u-Channel Progress

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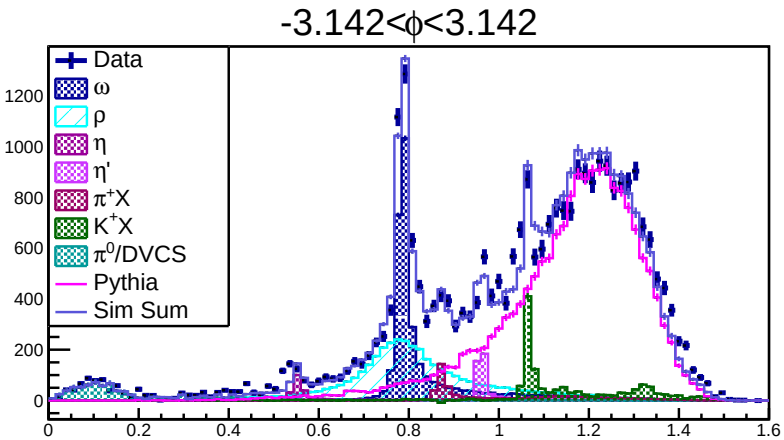
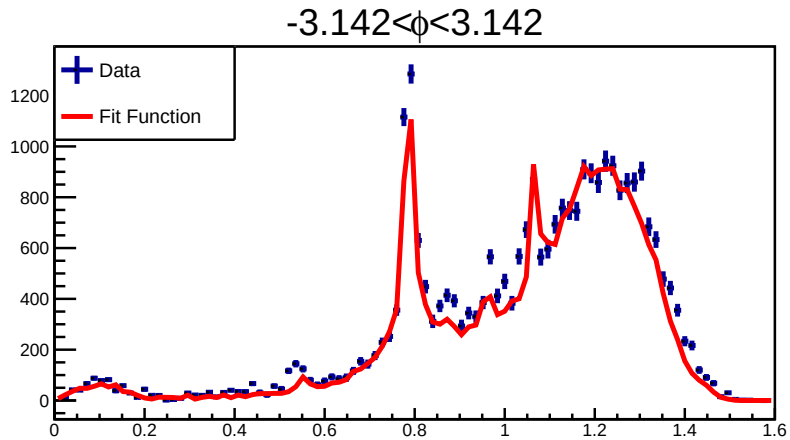
Recap

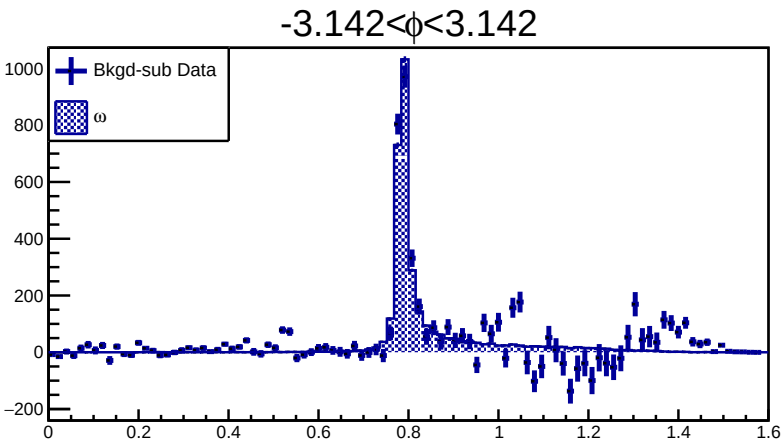
- Before the paper, I was working on the background/shape study for the u-channel data
- Used Pythia for improved background shape over SIMC model Xphasespace
- Added TF1 fit step after scaling

