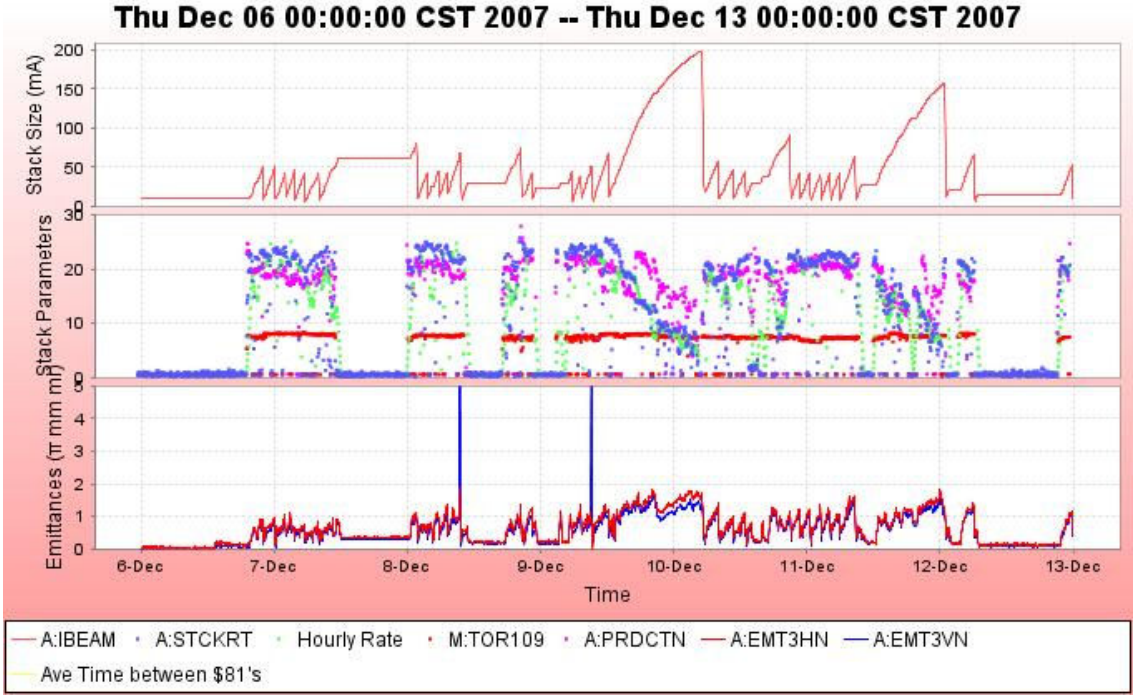
2007-12-13 Pbar Department Meeting

Thursday, December 13, 2007
9:05 AM

-
- Performance:



- Stacking
  - Pbars stacked: 1674.48 E10
  - Time stacking: 107.37 Hr
  - Average stacking rate: 15.60 E10/Hr

Uptime
- Number of pulses while in stacking mode: 153702
- Number of pulses with beam: 134848
- Fraction of up pulses was: 87.73%

The uptime's effect on the stacking numbers
- Corrected time stacking: 94.20 Hr
- Possible average stacking rate: 17.78 E10/Hr

Recycler Transfers

Pbars sent to the Recycler: 1598.49 E10
Number of transfers : 110
Number of transfer sets: 33
Average Number of transfer per set: 3.33
Time taken to shoot: 05.67 Hr
Time per set of transfers: 10.31 min
Transfer efficiency: 92.36%

Other Info
Average POT : 6.93 E12
Average production: 17.91 pbars/E6 protons

* Red indicates a problem during data retrieval. See the message window for details.

- Holiday Call-in list
  - At work
  - Pageable
  - Not available….
  - No call-in zone- starts 24th at noon to 26th at 8pm.
- Operationally
  - H717 failed…
  - DRF1-5 - PS replaced this morning. Back to over 900KV.
  - Debuncher blower now working. This is very hard to work on.
  - D:EKIK module moving around… Obie suspects the 4222 card and suggests that we switch two modules.
  - Stacking has fallen off.
  - DVM had to lower the voltage on the adiabatics at end of cycle since we were tripping off DRF1-8. This could impact the BPI10D output.

