Chess-2 tests at SCIPP (attempting charge injection)

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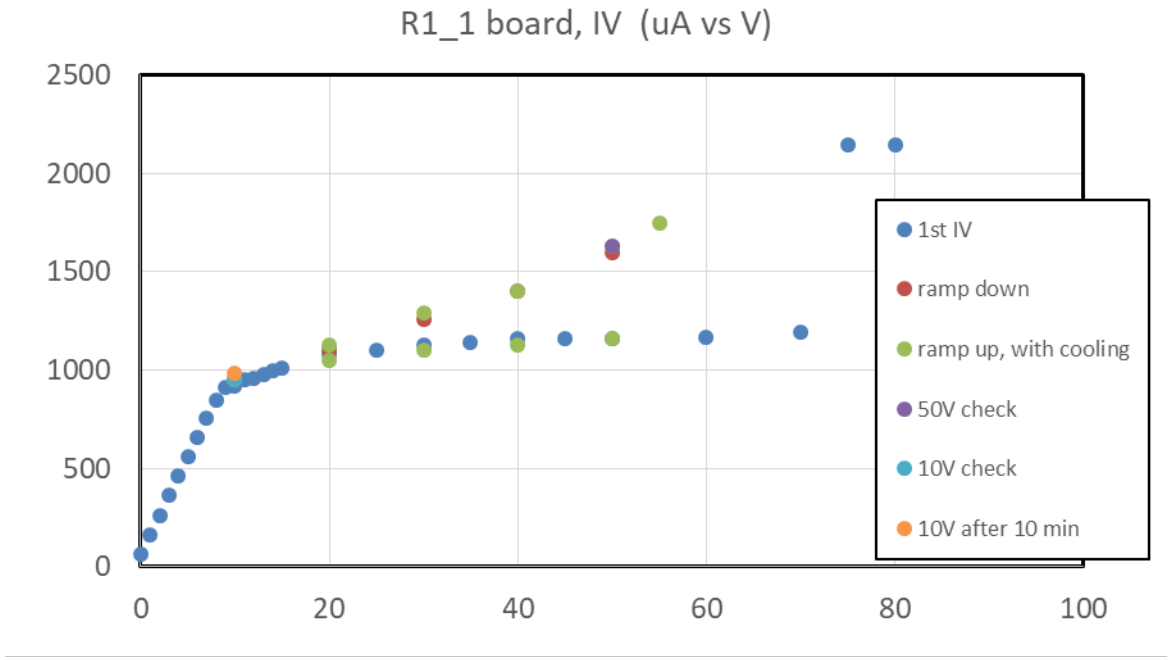
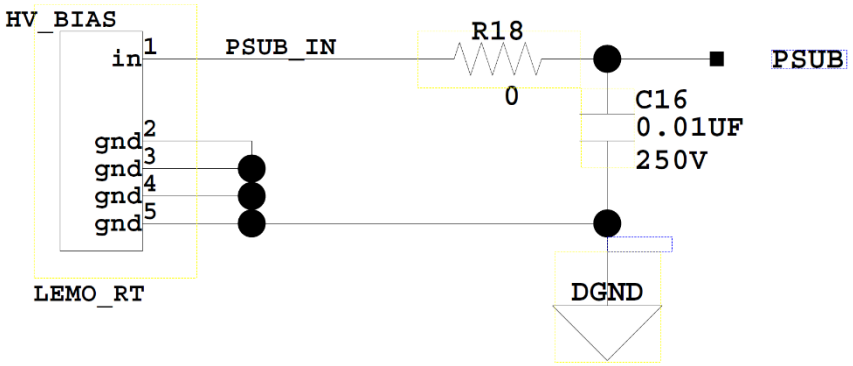
IV tests

Characterized IV for the board in hand, R1_1.

- Seems there is a breakdown at ~75 V. However, the current level rose in subsequent scans.
- Decided to run at up to 40 V for now.
- Note that, due to R18 = 10 kOhm in series, the voltage on the sensor is lower than what's supplied by ~10 V.