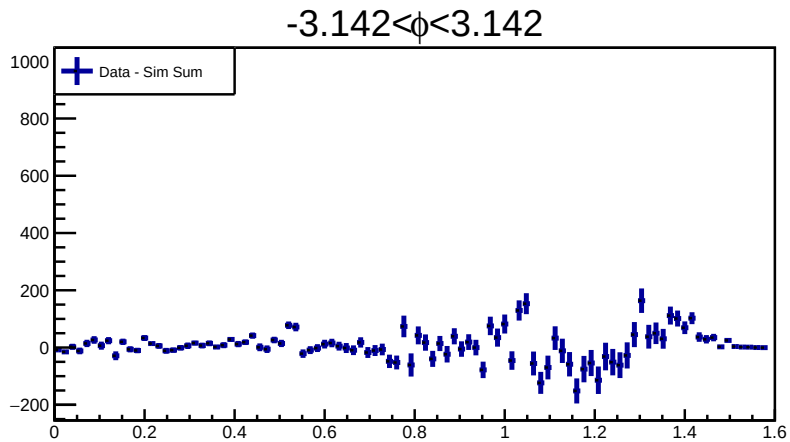
Sample Fitting Results

All data Q2=3, W=3.14, SHMS center





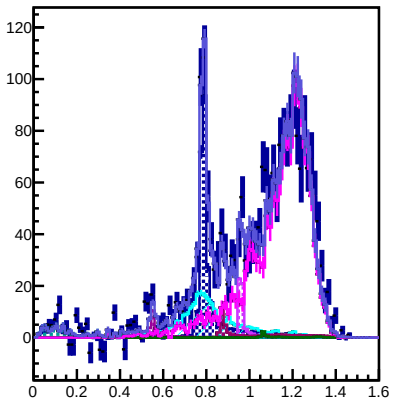




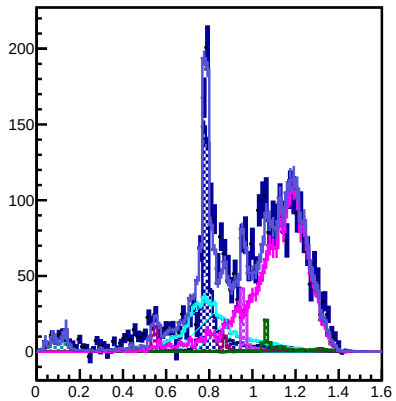
Binned Shape Study

All data Q2=3, W=3.14, SHMS center

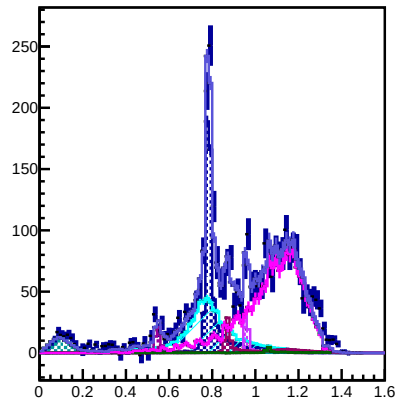
-3.142<ϕ<-2.356



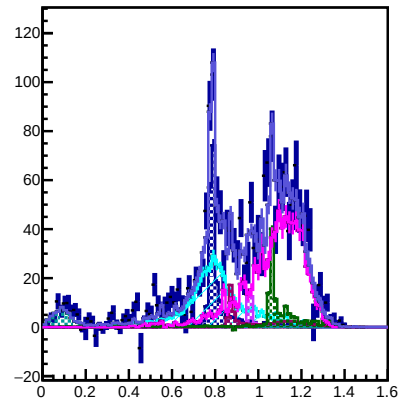
-2.356<ϕ<-1.571



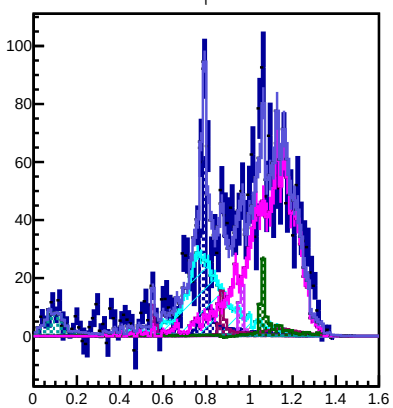
-1.571<ϕ<-0.785



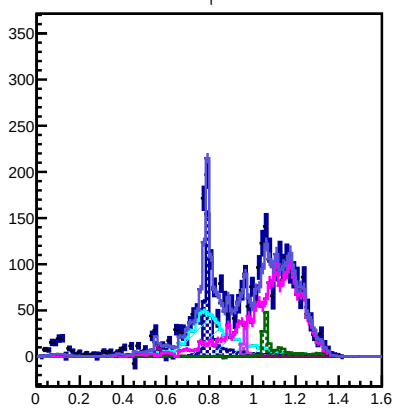
-0.785<ϕ<0.000



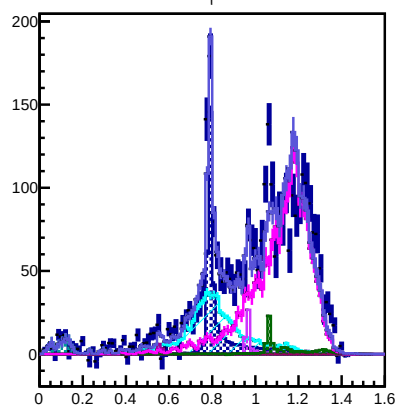
0.000<ϕ<0.785



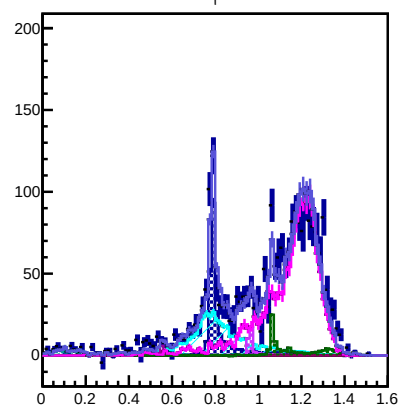
0.785<ϕ<1.571



1.571<ϕ<2.356



2.356<ϕ<3.142



Preliminary Asymmetry

