

New magnet cycle beam study

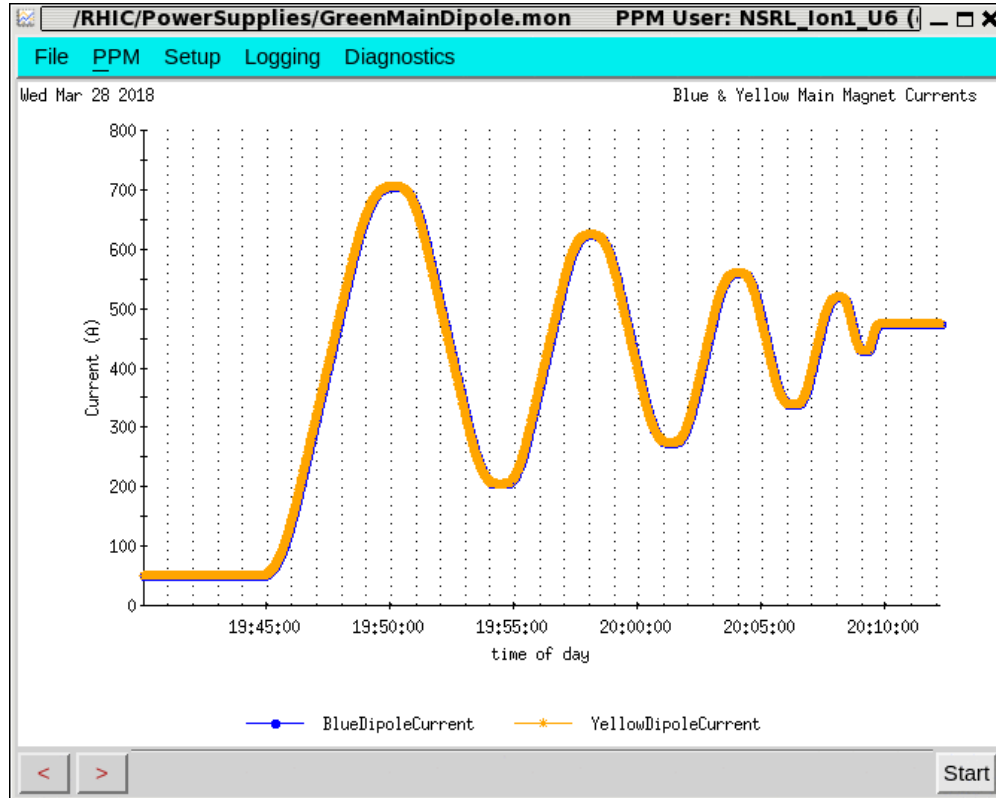
March 30, 2018

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Goal

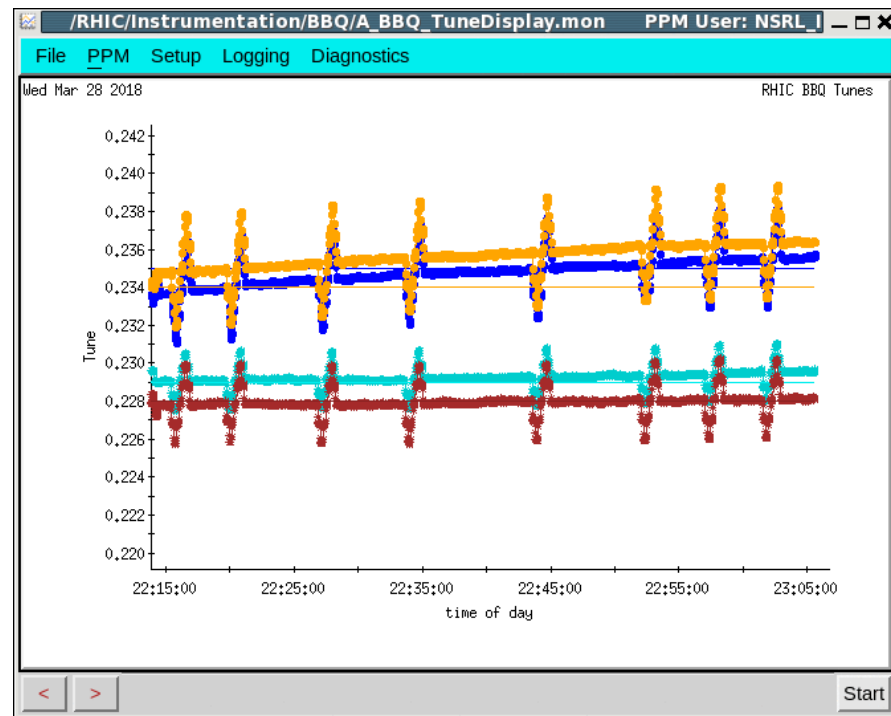
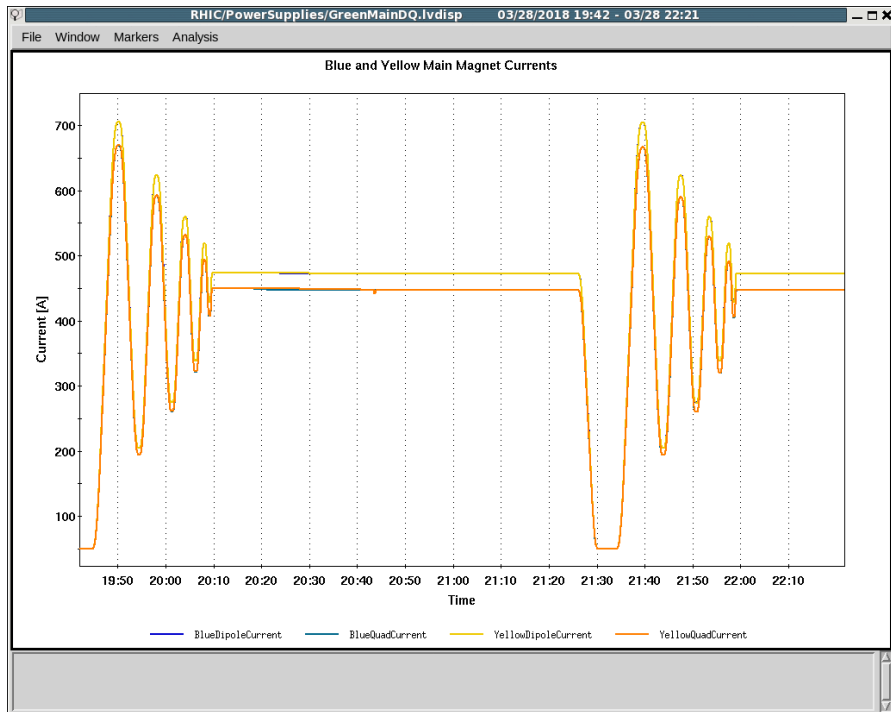
- Reduce high harmonic component of RHIC superconducting dipole at medium and low operating current.
- Improve machine reproducibility for medium and low energy operation.

New cycle for @injection



Plan

- Run new hysteresis, machine tuning, make measurements (orbit, tune, chrom) for drift correction to be compared with that at injection energy during normal operation.
- Run hysteresis again, make measurements to quantify machine reproducibility.
- ~5 hrs.



Orbit

RampEditor

Ramp Edit Buffer Optics Stepstone Compare Diagnostics Help

Editing: Au18-100GeV-e0 Live Stone: Au18-100GeV-e0::Injection Ramp State: FirstStone Save Activate / Make Live

Optics Table Stepstone Editor Compare/Revert

Stepstone	Pebble	Blue	Yellow	Green
injection	QUAD	Magnet	Design	Trim
snapback	SEXTUPOLE	b11-dh10	0.0389240	-0.0000336
t40	H_STEER		0.0389240	-0.0000150
t55	V_STEER			
beta5	GAMMA			
gammat1	SKEW_QUAD			
gammat2	SKEW_SEXT			
gammat4	NONLINEAR			
gammat5	ABORT			
stills	BEND			
t120	HELIX			
t140				
t160				
t180				
t200				
t220				
t240				
t260				
t280				
t300				
flattop				
store				

Nudge = 0.0000100

wfgMan:messageM = Ramp file Au18-100GeV-e0_1522282857 loaded (Mar 28 20:20:57)
wfgMan:messageM = Auxramp to first initiated (252 PS moved) (Mar 28 20:20:59)
Ramp file activated - Au18-100GeV-e0_1522282857 (Mar 28 20:21:23)

