Analysis Overview

Data Acquisition:

- Distribution of runs for Helium A, Helium B, Deuterium A, and Deuterium B were obtained.

Momentum Distribution Range:

- Momentum distribution range selected: 1.0 < |t| <= 3.0 and 3.0 <|t|<=4.6 for each distribution.

Optimum Selection Cuts Applied:

- No Extra Tracks
- Beam Energy (6.5-10.8)
- CL > 10^-3
- (PiPlus + PiMinus + Proton -Beam).P() = Pmiss < 300 Mev/c
- Proton Vertex(52,78 cm)

Plots Generation:

- Plots were generated for the selected momentum transfer |t| to visualize the distributions.

Next Steps:

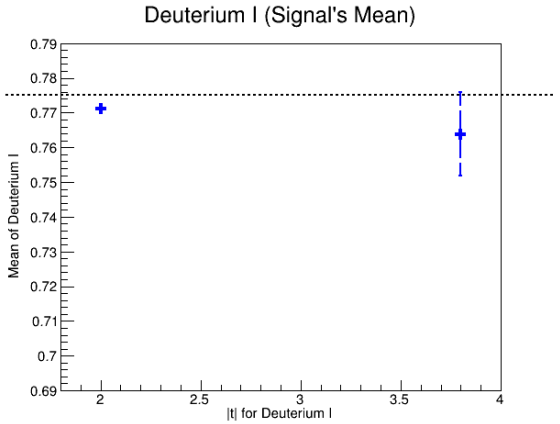
- Based on the plotted distributions, cuts on proton's angle were being considered for further background subtraction.
- After analyzing the distribution for 1.0 < |t| <= 3.0 protons with angles less than 25 degrees were rejected.

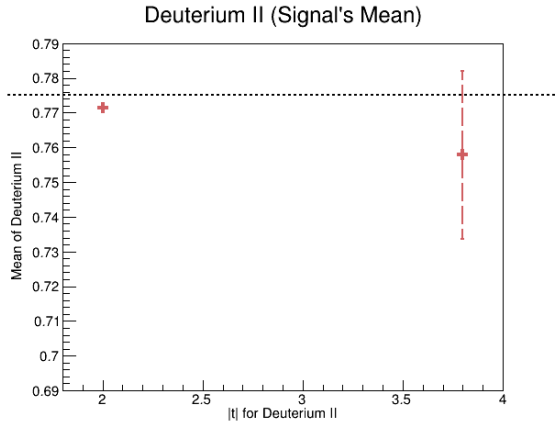
Similarly, for 3.0 <|t| <= 4.6, protons with angles less than 10 degrees were rejected

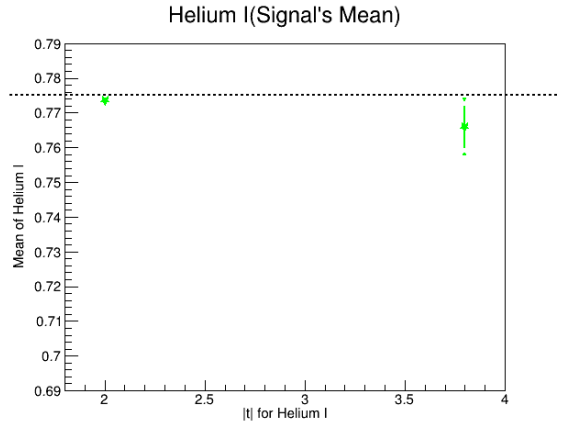
Plot to Analyze: (Backup)

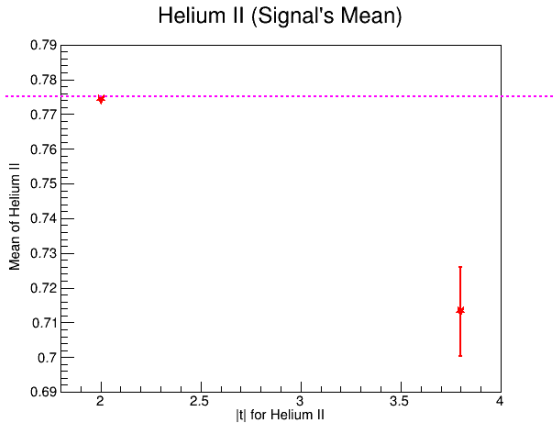
- Angular distribution(Theta) vs Invariant Mass
- Angular distribution(Theta) vs Momentum of Particle
- Angular distribution between charged particles.

