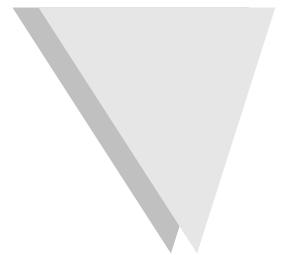
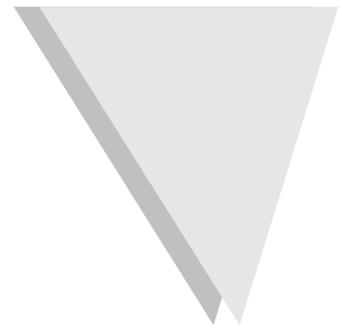
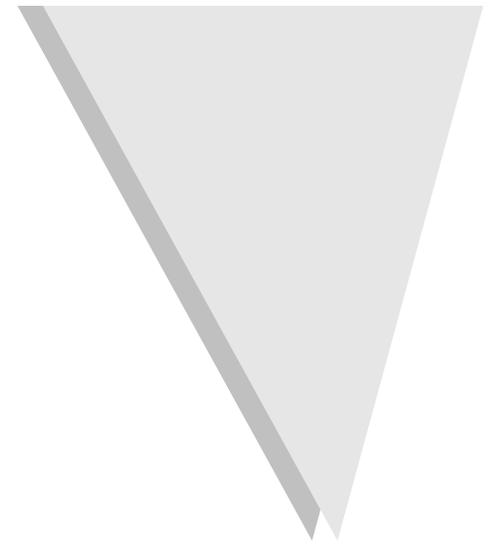


# Beta Squeeze, Triplet Correction/Performance

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# Beta-squeeze summary

- The lattices used:
  - $\beta^* = 10\text{m}$ , all IPs; Au injection
  - $\beta^* = 5\text{m}$ , all IPs; Au storage
  - $\beta^* = 3\text{m}$ , all IPs; p injection/storage
  - $\beta^* = 2\text{m}$ , all IPs; Au storage
  - $\beta^* = 1\text{m}$ , IP8; 2m, others IPs; Au storage
- Beta squeeze on the ramp worked very well
  - 28 stepstones for ramp21 ( $\beta^* = 1\text{m}$  squeeze)
  - Tune, chromaticity correction at each stepstone. Considerable changes during the squeeze.
  - The orbit correction at 4–7 stepstones

# IR triplet errors

- **Local skew correctors were put in early in the run.**
  - Most of them with the strengths calculated from previous run measurement (local bumps+action/angle methods)
  - Few IRs were corrected online using local bumps.
  - First turn difference orbit showed good compensation
  - At the flattop (and on the ramp) the same skew–corrector strengths as at the injection
- **Several times the corrector compensation was used**
  - The compensation involves the corrector on other side of the IR.
  - The two correctors at IR8 (bi8,yo8) required more than PS limit current at flattop and were compensated.
  - A tripped PS spoiled the ramp considerably → compensated.

# IR local skew corrections used last run

The screenshot shows a window titled "StepStone ramp19::injection" with a menu bar (File, Edit, Preferences) and tabs for "Blue", "Yellow", and "Green". Below the tabs are buttons for "SEXTUPOLE", "SKEW\_QUAD", "RF", and "SKEW\_SEXT". The main area contains a table with columns "SKEW\_QUAD", "want", "trim", and "ramp". The table lists skew correction values for 20 different quadrupoles. A red arrow points to the row for "bi8-qs3", which has a "trim" value of 0.0013.

