Magnetic Triggering (valentine's day edition)

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Introduction

Tasks done this week:

- ▶ Figure out externally triggered charge injection – in particular figure out how to delay external trigger programmatically
- ▶ Setup measurement of DCDC frequency vs. temperature on whatever modules we test
- ▶ Optimize trigger system (faster, less noise) and check statistics again

Injected Charge

Work this week focused mostly on trying to get charge injection to work with an external trigger. Tried the following things:

- ▶ Direct injection and varying strobe delay → didn't work because we need to vary the entire trigger packet, so strobed charges were simply not read
- ▶ Different ST trigger patters → didn't work either. At least I have added charge injection as a parameter to the code, though
- ▶ macro for external 3PG → would probably work, but we don't have the same AFG as they do. requires this to function properly. Sent by Bruce/Peter
- ▶ **Working:** change trigger delay at the NS level with Matt's suggestion:
  `e->ConfigureVariable(ST_HSIO_REG_BASE + 29, n*0x0001)`
 changes delay by n BX (1 BX = 25 ns)

Injected Charge

▶ implemented the NS level charge trigger delay change in the macro provided by Bruce/Peter ('External3PG.cpp') and re-ran it overnight

▶ Some error occured, should look into it. This is kind of the most complicated version of what we want to do, though → start a bit simpler to make sure the latency is actually being invoked

▶ **Now**: running some magnetic triggering tests with injected charge, and delay scanned via the HSIO register instead of the internal delay. Will see if this does anything, and this will show us if the delay is actually being scanned.
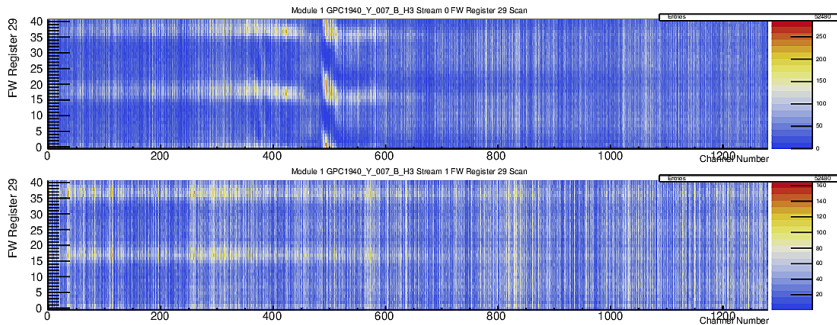
Scanning with FPGA delay

