

e+p Inclusive DIS Scattering Angle Studies



Michael Savastio; Stony Brook University

Scattering Angles:

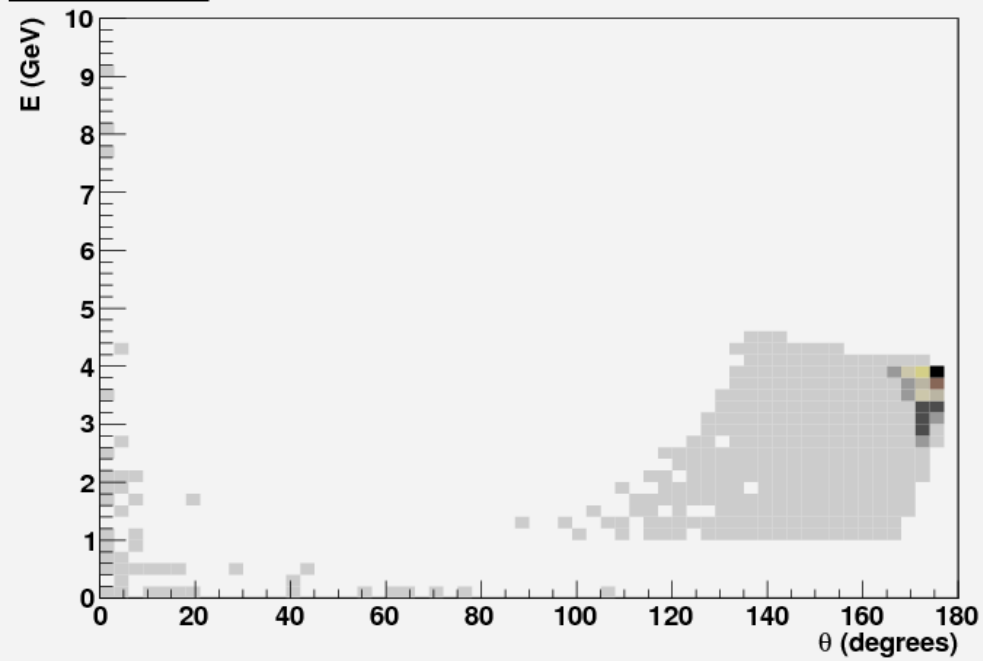
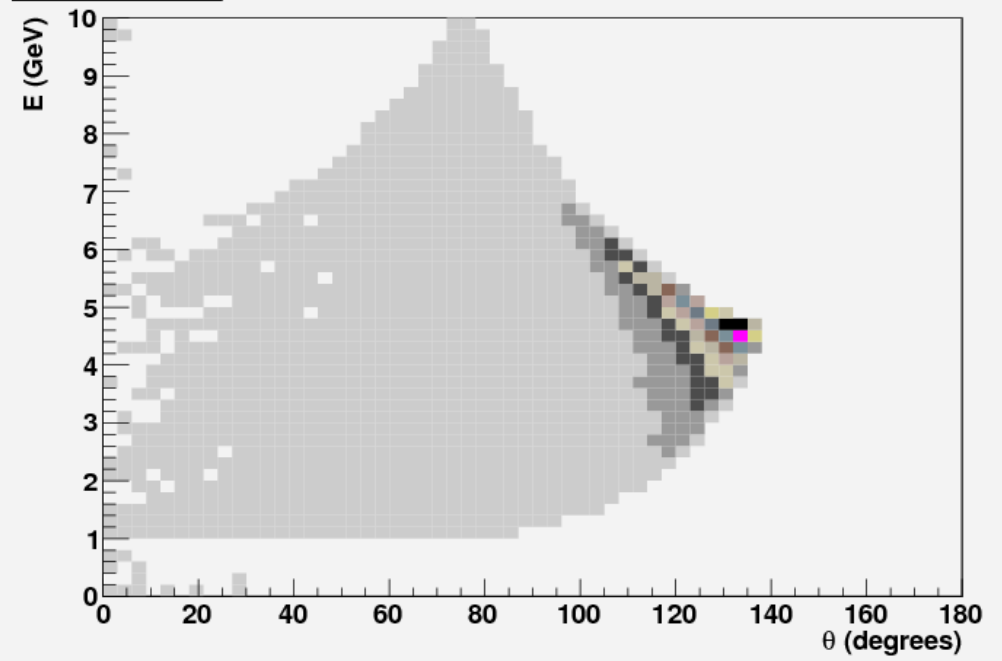
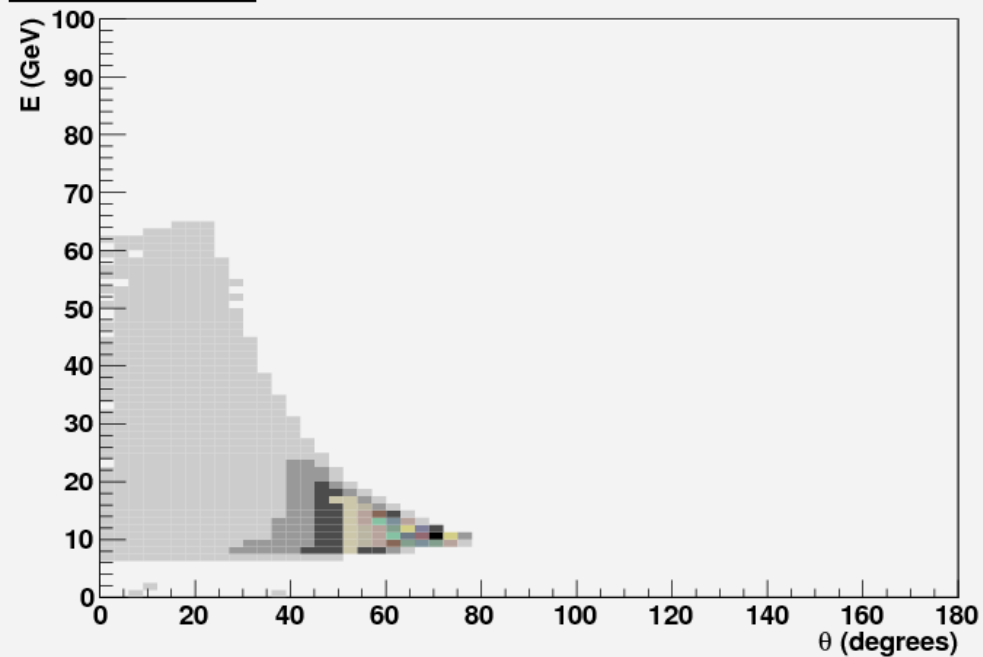
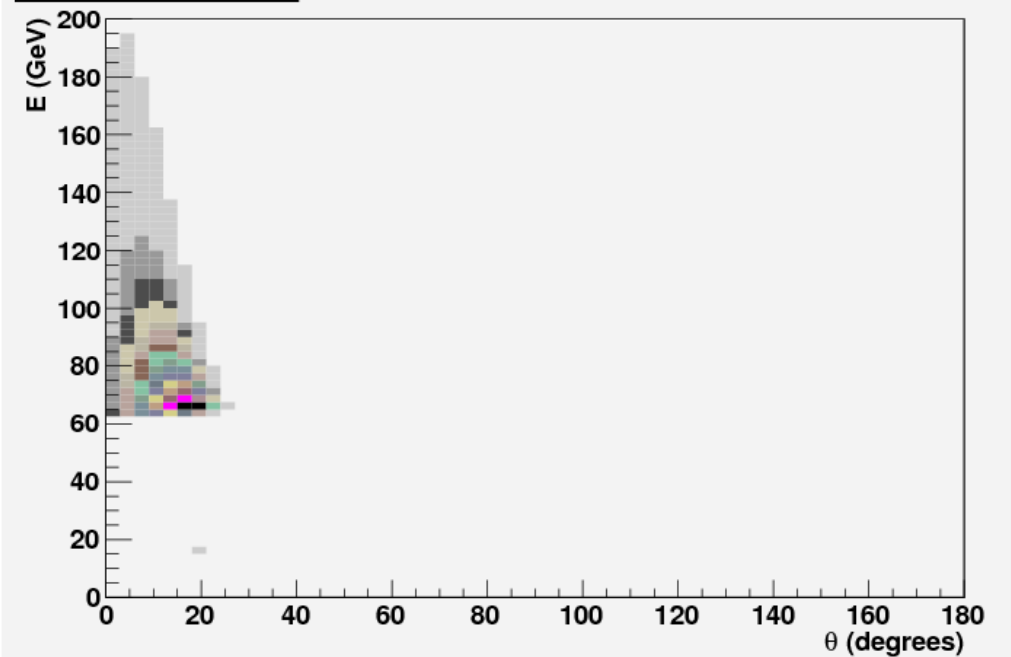
- Where do scattered e- go?
- Where do charged pions and kaons go?
- How do angles change as a function of Q^2 ?

