Beta* squeeze

APEX: December 12

Development: December 13

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+ Operations

Motivation

- Merging of APEX proposals 8-15 and 8-17
- Conjecture of unequal beam sizes affecting yellow beam lifetime →prepare ramp with squeeze only in yellow (dAu81)

With the 20/20 hindsight – since the conjecture weakened a bit ever since – we could have done both rings at the same time – but not too bad….

- Proof-of-principle in yellow
- Steve is preparing a ramp with both beam squeezed (dAu82), next step if dAu81 works

APEX -December 12

From the elog:

æ 11:15 **Plan for beta* squeeze**

(Fulvia, Todd, Vadim, Steve, Mei, Yun, Nikolay, Angelika, Vladimir, Al...)
ramp down to zero
load new ramp (dAu81)
hysteresis cycle and ramp check
(tuning if needed)
ramp 6x6 (no feedback, PLL on), then feedback

ramp development, tuning
if we get at store - store tuning (tunes, coupling, chrom), rates, backgrounds
physics-like ramp if all of the above works.
We also have the option of squeezing at store further to 0.6m

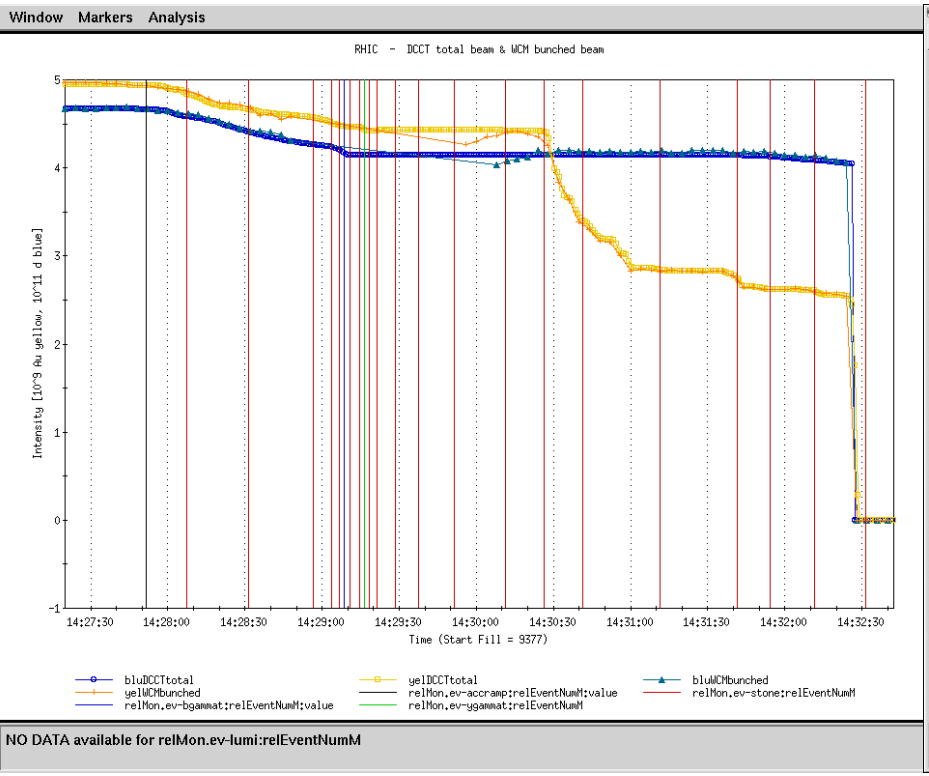
Preparation: PS work

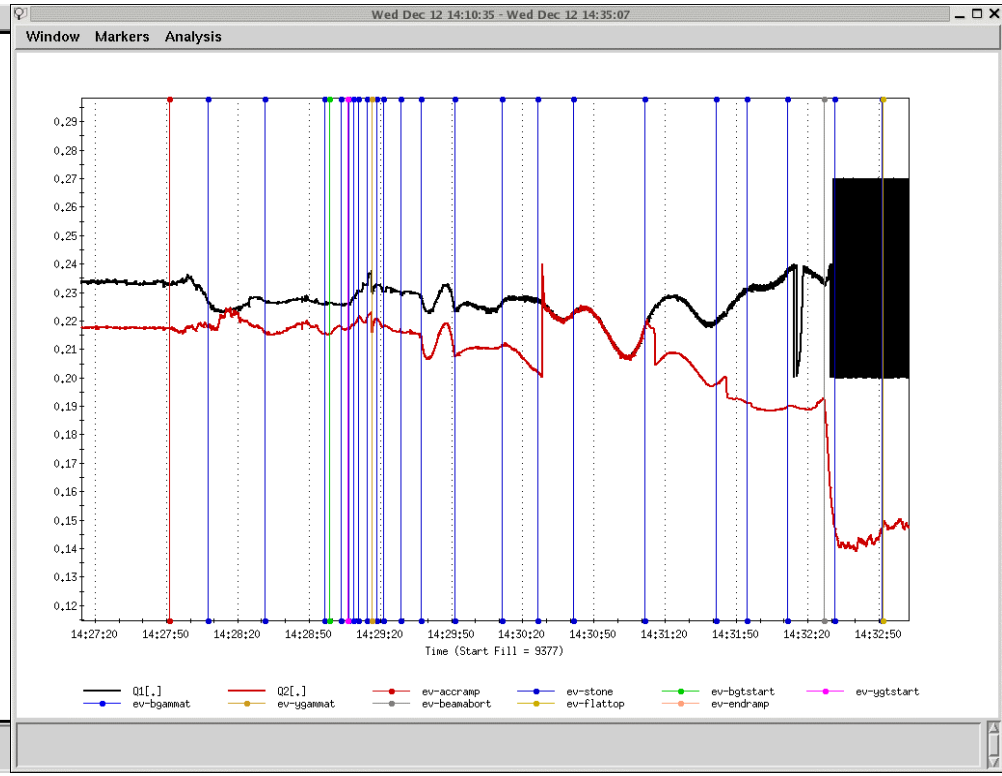
From 11am – 2pm we basically did PS ramp preparation: work done the day before was useful but one channel remained to be tuned. By 2pm we had a successful hysteresis ramp for dAu81

Incidentally: entry 13:20 from elog *(The Ghost of Xmas Present?):*

An interesting Quench, the 4b-qd1-Quench Detector brought down the Blue link due to a failure in the Blue Main Dipole Power Supply. While the Ramps were going from Park to Zero, **The Blue Main Dipole Current began to steadily rise to 130 amps on its own. There is no indication that it was told to do so**. The Iref and Program Current both told it to go to zero. There were no faults indicated and according to Carl, the Setpoint Trap contained no errors nor was there a Watchdog Fault. This one will require further investigation. -Gregg H. [rhic] [ps

