TARGET4

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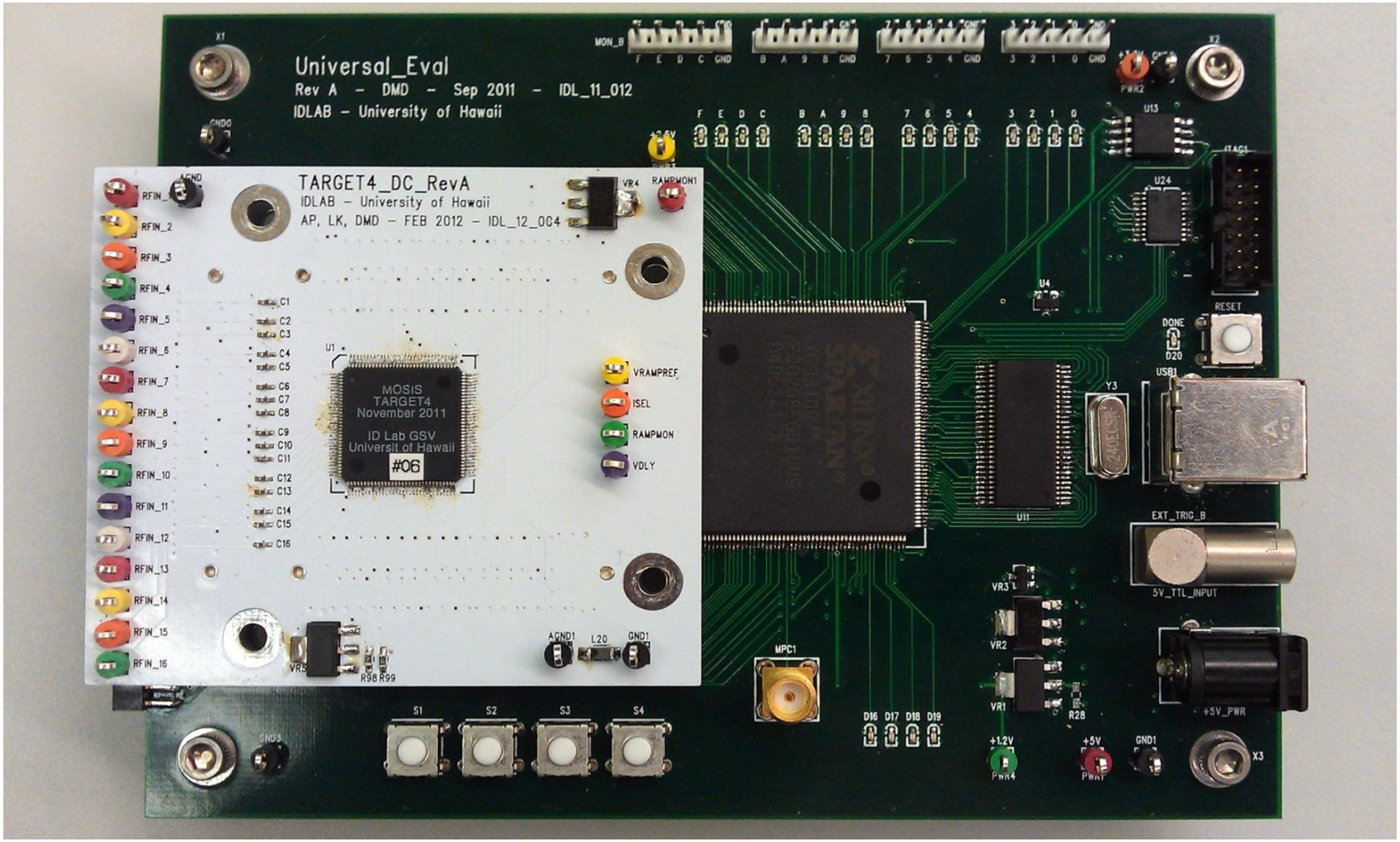
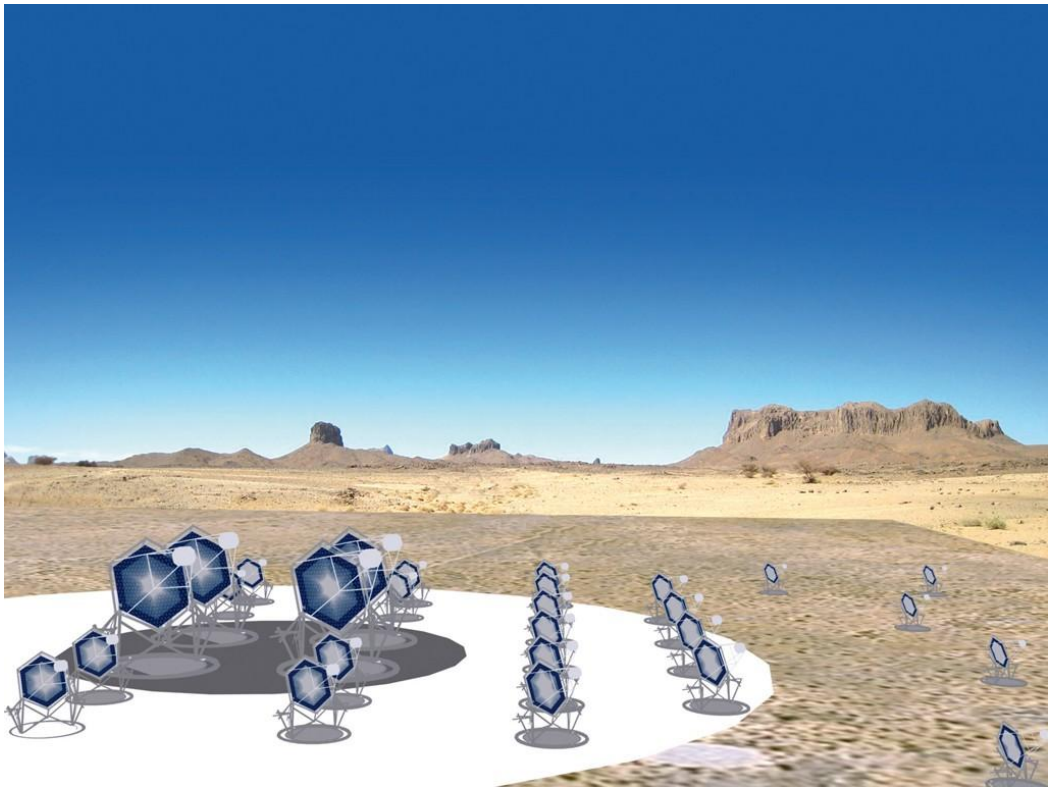


