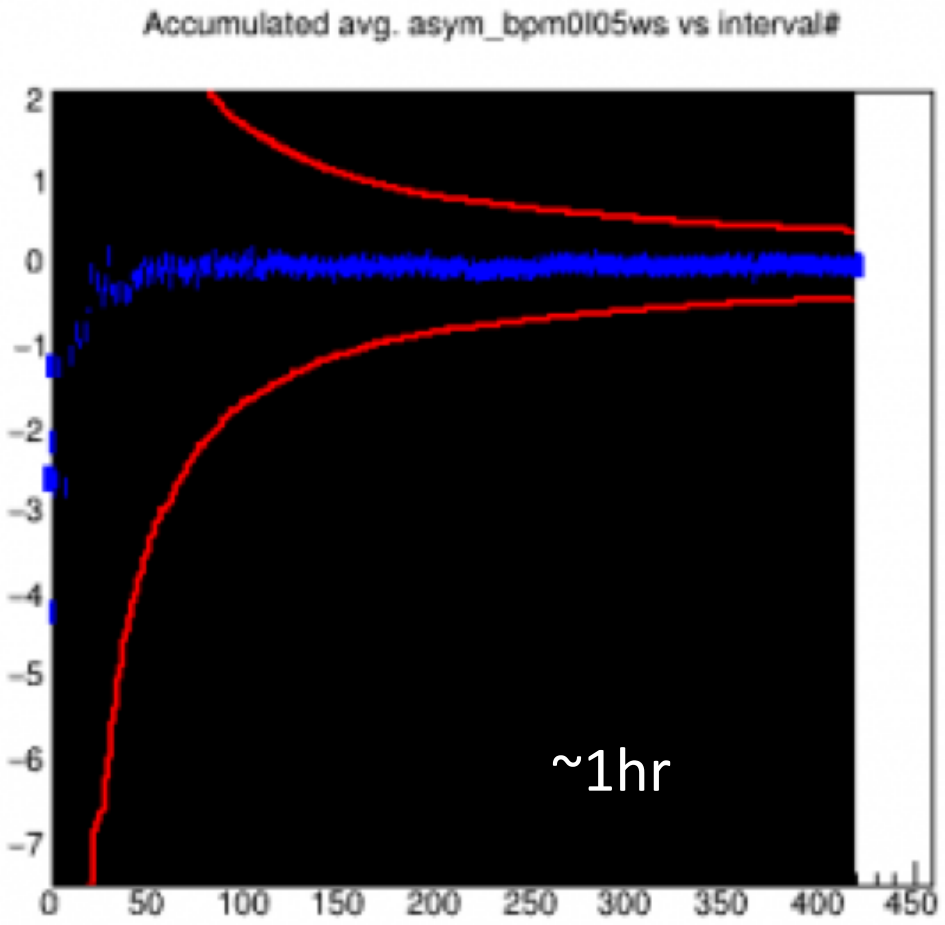
PQB Studies

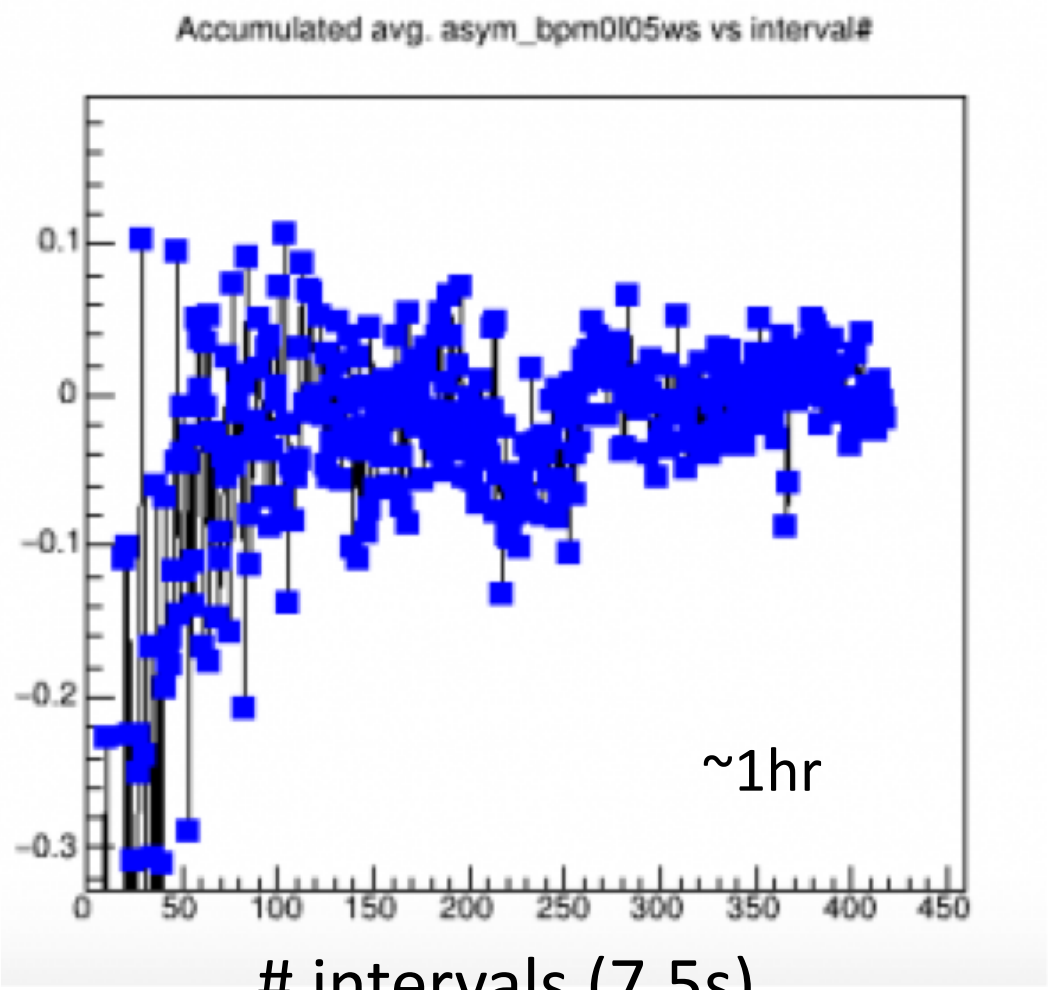
08/07/2018

RTP Aq feedback – near S2 (20% S1)

Aq (ppm) accumulated



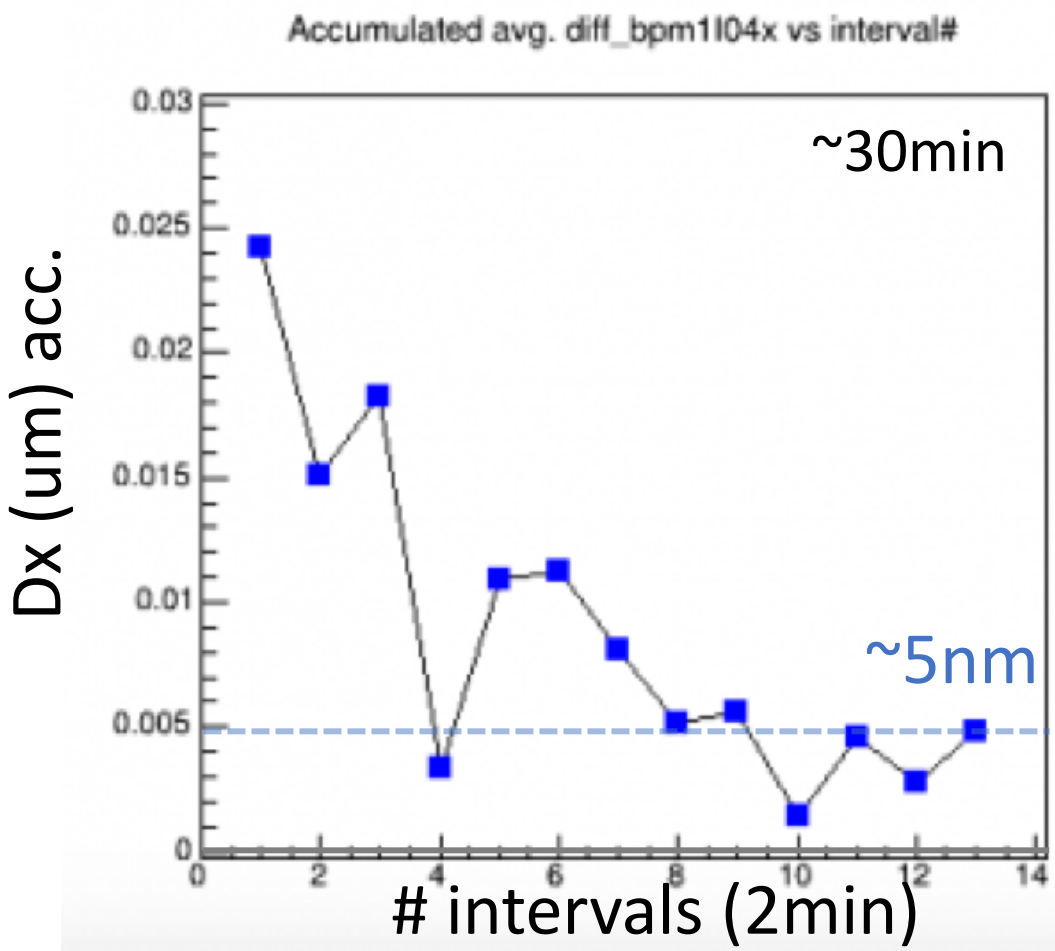
intervals (7.5s)