With beam: ramp 1

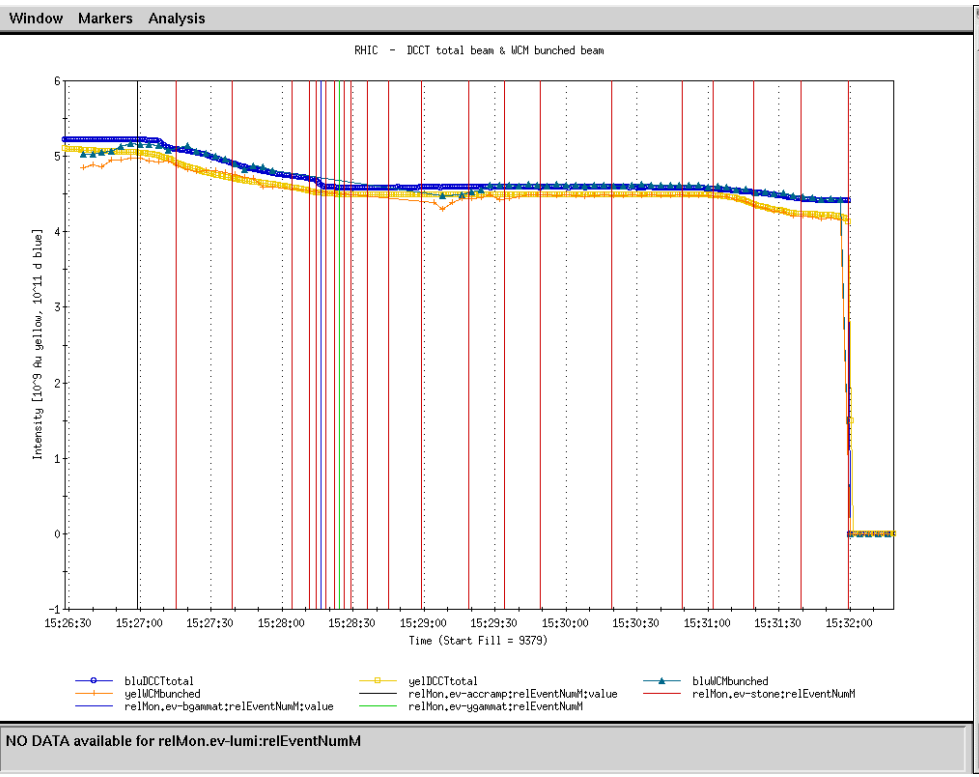


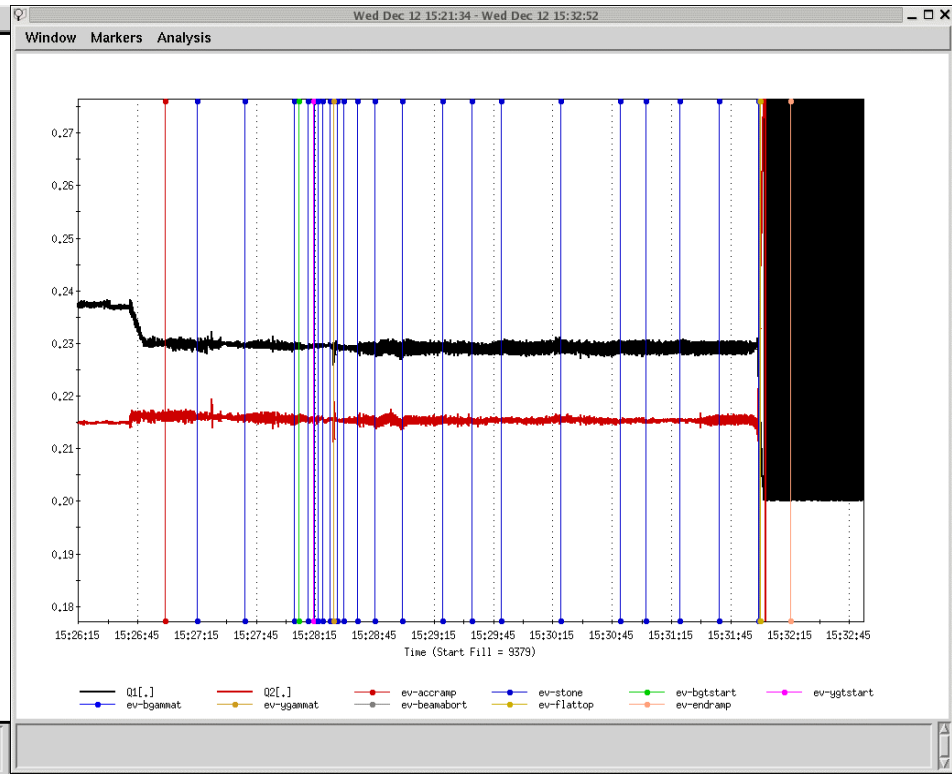


- No feedback
- Vtune below 0.2, Htune close to 0.25, huge coupling
- Bad orbits at the beginning of beta squeeze

→ Correct orbits on the ramp, try old trick to push down Vtune to get to store despite coupling → ramp 2 did not work