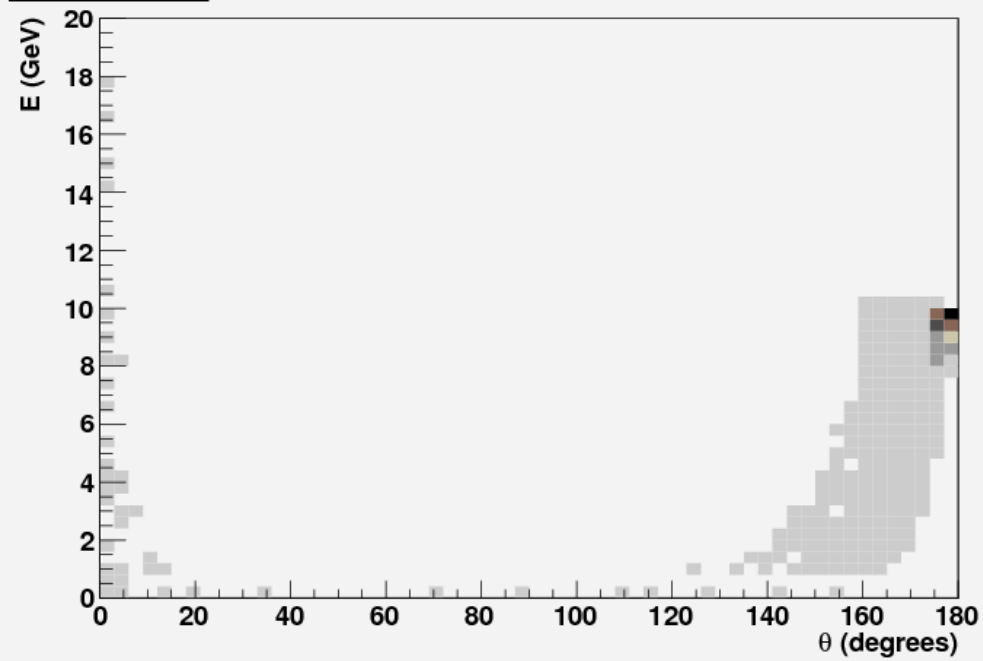
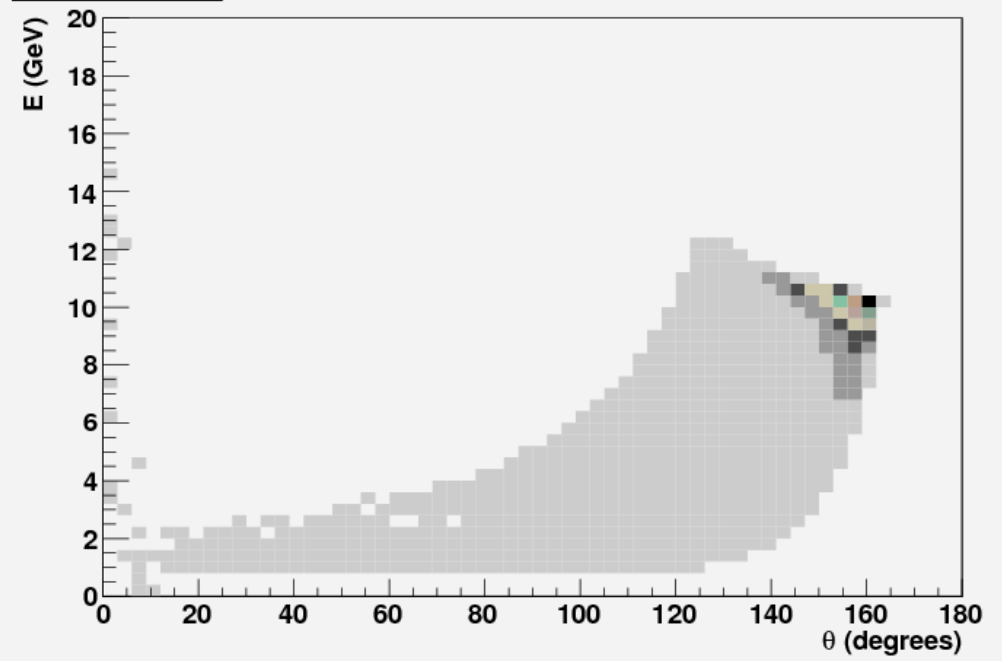
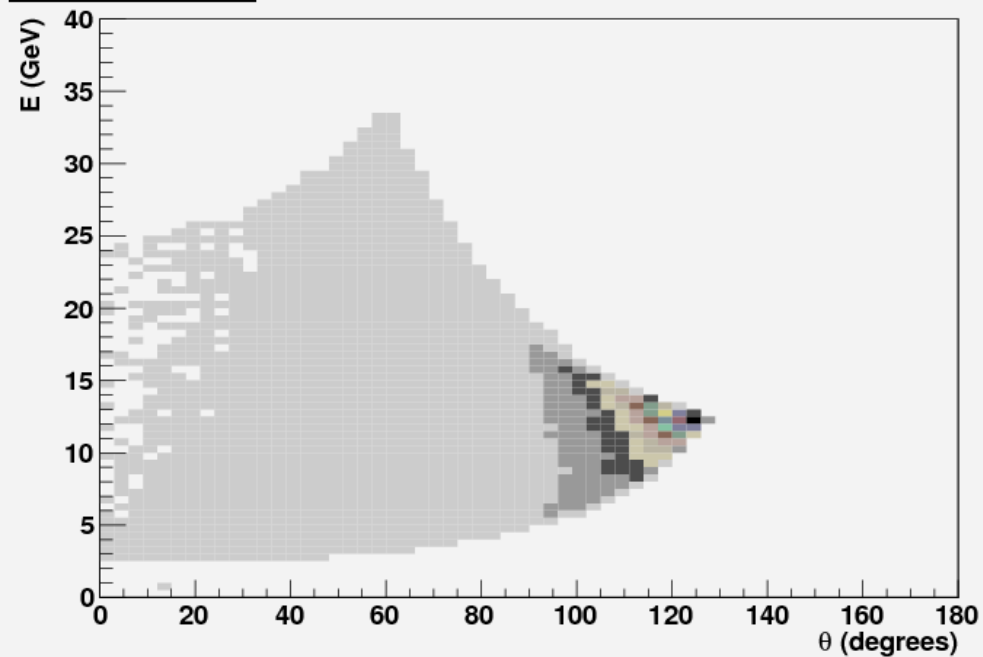
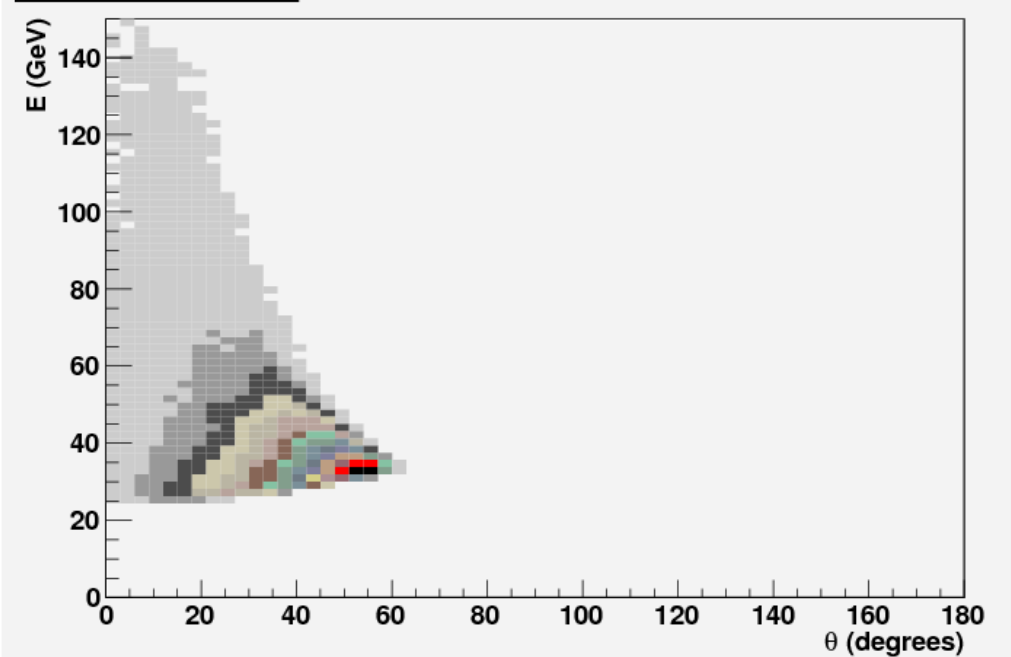
Scattering Energies:

- How energetic are scattered e- in different Q^2 regions?
- Where do we need the thickest lepton/hadron calorimeters?

