

# Benchmark Channels for the DAQ TDR

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# Benchmark Channels for TDR

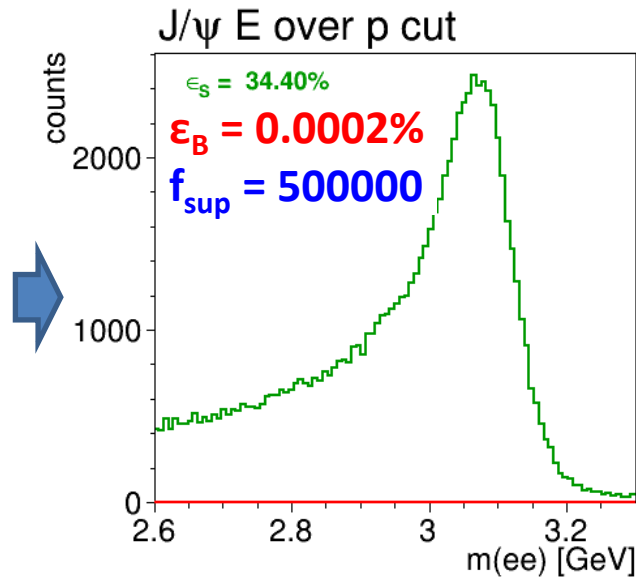
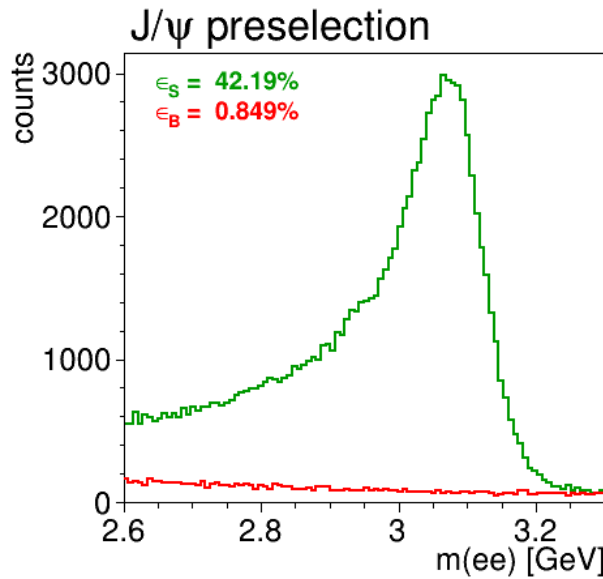
- Proof-of-principle benchmark channels for TDR
- Should cover various aspects of day-1 physics
- PhysCom decided on:
  1. Small cross section case / charmonium:  
 $\bar{p}p \rightarrow J/\psi X$  ( $= \pi^+\pi^- / \pi^+ \pi^- \pi^0 / \gamma / \pi^0 / \pi^0 \pi^0$ ) @ 3.872 GeV
  2. Very small cross-section, exclusive / form factor physics:  
 $\bar{p}p \rightarrow e^+e^-$  @ 2.254 GeV
  3. High cross section / hyperon physics:  
 $\bar{p}p \rightarrow \Lambda\bar{\Lambda}$  @ 2.304 GeV
- Single trigger lines (although should be simultaneous for  $J/\psi$ )
- Use mainly simple quantities, probably easy to determine online

# Simulation

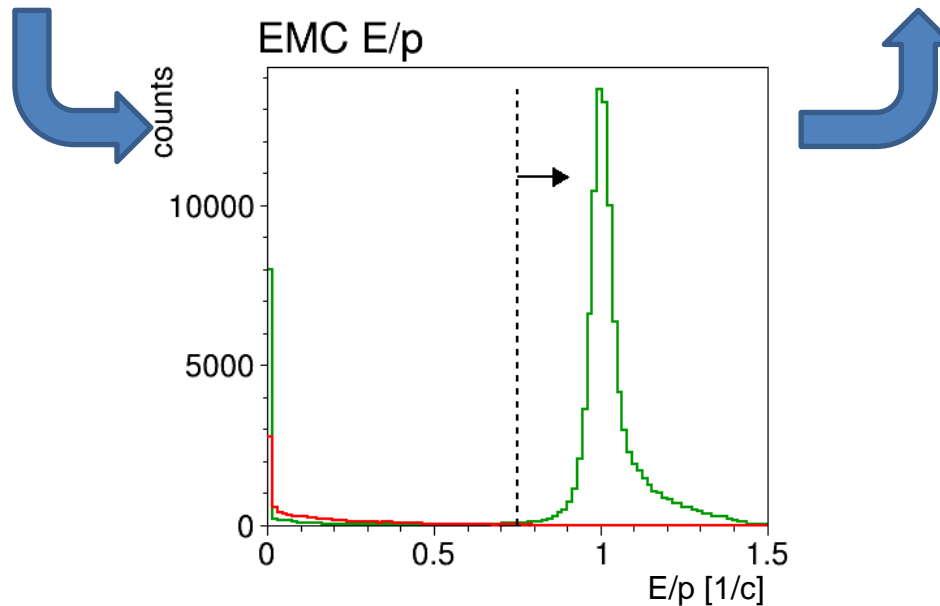
- Setup options for simulation
  - "day1 + gem + fts1256"
- Data:

