Spin TuneMeter @ Injection

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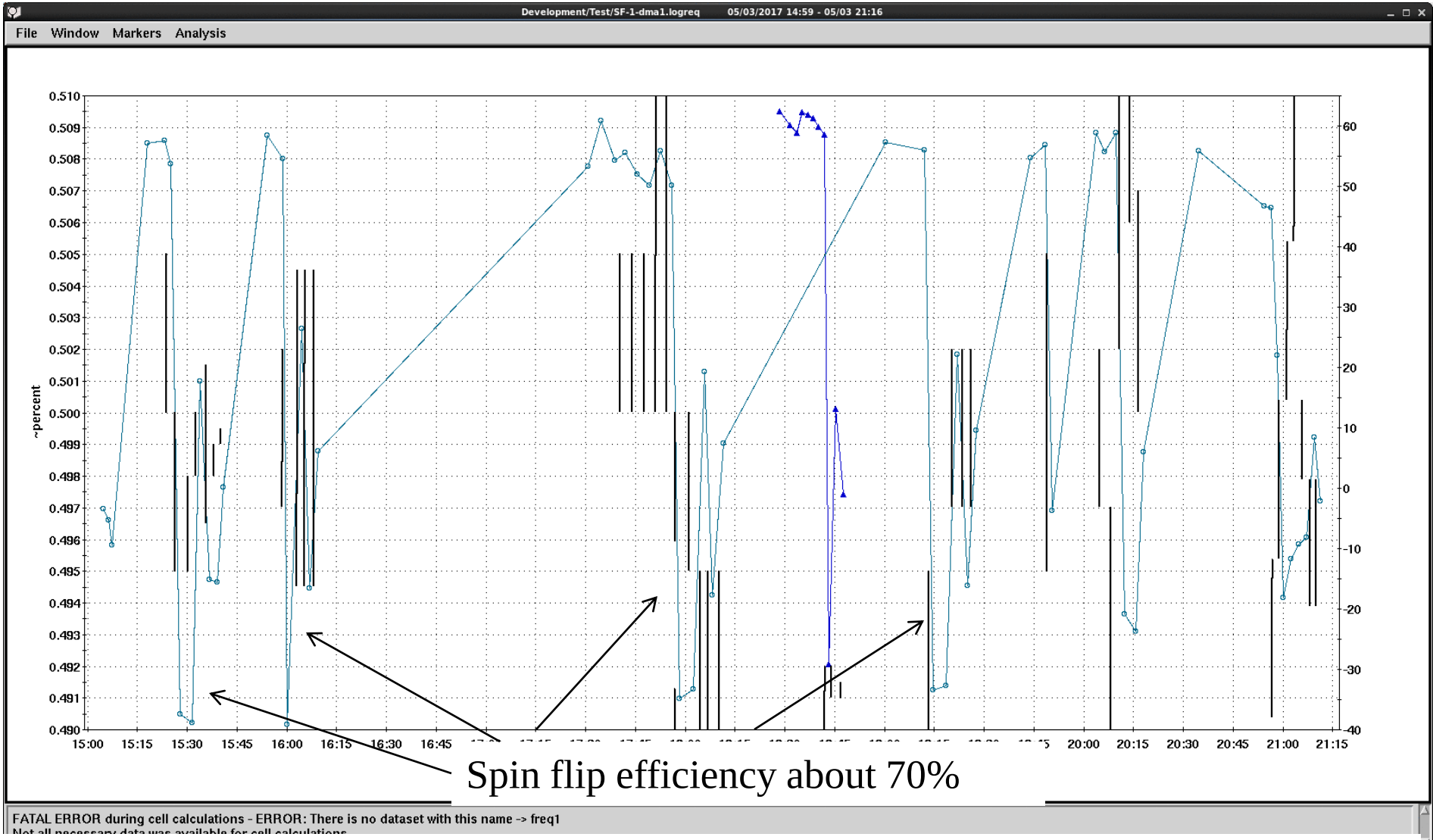
APEX Meeting

Polarization and Driving Tune Sweep



the vertical black bars show the driving tune sweep range.

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Experiment Details

- We started the experiment at 3pm and finished around 9pm. We lost about one hour during experiment due to injection kicker timing issue.
- We tested two spin flipper strength at injection. 900A gave about -70% flip efficiency, 600A gave about -35% efficiency (somewhat faster crossing speed). The sweep speed seems not a factor on efficiency. Dispersion was measured for this lattice, D'=0.007 (a few weeks ago, it was also measured as 0.009).
- With regular lattice, the spin can't be flipped, just depolarized: 57.6%->4.9%.
- We shifted the spin tune by about 0.008 with snake current change 323A->321A: spin tune changed from 0.4995 to 0.4915.
- The -26mm orbit bump at spin flipper was improved by using orbit feedback. The beam loss was greatly reduced. The spin flip efficiency was similar.
- We took data set with driven spin coherence at injection with driving tune 0.007-0.008 away from spin tune.
- At store, polarization loss happened even when the sweep range did not cover the spin tune, although it did cause spin flip when the spin tune is within the sweep range. This probably implies larger spin tune spread at store. Due to earlier polarization loss, the efficiency is hard to quantify for the spin flip case: 0.82+-0.13. We should measure the dispersion at store but ran out of time.

