Optics Simulations

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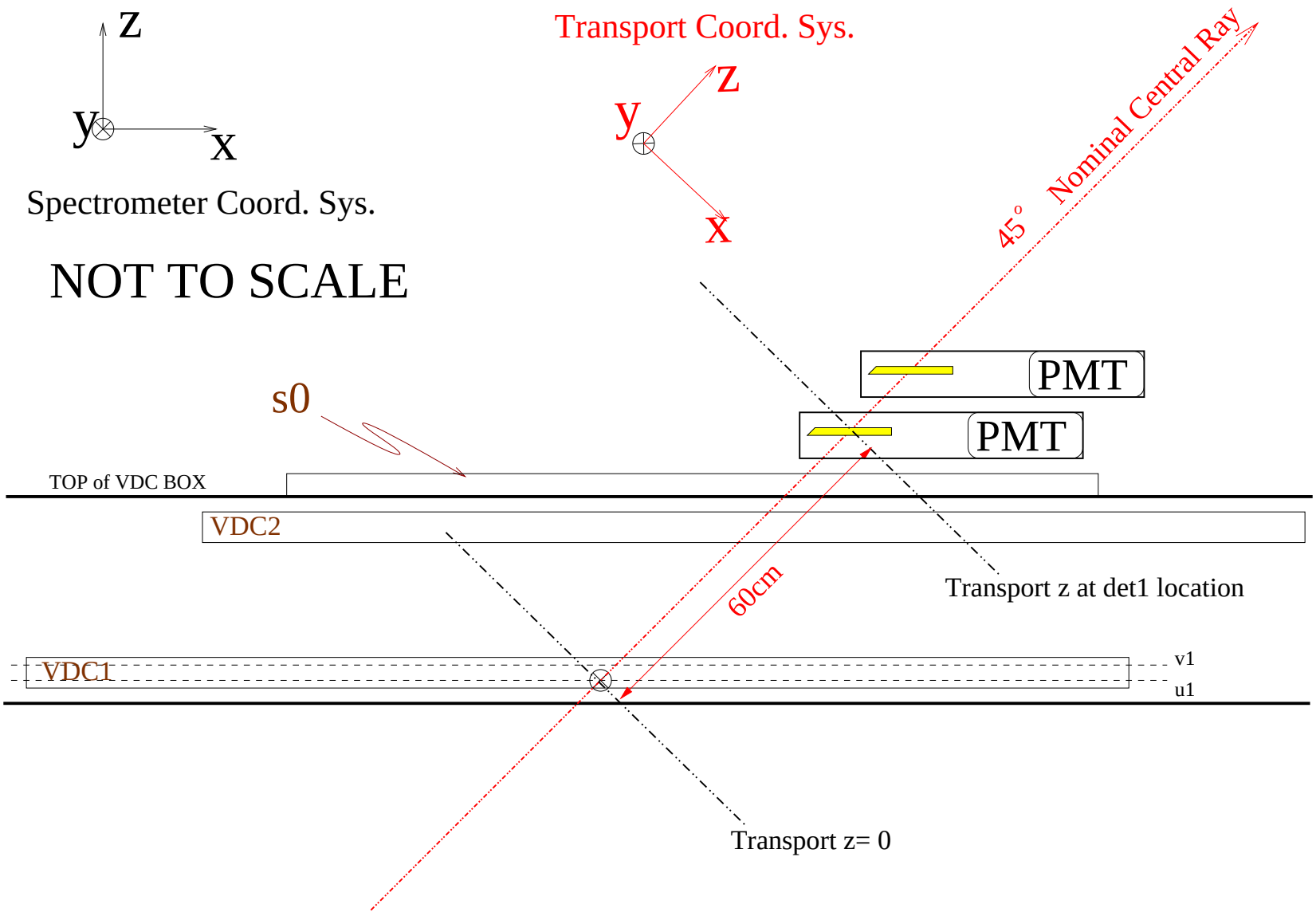
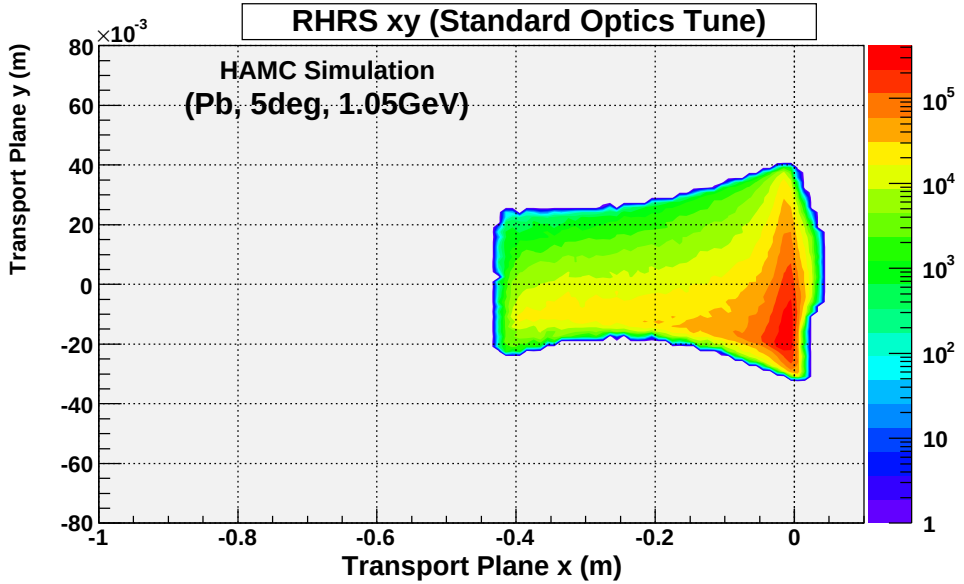
Optics Simulations

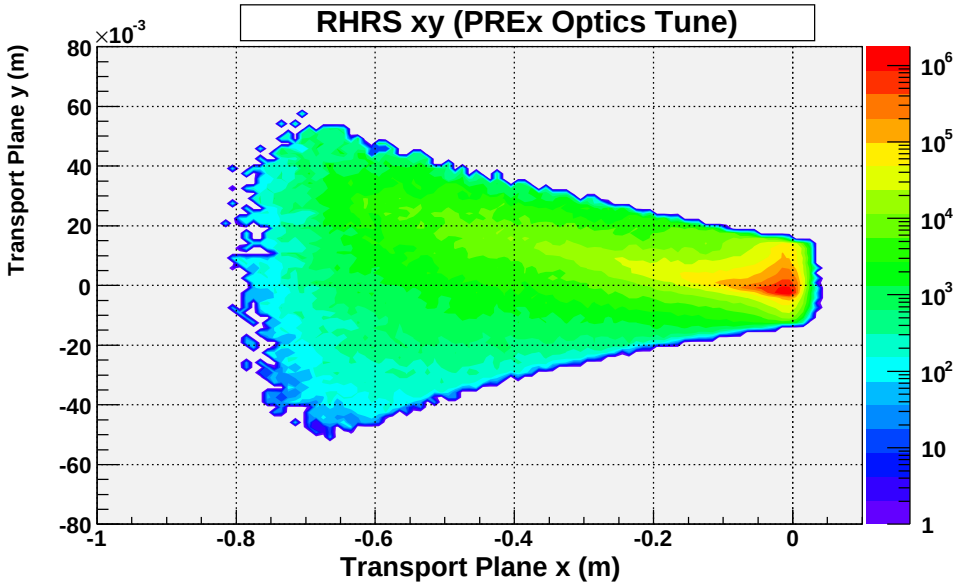
Outline

- New HRS Optics Tune for PREx
- A_T Hole Studies – Be $X_\circ$, FoM and Detector Size
- HAPPEX-III Focal Plane Distribution
- PREx Optics/detector beamtest during H-III Commissioning at 1pass
- Summary and Future Work