Channel	signal	background
$\bar{p}p \rightarrow J/\psi(e^+e^-)X$	250k	1M (DPM inel.)
$\bar{p}p \rightarrow J/\psi(\mu^+\mu^-)X$	250k	1M (DPM inel.)
$\bar{p}p \rightarrow e^+e^-$	50k	2M (DPM inel.) + 500k (DPM el.)
$\bar{p}p \rightarrow \Lambda\bar{\Lambda}$	100k	1M (filtered out Lambda)

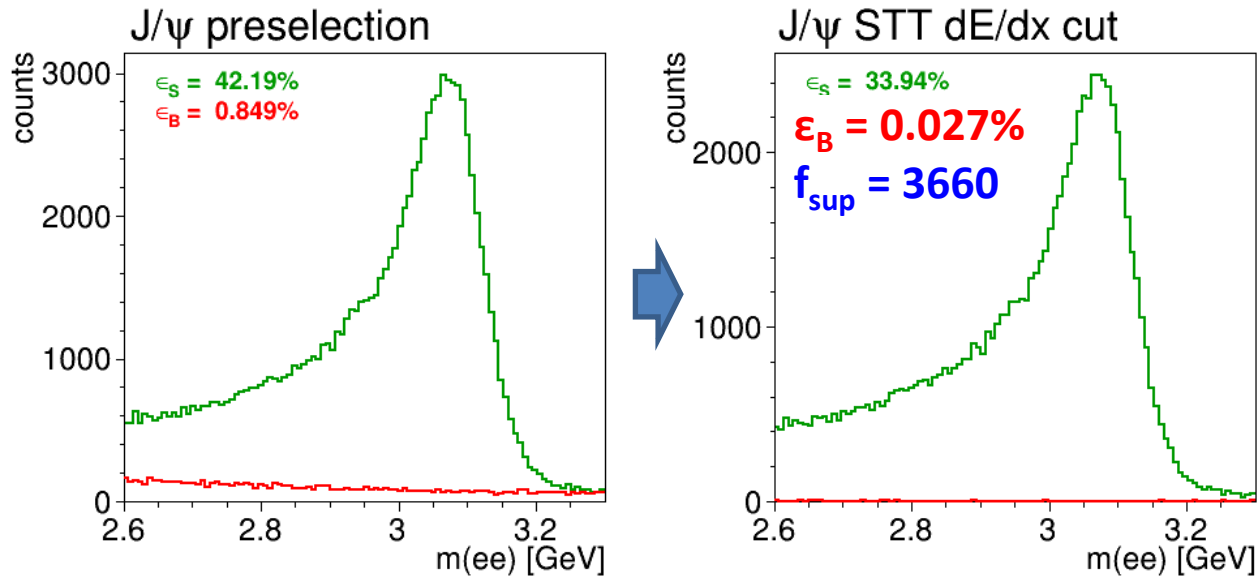
# $\bar{p}p \rightarrow J/\psi(e^+e^-)X$ (using EMC E/p)



