Eta, Phi and Omega reconstruction at SIS100

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35th CBM Collaboration Meeting, GSI

Outline:

- Reconstruction of eta:
  - Cut Optimisation
  - Acceptance and efficiency matrices
- Reconstruction of phi:
  - Cut Optimisation
  - Acceptance and efficiency matrices
- Reconstruction of omega
  - Acceptance and efficiency matrices
  - Differential Phase Space Analysis
- Reconstucted LMVM Cocktail

Tools Used:

- **CBM Frame -Work**

  CBMROOT (environment)

- **Event Generators**

  PLUTO : To generate signal particles (eta, phi, and omega) & decay them into dimuons.

  URQMD : To generate other background events.

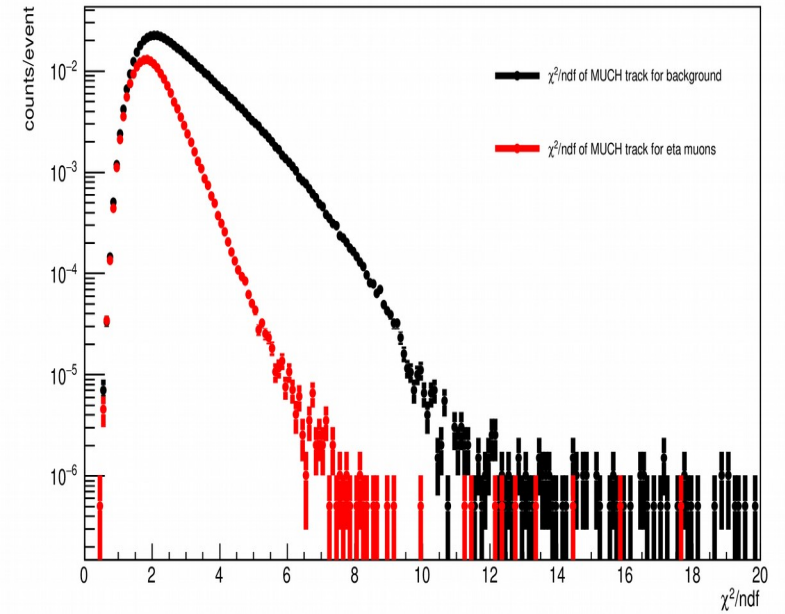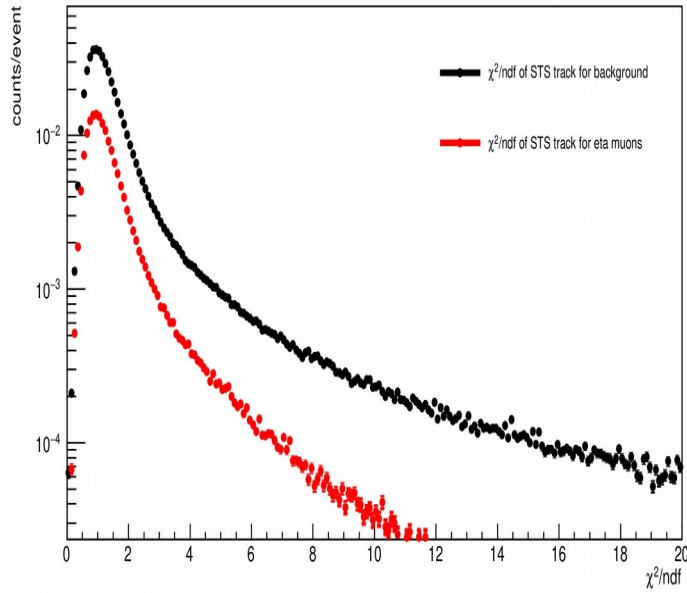- **GEANT3** :Transport the particles through the CBM set-up.

- **Geometry** : *much_v19c_sis100_1m_lmvm*

- **System :** Au + Au at 10 A GeV

Note: Centrally generated files have been used for all analysis(Thanks to Anna Senger).
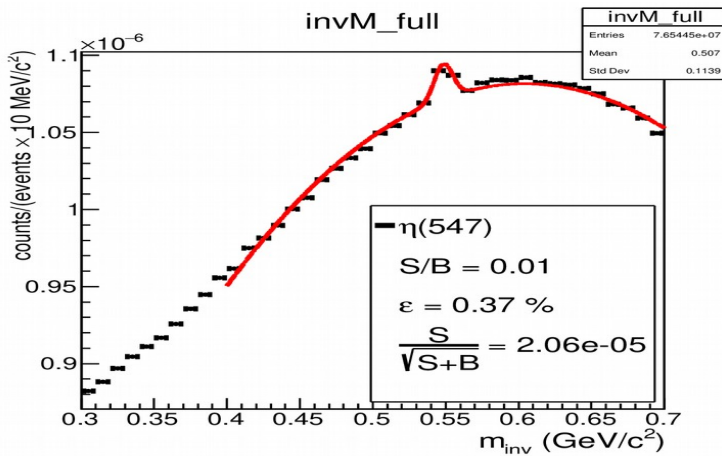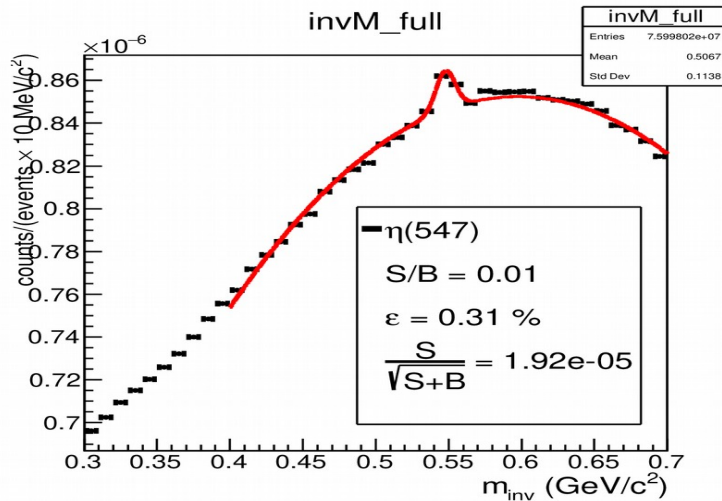
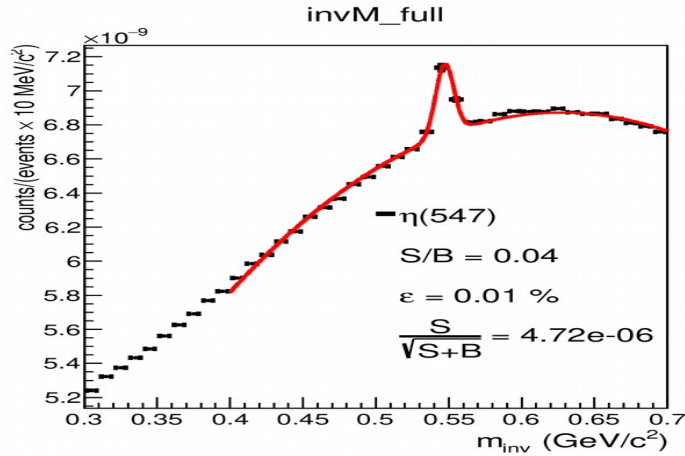# Reconstruction of eta

Track parameters(ŋ)
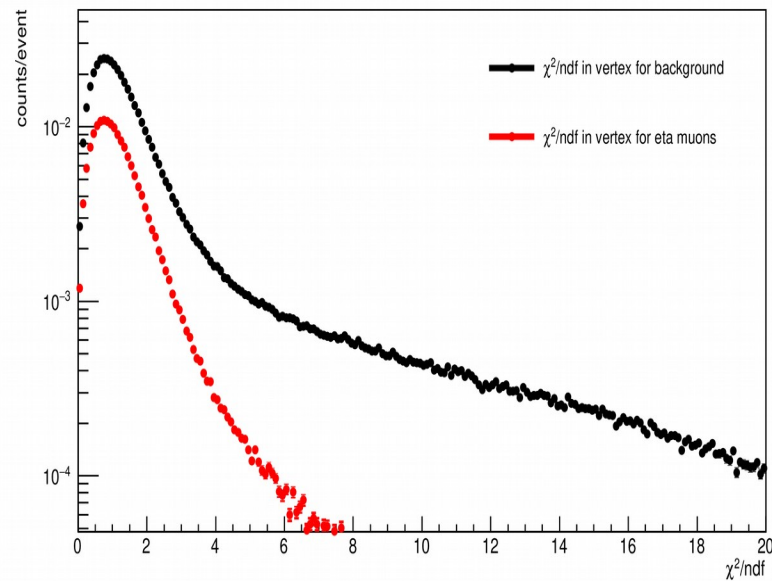
After Nominal Cuts:
MUCH Hits > 10
STS Hits > 6

Cut Optimization for η

Cuts:

N of STS hits ≥ 7

N of MUCH hits ≥ 11

N of TRD hits ≥ 1

$\chi^2_{vertex} \leq 1.0$

$\chi^2_{STS} \leq 1.0$

$\chi^2_{MUCH} \leq 2.0$

2σ cut in TOF

Note: In each analysis, combinatorial background is calculted using Super Event Technique.

