LHRS Analysis for d_2^n

Acceptance Studies

D. Flay

7/14/11

Outline

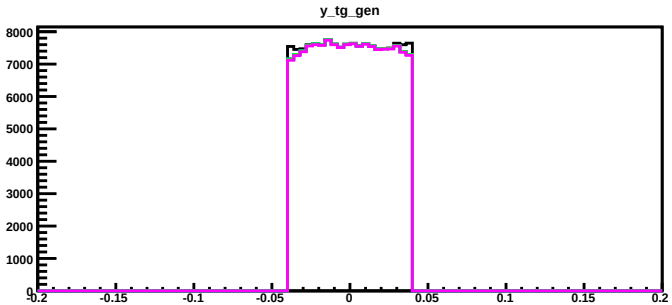
A New Look (1)
Discussion

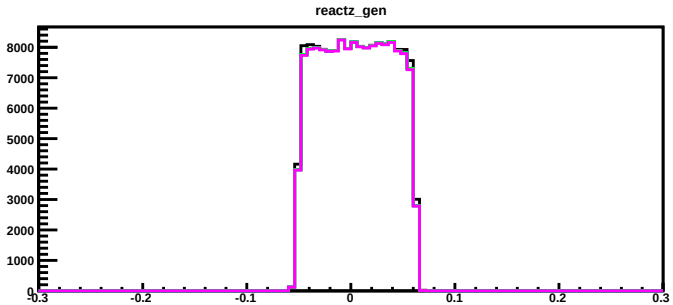
- Up until recently, SAMC has been utilized with the inclusion of energy loss and multiscattering corrections
- However, the acceptance weight w intends to correct for the geometrical effects due to an imperfect aperture of the LHRS – that is, the deviation of the aperture from the ideal 'rectangular' opening
- Therefore, the energy loss and multiscattering calculations must be left out of the acceptance calculations
- If we leave them in:
  - Then the acceptance necessarily depends upon the properties of the target and all of the materials leading up to the LHRS entrance
  - It leads to a pseudo-radiative correction to be applied to σ_{raw}
  - Subsequently, we will be over-correcting when (external) radiative corrections on σ_{exp} are calculated and applied

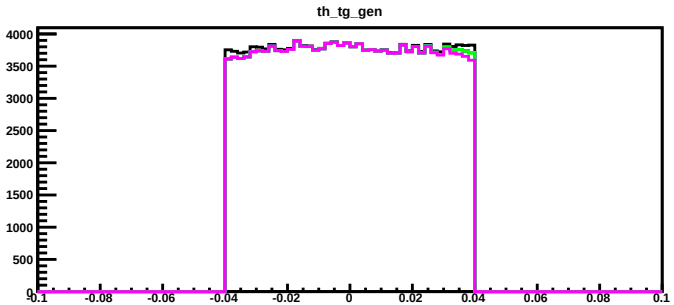
A New Look (2)
Review of the Method

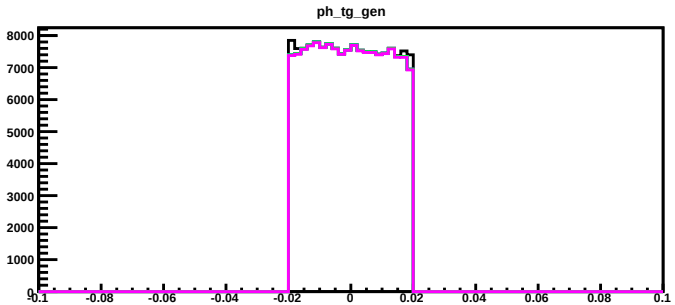
1. Generate events normally-distributed in y_{tg}, θ_{tg}, ϕ_{tg} and $\delta p/p$
2. Propagate them through the various apertures of the LHRS
3. If the event passes to the focal plane, it is accepted as a good event
4. The ratio of the number of events that pass to the focal plane to the generated distribution (each within cuts) gives the acceptance weight w