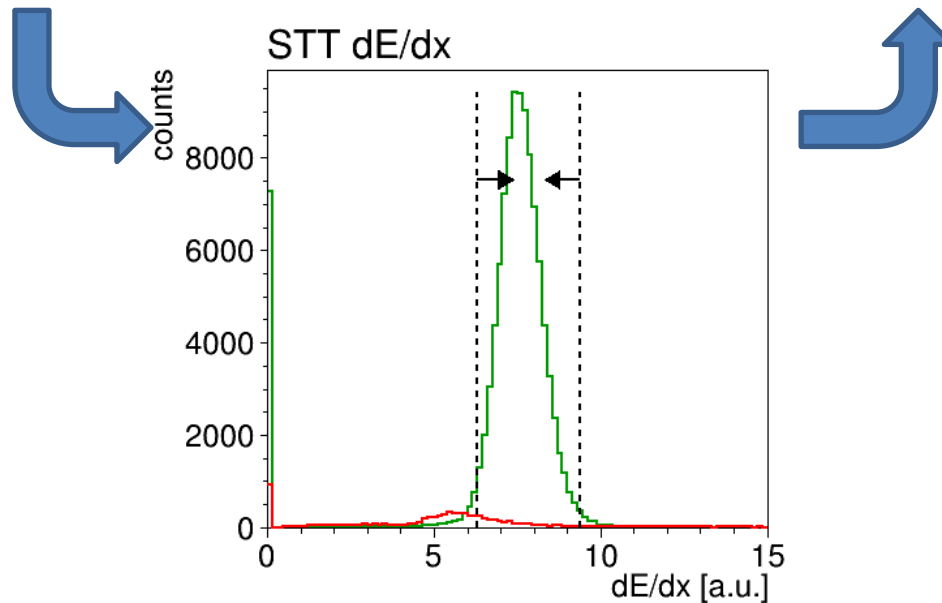
signal  
background



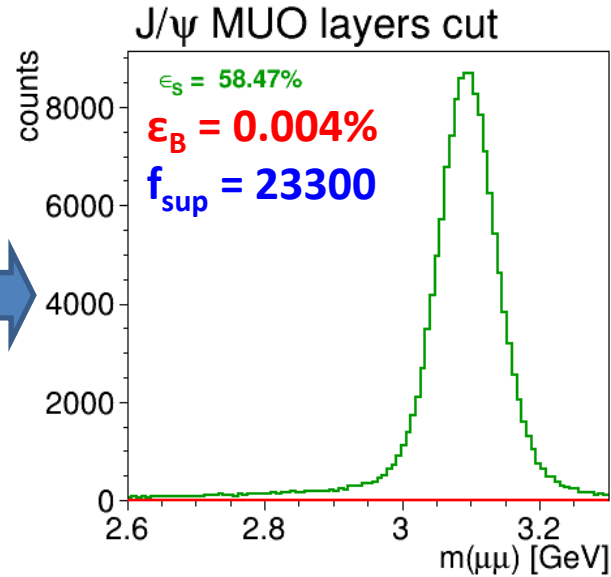
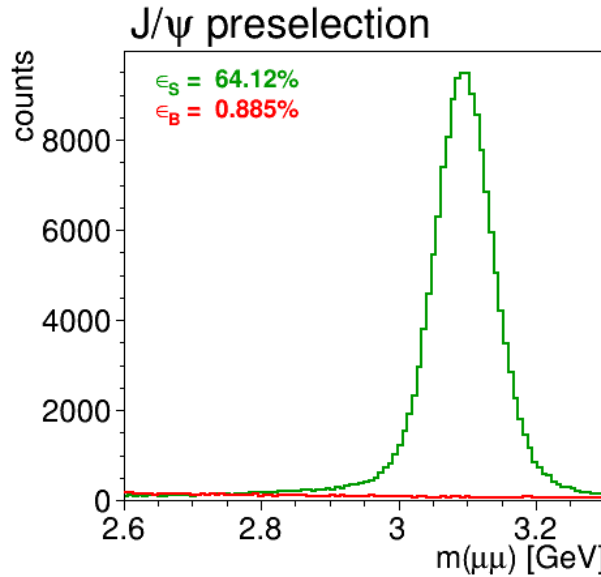
# $\bar{p}p \rightarrow J/\psi(e^+e^-)X$ (using STT dE/dx)



