

Feasibility of J/ψ measurement in p+A collision @ 25GeV

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Motivation

- Proton-nucleus (p+A) collisions is a fundamental component of any heavy-ion physics programme
- Defines the reference baseline relative to which we recognize HI specific phenomena
- p+A collisions provide a measure of the nuclear effects – helps in disentangling the “QGP” effect from the “non-QGP” effects. Here there is no formation time for the “secondary” medium , hence such collisions provide as essential tool to correctly account for the effect of the nuclear medium initially present.
- Charm propagation in cold nuclear matter & normal absorption.

The p-A System

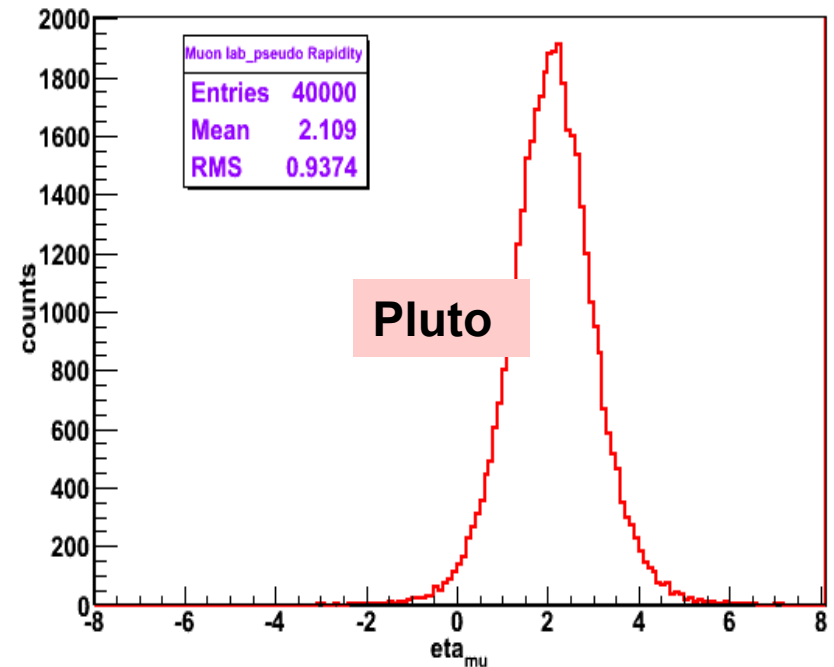
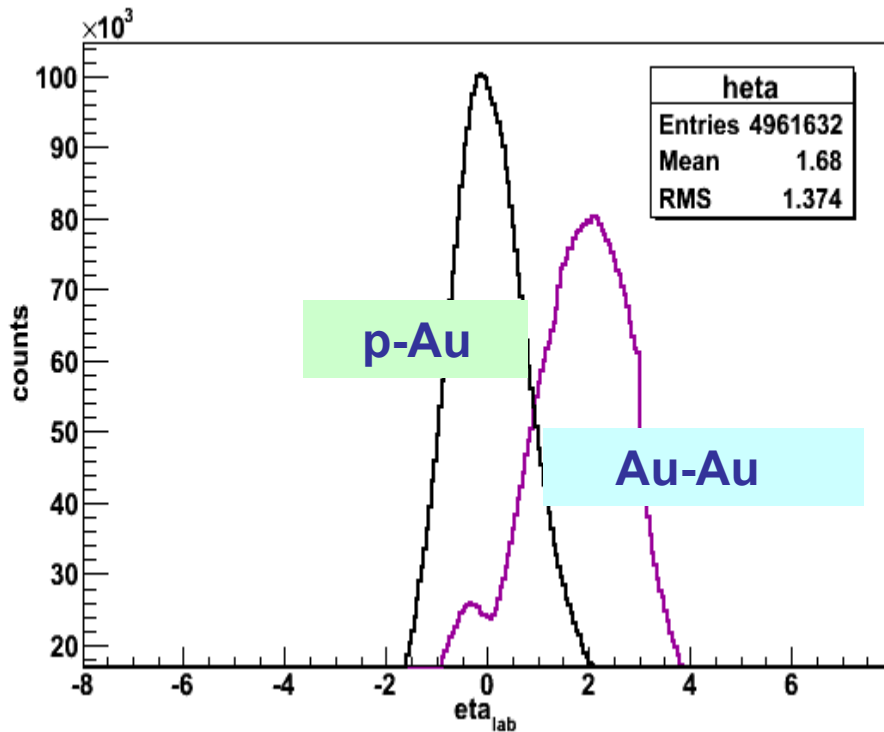
The specifications of the system chosen are:

- Target : Au (79 , 197)
- Projectile : p (1, 1)
- Beam energy : 25 GeV
- Collision type : Minimum bias
- Event generator :
 - Background : UrQMD
 - Signal : Pluto ($J/\psi \rightarrow \mu^+ + \mu^-$)
- Events simulated : 10,000
- **Muon detection system : Standard Geometry, Start version Geometry**

An extremely asymmetric system

Acceptance (system asymmetry)