Debuncher Cooling Talk - Steve Werkema

- Two sets of meaurements - transverse then later momentum. These are summarized in Doc Database 2929 at http://beamdocs.fnal.gov/AD-public/DocDB/ShowDocument?docid=2949.
- **Part 1: Transverse measurements**

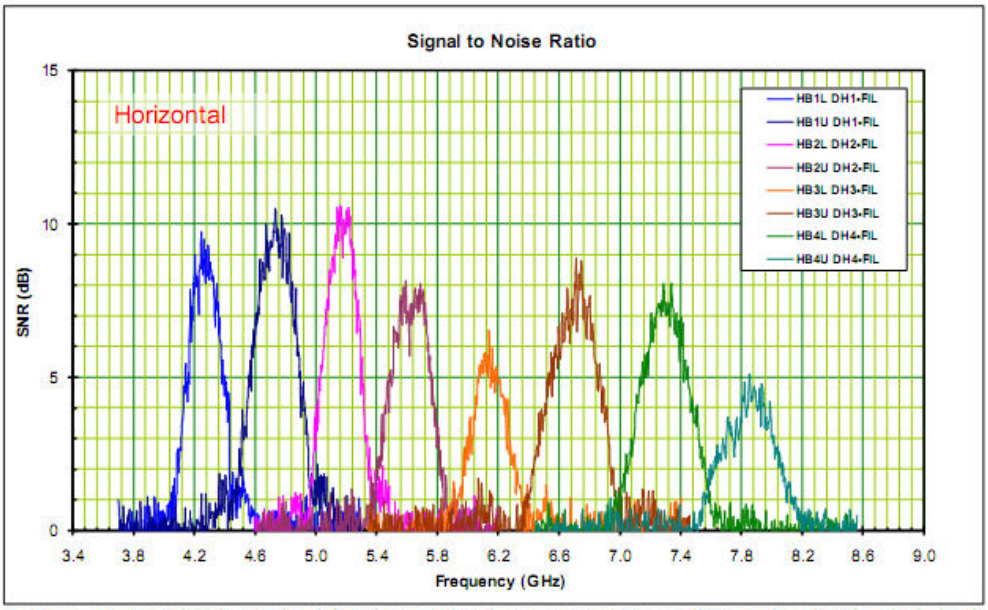


Figure 2 Horizontal SNR calculated from beam and no-beam response spectra. The raw data for this calculation is given in Figure 3.

- Some optimizations could be made by changing gains within each band.

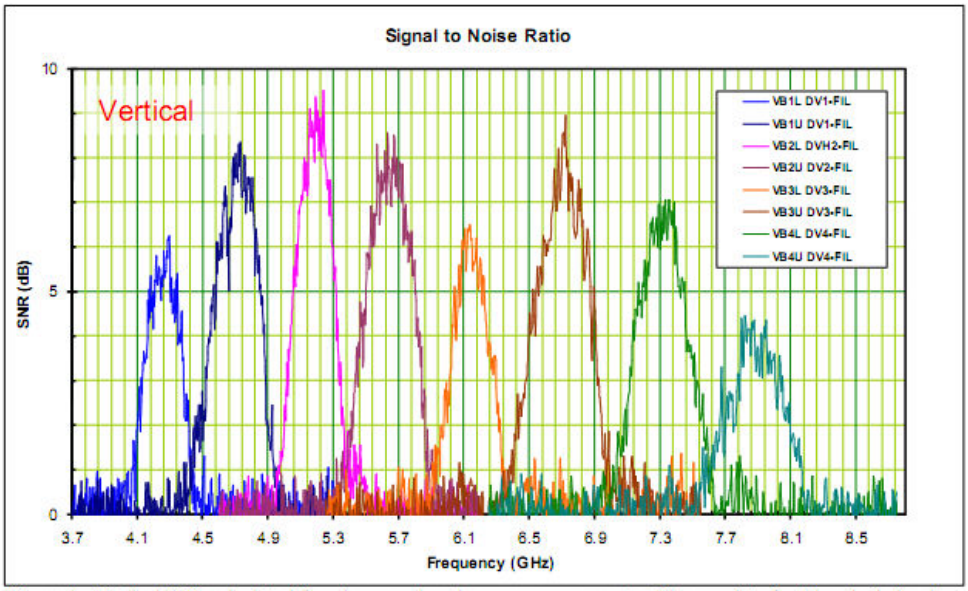


Figure 4 Vertical SNR calculated from beam and no-beam response spectra. The raw data for this calculation is given in Figure 5.

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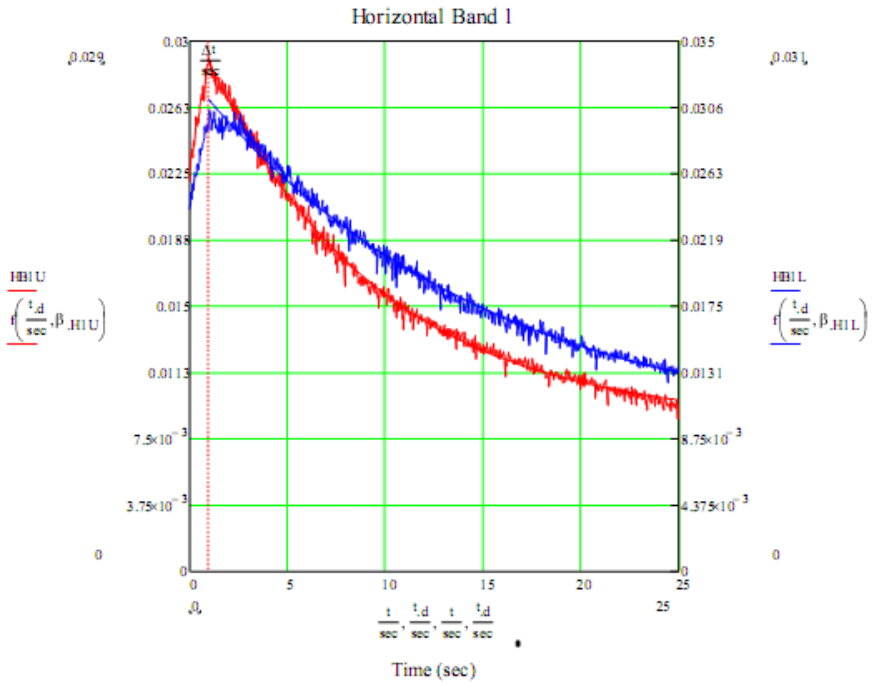
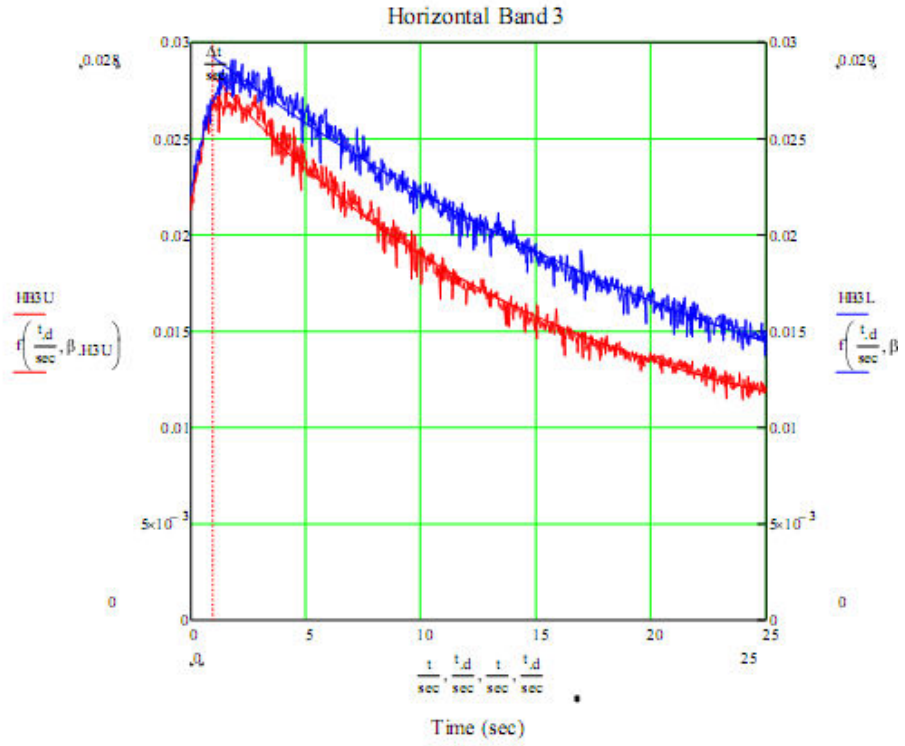
- Next, the cooling rates were measured



-
- Tuned sa to sideband. Set res bandwith to entire width, span 0. triggered trans cooling to come on one second after sweep of SA.
  - Band 1 - cooling exponential -
  - Other bands - the cooling does not immediately turn on and is not exponential for a few seconds.

exponential for a few seconds.



-
- Did not see this during last years measurement
- Did both with and without notch filters….notch filters made it better…

Table 5: Parameters affecting cooling

System	β_{pu} (m)	β_k (m)	$\Delta\phi$ (deg)	β_{eff} (m)	SNR (dB)	τ (sec)
HB1L	12.38	16.20	94.24	14.13	5.7	14.70
HB1U	19.10	16.20	90.73	17.59	6.4	8.73
HB2L	9.49	6.49	92.23	7.84	6.2	35.28
HB2U	5.53	6.49	80.91	5.92	4.4	21.55
HB3L	9.54	10.98	91.87	10.23	2.6	28.21
HB3U	13.69	10.98	84.72	12.21	4.3	14.95
HB4L	5.36	4.65	102.64	4.87	3.9	31.48
HB4U	3.44	4.65	83.29	3.97	1.9	38.06
VB1L	11.89	12.35	87.29	12.11	2.8	----------
VB1U	18.27	12.35	81.76	14.87	5.0	18.09
VB2L	6.96	7.95	91.41	7.43	4.5	33.92
VB2U	5.69	7.95	78.35	6.59	4.6	11.27
VB3L	8.41	9.60	93.75	8.97	2.4	26.47
VB3U	13.72	9.60	86.14	11.45	4.7	20.53
VB4L	6.79	5.38	87.26	6.04	3.0	54.41
VB4U	4.37	5.38	72.13	4.61	1.5	44.80

-
- Compare Signal to noise with a year ago.

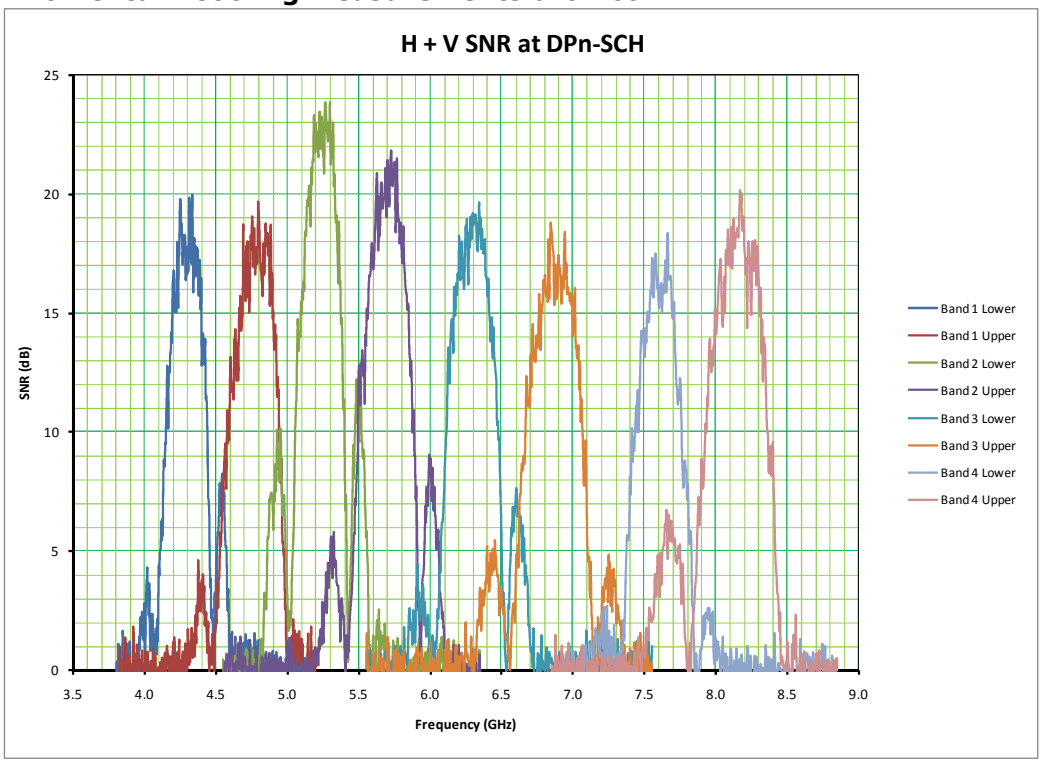
- Compare Signal to noise with a year ago.

Table 6: Horizontal SNR Comparison

Band	October 2006 SNR (dB)	Corrected Nov. 2007 SNR (dB)
H1L	10.1	10.9
H1U	9.5	11.6
H2L	10.7	11.4
H2U	9.4	9.6
H3L	4.2	7.8
H3U	6.3	9.5
H4L	6.4	9.1
H4U	4.2	7.1
H1 L&U	9.3	11.6
H2 L&U	9.9	----
H3 L&U	4.8	8.5
H4 L&U	4.8	7.9

-
- But, Debuncher intensity was not constant…
  - Band 1 and 2 are comparable.
  - Band 3 and 4 has better signal to noise.
  - We see the same thing vertically.
- Where this falls apart, is where you compare cooling time. The cooling rates are MUCH longer! Measured as band power in the schottky bands...
- A year ago comparing SEM widths, they are smaller now. But, intensities are lower now.

- **Part 2: Momentum Cooling Measurements** this week.



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- Looked at signal to noise for hor and ver pickups combined. This done to allow to balance sub-bands within a band.
- We have not yet measured cooling rates.

- Want to do balancing first….
- DVM recommends measuring cooling rates before and after...

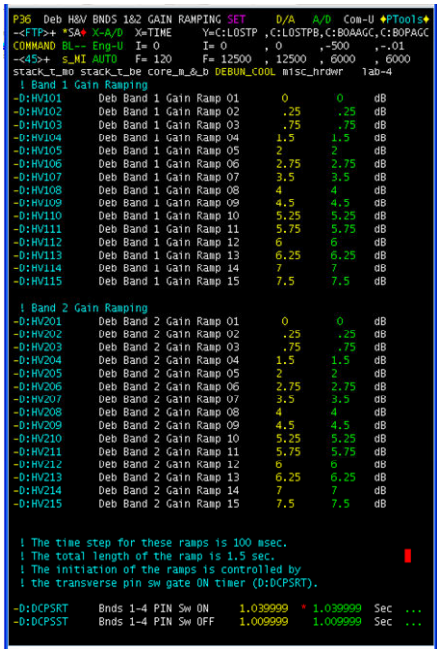
Lattice Change - Vladimir Nagaslaev

- Why change Debuncher Lattice?
  - Jan 2006 optics change : To optimize aperture and beam size
    - Aperture reached the Run II goals
    - Cooling tank upgrade plans were eliminated
    - Unable to keep pickup-kicker phase advance close to pi/2. Biggest error on vertical band 2.
  - Idea is to modify phase advance so that phase advance between kicker and pickup is preserved. Best way is to make the beta function shapes the same in the two sectors.
  - Number of defocusing shunts is low, so cannot get the necessary changes vertically.
  - Admittance
    - As found Ax=32,9 pi, Ay=33.9 pi
    - After Ax=34.1 pi, Ay=35 pi
  - IP measurements
    - Looked at emittances at 2 seconds.
      - Before: Hor 3.3 pi, vert 6.5pi
      - After: Hor 3.4pi, vert 4.1 pi
  - Change was done November 20th.
  - Looking at Production ACC and DEB - may be better?

Gain Ramping - Dave Peterson

Transverse Gain Ramping

- Band 1 and Band 2 gain values (15 each).
- Attenuation is decreased by ramp value at each step.



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P36  Deb H&V BNDS 1&2 GAIN RAMPING SET     D/A   A/D  Com-U ♦PTools♦
-<FTP>-+ *SA♦ X-A/D  X=TIME      Y=C:LOSTP ,C:LOSTPB,C:BOAAGC,C:BOPAGC
COMMAND BL-- Eng-U  I= 0         I= 0     , 0      ,-500    ,-.01
-<45>-+  S_MI AUTO   F= 120      F= 12500  , 12500  , 6000   , 6000
stack_t_mo stack_t_be core_m_&_b DEBUN_COOL misc_hrdwr  lab-4
 ! Band 1 Gain Ramping
-D:HV101      Deb Band 1 Gain Ramp 01      0        0      dB
-D:HV102      Deb Band 1 Gain Ramp 02      .25      .25    dB
-D:HV103      Deb Band 1 Gain Ramp 03      .75      .75    dB
-D:HV104      Deb Band 1 Gain Ramp 04      1.5      1.5    dB
-D:HV105      Deb Band 1 Gain Ramp 05      2        2      dB
-D:HV106      Deb Band 1 Gain Ramp 06      2.75     2.75   dB
-D:HV107      Deb Band 1 Gain Ramp 07      3.5      3.5    dB
-D:HV108      Deb Band 1 Gain Ramp 08      4        4      dB
-D:HV109      Deb Band 1 Gain Ramp 09      4.5      4.5    dB
-D:HV110      Deb Band 1 Gain Ramp 10      5.25     5.25   dB
-D:HV111      Deb Band 1 Gain Ramp 11      5.75     5.75   dB
-D:HV112      Deb Band 1 Gain Ramp 12      6        6      dB
-D:HV113      Deb Band 1 Gain Ramp 13      6.25     6.25   dB
-D:HV114      Deb Band 1 Gain Ramp 14      7        7      dB
-D:HV115      Deb Band 1 Gain Ramp 15      7.5      7.5    dB

 ! Band 2 Gain Ramping
-D:HV201      Deb Band 2 Gain Ramp 01      0        0      dB
-D:HV202      Deb Band 2 Gain Ramp 02      .25      .25    dB
-D:HV203      Deb Band 2 Gain Ramp 03      .75      .75    dB
-D:HV204      Deb Band 2 Gain Ramp 04      1.5      1.5    dB
-D:HV205      Deb Band 2 Gain Ramp 05      2        2      dB
-D:HV206      Deb Band 2 Gain Ramp 06      2.75     2.75   dB
-D:HV207      Deb Band 2 Gain Ramp 07      3.5      3.5    dB
-D:HV208      Deb Band 2 Gain Ramp 08      4        4      dB
-D:HV209      Deb Band 2 Gain Ramp 09      4.5      4.5    dB
-D:HV210      Deb Band 2 Gain Ramp 10      5.25     5.25   dB
-D:HV211      Deb Band 2 Gain Ramp 11      5.75     5.75   dB
-D:HV212      Deb Band 2 Gain Ramp 12      6        6      dB
-D:HV213      Deb Band 2 Gain Ramp 13      6.25     6.25   dB
-D:HV214      Deb Band 2 Gain Ramp 14      7        7      dB
-D:HV215      Deb Band 2 Gain Ramp 15      7.5      7.5    dB


