

# Ramp Optics Measurement and Correction

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Run-14 RHIC retreat

# Outline

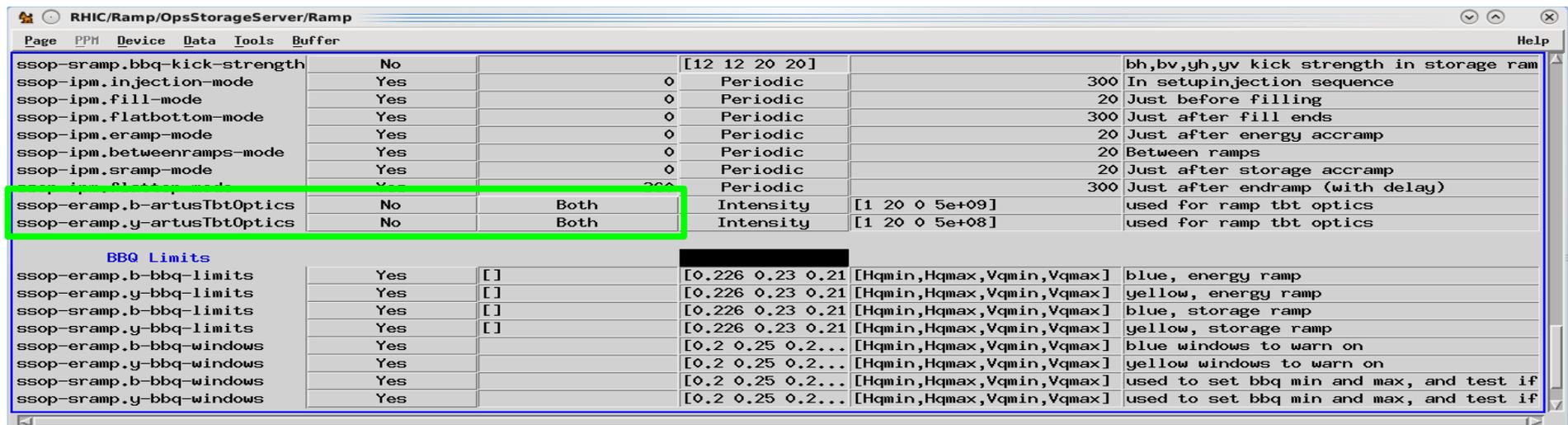
- Advance of ramp optics measurement
- Advance of ramp optics correction

# Achievements in 2013

- Optics correction being operational.
- Measured linear optics during beam acceleration parasitically in RHIC, with a script (A. Marusic).
- Implemented optics correction for rotator ramp operationally.
- Attempted optics correction on the energy ramp, encountered PS excursion when anchoring step-stone settings.

