

# d-Au Plan of the Day

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January 25, 2008

## 1 Sat 26 and Sun 27

1. The priority for the remainder of the d-Au run is Physics Production Stores with good rates.
2. Intensities should be limited to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
3. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up window which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)
4. d-Au run ends at 8 pm Sun 27 Jan.
5. APEX runs from 8 pm Sun 27 to 8 am Mon 28 Jan.

## 2 Fri 25 Jan

1. Near the end of this morning's store, Vadim, Nikolay, and Mei will again test the IR waist position knobs.
2. Then John Morris, Al Marusic, and Wolfram Fischer will test the injection drift compensation.
3. The priority for the remainder of the d-Au run is Physics Production Stores with good rates.
4. Intensities should be limited to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.

5. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up window which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)

### **3 Thur 24 Jan**

1. Near the end of this morning's store, Vadim, Nikolay, and Mei will test the IR waist position knobs. This is expected to take 15 to 20 minutes.
2. Then Carl Schultheiss will test the yellow dipole radial feedback loop at injection. This is expected to take one half hour. Greg Marr will look at blue injection kicker during this time.
3. After the next Physics store is put up, we will wait one half hour for stochastic cooling to take full effect and then measure beam decay rates with the beams in and out of collision. Then vernier scans will be done at both IPs. Near the end of this store, Vadim, Nikolay, and Mei will again test the IR waist position knobs.
4. For the subsequent store Angelika would like to do collimation on the ramp.
5. The priority for the remainder of the d-Au run is Physics Production Stores with good rates.
6. Intensities should be limited to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
7. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up window which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)

### **4 Wed 23 Jan**

1. APEX from 5 am to 5 pm.
2. The priority for the remainder of the d-Au run is Physics Production Stores with good rates.

3. Intensities should be limited to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
4. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up window which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)
5. Experience has shown that adjusting yellow store-stone tunes during a store can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for subsequent stores. If you do make tune changes during a store, please put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Ramp history has shown that these are good tune setpoints.)

## 5 Tue 22 Jan

1. The priority for the remainder of the d-Au run is Physics Production Stores with good rates.
2. Intensities should be limited to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
3. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up window which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)
4. Experience has shown that adjusting yellow store-stone tunes during a store can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for subsequent stores. If you do make tune changes during a store, please put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Ramp history has shown that these are good tune setpoints.)

## 6 Mon 21 Jan

1. RF personnel (Kevin Smith) will investigate problems with “baby bunches”, AGS L10 cavity, and Booster-to-AGS Synchro.
2. Keith Zeno will tune deuteron and gold setups in Booster and AGS.
3. Vernier scans for Star and Phenix will be done at the end of this morning’s store.
4. The priority for the remainder of the d-Au run is Physics Production Stores with good rates.
5. Intensities should be limited to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
6. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up window which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)
7. Experience has shown that adjusting yellow store-stone tunes during a store can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for subsequent stores. If you do make tune changes during a store, please put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Ramp history has shown that these are good tune setpoints.)

## 7 Sat 19 and Sun 20 Jan

1. The priority for the remainder of the d-Au run is Physics Production Stores with good rates.
2. Intensities should be limited to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
3. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up window which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)

4. Experience has shown that adjusting yellow store-stone tunes during a store can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for subsequent stores. If you do make tune changes during a store, please put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Ramp history has shown that these are good tune setpoints.)

## 8 Fri 18 Jan

1. The priority for the remainder of the d-Au run is Physics production stores with good rates.
2. Intensities should be  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
3. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)
4. Wolfram has put octupole settings back to  $-12 \text{ m}^{-3}$  at transition in yellow.
5. Christoph has restored chromaticity settings near transition in blue and yellow to values they had on ramps that produced good ZDC rates.
6. Mike Brennan and John Butler would like to modify yellow Landau cavity setup so that the cavity damper is NOT inserted prior to rebucketing. (The setup in blue was modified with no ill effects.)
7. Experience has shown that adjusting yellow store-stone tunes after a store has been put up can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for subsequent stores. If you do make tune changes after a store has been put up, please put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Ramp history has shown that these are good tune setpoints.)

## 9 Thur 17 Jan

1. When this morning's store (9593) is finished, Carl Schultheiss and Mike Brennan will test yellow main dipole radial feedback loop with 6 bunches at injection. This effort will take one half hour.
2. As per Jim Jamilkowski: John Morris reports that the system disk for the primary database server (OPSYB1) has developed a problem. While PHENIX makes an IR access early this afternoon, the backup server (OPSYB2) will be started up and the system disk for OPSYB1 will be repaired. Total downtime will be from about one hour to two and a half.
3. Christoph would like to lower the vertical chromaticity in blue by two units at stones beta5 and gammat2, but the RampEditor gives error message "could not set optics functions in the model". We need Nikolay to fix this but he can not be reached.
4. For the next Physics production stores, intensities should be  $1.1 \times 10^{11}$  deuterons and  $1.2 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
5. Longitudinal quadrupole damper should be active at transition in yellow. Voltage step (to 95 kV) at transition should be active in blue.
6. Make sure the orbit is being corrected on the ramp in both rings using orbit data from an appropriate previous ramp. (A pop-up which tells the operator what to do is supposed to appear during the Tape sequence for each ramp.)
7. Experience has shown that adjusting yellow store-stone tunes after a store has been put up can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for the next store. If you do make tune changes after a store has been put up, it is probably best to put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Recent history has shown that these are good tune setpoints.)

## 10 Wed 16 Jan

1. Maintenance until 4 pm.

2. For the first Physics production store after maintenance, use the 95 bunch pattern introduced by Wolfram yesterday. Limit intensities to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection. Longitudinal quadrupole damper should be active at transition in yellow (as per Natalia Abreu).
3. For subsequent fills, increase intensities to  $1.2 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection with 95 bunches per ring.
4. Experience has shown that adjusting yellow store-stone tunes after a store has been put up can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for the next store. If you do make tune changes after a store has been put up, it is probably best to put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Recent history has shown that these are good tune setpoints.)

## 11 Tue 15 Jan

1. For the next fill (9578), Blaskiewicz will program RF voltage in yellow at transition with hopes of fixing quadrupole oscillations. Also, quadrupole mode damping circuitry will be installed for Natalia.
2. For this fill (9578), limit intensities to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 93 bunches per ring.
3. For subsequent fills, increase intensities to  $1.2 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection with 93 bunches per ring.
4. Experience has shown that adjusting yellow store-stone tunes after a store has been put up can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for the next store. If you do make tune changes after a store has been put up, it is probably best to put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Recent history has shown that these are good tune setpoints.)

## 12 Mon 14 Jan

1. Continue putting up Physics production stores with the original (not “Fancy Gap”) bunch pattern.
2. Limit intensities to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 93 bunches per ring.
3. Experience has shown that adjusting yellow store-stone tunes after a store has been put up can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for the next store. If you do make tune changes after a store has been put up, it is probably best to put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Recent history has shown that these are good tune setpoints.)
4. For ramp 9574, Christoph increased horizontal and vertical chromaticities in yellow by one unit at stones gammat4 and gammat5.
5. Although there was only a small signal of horizontal instability near transition in yellow for this ramp (9574), the ZDC rate was only 100 kHz for Phenix.
6. For the ramp 9575, Vadim and Wolfram increased yellow tunes (horizontal and vertical) at transition (gammat4 and gammat5) by 0.0005.
7. For ramps after 9575, Wolfram has taken out the increases in chromaticity made by Christoph for ramp 9574.
8. For ramps after 9575, increase deuteron intensity to  $1.2 \times 10^{11}$  deuterons per bunch in blue at injection.
9. Fix RF quadrupole oscillations in yellow at transition (Blaskiewicz).  
**Deferred.**
10. Email from Wolfram:  
Christoph, Kip, Thomas, Mike, Vadim,  
So far we were not able to accelerate the same amount of Au beam through transition that we did in Run-7:  
(a) Run-8: 93 bunches with 1e9, with instability

- (b) Run-7: 103 bunches with  $> 1.1e9$ , without instability (i.e. about 20% less).

The differences I am aware of are:

- (a)  $\text{gammat}=26$  (Run-8) vs.  $\text{gammat}=23$  (Run-7)
- (b) difference in chromaticity set points before and after transition is about 10 units for Run-8 vs. about 5 units in Run-7 (both planes)
- (c) the octupoles in Run-8 are now more than twice as strong as in Run-7 ( $12$  vs.  $5 \text{ m}^{-3}$ ), the latest increases did not show any improvement
- (d) the electron cloud contribution to the instability from the Blue beam is weaker in Run-8 than it was in Run-7 (transition in Blue is 8sec earlier)

The instability is now always after transition (within 500ms), presumably at the point where we cross zero chromaticity. The growth time is about 100ms (from Pete's pictures).

In the past, crossing zero chromaticity before transition was better, although we don't know why.

Should we try to move the point where we cross zero chromaticity to before transition? Any other idea?

## 13 Sat 12 and Sun 13 Jan

1. Continue putting up Physics production stores with the original (not "Fancy Gap") bunch pattern.
2. Limit intensities to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 93 bunches per ring.
3. Experience has shown that adjusting store-stone tunes after a store has been put up can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for the next store. If you do make tune changes after a store has been put up, it is probably best to put the yellow store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Recent history has shown that these are good tune setpoints.)

4. Although the yellow ramp transmission efficiency is very good, beam instability near transition persists. This increases gold beam emittance and reduces luminosity. Wolfram has been incrementally increasing the octupole strength (at transition) to combat this.

## 14 Fri 11 Jan

1. Near the end of the present store (9560) Mike Brennan would like to see if lowering the yellow storage cavity voltage (thereby reducing momentum spread and tune spread) reduces yellow decay rate.
2. Also do a BTF measurement to see where the tunes are at the end of store 9560.
3. Put yellow store-stone tunes back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$ . Recent history has shown that these are good tunes.
4. Go back to original (not “Fancy gap”) bunch pattern.
5. Continue putting up Physics production stores.
6. Limit intensities to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 93 bunches per ring.
7. Experience has shown that adjusting store-stone tunes after a store has been put up can be misleading. Even though these changes may improve the beam lifetime, they may make the lifetime worse for the next store. If you do make tune changes after a store has been put up, it is probably best to put the store-stone setpoints back to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  before the next ramp. (Recent history has shown that these are good tune setpoints.)
8. Although the yellow ramp transmission efficiency is very good, beam instability near transition persists. This increases gold beam emittance and reduces luminosity. Wolfram has been incrementally increasing the octupole strength (at transition) to combat this.