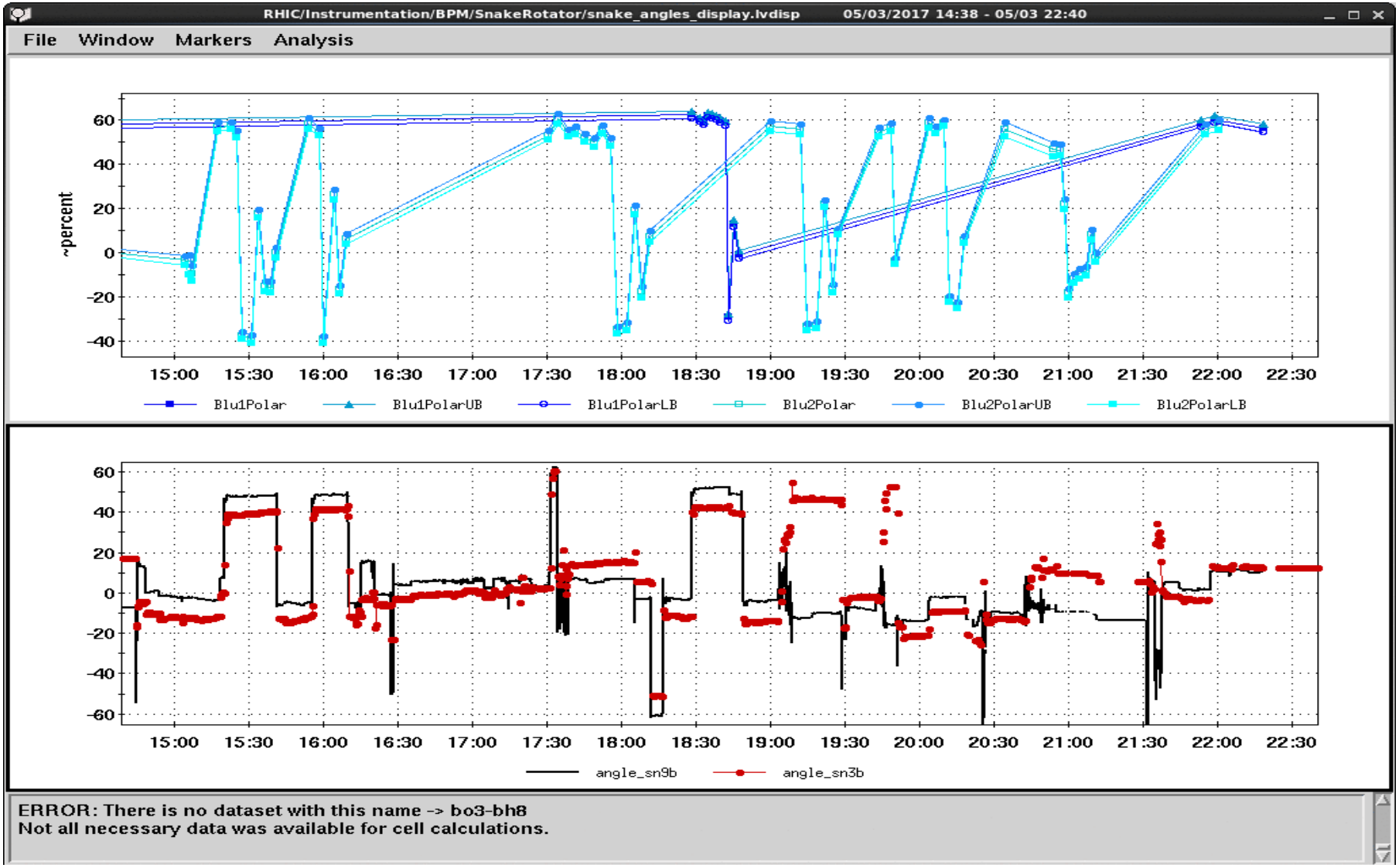
Store Spin Flipper Test at Injection

Start	End	Range	Initial		Final		Ratio		Snake	Time	Alpha
0.495	0.5	0.005	54.5	1.8	-38.2	1.9	-.701	.042	323A	3.	1.00
0.49	0.5	0.01	50.1	1.8	-34.9	1.8	-.696	.044	321A	6.	1.00
0.4945	0.5045	0.01	24.7	2.1	-16.5	2.2	-.668	.106	323A	12.	0.50
0.49	0.495	0.005	-33.3	1.9	19.4	2.1	-.583	.071	321A	6.	0.50
Weaker spin flipper (600A):											
0.502	0.51	0.008	60.4	1.6	-21.7	1.6	-.359	.028	323A	3.	1.60
0.5	0.507	0.007	-25.3	1.5	6.4	1.6	-.253	.065	323A	3.	1.40