Overview of TARGET4

- TARGET4 (TeV Array Readout with GSa/s sampling and Event Trigger)
- Originally designed to be used with the Cherenkov telescope array
- Records and stores data from photo sensors

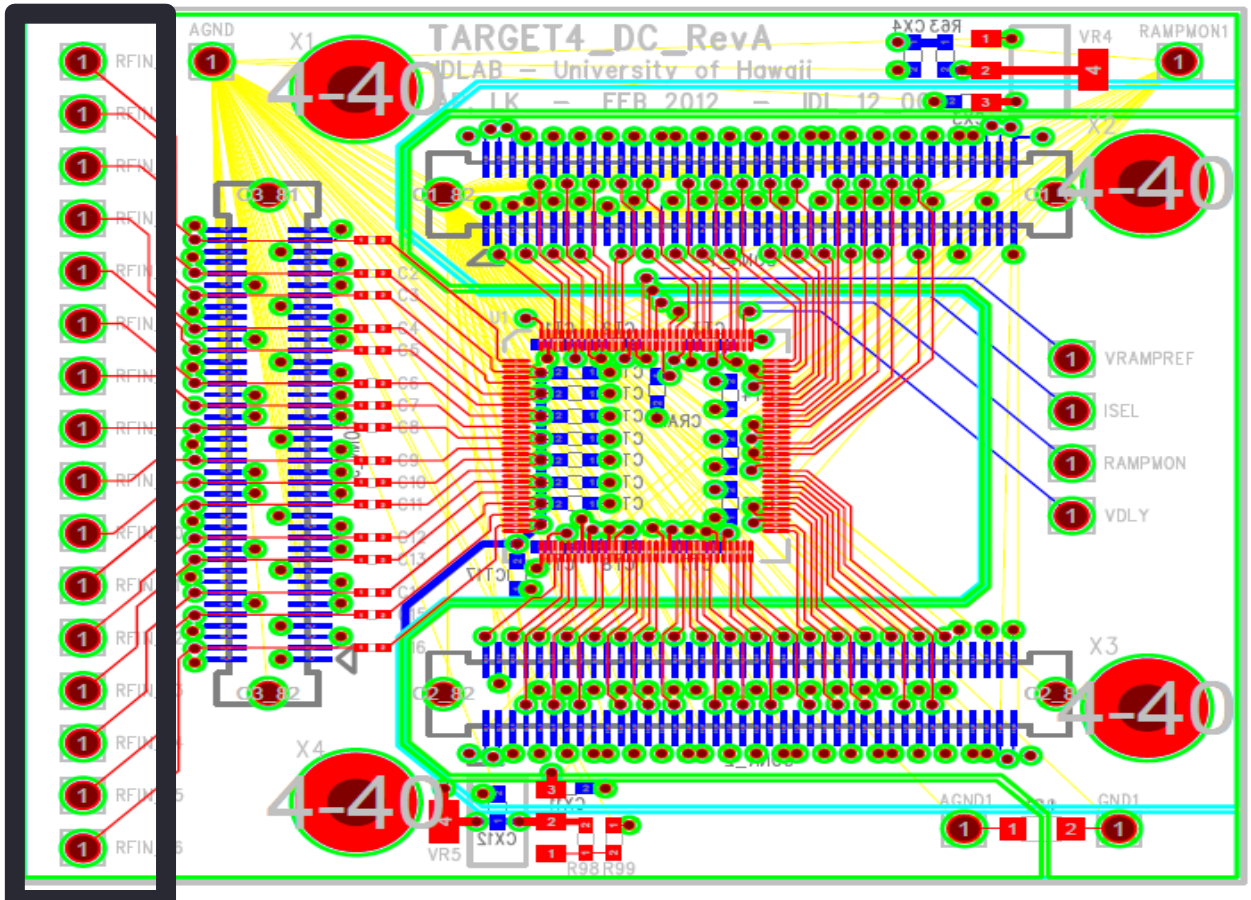


Motivation

- Previous versions of TARGET have had some problems with Digital to Analog Converter (DAC)
- Testing must be done in order to figure out if those problems still exist in the newest version of TARGET

