

Hardware Database for Cold Electronics

With LArASIC as an example

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Introduction

- Many thousands of chips to be tested for DUNE
 - Keeping track represents a large organisational challenge
- Will make use of the HWDB provided by Fermilab to record test results and track location of chips and boards
- Using example of LArASIC in this talk, work is easily repeated for other items

Hardware Database

Item: LArASIC

DUNE Hardware DB
DEEP UNDERGROUND NEUTRINO EXPERIMENT

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Batches

Cable Structures

Component Types

Items

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Requests, Issues? ↗

Edit Item D08100100001-00001

QR | SPECS LOG | STRUCTURE LOG | CONTAINER LOG | TEST LOG | IMAGES

Component Type D.FD1-HD TPC_Elec. and FD2-VD Bottom_Elec..LArASIC.LArASIC Version P5B version preproduction 1

Part ID D08100100001-00001-US128

Serial Number TEST

Country of Origin United States

Resp. Institution Brookhaven National Laboratory

Manufacturer --SELECT--

Batch ID --SELECT--

Created 2022-11-04 07:35:13

Created by Tristan Doyle

Contained in N/A

Specifications

QC result --SELECT--

Batch Number -1

Sub-components

SAVE DONE

Chip Number

Overall QC pass/fail status

Batch Number

Hardware Database

Test: LArASIC QC

- QC test produces summary pdf, however we need to be able to query the database
- Upload key information directly to database as well as summary pdf

FE Noise	--SELECT--
Noise ENC	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Noise RMS	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Temperature	--SELECT--
Baseline (mV)	{'200mV': {'sd': -1, 'mean': -1}, '900mV': {'sd': -1, 'mean': -1}}
Power (mW/Ch)	{'200mV BL': {'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1, 'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1}}
FE Power Cycle	--SELECT--
BGR Voltage (V)	-1
BL Restore Test	--SELECT--
Power Measurement	--SELECT--
Linearity 200mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 200mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
FE parameter measurement	--SELECT--
FE gain plot (DAC pulsing)	--SELECT--
Channel Response (Ext Pulse) @	--SELECT--
Channel Response (Internal DAC) @SDD_ON	--SELECT--
Channel Response (Internal DAC) @SDD_OFF	--SELECT--

Hardware Database

Recording Information

- Can upload information manually through web interface
 - Not practical given large number of chips - needs to be automated
- Make use of command line tools to speed up process and allow integration into QC scripts
- Following slides use abbreviations:
 - **CURL** → `curl --cert-type P12 --cert MyCert.p12:MyPassword`
 - **APIPATH** → `https://dbwebapi2.fnal.gov:8443/cdbdev/api/`

Recording an Item

- **CURL** -H "Content-Type:application/json" -X POST -d @test_item.json 'APIPATH/component-types/D08100100001/components'
- Commands require production of a json file with desired information
 - Easily automated

```
{
  "component_type": {
    "part_type_id": "D08100100001"
  },
  "serial_number": "TEST2",
  "country_code": "US",
  "institution": {
    "id": 128
  },
  "specifications": {
    "QC result": "fail",
    "Batch Number": -999
  }
}
```