With beam: ramp 3 - feedback

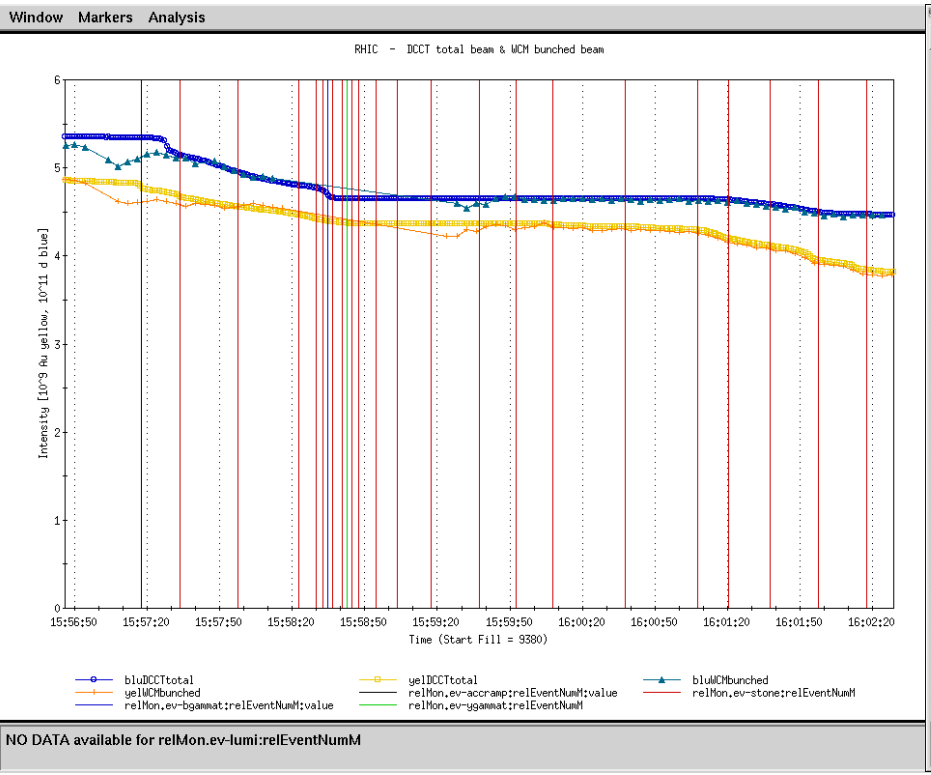


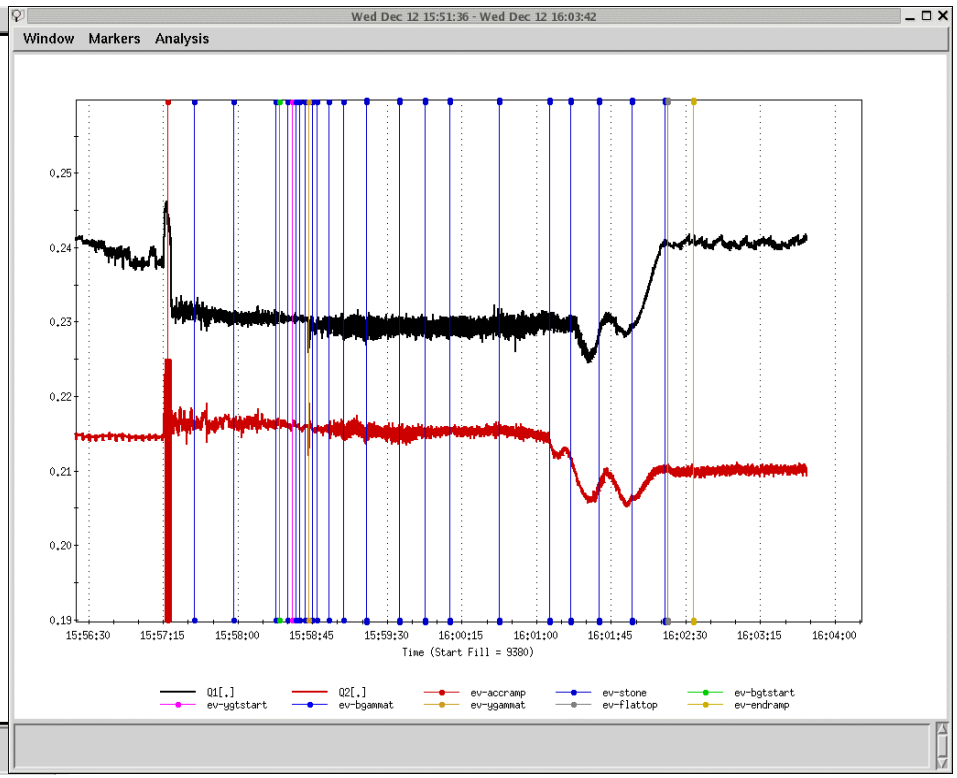


- Kept orbit correction and guesses for coupling corrections
- Almost got there (excursion attempt on 1 skew PS….)