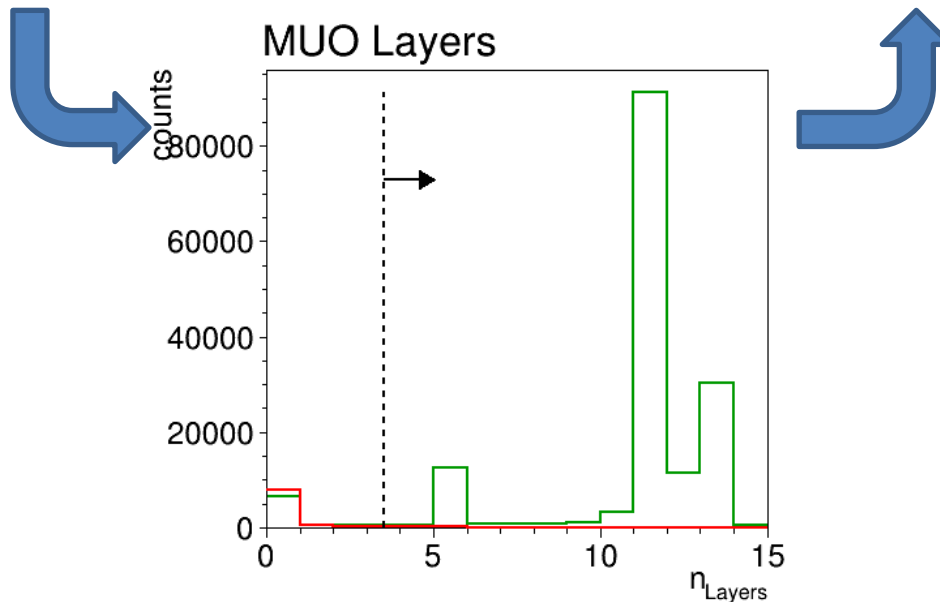
signal  
background



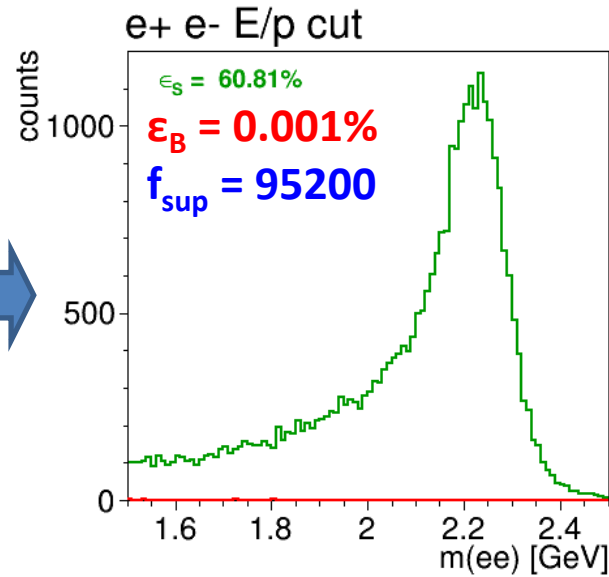
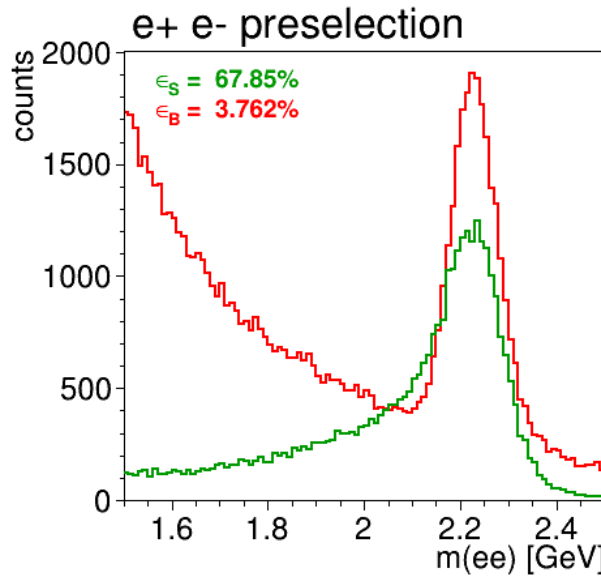
# $\bar{p}p \rightarrow J/\psi(\mu^+\mu^-)X$ (using MUO #layers)



signal  
background



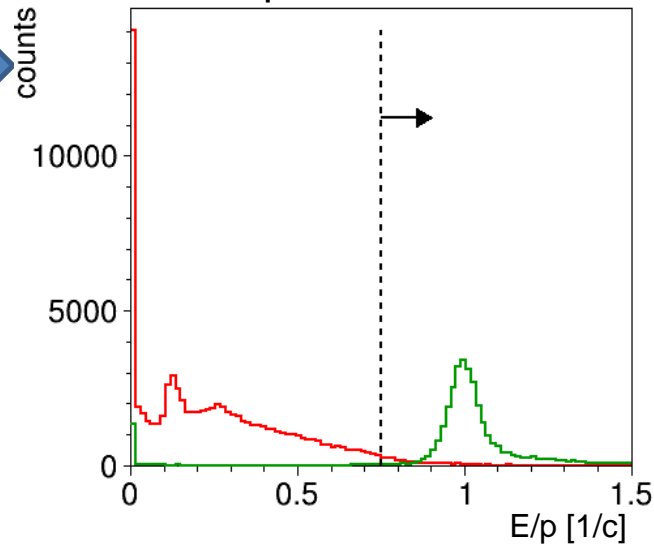
# $\bar{p}p \rightarrow e^+e^-$ (using EMC E/p)



