Beamline Performance

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SLAC

HPS Beam Requirements

Parameter	Requirement			Unit
E	1100	2200	6600	MeV
$\delta E/E$	$< 10^{-4}$			
Current	< 200	< 400	< 500	nA
Current Instability	< 5			%
σ_x	< 300			μm
σ_y	< 50			μm
Position Stability	< 30			μm
Divergence	< 100			μrad
Beam Halo ($> 5\sigma_Y$)	$< 10^{-5}$			

No issue in target heating.

$\sigma y < 50$ μm

σx as small as possible, but we don't want to spend too much time in tuning.

HARP   2C21 2C24   2H02A

SVT Wire scanner
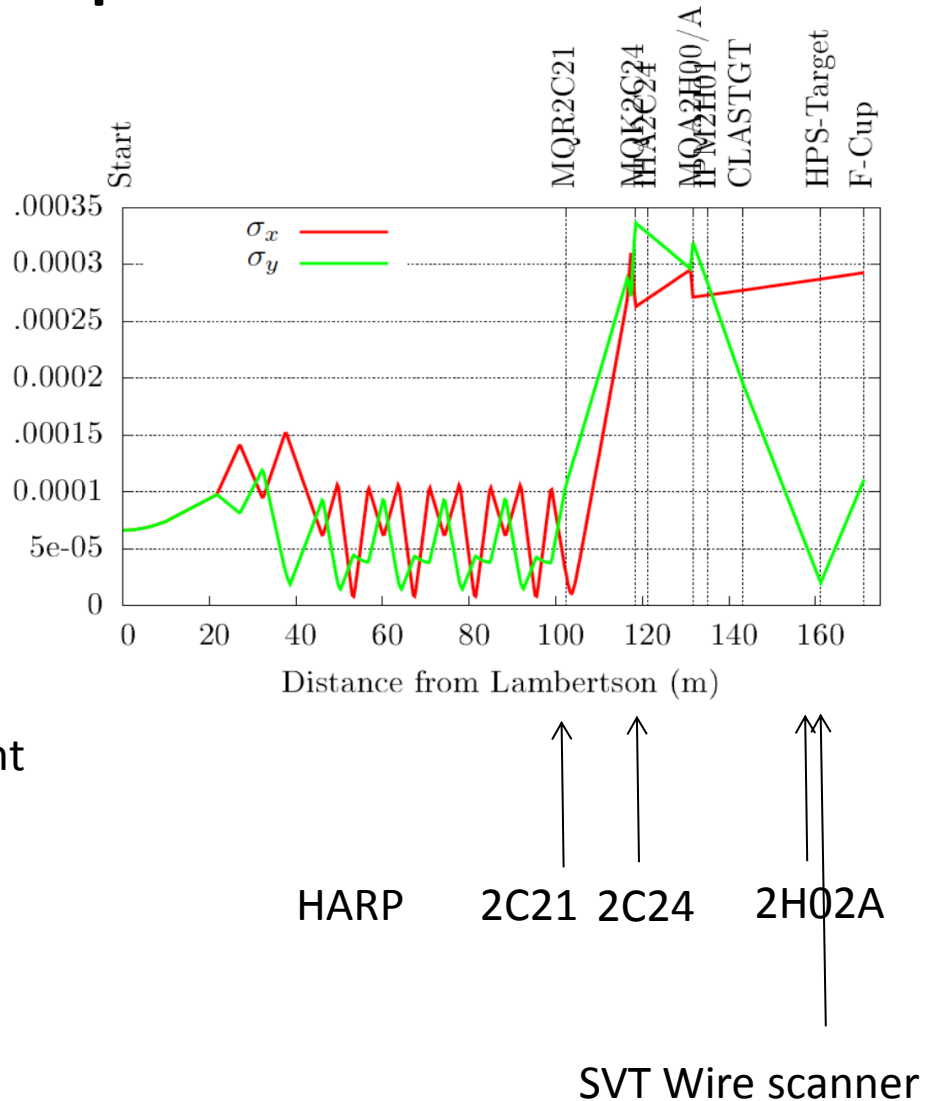
Establishing Acceptable Beam Conditions

HPS Beamline Commissioning document
The HPS Run Wiki/Short Term Schedule
The key is to have a good beam at the tagger dump.
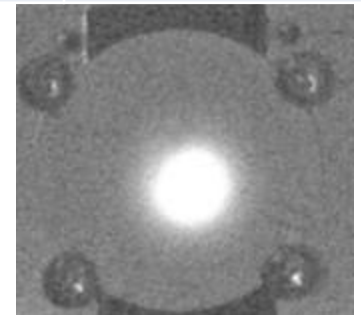
- 2C21 and 2C24 HARP

		Nominal	April 9 05:50	April 16 03:01	April 22 21:55
2C21	X, σ (mm)	19.18 , 0.031	18.67, 0.038	19.126, 0.086	19.48, 0.051
2C21	Y, σ	37.54, 0.132	36.94, 0.117	37.38, 0.167	37.48, 0.198
2C24	X, σ	35.72, 0.341	35.79, 0.126	36.55, 0.243	36.07, 0.146
2C24	Y, σ	20.93, 0.315	18.21, 0.287	19.46, 0.596	20.23, 0.364