## 15 Thur 10 Jan

1. Continue putting up Physics production stores.

2. Limit intensities to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 93 bunches per ring.
3. Continue using the bunch pattern with large gaps.
4. Mike Brennan and John Butler would like to modify yellow Landau cavity setup so that the cavity damper is NOT inserted prior to rebucketing. (The setup in blue was modified last week with no ill effects.)

Other items for consideration:

1. Go back to original bunch pattern to see if this really makes a difference in initial ZDC rates.
2. Assorted RF changes (said to be benign).
3. Periodic vertical orbit correction at store using Micado.
4. IR dispersion knobs.
5. Implement “smoothed out” replay in yellow (as per John Morris, 15:59 Fri 4 Jan rhic-dau-2008 elog).
6. Fix RF quadrupole oscillations in yellow at transition (Blaskiewicz).
7. Chromaticity jump test at injection (Montag).
8. Injection drift compensation (Hoff, Morris).

## 16 Wed 9 Jan

1. APEX from 5 am to 5 pm.
2. For the first Physics Store after APEX try to reproduce the conditions we had for “Golden Store” 9546 (Tue 8 Jan 3:55 am). For this store the intensities were  $1.1 \times 10^{11}$  deuterons and  $0.9 \times 10^9$  gold ions per bunch in RHIC at injection with 93 bunches per ring. (The initial ZDC rates were close to 160 kHz for Phenix.)
3. Continue using the bunch pattern that was introduced early Tuesday morning. (Tomorrow we may go back to the original pattern to see if this really makes a difference in initial ZDC rates.)

4. Mike Brennan and John Butler would like to modify yellow Landau cavity setup so that the cavity damper is NOT inserted prior to rebucketing. (The setup in blue was modified last week with no ill effects.) This should be done after a good Physics Store has been established following APEX.

## 17 Mon 7 and Tue 8 Jan

1. After store 9539 is dumped (and before the next ramp), set store-stone tunes to  $Q_H = 31.2488$  and  $Q_V = 32.3700$  in yellow. (Over the weekend we wandered away from these settings and had poor beam lifetime in yellow.)
2. For some reason beam is going unstable at intensities for which beam has been stable in the past. For now, limit intensities to  $1.1 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection with 93 bunches per ring.
3. Use the bunch fill pattern introduced by Brian van Kuik early Tuesday morning. This pattern, which has gaps, gave a store with the highest peak luminosity observed so far this run. (The jury is still out on whether or not the pattern is the reason for the higher rates.)

## 18 Sat 5 and Sun 6 Jan

1. Continue putting up Physics production stores using Ramp dAu82. (This ramp uses 0.7 m beta-star lattices in both yellow and blue.) Fill each ring with 87 bunches. The bunch intensities should be at least (but preferably more than)  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. Remember to have ramp replay ON for both blue and yellow.
2. Try increasing number of bunches per ring from 87 to 93.
3. Nominal tunes at store (as per configuration control) are  $Q_H = 0.2385$ ,  $Q_V = 0.2282$  in blue, and  $Q_H = 0.225$ ,  $Q_V = 0.235$  in yellow.
4. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.

5. Continue correcting vertical orbit in yellow and blue during store.  
This has been automated and should be done every half-hour as long as it helps decrease beam decay rate.
6. As per Angelika, please do at least one vernier scan in the same store in IR6 and IR8 over the weekend:
  - (a) Make sure you inform the experiments before you start (they usually can keep taking data).
  - (b) Use the default settings in lisa (adjusted Friday afternoon).
  - (c) Do IR6 first, keep collimators in.
  - (d) Do IR8 after that; depending on the ring you picked, pull out corresponding collimators before you do the scan
  - (e) Bring collimators back in and continue physics or dump (depending when you decide to do the scan).

## 19 Fri 4 Jan

1. Getting good steady gold beam at RHIC injection seems to be a problem as of late. Can anything be done?
2. Early in the run we had  $1.4 \times 10^{11}$  deuterons and  $1.4 \times 10^9$  gold ions per bunch in RHIC at injection. It would be useful to have these levels readily available so that we can easily try ramps with higher bunch intensity.
3. There is large mean radius excursion and visible transition loss in yellow since Phenix magnet polarity change. Vadim suggests we correct radial excursion with small adjustment of yellow bend trim at transition. He will make this adjustment before the next store goes up this morning.
4. Test waist position knobs using a 6x6 store (Vadim, Nikolay, Todd). This is deferred until the next APEX period. However, at the end of a store today, the knobs will be tuned to see whether or not they increase luminosity.
5. Is injection drift compensation (IDC) ready to be made active? The plan has been to first make it active with zero compensation. According to Larry Hoff IDC will not be ready until 21 January.

6. Try increasing number of bunches to 93 per ring? Wolfram says yes, so we will try this for the store that goes up this afternoon.
7. John Morris will “smooth out” yellow replay file to prevent the excursion errors that now occur during each ramp.
8. Switch air conditioning ON and OFF during a store to see if this is the noise source that has been plaguing us.
9. Continue putting up Physics production stores using Ramp dAu82. (This ramp uses 0.7 m beta-star lattices in both yellow and blue.) Fill each ring with 87 bunches. The bunch intensities should be at least (but preferably more than)  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. Remember to have ramp replay ON for both blue and yellow.
10. Nominal tunes at store (as per configuration control) are  $Q_H = 0.2385$ ,  $Q_V = 0.2282$  in blue, and  $Q_H = 0.225$ ,  $Q_V = 0.235$  in yellow.
11. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.
12. Continue correcting vertical orbit in yellow and blue during store. This has been automated and should be done every half-hour as long as it helps decrease beam decay rate.

## 20 Thur 3 Jan

1. Polarity of Phenix magnets was reversed during yesterday’s maintenance. Afterwards tune and coupling adjustments were made by Greg Marr and Yun Luo in blue at injection and store with the result that ramps with good transmission efficiency were achieved with the existing blue and yellow replay files.
2. Today Vadim found vertical separation bump in IR2 in a poor state and fixed it. This eliminated beam loss in blue that was occurring when gold was injected into yellow.
3. Greg Marr found (today) that yellow injection kicker timing had to be adjusted to restore good injection efficiency in yellow.

4. Vadim notes that: “Yellow mean radial orbit was considerably affected by PHENIX magnet polarity change. Yellow bend trim at the transition can be readjusted by 1e-6 to 2e-6 to correct for this, if needed.”
5. After Store 9517 is dumped (scheduled dump time is 6 pm), Mike Brennan and John Butler would like to setup up blue Landau cavity so that the damper is NOT inserted prior to rebucketing. If this helps blue rebucketing we will stay with this change; otherwise we will revert to the original setup.
6. Continue putting up Physics production stores using Ramp dAu82. (This ramp uses 0.7 m beta-star lattices in both yellow and blue.) Fill each ring with 87 bunches. The bunch intensities should be at least (but preferably more than)  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. Remember to have ramp replay ON for both blue and yellow.
7. Nominal tunes at store (as per configuration control) are  $Q_H = 0.2385$ ,  $Q_V = 0.2282$  in blue, and  $Q_H = 0.225$ ,  $Q_V = 0.235$  in yellow.
8. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.
9. Continue correcting vertical orbit in yellow and blue during store. This has been automated and should be done every half-hour as long as it helps decrease beam decay rate.

## 21 Wed 2 Jan

1. APEX ends at 8 am; Maintenance until 5 pm.
2. During the maintenance period, Phenix will reverse the polarity of their magnet. This will require tune and coupling adjustments at injection and possibly later in the ramp.
3. For the first ramp after maintenance we will use six bunches per ring. Tunes and coupling will be adjusted at injection to compensate for the Phenix magnet polarity reversal. We will then ramp using the existing replay in each ring. If this is not successful we may have to

do new feedback ramps. Yun Luo will lead the effort with the assistance of Al Dellapenna.

## 22 Mon 31 Dec and Tue 1 Jan

1. Continue putting up Physics production stores using Ramp dAu82. (This ramp uses 0.7 m beta-star lattices in both yellow and blue.) Fill each ring with 87 bunches. The bunch intensities should be at least (but preferably more than)  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. Remember to have ramp replay ON for both blue and yellow.
2. Nominal tunes at store (as per configuration control) are  $Q_H = 0.2385$ ,  $Q_V = 0.2282$  in blue, and  $Q_H = 0.225$ ,  $Q_V = 0.235$  in yellow.
3. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.
4. Correct vertical orbit in blue and yellow during store. This has been automated and should be done every half-hour as long as it helps decrease beam decay rate.
5. If Angelika is available, Phenix would like a vernier scan done at the beginning of a store.
6. Adjust tunes around transition in blue (Christoph Montag) for next ramp.
7. APEX starts at 8 pm on Tue 1 Jan.

## 23 Fri 28, Sat 29, and Sun 30 Dec

1. Continue putting up Physics production stores using Ramp dAu82. (This ramp uses 0.7 m beta-star lattices in both yellow and blue.) Fill each ring with 87 bunches. The bunch intensities should be at least (but preferably more than)  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. Remember to have ramp replay ON for both blue and yellow.

2. Nominal tunes at store (as per configuration control) are  $Q_H = 0.2385$ ,  $Q_V = 0.2282$  in blue, and  $Q_H = 0.225$ ,  $Q_V = 0.235$  in yellow.
3. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.
4. Correct vertical orbit in blue and yellow during store. This should be done every hour as long as it helps decrease beam decay rate.

## 24 Thur 27 Dec

1. Continue putting up Physics production stores using Ramp dAu82. (This ramp was commissioned during Wed 26 Dec APEX period. It uses reduced beta-star (0.7 m) lattices in both yellow and blue.) Fill each ring with 87 bunches. The bunch intensities should be at least (but preferably more than)  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. Remember to have ramp replay ON for both blue and yellow.
2. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.
3. Set up automatic periodic orbit correction during store.

## 25 Wed 26 Dec

1. APEX begins at 6 am. Setup reduced beta-star lattice in **blue** with Ramp dAu82. This ramp uses reduced beta-star lattices in both yellow and blue. If all goes well, it will become the ramp for subsequent Physics production stores. Otherwise we will go back to Ramp dAu81.
2. Wolfram suggests study in which locations of IP6 and IP8 collision points are changed by adjusting longitudinal phase. Look at ZDC rates versus collision point location.
3. Set up automatic periodic orbit correction during store.