Blue Orbit Display

File Acquire Orbit Correction Help

Scale Control: Region: Ring Orbit scale [mm]: 0.5

Orbit list:

#	Name	Comment	Src	Dir
3	Wed Mar 28 20:20:31 2018	Measured		
4	Wed Mar 28 20:20:32 2018	Measured		
5	Wed Mar 28 20:20:33 2018	Measured		
6	Wed Mar 28 20:20:34 2018	Measured		
7	Wed Mar 28 20:20:35 2018	Measured		
8	Wed Mar 28 20:20:36 2018	Measured		
9	Wed Mar 28 20:20:37 2018	Measured		
10	Wed Mar 28 20:20:38 2018	Measured		
1	Wed Mar 28 20:20:39 2018	Measured		
2	Wed Mar 28 20:20:40 2018	Measured		

Turn: 4 Increment: 1

Data Delete Trigger Avg Trigger TBT

Orbit Statistics:

	mean	rms	imax	Nbps
X:	0	0	0	0
Y:	0	0	0	0

Displayed Region
Arcs

Orbit manager for Blue ring created successfully.
GotOrbitError: code 33292313, message=some async data missing
GotOrbitError: code 33292313, message=some async data missing
GotOrbitError: code 33292313, message=some async data missing

Tune & chrom

RhicInjection Current Fill No: 21539 Pattern: 6x6

File Pattern Diagnostics Help

Horizontal Plane

Beam coherence at y_0 -bh10 (#2), 1024 turns, synchrotron motion subtracted

Vertical plane

Beam coherence at y_0 -bv11 (#3), 1024 turns

Ring Yellow Ru Next bucket 61 1 low intensity bunch

Injected 1 Take 1 undamped bunch

Remaining 5 Take 1 damped bunch

Reinitialize Take 1 AGS cycle

Acquisition ON Fill both Yellow

Start Orbit FB Stop Fill

Dump & cogging reset

turn	turn	target	status
1	2	-1.52	ok
3.18	3.18	-3.72	ok
2.56	-2.63	2.64	ok

Linear coupling correction (default calculation ON)

corrector	design	old	present	target	status
S.y-sq1	0,000	-0,007	-0,007	-0,007	ok
S.y-sq2	0,000	-0,186	-0,186	-0,186	ok
S.y-sq3	0,000	-0,007	-0,007	-0,007	ok

Auto Setup

Tune Plots

File Graphs PetPages Reload Data Kicker Expert 3D Help

Mode: MeasTuneEvent Trigger Mode: MeasTuneEvent Trigger

Bucket #: 1 fit window size: 8 Bucket #: 1 fit window size: 8

Set Hor Freq: 0.230903 Set Ver Freq: 0.22087 Set Hor Freq: 0.230903 Set Ver Freq: 0.228899

Horizontal FFT data

TUNE: 1, peak = 0,237915 2, peak = 0,227539

Vertical FFT data

TUNE: 1, peak = 0,164062 2, peak = 0,147461

RampEditor

Ramp Edit Buffer Optics Stepstone Compare Diagnostics

Editing: Au18-100GeV-e0 Live Stone: Au18-100GeV-e0:injection Ramp State: FirstStone Save Activate / Make Live

