Diffractive J/Ψ Production

Workshop on Collider Physics
LISHEP 2006

Ana Carolina Assis Jesus
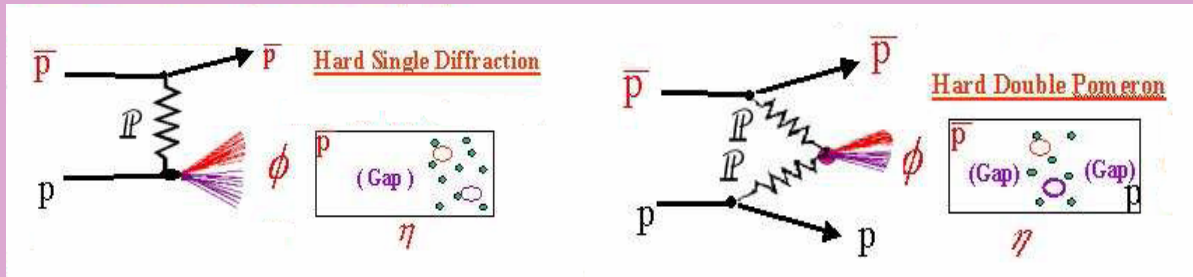### Brendan Cameron Kieran Casey

Adviser: Alberto Santoro

Co-adviser: Andre Sznajder

Diffractive Physics

⬛ Rapidity gaps are pseudo-rapidity regions (h) devoid of particles or energy deposition.

⬛ Single Gap Events: ⬛ Double Gap Events:

⬛ Single gaps: study of low x physics

  ⬛ "What is a pomeron?" can be studied by answering the question "What can be produced by a pomeron?"

⬛ Double gaps: low x + precision

  ⬛ Also interesting info on the nature of the pomeron
  ⬛ Tagging allows determination of initial energy of collision