Requirements:

X,Y within 1 mm
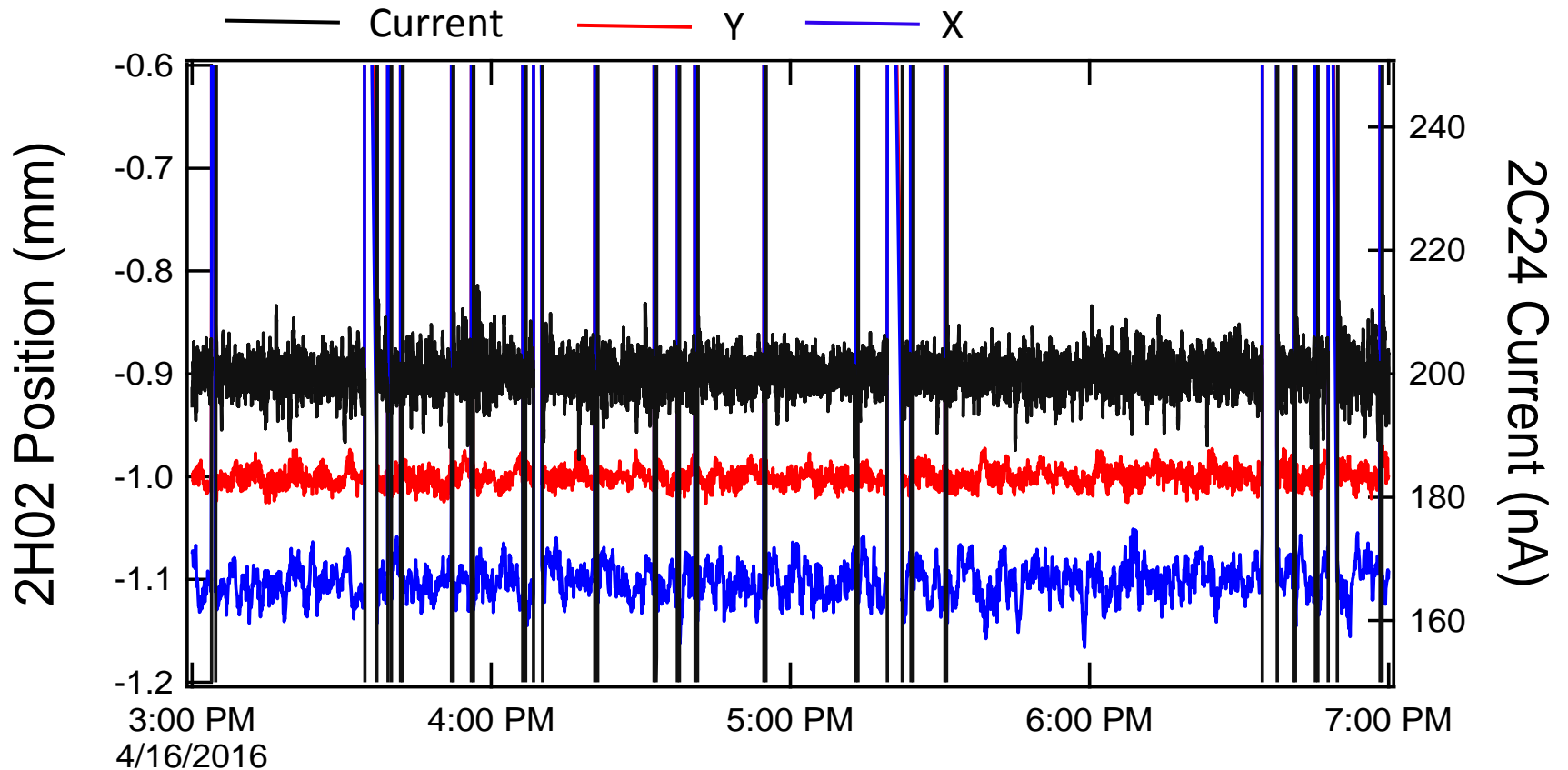σ(2C21) < 0.1 $\pm$0.05 mm
