Fall Optics Runplan

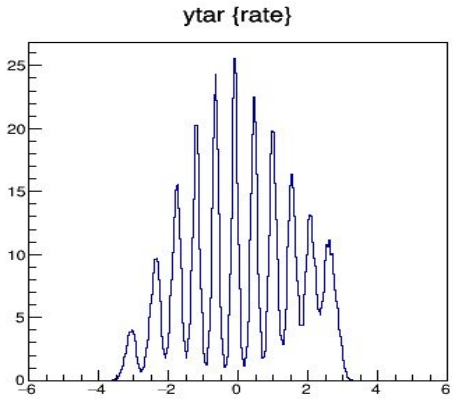
Shujie, 09.2018

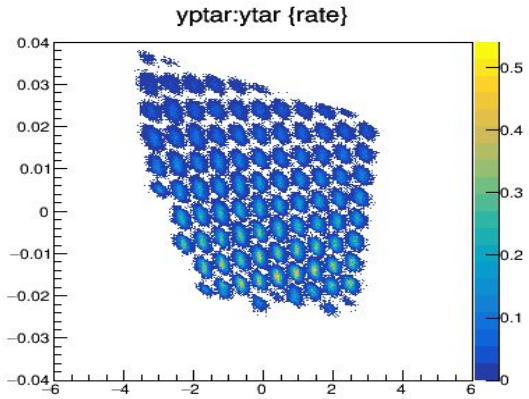
Options: 2nd pass v.s. Higher pass

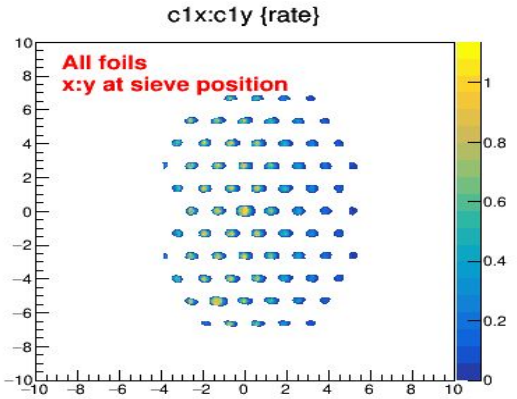
- Pro:
  - High rates (need <1 hour at 15 degree, < 1 minutes at 13 degree)
  - No pass change required
  - Can take Hydrogen elastic at 13 degree (with rastered beam. rate will be crazy)
- Con:
  - Scattering chamber flange block acceptance
  - Need to request survey (only 17 degree surveyed now)
  - Possible beam steering by Q1 magnetic field

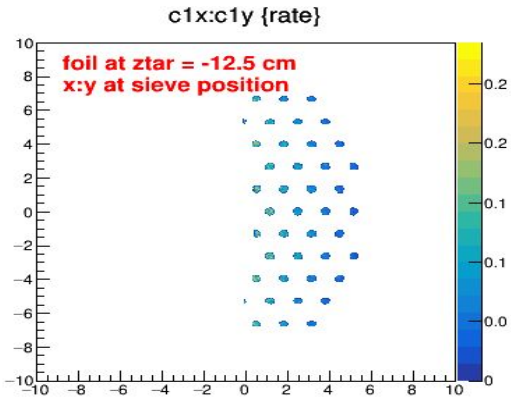
- Pro:
  - LHRS at 17 dgree already and surveyed
  - Nothing will block the acceptance
  - Larger target y coverage
  - Similar setting as in the spring, everything well understood
- Con:
  - Need to go higher pass
  - Slower (3 hours per setting)

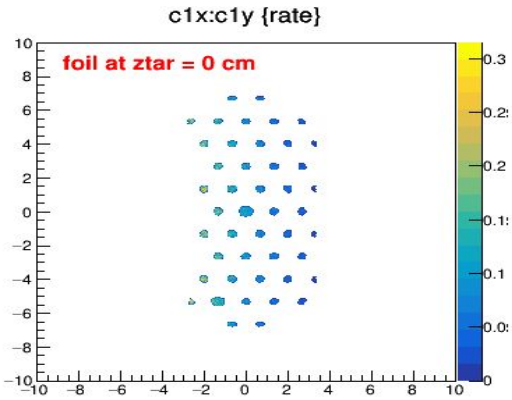
Simulation: 2nd pass beam, LHRS 13 degree