## 26 Mon 24 and Tue 25 Dec

1. Continue putting up Physics production stores using Ramp dAu81. (This ramp uses the reduced beta-star lattice in yellow and the nominal lattice in blue.) Fill each ring with 87 bunches. The bunch intensities should be  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. (Remember to have ramp replay ON for both blue and yellow.)
2. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.

## 27 Sat 22 and Sun 23 Dec

1. Continue putting up Physics production stores using Ramp dAu81. (This ramp uses the reduced beta-star lattice in yellow and the nominal lattice in blue.) Fill each ring with 87 bunches. The bunch intensities should be  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. (Remember to have ramp replay ON for both blue and yellow.)
2. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.

## 28 Fri 21 Dec

1. Continue putting up Physics production stores using Ramp dAu81. (This ramp uses the reduced beta-star lattice in yellow and the nominal lattice in blue.) Fill each ring with 87 bunches. The bunch intensities should be  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. (Remember to have ramp replay ON for both blue and yellow.)
2. Adiabatic changes in the setup may be made to improve machine performance and increase luminosity.
3. Mike Brennan wants one-half hour of time between stores to work on RF phase at RHIC injection.

4. Try to reduce losses in blue between injection and transition. Changes in tune and chromaticity settings between injection and transition were tried yesterday but did not help. The current speculation is that this is a longitudinal problem.
5. Investigate deuteron bunch width at AGS extraction? (Why so wide?)
6. Email from Angelika regarding Phenix background signals and study:  
After talking to Mike Leitch we have changed the signals to look at for PHENIX backgrounds (using one of the scintillators close to the Q2 magnet rather than one closer to the detector). It's S2 (blue) and N2 (yellow). There is a new GPM monitor reflecting this change: AllExpBkgdFy08.mon. This is also being logged now. The collimator application was changed accordingly. At this point just look to minimize these signals as there are no operational limits from PHENIX yet. There is no subtraction of a collision component (but from looking at pervious vernier scans there seem to be no need of that!).

In order to get to those limits we'll have to study the correlation between collimator position, background rate seen in S2 and the current in the MuID tubes. The update rate of the latter is slow: approximately 2 minutes. We'll need some study time to look at this correlation:

(These items were done this morning.)

- (a) Normal physics store, do everything as usual, bring in all collimators.
- (b) Wait for a few minutes for things to settle.
- (c) Call PHENIX (so they can start a special run if they want), sit for about 10-15 min.
- (d) Pull out collimators until you see a significant increase (order of 30% or so) in the S2 signal, sit there for 10 min. (Wait for PHENIX to tell you.)
- (e) Pull them out further (or fully - PHENIX will tell you if they can still get their data), sit there again for 10 min.
- (f) After that, bring collimators back in.

**Items for consideration at a later time:**

1. Study effect of blue landau cavity damper insertion on subsequent rebucketing (Mike Brennan). Needs fill with 6 six bunches per ring?
2. Re-measure position of minimum beta in IR6 and IR8 (Mei Bai). Needs fill with 6 six bunches per ring.
3. Develop knobs to adjust position of minimum beta in IR6 and IR8 (Steve Tepikian, Nicolay Malitsky).
4. Implement injection drift compensation.
5. Christoph wants time at injection to test the chromaticity jump.

## 29 Thur 20 Dec

1. Continue putting up Physics production stores using Ramp dAu81. (This ramp uses the reduced beta-star lattice in yellow and the nominal lattice in blue.) Fill each ring with 87 bunches. The bunch intensities should be  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. (Remember to have ramp replay ON for both blue and yellow.)
2. Adjust blue tunes and chromaticities to reduce losses between injection and transition.
3. Investigate debunching in blue at injection.

## 30 Wed 19 Dec

1. Maintenance day. Restore beam to RHIC by 4 pm.
2. Then put up Physics production stores using Ramp dAu81. (This ramp uses the reduced beta-star lattice in yellow and the nominal lattice in blue.) Fill each ring with 87 bunches. The bunch intensities should be  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. (Remember to have ramp replay ON for both blue and yellow.)
3. If there are problems providing Physics stores with ramp dAu81, revert to ramp dAu80. (For ramp dAu80, replay in yellow should be OFF.)

## 31 Tue 18 Dec

1. Commission reduced beta-star lattice in **yellow** (Ramp dAu81) with full intensity (87 bunches per ring with  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection) and proper collimation at store. This work will begin after the 9 am meeting. If all goes well, dAu81 will become the ramp for Physics production stores.
2. APEX begins at 8 pm. Setup reduced beta-star lattice in **blue** with Ramp dAu82. This ramp uses reduced beta-star lattices in both yellow and blue. If all goes well, it will become the ramp for subsequent Physics production stores.

## 32 Mon 17 Dec

1. After store 9412 has been dumped do scrubbing at injection with approximately 100 bunches in each ring.
2. Rf personnel would like the next store to be similar to 9412 so that the poor rebucketing in blue can be reproduced. This means 87 bunches per ring with  $1.2 \times 10^{11}$  deuterons and  $0.93 \times 10^9$  gold ions per bunch at injection in RHIC.
3. Overnight put up stores with 87 bunches per ring and with  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection.
4. Issues from the past weekend:
  - (a) AGS developed another vacuum leak Saturday night, this time at I17. It appears that even at low energy, dumping gold beam in AGS is a serious problem. As a result, we have had to modify our behavior to prevent these losses.
  - (b) Collimators brought down a number of stores Friday evening and Saturday. Angelika's adjustments on Saturday helped.
  - (c) Losses near transition in blue due to instability that develops as deuteron bunch intensity and number of bunches is increased. These were investigated by Wolfram who suggested increasing strength of octupoles after transition. This helped, but instability re-appeared late Sunday night.

- (d) Rebucketing has deteriorated in blue.
- (e) The kicker for gap cleaning in yellow is ringing and affecting bunches outside the gap. Ringing is thought to be due to reflection. Tom Russo is said to be working on a solution to eliminate the reflected pulse.
- (f) There was a yellow abort kicker prefire which brought down store 9402 on Saturday. Yellow kicker voltage was then reduced from 27 to 26 kV as per Messers Mi and Ahrens.
- (g) Two stores (9404 and 9410) were brought down by a QPA “Crow” fault.
- (h) Wolfram observes that bunches experiencing only one collision in yellow have better lifetime. He notes that the lifetime of bunches experiencing two collisions has been helped by tune changes.
- (i) From Wolfram: “It would be good to have the latest vernier scans analyzed to confirm (or change) the cross sections for the ZDC rates. We could be underreporting the luminosity by as much as 30%.”
- (j) Wolfram also did a calculation of the optimum store length based on Physics stores up to Friday morning. He gets 5.5 hours, which is close to the nominal 6 hours we have been using.

### 33 Sat 15 and Sun 16 Dec

1. Continue putting up Physics production stores with 87 bunches per ring and with  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection.
2. Try increasing intensities to  $1.2 \times 10^{11}$  deuterons and  $1.2 \times 10^9$  gold ions per bunch in RHIC at injection.
3. Try increasing the number of bunches.
4. Angelika would like to do a vernier scan study with Phenix at the start of the next Physics store.

## 34 Fri 14 Dec

1. Two hour low-luminosity (6 bunches per ring) store for Star. Stochastic cooling should be turned off for this ramp and store. Intensities should be  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection. Raise store stone setting of yellow vertical tune by 0.005.
2. Physics production stores for the rest of today and all weekend. With 87 bunches per ring, try increasing intensities to  $1.2 \times 10^{11}$  deuterons and  $1.2 \times 10^9$  gold ions per bunch in RHIC at injection. Then increase number of bunches.
3. Angelika would like to do a vernier scan study with Phenix at the start of the next Physics store. **Deferred.**

## 35 Thur 13 Dec

1. Machine development until 4 pm.
2. Go back to reduced-beta-star lattice (dAU81) in yellow. Do a complete feedback ramp with corrected orbits and coupling. (Use 6 bunches per ring with  $0.9 \times 10^{11}$  deuterons and  $0.9 \times 10^9$  gold ions per bunch at RHIC injection.)
3. Tune to get good transmission and good lifetime at store.
4. Repeat dispersion and optics measurements at store.
5. If there is good transmission and lifetime with 6 bunches, fill with 56 bunches per ring and ramp to store.
6. Revert to ramp dAu80. Put up Physics production stores with 87 bunches per ring and with  $1.1 \times 10^{11}$  deuterons and  $1.1 \times 10^9$  gold ions per bunch in RHIC at injection.
7. Angelika would like to do a vernier scan study with Phenix at the start of a Physics store.
8. Tomorrow Star would like to have a two hour low-luminosity (6 bunches per ring) store.

## 36 Wed 12 Dec

1. APEX from 5 am to 5 pm.
2. After APEX go back to yellow lattice we have been using and put up production stores with 87 bunches per ring. For the first store, intensities at RHIC injection should be  $1.0 \times 10^{11}$  deuterons per bunch and  $1.0 \times 10^9$  gold ions per bunch. For subsequent stores, try increasing intensities at RHIC injection to  $1.1 \times 10^{11}$  deuterons per bunch and  $1.1 \times 10^9$  gold ions per bunch.

## 37 Tue 11 Dec

1. Yesterday Vadim found that the separation of blue and yellow vertical tunes had increased since the decision was made to reduce the deuteron intensity to  $0.6 \times 10^{11}$  per bunch. This may be why we had to reduce the deuteron bunch intensity to improve lifetime in yellow.
2. Now with  $1.0 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection we get good lifetimes in both blue and yellow. With 87 bunches per ring the initial ZDC rates peaked at 90 kHz.
3. Todd has calculated some yellow quadrupole corrections from the ORM data obtained last week. He will apply the corrections during the present store (9367). This will take approximately one hour.
4. When Todd's work is finished, Mike Brennan would like to insert blue stochastic cooling tuners to see their effect on the stored beam. After this, store 9367 will be dumped.
5. To prepare for study of reduced beta-star lattice in yellow during APEX on Wednesday, Don Bruno needs to do two test ramps (without beam) with the new lattice. This work can start as soon as store 9367 is dumped.
6. While Don Bruno is doing the test ramps, RF personnel will access blue ring to investigate storage cavity BS1. Star and Phenix have requested short accesses during this time.