Optics Table Stepstone Editor Compare/Revert

Time	Stepstone	Gamma	TuneX	TuneY	ChromX	ChromY	TuneX	TuneY	ChromX	ChromY
0,0	Injection	10,520	28,1803	29,1938	-23,1	11,4	28,3205	29,1936	-8,1	-8,6
16,0	snapback	10,692	28,3442	29,2040	-8,7	-11,4	28,3444	29,2039	-8,6	-11,4
40,0	t40	12,861	28,3564	29,2028	-4,1	-10,9	28,3565	29,2028	-4,1	-10,9
55,0	t55	15,686	28,3532	29,2100	-0,3	-9,7	28,3532	29,2100	-0,3	-9,7
68,5	beta5	19,198	28,3486	29,2186	0,1	-7,7	28,3486	29,2186	0,1	-7,7
75,5	gamma1	21,380	28,3539	29,2239	1,0	-5,4	28,3539	29,2239	1,0	-5,4
79,0	gamma2	22,564	28,3642	29,2244	4,8	-5,2	28,3642	29,2244	4,8	-5,2
83,0	gamma4	23,993	28,3605	29,2245	9,9	3,8	28,3605	29,2245	9,9	3,8
91,5	gamma5	27,296	28,3412	29,2288	9,8	3,8	28,3412	29,2288	9,8	3,8
98,5	still5	30,290	28,3337	29,2315	7,0	3,8	28,3337	29,2315	7,0	3,8
120,0	t120	40,442	28,3229	29,2368	7,1	3,8	28,3229	29,2368	7,1	3,8
140,0	t140	50,005	28,3251	29,2555	6,7	3,8	28,3251	29,2555	6,7	3,8
160,0	t160	59,570	28,3266	29,2768	5,6	4,7	28,3266	29,2768	5,6	4,7
180,0	t180	69,135	28,3171	29,2806	3,5	5,5	28,3171	29,2806	3,5	5,5
200,0	t200	78,700	28,3184	29,2965	1,7	6,9	28,3184	29,2965	1,7	6,9
220,0	t220	88,215	28,2944	29,2976	-0,6	9,2	28,2944	29,2976	-0,6	9,2
240,0	t240	96,535	28,2905	29,3111	-2,0	9,1	28,2905	29,3111	-2,0	9,1
260,0	t260	102,514	28,2841	29,3243	-2,1	7,7	28,2841	29,3243	-2,1	7,7
280,0	t280	106,101	28,2681	29,3317	-2,6	9,6	28,2681	29,3317	-2,6	9,6
300,0	t300	107,346	28,2586	29,3316	-5,2	12,5	28,2586	29,3316	-5,2	12,5
310,0	flattop	107,396	28,2568	29,3330	-7,2	13,7	28,2568	29,3330	-7,2	13,7
320,0	store	107,396	28,2549	29,3330	-9,8	16,9	28,2549	29,3330	-9,8	16,9

Chrom Nudge = 5

wigMan:messageM = Auxramp to first initiated (469 PS moved) (Mar 28 20:51:26)
 Ramp activate successful. (Mar 28 20:51:29)
 Ramp file activated - Au18-100GeV-e0_1S22284684 (Mar 28 20:51:29)

RhicBTF V2.0

Setup Data Display Control PetPages Apps Help

Plane	Acquire	Start Tune	End Tune
Blue_Hor	NO	0,2	0,25
Blue_Ver	NO	0,2	0,25
Yellow_Hor	YES	0,2	0,25
Yellow_Ver	YES	0,2	0,25