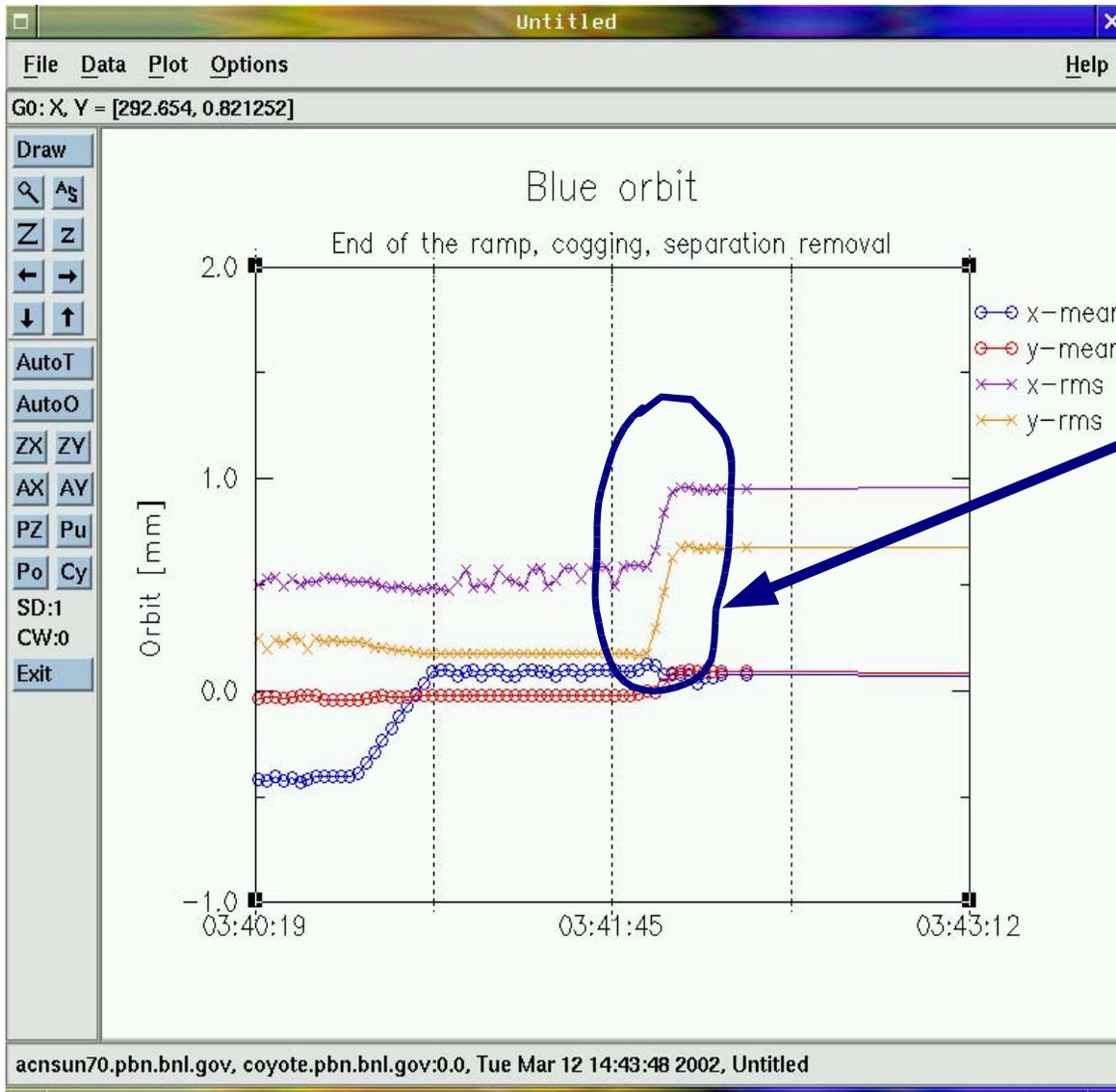
SKEW_QUAD	want	trim	ramp
bo6-qs3	0.0	0.0001	
bo7-qs3	0.0	-0.0008	
bi8-qs3	0.0	0.0013	
bi9-qs3	0.0	0.00035	
bo10-qs3	0.0	0.00065	
bo11-qs3	0.0	9e-05	
bi12-qs3	0.0	9e-05	
bi1-qs3	0.0	0.001	
bo2-qs3	0.0	0.0	
bo3-qs3	0.0	0.00032	
bi4-qs3	0.0	0.00032	
bi5-qs3	0.0	0.0004	
yi6-qs3	0.0	7e-05	
yi7-qs3	0.0	0.00036	
yo8-qs3	0.0	-0.0011	
yo9-qs3	0.0	0.0002	
yi10-qs3	0.0	0.001	
yi11-qs3	0.0	0.0003	
yo12-qs3	0.0	0.00035	
yo1-qs3	0.0	0.0002	
yi2-qs3	0.0	0.00076	
yi3-qs3	0.0	0.0004	
yo4-qs3	0.0	0.0005	
yo5-qs3	0.0	-0.00094	

8 o'clock triplet at IR8 required largest skew corrector strength both in Blue and Yellow rings

# IR triplet errors

- The collision bumps are still not completely closed
  - Beam separation removal at the flattop clearly indicates this
- Skew correctors should be revisited for the flattop
- Gradient errors should be evaluated
- The data for analysis from different sources:
  - Collision steering bumps
  - Difference closed orbit for action/angle analysis (Javier)
  - Beta and dispersion functions measurements (Todd)