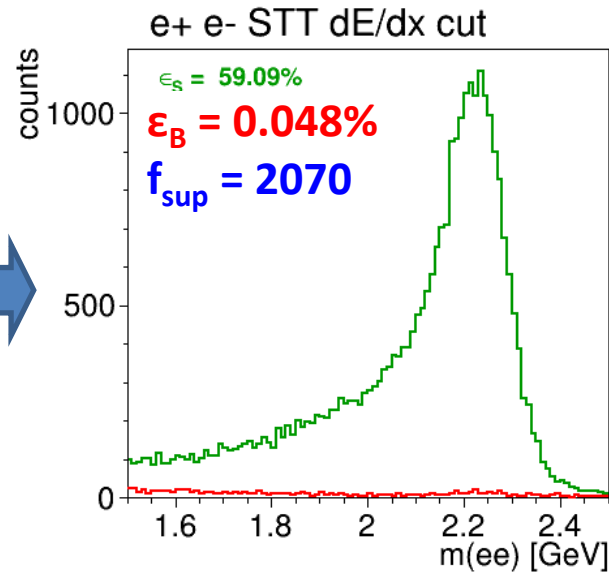
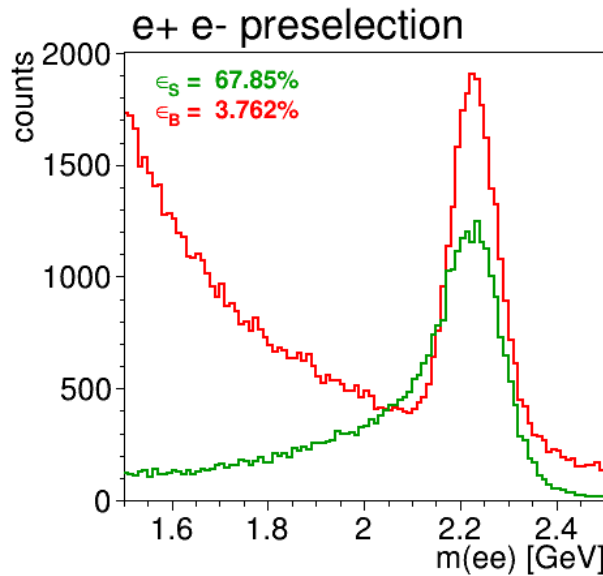
signal  
background



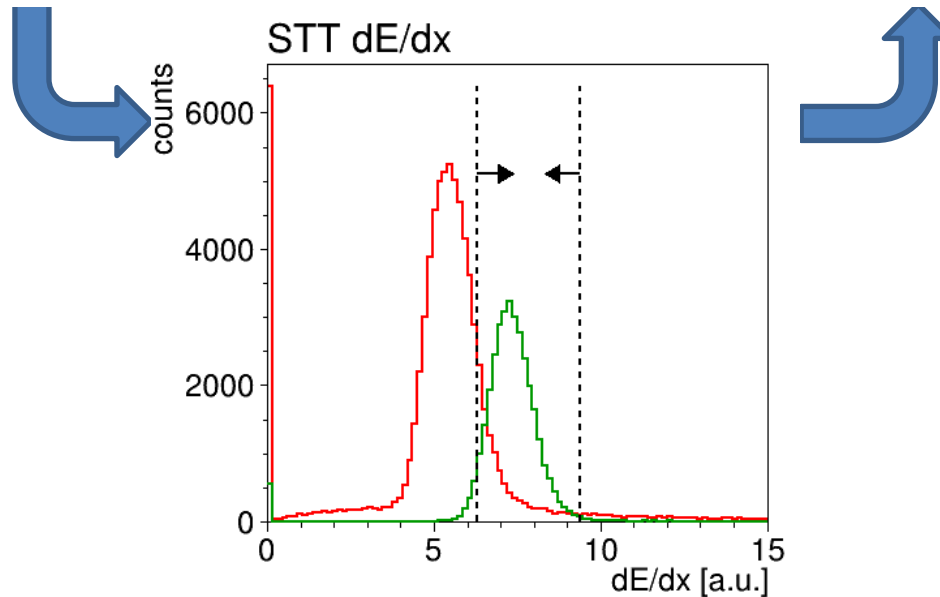
EMC E/p



# $\bar{p}p \rightarrow e^+e^-$ (using STT dE/dx)

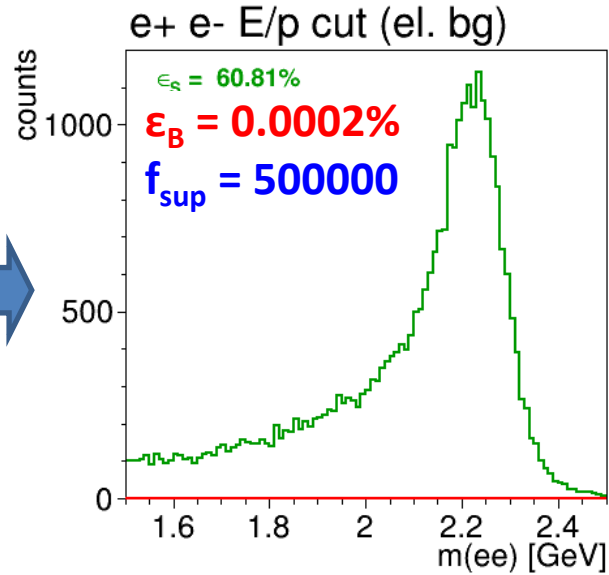
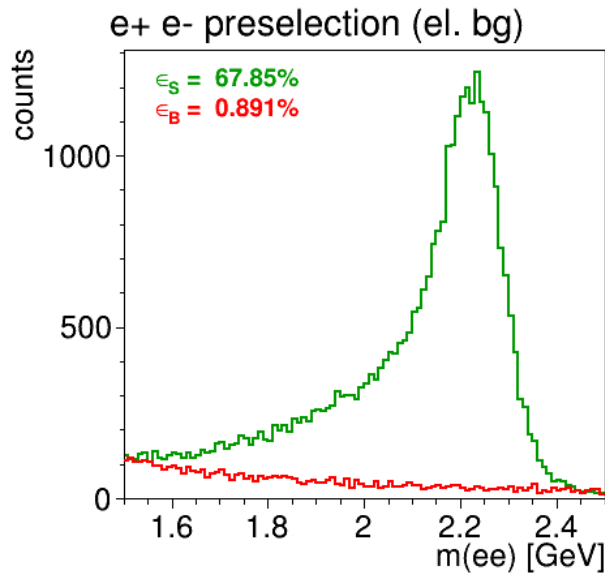


