

Optimization of Target and Beam-Dump Separation?

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LANL

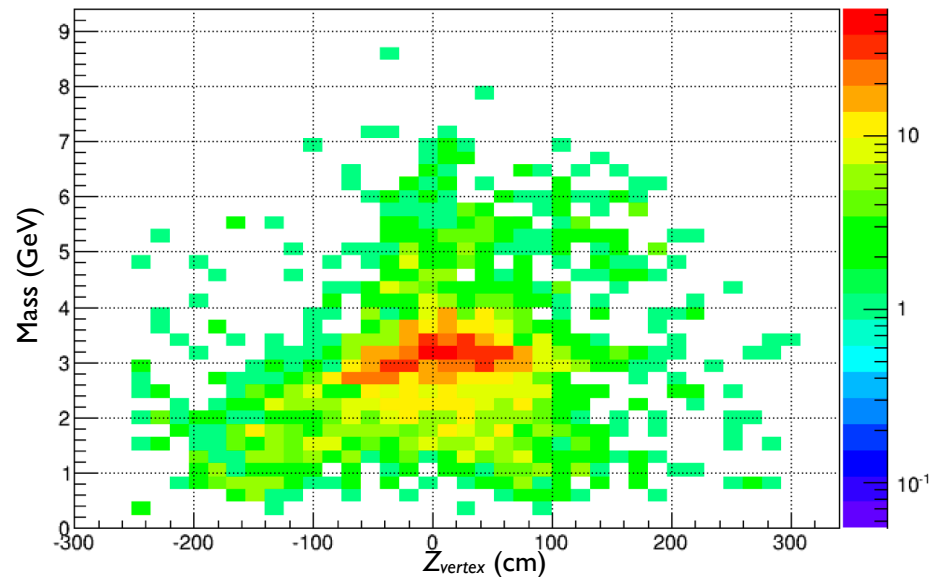
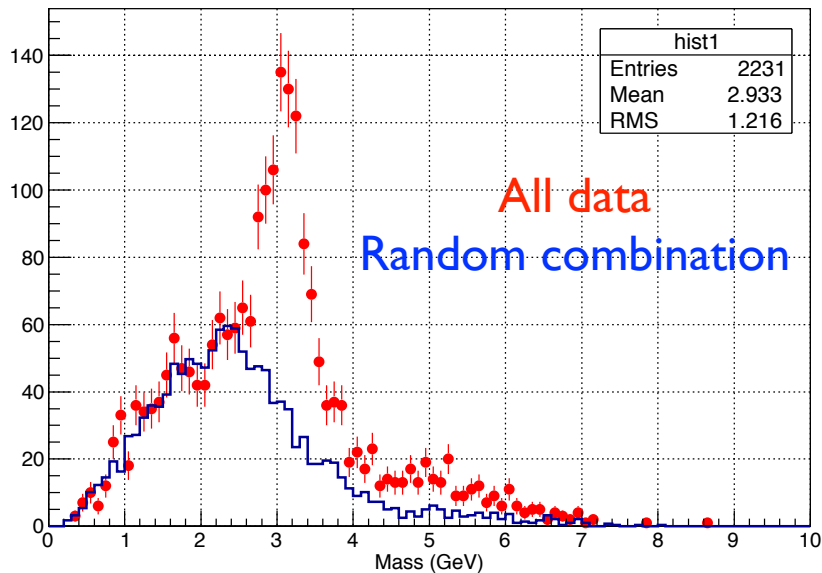
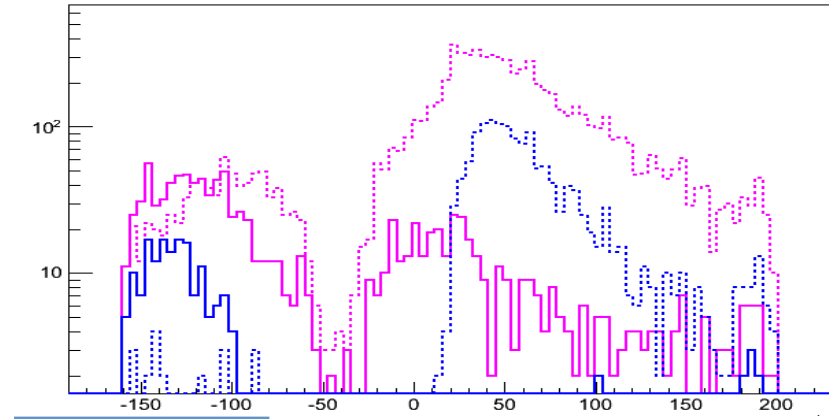
Motivations

- Target/Dump Separation
 - Optimization of Target/Dump Separation
- Physics desires for Siverson functions
 - Keep the small- x sea-quarks as much as possible
 - Significant TSSA A_N in DIS experiments
 - $x = 0.05 \sim 0.3$
 - E906 sea quark acceptance
 - $x = 0.1 \sim 0.4$
 - Would like to reach the small x_2 region around $0.1 \sim 0.2$

Siverson function plots
from global fits

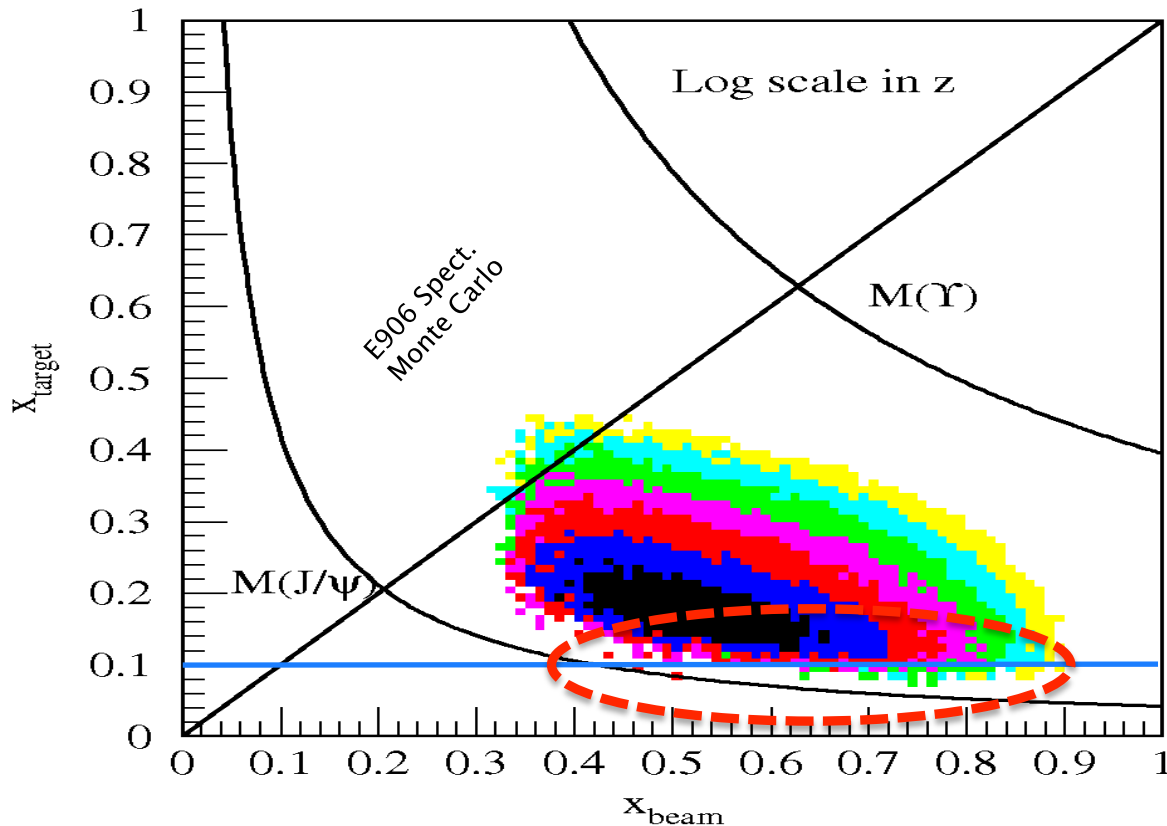
Target/Dump Separation

- Run2 data
 - “online z-sigma” $\sim 100\text{cm}$
 - Separation at trigger level needed for “small target”



Detector Acceptance for Physics

- Reasonable J/Psi and Drell-Yan separation
 - Drell-Yan: $M > 4\text{GeV}$
- Good access to “interesting” x_{target} region

