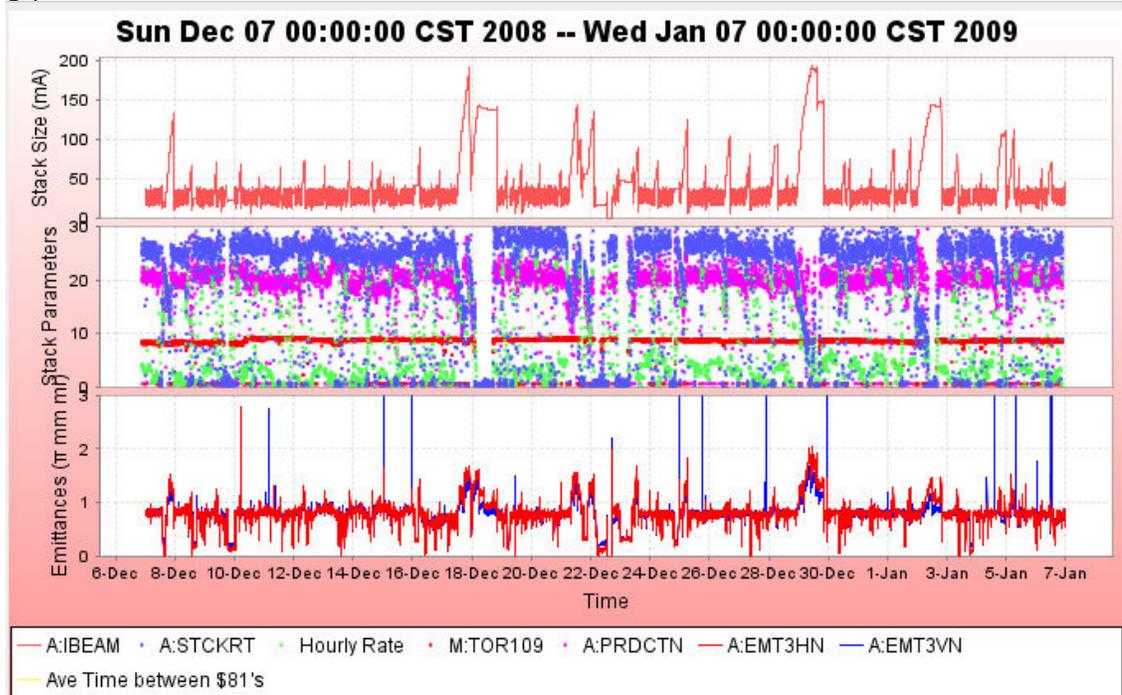


# 2009-01-07 Stacking Team Meeting

Wednesday, January 07, 2009  
10:01 AM

- Stacking performance:



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- After records, falling off a little bit.
- Jim points out to do our best, we need to have everything running optimally.
- Steve noticed that core width is slightly bigger.
- Projects for the next shutdown?
  - Stacktail notch filters #1 and #2 switch to cryo notch filters.
    - By going to cryo ones, does not eliminate having the BAWs as a backup.
    - Would have to make the filters (Pete?)
    - Low loss cable, etc....we have available.
    - Valeri says we would expect little gain.
  - Valeri says we may be better to put cryo notch filter in Debuncher momentum system.
    - Getting cyro there would be civil construction. Would be painful.
  - Steve's favorite! Add a second kicker tank to 4-8GHz Momentum system.
    - It has been shown that running the twts higher heats the beam.
    - Idea is to add more twts, so they can be run at lower power.
    - Valeri doesn't see how this could help.
    - We run two TWTs, 6 watts and 6 watts.....Running one at 12 watts, is only like running both at 3 watts. Factor of 4. Would have to run at 12watts x4 to get the same gain???
    - Valeri would like to do a measurement.
  - Adding an additional kicker tank in the Debuncher. One plane would have an additional tank and the momentum would be able to use as well. Would use a spare prototype.
    - Place where IPM is?
    - Question of space and time?
    - Is band 1.
    - Need to determine if optics allow this addition.
  - Upgrade 5W amps on core transverse to TWTs
    - Takes more than one shift...

- It can be staged....If have less than 8 hours, could get in.
  - If we had a shutdown, would spread it over two days.
  - Already decided that we would do this one.
- Meet again next week.....
  