Luminosity Monitor Detectors and Rapidity Gap Definition

- Luminosity System:
  1. LM covered range: $2.7 < |\eta| < 4.4$
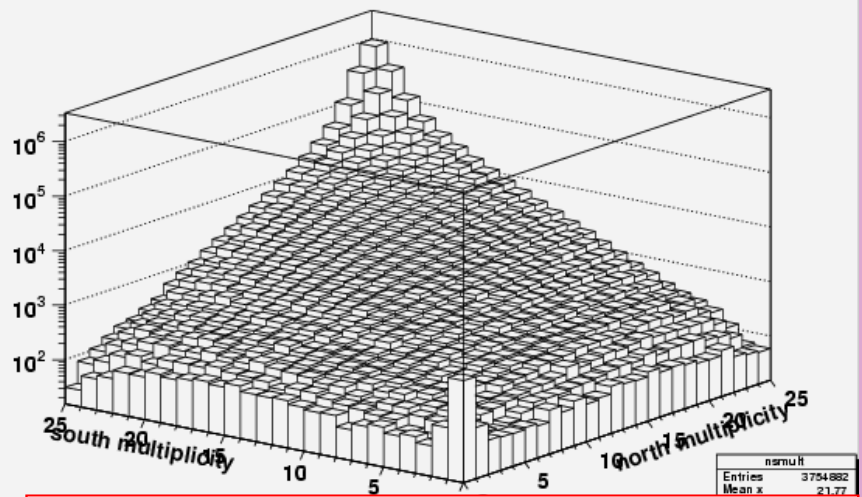 2. two detectors with 24 scintillator
wedges
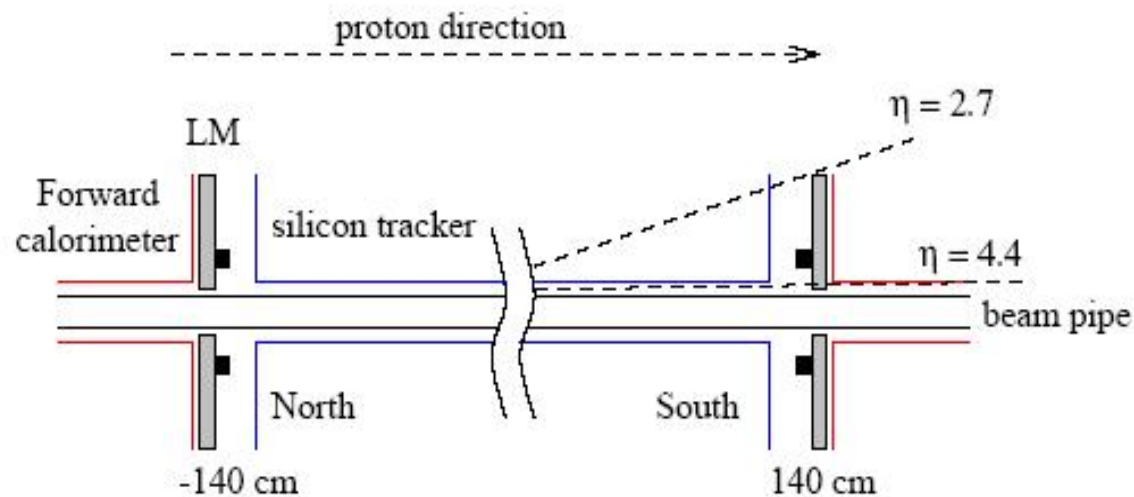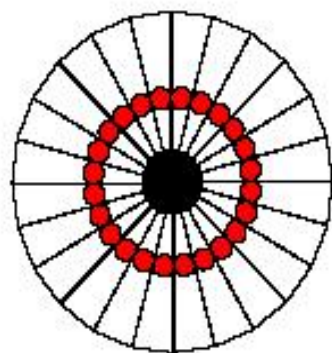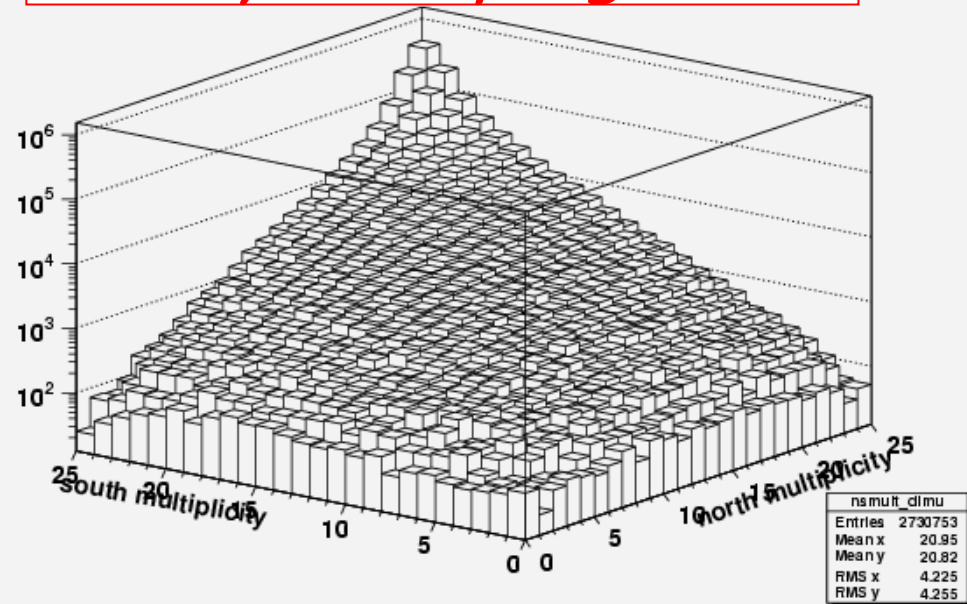

- Rapidity Gap Definition:
  Gap information provided by the hit multiplicity in the system