# Orbit blowup when separation removed



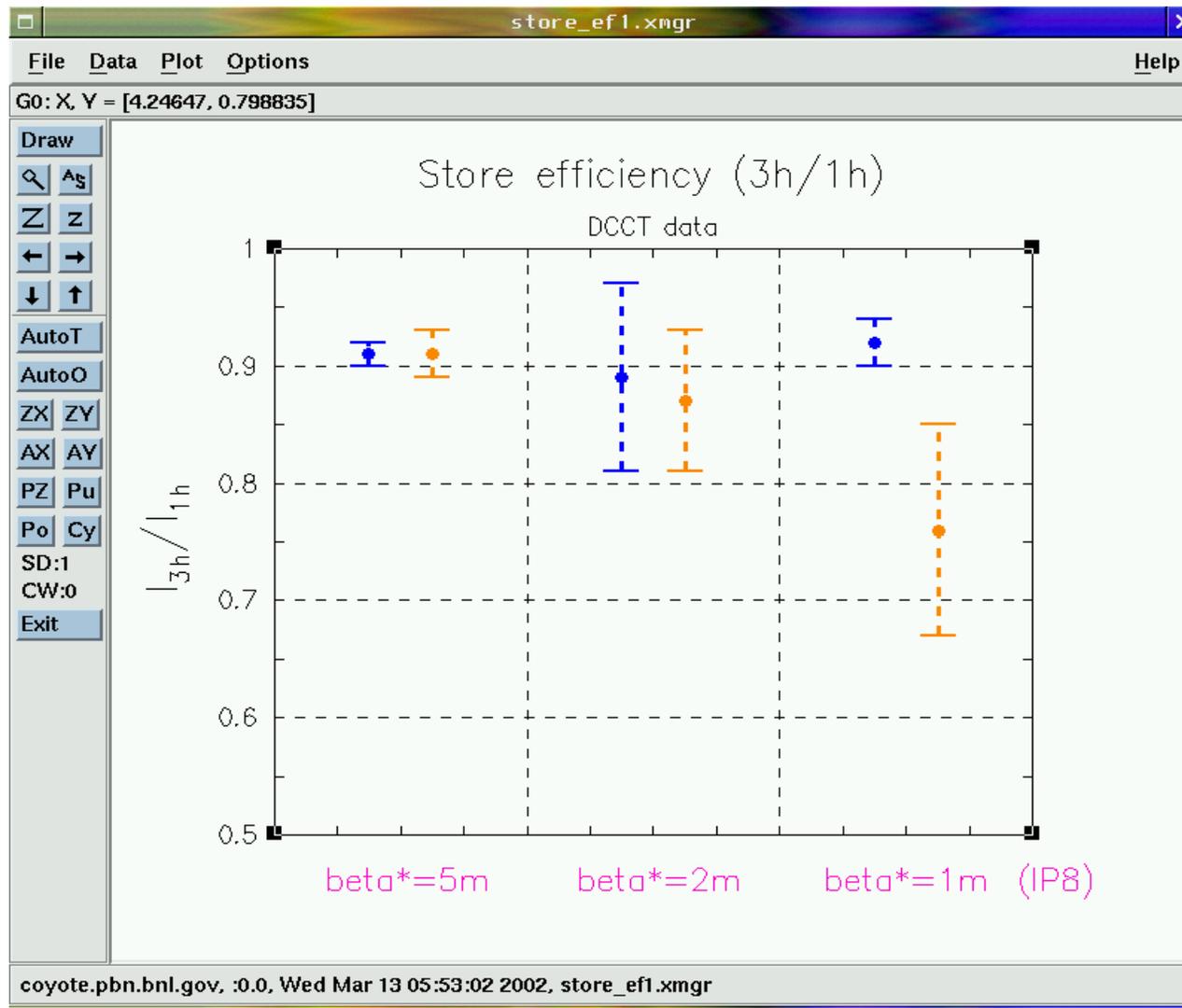
Some orbit blowup was still observed at the flattop during the vertical separation bumps (5mm) removal. The gradient and coupling error should be revised at the flattop.

