Two Methods of Calculating Efficiency

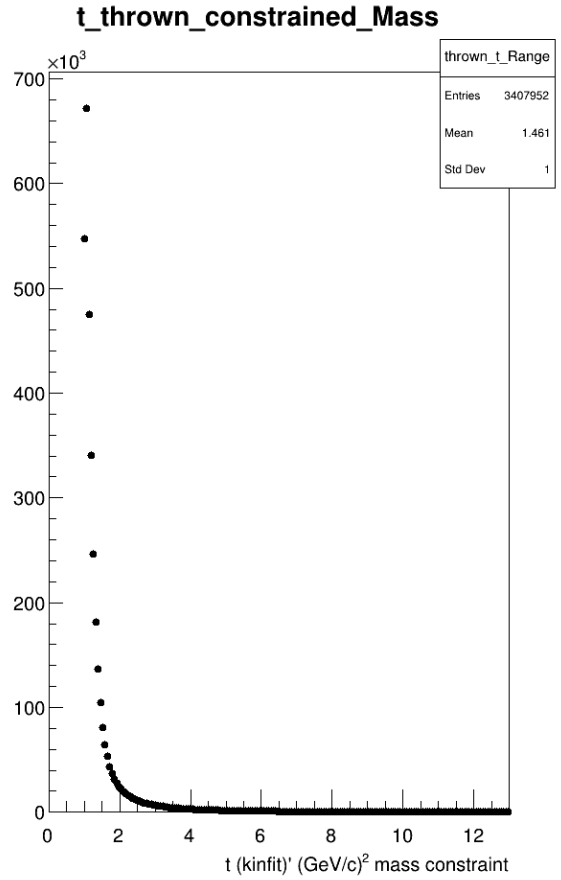
MethodA

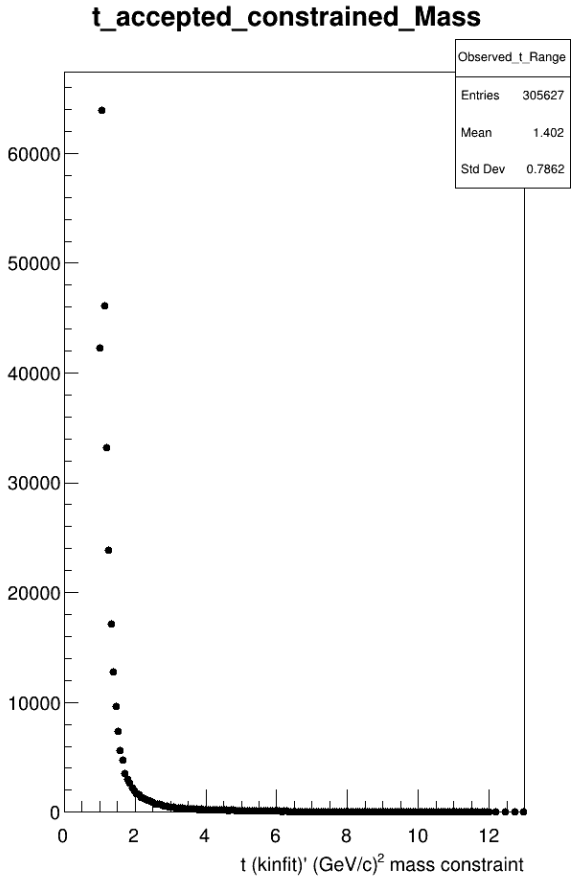
- Obtain a |t| distribution for both the thrown and observed simulations for the mass range of [0.6 < Mrho <0.92].
- Calculate the ratio of the |t| distribution to obtain the efficiency as a function of |t|.

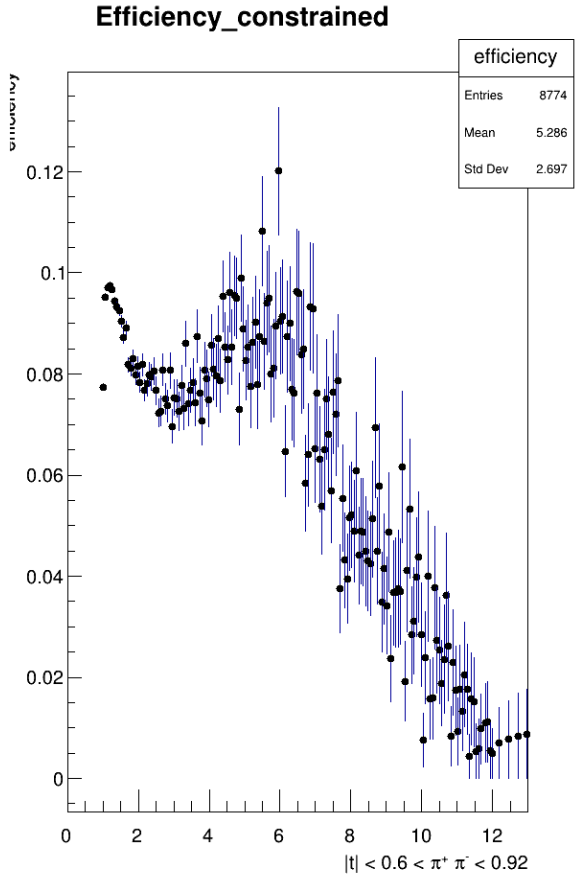
Method B

- Obtain the invariant mass for both the thrown and observed simulations at different bin of |t|.
- Extract the yield of the mass variable in different bins of |t| for the mass range of [0.6 < Mrho <0.92].
- Calculate the ratio between the extracted yields.

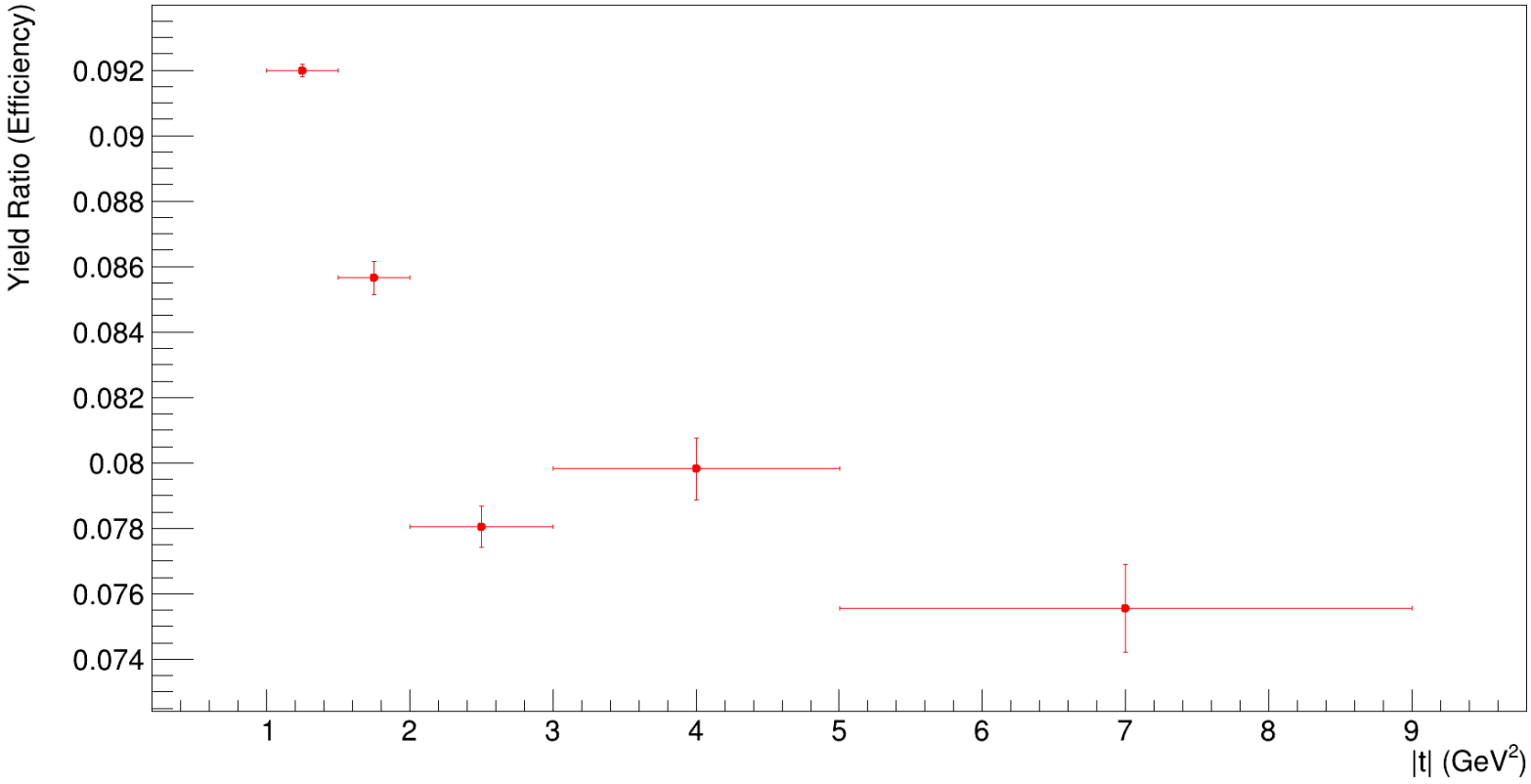
A. Efficiency for deuterium as a function of |t|.