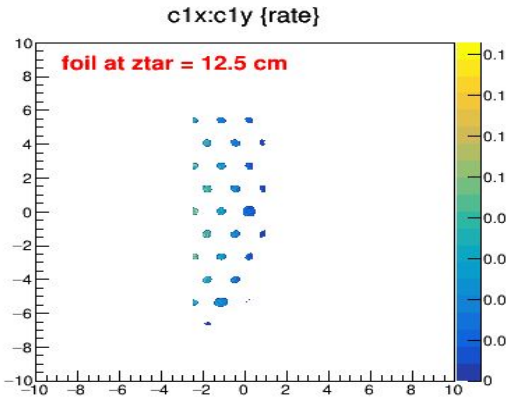




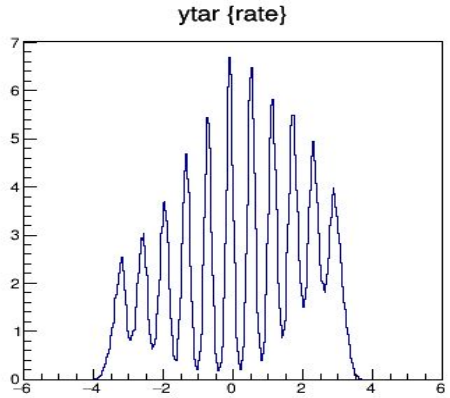


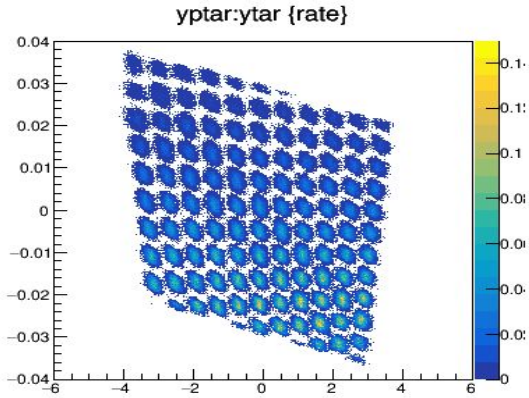


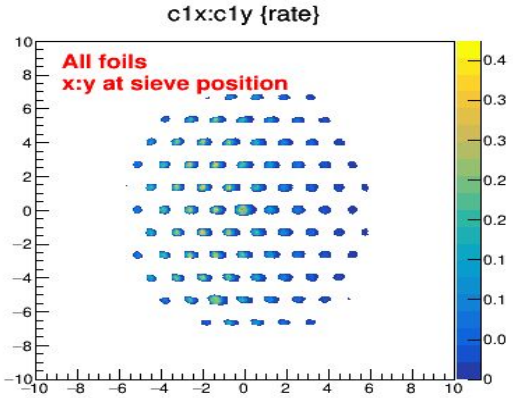


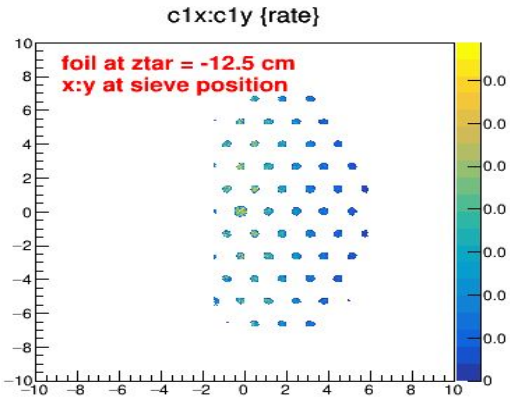


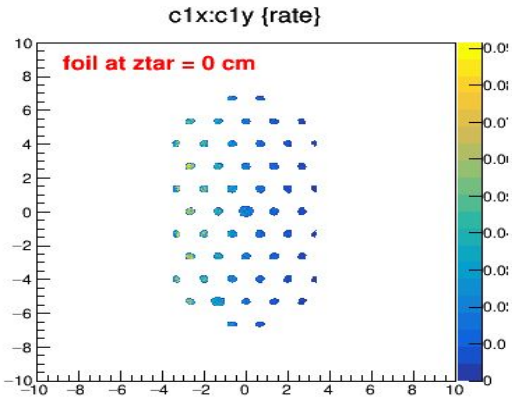
Simulation: 2nd pass beam, LHRS 15 degree