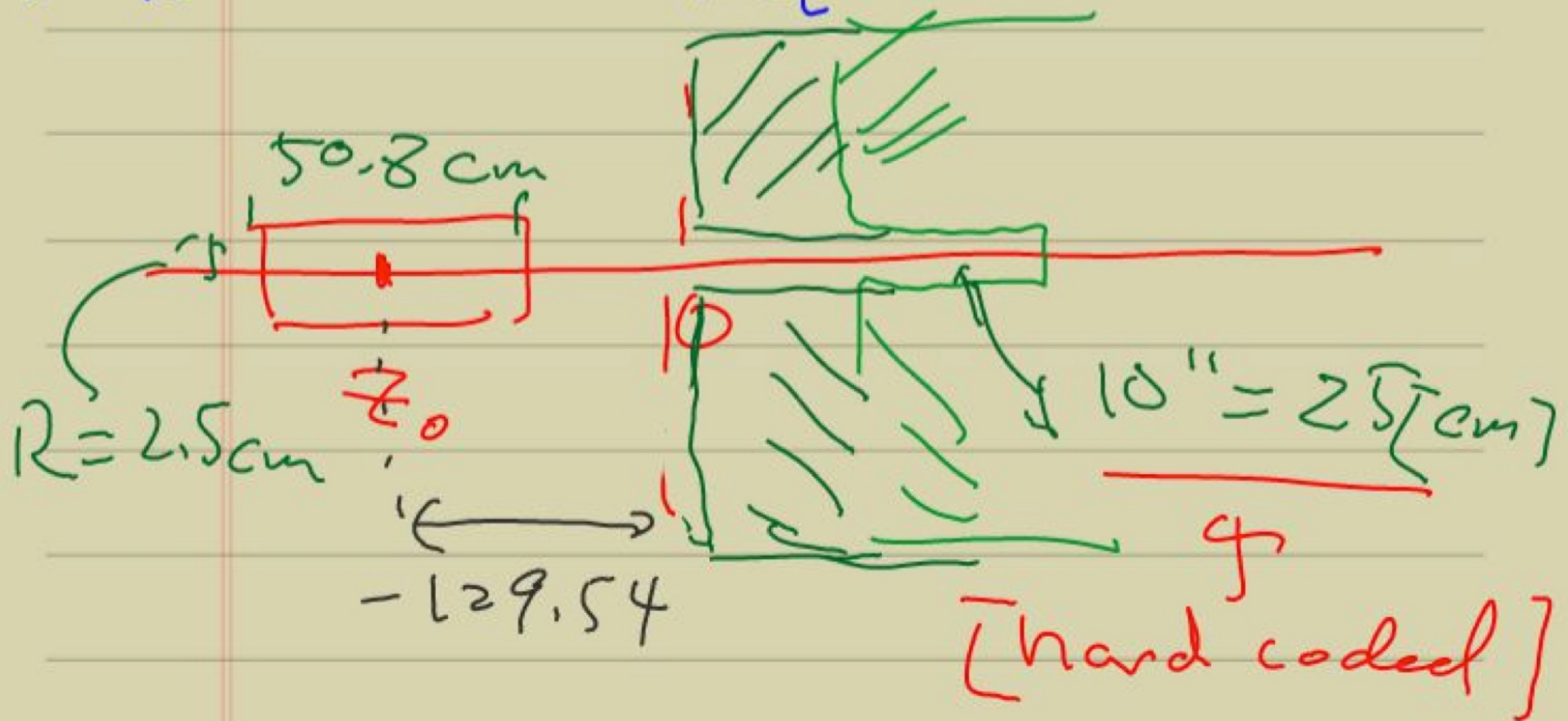


$$x_2 \sim 1/x_1 \cdot M^2/s$$

Target Position and Detector Acceptance

- Move the target upstream further away from beam dump
- Add SM0 dipole to keep the acceptance

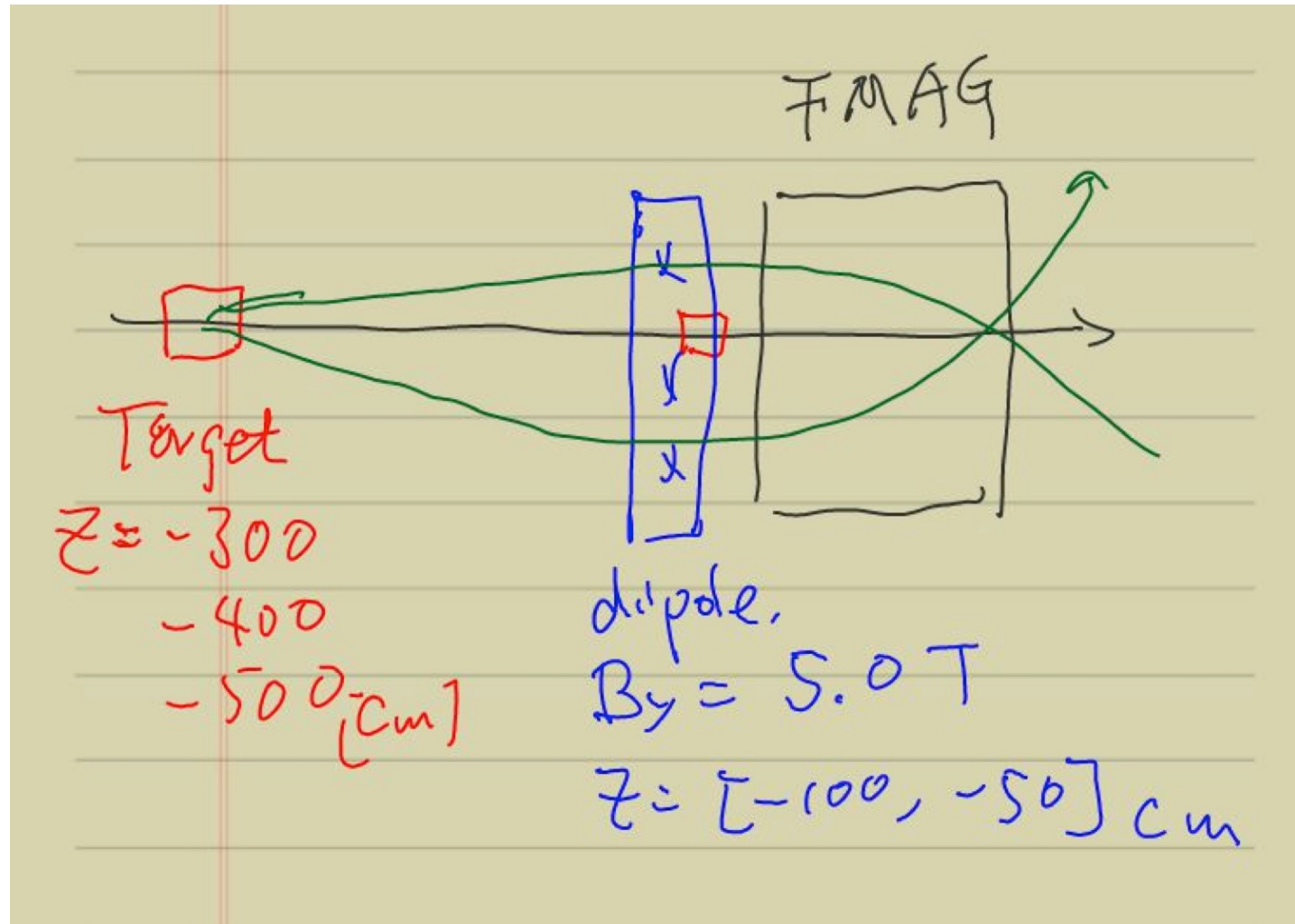
DR workbench



Add an ideal dipole

$B_y = 5 \text{ Teslas @ } Z = [-100, -50] \text{ cm}$

$B_y = +/- 2 \text{ Tesla @ } Z = [-200, -100] \text{ cm}$



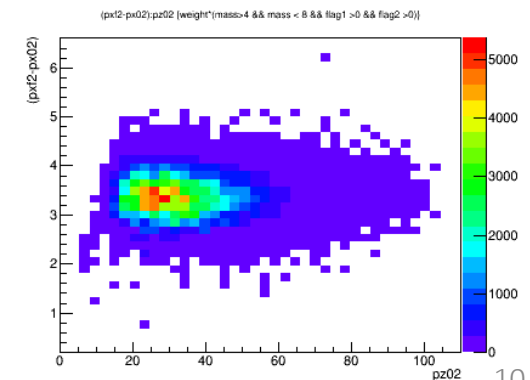
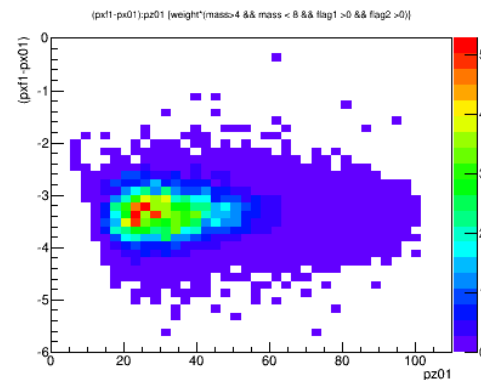
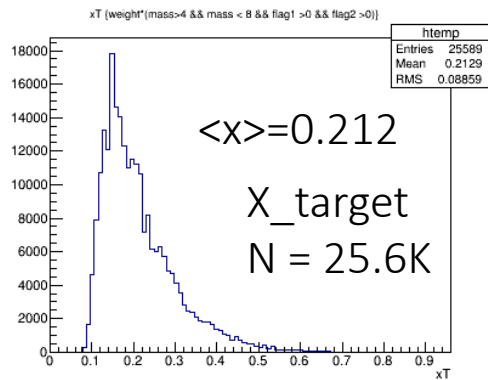
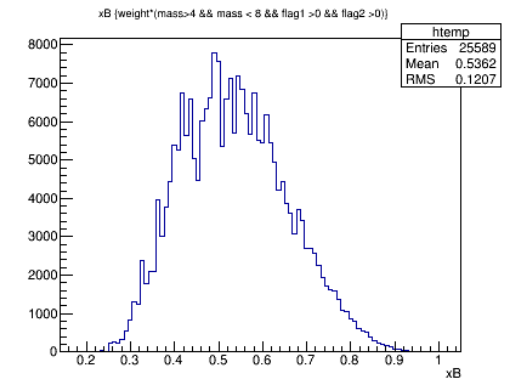
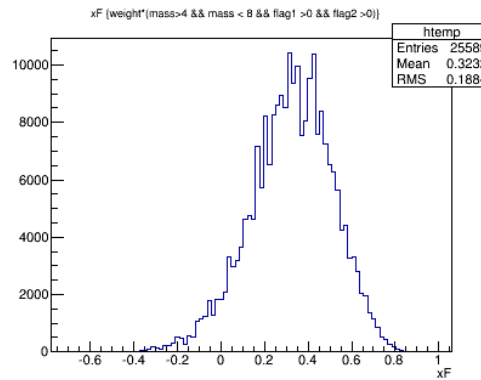
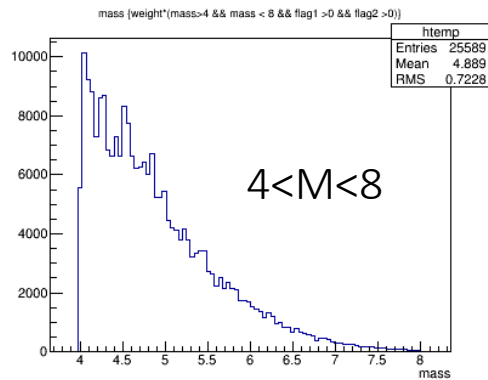
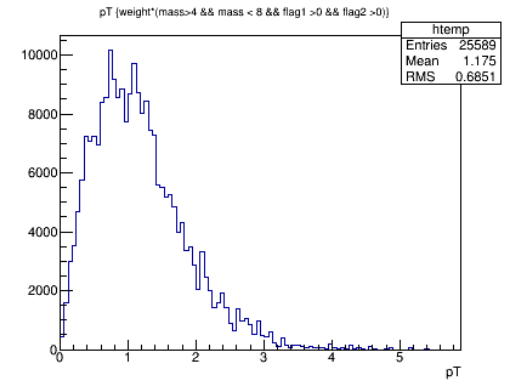
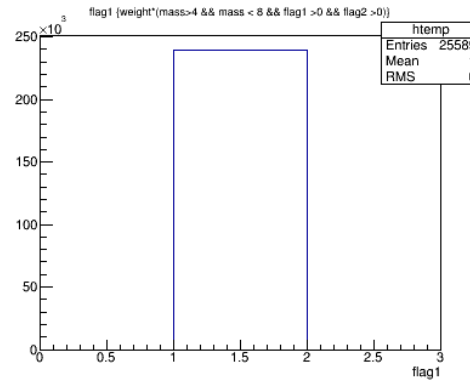
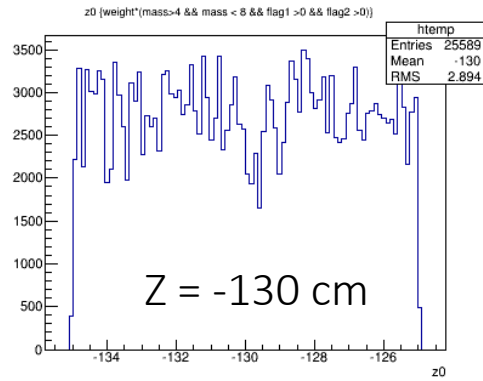
Target sea-quark x-Range and Statistics