Ramp4: replay + interpolation

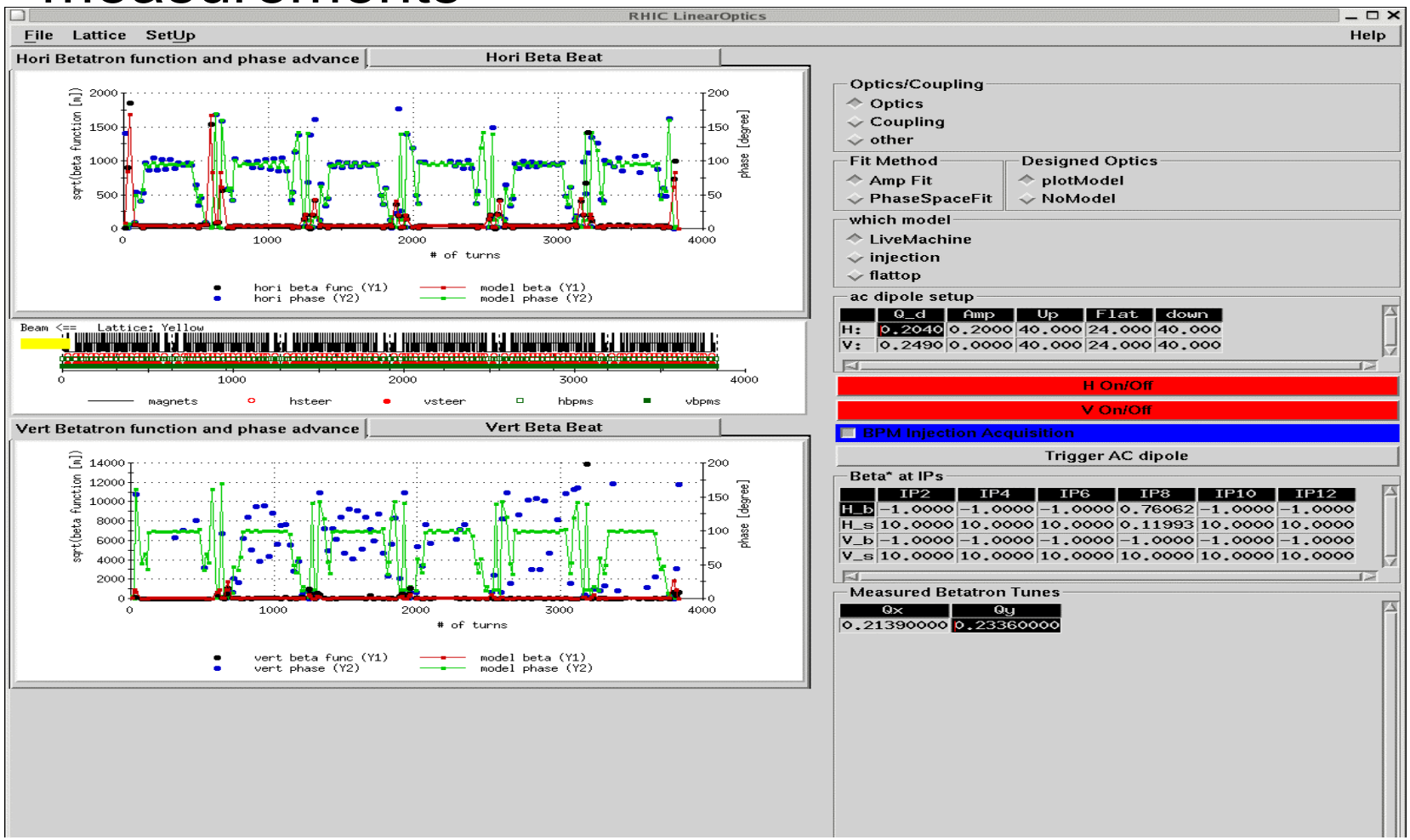
- 15:42 Larry has set up replay for us; if we replay yellow, we'll get the feedback ramp up to about t230, then we'll interpolate down to the store stone.Coupling changes put into store stone. Big changes. We are replaying to t230, then the ramp will linearly interpolate to these store stone settings. -TJS, Fulvia, Larry Hoff, et al





Ramp 5: more of the same

- Tune adjustments, coupling corrections, optics measurements



Development: December 13

æ 09:48 Shift plan: Plan for continuation of beta* squeeze development
Load dAu81 (Don, Wing)
Hysteresis ramp (ops)
Feed forward to dAu81 the settings of the last 'replayed' ramp from yesterday (Greg)
Feedback ramp in yellow - 6x6 - to get the beam to store and improve transmission (Al, Greg)