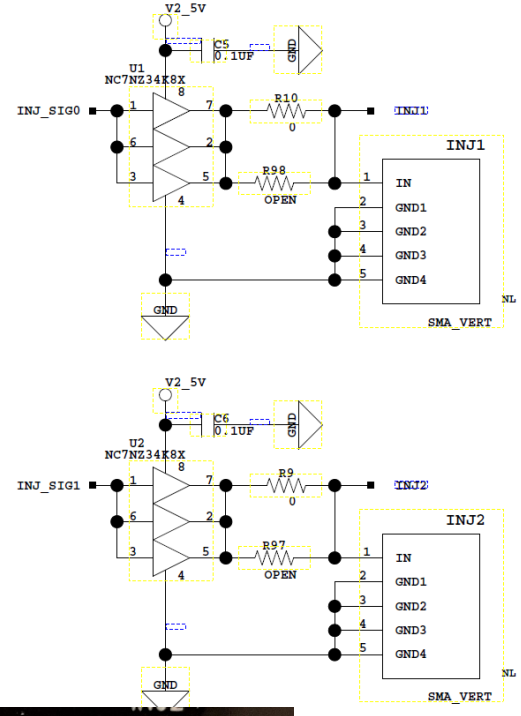


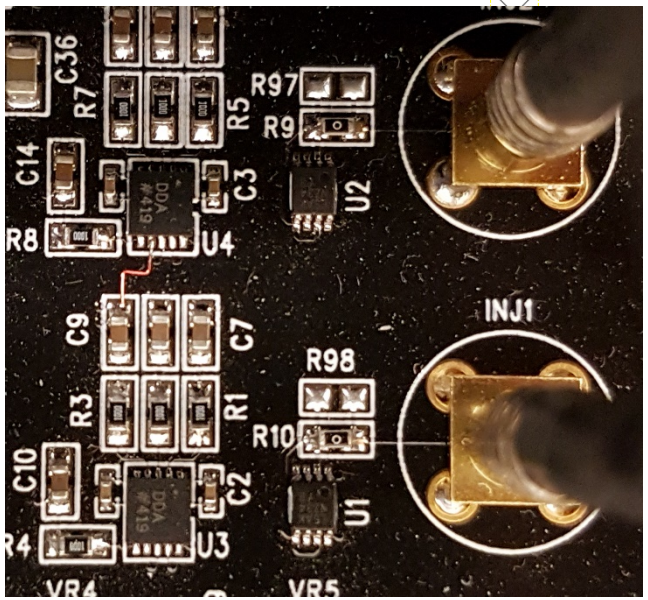


Charge injection

Trying to use charge injection.

- Using software from Herve and Derek (UCSC branch, a modification of the SLAC original one).
- The sequence in the code is:
  1. Issuing calibration pulse
  2. Issuing softTrigger
  3. Reading data out
- How this maps into the signals from FPGA to the chip is a bit unclear. For instance, would expect to read data without calibration pulse, i.e. “just noise”. But see no data in this case.
- As per Dionisio’s note and schematics, we have loopback connection on the board. This means:
  - The external pulser is not involved.
  - The voltage level of the pulse should be 2.5 V.

