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SLC Control Program

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Generalized Wire Scanner Software

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Author: *G. Sherwin, K. Krauter*

Subsystem: *SLC & FFTB* **User Impact:** *Large*
Panel Changes: *Few* **Documents:** *This Article* **Help File:** *Yes*

Introduction

To support generalized wire scanners for both the SLC and FFTB runs, enhancements have been made to the skew and emittance measurement packages in the SCP. Previously hard-coded wire scans and calculations for these measurements have been made flexible through the use of wire selection utilities and transformation algorithms. Most importantly, this effort was directed to support odd-angle wire scanners to be commissioned in the SLC final focus and the FFTB beam line. However, as generalized software, the modifications impact future skew and emittance measurements for all wire scanners.

Wire Selection: Panel and Display

The flexibility of the new skew and emittance packages allows the user to select any valid assortment of specific WIRE units and their individual wires to perform a skew or emittance measurement on a given micro. Wire selection is achieved through a new SCP panel, **WIRE MAP EDITING PANEL**. This panel is accessible from each wire scanner control panel by pressing [WIRE MAP PANEL].

The wire map editing panel presents buttons with the available WIRE units for the given micro under the title **Select WIRE scanner**. Whenever one of these WIRE unit buttons is selected, a row of buttons below them are updated with the individual wires available for the selected unit. Under the title of **Toggle wires ON/OFF**, each of these wire buttons will also have **YES** or **NO** highlighted upon them to indicate if the wire is selected or not for the currently defined measurement mode and type.

Measurement mode and type are defined by the two buttons under the title **Select Map**. The first button, $\boxed{\text{BIT MAP MODE}}$, toggles the wire selection mode between the measurement packages of **EMIT** and **SKEW**. The second button, $\boxed{\text{BIT MAP TYPE}}$, selects the type of scan. For an emittance measurement the available types are the scan planes just as are available on the wire control panel, i.e., either **X_ONLY**, **Y_ONLY**, **XY**, or **XYU** (FULL). For a skew measurement the only current available type is **SKEW**.

The reason these are referred to as "bit maps" is that the wire selection data for all the wires and for all measurement modes and types are stored in the database as bit maps. A public or default configuration of wire selections for all skew and emittance measurements is stored in the database. These are initially selected upon SCP-startup. The user can then modify these selections to create a set of configurations private to his or her SCP. The public or default configuration can be restored by selecting $\boxed{\text{RELOAD MICRO DEFLTS}}$ or by selecting $\boxed{\text{REINIT DB VALUES}}$ from the **SCAN OPTIONS PANEL**. Furthermore, a private configuration can be made public (i.e., written to the database for all users to use as a default) by selecting $\boxed{\text{SAVE MICRO DEFLTS}}$. This action will cause an informational message to be logged.

By selecting $\boxed{\text{DISPLY MICRO MAP}}$ the user can review both the public and private wire selection configurations for a given micro. The display presents the letters **X**, **Y**, **XY**, **XYU**, and **SK** to indicate which wires are currently selected for the respective multi-wire measurement mode and type. Also included are wire names and wire angles relative to horizontal.

Finally, the $\boxed{\text{ENTER MICRO}}$ button can be used to call up the WIRE unit and their respective wires for any valid micro to perform the same procedure. Online help is also available from the panel.

Wire Selection: Minimum Requirements

To configure a given skew or emittance scan properly, a sufficient number of selected wires must be made for the measurement to proceed. For emittance measurements, data sufficient for a minimum of three WIRE units is required. The maximum number of WIRE units that can be selected with the software for an emittance measurement is currently five. Regardless of the WIRE units selected, all emittance data is calculated with respect to the given micro's first WIRE unit for consistency. Emittance results for the given micro are also always written to this first WIRE unit's database.

Error messages are provided to indicate if either an excessive or insufficient number of wires have been selected for the measurement.

In turn, for a given WIRE unit to be valid and sufficient as part of an emittance measurement the unit must have a valid number of individual wires selected for the given scan plane. Under normal circumstances the WIRE unit will have true **X**, **Y**, and **U** wires that will singularly fulfill the requirements for an X, Y, or U scan by the unit. However, with the coming availability of odd-angle wire scanners (i.e., wires with orientations other than true horizontal, vertical, and diagonal) transformations will be necessary to relate wire scan data into fitted X and Y measurements at the given WIRE unit. A minimum of three selected wires on a unit is required for a proper fit of odd-angle wire data to X- and Y-plane equivalents.

For skew measurements only one selected WIRE unit is allowed. The only exception to this are the WS1 wires in FFTB where each planar wire for a skew measurement is located on three different WIRE units. This case is handled separately and the WS1 wire does not require the wire selection procedure. In all other cases, a skew measurement requires a minimum of three selected wires on a given WIRE unit. Both normal and odd-angle wire scan data for skew measurements are fed to a transformation algorithm that determines the proper measurement parameters.

Emittance Measurements

Once a sufficient number of WIRE units and their respective wires have been selected for an emittance measurement, the emittance measurement can proceed as it has been performed previously. Selection of the [MEAS EMIT] button from the wire control panel will start the procedure with wire scans occurring in reverse unit number order.

The **CEA** and **OLD** emittance calculations and displays are still supported with modifications to support a flexible variety of possible wire selection configurations. Recalculations and diagnostic displays are also supported as before. Although the **OLD** emittance feature where all possible combinations of three-wire emittance calculations are made and presented on the diagnostic display has been removed, the functionality still exists. When doing either an **OLD** or **CEA** calculation, the user can re-enter the wire map editing panel and de-select wires and then recalculate the emittance. No additional scans are required for this if there still remains a sufficient number of selected wires for the calculation.

Emittance measurements using odd-angle wires have additional affects. The data presented in the displays for these wires is summarized as a single X and/or Y measurement for the given WIRE unit. This data is calculated from the fitted transformation described above. Data from individual wire scans of the odd-angle wires is not presented in the emittance displays. Furthermore, asymmetric gaussian fit parameters are presented only for those WIRE units with wires that have true X- and/or Y-plane orientations.

Correlation plot support of emittance measurements also exists. Following proper wire selection, emittance measurements can be made from correlation plots using **PHYS** variables identical to those previously used. **PHYS** variable emittance measurement support currently exists for micros LI00, LI01, LI02, LI011, LI28, and EP05.

Skew Measurements

Once a sufficient number of wires have been selected on a WIRE unit for a skew measurement, the skew measurement can proceed as it has been performed previously. The skew calculation is new and can support any number of wires greater than three, regardless of wire orientation.

The skew display has also been slightly modified. The old "skew parameter" has been replaced by a new normalized correlation coefficient term, r_{xy}. This variable also represents the old r_{31}. The old emittance increase factor is now represented as ε, or "epsilon", in the new display. Furthermore, the fitted X and Y beam widths and their uncertainties are displayed along with the wire widths and uncertainties, TMITs, and asymmetrical fit parameters for each selected wire.

Recalculations are also supported. As with the emittance calculation, skew measurements using fewer wires can also be recalculated without making additional wire scans by first de-selecting wires in the wire map panel prior to recalculating.

Correlation plot support of skew measurements also exists. Following proper wire selection, skew measurements can be made from correlation plots using **WSCN** variables for valid WIRE units. As before, the supported correlation plots skew secondaries include **SKEWANGL** for the skew angle, **SKEWMJSQ** for σ^2_{maj}, **SKEWMNSQ** for σ^2_{min}, and **SKEWPARM** now representing the new r_{xy} parameter.

Summary

Generalized wire scanner support for the skew and emittance packages is now in production. The skew and emittance packages should have the same familiar look and feel when performing measurements from the SCP panels or correlation plots. The displays are very similar, and the database is currently preset so that the default wire selections are the same as the previously hard-coded configurations. The major software modifications involved in this support should become apparent only when a user desires to select different wires or a different number of wires for a measurement.

Once the **4D** emittance calculation becomes available there may be some changes in the definitions of what constitute **XY** and **XYU** (FULL) scans. The wire selection criteria for these coupled-emittance measurements may have to change to suit the requirements of the **4D** emittance calculation software. For now, the **XY** and **XYU** emittance scans are both treated as measurements that require sufficient wire selections for independent X-plane and Y-plane emittance scans.

New MPG IDIM display

Feb 23, 1994

Author: *Karey Krauter* **Subsystem:** *MPG* **User Impact:** *Small*
Panel Changes: *Couple* **Documents:** *This Article* **Help File:** *Yes, online*

Introduction

Three new Master Pattern Generator (MPG) rate/IDIM buttons have been added to the Beam Options Panel: the Rate History Button (previously hidden deeper down), the Active IDIM Display Button, and the Edit IDIM Panel Button.

The Active IDIM Display button is used to see the current MPG IDIM rate limiting state. The Edit IDIM Panel button is a placeholder for the future capability of disabling MPG IDIM ratelimiting (per-bit) from the SCP; this panel is fully functional except for the actual disabling, feel free to play with it (especially now when it cannot harm anything in the database or the MPG!). Online help is available for everything.

The Rate History Display shows you a history of MPG rate changes together with the asserted IDIM bits that caused those changes (or the MPS request which caused those changes). The old Rate History Display button has been moved up one panel to the Beam Option Panel, and it remains temporarily in its original location on the BGRP Control Panel. This is in anticipation of removing the Rate History Display from its original location on the BGRP Control Panel, where space is at a premium. This is also because the Rate History Display goes together with (is complementary to) the other new MPG IDIM buttons which have been added to the Beam Options Panel (described below). Online help is still available for the Rate History Display button in its new location on the Beam Options Panel.

It has been observed that it is difficult to tell, from the Rate History Display, which IDIM bit is presently causing the most severe rate limiting at the current time. So we have added $\boxed{\text{ACTIVE IDIM DISPLY}}$ to the Beam Options Panel located next to the Rate History Display button. The Active IDIM Display will show you which IDIM bits are currently causing the MPG to rate limit, and what level of rate limiting each asserted IDIM bit is causing. This display also gives you some overlap with the Rate History Display in showing you what BGRP's are presently being broadcast, the actual (MPG) rate each bgrp is running at, and the most recent MPS requested for each bgrp. The Active IDIM Display may well turn out to be more useful than the Rate History Display. There is online help for this new button with this same description.