- Case-1:
 - target @ $Z = -300/-400/-500$ cm
 - SM0: NO
- Case-2
 - target @ $Z = -300/-400/-500$ cm
 - SM0: $B_y = 5$ testla, @ $Z = [-100, -50]$ cm
- Case-3
 - target @ $Z = -300/-400/-500$ cm
 - SM0: $B_y = -2$ Tesla, @ $Z = [-300, -200]$ cm

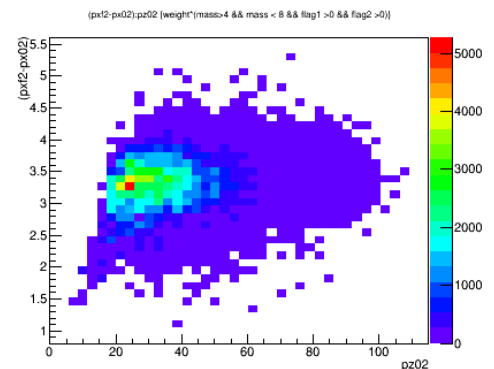
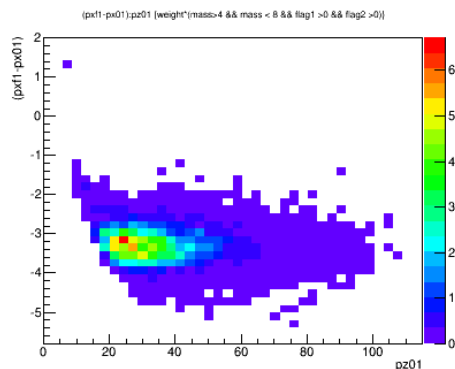
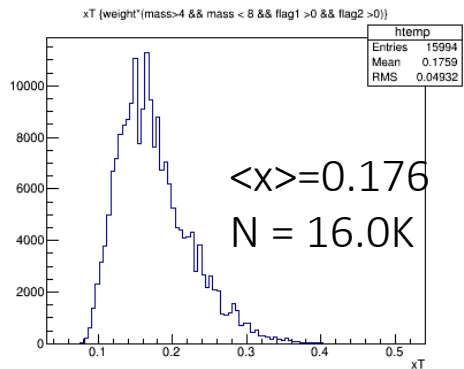
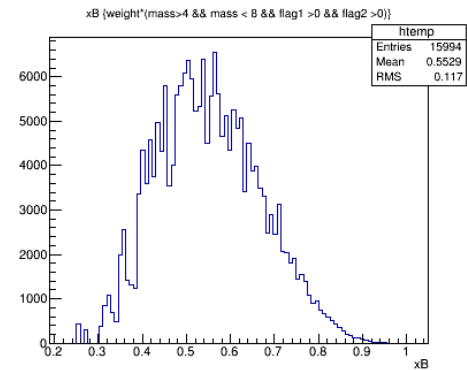
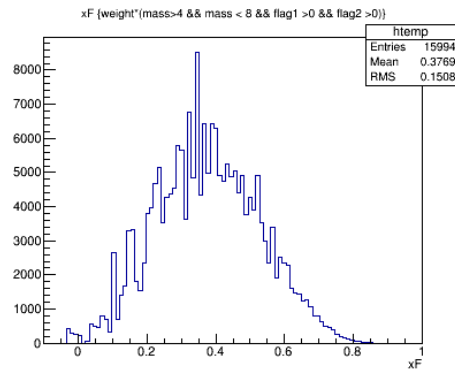
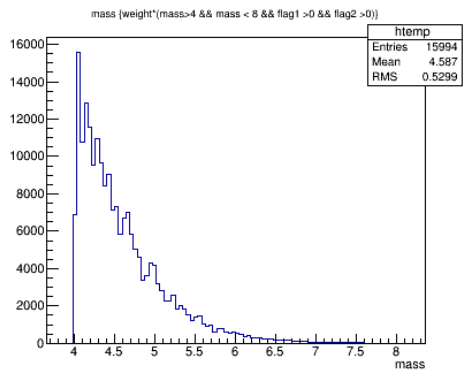
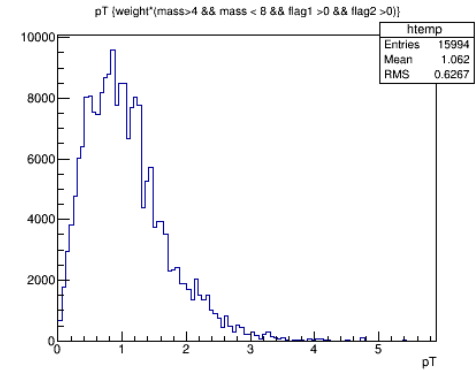
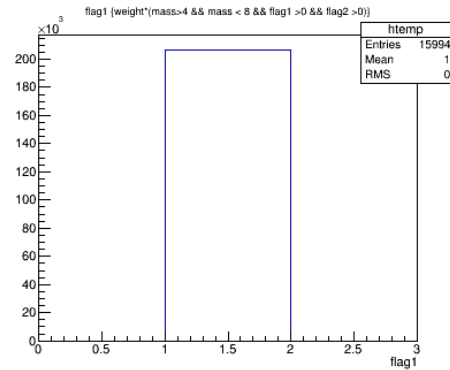
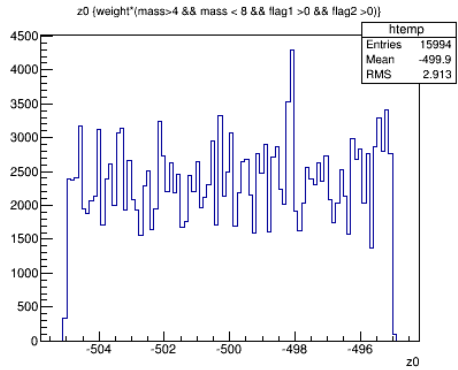
Case-I : E906 DY Target/Beam Dump Study

- E906 default spectrometers setup
- Target = 10cm thick, Liquid H₂
- Target_Z = [-130]cm
- Target_Z = -300, -400, -500 cm
 - Additional ideal dipole magnet at
 - Z = [-100, -50]cm
 - B_y = 5 Tesla
- Study mass, pT, xB, xT acceptance

Z = -130cm, Default, w/ Cross-section weighted



Z = -500cm, default, no SM0



Case-II: New SM0 Configuration

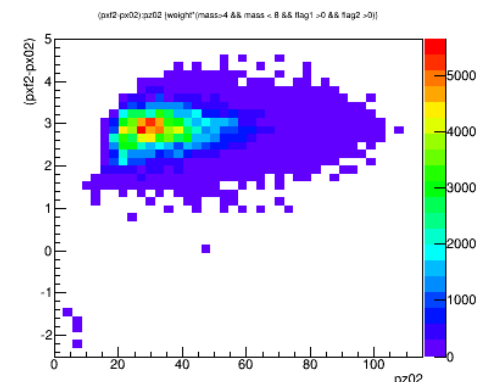
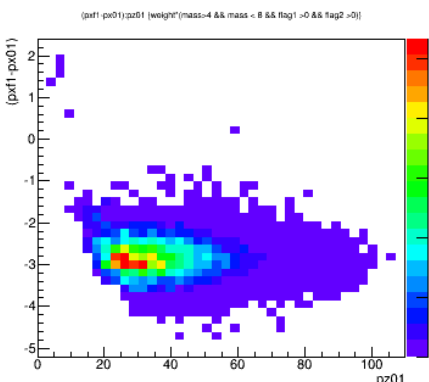
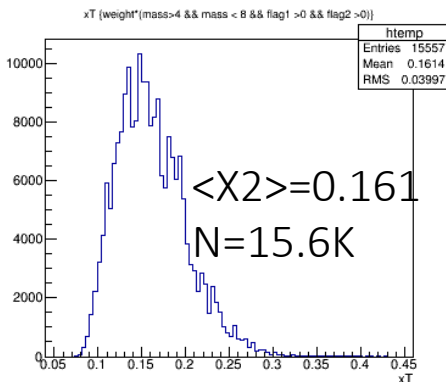
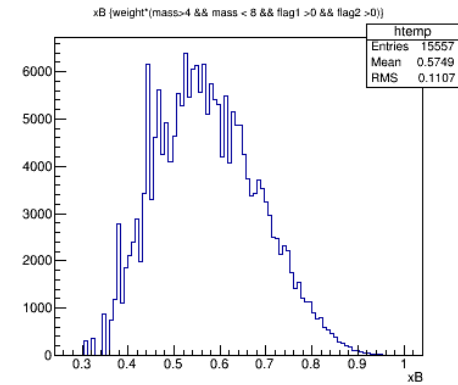
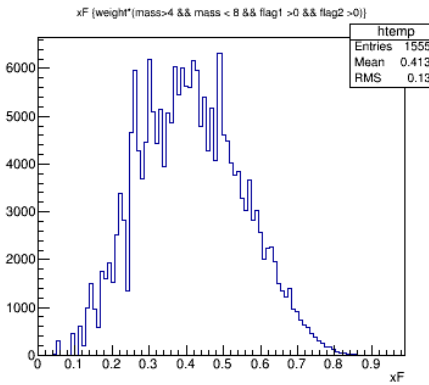
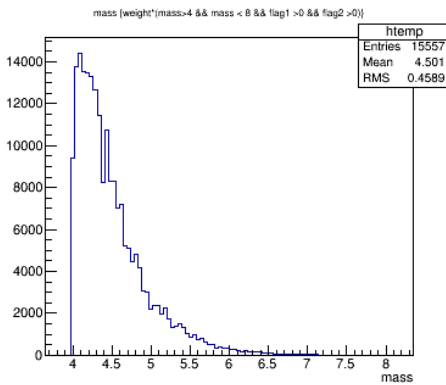
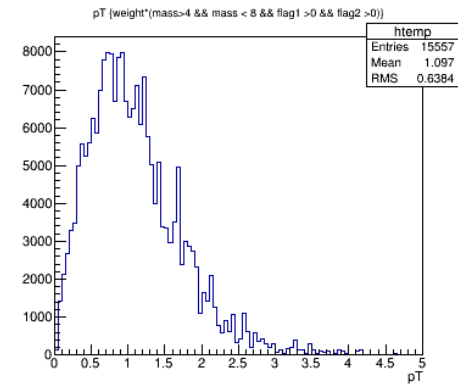
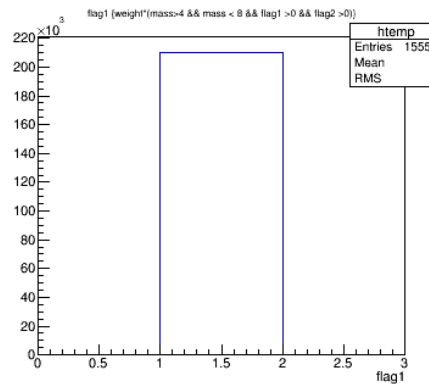
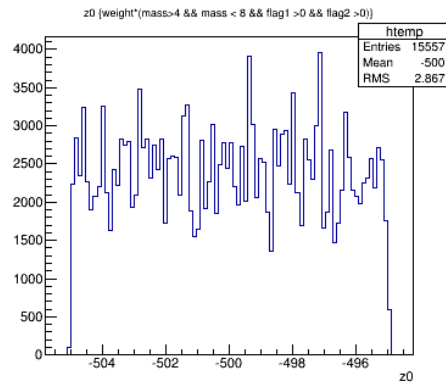
- $B_y = -2.0$ Tesla
- $B_x = B_z = 0$
- $Z = [-200, -100]\text{cm}$
- Target = 10cm LH2
- Target_Z = -500, -400, -300