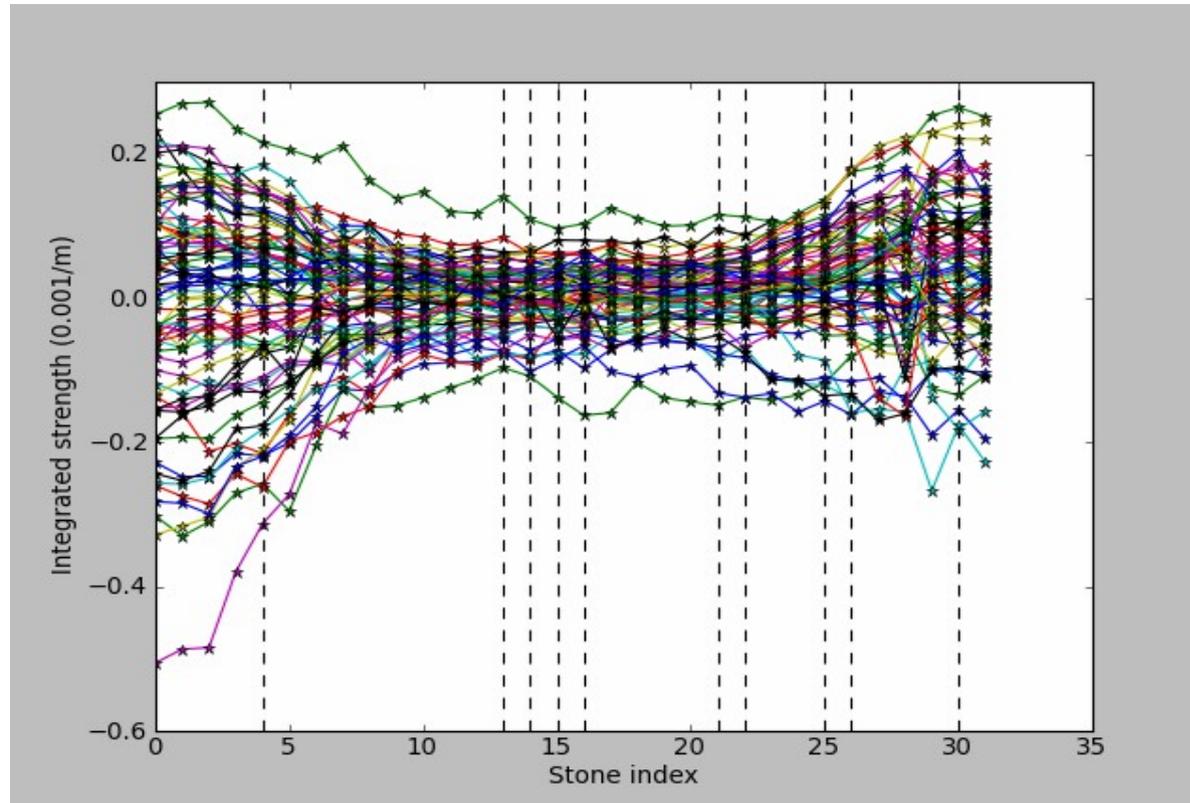
# Ramp Optics Measurement in tape sequence

Ramp Optics Measurement was truly operational with A. Drees, A. Marusic, R. Michnoff, I. Blackler, G. Marr's effort of implementing it in tape sequence.



Page	PPM	Device	Data	Tools	Buffer	Help
ssop-sramp.bbq-kick-strength	No		[12 12 20 20]			bh,bv,yh,yv kick strength in storage ram
ssop-ipm.injection-mode	Yes		0	Periodic	300	In setupinjection sequence
ssop-ipm.fill-mode	Yes		0	Periodic	20	Just before filling
ssop-ipm.flatbottom-mode	Yes		0	Periodic	300	Just after fill ends
ssop-ipm.eramp-mode	Yes		0	Periodic	20	Just after energy accramp
ssop-ipm.betweenramps-mode	Yes		0	Periodic	20	Between ramps
ssop-ipm.sramp-mode	Yes		0	Periodic	20	Just after storage accramp
ssop-ipm.flatbottom-mode	Yes		0	Periodic	300	Just after endramp (with delay)
ssop-eramp.b-artusTbtOptics	No	Both		Intensity	[1 20 0 5e+09]	used for ramp tbt optics
