Outline

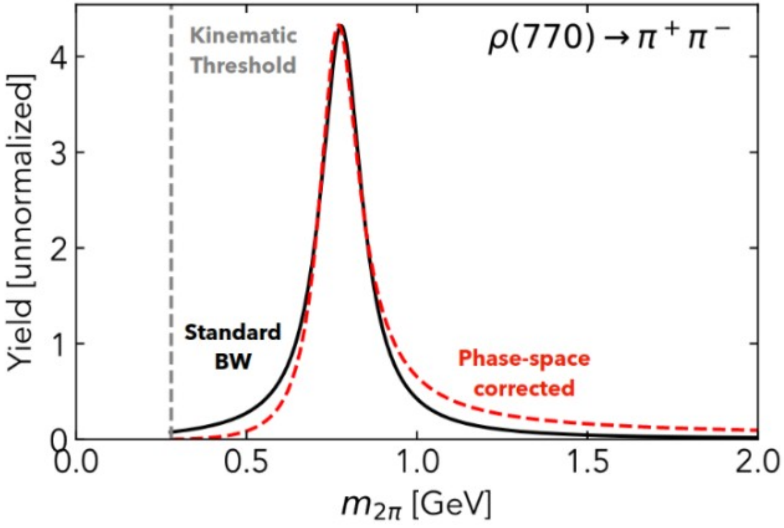
- Selection Criteria: (He4 and D2)
- Deuterium: Yield from Thrown MC, Simulated MC ,Data and efficiency
- Helium: Yield from Thrown MC, Simulated MC ,Data and efficiency
- Plots of Data Yield (He4 and D2)
- Luminosity calculation and plot of Yield/Luminosity
- Plots of Efficiency corrected yield
- Prelim Cross Section Ratio (He4/D2)

Selection cut for both Helium and Deuterium

- Extra tracks =0;
- Extra Showers =0;
- Confidence Level cut > 0.001
- Beam Energy > 6.5 GeV
- Missing Momentum < 250 Mev/c

Phase-space Corrected Relativistic Breit-Wigner function (As a signal)

For wide resonances near threshold, this is a large distortion; especially big for the $\rho(770)$



3. Contributions from ρ^0, $f_0(980)$, and $f_2(1270)$

Contributions from ρ^0, $f_0(980)$, and $f_2(1270)$ mesons are described analytically. The shapes of these resonances are described with a relativistic Breit-Wigner function (rBW) [64,65]:

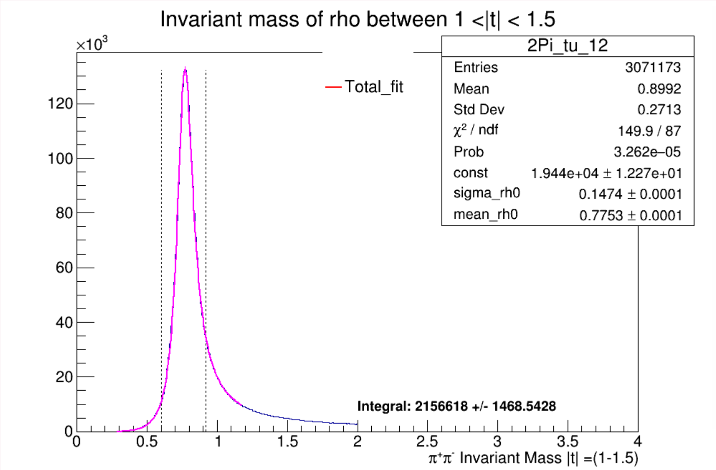
$$\mathrm{rBW}(M_{\pi\pi}) = \frac{A M_{\pi\pi} M_0 \Gamma(M_{\pi\pi})}{\left(M_0^2 - M_{\pi\pi}^2\right)^2 + M_0^2 \Gamma^2(M_{\pi\pi})}, \quad (1)$$

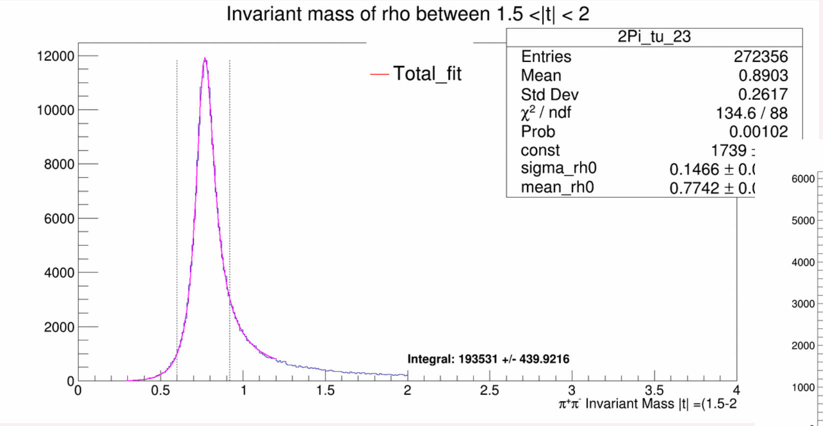
where M_0 is the mass of the resonance under study and A is a normalization constant. For wide resonances one should account for the dependence of the resonance width on mass:

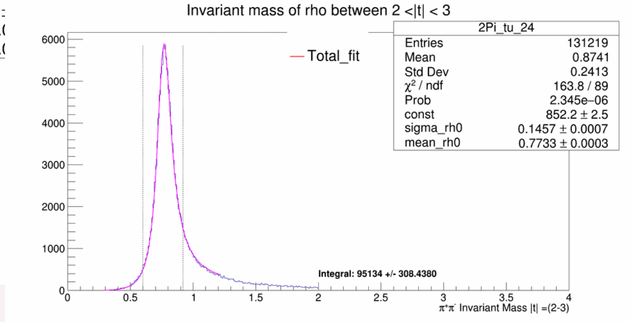
$$\Gamma(M_{\pi\pi}) = \left(\frac{M_{\pi\pi}^2 - 4m_\pi^2}{M_0^2 - 4m_\pi^2}\right)^{(2J+1)/2} \times \Gamma_0 \times M_0/M_{\pi\pi}, \quad (2)$$

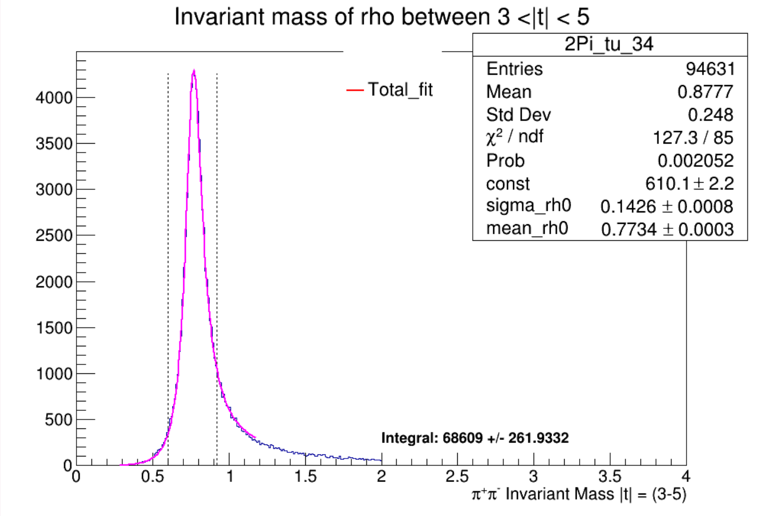
S. Acharya et al., Phys. Rev.C 91,064901 (2019)

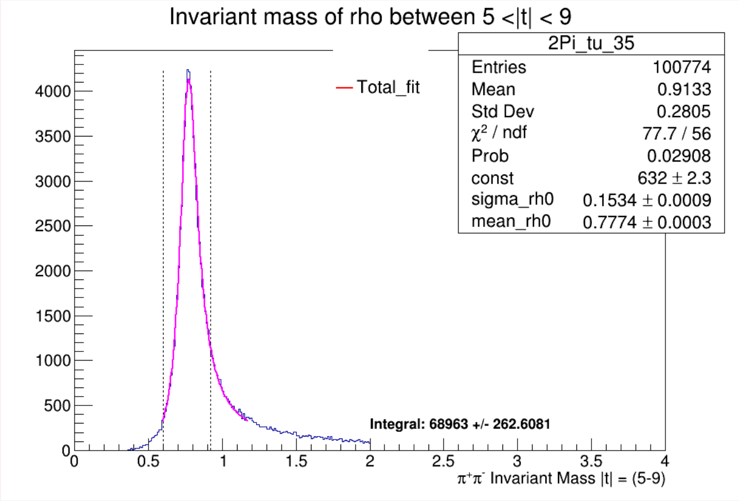
[A] Thrown MC: [γ + d➔ $\pi^+ + \pi^- + p + (n)$]