signal  
background

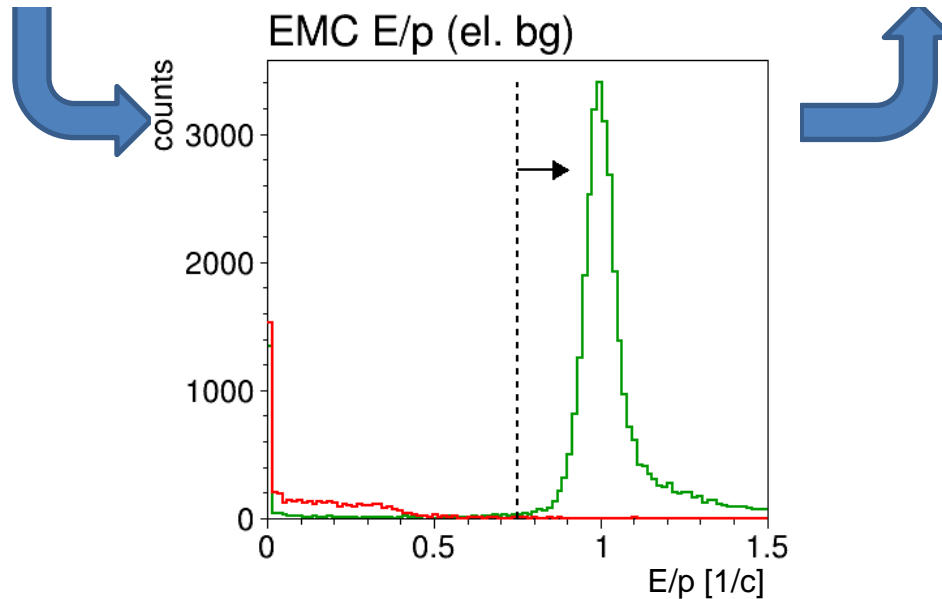




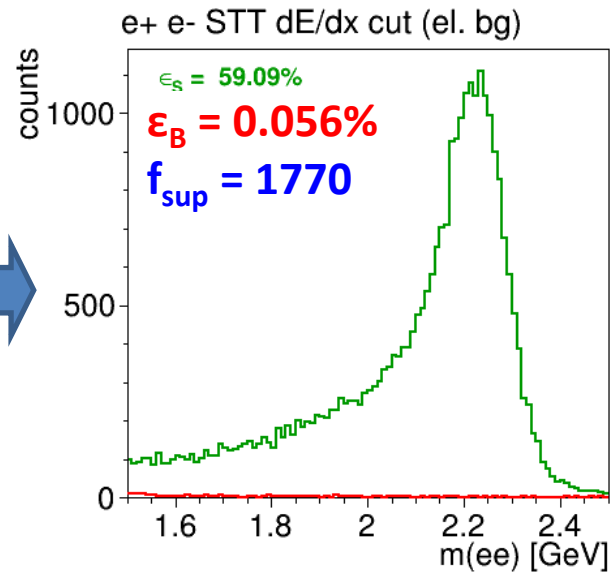
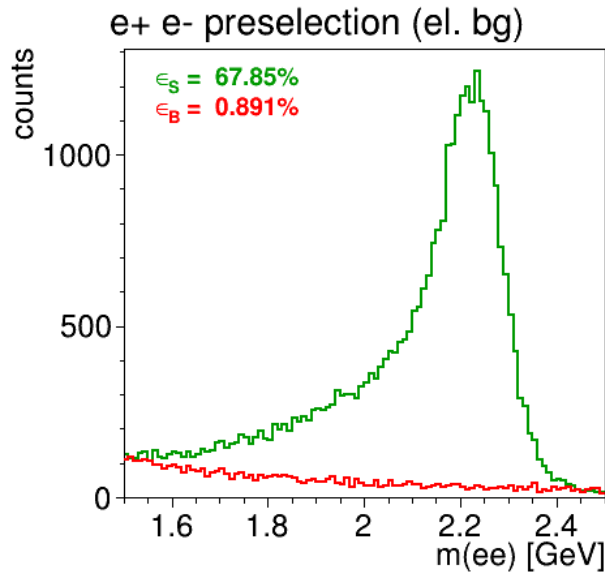
# $\bar{p}p \rightarrow e^+e^-$ (using EMC E/p, DPM el.)



