

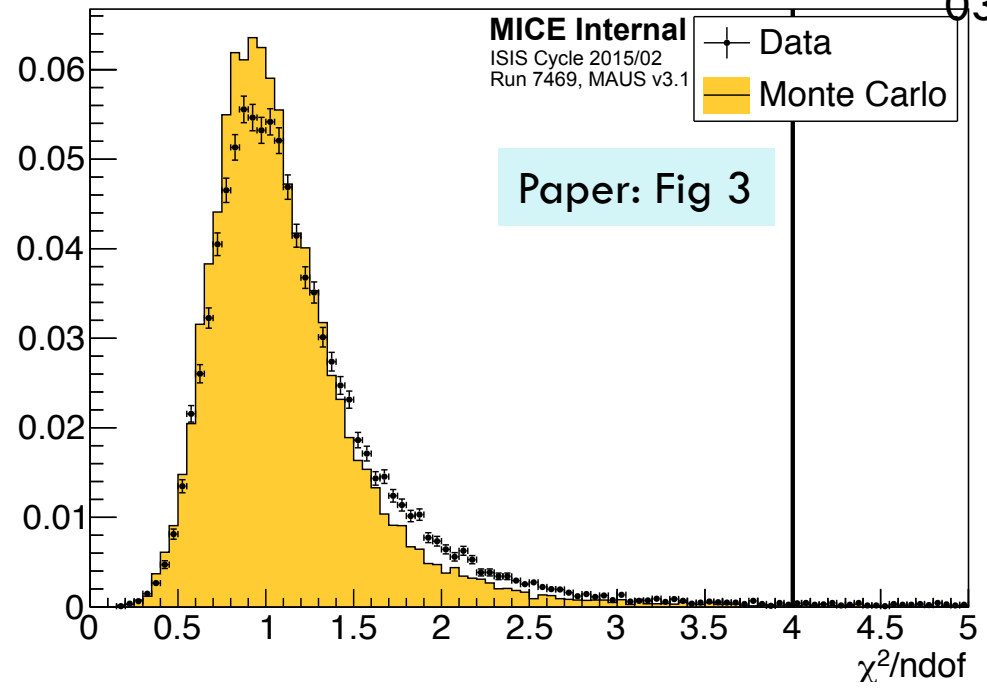
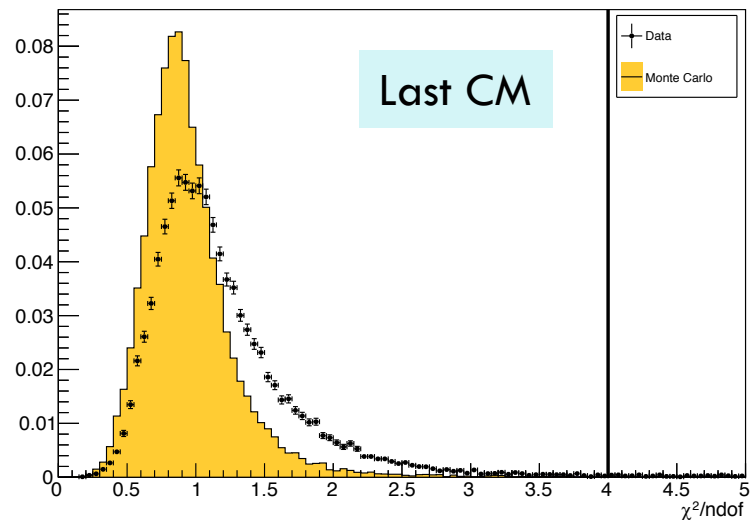
RUN 7469 EMITTANCE PAPER

V. Blackmore
June 27th 2018

STATUS

- Everyone should have a copy of the paper!
 - Email from Chris Rogers: 21st June 2018
 - Version that was sent out for comment is attached to Indico and [linked here](#)
 - Send comments!
 - Author list → Paul Kyberd
- Needs a larger MC sample, but otherwise complete.
- Plots have been seen in various shapes and forms now for a long time.
 - Will only show those that have changed, or are new, since last CM
- Have had a few comments back – none yet implemented.

CUTS

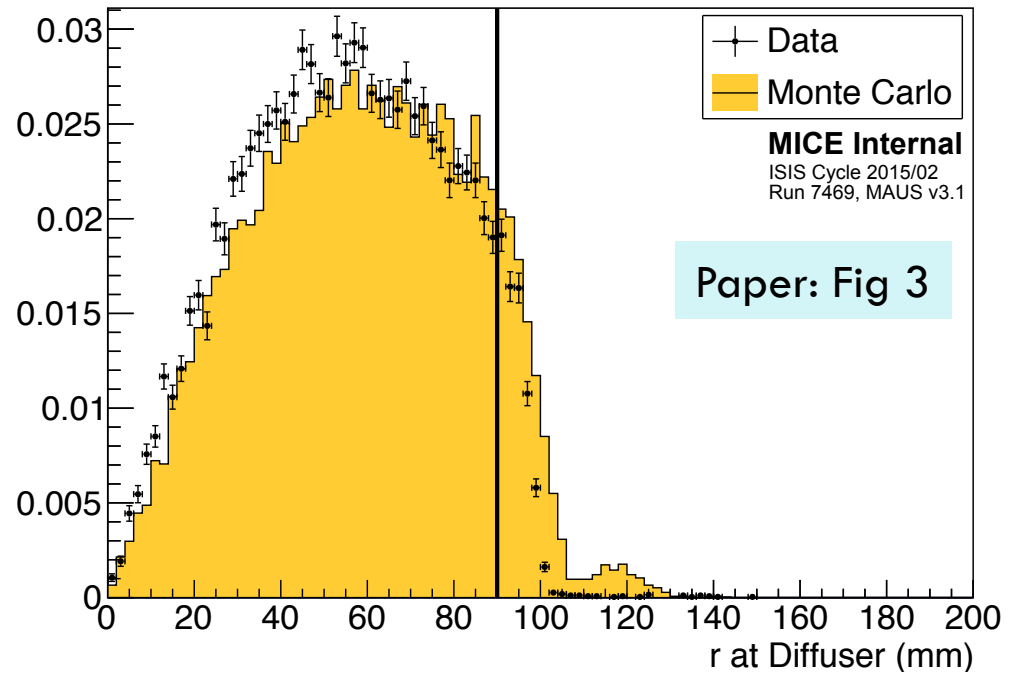
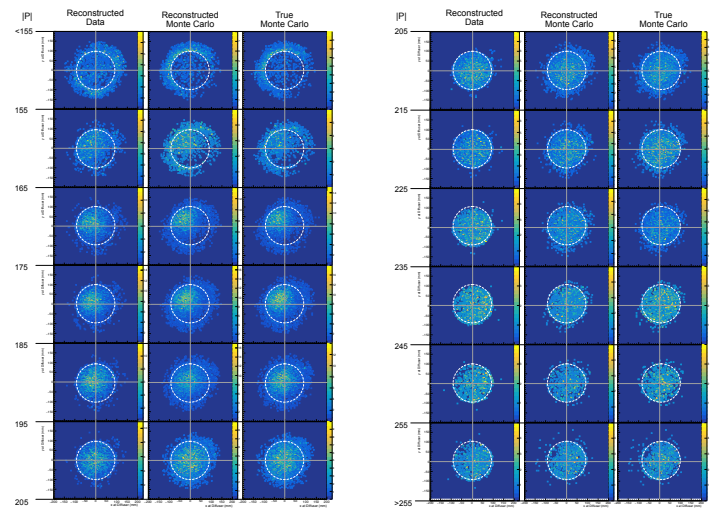


Plots show events that pass all cuts **except** the ones of interest

Chi-square: now has 'glue'