MUCH Detector acceptance rejects background

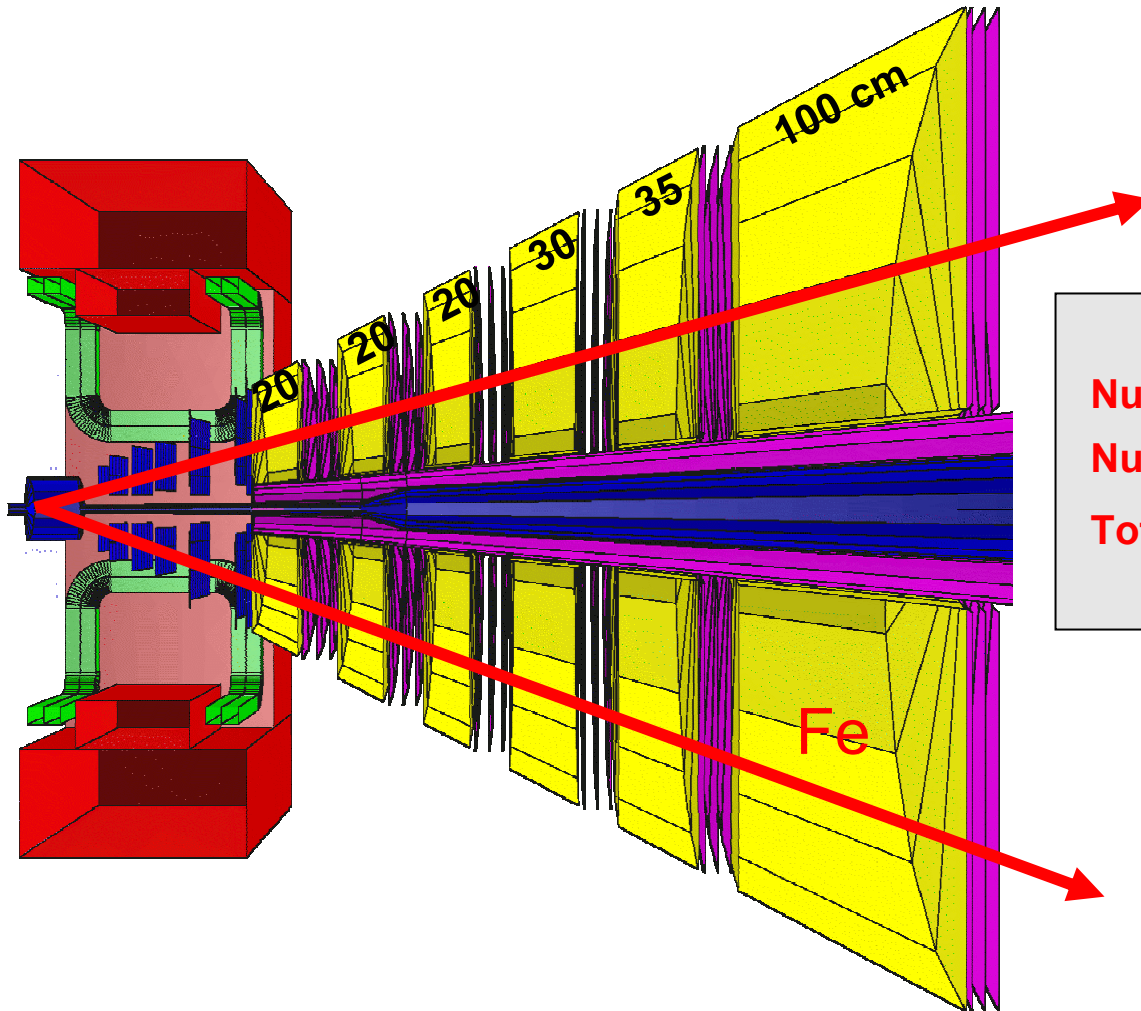


Detector coverage:

$\theta_{in} = 5.3$ degree $\theta_{out} = 26.7$ degree

$\eta_{max} = 3.07$ $\eta_{min} = 1.44$

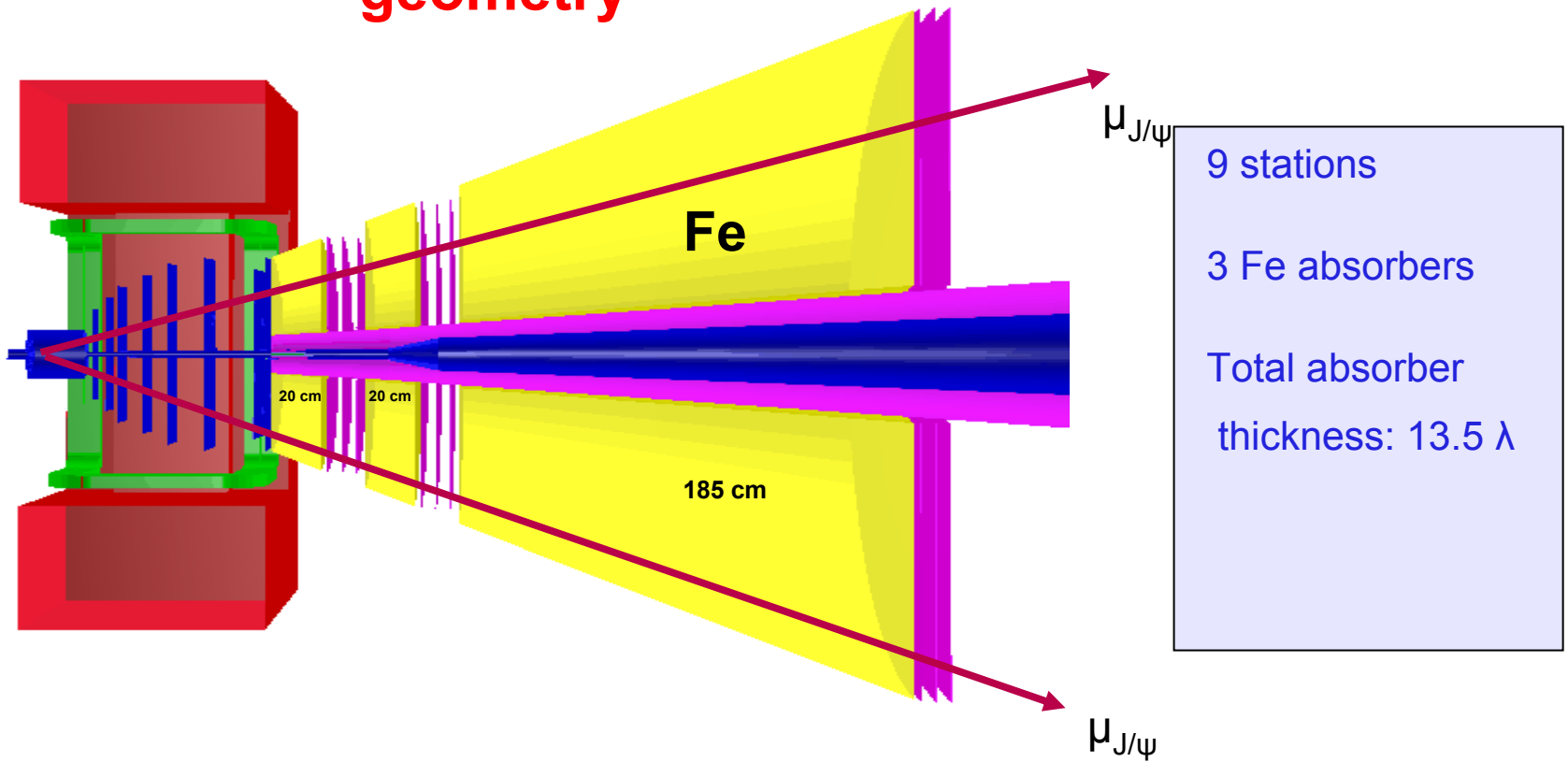
Muon Detection System: Standard Geometry