Recording a Test Result

Significant Parameters

- **CURL** -H "Content-Type:application/json" -X POST -d @test_test.json 'APIPATH/components/D08100100001-00001/tests'
- Even storing larger numbers of parameters is easily automated

```
{
  "test_type": "QC Test",
  "comments": "",
  "test_data": {
    "FE Noise": "fail",
    "Noise ENC": {
      "1us": {
        "sd": -999,
        "mean": -999
      },
      "2us": {
        "sd": -999,
        "mean": -999
      },
      "3us": {
        "sd": -999,
        "mean": -999
      },
      "0.5us": {
        "sd": -999,
        "mean": -999
      }
    },
    "Noise RMS": {
      "1us": {
        "sd": -999,
        "mean": -999
      },
      "2us": {
        "sd": -999,
        "mean": -999
      },
      "3us": {
        "sd": -999,
        "mean": -999
      },
      "0.5us": {
        "sd": -999,
        "mean": -999
      }
    },
    "Temperature": "RT",
    "Baseline (mV)": {
      "200mV": {
        "sd": -999,
        "mean": -999
      },
      "900mV": {
        "sd": -999,
        "mean": -999
      }
    },
    "Power (mW/Ch)": {
      "200mV BL": {
        "SE=OFF SEDC=ON": -999,
        "SE=ON SEDC=OFF": -999,
```

```

      "SE=OFF SEDC=ON": -999,
      "SE=ON SEDC=OFF": -999,
      "SE=OFF SEDC=OFF": -999
    },
    "900mV BL": {
      "SE=OFF SEDC=ON": -999,
      "SE=ON SEDC=OFF": -999,
      "SE=OFF SEDC=OFF": -999
    },
    "FE Power Cycle": "fail",
    "BGR Voltage (V)": -999,
    "BL Restore Test": "fail",
    "Power Measurement": "fail",
    "Linearity 200mV BL INL": {
      "1us": {
        "sd": -999,
        "mean": -999
      },
      "2us": {
        "sd": -999,
        "mean": -999
      },
      "3us": {
        "sd": -999,
        "mean": -999
      },
      "0.5us": {
        "sd": -999,
        "mean": -999
      }
    },
    "Linearity 900mV BL INL": {
      "1us": {
        "sd": -999,
        "mean": -999
      },
      "2us": {
        "sd": -999,
        "mean": -999
      },
      "3us": {
        "sd": -999,
        "mean": -999
      },
      "0.5us": {
        "sd": -999,
        "mean": -999
      }
    },
    "Linearity 200mV BL Gain": {
      "1us": {
        "sd": -999,
        "mean": -999
      },
      "2us": {
```

```

        "sd": -999,
        "mean": -999
      },
      "3us": {
        "sd": -999,
        "mean": -999
      },
      "0.5us": {
        "sd": -999,
        "mean": -999
      }
    },
    "FE parameter measurement": "fail",
    "FE gain plot (DAC pulsing)": "fail",
    "Channel Response (Ext Pulse) @": "fail",
    "Channel Response (Internal DAC) @SDD_ON": "fail",
    "Channel Response (Internal DAC) @SDD_OFF": "fail"
  }
}
```

Attaching an Image File

LArASIC QC Summary Report

- **CURL** -F "image=@Dual_DUT_LArASIC_test_FEChip_P5B_00100489_RT.pdf" 'APIPATH/components/D08100100001-00001/images'
- More detailed information stored in pdf is very easy to associate with a test or item

LArASIC Test Summary

Date & Time: 2022-10-17 16:11:20

Temperature: RT

ColdADC Chip ID: ColdADC_P2_86

Board ID: DUAL_DUT

FE Chip ID: FEChip_P5B_00100489

Summary:

Power Measurement	Passed
FE parameter measurement	Passed
Channel Response (Internal DAC) @SDD_OFF	Passed
Channel Response (Internal DAC) @SDD_ON	Passed
Channel Response (Ext Pulse) @	Passed
BL Restore Test	Passed
FE Power Cycle	Passed
FE gain plot (DAC pulsing)	Passed
FE Noise	Passed

Summary, Plans and Questions

- Making use of the HWDB to track items and test results relating to cold electronics
- Have tested commands line tools and am ready to integrate this with the LArASIC QC scripts
- Commands require use of a p12 certificate from cilogin AND it's password
 - Is it possible to get a common certificate we can use in automated scripts?
Either for the BNL group or whole CE group?

BACKUP

LArASIC Test Entry

Add summary pass/fail entries and test temperature

LArASIC Test Summary

Date & Time: 2022-10-17 16:11:20

ColdADC Chip ID: ColdADC_P2_86

FE Chip ID: FEChip_P5B_00100489

Temperature: RT

Board ID: DUAL_DUT

Summary:

Power Measurement	Passed
FE parameter measurement	Passed
Channel Response (Internal DAC) @SDD_OFF	Passed
Channel Response (Internal DAC) @SDD_ON	Passed
Channel Response (Ext Pulse) @	Passed
BL Restore Test	Passed
FE Power Cycle	Passed
FE gain plot (DAC pulsing)	Passed
FE Noise	Passed

FE Noise	--SELECT--
Noise ENC	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Noise RMS	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Temperature	--SELECT--
Baseline (mV)	{'200mV': {'sd': -1, 'mean': -1}, '900mV': {'sd': -1, 'mean': -1}}
Power (mW/Ch)	{'200mV BL': {'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1, 'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1}}
FE Power Cycle	--SELECT--
BGR Voltage (V)	-1
BL Restore Test	--SELECT--
Power Measurement	--SELECT--
Linearity 200mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 200mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
FE parameter measurement	--SELECT--
FE gain plot (DAC pulsing)	--SELECT--
Channel Response (Ext Pulse) @	--SELECT--
Channel Response (Internal DAC) @SDD_ON	--SELECT--
Channel Response (Internal DAC) @SDD_OFF	--SELECT--

