

Hall C Fall Commissioning

Mark Jones (Jlab)
Hall A/C Summer Meeting 2017

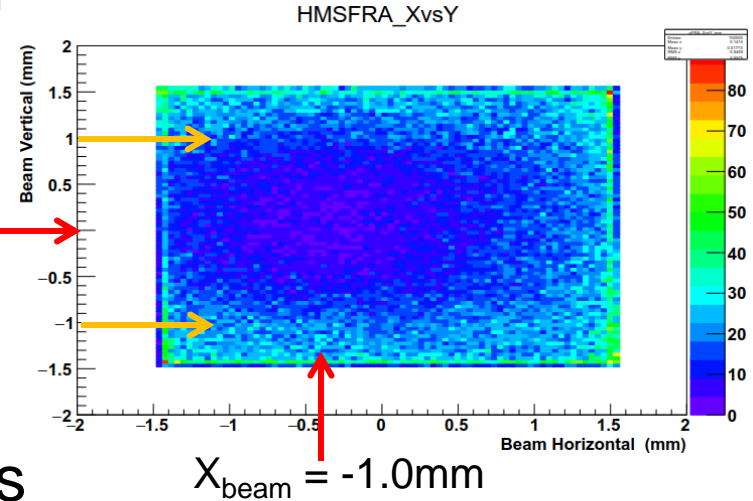
General Overview

- KPP run
 - Beam line checkout.
 - Detector checkout.
 - Initial optics checkout.
- Commissioning Oct 2nd to Oct 11th, 2017.
 - 10 days of beam = 5 days of data.
 - Beam energies of 2.2 and 6.6 GeV. (12 hours to change?)
 - Tests of SHMS fringe field on beam.
- Preparation is needed
 - Hardware work
 - Software work (Eric Pooser's talk)
- Run Plan for Fall Commissioning
 - [Draft version](#) from Rolf Ent and Tanja Horn
 - **Need to identify person/group for each commissioning task**
 - Need to update plan and set priorities.

KPP Beam Results

- Raster works. 3x3mm
- Centering of target on beam.
- Hole known 2mm diameter

$$Y_{\text{beam}} = +4.5\text{mm}$$



Need to center beam on spectrometers

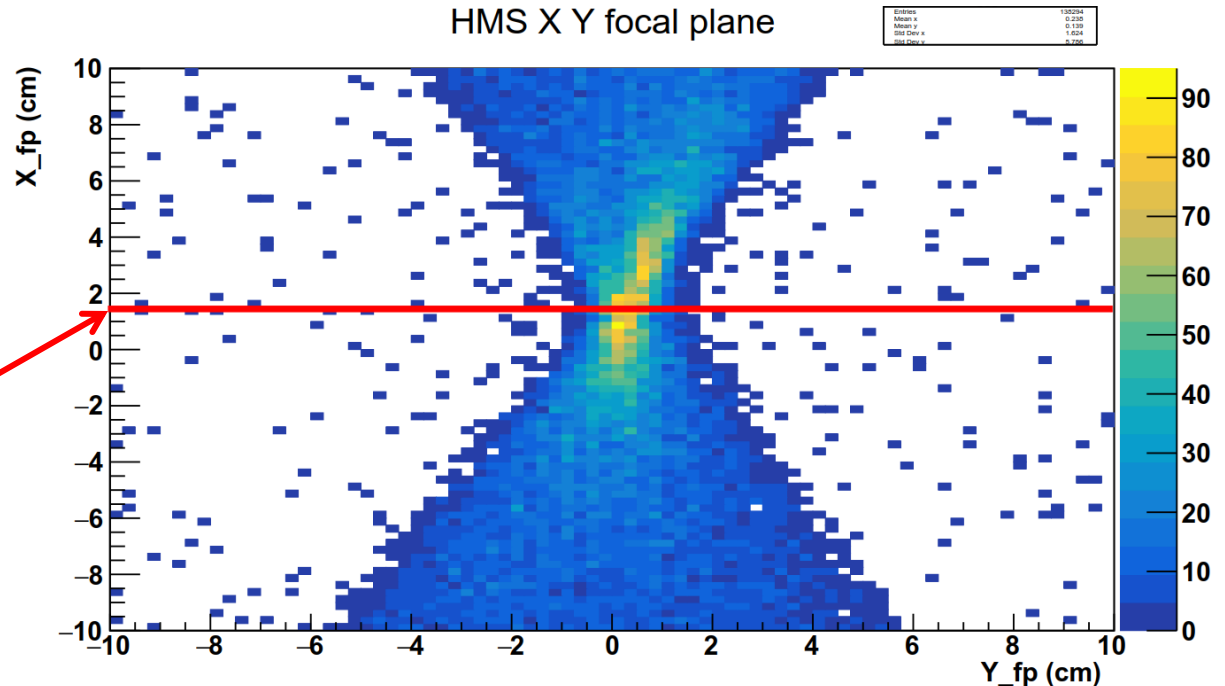
- Beam vertical offset of $Y_{\text{beam}} = +4.5\text{mm}$ to center beam on target
- First order HMS optics