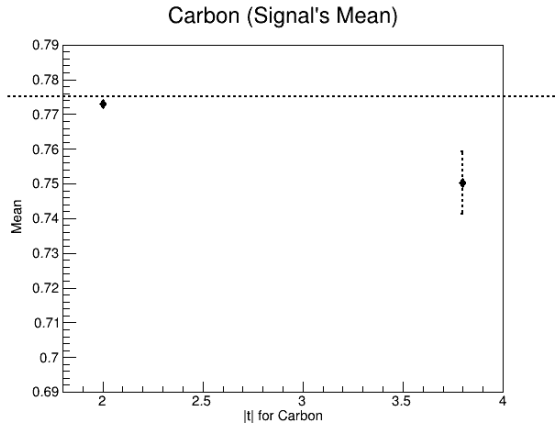
Invariant Mass Plot

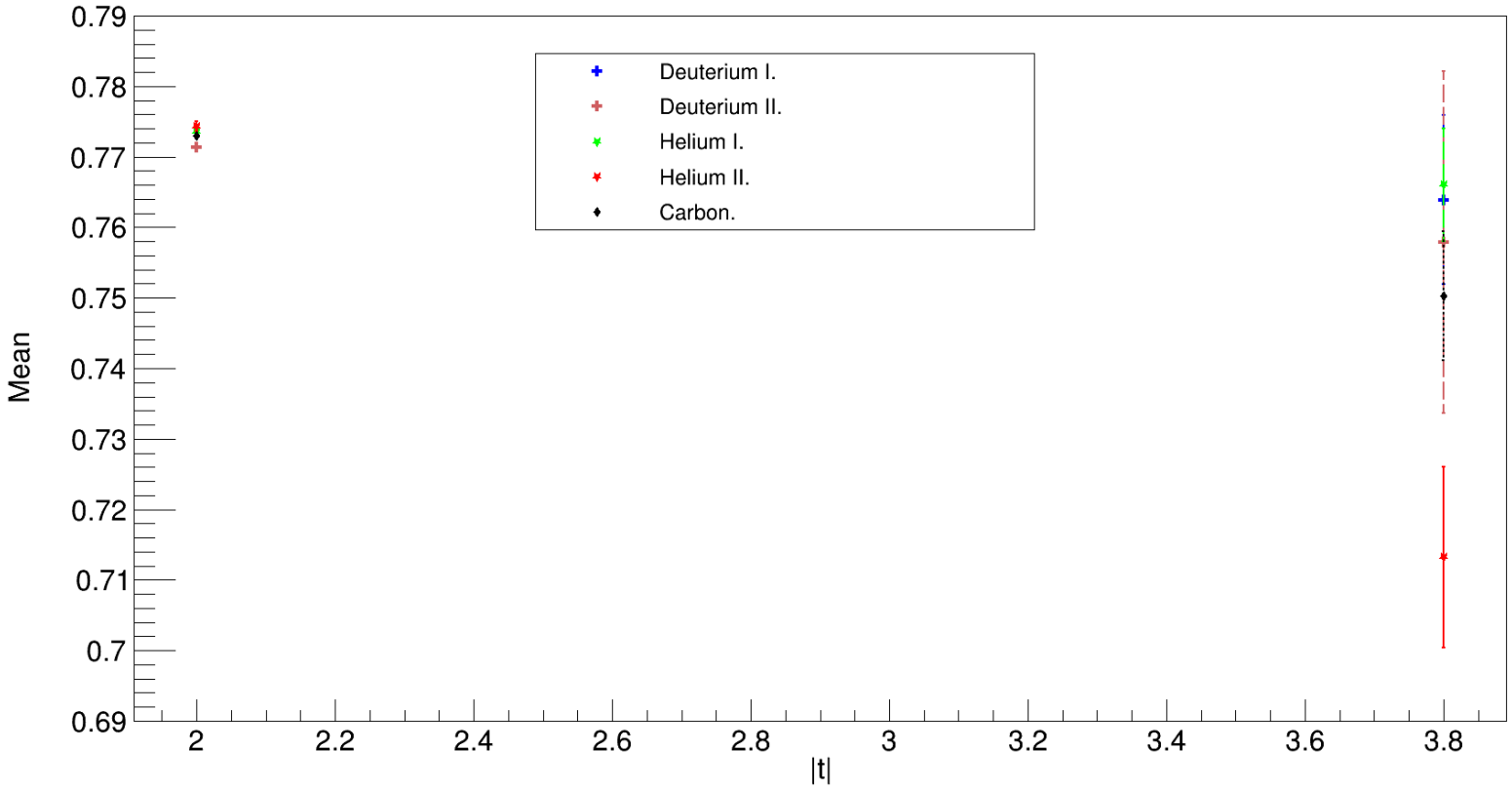






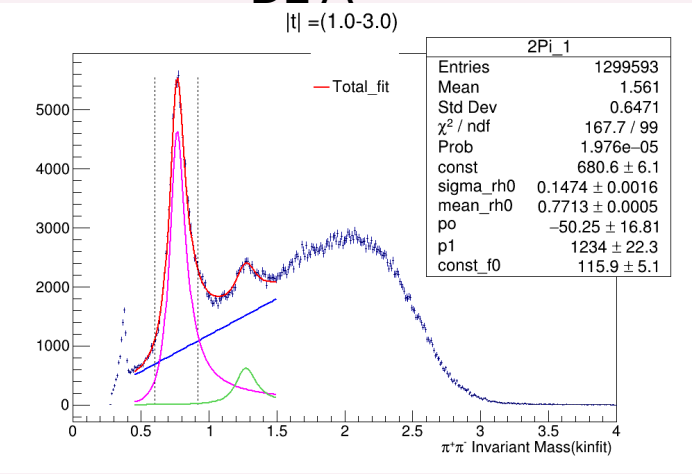




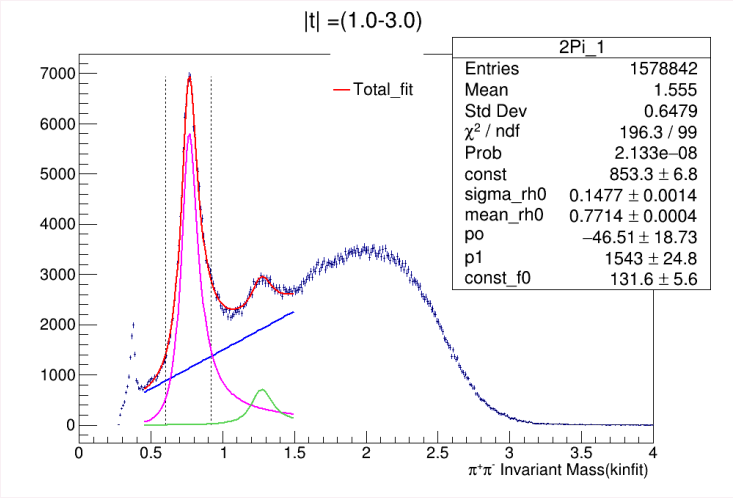

Deuterium I.
Deuterium II.
Helium I.
Helium II.
Carbon.
Mean
|t|
0.79
0.78
0.77
0.76
0.75
0.74
0.73
0.72
0.71
0.7
0.69
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8

Invariant Mass

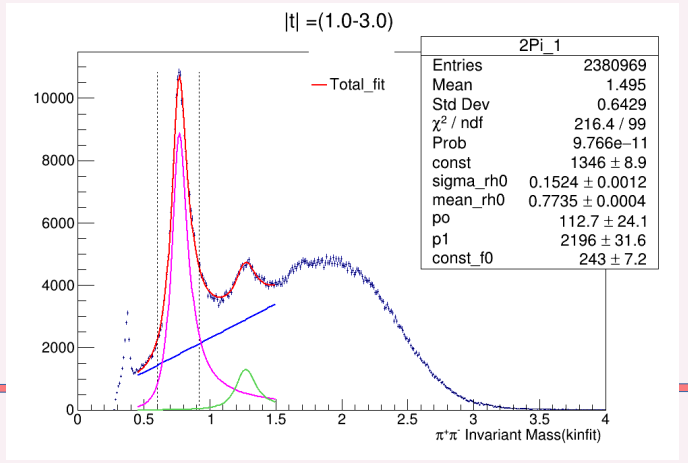
D2 A



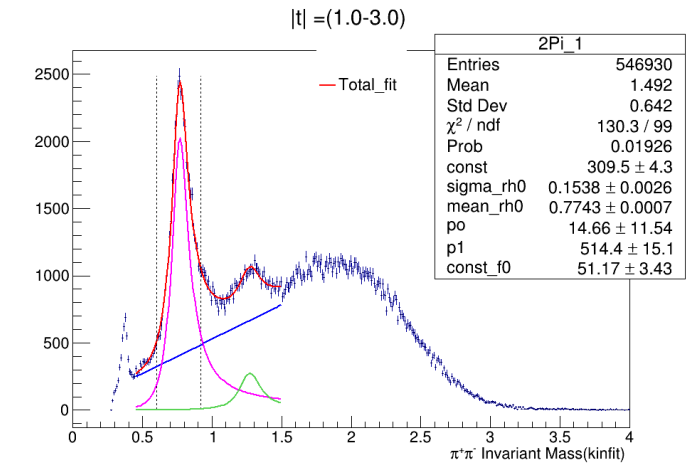
D2 B



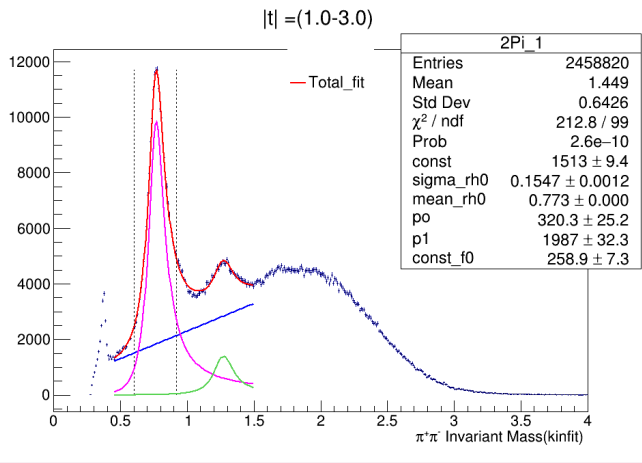
He4 A



He4 B

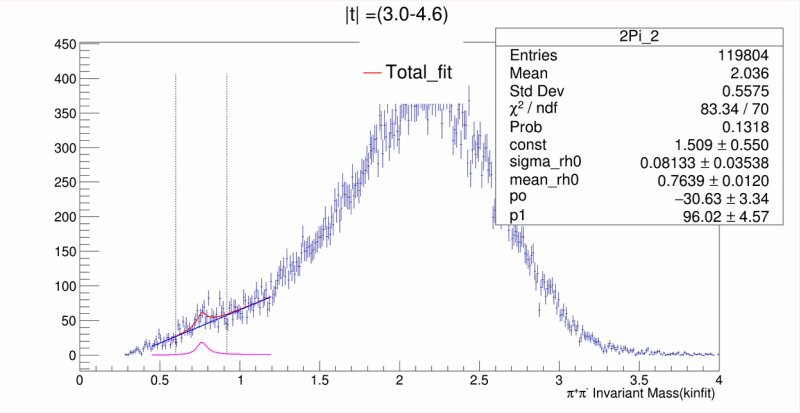


Carbon

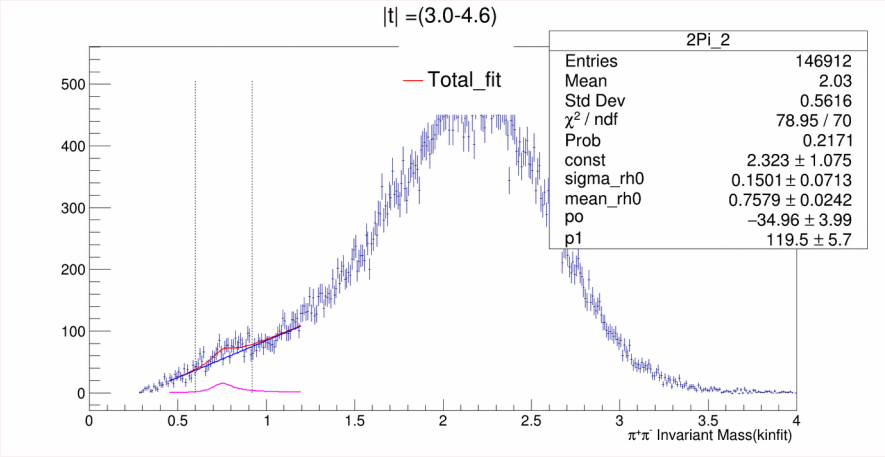


Invariant Mass at High |t|

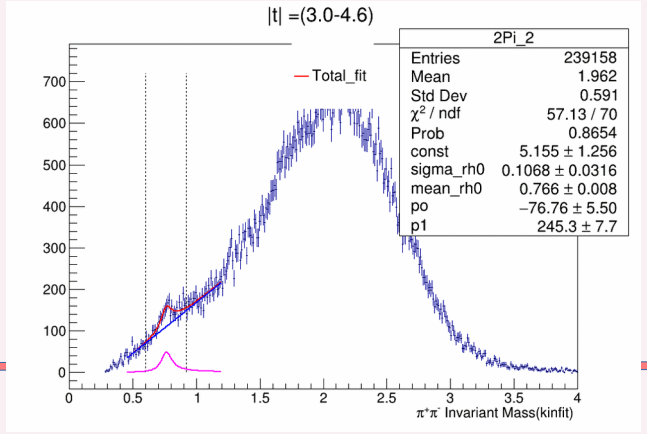
D2 A



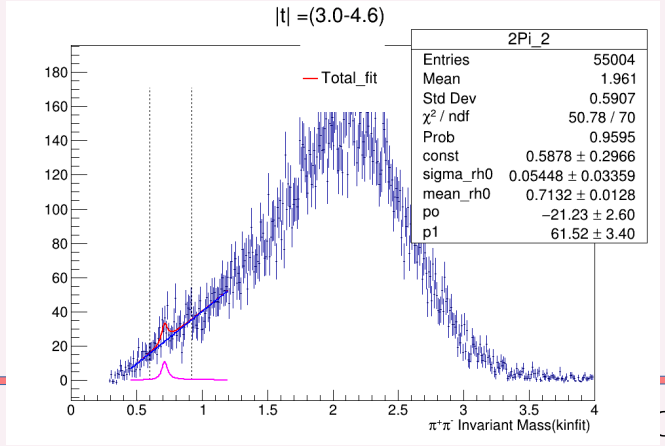
D2 B



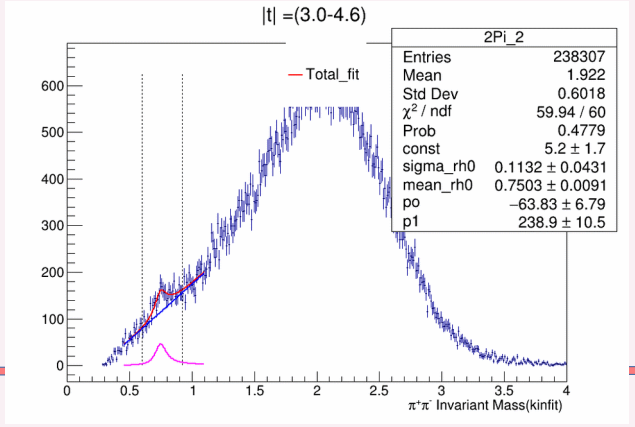
He4 A



He4 B

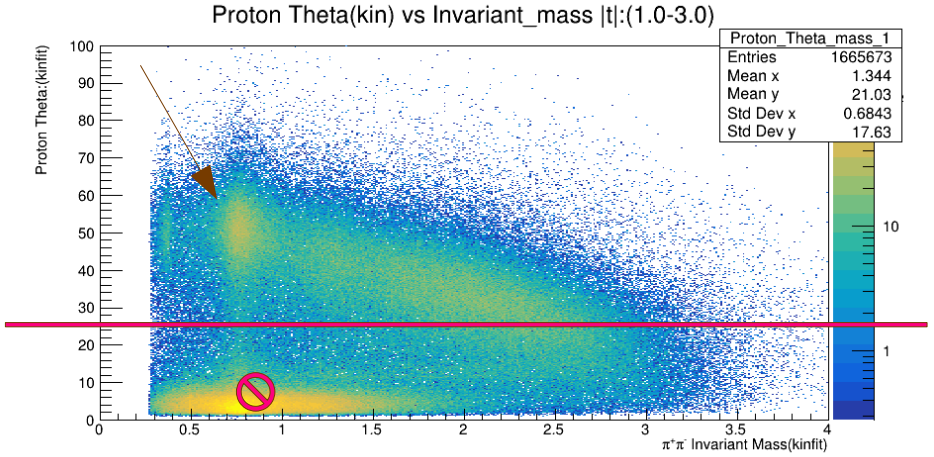


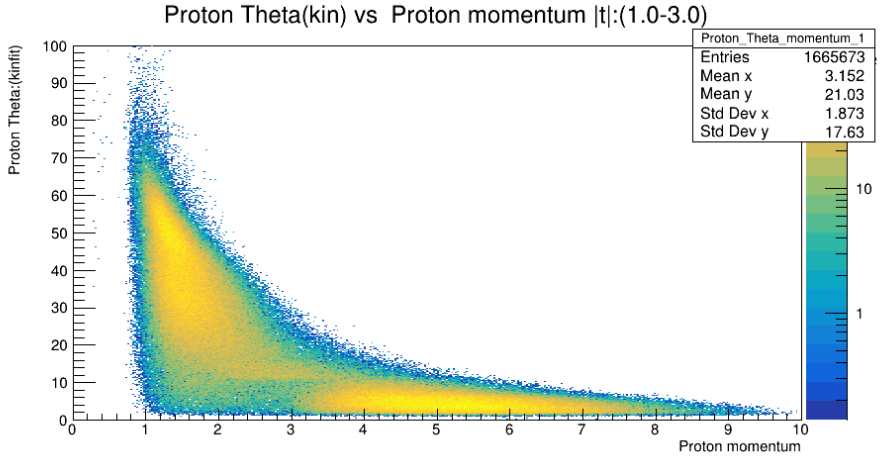
Carbon

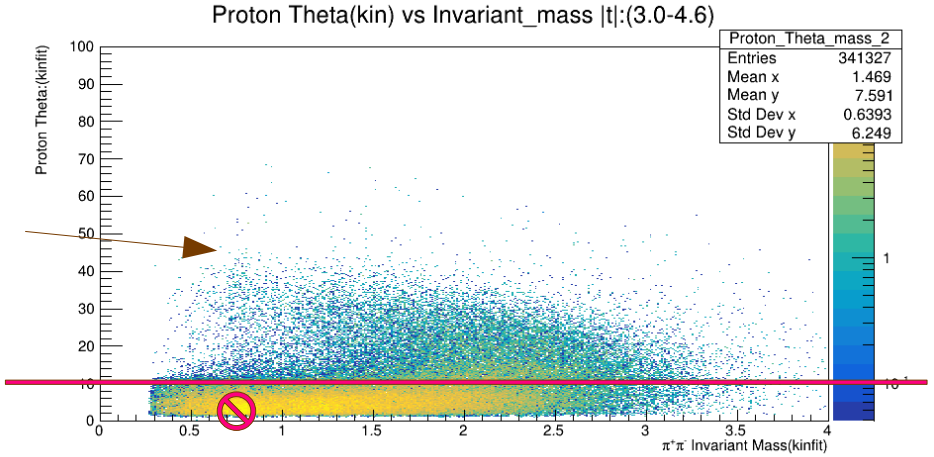


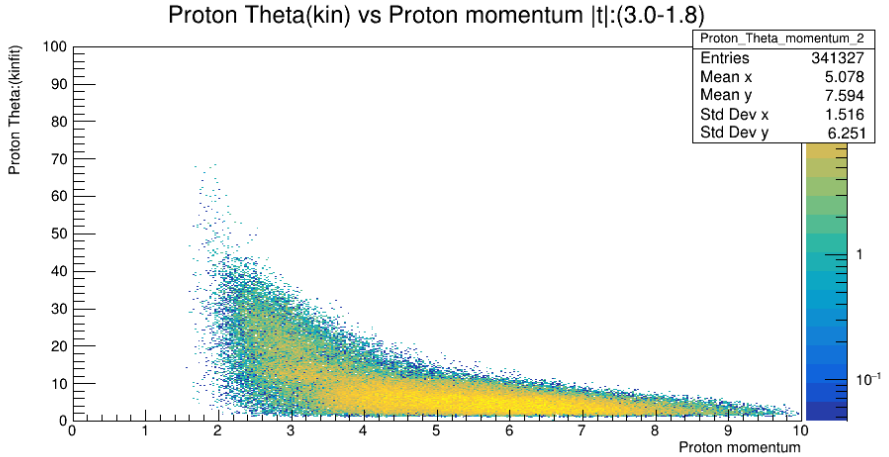
BackUp

Proton Theta vs (Invariant mass & Momentum)

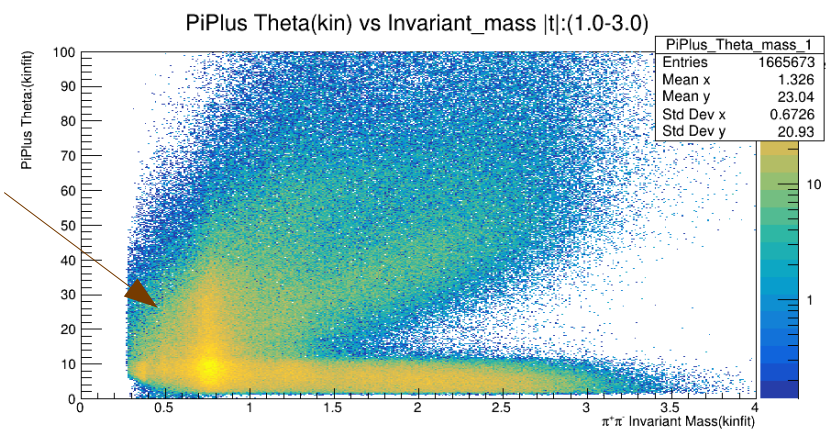


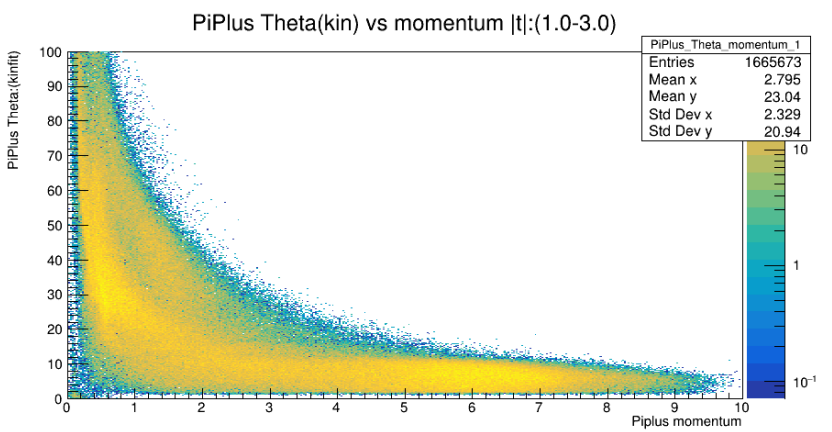


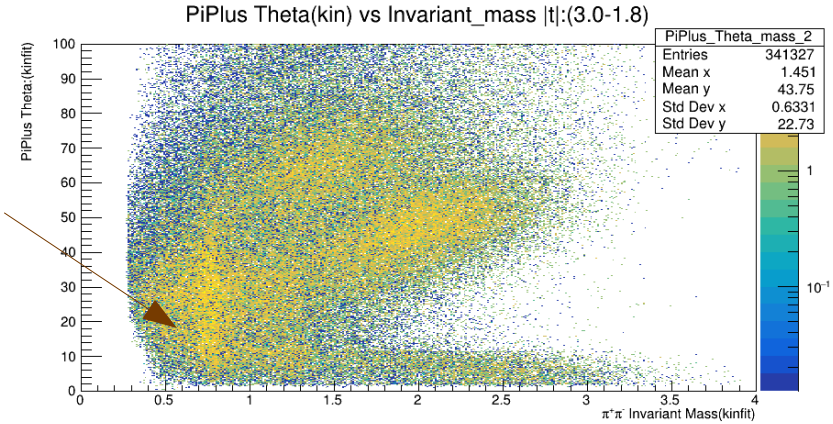


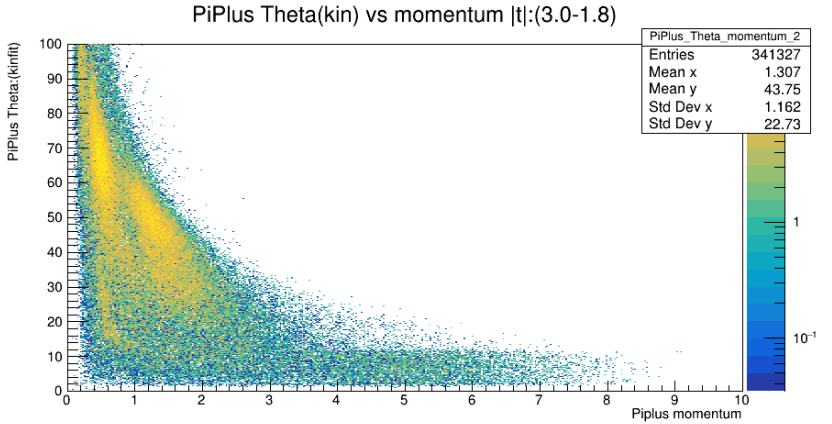


PiPlus Theta vs (Invariant mass & Momentum)