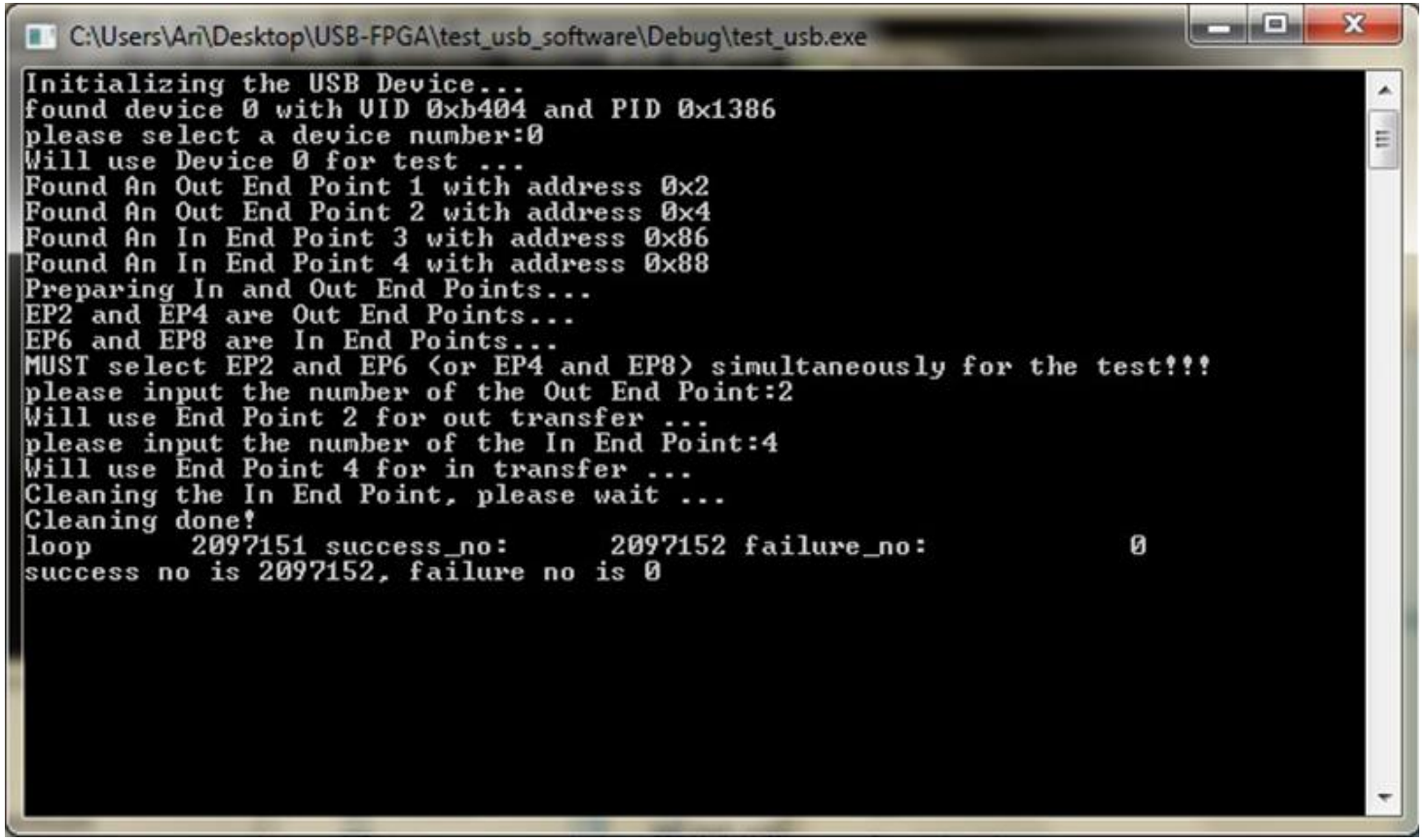
Circuit board design

- We modified the daugher card used with TARGET3 by adding test points to allow easier inserting of signals