$$X_{\text{fp}} = -3.3 X_{\text{tar}} = 3.3 * Y_{\text{beam}}$$

$$X_{\text{fp}} = +15\text{mm}$$

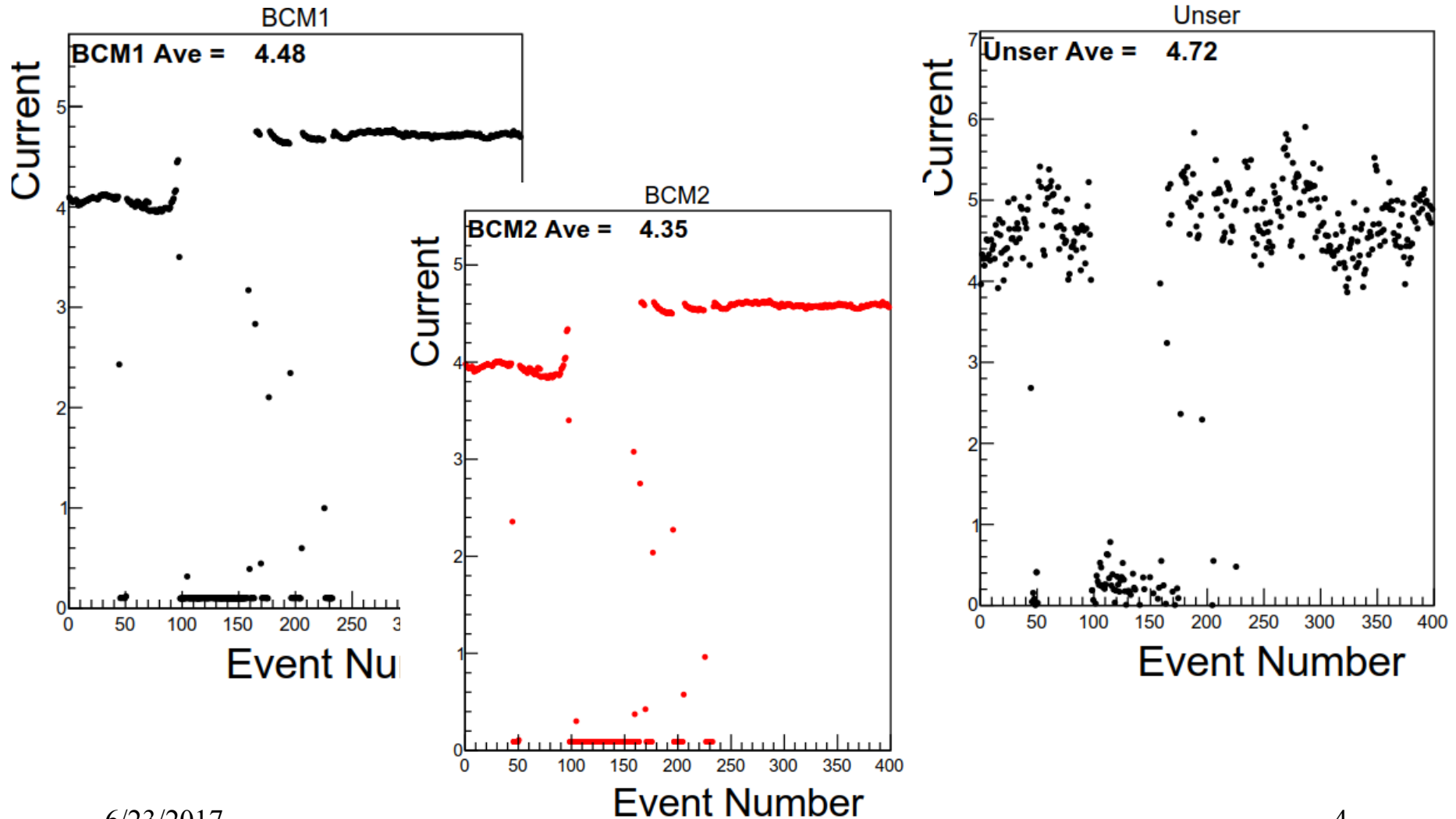
- First order SHMS optics

$$X_{\text{fp}} = -1.4 X_{\text{tar}}$$



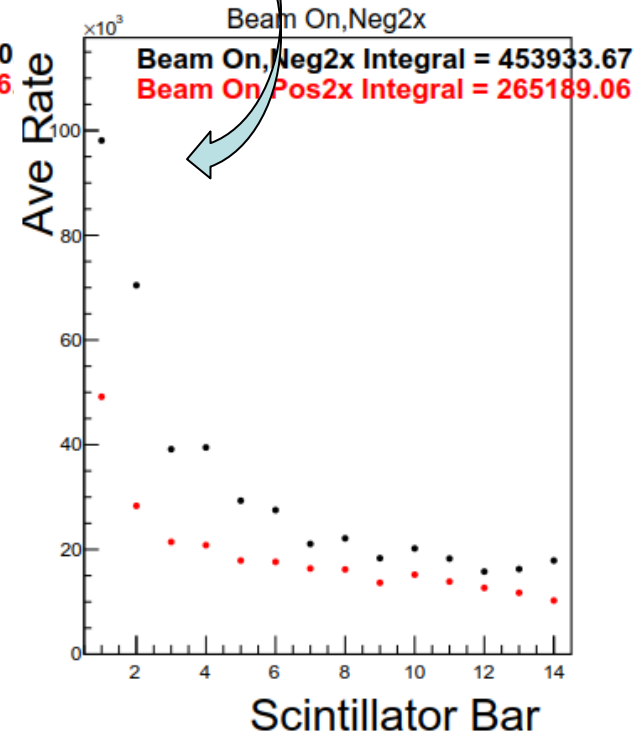
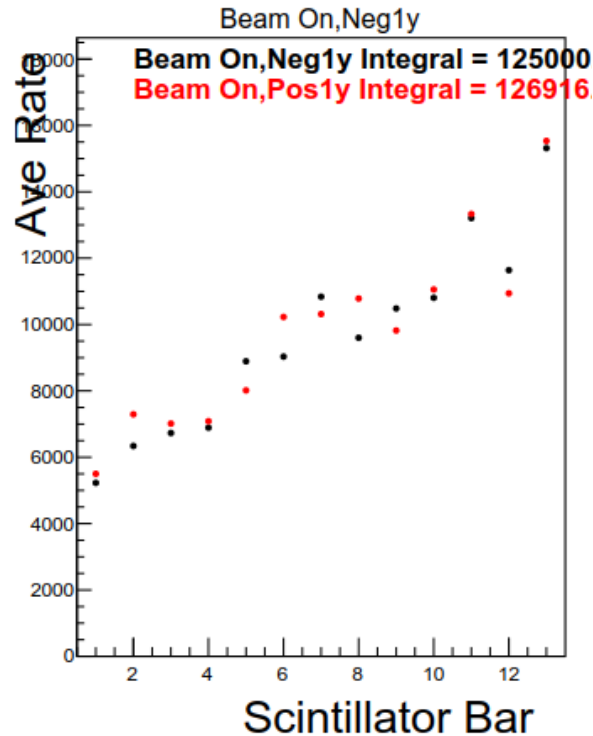
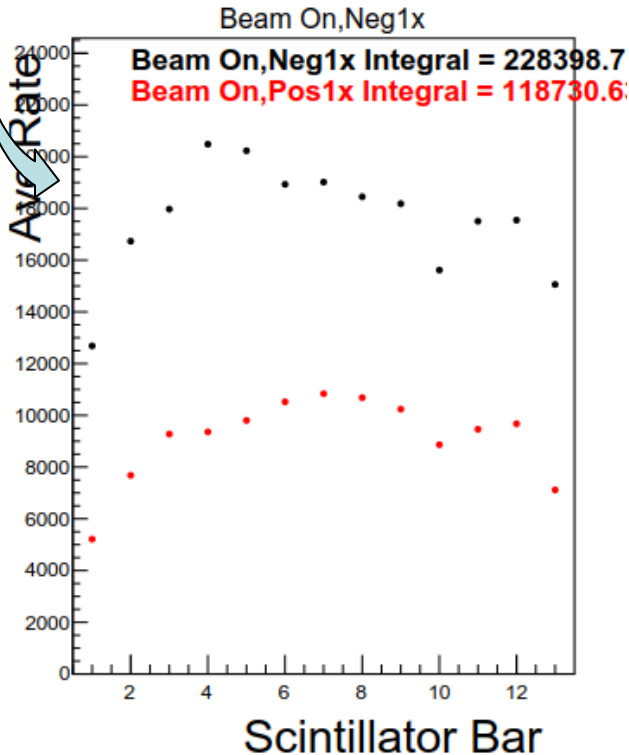
KPP Beam Results

Crude calibration of BCM scalers



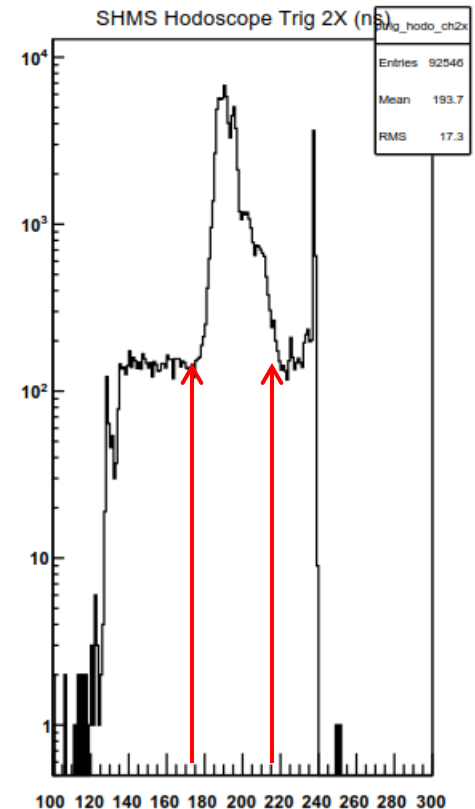
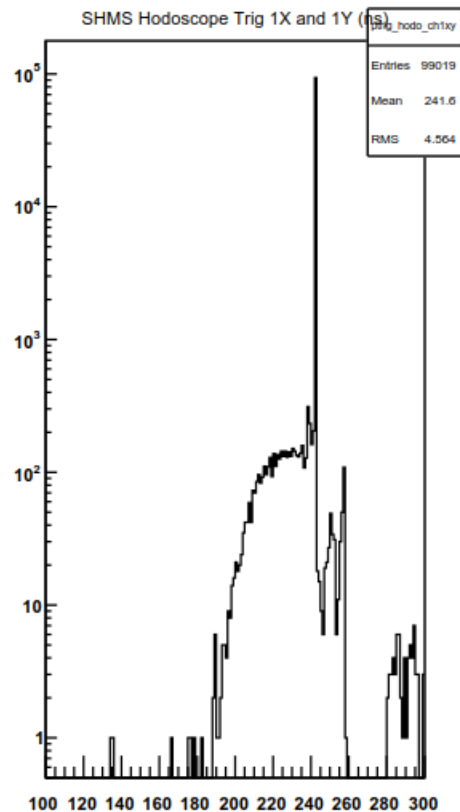
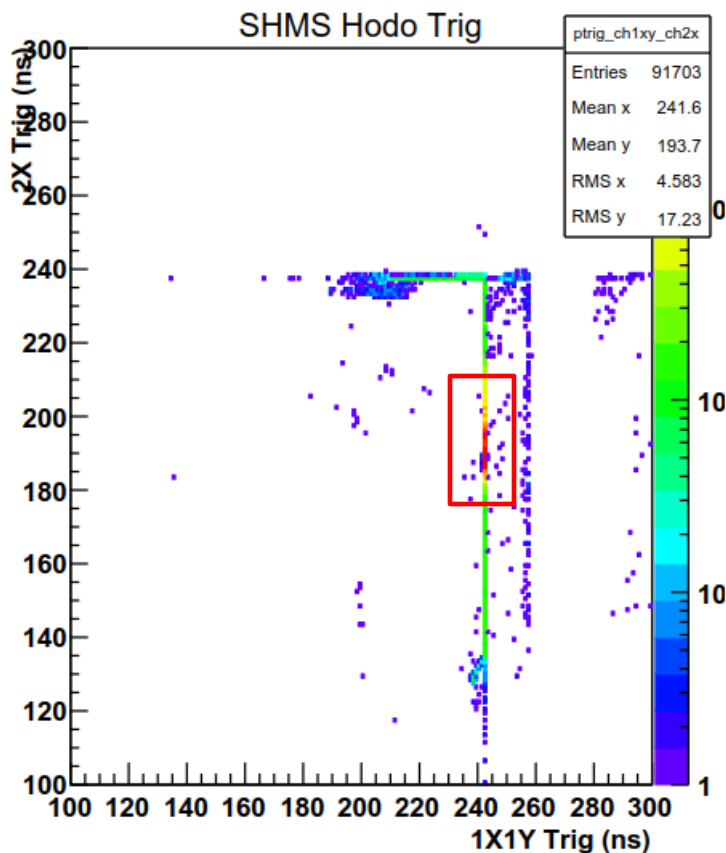
KPP Background in SHMS Hodoscope scalers