LArASIC Test Entry

More detailed information from test results

LArASIC: Passed

Power Measurement

SE=OFF SEDC=OFF	900 mV (BL)	
Power Rail	Voltages (V)	Current (mA)
VDDP	1.87	32.2
VDD	1.86	19.39
VDDO	1.88	0.0
Power (mW/Ch)	6.02	

SE=ON SEDC=OFF	900 mV (BL)	
Power Rail	Voltages (V)	Current (mA)
VDDP	1.87	31.74
VDD	1.86	43.27
VDDO	1.87	9.56
Power (mW/Ch)	9.86	

SE=OFF SEDC=ON	900 mV (BL)	
Power Rail	Voltages (V)	Current (mA)
VDDP	1.87	31.58
VDD	1.86	49.49
VDDO	1.87	18.69
Power (mW/Ch)	11.63	

SE=OFF SEDC=OFF	200 mV (BL)	
Power Rail	Voltages (V)	Current (mA)
VDDP	1.87	32.21
VDD	1.86	19.39
VDDO	1.88	0.0
Power (mW/Ch)	6.02	

SE=ON SEDC=OFF	200 mV (BL)	
Power Rail	Voltages (V)	Current (mA)
VDDP	1.87	31.74
VDD	1.86	43.26
VDDO	1.87	9.56
Power (mW/Ch)	9.86	

SE=OFF SEDC=ON	200 mV (BL)	
Power Rail	Voltages (V)	Current (mA)
VDDP	1.87	31.58
VDD	1.86	49.48
VDDO	1.87	18.68
Power (mW/Ch)	11.63	

FE Noise	--SELECT--
Noise ENC	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Noise RMS	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Temperature	--SELECT--
Baseline (mV)	{'200mV': {'sd': -1, 'mean': -1}, '900mV': {'sd': -1, 'mean': -1}}
Power (mW/Ch)	{'200mV BL': {'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1, 'SE=OFF SEDC=ON': -1}}
FE Power Cycle	--SELECT--
BGR Voltage (V)	-1
BL Restore Test	--SELECT--
Power Measurement	--SELECT--
Linearity 200mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 200mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
FE parameter measurement	--SELECT--
FE gain plot (DAC pulsing)	--SELECT--
Channel Response (Ext Pulse) @	--SELECT--
Channel Response (Internal DAC) @SDD_ON	--SELECT--
Channel Response (Internal DAC) @SDD_OFF	--SELECT--

LArASIC Test Entry

More detailed information from test results

LArASIC Parameters

Baseline Measurement (LArASIC + Commercial ADC): Passed

Ch#	BL @ 200mV	BL @ 900mV
0	253.1	929.62
1	259.92	935.87
2	250.13	929.53
3	255.79	934.24
4	251.09	931.17
5	257.15	935.02
6	259.53	934.78
7	257.22	935.03
8	258.71	935.85
9	256.51	934.16
10	257.89	933.16
11	259.83	934.12
12	257.77	934.1
13	259.04	934.59
14	253.09	930.94
15	260.25	935.64
Mean	256.69	933.61
SD	3.11	2.06

VBGR (V)	1.1813
Temp (mV)	930.58

FE Noise	--SELECT--
Noise ENC	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Noise RMS	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Temperature	--SELECT--
Baseline (mV)	{'200mV': {'sd': -1, 'mean': -1}, '900mV': {'sd': -1, 'mean': -1}}
Power (mW/Ch)	{'200mV BL': {'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1, 'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1}}
FE Power Cycle	--SELECT--
BGR Voltage (V)	-1
BL Restore Test	--SELECT--
Power Measurement	--SELECT--
Linearity 200mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 200mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
FE parameter measurement	--SELECT--
FE gain plot (DAC pulsing)	--SELECT--
Channel Response (Ext Pulse) @	--SELECT--
Channel Response (Internal DAC) @SDD_ON	--SELECT--
Channel Response (Internal DAC) @SDD_OFF	--SELECT--

LArASIC Test Entry

More detailed information from test results

Noise

Noise Measurement (LArASIC + ColdADC), RMS: Passed

Ch#	RMS(LSB) @0.5us	RMS(LSB) @1us	RMS(LSB) @2us	RMS(LSB) @3us
0	70.16	81.78	94.92	104.5
1	68.97	79.6	92.13	101.03
2	62.97	70.92	81.87	91.51
3	70.15	80.26	93.41	102.61
4	64.72	72.93	82.68	91.68
5	71.96	82.79	95.22	106.33
6	67.11	76.27	86.97	94.71
7	70.09	79.17	90.24	97.48
8	69.95	78.87	92.17	98.97
9	69.3	77.86	88.65	95.88
10	66.49	73.86	83.13	92.01
11	71.01	80.63	91.9	102.23
12	70.19	79.87	90.64	101.13
13	71.71	81.75	94.02	105.25
14	71.43	81.6	94.67	104.17
15	66.88	74.29	83.69	90.53
Mean	68.94	78.28	89.77	98.75
SD	2.52	3.47	4.55	5.25

