

Procedure for Gap Cleaning November 6, 2001

Ray Filler, Angelika Drees

- The purpose of gap cleaning is to remove the unbunched beam in the abort gap. To do this you will use the tune meter to resonantly kick the beam in the abort gap, and the scrapers to scraper away the beam. This should reduce the chance of “dirty” dump and/or a quench at the dump. To clean the beam takes at least one half hour, more likely one hour.
- **Read and Understand this procedure before doing ANY of it.** This means ask another operator, or call Ray or Angelika if need be. Most questions are answered by simply reading the procedure carefully. Gap cleaning will not be effective if this is not followed.
- **If at any time you type in the wrong value for a step command, the PANIC button will stop the scraper at its current position as seen in step rdbk boxes. If you type in the wrong command, before you type in the correct command, you *MUST* hit PANIC. If not the scraper will not stop moving until the first command is completed, and then the second command will be executed.**
- You will not insert the yellow crystal. There is no blue crystal. The crystal is not to be used for gap cleaning or any other cleaning for that matter. The crystal is not operational.

1. Scraper Insertion

- (a) Open GPM page pindiodes.mon under RHIC → Collimator. For blue ring look at Blue03, Blue04. For Yellow look at Yellow01 – Yellow 04.
- (b) open PET page for scraper under RHIC → Instrumentation → Collimators For Blue use BlueScraper and for Yellow use YellowScraper.
- (c) Skip to step 1i is scraper is already inserted (the step rdbk > 0 on for all values means that it is inserted).
- (d) Set Scraper Skew step cmd.(stepper.8b-scraper.1.Z for Blue, stepper.8b-scraper.2.Z for Yellow) to 35000.

- (e) Set Vertical step cmd (1.Y or 2.Y) to 60000.
 - (f) Set Horizontal step cmd(1.Xor 2.X) to 20000 for blue and 12000 for yellow.
 - (g) Step scraper in horizontally (increasing X),in steps of 3000 or so until you see additional count rates on the PIN diodes. At this point, the scraper is in the beam halo, you are seeing the beam ions scattering from the scraper.
 - (h) Adjust skew in units of ± 1000 to reduce the count rate. This aligns the scraper to the beam. If after moving 10000 steps or so, no reduction is seen, return to original position and move on to next step.
 - (i) When the count rate is minimized (or you otherwise arrived here), insert the scraper horizontally in steps of <3000 until the rates increase to about 10000 counts above the background level. If the scrapers are inserted already, just insert horizontally until the rates on the PIN diodes increase (any amount is good).
 - (j) If step 1h was unsuccessful or skipped , now is a good time to retry adjusting the skew as in step 1h.
2. Activate the Start Cleaning procedure for the appropriate ring in the sequencer under RHIC \rightarrow Artus \rightarrow Blue/Yellow \rightarrow Start Cleaning. This starts the tunemeter kicking the beam in the abort gap and measuring tunes there.
 3. Insert the Scrapers more.
 - (a) At this point you should see spikes every 4 seconds in the PIN diodes and BLM's, and the rate on the PIN diodes should increase.
 - (b) Insert the scrapers horizontally (increasing X) or vertically (increasing Y) in steps of <2000 steps. All the while watching the Beam Loss monitors and the beam currents. Keep stepping in the scraper, watching the losses increase on the scrapers (7 o'clock side of IP8 for Yellow, 8 o'clock side of IP8 for Blue, both just after the Triplet). You know that you have gone too far if the bunched beam signal starts to drop. The unbunched beam is expected to drop (that is the whole point!). Let fear be your guide, you can take out the whole beam this way!

- (c) Rates on the PIN Diodes should show about 200,000, peaks >400,000 during moving are O.K.
4. Adjust the Tunemeter
- (a) Open Artus application. Click yes under 2DPlots for both horizontal and vertical in the appropriate ring to see the tune FFT data. It is likely that this is floating around somewhere.
 - (b) If there are tunes on the debunched beam in the gap, set the kick frequency, to the measured tune by changing the number under Tune for the appropriate ring and plane. (Usually only the horizontal is seen). **Note: The 0.24 peak is noise.**
 - (c) If you don't see the tunes, retract the scraper in that ring, (using the sequence RHIC → Collimator → Blue/Yellow → Home). Measure the tune in an occupied bucket, move back into the abort gap. Stop the tunemeter and insert the scraper again using the values you just retracted from (**Set the skew first**, if not you will surely cause badness when you insert horizontally). Start the tunemeter again. (you can just run RHIC → Artus → Blue/Yellow → Start Cleaning again). Start with the kick frequency near the value you just measured.
 - (d) Change the kick frequency in units of ± 0.002 around this value to maximize the beam loss on the PIN diodes/BLMs. Wait a few seconds (>10) before changing tune again. It takes a little time for the beam to move out, and the tunemeter is only kicking every 4s.
 - (e) Other than this, no other ARTUS parameters are to be changed.
5. Repeat for other ring, if necessary.
6. Periodically adjust the scrapers, the tunemeter kick frequency and the bucket number to keep PIN diode rates on the order of 200kHz, and BLM signals maximized. **This is a necessary step.**