Collection Mode: Normal Gated Edit

Begin Data Collection Stop Data Collection

Import All Planes... Clear All Plots

Hor A P T C BLUE Ver A P T C

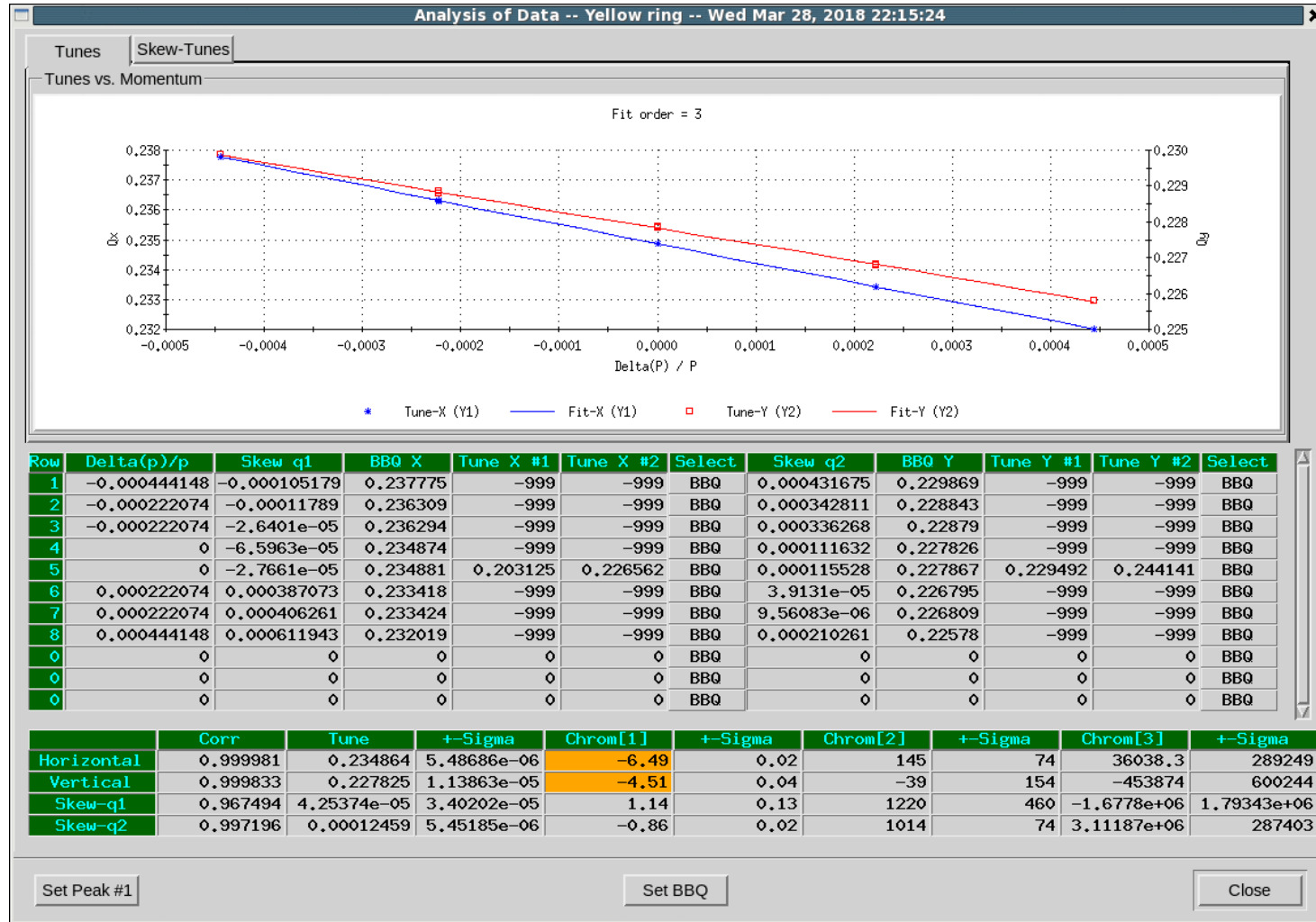