FE Noise	--SELECT--
Noise ENC	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Noise RMS	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Temperature	--SELECT--
Baseline (mV)	{'200mV': {'sd': -1, 'mean': -1}, '900mV': {'sd': -1, 'mean': -1}}
Power (mW/Ch)	{'200mV BL': {'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1, 'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1}}
FE Power Cycle	--SELECT--
BGR Voltage (V)	-1
BL Restore Test	--SELECT--
Power Measurement	--SELECT--
Linearity 200mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 200mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
FE parameter measurement	--SELECT--
FE gain plot (DAC pulsing)	--SELECT--
Channel Response (Ext Pulse) @	--SELECT--
Channel Response (Internal DAC) @SDD_ON	--SELECT--
Channel Response (Internal DAC) @SDD_OFF	--SELECT--

LArASIC Test Entry

More detailed information from test results

Noise

Noise Measurement (LArASIC + ColdADC), ENC: Passed

Ch#	ENC(e-) @0.5us	ENC(e-) @1us	ENC(e-) @2us	ENC(e-) @3us
0	766.83	874.06	926.89	996.93
1	719.43	813.49	872.26	940.04
2	651.21	719.38	771.62	842.88
3	719.9	807.8	879.07	942.82
4	666.01	736.58	779.34	845.43
5	743.43	836.25	896.17	980.51
6	690.99	772.05	819.84	875.49
7	725.32	801.58	853.33	897.4
8	744.33	823.34	894.92	939.24
9	710.24	783.06	835.62	880.76
10	682.43	745.55	783.45	851.32
11	738.97	823.32	872.1	947.33
12	723.56	805.24	860.13	937.07
13	744.05	828.48	886.92	977.46
14	746.5	836.52	898.52	963.55
15	705.74	765.56	797.55	839.57
Mean	717.43	798.27	851.73	916.11
SD	30.73	40.31	46.84	52.2

FE Noise	--SELECT--
Noise ENC	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Noise RMS	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Temperature	--SELECT--
Baseline (mV)	{'200mV': {'sd': -1, 'mean': -1}, '900mV': {'sd': -1, 'mean': -1}}
Power (mW/Ch)	{'200mV BL': {'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1, 'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1}}
FE Power Cycle	--SELECT--
BGR Voltage (V)	-1
BL Restore Test	--SELECT--
Power Measurement	--SELECT--
Linearity 200mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 200mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
FE parameter measurement	--SELECT--
FE gain plot (DAC pulsing)	--SELECT--
Channel Response (Ext Pulse) @	--SELECT--
Channel Response (Internal DAC) @SDD_ON	--SELECT--
Channel Response (Internal DAC) @SDD_OFF	--SELECT--

LArASIC Test Entry

More detailed information from test results

Linearity (LArASIC + ColdADC)

Tp=20us, BL =200mV, SE = BUF OFF, SEDC = SEDC OFF:Passed

Ch#	Gain @0.5us	Gain @1us	Gain @2us	Gain @3us
0	10.93	10.69	9.76	9.54
1	10.43	10.22	9.47	9.3
2	10.34	10.14	9.43	9.21
3	10.26	10.06	9.41	9.19
4	10.29	10.1	9.43	9.22
5	10.33	10.1	9.41	9.22
6	10.3	10.12	9.43	9.24
7	10.35	10.12	9.46	9.21
8	10.64	10.44	9.71	9.49
9	10.25	10.06	9.43	9.19
10	10.26	10.09	9.42	9.25
11	10.41	10.21	9.49	9.27
12	10.31	10.08	9.49	9.27
13	10.38	10.13	9.43	9.29
14	10.45	10.25	9.49	9.25
15	10.55	10.31	9.53	9.27
Mean	10.4	10.2	9.49	9.28
SD	0.17	0.16	0.1	0.1