ssop-eramp.y-artusTbtOptics	No	Both		Intensity	[1 20 0 5e+08]	used for ramp tbt optics
<b>BBQ Limits</b>						
ssop-eramp.b-bbq-limits	Yes	[ ]	[0.226 0.23 0.21]	[Hqmin,Hqmax,Vqmin,Vqmax]		blue, energy ramp
ssop-eramp.y-bbq-limits	Yes	[ ]	[0.226 0.23 0.21]	[Hqmin,Hqmax,Vqmin,Vqmax]		yellow, energy ramp
ssop-sramp.b-bbq-limits	Yes	[ ]	[0.226 0.23 0.21]	[Hqmin,Hqmax,Vqmin,Vqmax]		blue, storage ramp
ssop-sramp.y-bbq-limits	Yes	[ ]	[0.226 0.23 0.21]	[Hqmin,Hqmax,Vqmin,Vqmax]		yellow, storage ramp
ssop-eramp.b-bbq-windows	Yes		[0.2 0.25 0.2...]	[Hqmin,Hqmax,Vqmin,Vqmax]		blue windows to warn on
ssop-eramp.y-bbq-windows	Yes		[0.2 0.25 0.2...]	[Hqmin,Hqmax,Vqmin,Vqmax]		yellow windows to warn on
ssop-sramp.b-bbq-windows	Yes		[0.2 0.25 0.2...]	[Hqmin,Hqmax,Vqmin,Vqmax]		used to set bbq min and max, and test if
ssop-sramp.y-bbq-windows	Yes		[0.2 0.25 0.2...]	[Hqmin,Hqmax,Vqmin,Vqmax]		used to set bbq min and max, and test if