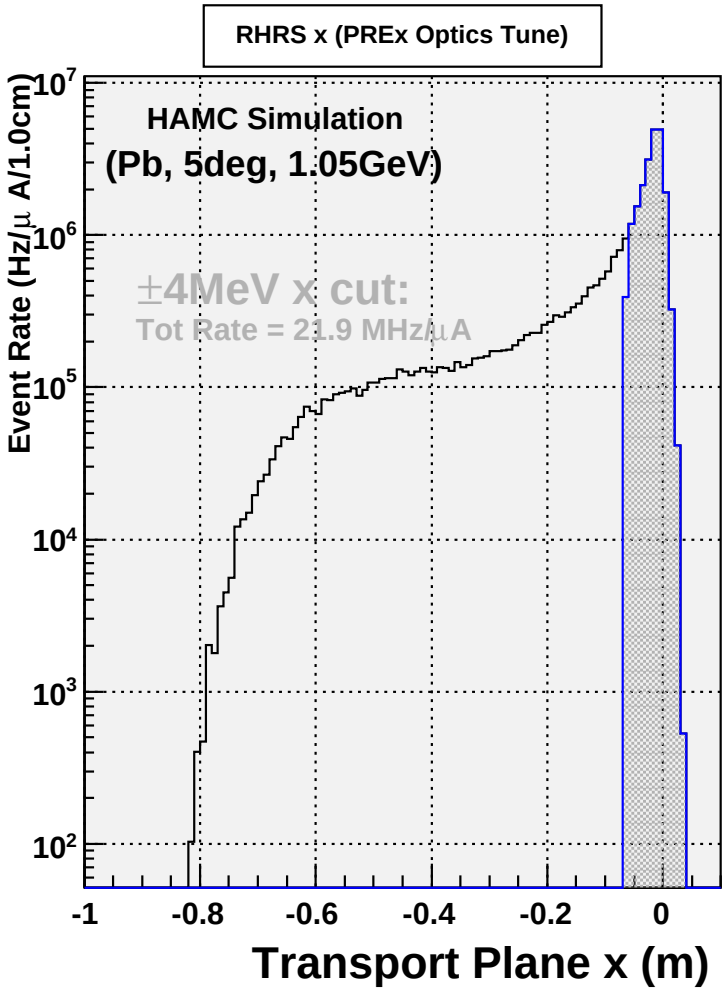

z
y
x
Spectrometer Coord. Sys.
Transport Coord. Sys.
z
y
x
NOT TO SCALE
45°
Nominal Central Ray
PMT
PMT
s0
TOP of VDC BOX
VDC2
60cm
Transport z at det1 location
VDC1
v1
u1
Transport z= 0

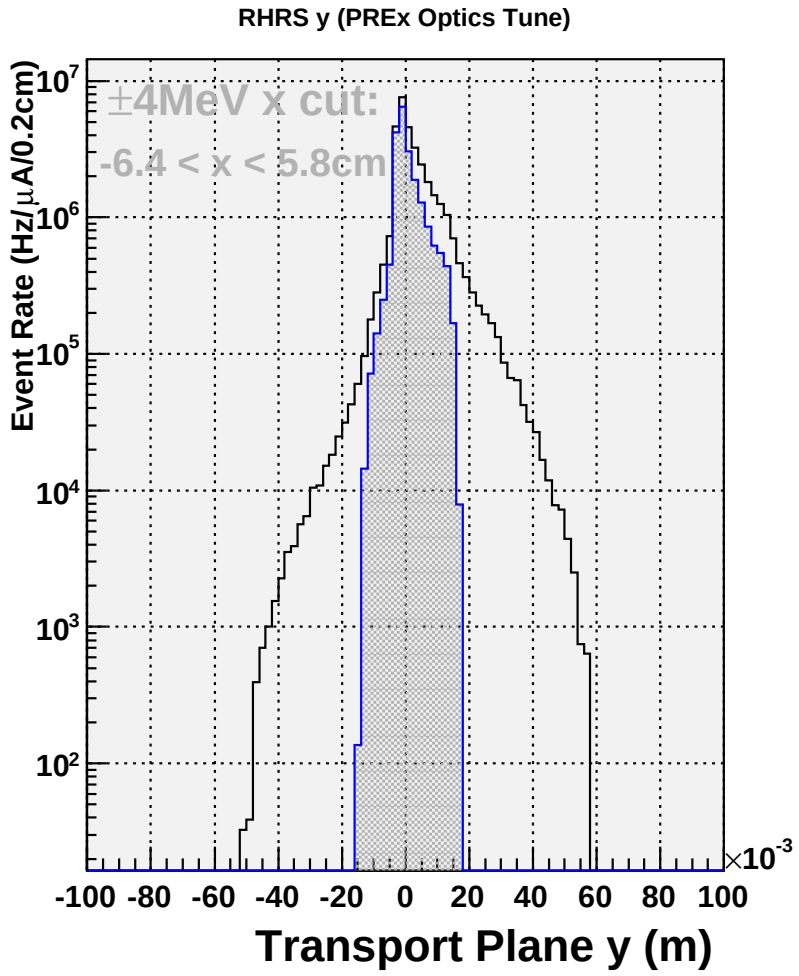
Standard (Old) and PREx (New) HRS Optics Tune