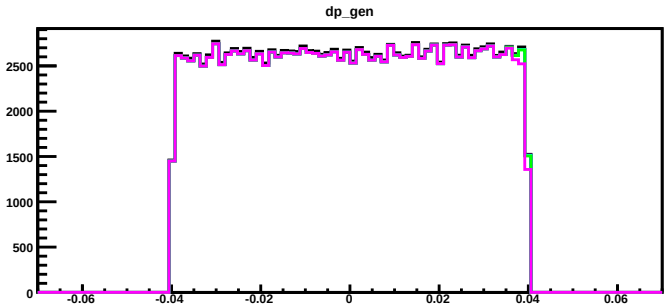
A New Look (3)
SAMC Distributions



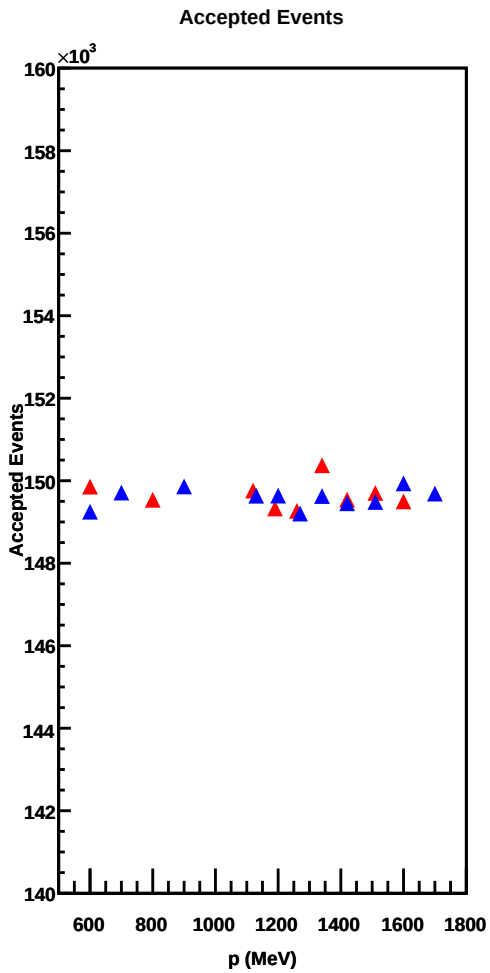