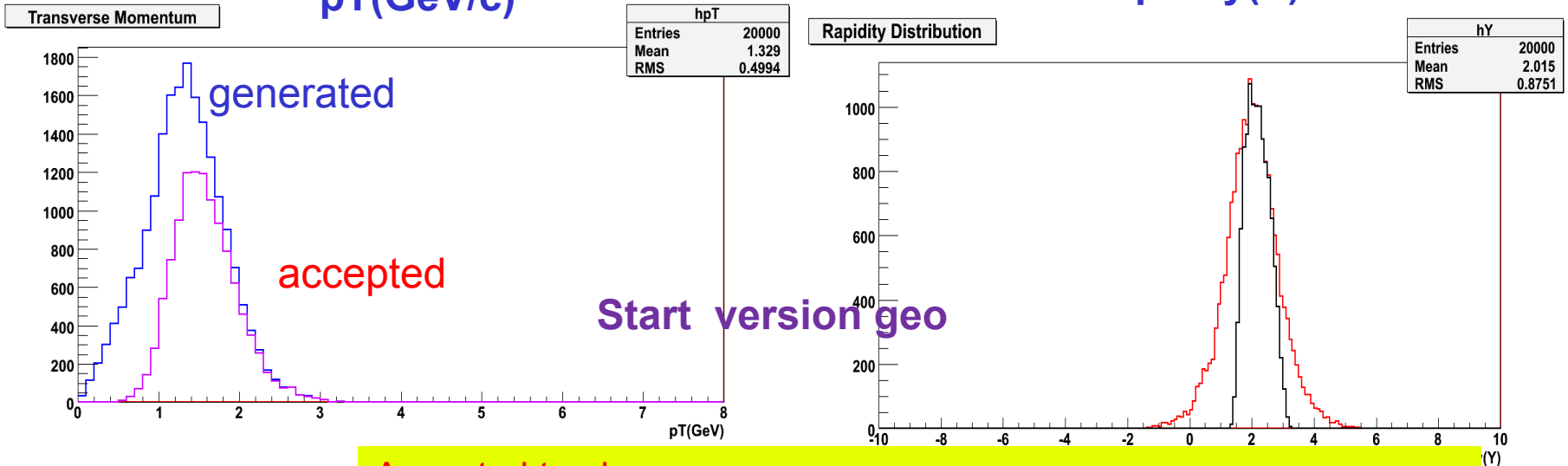
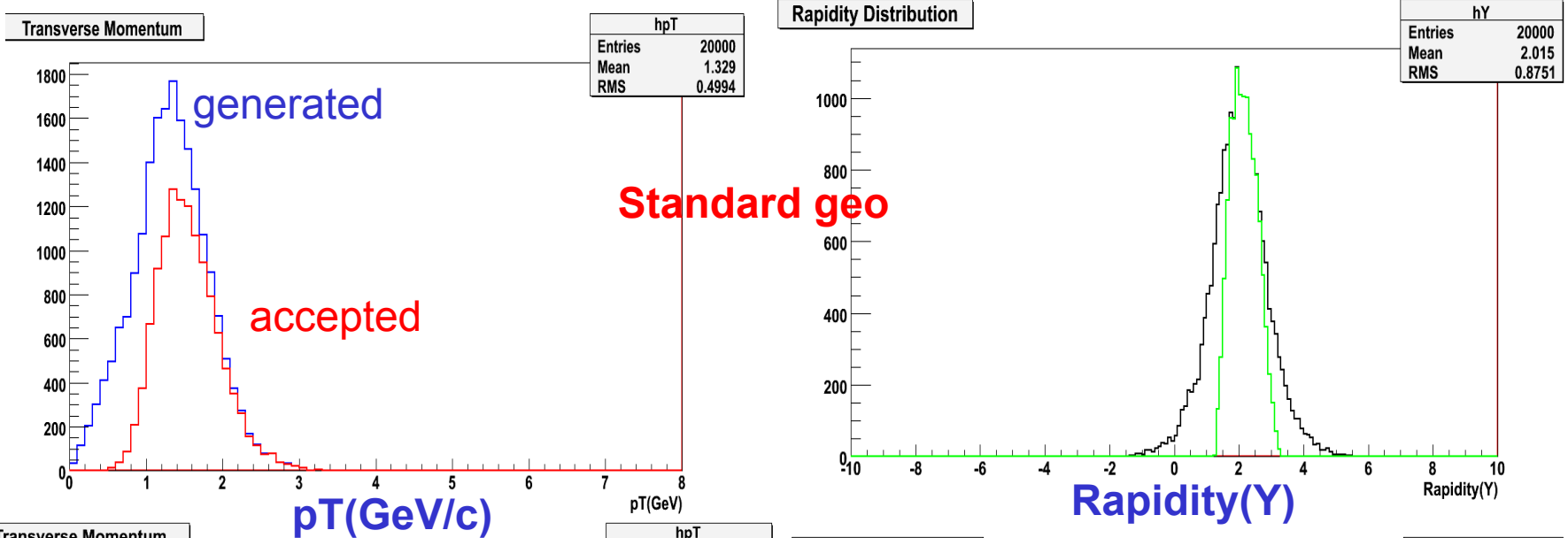
Number of stations : 18
Number of absorbers : 6
Total absorber thickness: 13.5λ

New Geometry (Reduced Number of stations)

Start Version
geometry

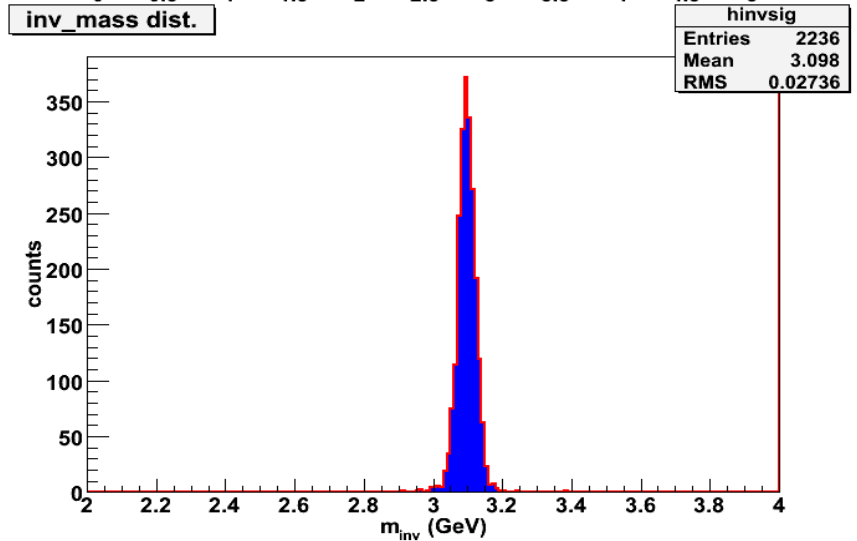
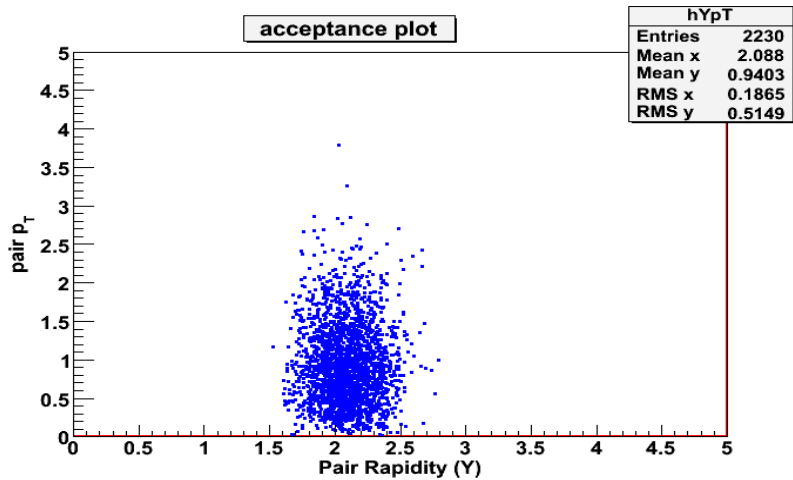
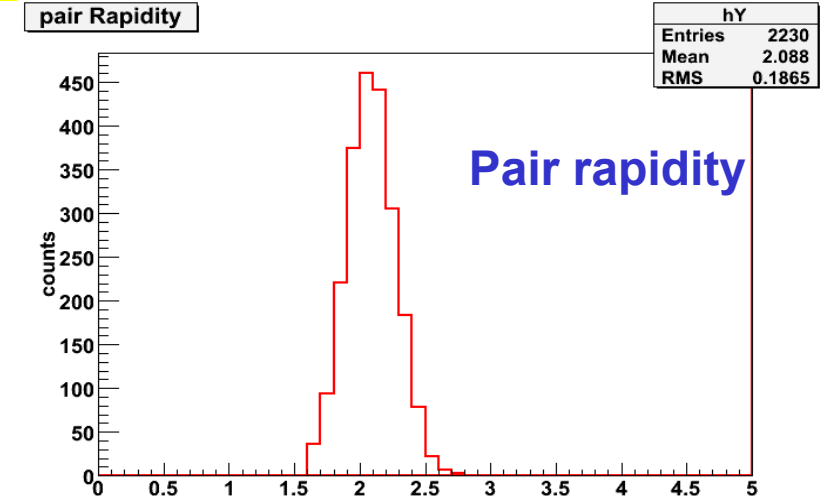
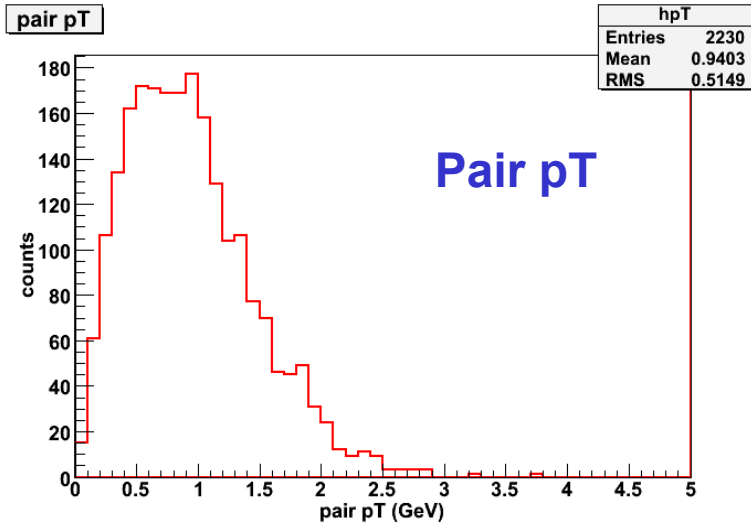


Pluto (signal muons)



Accepted tracks
 (STS points ≥ 4 , MUCH Points $\geq 70\%$ of the total no. of muon detectors)

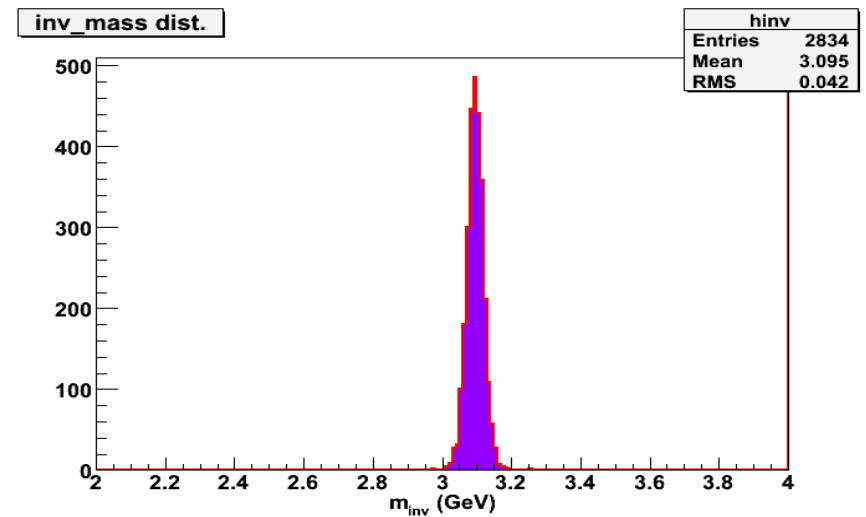
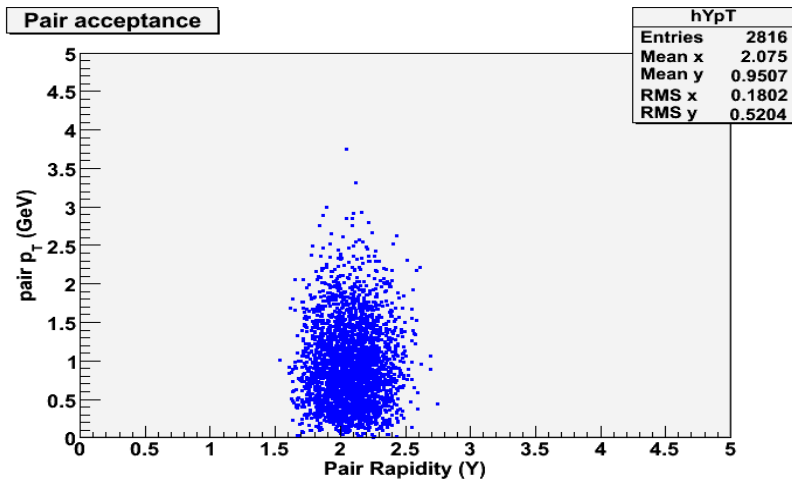
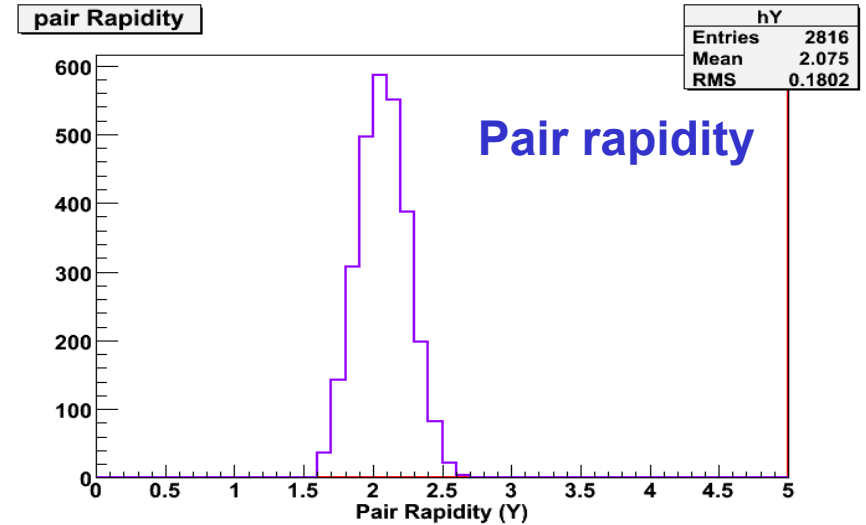
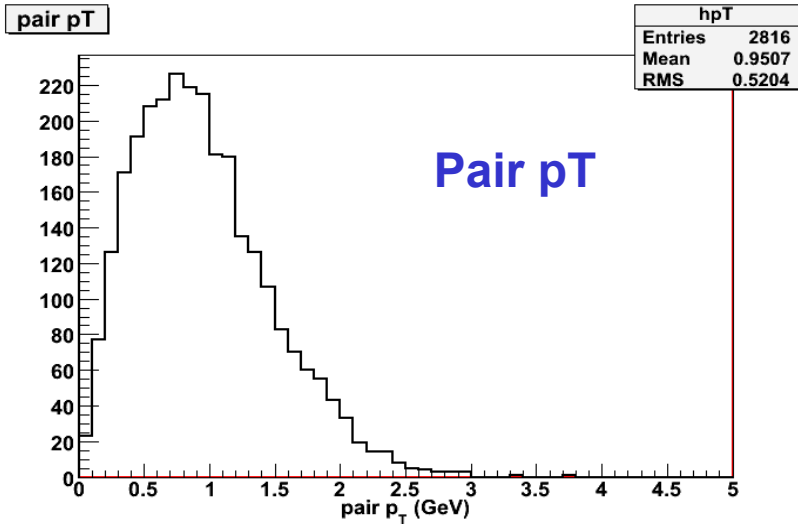
Reconstructed J/ψ Standard Geometry



Invariant mass

Reconstruction efficiency : 22.3 %,
(10 K embedded events, URQMD+PLUTO)

Reconstructed J/ψ Start version Geometry



Summary & Future Plans

First estimates of reconstruction efficiency of J/ψ in SIS100 clearly shows the feasibility of measurement

Much less background in pA owing to the typical geometrical acceptance

A **START VERSION** geometry of MUCH with 9 stations implemented. preliminary comparison conveys similar reconstruction efficiency. More study underway.