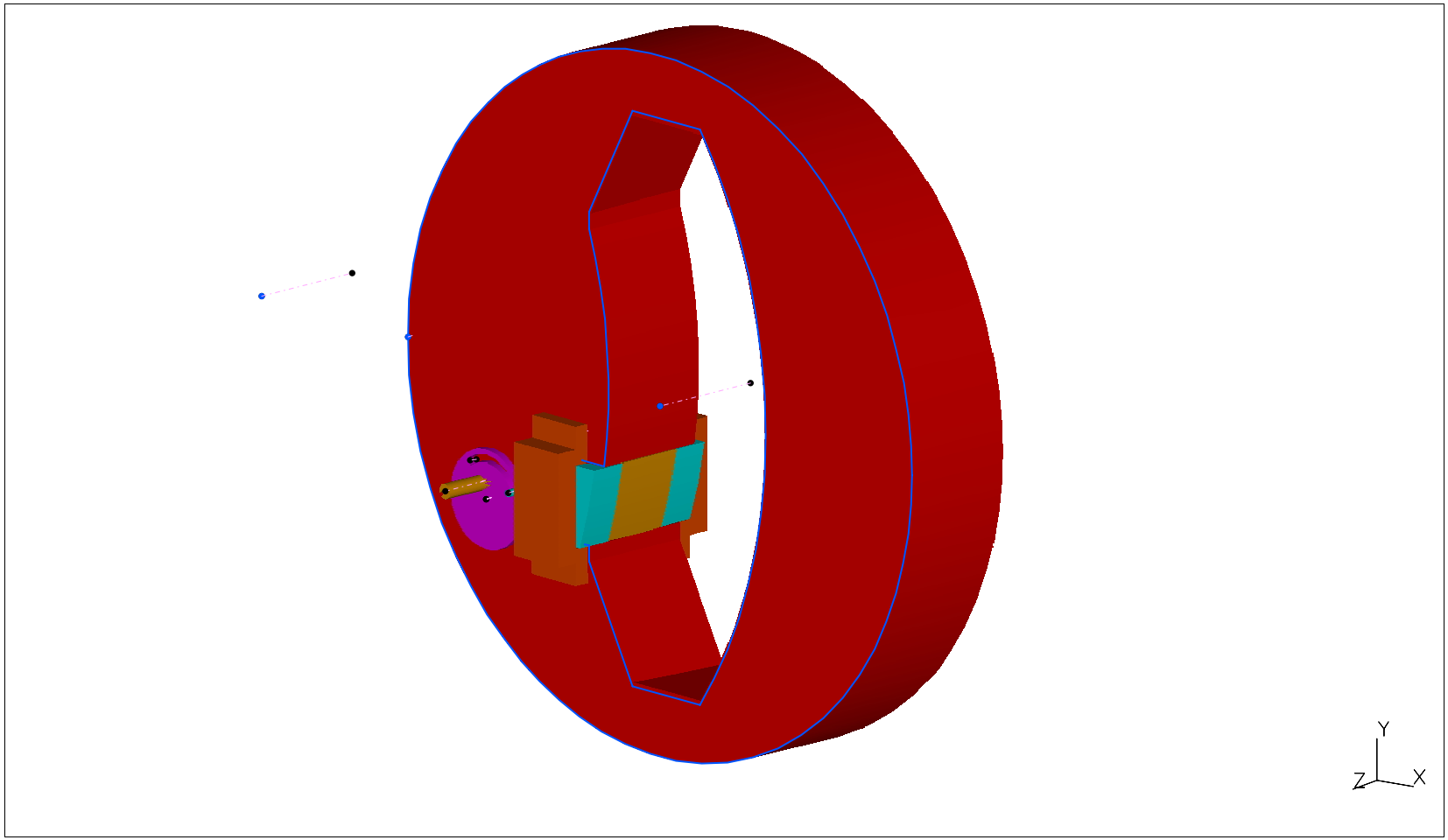


PREx: Transport Plane Rates

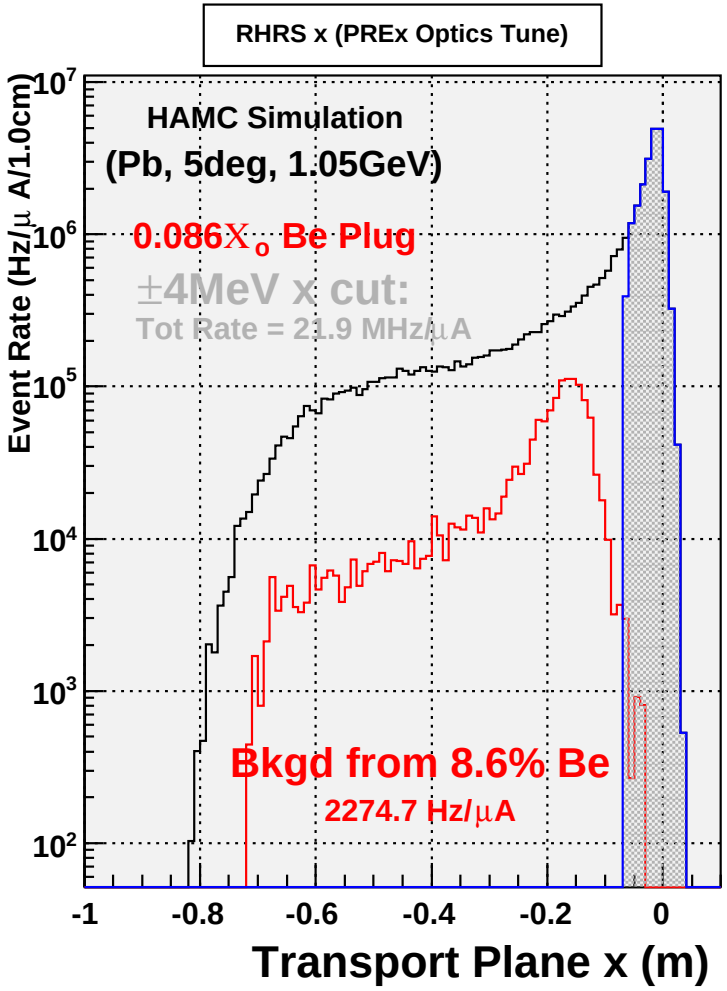


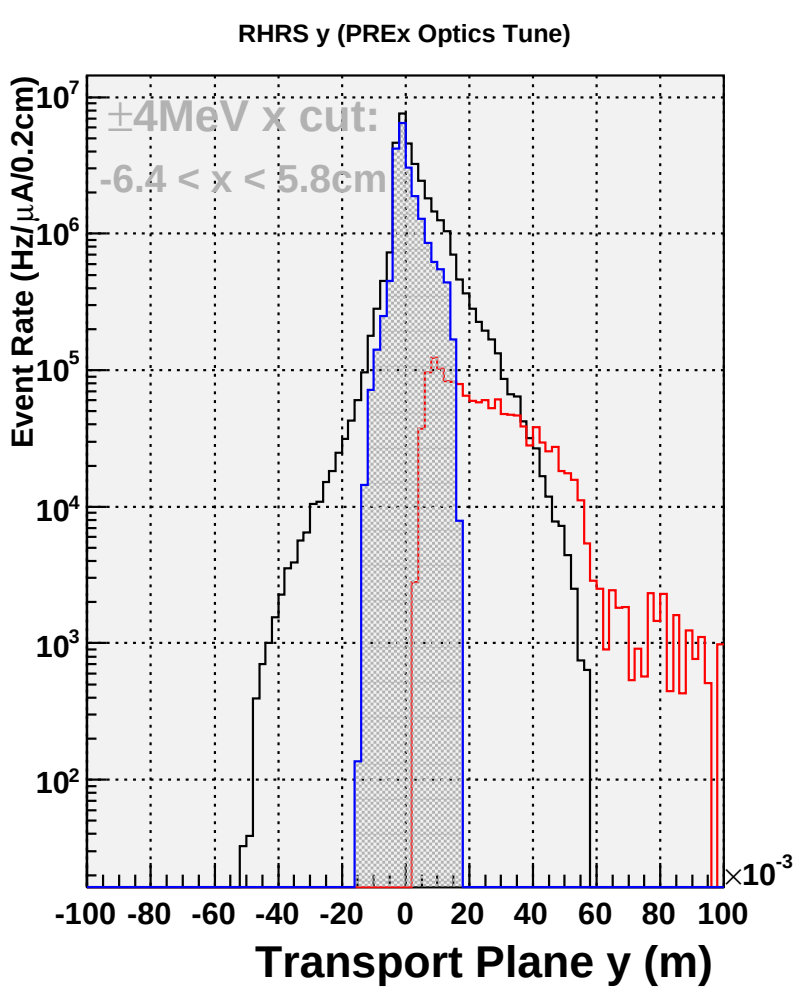


PREx Collimator and A_T Hole with ^{9}Be Plug



A_T Hole Event Distributions (PREx Tune)



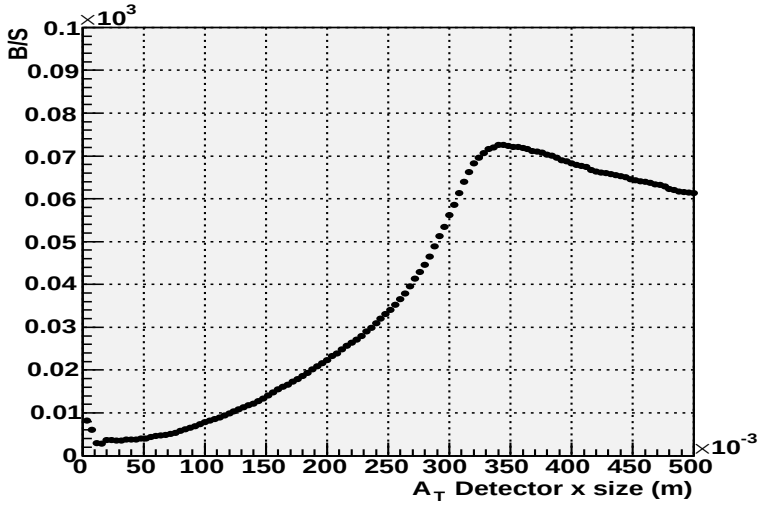


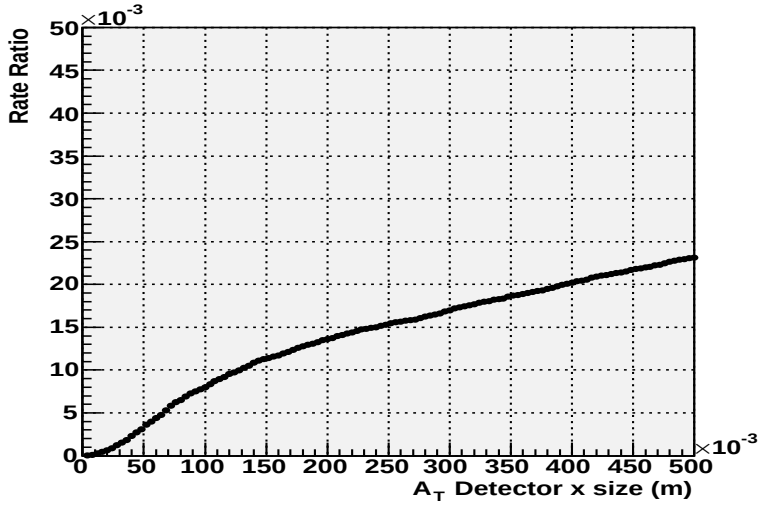
Paul's A_T Correction Figure of Merit

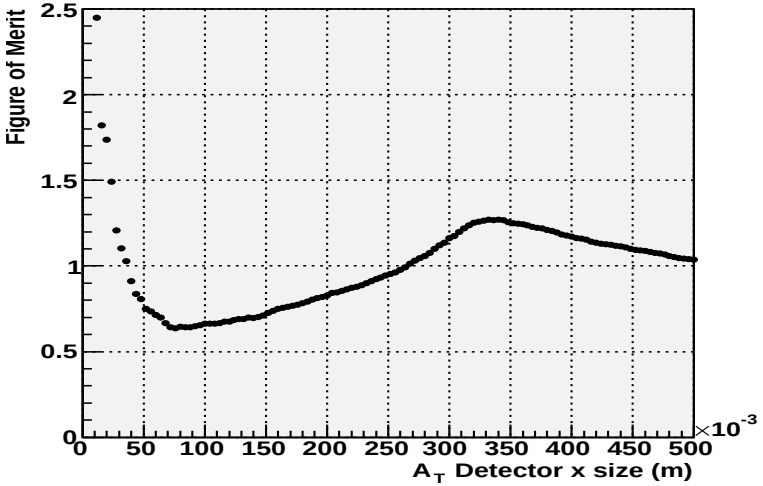
$$M = \frac{1}{E}\frac{1}{\sqrt{R}}\sqrt{1+\frac{B}{S}} \qquad (1)$$