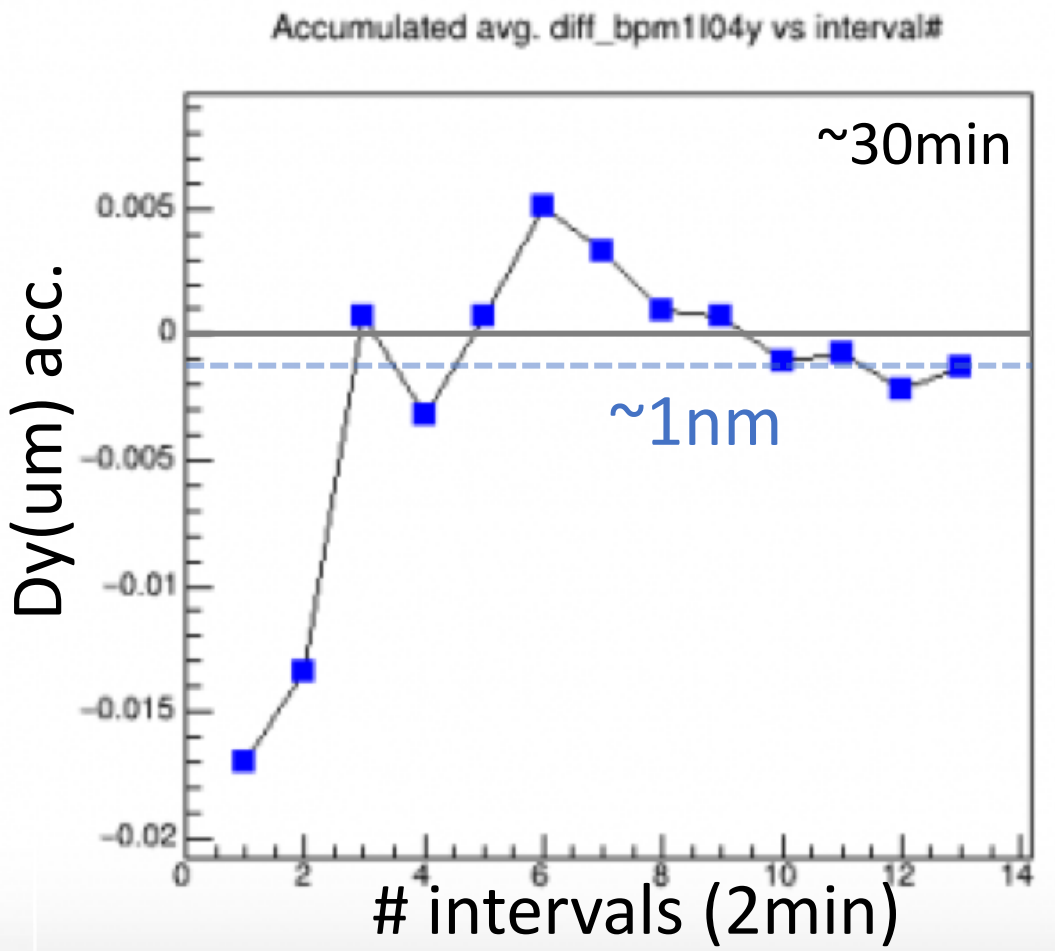


intervals (7.5s)

Run3972_Aqfeedback0I05_Aqinterval7p5s_Aqconverging.png

BPM1I04 Pos. Diff. feedback – near S2



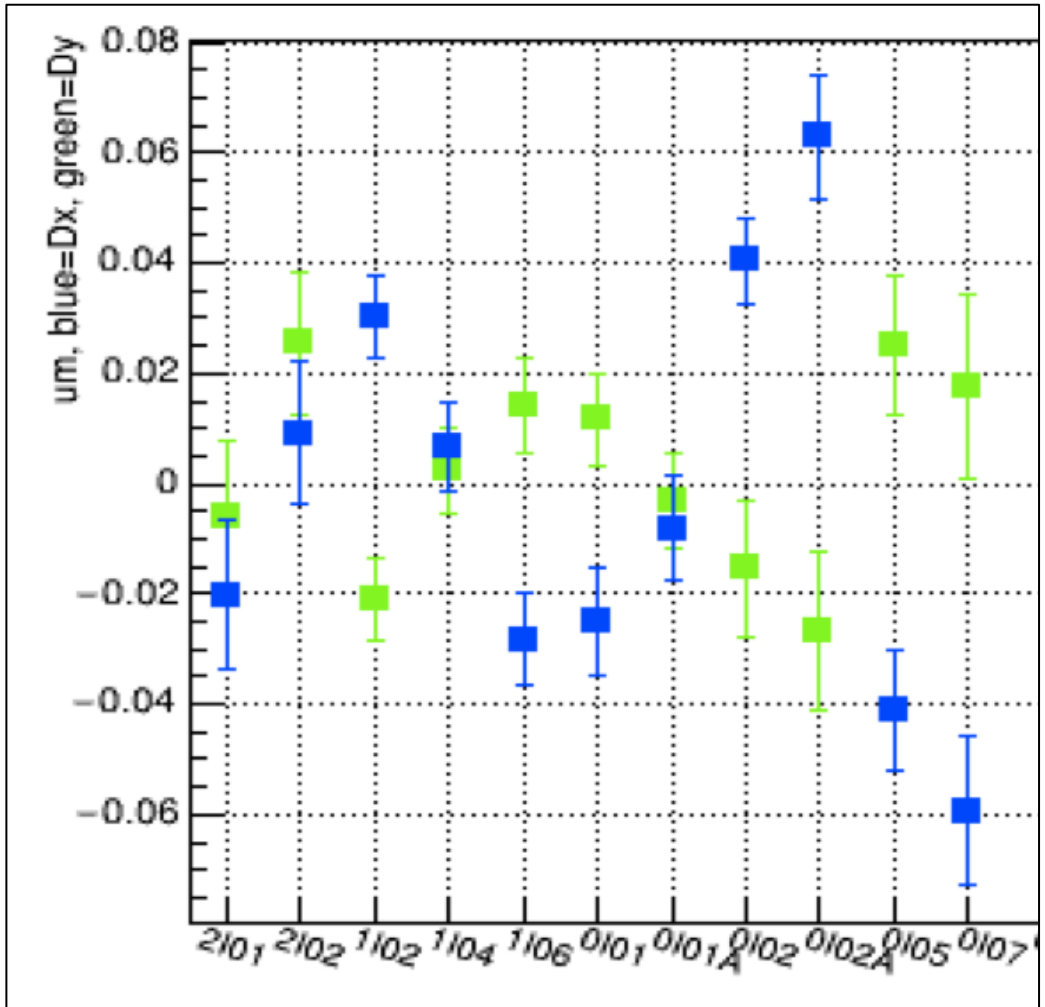


Run4017_RHWP1000_IHWPout_1I04feedback_Dxconverge.png
Run4017_RHWP1000_IHWPout_1I04feedback_Dyconverge.png

BPMs in FC1 region

- 2 new bpms 2I01, 2I02 just after the cathode
- Was able to minimize the overall <FC1 region to <70nm