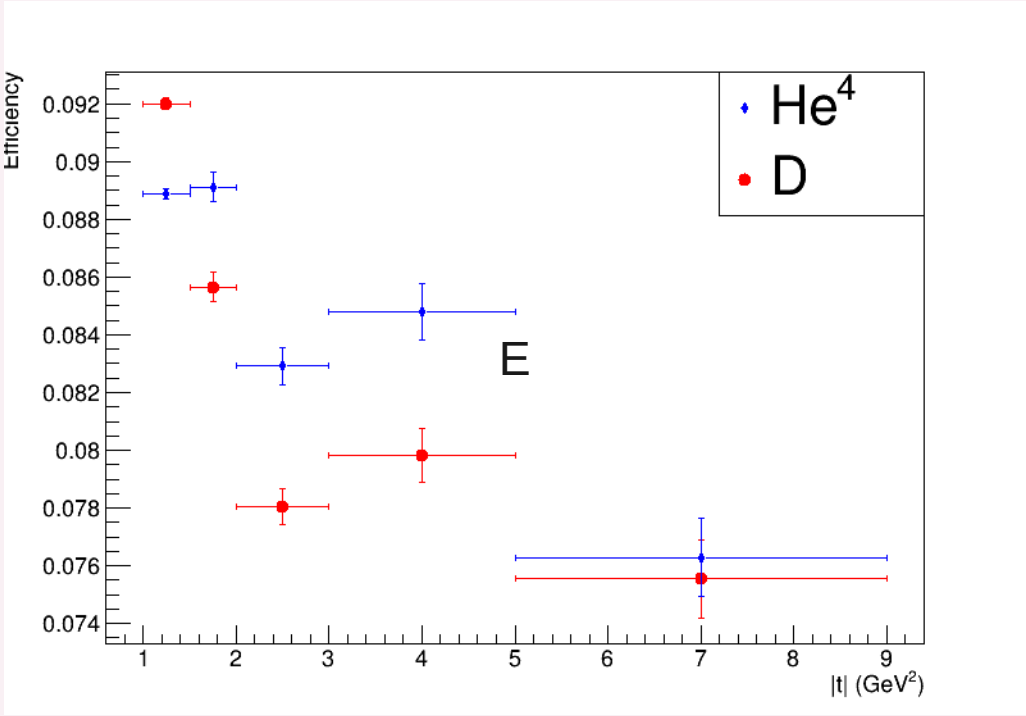


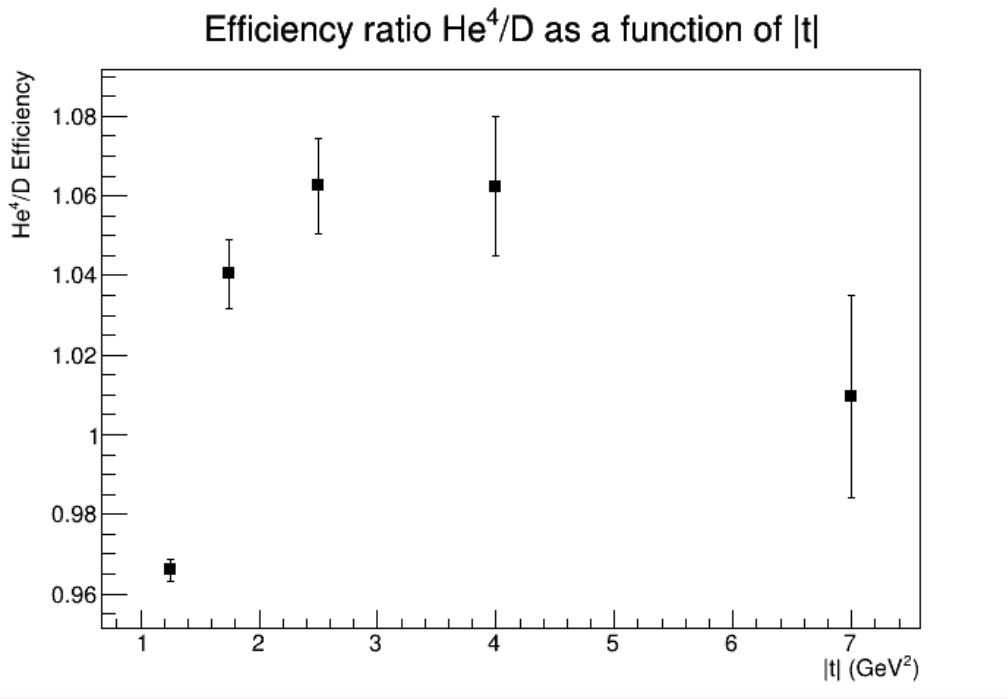


Efficiency for deuterium as a function of |t|.



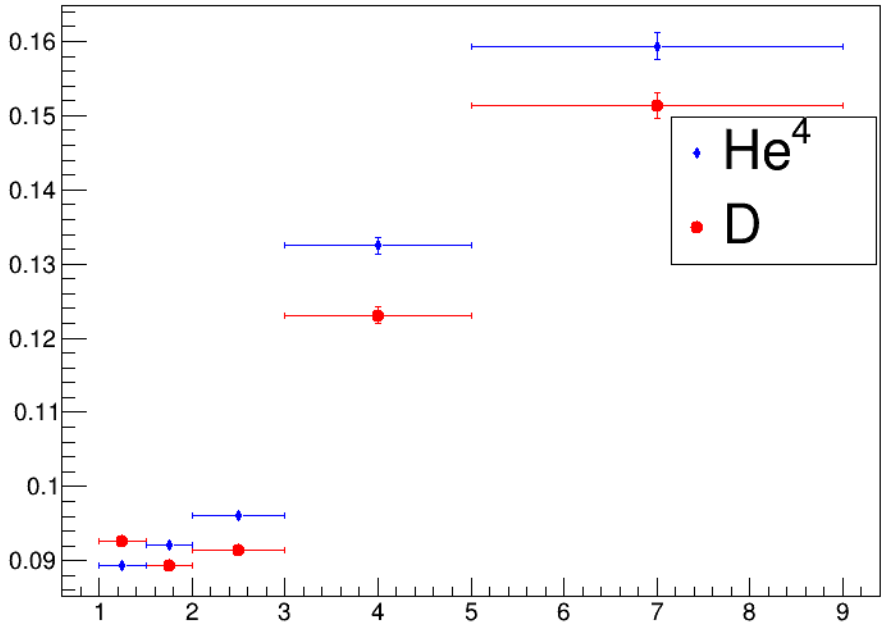
Ratio of efficiency between deuterium and helium

