[WCM] Users Guide

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Purpose of this Document

This document serves as guide for the users of the application. Mainly the Graphical User Interface (GUI) will be discussed, which results in a small summary of how to control the Wall Current Monitor (WCM) applications HardWare (HW).

Purpose of the Application

A Wall Current Monitor (WCM) measures the instantaneous time domain value of the electrical current flowing in the opposite direction of the accelerated beam. Subsequently, the application performs spectral analysis of this signal to identify characteristic properties of the different beam configurations. The new acquisition system for the PS ring wall current monitors has been installed to be able to perform higher frequency measurements and RT visualizations of a beam bunch. This represents an important improvement in relating loses and instabilities of a beam bunch to RF oscillations. In the PS ring three kinds of signal pick-ups are available for the application, the vertical, horizontal and sum, where each signal is associated to different instabilities.

The software consists of two separated applications, the data visualization and the data acquisition, that will run on a desktop Linux environment and a RT Phar Lap target, respectively. A CERN internally developed Controls MiddleWare (CMW) library provides a common software communication infrastructure for the accelerator complex and is used within this project to communicate between the two applications.

The software application needs to be developed using the Laboratory Virtual Instrumentation Engineering Workbench (LabVIEW) development environment by National Instruments (NI). Since the NI vector signal analyzer installed in the Real-Time (RT) target digitizes the signal in the frequency domain, which improves accuracy and the ability for RT visualization.

GUI Guide

- First of all if you perform an exit through CCM, see image, CCM performs a kill instead of a proper close. This means that if any acquisition was active, it will perform this acquisition until you relaunch the WCM application.

- When the application is Launched (through CCM), the following window shows, where the user can select the appropriate PXI for the acquisition. The application will pop-up n numbers of windows showing graphs for the n PXI's selected.
The main GUI should look like this (few changes could have been made), where the numbers stand for:

1. Here you can control the PXI the user wants to control, for example nr. 4 & 5 will swap accordingly to the appropriate PXI that is desired to control.

   The PXI selection menu can be relaunched using "change PXI" button.

2. Two Acquisition modes are available, Power Spectrum or IQ, where controls will swap accordingly.

3. Menu controls where the following options are available,
   - Expert mode can be launched
   - Snapshot (all windows)
   - Calibration target
   - Show target Health (temperatures, voltages and fan speeds)
   - Remote reboot target
   - Abort application

4. Controls for FFT or IQ (explained here) acquisition. It also shows the previous applied configurations.
   - For FFT the Controls are:
     - Reference level (dBm)
     - Start frequency (Hz)
     - Stop frequency (Hz)
     - Resolution Bandwidth (Hz)
     - Window type (explained here)
   
   - For IQ the Controls are:
     - Reference level (dBm)
     - IQ rate (Samples/s)
     - Carrier frequency (Hz)
     - Samples

5. Controls for trigger and CERN Accelerator Logging Service (CALS).
   - Trigger settings has options
     - None - Continuous Acquisition
     - Trigger Single - supported for all acquisitions
     - Trigger Burst - only supported in power spectrum mode with intensity plot
   
   Event frame (hex value) is the event that is selected to trigger for, by default StartCycle (PX.SCY-CT, event frame 34050000), a list of events for CPS can be found here.

   Log to CALS is only supported for power spectrum burst acquisition

6. A string displayer for the messages from the host and target

7. Current User being played in the PS (CPS.TGM_NEW/User)
The Intensity graph looks like this for power spectrum burst acquisition.

Note that
1. "peak search" button, IQ button and "Intensity" button (used to change plots) are disabled and grayed out to prevent unsupported acquisitions.
2. Acquisition time \( T = 1/df \) is shown on bottom right of the graph
3. graph options are available on left bottom

The Waterfall/Regular plot mode looks as follows.

Note that
1. for trigger settings only None (continuous) and Trigger-Single are available
2. Log to CALS is disabled and grayed out, since it is only supported for power spectrum Trigger-Burst acquisition
3. Filter is OFF and can be turned on, where the filter cursor (yellow line) will serve as the filter threshold.
4. Newest plot always has the same (greenish) color and ID for oldest plot (purplish).
5. Number of plots can be controlled.
6. Acquisition time \((T=1/df)\) is shown on bottom right of the graph.
7. Graph options are available on left bottom.

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