Dx<70nm
Dy <40nm



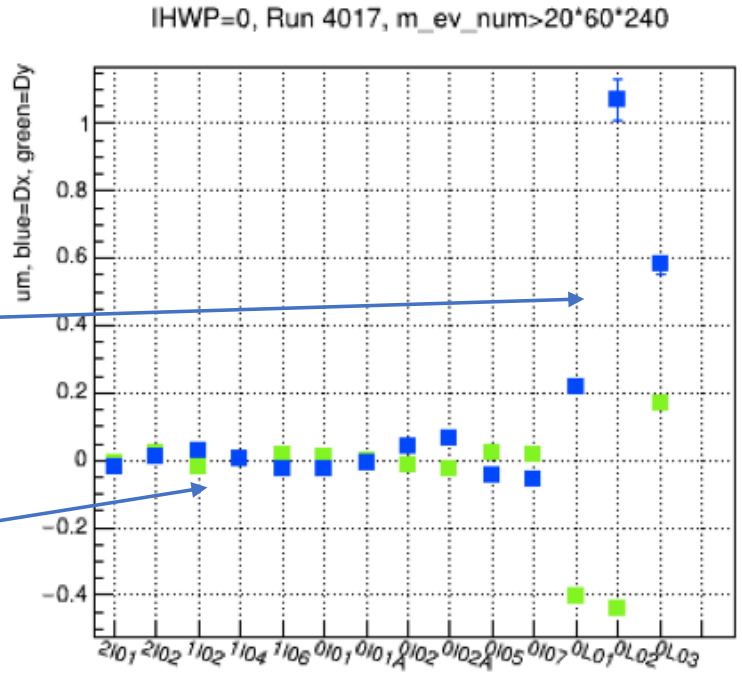
240Hz,Octet

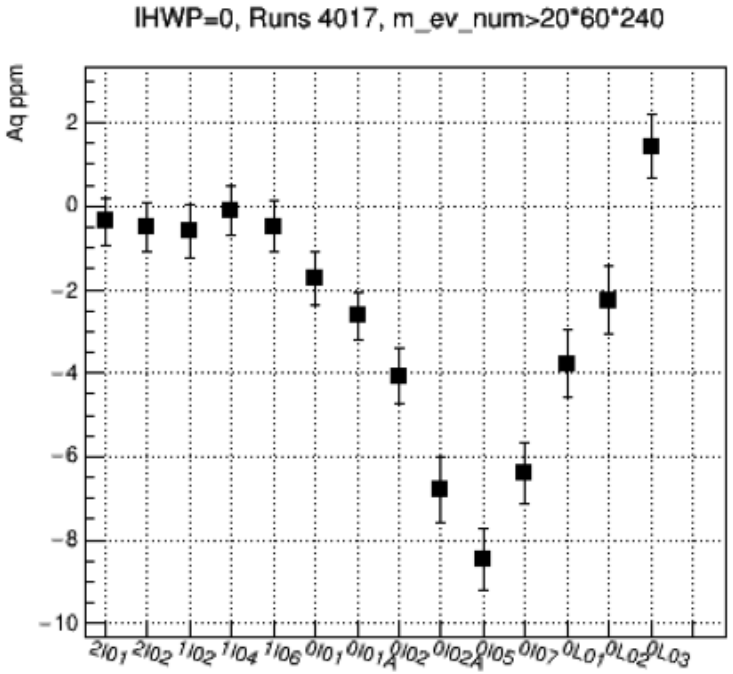
Big

Dx ~ 0.6um

Dy ~0.4um

Tiny<60nm



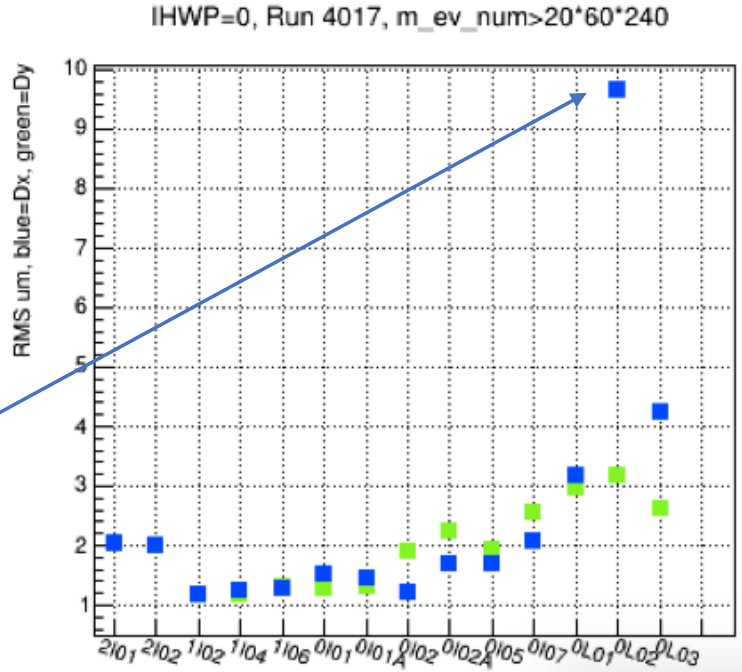


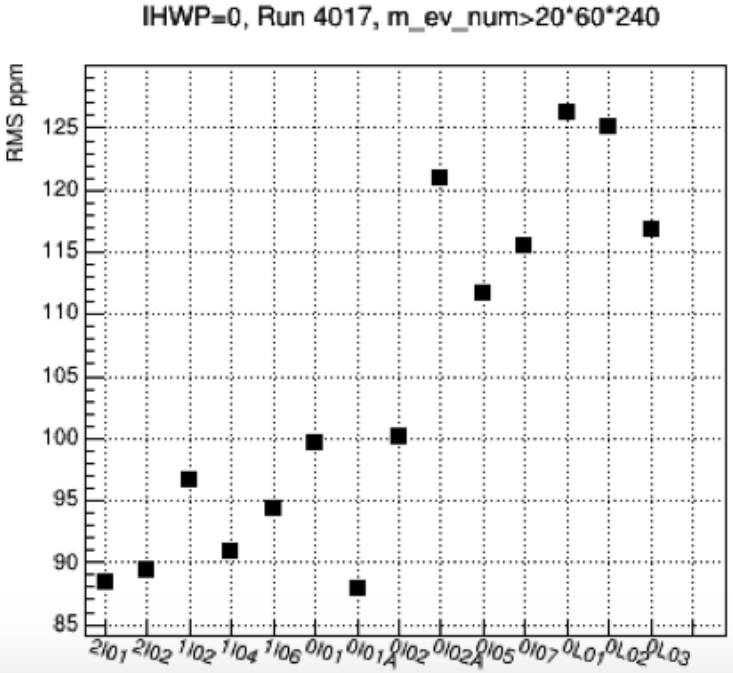
Aq 0-8ppm

Run4017_IHWPout_RHWP1000_FC2_REDO

RMS 1-3um

bpm0L02 may have an issue





RMS 90-125ppm

Qweak

Asymmetry vs. bunch position

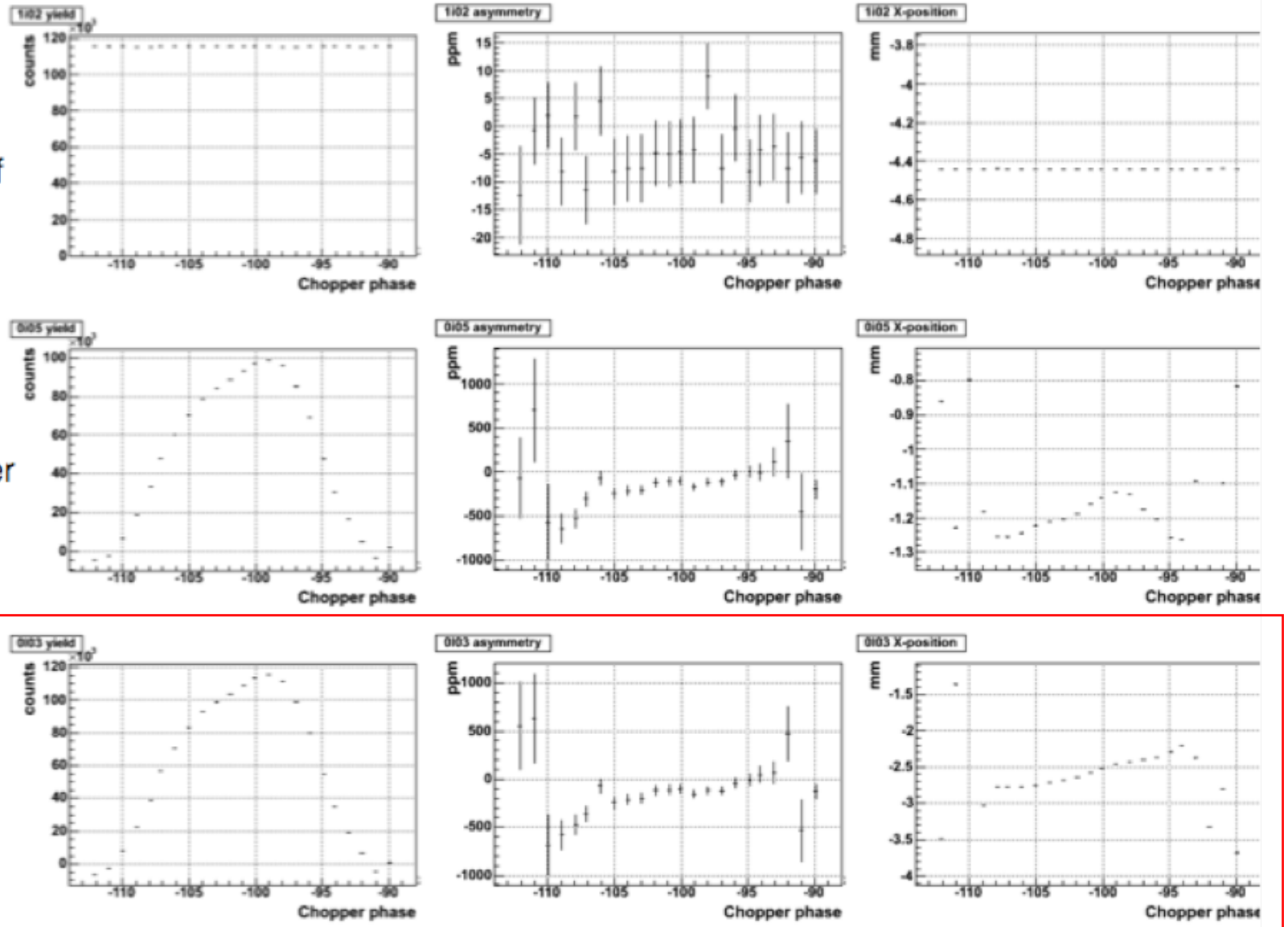
Narrow slit, scanning chopper phase to measure portions of each bunch

ELOG:Beam:259 [Manolis]

Upstream of chopper

After chopper

0L05 (5MeV)