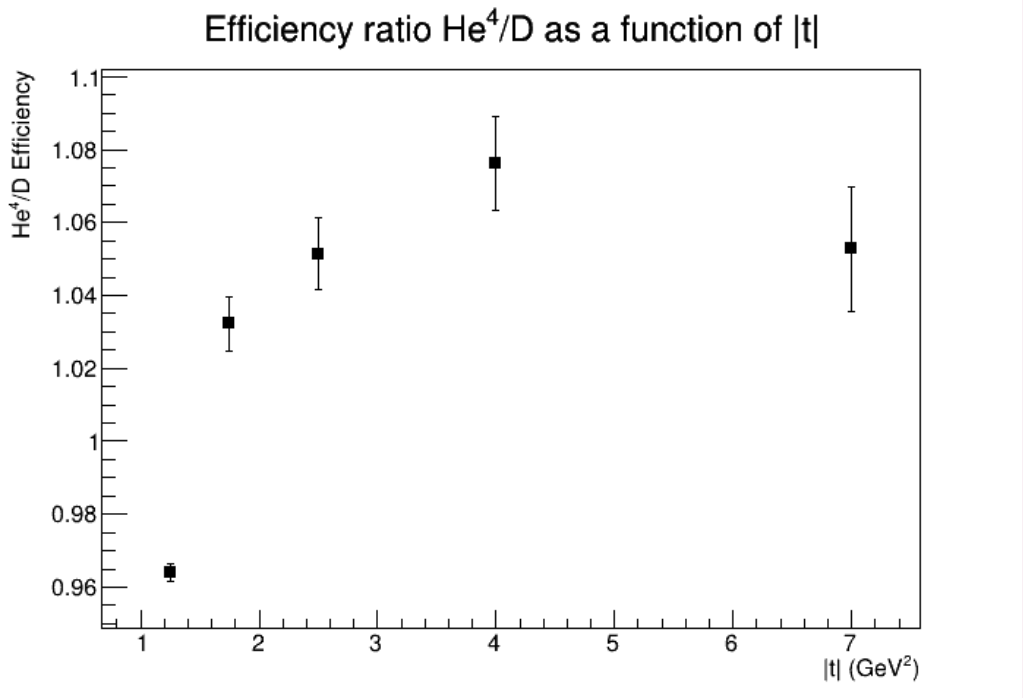




Ratio of efficiency between deuterium and helium

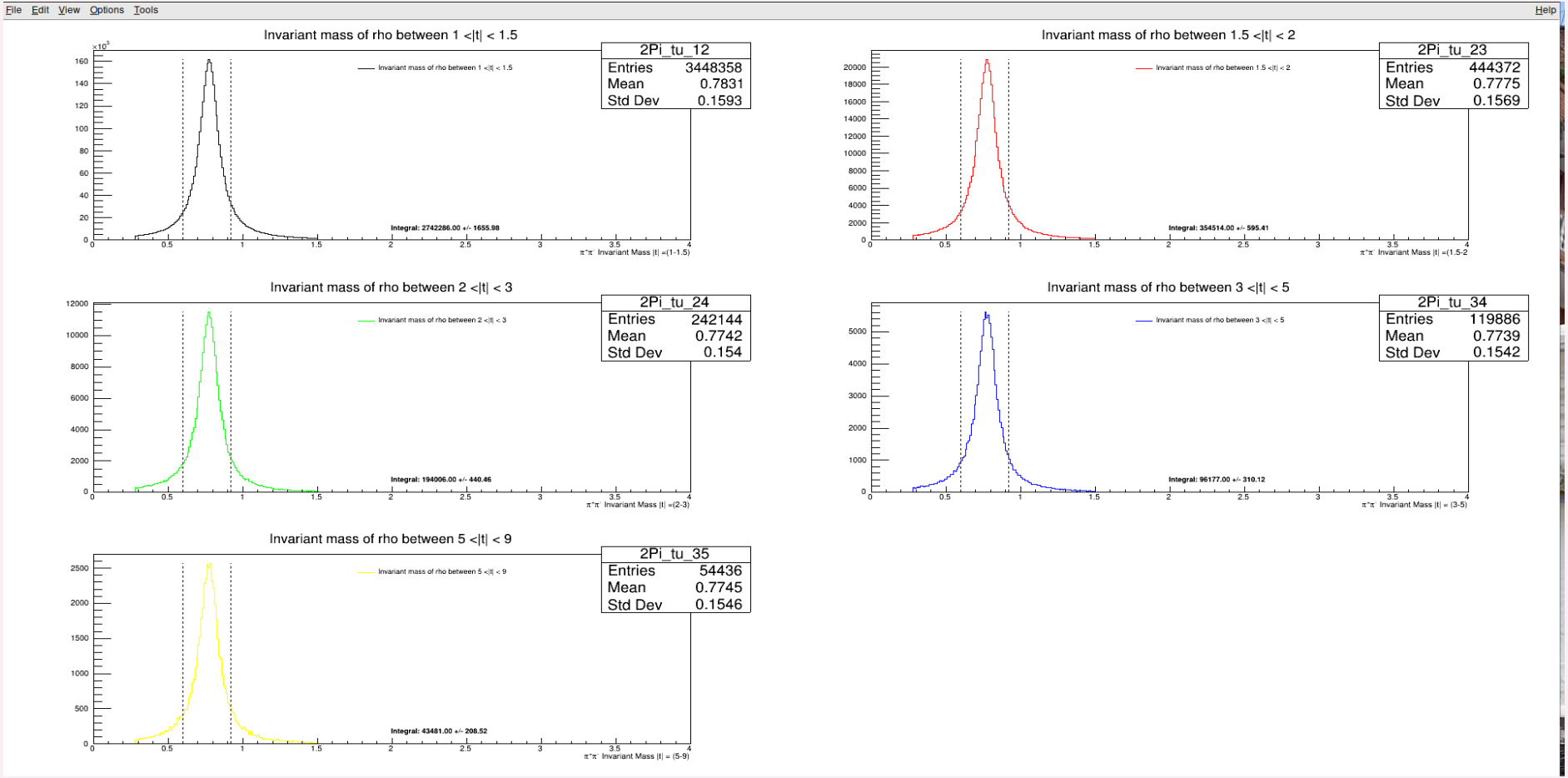
If we calculate efficiency based on the mass of two pions then we see a different plot.