Q2=3, W=3.14, SHMS center, all *u*: missing mass window 0.75 – 0.95 GeV.

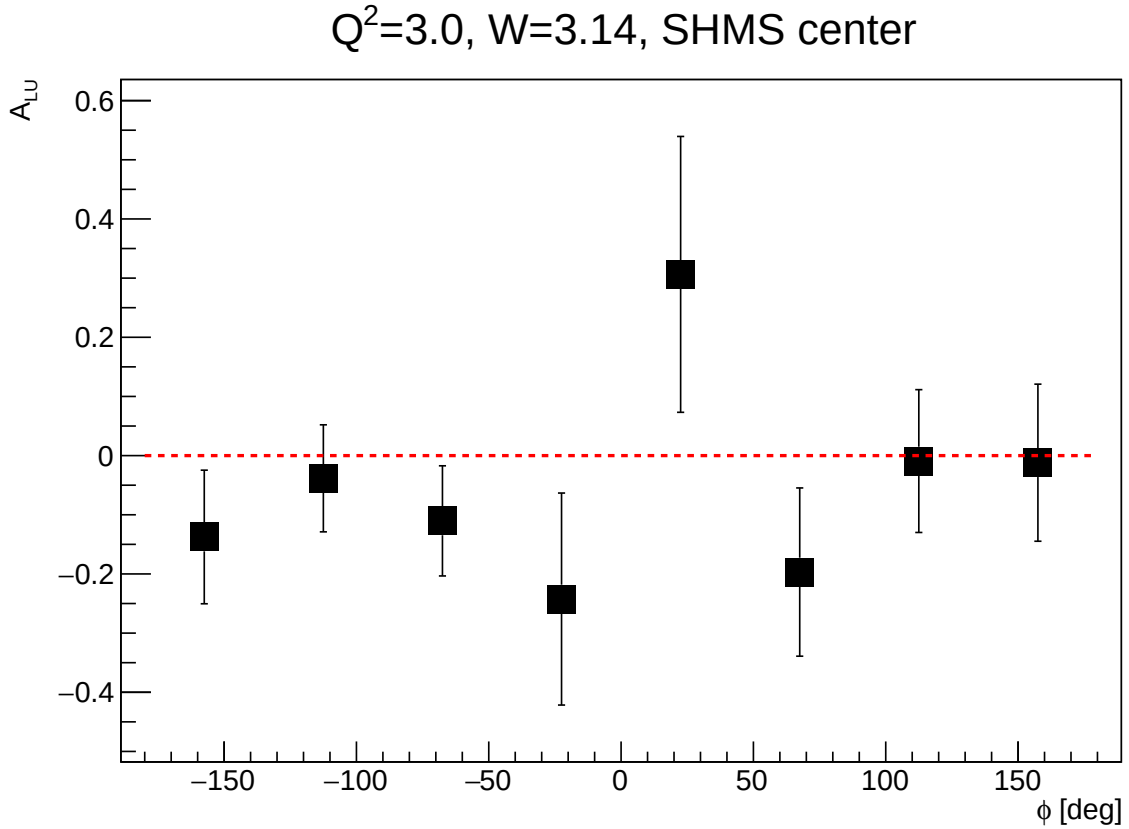
	Helicity +1			Helicity -1				
phi bin	Counts	Background	Omega	Counts	Background	Omega	Asymmetry	Stat err
1	292.372	160.058	132.314	310.539	141.339	169.2	-0.122	0.101
2	539.742	293.97	245.772	553.742	290.517	263.225	-0.034	0.081
3	609.933	367.469	242.464	643.266	347.96	295.307	-0.098	0.083
4	279.85	200.276	79.5742	336.684	213.238	123.446	-0.216	0.159
5	329.93	226.542	103.388	289.597	230.519	59.078	0.273	0.208
6	532.747	390.572	142.175	563.247	360.68	202.567	-0.175	0.127
7	456.423	281.171	175.252	440.923	262.713	178.21	-0.008	0.107
8	305.817	183.867	121.95	303.317	170.447	132.87	-0.043	0.122