- Hodoscope scalers show large background
- Hodo 1XNeg (small angle side) has 2x rate of 1XPos.
- Hodo 1YNeg Rate = 1YPos rate. Both grow as paddle is at smaller angle.
- Hodo 2XNeg rate has 2x rate of 2XPos.
- Hodo 2XNeg has larger increase in rate for top paddles.




KPP Background SHMS Triggers

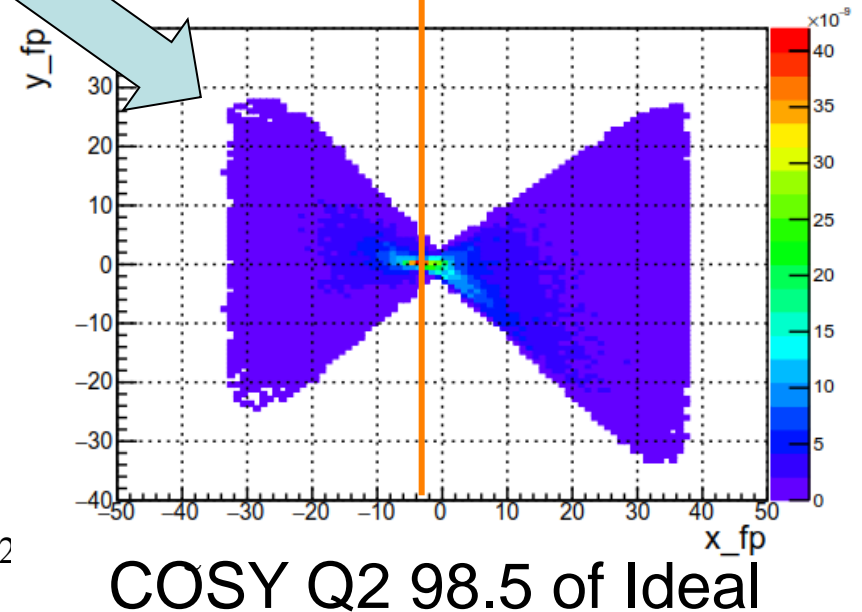
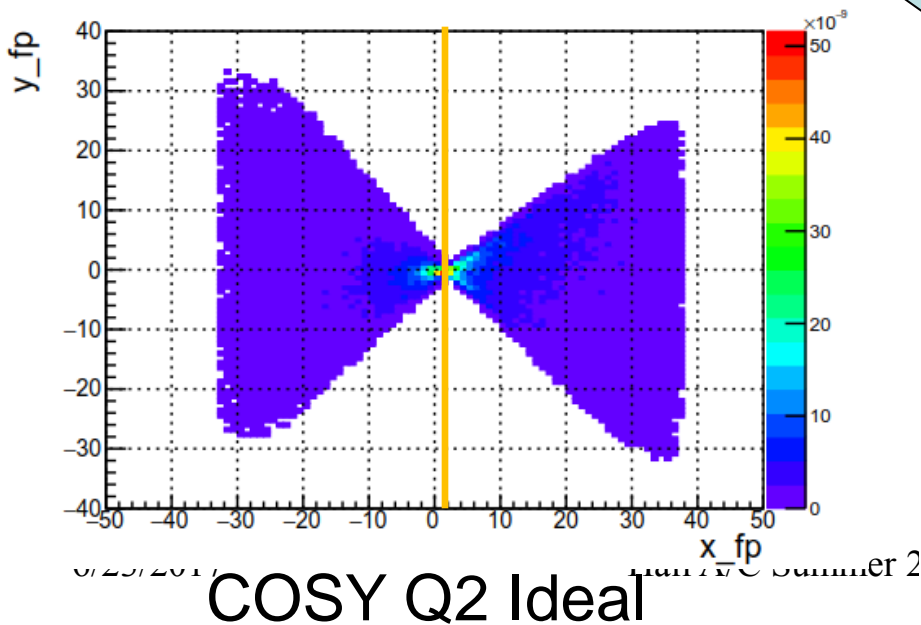
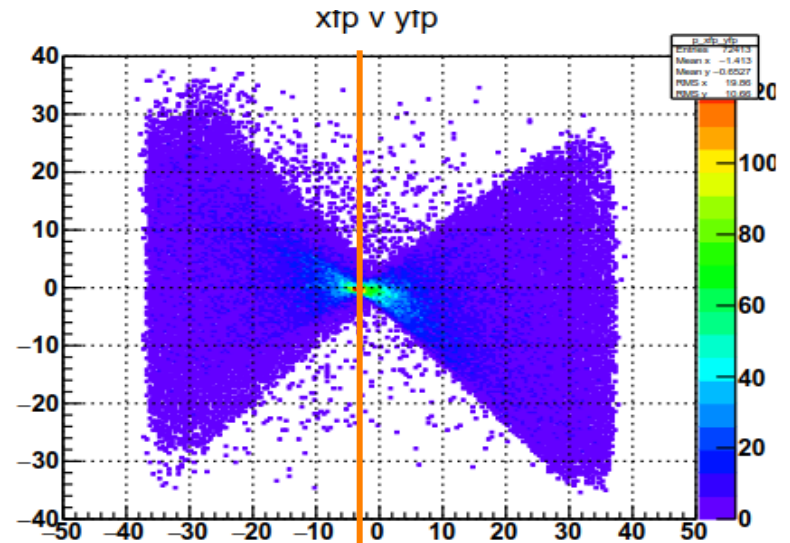
- SHMS Trigger was AND of S1X,S1Y and S2X planes.
- Set timing so that all paddles in S1X plane would determine the timing
- See delta timing peak is S1X and S1Y Trigger signal for good coincidence
- Broader 40ns region for coincidence for S2X.