7. Continue putting up Physics production stores. Fill each ring with 87 bunches. Nominal intensities at RHIC injection should be  $1.0 \times 10^{11}$  deuterons per bunch and  $1.0 \times 10^9$  gold ions per bunch.
8. Angelika would like to do a vernier scan study with Phenix when a new store is put up.
9. During the last two fills there were problems with capture in yellow at injection. This is likely due to “baby bunches” in AGS at extraction. This needs to be investigated.
10. During the last fill, debunching was observed in both rings during rebucketing. ZDC rates dropped when rebucketing happened. This was due to storage cavities dropping out. The tuner for YS1 is getting stuck and will eventually require some attention; for now the cavity is operational (as per Alex Zaltsman). Blue storage cavity BS1 is broken and requires an access to fix.
11. Transition in yellow looks messy. Christoph Montag will look into this.
12. Work on improving ramp transmission efficiency and blue lifetime. (Adjust chromaticities up the ramp and at store?)
13. Friday morning, Star would like to have a two hour low-luminosity (6 bunches per ring) store.

## 38 Mon 10 Dec

1. Try ramps with  $0.8 \times 10^{11}$  deuterons per bunch and  $1.0 \times 10^9$  gold ions per bunch in RHIC at injection. (Vadim found that the separation of blue and yellow vertical tunes has increased since the decision was made to reduce the deuteron intensity to  $0.6 \times 10^{11}$  per bunch. This may be why we had to reduce the deuteron bunch intensity to improve lifetime in yellow.)
2. Increase number of bunches per ring from 78 to 87.
3. Increase deuteron intensity to  $1.0 \times 10^{11}$  per bunch in RHIC at injection.

4. Todd has calculated some yellow quadrupole corrections from the ORM data obtained last week and will analyze their effect on the lattice today. If everything looks OK, he would like to apply the changes to a ramp latter today. **Deferred.**
5. Then Mei Bai will measure dispersion and beta-star in yellow at store with 6 bunches per ring. **Deferred.**

6. Preparations for reducing yellow beta-star (email from Fulvia):

I include the draft plan for APEX next week, as discussed at the friday meeting. After optics measurements and collimation development we will get started with beta\* squeeze activities. Steve is working on a stretched ramp to achieve a beta\* of 0.7 (fallback 0.8 if problems) in yellow. Don will check. We will try to test (without beam) monday or tuesday if there is the opportunity - otherwise 2 test ramps will be done prior to ramp development in APEX. IF successful we will need the Star and Phenix to check rates and backgrounds. If the ramp does not work we will restart physics earlier.

Updates after the 3PM scheduling meeting on monday.

7. Preliminary results from yellow ORM scan (email from Todd):

I have preliminary results from the yellow ORM scan from last Wednesday's APEX meeting. Blue analysis will be started tomorrow, after I clean up the data a bit; yellow results have had higher priority. After a few dozen different fitting approaches (mostly changing the fitting method and the SVD cut), the best and most consistent results reduce the chi2/degree of freedom from 468 to 38 (92%). Results can be summarized as:

Quad fits std/min/max: 1.565e-05/-1.045e-04/4.870e-05

yo4qd3 dk =-0.000104 yo1qf2 dk = 0.000025

yi2qd2 dk =-0.000101 yo4qf2 dk = 0.000030

yi3qd2 dk =-0.000086 yi6qf3 dk = 0.000031

yi11qd2 dk =-0.000068 yi7qd2 dk = 0.000046

yo9qf2 dk =-0.000065 yi3qf3 dk = 0.000049

Skew fits std/min/max: 2.326e-05/-1.693e-04/1.757e-04

yo8qf2 dtheta=-0.000169 yo8qd1 dtheta= 0.000059

yi7qf3 dtheta=-0.000110 yi3qd2 dtheta= 0.000063  
yi2qd2 dtheta=-0.000073 yo1qf2 dtheta= 0.000068  
yo4qf2 dtheta=-0.000070 yo8qd3 dtheta= 0.000106  
yi7qf1 dtheta=-0.000062 yi7qd2 dtheta= 0.000176

These are the top 5 offenders at either extreme (highest, lowest) for both the gradient and roll fits. I believe that units are m<sup>-2</sup> for the dk and radians for the dtheta. These results are consistent whether I fit ALL the quads, or just Q1-9 quadrupoles. I find it interesting that for the most part it says we should raise qf2/3 magnets and lower qd2/3 magnets. Rolls tend to average out to zero over IRs, with 7/8 o'clock having the largest individual rolls.

The dk values above are consistent with maximum changes of about 0.18%, which is small – 9.4A out of 5200A, for instance. I haven't checked relative beta\*s yet, but will do that tomorrow and see if it agrees with Mei's optics measurements and the relative luminosities. If this all checks out, I believe that we can try putting these corrections in at store with relatively little risk, and remeasure optics and a few difference orbits. More tomorrow!

## 39 Sun 9 Dec

Continue putting up Physics production stores. Fill each ring with 78 bunches. Nominal intensities at RHIC injection should be  $0.6 \times 10^{11}$  deuterons per bunch and  $1.0 \times 10^9$  gold ions per bunch.

## 40 Sat 8 Dec

Continue putting up Physics production stores. Fill each ring with 78 bunches. Nominal intensities at RHIC injection should be  $0.6 \times 10^{11}$  deuterons per bunch and  $1.0 \times 10^9$  gold ions per bunch.

## 41 Fri 7 Dec

Today's items:

1. Because the machine is running well (relatively speaking), and because it is Friday, we will not do any machine development today.
2. Continue putting up Physics production stores today and over the weekend. Fill each ring with 78 bunches. Nominal intensities at RHIC injection should be  $0.6 \times 10^{11}$  deuterons per bunch and  $1.0 \times 10^9$  gold ions per bunch.
3. According to the relation

$$\frac{\epsilon_g \beta_g^{*2}}{N_g A_g} = \frac{\epsilon_d \beta_d^{*2}}{N_d A_d} \quad (1)$$

Yun Luo notes that we should have

$$\frac{N_d}{N_g} = \left( \frac{A_g}{A_d} \right) \left( \frac{\beta_d^*}{\beta_g^*} \right)^2 \left( \frac{\epsilon_d}{\epsilon_g} \right). \quad (2)$$

Here  $A_g \approx 197$ ,  $A_d \approx 2$  and  $\beta_d \approx \beta_g$ , and according to the latest IPM measurements,  $\epsilon_d/\epsilon_g \approx 9/16$ . Thus we should have

$$\frac{N_d}{N_g} = \left( \frac{197}{2} \right) \left( \frac{9}{16} \right) = 55 = \frac{0.55 \times 10^{11}}{1.0 \times 10^9}. \quad (3)$$

This is very close to what we actually have.

4. Phenix and Star say they could benefit from vernier scans. Angelika will help with this later today. Phenix would also like to look at their backgrounds as a function of deuteron beam steering.
5. Phenix would like to do a zero field run near the end of the present store (9357).
6. Mike Brennan would like to have the yellow Landau cavity brought on for the next and subsequent ramps.

### **Additional items and ideas:**

1. Email from Wolfram:

I was thinking a bit on what to do next in the airplane, and in conclusion I would agree with Dejan's suggestion that it is best to increase Blue beta\*. Here is the reasoning:

- (a) Unfortunately, the store that Vadim had prepared with the Blue beam emittance increased by BBQ noise was too short to conclude much. It could have definitely proven that an increase in the Blue beam size will restore the Yellow beam lifetime.
- (b) We can almost conclude this from our observations already: increase in Yellow beam lifetime with reduced Blue intensity, store on November 22 with good luminosity lifetime, behavior of individual Yellow bunches of different emittance and intensity. It is not quite as strong as Vadim's successful test would have been, but close.
- (c) The increase of the Blue emittance is not as easy as I had thought. The BBQ noise method at store is not as smooth, loss free, and controllable (we can't monitor the emittance growth very well) as I had hoped. Increasing the Blue emittance at injection is possible, but operation will not be stable unless we change significantly the way we use the damper. Worst of all, the Blue beam losses in t260 will go up again, and probably prevent a significant increase in the Blue intensity.
- (d) Raising Blue beta\* by 40% will reduce the instantaneous luminosity by about 20%. We would gain this back by the better luminosity lifetime, and have the ability to raise the Blue intensity.
- (e) This appears to be more reliable for a beam size increase than the methods to increase the emittance we have contemplated so far (maybe there are better ones, but I don't know right now). It would also reduce the losses during beta-squeeze, which have aborted already a number of ramps.
- (f) Raising beta\* can probably be done in 1-2 shifts, if well prepared, and executed by a good team. This is not too far off from further test which increase the Blue emittance at injection or store.

Lowering beta\* in Yellow would be, of course, even better and we should think about this. The effort for this is significantly larger than raising beta\* in Blue, which we should come first.

I don't understand how stochastic cooling affects the Yellow beam, and the luminosity lifetime. Vadim and S.Y. had discussed this yesterday afternoon (e-log at 14:55), and there appears to be a connection. This could have some bearing on the above.

In the yesterday's plan of the day I see that one aim is to make  $\xi_g = \xi_d$ . I think this is not as important as  $\sigma_g = \sigma_d$ .

As stated in the plan, one could achieve  $\xi_g = \xi_d$  by increasing the Au bunch intensity, which is not likely to improve the Yellow beam lifetime.

2. As of today (Fri 7 Dec) the general consensus is that we should direct our efforts toward reducing the beta-star in yellow at IP6 and IP8. The current beta-star at these locations is 1.0 meter according to the model. Steve Tepikian is looking into reducing this to 0.8 or even 0.7 meters in the model. If this is possible, we will try to make it happen in the actual machine during the Wed 12 Dec APEX period.
3. As we increase the bunch intensity we will need to increase the chromaticity (more negative before transition and more positive after). Having flat tunes up the ramp (which we have in blue, but not yet in yellow) will make this easier.
4. Do a tune feedback ramp in yellow (with Booster NOT pulsing) so that we can replay tune and coupling correction. Make sure closed orbit is corrected before doing feedback ramp.
5. Commission Injection Drift Compensation as per John Morris' plan.
6. Todd and Roger would like some time to do IPM calibration. This involves changing the position of the beam at the IPM (in IR2).
7. At some point we should bring on octupole corrections.
8. At some point we should tune nonlinear corrections in triplets (Dejan's suggestion).
9. Christoph suggests that the 10 Hz orbit feedback should be brought on in the near future.
10. Christoph wants time at injection to test the chromaticity jump.