Same error equation as in Ivan's K^+ analysis (including only physics backgrounds, not coincidence and dummy subtraction)

$$A = \frac{Y^+ - Y^-}{Y^+ + Y^-}, \qquad \delta_{stat}(A) = \frac{2\sqrt{(Y^+)^2 N^- + (Y^-)^2 N^+}}{(Y^+ + Y^-)^2}$$

Where $Y^\pm = Y^\pm_{total} - Y^\pm_{bkgd}$ and $N^\pm = Y^\pm_{total} + Y^\pm_{bkgd}$.

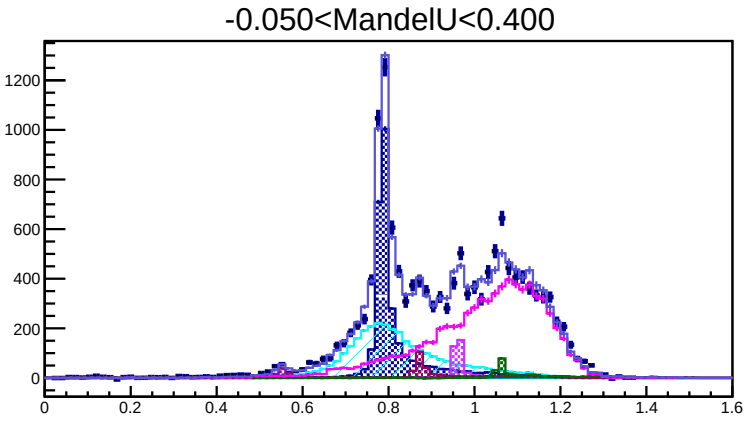
Prelim Asym Plot

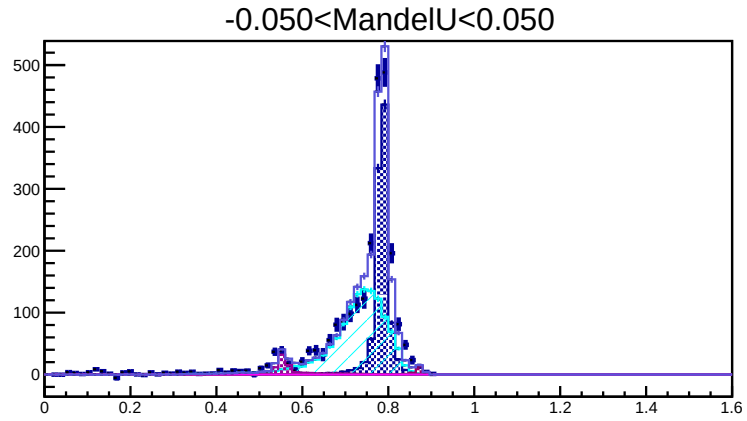


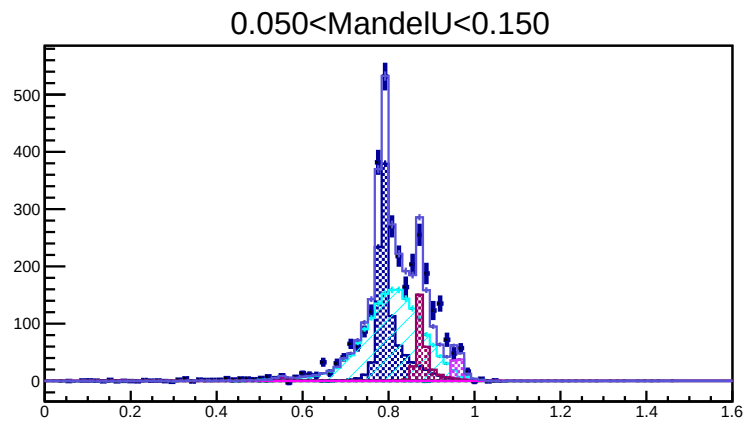
All points within 2σ of zero, no clear $\sin\phi$ shape, systematics will be large.