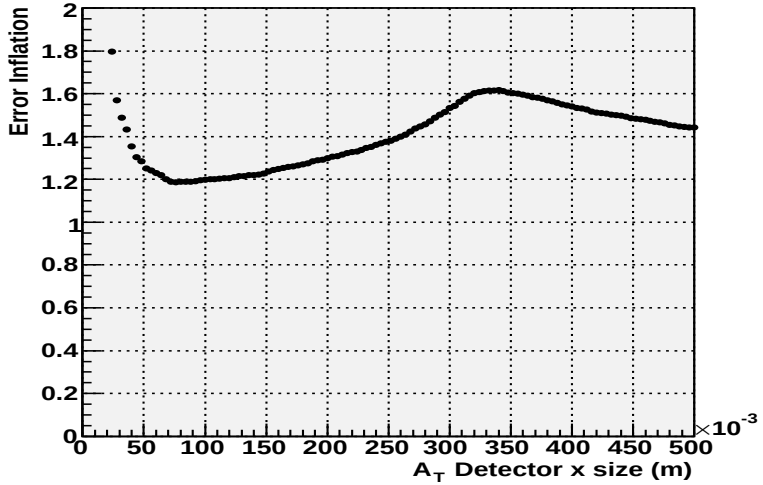
- E is the enhancement in A_T sensitivity for the hole events (estimated to be ~ 50)
- R is the ratio of rates of the detected hole events relative to the main detector events (Additional factor of 2 reduction to account for radiative tail in hole events)
- B/S is the ratio of background to A_T hole signal
- The error inflation due to the correction is $\sqrt{1+M^2}$
- For example, if M = 0.64, error inflation = 1.19

A_T Hole Figure of Merit Study

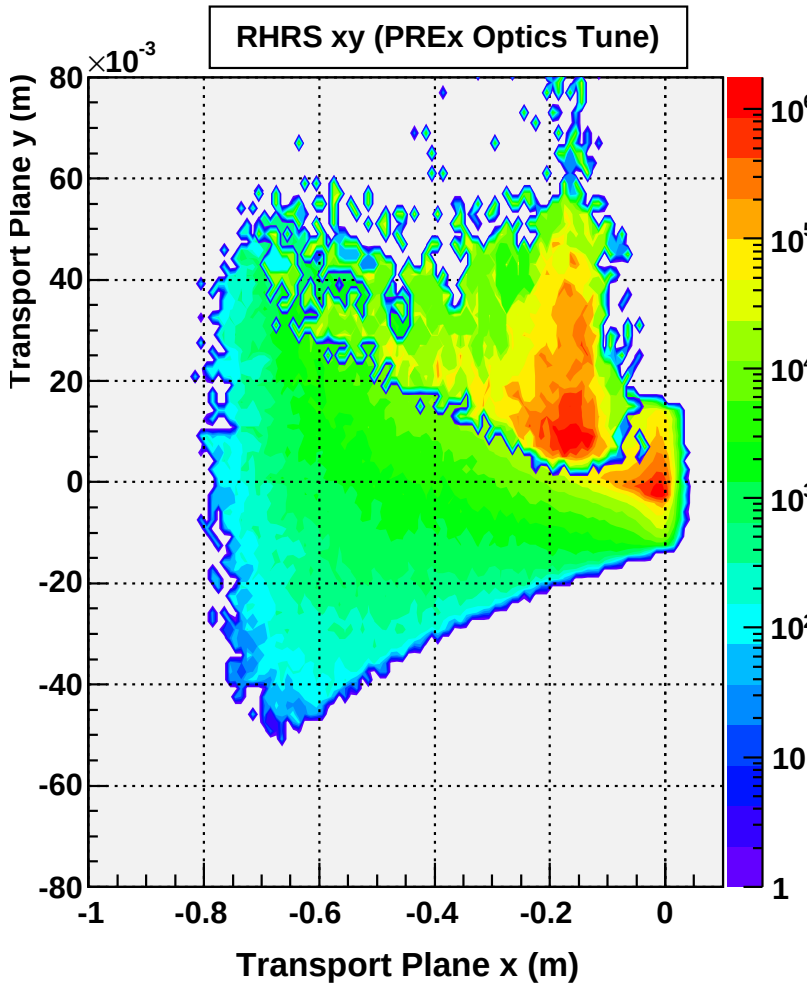


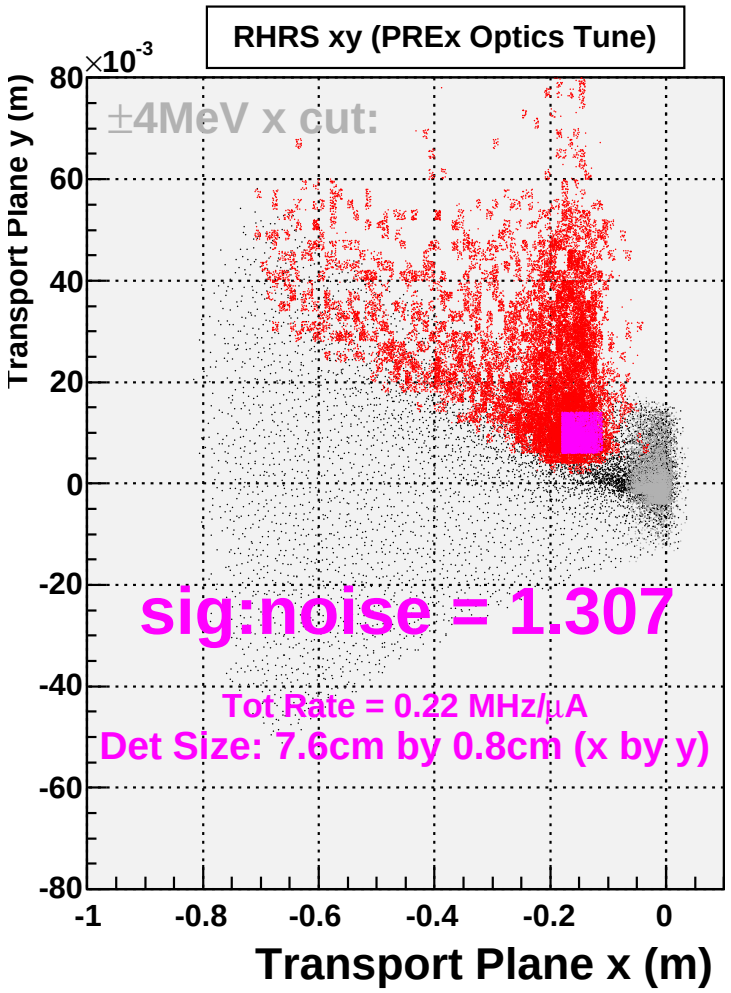




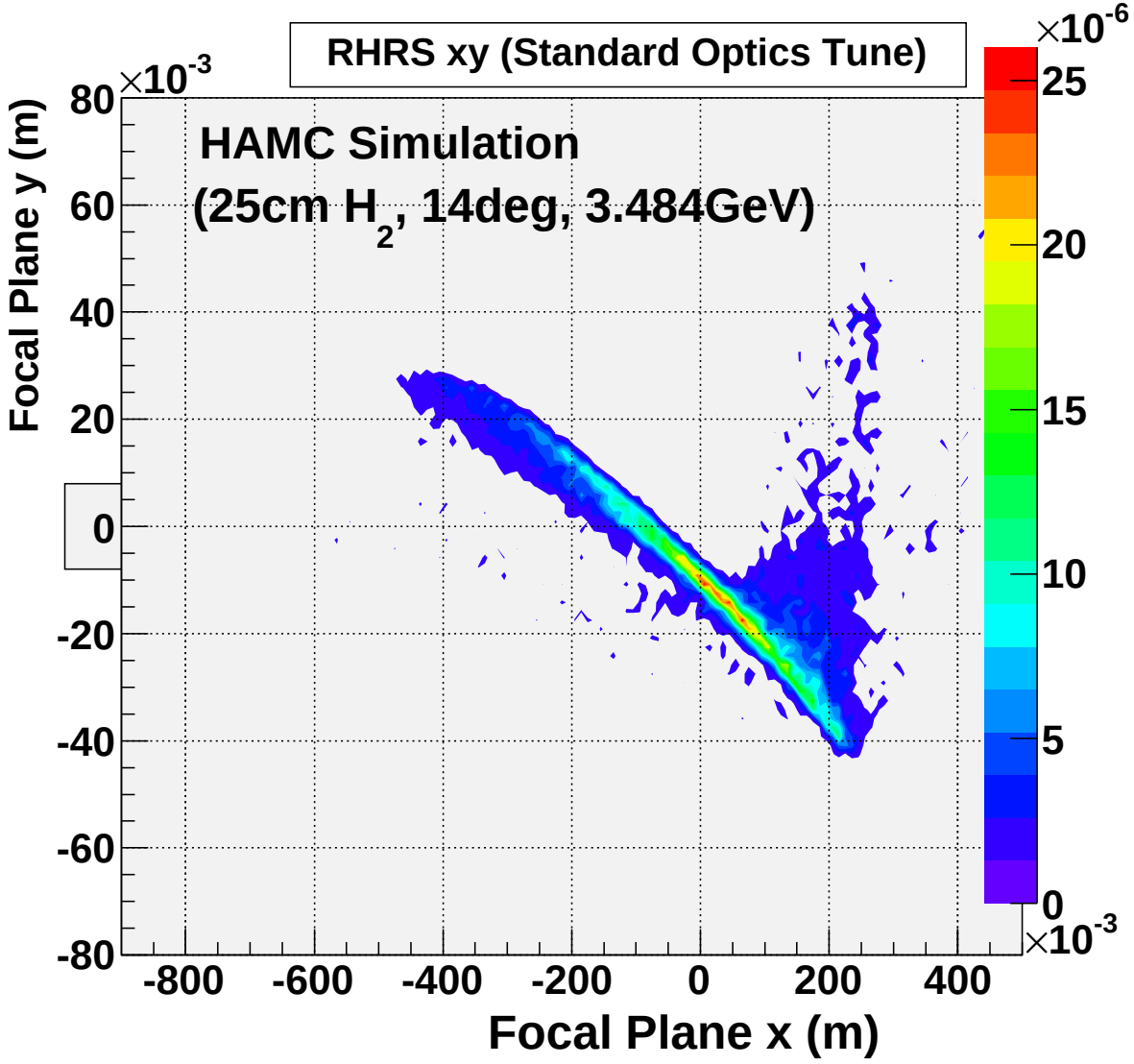


A_T Hole Detector (PREx Tune)