# Correction strength during acceleration

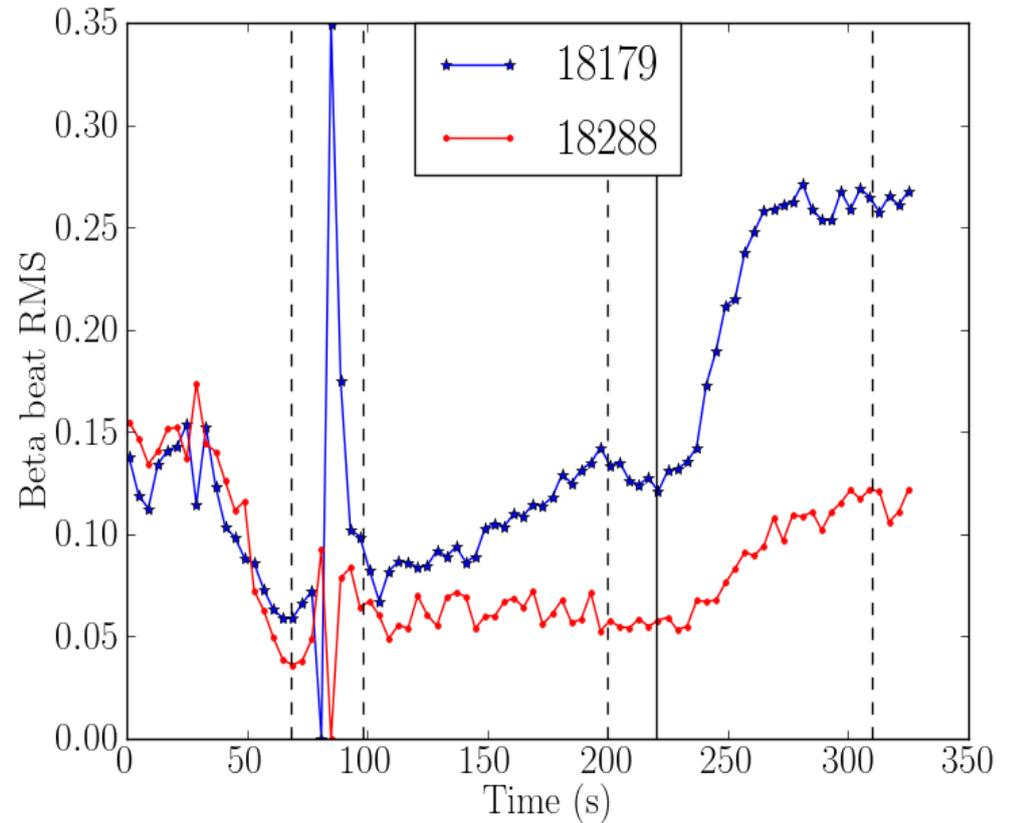
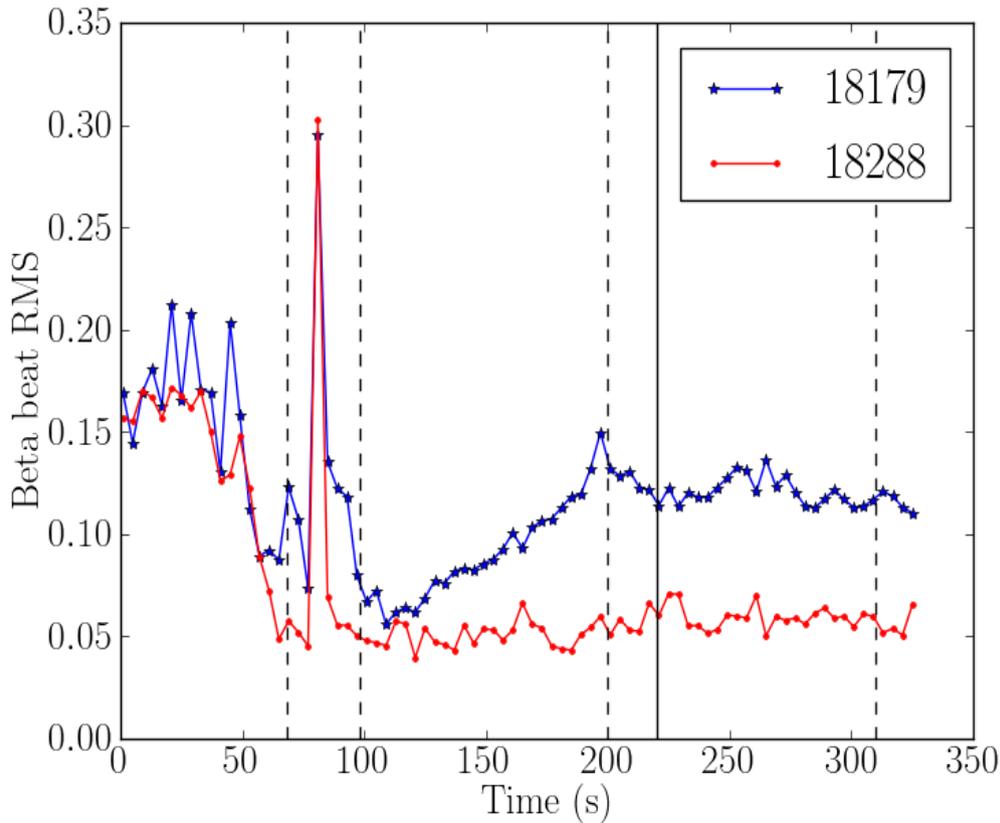