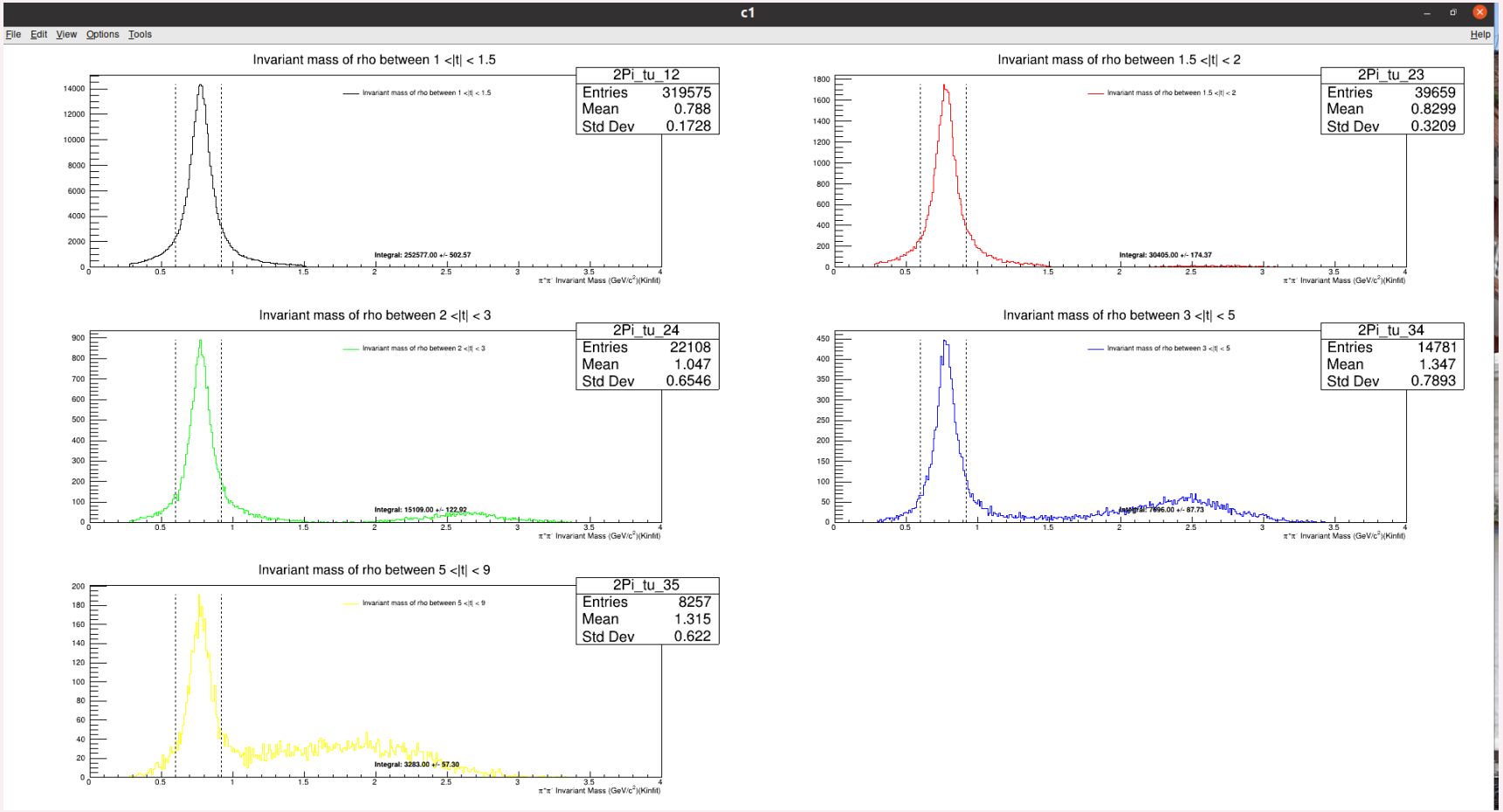


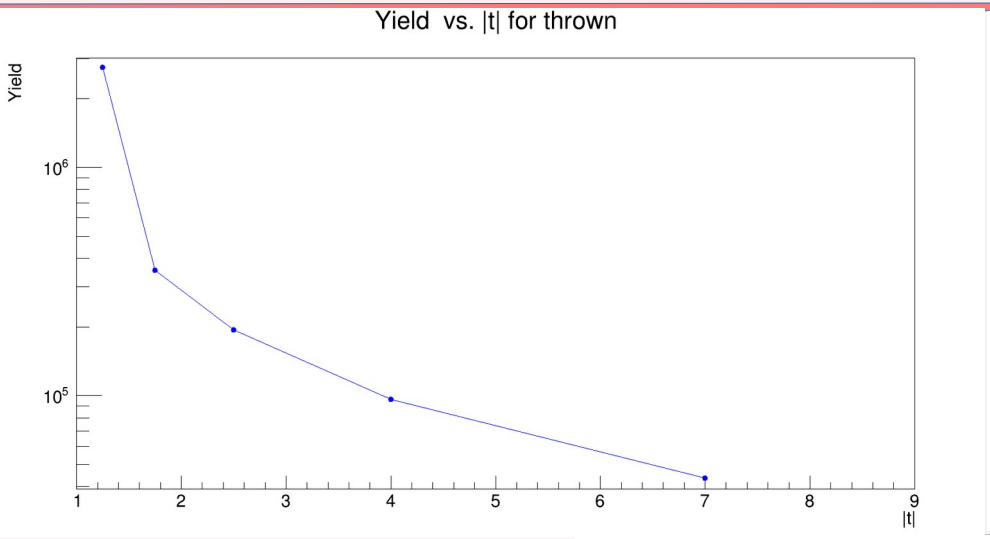
- My range for |t| distribution are as follows.
- 1 < |t| <= 1.5
- 1.5 <|t| <= 2
- 2 <|t| <= 3
- 3 <|t| <= 5
- 5 <|t| <= 9

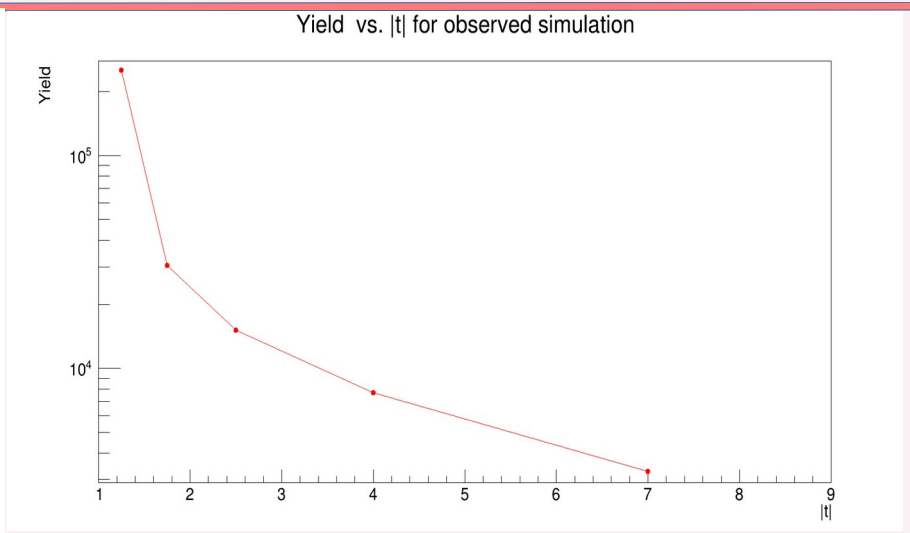
Extraction of yield from invariant mass for thrown data:Deuterium