$B_y = -2.0$ Tesla
 $Z = [-200, -100]\text{cm}$

Target_Z = -500, -400., -300

GMCbuildmaster_dev3

Target Z = -500 cm; By = -2.0T

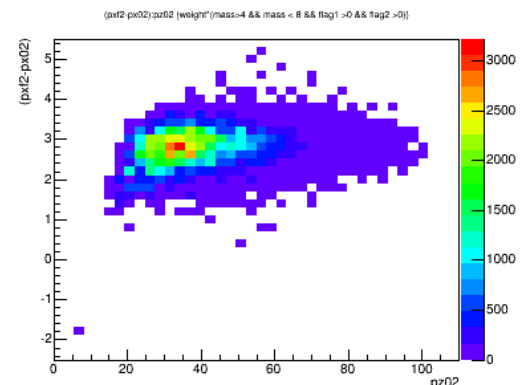
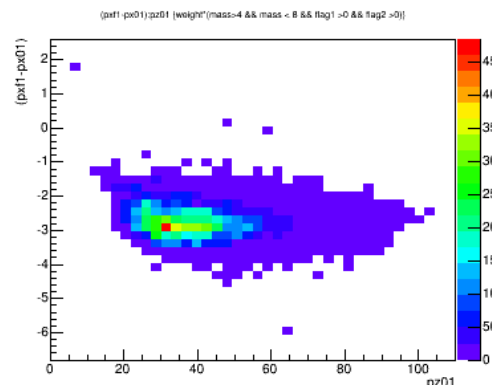
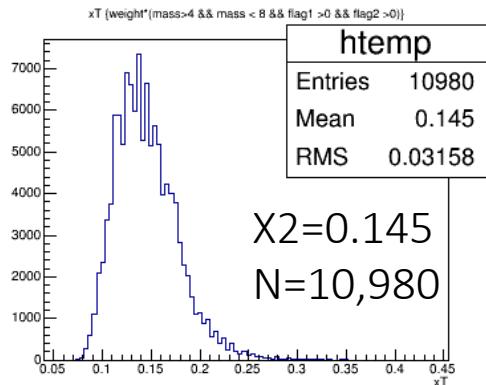
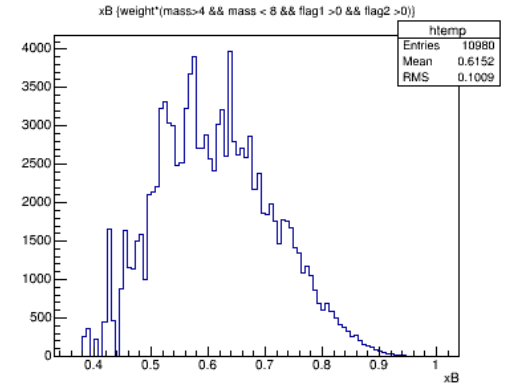
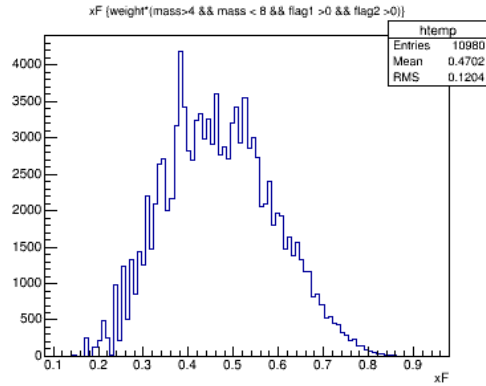
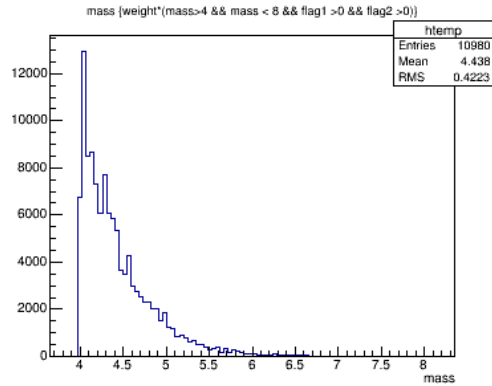
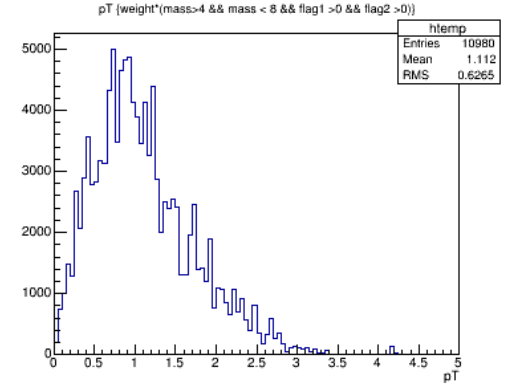
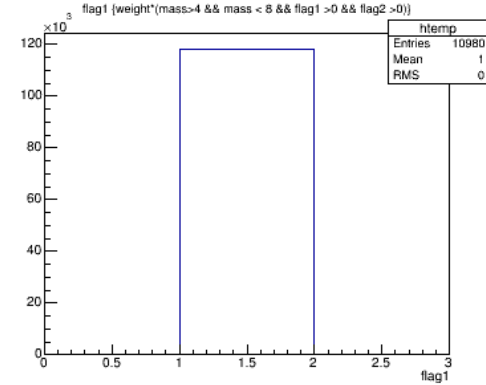
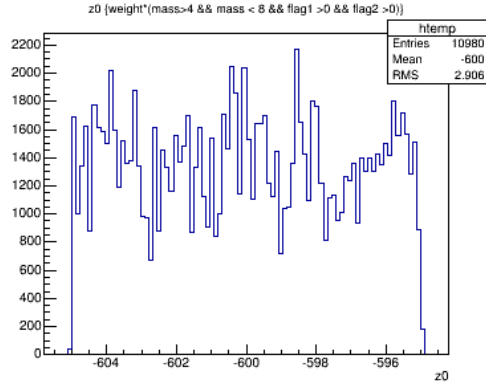