Multiplicity Hits Distribution

north X south multiplicity hits distribution for all events
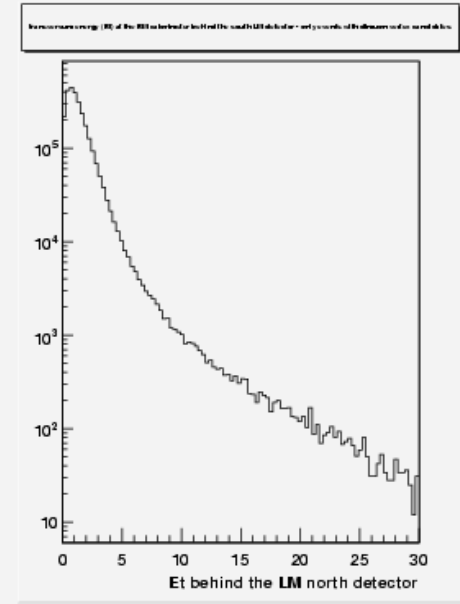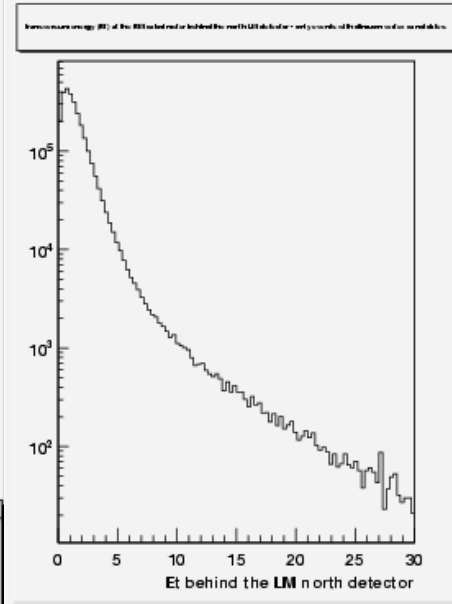

Analysis in progress!

