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SLC Control Program

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SLAC's Software Engineering Newsletter

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New Flat Beam Deflection Fit

June 15, 1993

Author: *Pantaleo Raimondi* **Subsystem:** *Final Focus* **User Impact:** *Medium*
Panel Changes: *One* **Documents:** *No* **Help File:** *No*

In order to properly evaluate the beam spot sizes at the Interaction Point with "Flat" beams ($\sigma_x \neq \sigma_y$), a new "Flatbeam" deflection fit has been added to the correlation plot fitting options. This is now the default fit used for IP beam deflection scans. It may be toggled On/Off with the Deflection Fit Type button on the Wire/Beam Scan Options Panel.

The fitting formula used for non-round beams is:

$$y = A + B \times Z \times e^{Z^2} \times \mathrm{erf}(Z, \frac{Z \times F}{C})$$

where

$$Z = \frac{X - D}{\sqrt{2(F^2 - C^2)}}$$

$$\mathrm{erf}(a,b) = 2 \times \int_a^b e^{-t^2} dt$$

Note that in the definition of $\mathrm{erf}(a,b)$, a factor of $\frac{1}{\sqrt{\pi}}$ has been suppressed so that the scale factor B has the same value as in the round beam fit when ($\sigma_x = \sigma_y$). The fitted variables are A, C, D and F where the variables A, C and D have the same meaning as for the round-beam fit, specifically:

$A =$ deflection offset

$C =$ in-plane beam cap-sigma

$D =$ distance between the two beams

$F =$ out-of-plane cap-sigma

The scale factor B depends only on the intensity of the target beam (the beam not being deflected) so it is a fixed parameter and not fitted. Rather than pass the target beam intensity as a parameter for the flat beam fit, the measured deflection angles are normalized to 1.0×10^{10} particles in the target beam. This is only done when the default deflection fit is "Flatbeam". For typical beam intensities, the deflection amplitude displayed is reduced by about a factor of 3. The value of B is displayed as a parameter (with error set to zero) for compatibility with the round-beam fit.

The value presently used for the scale factor B is 600, rather than the theoretical value of 631. It has been rescaled to take into account an apparent scale error in the BPMs, which read about 95% of the expected value. This rescaling mostly affects the value of the out-of-plane spot size (the F parameter), which is now very close to the value measured by the beam-beam scan in the other plane. The residual systematic effect on the measurement of the in plane spot is less than 1% (corresponding to an error of 3% in the determination of the absolute value of B).

The effect of disruption on the behaviour of the beam-beam deflection scan has been estimated. The effective deflection curve including disruption is not very different from the deflection seen without disruption but with larger cap-sigmas. With 1993 optimal beam parameters, the vertical beam size is overestimated by about 4-8%. With expected 1994 parameters, the overestimate will be more significant, a factor of 20-30%. A new formula is being developed with P. Chen which will include the effects of disruption.

CATER Version 4.6

June 23, 1993

Author: *Robert C. Sass* **Subsystem:** *CATER* **User Impact:** *Small*
Panel Changes: *None* **Documents:** *No* **Help File:** *Yes*

CATER V4.6 adds new shops and subsystems to provide better administrative handling for certain types of problems. The following are changed and new subsystems:

1. The name of the **COW** subsystem has been changed to **COMPUTER** and its description enhanced to include the workstations, printers, Ethernet and other items associated with the central SLC/MCC VAX computers. Existing problems in the database have been updated to reflect this change.

2. Problems with scopes are now included in the description for the **PROFILE** subsystem.

3. VETO is now an item under the **MPS** subsystem.

4. There is now a **MOVERS** subsystem which defaults to the CTL shop. This separates mover problems which are handled by controls, from magnet problems which are handled by the AMW or AME shops.

5. There is a new **BCS** subsystem for Beam Containment problems. It defaults to the CTL shop.

The following are new shops:

1. The Beam Diagnostic Systems **BDS** shop uses the building 212 laser writer. No subsystem defaults to it. This printer (LWB212) has also been added to the list of available printers for all reports.

2. Software Engineering (**SWE**) has been added as a shop for those problems that involve software and hardware or whose origin is ambiguous. No subsystem defaults to it. If either shop in a Hardware problem specifies **SWE**, the problem is emailed to the software group as well as printed on the designated printer of any hardware shop which is entered.

3. The Power Conversion Engineering (**PCE**) shop has been added and uses the Building 15 imagen printer (IMB15). No subsystem defaults to it.

A bug has been fixed in the entry of the beam time lost field and CTRL-Z is now valid when entering the number of a problem to solve.