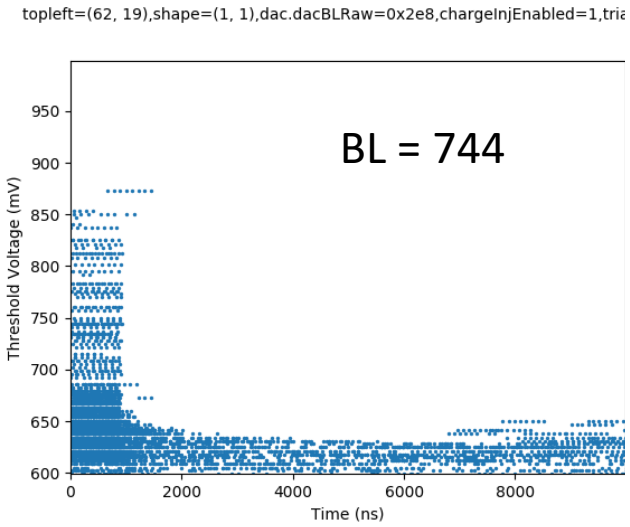


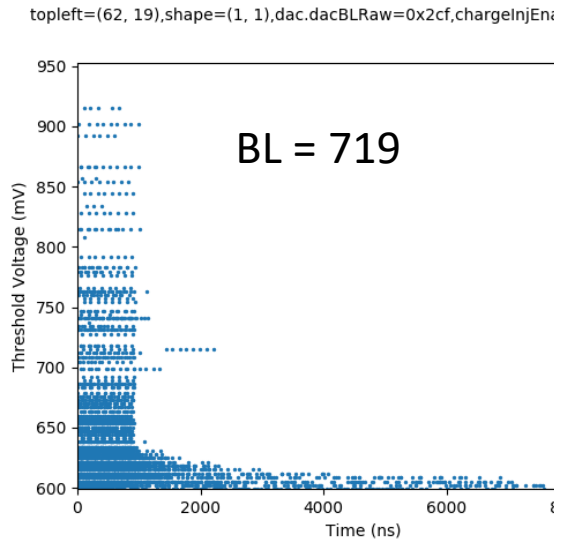


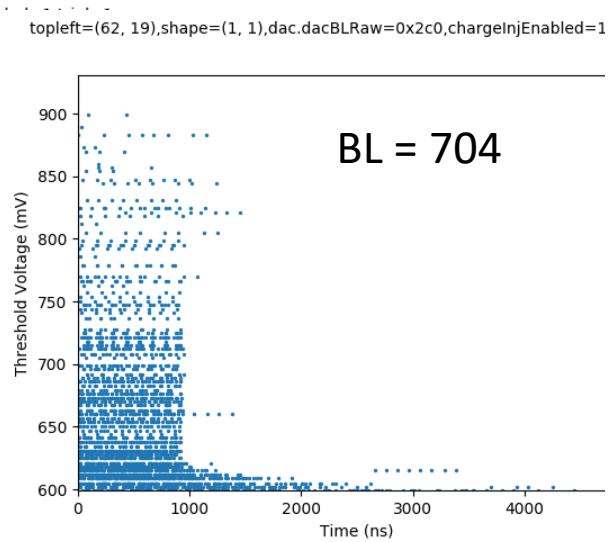
Threshold-Time dependence

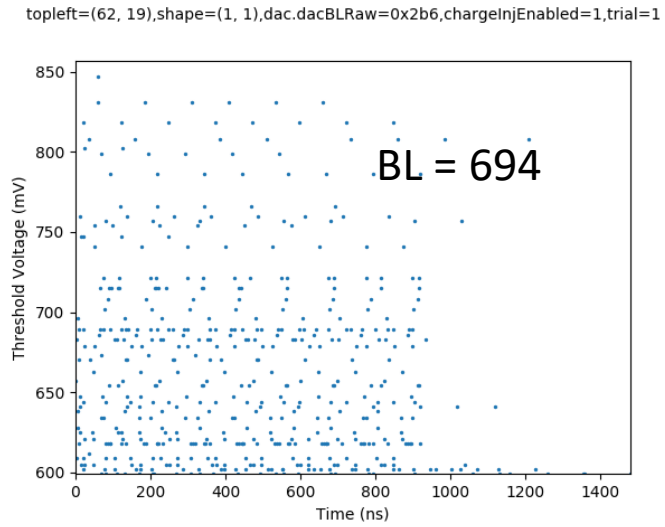
Occupancy of Threshold-time is peculiar:

- Yubo noted that time would be spread for thresholds close to the BL level (i.e. random noise).
- This makes sense qualitatively. Changing BL moves the distribution along the threshold axis.
- Decided to keep BL = 704 for further tests.
- Scans uncussessful when BL is higher than 744. The system seems to hang.
- Note that the threshold scans starts from 744. The CHESS2 Specifications recommends threshold ~10 mV above BL.
- The low-T clustering may indicate it's signal?? There seems to be 1 us-long data binning happening.