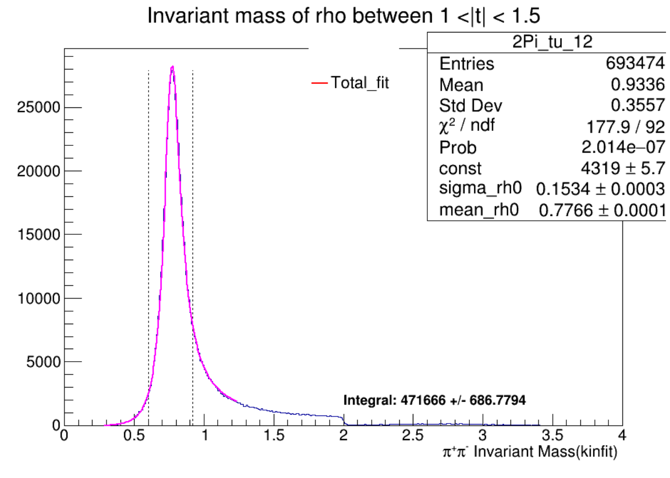


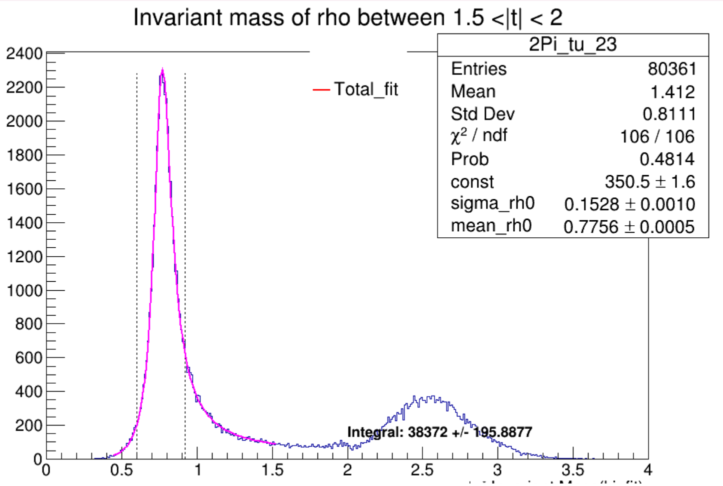


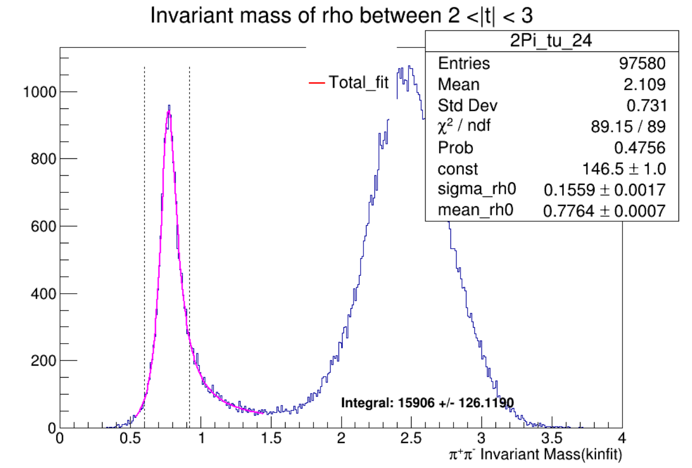


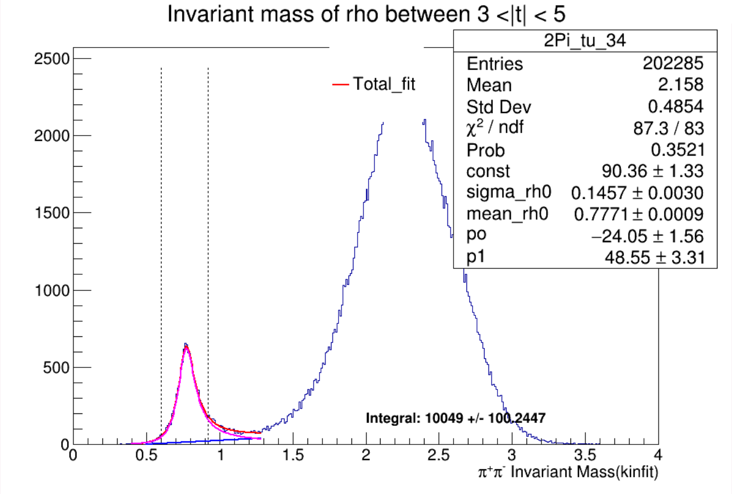


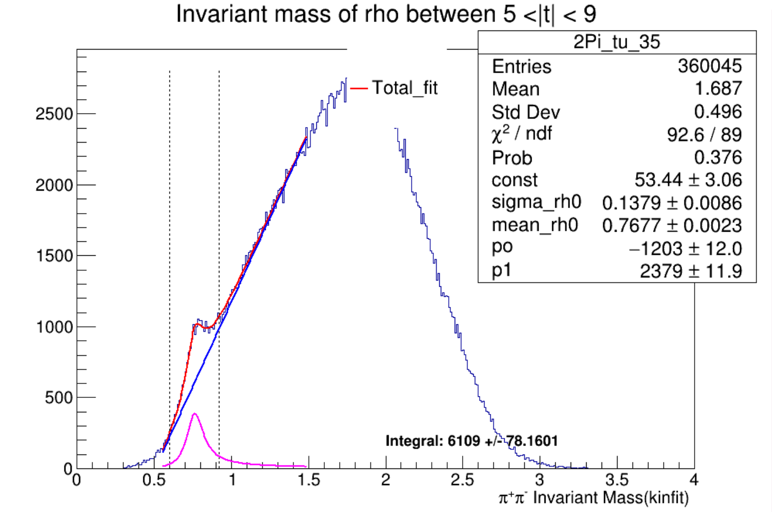
[B] Reconstructed MC: [$\gamma + d \rightarrow \pi^+ + \pi^- + p + (n)$]



