Basic instructions for SVX4_MS_1.8.xls

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1.Introduction

SVX4_MS_1.8.xls is a MS Excel Spreadsheet to be used for testing of Run IIa / IIb hybrids and detectors.

The necessary run2b hardware consist of a VME crate controlled by a Bit 3 PCI bus, a Stand Alone Sequencer, a 50-conductor 3M cable, a Purple card, a jumper cable, Low voltage power supplies and the hybrid to be read out (look in http://d0server1.fnal.gov/projects/run2b/silicon/www/smt2b/readout/readout.html for details).

There are different Bit3 versions and this spreadsheet works with a 616, 617, 618 or 620 SBS model PCI bus to VME bus on a Windows NT4, 2000 or XP machine. The board comes with its own drivers but I suggest installing the drivers designed by Robert Angstadt (angstadt@fnal.gov).

There is a great documentation on how to install these drivers (giveio.sys, mapmem.sys and bntdv617.dll) in http://d0server1.fnal.gov/users/angstadt/www/b3/b3_61x.htm. To convert the spreadsheet to a different Bit3 model and/or Operative systems go to http://d0server1.fnal.gov/users/angstadt/www/d0notes/2589/convertb3.htm.

This spreadsheet uses Visual Basic macros. In order to enable them the security level of MS Excel should be set to medium (go to Tools ->Macros -> Security and choose “Medium”) and some add-ins should be enabled (Tools -> Add-Ins and select “Analysis ToolPak” and “Analysis ToolPak-VBA”). Also some source files for the unpacking of the data and some dlls (Xutil.dll, MCMutil2.c, MCMutil2.def, MCMutil2.h, MCMutil2s.h, mcmutil2.dll) should be copied in C:\Winnt\System32 (these files are available at http://d0server1.fnal.gov/projects/run2b/Silicon/www/smt2b/Testing/DLLfiles.html).

2.Features

2.1 M_S_ave sheet

This is the main sheet from where most of the things can be done. The basic steps to use it are steps 1 to 5 below.

1. **Hit the "Init Bit 3" button**. The value of cell (C5) shows the result and if this is "ok!" the Bit 3 was successfully initialized (*1).
2. **Enter the desired parameters** (see section 2.1.2).
3. **Hit "Init Sequencers"**. This will download the SASeqs with the parameters set in the corresponding "Saseq_Master/Slave" sheet.
4. **Hit "Download SVX chips"**. This downloads the type of chips specified in Cell(G9) for the active chains with the corresponding parameters in the "Init_SVX4(2)_Master(Slave)" sheet. Cell (E11) will show the result of the download ("Init OK" in a green background or "n errors" in red background). There are many possible reasons (Chip, SASeq and/or spreadsheet related) why this may not work the first time but the second, just keep trying.
5. **Hit "Get Data".** The program will begin reading incrementing a counter in Cell(B9) till it gets the predetermined number of events. If for some reason there were readout errors, those particular events are tagged as bad and not taken into account, and a counter of bad events in Cell (E9) gets incremented. If the counter of bad events is the only one that gets incremented the user might want to stop the program, to do so just press the "End" key of the keyboard. Once the desired number of events is collected, the program will print channel numbers in a column that begins in Cell (B32), the average of the readout for each channel in the column beginning in Cell (D32), ten times the Total noise in the next column and ten times the Differential noise in the last column (*2). Plots for all these values are shown in the sheet if desired.
6. Hitting "Plot Favorite Chip" will show a separate plot for the chip specified in Cell (Y4) in the chain that corresponds to the value of Cell (Y3).
7. By clicking on the "Delete Plots" button the user will get exactly that.

2.1.1 “M_S_ave” other features

1. **Pedestal distributions**. If the user would choose to get a pedestal distribution for a single channel or all the channels in a chip, entering the necessary parameters in cells(X9, X10, X11, Y10, Y11), (see section 2.1.2 to figure out how to do that) the corresponding histogram will be done in the “Histo” sheet and Cell (X12) will show the number of entries for that histogram. By default the flag in cell(X9) is in FALSE so that the readout is the fastest.
2. **Scanning pipeline-cells**. Pressing the “Peds (Pipeline)” button will cause a not so fancy process that will scan the pedestal values for all channels and chips as a function of the Pipeline cell value (Cell (B21) and Cell (B44) of “Init_SVX4 (2)_Master (Slave)”). The value of Cell (V22) tells the number of pipeline cells to be scanned. If the flag in Cell(V24) is TRUE (FALSE) the scan is going to begin in pipeline cell 0 (42). Basically a loop will begin and in each step the chips will be downloaded for a different value of the pipeline cells and then a readout loop will take place. After the scan is done the results (values and plots for pedestals, Total noise and Differential noise) will be shown in the “Pipeline_Ped” sheet.
3. **Scanning the gain as a function of pipeline-cells**. Hitting the “Gain of Pipeline” button will do a similar process as in step 9 but instead of scanning the pedestals as a function of the pipeline cells, what is scanned here is the difference between the cal-injected and not cal-injected values for each channel. The results will be shown in the “Pipeline_Gain” sheet.
4. **Correlation between chips**. Cell(X13) has a flag that by default is FALSE. If this flag is TRUE, setting the desired parameters in cells(X14, X16, AA14, AA15, AA16, AA17) (see section 2.1.2 for details on these cells) will show a scatter plot (in the “Correlation” sheet) of the readout of the desired channels of a chip versus other group of channels of other chip.
5. **Exporting plots**. The “Export Active Plot” button allows to save the active plot (left click on the plot to activate it) as a .GIF, .JPEG or .HTML file in the desired folder.