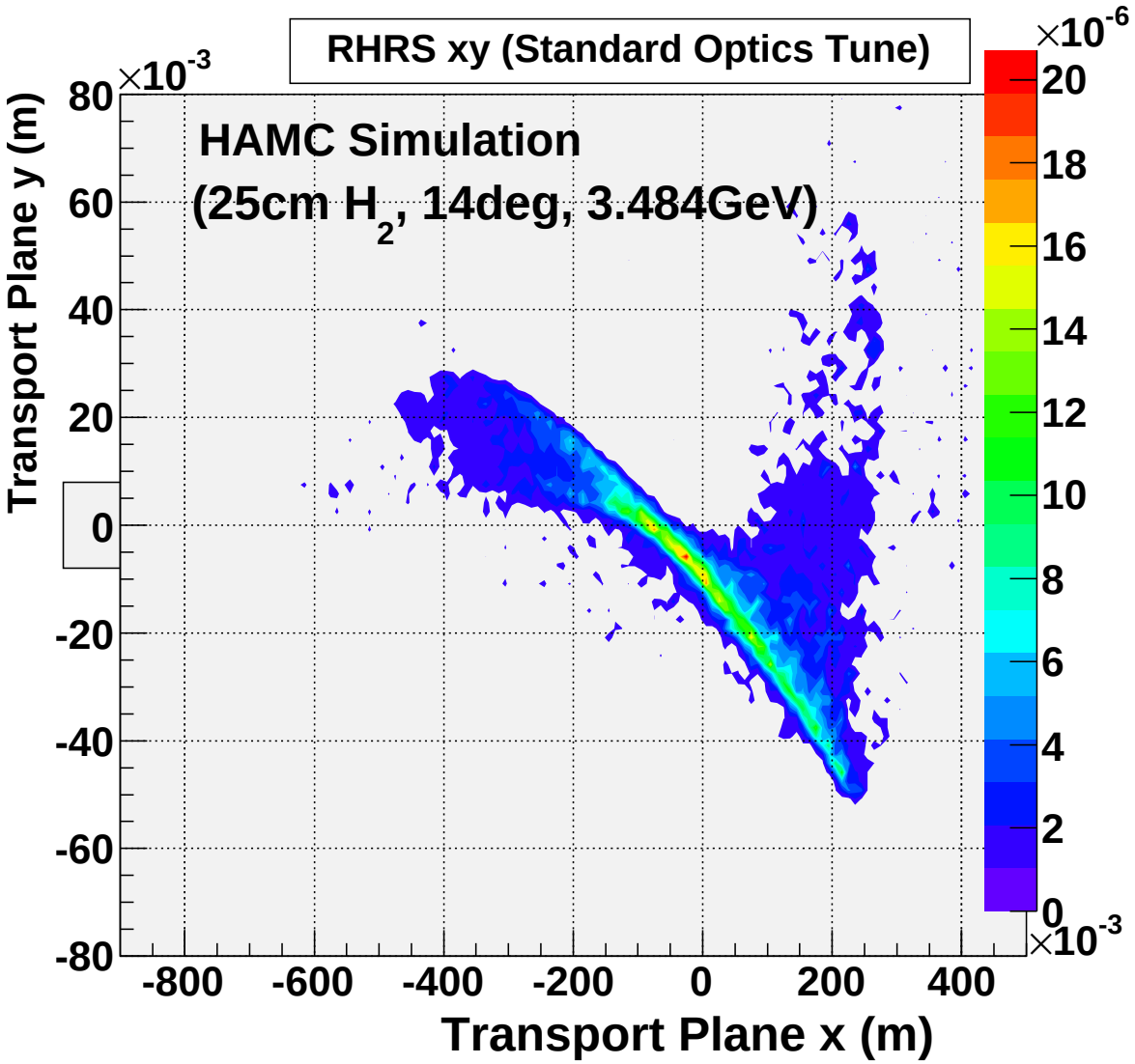




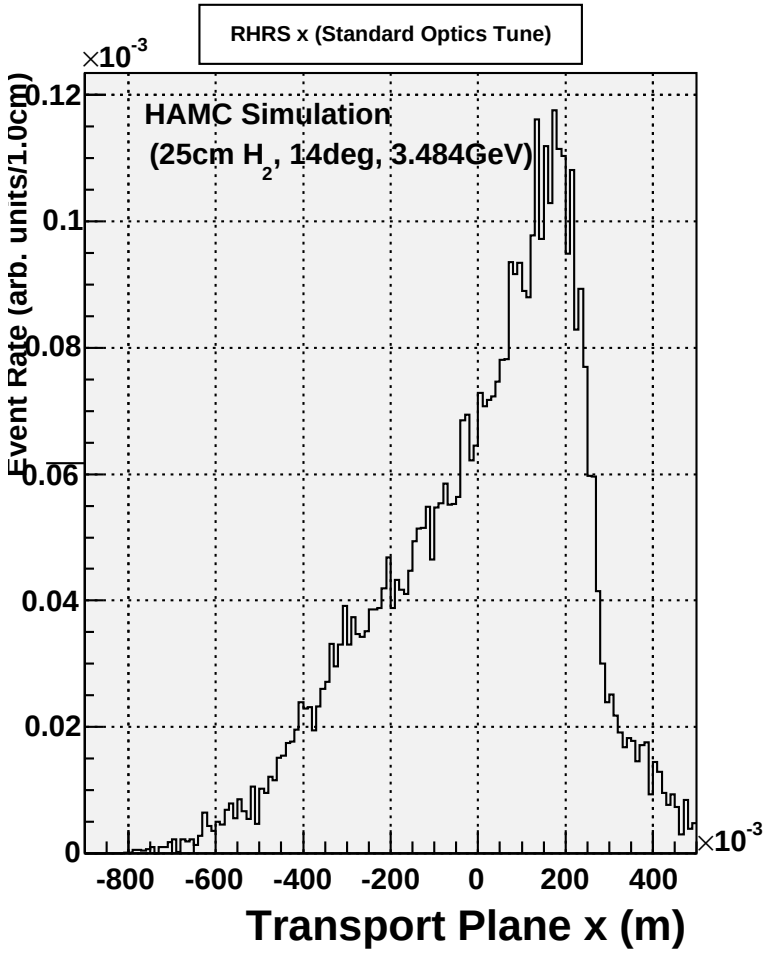
HAPPEX-III Focal Plane Distributions

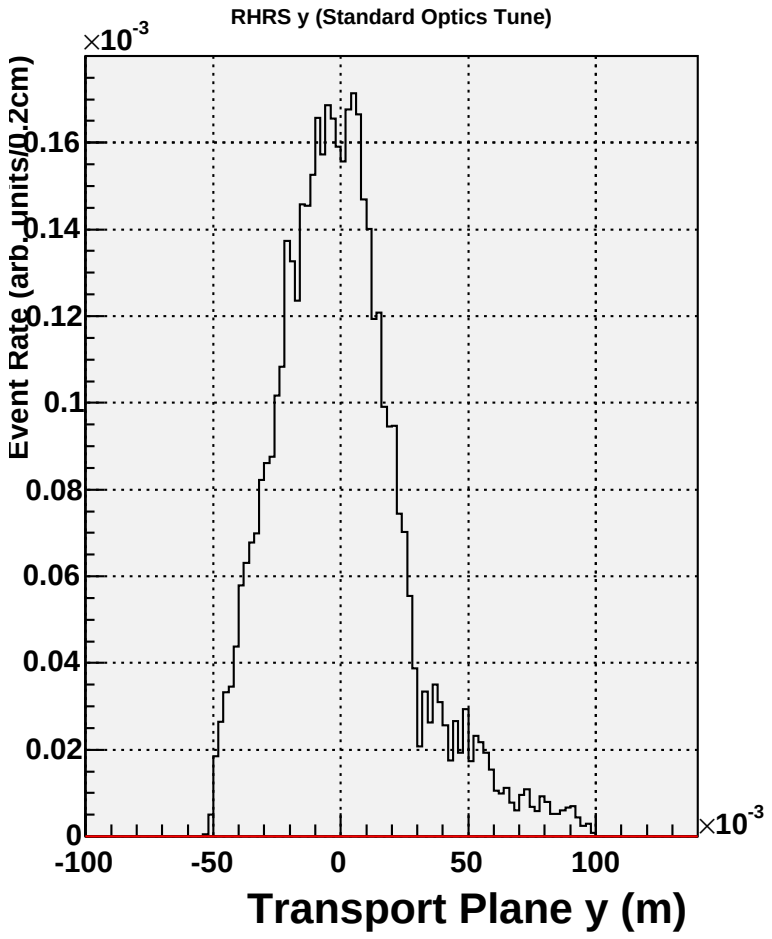