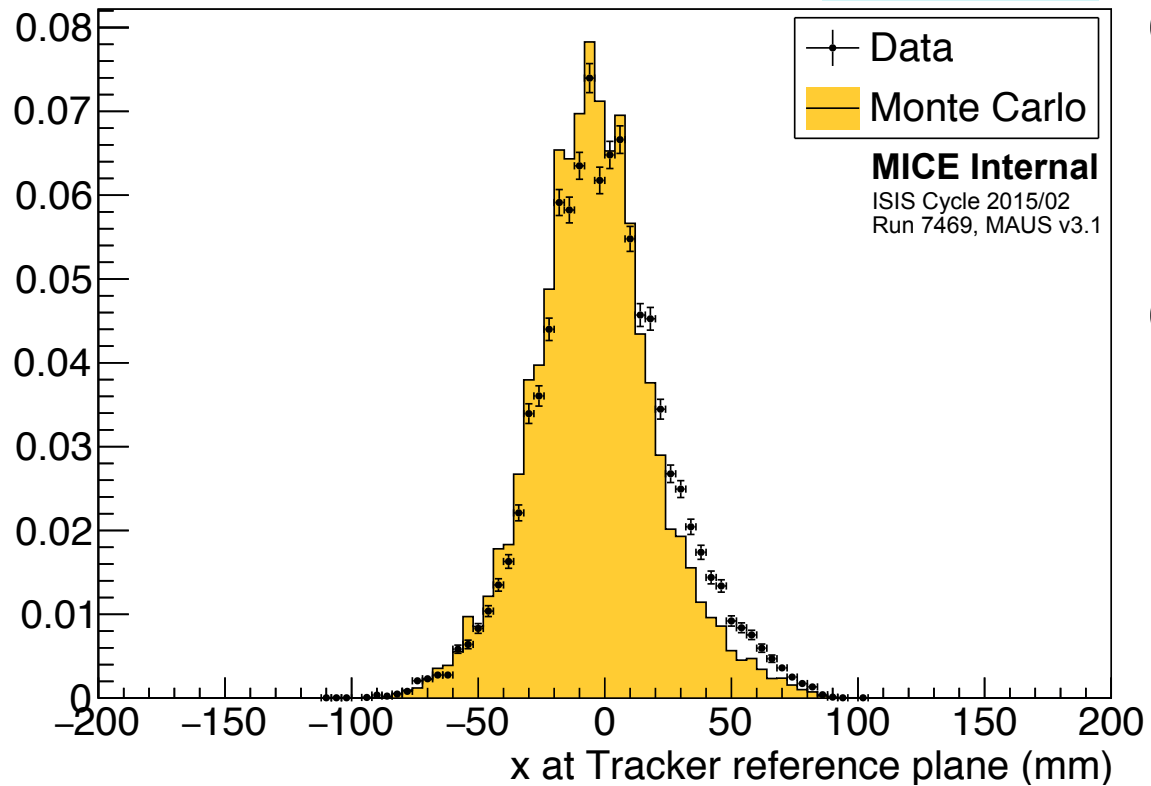
Diffuser: 90mm cut OK (see later new plot)

(it will be bigger)