It works to scan latency, but unclear if charge injection is working yet. Scan at cold temp (-15C) over FPGA delay register, with injected charge of 39 (daq number, about .9 fC I think)
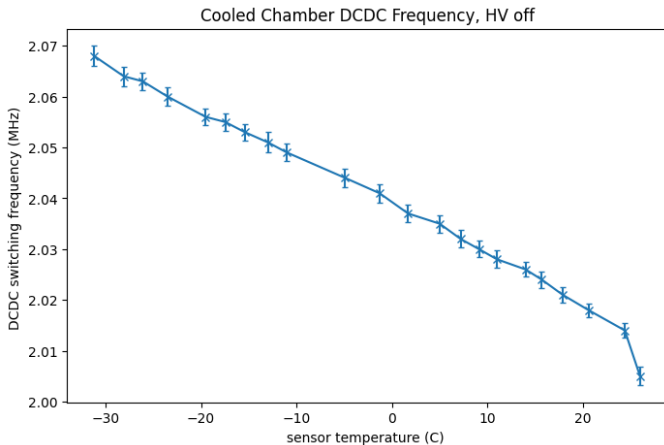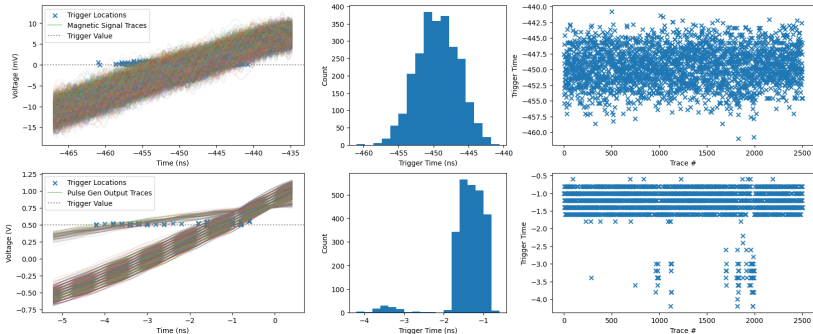
0 injected charge
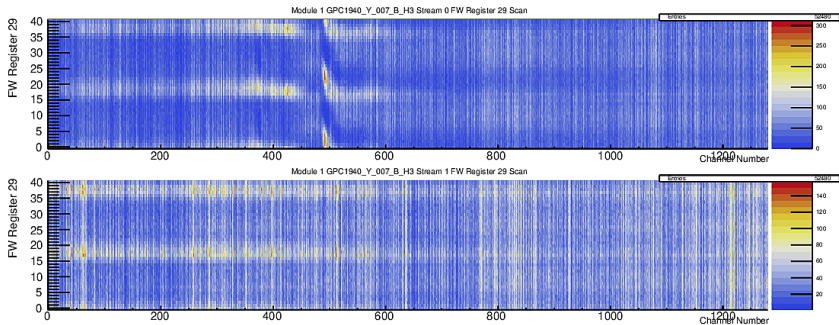
39 injected charge, .9fC

DCDC Frequency

Cooled Chamber DCDC Frequency, HV off

Interested in knowing how the DCDC frequency depends on temperature for different modules, since it may be different on highly modified modules. Set up this measurement.

Trigger Properties

Analyzed 2000 trigger instances, where the cooler is set to -50 C and the air temp monitor reads around -30 C.
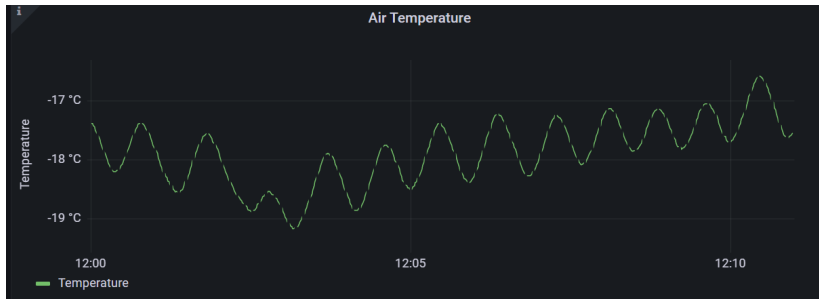
Trigger Properties

Figure 1: Climate chamber temp measurement during the trigger scan (-50C chiller set temp)
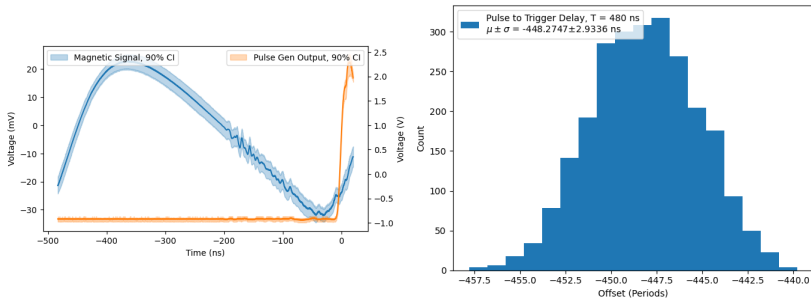
Trigger Properties

Figure 2: Average and error-bounded traces (left) and histogram of signal-to-trigger delays (right)

Objectives, next week

▶ Ensure that trigger delay is doing what we think it is

▶ Re-write latency scan/3PG to use FPGA level delay and do some tests

▶ Try out scans on False Blue module with very obvious CN