The correction strengths for 72 trim quadrupoles in the Yellow ring on the energy ramp calculated for pp13b-v2. Dashed lines are at the stones where magnet setting are anchored or partially anchored. In-between the anchored stones, strengths change more or less **LINEAR**. The same is true for the Blue ring as well.

**This led to the decision of applying corrections for selected stones.**

# Correction results

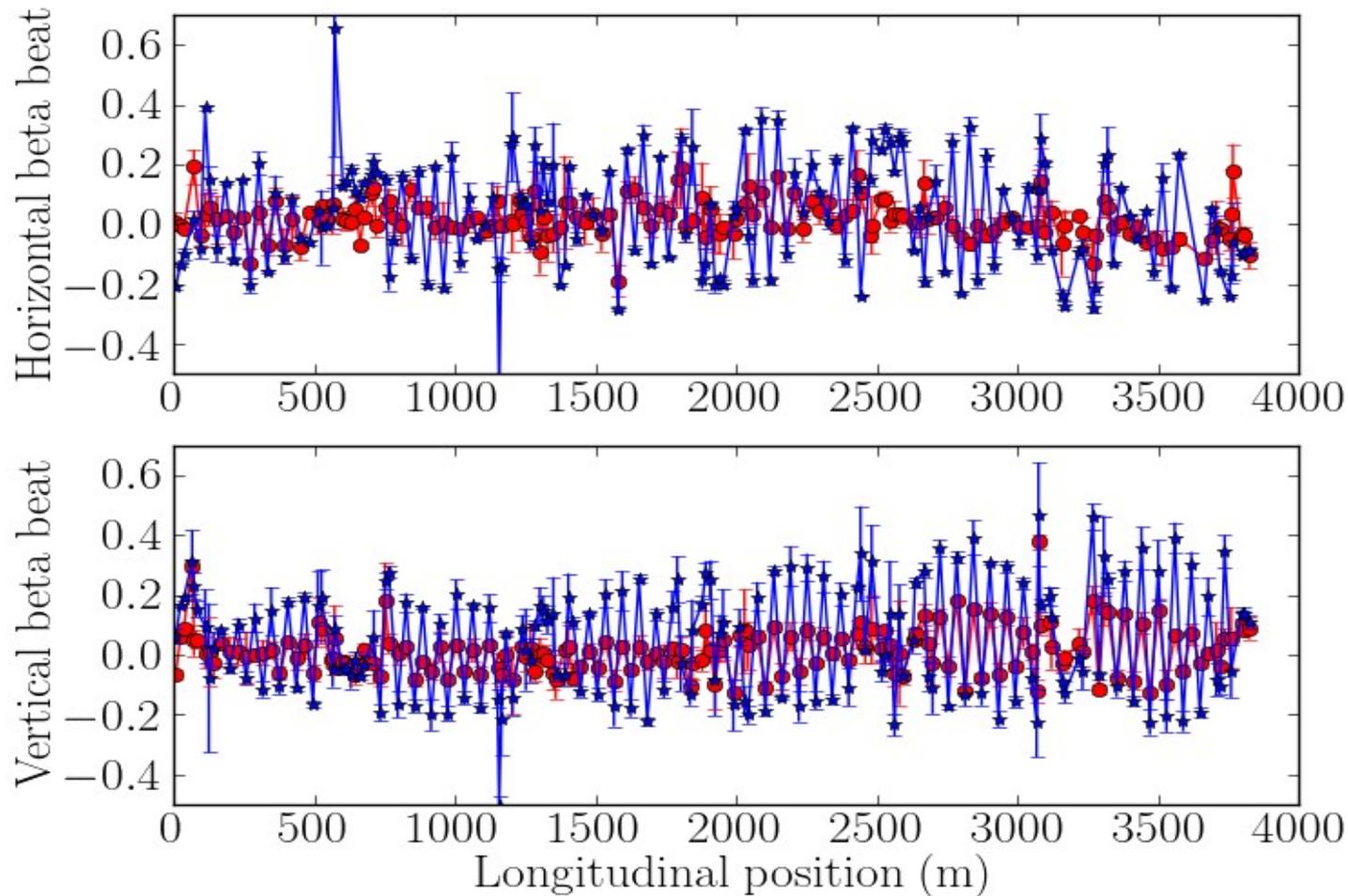
## --Global beta beat on the ramp



The global beta beat measured for fill #18179 (w/o correction) and #18288 (with ramp optics correction): the left and right plot are for horizontal and vertical plane in the Yellow ring, the corrections were only applied at the stones marked by the vertical lines.

