SIDIS Large Angle EC
1. Simulate background at front surface of calorimeter (Zhiwen) and look at the most inner radius (highest background)
2. Simulate calorimeter response to a wide range of background particle
3. Combine above two sum over all contributions (EM, DIS, pio, pi+,pi-) -> background distribution
4. Imbed into the signal simulation (high energy e, pi), assuming a 50ns coincidental window
Dominant background

- 0.3 GHz low energy photon for inner-R 1+6 hexagon clusters
- But well shielded by 2-Xo preshower absorber
Background distribution

- Photon
- Electron
- Pion
Pion rejection w/o background @ 94% electron eff
w/ background (inner-R) Electron efficiency
w/ background (inner-R)
Pion efficiency (1/rejecton)

Worse rejection
But not below the bar (1:100)
Proposed trigger rate and rejection

\[ T_L^e(11 \text{ GeV}) = Y_L^e + Y_L^\gamma + \frac{Y_L^h}{R_{LC}} = 11 + 51.5 + \frac{55.6}{20} = 65 \text{ kHz} \]

- Pion rejection needed ~ 20:1, but I think can be relaxed
- Additional photon rejection help more
- Single-Shower 1+6 cluster trigger tested
  - Full background spectrum considered
  - Cut on shower energy deposition > 2.6 GeV
  - Very high electron trigger efficiency
Pion turn-on curve
Single-Shower trigger > 2.6 GeV

Rejection > 20:1 for lower energy pions
What if we also want to rejection photons? - Add a scintillator pad

Scintillator MIP rate

- Photon originated
- Electron
- Pion

- $1 \text{GeV} < E_\gamma < 7 \text{ GeV}$
- $1 \text{GeV} < E_\gamma < 2 \text{ GeV}$

~10:1 rejection with 45 segments (matching size)
PVDIS Calorimeter

Simulated using Apr 2012 BaBar baffle
Still trying tricks to improve performance
Why it is hard – lots of deep pions

- Photon
- Electron
- Pion - Pion+
Per-event pion rate for 1+6 hexagon cluster at inner radius

Background particle per trigger

- Electron
- Pion-
- Pion+

High pi+ rate?? Need to be checked
Electron efficiency w/ background at inner radius. Ignore gamma and pi+ bgd
Pion efficiency w/ background at inner radius. Ignore gamma and pi+ bgd

Significant drop in rejection
What we can further try

- Position or kinematic dependent trigger threshold and cut threshold
- Use track multiplicity to assist calorimeter cuts