Cuts:

N of STS hits ≥ 7

N of MUCH hits ≥ 11

N of TRD hits ≥ 1

$\chi^2_{vertex} \leq 3.0$

$\chi^2_{STS} \leq 2.0$

$\chi^2_{MUCH} \leq 3.0$

2σ cut in TOF

Cuts:

N of STS hits ≥ 7

N of MUCH hits ≥ 11

N of TRD hits ≥ 1

$\chi^2_{vertex} \leq 3.0$

$\chi^2_{STS} \leq 3.0$

$\chi^2_{MUCH} \leq 3.0$

2σ cut in TOF
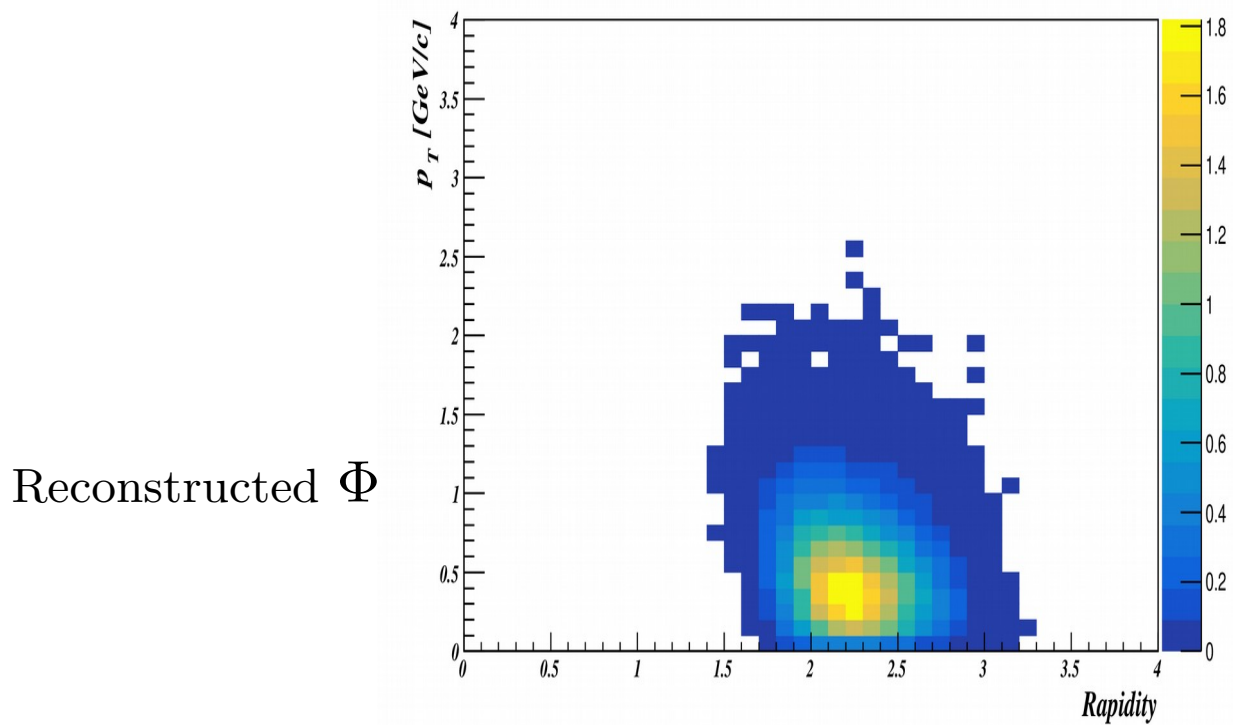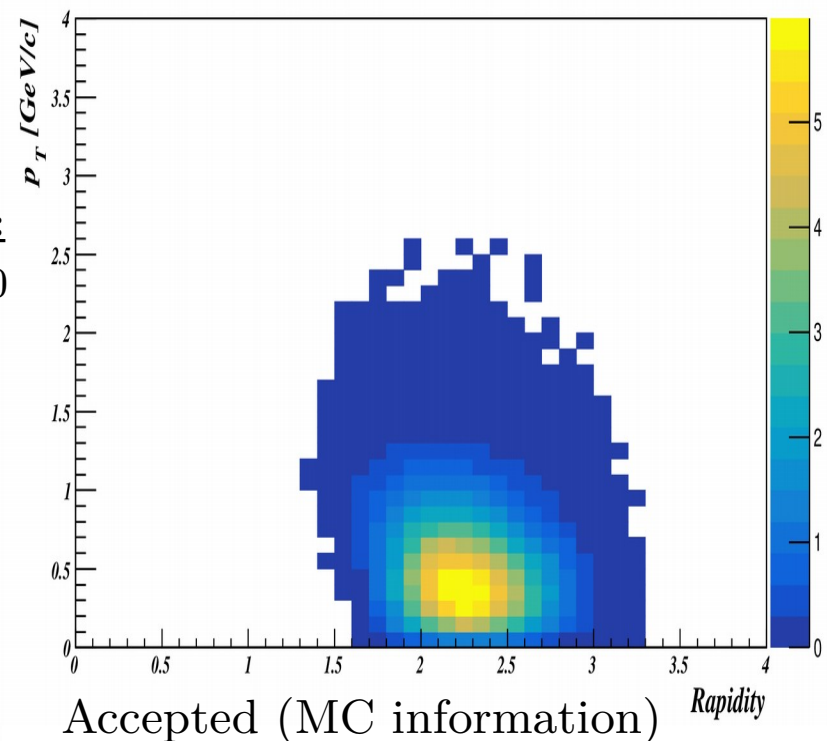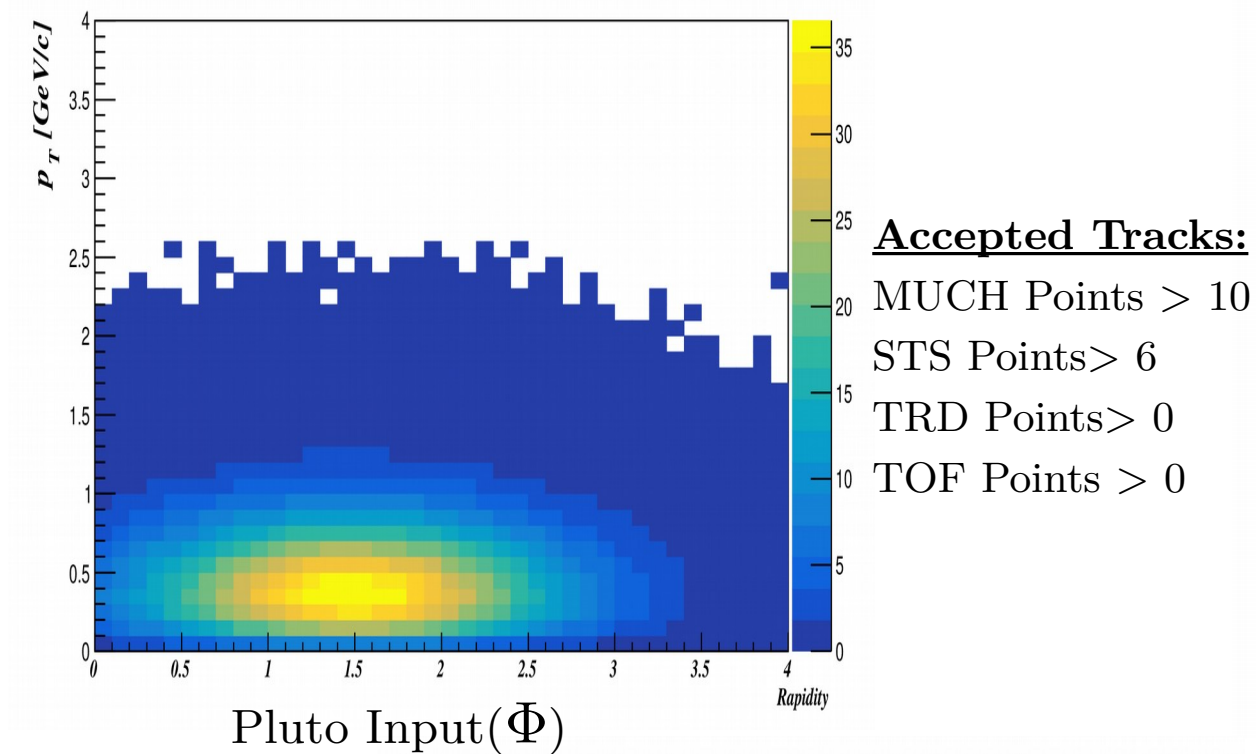
Pluto Input(η)

Accepted Tracks:

MUCH Points > 10

STS Points> 6

TRD Points> 0

TOF Points > 0

Accepted (MC information)

Reconstructed η

Muon Candidate Selection Cuts:

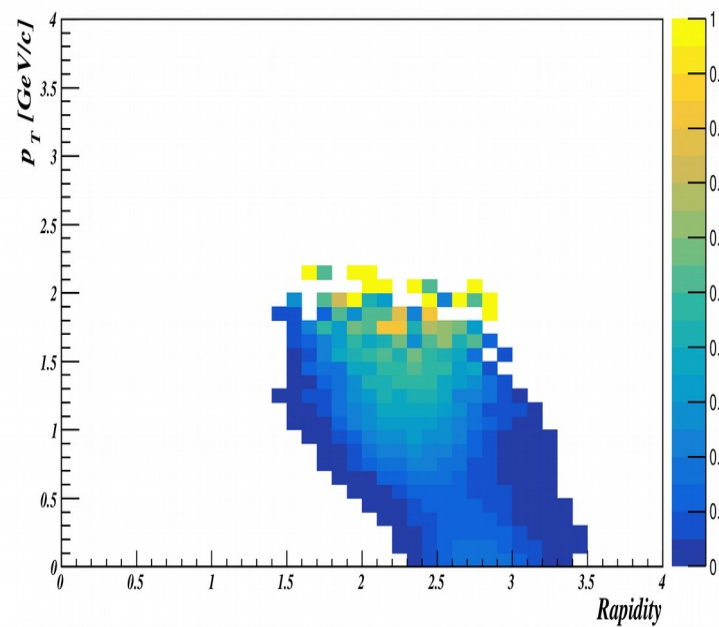MUCH Hits > 10

STS Hits > 6

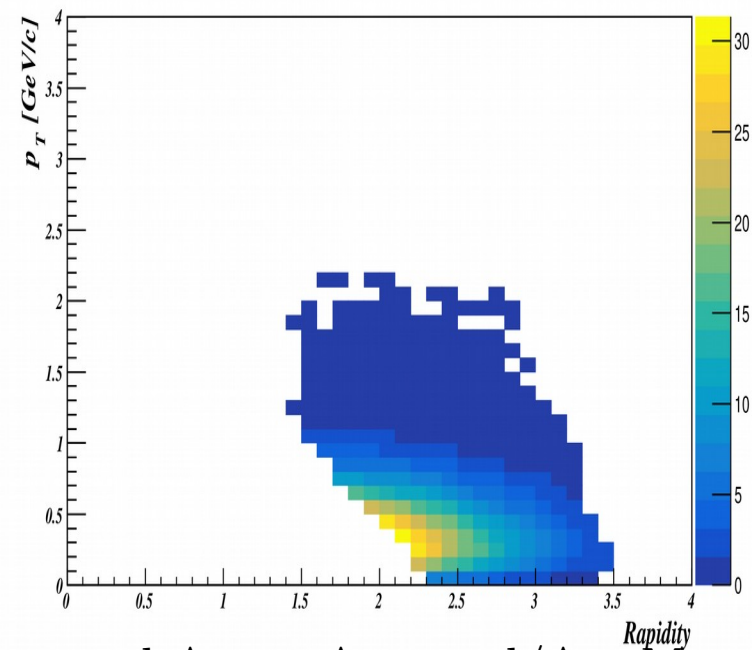TRD > 0

TOF > 0

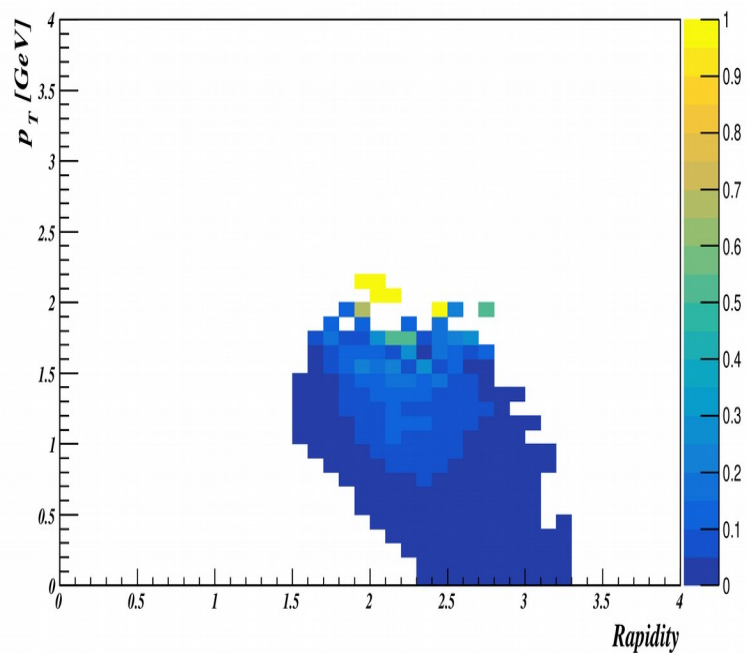$X^2_{vertex} < 3$

$X^2_{STS} < 2$

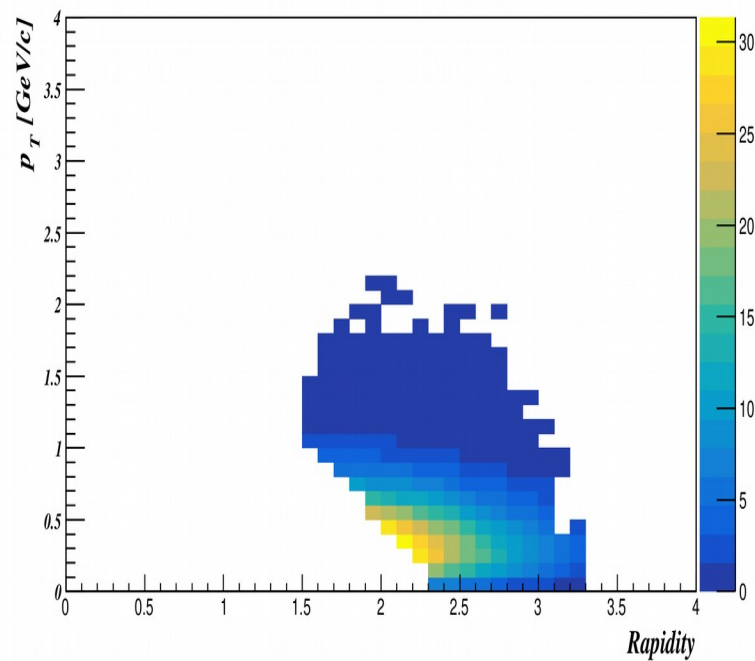$X^2_{MUCH} < 3$

2 Sigma Cut in TOF Mass

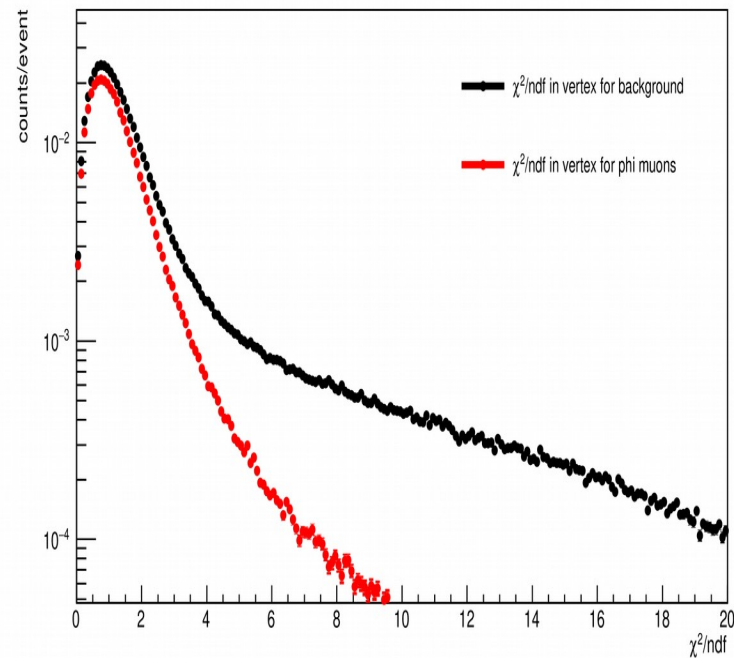Acc Matrix = Accepted/Pluto

Corrected Acc = Accepted/Acc Matrix

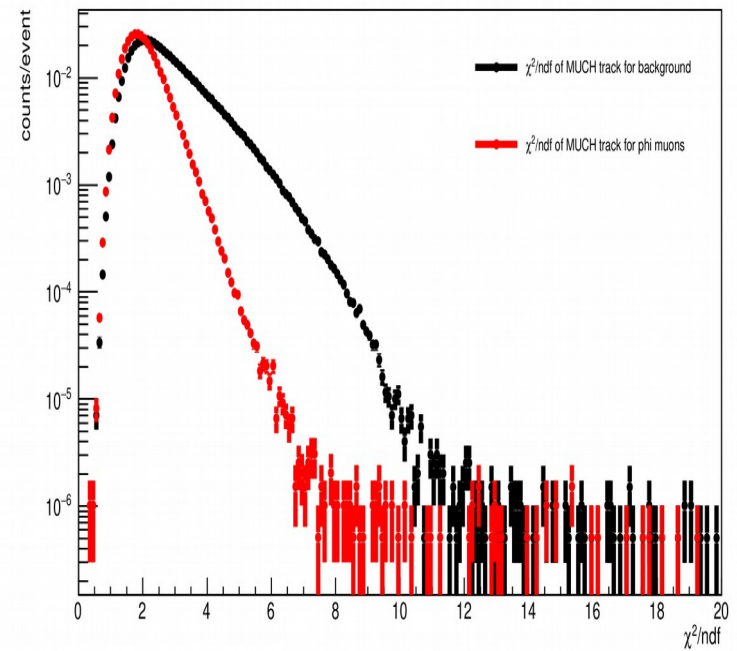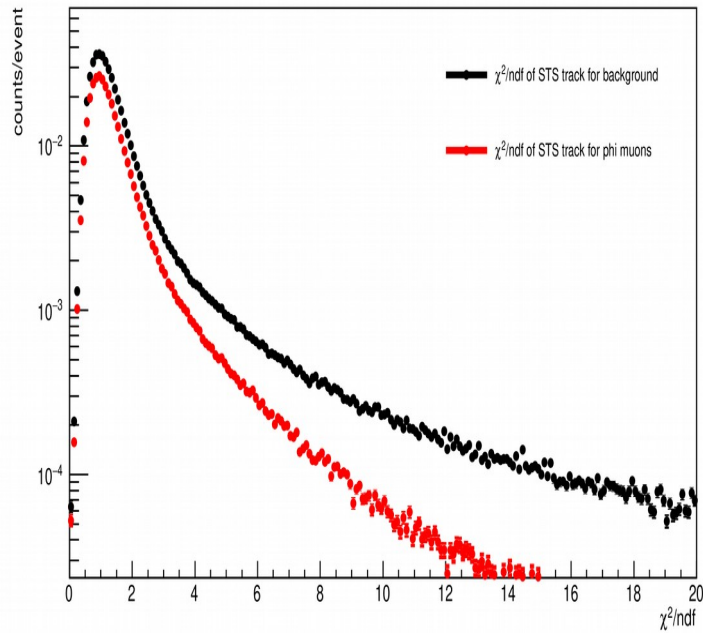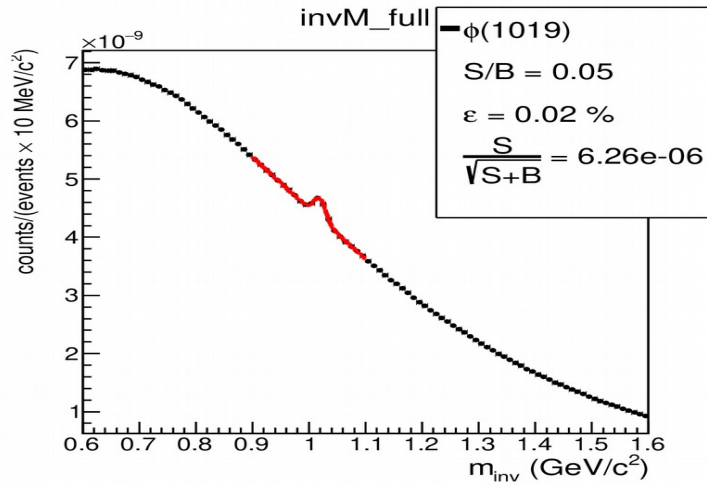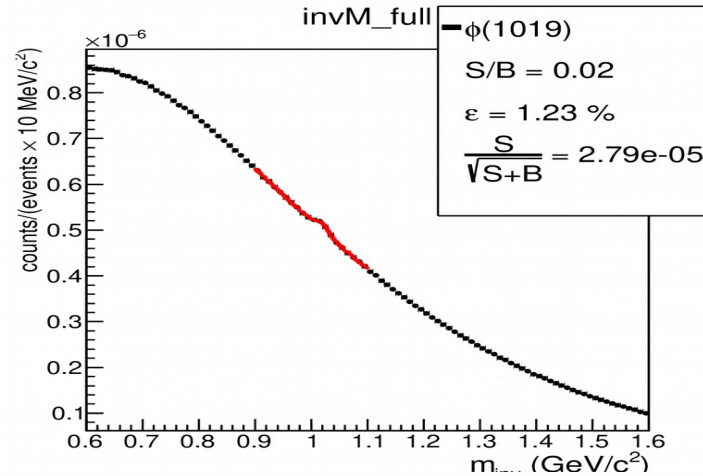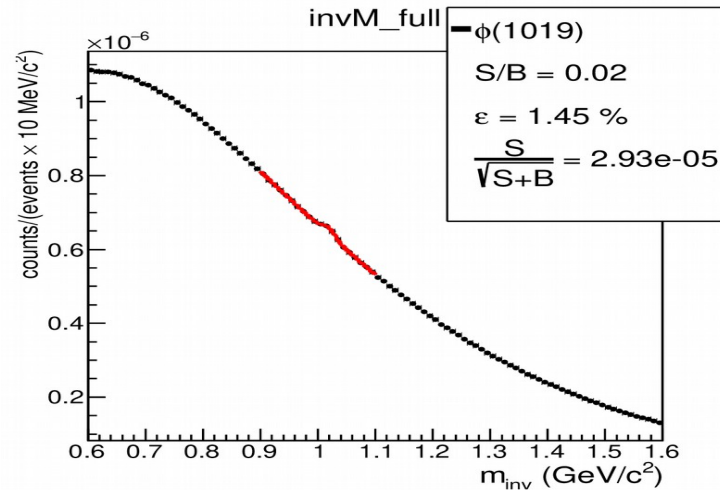Eff Matrix = Reco/Corr Acceptance

Corrected = Reco/Eff Matrix

Reconstruction of phi

Track parameters(Φ)

After Nominal Cuts:
MUCH Hits > 10
STS Hits > 6

Cut Optimization for Φ

Pluto Input(Φ)

Accepted Tracks:

MUCH Points > 10

STS Points > 6

TRD Points > 0

TOF Points > 0

Accepted (MC information)

Reconstructed Φ

Muon Candidate Selection Cuts:

MUCH Hits > 10

STS Hits > 6

TRD > 0

TOF > 0

$X^2_{vertex} < 3$

$X^2_{STS} < 2$

$X^2_{MUCH} < 3$

2 Sigma Cut in TOF Mass
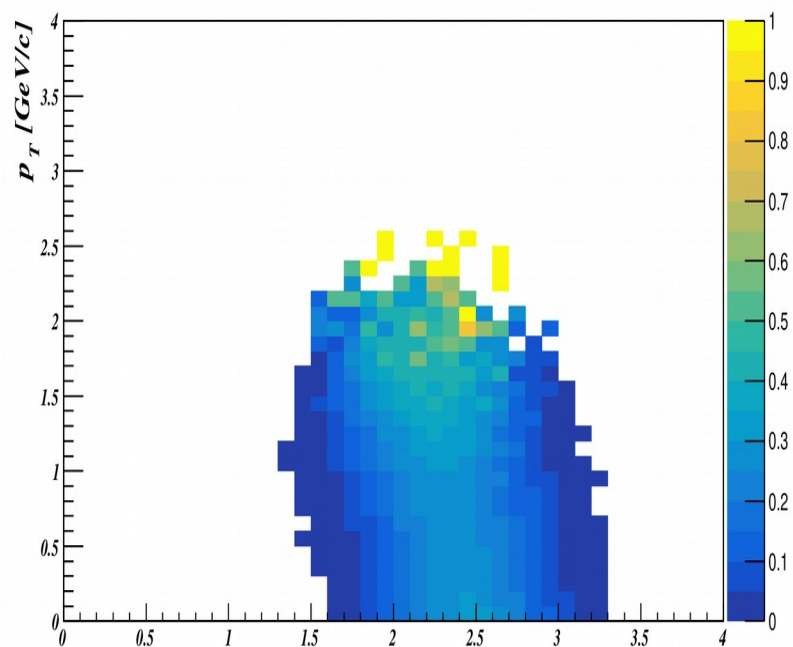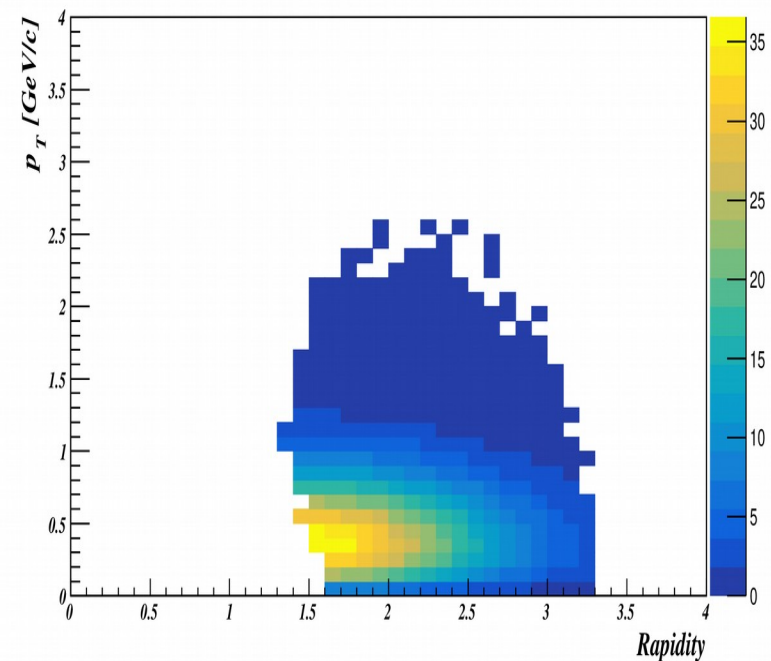
Acc Matrix = Accepted/Pluto
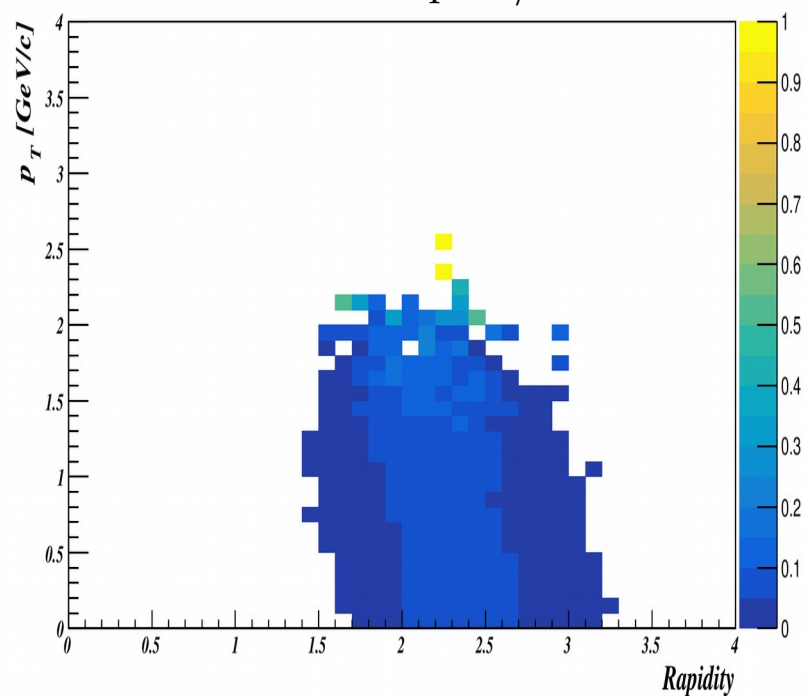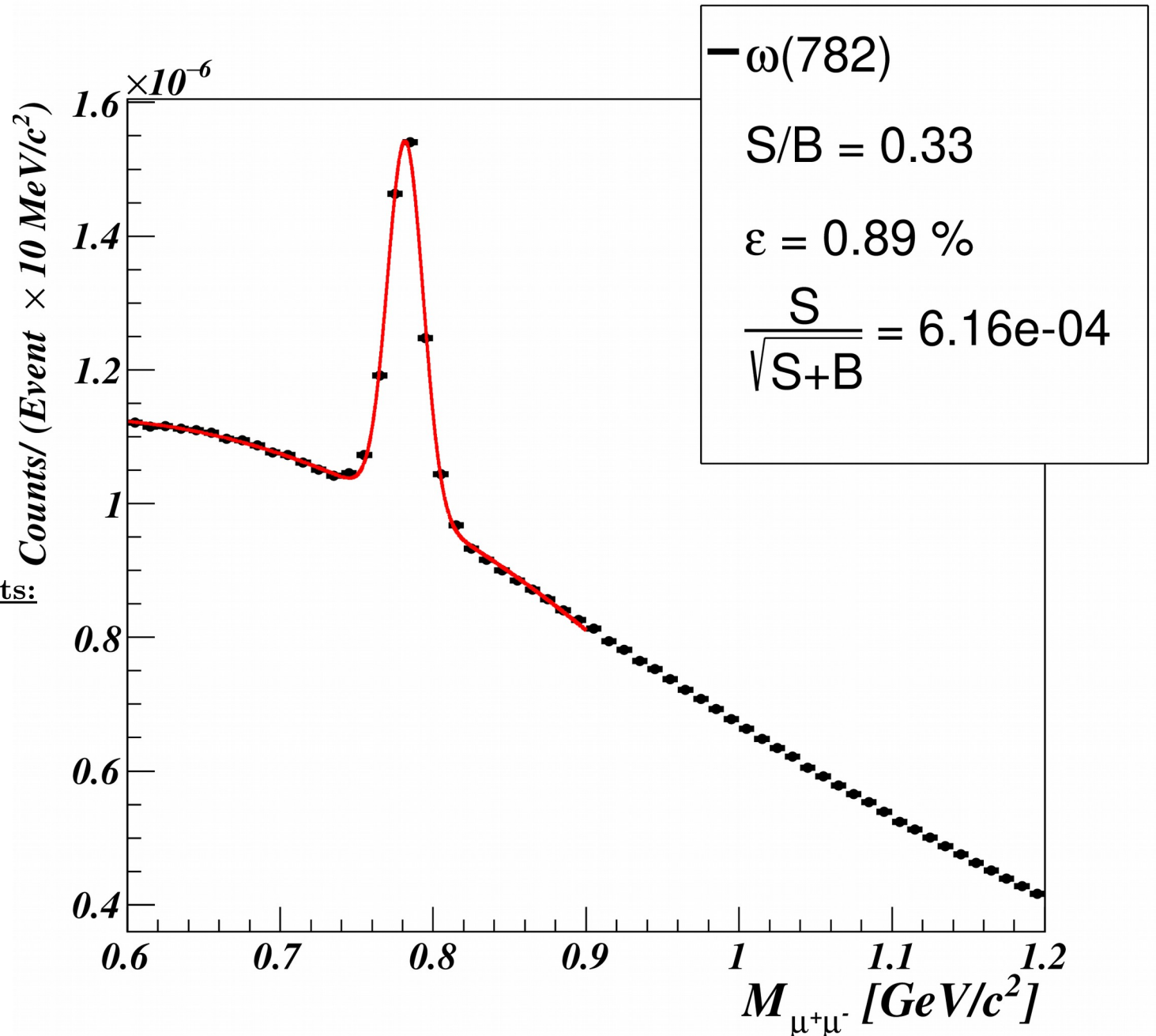