http://qweak.jlab.org/elog/Beam/259

500MHz

Δt=55ps pulse

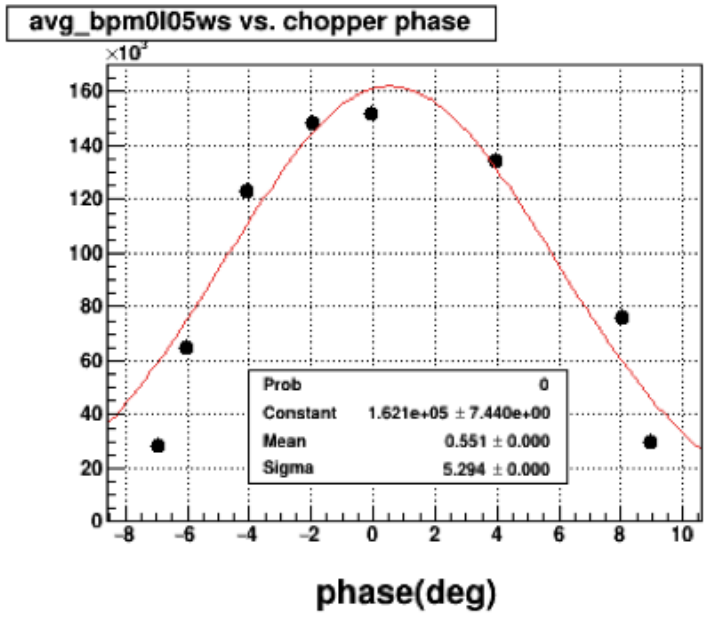
ΔAq=400ppm

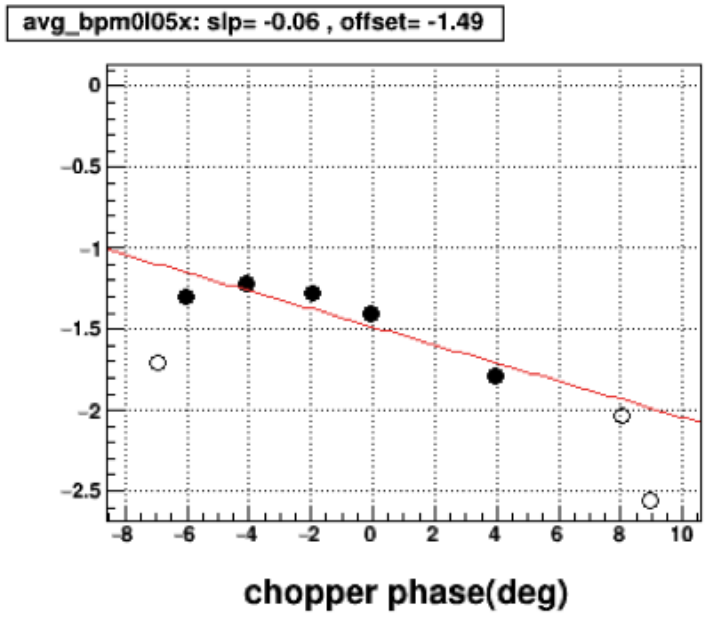
ΔX=0.5mm

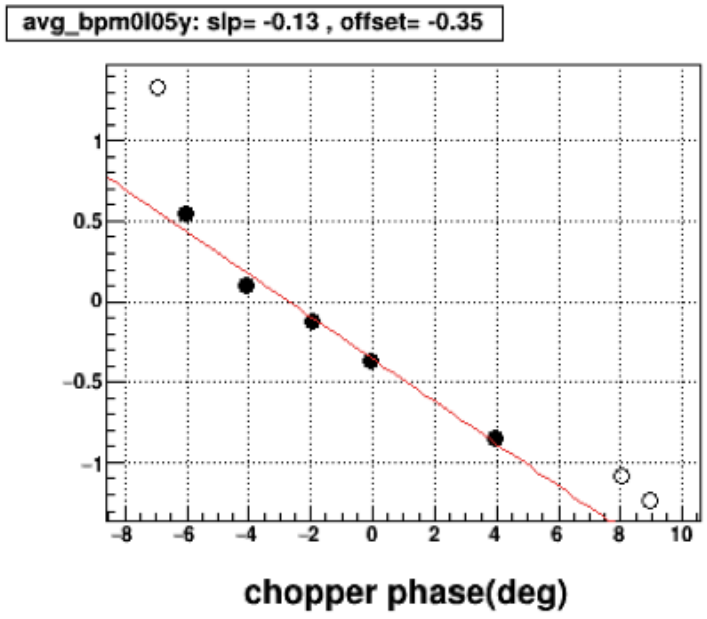
KD*P now

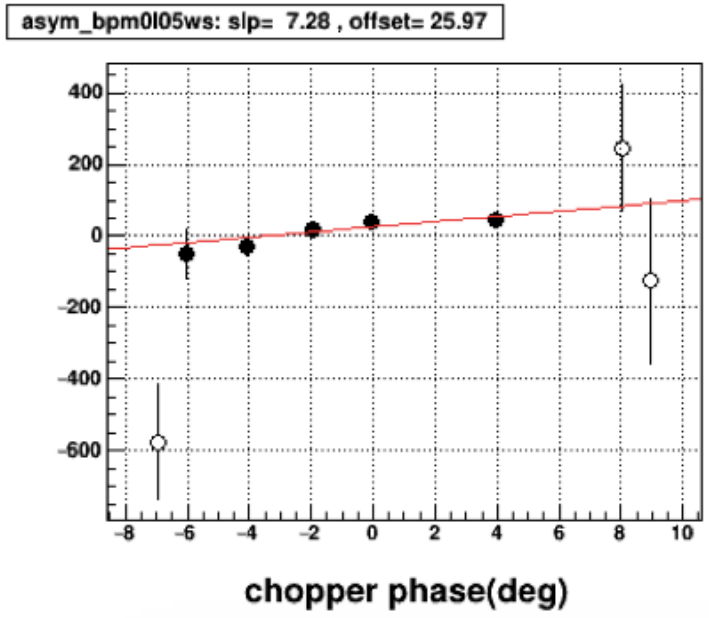
500MHz **ΔAq=300ppm**

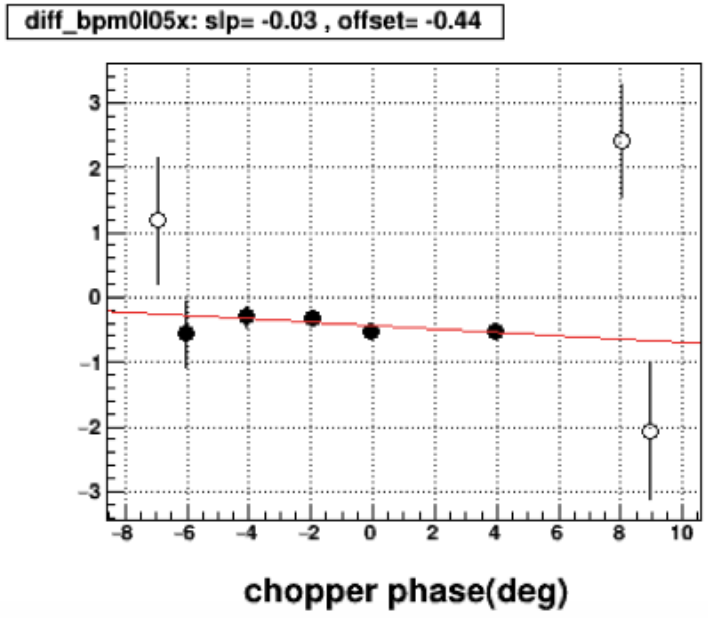
Δt=57ps pulse ΔX,Y=0.5-1mm

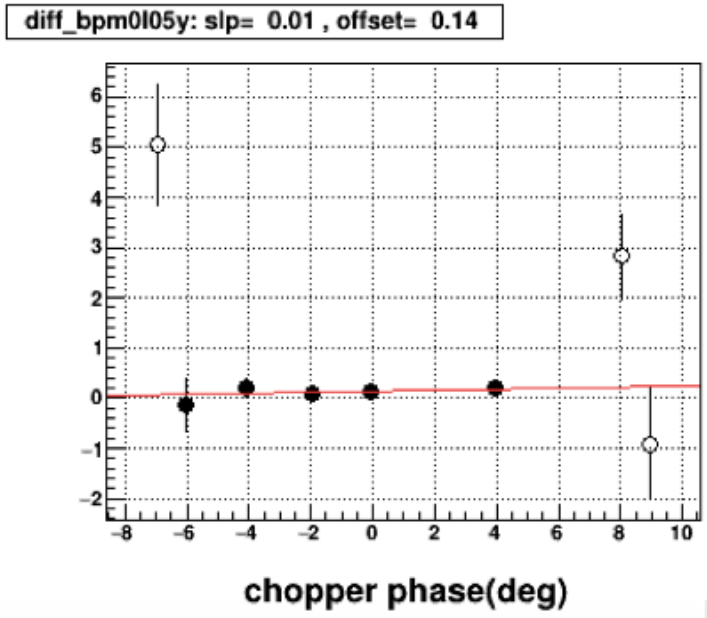












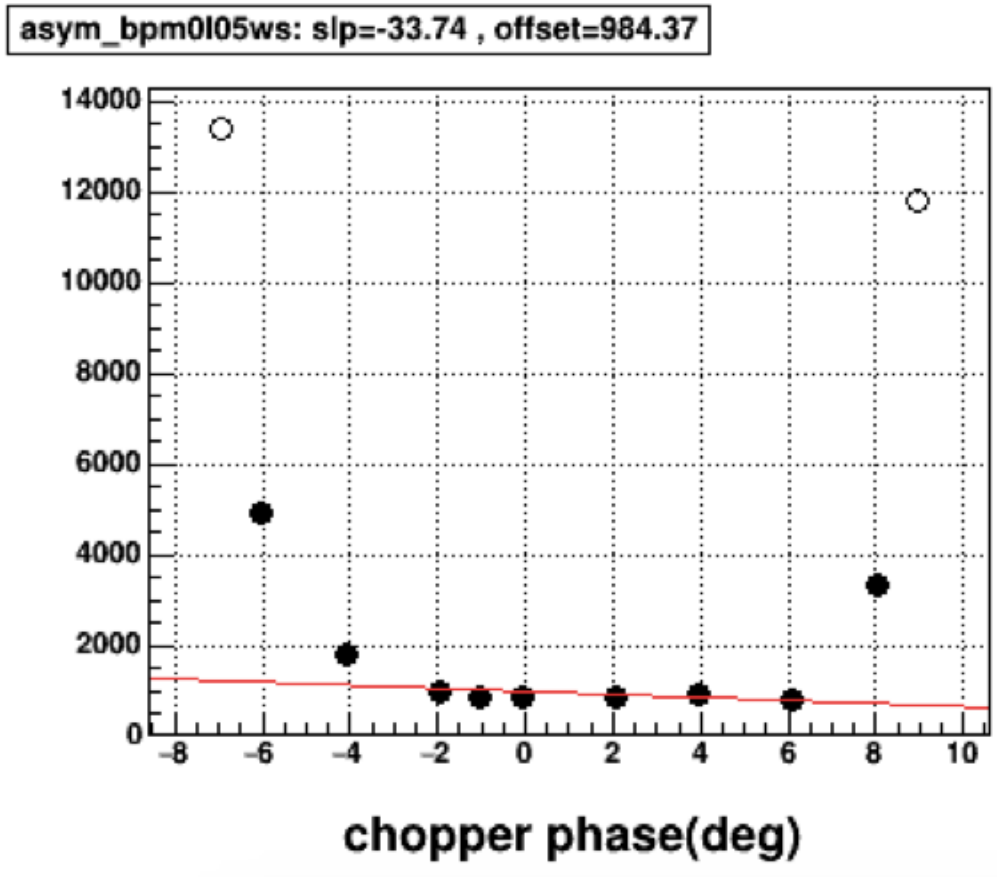
Did a variety of conditions

- PCon (IA off), IA on (PC off), Pcon (IA zeroed)
- RHWP – S1, S2
- IHWP in/out
- 80uA, 40uA
- Prebuncher gset=0.1,1.1,1.5

- Found large effect – central Aq early on gives rise to large Aq in temporal tails of bunch as seen by chopper scan (i.e. longitudinal spot size asymmetry)
- Found consistently that only the existence of an Aq need be there to cause highly asymmetric tails , regardless off where Aq came from (PC,IA)
- Evidence indicates space charge effect: 1500ppm Aq → >4x10^-5 longitudinal spot size asymmetry, as lower limit.