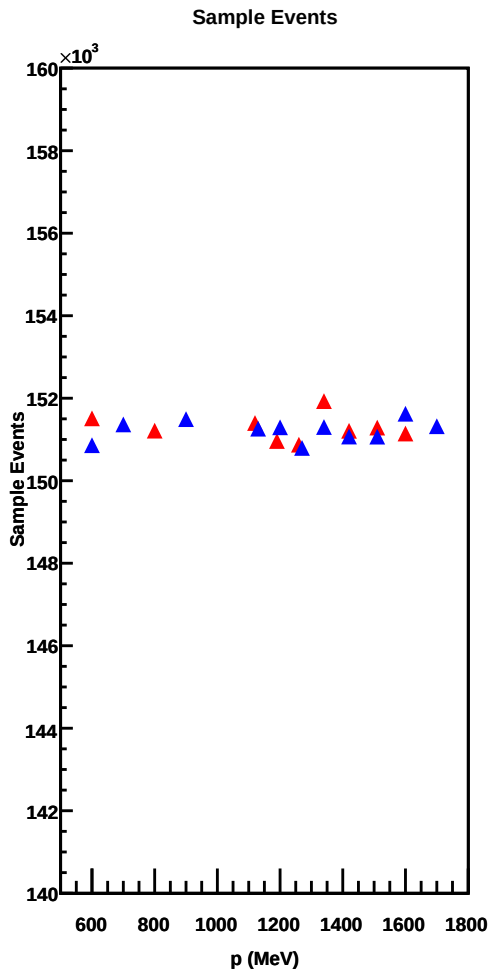


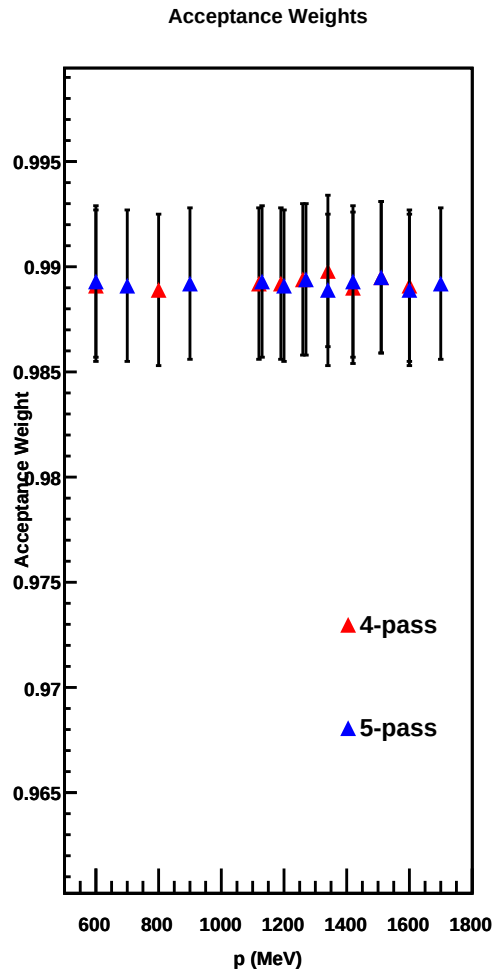




Momentum Dependence (1)
Results

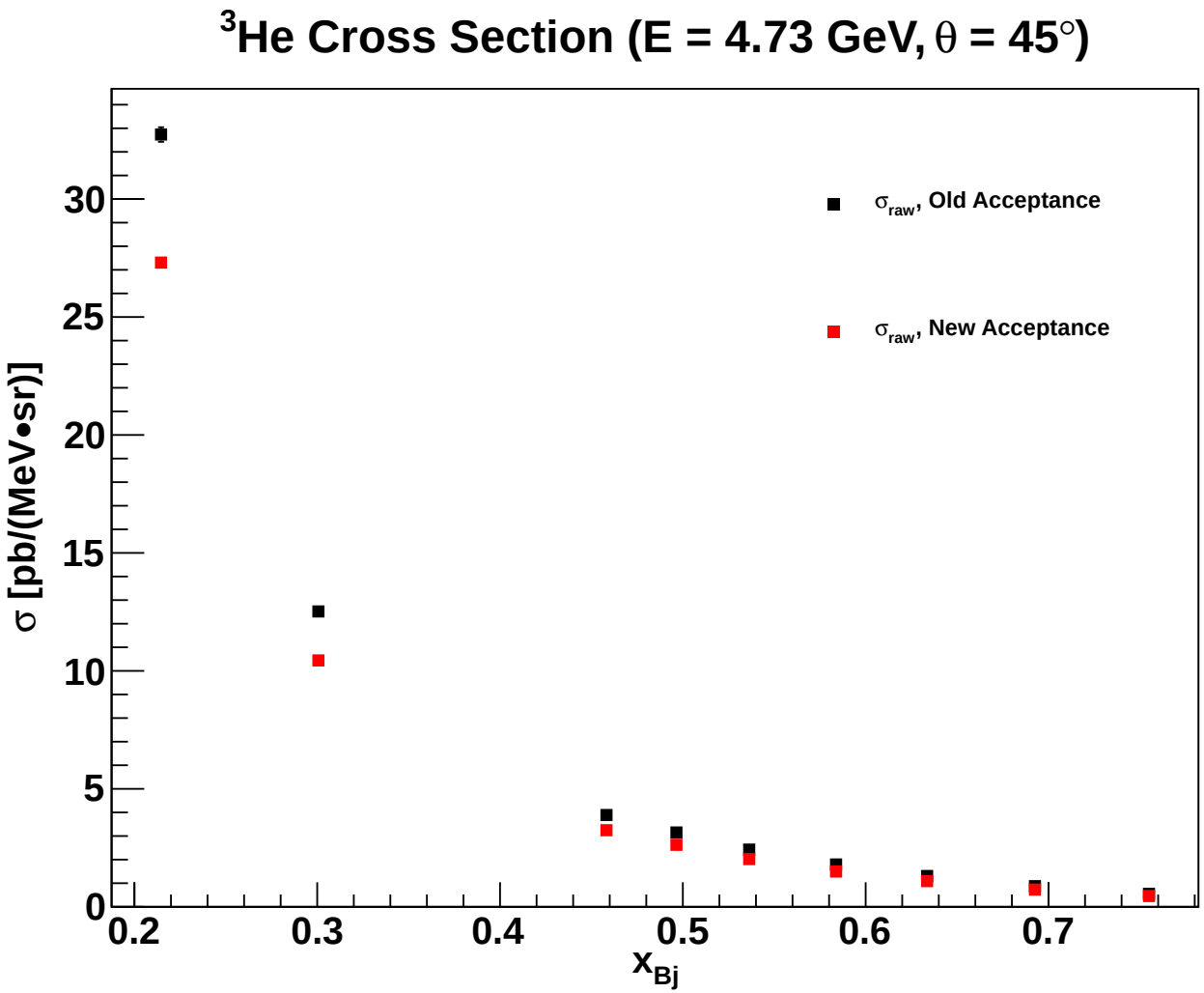






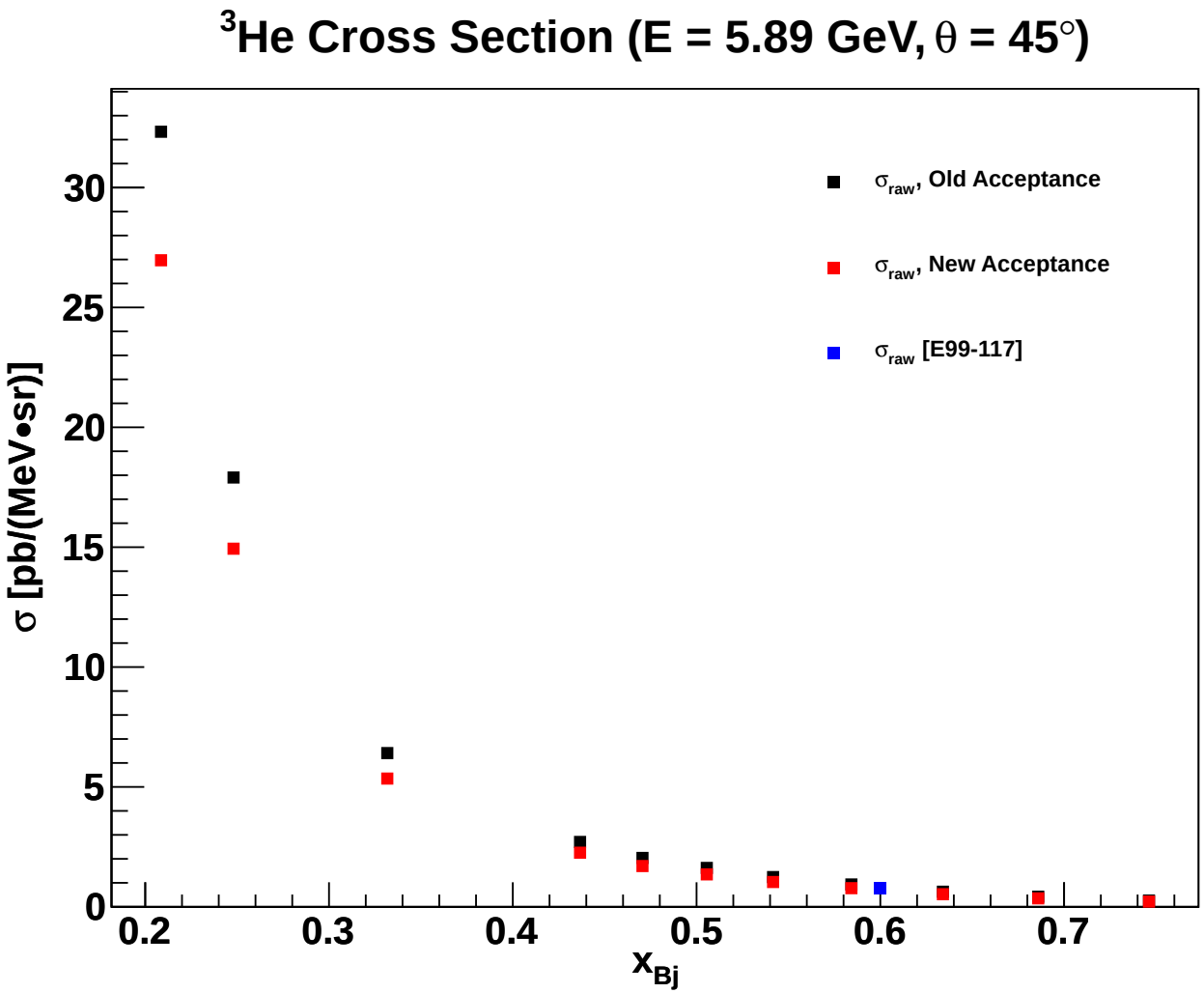
Momentum Dependence (2)