- Keith set up loss monitors to look at D/A transfer.
  - Losses start low and losses increase over supercycle.
  - Losses also increase with stack size.
  - Backstreaming?
  - Phase advance from IKIK you hit most of the loss monitors.
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- Vander's List
  - 1) 4-8 core momentum cooling. We seem to cool better with 2 TWT's running at 6W than 1 TWT at 12W. I was going to measure the cooling rate for each TWT running at 12W, then the rate with the sum of both at 12W. The difference in rate should tell us if it would be worth adding another 4-8 DP kicker in the A50 straight. The old 2-4 / 4-8 core transverse kicker tank in in the A50 gas shed and can be modified to be a 4-8 momentum kicker with ease. All we need in hardware is to find or make two new 4-8 kicker boards (Don Poll, Ding Sun) to replace the 2-4 boards already in the tank (Don poll/Jim Budlong would do the assembly and cleaning work).
  - 2) Either with the above upgrade or by itself, the present core 4-8 DP kicker tank should be moved downstream 1-2 meters. The limitation in the move is the wall of the stubroom because that would require bending the cables around a corner. The U/S end of the tank is an aperture vertically. This is a total no brainer - if we just slid the tank downstream and the electronics follow, we'll actually have to add cable delay to make up for the longer time of flight for the beam.
  - 3) When the vacuum in A50 is down, the 4-8 microwave cutoff should be removed. See Pbar note #531 by Ken Fullett, 1992. This particular cutoff is on the wrong side of the kicker anyway. Every time I bring this up, Steve is fearful we still need it. It would be a good idea to do a study on a day where we are not stacking and have no beam in the machine to determine if there is any communication between kicker and pickup by closing any beam valve between them and comparing response with the valve open (Ralph). One important fact is we have the 4-8 core transverse kickers in A30 packed with absorber to kill 4-8 modes anyway falling between momentum pickup and kicker, and we have the 4-8 transverse pickups in A10 doing the same in the other direction. The A50 cutoff has no purpose anymore and given its position relative to the kicker, probably never did much good anyway. This project would only require labor and a few flanges - all the pipe we need is already in the tunnel. We might need some adapter parts made (Chris Ader) to fit everything together.
  - 4) The bellows on the U/S end of D:ISEP are much too compressed. I'm worried that the bellows will eventually fail because of the stress. We should remove the can on the U/S end of the septon and just extend the bellows to fill the space (Christine Ader). The can was originally intended for an OTR, but that idea was dropped long ago. When the bellows work is done, the range of motion should be increased (I had Mark restrict its motion to  $\pm 5\text{mm}$  as I recall). This project requires no parts, just labor time - cutting & welding.
  - 5) It would be very nice to have horizontal movement on D:ISEP. Christine and/or Joel might be able to come up with a design that will work with the existing stands. This might require the purchase of stepper motors and other parts machined. Dave Peterson would need to do the PLC work for movement.
  - 6) Remove the rectangular beam pipe inside of DH611. It is activated, but expect the song and dance about 'the beam should fly right though it'. I've talked about wanting to do this for about 3 years now. This requires nothing but some simple parts we already have in the tunnel - 5.5" beam pipe - and labor time to split DH611 and cut out the old piece of pipe.
  - 7) Make the vacuum in the D2A line common with the Debuncher by removing the U/S vacuum window. There is no operational reason for it to be there anymore. This just requires some flange design work on the U/S end of the septon magnet. This requires nothing when done with item #8, and only a new U/S flange and a short piece of

- beam pipe if done by itself.
- 8) Take one of our spare septer magnets, machine the flat side smooth (and clean, so it is vacuum friendly), and weld a 1/2 round beam pipe to the back of it. We would need to talk with the magnet guys about how much we are allowed to machine off. This will give us ~5mm of additional horizontal aperture for circulating beam at D:ESEP. I had originally wanted to do this instead of adding DEX bump. We still hit the D-chamber pretty hard. This project requires new U/S & D/S flanges and some adapter pieces be made. We have all the parts necessary to do this.
- 9) We could also replace A:ISEP1V (D/S most septer magnet?) with a modified version similar to #8 above. This would give us several more mm's of horizontal aperture, would be bakable, and keep the D2A line vacuum separate from the accumulator. We have all the parts necessary to do this.
- 10) The beam pipe between ELAM & A2B3 could be replaced with something bigger but more importantly something without all the joints and bellows.
- 11) The BAW filters for stacktail filters 1 & 2 should be replaced with super conducting filters. McGinnis also supports this opinion (see note from Dave on your marker board). I've pointed out many times to the Three Amigos that whatever is wrong with the stacktail, it is in the medium level. That is not to say that fixing whatever is wrong there will improve things much, but whatever is wrong is there. If I turn off one of the two leg 1 pickups, I can lower the leg 1 trunk attenuator and still stack just fine (see e-log entry 2007 Fri Mar 30 17:06:12 comment by...DVM --). This proves we have no signal to noise problem on the front end, so there is no low-level problem in leg 1. I also noticed that beyond a certain point, adding watts to the stacktail stops improving the stackrate and just hurts the beam emittance and blows out the core longitudinally. Even with practically no stack, the addition of more watts does not improve the stackrate beyond a certain point. So we are not limited by power and so it is not a high level problem (if you accept the TWT intermods are not a problem - Steve & Ralph measured them a while back and that was their conclusion). So we have no front end signal to noise problem and are not power limited in the high level - so that leaves the medium level. In theory the BAWs have ~35dB of dynamic range, but we have an operating range of only 14dB in the trunk attenuator between max watts (which we cannot use) and where we don't stack at all. This is another glaring 1st order problem not being addressed. It should have been fixed before any silly equalizer work was ever done. The super conducting filters would give us better nulling of core signal (see my e-log entry 2007 Tue Oct 21 18:37:32 comment by...DVM -- And\* \*why do we like\*\* cryo filters so much?) and would be a benefit for bigger stacks (>40mA where the core starts popping out of the BAW filters). Fixing the dynamic range issue would improve the stackrate for any stack size. We have all the parts necessary to do this work. 30mA/hr will never happen without these changes in my opinion, but may never be possible with this system. We have all the super conducting cable we need and there is one more dewar out there someplace. The dynamic range issues are simply Ralph, Pete, and Wes making \_real\_ signal power measurements on the front end with stacktail beam profiles and adjusting pads downstream to maximize dynamic range. It is a big job, but it should have been part of commissioning the system back in 1999 or 2000.
- 12) DRF2 should be in zero dispersion in D20 or D30. We have the real estate for it, but this requires the RF get piped over to AP30 and a new tuning procedure with a BPM be developed. It is still very activated. I always got the "it's secondaries we don't care about" talk, but if we are losing Pbars, it has to be in a place that is activated, not a place where there is no activation! I never got more than an opinion to support the 'secondaries' argument. I got the same talk when discussing moving DRF3, but it turned out it was 0.250" low and 0.170" towards the wall on the downstream end because something banged into the stand at some point. So much for the theory approach. Come to think of it, this is the same reasoning I got when wanting to rearrange A10. This project requires only beam pipe and welding, which we have.
- 13) We need an aperture plan for the A20 high dispersion region. When we eventually drop the vacuum to repair A:IKIK, the tank will be out in the isle anyway, so surveyors will be part of the project. When the kicker tank is back in the beam line, it would be nice to put it in the best longitudinal position. I asked our scientific staff to look and see if moving IKIK D/S and EKIK U/S would improve both the aperture and

the phase advances. All I got was no answer. We have everything we need to do this right now.

- 14) Since we rarely use stacktail TWT #1, it would be nice to investigate the possibility of adding a second 2-4 momentum TWT there. We would need to do a study of the system cooling rate with the 1 TWT at different powers and see if more power is good, and if the power necessary for optimal cooling has an issue with intermods. The 2-4 momentum seems to do very little for us these days and it would be nice to figure out why. With 1/2 the band width of the 4-8 and 1 TWT, the cooling rate does not seem to scale with the 4-8 system.
- 15) Install the prototype Debuncher horizontal band 1 kicker tank (stored across from Obie's office behind the cabinets) in D20 between D2Q7 & D2Q6. Vladimir determined that the phase advance from the HB1 pickup to this location (where the IPMs currently reside) is just about perfect. By my calculations, the time of flight of the beam from the pickup to this kicker is 482.28ns, but this should be double checked by Vladimir. We have all the TWTs we need and a movable stand, too. The stand I was going to use was under the prototype stacktail kicker tank that we just removed from the tunnel to put the spare A:IKIK module in. The only question unanswered right now is do we have the time in the electronics? Pete can easily answer this, but Ralph has to tell him to do it. Again, we appear to have all the parts necessary to do this job. Ralph will gripe about rack space (which we do have, I checked) and TWTPM controls stuff. These are problems which can be solved.
- 16) Remove the stacktail equalizer and test the 3-path version. It was the only version that actually showed an improvement. We also never understood why flipping the hybrids messed up the emittances. Ralph even made the logbook comment - 2007 Thu Mar 22 14:43:48 - "we just made some adjustments to the Stacktail. flipped 180 in leg 1 added 180 ps and flipped +90 deg in leg 2 added 108 ps. may not have been a good change - RJP". This was never retreated from and was never understood.