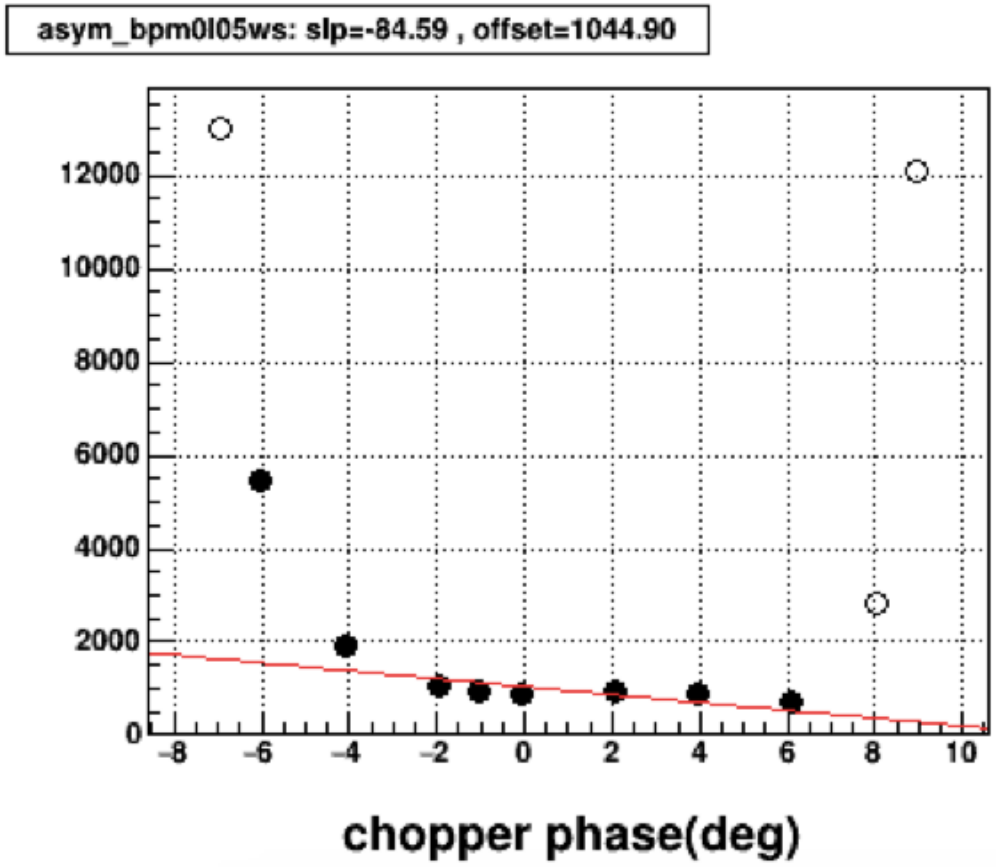
Example: compare S2, IA

S2



Run4202_PITAAq1519

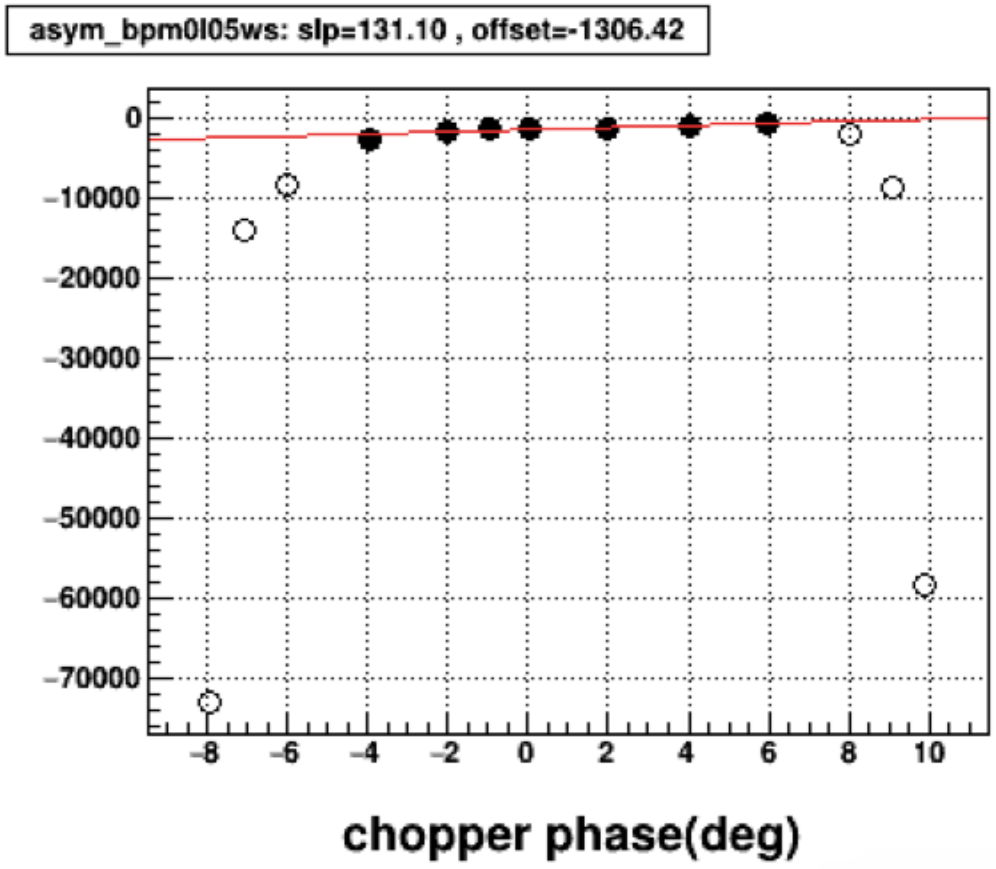
IA



Run4198_IA503_Aq1513

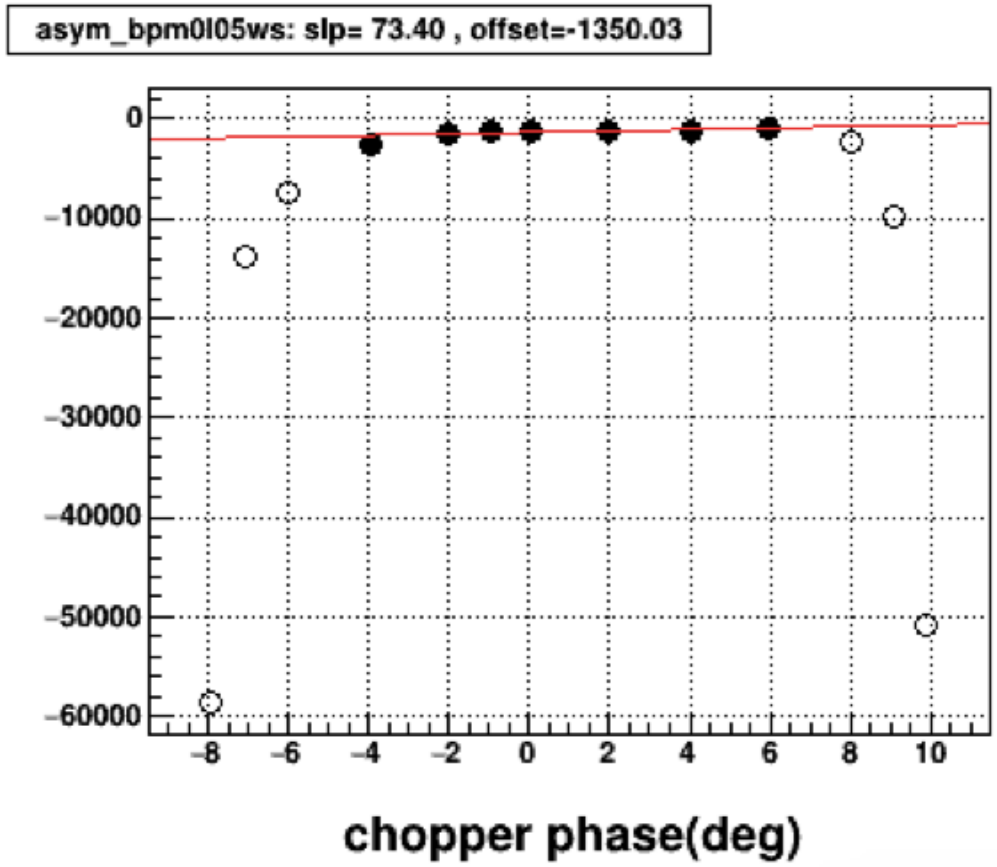
Example: compare S1,S2

S1

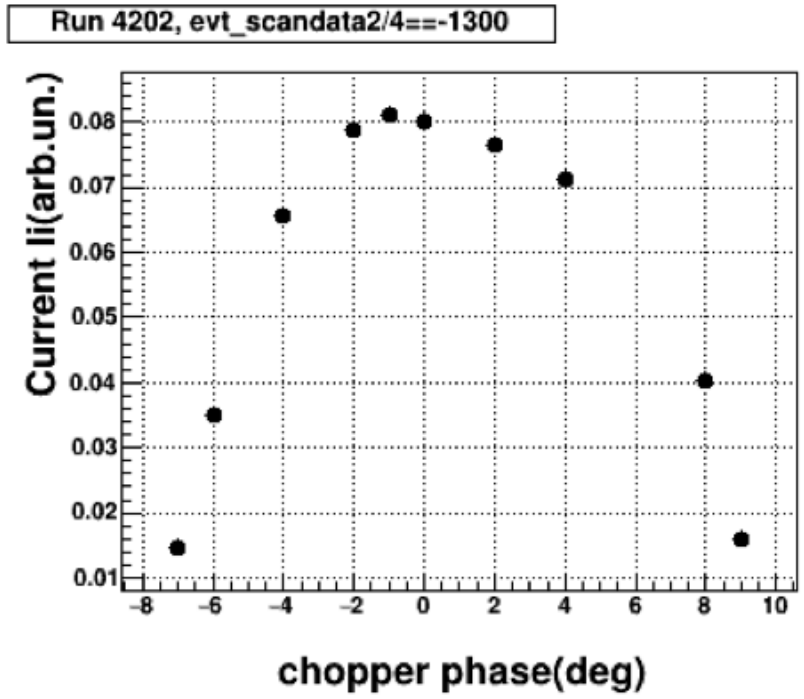


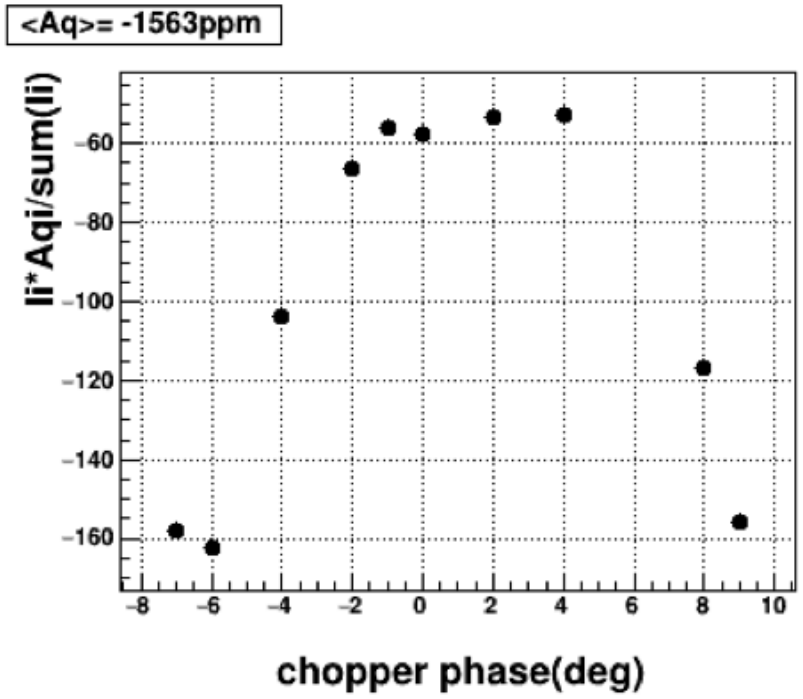
Run4187_chopperPITAscan_IHWPin_RHWP1500_S1_0I05_PITAm1000cnts

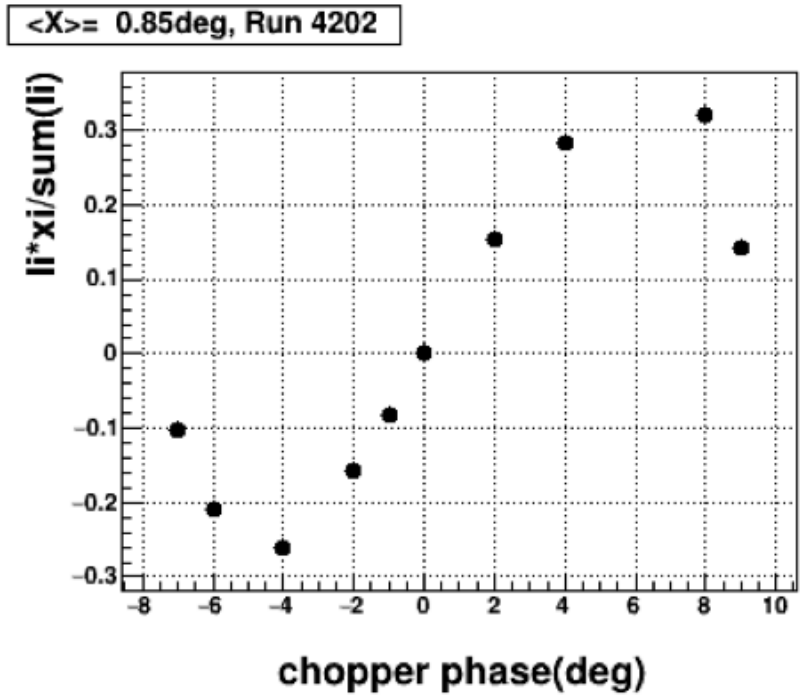
S2

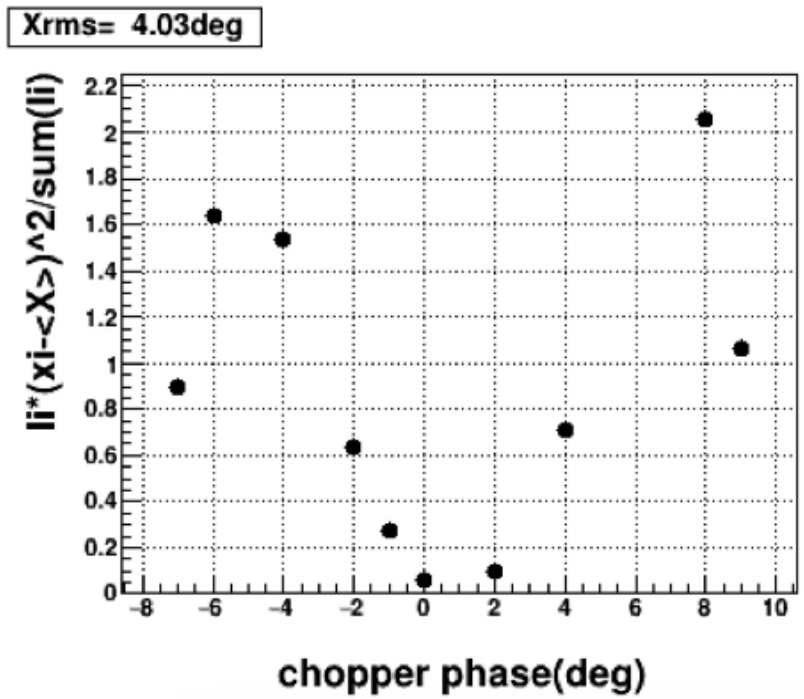


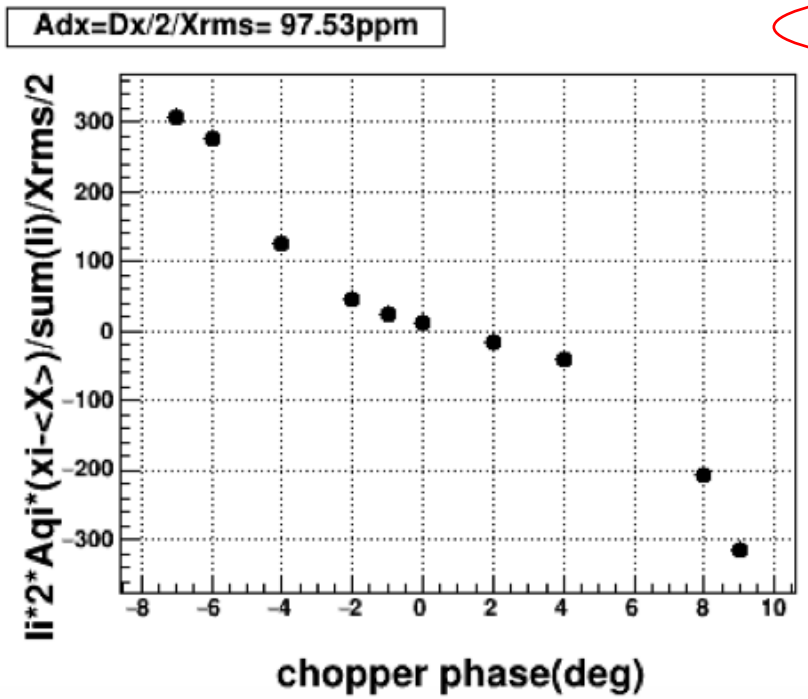
Run4190_chopperPITAscan_IHWPout_RHWP1000_S2_0I05_PITA5000cnts