BPM Sampler Changes for Regional Beam Codes

June 23, 1993

Author: *Mike Zelazny* **Subsystem:** *Accelerator* **User Impact:** *Small*
Panel Changes: *None* **Documents:** *No* **Help File:** *None*

Since the release of Regional Beam Codes, the BPM Sampler has been acting peculiar. Data acquisitions would stop at random times during the day causing loss of history data. To restart data taking, the BPM Sampler would have to be stopped and started from the SLCSHR account with the following command:

SLC> `warmslcx bpmsampl /restart`

A new version of the BPM Sampler has been released to correct this problem.

In addition, the BPM Sampler no longer stops and restarts its data taking every morning at 7:00 am. Data taking just continues from one day to the next. In the past, the BPM Sampler had to stop every day in order to close data files logged to disk. Since, no one was using these files, data logging was discontinued in 1992. If logging is required in the future, it will have to be enabled in the software.

Configuration Facility Modifications

June 22, 1993

Author: *Daniel Van Olst* **Subsystem:** *SLC* **User Impact:** *Small*
Panel Changes: *Few* **Documents:** *No* **Help File:** *Yes*

Many changes have been made to the configuration facility over the course of the last month. Some were released along with the Regional Beam Code software; others were small software requests; and a few were CATER fixes.

"DISPLAY INDEX" Paging

As requested by a majority of operators who responded, the configuration **DISPLAY INDEX** display comes up on the last page automatically. (Note that if an operation is being performed when this display is up, such as **DELETE CONFIG**, the display will stay on the same page).

Default for "LOAD CONFIG"

A default has been provided for loading configurations. The default is the last saved configuration for the current directory. For example, if the current configuration directory is **SCRATCH** and you load a config, and choose the default, the last saved **SCRATCH** config will be loaded. (Note that at present this feature is only available on the **CONFIG INDEX** (and from panels off the **CONFIG INDEX**) and from the **BPM REF ORBIT** panel. It is not available for fast feedback or injection configurations).

Changes to Speed Up "DISPLAY CONFIG"

Changes have been made to the **DISPLAY CONFIG** displays to increase their speed.

Due to the increasing size of many configurations (especially timing configurations with the new RGBM information) the **DISPLAY CONFIG** displays have slowed down. To improve their speed, several changes have been made to these displays:

- The file being displayed is brought into memory the first time it is used, and kept for an hour. Therefore, a small delay may be seen if a new file is chosen for display, or the display has not been refreshed in the last hour.
- The "current" data for the display (such as CON and DES values) is stored in memory the first time the data is used, and retained for an hour. A fresh copy of the current data is obtained from the database if a new save file is brought up, OR if one of the **DISPLAY CONFIG** buttons is pressed, OR an hour or more has elapsed since the last display refresh (this will cause a small delay). Current data is not obtained, however, if the paging buttons (**DISPLAY FIRST PAGE, DISPLAY LAST PAGE**, etc.) are used; this allows paging to occur much faster than before.
- Since these displays do not get fresh database data when being paged, the last time current data was acquired is shown at the top of each page of the display.
- The **DISPLAY CONFIG** buttons themselves, when pressed, no longer force the display to the first page. This allows a fresh copy of the current data to be acquired for the display without changing the current page. The paging buttons must be used to go to the first page of these displays.

Regional Beam Code Support

Regional Beam Code support has been added to the configuration facility. Since the configuration facility was never intended to handle data as complex as that of Regional Beam Code Facility, in some respects the support is minimal at best.

Existing timing items in timing configurations represent a delay and activation status of a device. These items have pseudo-secondaries of TACT, TOFF, or TBAD to indicate that the items are of a timing nature.

The new regional beam code items have pseudo-secondaries of RACT, ROFF, and RBAD to indicate that the item contains information of a regional beam code nature. (RACT indicates that the data was saved correctly, RBAD that there were problems during the save. ROFF is reserved for future use.)

Note that regional beam code items from save files are displayed along with the current values from the TMATRIX. The configuration software attempts to determine if the file value and current value are identical, and colors the current value green or red as appropriate. Note that the configuration software is not 100% accurate in determining whether the file and current values match, so these colors should be considered advisory at best.

- Regional beam code items have been added to the pre-existing timing configuration regions (which all begin with the letters TIM, such as TIM00-01). Timing configurations first list all the delay/activation values for devices, then list all the regional beam code values for the same devices. For example, TIM00-01 contains the delay/activation status for TRIG LI00 202 in the first half of the save file (pseudo-secondary is TOFF or TACT) and the regional beam code information (for TRIGs and other DUPCDs, the information is a set of conditional- expression pairs) in the second half of the save file (pseudo-secondary RACT).

