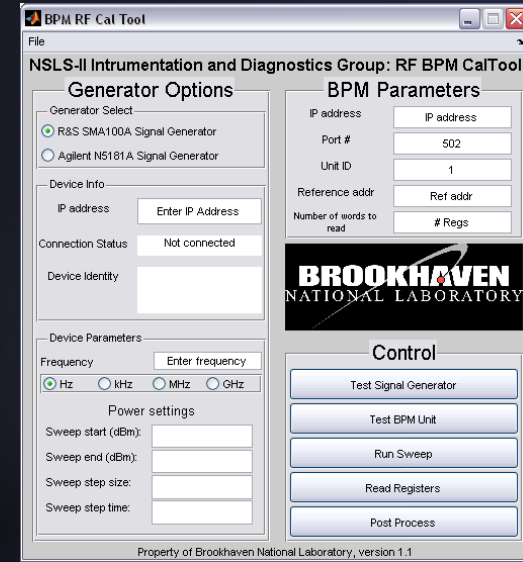
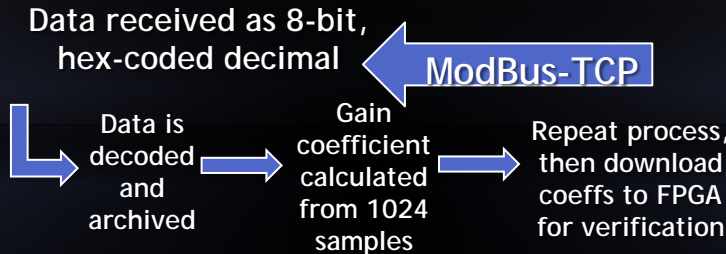
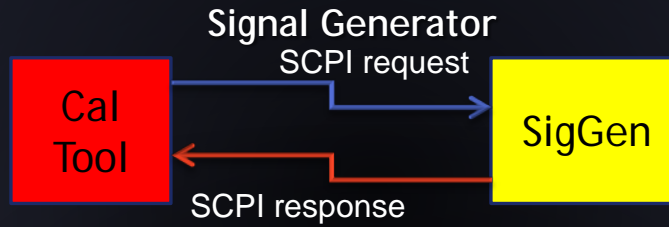


Instrumentation using MATLAB for Calibration & Diagnostics

by Samuel Fanfan

Interface Dynamics



Introduction

This project demonstrates how MATLAB & its Instrument Control Toolbox can be used to craft a custom solution to a real instrumentation problem. Work was completed in collaboration with Brookhaven National Laboratory in Upton, LI.

What is instrument control & why is it important

Instrument control consists of connecting a desktop instrument to a computer and taking measurements. Important in custom hardware design scenarios, especially when interfacing with different devices. Example: calibration of custom HW

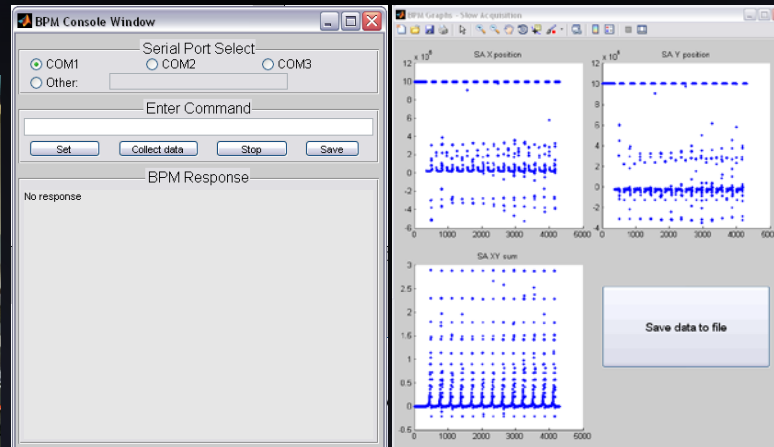
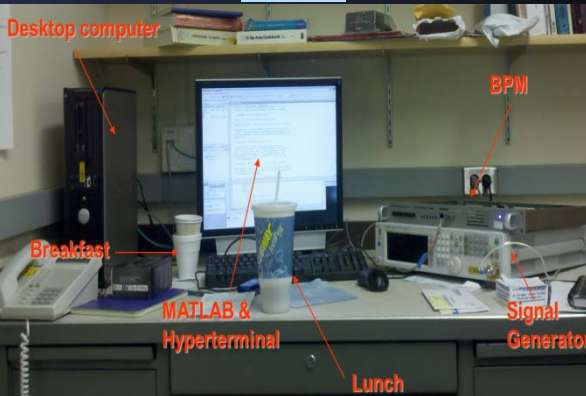
Why MATLAB

- Versatility – to interface device with computer software must support interface to communication with UUT.
- MATLAB & the Instrument Control Toolbox provides support for any (even custom) I/O interface.
- Reduces number of development tools in play.
- Cost!

What's a BPM

BPM = Beam Position Monitor
Brookhaven National Laboratory is home to the National Synchrotron Light Source (NSLS), and the NSLS-II facility (under construction) is slated to be the brightest light source in the world. BPM's are the "backend" of the facility's technology. Data is received from electrodes placed throughout the storage ring and is processed by many BPMs in parallel to determine and monitor the position of the electron beam and it's response to various stimuli/configurations.

The Setup



Results

- RTP Tool
 - Depicts internal calculations in real time
 - Enables archiving of data
- RF Cal Tool
 - Forms closed-loop system between UUT and signal/power generator
 - Sweeps generator while feeding and compiling data from BPM
- Automated Calibration
 - At time of testing, ~17hrs
 - After optimizations, ~3hrs

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