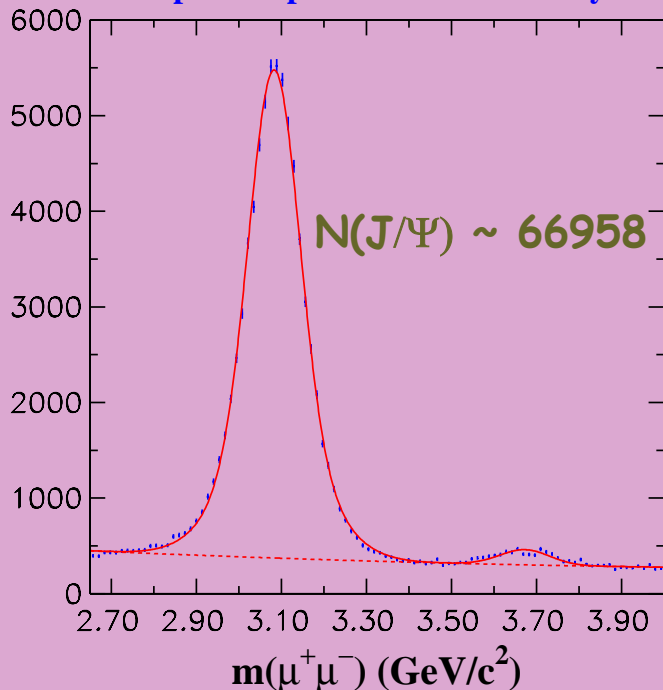**Data Sample:**

1) Data from October 2005 to January 2006

2) 3.75E+06 events

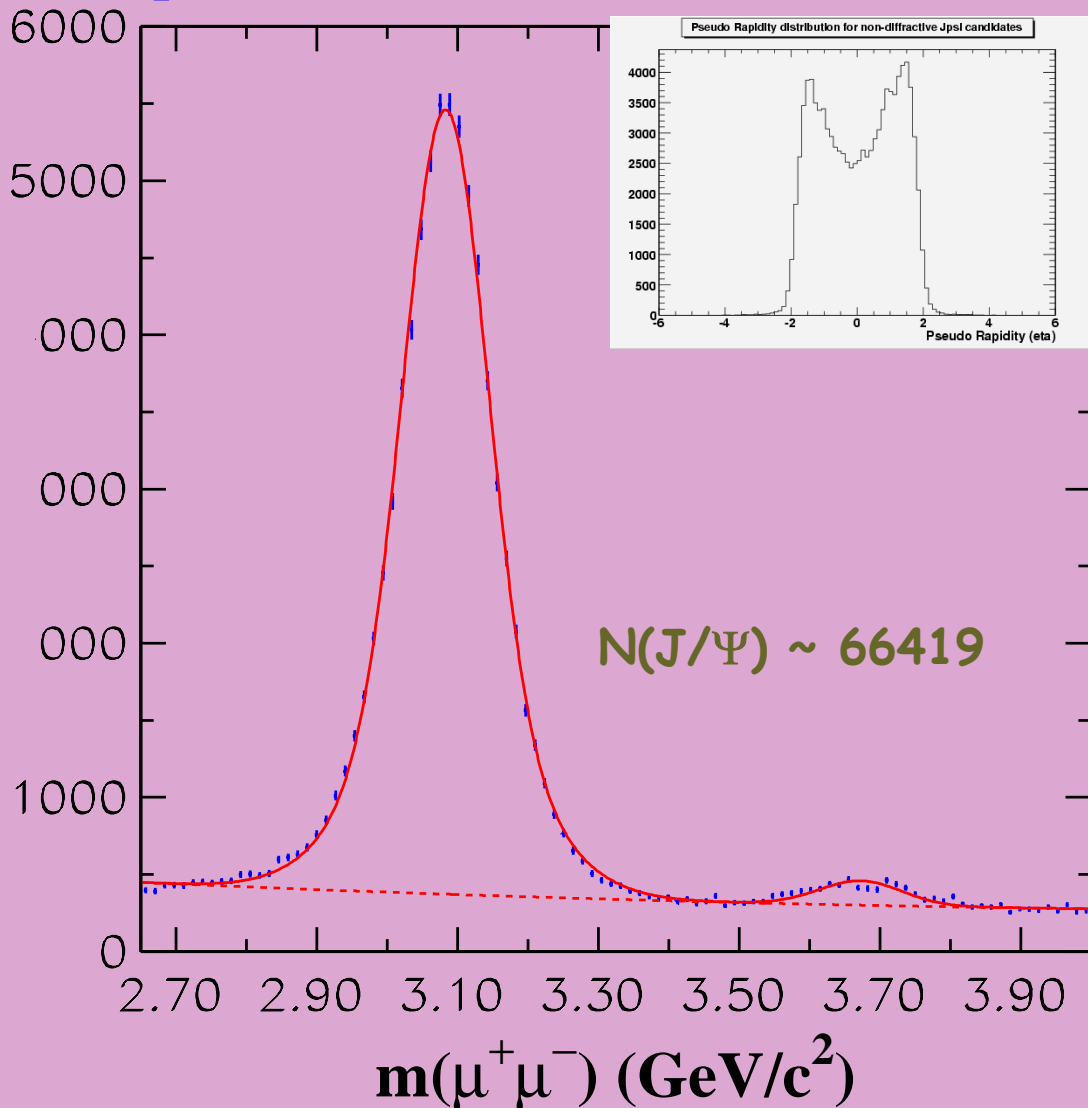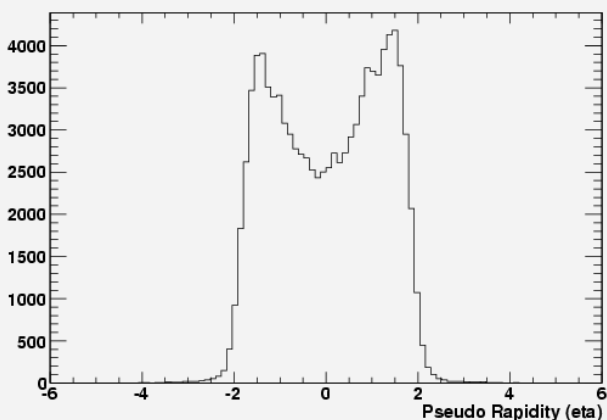Transverse Energy

(Et at EM calorimeter) behind the LM detectors

J/Ψ candidates

J/psi Sample   DØ Preliminary

N(J/Ψ) ~ 66958

$m(\mu^+\mu^-)$ (GeV/c^2)

Pseudo Rapidity distribution for non-diffractive Jpsi candidates

Pseudo Rapidity (eta)

N(J/Ψ) ~ 66419

$m(\mu^+\mu^-)$ (GeV/c^2)

Pseudo Rapidity distribution for Jpsi candidates

Pseudo Rapidity (eta)

Analysis in progress!