Hor A P T C YELLOW Ver A P T C

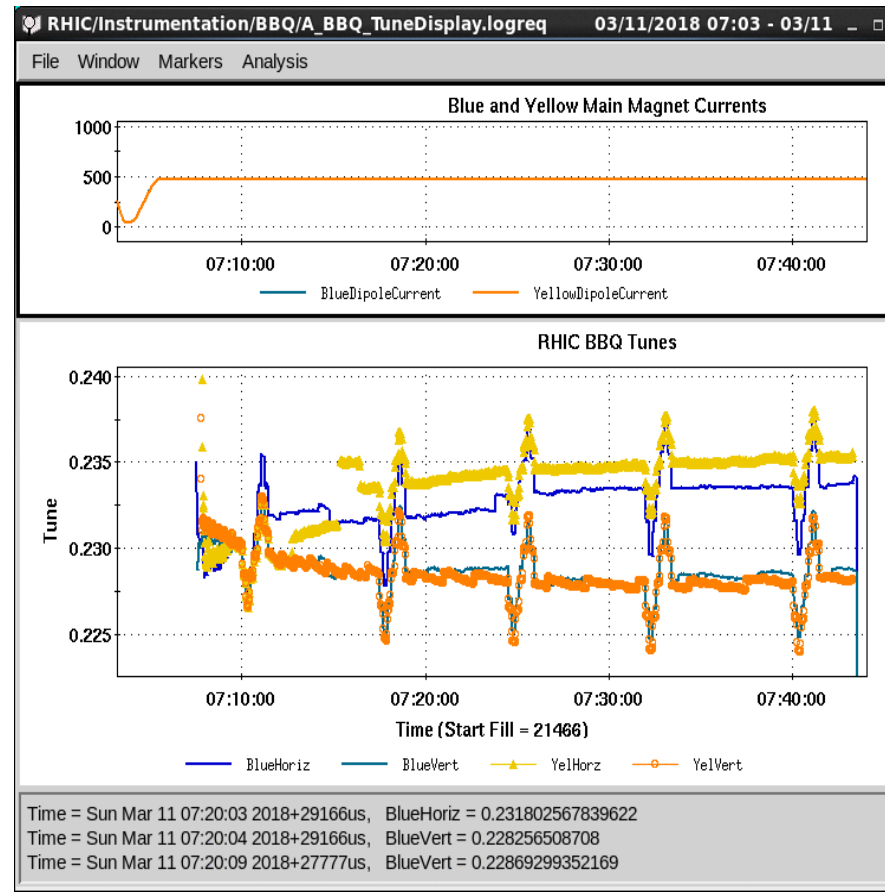
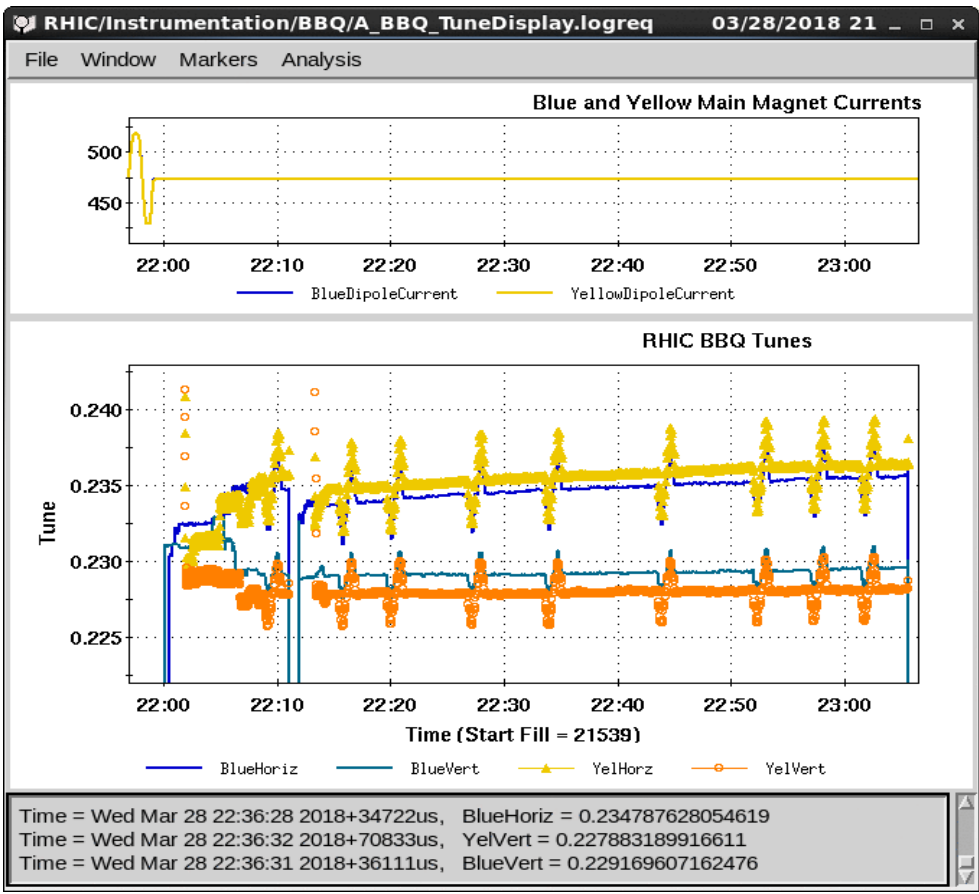
H - Fill 21539 20:37:45 Tune: 0,2364
 V - Fill 21539 20:37:50 Tune: 0,2161