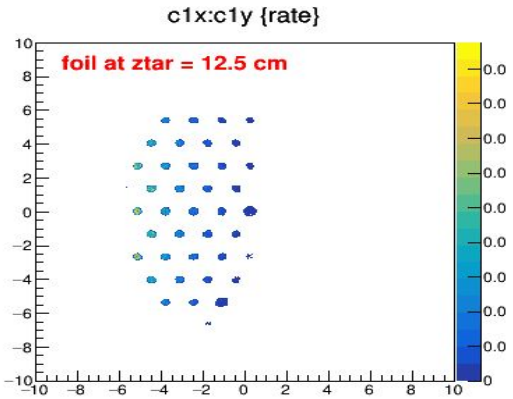








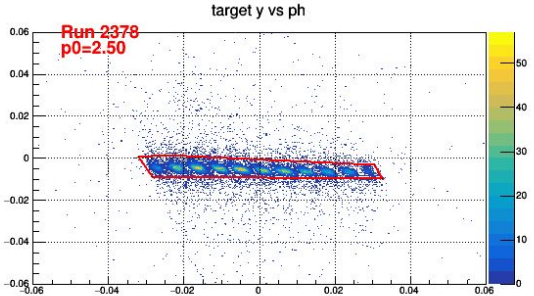


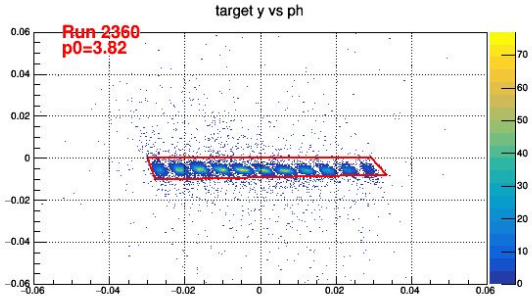


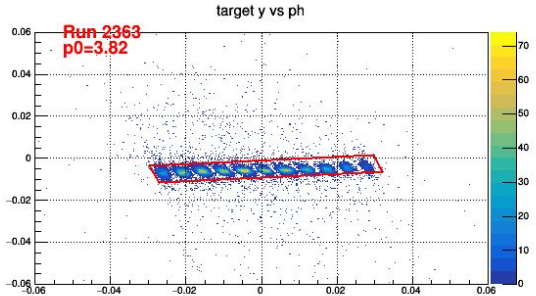
Q1 Saturation Study with Marathon Optics Data

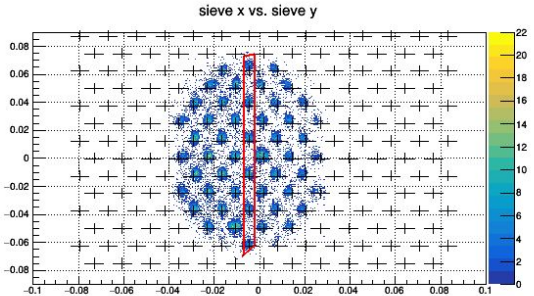
- Why:
  - We need to decide which Q1 curent to use for our production run considering the Q1 saturation effect.
  - While the solid angle and y tar can be re-calibrated with sieve runs, we may not get Hydrogen elastic data at the exact production momentum to calibrate delta (unless we wish to go 13 degree)
- How:
  - In the spring we took single TI foil sieve data with various Q1 current setting
  - The existing GMp optics should work with the p0=2.5 GeV/c sieve data perfectly
  - A weaker Q1 will have aweaker focus on vertical direction ⇒ larger span of vertical sieve pattern
- Goal:
  - Find the best Q1 setting so that the existing optics can reproduce the same sieve pattern at a saturated momentum setting