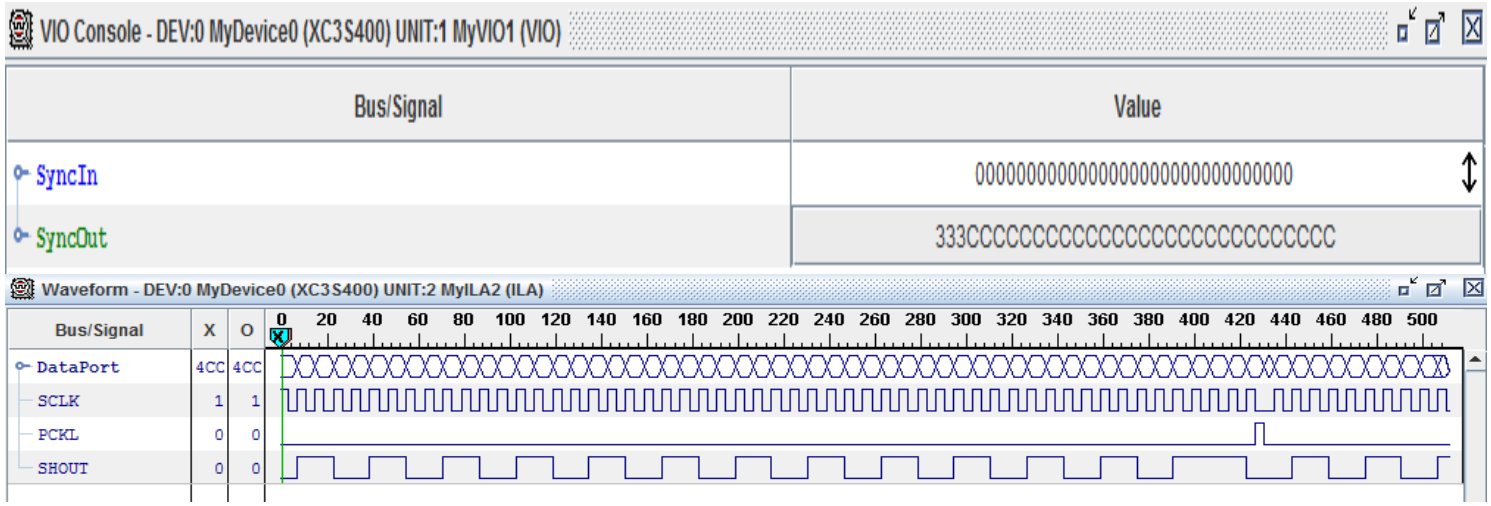
Universal evaluation board

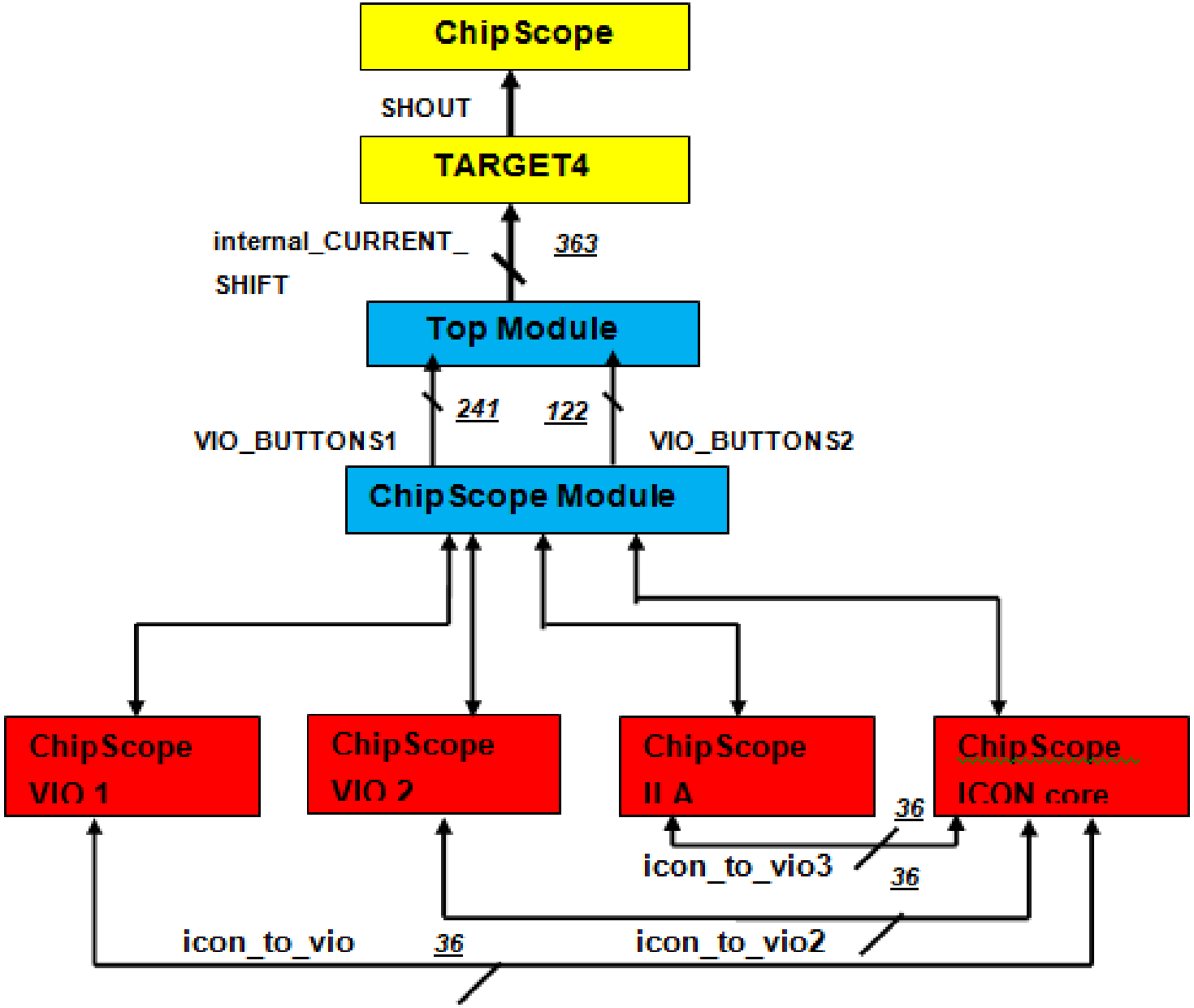
- Soldering
- Uploading USB-firmware



Writing firmware for DAC

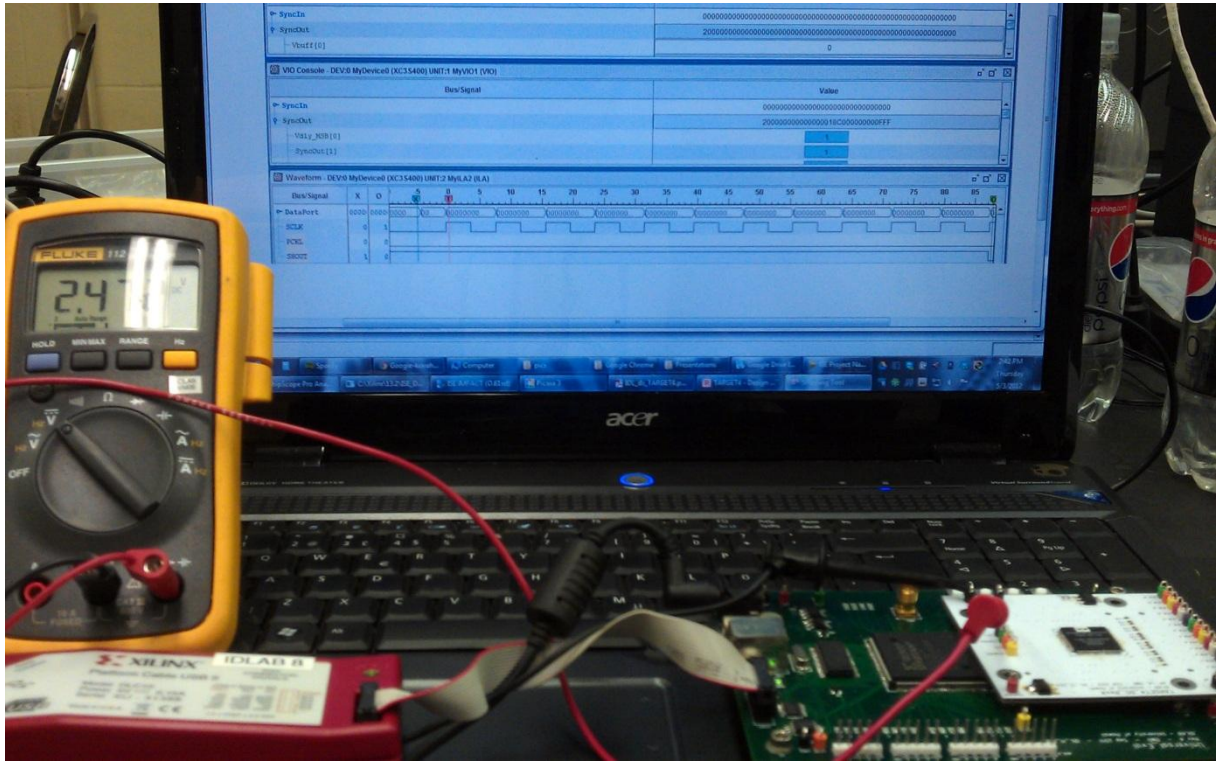
- Firmware had to be written to set up the DAC registers so that the DAC can be tested
- User can change the register values via ChipScope
  - ChipScope is a program which allows monitoring and changing internal and I/O signals with computer