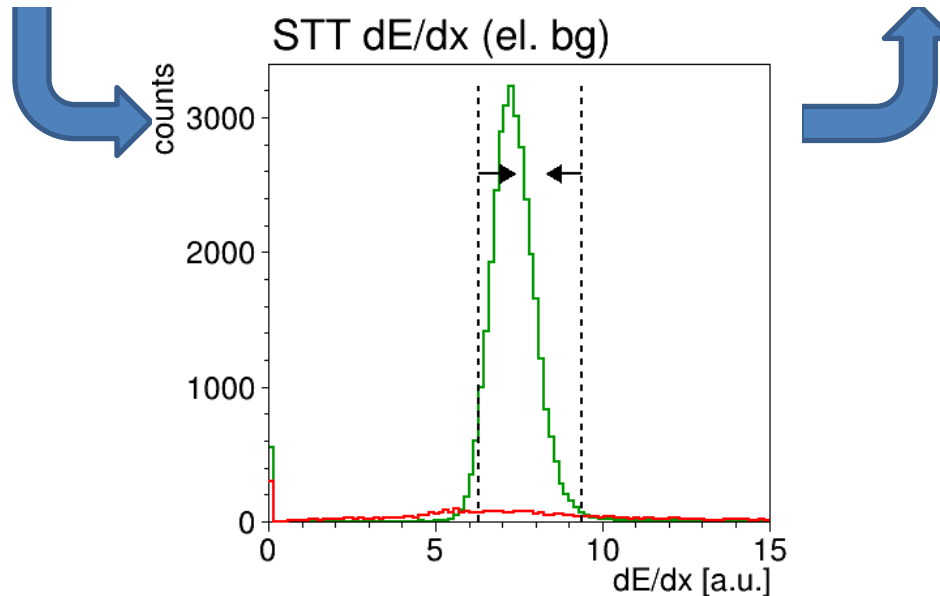
signal  
background



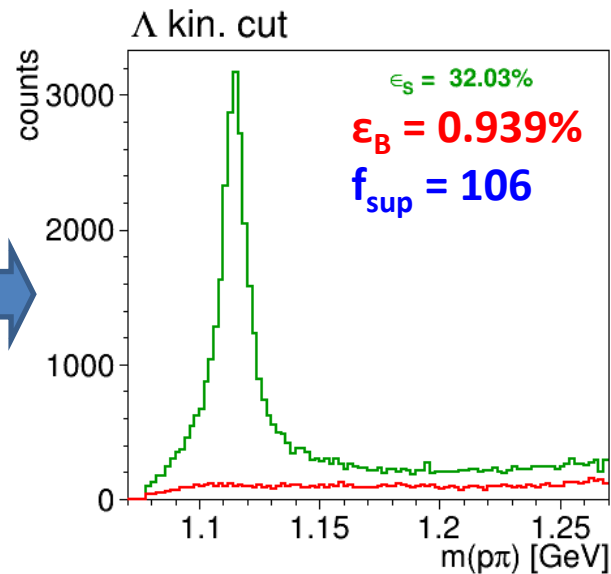
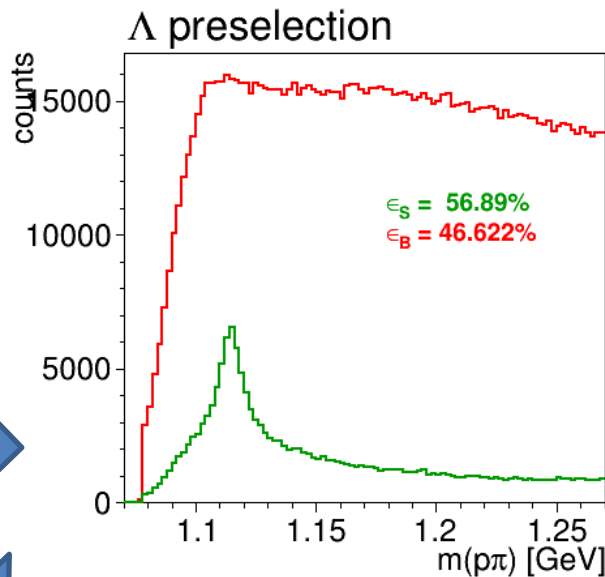
# $\bar{p}p \rightarrow e^+e^-$ (using STT dE/dx, DPM el.)



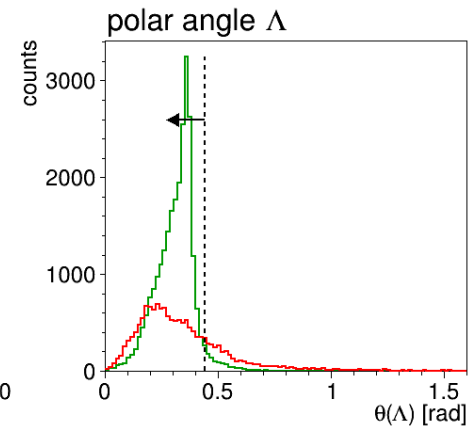
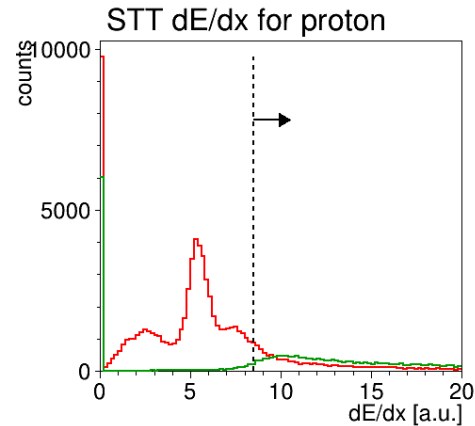
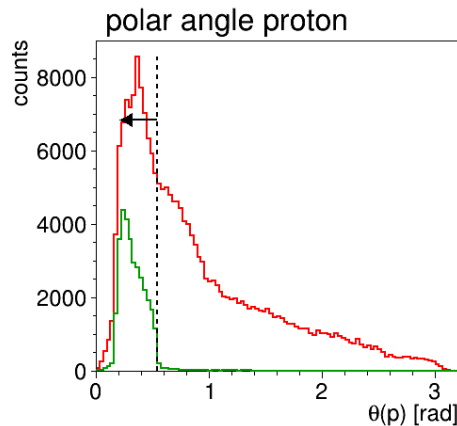
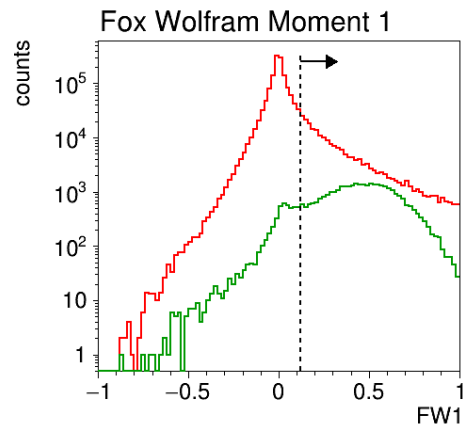
signal  
background



# $\bar{p}p \rightarrow \Lambda\bar{\Lambda}$ (using kinematics + STT dE/dx)



signal  
background



# Summary Table

Channel	$\epsilon_S$ [%]	$\epsilon_B$ [%]	BG suppr.
$\bar{p}p \rightarrow J/\psi(e^+e^-)X$ (EMC)	34.4	0.0002	500,000
$\bar{p}p \rightarrow J/\psi(e^+e^-)X$ (STT)	33.9	0.027	3,660
$\bar{p}p \rightarrow J/\psi(\mu^+\mu^-)X$ (MUO)	58.5	0.004	23,300
$\bar{p}p \rightarrow e^+e^-$ (EMC)	60.8	0.001	95,200
$\bar{p}p \rightarrow e^+e^-$ (STT)	59.1	0.048	2,070
$\bar{p}p \rightarrow e^+e^-$ (EMC) DPM el	60.8	0.0002	500,000
$\bar{p}p \rightarrow e^+e^-$ (STT) DPM el	59.1	0.056	1,770
$\bar{p}p \rightarrow \Lambda\bar{\Lambda}$ (kin. + STT)	32.0	0.939	106

# Conclusions

- First results look promising
- Leptonic benchmark channels are easy to trigger
  - $J/\psi \rightarrow e^+e^-$ : BG reduction of 500k (EMC), 3k (STT)
  - $J/\psi \rightarrow \mu^+\mu^-$ : BG reduction of 23k (MUO)
  - $\bar{p}p \rightarrow e^+e^-$ : BG reduction of 500k (EMC), 2k (STT)
- Lambda channel more challenging
  - reduction factor merely about 100
- More reliable results require more realistic (online) simulation