Corrected Acc = Accepted/Acc Matrix

Eff Matrix = Reco/Corr Acceptance
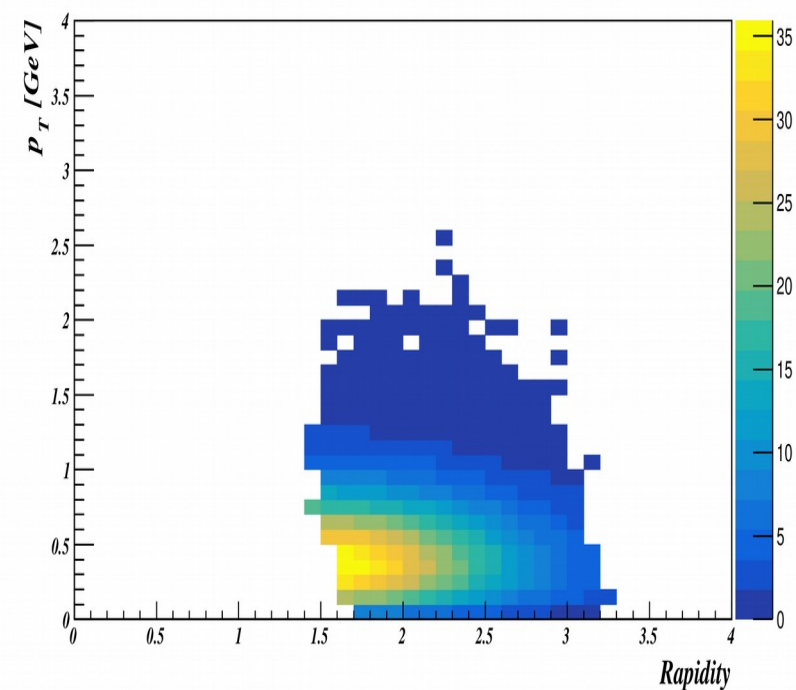
Corrected = Reco/Eff Matrix

Reconstruction of omega

Invariant Mass Spectra for omega

Muon Candidate Selection Cuts:

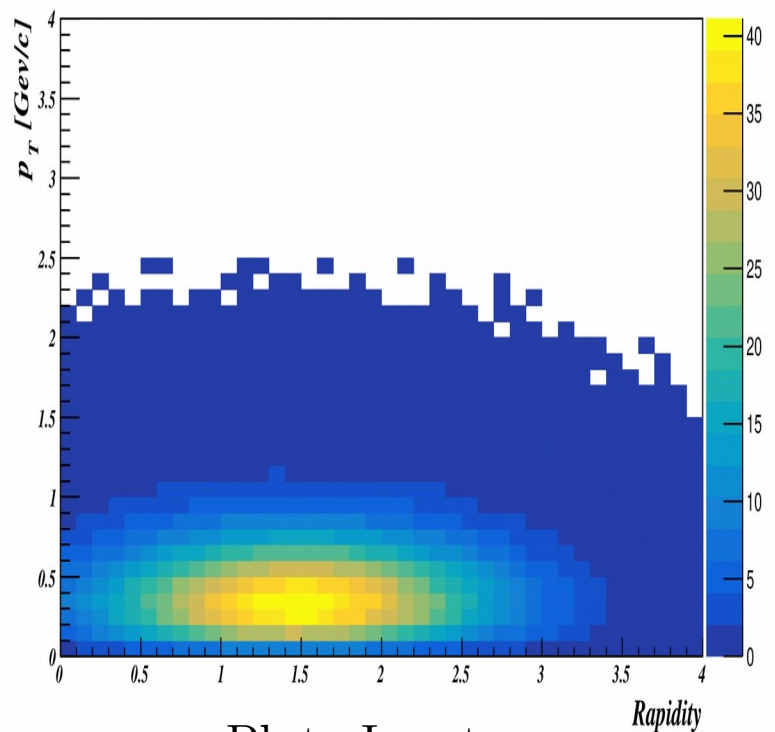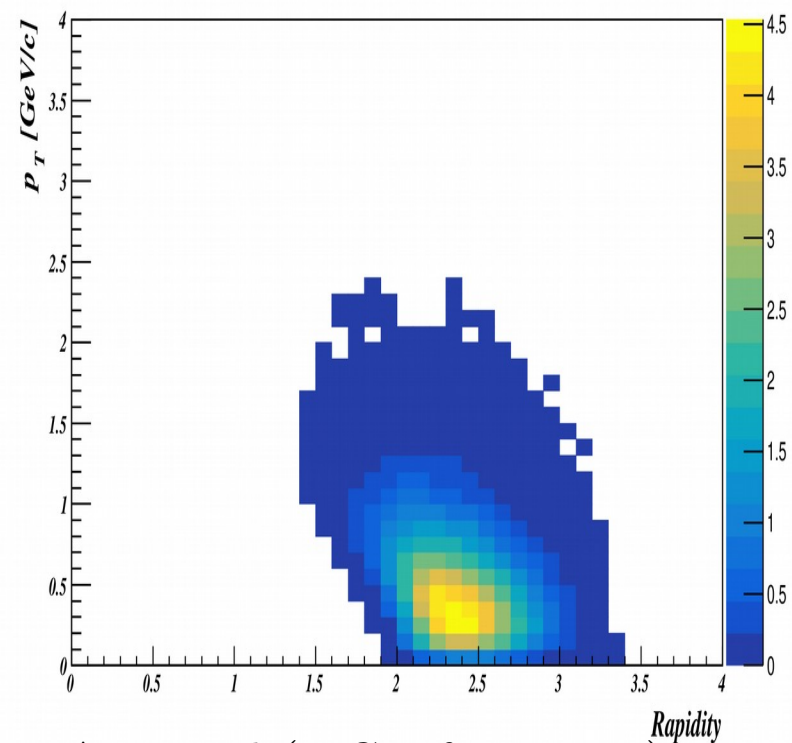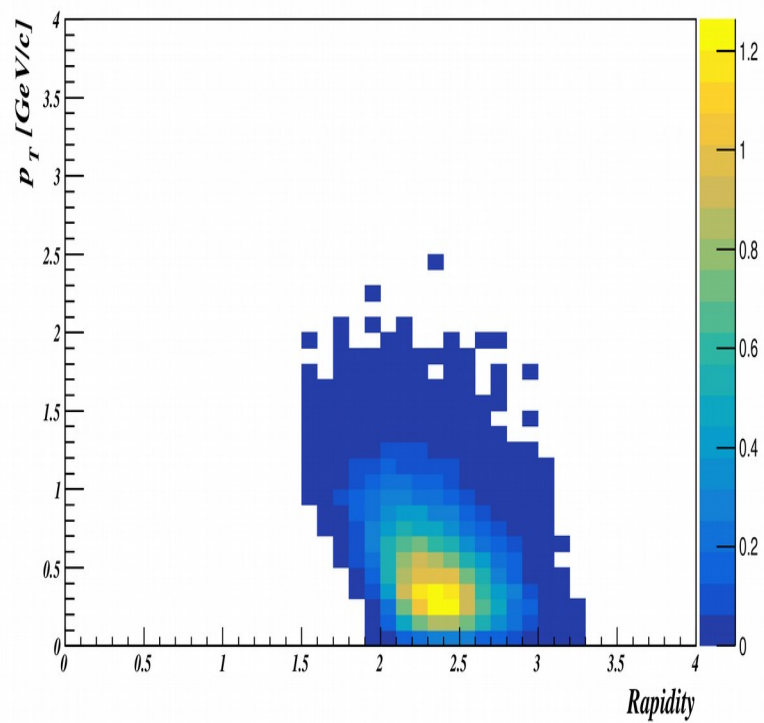MUCH Hits > 9