## 42 Thur 6 Dec

### Today's items:

1. Revert to ramp before Yun's nonlinear chromaticity corrections were applied.
2. Measure chromaticity up the ramp by putting a radial offset in in blue AND yellow (because yellow frequency is locked to blue). Two ramps are required; first one with radial offset and then one without. Use fills with 6 bunches per ring. Tunes from BBQ. Artus ON too.
3. Put in setting of yo12-qb2-ps that is supposed to fix yellow dispersion and also beta-star at IP6.
4. Measure dispersion first and then optics after yo12-qb2-ps change. Use fills with 6 bunches per ring.
5. Investigate increasing blue emittance by inserting flags in the ATR line. Does it help yellow lifetime at store?
6. Physics production stores in the evening (starting at 4 pm) and overnight.

**Additional items and ideas:**

1. Investigate increasing blue emittance by mis-steering at injection. Does it help yellow lifetime at store?
2. Back-of-the-envelope beam-beam (Vadim, Thomas, Dejan):

$$\xi_g = \frac{N_d \beta_g^* Z_g Z_d}{\sigma_d^2 A_g}, \quad \xi_d = \frac{N_g \beta_d^* Z_d Z_g}{\sigma_g^2 A_d} \quad (4)$$

where

$$\sigma_g^2 = \beta_g^* \epsilon_g, \quad \sigma_d^2 = \beta_d^* \epsilon_d. \quad (5)$$

We want effect of d on Au bunch to be the same as Au on d. Thus

$$\xi_g = \xi_d \quad (6)$$

which gives

$$\frac{N_d \beta_g^*}{\beta_d^* \epsilon_d A_g} = \frac{N_g \beta_d^*}{\beta_g^* \epsilon_g A_d}, \quad \frac{N_d \beta_g^{*2}}{\epsilon_d A_g} = \frac{N_g \beta_d^{*2}}{\epsilon_g A_d}, \quad \frac{\epsilon_g \beta_g^{*2}}{N_g A_g} = \frac{\epsilon_d \beta_d^{*2}}{N_d A_d}. \quad (7)$$

So, to compensate for smaller deuteron emittance  $\epsilon_d$ , one could:

- (a) Decrease  $N_d$  (the number of deuterons per bunch) as we have been doing; or
  - (b) Increase blue beta-star  $\beta_d^*$  (as proposed by Wolfram); or
  - (c) Decrease gold emittance  $\epsilon_g$ ; or
  - (d) Decrease yellow beta-star  $\beta_g^*$ ; or
  - (e) Increase  $N_g$  (the number of gold ions per bunch).
3. Todd's comment from yesterday's rhic-dau 2008 elog:  
 "My results from Mei's beta\* measurement are consistent with her observations during the optics APEX – yellow horizontal beta\*=1.2m, while all other beta\*s (yellow vertical, blue horizontal/vertical) are 1.0m. This is also consistent with observed ZDC rate differences between STAR and PHENIX."
  4. Should we bite the bullet and fix setting of yo12-qb2-ps, which in addition to fixing the dispersion also fixes horizontal  $\beta^*$  in yellow.
  5. As soon as the above gets sorted out, it would be useful to measure chromaticity up the ramp. Todd proposes that this be done by doing a ramp with a radial offset in the RF program.
  6. As we increase the bunch intensity we will need to increase the chromaticity (more negative before transition and more positive after). Having flat tunes up the ramp (which we have in blue, but not yet in yellow) will make this easier.
  7. Do a tune feedback ramp in yellow (with Booster NOT pulsing) so that we can replay tune and coupling correction. Make sure closed orbit is corrected before doing feedback ramp.
  8. Commission Injection Drift Compensation as per John Morris' plan.

## 43 Wed 5 Dec

1. Scheduled Maintenance begins with Controlled Access LOTO in AGS at 6:30 am.
2. RHIC sweeps begin at 1 pm.
3. Restore beam to W dump at 3 pm.

4. Restore beam to RHIC at 4 pm.
5. Physics production stores this afternoon (upon restoration of beam to RHIC after maintenance), evening, and overnight. Fill each ring with 87 bunches. Nominal intensities at RHIC injection should be  $0.6 \times 10^{11}$  deuterons per bunch and  $1.0 \times 10^9$  gold ions per bunch. (We will stay with the reduced deuteron bunch intensity in blue until we have a solution to the problem of poor gold lifetime in yellow at the higher deuteron bunch intensities.)
6. The nonlinear chromaticity corrections obtained at store in yellow during APEX overnight should be used in today's ramps for Physics. (See Yun's 06:12, 06:13, and 06:18 entries in the 05 Dec 2007 rhic-dau-2008 elog.)

## 44 Tue 4 Dec

1. Physics production stores until 4 pm. Fill each ring with 78 (or more) bunches. Nominal intensities at RHIC injection should be  $0.6 \times 10^{11}$  deuterons per bunch and  $1.0 \times 10^9$  gold ions per bunch.
2. Machine Development until 8 pm.
3. Explore ways to increase deuteron transverse emittance (or decrease gold emittance). Study yellow (gold) lifetime versus blue (deuteron) emittance.
4. Al Dellapenna will introduce noise in blue BBQ at store to blow up blue transverse emittance. Schottky can be used to see relative change in emittance. IPM? Vernier scans?
5. We can also increase deuteron beam emittance by filling the Booster aperture at injection. Measure emittance in ATR before and after this is done.
6. Dejan proposes that we reduce yellow beta-star at store so that yellow and blue beam size at the collision IP's are the same. It should be relatively easy to do this as the IBS suppression lattice favors smaller beta-star. However, reducing beta-star also means possible problems with larger beam in the triplets.
7. APEX from 8 pm to 8 am Wed 5 Dec.

## 45 Mon 3 Dec

1. Behavior of yellow longitudinal bunch width is puzzling. Even with stochastic cooling off, the bunch width decreases.
2. Continuous loss of yellow beam points to some continuous noise source (Roser). IBS? BBQ? Something else? Speculation is that available aperture is as it should be, but yellow emittance grows large.
3. Yun's nonlinear chromaticity correction in yellow at store indicates that our yellow lifetime problem is not tune related.
4. Change Yellow y012-qf2-ps by 18 A (as suggested by model) and measure dispersion at store. Use 6x6 ramp.
5. Todd Satogata will use 4 hours to do ORM measurements at store. Use 6x6 ramp.
6. Al Dellapenna will look into getting Schottky emittance measurements at store. He will also look into getting IPM measurements.
7. Todd will look into getting yellow beam decay rates versus bunch intensity.
8. 59x59 test ramp with the following:
  - (a) All separations on (longitudinal/transverse): No collisions.
  - (b) Rebucketing ON.
  - (c) Collimation OFF (since separation bumps are on).
  - (d) Gap cleaning OFF.
  - (e) BBQ OFF.
  - (f) IPM OFF (but occasional manual IPM measurements).
  - (g) Artus ON (since it only affects one bunch).
  - (h) Transition monitor noise source OFF.
  - (i) Stochastic cooling OFF.
  - (j) 10Hz IR feedback OFF.

Bring each thing ON in turn to see effect on yellow lifetime.

9. Nonlinear corrections in triplets (Dejan's suggestion). **Deferred.**
10. Yellow tune feedback ramp (with Booster NOT pulsing) and replay. **Deferred.**
11. Injection Drift correction. **Deferred.** Ready to go as per John Morris' plan at <http://www.cadops.bnl.gov/Controls/doc/projects/DriftCorrection/DriftCorrectionWithReplayTestPlan.html>  
Need to confirm that:
  - (a) cfe-4b-rtdl runs properly with new software;
  - (b) wfgs properly use newly assigned rtdl frames for dtrim, ytrim;
  - (c) ramp replay works (with 16 second phase in);
  - (d) drift correction works without ramp replay (yellow ring);
  - (e) drift correction works with ramp replay (blue ring)
 Steps (c) and (d) can be done together - blue does replay, yellow doesn't.
12. Physics production stores in the evening, overnight and until 4 pm tomorrow (Tue 4 Dec).
13. Try production stores with 68x68 bunches,  $0.6 \times 10^{11}$  deuterons per bunch, and  $1.0 \times 10^9$  gold ions per bunch.

## 46 Sun 2 Dec

1. Lifetime in yellow is poor for unknown reason(s). Suspect chromaticity at store.
2. Keep present store (9315) until Vadim is available to assist with chromaticity measurement in yellow at store.
3. Then dump store 9315 and put up a 6x6 store for chromaticity measurement.
4. Apply nonlinear chromaticity if needed and if possible.

5. RF personnel should be contacted to assess the health of yellow stochastic cooling. Mike Brennan has called and would like to turn off stochastic cooling for the present store (9315) and observe effect on yellow lifetime.
6. **BBQ should be turned OFF for subsequent stores.**
7. Continue putting up production stores for Physics. **Yellow injection intensity should be no more than  $0.9 \times 10^9$  gold ions per bunch.** Blue injection intensity should be no more than  $1.0 \times 10^{11}$  deuterons per bunch.

## 47 Sat 1 Dec

1. Production stores for Physics all weekend. Start with 59x59 bunch fills and gradually increase the number of bunches. **Reduce yellow injection intensity from  $1.0 \times 10^9$  to  $0.9 \times 10^9$  gold ions per bunch.** Blue injection intensity should be no more than  $1.0 \times 10^{11}$  deuterons per bunch.
2. For each fill make sure that yellow stochastic cooling is working. If it is not working, contact RF personnel and keep the Experiments informed.
3. Change yellow octupole settings at gammat1 and gammat6 from  $-1$  to  $-2$  to help with horizontal instability.
4. Increase yellow horizontal chromaticity after transition. (Use PlotFill to look at decoherence time.)

## 48 Fri 30 Nov

1. Replace oscillating power supply yo8-qr2-ps. Place diagnostic equipment on Quench Switch. (Don Bruno)
2. Put up 59x59 bunch store with RHIC injection intensities of no more than  $1.0 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch.
3. Make yellow Stochastic Cooling operational for the weekend. (Brennan and Blaskiewicz)

4. Physics stores this afternoon, tonight, and all weekend. Start with 59x59 bunch fills and gradually increase the number of bunches. RHIC injection intensities should be no more than  $1.0 \times 10^{11}$  deuterons and  $1.0 \times 10^9$  gold ions per bunch.