KPP SHMS Optics Focal Plane Positions


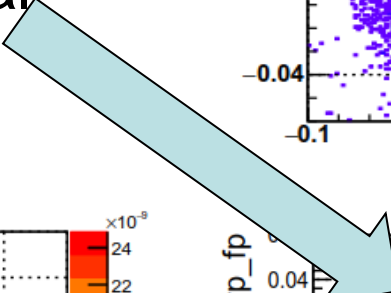
Compare Y_{fp} versus X_{fp}

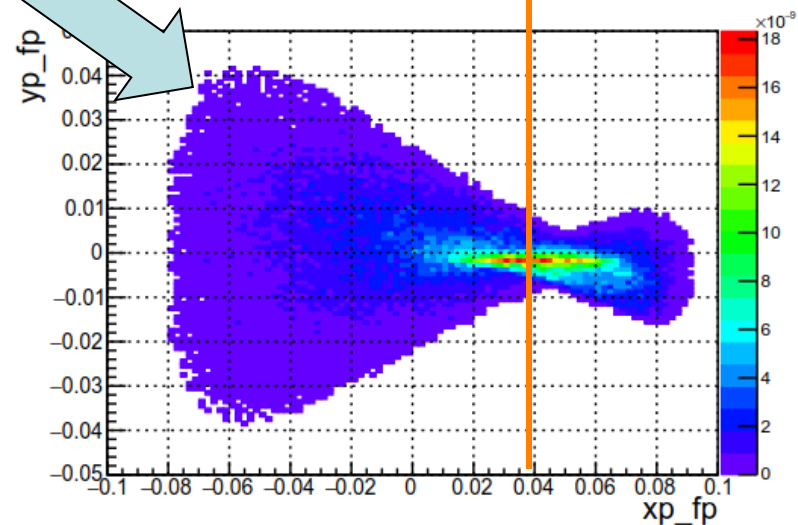
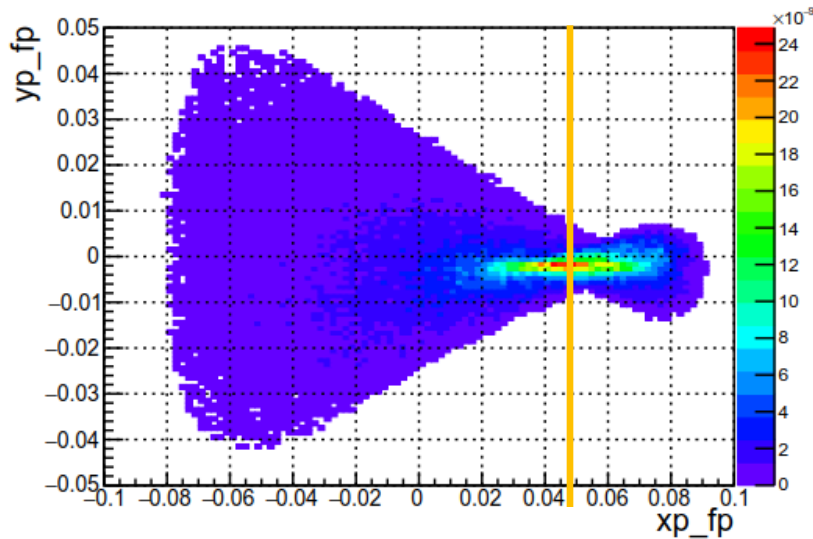
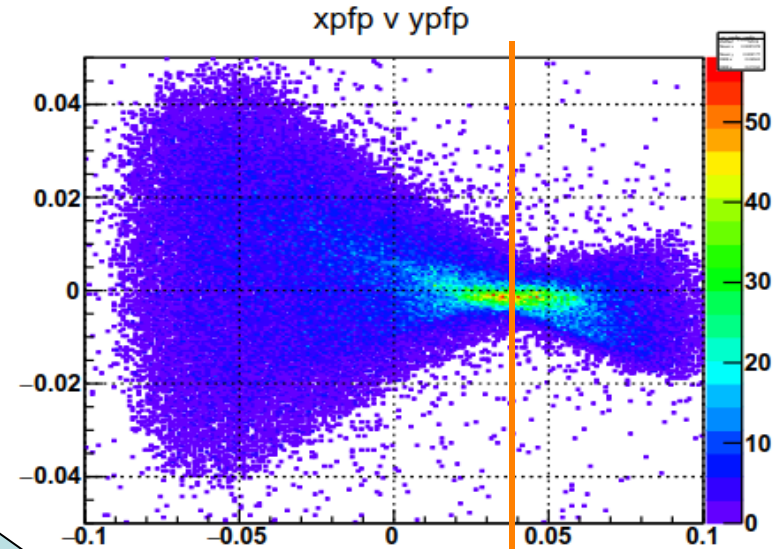
Data Run 481 
Matches COSY simulations
with Q2 at 98.5% of ideal



KPP SHMS Optics Focal Plane Angles

Compare Y'_{fp} versus X'_{fp}

Data Run 481 
Matches COSY simulations
with Q2 at 98.5% of ideal 



COSY Q2 Ideal

COSY Q2 98.5 of Ideal

KPP SHMS Optics Y target

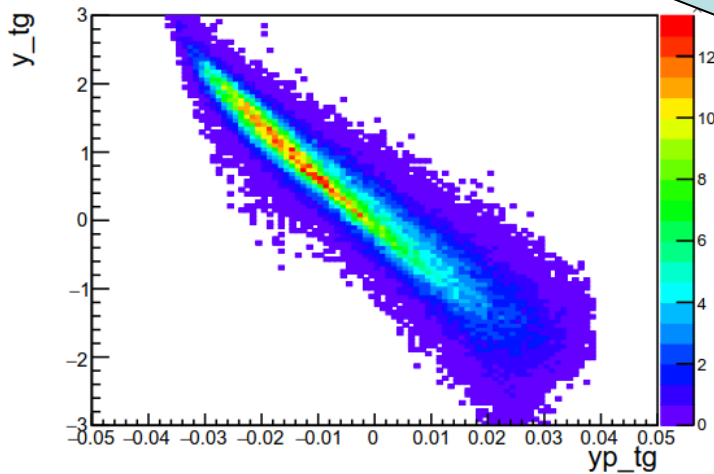
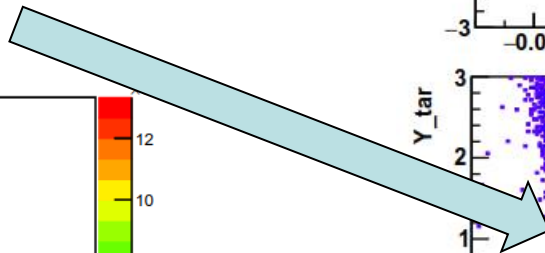
Compare Y_{tar} versus Y'_{tar}

Data Run 481

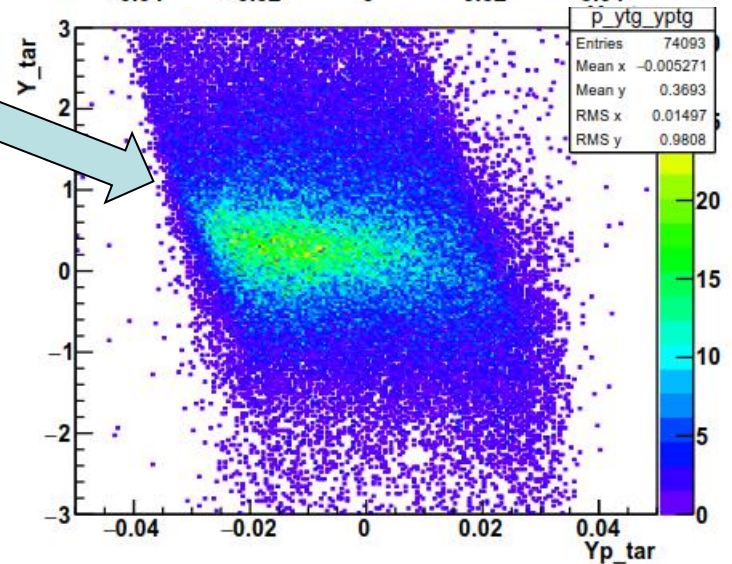
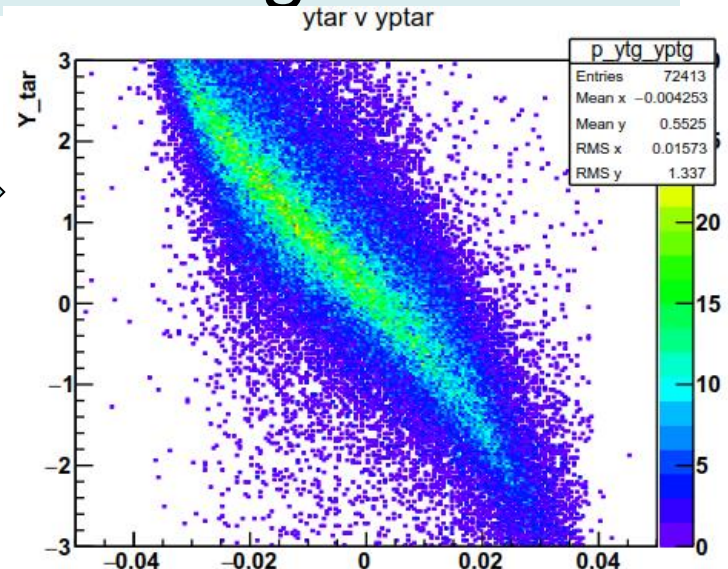


Run simulation with forward matrix Q2 at 98.5% and recon with Q2 ideal

Data with Q2 at 98.5%



COSY Q2 98.5 of Ideal



Data with COSY Q2 at 98.5%

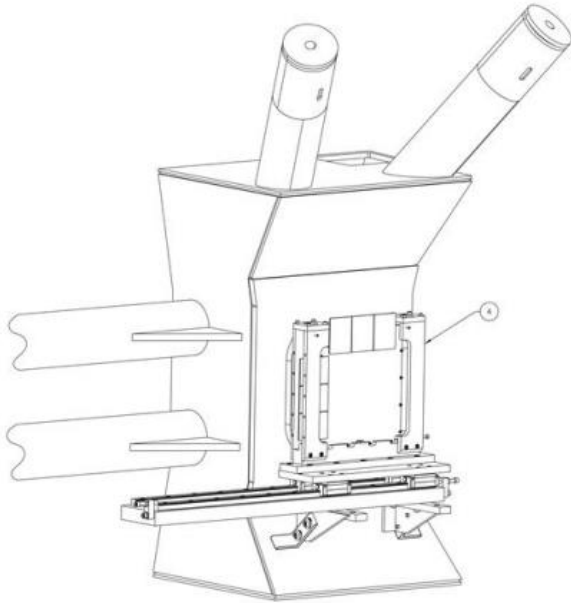
Summer Hardware work

- SHMS/HMS pointing surveys.
- Install SHMS shielding around the Dipole openings.
- Replace Noble Gas Cherenkov with vacuum pipe.
- Magnet Cycling Procedure.
- Install new HMS drift chambers, survey and cosmic checkout
- Change out SHMS chamber?
- Install GEM sieve
- BCM checkout
- Trigger setup (adding Cherenkov signal arm, coincidence)
- Electronic deadtime
- Add FADC scalers to general scaler display.

Commissioning Tasks

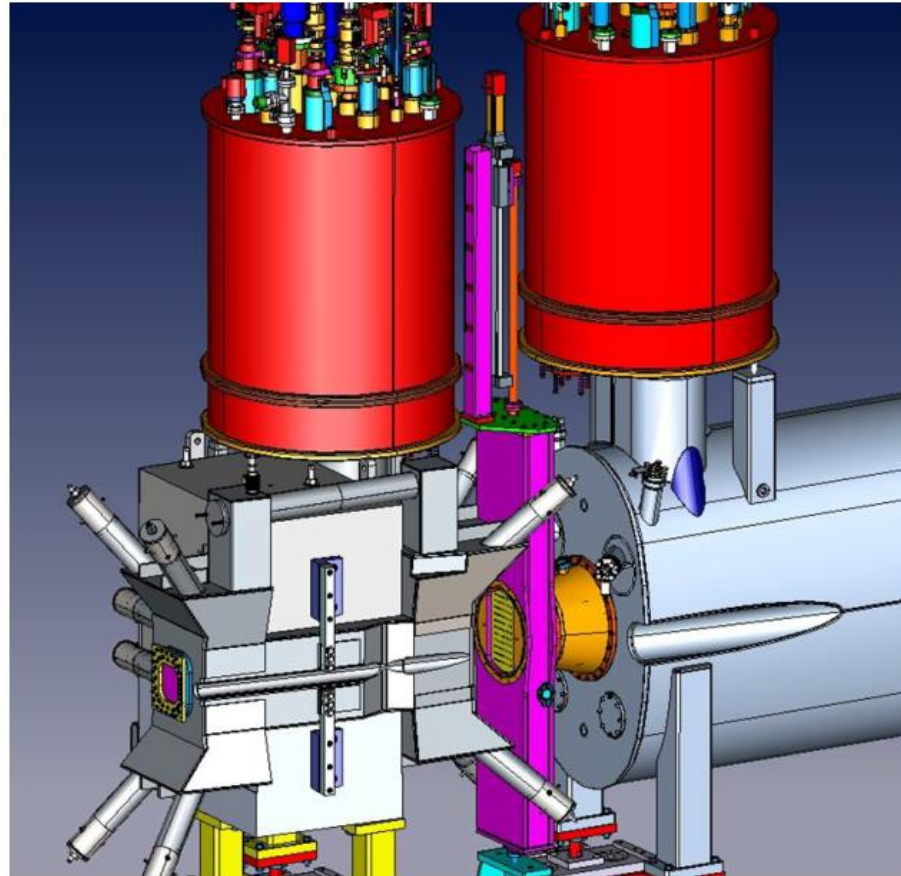
- Harp scans and BPM checkout. Raster checkout.
- Final HMS and SHMS detector checkout plans. Defocused tune?
- HMS and SHMS trigger efficiency with Hodo, Hodo+ Cerenkov.
- HMS and SHMS DC checkout, software alignment and tracking efficiency
- Beam energy
- BCM Calibration
- Target Boiling
- Carbon elastic with sieve for final SHMS tune determination
- Carbon elastic scan for delta matrix optimization
- Carbon inelastics with sieve for Y_{tgt} , Y'_{tgt} and X'_{tgt} (Need 20 deg for Y_{tgt})
- Sieve check after cycling SHMS magnets from positive to negative and back
- Determine SHMS central momentum and angle with set of elastic ep data.
- Inelastic carbon xn measurements with overlapping momentum settings to for acceptance check.
- GEM Front Sieve to better understand HB. Do optics with π^+ to check optics.
- Coincidence timing checkout and optimization.
- Electronic deadtime checkout.
- Single Kaon production. Coincidence π and K production.

Collimator and Sieves



GEM SIEVE SLIDE ASSY
SOME ITEMS OMITTED FOR CLARITY
SHOWN WITH SHIELD ASSY REMOVED

Front sieve and
GEM in front of HB



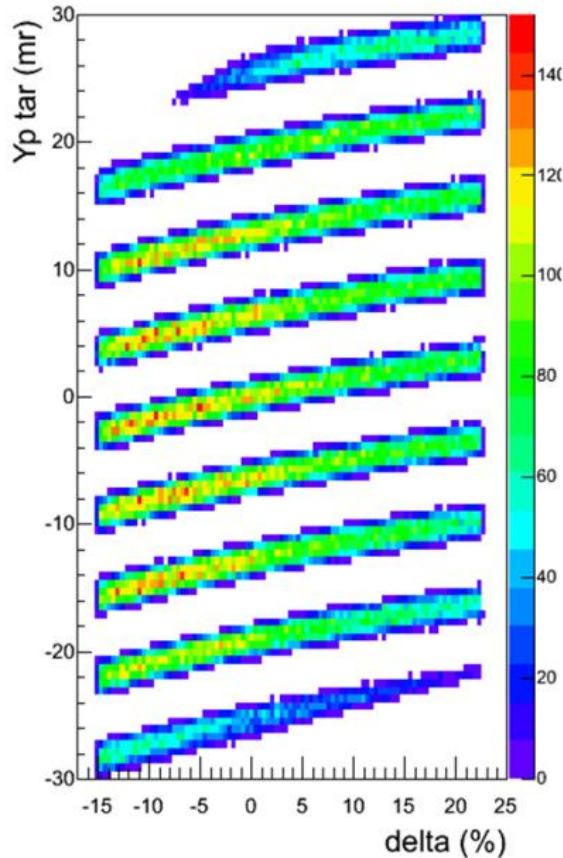
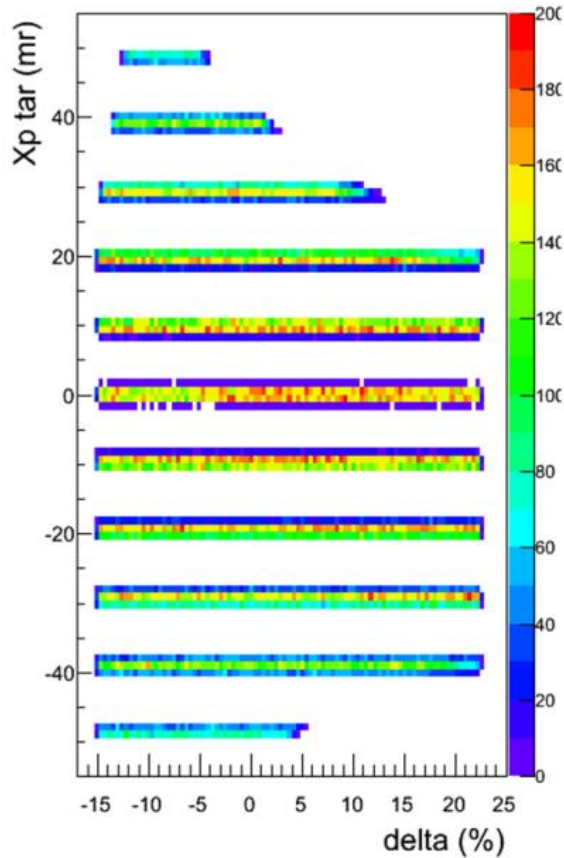
Sieve and Collimator between HB and Q1

Sieve pattern

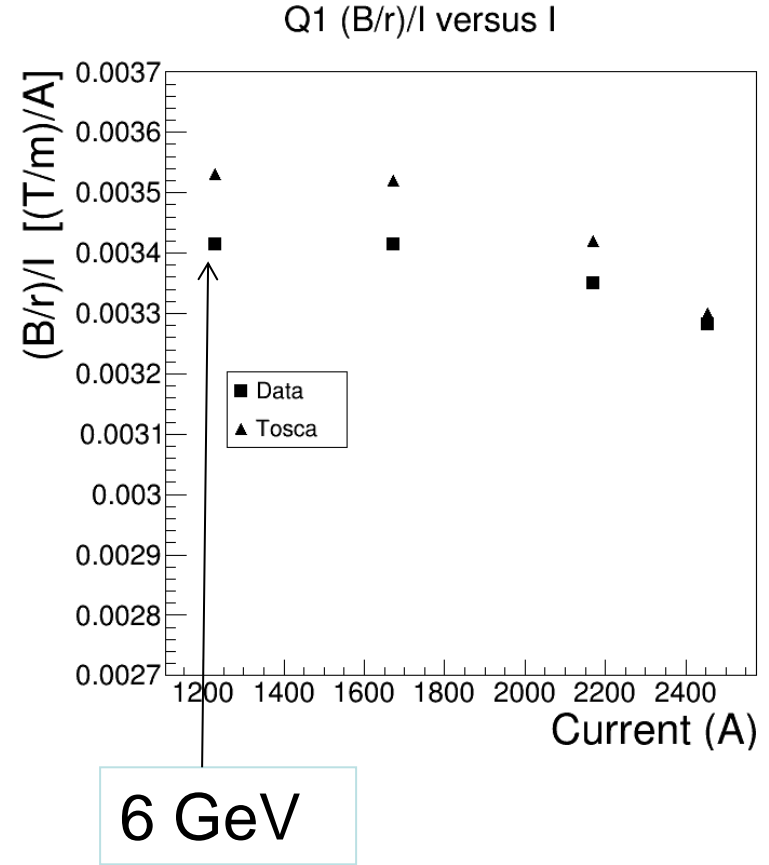
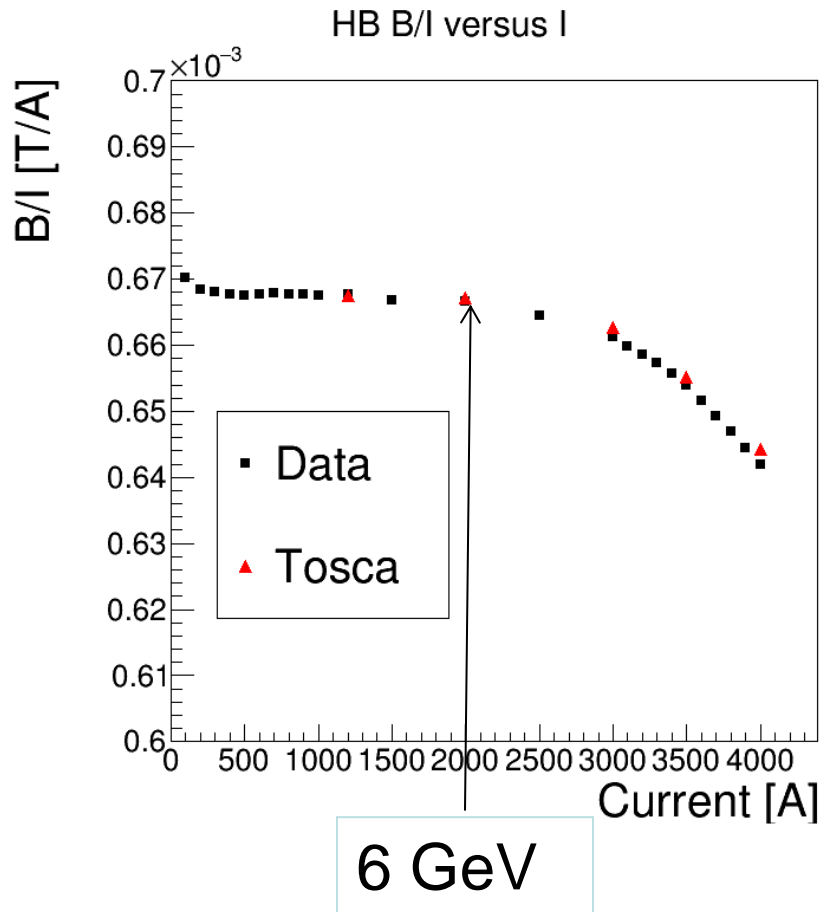
HB produces Y'_{tar} versus Delta correlation

$$\Delta Y'_{tar} = 1mr \text{ when } \Delta\text{Delta} = 5\%$$

Clearly see X'_{tar} holes



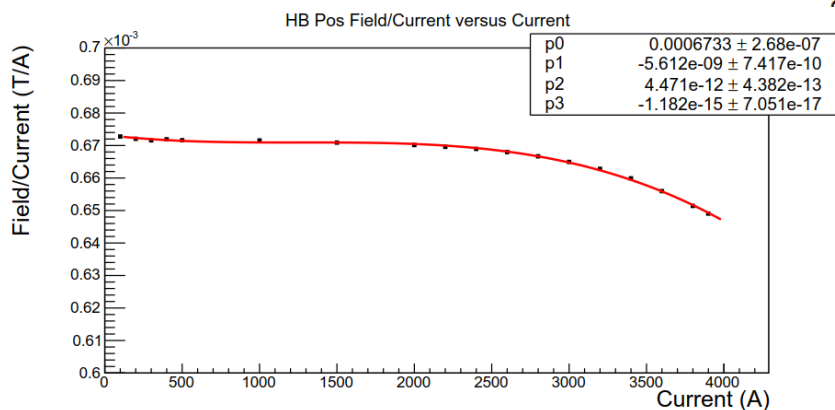
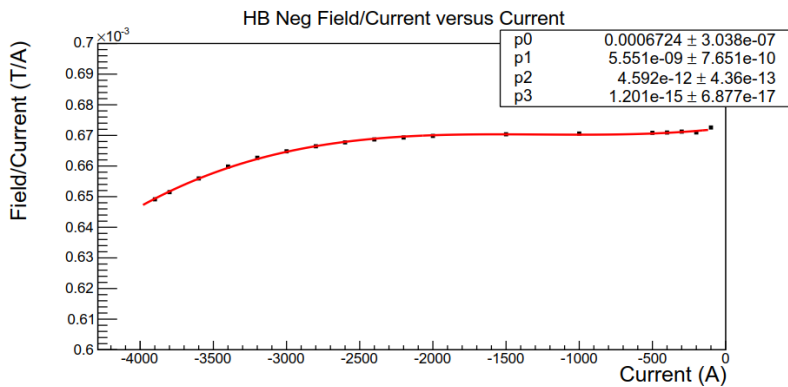
SHMS HB and Q1 magnet mapping



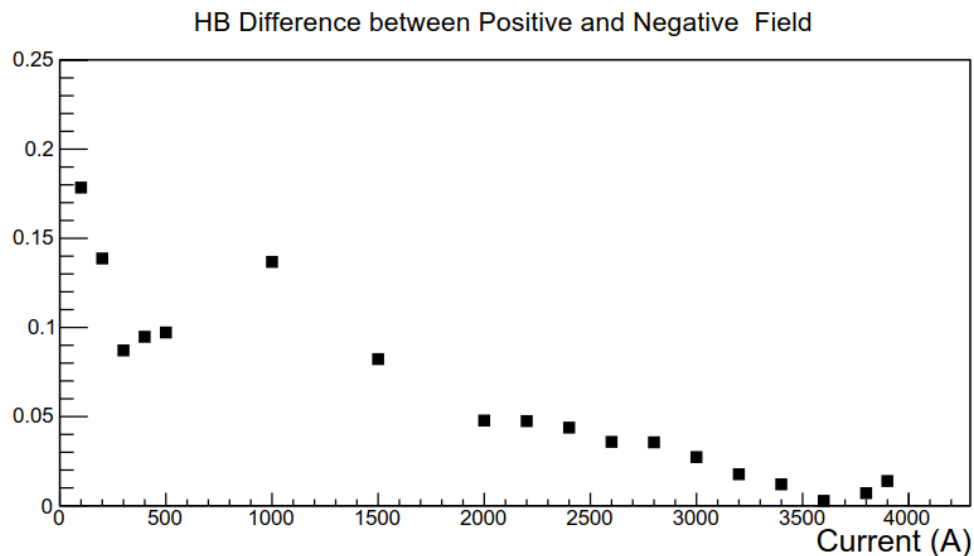
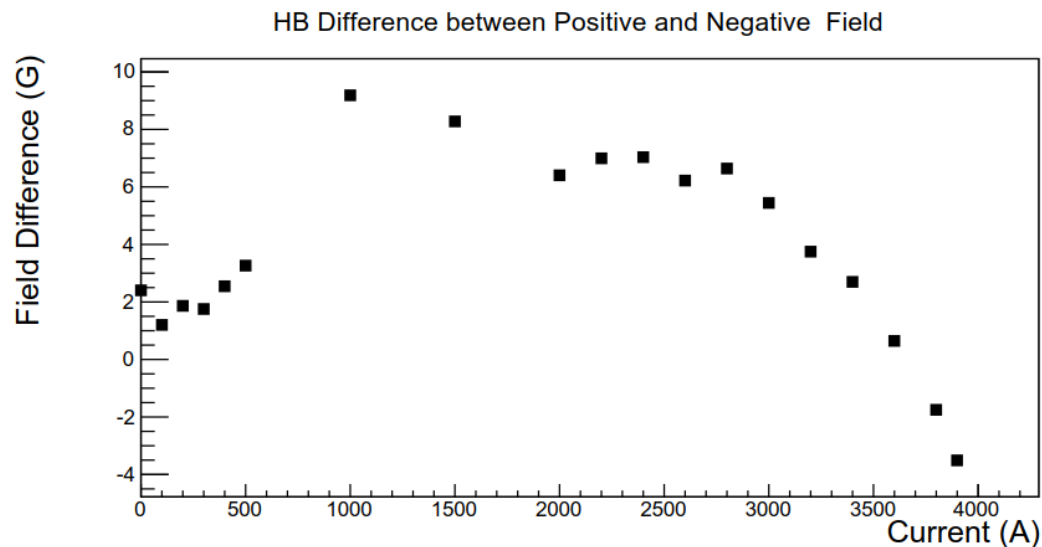
- Q1 Need checks at lower current and negative current
- Q2, Q3 and dipole need data.

SHMS HB

Comparison of HB
negative versus
positive polarity



Field Difference (%)




Conclusion

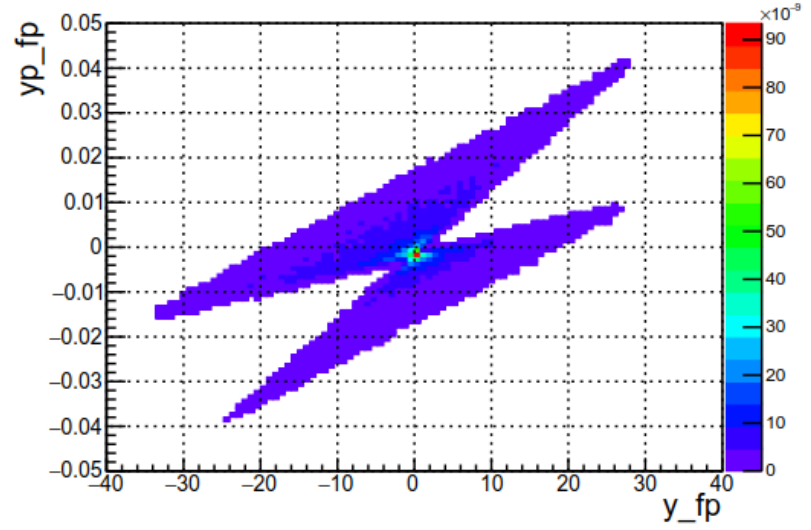
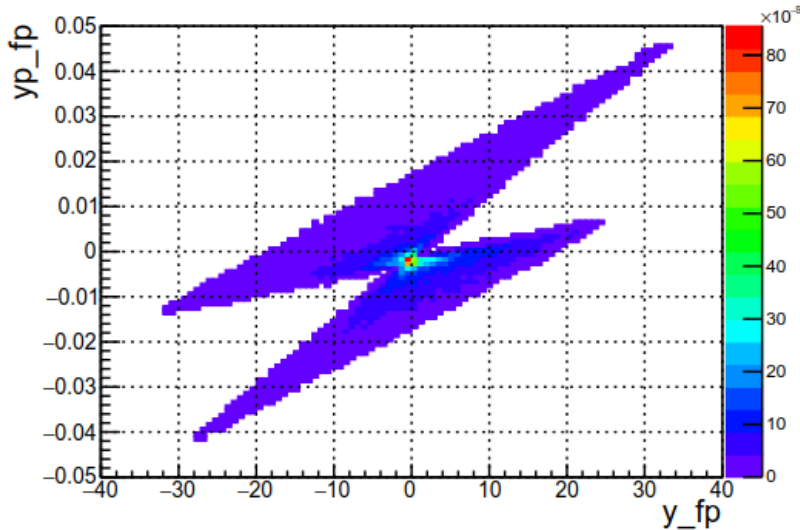
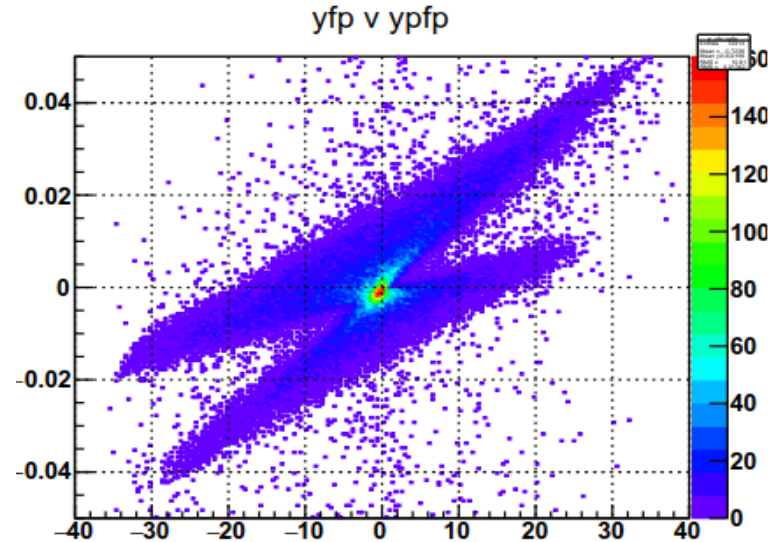
- Weekly meeting every Wed at 11 in L210.
 - Alternate between software and hardware
 - [Hardware meeting wiki](#).
 - Join the hallcsw [mailing list](#) for notification
 - Next Wed June 28th will be a detector meeting
 - [Wiki](#) on the past optics meetings.