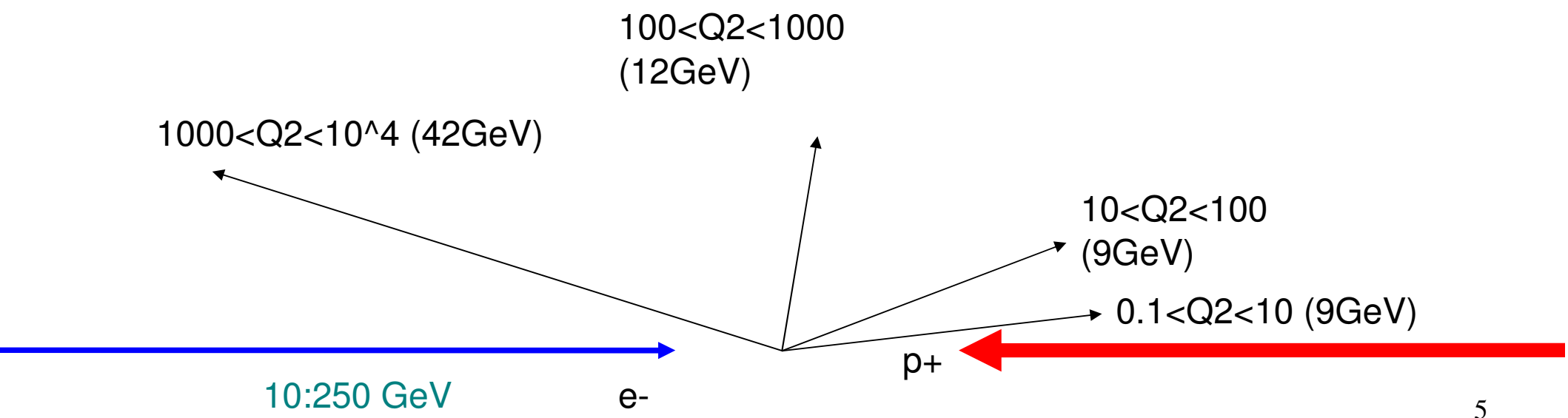
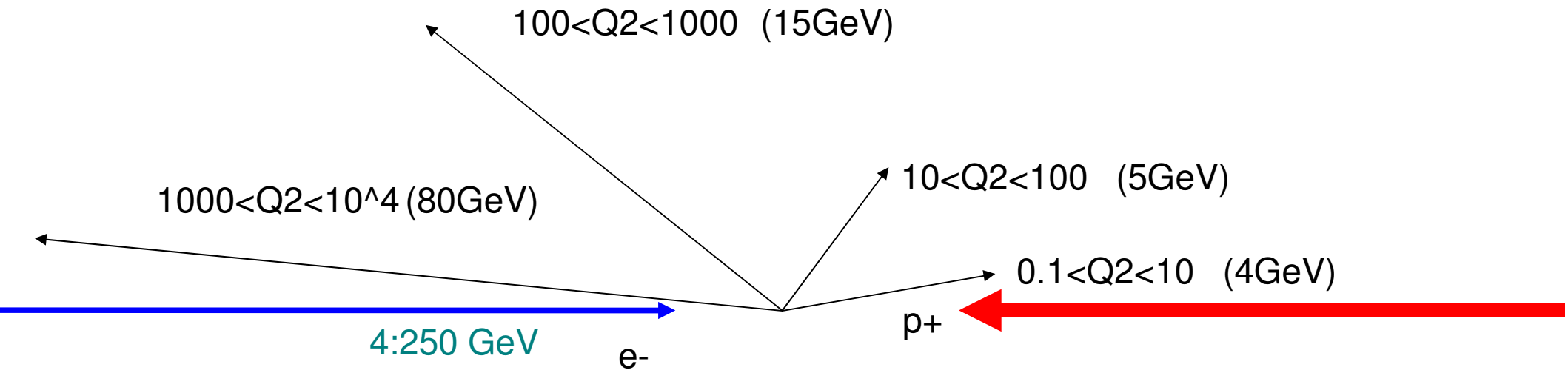
Low/High s comparison:

- Scattering distribution for $s=4000$ (4:250 GeV) and $s=10000$ (10:250 GeV)
- Do we need more acceptance to cover both?

$(0.1 < Q^2 < 10)$  $(10 < Q^2 < 100)$  $(100 < Q^2 < 1000)$  $(1000 < Q^2 < 10000)$ 

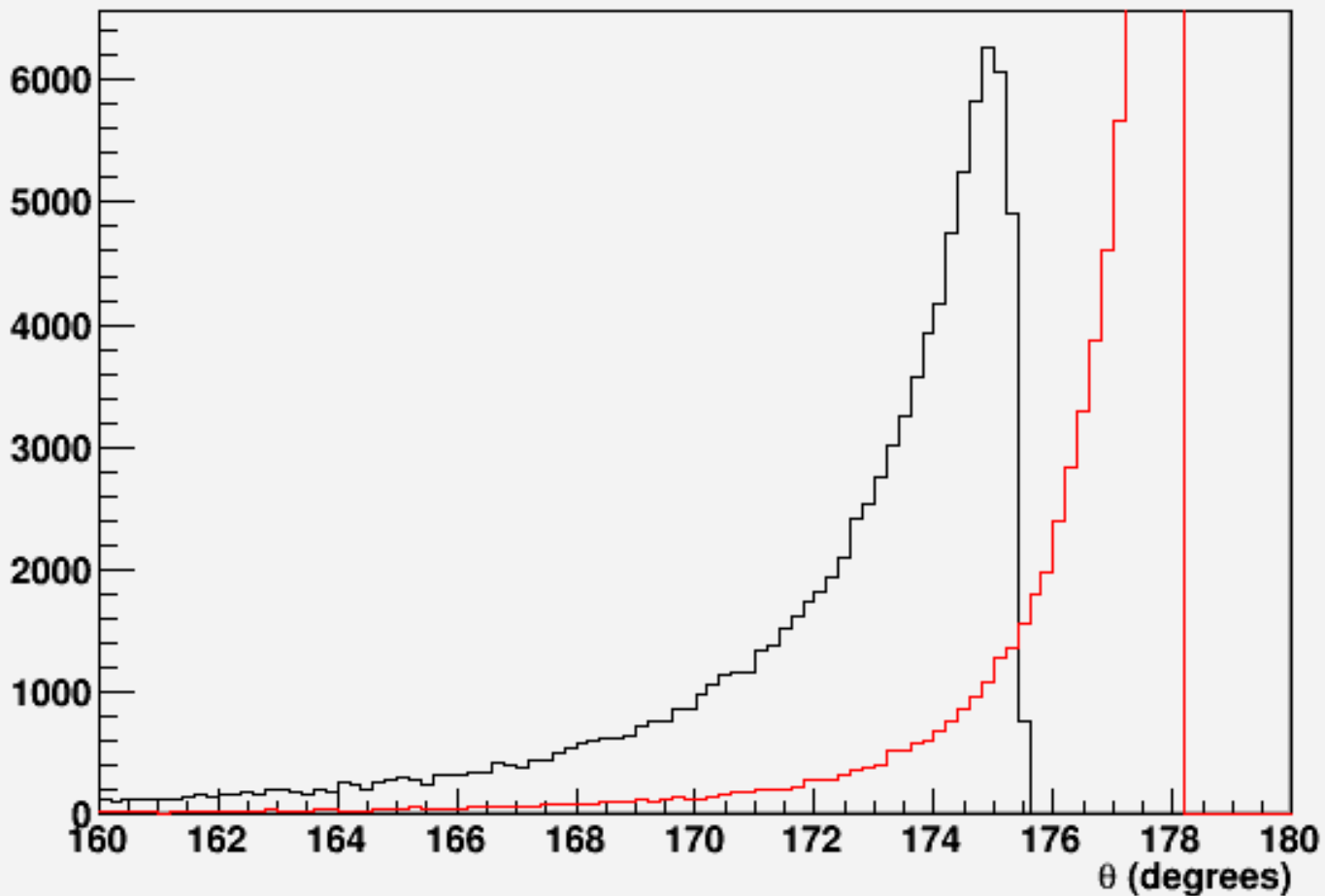
$(0.1 < Q^2 < 10)$  $(10 < Q^2 < 100)$  $(100 < Q^2 < 1000)$  $(1000 < Q^2 < 10000)$ 