Ch#	INL @0.5us	INL @1us	INL @2us	INL @3us
0	0.4	0.28	0.2	0.27
1	0.17	0.17	0.11	0.22
2	0.22	0.34	0.11	0.13
3	0.28	0.22	0.24	0.38
4	0.18	0.28	0.37	0.1
5	0.36	0.12	0.27	0.35
6	0.15	0.27	0.09	0.12
7	0.22	0.29	0.06	0.23
8	0.38	0.34	0.42	0.04
9	0.34	0.39	0.22	0.41
10	0.17	0.19	0.25	0.03
11	0.31	0.12	0.1	0.11
12	0.25	0.34	0.26	0.1
13	0.15	0.4	0.52	0.16
14	0.43	0.18	0.64	0.33
15	0.4	0.27	0.31	0.34
Mean	0.28	0.26	0.26	0.21
SD	0.1	0.09	0.16	0.12

FE Noise	--SELECT--
Noise ENC	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Noise RMS	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Temperature	--SELECT--
Baseline (mV)	{'200mV': {'sd': -1, 'mean': -1}, '900mV': {'sd': -1, 'mean': -1}}
Power (mW/Ch)	{'200mV BL': {'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1, 'SE=OFF SEDC=ON': -1}}
FE Power Cycle	--SELECT--
BGR Voltage (V)	-1
BL Restore Test	--SELECT--
Power Measurement	--SELECT--
Linearity 200mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 200mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
FE parameter measurement	--SELECT--
FE gain plot (DAC pulsing)	--SELECT--
Channel Response (Ext Pulse) @	--SELECT--
Channel Response (Internal DAC) @SDD_ON	--SELECT--
Channel Response (Internal DAC) @SDD_OFF	--SELECT--

LArASIC Test Entry

More detailed information from test results

Linearity (LArASIC + ColdADC)

Tp=20us, BL =900mV, SE = BUF OFF, SEDC = SEDC OFF:Passed

Ch#	Gain @0.5us	Gain @1us	Gain @2us	Gain @3us
0	11.37	10.51	9.55	9.39
1	10.73	10.02	9.29	9.14
2	10.61	9.96	9.25	9.06
3	10.58	9.88	9.26	9.02
4	10.56	9.92	9.26	9.06
5	10.59	9.9	9.28	9.07
6	10.53	9.92	9.24	9.07
7	10.63	9.94	9.29	9.11
8	10.94	10.25	9.51	9.35
9	10.42	9.85	9.23	9.04
10	10.52	9.87	9.25	9.06
11	10.7	10.0	9.3	9.13
12	10.55	9.87	9.27	9.12
13	10.65	9.93	9.27	9.14
14	10.68	9.97	9.33	9.12
15	10.86	10.08	9.37	9.2
Mean	10.68	9.99	9.31	9.13
SD	0.22	0.17	0.09	0.1

Ch#	INL @0.5us	INL @1us	INL @2us	INL @3us
0	0.39	0.24	0.1	0.39
1	0.2	0.25	0.14	0.21
2	0.09	0.12	0.08	0.37
3	0.12	0.28	0.11	0.18
4	0.27	0.15	0.24	0.22
5	0.29	0.12	0.2	0.09
6	0.1	0.12	0.14	0.12
7	0.21	0.06	0.24	0.14
8	0.11	0.05	0.08	0.08
9	0.1	0.11	0.15	0.08
10	0.2	0.08	0.17	0.31
11	0.08	0.09	0.28	0.24
12	0.19	0.07	0.18	0.21
13	0.15	0.16	0.42	0.35
14	0.1	0.07	0.22	0.14
15	0.02	0.27	0.08	0.19
Mean	0.16	0.14	0.18	0.21
SD	0.09	0.08	0.09	0.1

FE Noise	--SELECT--
Noise ENC	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Noise RMS	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Temperature	--SELECT--
Baseline (mV)	{'200mV': {'sd': -1, 'mean': -1}, '900mV': {'sd': -1, 'mean': -1}}
Power (mW/Ch)	{'200mV BL': {'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1, 'SE=OFF SEDC=ON': -1, 'SE=ON SEDC=OFF': -1}}
FE Power Cycle	--SELECT--
BGR Voltage (V)	-1
BL Restore Test	--SELECT--
Power Measurement	--SELECT--
Linearity 200mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL INL	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 200mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
Linearity 900mV BL Gain	{'1us': {'sd': -1, 'mean': -1}, '2us': {'sd': -1, 'mean': -1}, '3us': {'sd': -1, 'mean': -1}}
FE parameter measurement	--SELECT--
FE gain plot (DAC pulsing)	--SELECT--
Channel Response (Ext Pulse) @	--SELECT--
Channel Response (Internal DAC) @SDD_ON	--SELECT--
Channel Response (Internal DAC) @SDD_OFF	--SELECT--