- New configuration regions have been created for several BGRPs, and there is one new region for all TMVAs. These regions are on their own panel, which may be reached from the **TIMING CONFIG** panel.

Fast Feedback Trouble-shooting Hint

June 22, 1993

Author: *Linda Hendrickson* **Subsystem:** *SLC* **User Impact:** *Small*
Panel Changes: *None* **Documents:** *Yes* **Help File:** *Yes*

Operators have expressed confusion recently about certain error messages associated with fast feedback loops. Here's a (hopefully) helpful hint about some of these. If you see a kisnet error message such as "LI18 KISPort 2: KISnet link is not connected?" you can learn more about this from a terminal by typing "KISTEST" and then "HELP". By finding the micro and the kisnet port (LI18 and 2 in this example) in the help you can determine what the link is used for and which other micro is involved. Recent software changes should alleviate this problem, but in some cases it has helped to IPL both of the associated micros.

SLCORBIT Display Changes

June 22, 1993

Author: *Ron Mackenzie* **Subsystem:** *SLC* **User Impact:** *Small*
Panel Changes: *None* **Documents:** *Yes* **Help File:** *Yes*

In order to help investigate various jitter related problems, the SLCORBIT CUD display has been modified. Previously, the SLCORBIT display consisted of a map of the LINAC/SLC at the top and various text items at the bottom. The map portion of the display has been replaced with the following stability related items.

Column Heading	Explanation
LI27 POS JTR	Linac Transverse Jitter (as calculated by feedback) in units of design beam size. There are four data items representing x and y jitter for both electrons and positrons.
INTEN JTR %	Intensity Jitter expressed as a percent of intensity. Data is provided for the end of the RTLs and the IP.
BSY E JTR	Energy Jitter at the BSY in units of MEV.
Blank Space	Room has been left on the right side of the display for time slot differences to be added in the future.

Note: Each jitter display item may contain one of the following:

Field Entry	Significance
A numeric value	There are no errors and all is normal.
"FBCK" or "**"	The associated loop is not in feedback or in compute state.
"–"	Overflow of the field (the value wont fit).
A blank field	An internal software error.

Online help is available for the SLCORBIT display from the SDS (CUD) control panel.

PCs as Legal SLC Control Micros

June 24, 1993

Author: *Lahey, Levitt, Mackenzie, Sherwin* **Subsystem:** *Micros* **User Impact:** *Small*
Panel Changes: *Few* **Documents:** *Yes* **Help File:** *None*

It is now possible to attach IBM compatible personal computers to the SLC control system. This facility will initially be used to support some FFTB instrumentation that is being connected to the SLC control system via PCs called PC01, PC02, PC03, and MV01. These PCs are currently visible only from a development SCP called FFTBSCP.

After release of the software this week, the PCs will initially appear as the first set of micros in the "**Micro Status Display**". The PCs will be moved to the end of this display after the following DBINSTALL.

MV01 is being used to control the FFTB magnet movers. PC02 will soon be connected to MCC to control and monitor KEK instrumentation. This equipment is now being commissioned by FFTB experimenters.

It should be noted that until these pseudo micros are officially turned online, and announced in future Index Panel articles, they are not to be used by anyone other than FFTB personnel.

Jurassic Park Fixes

April 1, 1993

Author: *Controls Management* **Subsystem:** *PPS* **User Impact:** *Large*
Panel Changes: *Few* **Documents:** *No* **Help File:** *No*

As you all know, major problems were recently experienced at Jurassic Park that led to a number of deaths. Many of these problems were due to sabotage of the control system by a fat greedy software engineer. The problem was compounded by the fact that all the park's systems (including security) were controlled by one central control system.

Recognizing the similarity between the SLC control system and that of Jurassic Park, the controls group will shortly be implementing the following changes.

- The candy and soda vending machines will be removed from MCC (to encourage people to eat healthy foods).
- High voltage (30,000 volts) will be put on the PPS gates to make sure no Z^0s escape.
- The control of this high voltage will be manual. Three separate keys (to be held by Richter, the EOIC, and Hamid Shoaee) will be needed to shut it off.
- All software engineers will be given large raises so they won't be tempted to steal and sell any young Z^0s.
- Since the root cause of the Jurassic Park Problem was the centralized control system, we will decentralize our control system. This will be done by removing SLCNET and ethernet and hooking terminals up to each micro. This will have the added benefit of creating extra job openings for operators. The Clinton administration has agreed to add this to its economic stimulation package.
- We have asked for bids for an uninterruptible power supply capable of running the full SLAC site (with the linac on of course) for 24 hours. This will prevent loss of Z^0s in case of major power outages.