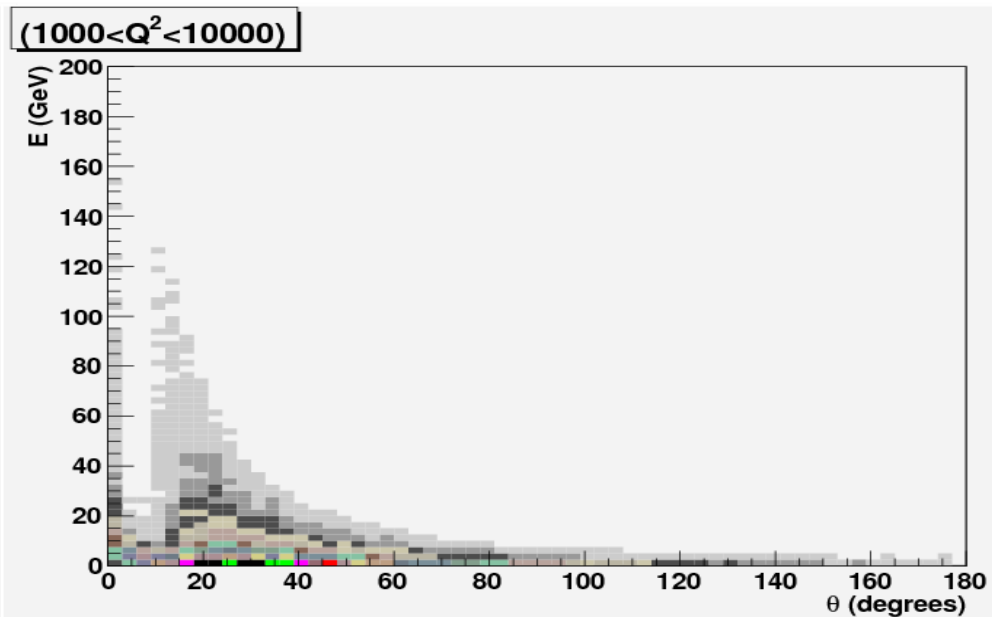
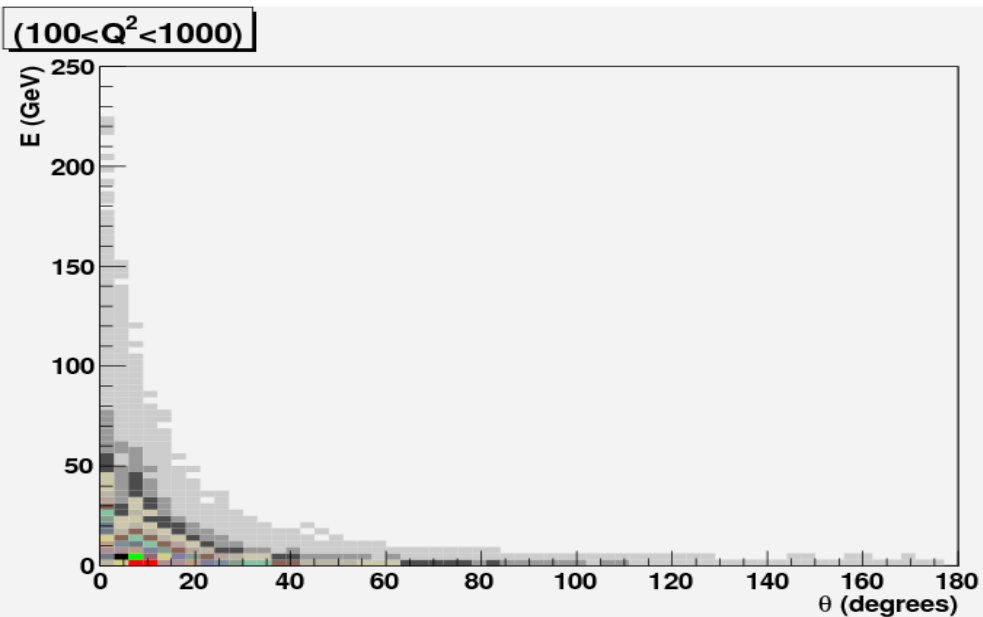
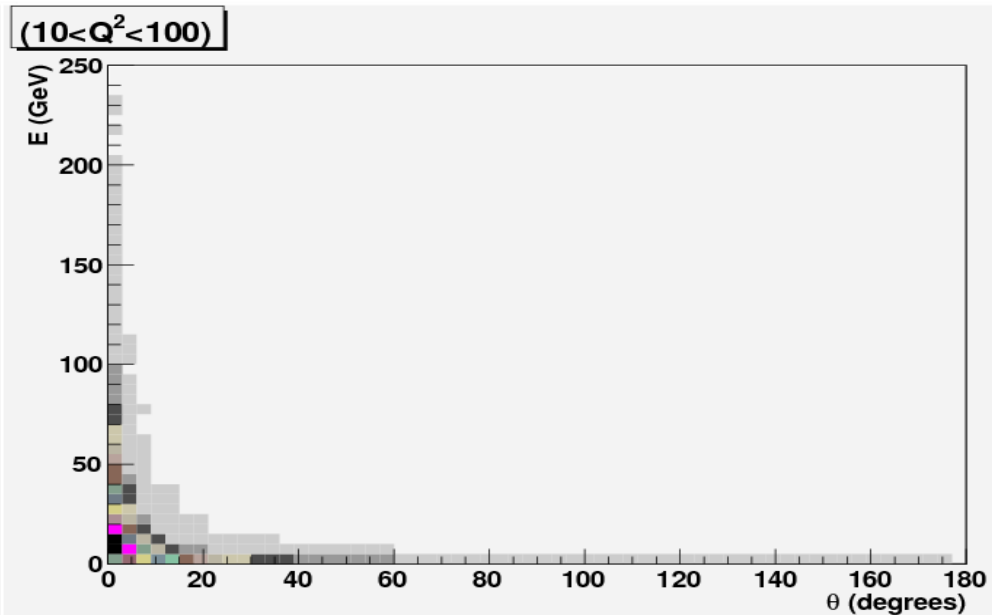
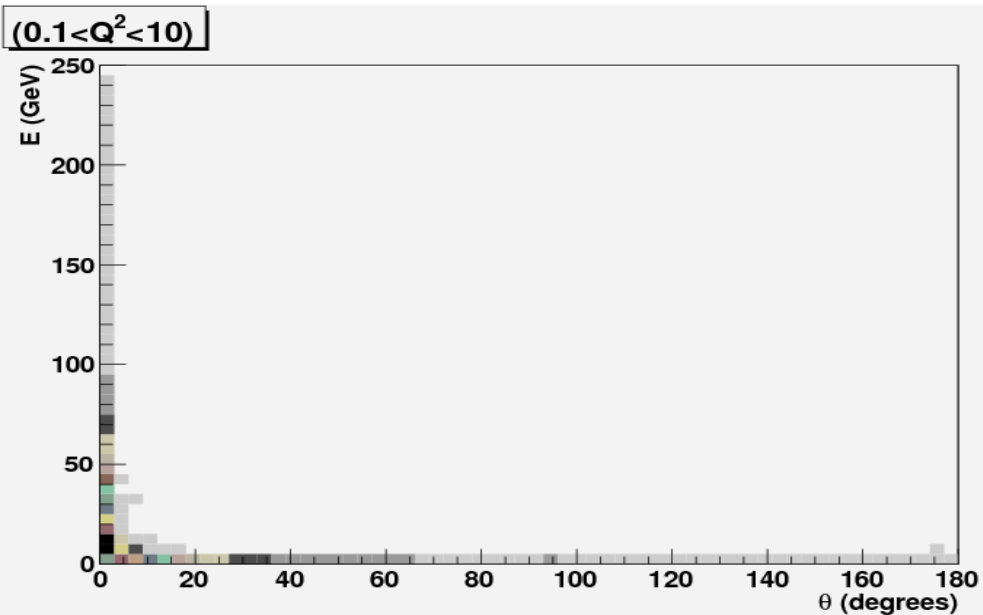
e- Average Scattering Regions