Case-III: New SM0 Configuration

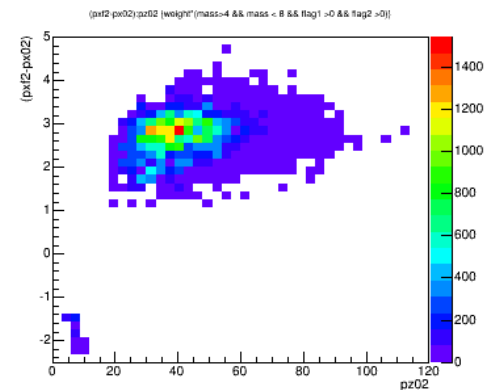
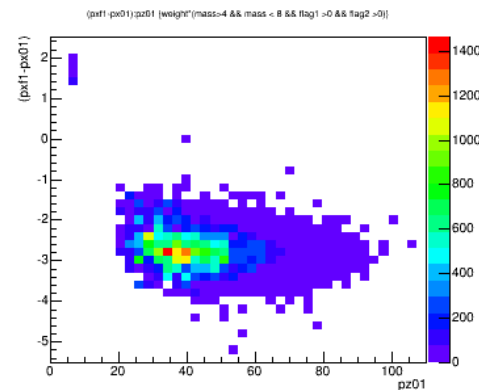
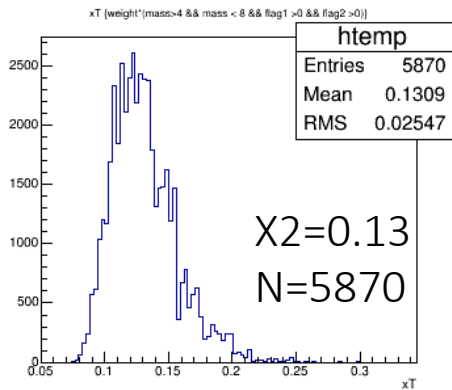
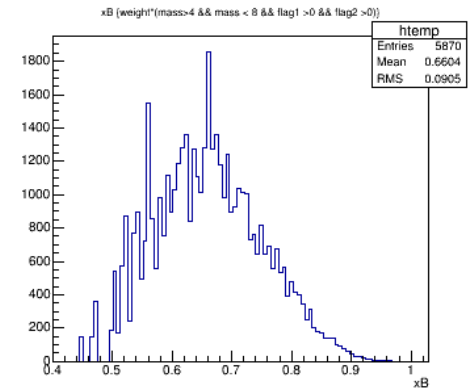
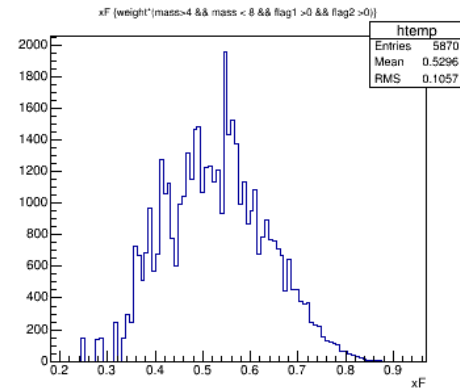
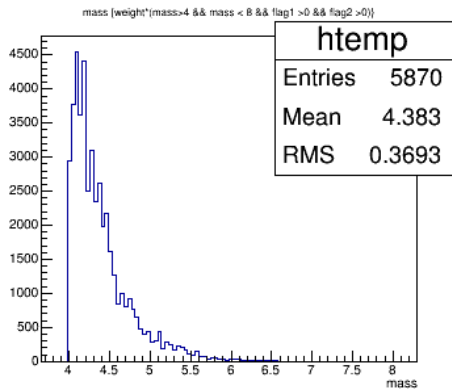
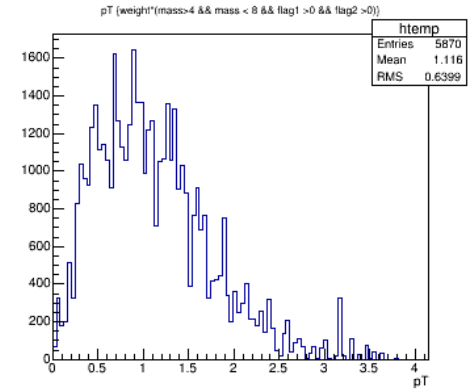
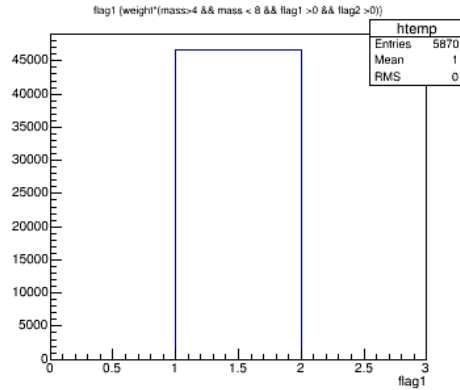
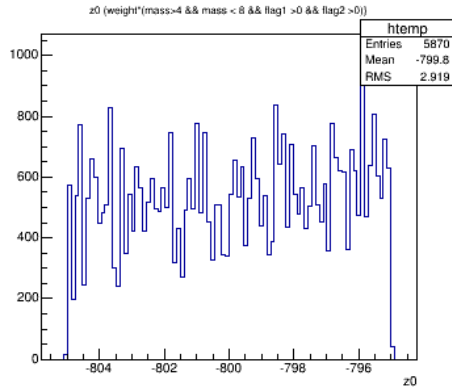
- $B_y = -2.0$ Tesla
- $B_x = B_z = 0$
- $Z = [-500, -400]\text{cm}$

- Target = 10cm LH2
- Target_Z = -600, -700, -800cm

Z= -600cm; By=-2.0Tesla



Z= -800cm; By=-2.0Tesla



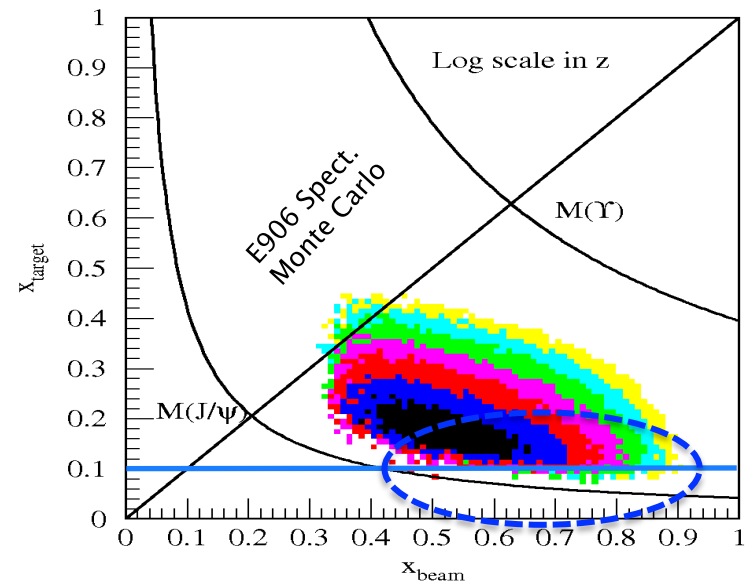
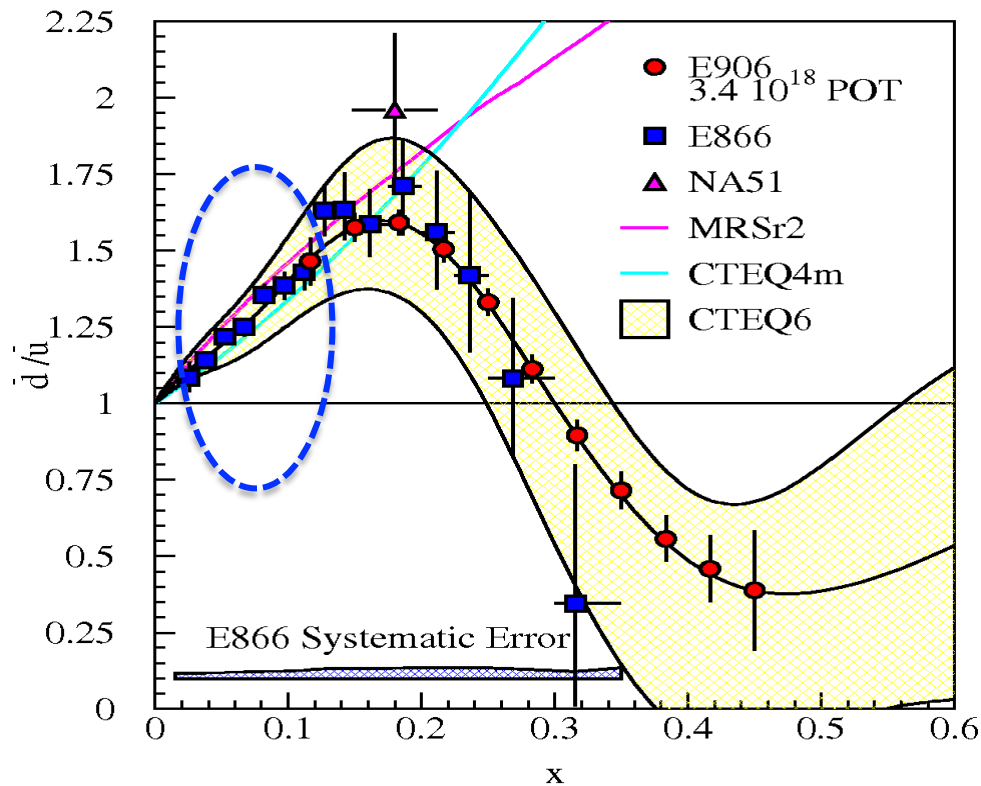
Target/Dump Separation at Trigger

Configuration	Before selection		After selection	
	Target acc	Target/Dump	Target acc	Target/Dump
Target: -500cm No SM0	63%	0.02	41%	0.70
Target: -500cm With SM0	68%	0.03	42%	0.76
Target: -400cm With SM0	62%	0.02	39%	0.27
Target: -130cm No SM0	54%	0.03	46%	0.06

- ‘Before selection’ still requires one track on top, the other on bottom;