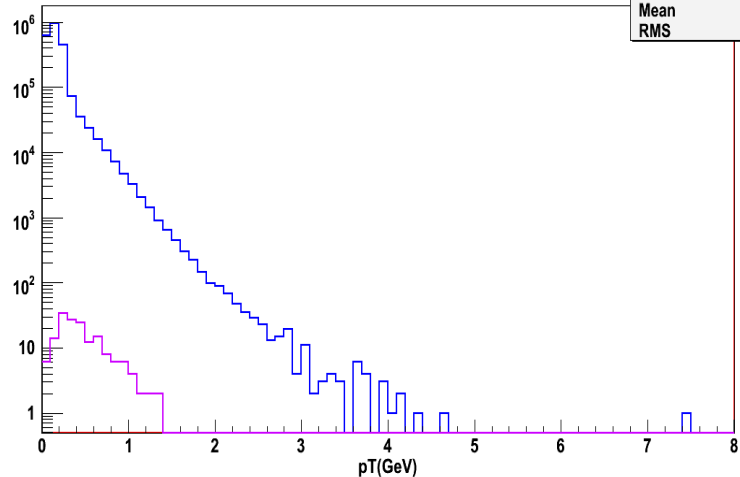
Estimation of background & calculation of S/B ratio will be done

Transport models (HSD) will be implemented to include the system asymmetry in production of signal muons .

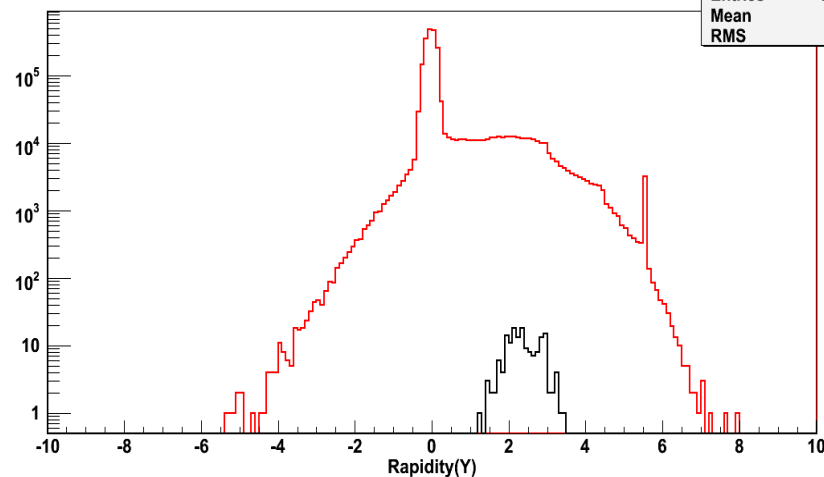
BACKUPS

UrQMD (background)