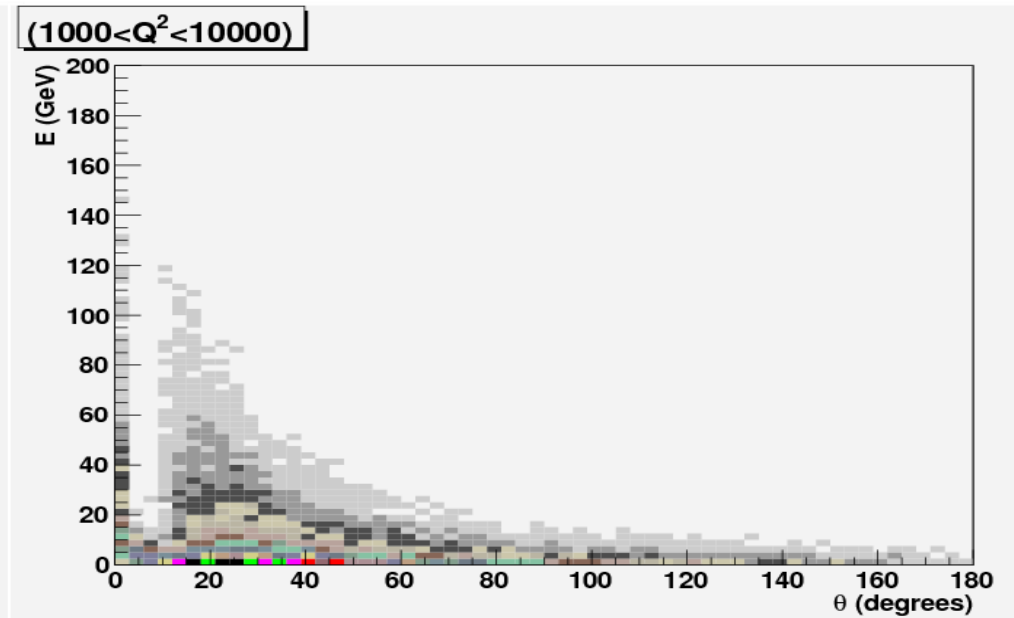
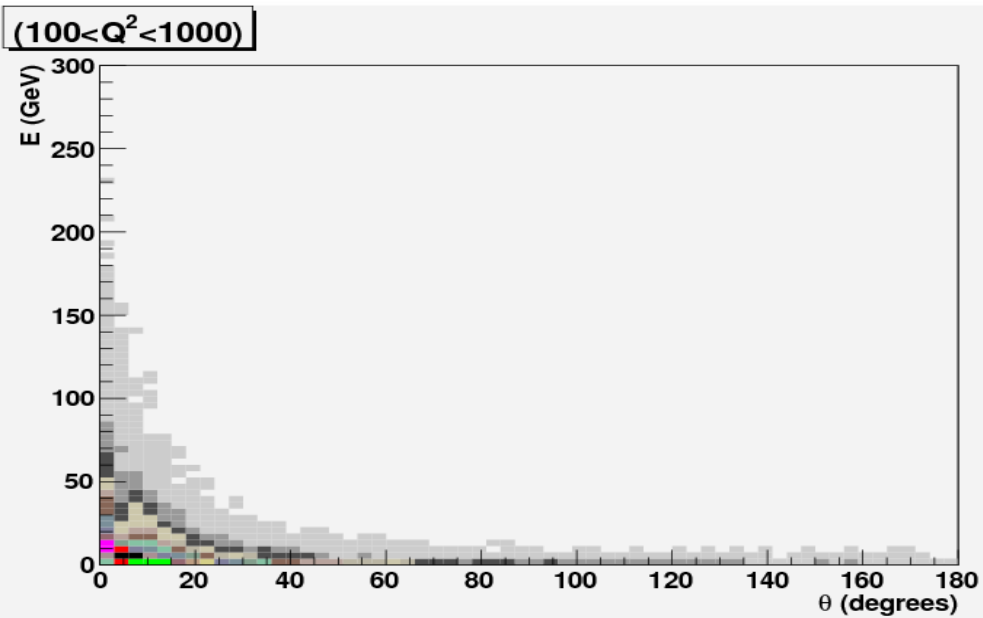
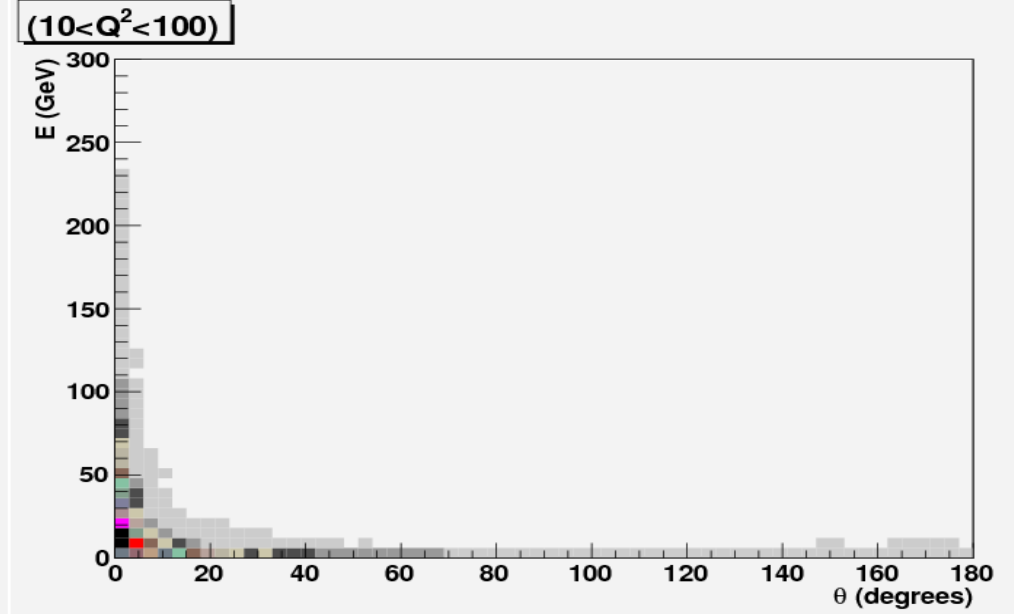
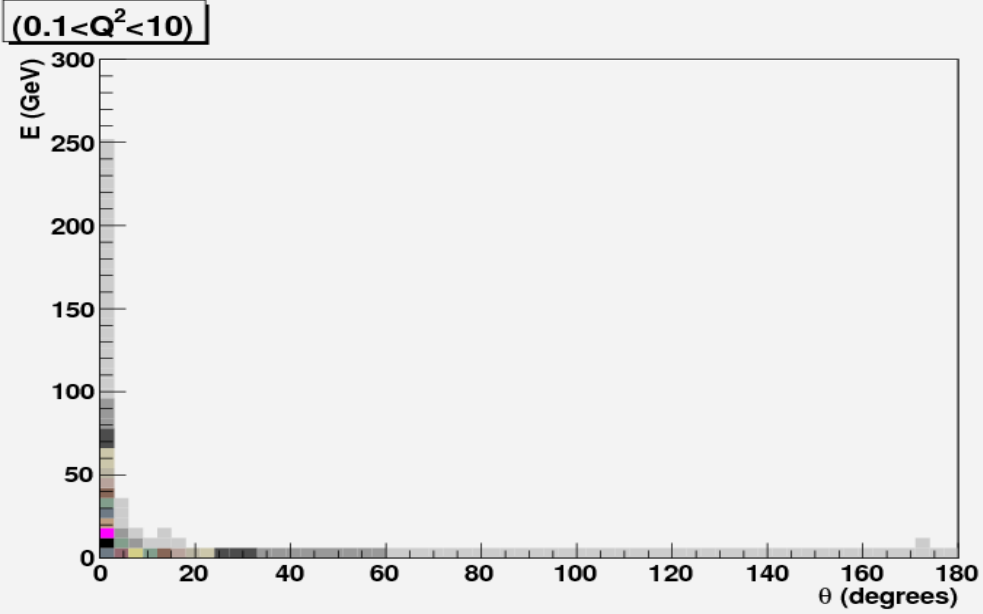


- Electrons scatter to smaller angles (in original e- beam direction) at greater s
- High Q^2 electrons scatter closer to beampipe at lower s

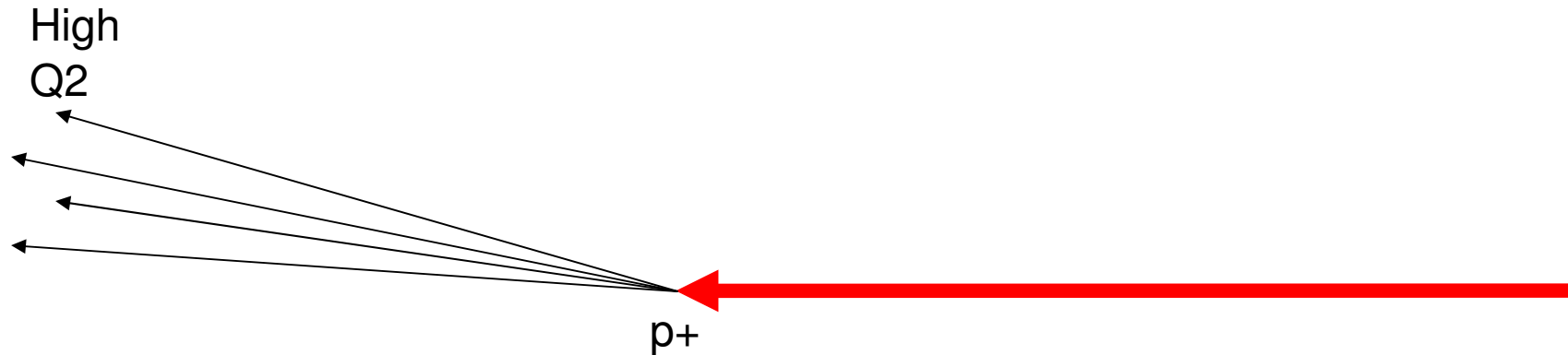
e^- Scattering Angles $s=4000$ and $s=10000$



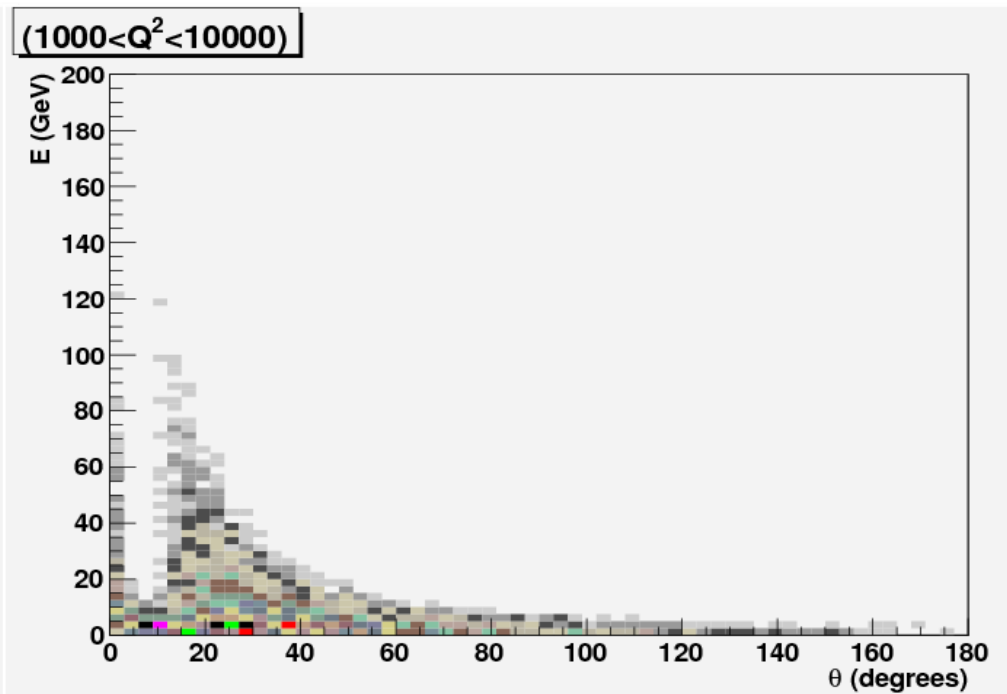
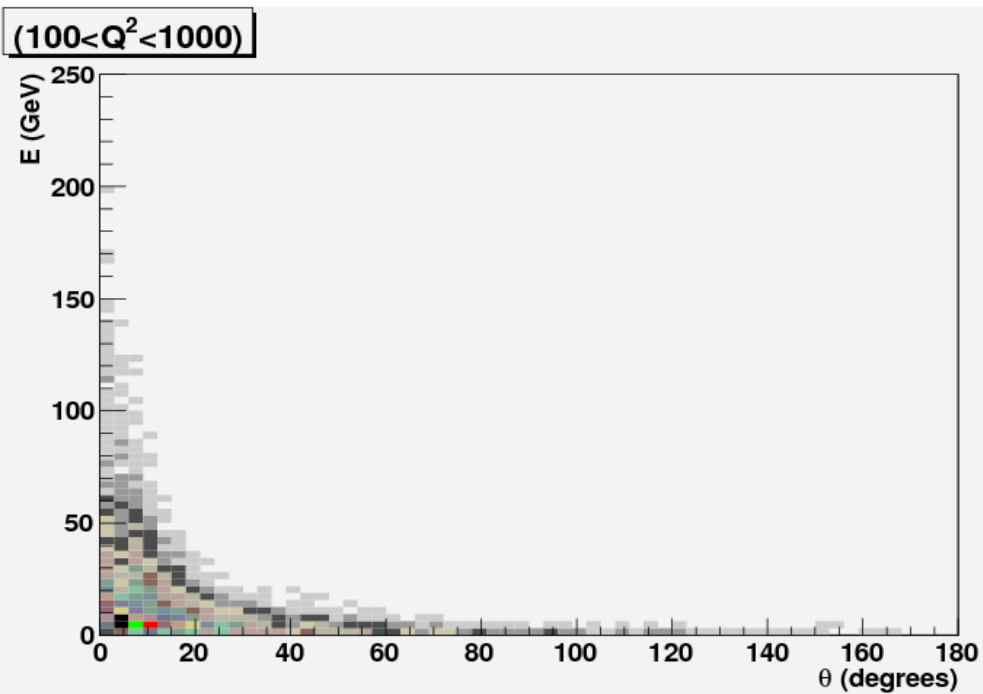
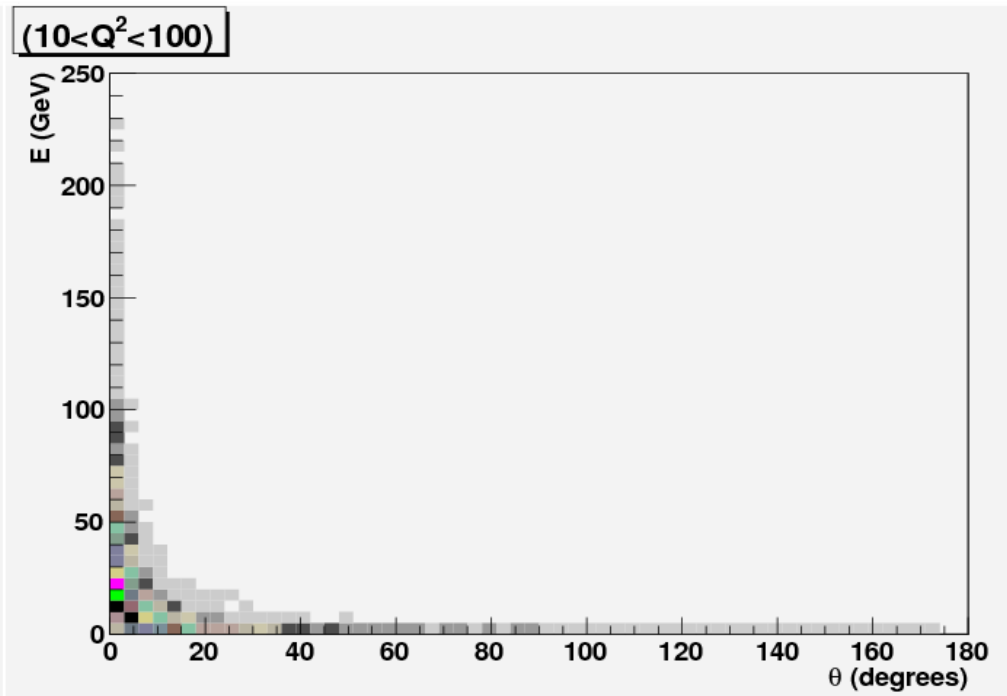
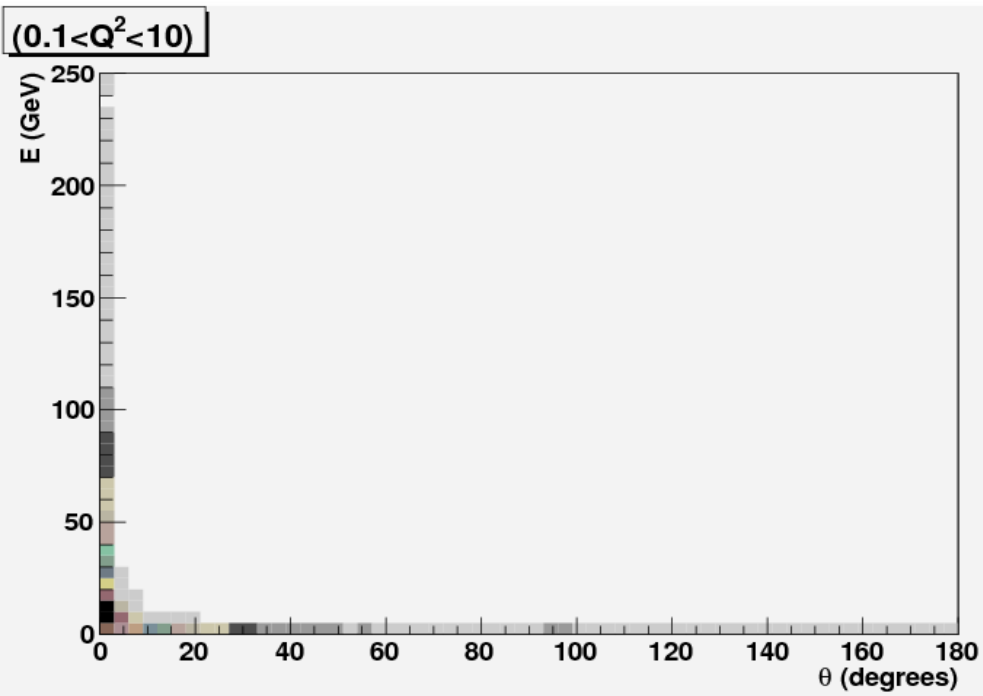