Diffractive J/Ψ candidates

J/psi Sample (gap north)   DØ Preliminary

N(J/Ψ) ~ 105

m(μ⁺μ⁻) (GeV/c²)
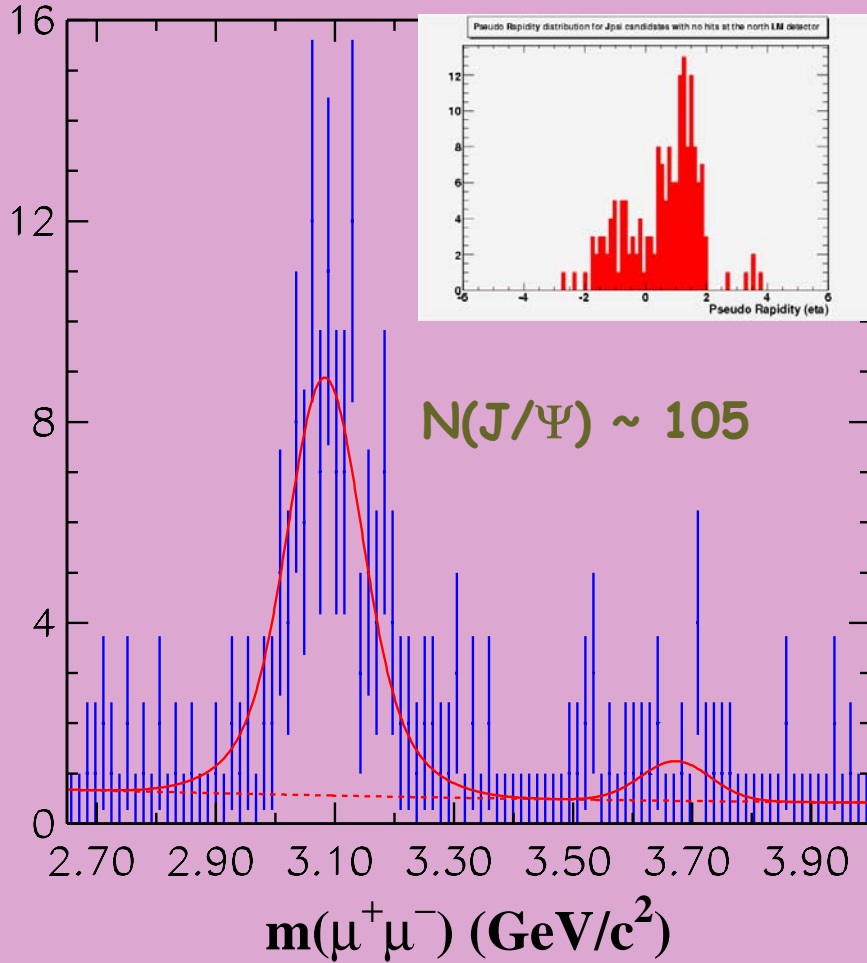
J/psi Sample (gap south)   DØ Preliminary

N(J/Ψ) ~ 120

m(μ⁺μ⁻) (GeV/c²)
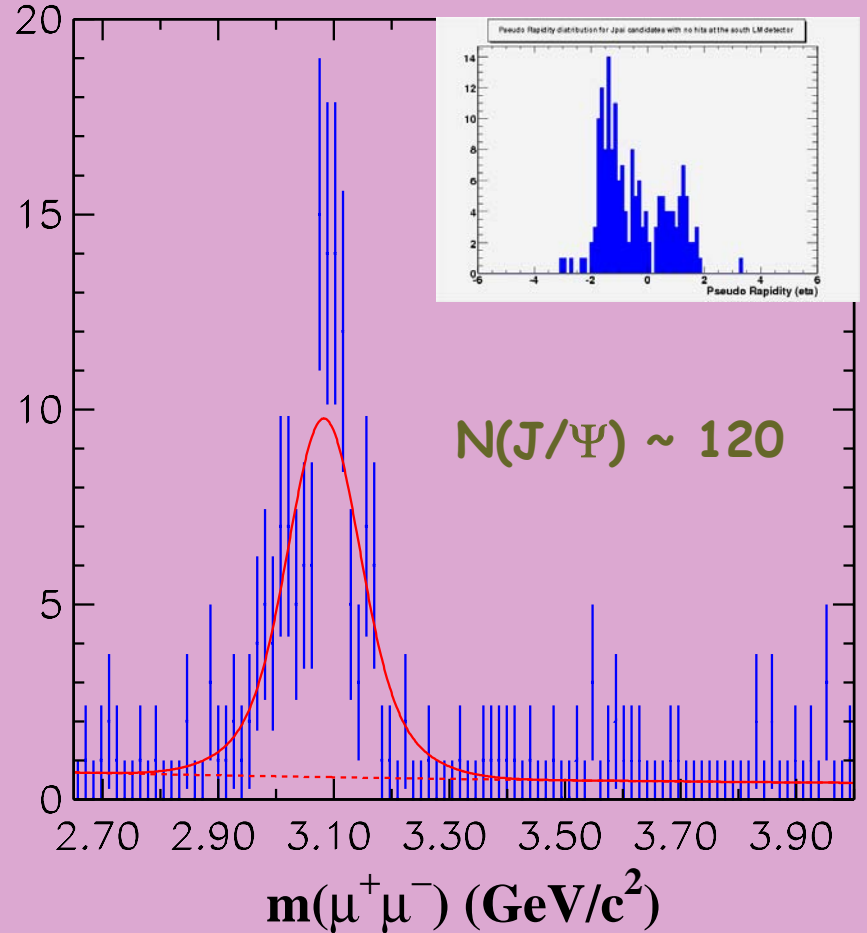
Analysis in progress!

Et for events with non-diffractive jpsi candidates
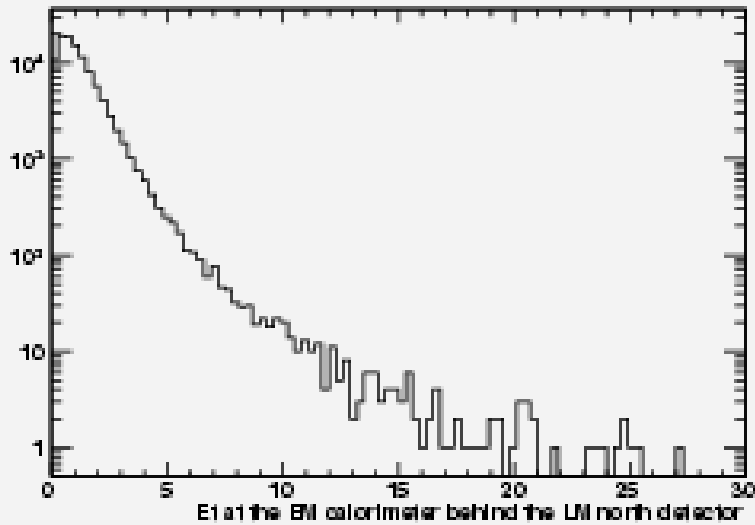
Et at the EM calorimeter behind the LM north detector

Et for events with non-diffractive jpsi candidates

Et at the EM calorimeter behind the LM south detector
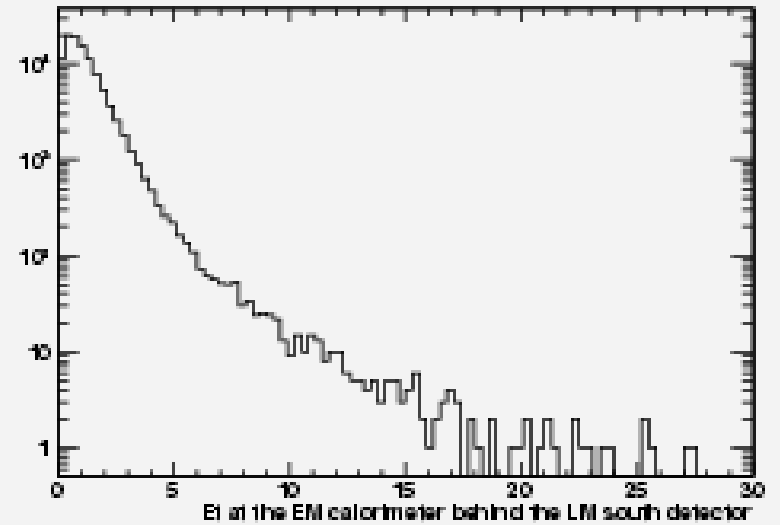
Et for events with diffractive jpsi candidates - gap at the north forward end

Et at the EM calorimeter behind the LM north detector
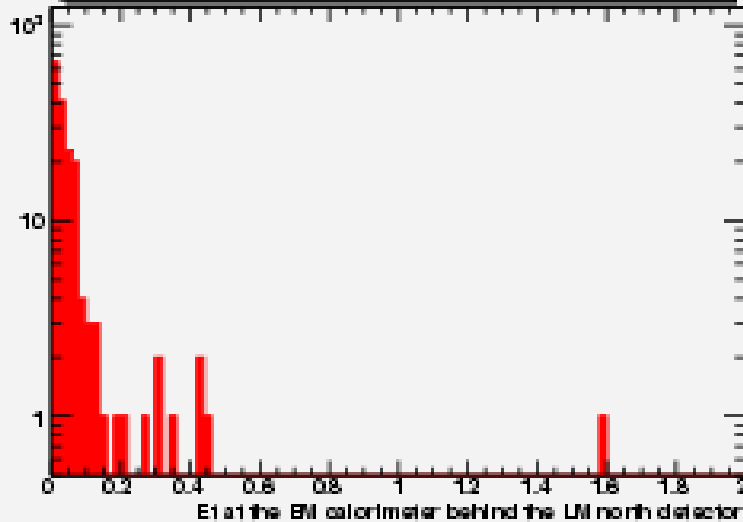
Et for events with diffractive jpsi candidates - gap at the south forward end

Et at the EM calorimeter behind the LM south detector
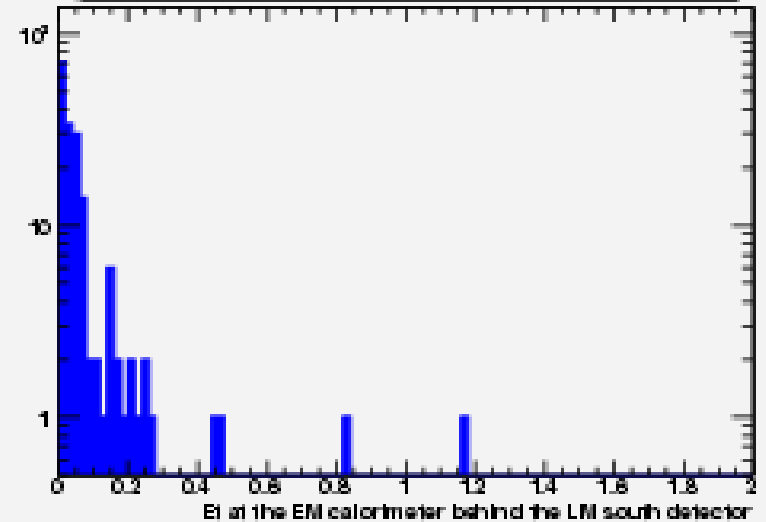
Diffractive Fraction by η bins