Both Blue Yellow

Wed Mar 28 20:37:58 2018: Data collection complete

Q and Q' measurement





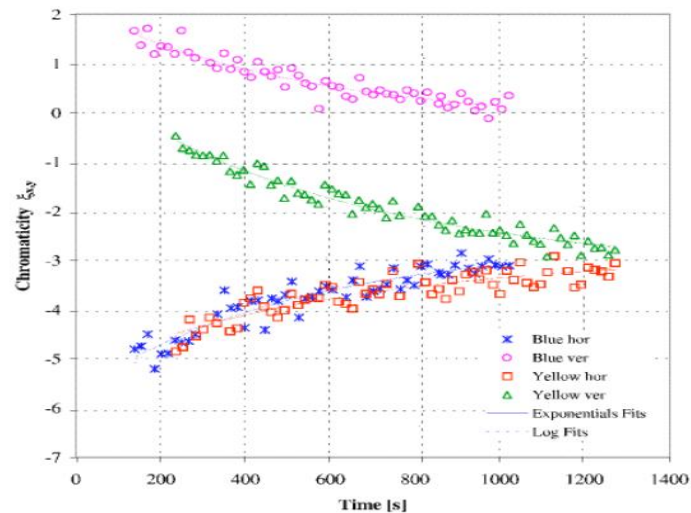
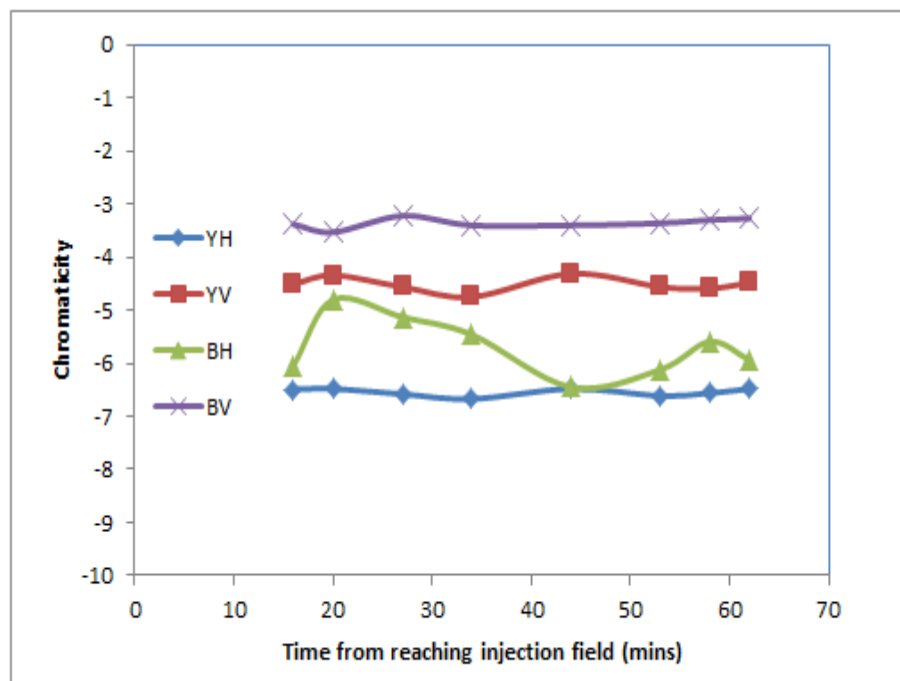
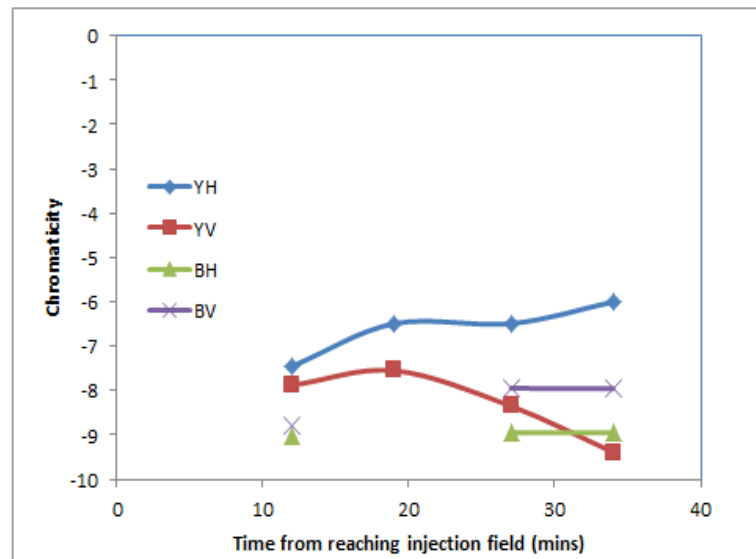


FIG. 3. (Color) Measured chromaticity in the two RHIC rings on a linear time scale.



Summary

- Beam-based measurements revealed much reduced persistent current decay.
- Both rings showed excellent stability.

Plan

- Reduce time length for the new cycle?
- Focus on new cycle for 3.85GeV.
- Alleviate snap-back problem during operation ramp?