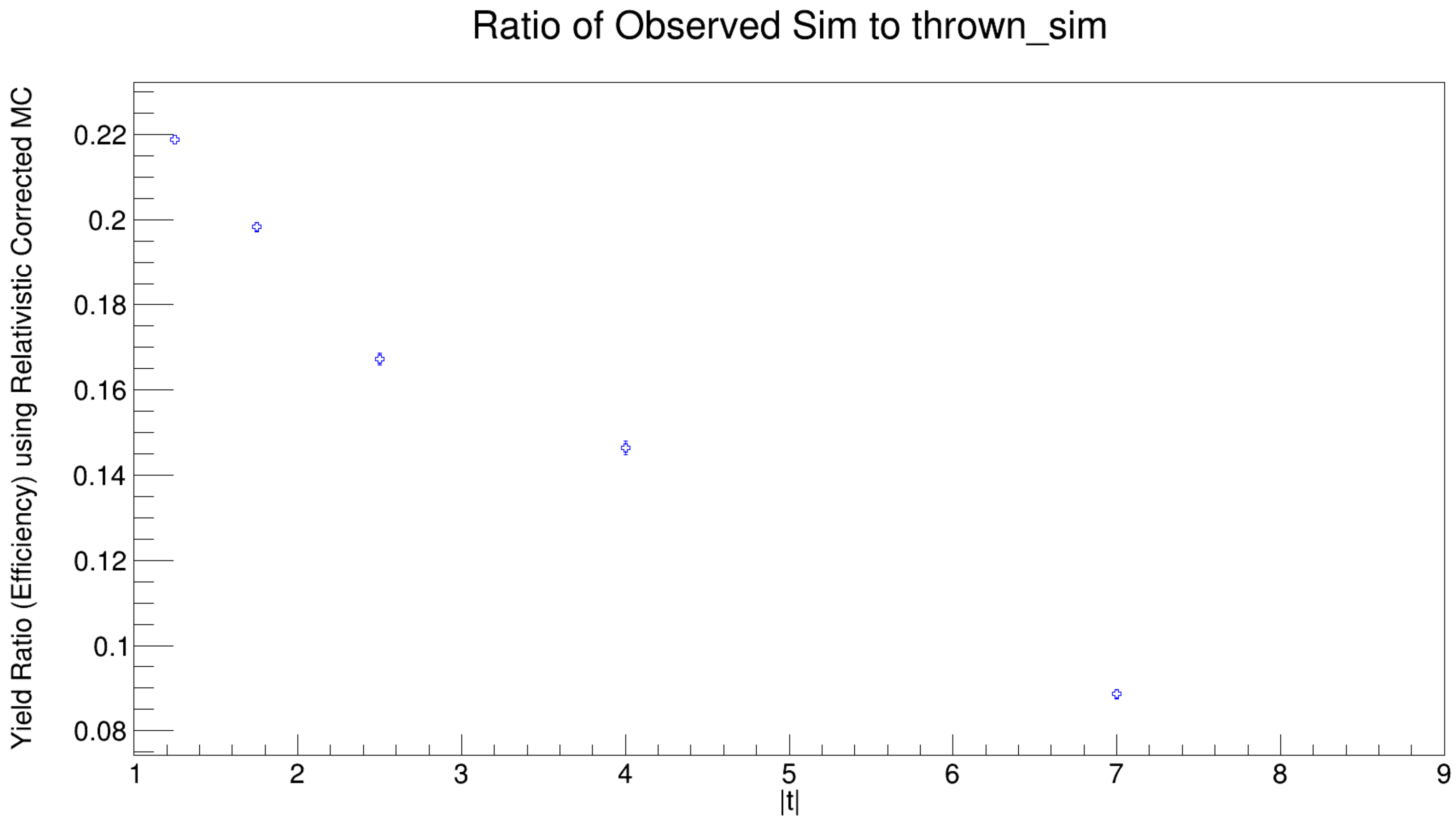




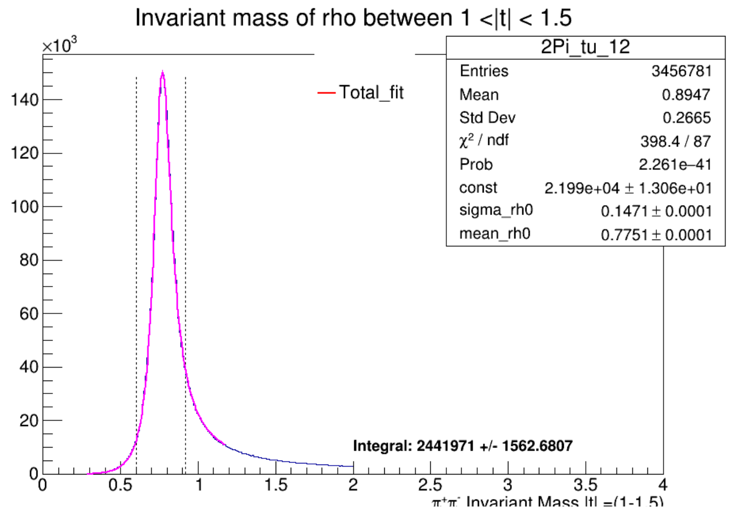


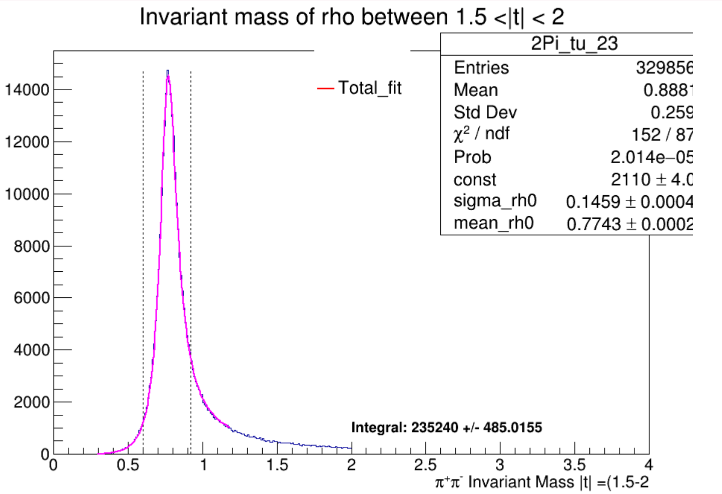


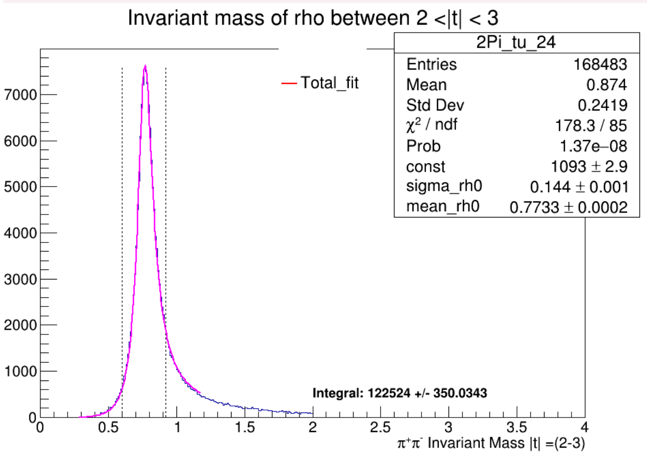
[C] Efficiency: [$\gamma + d \rightarrow \pi^+ + \pi^- + p + (n)$]

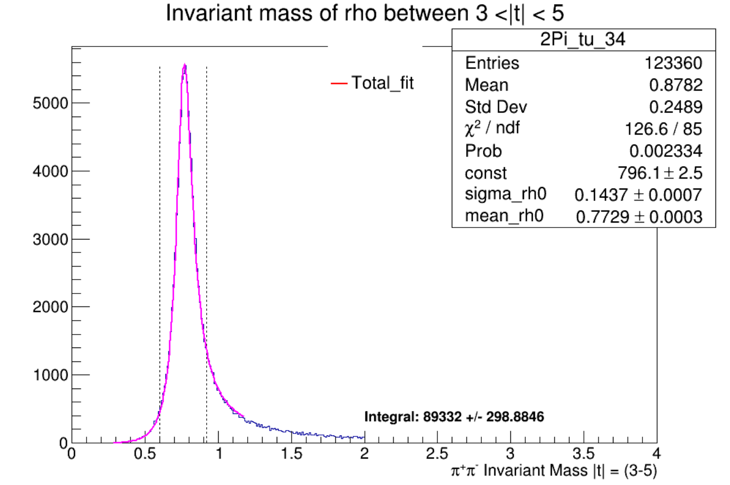


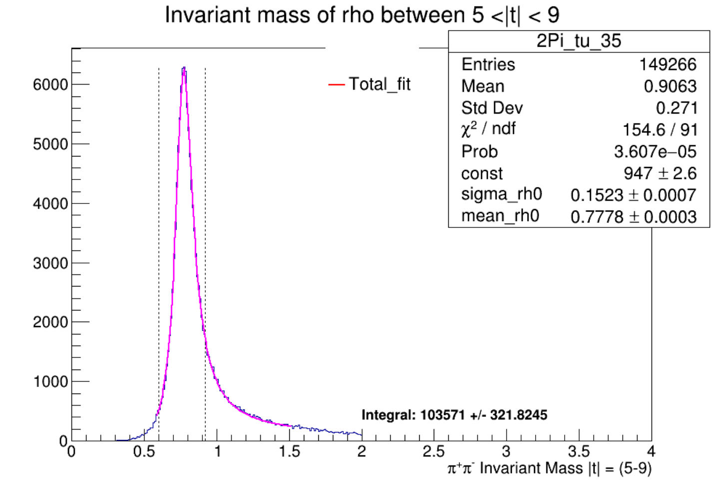
[D] Thrown MC: [γ + he4→ π^+ + π^- + p + (tritium)]



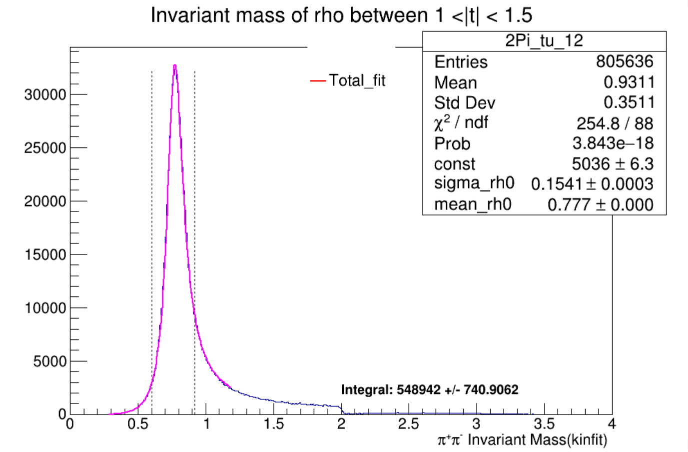


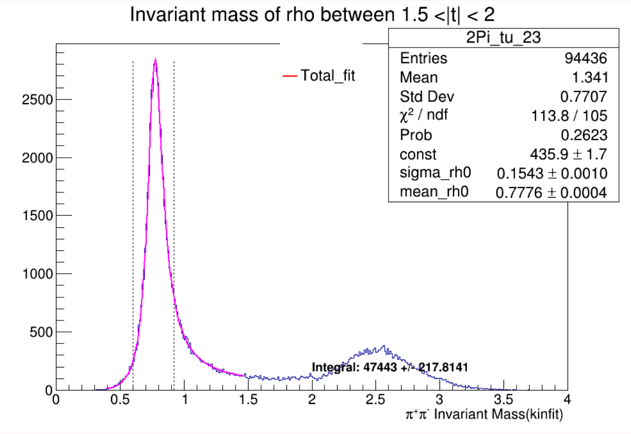


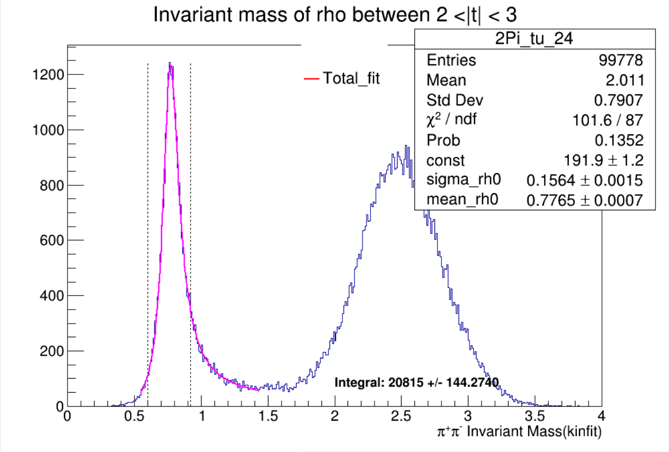


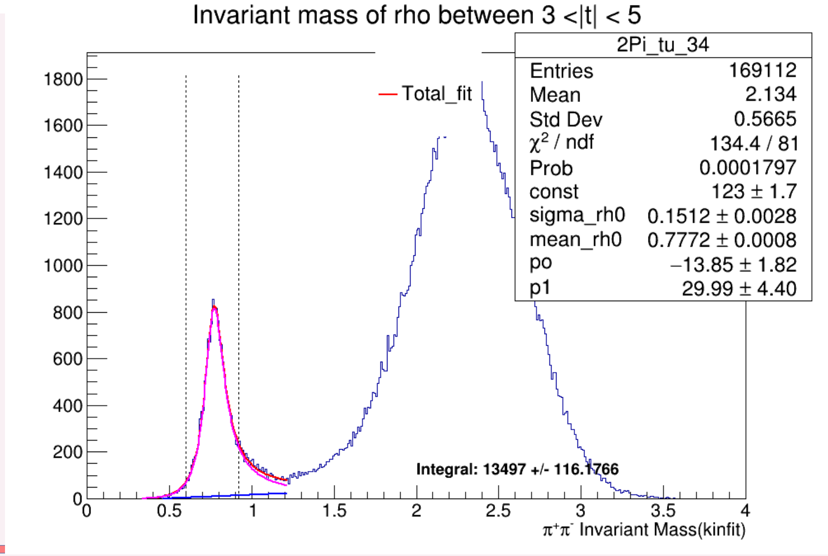


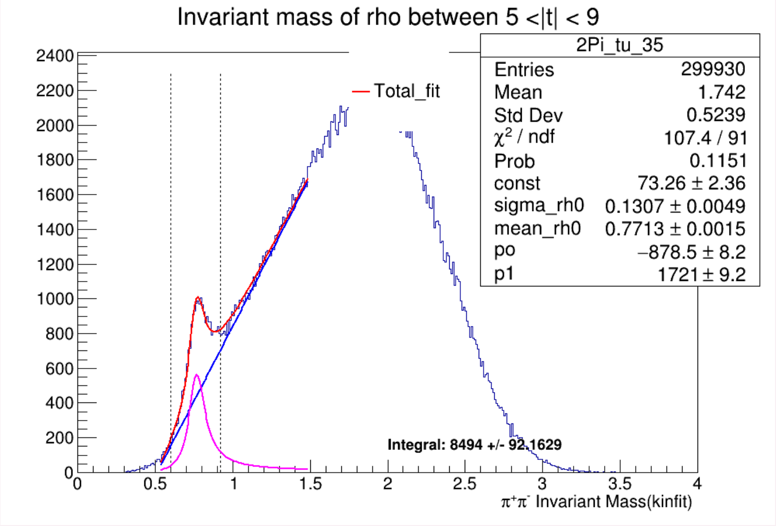
[E] Reconstructed MC: [γ + he4→ $\pi^+ + \pi^- + p$ + (tritium)]



