

Transverse Variables for HPTPC

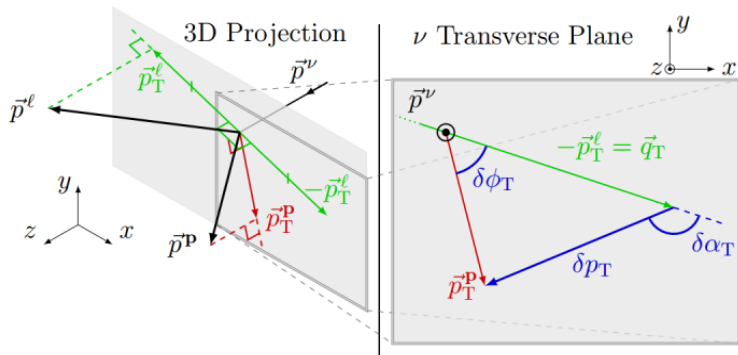
Patrick Dunne - Imperial College London

Overview

- ▶ Update on previous presentation on Single Transverse Variables (STV)
 - Now have 2D distributions and weighting for target mass in HPTPC ND280 comparisons
- ▶ Reminder of STV
- ▶ Distributions of STV for ND280 and HPTPC-like selections focussing on $CC0\pi1p$

Single Transverse Variables

- ▶ Use hadronic information to estimate nuclear effects
- ▶ For simple CCQE without nuclear effects $\delta p_T = 0$, $\delta \alpha_T = \pi$, $\delta \phi_T = 0$



HPTPC Study

- ▶ HPTPC-like and ND280-like momentum thresholds (below) and efficiencies (see Mark's talk 10th October) were applied to ND280 MC truth
 - Same as shown previously
- ▶ HPTPC sample then weighted by 635/2202 to account for target mass
- ▶ Then calculated transverse variables
 - Only make sense in samples with a proton or a pion

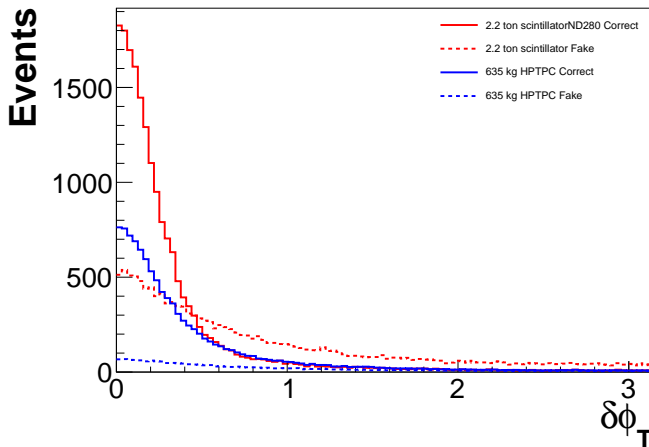
Particle	ND280 Threshold/MeV	HPTPC Threshold/MeV
μ	100	15
π	120	16
p	450	60
e	100	1

HPTPC Study

- ▶ Truth information is used to determine which events truly belong in the sample (“correct”), and which are “fakes”
 - Distributions of transverse variables are shown for both
- ▶ Saw last time that distributions of transverse variables were similar between ND280 and HPTPC, but much lower fake rate
- ▶ Will investigate 2D distributions with each other and other kinematic variables

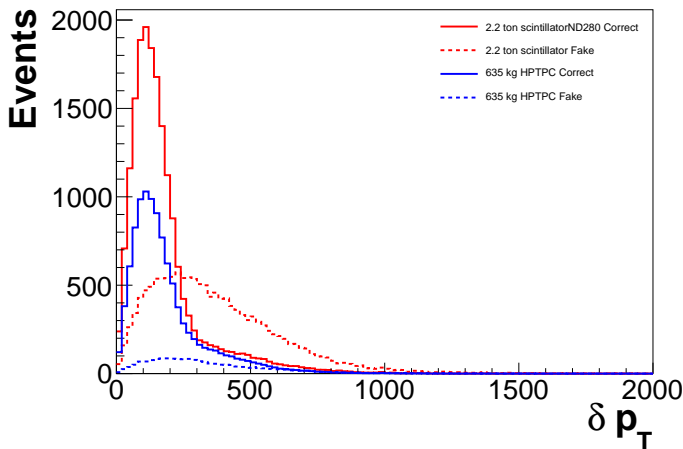
1D distributions for CC0 π 1p

cc0pi1p_d_phit



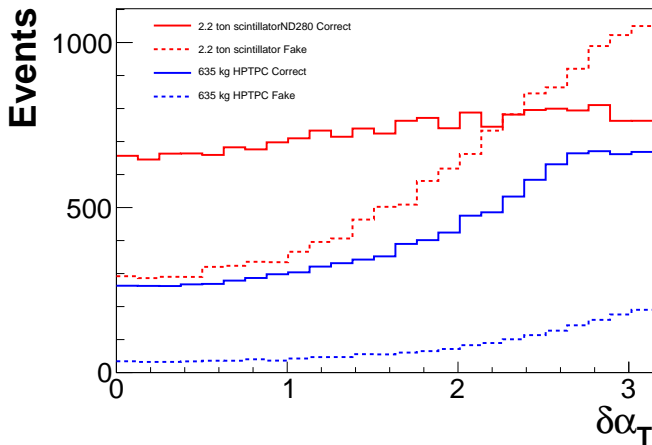
1D distributions for CC0 π 1P

cc0pi1p_d_pt

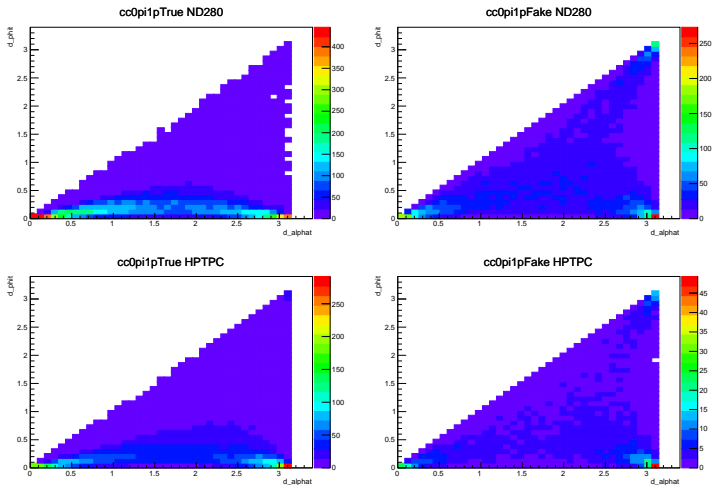


1D distributions for CC0 π 1P

cc0pi1p_d_alphat



2D distribution highlights for CC0 π 1P



Additional information

- ▶ Particularly for δp_T context is important



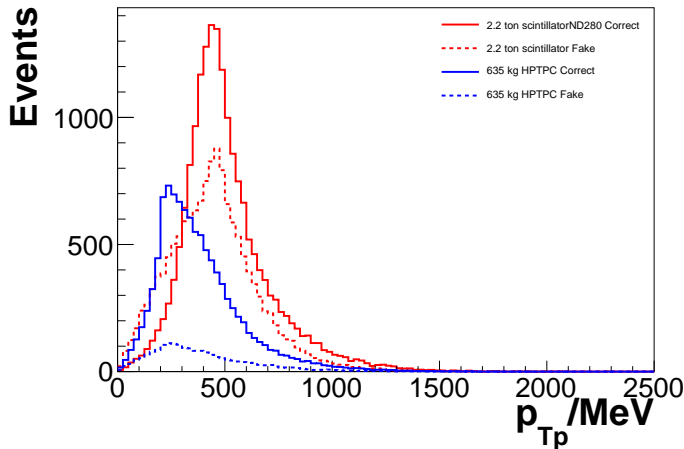
VS



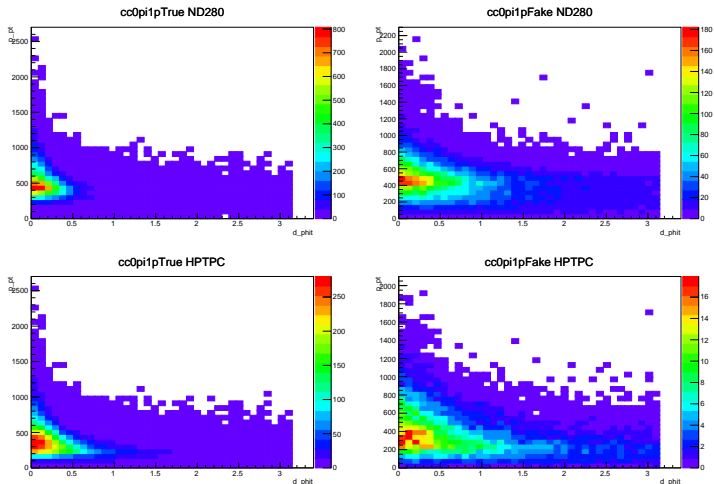
- ▶ Both events have the same δp_T but this is clearly more significant on the right

Additional information

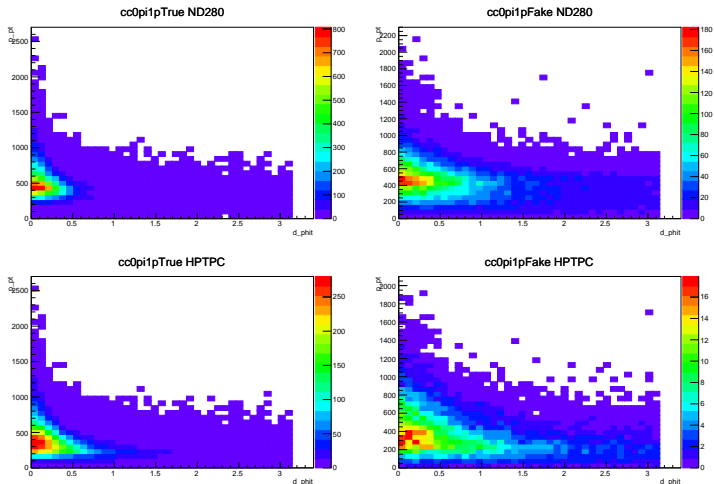
cc0pi1p_p_pt



2D distribution highlights for CC0 π 1P



2D distribution highlights for CC0 π 1P



- ▶ Transverse variables on their own don't immediately give better signal/background discrimination
- ▶ Combination with other variables has potential to help with this
- ▶ Next step is to look at these variables with Mark's fake data studies to determine how transverse variables impact model determination