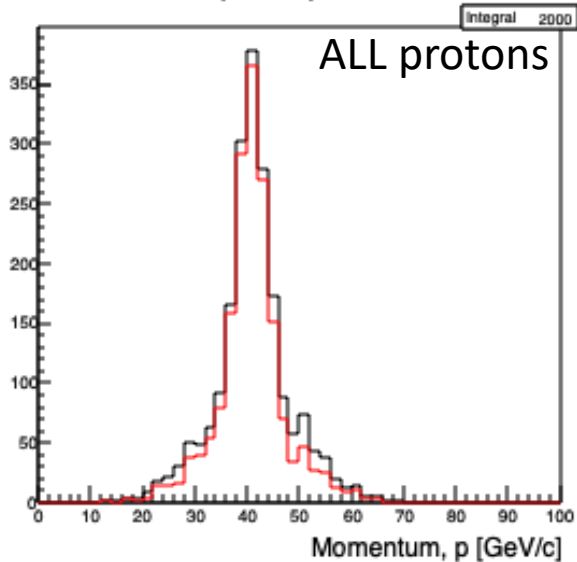


Ivica 5x41 results – spectator protons – SRC

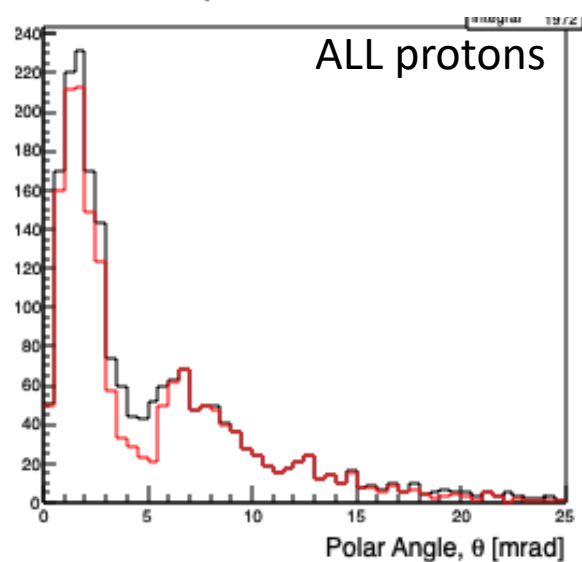
$\Delta\theta_{di_protons_MC}$



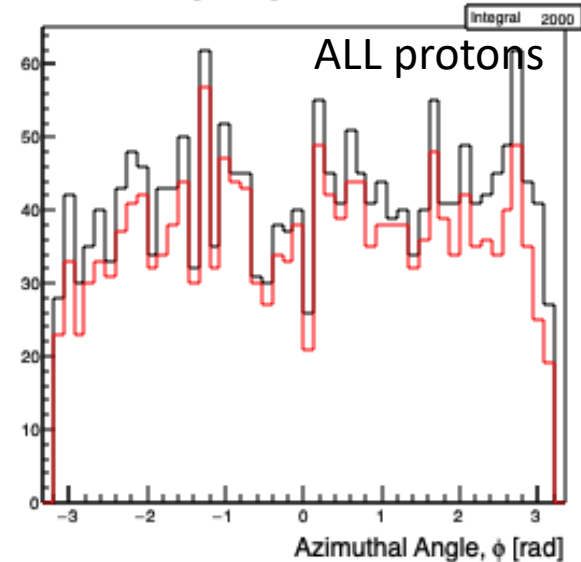
proton_p_MC



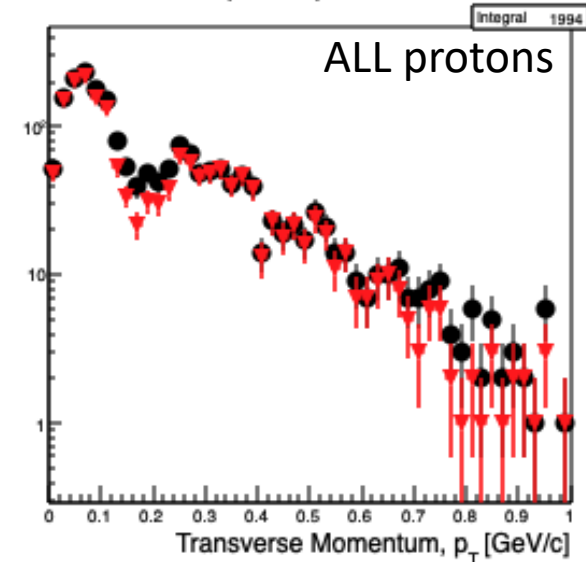
proton_t θ