σ(2C24) < 0.35$\pm$0.1 mm
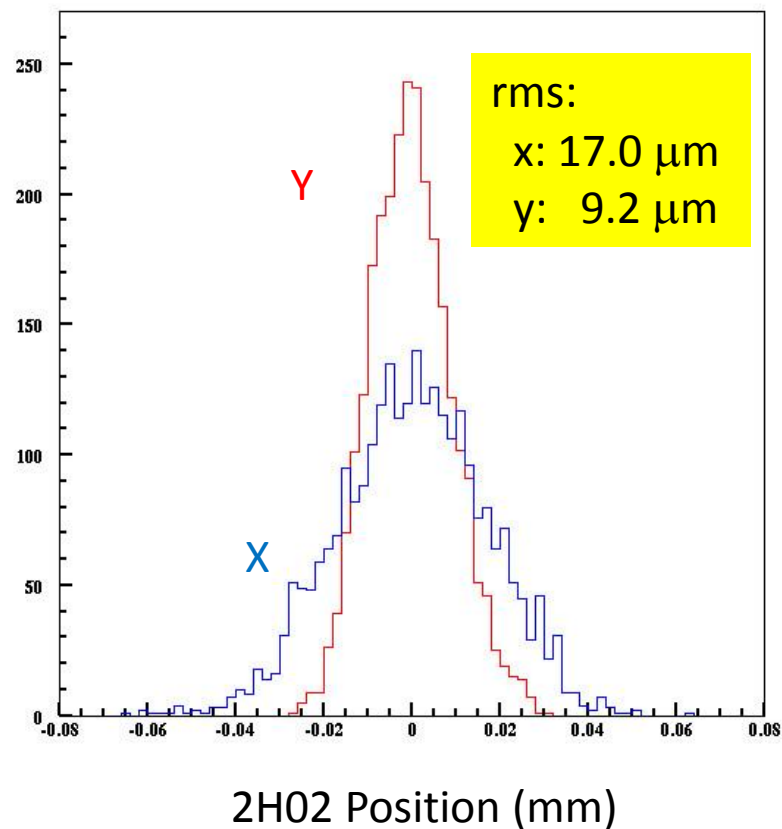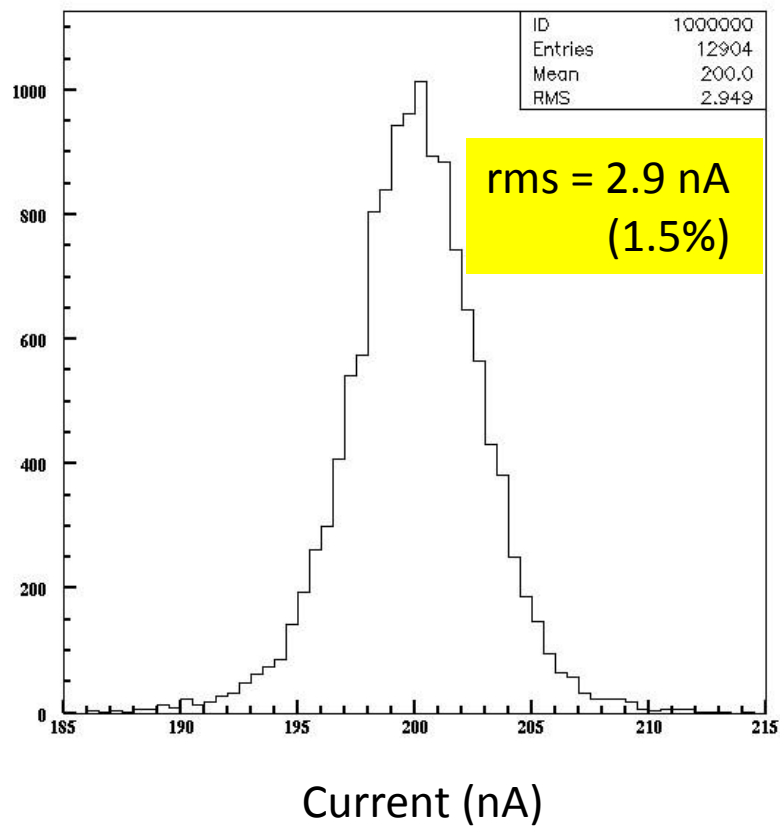