Store Spin Flipper Test

Start	End	Range	Initial	Final	Ratio	Snake	Time	Alpha
0.49	0.495	0.005	45.4 2.6	23.4 2.3	.515 .059	323A	3.000	1.00
0.495	0.5	0.005	23.4 2.3	-19 2.3	-.812 .127	323A	3.000	1.00
0.5	0.505	0.005	-19 2.3	-13.1 2.3	.689 .147	323A	3.000	1.00
0.505	0.51	0.005	-13.1 2.3	-9.3 2.3	.710 .215	323A	3.000	1.00
0.4975	0.5	0.0025	-9.3 2.3	-7.1 2.3	.763 .311	323A	3.000	0.50
0.4935	0.4975	0.004	-7.1 2.3	8.8 2.4	-1.239 .525	323A	3.000	0.80
0.4935	0.4975	0.004	8.8 2.4	-2.8 2.4	-.318 .286	323A	3.000	0.80

Polarization and Snake Angles

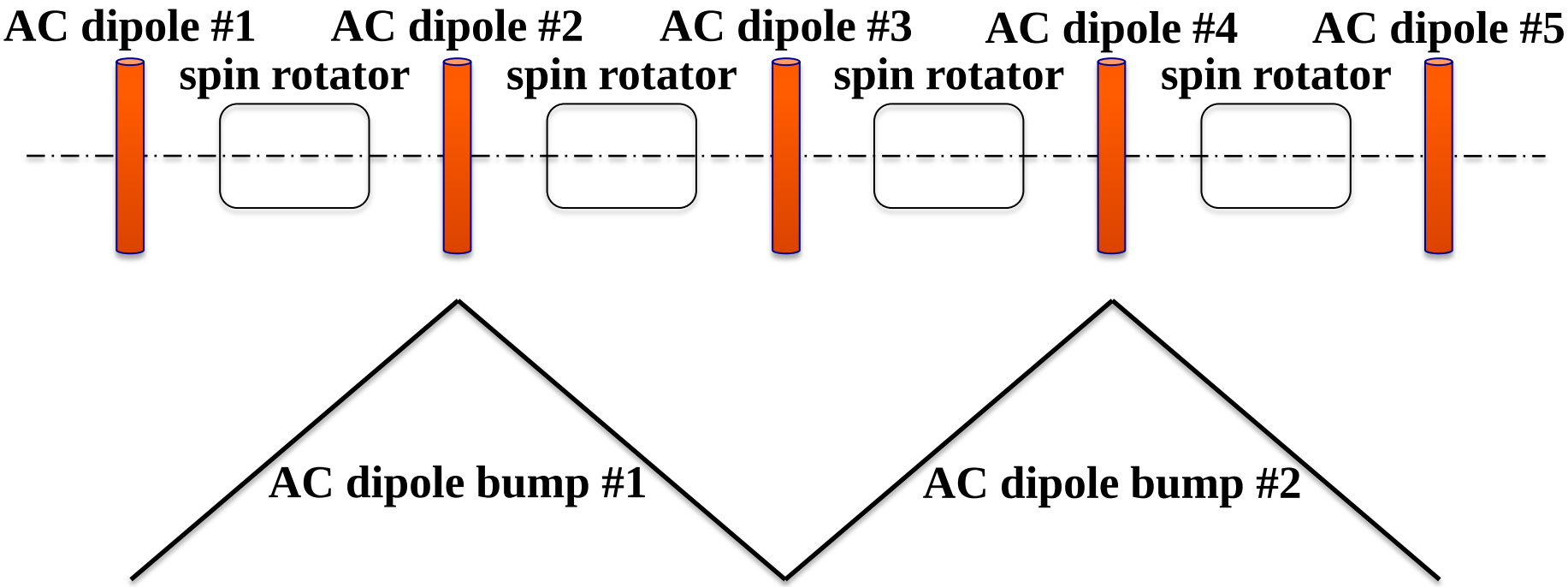


The snake angles are different at various times. This may contributed to the spin tune shift from 0.4995 to 0.502.

Near Term Plan

- In the end of store, measure dispersion. Then put in D' lattice and measure dispersion again. Check spin flipper.
- At injection, scan the D' knob to minimize the D' difference at the two snakes.
- Measure the spin tune with D' lattice by fixed driving tune method to compare the spin tune spread with a few weeks ago.
- Compare the snake angles at the two snakes during the last two sessions. Search for the source of the different flip efficiency.

Spin Flipper Layout



The spin flipper system consists of four DC dipole magnets (spin rotators) and five AC dipole magnets. The aim of this configuration is to produce a rotating field which eliminates the mirror resonance. Multiple AC dipoles are needed to localize the driven coherent betatron oscillation inside the spin flipper.