## 49 Thur 29 Nov

1. Measure Yellow tunes at injection versus various power supply settings as per list from Steve Tepikian. It is believed that one (or more?) of these supplies has the wrong polarity; it is hoped that the measurements will reveal which one(s). A 6x6 fill will be used at injection for the measurements.
2. Investigate BPM offsets in IR6 triplet. This can be done during the above 6x6 fill at injection.
3. Measure yellow tunes versus radius at store to determine linear and nonlinear chromaticity. Ramp 6x6 bunches to store **without cogging and rebucketing** for these measurements. Apply chromaticity corrections if appropriate.
4. Stochastic cooling setup in yellow. Do this with 59x59 bunches at store. If appropriate, use this store for Physics.
5. Undo changes made to AGS H10 magnet control yesterday. This effort can hide behind the above 59x59 store.
6. Orbit correction in IR triplets during beta squeeze. There are offsets in the IR6 BPMs.
7. Small adjustment of yellow main dipole field around transition to remove large radial excursion.
8. Tune feedback ramp in yellow with Booster NOT pulsing.
9. Tune measurement along bunch train at injection to detect presence of electron cloud (Wolfram). This is no longer critical item as effect of yellow injection on blue is no longer seen. (Presumably because of yesterday's bunch pattern phase adjustments to keep blue and yellow bunches longitudinally separated at injection.)
10. Scrubbing. Not yet evidence that it is needed.

11. Todd Satogata still wants 4 hours to do ORM work. (Inserted here as a reminder.)
12. Physics stores in the evening (starting at 4 pm) and overnight.

## 50 Wed 28 Nov

1. Maintenance from 6 am to 6 pm. RA LOTO of AGS at 6 am. Experimental sweeps begin at 4 pm. Beams restored to RHIC by 5 pm. Physics running by 6 pm.
2. Physics stores during the evening and overnight. 56x56 fills. Start with deuteron intensity at RHIC injection of  $0.9 \times 10^{11}$  per bunch. Increase intensity in subsequent fills if losses in blue are low. Gold intensity can be  $1.0 \times 10^9$  per bunch or higher without causing problems in yellow.

## 51 Tue 27 Nov

1. Setup proper longitudinal phasing (to avoid beam-beam interaction) at injection (Peggy, Wolfram).
2. Insert yellow stochastic cooling apparatus to check aperture (Brennan and Blaskiewicz). This can be done at injection with a 6x6 fill.
3. Mei will do optics measurement in blue at injection.
4. Correct orbits up the ramp.
5. Correct coupling and chromaticities.
6. Do yellow feedback ramp and replay.
7. Mei will do beta-star measurement at store in yellow without rebucketing.
8. Gradually increase bunch intensity for 56x56 fills.
9. Orbit correction in sector 6 triplets (Todd, Vadim).
10. Collimation at injection?

11. Physics stores (56x56 fills) this evening (starting at 4 pm) and overnight. Deuteron intensity at RHIC injection should be not more than say  $0.8 \times 10^{11}$  per bunch (to keep losses in blue from pulling the permit). Gold intensity can be  $1.0 \times 10^9$  per bunch or higher without causing problems in yellow.
12. Tomorrow (Wed 28 Nov) is a maintenance day.
13. Possibly do scrubbing on Thur 29 Nov. Vacuum personel need one day's notice.
14. Wolfram, Mike Blaskiewicz, and SY Zhang are interested in measuring tune drift from front to end of bunch train at high intensity.

## 52 Mon 26 Nov

1. Tune injectors to get  $1 \times 10^{11}$  deuterons and  $1 \times 10^9$  gold ions per bunch at AGS extraction.
2. Fix tune jump at start of ramp in blue. We will go with John Morris' option (b) here, namely, modifying the replay file to take out the early corrections. If this does not work, then Yun suggests doing a new feedback ramp in blue.
3. Yesterday Waldo found that the blue **main** quad current has a momentary excursion when the blue main quad **trim** current shifts prior to acceleration. Note that this shift of the trim current is different with the replay on than with the replay off.
4. Rebucketing in blue; longitudinal emittance too big? RF personnel will look into this.
5. There appears to be a problem with the automatic display of bunch profiles before and after rebucketing; data for only one ring are shown.
6. There is coupling near the end of the ramp in blue. Yun will address this during his shift today.
7. Radial excursion around transition in yellow has gotten large again. Brennan notes that radial excursion in blue seems to happen at

yellow transition. Angelika notes that the times at which data are displayed may be shifted by several seconds.

8. Dejan suggests chromaticity measurements (and subsequent correction) up the ramp in blue.
9. It has been agreed that today the experiments are to have collisions for the evening shift (4 pm to midnight) and overnight into tomorrow (Tuesday) morning. We will stick with this agreement, providing 56x56 stores this evening and overnight. It has been agreed that the stores should be 6 hours long. This will be a good test of our ability to provide back-to-back stores.
10. Looking ahead, Thomas notes that the beta squeeze during the ramp has been the bottleneck in the past as we try to increase the intensity. Collimation before the squeeze may help.

## **53 Sun 25 Nov**

1. Do vernier scans at IP6 (Star) and IP8 (Phenix) this morning with the current store (from overnight).
2. Work on increasing the bunch number and bunch intensity (S.Y. Zhang).
3. Optimize collimator positions (with assistance from Angelika Drees if necessary).
4. Mai Bai will do beta function measurements in yellow this afternoon.
5. Collisions for experiments from midnight tonight (or possibly earlier) to 9:30 am tomorrow (Mon 26 Nov).
6. It has been agreed that Physics is to be declared when a Store for the experiments has been put up tonight.
7. It has also been agreed that tomorrow (Monday), the experiments are to have collisions for the evening shift (4 pm to midnight) and overnight into Tuesday morning.

## 54 Sat 24 Nov

1. Global orbit correction needs to be done at the beginning of each Store. This, together with collimation, is needed to reduce backgrounds at Star and Phenix. Angelika should be contacted for help and advice when collimation is attempted. A vernier scan should also be done.
2. We need the Blue Landau cavity to help with the “dancing bunches”. Contact Mike Brennan and John bulter to see if we can get this working today.
3. The transmission efficiency in blue has deteriorated over the past couple of days, and the overnight fill showed significant coupling at store. Vadim will work today on re-establishing good transmission efficiency in blue.
4. We have been doing 56x56 ramps. Try going to more bunches.
5. During the afternoon, Mei would like a 6x6 store to do optics measurements. Al would like to use the same store to make coupling measurements for Yun.
6. Collisions for experiments from midnight tonight (or possibly earlier) to 9:30 am tomorrow (Sun 25 Nov).

## 55 Fri 23 Nov

1. Contact RF group to bring on storage cavities that were turned OFF yesterday. Bring on Landau cavities?
2. If RF group needs access into ring, then Star and Phenix would also like to go in.
3. We need a plan to fix the yellow collimators. Contact Angelika.
4. Move beams out of collision for STAR so that they can look at rates under this condition.
5. Phenix zero field run; they would like to take data with their magnets OFF for about an hour. Do a 6x6 ramp for this exercise?

6. Vernier scans; contact Angelika for assistance.
7. The interaction between blue and yellow beams at injection remains a mystery. Does increasing vertical separation bumps even further help?
8. Collisions for experiments from midnight tonight (or possibly earlier) to 9:30 am tomorrow (Sat 24 Nov).

## **56 Thur 22 Nov**

1. Correct orbit at injection in blue.
2. Go back to 37x37 ramp. (Some speculation that this will give better rebucketing and better vertex for the experiments.)
3. Contact Roger Connolly about getting IPM's working.
4. Collimator motion problem; contact Angelika.
5. Vernier scan late this evening (10 pm?); coordinate with Experiments and contact Angelika for help if needed.
6. If time permits during Christoph's shift, he may do chromaticity jump work at injection.
7. Collisions for experiments from midnight tonight (or possibly earlier) to 9:30 am tomorrow (Fri23 Nov).
8. Experiments study backgrounds.

## **57 Wed 21 Nov**

1. Experimental access from 9 am to 1 pm. Phenix would like to be on restricted (not controlled) access during this time. Star should be ready to be swept before 1 pm.
2. Work with beam can be done in Booster and AGS during the experimental access.

3. Address yellow q89 concerns (limit of 275 A is being exceeded). Steve Tepikian will provide a modified yellow lattice which should reduce the current required in q89. (This is done by reducing beta-star at IPs other than IP6 and IP8.) The expectation is that this lattice will be available and ready to test by 1 pm (or sooner).
4. Re-establish beam in blue and yellow.
5. Collimation, gap cleaning, and rebucketing operational? (Angelika, Greg, RF group)
6. Collisions for experiments from midnight tonight to 9:30 tomorrow (Thursday, Thanksgiving Day).
7. Physics may be declared at some time over the long Thanksgiving weekend.

## 58 Tue 20 Nov

1. Experiments (mainly Phenix) continue using beam with present store until 11 am.
2. RF work on rebucketing with the current store or with a 6 x 6 store if the present one is lost.
3. Troubleshooting of blue clock for Phenix (Rob, Waldo)
4. Gap cleaning setup with current store (Greg).
5. Dispersion measurement in yellow at store with current store or with a 6 x 6 store if the present one is lost (Todd).
6. At injection, test the injection drift correction (John Morris, Wolfram). According to Wolfram, the first test of the system (checking that all is working that has been tested in Run-7) would require 0.5 to 1 hour at injection, and possibly a hysteresis ramp.
7. Work on yellow dipole feedback (Carl Schultheiss).
8. Work on increasing the number of bunches.
9. Work on decoupling, feedback, and replay in yellow (Yun during his 4 pm to midnight shift today).

10. Finish collimation work in blue (Angelika this afternoon or evening).
11. Work on increasing the number of bunches.
12. Collisions for experiments from midnight tonight to 9:30 am tomorrow.

## 59 Mon 19 Nov

1. While Star and Phenix are preparing to bring on their magnets:
  - (a) Angelika will examine collimators in blue and yellow.  
Depending on what she finds, an access into the RHIC tunnel may be required. This would take place while the experiments access their areas to prepare for bringing on their magnets.
  - (b) RF personnel need two hours with beam for rebucketing setup.  
(According to Alex Zaltsman, the storage cavities are conditioned.)
2. Preparation for bringing on the experimental magnets will require access for Star and Phenix from 1 pm to 2 pm. During this time:
  - (a) PHENIX Iris Scanner will be made functional.
  - (b) PHENIX will check the interaction region for magnetic or metal materials prior to turning on the magnet.
  - (c) PHENIX will roll in their East Carriage.
  - (d) STAR will do some trigger recabling.
  - (e) STAR will complete their magnet interlock testing.
3. Bring on Star and Phenix magnets.
4. Re-establish beam in blue and yellow with experimental magnets ON.
5. Redo feedback ramp in blue to establish playback?
6. Remove coupling in yellow.
7. Adjust chromaticity in yellow for BBQ operation.
8. Setup Tune feedback and replay in yellow.