HAPPEX-III Transport Plane Distributions

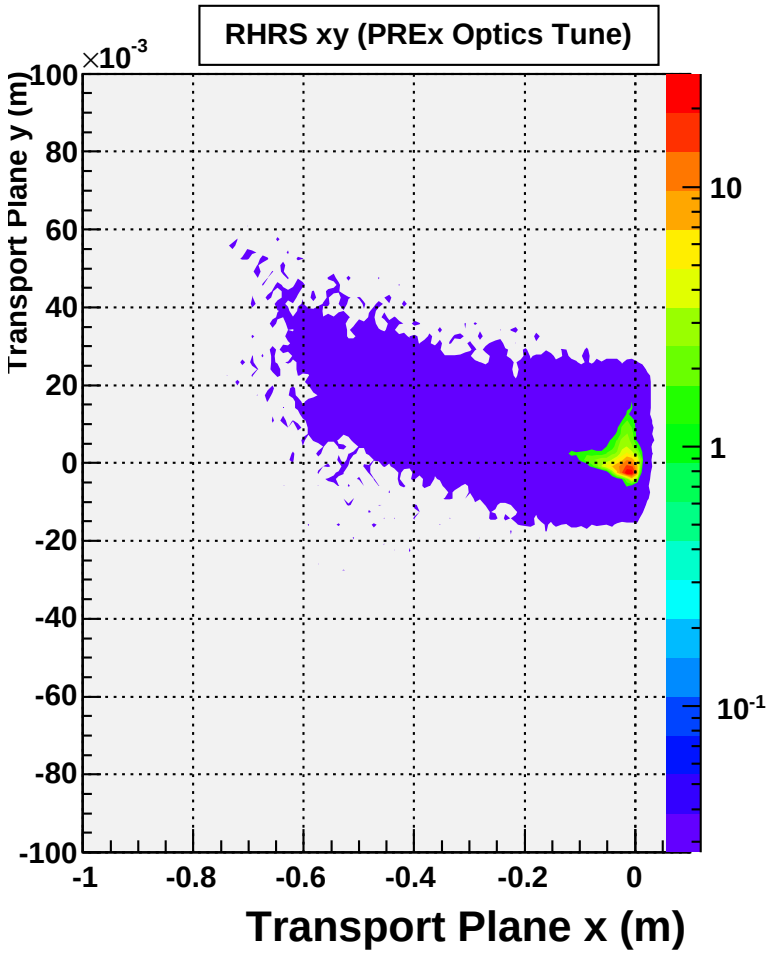


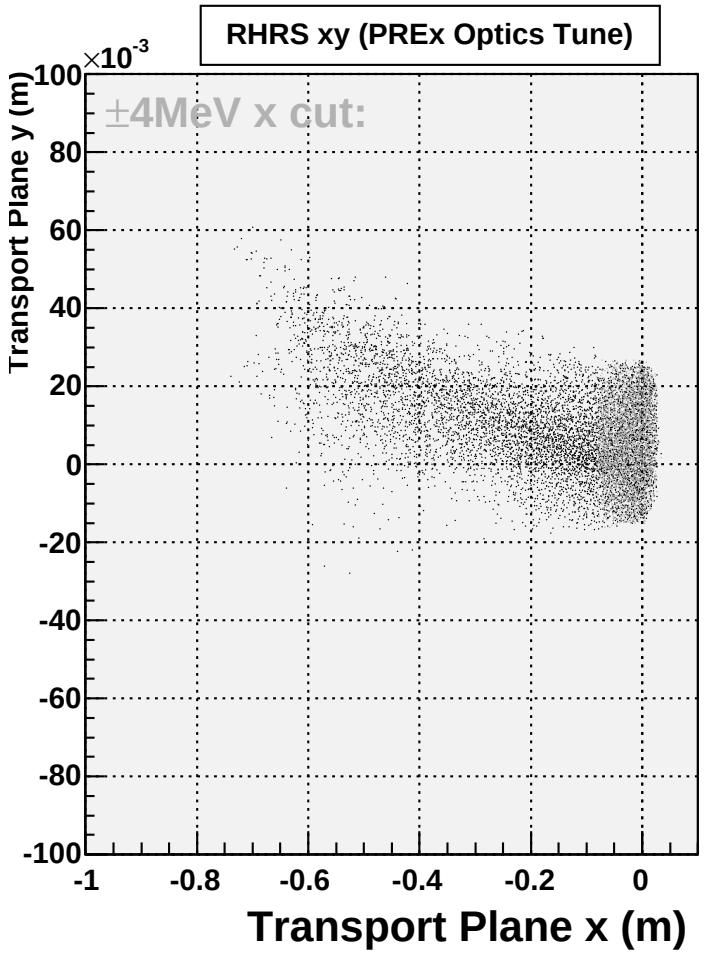
HAPPEX-III Transport Plane Distributions





PREX beamtest during HAPPEX-III Commissioning





Summary and Future Work

- Based on HAMC simulation of new PREX HRS optics, optimal prex detector size is roughly 10cm dispersive (x) by 4cm transverse (y)
- For A_T measurment/correction FoM studies, A_T detector size is optimized at 7.6cm in x and 0.8cm in y with estimated error inflation of $\sim 20\%$
- Examine sieve slit distributions using new PREX optics tune?
- Determine roll and pitch angles for HAPPEX-III detector positioning?
- Determine Rates for HAPPEX-III running
- Examine thick Ta spectra for H-III commissioning at 1pass?
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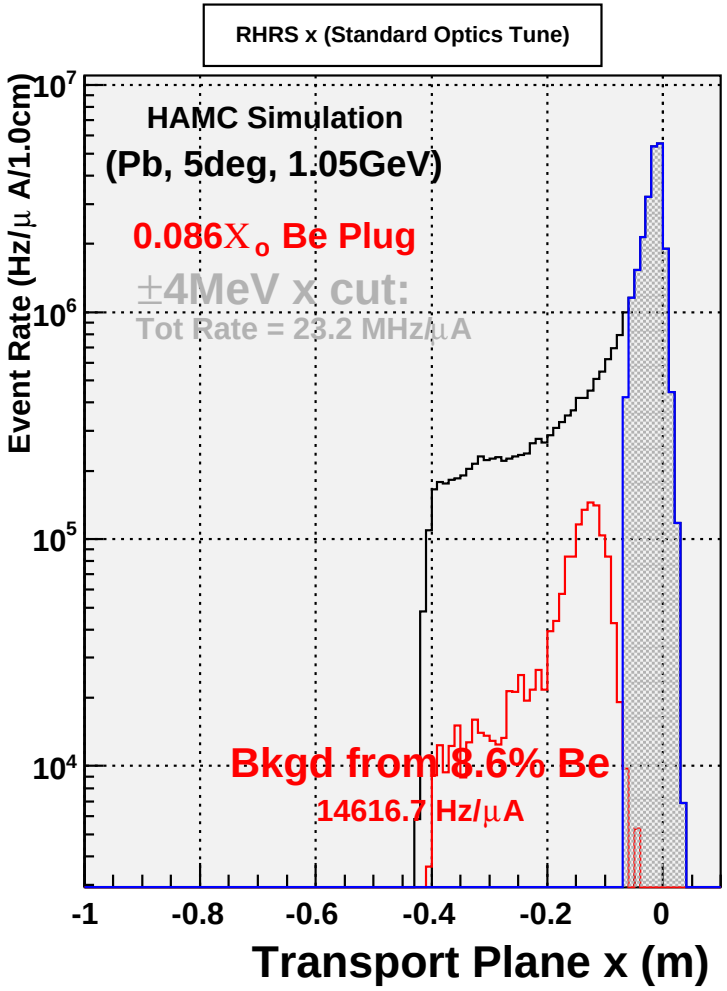
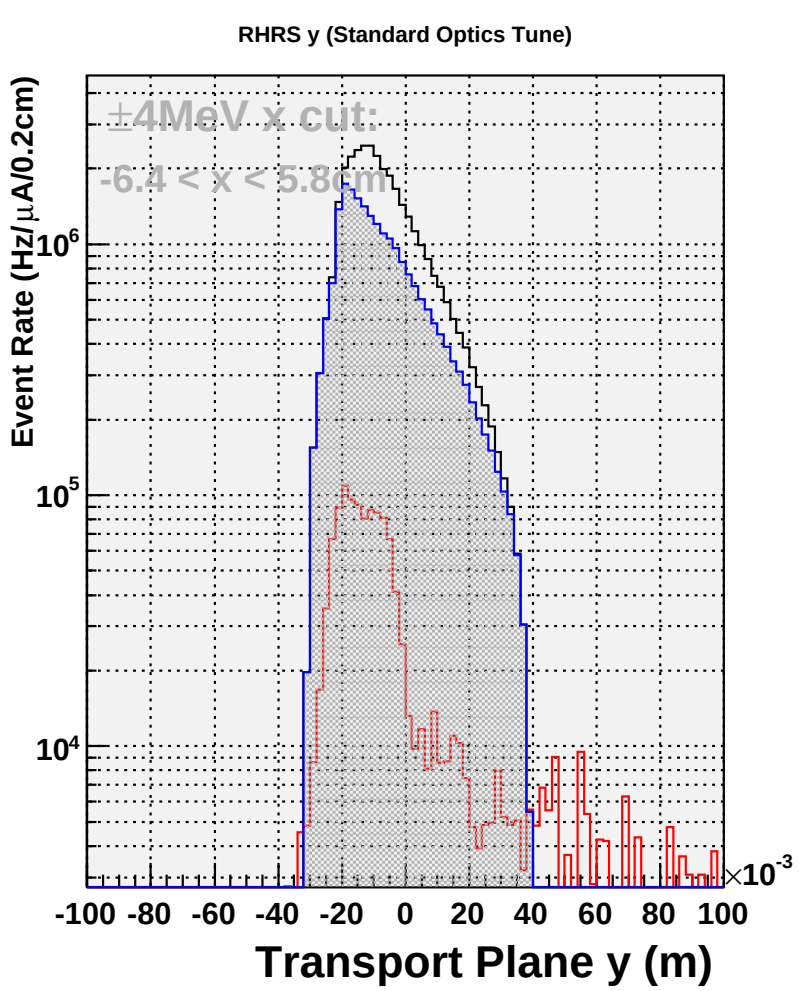
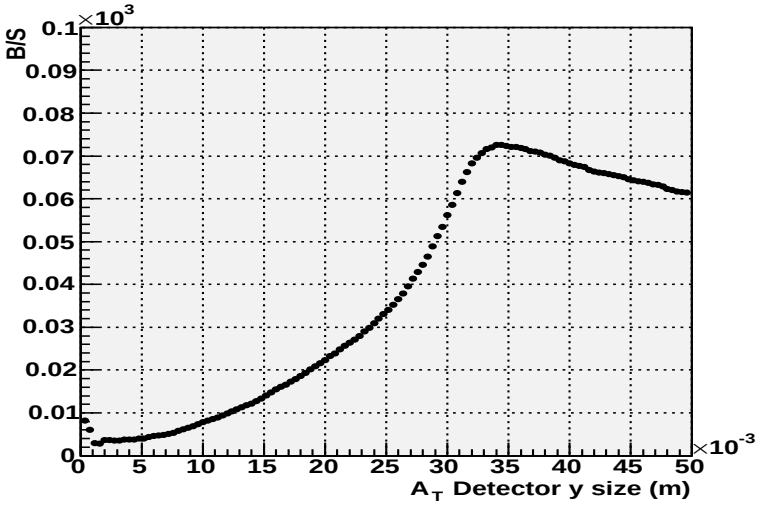
EXTRA SLIDES

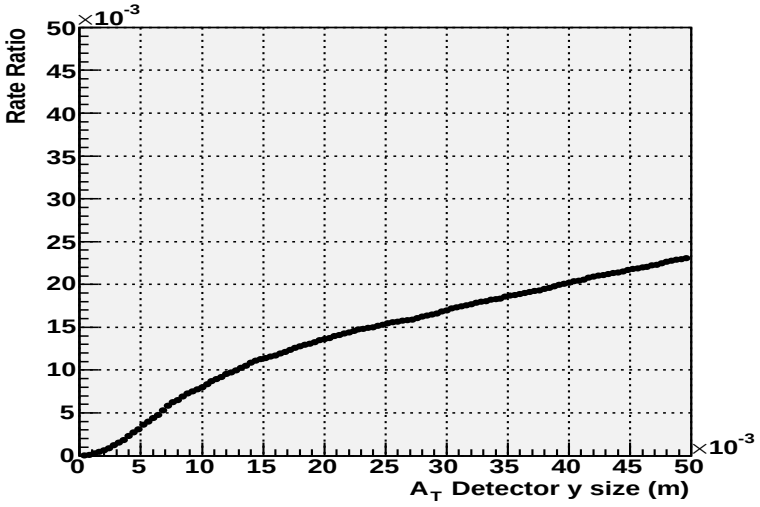
A_T Hole Event Distributions (Standard Tune)