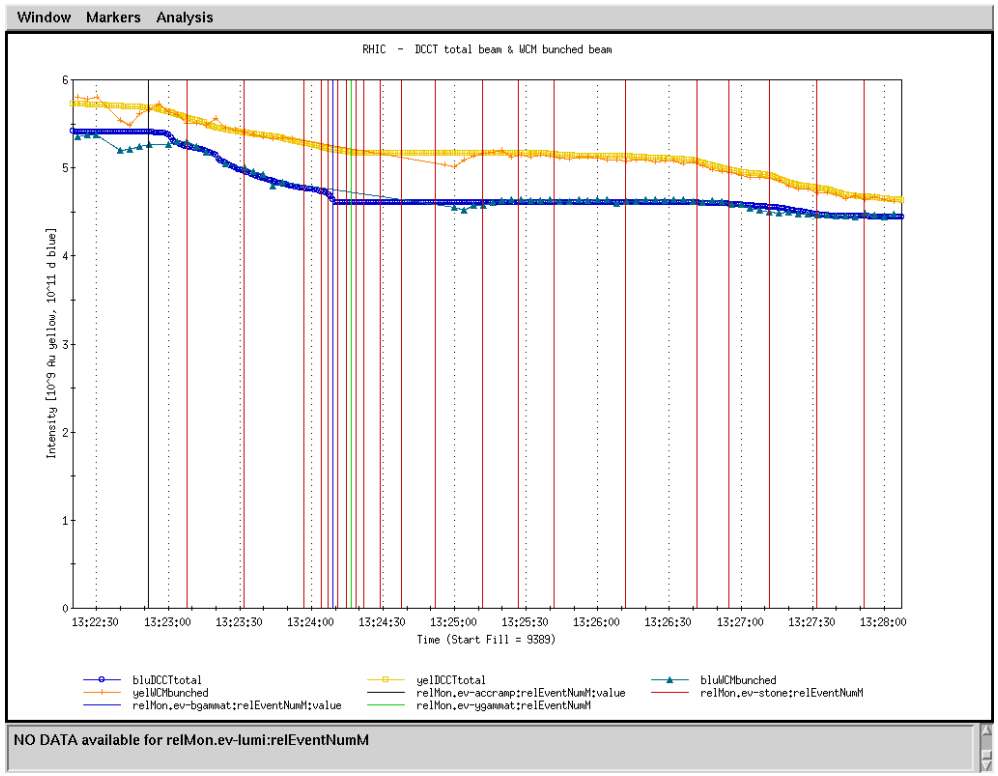
→reloaded and replayed yesterday ramp

Better tuning of store: orbit, decoupling, tunes, chrom...(Yun, Todd, Vadim)
Repeat optics measurements (Mei)
If/when ramp and store OK, load a 56 bunches physics store: measure rates, collimation and check backgrounds (Greg, ops)