- Beam is at the center of the screen.

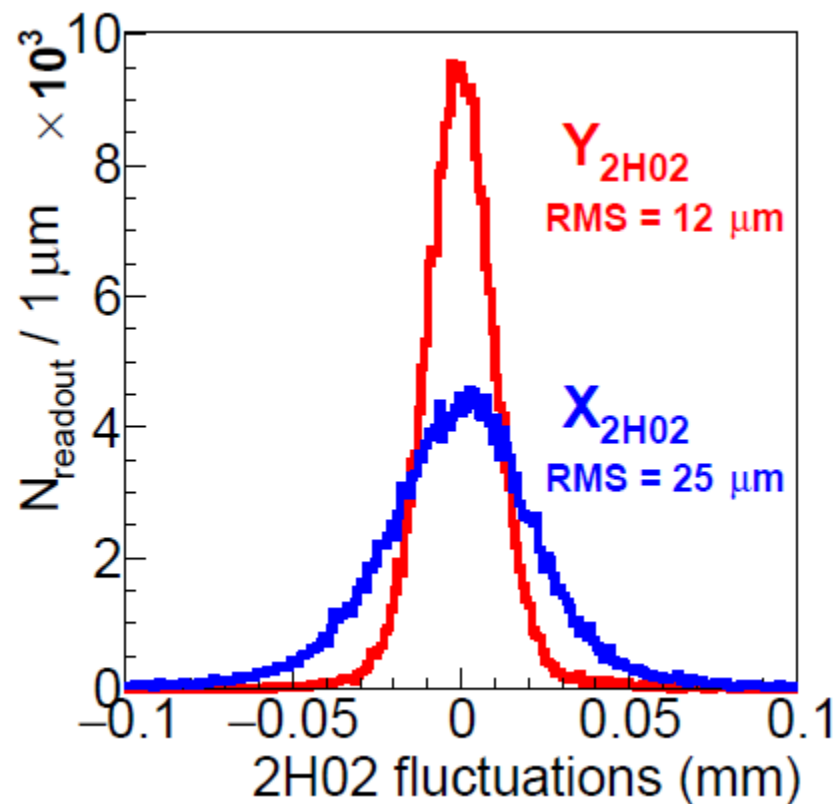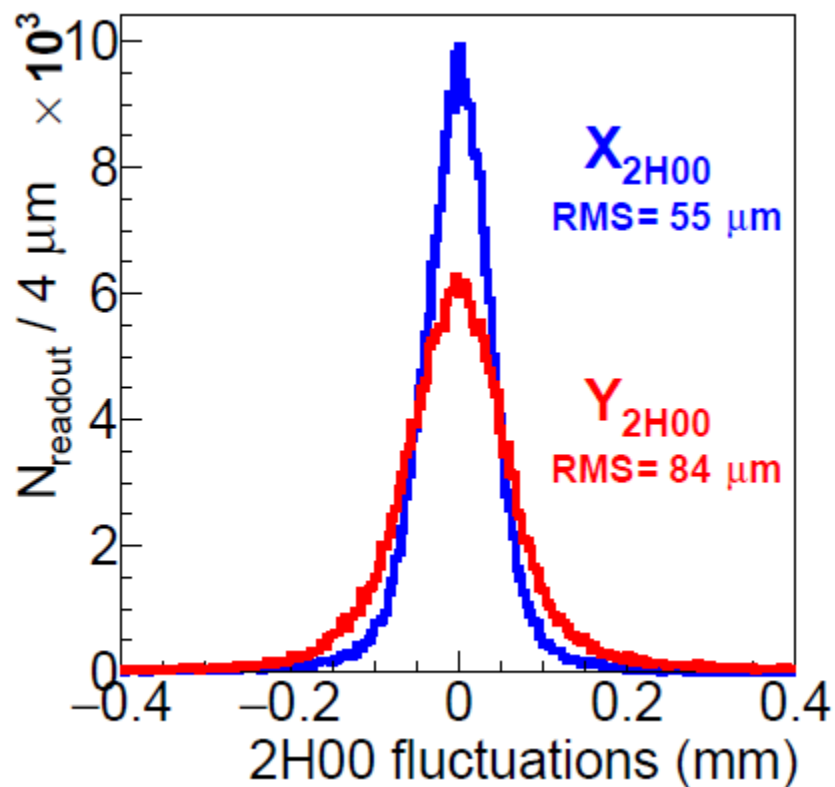Beam will go through the SVT protection collimator.

Beam Stability

Best 4-hour period: April 16 15:00 – 19:00

Golden Period

rms = 2.9 nA (1.5%)

ID   1000000
Entries   12904
Mean   200.0
RMS   2.949

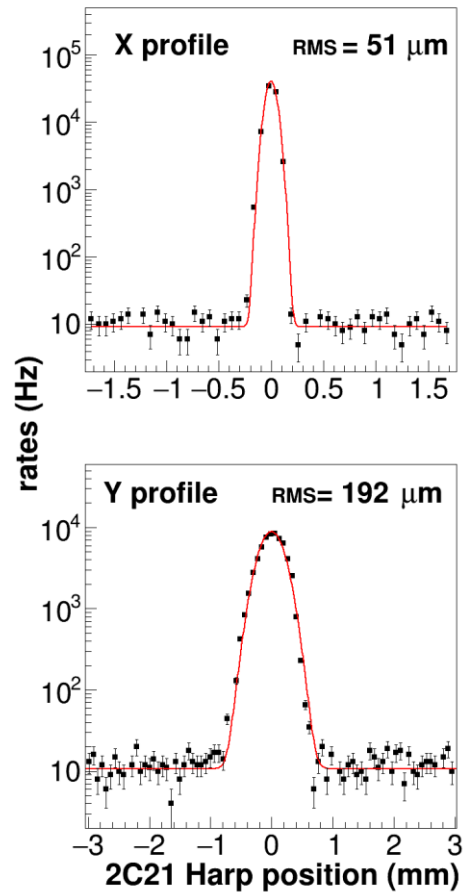Current (nA)

rms:
  x: 17.0 μm
  y: 9.2 μm

2H02 Position (mm)