Diffractive jpsi fraction in Pseudo Rapidity bins
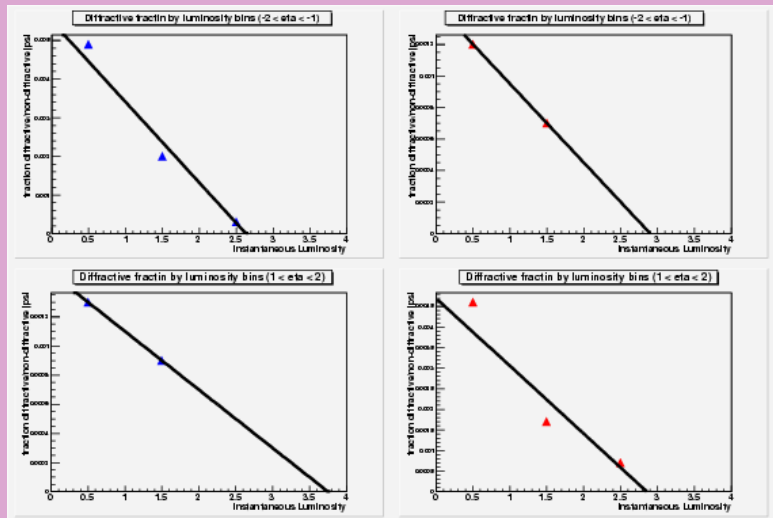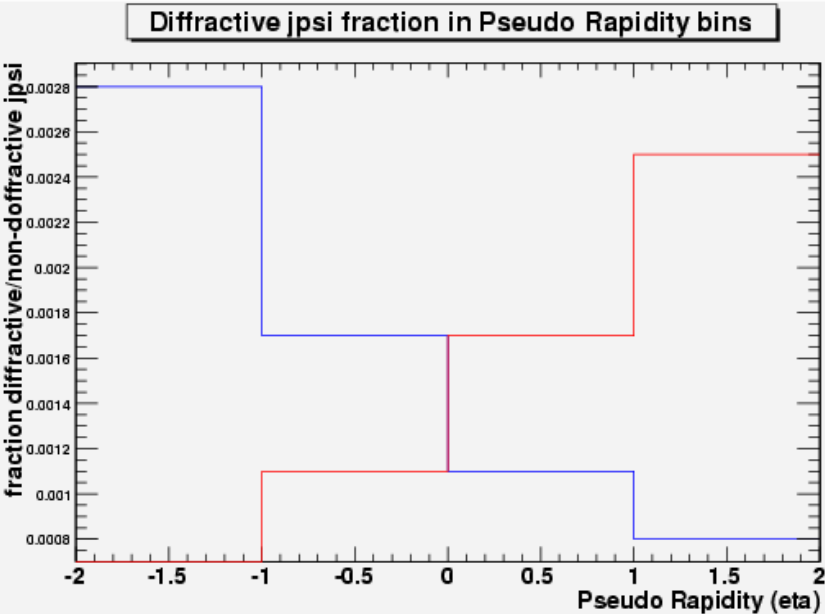
Diffractive jpsi fraction in Pseudo Rapidity bins when L = 0
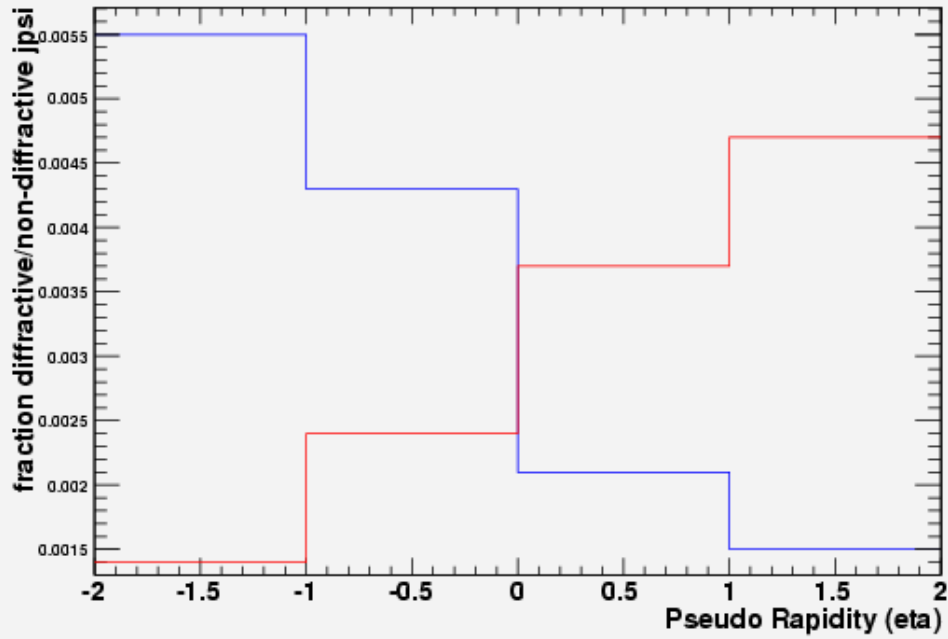
Blue: gap at the south forward end

Red: gap at the north forward end

Analysis in progress!

Conclusions

- **Procedure for determining diffractive heavy flavor established:**

  - Multiplicity at high eta separates diffraction from non-diffractive tail

  - Effects of pile-up from multiple interactions removed by studying fraction as a function of luminosity

  - First order efficiencies cancel by studying fraction in eta bins.

- **Procedures established with last 100 pb^{-1} of Tevatron RunIIa. Ready for large RunIIb data set!**