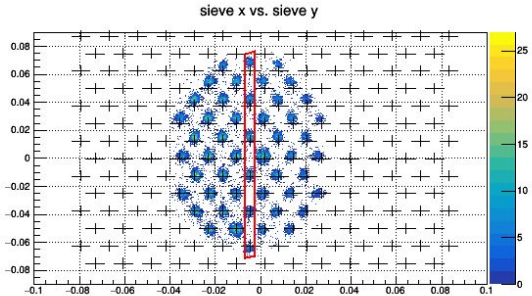
Q1 Saturation Study with Marathon Optics Data

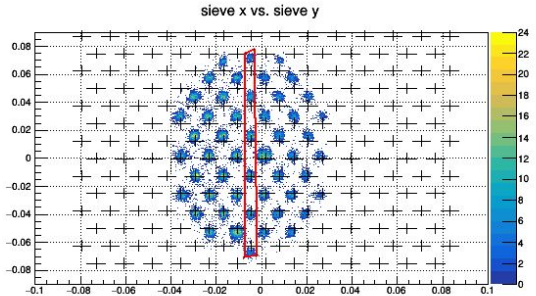


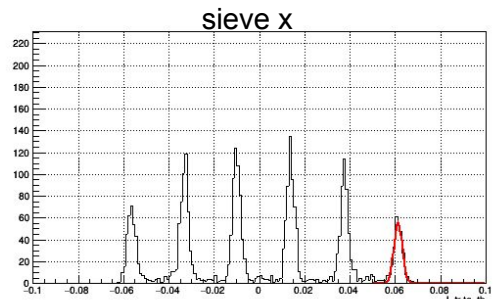


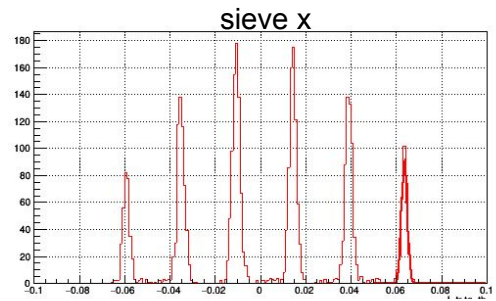


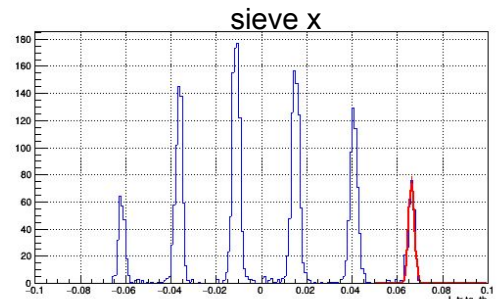




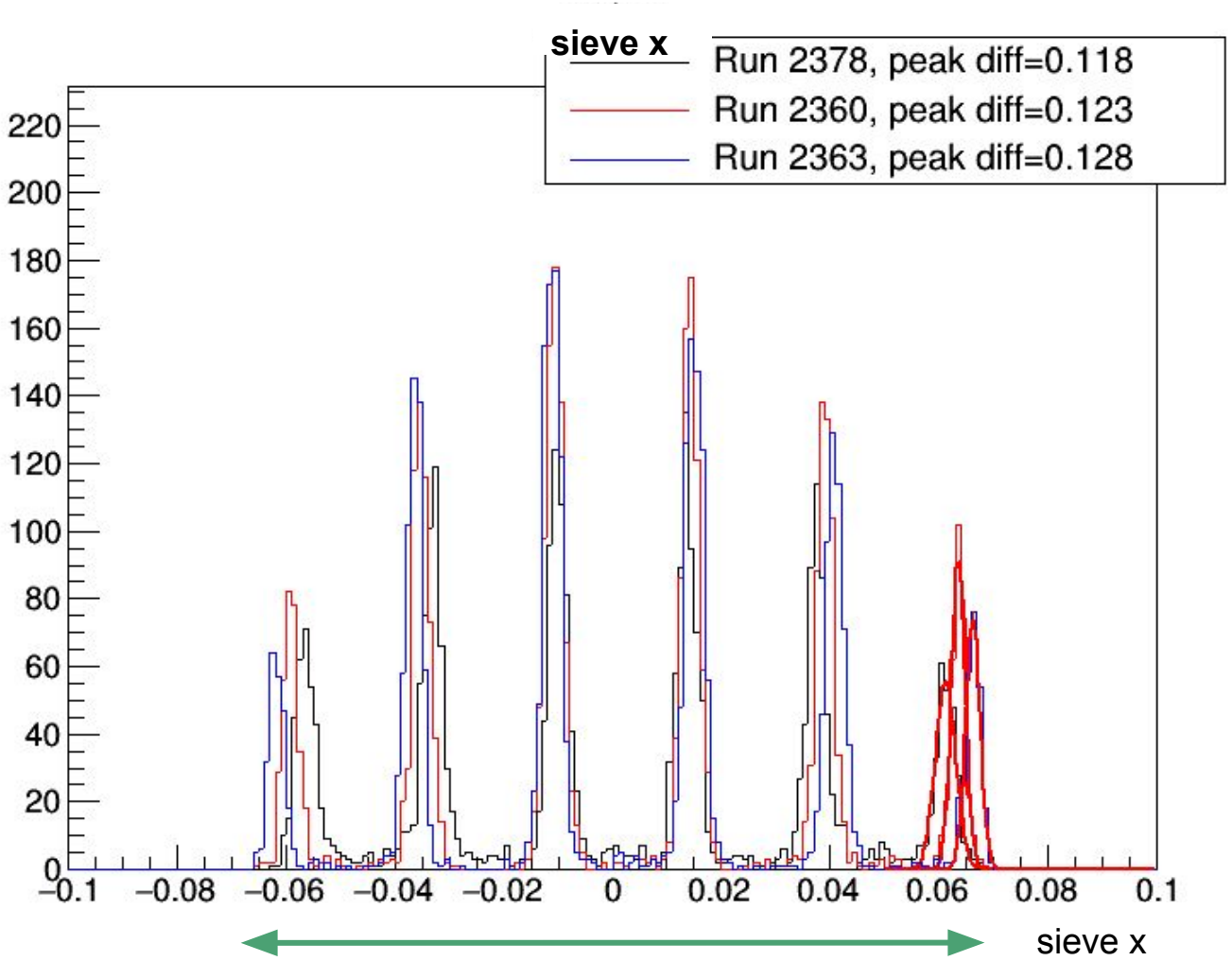








Q1 Saturation Study with Marathon Optics Data



Take the difference b/w the first and last peaks

p0	Q1 current	regulator	run number	peak diff	Peak diff/0.118
2.5	521.468	on	2378	0.118	1
3.82	819.7	off	2363	0.128	1.085
3.82	830.6	off	2362	0.126	1.068
3.82	838.87	on	2361	0.125	1.059
3.82	847.4	off	2360	0.123	1.042
3.93	843.3	off	2381	0.12729	1.078

quadratic fitting:

Y = -8.63429×10^-6 x^2 + 0.0129067 x - 3.69389

⇒ Q1 = 869.8 A at 3.82 GeV/c

882.8 A at 3.93 GeV/c (assume the fit has the same shape but a different constant term)

linear fitting:

Y = 2.30225 - 0.00148502 x

⇒ Q1 = 876.9 A at 3.82 GeV/c

896.3 A at 3.93 GeV/c (same shape fit)

fit		
	data	{{819.7, 1.084745763}, {830.6, 1.06779661}, {838.8, 1.059322034}, {847.4, 1.042372881}}
	model	polynomial of degree 2 or less

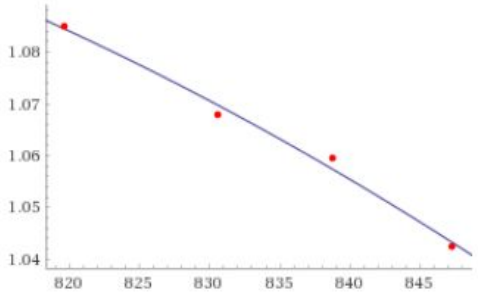
Least-squares best fit:

$$-8.63429\times10^{-6}\,x^2 + 0.0129067\,x - 3.69389$$

Fit diagnostics:

AIC	BIC	R^2	adjusted R^2
−30.4564	−32.9112	0.991134	0.973402

Plot of the least-squares fit:



Plot of the residuals: