PREX Respin2 : Beam Correction Weighted Averages

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1 Grand Averages

	Mean(ppb)	Error(ppb)	RMS(ppm)	χ^2/ndf
Lagrange-all	492.69	13.38	100.42	117.6/95
Regression-all	493.48	13.29	99.35	118.3/95
Dithering	494.39	13.91	106.34	115.8/95
Regression-5BPM	497.65	13.59	102.18	118.8/95

Table 1: Main detector results(corrected) including single-arm data

	Mean(ppb)	Error(ppb)	RMS(ppm)	χ^2/ndf
Lagrange-all	432.98	43.44	349.57	149.7/95
Regression-all	429.37	43.60	349.57	153.3/95
Dithering	435.89	43.31	349.57	147.4/95
Regression-5BPM	434.11	43.34	349.57	148.2/95

Table 2: Main detector results(Raw) including single-arm data

	Mean(ppb)	Error(ppb)	RMS(ppm)	χ^2/ndf
Lagrange-all	18.64	13.21	91.08	113.6/87
Regression-all	16.10	13.14	90.59	112.0/87
Dithering	15.46	14.03	98.22	115.7/87
Regression-5BPM	9.87	13.65	94.13	122.5/87

Table 3: Main detector Left-Right differences(corrected)

	Mean(ppb)	Error(ppb)	RMS(ppm)	χ^2/ndf
Lagrange-all	83.91	71.86	497.85	136.6/87
Regression-all	80.66	71.87	497.85	138.0/87
Dithering	87.96	72.06	497.85	135.3/87
Regression-5BPM	87.92	71.91	497.85	137.6/87

Table 4: Main detector Left-Right differences(Raw)

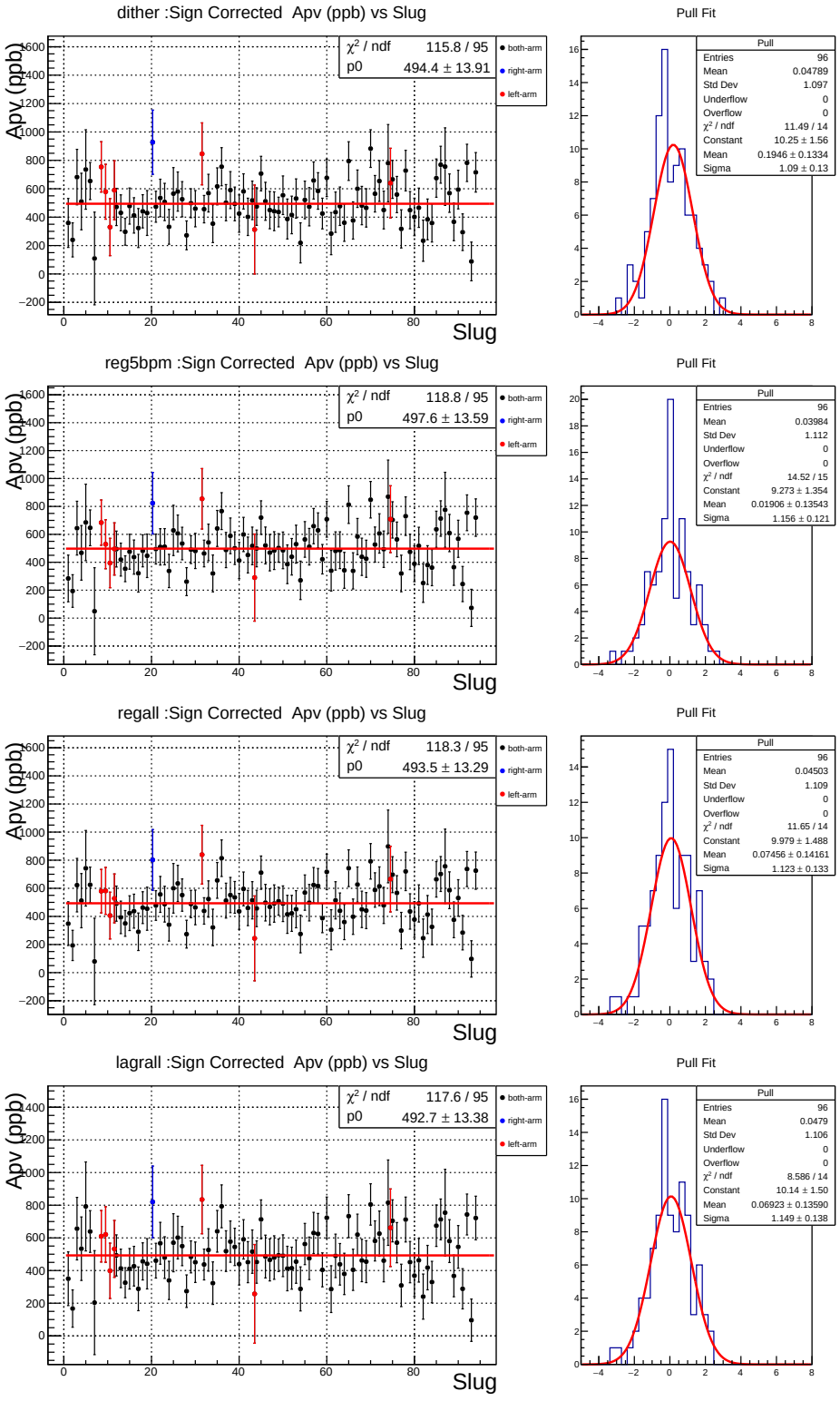

Figure 1: Apv Central Values:top to bottom, dither, reg5bpm, regall, Lagrange

2 Eigenvector-based Corrections

2.1 Eigenvector Identity

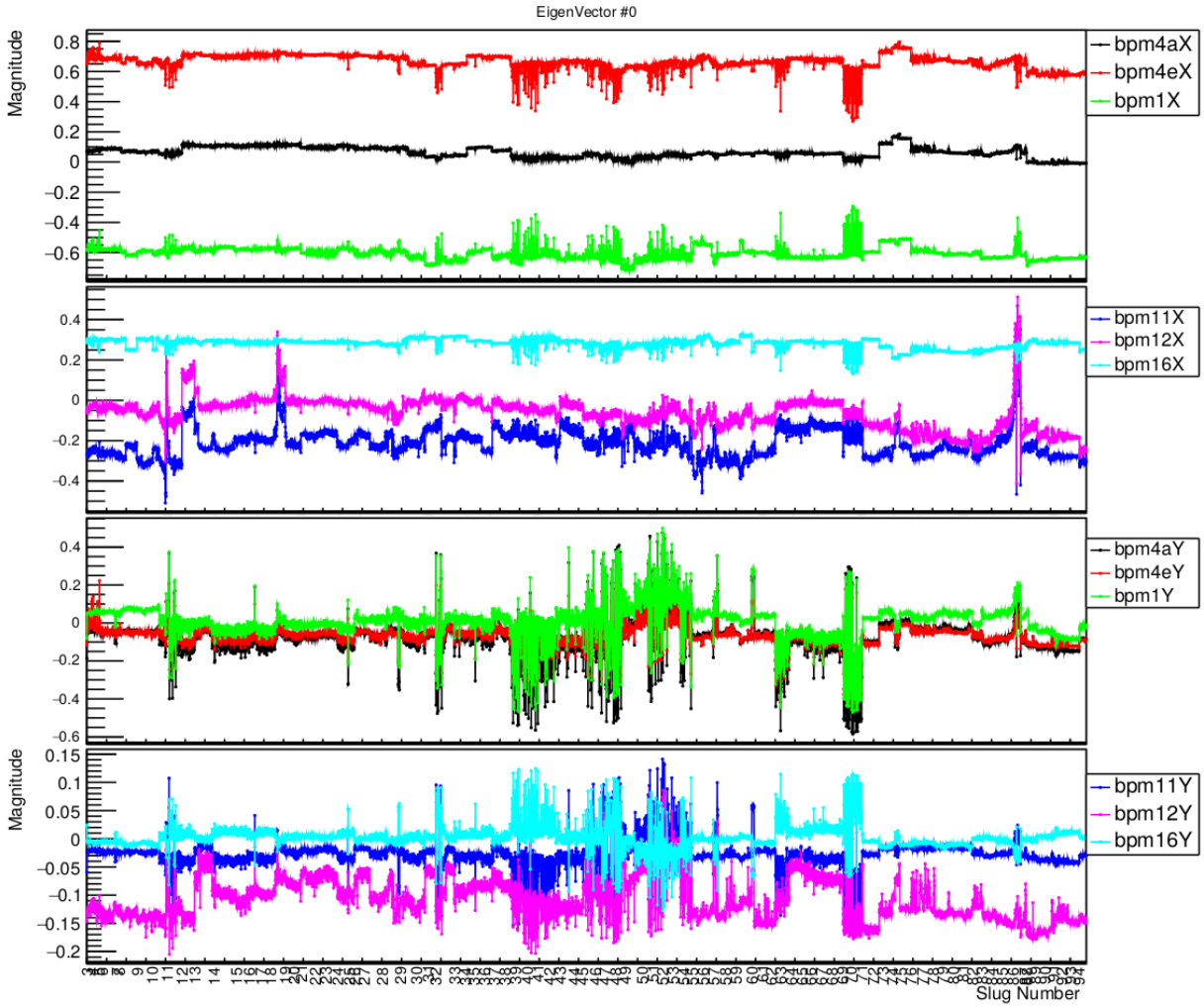

Figure 2: evMon0 vs minirun

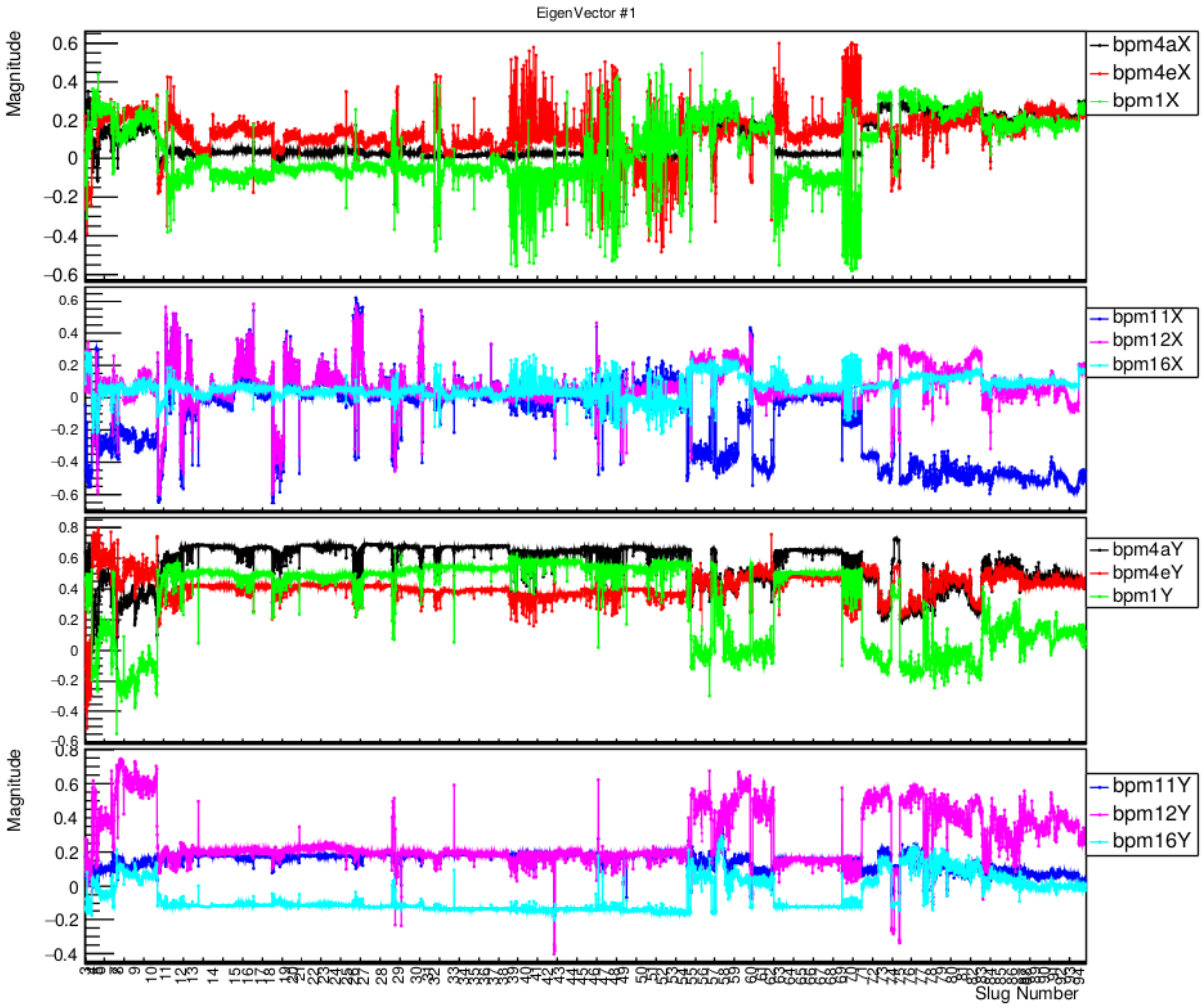

Figure 3: evMon1 vs minirun

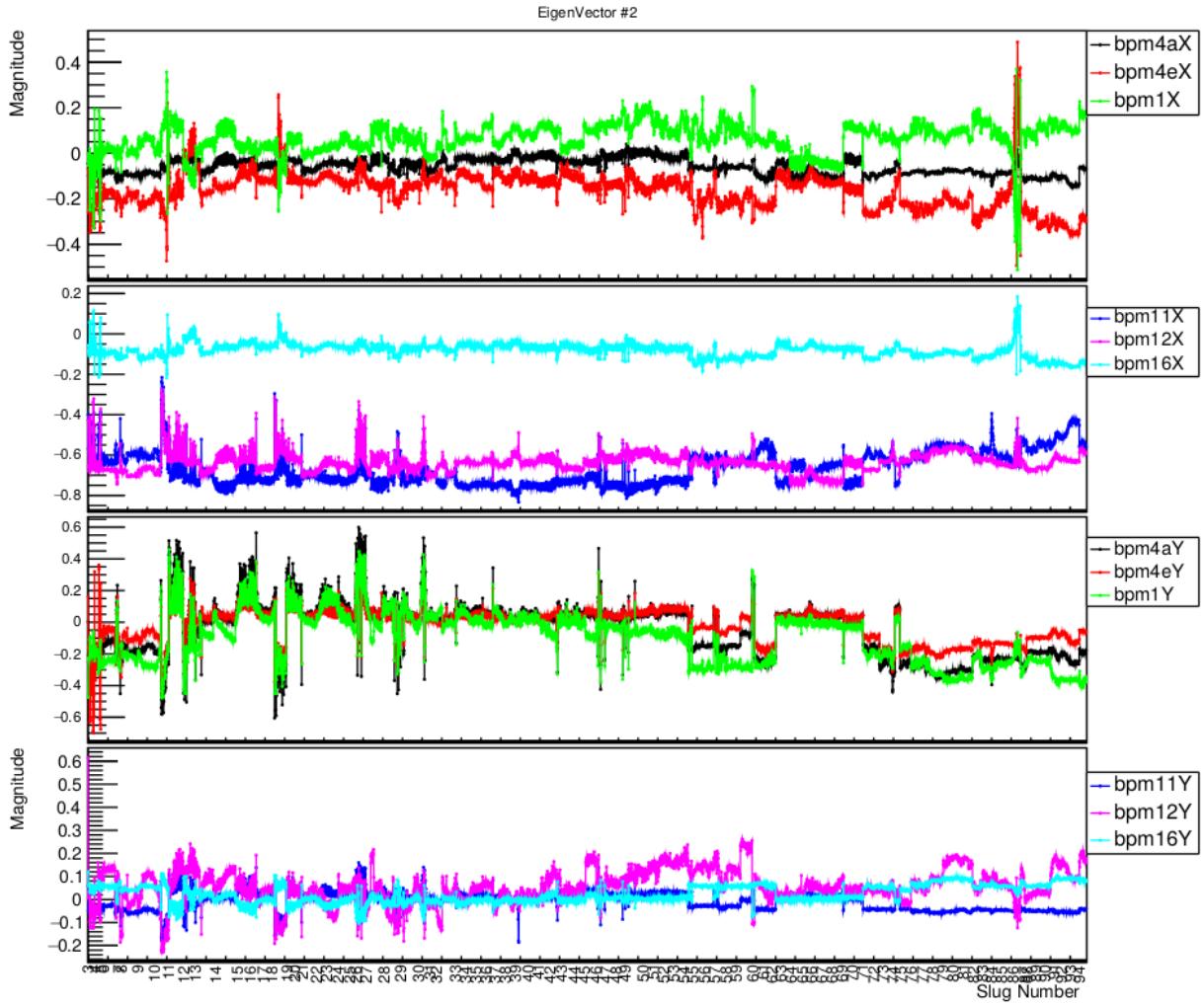

Figure 4: evMon2 vs minirun

2.2 Slopes

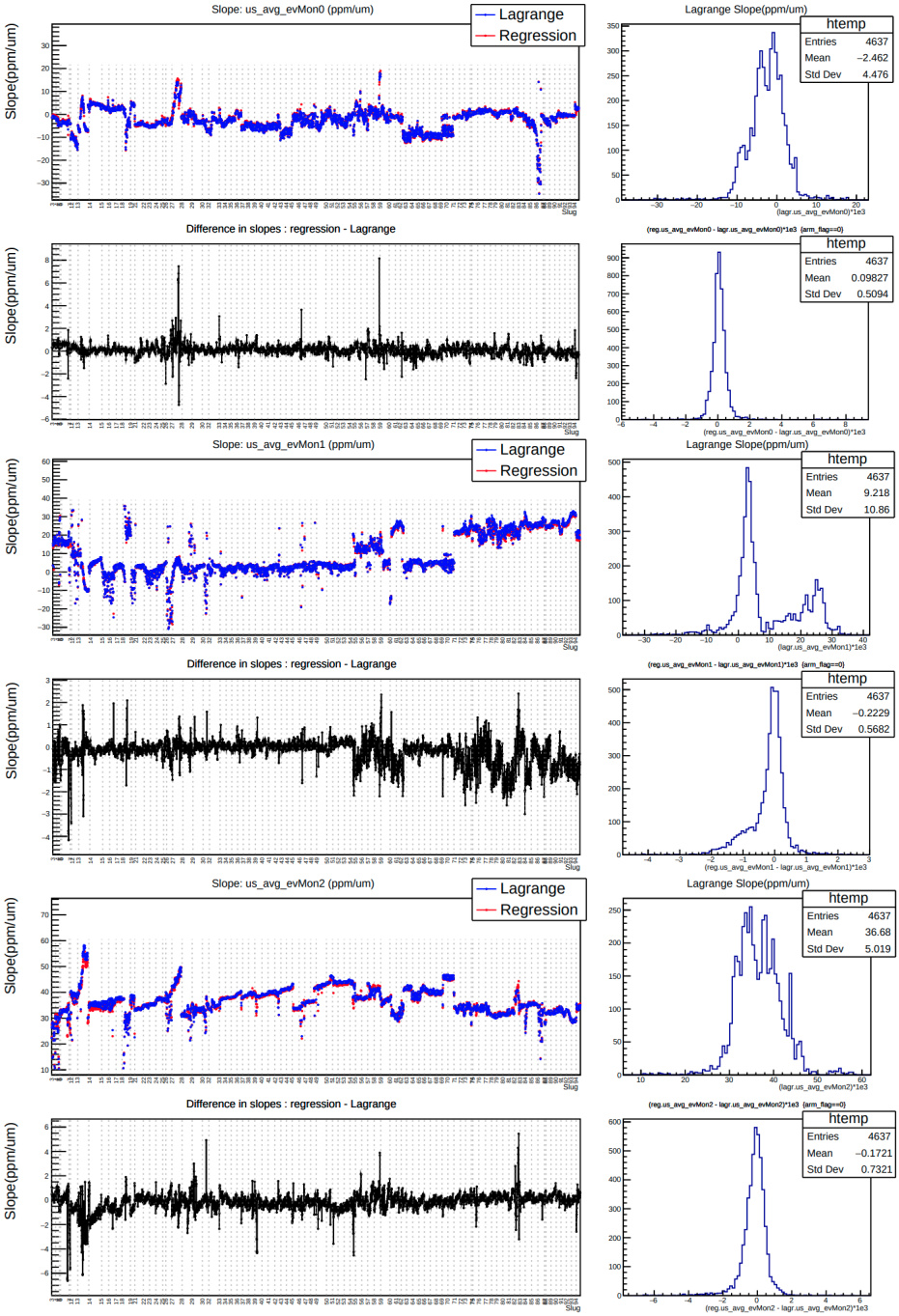

Figure 5: us avg slope vs evMon0, evMon1, evMon2 (ppm/um)
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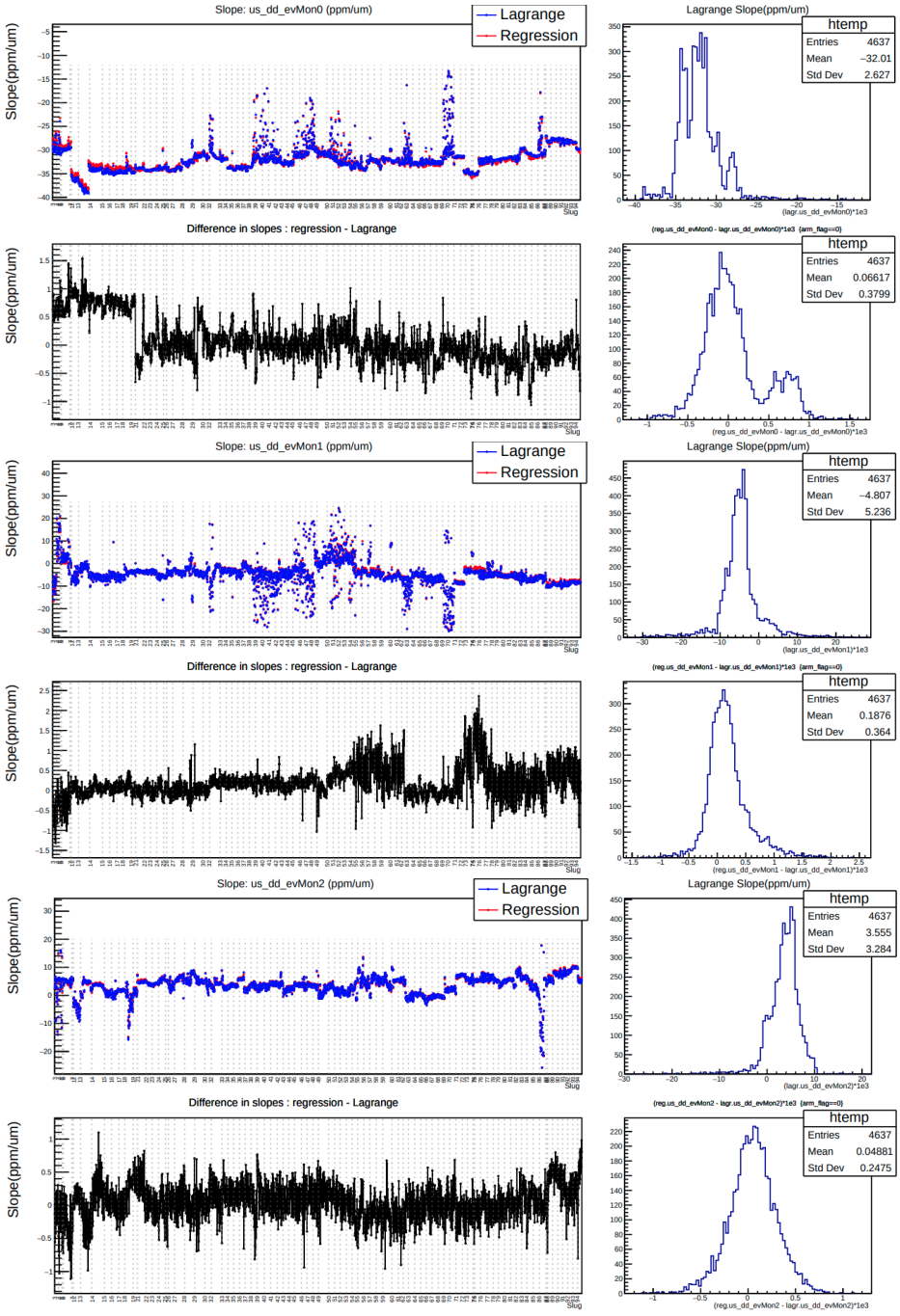

Figure 6: us dd slope vs evMon0, evMon1, evMon2 (ppm/um)

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2.3 Main Detector Apv corrections

Eigenvector	Mean(ppb)	Error(ppb)	RMS(ppm)
0	-21.71	16.25	189.92
1	22.13	10.35	88.51
2	-69.81	35.96	257.54
3	-2.93	4.39	35.83
4	9.59	5.66	41.58
5	1.31	0.93	7.14
6	0.06	1.31	12.63
7	0.90	1.44	11.09
8	0.22	0.60	5.09
9	0.23	0.41	3.15
10	0.23	0.55	5.27
11	0.08	0.39	3.67
Sum(5to11)	3.03		
Sum	-59.7		

Table 5: Lagrange(all) Eigenvector correction on Main detector, including single-arm data

2.4 Main Detector Left-Right Differences

Eigenvector	Mean(ppb)	Error(ppb)	RMS(ppm)
0	91.35	69.49	481.47
1	-10.11	11.79	84.73
2	-5.01	5.35	36.23
3	-3.55	1.75	13.27
4	-2.90	1.77	12.56
5	-0.12	0.56	3.90
6	-2.46	1.52	11.47
7	-0.38	0.61	4.25
8	-0.54	0.39	2.74
9	-0.01	0.39	2.60
10	-0.51	0.76	5.53
11	-0.51	0.50	3.64
Sum(5to11)	-4.53		
Sum	65.25		

Table 6: Lagrange(all) Eigenvector correction on differences

2.5 Regression and Lagrange Comparison

	Apv		us dd	
Eigenvectors	Lagrange	Regression	Lagrange	Regression
0	-21.71	-22.51	91.35	88.66
1	22.13	21.31	-10.11	-9.39
2	-69.81	-70.64	-5.01	-5.08
3	-2.93	-3.48	-3.55	-4.11
4	9.59	9.03	-2.9	-2.37
5	1.31	1.24	-0.12	-0.18
6	0.06	-0.17	-2.46	-2.3
7	0.9	0.86	-0.38	-0.06
8	0.22	-0.01	-0.54	-0.33
9	0.23	0.08	-0.01	0.16
10	0.23	0.18	-0.51	0.05
11	0.08	0.01	-0.51	-0.5
SUM	-59.7	-64.1	65.25	64.55

Table 7: Eigenvector-based Comparison between Regression and Lagrange, unit in ppb

3 $\Delta A \pm \sigma(\Delta A)$

3.1 Apv

	ΔA (ppb)	$\sigma(\Delta A)$(ppb)	χ^2/ndf	Prob.
dit - reg(5bpm)	-3.1	2.7	125.3 /95	0.02
dit - Lagrange(all)	2.9	3.5	86.6/ 95	0.72
Lagrange(all) - reg(all)	-0.8	1.2	89.6/ 95	0.64

Table 8: ΔA: Main detector Results(corrected)

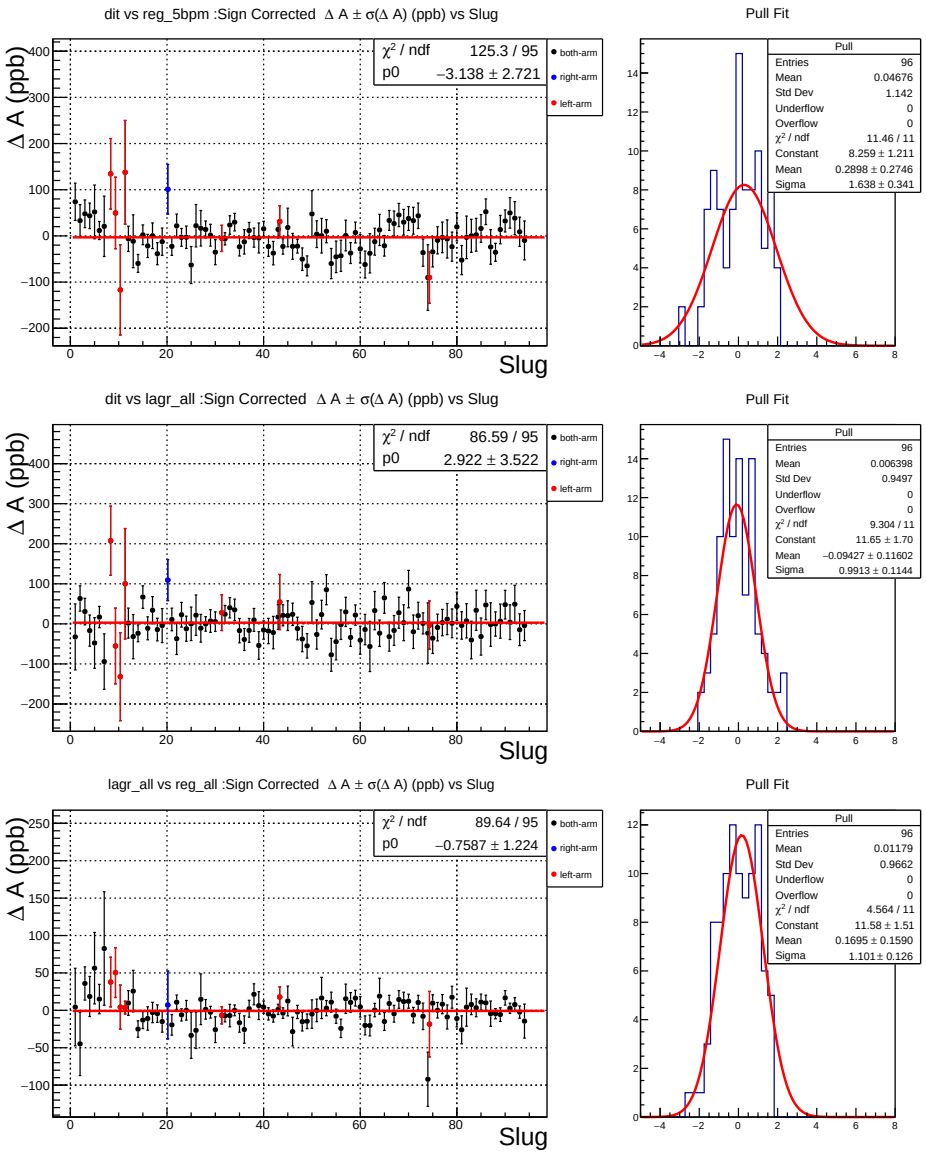

Figure 7: ΔA on Apv: Top to bottom: a) Dit - Reg5bpm; b) Dit - Lagrange; c) Lagrange -Regression

3.2 Left-Right Differences

	ΔA (ppb)	σ(ΔA)(ppb)	χ^2/ndf	Prob.
dit - reg(5bpm)	3.6	1.5	108.2/87	0.06
dit - Lagrange(all)	-0.1	3.6	103.9/87	0.10
Lagrange(all) - reg(all)	1.1	0.8	142.6/87	0.00

Table 9: Δ A: Main detector Left-Right differences(corrected)

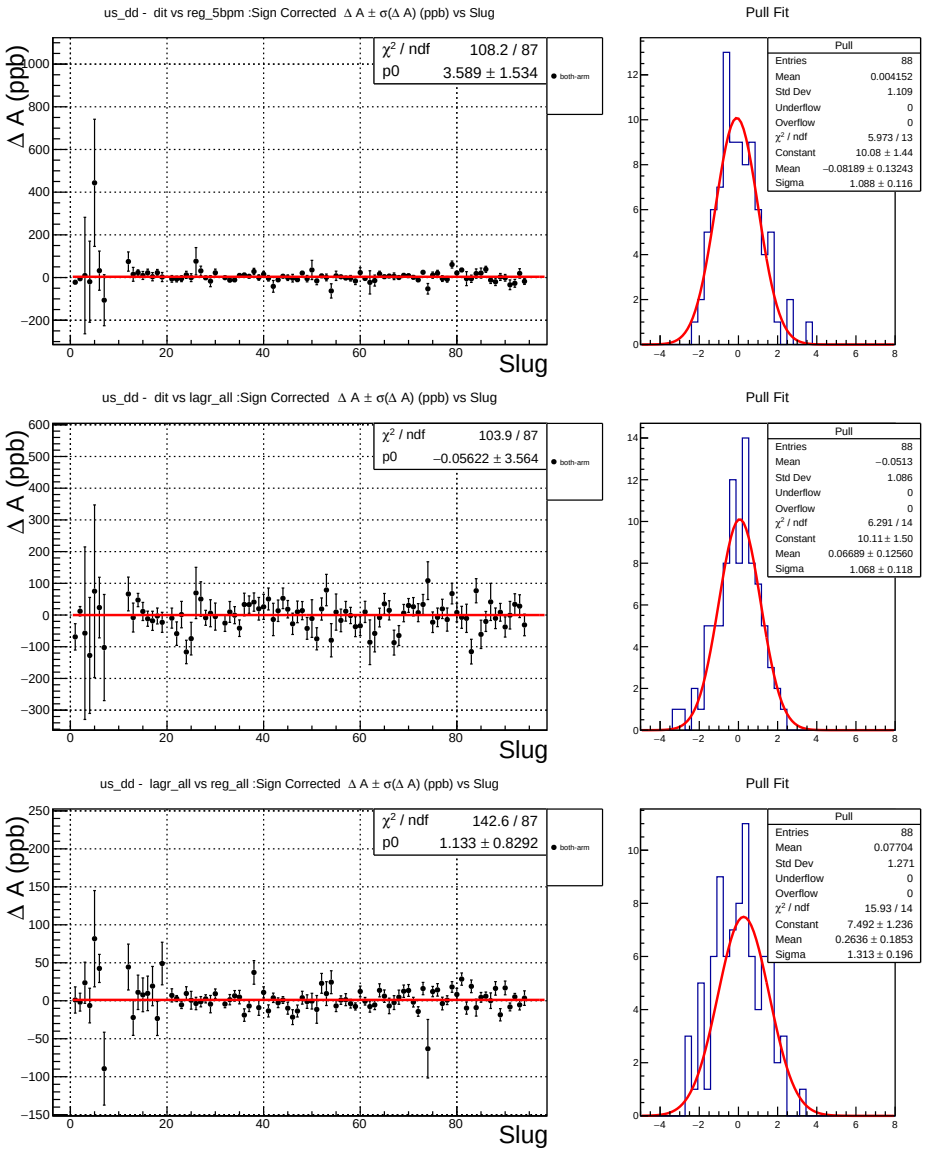

Figure 8: ΔA on Left-Right differences: Top to bottom: a) Dit - Reg5bpm; b) Dit - Lagrange; c) Lagrange -Regression