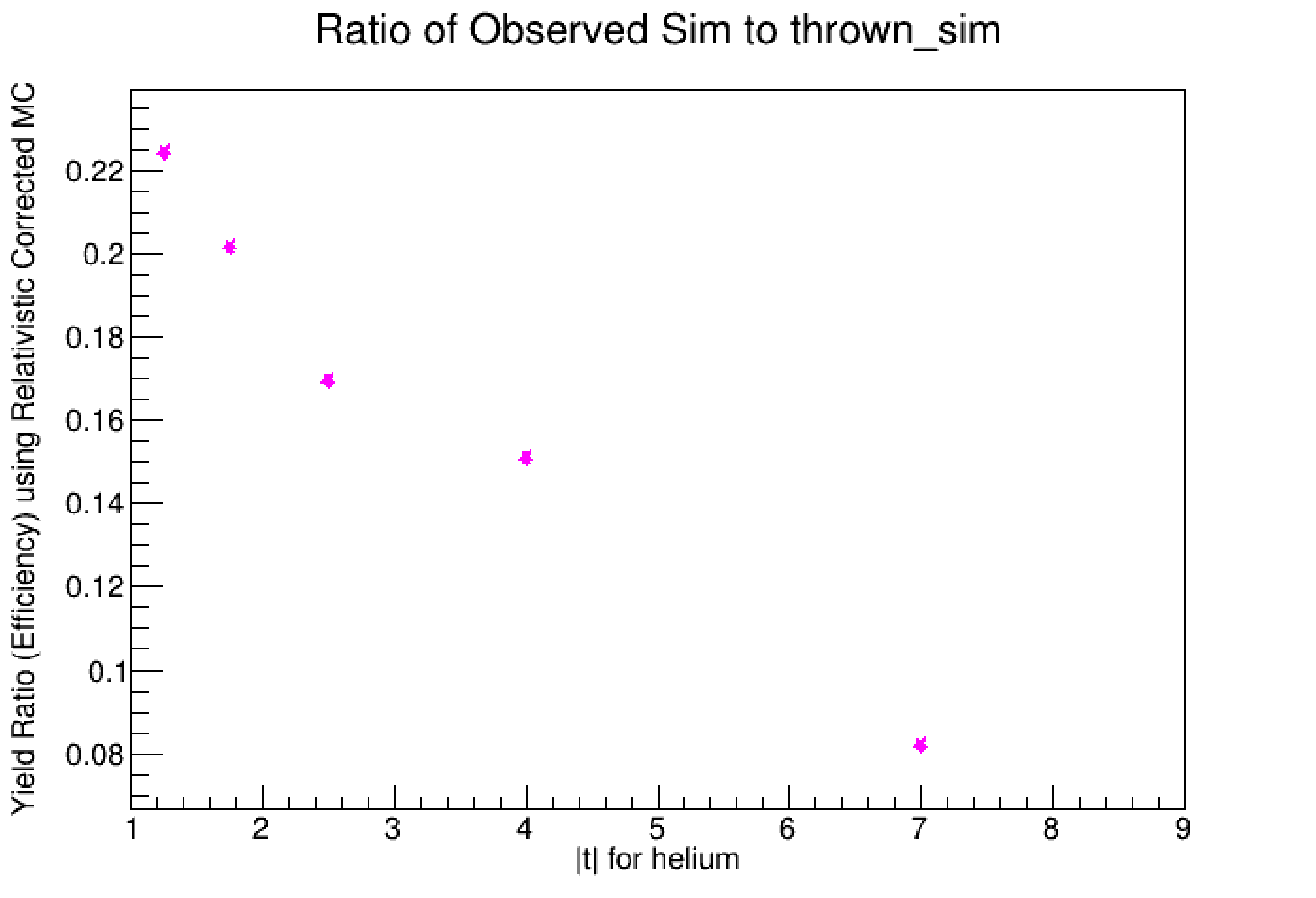




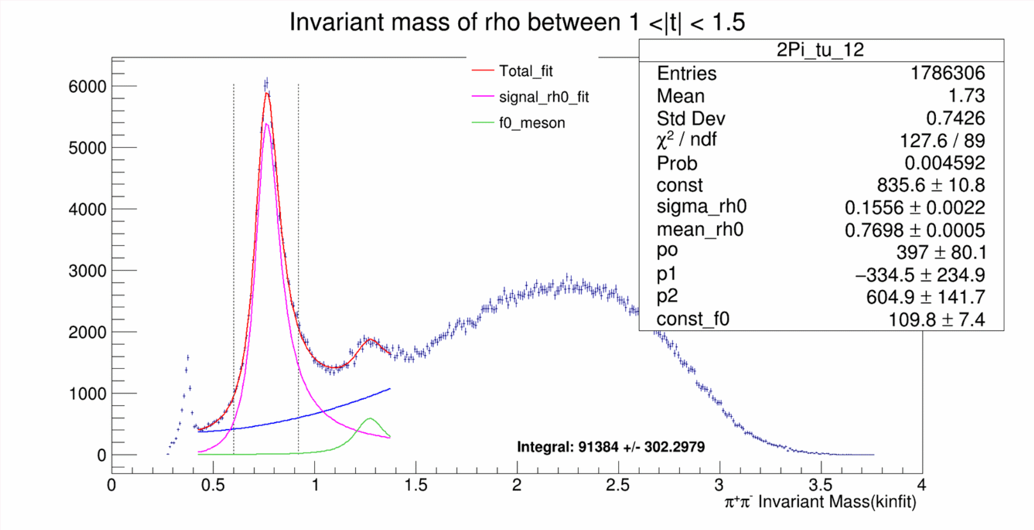


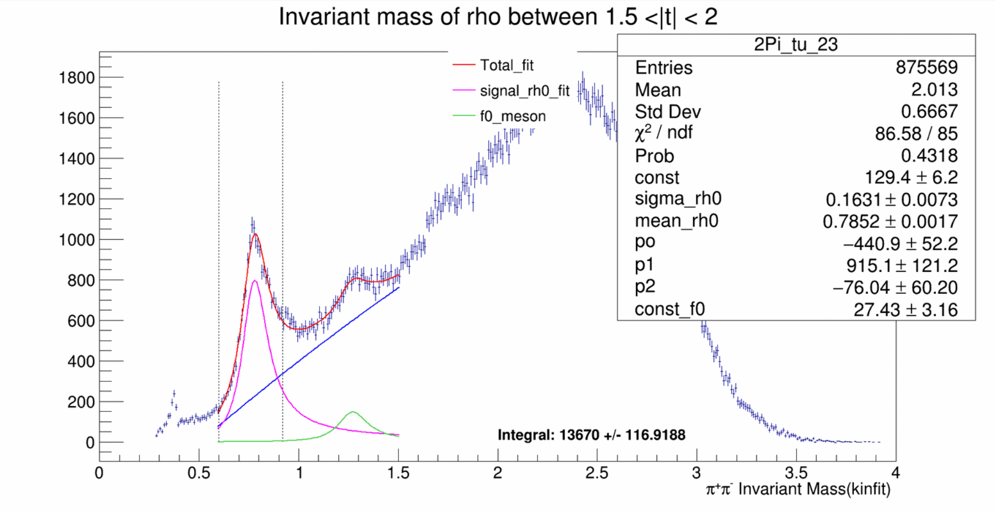


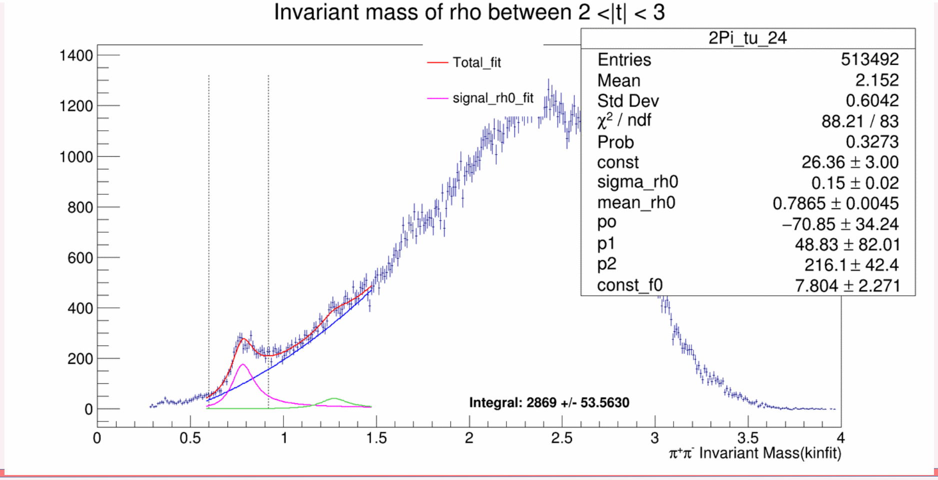
[F] Efficiency: [γ + he4→ $\pi^+ + \pi^- + p$ + (tritium)]