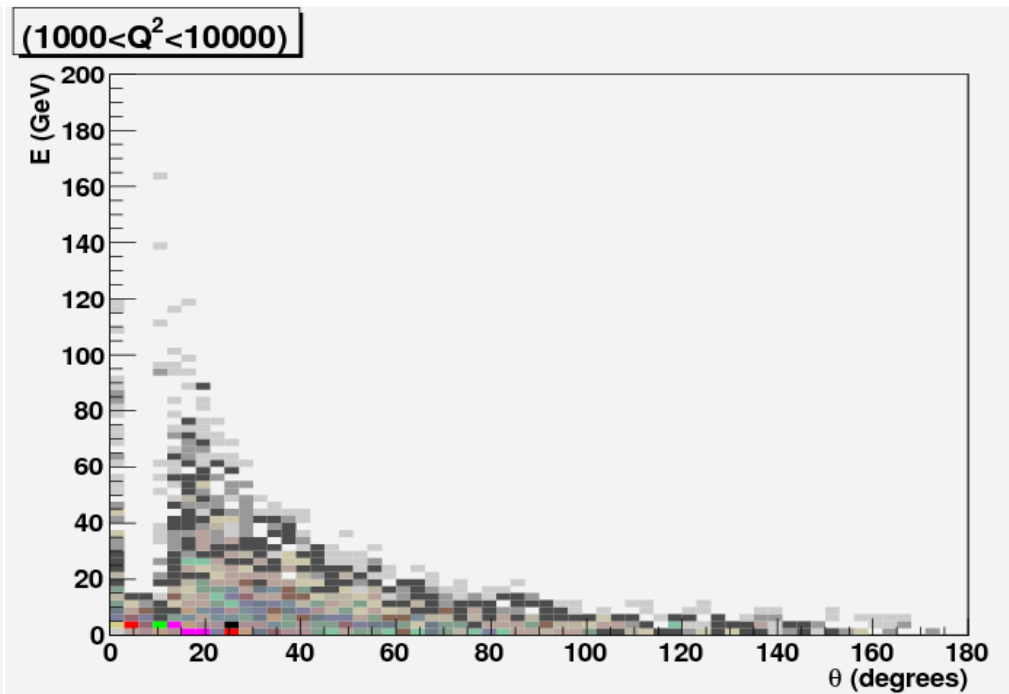
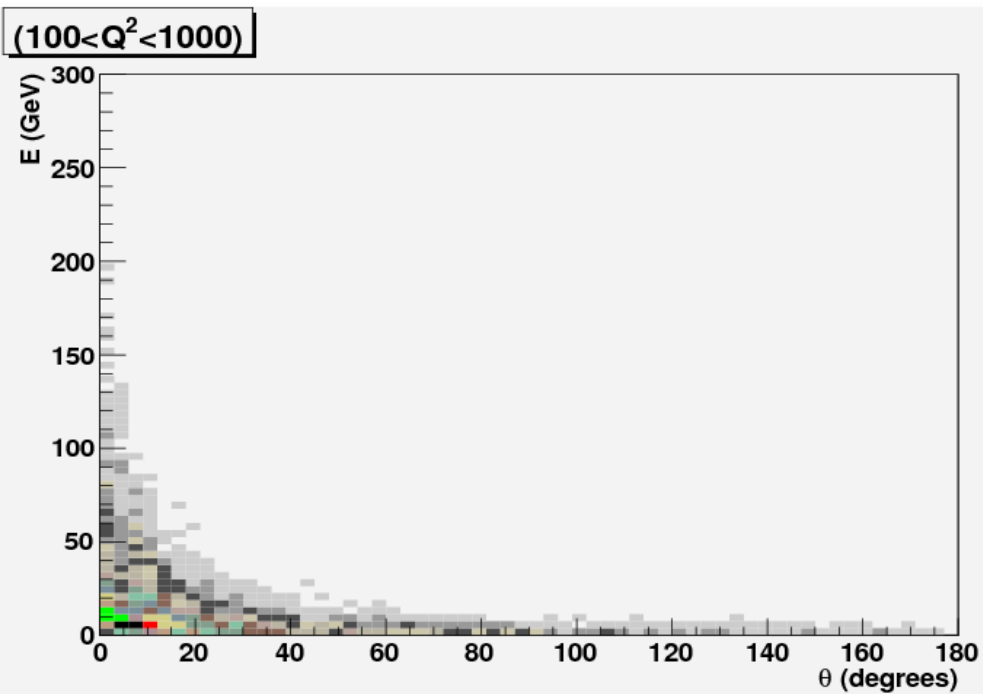
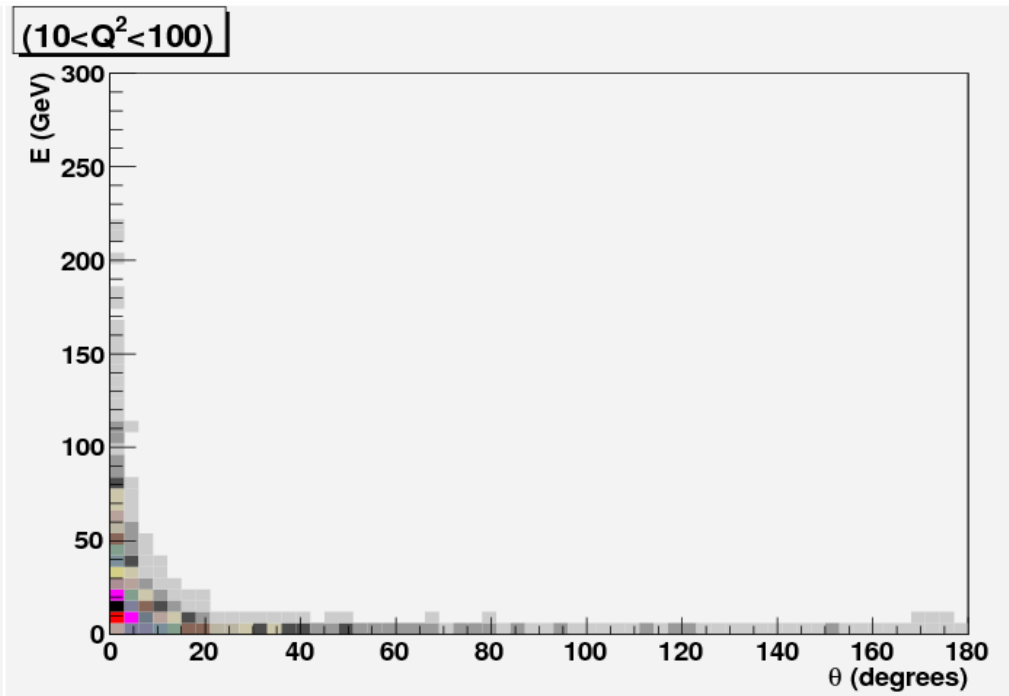
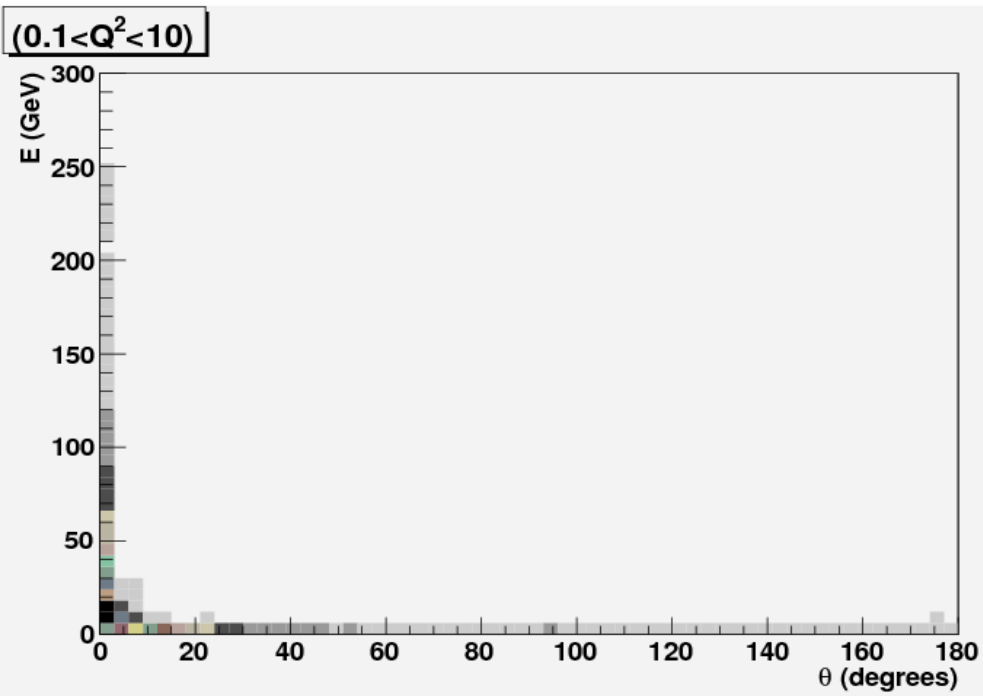


Pi+ Average Scattering Regions

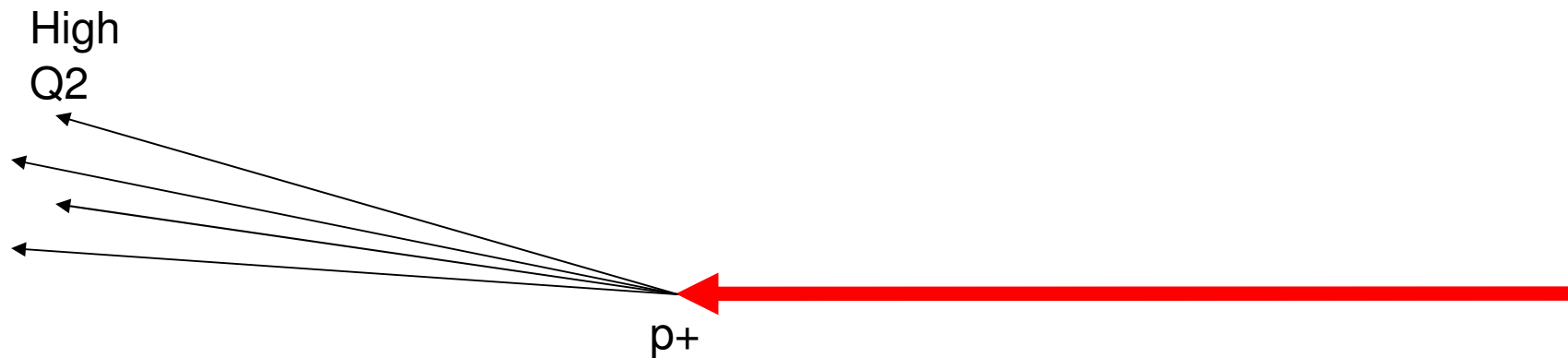


- Pions scatter to greater theta at $s=10000$
- Mean pion scattering angle of about 40° for $1000 < Q^2 < 10000$
- Mean energy about 20GeV for $(0.1 < Q^2 < 100)$
- Mean energy about 10GeV for $(100 < Q^2 < 10000)$
- Scattered pion energy similar at $s=4000$ and $s=10000$