Effect on Cross Sections: 4-pass



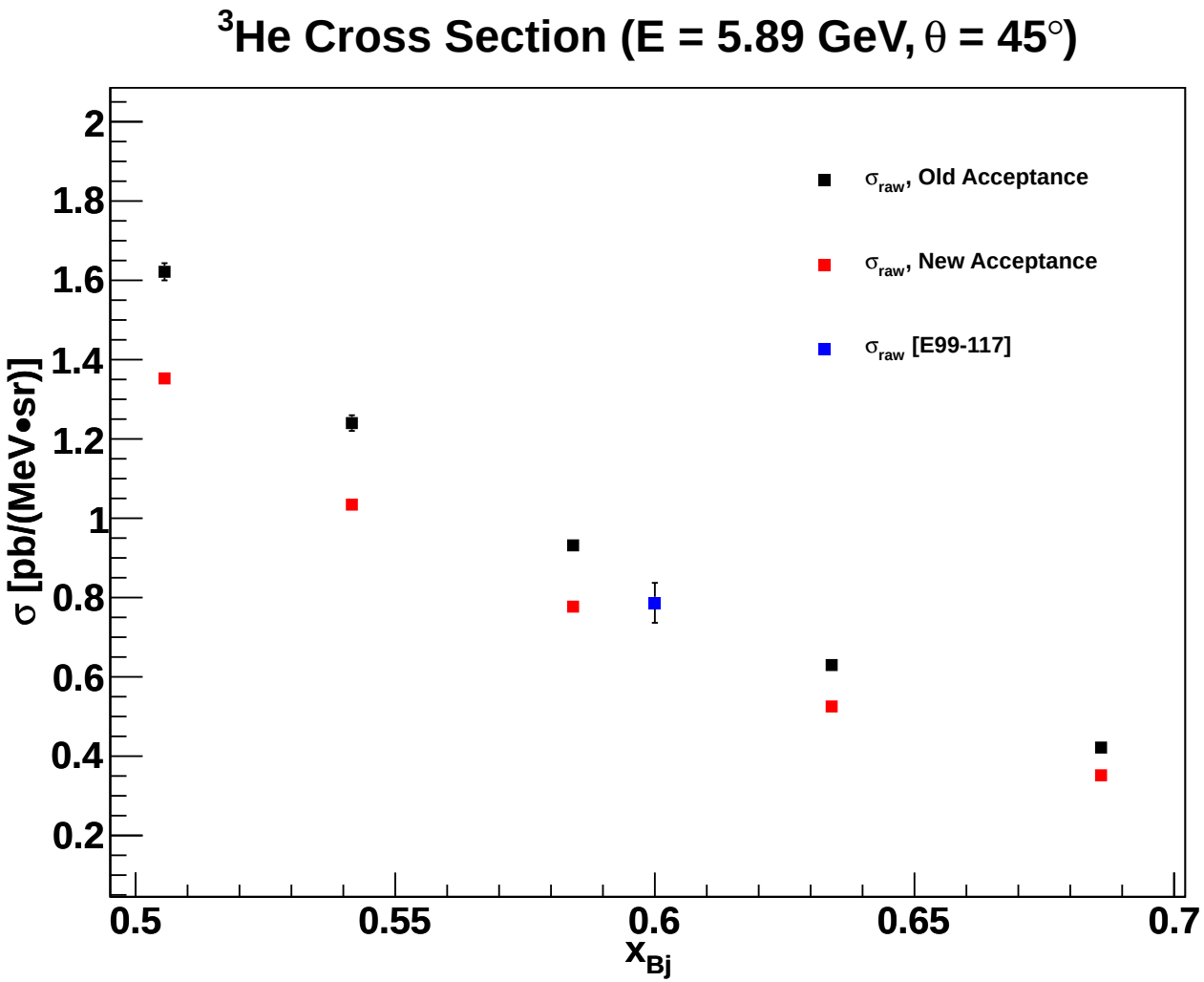
Momentum Dependence (3)