Beam Position Stability during 2016 run

Beam Profile
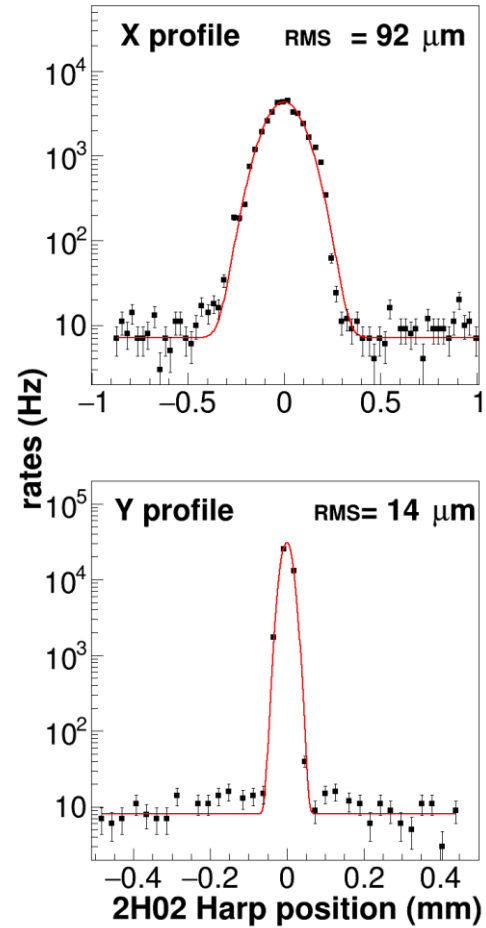
SVT Wire scan
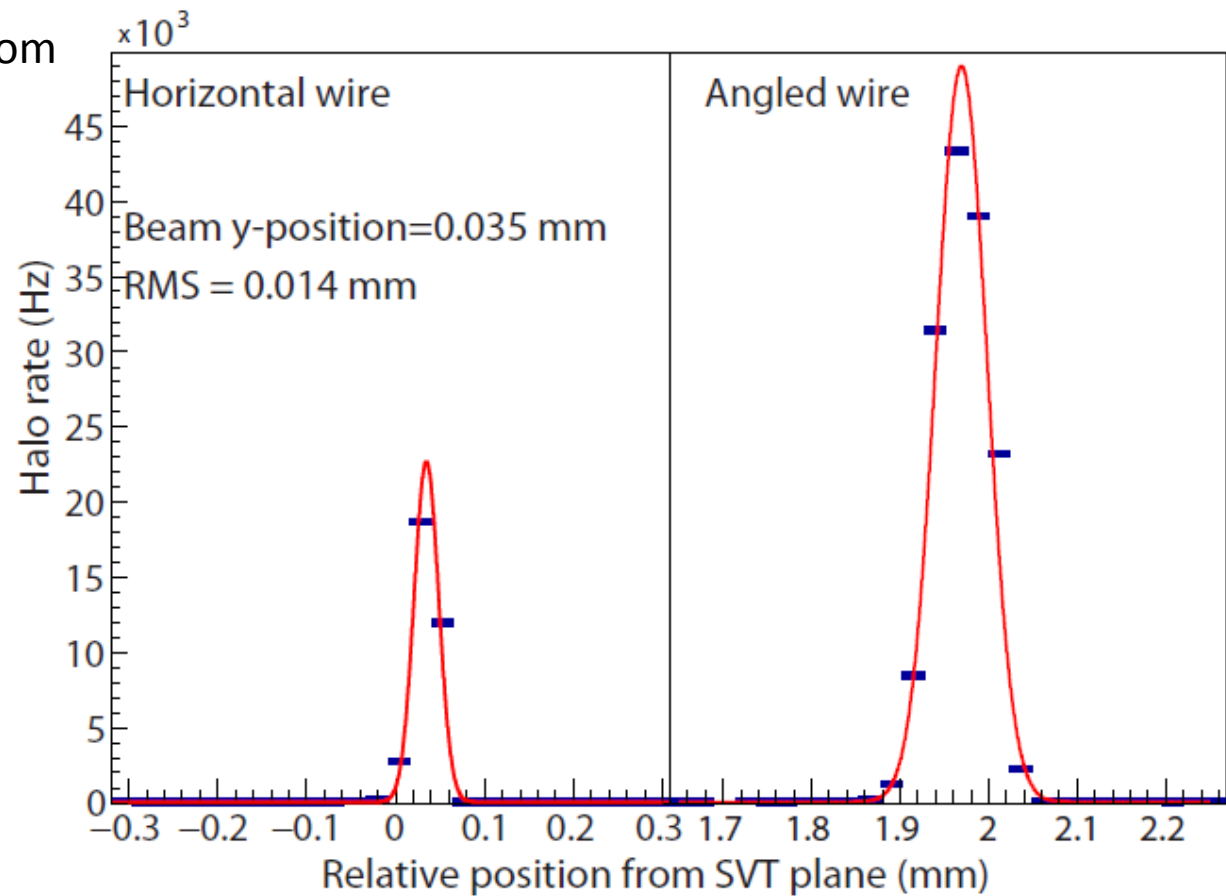