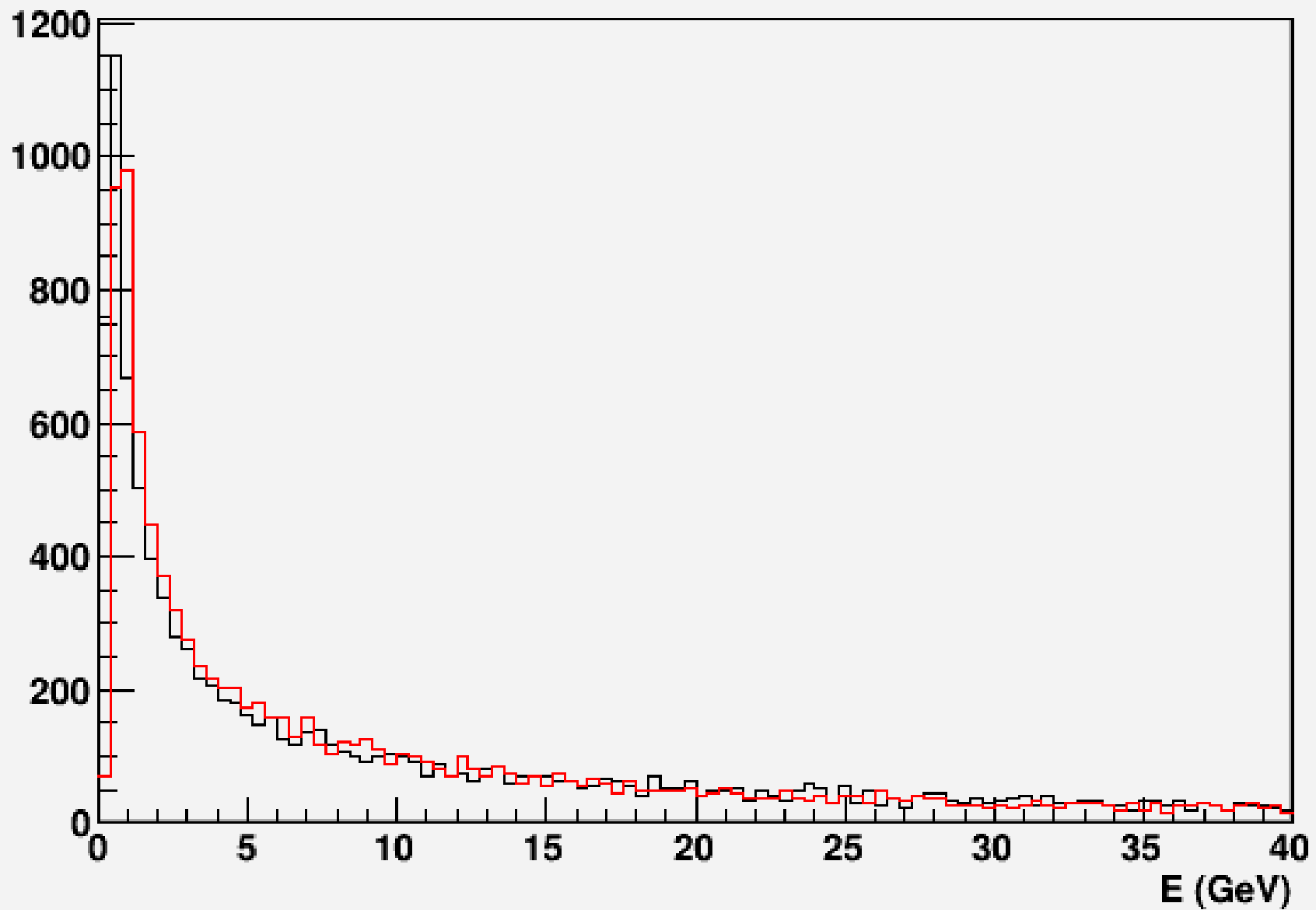


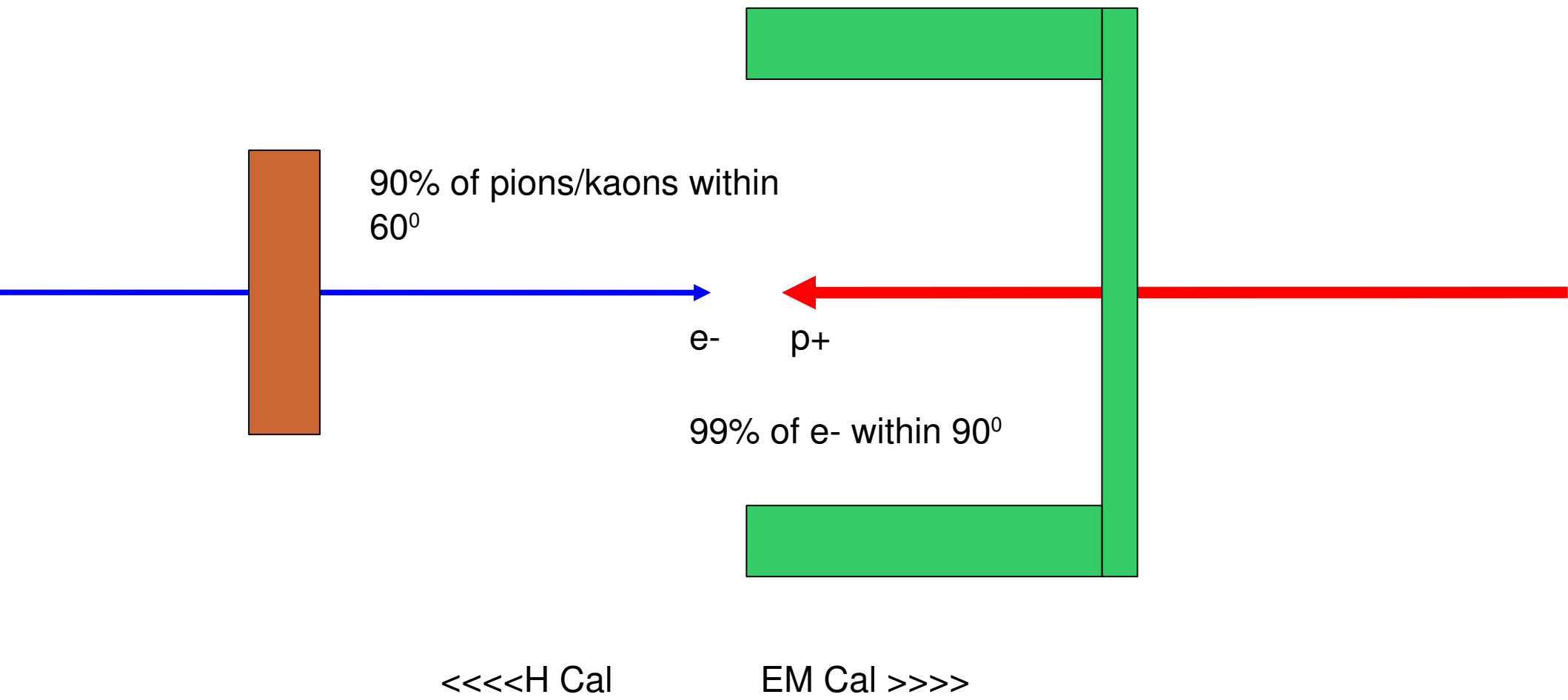
K⁺ Average Scattering Regions



- K⁺ scattering angles indistinguishable from Pi^+ angles
- Kaon E only slightly greater than for pions ($\sim 1\text{ GeV}$)
- Will need pion/kaon particle ID in proton direction
- Pions/Kaons mostly covered in $0 < \theta < 50^\circ$

π^+ and K^+ (red) Energy Distributions





(slightly more e^- lost at low s)

Pion/Kaon ID Issues

- Energy angle distributions nearly identical
- At typical energy (~ 10 to 20 GeV) pion/kaon momentum differs by about 0.1% at most
- No additional acceptance needed for $s=4000$, $s=10000$

Meson ID methods

- Cerenkov counters
- Time of flight
- Hadronic calorimetry
- Tracking (with chambers and B field)
- Some combination of the above

- We have started studying the comparison of acceptances for different energy settings of EIC beams
- The low energy Stage 1 (4:250) could be served by a limited detector acceptance focusing on tracking and identifying particles in the extreme forward/backward regions around the IR
- Exclusive DIS will require good particle ID
- These studies will continue with input from the detector and physics working groups