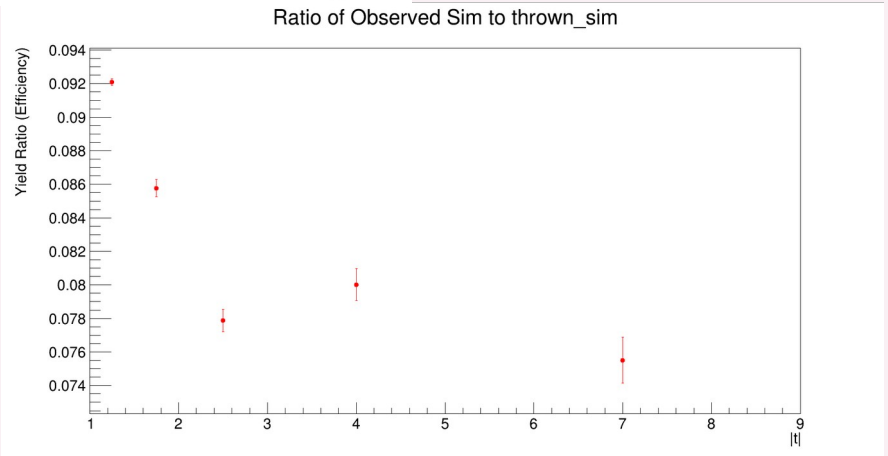


Extraction of yield from invariant mass for Observed simulation:Deuterium

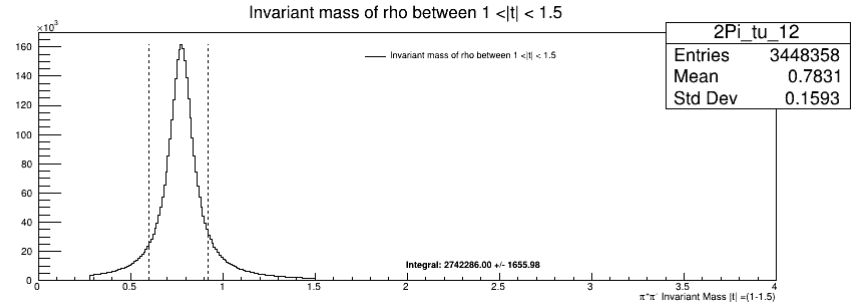


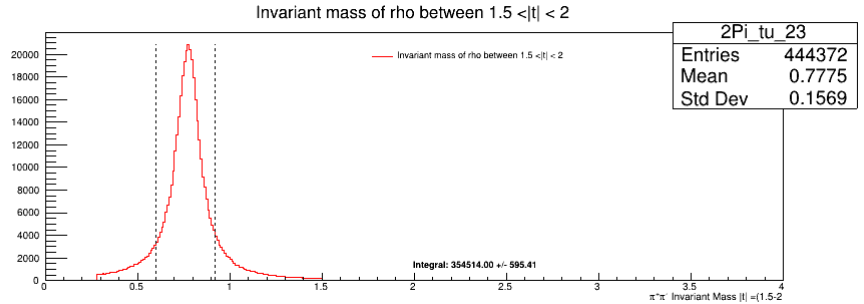

Yield vs. |t| for thrown
Yield
10^6
10^5
1
2
3
4
5
6
7
8
9
|t|

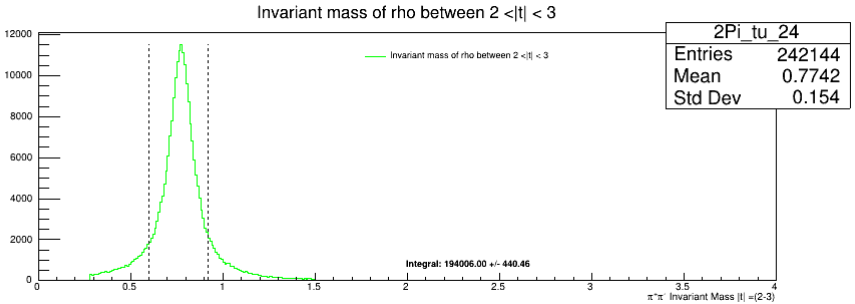

Yield vs. |t| for observed simulation
Yield
10^5
10^4
1
2
3
4
5
6
7
8
9
|t|

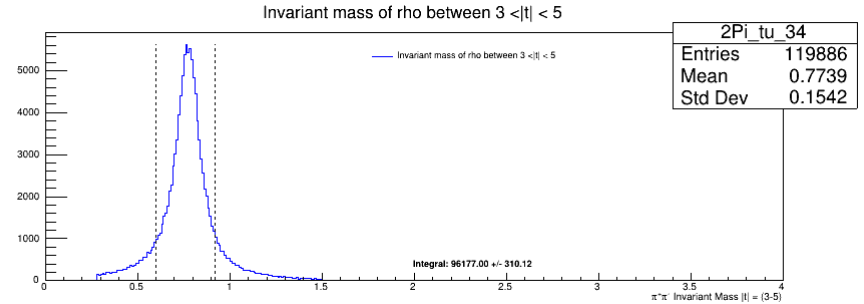

Ratio of Observed Sim to thrown_sim
Yield Ratio (Efficiency)
0.094
0.092
0.09
0.088
0.086
0.084
0.082
0.08
0.078
0.076
0.074
1
2
3
4
5
6
7
8
9
|t|

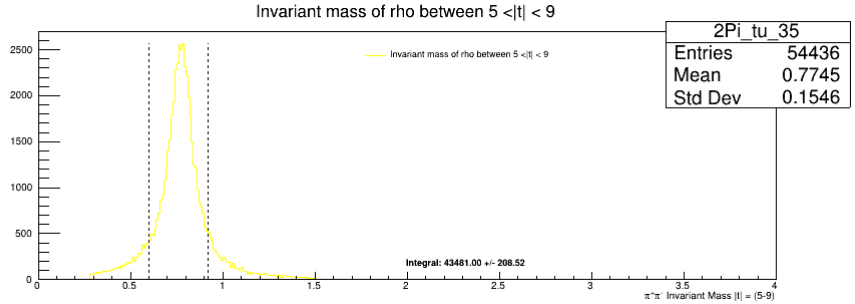
Helium atom: Thrown Data





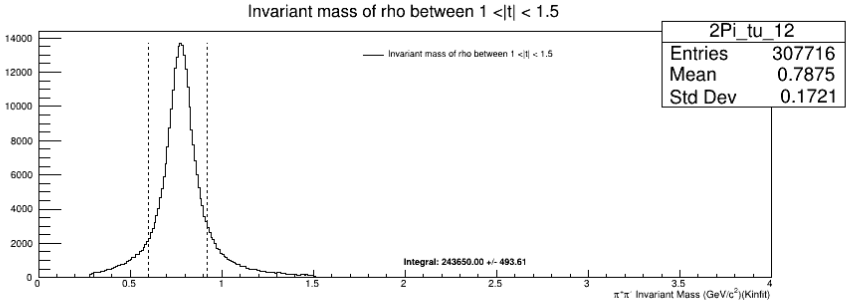


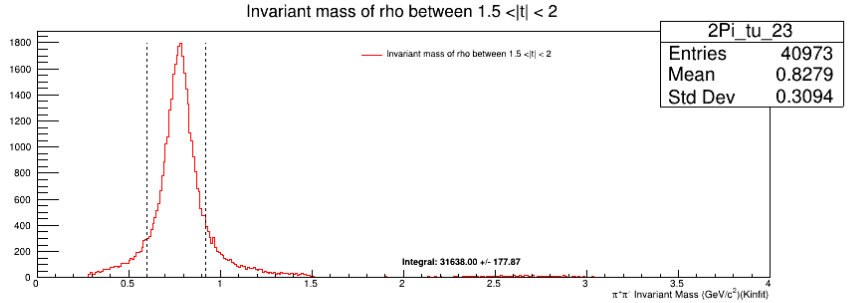


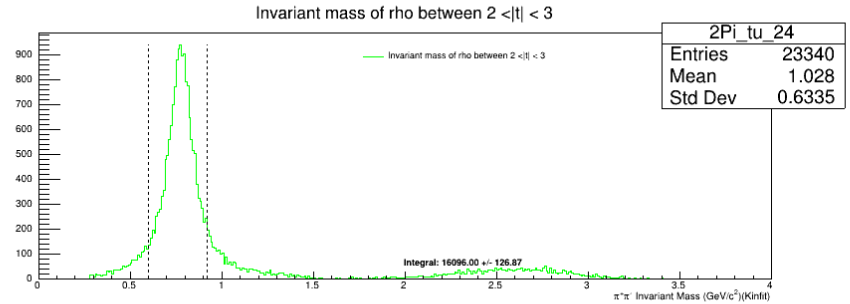


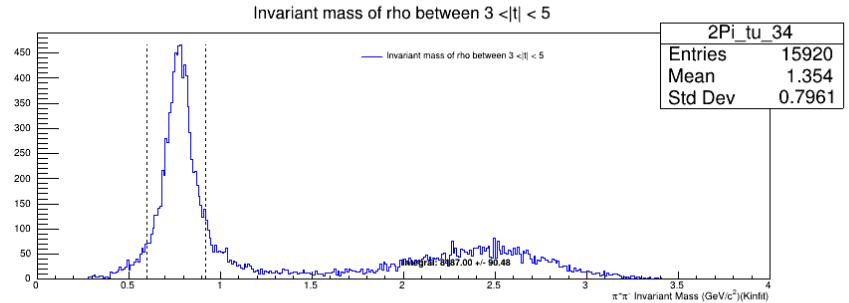
Yield for thrown data from Helium=
Yield for thrown data from Deuterium.

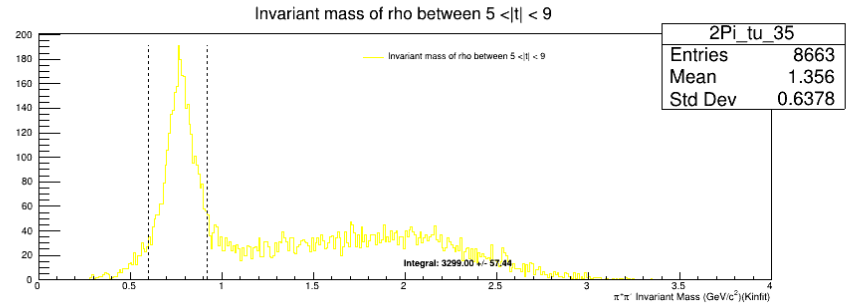
Helium atom: Observed Simulation

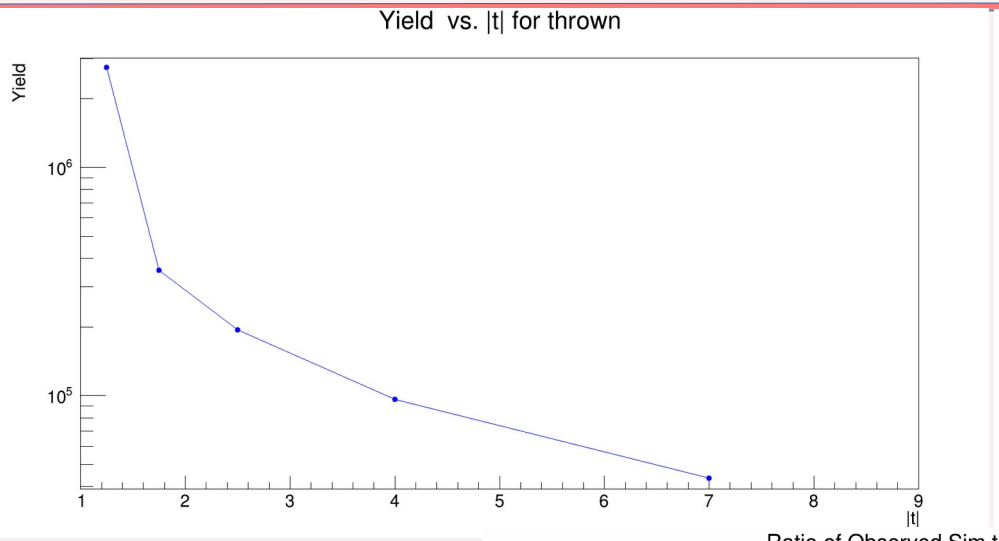


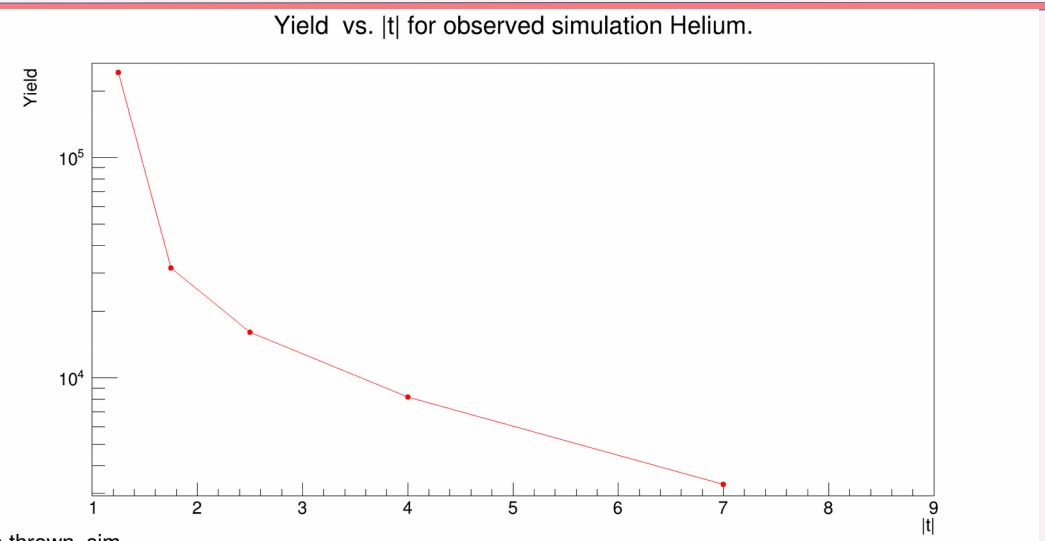


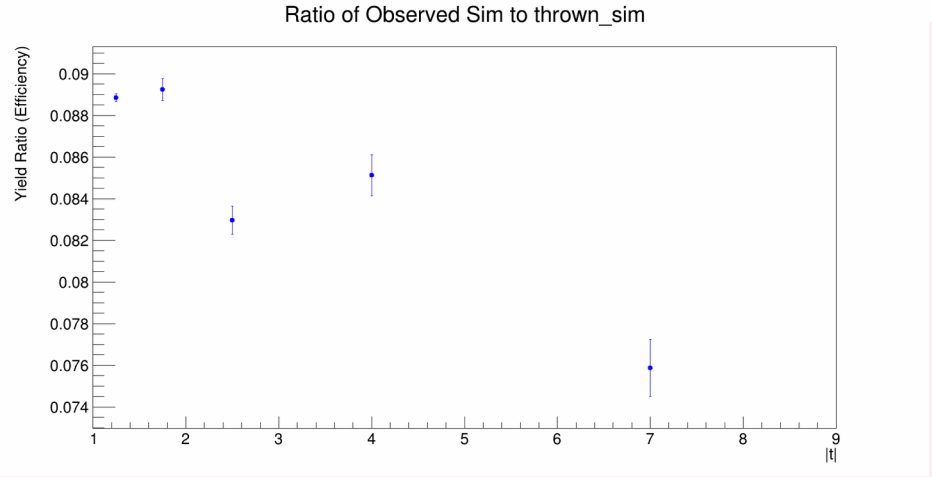


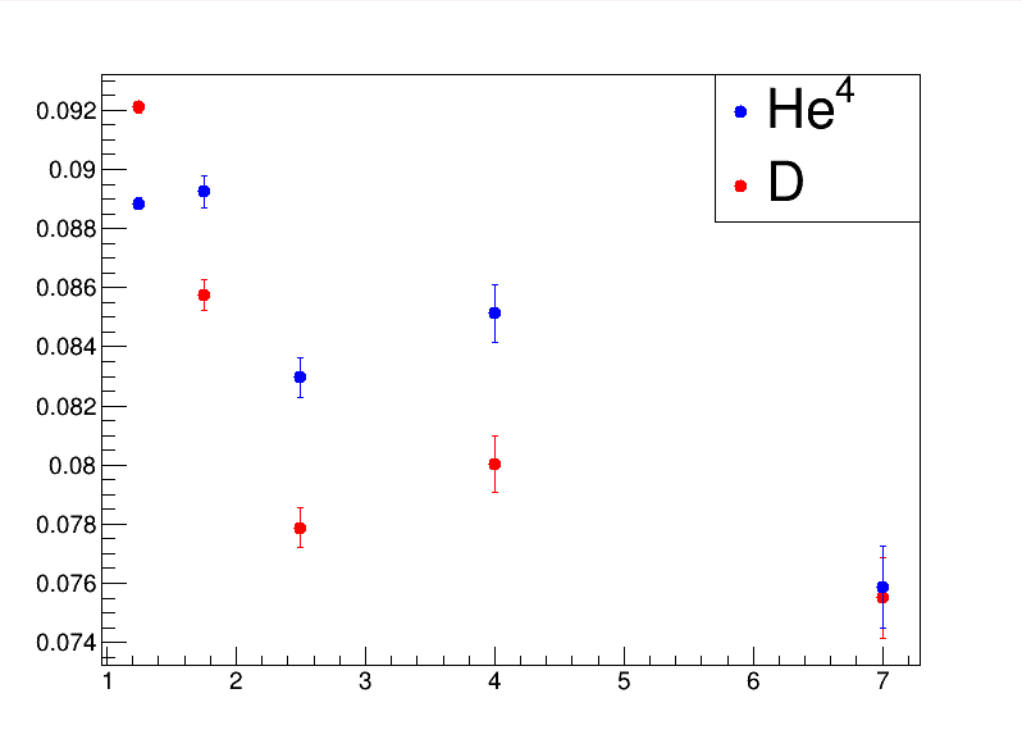


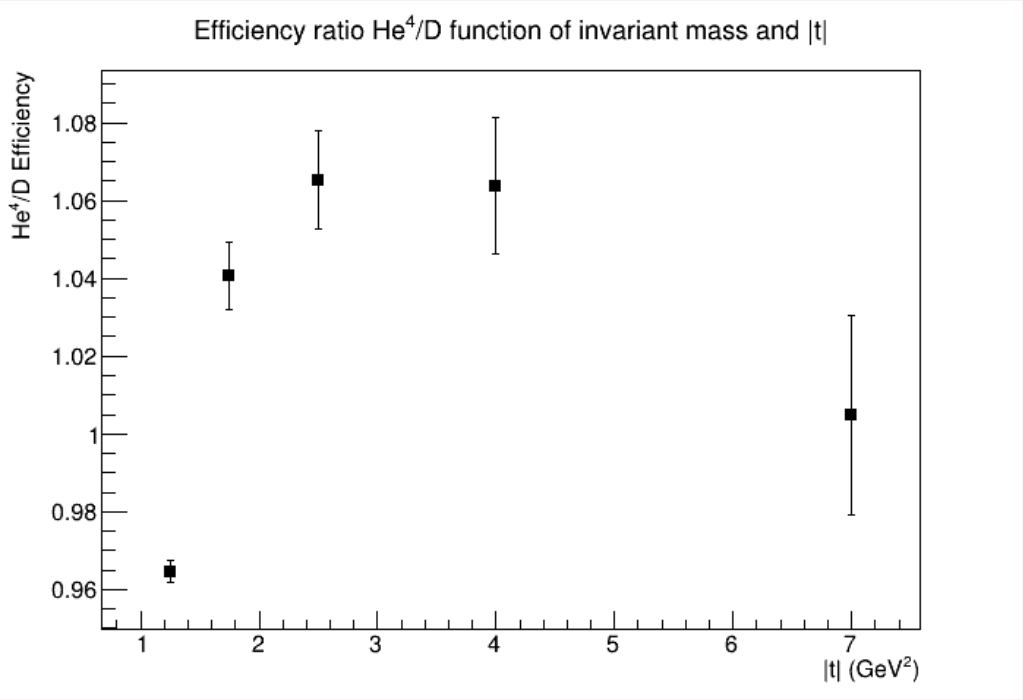



Yield vs. |t| for thrown
Yield
10^6
10^5
1
2
3
4
5
6
7
8
9
|t|


Yield vs. |t| for observed simulation Helium.
Yield
10^5
10^4
1
2
3
4
5
6
7
8
9
|t|

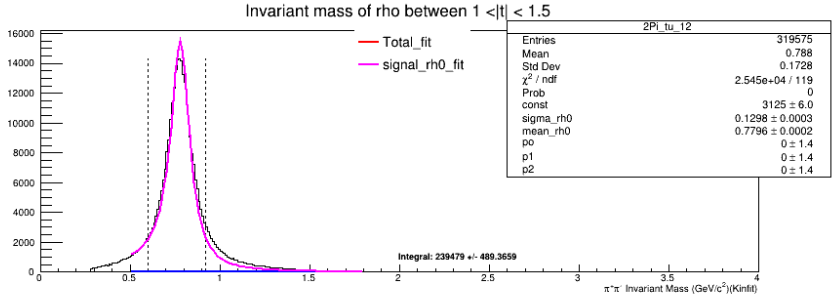

Ratio of Observed Sim to thrown_sim
Yield Ratio (Efficiency)
0.09
0.088
0.086
0.084
0.082
0.08
0.078
0.076
0.074
1
2
3
4
5
6
7
8
9
|t|

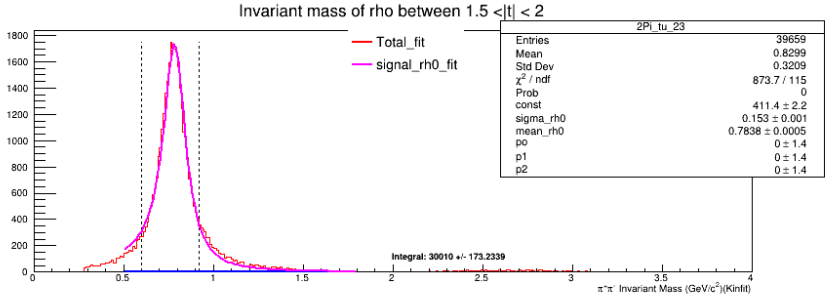

He4
D
0.092
0.09
0.088
0.086
0.084
0.082
0.08
0.078
0.076
0.074
1
2
3
4
5
6
7

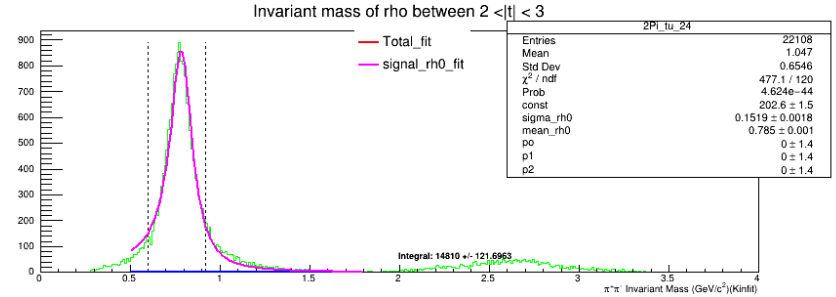

Efficiency ratio He4/D function of invariant mass and |t|
He4/D Efficiency
1.08
1.06
1.04
1.02
1
0.98
0.96
1
2
3
4
5
6
7
|t| (GeV2)

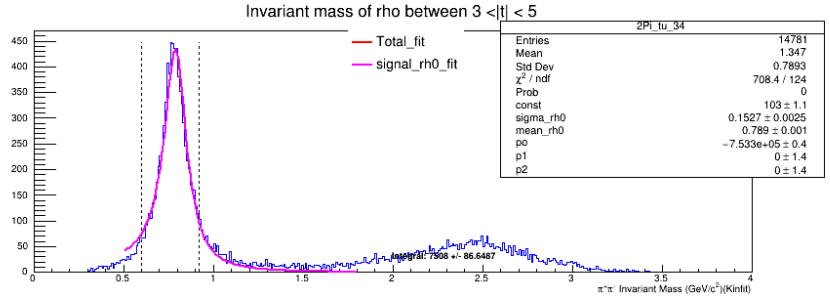
- Method 3
- Using Invariant mass but using a fitted function instead of direct extraction which resembles our data.
- Efficiency_ratio = $Efficiency_{helium} / Efficiency_{deuterium} = (observed_{he} / thrown_{he}) / (observed_{D} / thrown_{D}) = (observed_{he} / observed_{D})$

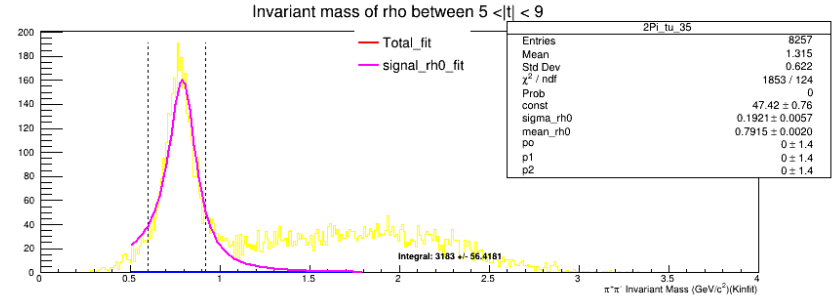
Yield of invariant mass of observed simulation Deuterium.