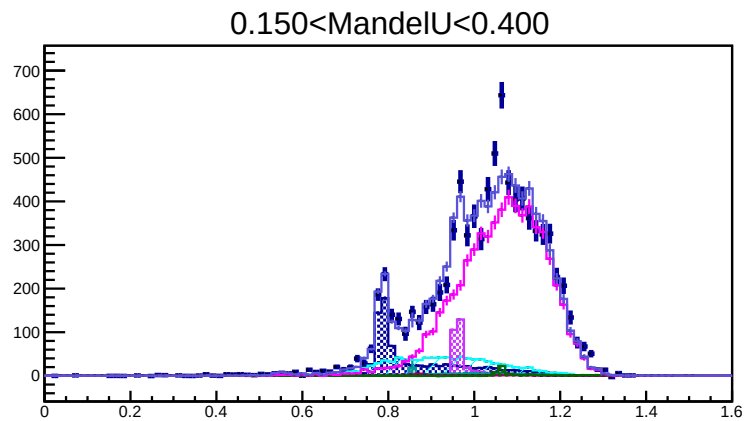
Production Ratios

If asymmetry isn't significant, then what about the production ratios of different mesons?

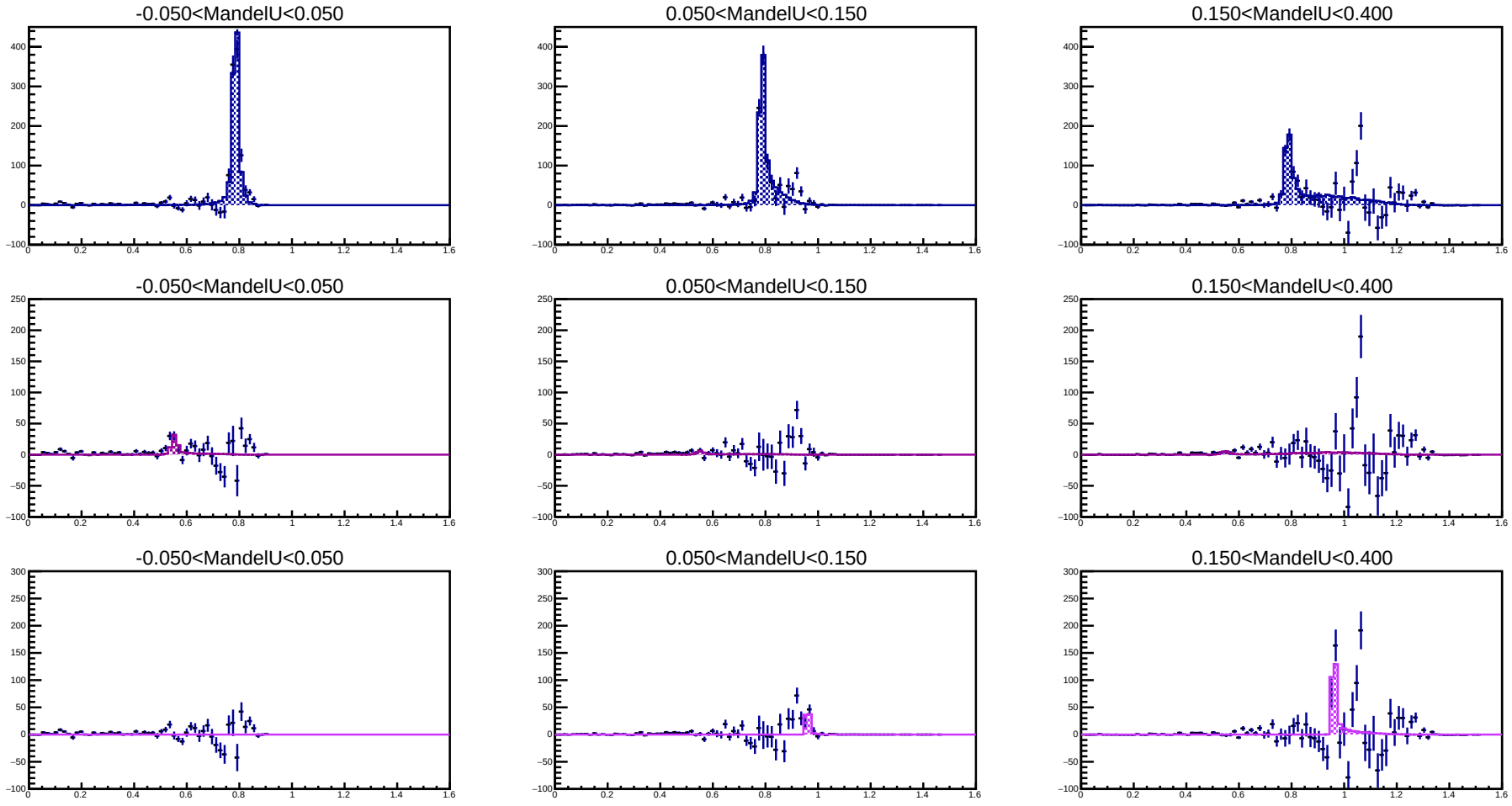






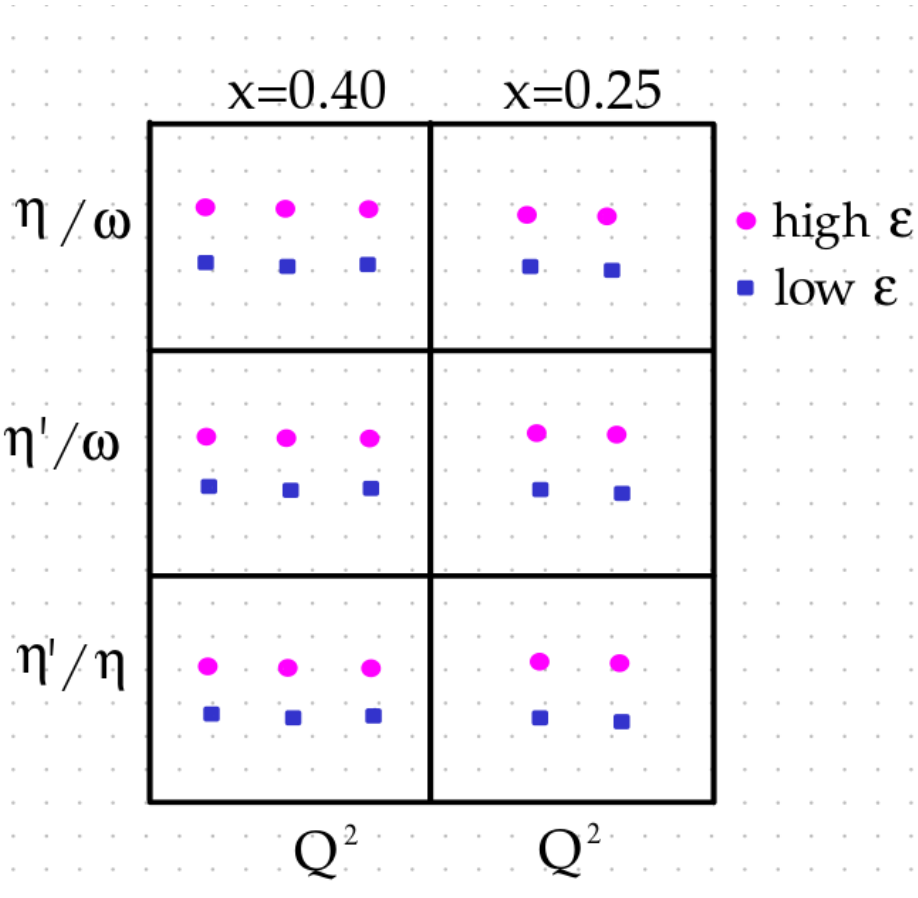


Exclusive Channels



Different u-dependence per meson makes u-binning difficult

Potential Measurement

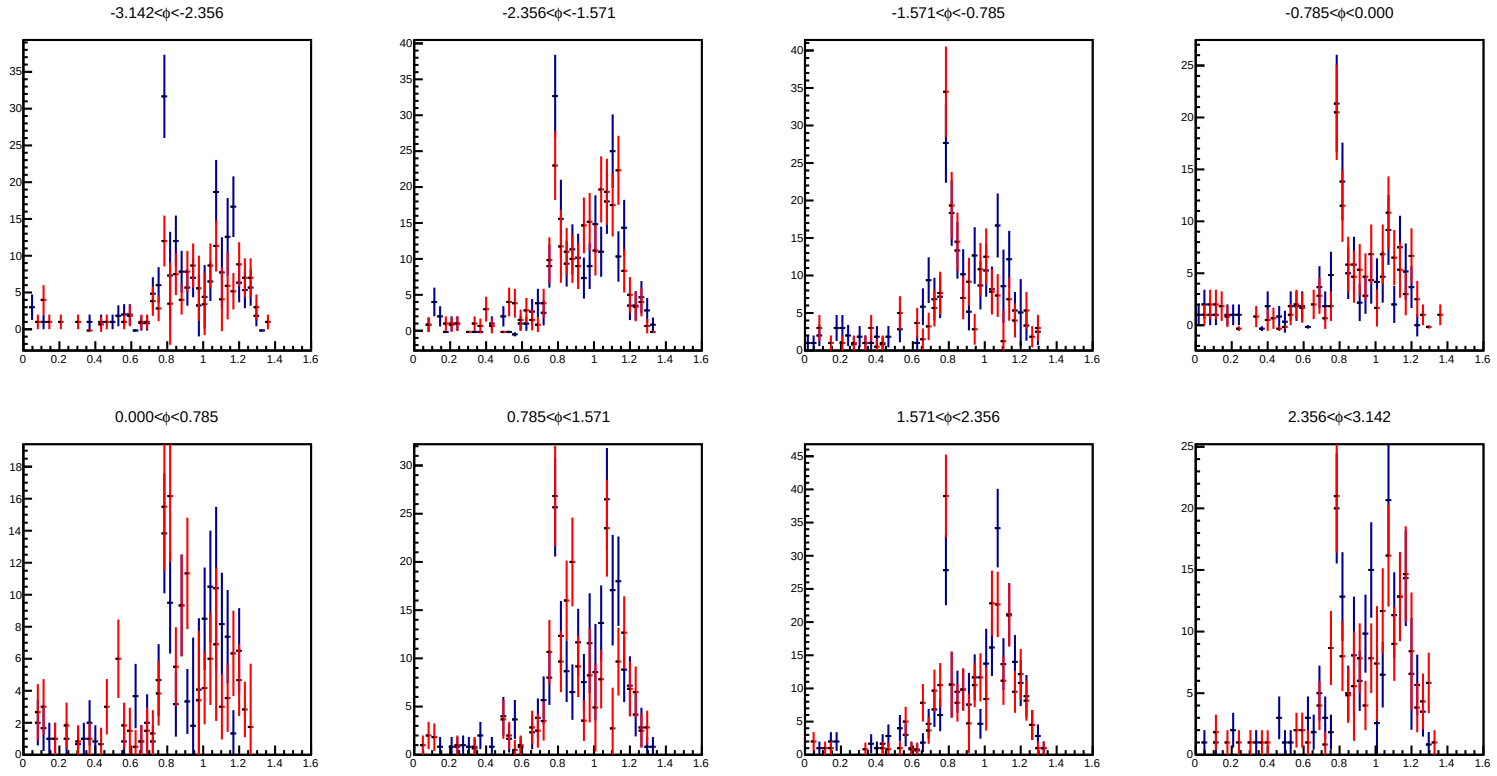


- Meson production ratios for 1 $u-\phi$ bin per setting
- Plot as a function of Q^2 at same x_B
- Potential for high/low ϵ comparison

Statistics

- Bill's thesis states that a $u - \phi$ bin was excluded on the basis of statistics if the raw experimental yield is less than 70 counts after random and dummy target subtraction
- I will need to shift this value as my signal to background ratio is different
- For my data, we currently have 1 u-bin & 8 ϕ-bins
- Q^2 =3.0, W=3.14: $\approx$ 2000 counts/bin
- Q^2 =2.1, W=2.95: $\approx$ 6000 counts/bin (highest statistics)
- Q^2 =5.5, W=3.02: $\approx$ 300 counts/bin (lowest statistics, cleanest PID)

MMp Q^2 =5.5, W=3.02



SIMC not done running, ω peak still clear. However η and η' are likely not identifiable.

To-Do List

- Run SIMC exclusive channels for all settings
- Pythia+SIMC for all settings
- Replay low ϵ data
- GitHub pushes: hcana, SIMC