Keep dAu81 or revert to dAu80 - depending on all of the above
(Steve is working on dAu82 - with squeeze in both rings)

Development December 12

From 10am to 1pm: PS work + attempts at feedback

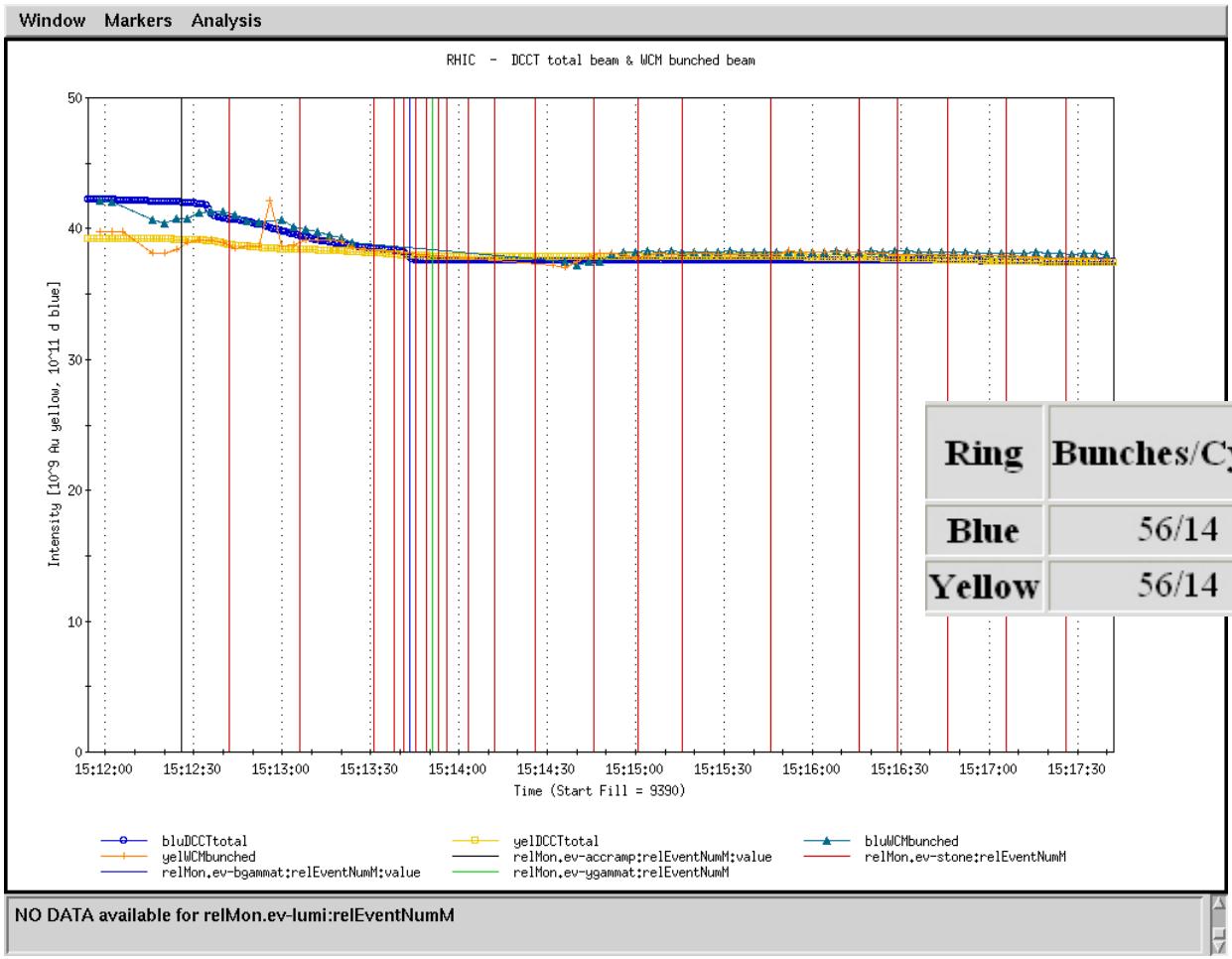
Reload ramp from yesterday: (6x6)