STS Hits > 6

TRD > 0

TOF > 0

$X^2_{vertex} < 3$

$X^2_{STS} < 2$

$X^2_{MUCH} < 3$

2 Sigma Cut in TOF Mass

$\omega(782)$

S/B = 0.33

$\varepsilon = 0.89\ \%$

$\dfrac{S}{\sqrt{S+B}} = 6.16\text{e-}04$

Pluto Input

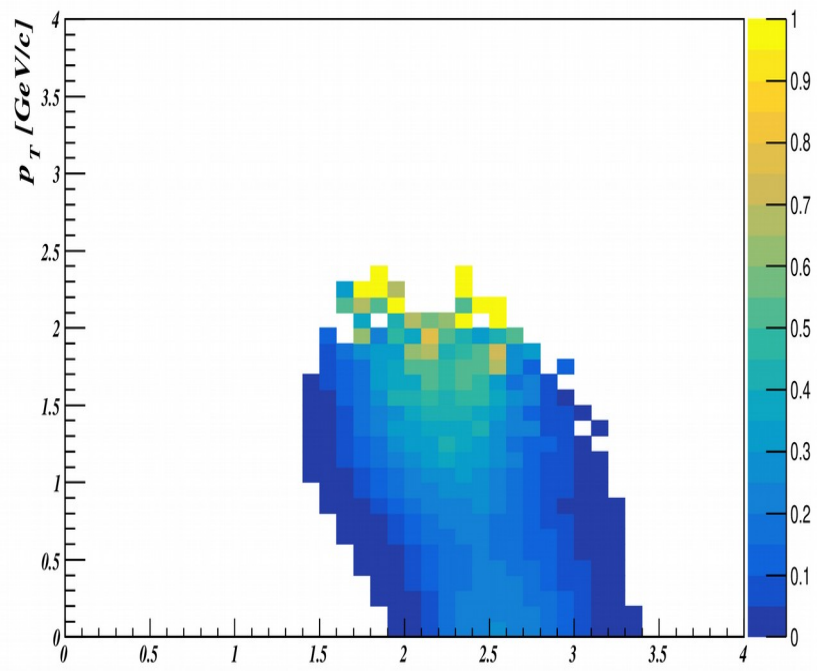**Accepted Tracks:**

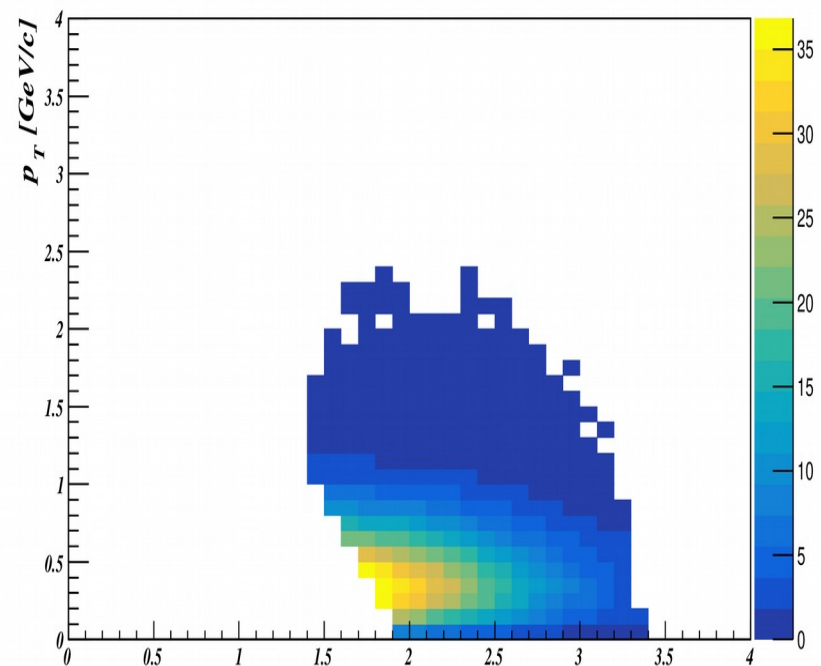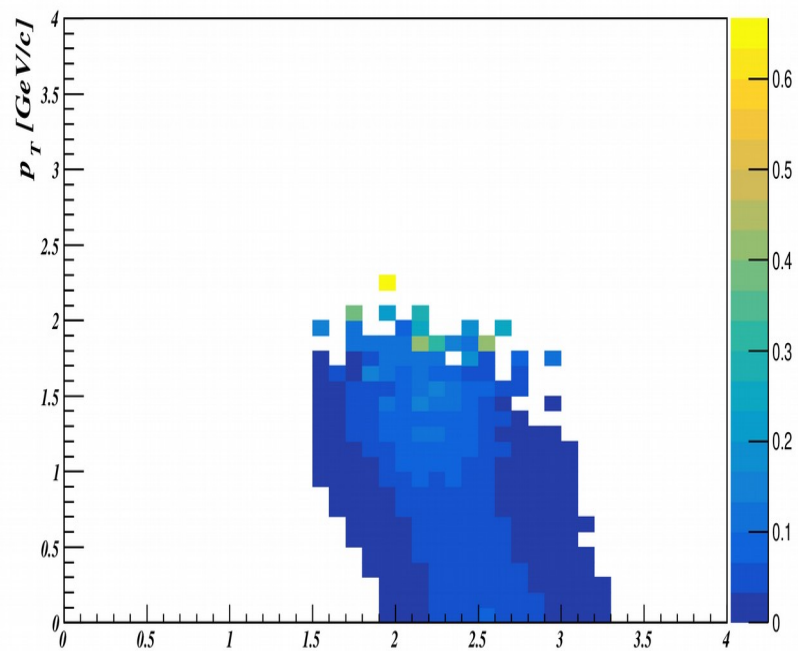MUCH Points > 9