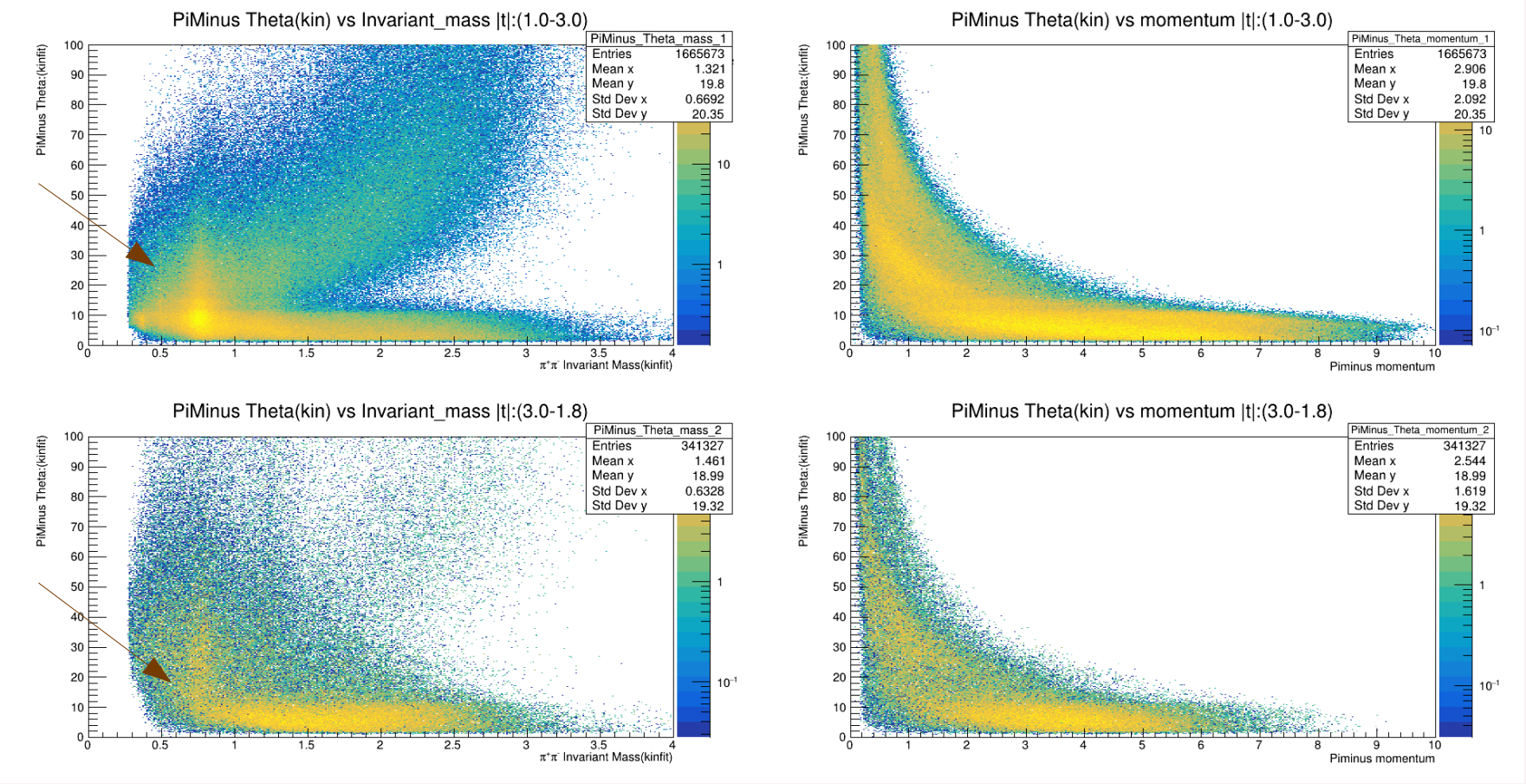




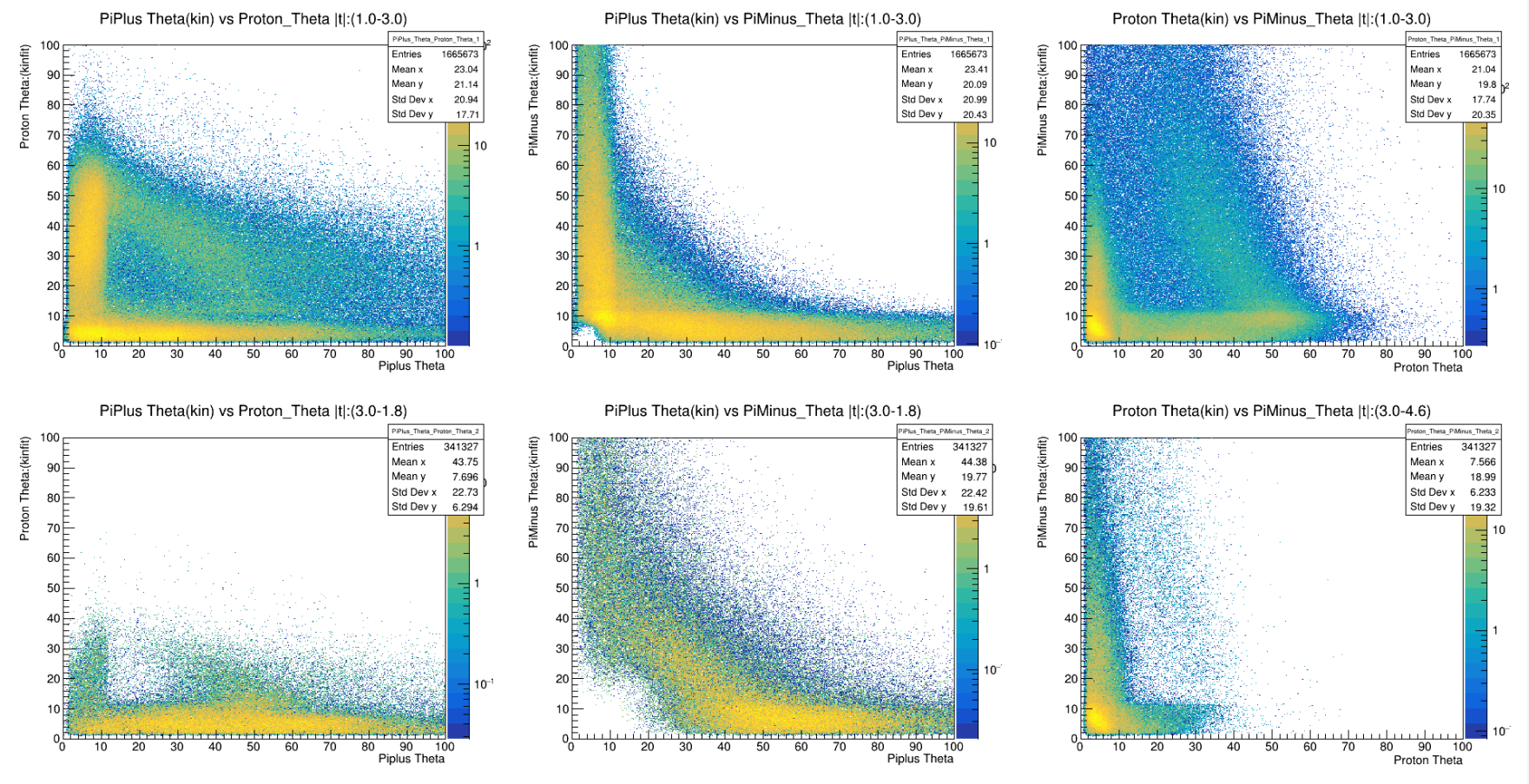


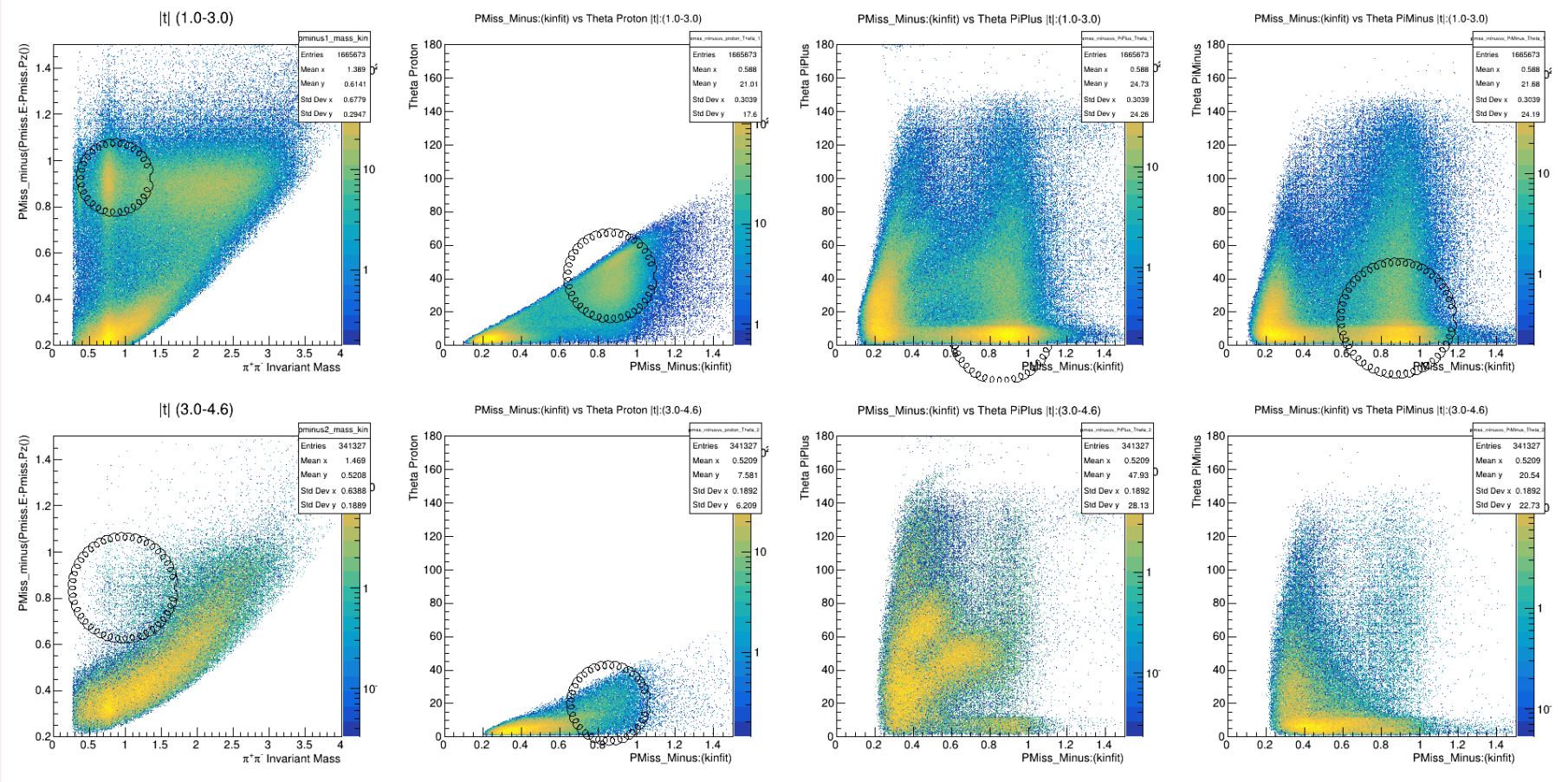


PiMinus Theta vs (Invariant mass & Momentum)



Distribution of theta between Piplus, PiMinus and Protons




|t| (1.0-3.0)
PMiss_Minus:(kinfit) vs Theta Proton |t|:(1.0-3.0)
PMiss_Minus:(kinfit) vs Theta PiPlus |t|:(1.0-3.0)
PMiss_Minus:(kinfit) vs Theta PiMinus |t|:(1.0-3.0)
|t| (3.0-4.6)
PMiss_Minus:(kinfit) vs Theta Proton |t|:(3.0-4.6)
PMiss_Minus:(kinfit) vs Theta PiPlus |t|:(3.0-4.6)
PMiss_Minus:(kinfit) vs Theta PiMinus |t|:(3.0-4.6)
PMiss_minus(Pmiss.E-Pmiss.Pz())