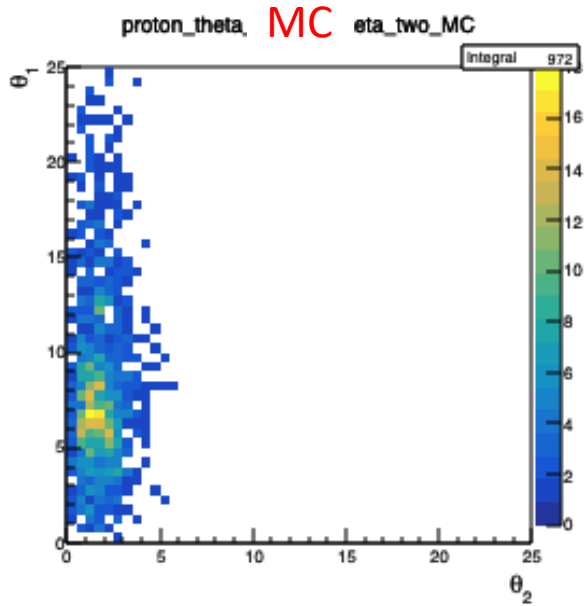
Integral 2000



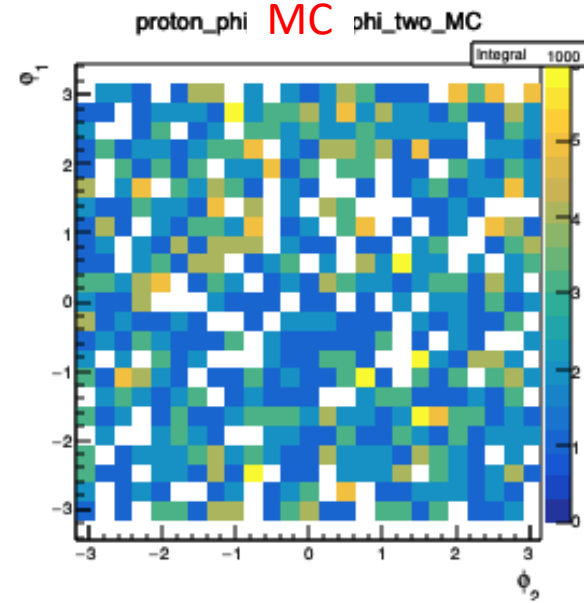
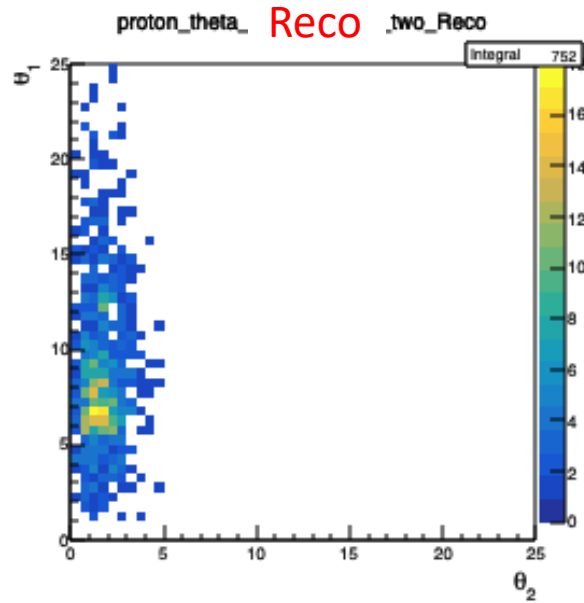
proton_p t _MC



Ivica 5x41 results – spectator protons – SRC



Proton 1 theta vs. proton 2 theta



Proton 1 phi vs. proton 2 phi