STS Points> 6

TRD Points> 0

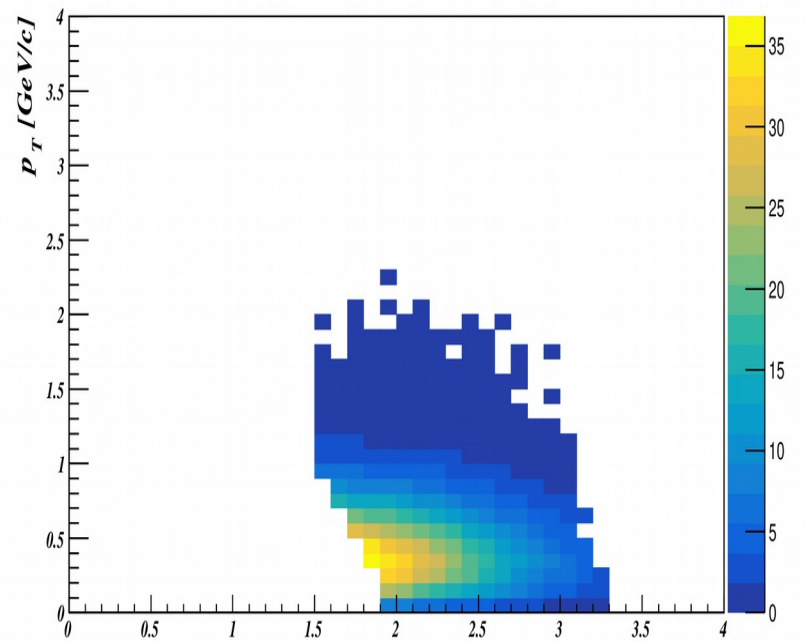TOF Points > 0

Accepted (MC information)
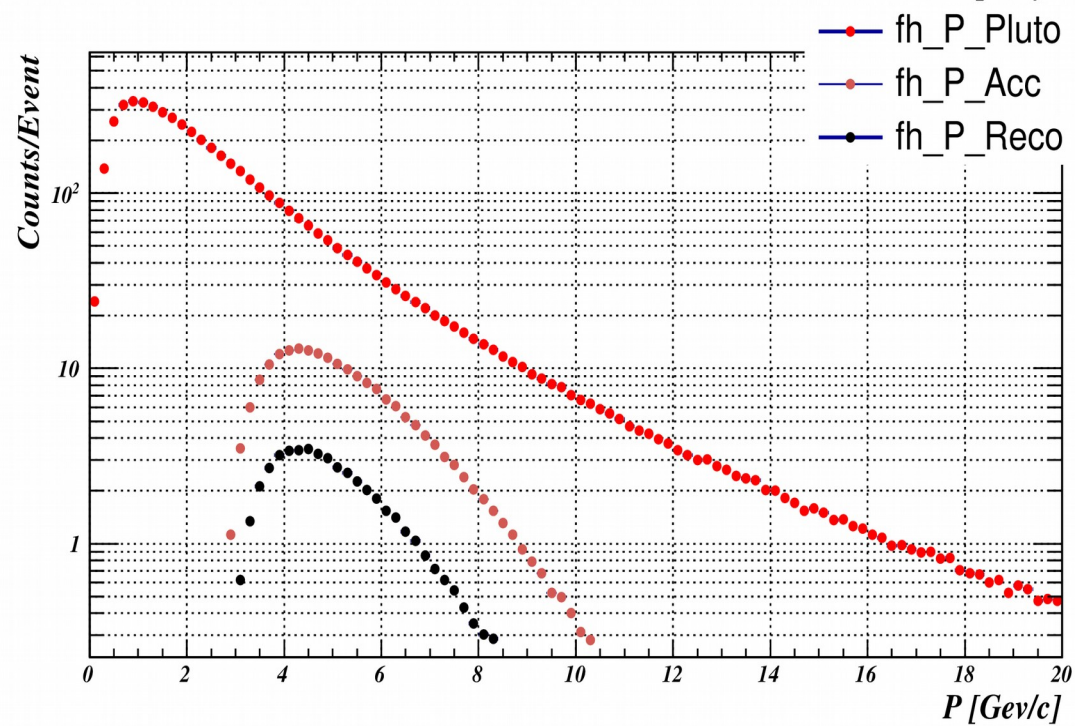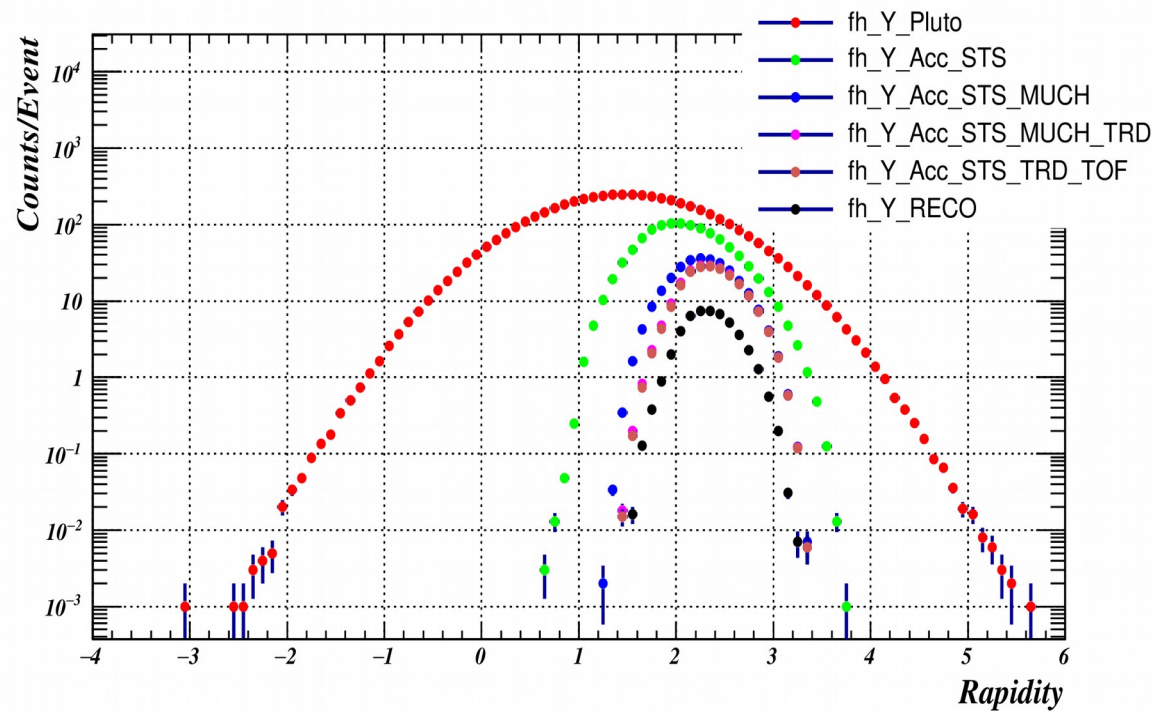
Reconstructed

Acc Matrix = Accepted/Pluto

Corrected Acc = Accepted/Acc Matrix

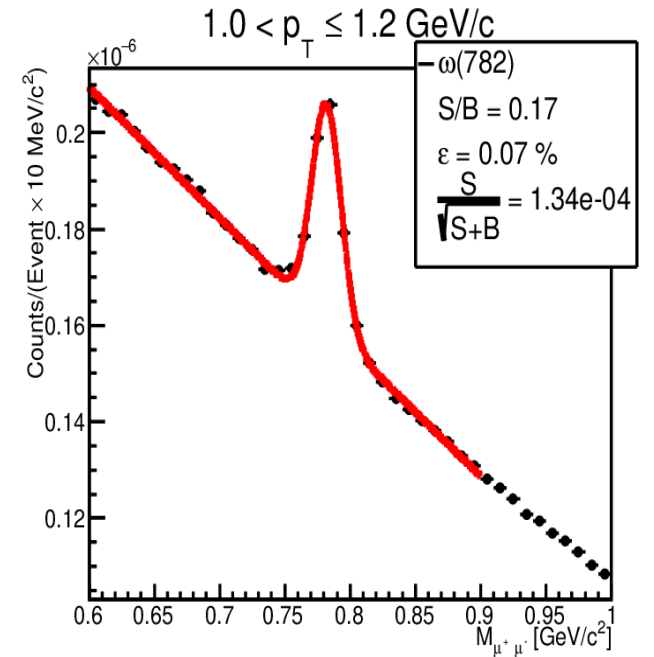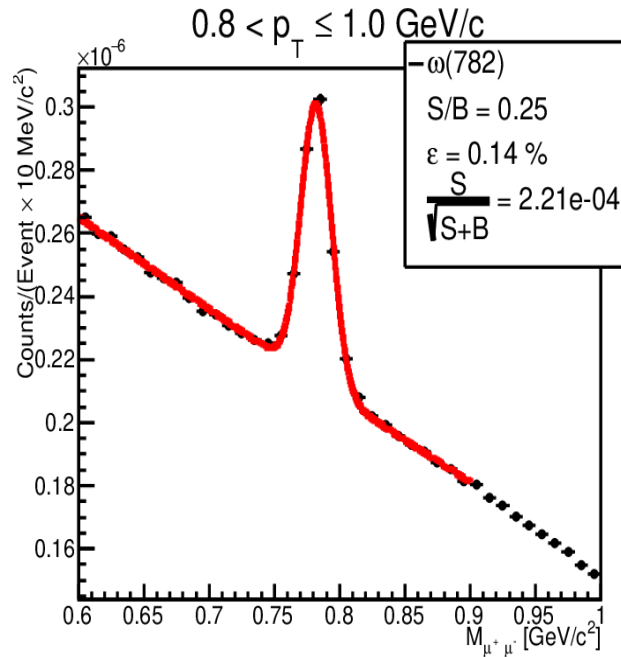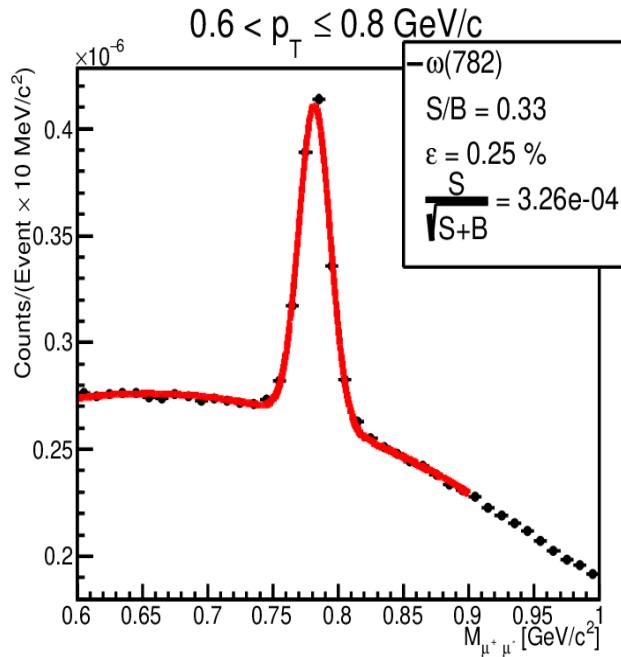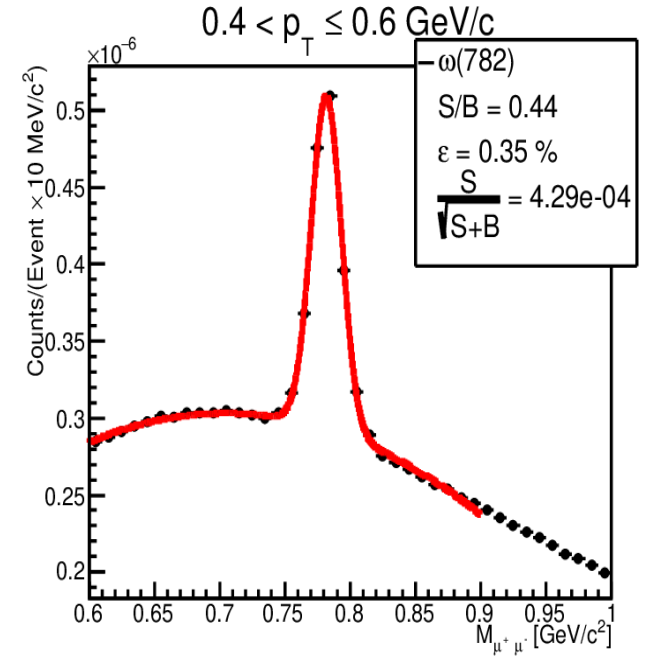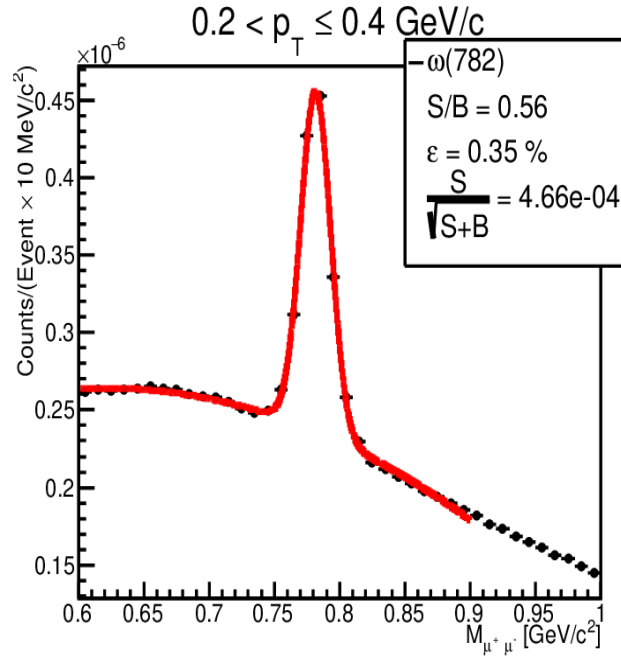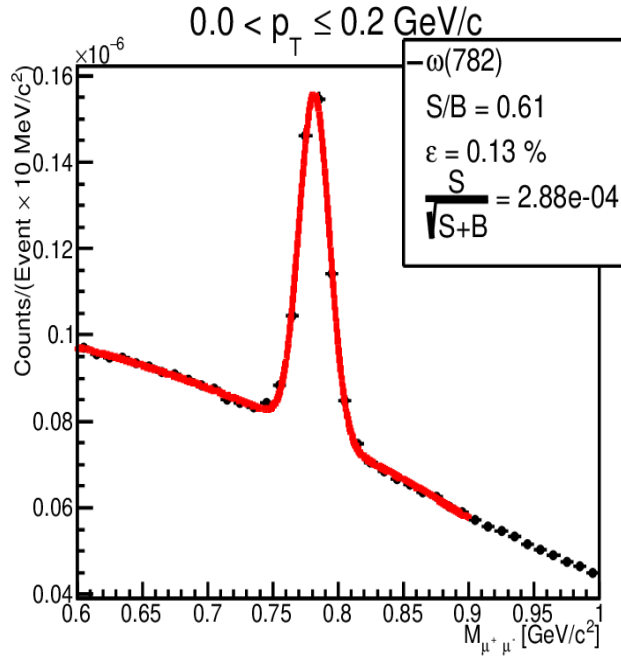Eff Matrix = Reco/Corr Acceptance