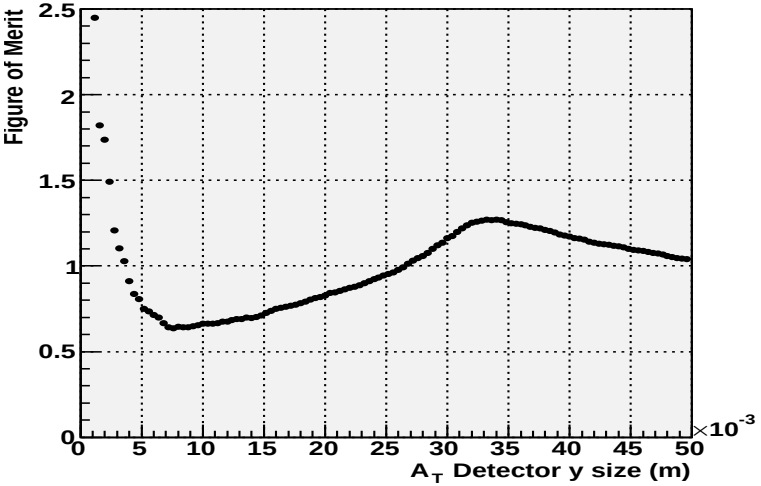


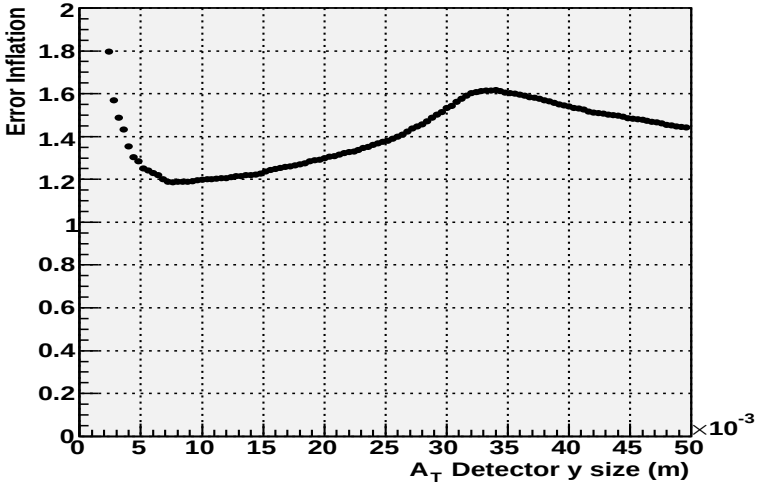


A_T Hole Figure of Merit Study

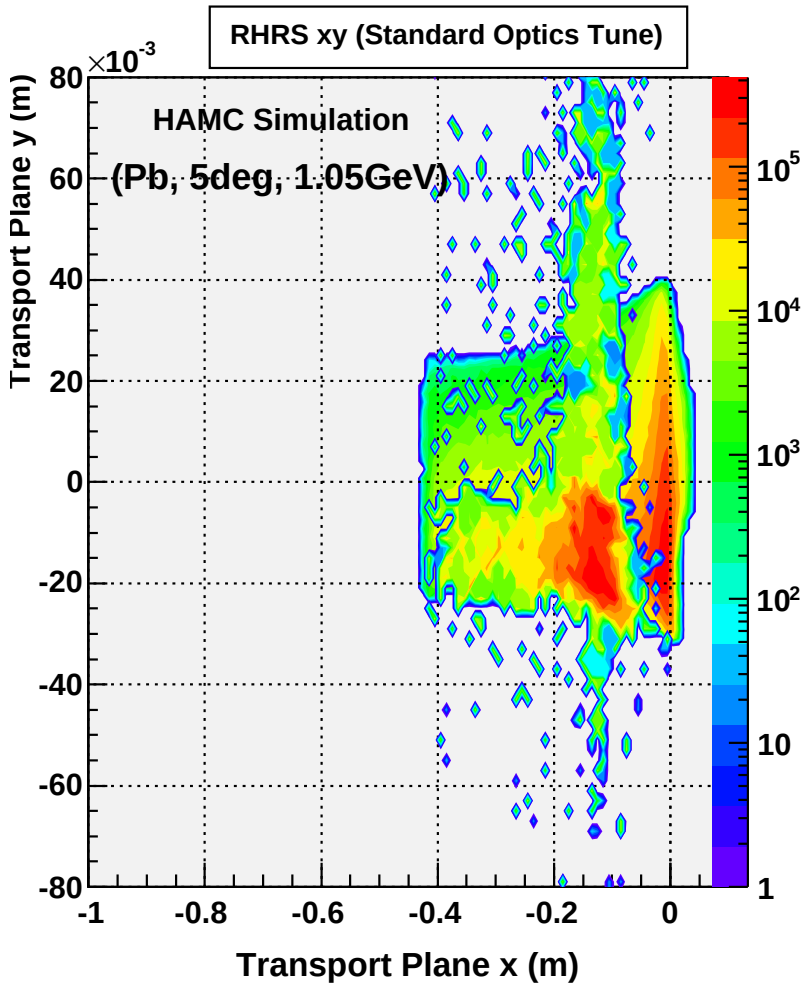


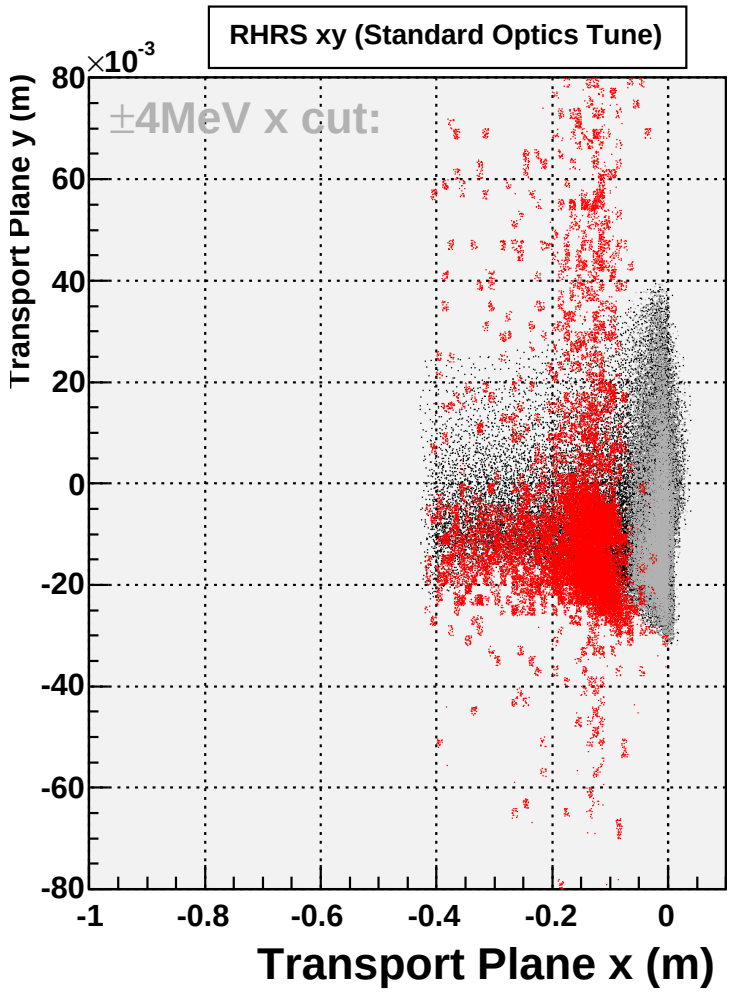




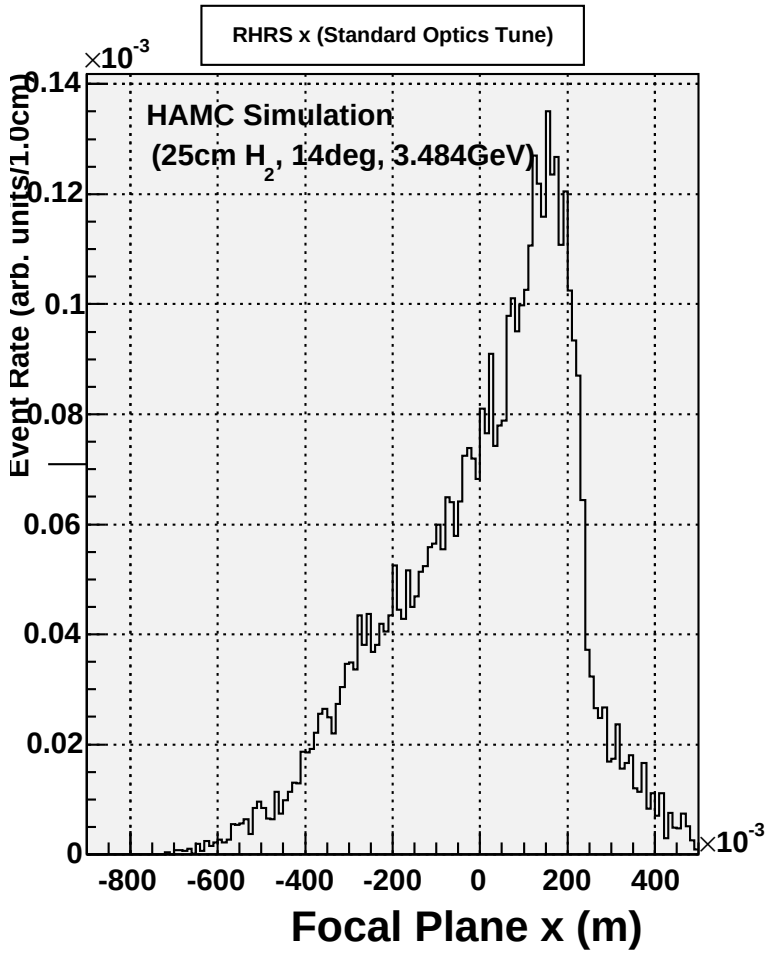


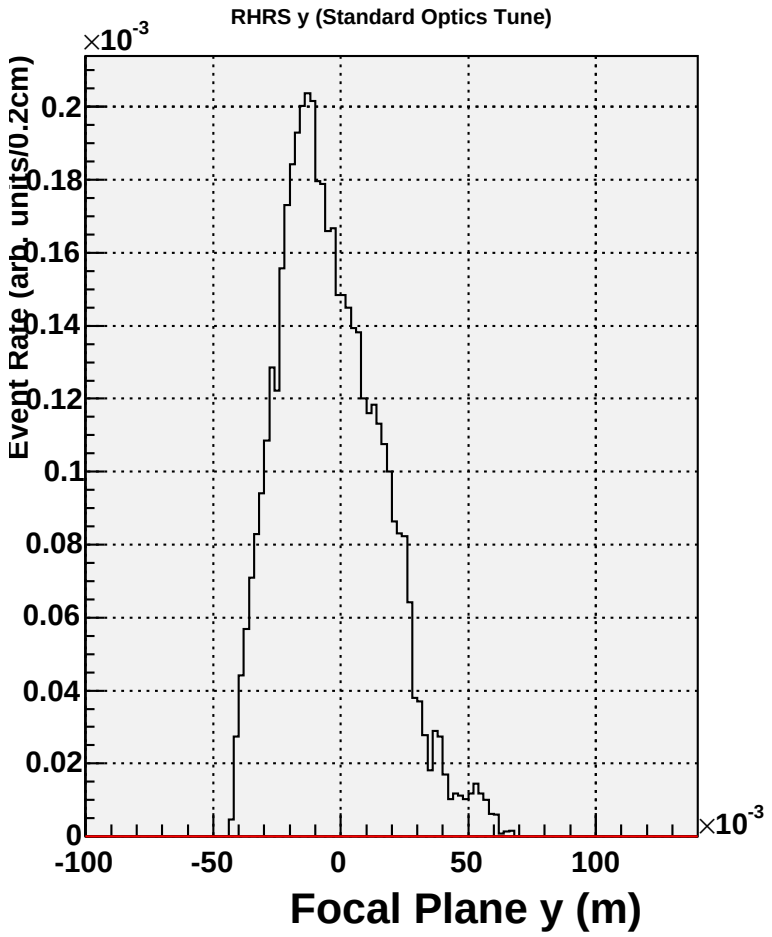
A_T Hole xy Distributions (Standard Tune)





HAPPEX-III Transport Plane Distributions





est during HAPPEX-III Commissioning