The $\boxed{\text{IDIM EDIT PANEL}}$ button has been added to the Beam Options Panel located next to the Active IDIM Display and the Rate History Display buttons. This panel is not quite fully functional yet although you are invited to explore the new panel and try it on for size. This panel is an advance preview of an upcoming feature that will allow you to disable IDIM bit ratelimiting on a per-bit basis. Online help is available for all the buttons on the IDIM Edit Panel.

On the IDIM Edit Panel, there is a button for each IDIM bit which indicates whether that bit's ratelimiting effect is enabled or disabled. If the bit is enabled, that bit's button will show the ratelimiting the bit would cause if it is asserted. If the bit is disabled, the button shows "NONE" to indicate no ratelimiting effect at all. The user may poke the IDIM bit button to toggle its state between enabled and "NONE". Each IDIM bit button is tagged with a "*" if it currently shows a ratelimiting value different from the database ratelimiting value for that bit. There is a

[DISPLY IDIM MAP] button which will show the list of currently (as indicated on the IDIM Edit Panel) enabled IDIM bits and what their ratelimiting is, together with a static default list of what all the bits' normal (enabled) ratelimiting is. The display calls the "normal" values the "gold" values in reference to Gold Configurations that are used to remember a desirable default state.

If the user wishes to back out of IDIM Edit Panel changes (see the IDIM bit buttons tagged with a "*") presently shown on each IDIM bit button there is a [LOAD DB VALUES] button which restores the original IDIM bit ratelimiting values. If the user wishes to save the changes presently shown on the panel, there is a [SAVE DB VALUES] button.

NOTE: The Save DB Values button currently does not actually save anything to the database, although it will tell you in the SCP messages window what it would have saved if it were allowed to. In the future (soon), the Save DB Values button will also tell the MPG to act on the new values saved to the database; this is not presently done. Stay Tuned!

PDP-11 Retirement

March 7, 1994

Author: *R. Chestnut, M. Stanek* **Subsystem:** *Timing* **User Impact:** *None*
Panel Changes: *Few* **Documents:** *No* **Help File:** *No*

Introduction

After many years of stalwart service, the PDP-11 computers in MCC and the Intel 86/12 micro in CCR (the old control room) are no longer needed for operation, and are now shut down. The last time this retirement was proposed, in 1987, Ralph Johnson summarized the functionality remaining on the PDP-11s and the conclusion was that too much needed to be done. In the meantime attrition has taken its toll, and most signals had been replaced or were no longer needed. Mike Stanek and Dave Hamilton undertook the task of moving the last known required signals off the PDP-11 and CCR micro computers. The last required controls fron the PDP touchpanels are now available on the VAX, and can be exercised as detailed below:

RA-Line Assignment

Research Area (RA) line patterns formerly assigned on the PDP setup panel are now generated by MC00 Crate 3 PDU. A TRIG exists for each RA line, and is named appropriately on the MC00 Trig Panel.

1. TRIG308 = RA1
2. TRIG309 = RA2

3. TRIG310 = RA3
4. TRIG311 = RA4
5. TRIG312 = RA5
6. TRIG313 = RA6
7. TRIG314 = RALo

These triggers exactly emulate the RA control on the PDP, where the RALo signal in conjunction with RA1 - RA6 indicates the "lower" signal.

50 Microsecond Permissive

The 50 microsecond permissive for each beamline had On/Off control on the PDP MAINT panel, which acted in series with the MCC Console On/Off control. In BASII mode, the MCC Console On/Off was disabled, and the PDP had the only control for the 50 microsecond permissive. The PDP control has been replaced by a PPOM in LI27 which toggles the 50 microsecond permissive On/Off for *all beamlines*. This new control is through the CCR Control Panel off the Linac MPS Panel.

Positron and Sector 30 PLIC Gates

The two negative gates on the Linac PLIC signal (which cancel the PLIC from the positron return line positron pileup and from the Sector 29 and 30 collimators) were generated for each beamline by a pattern assigned on the PDP-11 Setup-2 Panel. This is now replaced by TRIG MC00 105, which should be activated on any SLC beamcode that has Linac beam.

RMXIII 32 Bit Code in all Standard Micros

March 9, 1994

Author: *Robert Sass* **Subsystem:** *Micros* **User Impact:** *Small*
Panel Changes: *None* **Documents:** *No* **Help File:** *None*

Introduction

All standard micros are now running in full 32 bit mode. They use the RMXIII version of the operating system and all programs have been recompiled and linked with 32 bit versions of the micro utilities. While there shouldn't be any noticable operational difference (if we did our job well), there were compelling reasons for making the change.

1. Intel is no longer updating the RMXII 16 bit version of the operating system and utilities.

2. Programs run about 20%-30% faster and more fully utilize the capabilities of the 386/486 CPUs.

3. Each data and code segment can now be up to 4 Gbytes in size instead of 64 Kbytes, thus freeing us from the tyranny of the 64K barrier for future software development.

Don't ask about Pentium.