ADQ14 Control

8th August 2019

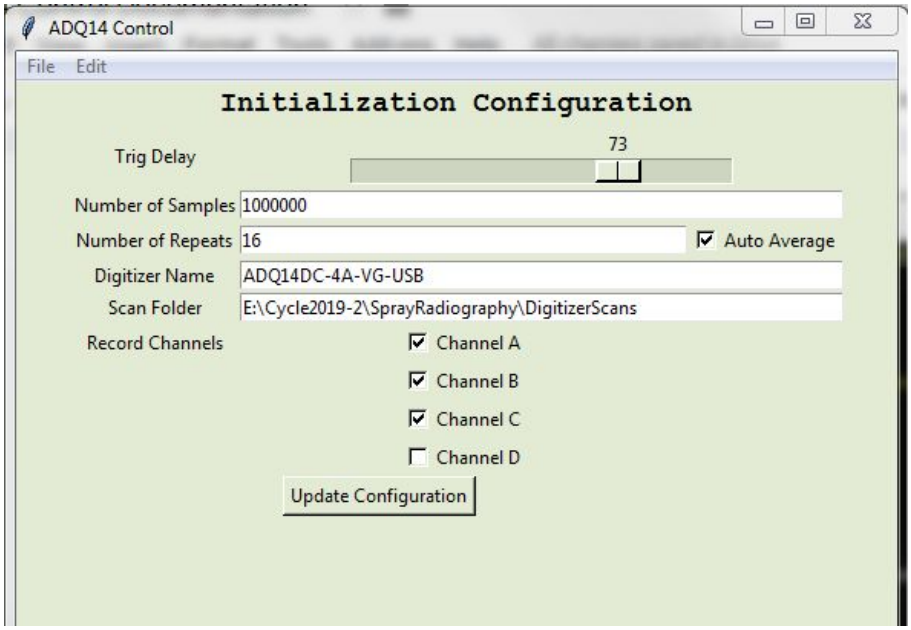
Dan Hudetz

OVERVIEW

ADQ14 Control is a GUI for running the ADQ14 digitizer at the 7B beamline of the Advanced Photon Source. It is integrated with the existing EPICS system. The 14 bit data received from the digitizer is stored in a custom HDF5 format. ADQ14 Control also has a simple data viewer for looking at the attributes and graphs of the stored data.

INITIALIZATION CONFIGURATION

This page serves as a quick and easy way to tweak the settings of the digitizer.



Trigger Delay - The percentage of the data will be saved before the trigger. Example: 0% takes all data after the trigger, 100% takes all data from the buffer before the trigger, and 50% takes half from each.

Number of Samples - How many two nanosecond samples to take. 500000 samples would result in a 1 millisecond record length.

Number of Repeats - The number of repeated data acquisitions before reporting back to EPICS that the scan loop is ready for a new coordinate.

Auto Averaging - Choose to average the number of repeats. Having this option off will save every repeated coordinate. Having this option on will save (1 / Number of Repeats) as much data, but it will remove the option of viewing all repeated data.

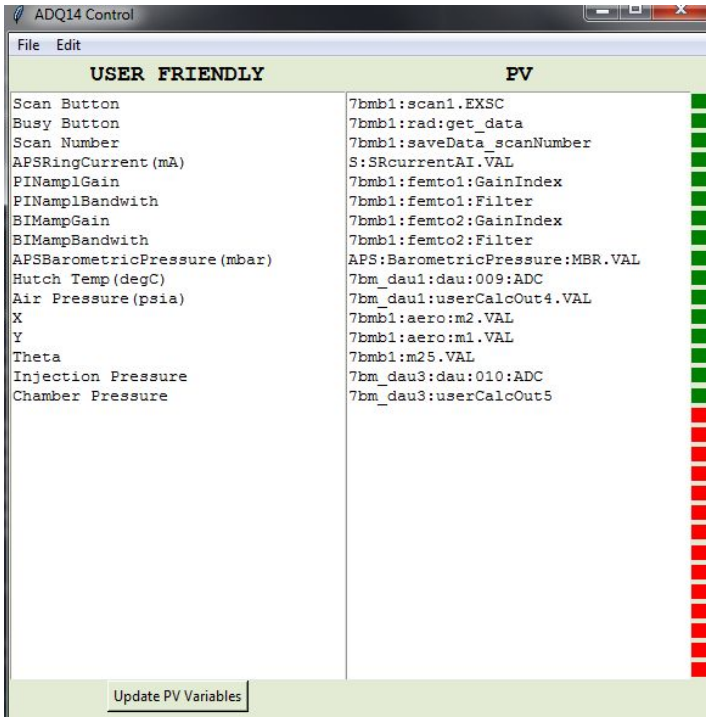
Digitizer Name - Name the current device that is being used. This is saved as a scan attribute.

Scan Folder - Where data will be written to and read from.

Record Channels - Select which channels are actually being used for data acquisition. This helps with conserving harddrive space and can also speed up runtime.

To save the changes made, press the 'Update Configuration' button.

EPICS VARIABLES



This screen allows for the user to create a list of EPICS variables that will be saved in each coordinate as attributes. The colored indicators next to each line represents if each variable is recognized by the system. To update the PV config, make sure to press the 'Update EPICS PVs' button. The user friendly names of the first three variables in the list are hard coded into the operations of the scan loop.

SCAN LOOP

Pressing the ‘START LOOP’ button starts the scan loop and runs the digitizer through its initialization.

Note: attempting to close the program during this initialization process destabilizes the digitizer and requires it to be restarted manually.

The scan loop waits for a new scan to start. After a new scan is started (either from EPICS or by using the ‘NEW SCAN’ button), EPICS sets the busy button to 1 (busy). This holds EPICS back from moving the motors until the digitizer is ready for the next coordinate. The scan loop sees the new scan and arms the digitizer to wait for a trigger.

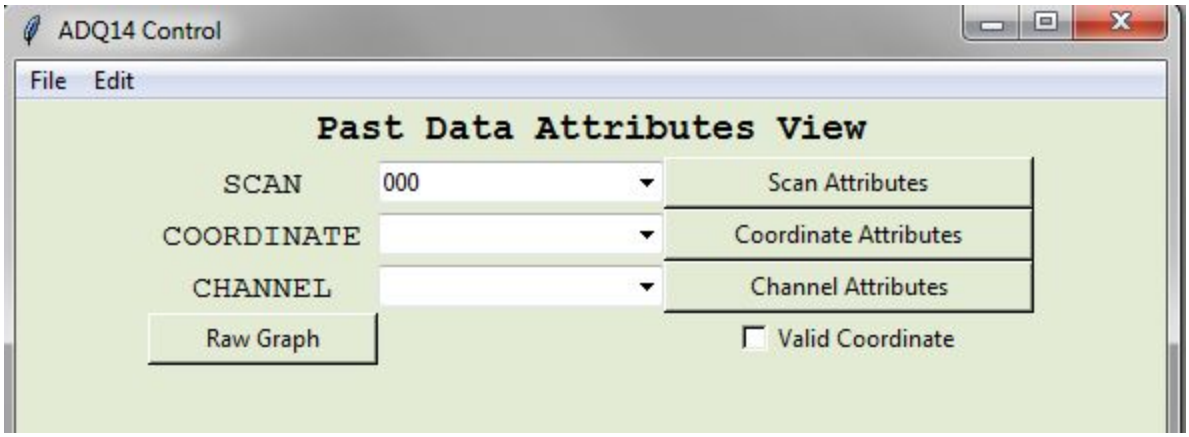
Once a trigger is detected, the data is collected and stored in the HDF5 scan format. If ‘Number of Repeats’ in the initialization configuration is above 1, then data collection will continue until all repeats are collected.

When the coordinate is complete, the busy button in EPICS is set back to 0 (done), telling EPICS that the digitizer is ready for a new coordinate. If there is a new coordinate, the motors move and EPICS sets the busy button to back to busy and the loop continues.

If the scan is complete and there aren’t any new coordinates, the scan loop begins looking for a new scan again.

Shut down the scan loop by pressing the ‘STOP LOOP’ button or by closing ADQ14 Control.

ATTRIBUTES VIEWING



Using the 'View Past Data' page, select the scan, coordinate, and channel of data to be viewed. The scans displayed are all of the scans currently stored in the scan folder set in the configuration.

Scan Attributes - Display the different attributes associated with the entire scan.

Coordinate Attributes - Display the attributes that are specific to each coordinate.

Channel Attributes - Display the attributes that only apply to each specific channel.

Valid/Invalid Coordinate - Flip the validity of a coordinate. The 'valid' attribute of a coordinate serves as a way to manually show which coordinates apply to the data.

Raw Graph - Display a simple graph GUI for looking at the raw data that is held in that channel.

DATA FORMAT

Each new scan creates a new HDF5 file. Then each new coordinate taken creates a group with each of the four channels of data as subgroups. It looks like this:

Scan 001

- Coordinate 0
  - Channel 0
  - Channel 1
  - Channel 2
  - Channel 3
- Coordinate 1
  - Channel 0
  - Channel 1
  - Channel 2
  - Channel 3