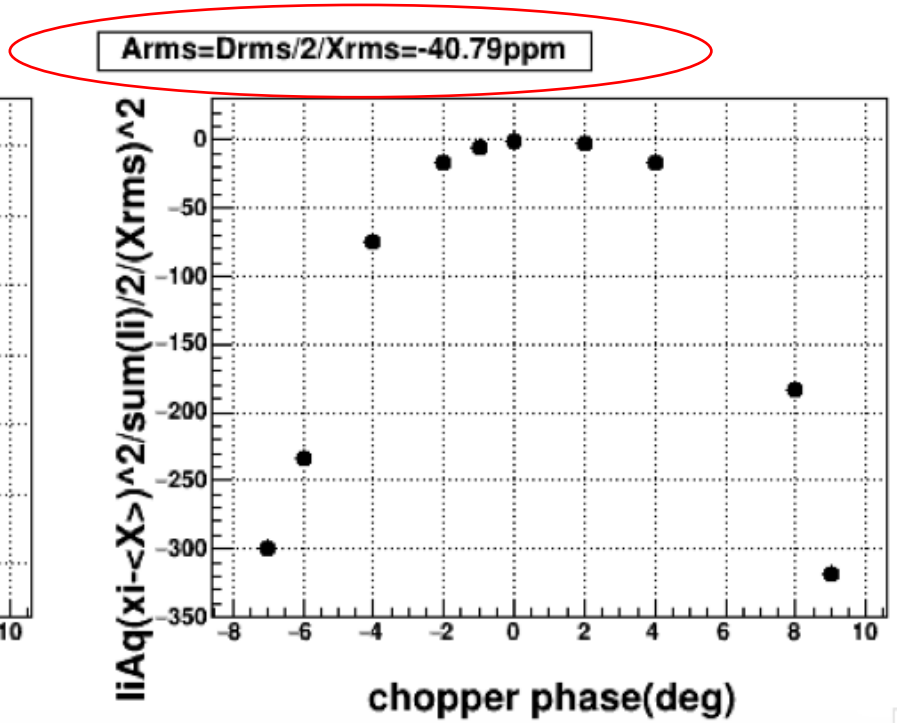

Run 4202, evt_scandata2/4==-1300
Current Ii(arb.un.)
chopper phase(deg)


<Aq>= -1563ppm
Ii*Aqi/sum(Ii)
chopper phase(deg)


<X>= 0.85deg, Run 4202
Ii*xi/sum(Ii)
chopper phase(deg)


Xrms= 4.03deg
Ii*(xi-<X>)^2/sum(Ii)
chopper phase(deg)

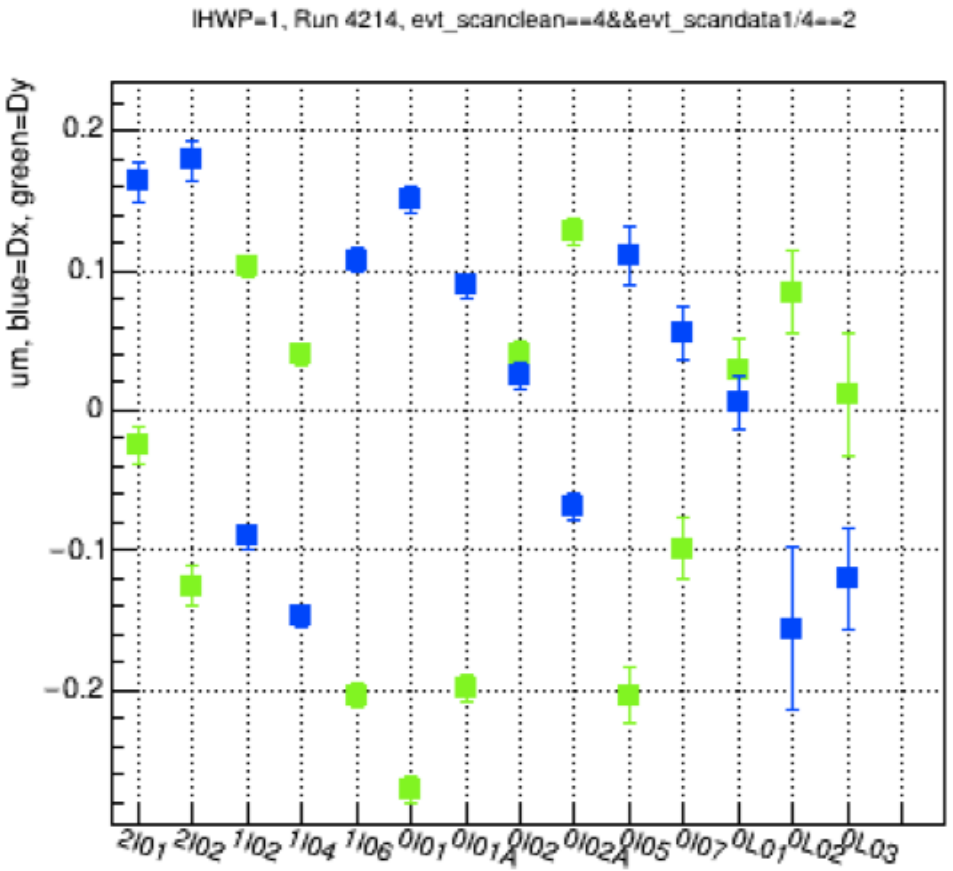

Adx=Dx/2/Xrms= 97.53ppm
Ii*2*Aqi*(xi-<X>)/sum(Ii)/Xrms/2
chopper phase(deg)


Arms=Drms/2/Xrms=-40.79ppm
IiAq(xi-<X>)^2/sum(Ii)/2/(Xrms)^2
chopper phase(deg)

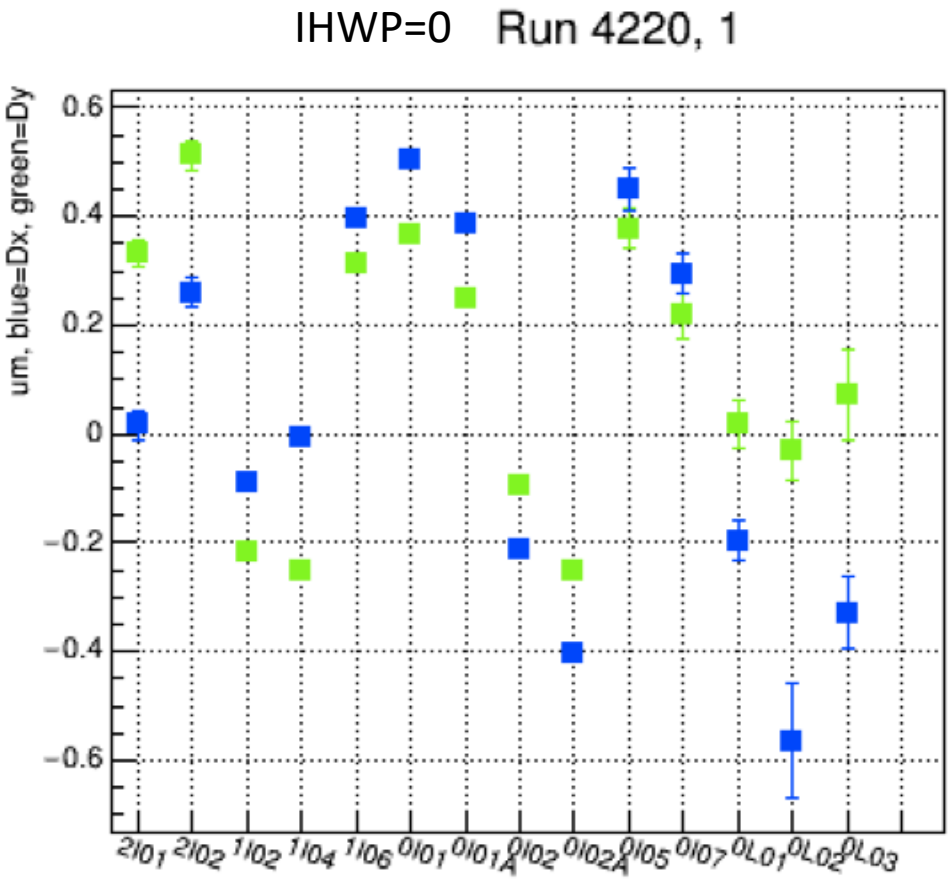
								Dphi/2 /RMS ppm	Drms /2 /RMS ppm	dR/dphi* Dphi nm	Xrms =0.5mm ppm	
Run		Aq 1I04	<Aq>	relative slope	<phi>	RMS	sigma fit	Adphi	**Arms**	Dr transverse	Arms transverse	dR/dphi
4198	IA cell	1513	1776	1.02	0.77	4.0	5.2	-264.1	**42.8**	262.1	42.5	-0.13
4202	PC S2 80uA prebuncher=1.1	1519	1802	0.91	0.85	4.0	5.8	-51.2	**43.4**	53.7	45.5	-0.13
4198	IA cell	-1302	-1477	1.02	0.80	4.0	5.0	239.3	**-38.9**	-231.3	-37.6	-0.12
4202	PC S2 80uA prebuncher=1.1	-1348	-1536	0.91	0.85	4.0	5.3	97.5	**-40.8**	-106.9	-44.7	-0.14
4206	PC S2 80uA prebuncher=0.1	-1328	-1796	1.41	2.04	7.1	10.4	-102.4	**-44.6**	130.4	-56.8	-0.09
4207	PC S2 80uA prebuncher=1.5	-1325	-1465	1.14	0.67	2.9	3.4	436.0	**-38.7**	-418.0	-37.1	-0.17
4212	PC S2 40uA prebuncher=1.1	-1337	-1619	1.25	1.19	2.7	3.9	23.8	**-40.5**	-9.6	-16.4	-0.08
4211	PC S2 40uA prebuncher=0.1	-1337	-1566	1.18	2.42	5.1	8.3	271.3	**-36.7**	-162.0	-21.9	-0.06
4209	PC S2 40uA IHWPin 1.1	1246	1524	1.26	1.24	2.6	3.9	-122.9	**39.5**	47.1	15.1	-0.07
4198	IA cell	-5	17	1.02	0.82	3.9	4.9	-16.3	**2.6**	15.6	2.4	-0.12
4202	PC S2 80uA prebuncher=1.1	-4	77	0.91	0.62	7.6	5.3	270.7	**7.9**	-586.9	17.0	-0.14
4206	PC S2 80uA prebuncher=0.1	10	54	1.41	2.03	7.2	9.6	-17.0	**6.0**	21.9	7.8	-0.09
4207	PC S2 80uA prebuncher=1.5	10	46	1.14	0.66	2.9	3.5	31.4	**3.1**	-30.4	3.0	-0.17
4212	PC S2 40uA prebuncher=1.1	20	77	1.25	1.23	2.7	3.9	45.6	**8.6**	-17.8	3.3	-0.07
4211	PC S2 40uA prebuncher=0.1	22	41	1.18	2.38	5.2	8.2	1.6	**6.0**	-1.2	4.5	-0.07
4209	PC S2 40uA IHWPin 1.1	-77	-148	1.26	1.25	2.6	4.0	-102.4	**-11.6**	44.6	-5.0	-0.08

KD*P pretty good – cathode rotation?