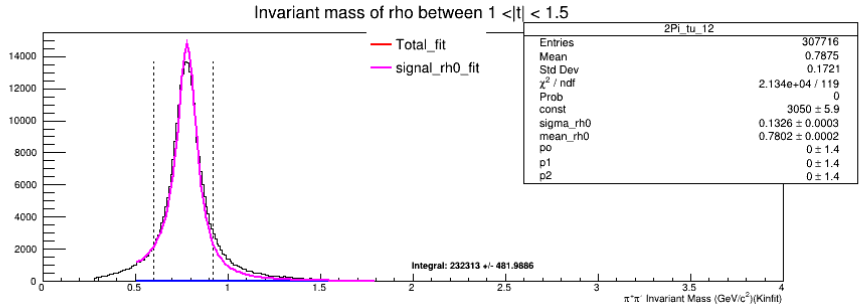


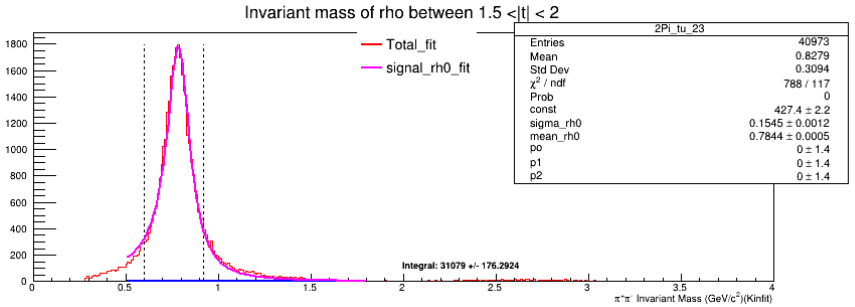


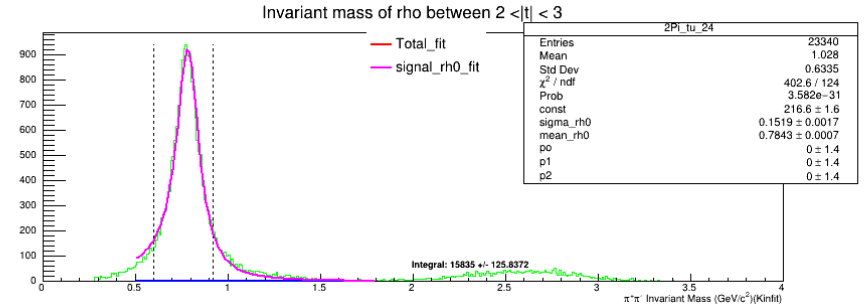


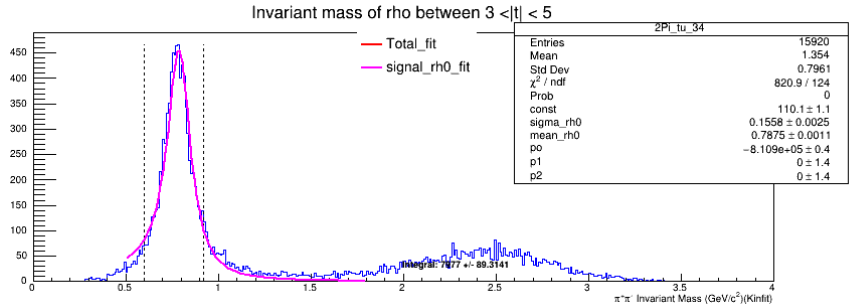


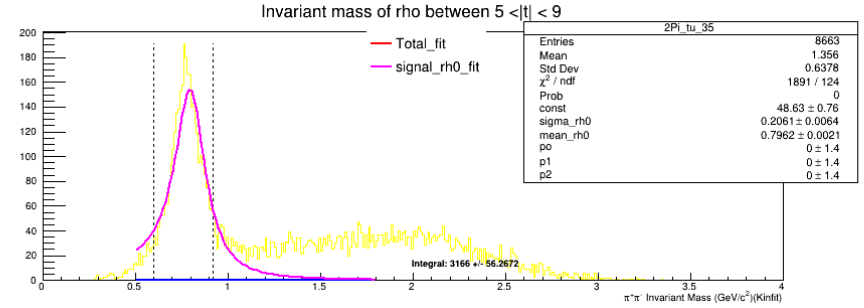
Yield of invariant mass of observed simulation Kinfit.



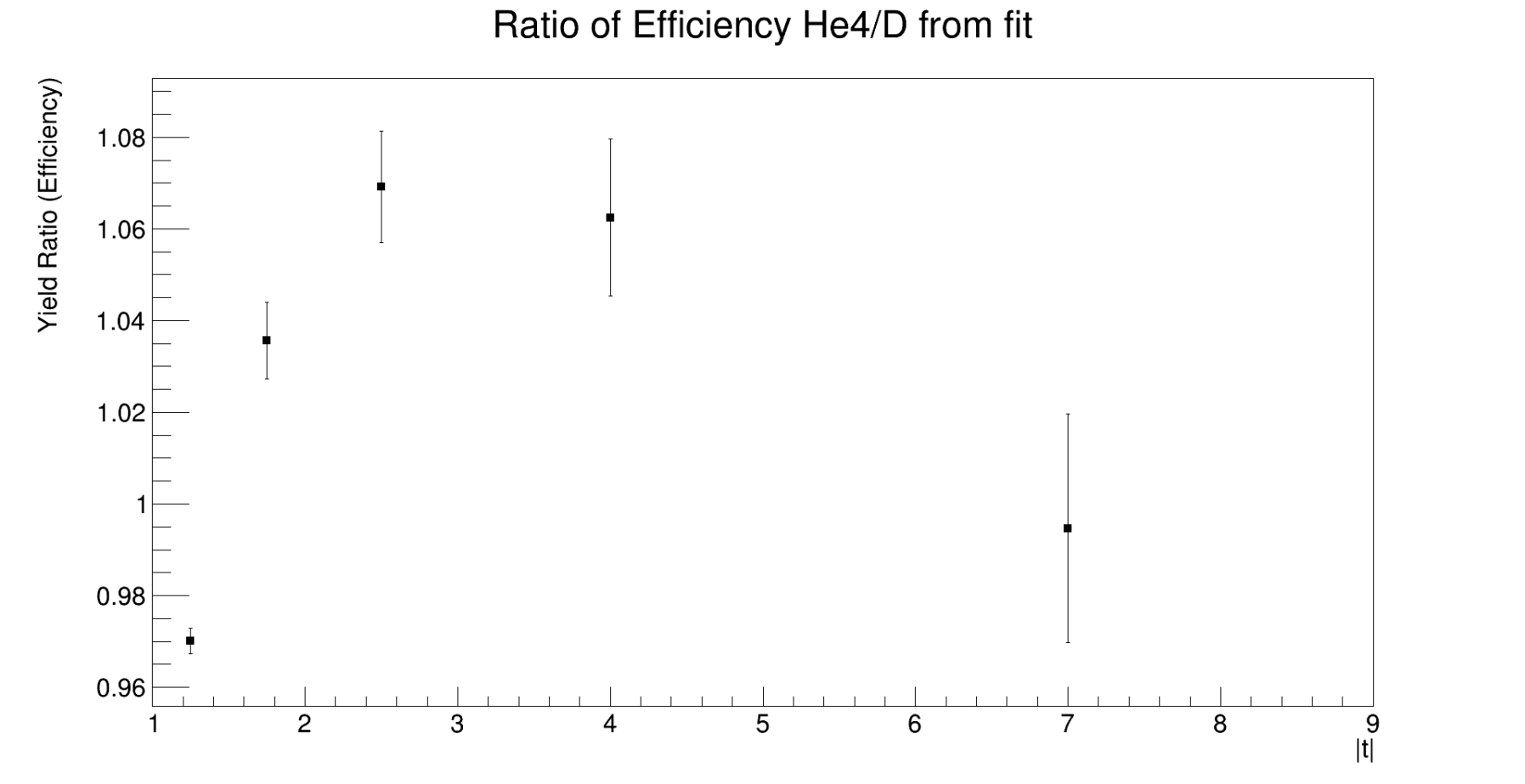








Yield of invariant mass of observed simulation. Helium



Final comparision of ratio of efficiency He4/D