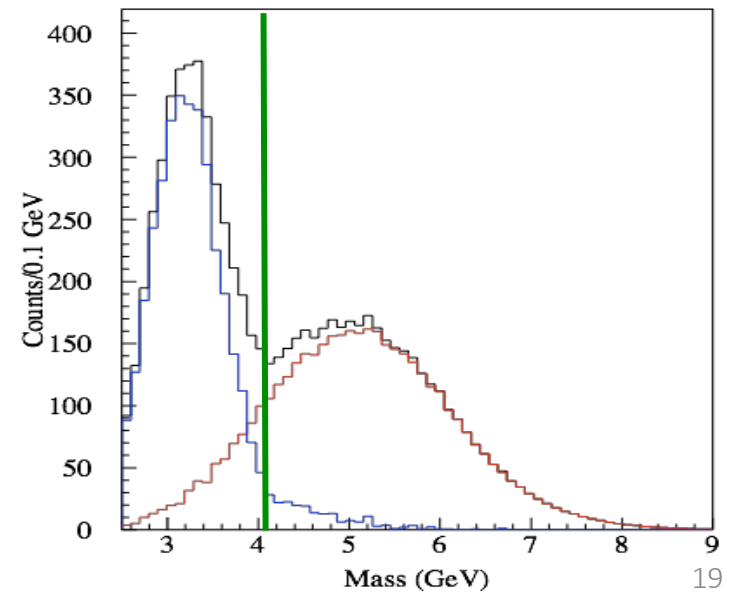
Backup slides

E906 Acceptance



Interesting kinematic range:
 $X_2 = [0, 0.3]$ for pol. DY A_N

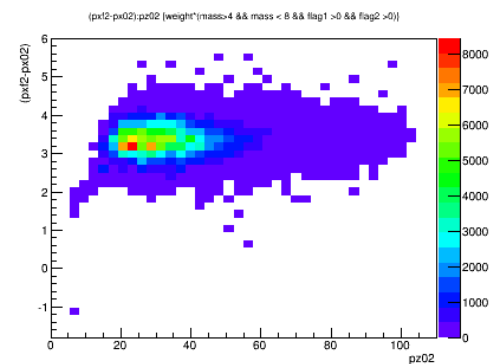
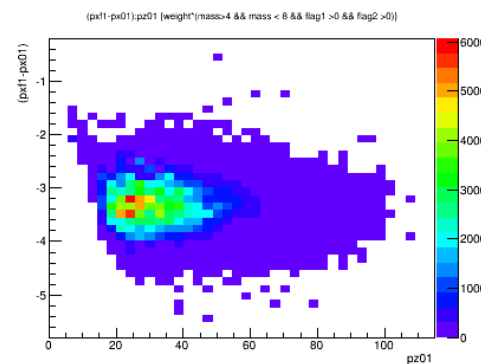
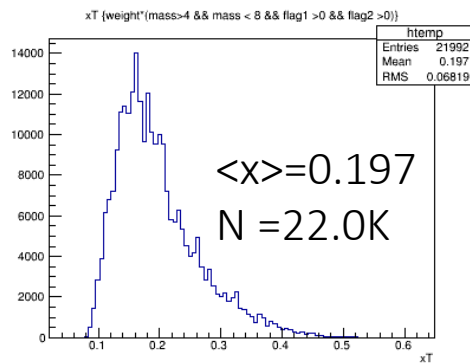
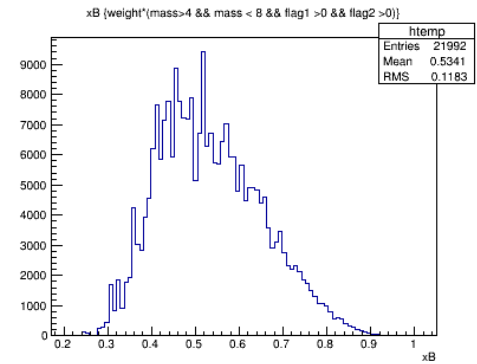
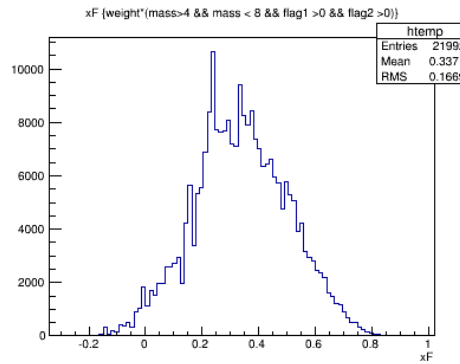
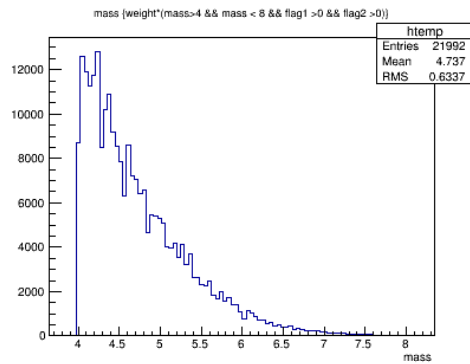
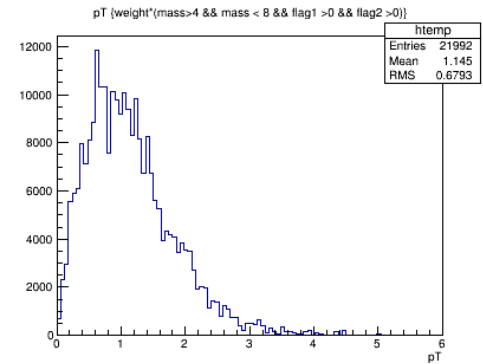
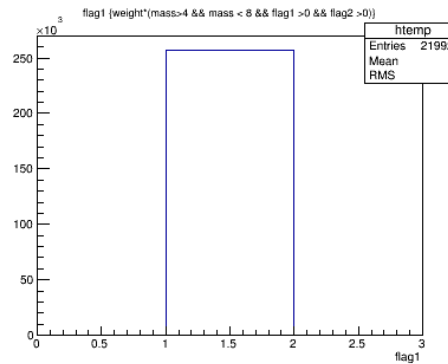
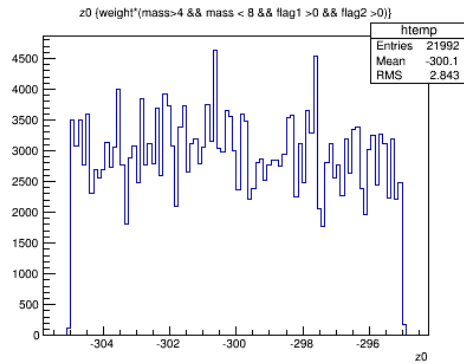
Default E906 = $[0.1, 0.4]$



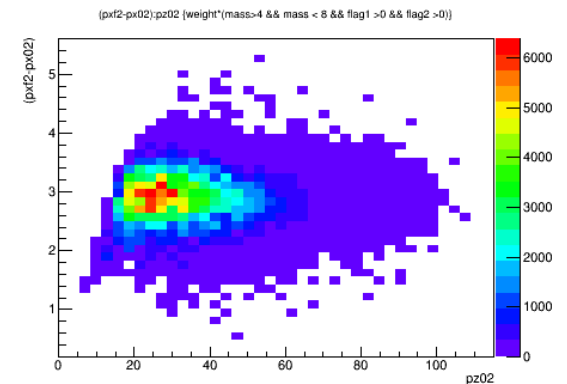
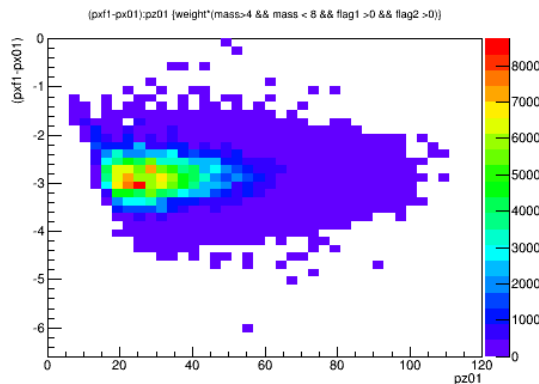
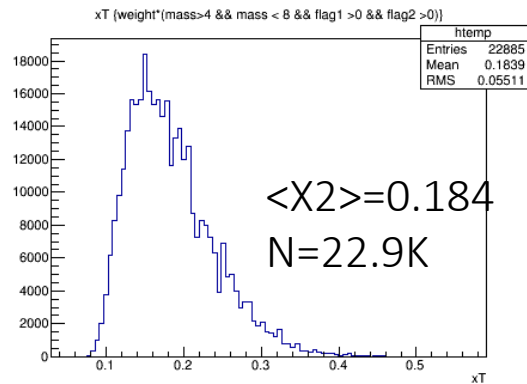
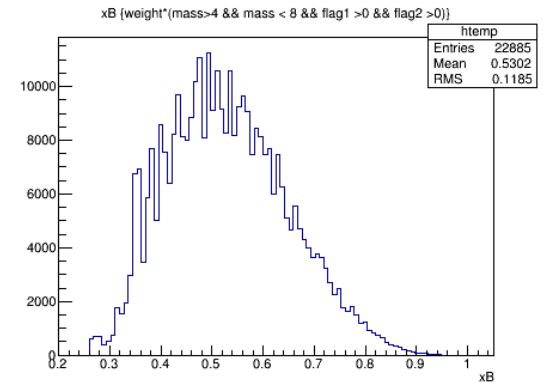
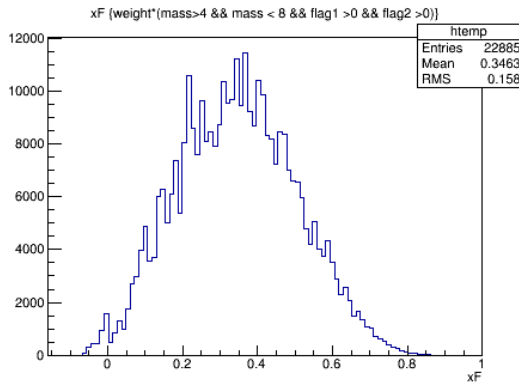
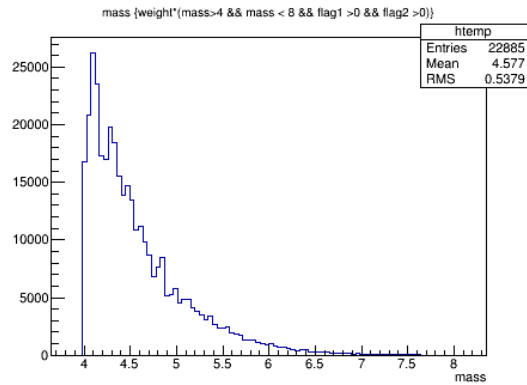
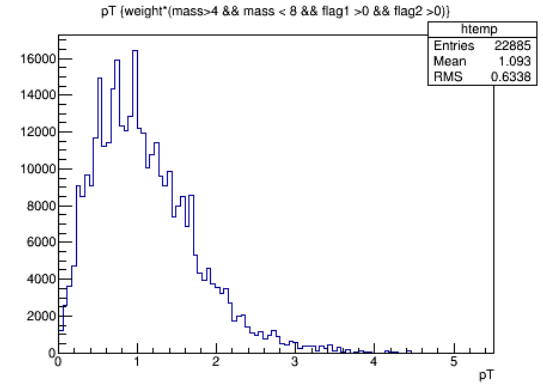
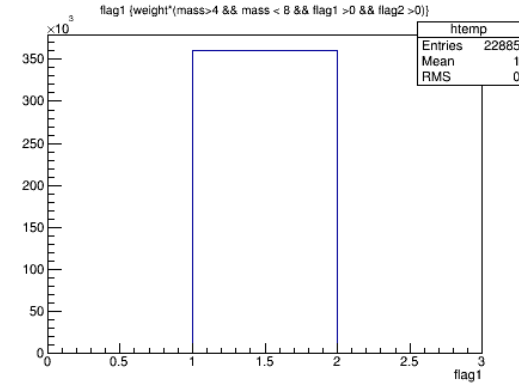
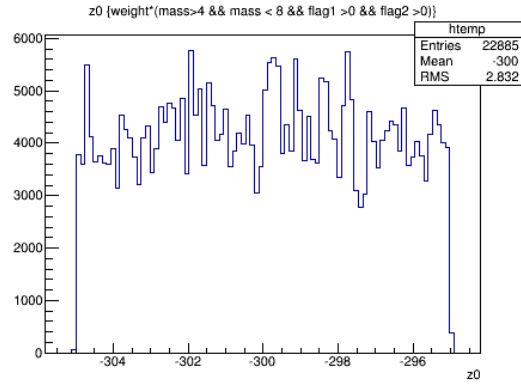
Initial Study with simple SM0