9. Re-establish collisions at IP6 and IP8.
10. Continue increasing number of bunches in each ring. (There was a QLI in blue early this morning when a 78 x 78 ramp was attempted.)
11. Todd would like to do another dispersion measurement in yellow at store.
12. Todd also requests 3 to 4 hours for ORM work at store in blue and yellow with 6 bunches in each ring. (There may not be time for this today.)
13. Angelika will setup collimation at Store from midnight tonight to 4 am Tuesday morning.
14. Collisions for experiments from 4 am to 10 am Tuesday morning.
15. Test and setup injection drift compensation in blue and yellow. According to Wolfram Fischer, the first test of the system (checking that all is working that has been tested in Run-7) would require 0.5 to 1 hour at injection, and possibly a hysteresis ramp.  
Here is email from John Morris on drift compensation:  
I see three basic tasks in getting drift correction going:
  - (a) Test the drift correction machinery exactly as it was left by Al. This includes modifying injection stone and running Al's drift correction script.
  - (b) Test the combination of injection drift correction with tune feedback and ramp replay. This requires a software change in the tuneOut ADO to combine the winding down of drift correction with the start of tune feedback or replay. The software is not ready for that yet. I don't anticipate a lot of development work but testing time would obviously be needed. I think that being ready to do this early next week is feasible. (Larry and I have to decide who will handle that software change)
  - (c) Move the management of injection drift correction into tape sequences.
16. Carl Shultheiss needs time (with and without beam) to test and setup dipole feedback in yellow.

## 60 Sun 18 Nov

1. Inject 120 (gold) bunches into yellow with as much intensity as possible. Look for pressure bumps at injection, then dump beam. Do the same with deuterons in blue.
2. Do 56 x 56 ramp.
3. Fix radial excursions in yellow (see ramp 9171).
4. Contact Steve Tepikian and Pete Cameron regarding formula (tune path) for avoidance of 60 Hz lines for BBQ in yellow.
5. Fix yellow coupling.
6. Continue to work with the ramp and more bunch numbers if time permits.
7. Work on tune feedback in yellow this afternoon or evening, or defer until after Experimental magnets have been turned on.
8. Star and Phenix magnets on tomorrow (Monday) morning.
9. Work on collimation at store (Angelika).
10. Exercise LISA.
11. Rebucketing. According to John Butler not much conditioning time is needed for the common storage cavities.
12. Star and Phenix ready for collisions tomorrow (Monday) night.

## 61 Sat 17 Nov

1. Get blue and yellow ramp efficiencies back up to those achieved by Vadim yesterday (Angelika).
2. Work on collimation at injection (Angelika).
3. If transmission is good, increase number of bunches to 12 in each ring.
4. When Yun is available this evening, continue tune/coupling feedback work. Check feed-forward and replay.

5. By Monday or Tuesday we may be able to have collisions for the experiments overnight. Experimental magnets should be brought on Monday or Tuesday. Storage RF needs to be brought on too.

## **62 Fri 16 Nov**

1. Continue orbit and tune correction on yellow ramp.
2. Setup BBQ on yellow ramp; measure chromaticity.
3. Work on collision setup.
4. Christoph would like to test the chromaticity jump at yellow injection.
5. Tune/coupling feedback work is deferred until Yun is available.

## **63 Thur 15 Nov**

1. Continue work on yellow ramp.
2. Yun needs time to measure the coupling angle in yellow at store.
3. Yun, Al, and Larry need 1 to 2 hours to work on tune/coupling feedback at injection in blue.
4. Carl Schultheiss needs one hour this afternoon to install and test new MMPS software.

The common storage cavities will (at some time to be determined) need several hours of conditioning.

We also need to think about getting the injection drift corrections (dipole, quadrupole, sextupole) to work. As a first step, the application needs to be dusted off and run as is at injection. (This may require doing a hysteresis ramp afterwards to reset the injection field to the proper value.)

## **64 Wed 14 Nov**

1. Don Bruno and co-workers will setup the new ramp (dAu82) with slow factor 1. This requires that they do several (4 or 5) ramps.

2. Carl Schultheiss will fix a connector (no access required).
3. dAu82 needs to be made the default ramp.
4. Brian van Kuik request some time to exercise mode switching between deuterons and gold. This can go on during Don Bruno's work.
5. Yun, Al, and Larry need 1 hour to work on tune feedback at injection in blue.
6. Then work on optics in yellow at store.
7. Yun needs to measure the coupling angle in yellow at store.
8. The yellow gammat settings specified by Don Bruno need to be checked and loaded. These settings need to be understood.
9. Synchronization of Yellow frequency with blue needs investigation. This may be an intensity issue (intensity too low).
10. Orbit correction on yellow ramp needs investigation.
11. Peggy, Freddy, and Keith need some time to work with gold in Booster.
12. The Blue RHIC RF beam permit link input is being pulled at the end of every Back to Injection sequence but the cavities appear to be functioning normally. This should be addressed during the day.

As of 2 pm, Don Bruno and George Ganetis have informed us that the new ramp (dAu82) is not acceptable. We must go back to the old ramp (dAu80), keeping the changes Steve Tepikian put in to remove the radial excursions in yellow. (It turns out that slowing down the beta squeeze is what made dAu82 unacceptable.) Don and George need about 4 hours to go back to dAu80 and tune it to make it acceptable.

During this time Peggy, Freddy, and Keith will work with beam in Booster. This is also a good time for STAR to do their magnet test if they can gather the required people in time.

The common storage cavities will (at some time to be determined) need several hours of conditioning.

We also need to think about getting the injection drift corrections (dipole, quadrupole, sextupole) to work. As a first step, the application needs to be dusted off and run as is at injection. (This may require doing a hysteresis ramp afterwards to reset the injection field to the proper value.)

## **65 Tue 13 Nov**

Repair of cooling water leak in building 912 requires that Booster RF be OFF. During this time Access into RHIC tunnel to replace DAC module for yellow.

When access is complete re-establish deuteron beam in blue and correct orbit on the ramp.

Then try to set up feedback ramp in blue.

Steve Tepikian needs to modify the yellow ramp (slow down the beta squeeze) so that we can go to a slow factor of 1. After this modification is made, Don Bruno needs time to get yellow ramp to work with the new slow factor.

The yellow ramp also needs to be modified to remove radial excursions that occur when yellow frequency is locked to blue.

Yun needs time at store (in blue) for decoupling work.

If there is any down time, STAR needs 3 hours to test their magnet.

The common storage cavities will (at some time to be determined) need several hours of conditioning.

## **66 Mon 12 Nov**

The gamma-t quads in yellow have been tripping, so Don Bruno needs time to look at these power supplies.

Split blue and yellow wfgs so that work in blue can proceed independently of work on yellow power supplies.

Al Dellapenna and Larry Hoff will work on tune feedback in blue.

Steve Tepikian needs to modify the yellow ramp (slow down the beta squeeze) so that we can go to a slow factor of 1. After this modification is made, Don Bruno needs time to get yellow ramp to work with the new

slow factor.

Steve Tepikian also needs to modify the yellow ramp dipole field to remove radial excursions (in yellow) that occur when yellow frequency is locked to blue. The radial excursions could also be handled by the yellow dipole feedback to be commissioned by Carl Schultheiss and Larry Hoff.

During the evening, Yun will work on decoupling.

Yellow transition work once the yellow gamma-t power supplies are fixed?

## **67 Sun 11 Nov**

Don Bruno needs access into the RHIC tunnel starting at 10:30 am. He needs two to three hours for PS work. Access into ATR will also take place during this time.

Blue model server is having a problem when set tune is near 1/3. Nikolay Malitsky will look into this. Also, the orbit in yellow seems not to respond to correction. Is this also a model server problem.

Steve Tepikian needs to look into ramping of blue and yellow with yellow frequency locked to blue.

When RHIC tunnel access is complete, continue work with beam (gold) in yellow. RF personnel should be contacted to setup capture in yellow at injection and then RF loops for ramping yellow.

Yellow instrumentation needs to be setup.

Work on ramping to Store in Yellow. Merge blue and yellow wfgs so that blue and yellow can be ramped together.

Larry Hoff is available this evening and tomorrow for tune feedback work. This work also requires Al Dellapenna for BBQ setup.

If time is available, Christoph Montag could look at yellow chromaticity knobs at injection.

## **68 Sat 10 Nov**

Access Controls personnel will test the flammable gas detection system from 7 am to 11 am. No beam in RHIC during this time.

Upon completion of the flammable gas detection system testing, we will

re-establish deuteron beam at injection in blue and then work on ramping to Store. To do this we need Al Dellapenna for BBQ setup, and Freddy Severino and Peggy Harvey for setup of RF loops. The initial ramp should be setup with the trim values from Run-7.

Don Bruno and co-workers will be doing yellow PS work during the day. They will notify us when they want to ramp yellow; there is a chance that this could interfere with blue. MCR should also notify Bruno when we begin to ramp in blue.

Don Bruno says that he may be able to give us yellow at injection by this evening (without a hysteresis ramp). If that is the case then Todd can work on injection of gold into yellow during his shift.

There is some concern (expressed by Dejan and Wolfram) about the difference between the values of gamma in yellow ramp and values obtained by locking yellow frequency to blue frequency. Steve Tepikian needs to be contacted to see if there are any issues here.

## **69 Fri 9 Nov**

AGS A5 kicker modification from 6 am to 6 pm.

PS work in yellow during the day. (Yellow PS work can continue during the evening if it does not interfere with deuteron beam in blue.)

Sweeps of Experimental areas will begin at 5 pm.

Check new A5 kicker pulse width with deuteron and gold beams in AGS. (Modification of the width in the “proton” mode may affect the width in the “ion” mode.)

In the evening and overnight, continue work with deuterons in blue.

Don Bruno estimates that yellow will be ready for injection late Saturday or sometime on Sunday (11 November).

For this evening the plan is to:

1. Re-establish deuteron injection into blue.
2. If necessary adjust AGS field at extraction to obtain nominal injection radius in RHIC.
3. Continue BPM timing work and BPM checkout with difference orbits.

4. Correct closed orbit.
5. Measure and correct tunes and chromaticities. (BTF plots from last night are no good because they were found to have been taken on a resonator rather than with real beam.)
6. Attempt to ramp with beam (starting with trim values from Run-7).

## 70 Thur 8 Nov

RHIC power supply work until 6 pm. A blue hysteresis ramp will be done with the field left at Park.