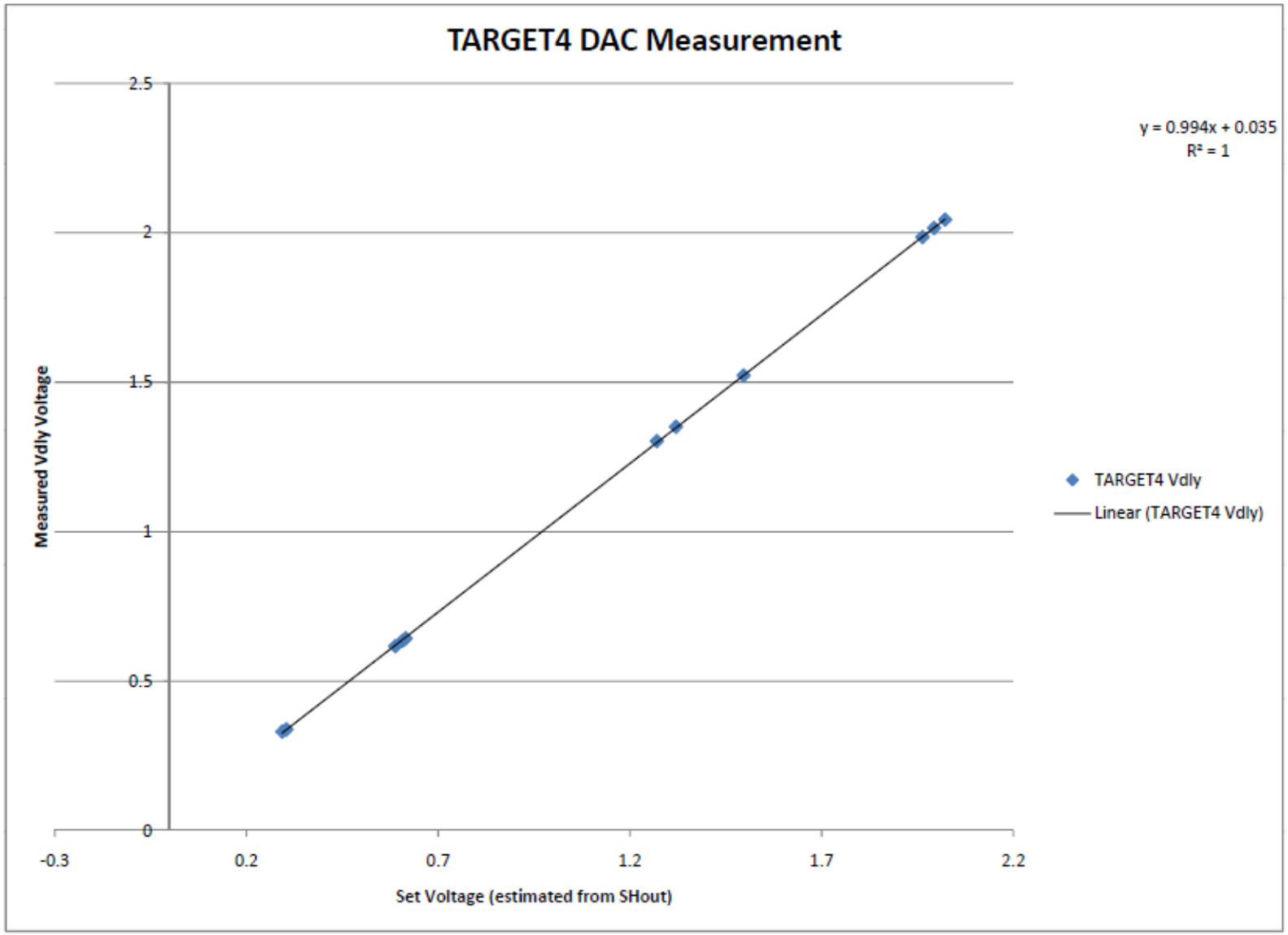

ChipScope
SHOUT
TARGET4
internal_CURRENT_
SHIFT
363
Top Module
241
122
VIO_BUTTONS1
VIO_BUTTONS2
ChipScope Module
ChipScope
VIO 1
ChipScope
VIO 2
ChipScope
ILA
ChipScope
ICON core
36
icon_to_vio3
36
icon_to_vio
36
icon_to_vio2