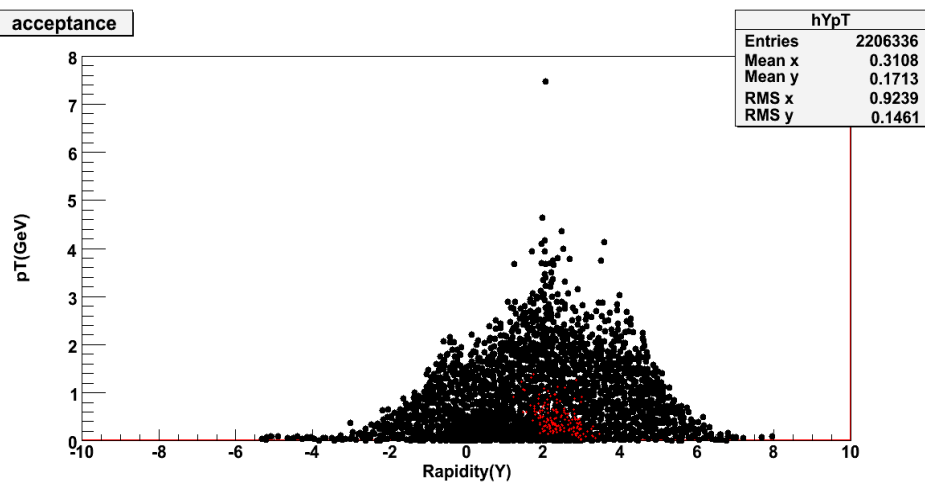
Transverse Momentum



Rapidity Distribution

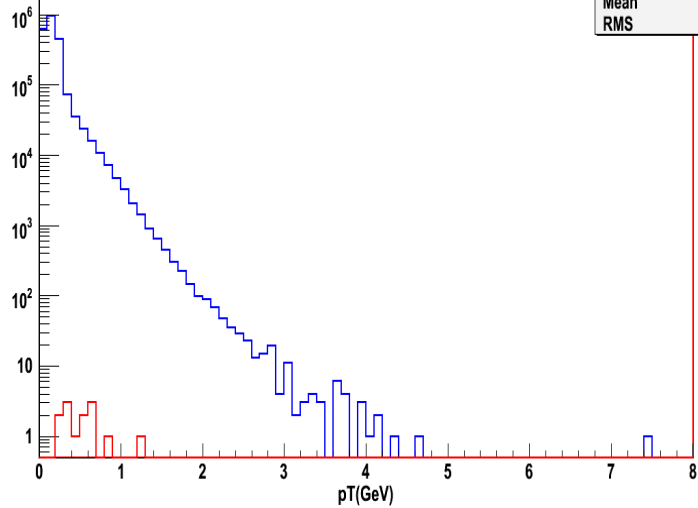


acceptance

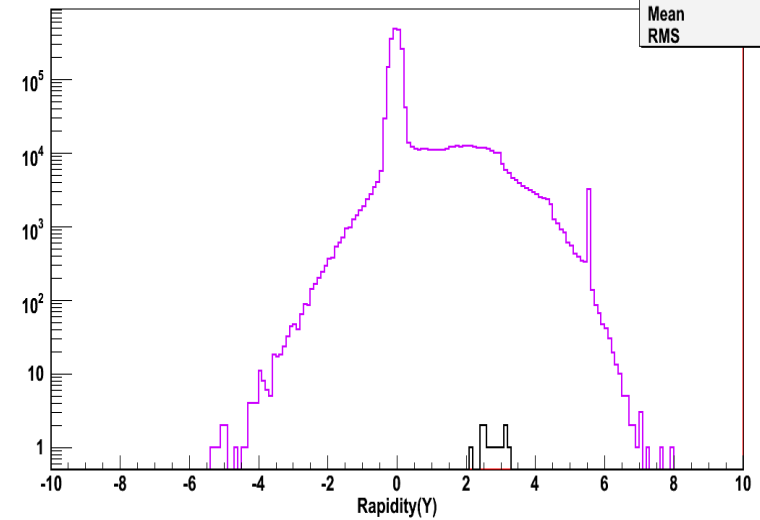


UrQMD (background)– start version geometry

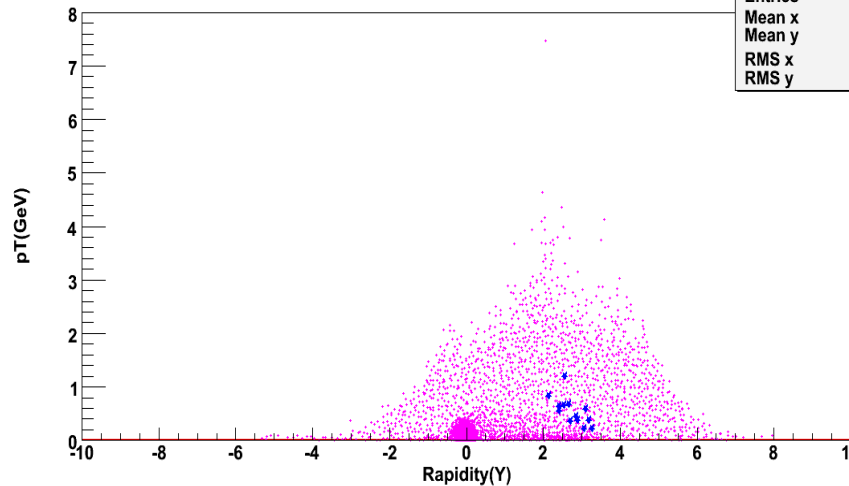
Transverse Momentum



Rapidity Distribution



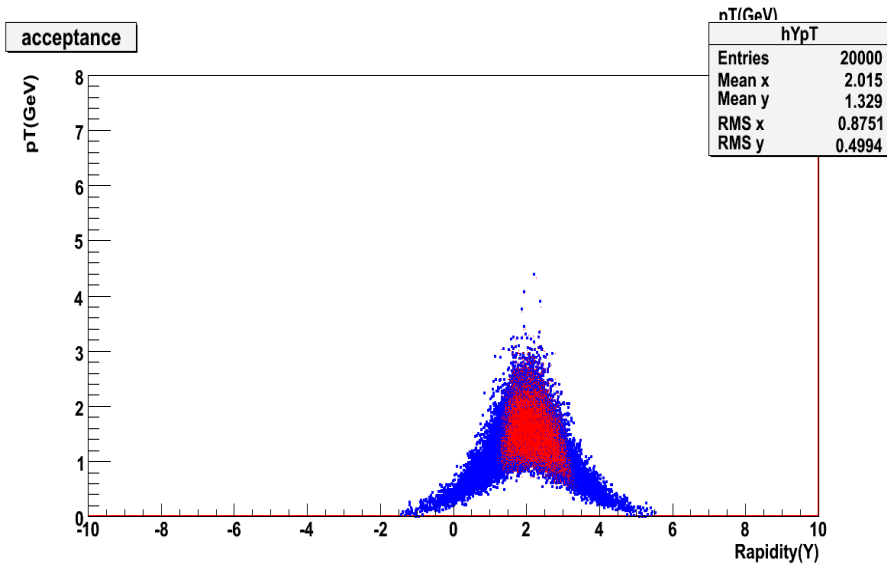
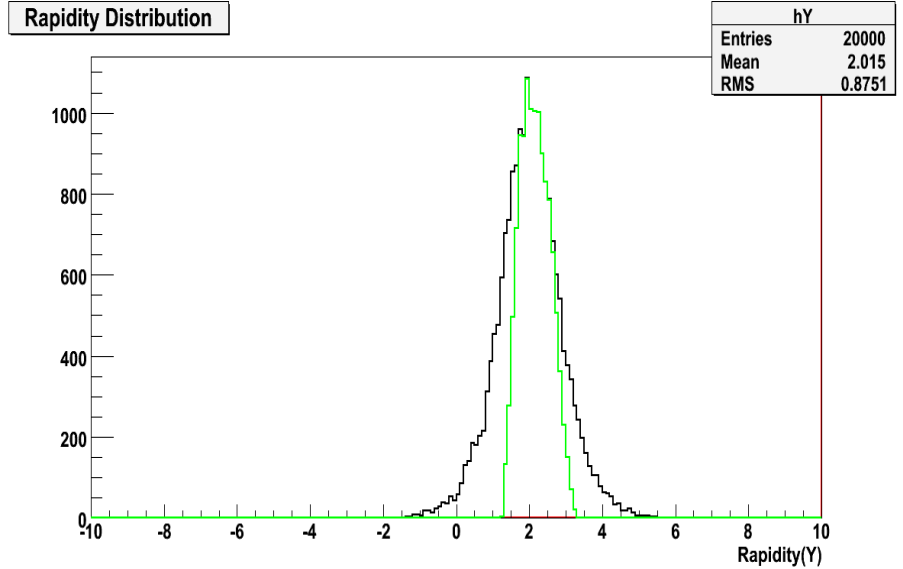
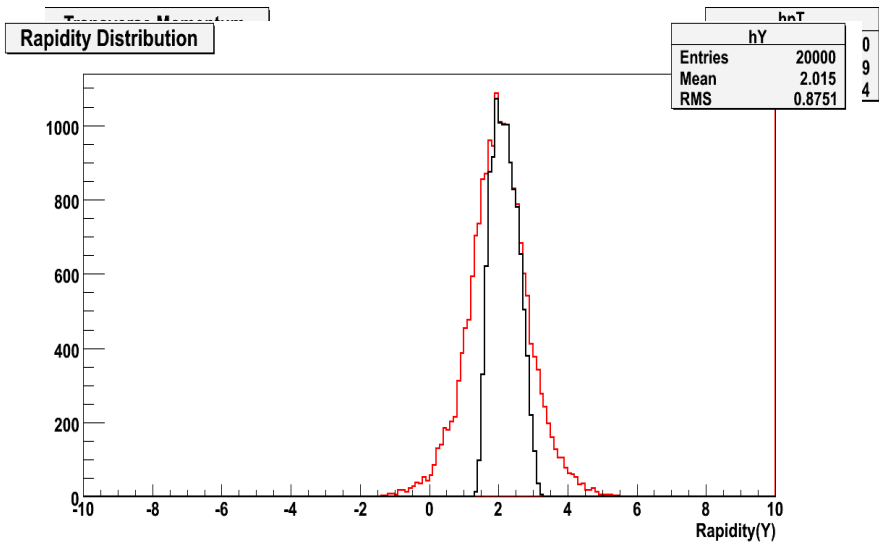
acceptance