 ! The time step for these ramps is 100 msec.
 ! The total length of the ramp is 1.5 sec.
 ! The initiation of the ramps is controlled by
 ! the transverse pin sw gate ON timer (D:DCPSRT).

-D:DCPSRT     Bnds 1-4 PIN Sw ON     1.039999  * 1.039999  Sec  ...
-D:DCPSST     Bnds 1-4 PIN Sw OFF    1.009999    1.009999  Sec  ...
```

Transverse Gain Ramping

- Bands 3 & 4 are combined.

```
P36  Deb H&V BANDS 3&4 GAIN RAMPINGSET     D/A   A/D  Com-U ✦PTools✦
-<FTP>+ *SA✦ X-A/D  X=TIME      Y=C:LOSTP ,C:LOSTPB,C:BOAAGC,C:BOPAGC
COMMAND BL-- Eng-U  I= 0        I= 0      , 0      ,-500    ,-.01
-<46>+  s_MI AUTO   F= 120      F= 12500  , 12500  , 6000   , 6000
stack_t_mo stack_t_be core_m_&_b DEBUN_COOL misc_hrdwr   lab-4

 ! Bands 3&4
-D:HV3401     Deb Bnds 3&4 Gain Rmp 01      0        0      dB
-D:HV3402     Deb Bnds 3&4 Gain Rmp 02      .25      .25    dB
-D:HV3403     Deb Bnds 3&4 Gain Rmp 03      .5       .5     dB
-D:HV3404     Deb Bnds 3&4 Gain Rmp 04      .75      .75    dB
-D:HV3405     Deb Bnds 3&4 Gain Rmp 05      1        1      dB
-D:HV3406     Deb Bnds 3&4 Gain Rmp 06      1.375    1.375  dB
-D:HV3407     Deb Bnds 3&4 Gain Rmp 07      1.625    1.625  dB
-D:HV3408     Deb Bnds 3&4 Gain Rmp 08      1.75     1.75   dB
-D:HV3409     Deb Bnds 3&4 Gain Rmp 09      2        2      dB
-D:HV3410     Deb Bnds 3&4 Gain Rmp 10      2.25     2.25   dB
-D:HV3411     Deb Bnds 3&4 Gain Rmp 11      2.375    2.375  dB
-D:HV3412     Deb Bnds 3&4 Gain Rmp 12      2.5      2.5    dB
-D:HV3413     Deb Bnds 3&4 Gain Rmp 13      2.75     2.75   dB
-D:HV3414     Deb Bnds 3&4 Gain Rmp 14      2.875    2.875  dB
-D:HV3415     Deb Bnds 3&4 Gain Rmp 15      3        3      dB

 ! The time step for these ramps is 100 msec.
 ! The total length of the ramp is 1.5 sec.
 ! The initiation of the ramps is controlled by
 ! the transverse pin sw gate ON timer (D:DCPSRT).

-D:DCPSRT     Bnds 1-4 PIN Sw ON     1.039999  * 1.039999  Sec  ...
-D:DCPSST     Bnds 1-4 PIN Sw OFF    1.009999    1.009999  Sec  ...
```

Transverse Ramp Counter

- The ramp counter is reset by the toggle of the PIN switch.
- In spite of what the parameter page says, the counter presently increments every 0.13 seconds so ramp takes 1.95 sec.

Enabling Ramping

- Ramps are enabled by setting the appropriate PIN attenuator to Auto (Plus) mode.
- Digital status will be A (auto) or M (manual).