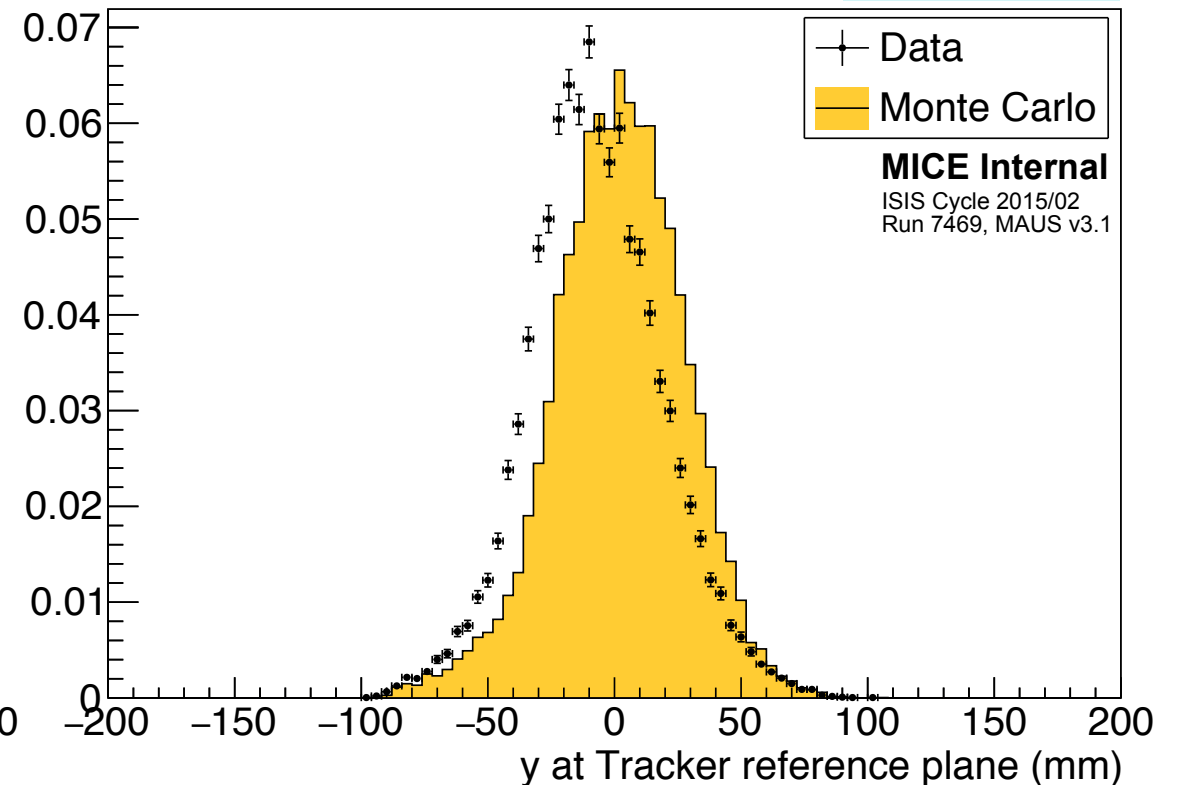


1D DISTRIBUTIONS: X, Y

Paper: Fig 5



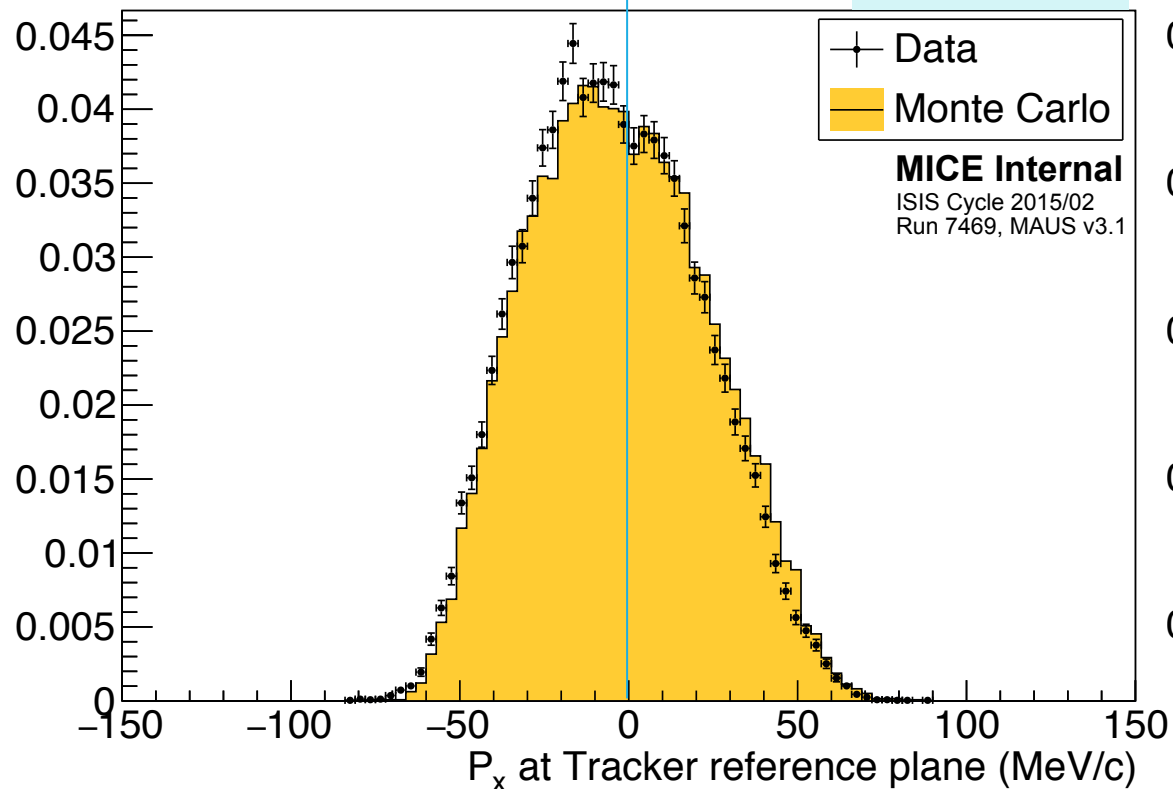
Paper: Fig 5



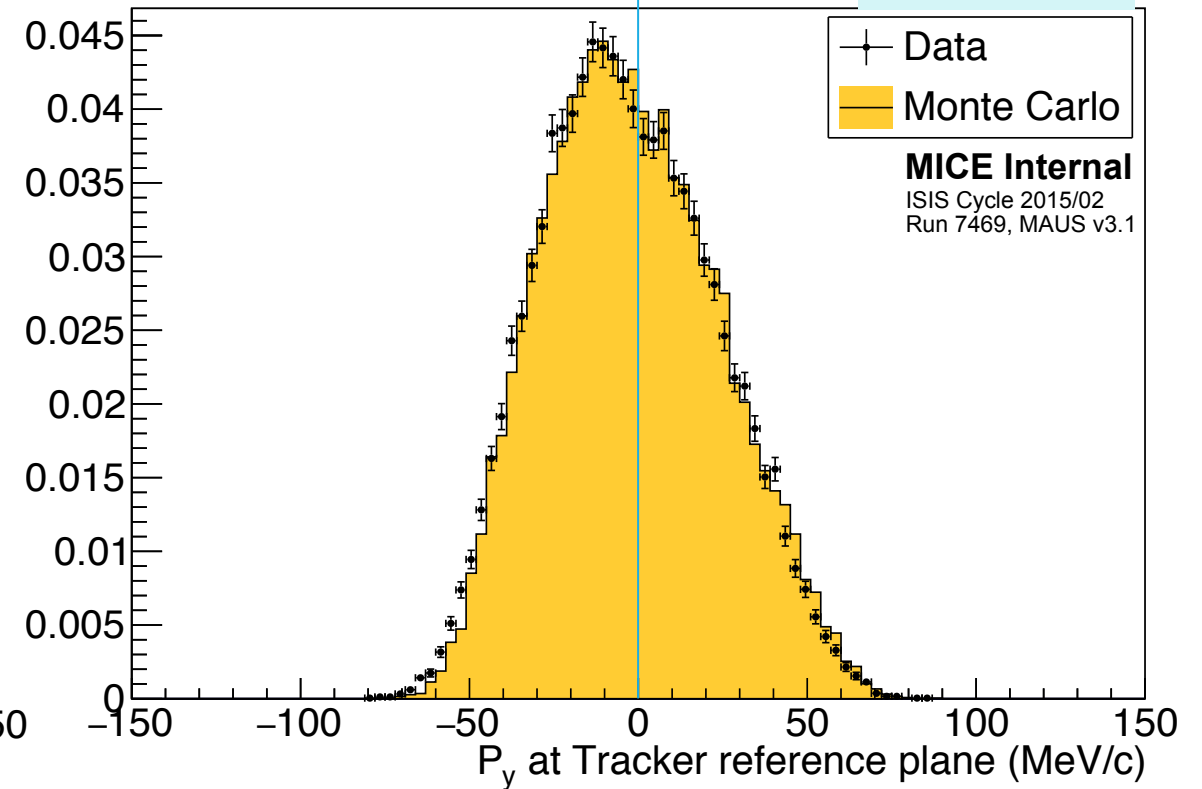
1D DISTRIBUTIONS: P_X, P_Y

← Small dip at zero: Will check if this is P-dependent →