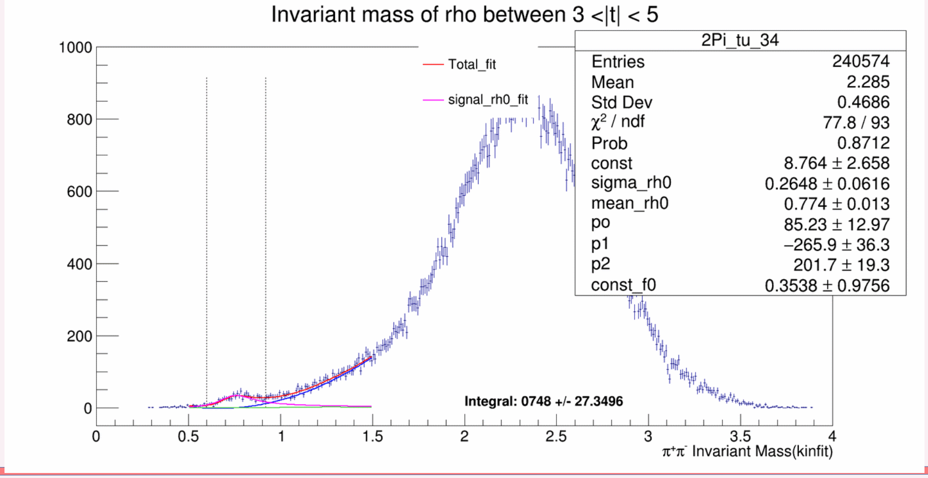


[G] Yield Calculation: [$\gamma + d \rightarrow \pi^+ + \pi^- + p + (n)$]

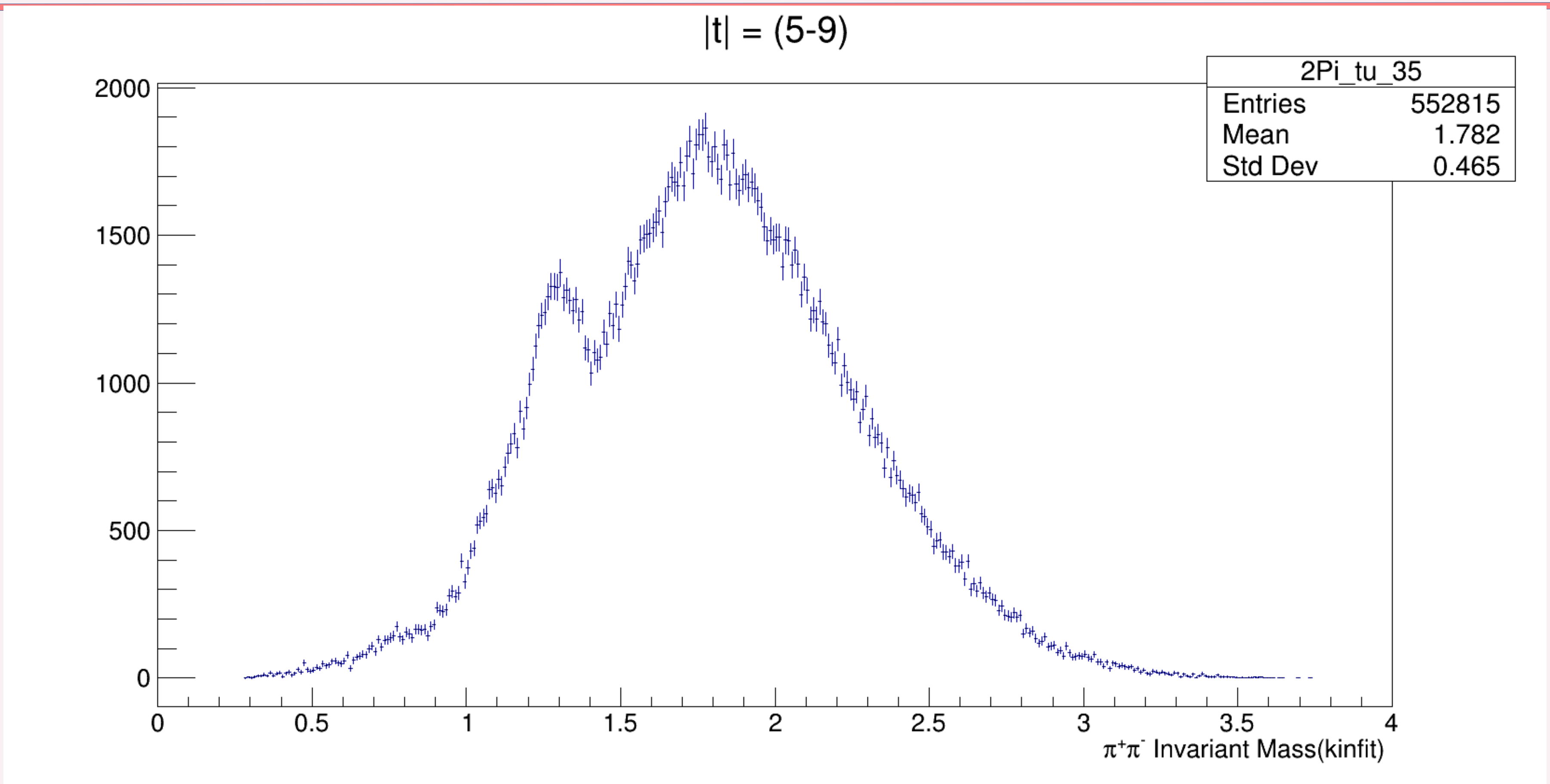






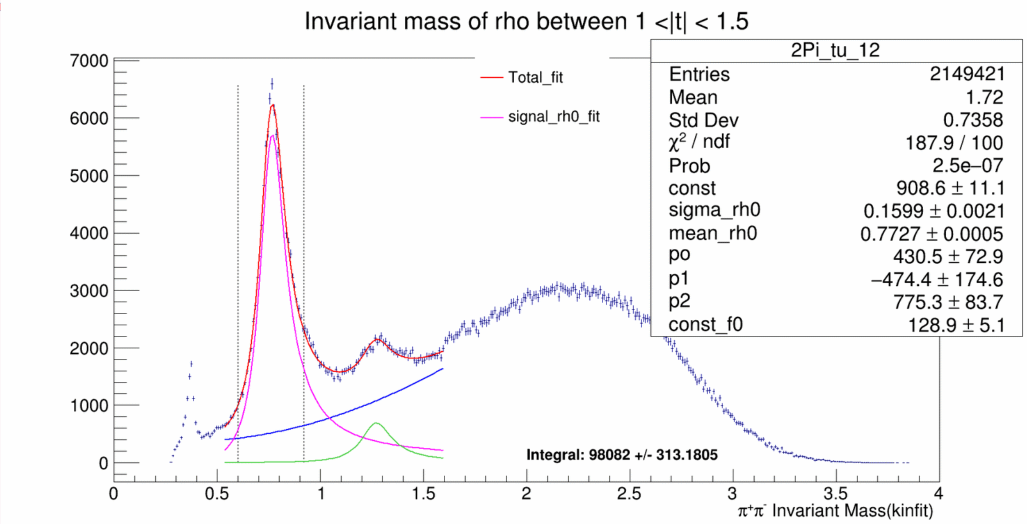


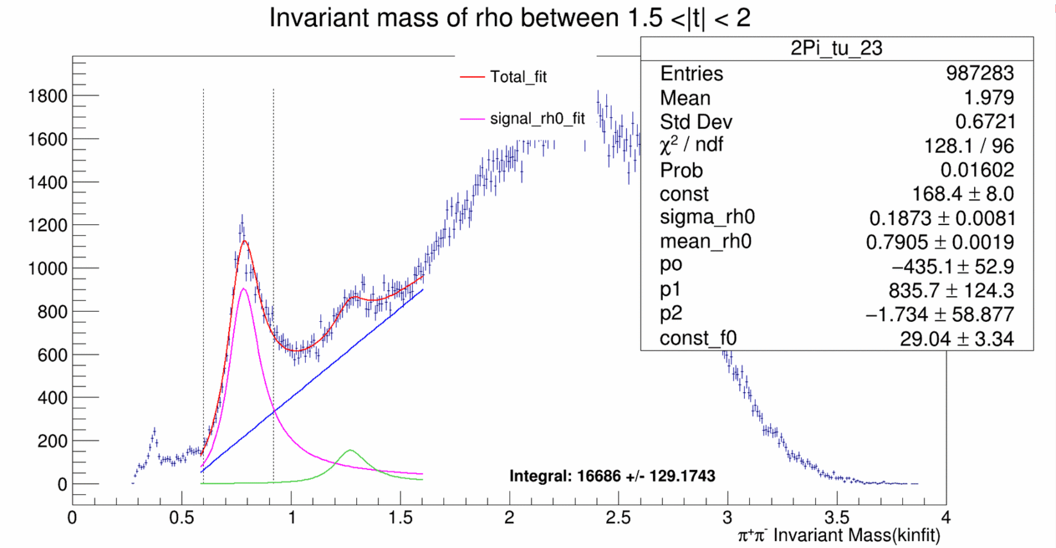
[H] Calculation: [$\gamma + d \rightarrow \pi^+ + \pi^- + p + (n)$]