4 Residual Dithering Sensitivities

4.1 Lagrange AllBPM

	Sens.(ppm/count)	Res.(ppm/count)	Width(ppm/count)
us avg vs coil 1	2.26	-1.4e-03	0.76
us avg vs coil 2	-8.19	2.1e-04	0.19
us avg vs coil 3	0.49	5.2e-04	0.28
us avg vs coil 4	-6.30	-1.5e-03	0.20
us avg vs coil 5	-2.19	-9.2e-04	1.76
us avg vs coil 6	8.32	-4.8e-03	0.30
us avg vs coil 7	43.58	1.6e-03	0.69
us dd vs coil 1	-47.04	3.3e-03	0.34
us dd vs coil 2	1.00	5.1e-04	0.11
us dd vs coil 3	-14.61	5.3e-04	0.13
us dd vs coil 4	-0.70	-4.5e-04	0.10
us dd vs coil 5	66.48	-5.1e-04	0.57
us dd vs coil 6	0.04	-7.7e-03	0.18
us dd vs coil 7	10.84	-1.3e-03	0.27

Table 10: Residual Sensitivities with Lagrange slopes: Dithering Coils

	Sens.(ppm/count)	Res.(ppm/count)	Width(ppm/count)
us avg vs coil 1	2.17	-0.06	1.39
us avg vs coil 2	-7.53	0.03	0.25
us avg vs coil 5	-2.63	-0.21	1.02
us avg vs coil 6	2.53	0.08	0.22
us dd vs coil 1	-55.33	-0.26	0.45
us dd vs coil 2	0.77	0.03	0.13
us dd vs coil 5	55.55	-0.31	0.42
us dd vs coil 6	0.33	0.09	0.15

Table 11: Residual Sensitivities with Lagrange slopes: Redundant Coils

4.2 Regression AllBPM

	Sens.(ppm/count)	Res.(ppm/count)	Width(ppm/count)
us avg vs coil 1	2.26	-0.07	0.88
us avg vs coil 2	-8.19	-4.57	0.46
us avg vs coil 3	0.49	0.01	0.41
us avg vs coil 4	-6.30	-1.05	1.61
us avg vs coil 5	-2.19	-0.66	1.70
us avg vs coil 6	8.32	1.62	2.57
us avg vs coil 7	43.58	0.35	0.84
us dd vs coil 1	-47.04	-0.28	0.78
us dd vs coil 2	1.00	0.87	0.76
us dd vs coil 3	-14.61	7.7e-03	0.27
us dd vs coil 4	-0.70	0.07	0.50
us dd vs coil 5	66.48	-0.38	0.57
us dd vs coil 6	0.04	-0.23	0.82
us dd vs coil 7	10.84	-0.03	0.39

Table 12: Residual Sensitivities with regression slopes: Dithering Coils

	Sens.(ppm/count)	Res.(ppm/count)	Width(ppm/count)
us avg vs coil 1	2.17	0.70	1.25
us avg vs coil 2	-7.53	-1.46	2.36
us avg vs coil 5	-2.63	-0.07	0.94
us avg vs coil 6	2.53	2.84	0.49
us dd vs coil 1	-55.33	0.04	0.45
us dd vs coil 2	0.77	0.23	0.74
us dd vs coil 5	55.55	0.05	0.96
us dd vs coil 6	0.33	-0.30	0.21

Table 13: Residual Sensitivities with regression slopes: Redundant Coils

A ΔA calculation

- $\Delta A_i = A_i^I - A_i^{II}$: difference in corrected asymmetry central values between Method-I and Method-II in i-th minirun.
- $\langle \Delta A \rangle$: averaged ΔA_i over miniruns in a slug

$$\langle \Delta A \rangle = \frac{1}{N} \sum_i^N \Delta A_i.$$

- $\sqrt{\langle (\Delta A)^2 \rangle}$: averaged distance between two methods over N miniruns in a slug

$$\sqrt{\langle (\Delta A)^2 \rangle} = \sqrt{\frac{\sum_i^N (A_i^I - A_i^{II})^2}{N}}.$$

- $\sigma(\langle \Delta A \rangle)$: error bar on $\langle \Delta A \rangle$

$$\sigma(\langle \Delta A \rangle) = \frac{\sqrt{\langle (\Delta A)^2 \rangle}}{\sqrt{N}}.$$

  where N is the number of miniruns in a given slug.
- A_{PV} sign correction: corrected according to insertable half-wave plate and Wien flip.