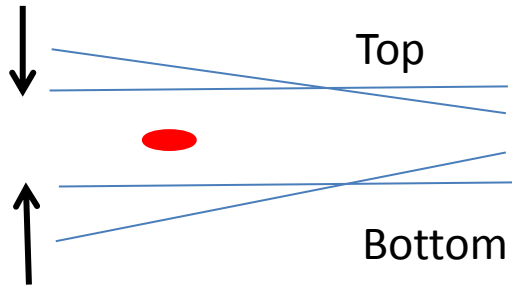
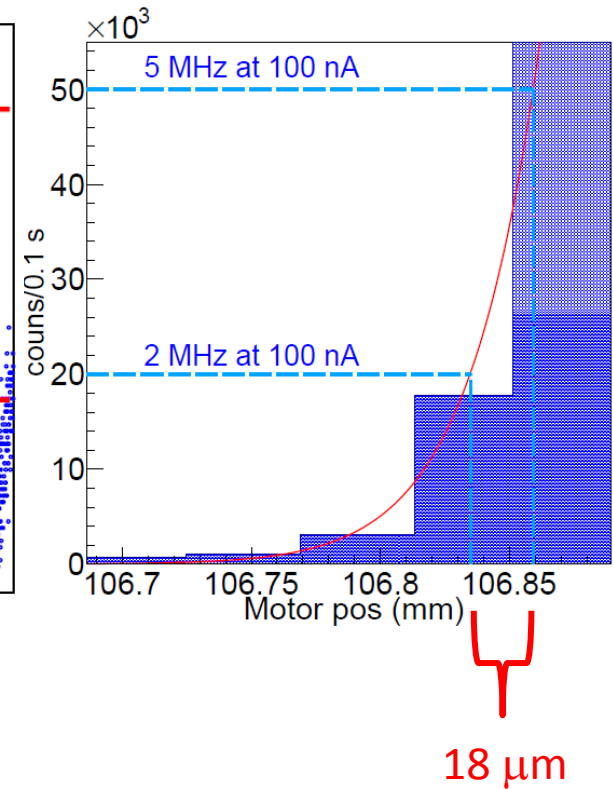# Fast beam motion
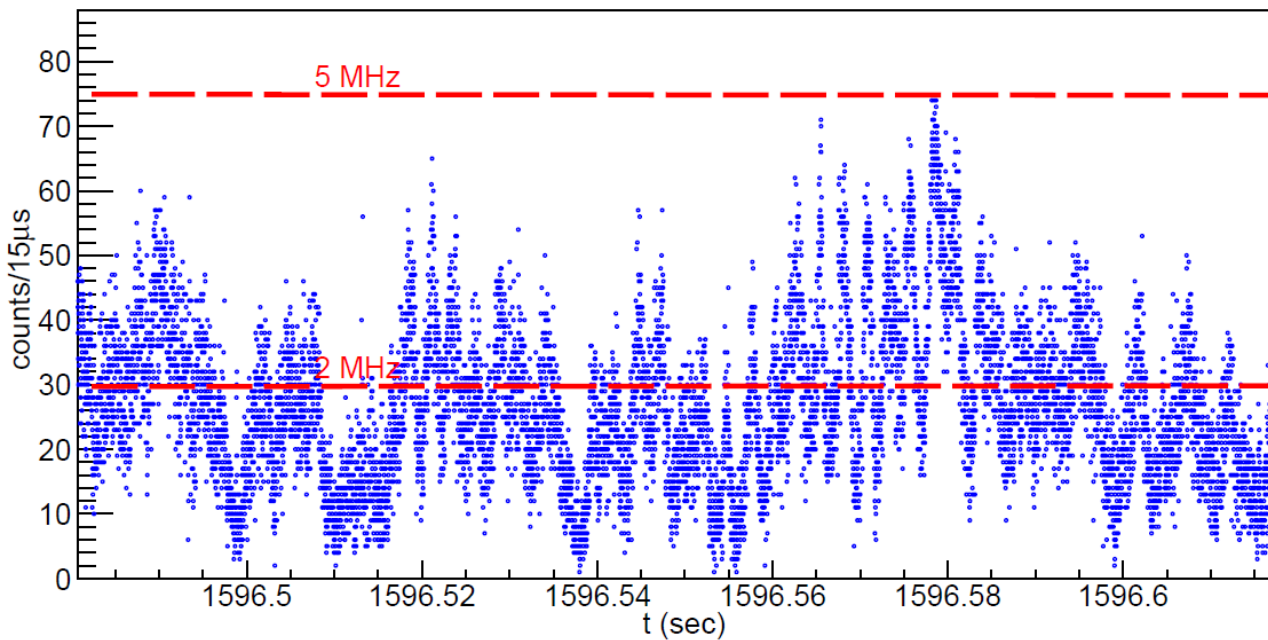
FSD test