Effect on Cross Sections: 5-pass



Momentum Dependence (4)

Effect on Cross Sections: 5-pass (Zoomed In)



A Starting Point (1)
Discussion

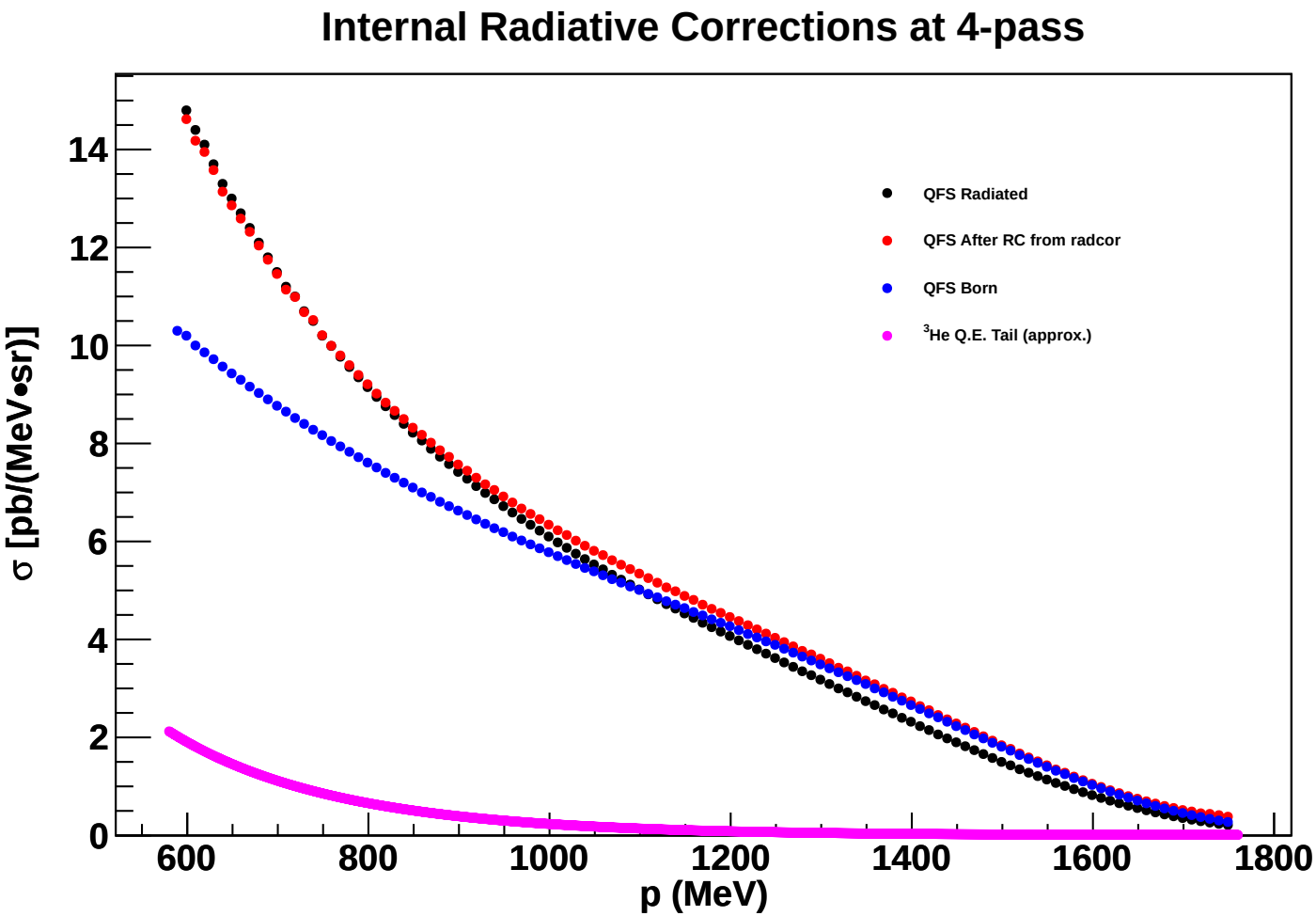
- We have two cross section spectra: $E = 4.73\ \mathrm{GeV}$ and $E = 5.89\ \mathrm{GeV}$
- In order to determine the radiative corrections for each, we need data between these two values of E, and at least one spectrum below $4.73\ \mathrm{GeV}$
  - We intend to use a model to fill in not only our spectra, but also to determine the spectra for which we do not have data
  - Once we have obtained the correct parameters that give agreement between QFS and our data, then we will begin the radiative correction procedure...