KPP SHMS Optics Y Angle vs Position

Compare Y'_{fp} versus Y_{fp}


Data Run 481 

Q2 changes not much effect

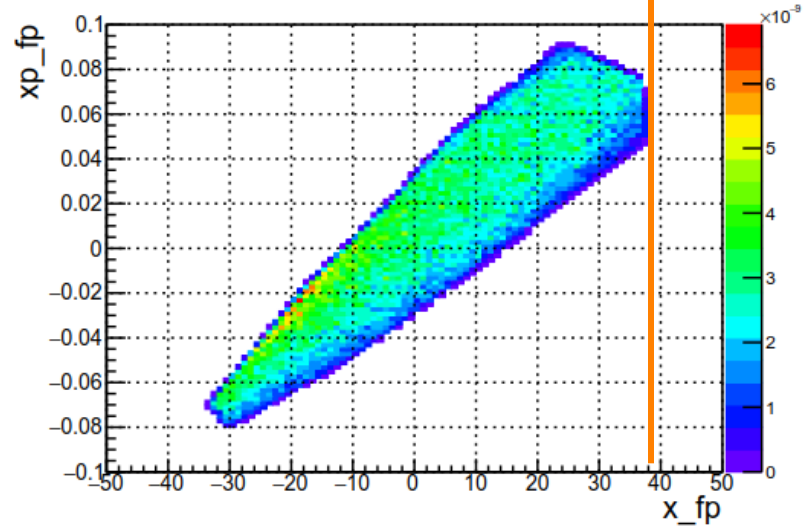
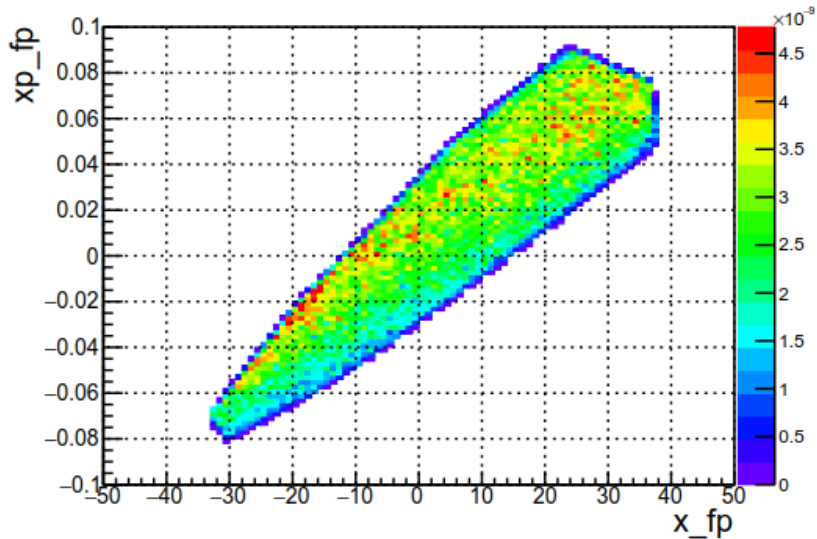
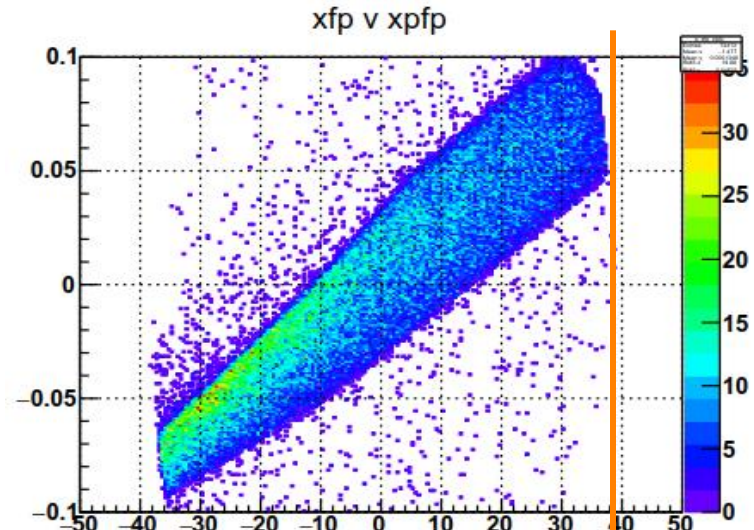


KPP SHMS Optics X Angle vs Position

Compare X'_{fp} versus X_{fp}

Data Run 481 

Q2 changes not much effect

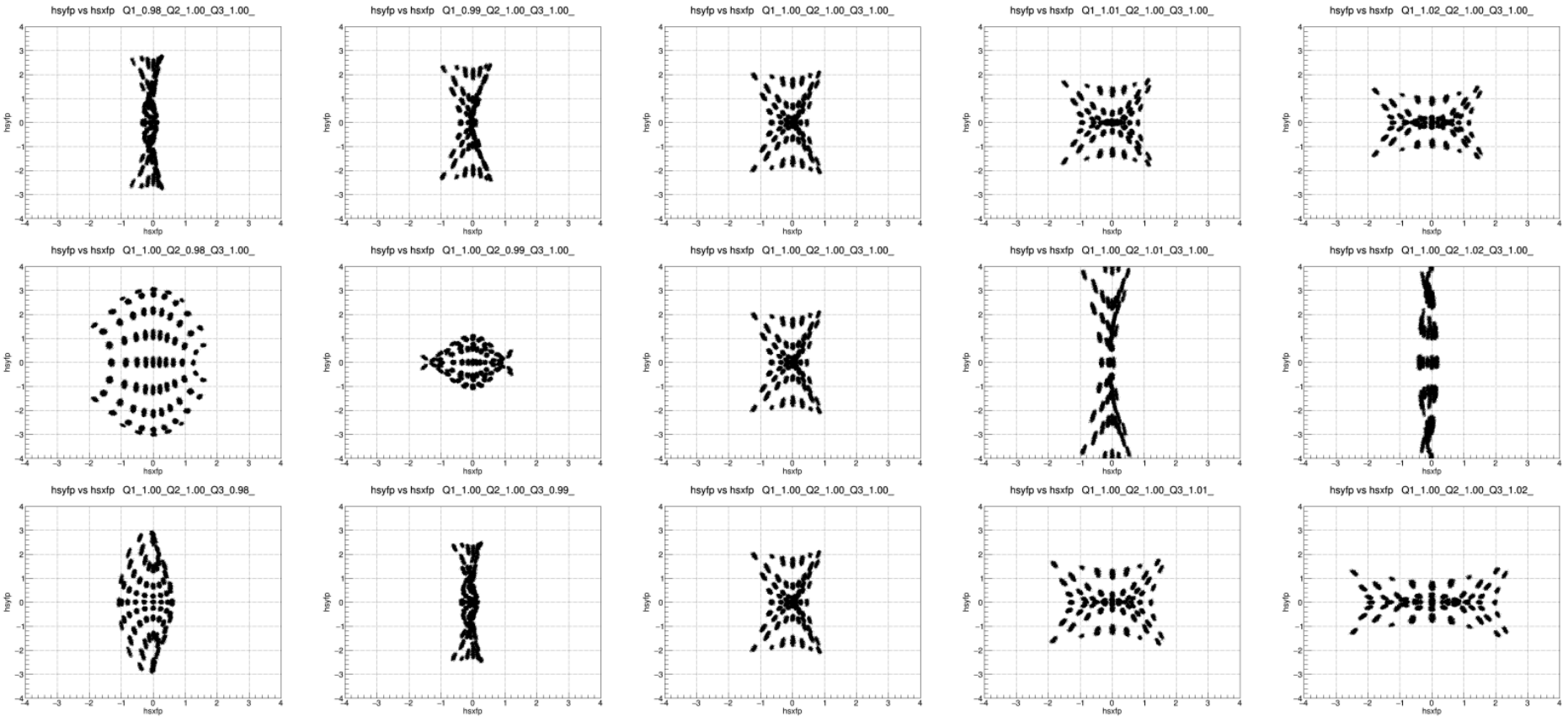


COSY Q2 Ideal

COSY Q2 98.5 of Ideal

Carbon elastics to determine SHMS tune

Y_{fp} versus X_{fp} is sensitive
Change Quads by 1% steps



Carbon elastics to determine SHMS tune

Y'_{fp} versus X'_{fp} is not sensitive
Change Quads by 1% steps