Motivation

- ◆ Aim of the relativistic heavy-ion collisions is to study the onset of de-confinement and the properties of the de-confined media in the laboratory.
- ◆ Necessary to define unambiguous and experimentally viable probes for de-confinement.
- ◆ Proton-nucleus (p+A) collisions is thus a fundamental component of any heavy-ion physics programme
- ◆ Defines the reference baseline relative to which we recognize HI specific phenomena
- ◆ p+A collisions provide a measure of the nuclear effects – helps in disentangling the “QGP” effect from the “non-QGP” effects. Here there is no formation time for the “secondary” medium, hence such collisions provide as essential tool to correctly account for the effect of the nuclear medium initially present.
- ◆ Charm propagation in cold nuclear matter & normal absorption.

Pluto (signal muons)—Standard Geometry



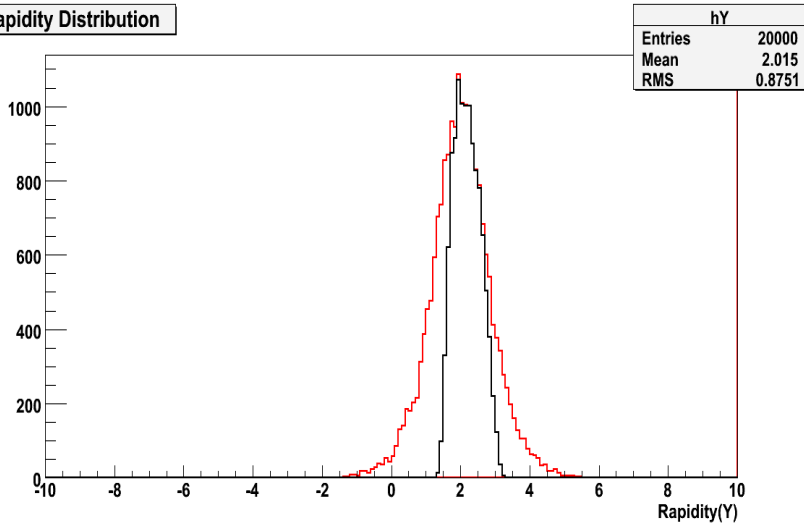
Accepted tracks

(STS points ≥ 4)

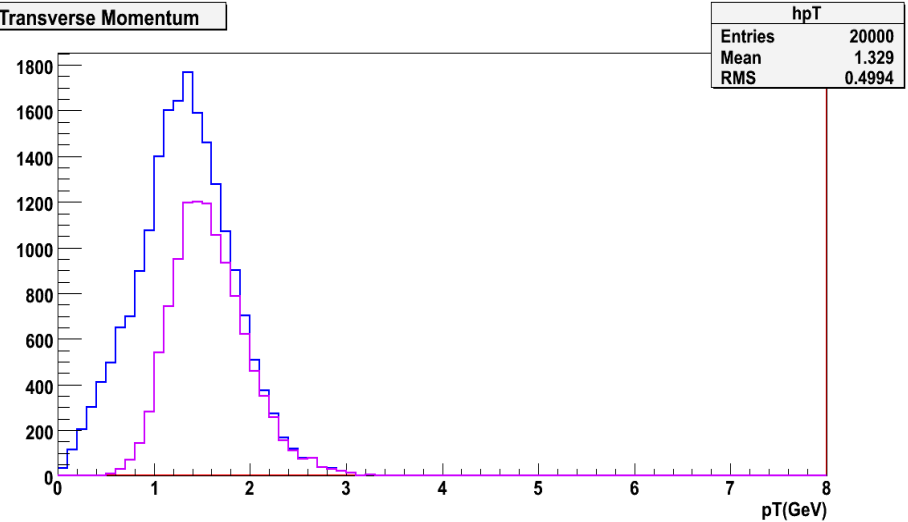
Much Points $\geq 70\%$ of the total no. of muon detectors)

Pluto (signal muons)

Rapidity Distribution



Transverse Momentum



acceptance