```
P36  TRANSVERSE ATTEN              SET     D/A   A/D  Com-U ♦PTools♦
-<FTP>+ *SA♦ X-A/D  X=TIME      Y=C:LOSTP ,C:LOSTPB,C:BOAAGC,C:BOPAGC
COMMAND BL-- Eng-U  I= 0        I= 0      , 0      ,-500    ,-.01
-<44>+  s_MI AUTO   F= 120      F= 12500  , 12500  , 6000   , 6000
stack_t_mo stack_t_be core_m_&_b DEBUN_COOL misc_hrdwr   lab-4


-D:H1PA1      Deb Hor Band 1 PIN Atten     6        0     dB   A
-D:H2PA1      Deb Hor Band 2 PIN Atten     25.5     18    dB   A
-D:H3PA1      Deb Hor Band 3 PIN Atten     18       15    dB   A
-D:H4PA1      Deb Hor Band 4 PIN Atten     17       14    dB   A

-D:V1PA1      Deb Ver Band 1 PIN Atten     14       6.5   dB   A
-D:V2PA1      Deb Ver Band 2 PIN Atten     18.5     11    dB   A
-D:V3PA1      Deb Ver Band 3 PIN Atten     13       10    dB   A
-D:V4PA1      Deb Ver Band 4 PIN Atten     16       13    dB   A
```

Note that values are at end of ramp.

Momentum Ramping

- Enabled by PIN attenuator digital control.
- Attenuator value increased during ramp.

```
P36  ATTENUATORS                   SET     D/A   A/D  Com-U ♦PTools♦
-<FTP>+ *SA♦ X-A/D  X=TIME      Y=C:LOSTP ,C:LOSTPB,C:BOAAGC,C:BOPAGC
COMMAND BL-- Eng-U  I= 0        I= 0      , 0      ,-500    ,-.01
-<36>+  s_MI AUTO   F= 120      F= 12500  , 12500  , 6000   , 6000
stack_t_mo stack_t_be core_m_&_b DEBUN_COOL misc_hrdwr   lab-4


-D:P1PA       Deb Mom Band 1 PIN Atten     9      * 14.75  dB   A
-D:P2PA       Deb Mom Band 2 PIN Atten     5.5    * 11.25  dB   A
-D:P3PA       Deb Mom Band 3 PIN Atten     1.5    * 7.25   dB   A
-D:P4PA       Deb Mom Band 4 PIN Atten     4      * 9.75   dB   A
```

Note that values are at end of ramp.

Momentum Ramp Counter

- The ramp counter is reset by the toggle of the PIN switch.
- The counter presently increments every 0.1 seconds so ramp takes 1.5 sec.

```
 ! GAIN RAMPING CONTROL
-D:P1PA       Deb Mom Band 1 PIN Atten     9       * 14.75  dB   A
-D:P2PA       Deb Mom Band 2 PIN Atten     5.5     * 11.25  dB   A
-D:P3PA       Deb Mom Band 3 PIN Atten     1.5     * 7.25   dB   A
-D:P4PA       Deb Mom Band 4 PIN Atten     4       * 9.75   dB   A

 ! Gain is increased linearly by the set value of
 ! these devices over 1.5 sec.  The initiation of
 ! these ramps are controlled by the pin switch
 ! gate ON timer (D:DPPSON).

-D:DPPSON     On Event for DP        1.049999    1.049999  secs ..
-D:DPPSOF     Off Event for DP pin   1           1         secs ..
```

Ramp Table

- The momentum ramp table is hard coded in the PLC and is the same for all 4 bands.
- Hex = 0, 2, 4, 6, 8, B, D, 10, 13, 16, 1A, 1E, 23, 28, 2E
- dB = 0.00, 0.25, 0.50, 0.75, 1.00, 1.375, 1.625, 2.00, 2.375, 2.75, 3.25, 3.75, 4.375, 5.00, 5.75

- **Studies Plan**
  - Have pad changes for debuncher cooling changes.