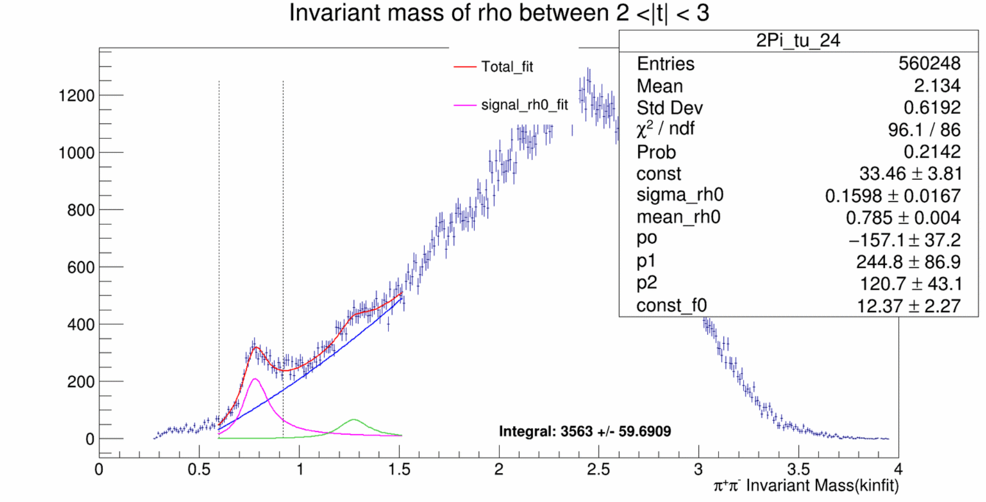


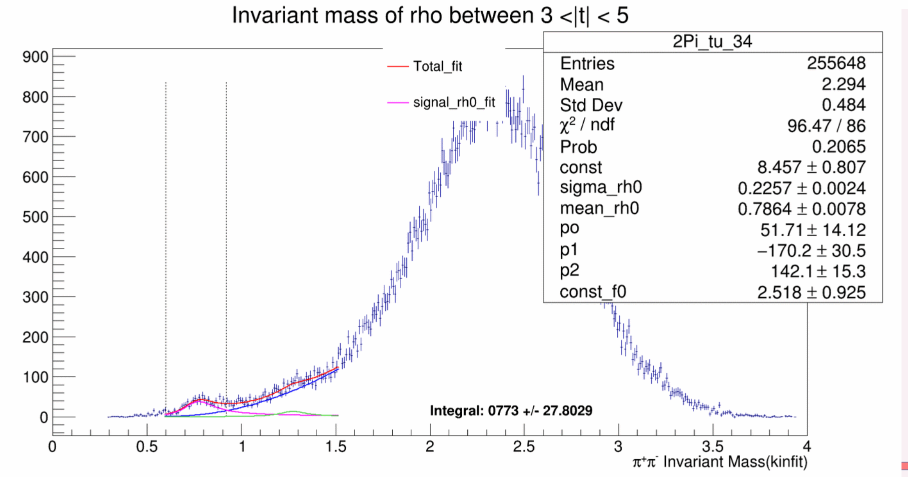
Still working out to remove background from Signal

[I] Yield Calculation: [γ + he4→ π⁺ + π⁻ + p + (trition)]

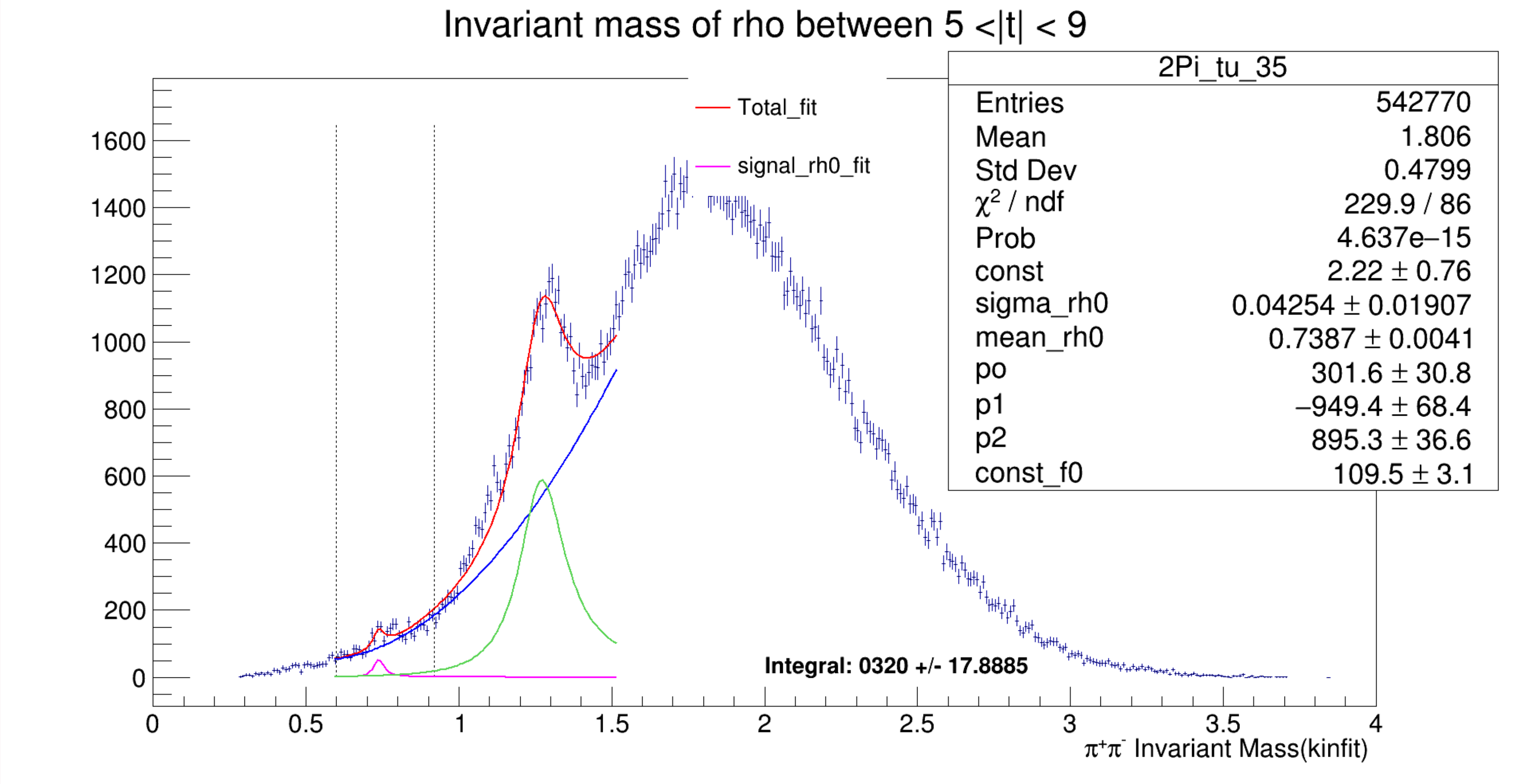




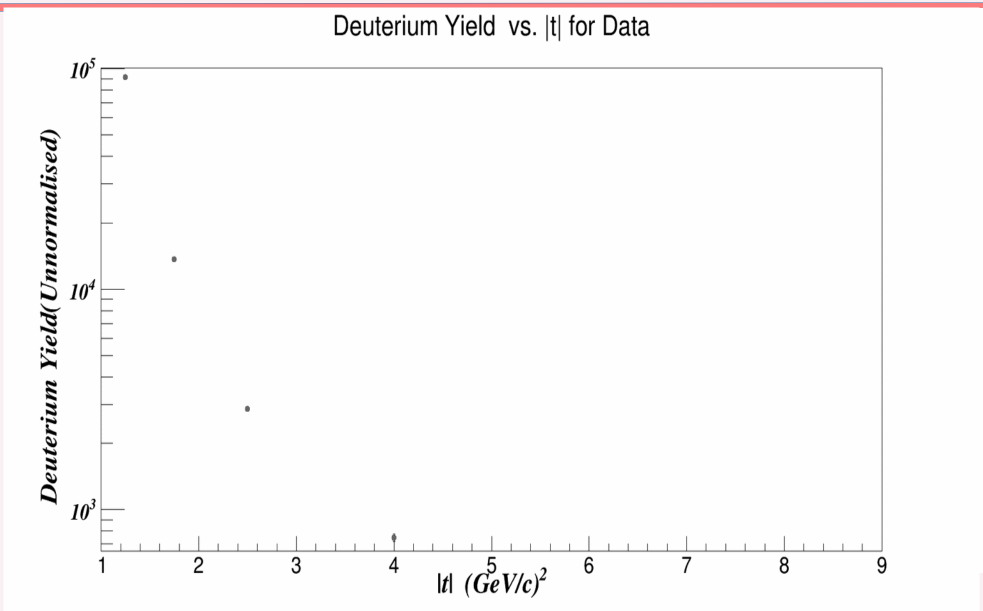


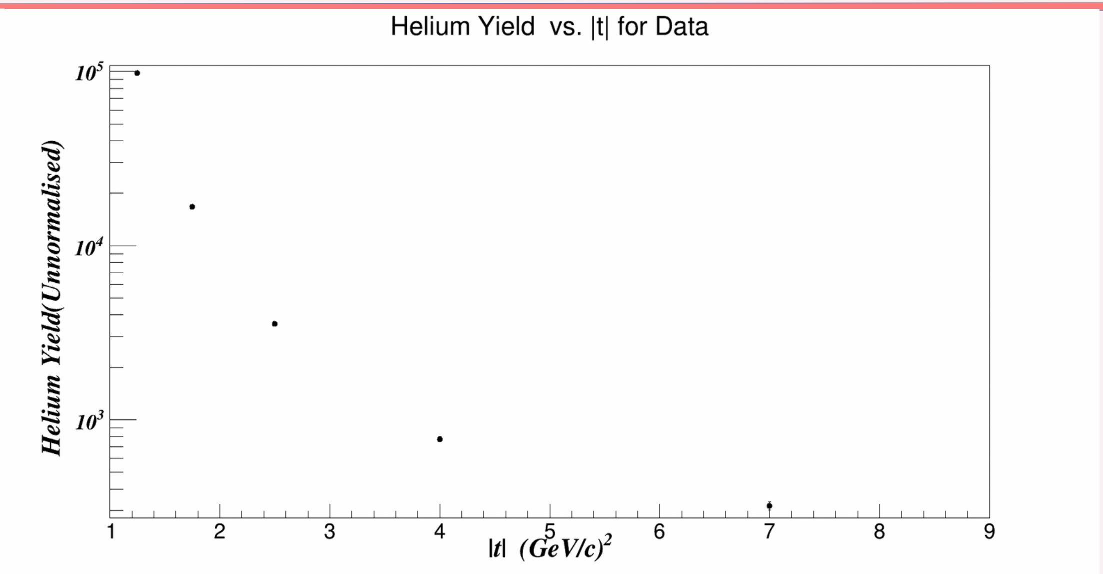


[J] Yield Calculation: [γ + he4→ $\pi^+ + \pi^- + p$ + (trition)]



[K] Yield Comparison





[L] Flux Calculation for He4 and D2

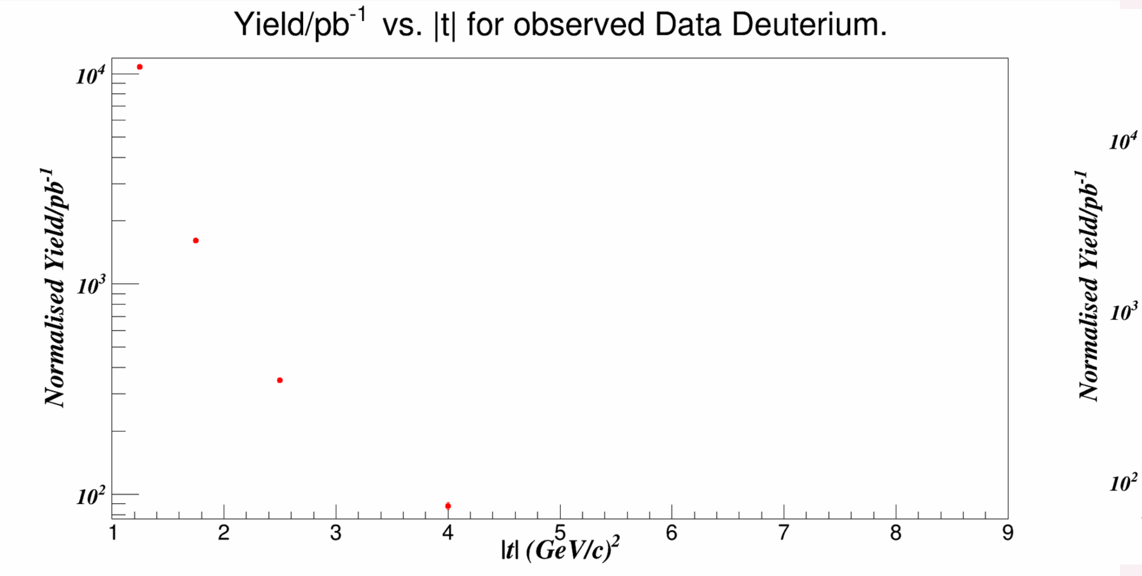
Flux for Helium

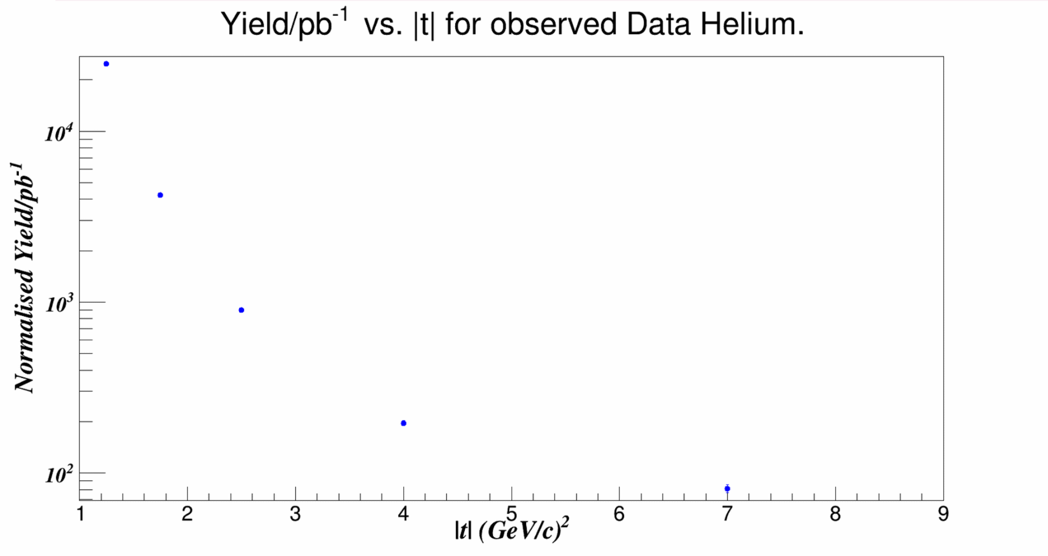
Total flux (E > 7.0 GeV)	(10e12):	27.9635237	Lumi (per nucleus)	(pb-1)	15.1032269
Total flux (E > 8.0 GeV)	(10e12):	21.5820348	Lumi (per nucleus)	(pb-1)	11.6565556
Total flux (E > 6.5 GeV)	(10e12):	29.2721365	Lumi (per nucleus)	(pb-1)	15.8100147

Flux for Deuterium

Total flux (E > 7.0 GeV)	(10e12):	11.2603676	Lumi (per nucleus)	(pb-1)	16.2697120
Total flux (E > 8.0 GeV)	(10e12):	8.8104260	Lumi (per nucleus)	(pb-1)	12.7298769
Total flux (E > 6.5 GeV)	(10e12):	11.7697761	Lumi (per nucleus)	(pb-1)	17.0057385

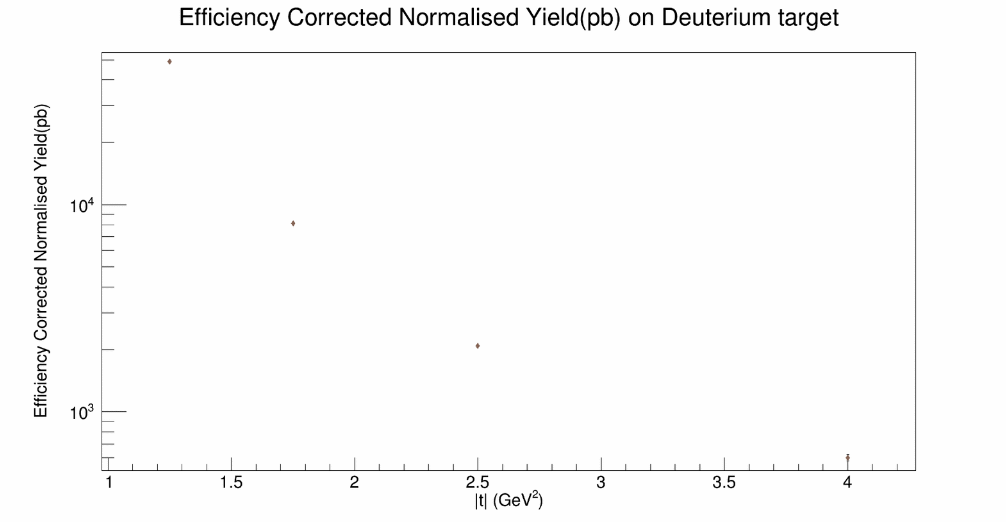
[M] Normalised Yield with Luminosity

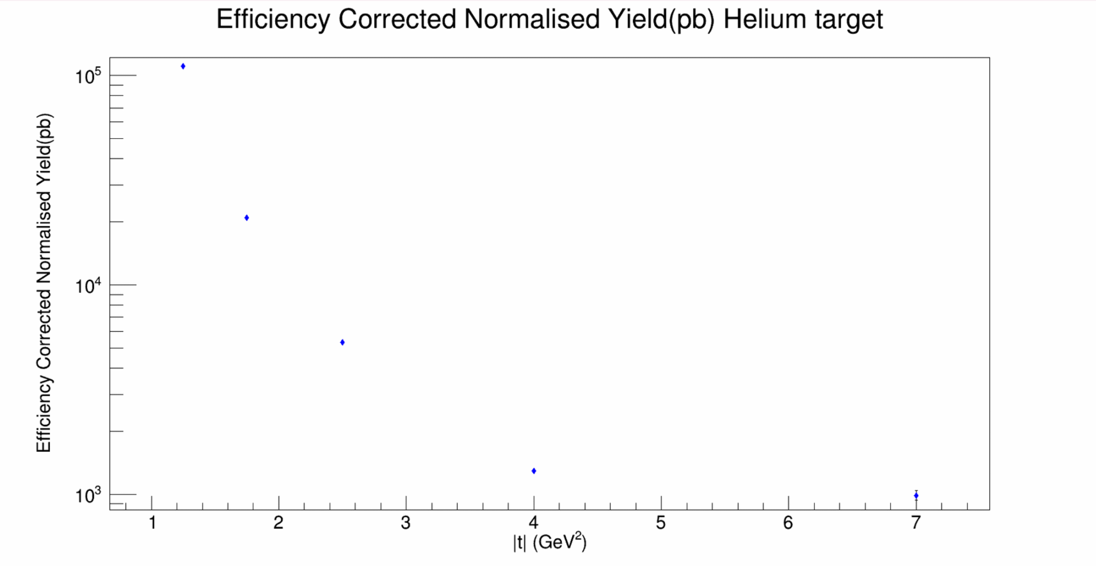




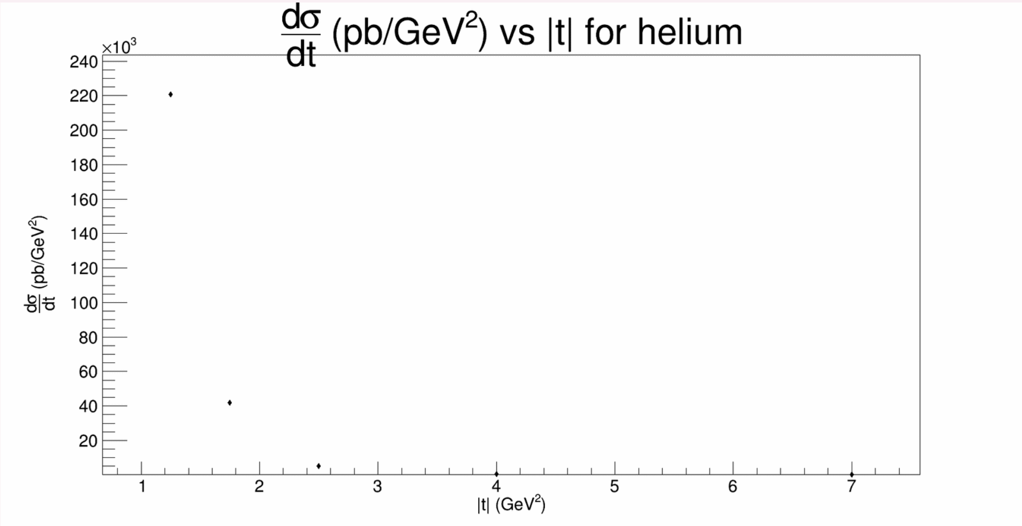
Normalised Yield = Yield /(Lumi per nucleus / A)
Where A = 2 for D;
And A = 4 for He4;

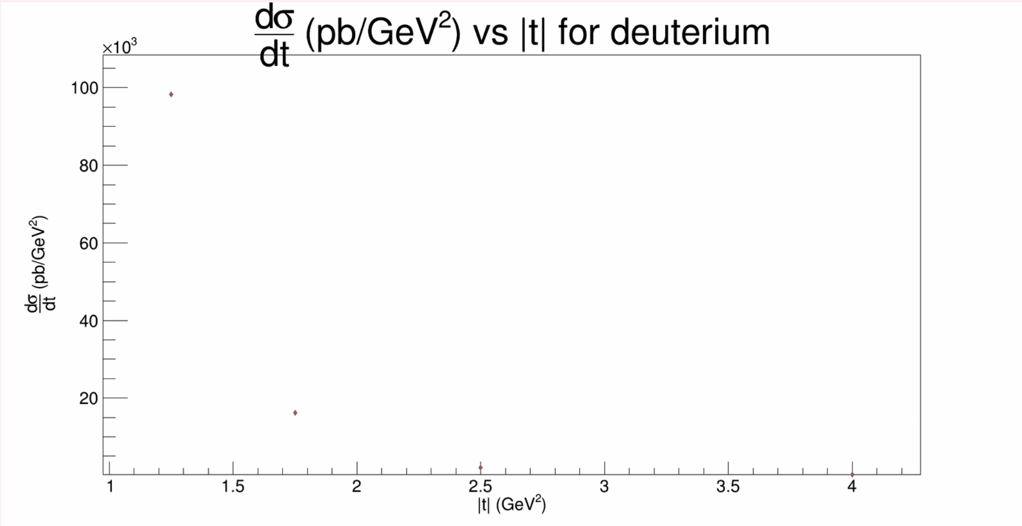
[N] Efficiency corrected Normalised Yield for D2 and He4





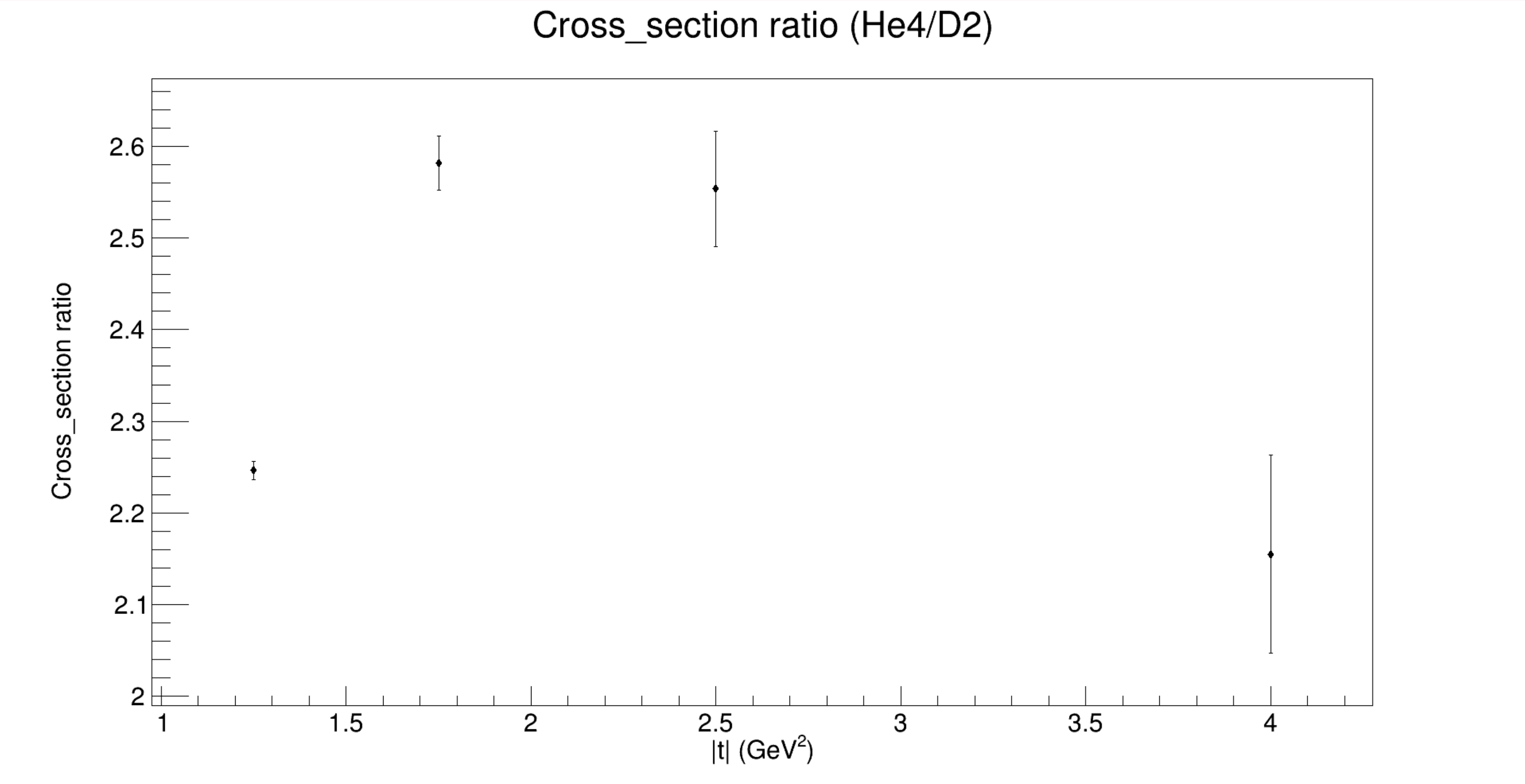
Dividing Normalised yields by efficiency



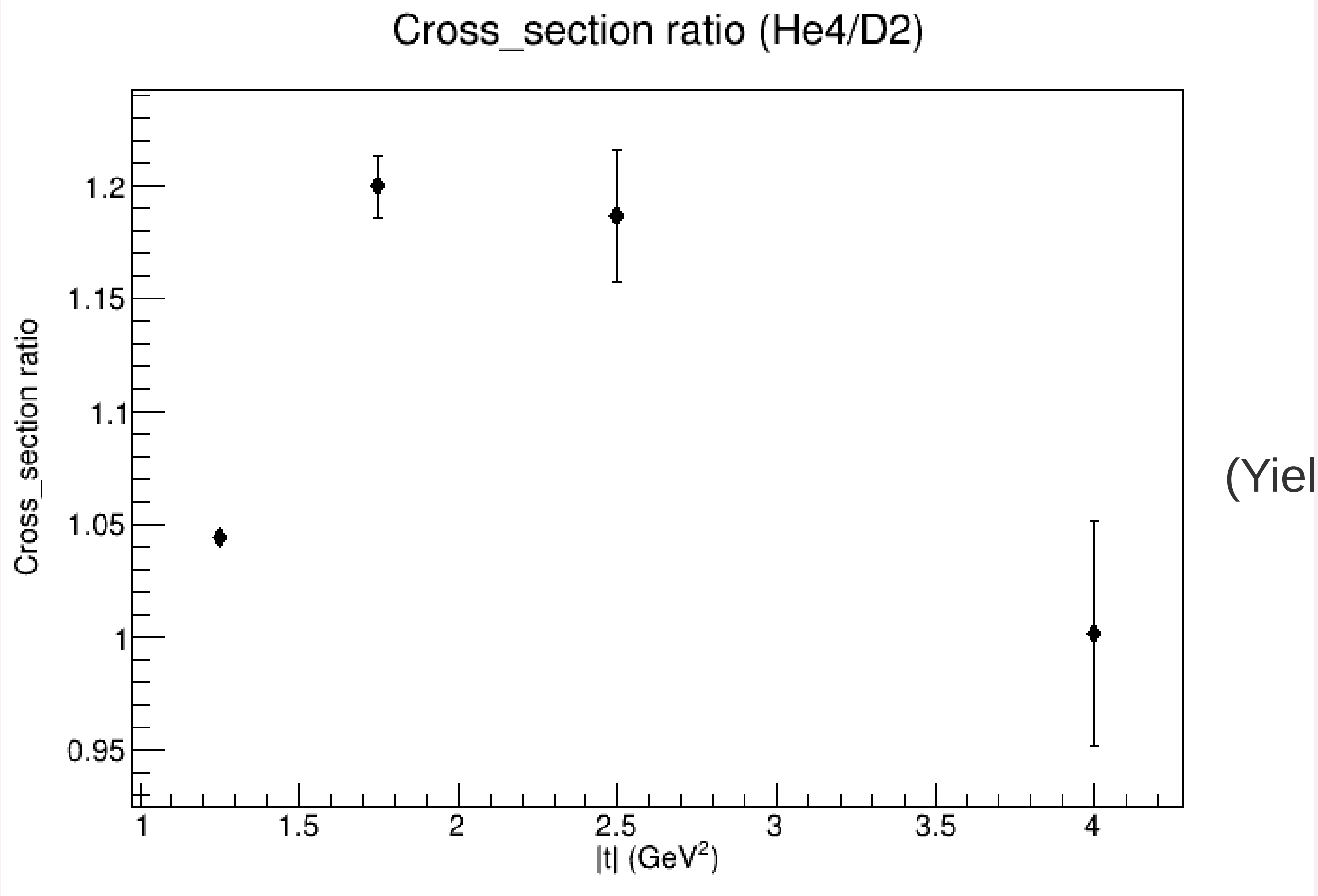


Dividing Efficiency corrected yield with bin size of |t|

Prelimn Results: Cross-Section Ratio



Backup



Dividing
(Yield_Heli/Effic_He)/(Yield_Deu/Effi_De)