(*1) If there is more than one spreadsheet open (with Bit 3 related macros) or a macro was compiled it might be the case that the message “Connection lost, no buffer from mapmem.sys” appears. This is related to the fact that the mentioned .sys file has single threading protection and Visual Basic somehow causes bntdv617.dll and its mapmem.sys connection to be broken. In that case Excel should be restarted.

(*2) Total noise is defined as the standard deviation of the readout values for each channel, while the differential noise is the standard deviation of the difference between the readouts of one channel an its following neighbor.

2.1.2 Parameters

This sheet has blue-ish fields that can be adjusted to the user’s preferences.

- Cells(C2-C3) are related to the Bit3 base address and should be “39” and “D0000” respectively.
- Cell (C6) sets the desired number of events to be taken.
- Cell (C14) indicates the number of SASeqs-Slaves to be downloaded.
- Cells (C15-C16-C17) are the base addresses of the Master and Slaves SASeqs respectively. For “old” SASeqs (serial number 1 to 60) the value of this address is 50dxxx (usually 50d000). The address of the SASeqs can be physically determined setting some switches on the board. For more information go to http://d0server1.fnal.gov/users/utes/WEBPAGE/saseq2.htm. For new SASeqs some adjustments in the downloading sheet (Saseq_Master) need to be made and possibly the address may look different (more information on this for the next version of the spreadsheet…).
- Cells (C21-26) set the number of chips to be readout in each chain. It is important to have the proper numbers in these fields.
- Cells (I2-4) enable/disable the SASeqs’ chains (0=both chains off, 21=chain A on, 12=chain B on and 23=both chains on.
- Cell (G6) is a flag that, when set to TRUE, allows to display the raw data in a column that begins in Cell (U30) for the SASeq Master and in Cells (V30-W30) for the Slaves. The first to characters of each word correspond to chain B and the rest for chain A. For SVX4 chips the fourth word corresponds to chip ID, the

sixth eight etc is channel 1, 2… to channel 128 (you will read 7F for this last channel). The same structure repeats for the following chips.

- Cell (G7) allows choosing between Cal Inject mode (TRUE) and Trigger mode (FALSE) that are two different readout modes for the SASeq (the former being useful for most purposes).
- Cell (G8) is a flag that allows seeing some information about the readout errors if any. Errors are shown in rows 21-26 for each chain of the corresponding SASeq.
- Cell (G9) sets the type of chip to be read out (TRUE=SVX4 and FALSE=SVX2).
- Cell (P2) indicates the mask that is going to be cal-injected (in Cal-Inject mode, 0=none, 9=all, 1 to 8=mask 1 to 8 + n*8, for n=0…15 for each chip. So mask 3 means that the masks that will be cal-injected per chip are 3, 11, 19…123).
- Cell (Q4), if TRUE, indicates that a plot showing the readout of all chips is going to be done. FALSE will erase the previous plots and will not crate any other plot.
- Cell (Q5) sets a separate plot for each chain when this flag is set to TRUE.
- Cell (Q6) keeps the status quo of the actual plots when set to TRUE.
- Cells (Y3-4) sets the information about the Chain and Chip to be plotted when the “Plot Favorite Chip” button is hit.
- Cell (X9) determines if an update in the “Pedestal Distribution” plot in the Histo sheet is desired. If set to TRUE, Cell (X11) determines if the histogram is going to be done for all channels in a chip (TRUE) or for a single channel (FALSE). The chip and channel numbers are indicated in Cells (Y10-11) respectively.
- Cell (V22) determines the number of Pipeline Cells to be taken into account for the “Ped (pipeline) test”. Cell (V223) is a counter and Cell (V24) indicates if the starting cell is “0” (TRUE) or “42” (FALSE).
- Cells (Y22, Y23, Y24) follow the same attributes as Cells (V22, V23, V24) but for the Gain (Pipeline) test.
- Cell(X13) is a flag to turn on/off the correlation measurement between chips. Cells(X14, X16) determines de number of the chips to be compared and Cells(AA14, AA15, AA16, AA17) specify the number of channels to be compared for each chip (i.e. StartChannelX=1, EndChannelX=1, StartChannelY=1,

EndChannelY=128 will compare de first channel of chipX versus the average of the 128 channels of chipY).

3. Plans for the future

Work is being done to improve this spreadsheet and add new features.

- Since the SASeqs will support DMA, the code will be adjusted to this feature so that the time to readout hopefully will be ten times less.
- There is a sheet named “hvSlot7” that allows to control one or more 4877PS HV motherboards. This sheet is being modified to be able to measure depletion voltages and leakage currents of detectors.
- Laser test.
- Fixing of bugs.
- More and deeper documentation?
- Any suggestion is welcome.