IHWPin <300nm



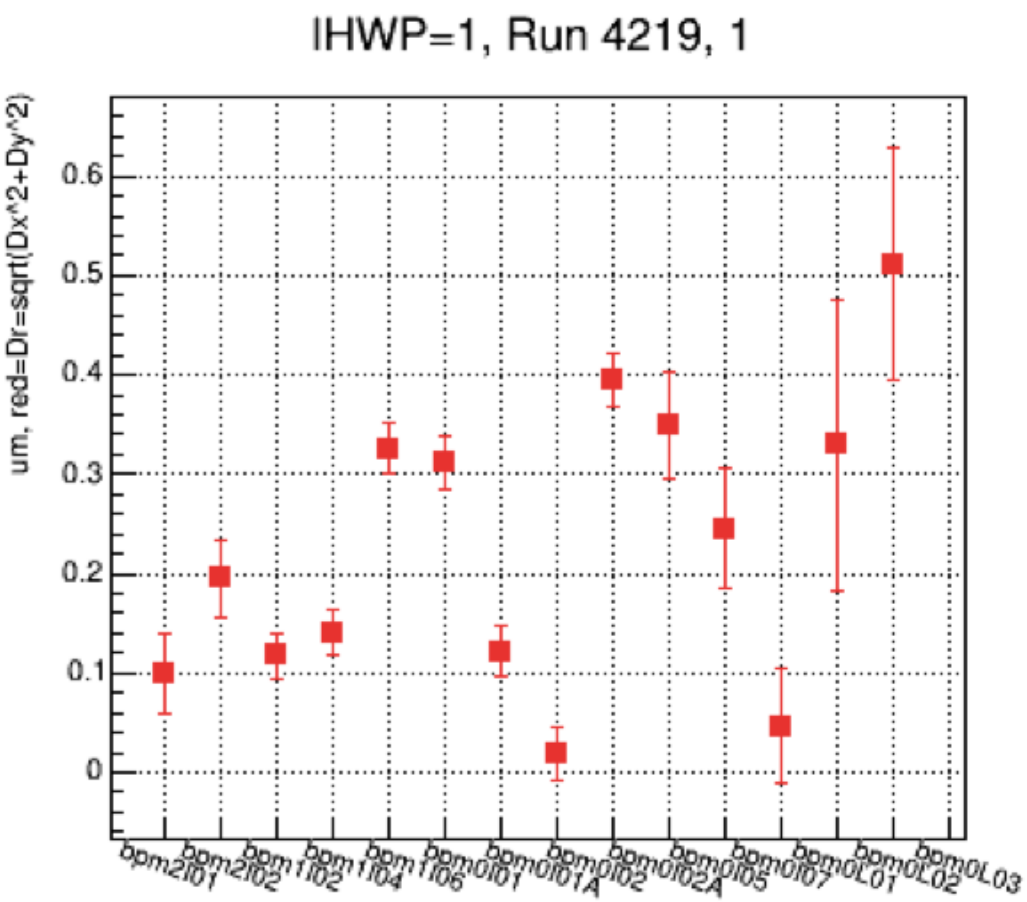
IHWPout <600nm



RHWP scans indicate a position difference offset term that flips sign of ~300nm
->cathode rotation before PREX?

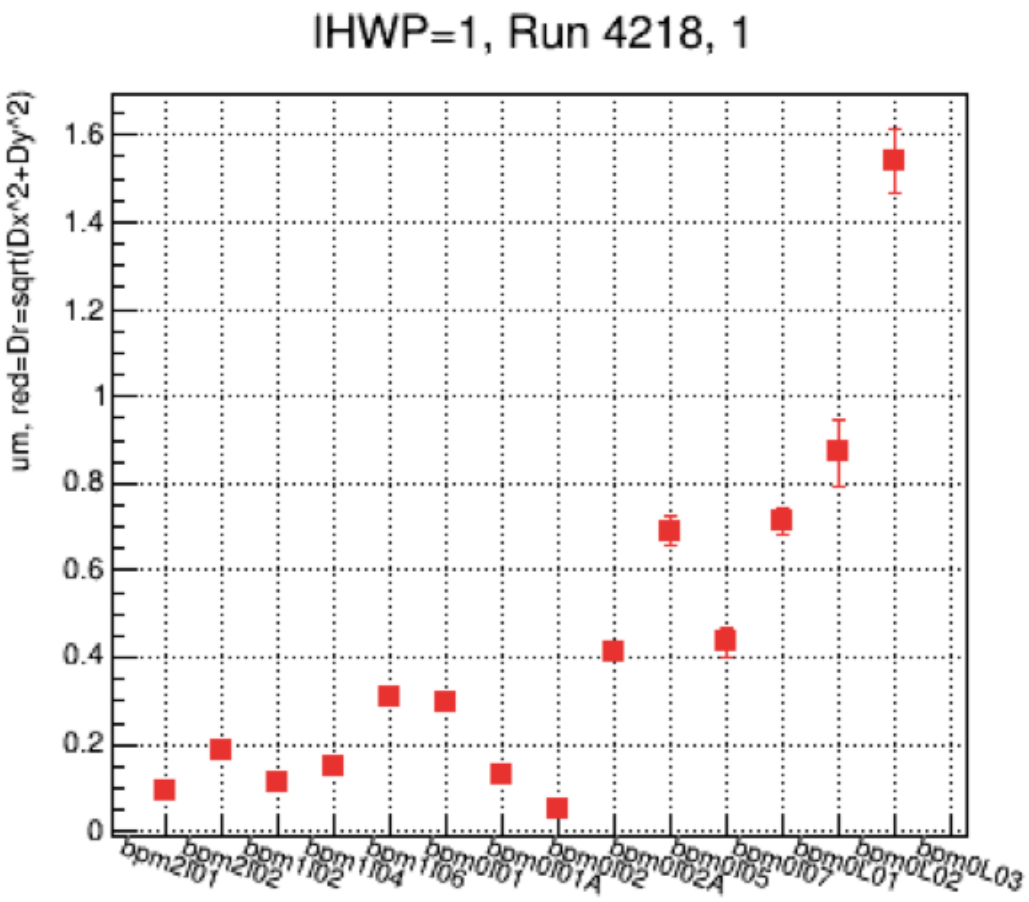
Got Pos Diffs worse for 1run

Prebuncher=1.1 PITAV->1000ppm



Run4219_IHWPin_RHWP750_prebuncher1p1_PITA1000_injbpms_Dr

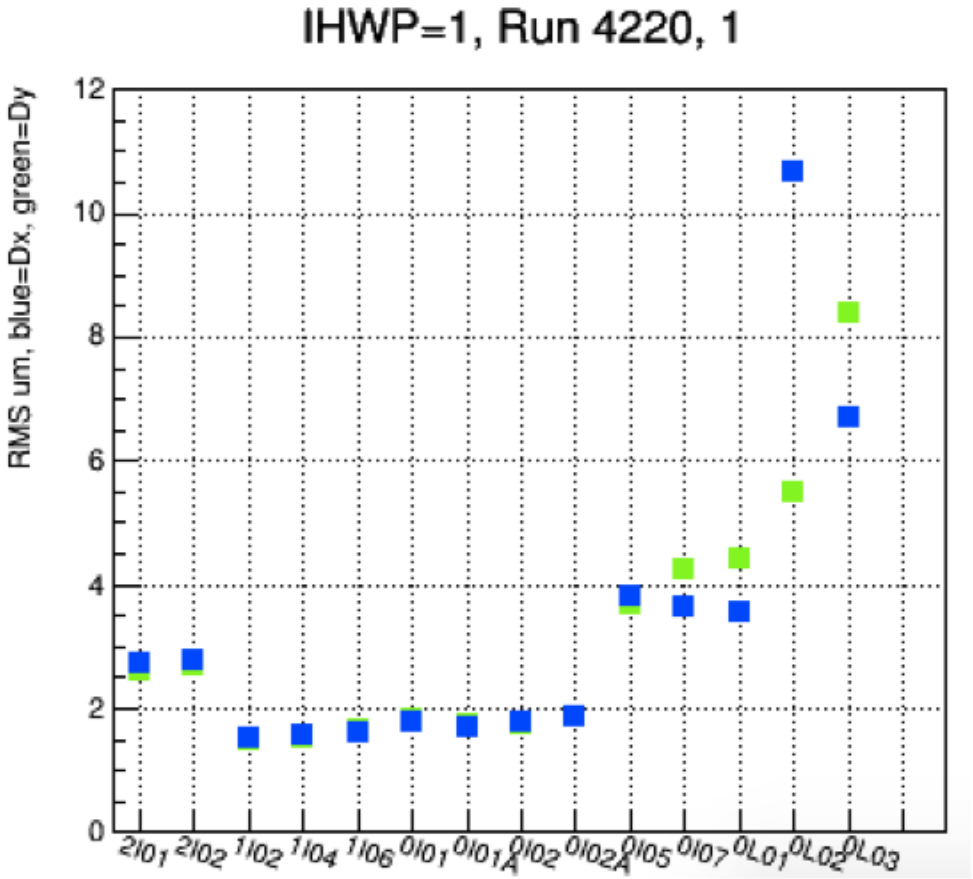
Prebuncher=0.1 PITAV->1000ppm



Run4218_IHWPin_RHWP750_prebuncher0p1_PITA1000_injbpms_Dr

RMS in 0L02,0L03

08/04/2018



07/15/2018