Paper: Fig 5

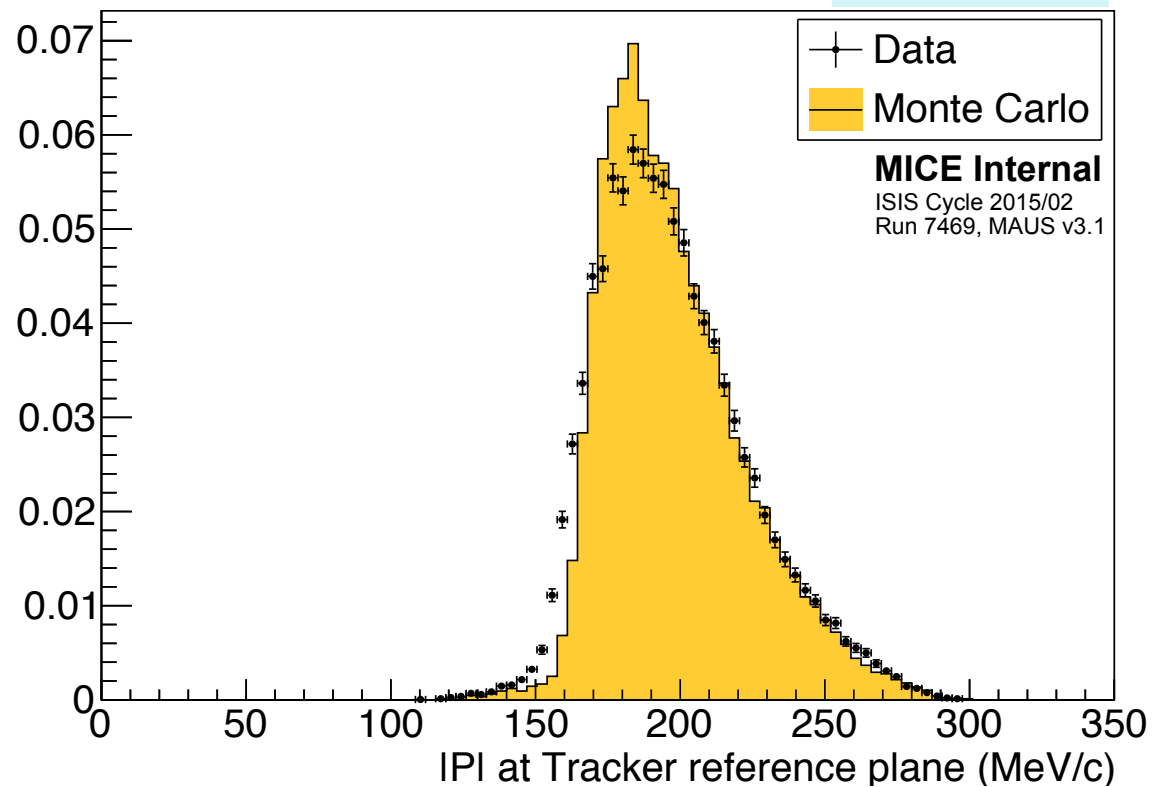


Paper: Fig 5

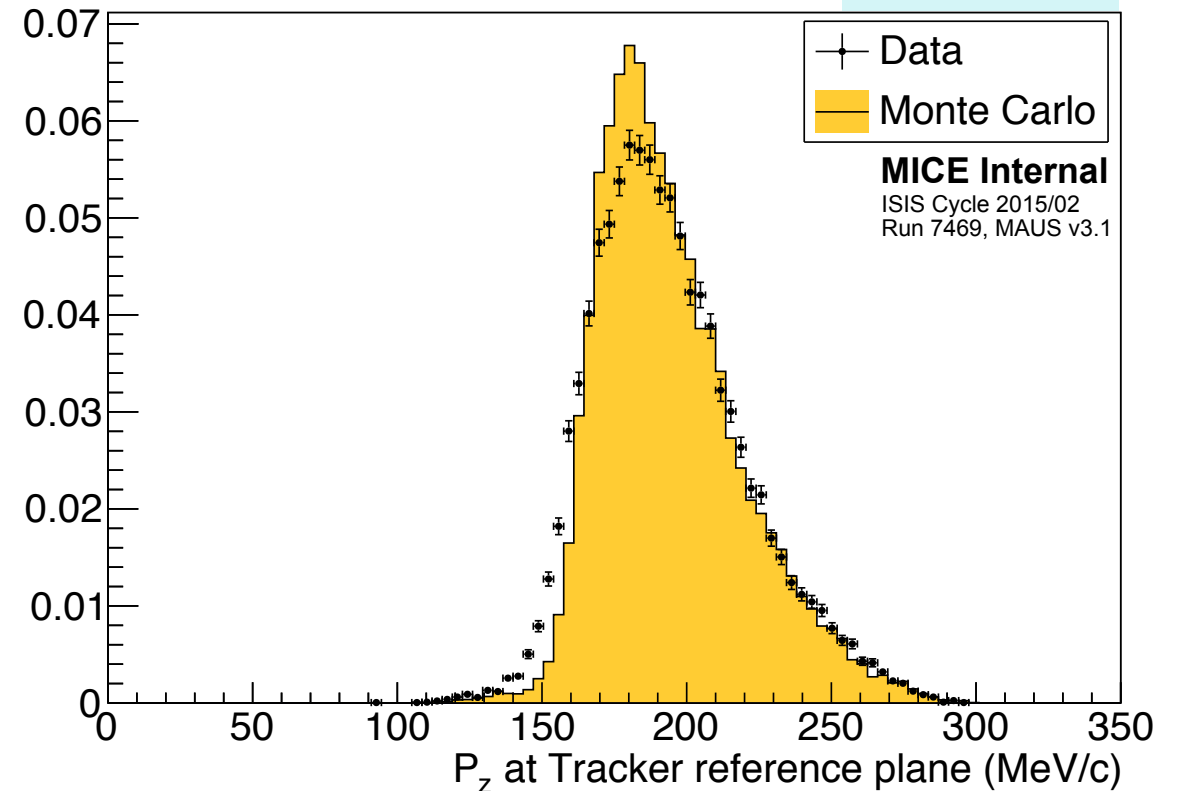


1D DISTRIBUTIONS: P, PZ

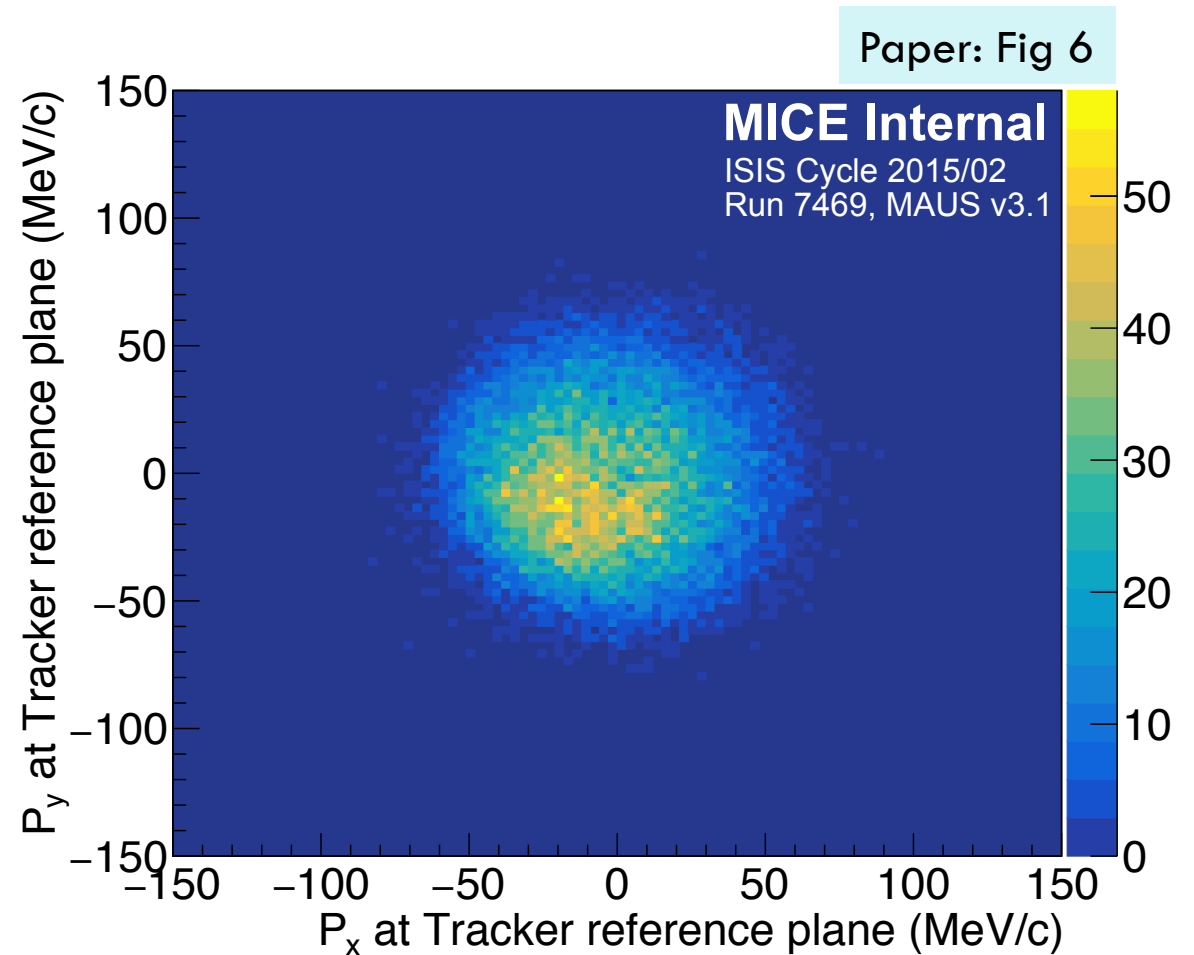
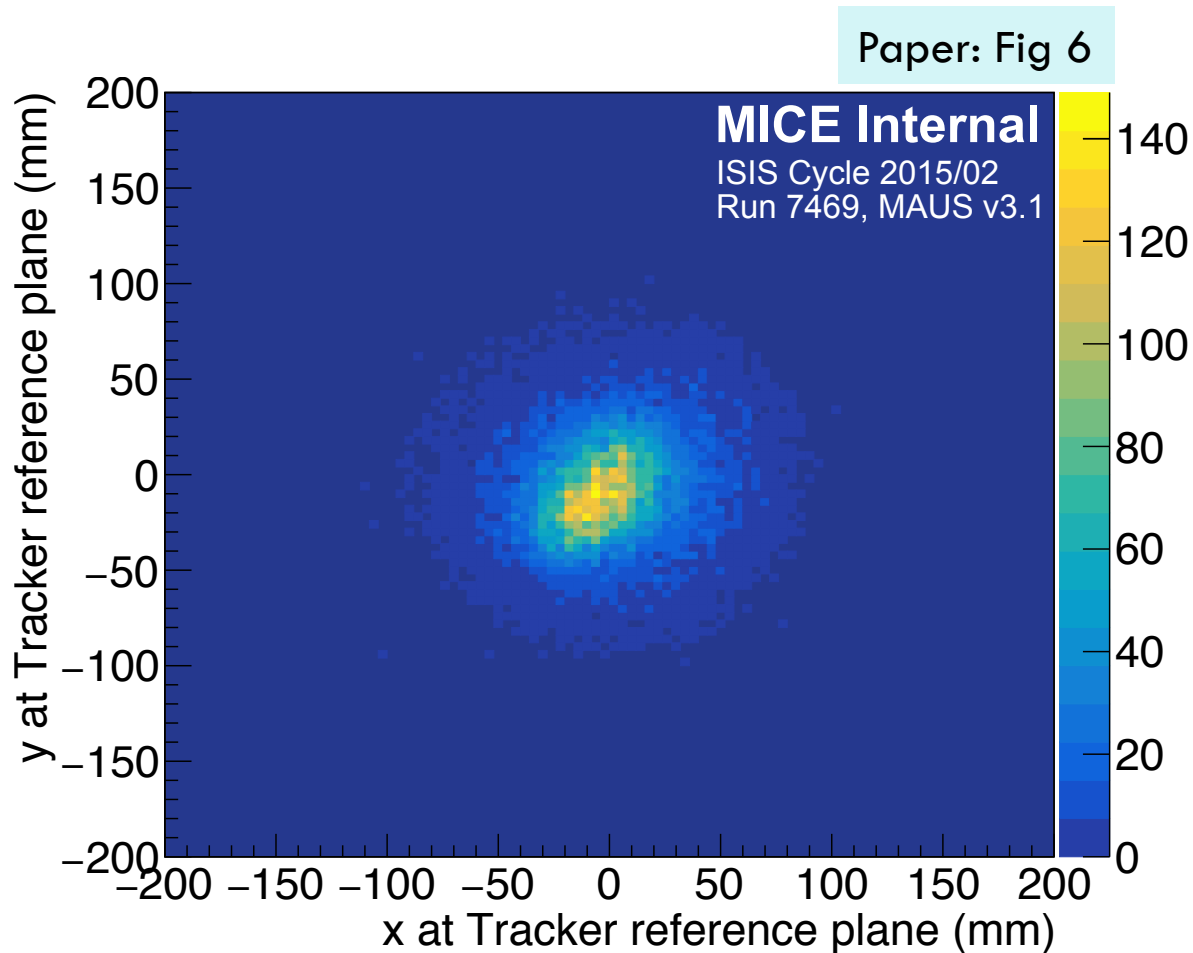
Paper: Fig 5



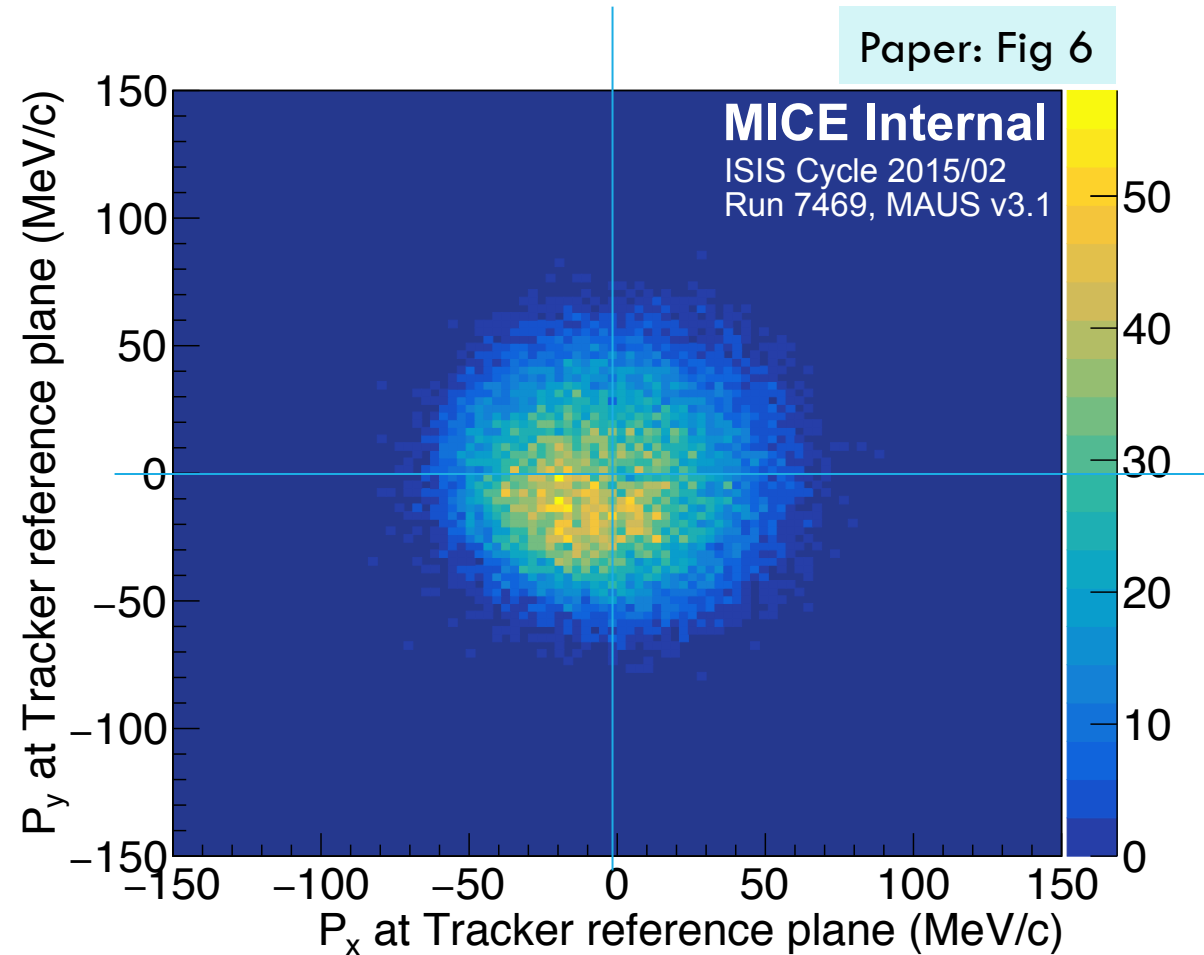
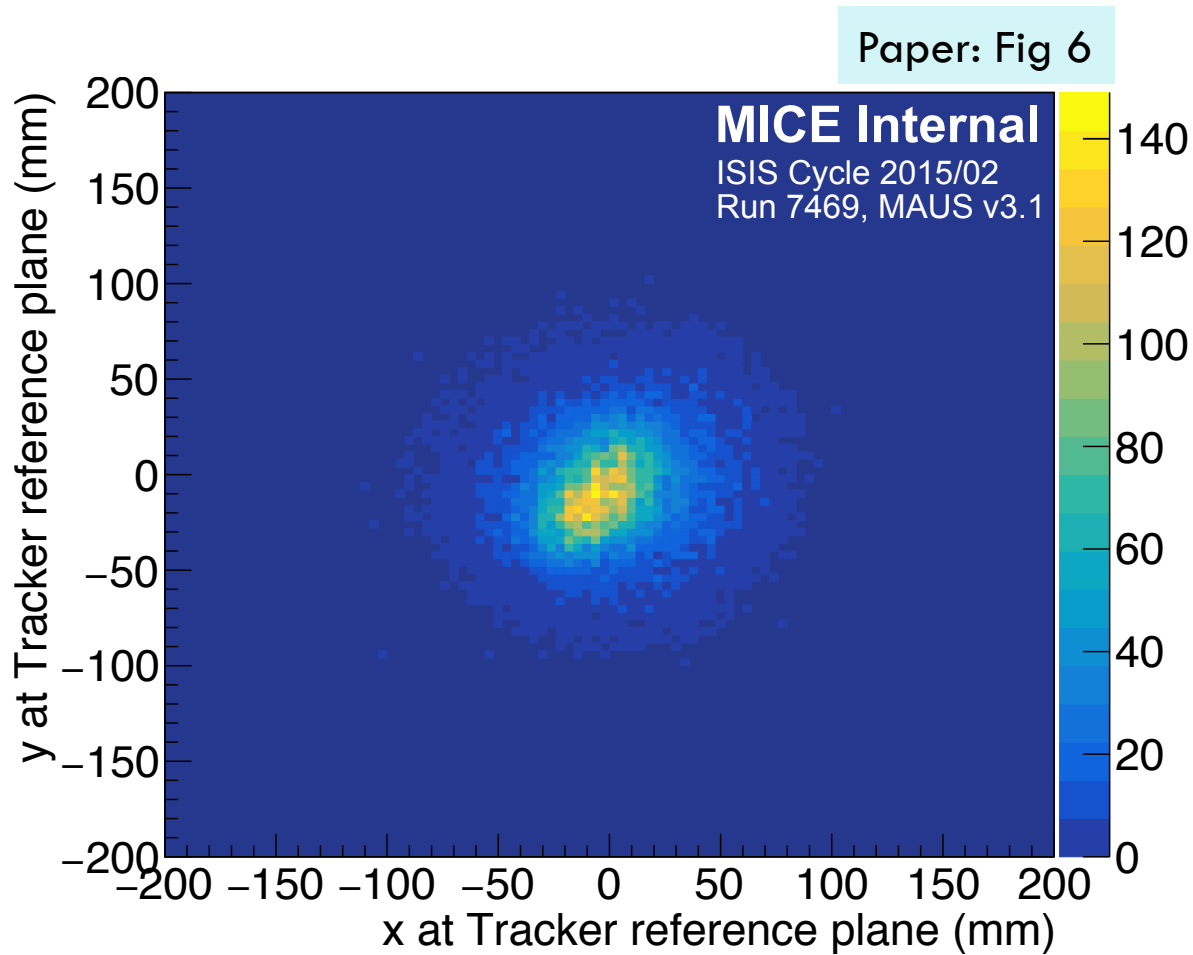
Paper: Fig 5



2D DISTRIBUTIONS: XY, PXPY

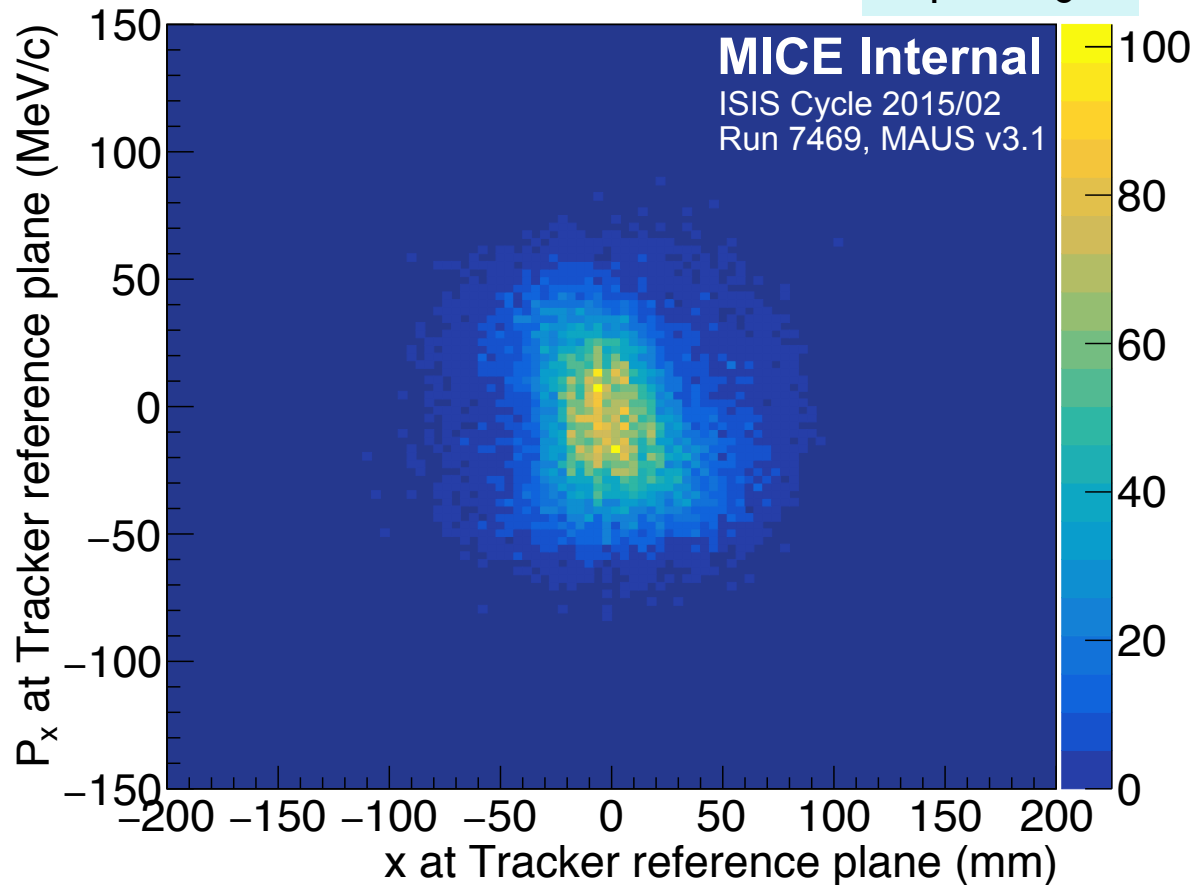


2D DISTRIBUTIONS: XY, PXPY

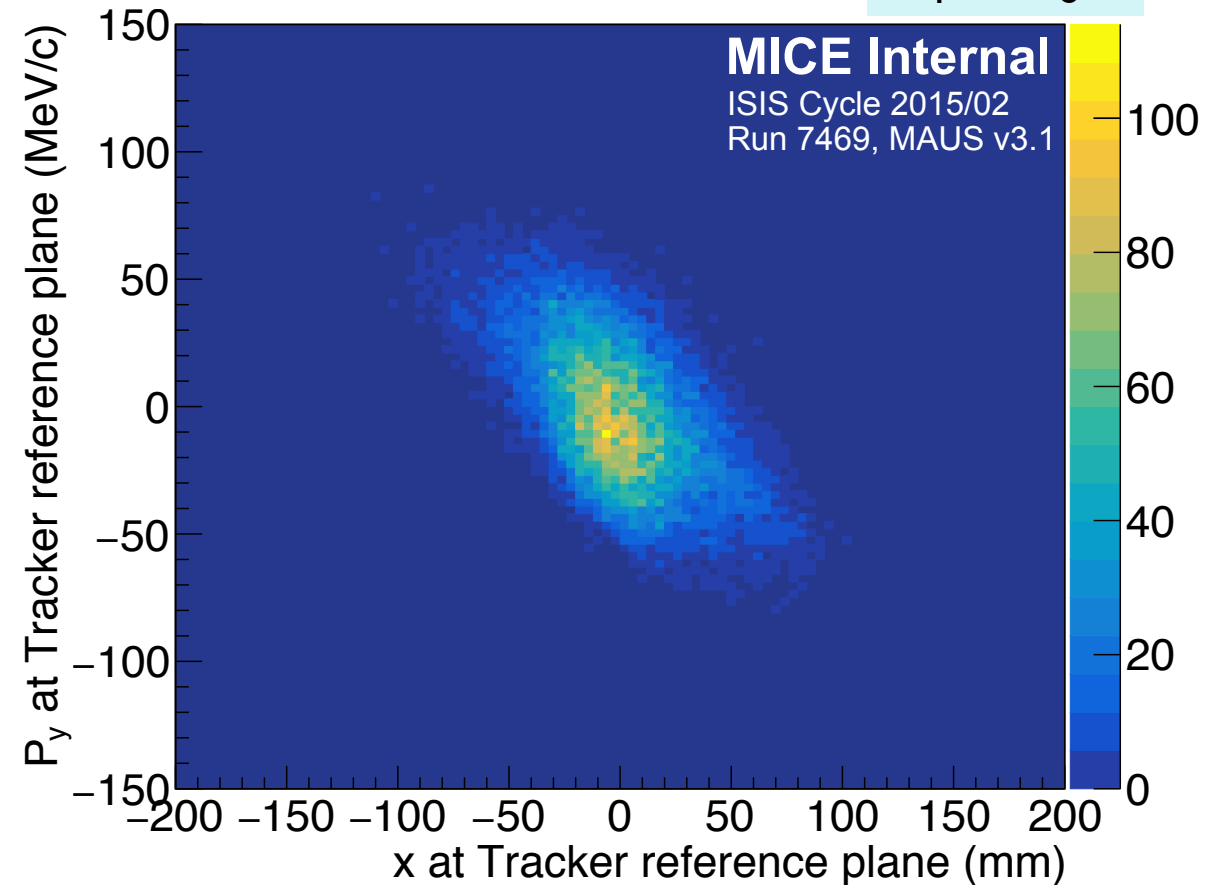


2D DISTRIBUTIONS: XPX, XPY

Paper: Fig 6

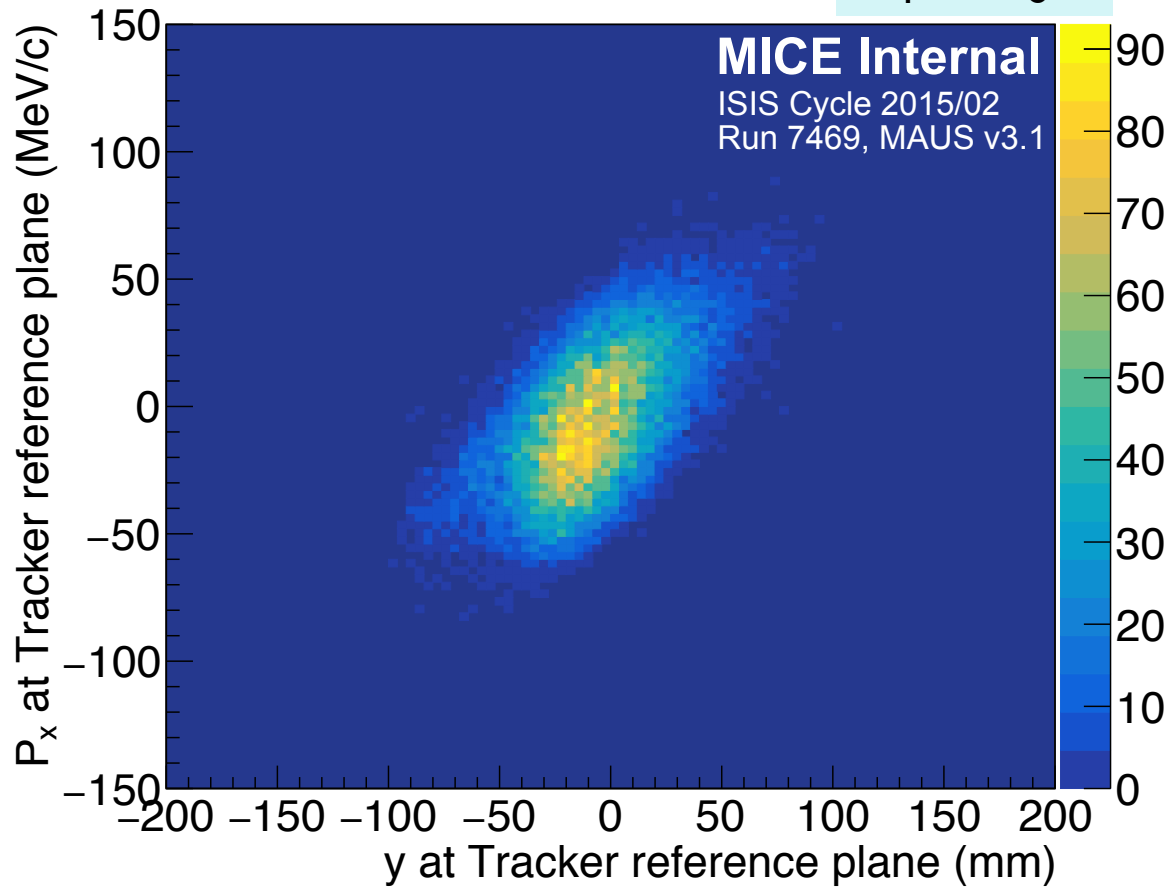


Paper: Fig 6

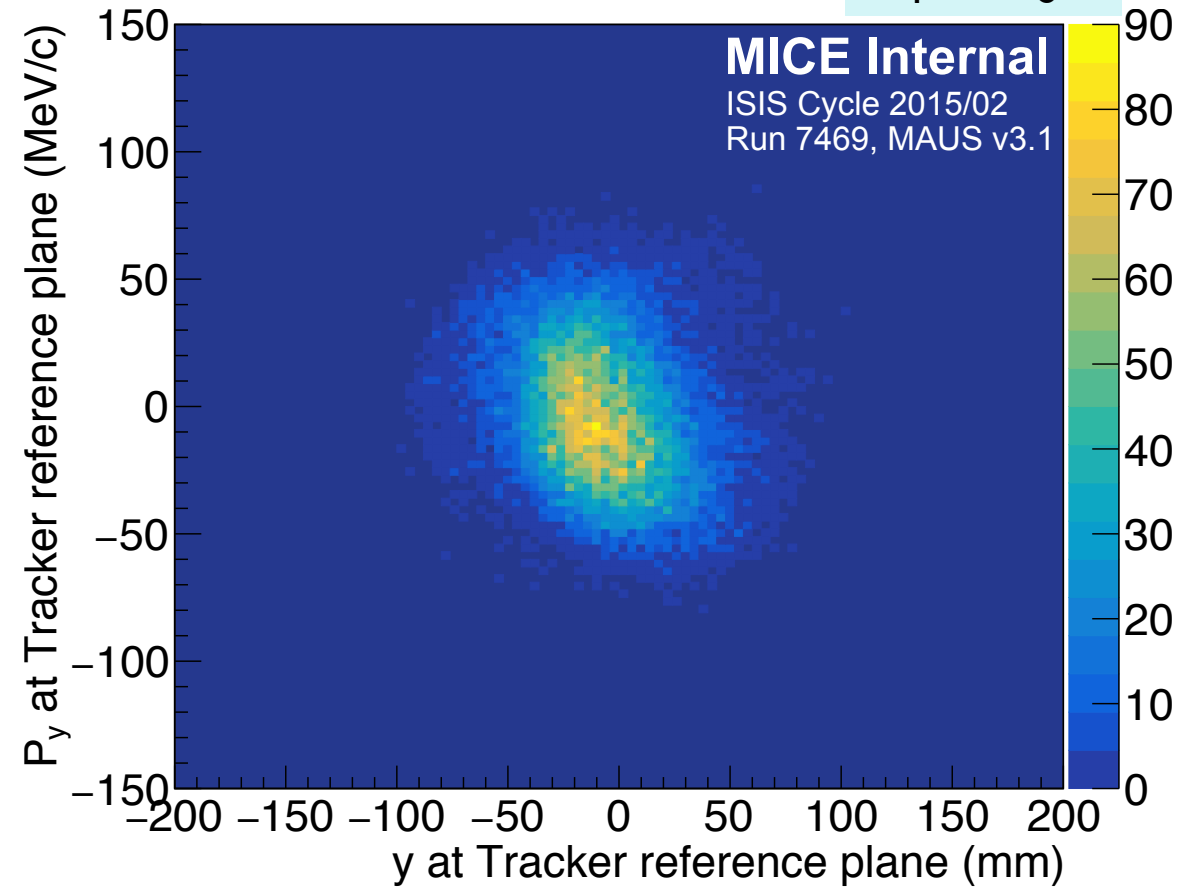


2D DISTRIBUTIONS: YPX, YPY

Paper: Fig 6



Paper: Fig 6



Note: Fig 9

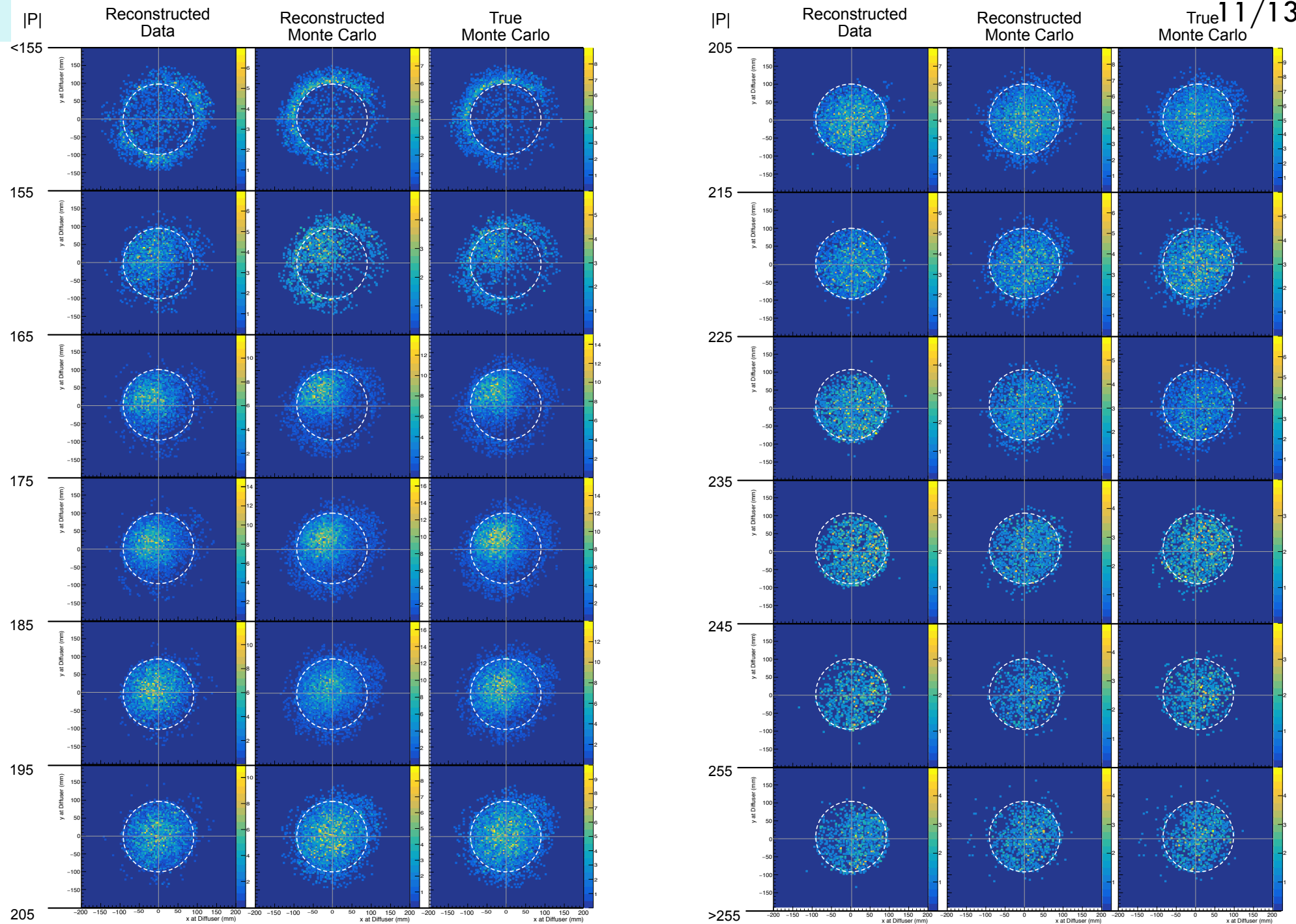
BINNING IN P

(x, y) position of
particles tracked back
to diffuser

(subset of cuts: no
diffuser cut, no tof-tku
cut)

Plots are divided into
10 MeV bins of P

Can see the beam
clipping on diffuser
aperture (white
dashed ring)

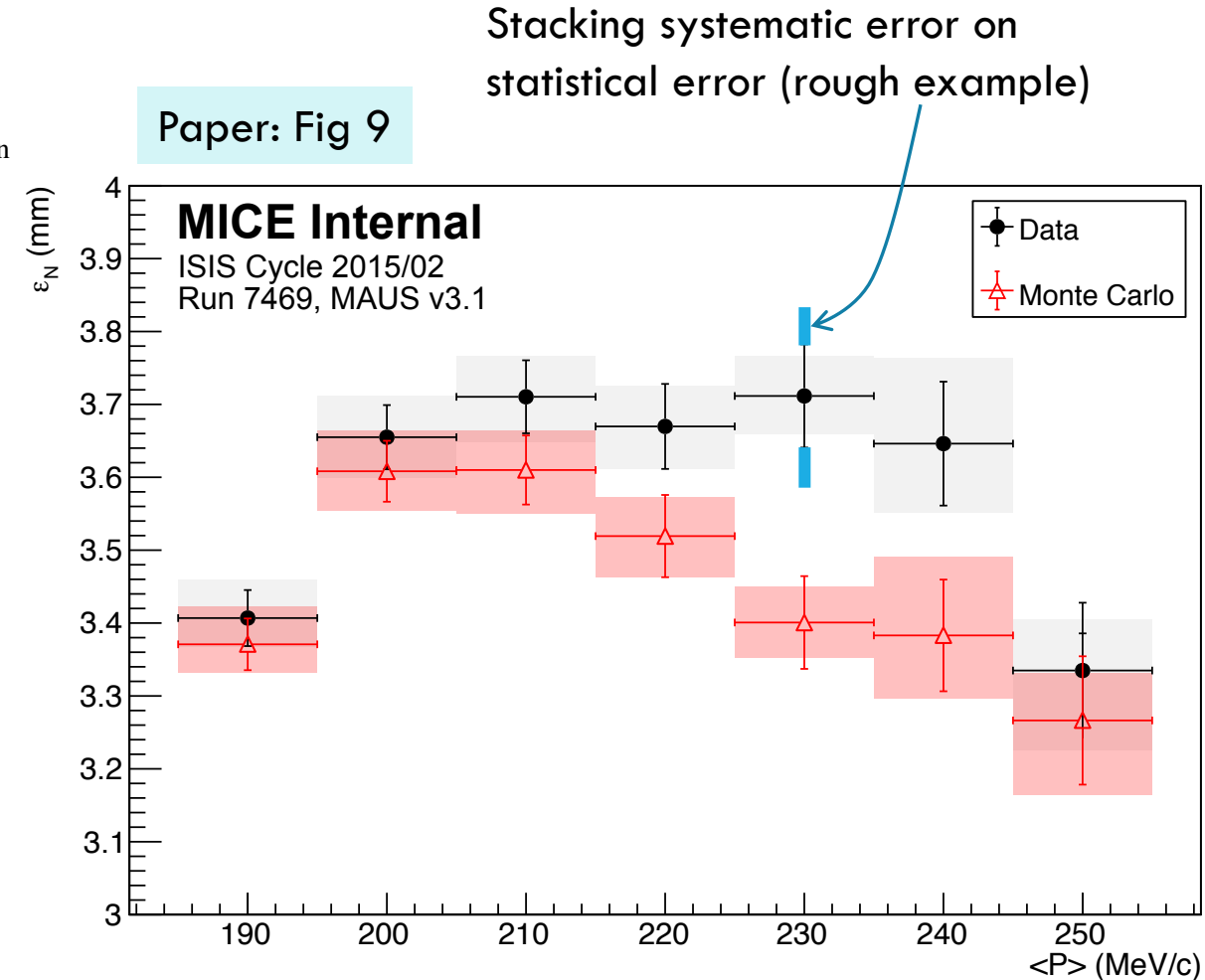


EMITTANCE PLOT

Table 3: Statistical and systematic uncertainties and biases, on the measured emittance as a function of mean momentum, $\langle p \rangle$.

Source	$\langle p \rangle$ (MeV/c)						
	190	200	210	220	230	240	250
Measured emittance (mm rad)	3.40	3.65	3.69	3.65	3.69	3.62	3.31
Statistical uncertainty	± 0.04	± 0.04	± 0.05	± 0.06	± 0.07	± 0.08	± 0.09
Beam selection:							
Diffuser aperture	+0.05 -0.04	+0.05 -0.05	+0.05 -0.06	+0.05 -0.05	+0.04 -0.04	+0.11 -0.05	+0.04 -0.10
$\frac{\chi^2}{N_{\text{DOF}}} \leq 4$	+0.01 -0.00	+0.00 -0.00	+0.01 -0.00	+0.00 -0.00	+0.00 -0.00	+0.01 -0.01	+0.01 -0.00
Muon hypothesis	+0.00 -0.00	+0.00 -0.01	+0.01 -0.00	+0.00 -0.00	+0.00 -0.01	+0.01 -0.07	+0.01 -0.00
Beam selection (Overall)	+0.05 -0.04	+0.05 -0.05	+0.05 -0.06	+0.05 -0.05	+0.04 -0.04	+0.11 -0.08	+0.04 -0.10
Binning in p	± 0.02	± 0.02	± 0.02	± 0.03	± 0.03	± 0.04	± 0.05
Magnetic field misalignment and scale:							
Bias	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02
Uncertainty	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tracker resolution	± 0.00	± 0.00	± 0.00	± 0.00	± 0.01	± 0.01	± 0.01
Total systematic uncertainty	+0.05 -0.04	± 0.06	± 0.06	± 0.06	± 0.05	+0.12 -0.09	+0.07 -0.11
Corrected emittance (mm rad)	3.41	3.66	3.71	3.67	3.71	3.65	3.34
Total uncertainty	± 0.06	± 0.07	+0.07 -0.08	± 0.08	± 0.09	+0.14 -0.13	+0.12 -0.14
Total uncertainty (%)	+1.90 -1.63	+1.96 -1.94	+2.01 -2.15	+2.19 -2.34	+2.40 -2.37	+3.97 -3.49	+3.47 -4.30

Paper: Table 3



SUMMARY

- Please read the paper and send comments
- Both paper and the (longer) note are attached to the Indico page
- In the meantime...
 - Will look at the few comments received so far
 - Will iterate through a larger MC dataset