Yellow ramp efficiency is about 90% (or slightly more) without Artus

More tuning at store: bumps, tunes, chrom

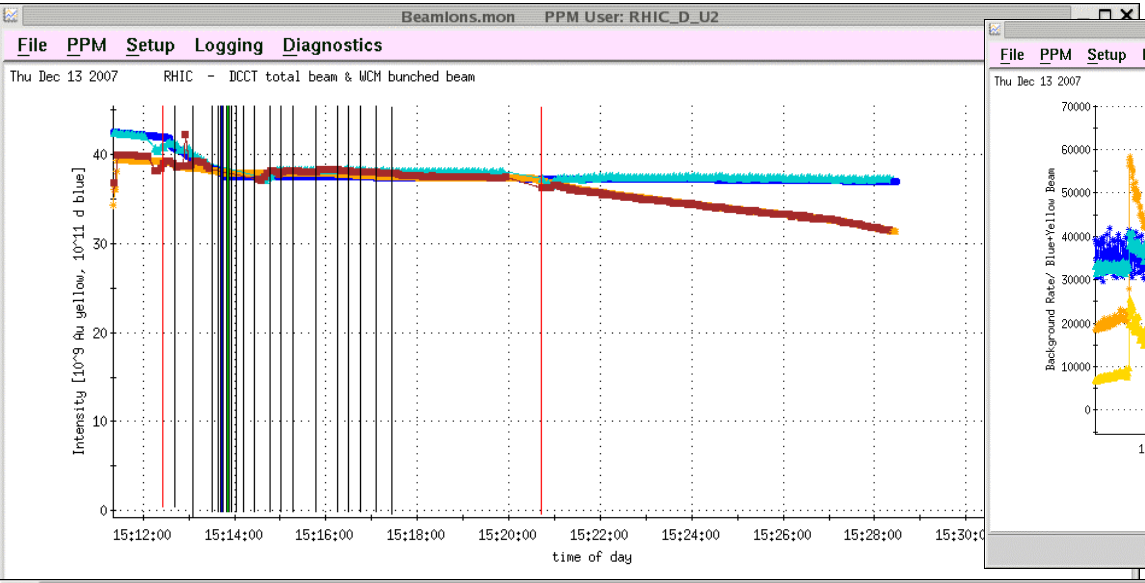
Physics-like ramp (56x56)