# Nonlinear effects

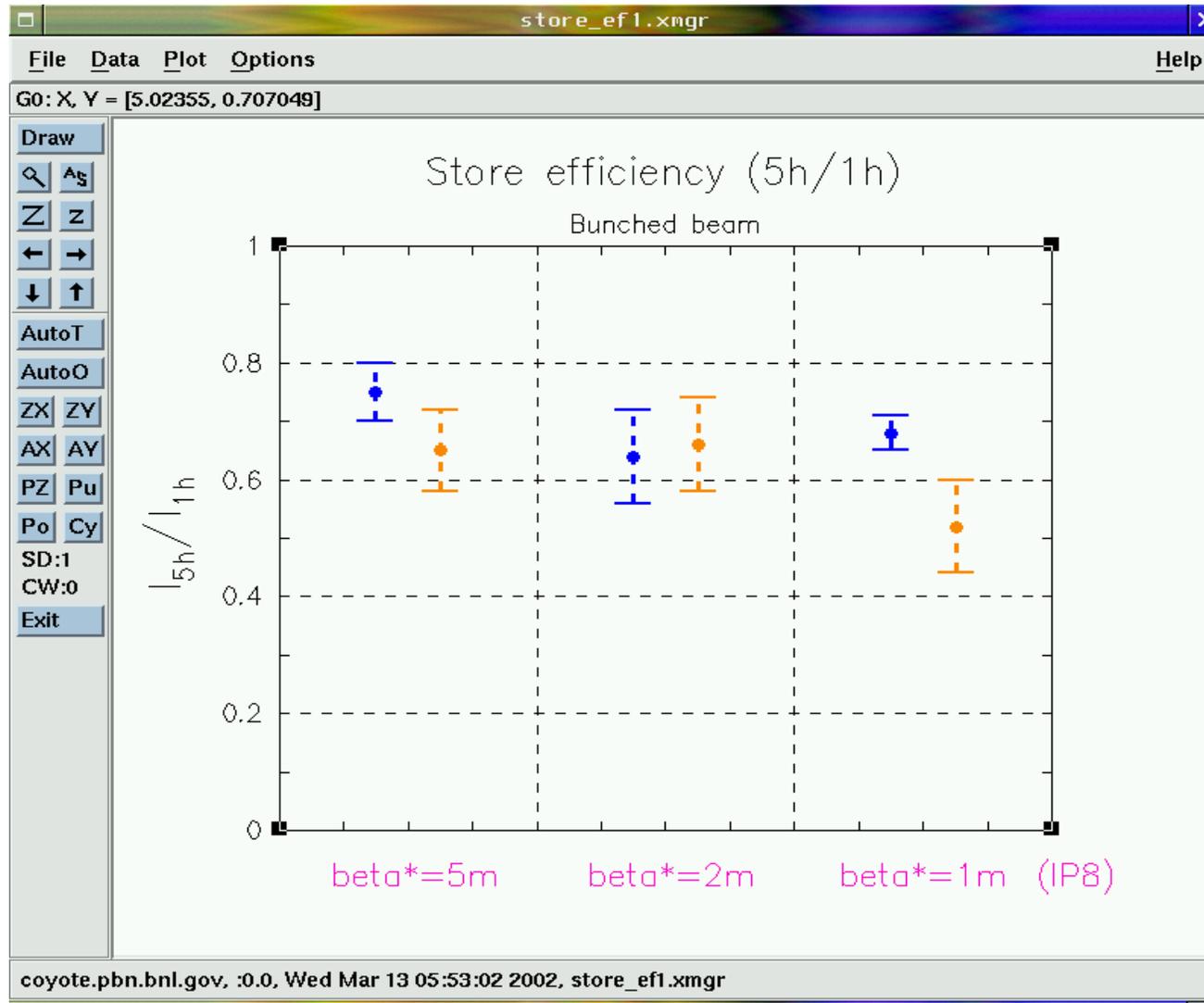
- Do we see any negative effects of the beta-squeezes?
  - Yes, the Yellow lifetime was deteriorated after squeezing PHENIX beta\* to 1m
- BRAHMS (IP2) wants to be squeezed to 1m too
  - Measured nonlinear tuneshifts from IR2 (local orbit bumps) does not look good (similar to Yellow IR8)
- Nonlinear corrections needed at both squeezed IRs
  - This run the corrections was demonstrated to work during the proton run
- Chromatic effects for beta\*=1m could be evaluated from the logged data

Store efficiency for different beta\* using 5 best stores for each optics.

Drop in Yellow efficiency (yellow lines), while Blue stays about the same.



# Store efficiency for bunched beam over 4 hours



# Measured linear (sextupole) component of the tune shift versus bump amplitude in IR8 and IR2.

Averaged over two transverse planes and two triplets.