DAC testing

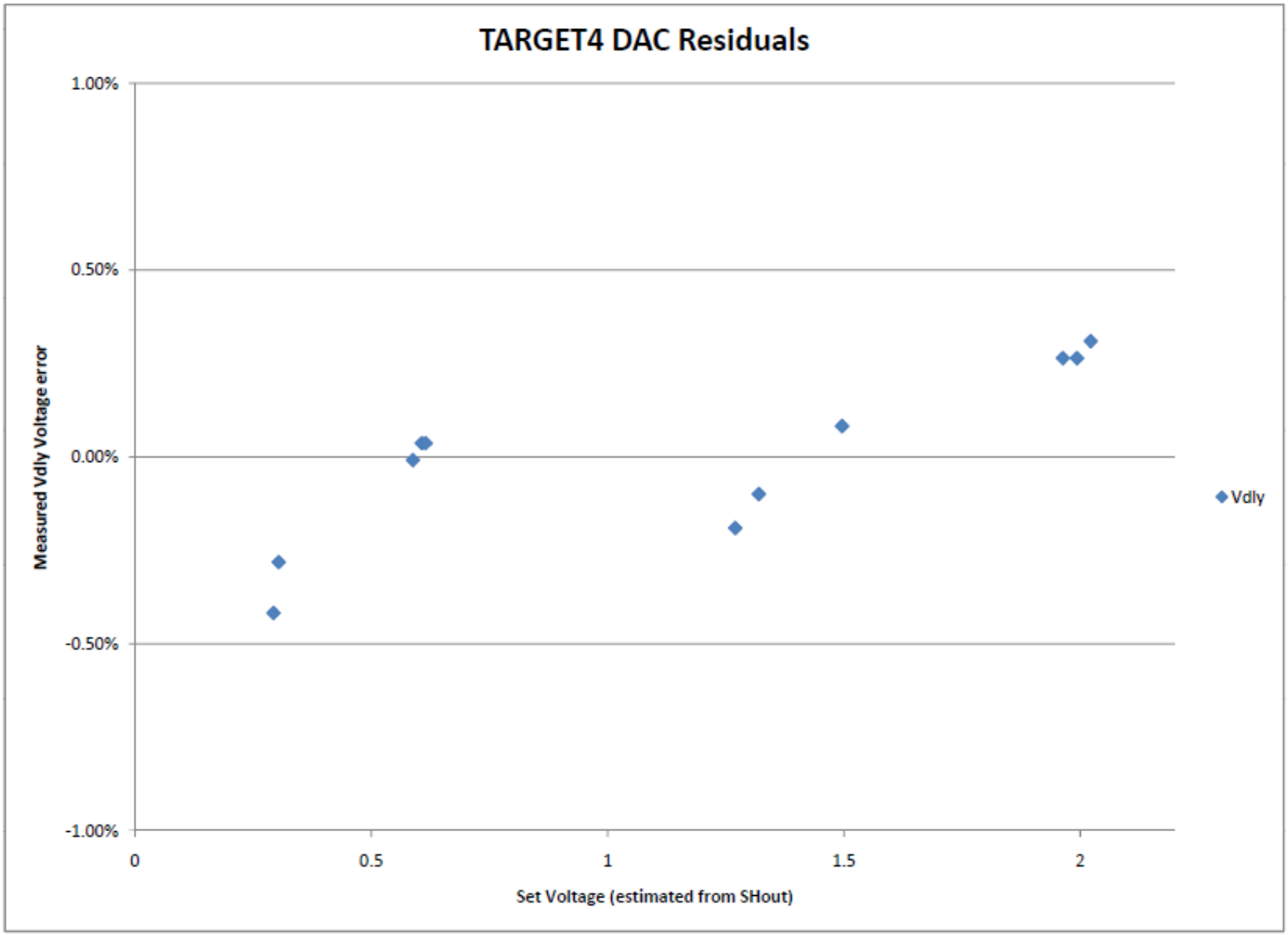
- Work in progress
- We are monitoring two registers that we can measure from daughter card



Results


TARGET4 DAC Measurement
y = 0.994x + 0.035
R² = 1
Measured Vdly Voltage
2.5
2
1.5
1
0.5
0
-0.3
0.2
0.7
1.2
1.7
2.2
Set Voltage (estimated from SHout)
TARGET4 Vdly
Linear (TARGET4 Vdly)

Results


TARGET4 DAC Residuals
1.00%
0.50%
0.00%
-0.50%
-1.00%
Measured Vdly Voltage error
0
0.5
1
1.5
2
Set Voltage (estimated from SHout)
Vdly

Results

5/4/2012		
Shout in voltage (V)	Vdly (V)	Vdiff
2.363	2.379	-0.016
1.27	1.303	-0.033
1.32	1.351	-0.031
1.963	1.986	-0.023
1.993	2.016	-0.023
2.022	2.044	-0.022
0.607	0.635	-0.028
2.227	2.249	-0.022
2.218	2.239	-0.021
2.247	2.267	-0.02
2.189	2.213	-0.024
2.49	2.469	0.021
0.293	0.331	-0.038
0.304	0.339	-0.035
1.496	1.523	-0.027
2.363	2.379	-0.016
2.491	2.47	0.021
2.324	2.37	-0.046
0.588	0.617	-0.029
0.615	0.643	-0.028
2.482	2.465	0.017
2.422	2.429	-0.007
2.492	2.47	0.022
2.48	2.465	0.015
2.499	2.473	0.026

Full Voltage	Not Full Voltage
F = 1111	C = 1100
E = 1110	9 = 1001
D = 1101	8 = 1000
B = 1011	4 = 0100
A = 1010	3 = 0011
7 = 0111	2 = 0010
6 = 0110	1 = 0001
5 = 0101	0 = 0000

Summary

- TARGET4 is a ASIC that is developed to read out and store data from photosensors in Cherenkov telescope array
- We modified daughtercard, soldered universal evaluation board, wrote firmware to test digital to analog converters and tested the DAC's.
- Digital to analog converters have still some problems that are going to be fixed in TARGET5

Thank You