π⁺π⁻ Invariant Mass
Theta Proton
Theta PiPlus
Theta PiMinus
PMiss_Minus:(kinfit)

Proton Angle Cuts for Different Momentum Range

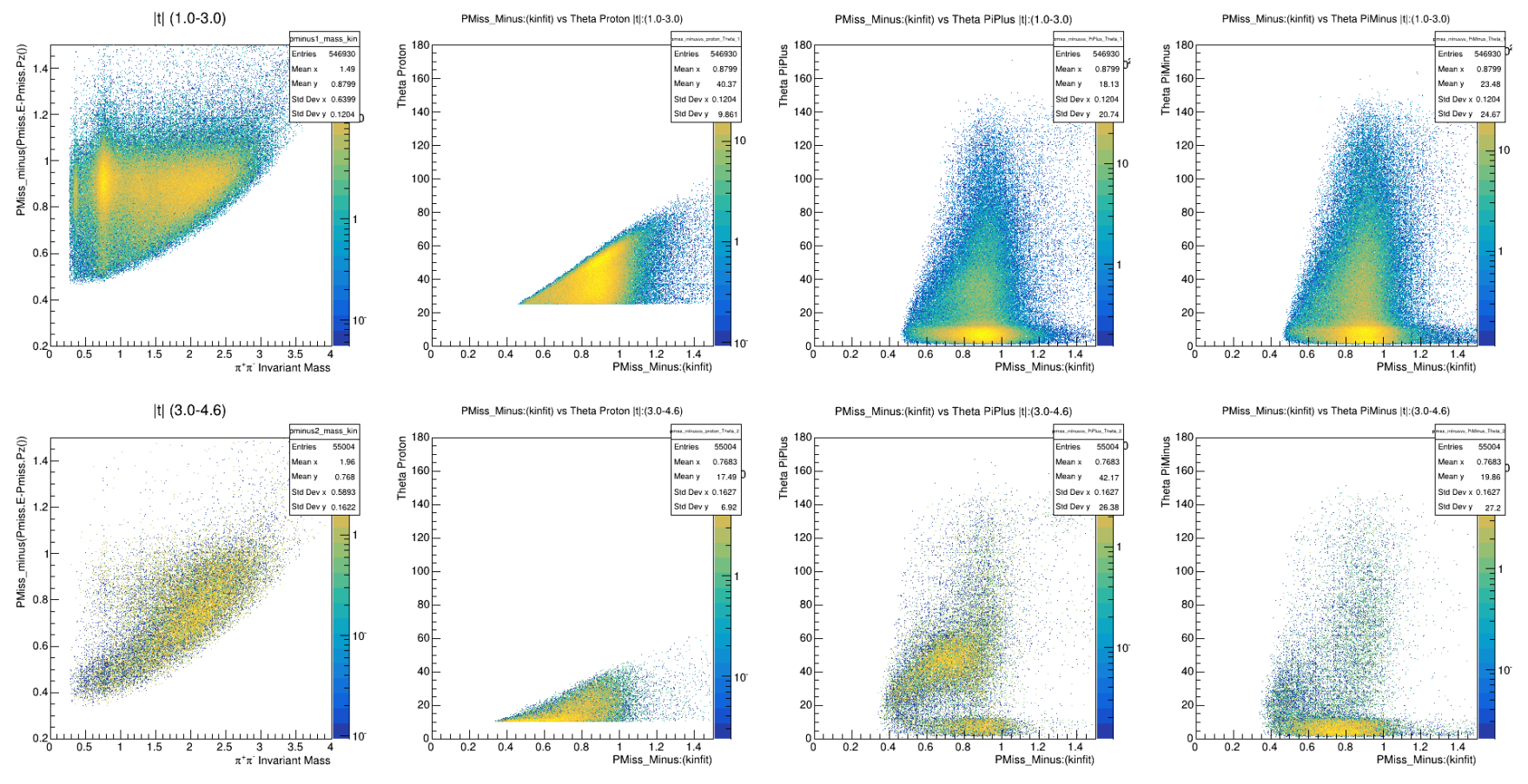
Analysis Results:

- After analyzing the distribution for 1.0 < |t| <= 3.0 protons with angles less than 25 degrees were rejected.

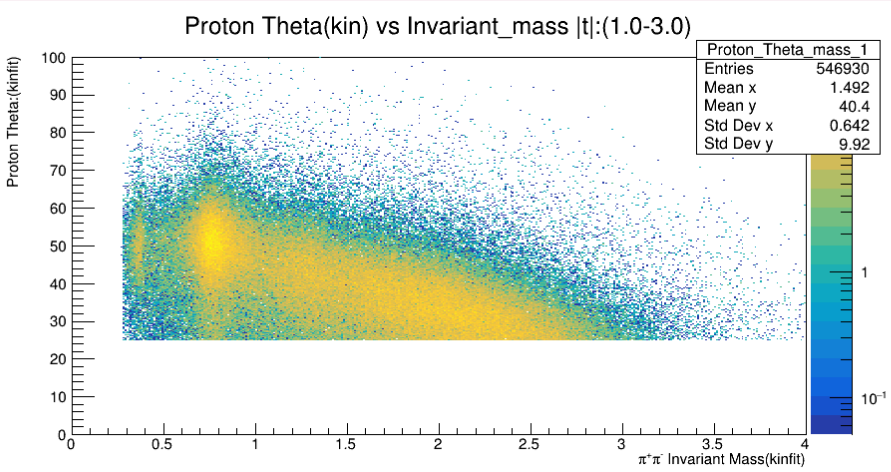
  Similarly, for 3.0 <|t| <= 4.6, protons with angles less than 10 degrees were rejected.
- **No Cuts on PiPlus and PiMinus:**
- It's noted that no cuts on PiPlus and PiMinus were implemented as they may distort the Rho0 invariant mass

