



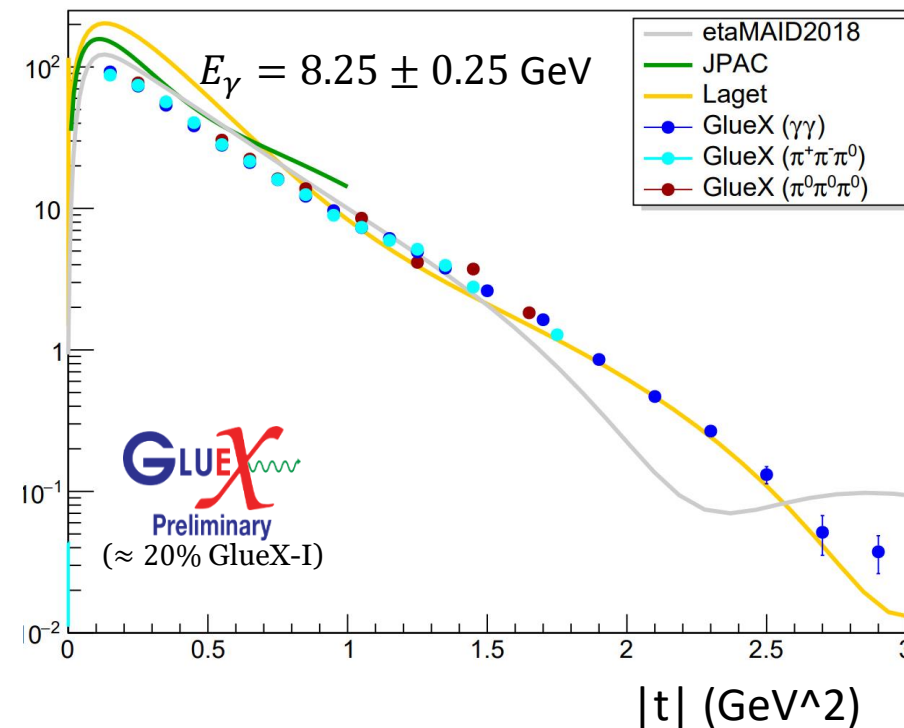
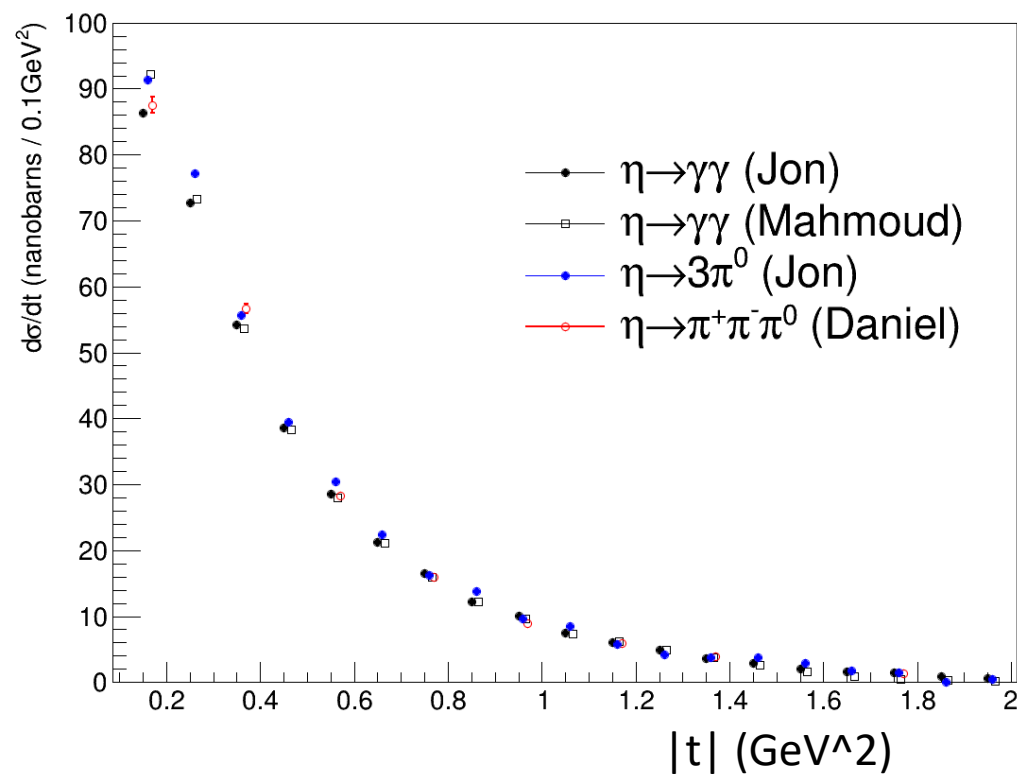
Run Periods, Event Selection

- Spring 2017
- Spring 2018
- Fall 2018
- ReactionFilter standard cuts
- Beam $E > 6.0$ GeV
- Proton:
 - $52 < \text{measured } z < 78$ cm
 - $\text{measured } r < 1.5$ cm
 - $\text{measured } p > 350$ MeV
- Kinematic fit: p4+vertex
 - $\chi^2/NDF < 5$
- $0.09 < m_{\pi^0} < 0.16$ GeV



Differential Cross Sections

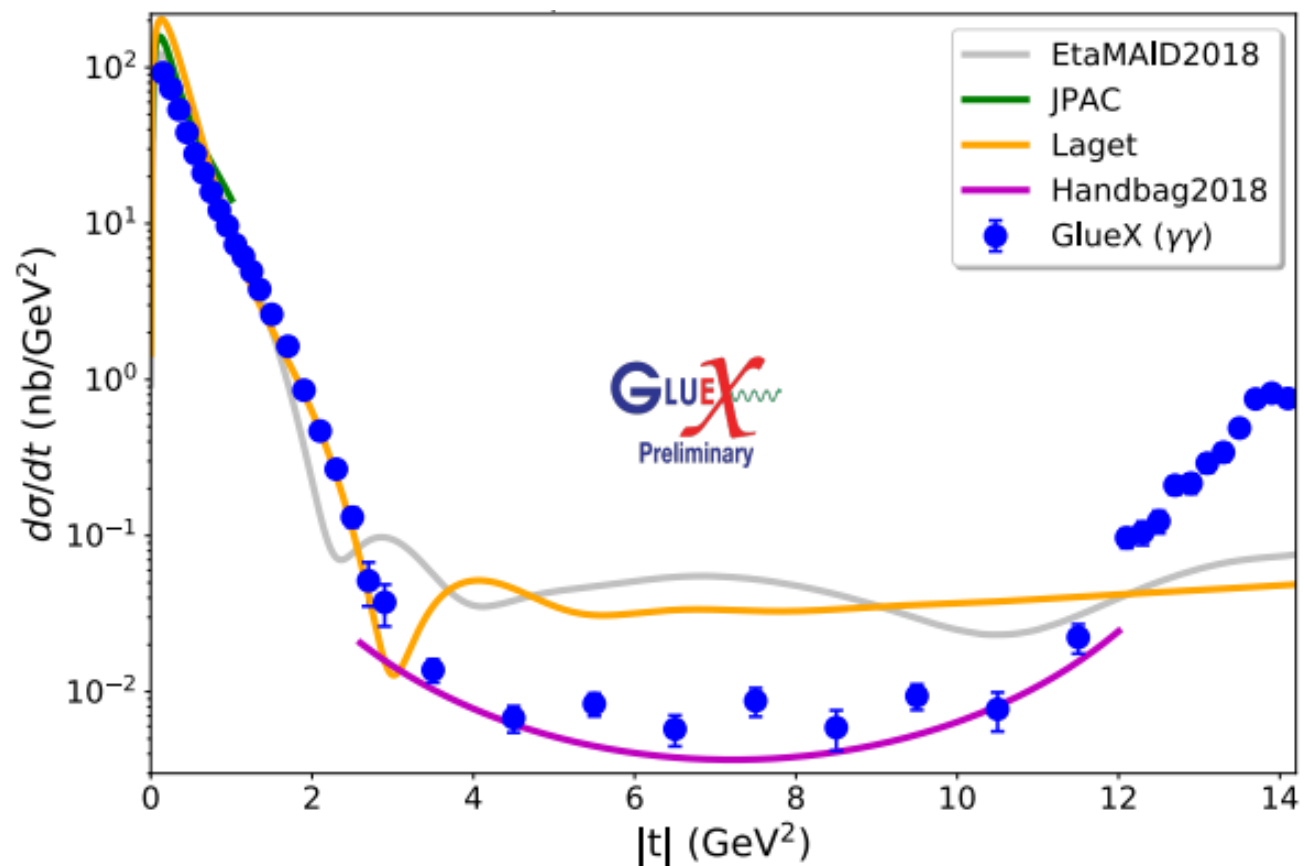
A bit lower than theory models predict





Differential Cross Sections, cont.

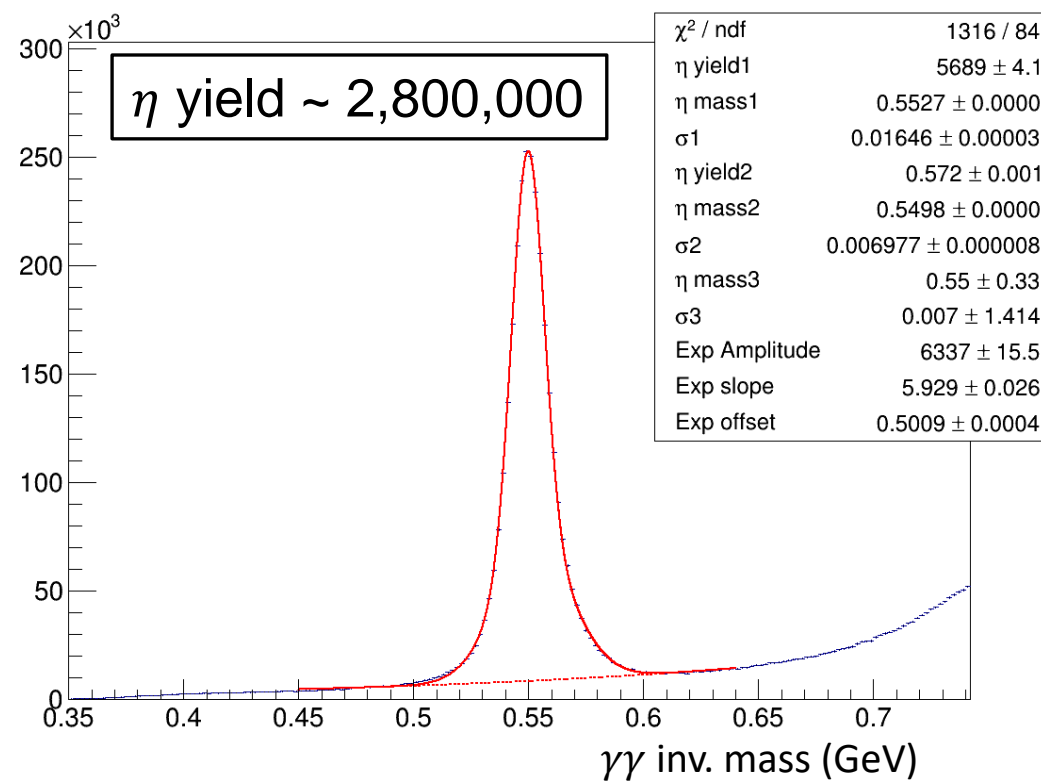
- Some u channel as well,
(not that we'd use those events for studying η decays)





Yields, $\eta \rightarrow \gamma\gamma$

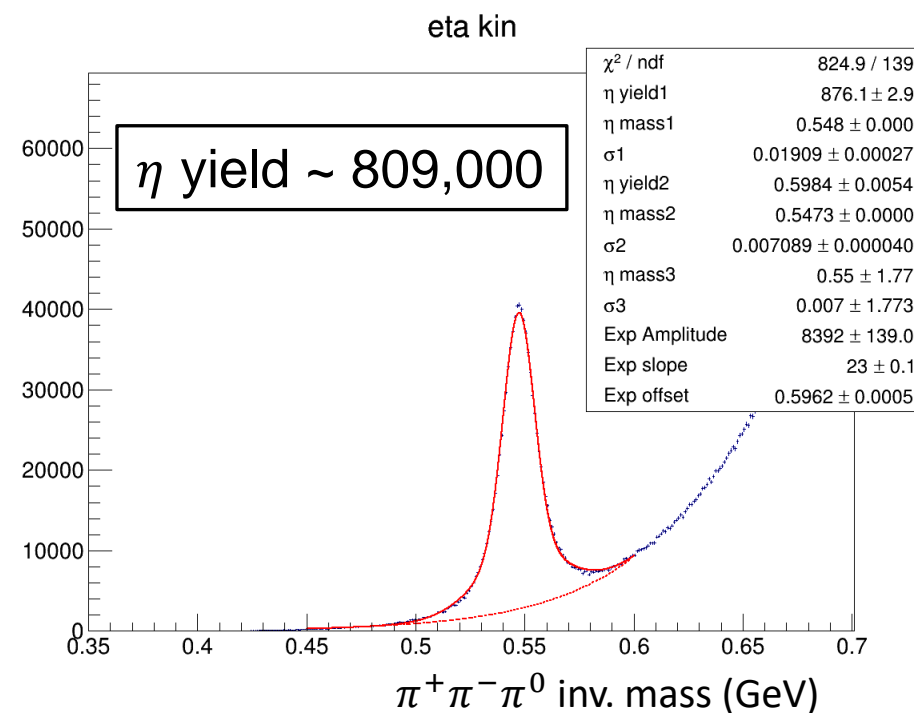
- Spring 2017, spring 2018, fall 2018
- $E_{beam} > 6$ GeV
- $|t| < 3$ GeV²





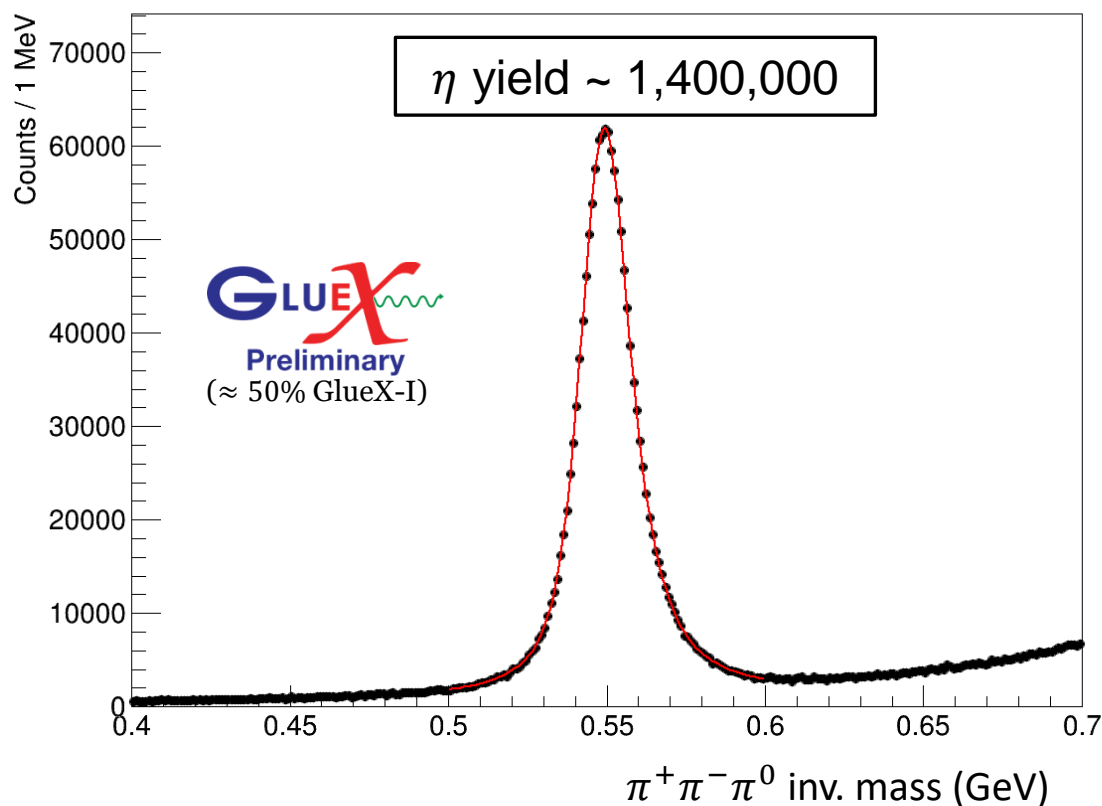
Yields, $\eta \rightarrow \pi^+ \pi^- \pi^0$

- Spring 2017, spring 2018, fall 2018
- $E_{beam} > 6$ GeV
- $|t| < 3$ GeV²





Yields, $\eta \rightarrow \pi^+ \pi^- \pi^0$ Notes

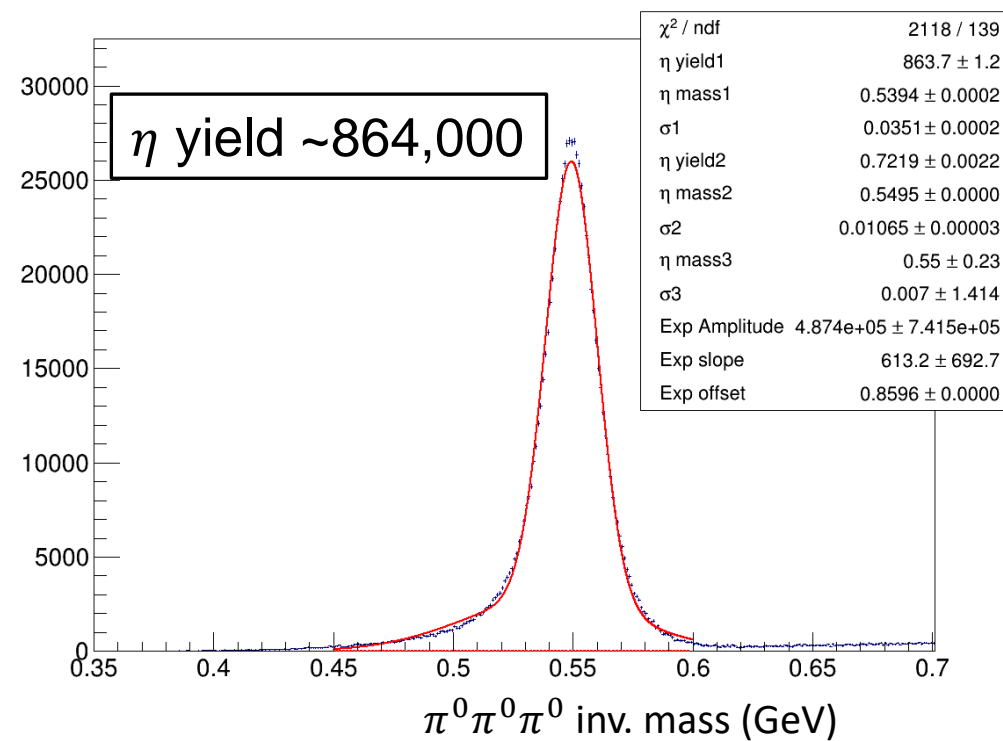


- Talk I gave at DNP last year would have predicted yield of **2,800,000**
- I'll have to double check things here
- Other modes come out exactly $2 \times$ DNP results



Yields, $\eta \rightarrow \pi^0 \pi^0 \pi^0$

- Spring 2017, spring 2018, fall 2018
- $E_{beam} > 6$ GeV
- $|t| < 3$ GeV²





Yield Summary Table

Mode	Yield	Branching Fraction
$\eta \rightarrow \gamma\gamma$	2.8 million	0.39
$\eta \rightarrow \pi^+\pi^-\pi^0$	809 k – 2.8 million ?	0.23
$\eta \rightarrow \pi^0\pi^0\pi^0$	864 k	0.33

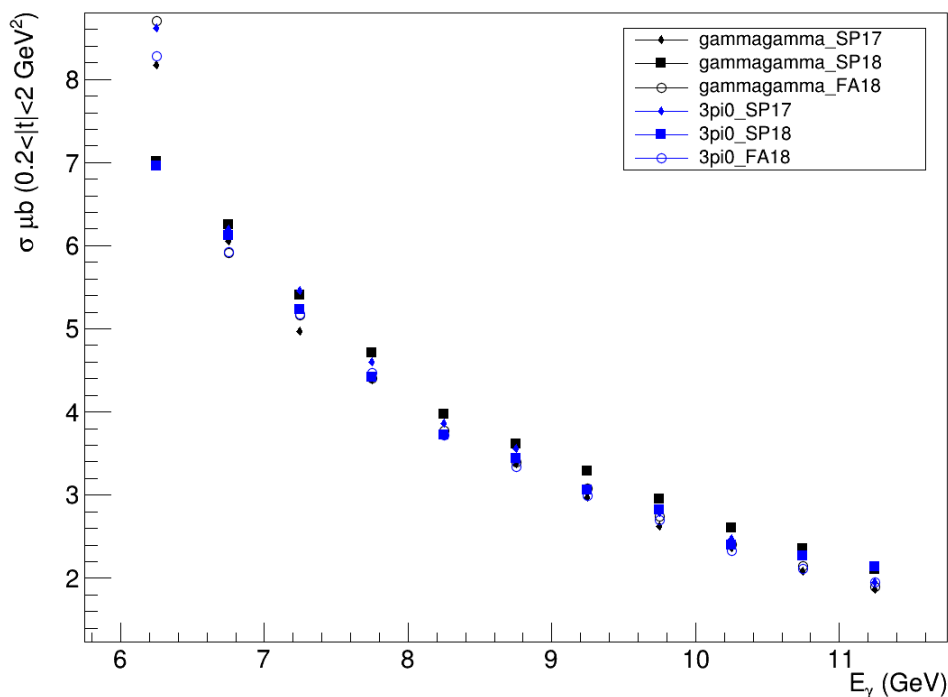
- GlueX phase I (spring 2017, spring 2018, fall 2018)
- $E_{beam} > 6$ GeV
- $|t| < 3$ GeV²



(Nearly) Total Cross Section

- $0.2 < |t| < 2 \text{ GeV}^2$
 - No Primakoff peak, no u-channel in this range

σ (almost) total



VERY preliminary

- A few of the poorer fits drive variation here
- This can, will be improved for xsec publication



Table of Cross Section

$0.2 < |t| < 2 \text{ GeV}^2$

Beam E range	Cross Section (μb)
6.0-6.5 GeV	7.96
6.5-7.0 GeV	6.07
7.0-7.5 GeV	5.23
7.5-8.0 GeV	4.50
8.0-8.5 GeV	3.79
8.5-9.0 GeV	3.45
9.0-9.5 GeV	3.08
9.5-10.0 GeV	2.77
10.0-10.5 GeV	2.43
10.5-11.0 GeV	2.19
11.0-11.5 GeV	1.98

Averaged over run periods

- Statistical uncertainty suppressed
- Final result will be systematic dominated anyways



Fun Aside

- Clear $\eta' \rightarrow \pi^0 \pi^0 \pi^0$ signal (B.F.=0.0025)

