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SLC Control Program

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Dithering Beam-Beam Scan

September 18, 1992

Author: *Lee Ann Yasukawa* **Subsystem:** *Final Focus* **User Impact:** *Medium*
Panel Changes: *Few* **Documents:** *No* **Help File:** *No*

In order to improve tuning procedures at the interaction point, a new option for beam-beam scans has been developed. The *dither* beam scan option enables optimization to be less invasive than the standard scan by keeping the beams in collision during a larger portion of the scan. In addition, the *dither* scan measurements are expected to be more precise than standard scans.

The input to the dithering beam-beam scan option consists of the starting position for the beam, s_0, the number of steps, ns, and the step size, Δ. The scans then occur at beam positions

$$s_0,\ s_0 + \Delta s,\ s_0 + 2\Delta s, \ldots, s_0 + (ns - 1) * \Delta s$$

This sequence is then repeated, *i.e.* the beam is scanned beginning at the starting position. The number of data points for all dithering beam-beam scans will be 100 so the above stepping and scanning pattern repeats until 100 samples are taken. The range for the number of steps is limited from 2 to 5.

To support dithering beam-beam scan, two new buttons have been added to the SCAN OPTIONS PANEL. The [TOGGLE BSCN DITHER] button toggles the regular beam-beam scan to the dithering beam-beam option. The fourth line on this button displays either scan OFF or ON depending on the type of scan selected. The [STRT -2 #STP 3 #AVG 3] button displays the Start Position (STRT), Number of Steps (#STP), Number of readings to average internally in BPM software (#Avg), and step size (SSIZ) for a dithering beam scan. The SSiz value appears on the fourth line. The default values for these parameters are: Starting Position = −2 microns, Number of Steps to Use = 3, Number of BPM readings to average = 3, and Step Size = 2 microns. Any of these values may be changed with this button. The information on this button overrides similar information on regular beam-beam scan buttons when the Dithering Scan is selected.

A label is displayed On the FF BEAM-BEAM SCAN CORRELATION PLOTS panel informing the user of the type of scan selected. In the regular beam-beam scan mode, the label displays

MODE:
BEAMSCAN

and in the dithering mode, it displays DITHER.

The new buttons determine the type of scan used for Single Scans and for the optimization scans but not for Auto Beam Collides. Auto Beam Collides will never use the dithering beam-beam scans even if the TOGGLE BSCN DITHER button is ON.

The output of these dithering scans will be the average slope of the lines which best fit the points for each pass. For the optimization scans, the inverse slope will be used to find the location of the optimal beam-beam locations instead of using $(\text{width})^2$ which is currently used for regular beam-beam optimization scans.

Beam scans and FB69 Fast Feedback

October 9, 1992

Author: *Gromme,Grossberg,Hendrickson* **Subsystem:** *Final Focus* **User Impact:** *Small*
Panel Changes: *None* **Documents:** *No* **Help File:** *None*

In order to speed up IP optimization procedures, beam scan software has been modified to add an option for FB69 fast feedback to keep the beams in collision during waist scans and other tuning procedures. In between steps of a waist scan or other correlation plot scan, the feedback will keep the beams in collision in both planes, except for the actual pulses of an individual beam scan. This replaces the need for an extra beam scan in the other plane. Furthermore, this change is needed to support the new dithering beam scan option, which has a greater need than traditional beam scans to have the beams in collision.

This feature is selected from the beam scan option panel. Toggle the BSCN Auto ReCenter button to FEEDBACK from the usual "1 PLANE" to "FEEDBACK".

Measurement-Only Feedback Loops

October 05,1992

Author: *Phyllis Grossberg* **Subsystem:** *Fast Feedback* **User Impact:** *Small*
Panel Changes: *None* **Documents:** *No* **Help File:** *No*

In order to study beam conditions immediately prior to MPS trips, eleven diagnostic fast feedback loops have been created. The ring buffers for these loops will be frozen whenever an MPS trip occurs, that is, whenever the beam rate drops to less than 5 Hz. The ring buffers will remain frozen until either two minutes have passed or until the ring buffer has been acquired. This allows the BPM measurements in these micros to be saved for beam pulses immediately before an MPS trip. It is expected that a button macro will be created to acquire the ring buffer data and save it to MATLAB for later analysis.

The new diagnostic loops are in micros LI05, LI08, LI09, LI16, LI17, LI21, LI22, LI25, LI26, LI29, and LI30. Some of these loops measure electron BPMs and others measure positrons. These loops will generally take data at 120 Hz. These loops are measurement-only and their HSTAs can be set to SAMPLE or OFF only. They are accessible from the fast feedback MAIN panel, and it is usually necessary to select the "Next Feedback" button to access them.