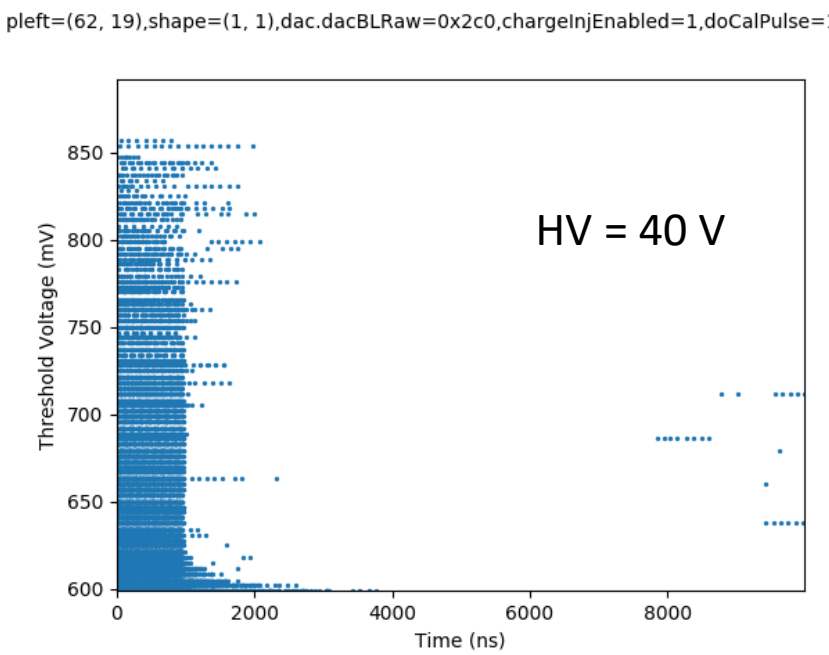


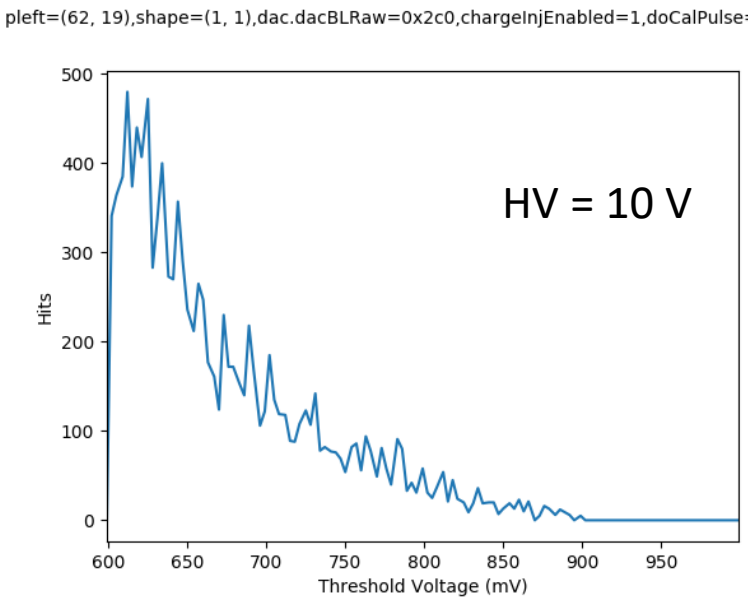


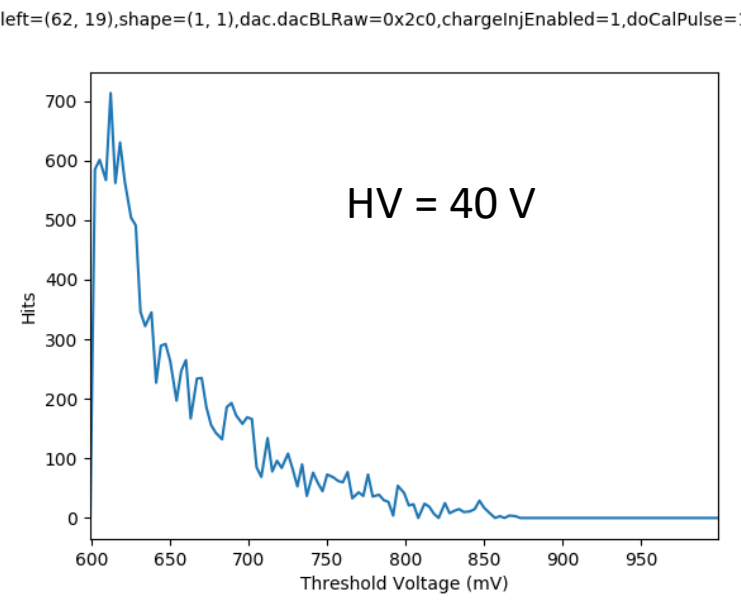
Higher statistics

High-statistics S-curve scan can help to check the chip performance.

- Took data with 2000 triggers per threshold, at 10 V and 40 V (values at PS).
- There are signs of an S-curve, with maybe some difference for the different biases. But really need to fit the curve and compare.







Plan

The short-term work plan:

- To quantify the S-curves.
- To check results for different calibration pulse parameters:
  - inhibit, polarity, timing.
- It’s tempting to remove routing resistors on the carrier board, then inject the charge with a pulser at varying amplitudes.

Other suggestions are more than welcome!

Configuration Used

Baseline: 567mV

Scanned threshold range:599 to 999 mV

Chess2Ctrl1.VPTrimatt=12

Chess2Ctrl1.VPLoadatt=30

Chess2Ctrl1.VNatt=30

Chess2Ctrl1.VNSFatt=29

Chess2Ctrl1.VNLogicatt=28

Chess2Ctrl1.VPFBatt=10