# Correction results

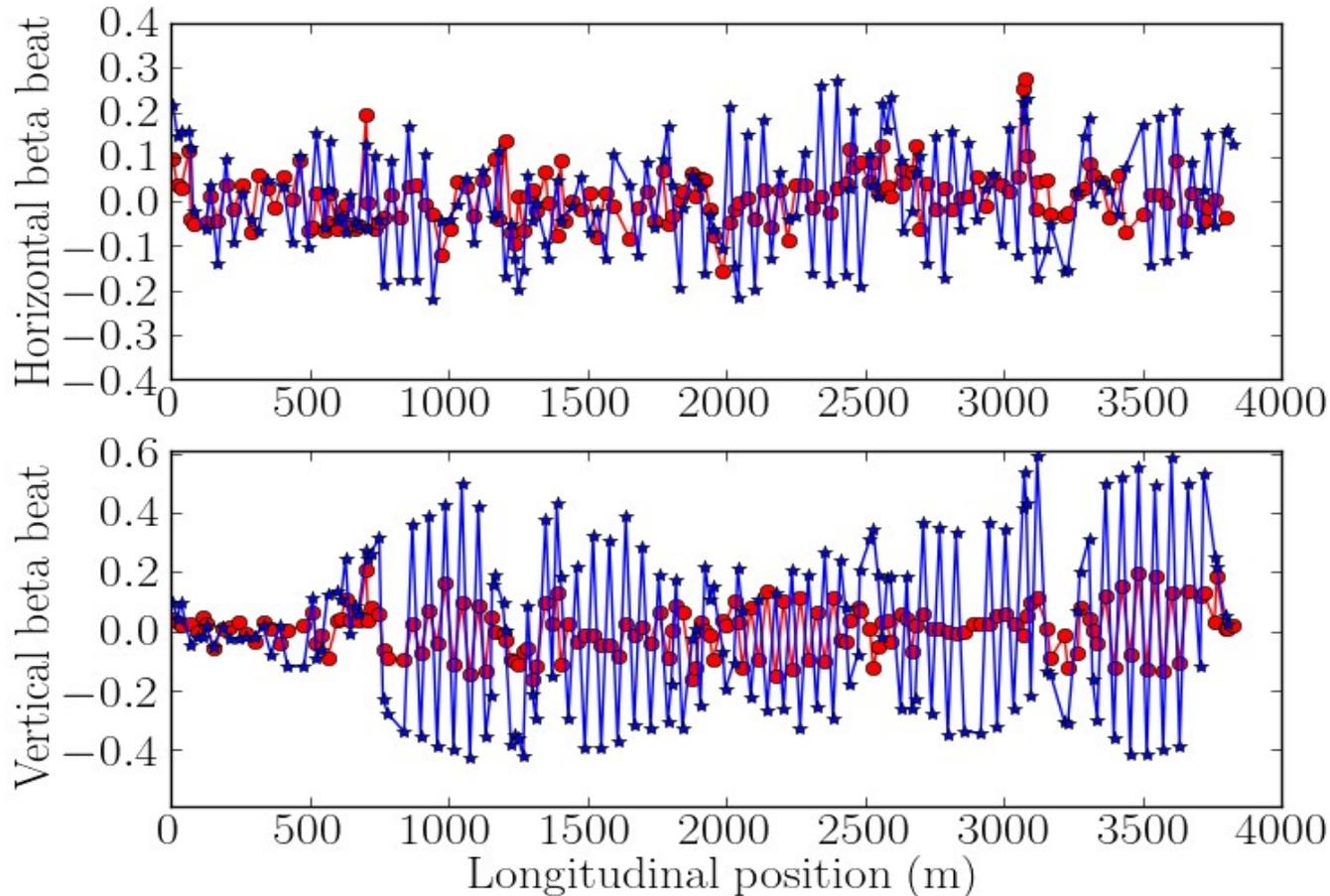
--global beta beat at store



Global beta beat at store measured for #18179 and #18288 for the Blue ring: the upper and lower are the horizontal and vertical beta beat, blue and red data are for #18179 and #18288.

# Correction results

--at an intermediate point, t260



Global beta beat at t260 measured for #18179 and #18288 for the Yellow ring: the upper and lower are the horizontal and vertical beta beat, blue and red data are for #18179 and #18288.

Interpolated corrections worked well on the ramp.

# Summary

- Ramp Optics Measurement is operational, optics information can be obtained every 4 s on the ramp, facilitated ramp tuning as well.
- Ramp Optics Correction is operational, corrected the optics on the ramp for the first time in a hadron collider, improved absolute emittance measurement by IPMs.