- Target at -500, -400, -300cm from
- SM0 options
 - $B_y = \pm 2$ Testla
 - $L = 100$ cm

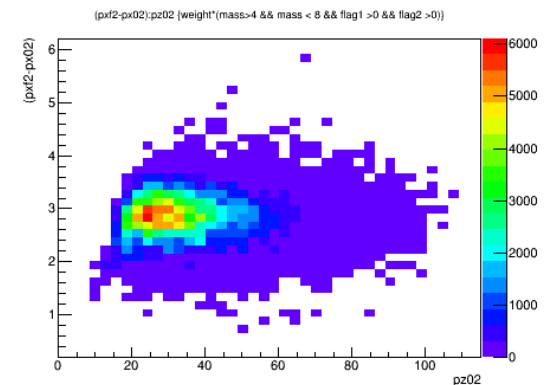
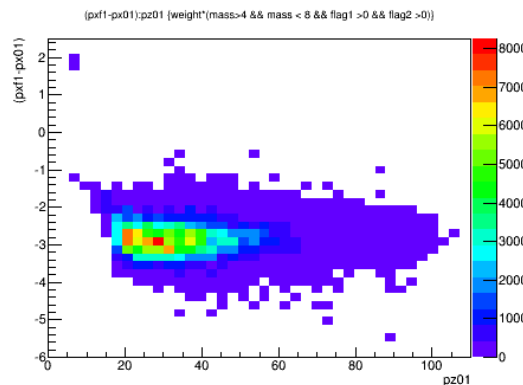
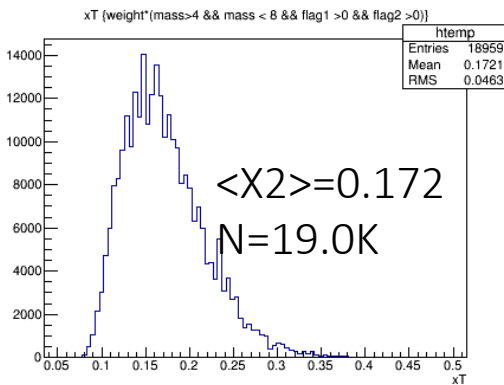
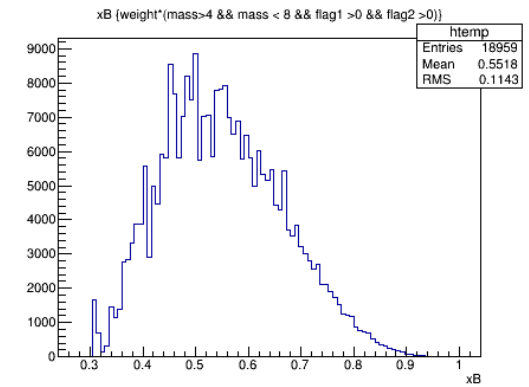
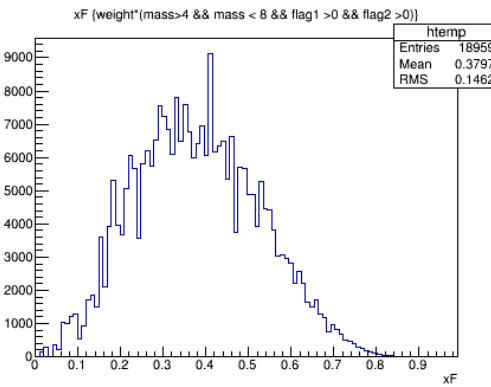
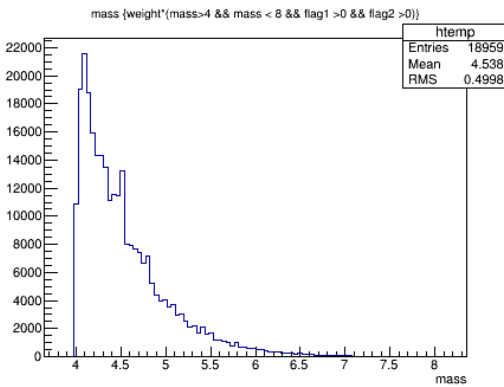
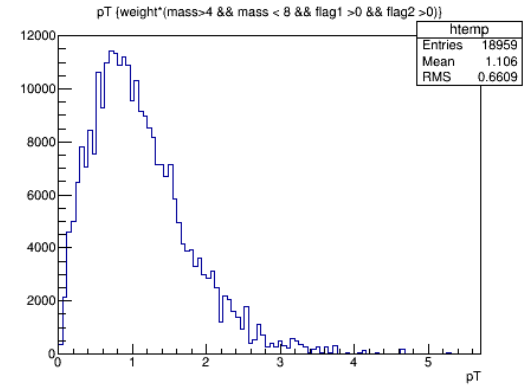
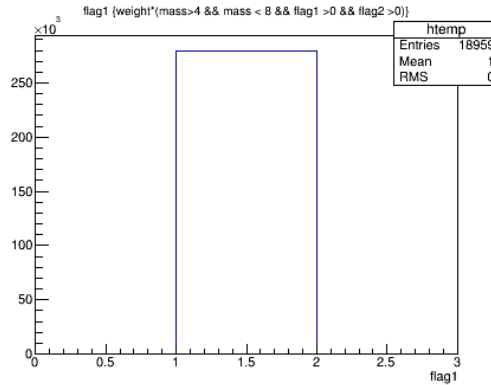
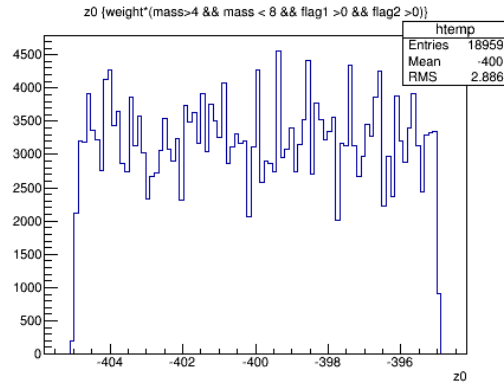
Z = -300cm, default



Target Z = -300 cm; By = -2.0T



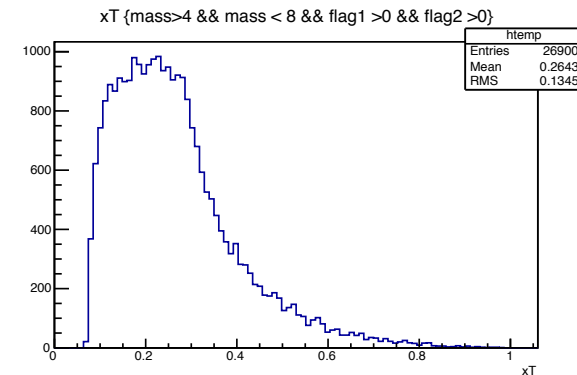
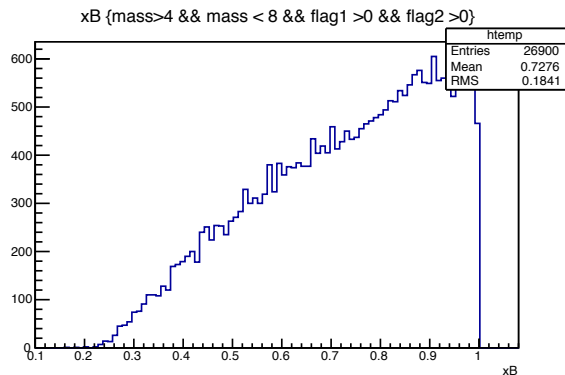
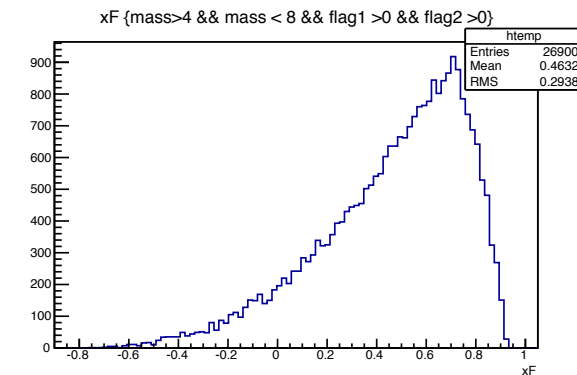
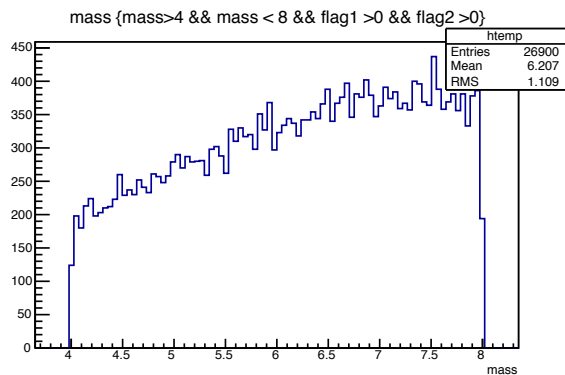
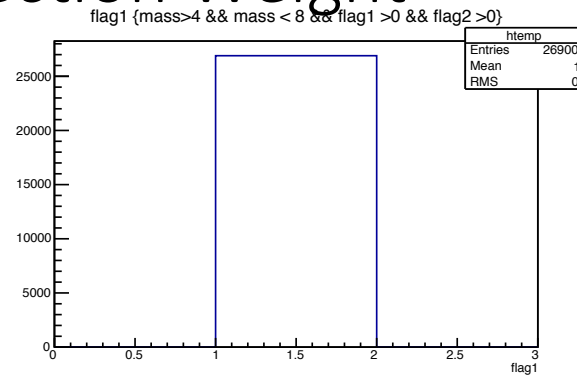
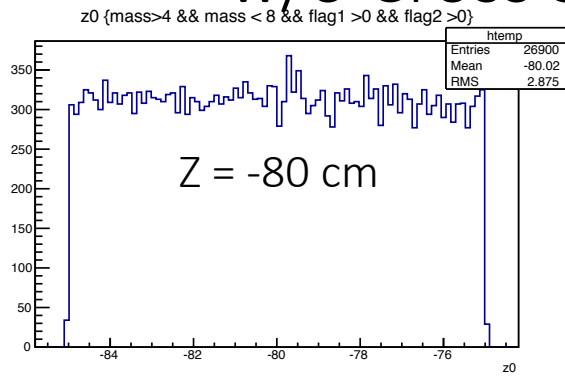
Target Z = -400 cm; By = -2.0T