Corrected = Reco/Eff Matrix

Y, P - Distribution

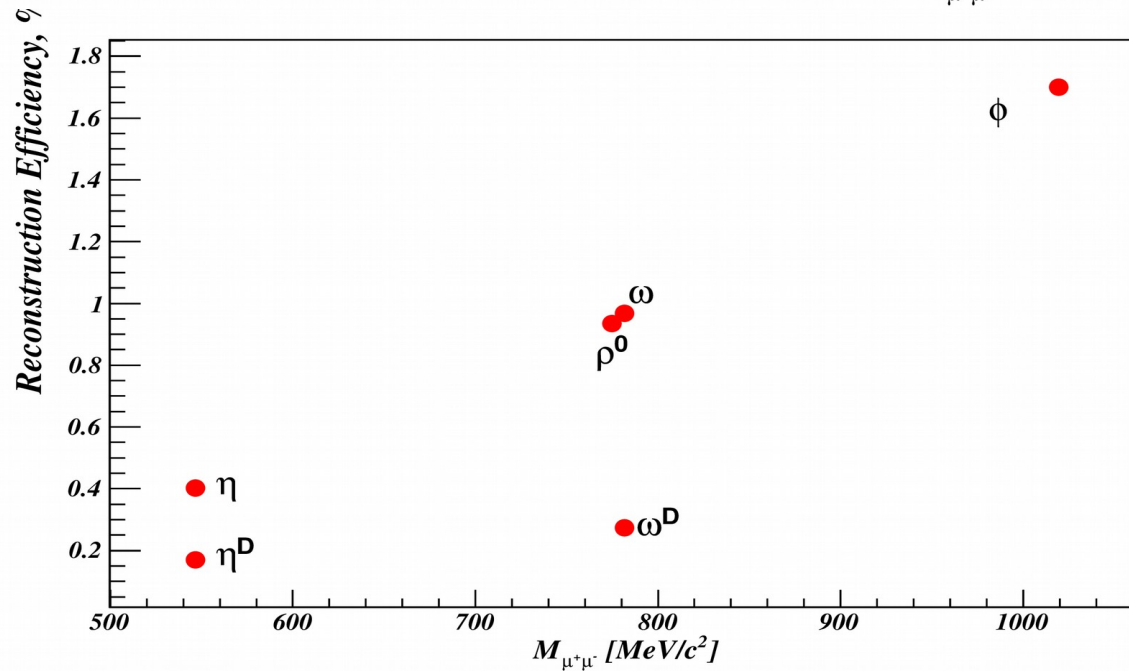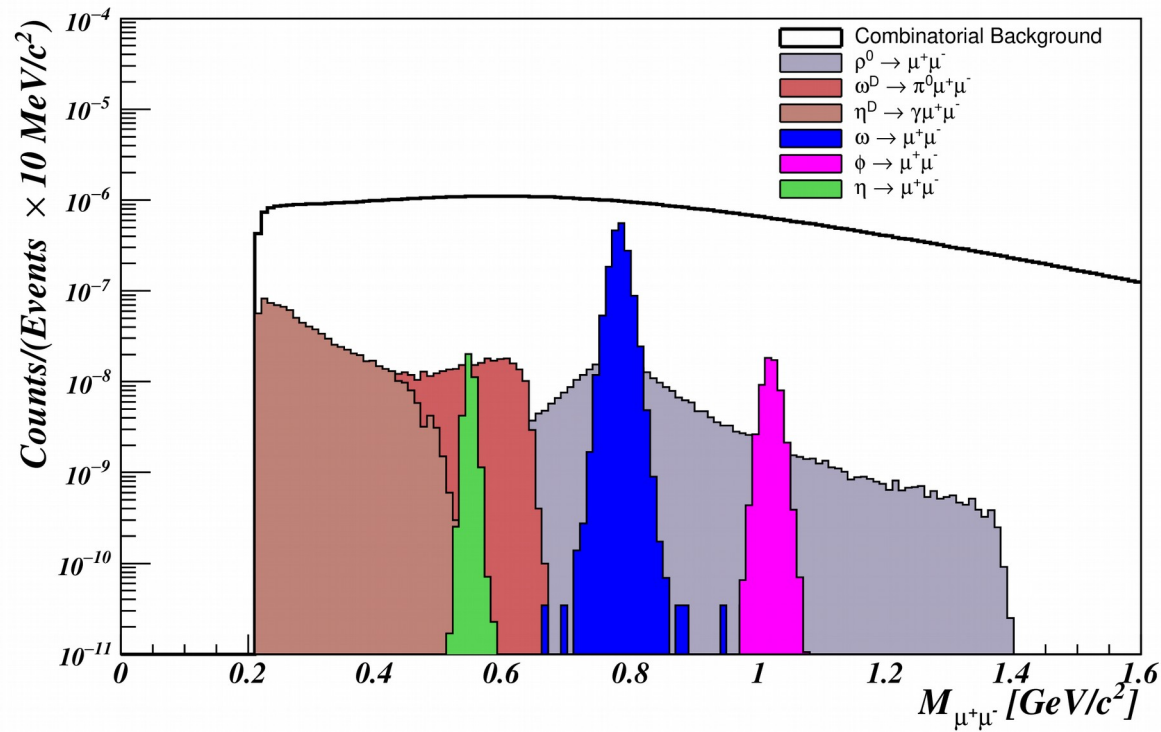# Differential Analysis (Inclusive Y)

Reconstructed cocktail

Summary

1. Reconstruction of eta, phi and omega for central Au+Au collision 10 A GeV.
2. Studied, How the reconstruction efficiency and S/B depend on rapidity inclusive pT?
3. Reconstructed cocktail are presented for lmvm and showed how efficiency depends on mass.