2H02A wire

1 ms integration time

Threshold: 60/300μs (200 kHz)

counts/300μs

t (sec)
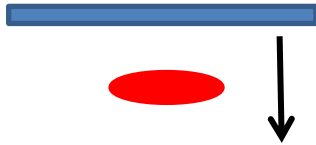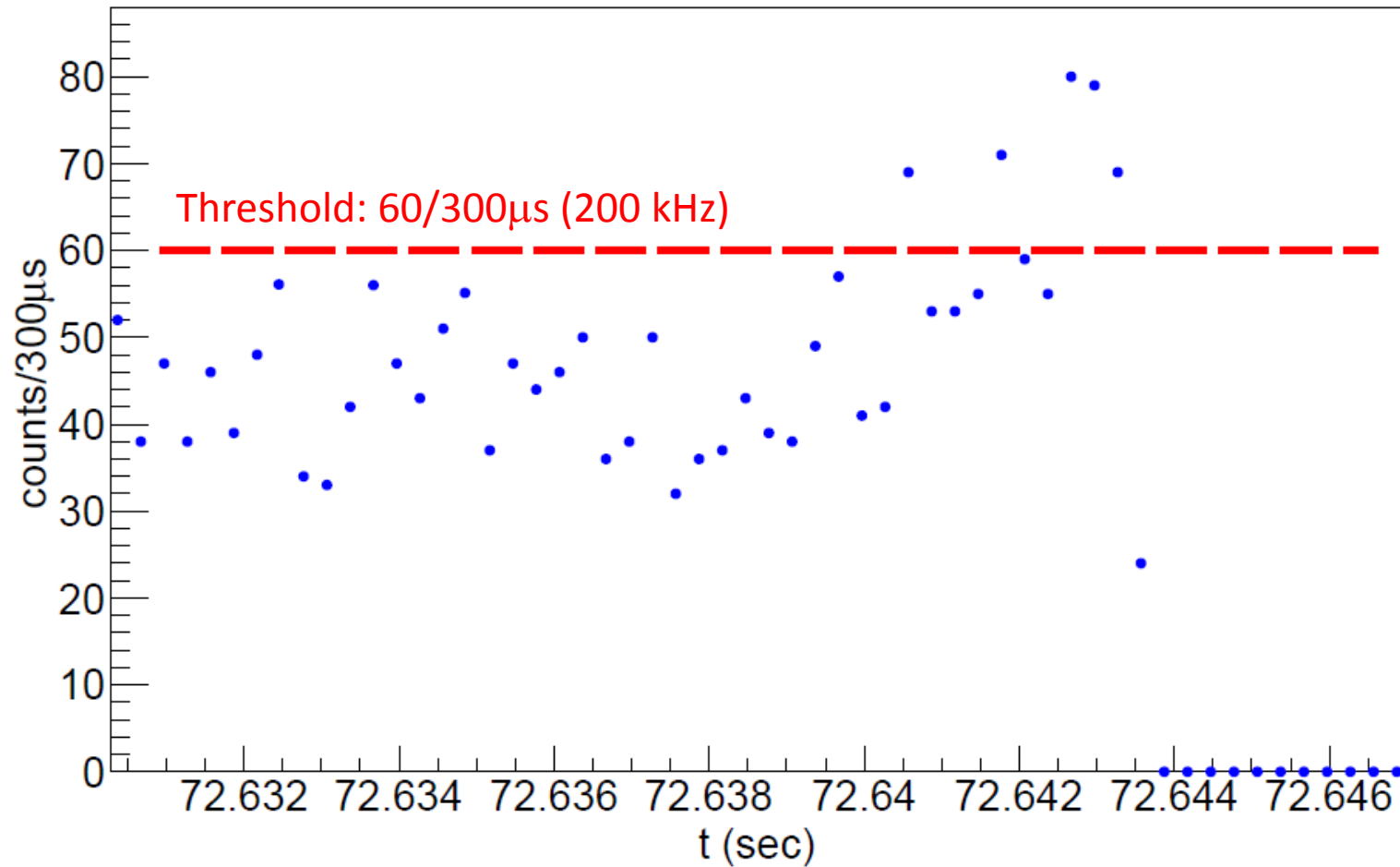
Beam Halo during 1.05 GeV run
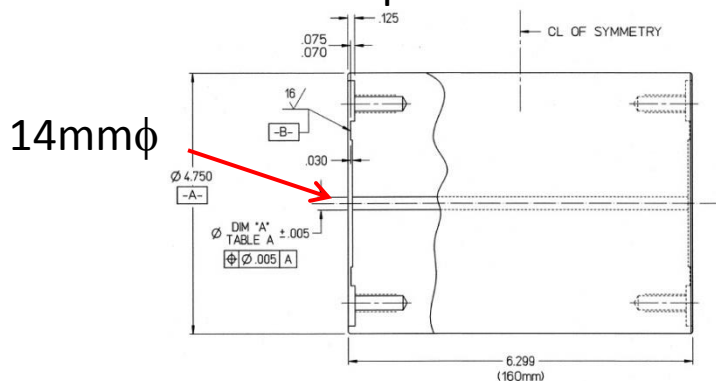
1.05 GeV Run using 4 mm collimator
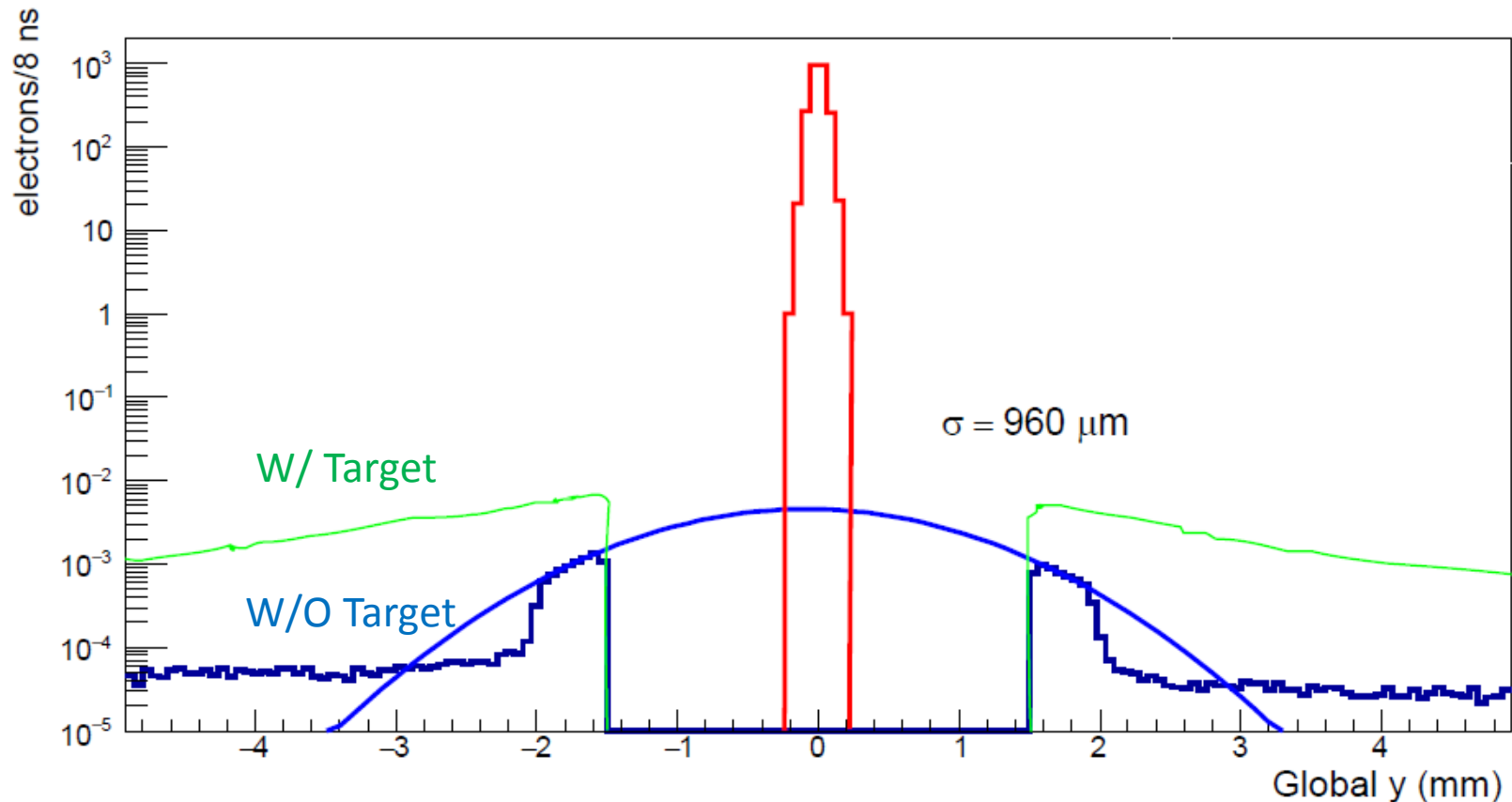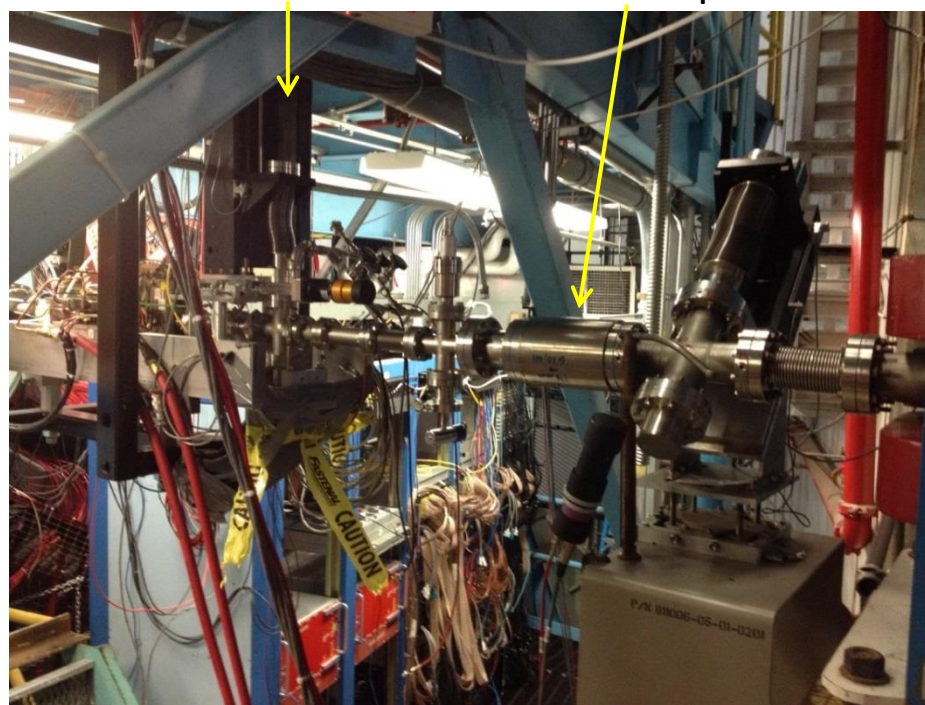
New collimators

SVT Protection collimator

4   2.25   2.82 mm

- 4 mm collimator was used when the beam was delivered for the first time and the SVT was fully retracted.
- 2.25 mm collimator had too much beam scraping.
- 2.82 mm collimator has been used since Feb 27.

Clean-up collimator

14mmφ

Protection Collimator   Clean-up Collimator

New SVT Layer 0 will not be fully protected.
Is it possible to move the collimator upstream?

Summary

- Small beam size was achieved.
  - σy = 14 μm at 2H02 and SVT Wire scanner.
- Beam was stable.
  - ~5 trips/hours when it is stable.
  - Y-position rms at 2H02 was 12 μm.
- FSD threshold seemed reasonable.
  - A few FSD trips/shift when the beam was stable.
- 2.82 mm collimator worked.
  - New SVT Layer 0 will not be fully protected.