# LArPix Testing setup at Caltech

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Introduction

- Zoya Vallari and I Visited LBNL to get familiar with DAQ procedures

- Used LArPix v1 readout board for initial familiarity and testing

- Python based Artix DAQ system

  - Nice for scripting

  - Good for calculation of results

  - Can save test data

  - Interface to database for storing summary results

- Plan to setup a v1 board with DAQ in the next week or 2 to develop test procedures
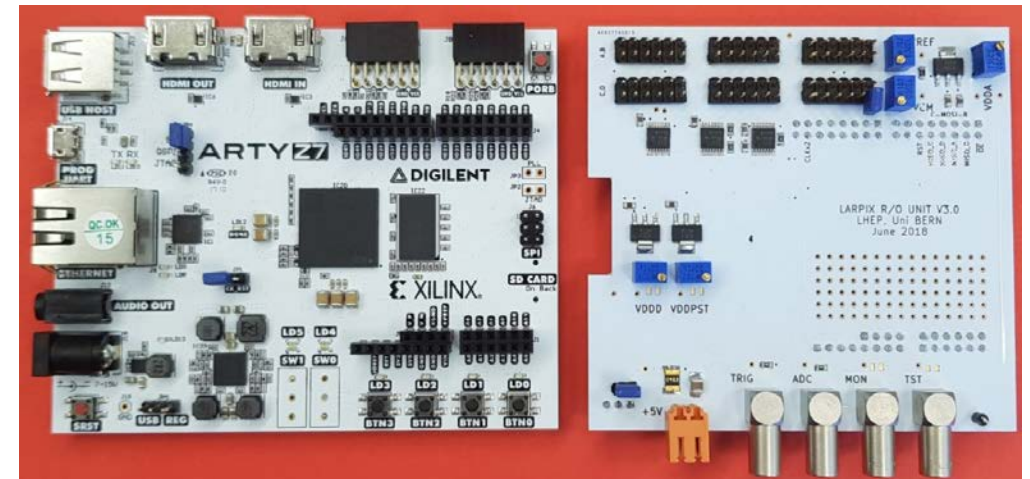
Items to Test/Measure

- Power draw with on-chip monitoring
- Noise – All channels
- Leakage current – All Channels
  - RMS of leakage? Residual from fit
- Gain (that it changes with settings, not calibration)
- Threshold Setting (configuration and range)
- Charge injection to exercise CI configuration
  - and ADC range
  - And threshold?
- ChipID pins – N/A, but test configurability
- Analog out
- Memory exercise

General Plan

- Develop tests on v1 test board
- Meanwhile Design/Build v2 readout board with sockets
  - Something like a 4x4 array to allow parallel testing
  - Configurable network layout (via jumpers)
    - Allows testing small number (one) to begin with and build up to more
    - Might only stuff one socket on board first to make sure it works. (sockets are expensive)
- When interface design is complete (chips out for fab) port v1 testing program to v2
- When v2 ASICs are packaged and available participate in checkout testing on the first parts @LBNL
  - Allow for parallel confirmation of results/methods, fast feedback

Some Specifics

- Planning for testing ~10,000 ASICs before assembly
  - Probably too few for fully automated (robotic) testing
  - If 16 ASICs per board/cycle, need ~600 cycles
    - 3 month test program implies ~10 cycles/day
    - Premounted, or etched serial numbers would be VERY helpful
- Test program can/must/will be flexible
- Can modify testing as it proceeds
  - Initial parts may get more in-depth testing on all channels
    - Many points for threshold, leakage measurements
  - If test time requires, we can back off and measure a sampling of channels with many points and only a few points on others

Test Equipment

- Equipment needs relatively modest
  - DAQ board
  - V2 socketed test board ~20cmx20cm
  - Computer for DAQ
  - Database for results (FNAL or local)
  - Power supply (5V low power)
  - Chip handling – ESD safe suction mover
  - Grounded/Shielded box for test board
- Development/Testing
  - Program development will take some effort, but that's fun
  - Testing effort will be repetitive, distribute burden, add undergrads

Conclusions

- Developing automatic test program for v2 LArPix ASICs

  - At this stage automatic, but not autonomous, needs people

  - Resources for testing and development should be in place when parts are available for testing this summer

  - Ramp up for production testing by end of summer, early fall