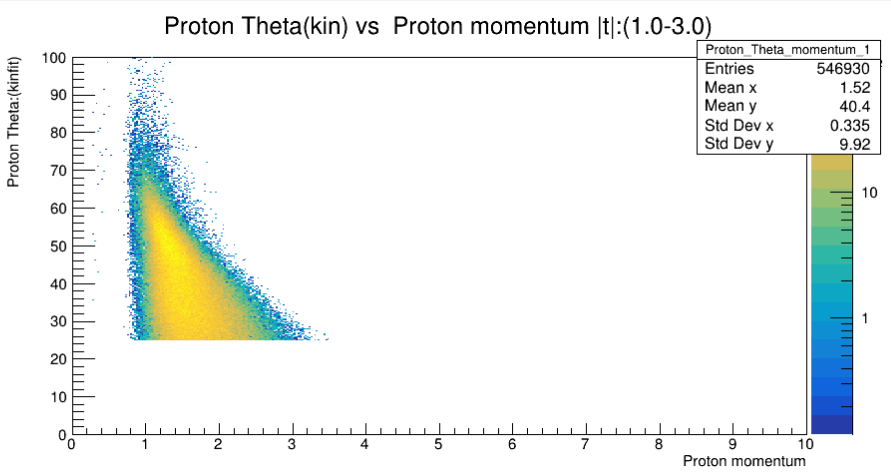
Plot after Cuts were implemented:

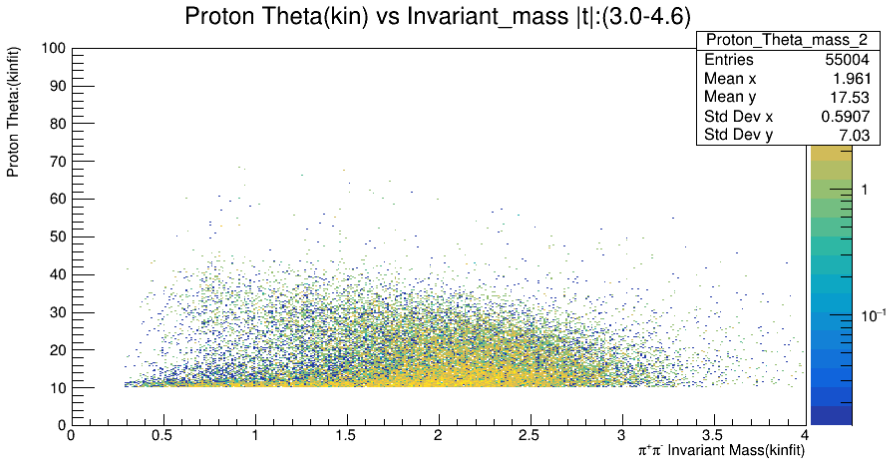
- Angular distribution(Theta) vs Invariant Mass
- Angular distribution(Theta) vs Momentum of Particle
- Angular distribution between charged particles.

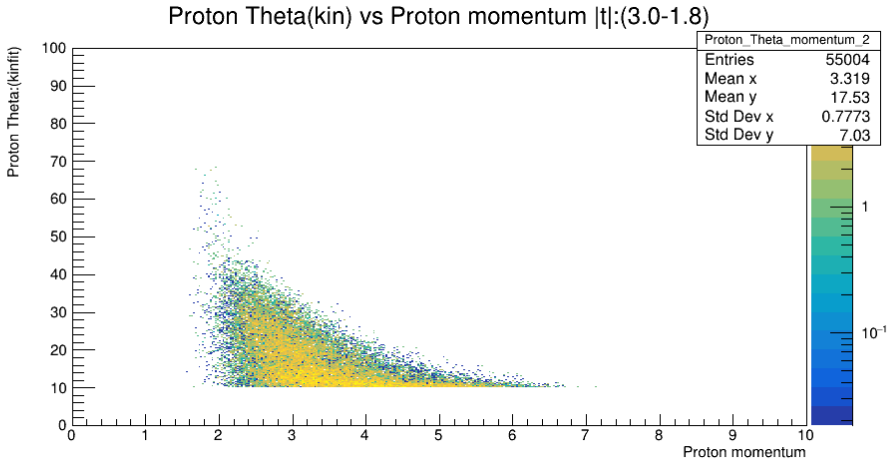

|t| (1.0-3.0)
PMiss_minus(Pmiss.E-Pmiss.Pz())
π⁺π⁻ Invariant Mass
Entries 546930
Mean x 1.49
Mean y 0.8799
Std Dev x 0.6399
Std Dev y 0.1204
PMiss_Minus:(kinfit) vs Theta Proton |t|:(1.0-3.0)
Theta Proton
PMiss_Minus:(kinfit)
Entries 546930
Mean x 0.8799
Mean y 40.37
Std Dev x 0.1204
Std Dev y 9.861
PMiss_Minus:(kinfit) vs Theta PiPlus |t|:(1.0-3.0)
Theta PiPlus
PMiss_Minus:(kinfit)
Entries 546930
Mean x 0.8799
Mean y 18.13
Std Dev x 0.1204
Std Dev y 20.74
PMiss_Minus:(kinfit) vs Theta PiMinus |t|:(1.0-3.0)
Theta PiMinus
PMiss_Minus:(kinfit)
Entries 546930
Mean x 0.8799
Mean y 23.48
Std Dev x 0.1204
Std Dev y 24.67
|t| (3.0-4.6)
PMiss_minus(Pmiss.E-Pmiss.Pz())
π⁺π⁻ Invariant Mass
Entries 55004
Mean x 1.96
Mean y 0.768
Std Dev x 0.5893
Std Dev y 0.1622
PMiss_Minus:(kinfit) vs Theta Proton |t|:(3.0-4.6)
Theta Proton
PMiss_Minus:(kinfit)
Entries 55004
Mean x 0.7683
Mean y 17.49
Std Dev x 0.1627
Std Dev y 6.92
PMiss_Minus:(kinfit) vs Theta PiPlus |t|:(3.0-4.6)
Theta PiPlus
PMiss_Minus:(kinfit)
Entries 55004
Mean x 0.7683
Mean y 42.17
Std Dev x 0.1627
Std Dev y 26.38
PMiss_Minus:(kinfit) vs Theta PiMinus |t|:(3.0-4.6)
Theta PiMinus
PMiss_Minus:(kinfit)
Entries 55004
Mean x 0.7683
Mean y 19.86
Std Dev x 0.1627
Std Dev y 27.2

Proton Theta vs (Invariant mass & Momentum)