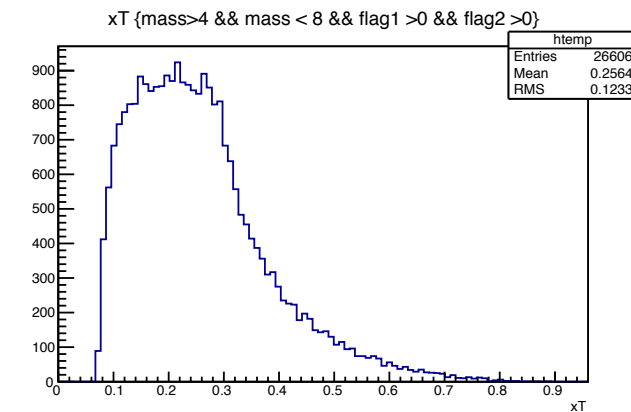
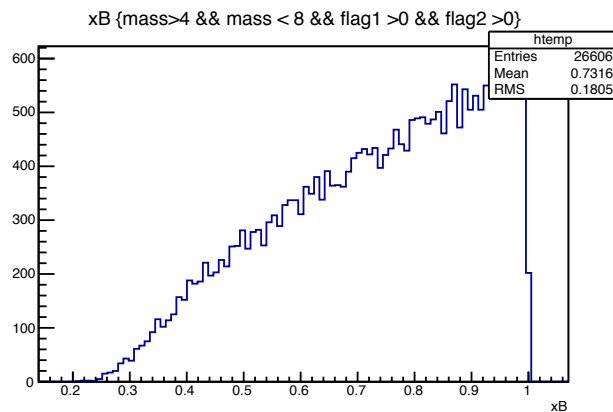
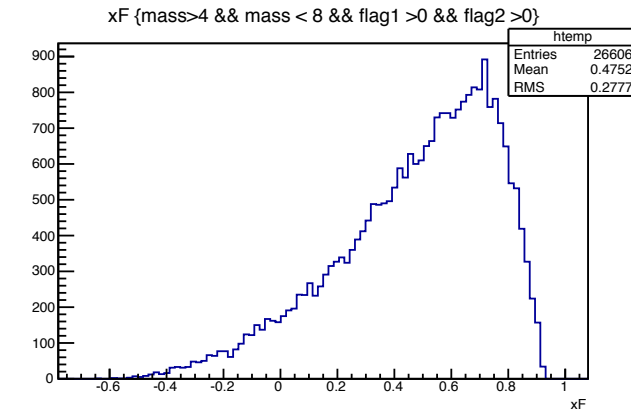
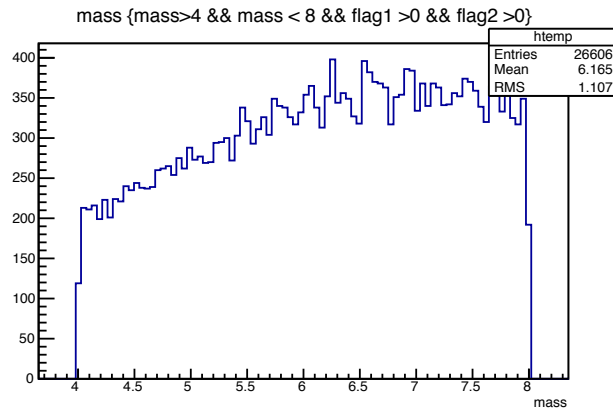
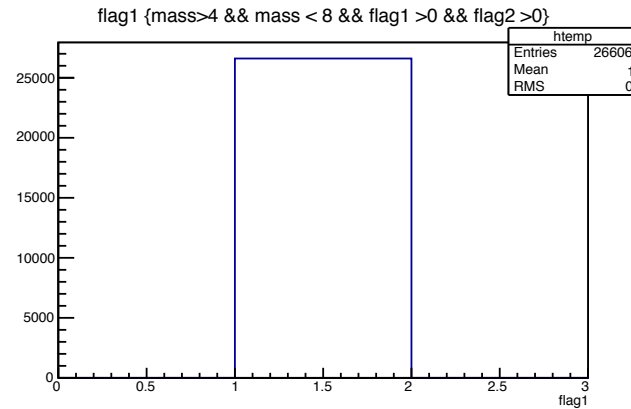
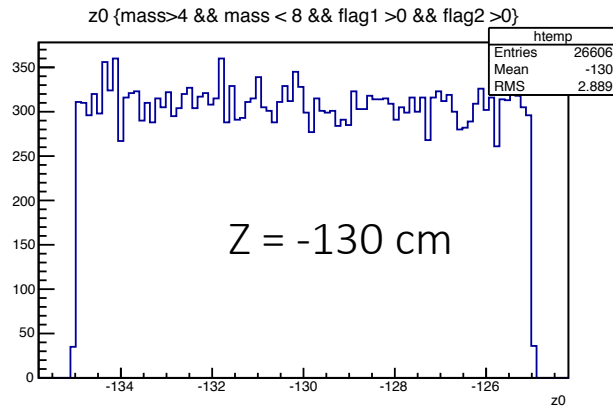


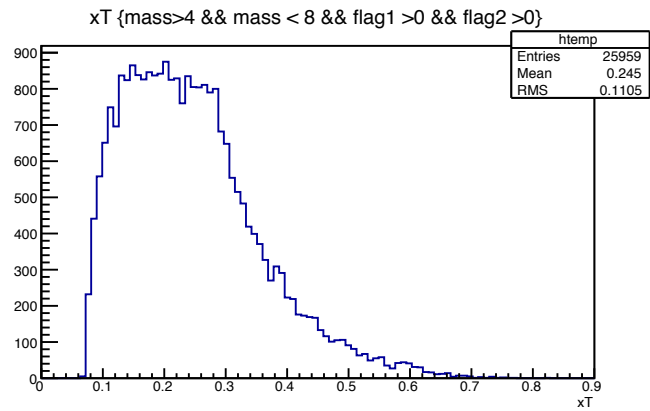
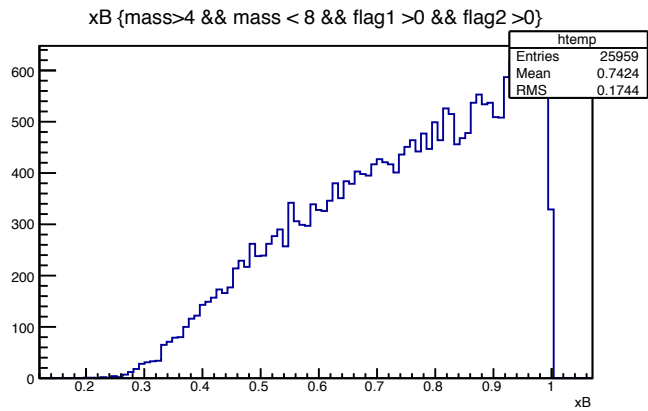
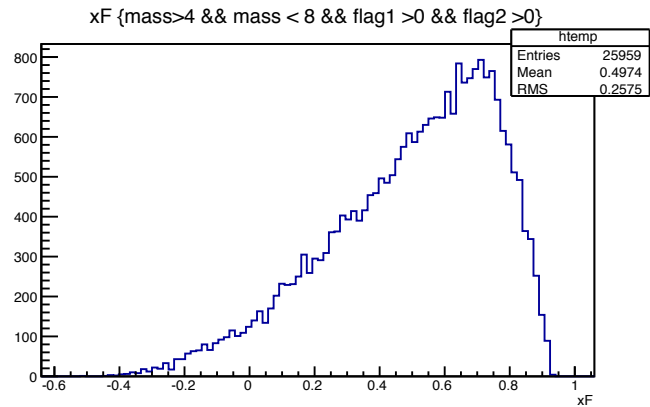
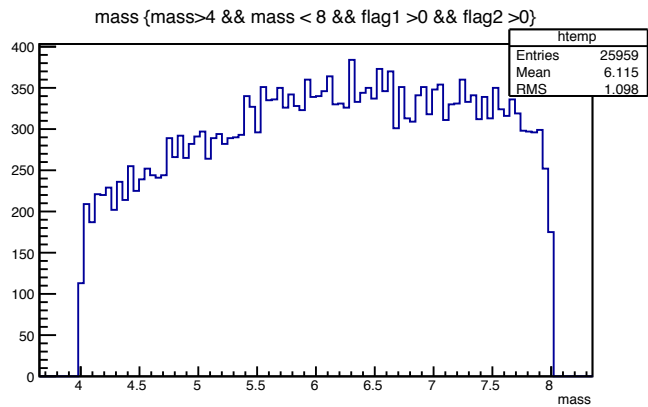
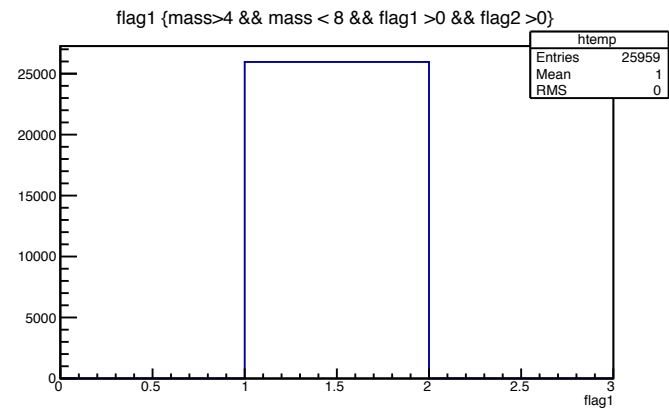
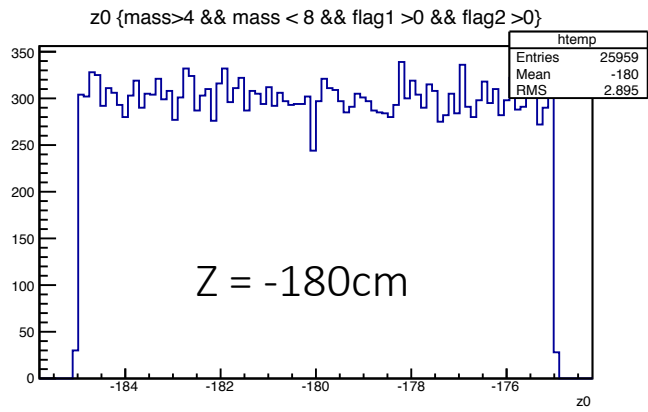
MC Events

Default Setup Accepted Events

w/o Cross Section Weight







NOT cross section
weighted
distributions