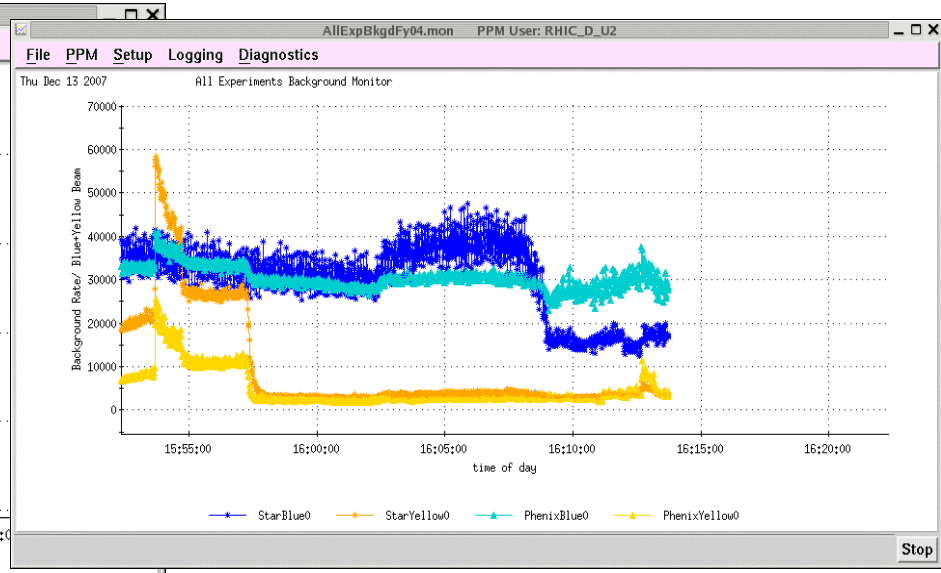


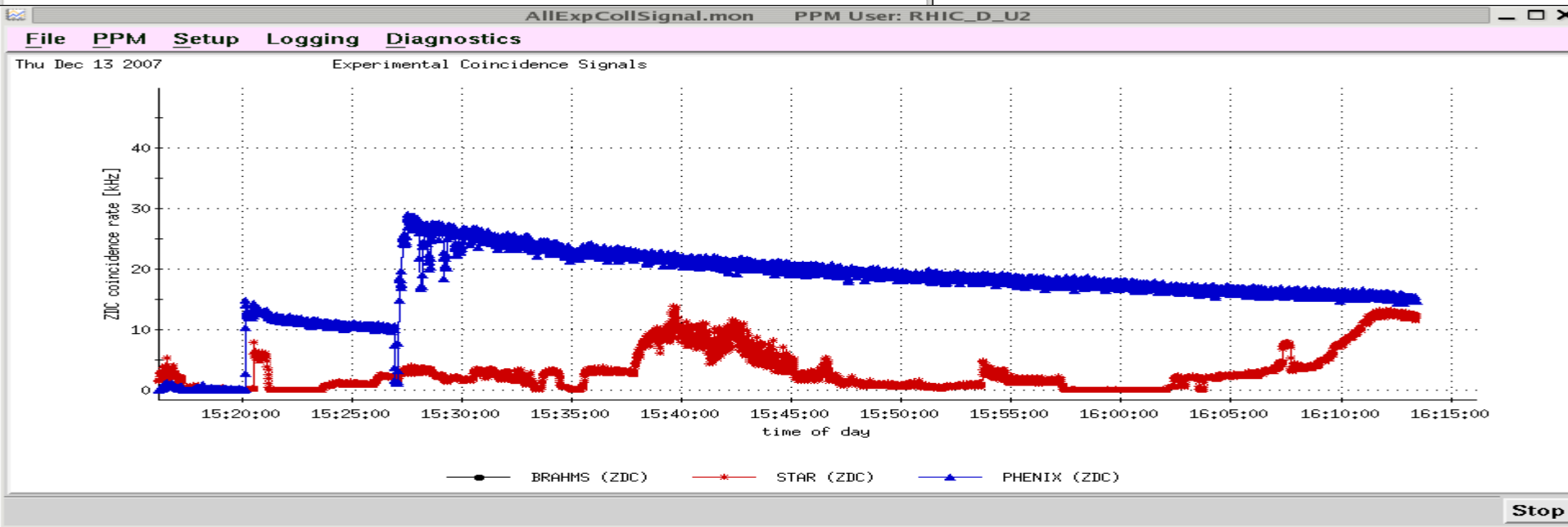
Ring	Bunches/Cycles	Avg Bunch in RHIC (10^6 ions)
Blue	56/14	89354
Yellow	56/14	702

æ 15:20 **Blue ramp efficiency: 89.1%, Yellow ramp efficiency: 95.6%** -tape

Collision set-up, collimation







Set-up for physics

- Eventually VP and VL found a good tune for good yellow lifetime
- Rebucketing good
- Emittance

Horizontal	Vertical	Horizontal	Vertical
Dec 13, 15:55:48	Dec 13, 15:55:48	Dec 13, 15:55:48	Dec 13, 15:55:48
150	150	1	1
17.0944	11.8067	18.2398	21.351
0.649075	1.43272	0.656715	2.4011

- Phenix and STAR got some data→ background levels 2-3 times higher

At 4:00 PM we made good progress but we were not ready for physics production → revert to dAu80

Needs to be done:

- Ramp full bunch intensity
- Verify yellow lifetime, rates
- Improve collimation
- Measure optics

Plan for tomorrow - DRAFT

Load Au81 (yellow squeeze)

- Physics ramp (87x 1-1.1e)
- Verify yellow lifetime, rates
- Improve collimation
- (Measure optics)

→ *OPERATIONS if successful*

Load Au82 (yellow + blue squeeze)

- PS ramp tuning (no beam)
- ramp 6x6 (feedback if possible), ramp development
- store tuning (tunes, coupling, chrom), steering, measure optics
- Physics ramp: rebucketing, steering, collimation
- STAR, Phenix taking data (test)

→ *OPERATIONS if successful*