A Starting Point (2)
Procedure

1. Radiate QFS to obtain each spectra
2. Subtract the elastic ^{3}He tail (from `rosetail.f`)
3. Input these spectra into the `radcor.f` code to unfold σ_{Born} for each of our data sets

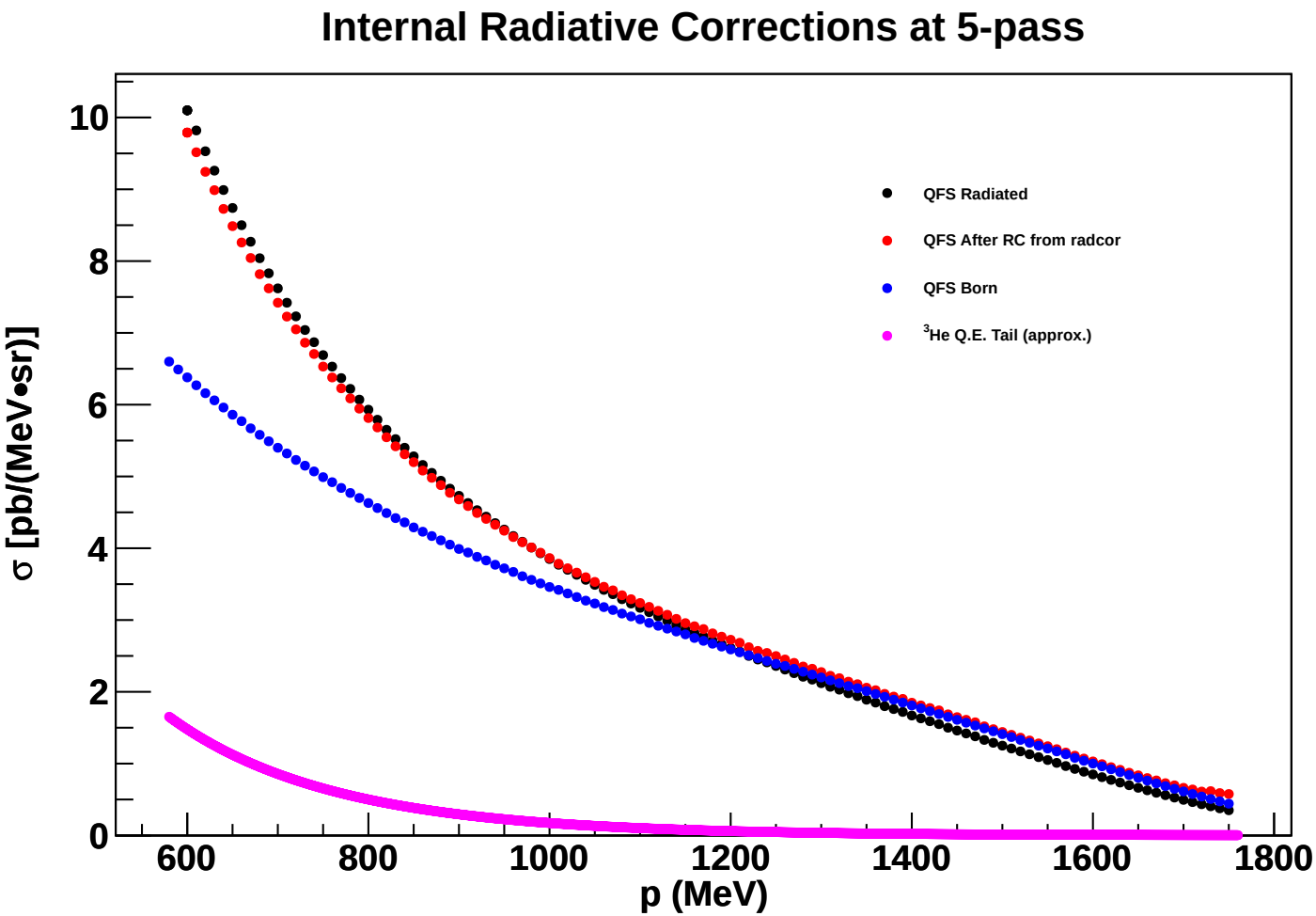
- Lets look at some sample QFS spectra. . .

Investigating the Code (1)
Estimating the Size of the Radiative Corrections



Investigating the Code (2)

Estimating the Size of the Radiative Corrections



Investigating the Code (3)
Discussion

- Need to understand why the resulting RC spectrum (red) differs largely from the QFS Born (blue) spectrum
  - Based on the kinematics, it looks as if the Q.E. tail needs to be subtracted before we apply the radiative corrections which would imply that the Q.E. tail should be treated separately

Summary

- Acceptance:
  - Proper way to look at the geometrical acceptance factor w is to run SAMC without energy loss or multiscattering effects
    - Subsequently, $w \sim 0.99$ for all p_0 settings
  - The use of energy loss and multiscattering calculations is only useful for the comparision of SAMC-generated distributions (y_{tg}, θ_{tg}, ϕ_{tg}, $\delta p/p$) to the real data
  - Sizeable effect on cross sections – scales them down by $\sim 20\%$
- Radiative Corrections:
  - The code `radcor.f` is running
  - RC look to be the most sizeable at large ν (low p)
  - Working our way through the steps and understanding how the spectra change due to RC

What's Next?

- Cross Section:
  - Apply yields for background processes to σ_{raw} to determine σ_{exp} at all p_0 settings
  - Radiative Corrections:
    - Continue investigation of sample QFS spectra and be able to reproduce σ_{Born}
    - Determine model for corrected cross section data using QFS (as input to `radcor.f`)
    - Determine Q.E. and inelastic contributions to RC
- First draft of PANIC talk will be sent out tomorrow