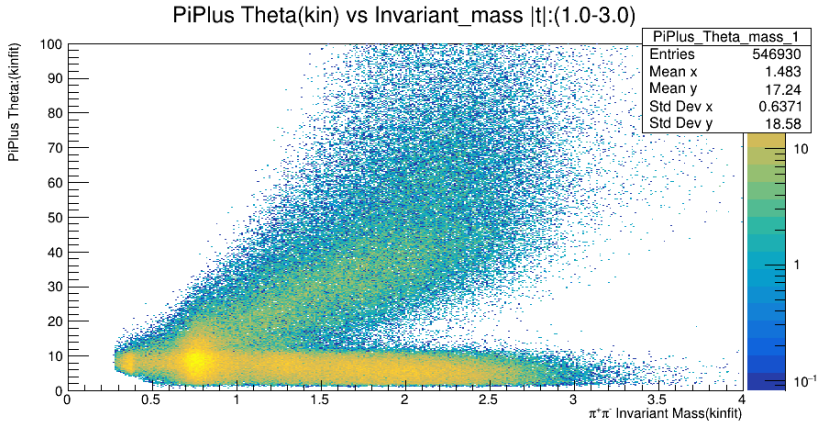


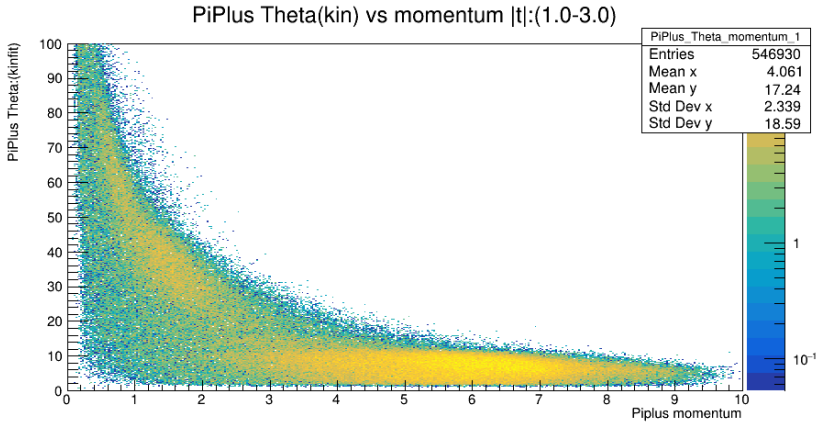


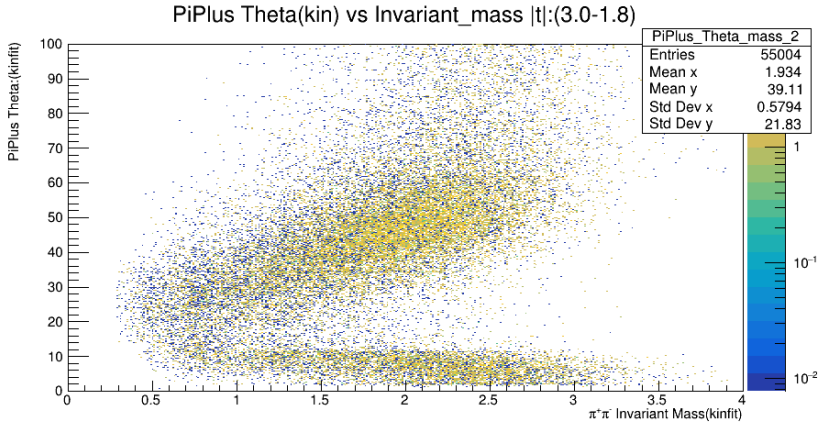


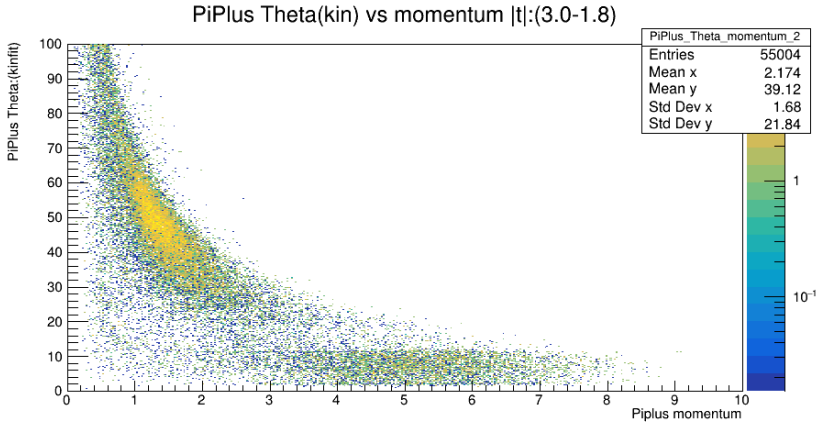


PiPlus Theta vs (Invariant mass & Momentum)

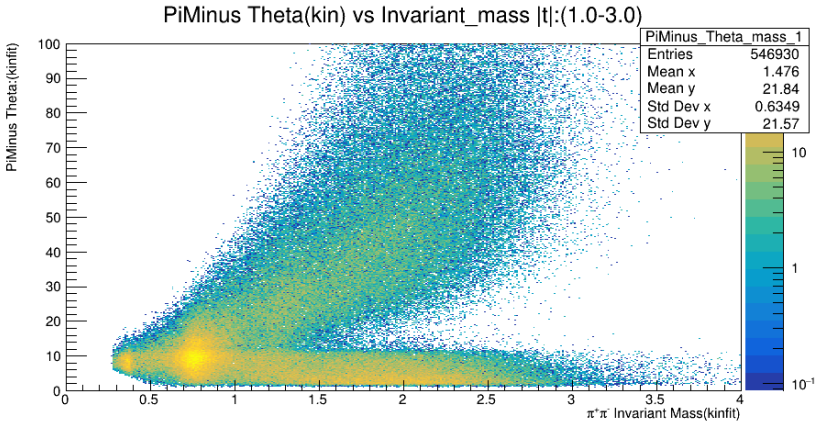


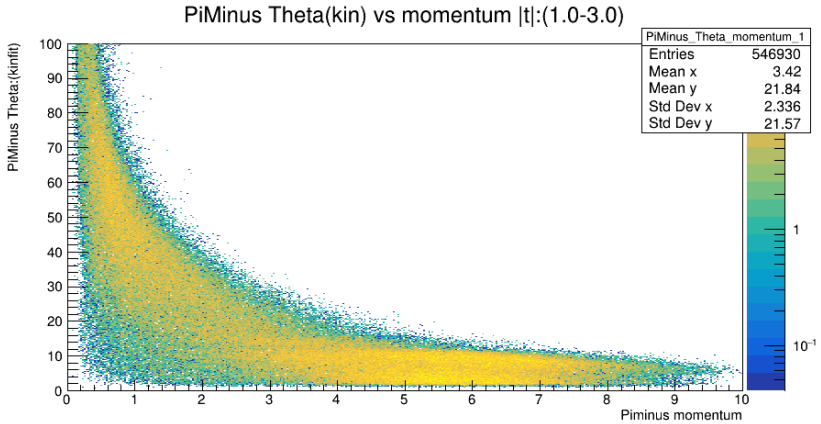


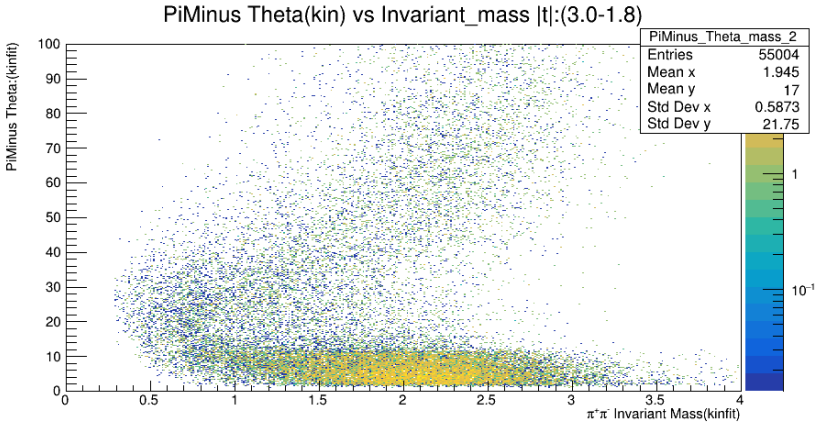


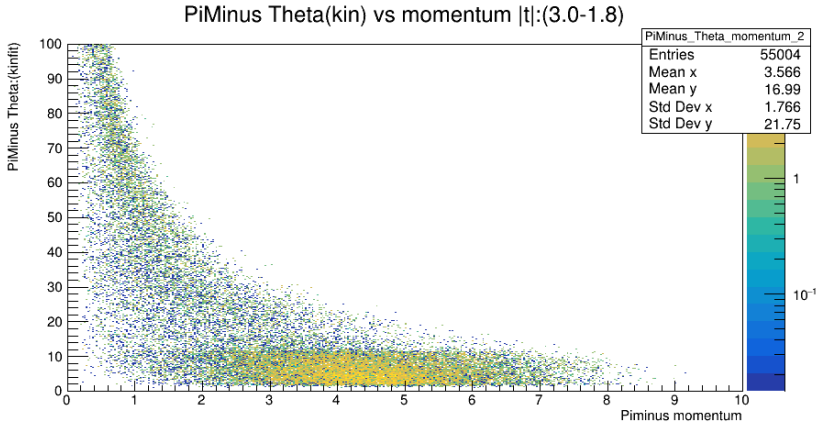


PiMinus Theta vs (Invariant mass & Momentum)









Distribution of theta between Piplus, PiMinus and Protons