Sweeps of the RHIC tunnel will begin at 3 pm.

Sweeps of Experimental areas will begin at 5 pm.

Work with deuterons in blue will commence no later than 7 pm.

LOTO of AGS will begin at 4 am tomorrow (Friday), in preparation for A5 kicker work scheduled for 6 am to 6 pm.

Don Bruno estimates that yellow will be ready for injection sometime on Sunday (11 November).

For this evening the plan is to:

1. Re-establish injection of deuterons into blue (having done a hysteresis ramp with the field left at Park).
2. Setup RF capture.
3. Setup instrumentation timing.
4. Checkout BPMs by exciting a trim dipole and taking a difference orbit.
5. Correct closed orbit.
6. Measure and correct tunes and chromaticities.
7. With RHIC frequency fixed at the “book” value, one must in principle adjust the momentum at AGS extraction and the RHIC injection field to give nominal radius at RHIC injection. In practice, the RHIC injection field is set to its “Book” value and the AGS extraction field is adjusted to give the nominal radius at RHIC

injection. Changing the field at injection in RHIC would require ramping up to Store, down to Park, and up to the new injection field.

## 71 Wed 7 Nov

We were not able to inject into blue last night because of problems with the blue main PS. This will be worked on during the day. Don Bruno says that some hi-potting in yellow can also proceed.

The plan is to start sweeping the RHIC tunnel at 3 pm and to be ready for beam by 6 pm. The experiments (STAR and PHENIX) will be swept last.

Provided the blue PS problems are fixed, we will then proceed with the injection of deuterons into blue. AGS-to-RHIC synchro was setup last night for both deuterons and gold, so we should have proper timing for the blue injection kicker and for timing in the blue BPMs.

Since John Butler set up the blue acceleration cavities last night, RF capture should also be possible.

Status as of 5:30 pm:

At 3 pm the decision was made to let Don Bruno and co-workers work on blue power supplies until midnight so that they can do a hysteresis ramp.

Sweeps of the RHIC tunnel commenced at 5 pm.

We expect to begin blue injection work around midnight.

## 72 Tue 6 Nov

The plan is to inject deuterons into blue this evening.

(Work will not be done to shorten the AGS A5 kicker pulse width today as originally planned.)

During the day Don Bruno and co-workers have some additional PS work to do in blue. They hope to be able to do hysteresis ramps in blue by this evening.

Sweeps of the RHIC ring will begin around Noon; PHENIX will be swept last.

Wolfram cautions that one turn of deuterons may not be sufficient to search for obstacles in blue. In any case, the goal is to establish good

circulating beam.

Mike Brennan points out that AGS-to-RHIC synchro is needed for RHIC injection kicker timing.

Todd suggests that RF capture could possibly occur this evening.

## 73 Mon 5 Nov

As per Dewey Lererle (this morning): **The blue ring cooldown is complete.** The 4K cooldown of the yellow ring began Saturday and is about halfway complete. The yellow ring cooldown should be complete Tuesday. There is an instrumentation problem in sector 4; cryo is trying to find out why the temperature there is reading high.

During the day, the RF group will work (with both deuteron and gold beam) on the AGS Rev-Tick synchronization.

Don Bruno and co-workers will continue with PS work in Blue and Yellow. According to Don, the blue ring most likely will not be ready for injection until sometime Tuesday.

Larry Hoff and co-workers will work on ramps (with power supplies OFF).

This evening Keith Zeno will work on optimizing the deuteron and gold setups in Booster and AGS. Some portions of the RHIC tunnel will be swept.

Testing of magnets in the y arc (and possibly also in the x arc) will take place in the evening. This will prohibit extraction from AGS.

## 74 Sun 4 Nov

The blue ring appears to be cold and the 4K wave is proceeding around the yellow ring.

Don Bruno (and co-workers) are working (high-potting among other things) on RHIC power supplies. It is unlikely that the supplies will be ready for injection into blue tonight.

The deuteron merge on the AGS injection porch was not working; Peggy Harvey and Kevin Smith came in and fixed it.

Continue work on optimizing deuteron and gold setups to the w dump.

## **75 Sat 3 Nov**

During the early morning hours, gold beam was transported to the w dump and mode switching between deuteron and gold setups was exercised several times. Nick Tsoupas came in later in the morning and found that AGS extraction (of gold) had been setup at the Run-7 magnetic rigidity. This was fixed and gold was extracted and transported to the w dump at the magnetic rigidity required for d-Au Run-8.

Exercise mode switching between deuterons and gold with the correct rigidity for gold at AGS extraction and in the ATR line.

Don Bruno (and co-workers) will be working on RHIC power supplies.

## **76 Fri 2 Nov**

Setup Booster-to-AGS synchro with gold.

Go to four transfers of gold from Booster to AGS (per AGS cycle) and setup cogging.

Setup the 24-to-12 and 12-to-4 merges on the AGS injection porch. (Or do debunch and rebunch on harmonic 12 so that acceleration to top energy can be tested quickly.)

After the merge setup is complete, accelerate gold to top energy in AGS.

If time permits, work on AGS extraction and transport of gold to the w dump.

## **77 Thur 1 Nov**

LIPA work from 7 am to 7 pm.

Bring Booster back on with deuterons. Make sure that deuteron setup is OK in Booster, AGS, and to the w dump.

Switch to gold and setup booster injection and acceleration. If time permits, setup booster extraction, BTA transport, and AGS injection.

## 78 Wed 31 Oct

Continue work on deuteron setup during the day.

Power outage from 5:30 pm to 8:30 pm.

Then restore deuteron beam to TTb, Booster, AGS, and ATR.

## 79 Tue 30 Oct

Daytime, evening and overnight setup of AGS extraction and transport of deuterons to the w dump.

## 80 Mon 29 Oct

The reason for the jitter in the AGS frequency was found this morning and the problem has been fixed. The plan is to establish the eight-to-four merge (of deuteron bunches on the AGS injection porch) and then accelerate to full energy on harmonic  $h = 12$ . Once this is accomplished, setup of AGS extraction and ATR transport to the W dump can proceed.

## 81 Sun 28 Oct

As of 2:30 pm Kevin Smith and Freddy Severino are working (since this morning) on the eight-to-four merge (of deuteron bunches on the AGS injection porch). Their goal is to establish the merge and then accelerate to full energy on harmonic  $h = 12$ . Once this is accomplished, setup of AGS extraction and ATR transport to the W dump can proceed.

As of 8:30 pm, Freddy is going home to get some much needed rest. He and Kevin were not able to set up the eight-to-four merge in AGS because the AGS frequency is drifting. Freddy believes he knows why this is happening and says that a fix will be worked out Monday morning. After documenting the current setup, operations will turn the beam over to Tandem for the night.

## 82 Sat 27 Oct

Early this morning (6:45) the deuterium source failed (after a night of intermittent failures) and had to be replaced. Deuteron beam was re-established in Booster around 10:00 am. As of noon there are still problems with Booster-to-AGS synchro; Freddy and Peggy are trying to get it to work. Leif is looking at beam in Booster.

Freddy and Peggy finally got synchro working around 8 pm. Their plan is to continue working into the night and get acceleration to full energy in AGS. As of 9 pm they are setting up cogging between Booster and AGS to enable bunch-to-bucket transfer of eight Booster loads into the eight buckets on the AGS injection porch. The L10 cavity then needs to be brought on so that the eight-to-four merge can be set up. After the eight bunches are merged into four, acceleration to full energy will proceed on harmonic  $h = 12$ .

When Freddy and Peggy are done for the night, operations should document the setup and then turn the beam over to Tandem.

Nick Tsoupas will come in Sunday morning to set up AGS extraction and ATR transport to the W dump.

## 83 Fri 26 Oct

Nsrl finished its Fall run (Nsrl07c) today at 1:30 pm. The iron setup was then documented and Greg Marr proceeded to test mode switching between iron and deuterons (in preparation for deuteron-gold mode switching).

As of 4 pm, the beam has been turned over to Tandem. They need two hours to switch the source pulser from MP7 to MP6 and re-establish deuteron beam. During this time a gold target will be installed in MP7 for the startup of gold operation. An additional one to two hours will be needed to improve transport of deuterons in the TTB line.

The plan for this evening is to first re-establish deuteron beam in Booster, BTA, and AGS at injection. Once good survival of circulating beam has been established on the AGS injection porch, Booster-to-AGS synchro needs to be set up. Then the plan is to go to eight Tandem pulses into Booster per AGS cycle. (The AGS repetition period should not be less than 3.6 seconds.)

Saturday morning RF personnel will be in around 9 am to work on capture and acceleration in AGS. They will set up cogging between Booster and AGS to enable bunch-to-bucket transfer of eight Booster loads into the eight buckets on the AGS injection porch. The L10 cavity then needs to be brought on so that the eight-to-four merge can be set up. After the eight bunches are merged into four, acceleration to full energy will proceed on harmonic  $h = 12$ . RF personnel estimate that they can establish acceleration to full energy in AGS by Saturday evening.

Saturday evening and during the overnight hours may be a good time for Tandem personnel to work with deuterons and gold in the TTB line. Check Saturday's "Plan of the Day" to see if this is what will be done.

The next step after good acceleration to full energy in AGS is to setup AGS extraction and transport in the ATR line to the W dump. This will most likely happen during the day on Sunday.

The "Plan of the Day" will be updated on Saturday and Sunday.

## **84 Thur 25 Oct**

After NSRL has finished its scheduled activities for the day, work will continue with deuterons in Booster and AGS. The RF group had some success with the two-to-one merge in Booster last night, but they need more time. Keith Zeno was also able to inject deuterons into AGS with beam surviving for several turns. The focus of activity this evening will again be the merge in Booster and injection into AGS. If things go well and time permits, work on acceleration in AGS could also proceed.

## **85 Wed 24 Oct**

After NSRL has finished its scheduled activities for the day, continue work with deuterons in Booster. The two-to-one merge still needs work, so this will be the focus this evening.

## **86 Tue 23 Oct**

After NSRL has finished its scheduled activities for the day, continue setup of deuterons in Booster on BU2 (Booster User 2). Work on two-to-one

merge. (Work on Booster extraction will not be possible this evening because of work in ATR requiring locks on Booster extraction. These locks will be moved downstream tomorrow.)

## **87 Mon 22 Oct**

After NSRL has finished its scheduled activities for the day, setup injection and acceleration of deuterons in Booster on BU2 (Booster User 2).

## **88 Tue 9 Oct–Thur 11 Oct**

RHIC Dry Run.