

# Report: OKF4 electrical validation

Benjamin Boitrelle

March 2016

## 1 Electrical tests

### 1.1 Auxiliary board

Some parameters of the auxiliary board are measured (without any module connected).

- Consumption: 343 mA
- $V_{clp} = 2.28 \text{ V}$
- $V_{DD_D} = 3.35 \text{ V}$
- $V_{DD_A} = 3.35 \text{ V}$

### 1.2 AM03 smoke test

First smoke test done without changing the value of  $V_{clp}$ ,  $V_{dd_D}$  of  $V_{dd_A}$ :

- POWER ON: 608 mA
- RESET: 42 mA
- ALL: 659 mA
- READ: 659 mA mA with 955 errors
- START: 1145 mA

Parameters of the auxiliary board measured after connecting the module:

	Voltages without module (V)	Adjusted voltages (V)
$V_{clp}$	2.28	2.15
$V_{dd_D}$	3.15	3.32
$V_{dd_A}$	3.24	3.35

## 2 Calibration

### 2.1 Oscilloscope output

The sensor number 2 was disconnected  $\Rightarrow$  only 5 sensors are working.

	Chip 1	Chip 2	Chip 3	Chip 4	Chip 5	Chip 6
REST/JTAG	OK	Disconnected	OK	OK	OK	OK
HEADER/TRAILER	OK	Disconnected	OK	OK	OK	OK
Pixels	Closed	Disconnected	OK	OK	OK	Closed

## 2.2 DAQ calibration

### 2.2.1 Chip 6

Few pixels are opened on the sub-matrix D.

- Estimation of the "middle points":

$V_{ref2}$	$V_{ref1A}$	$V_{ref1B}$	$V_{ref1C}$	$V_{ref1D}$
98	162	158	100	118

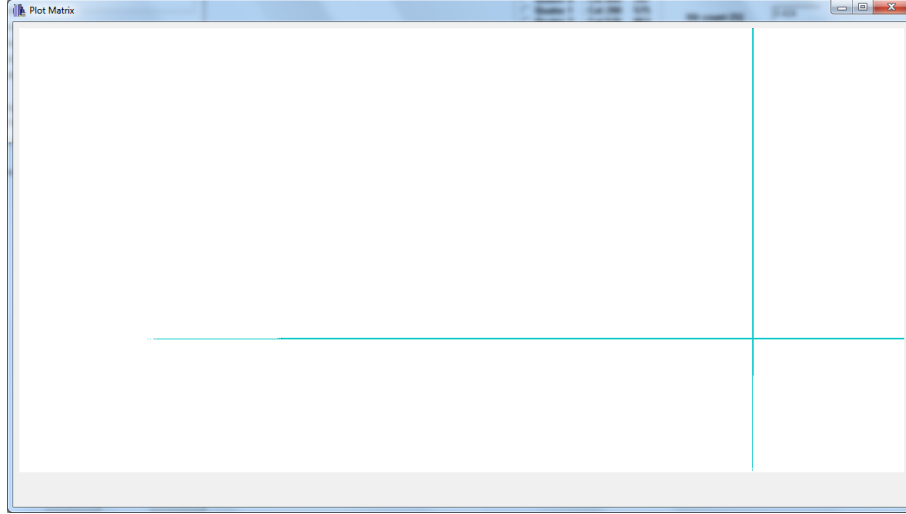


Figure 1: Discriminators output for thresholds set to 255. They are two lines opened and four columns on submatrix D.

- Discriminators calibration:

$V_{ref1A}$ START	$V_{ref1B}$ START	$V_{ref1C}$ START	$V_{ref1D}$ START	$V_{ref2}$	$V_{ref1A}$ STOP	Step	Event nb / step	Number of Runs
134	130	72	90	98	190	2	500	29

- Temporal noise, fixed pattern noise and offset:

Matrix	TN	FPN	Offset
A	1.035	0.603	0.550
B	0.965	0.268	0.539
C	0.980	0.595	0.476
D	1.058	0.528	0.961

- Estimation of the fake hit rate ("middle points" thresholds + 20 uadc):  $1.6610^{-3}$  hits/frame/pixels.

### 2.2.2 Chip 5

- Estimation of the "middle points":

$V_{ref2}$	$V_{ref1A}$	$V_{ref1B}$	$V_{ref1C}$	$V_{ref1D}$
98	84	162	131	183

- Discriminators calibration:

$V_{ref1A}$ START	$V_{ref1B}$ START	$V_{ref1C}$ START	$V_{ref1D}$ START	$V_{ref2}$	$V_{ref1A}$ STOP	Step	Event nb / step	Number of Runs
56	134	103	155	98	112	2	500	29

- Temporal noise, fixed pattern noise and offset:

Matrix	TN	FPN	Offset
A	1.026	0.487	0.493
B	0.983	0.257	0.558
C	1.054	0.387	0.497
D	0.988	0.314	0.487

- Estimation of the fake hit rate ("middle points" thresholds + 20 uadc):  $4.3710^{-5}$  hits/frame/pixels.

### 2.2.3 Chip 4

- Estimation of the "middle points":

$V_{ref2}$	$V_{ref1A}$	$V_{ref1B}$	$V_{ref1C}$	$V_{ref1D}$
98	133	88	142	129

- Discriminators calibration:

$V_{ref1A}$ START	$V_{ref1B}$ START	$V_{ref1C}$ START	$V_{ref1D}$ START	$V_{ref2}$	$V_{ref1A}$ STOP	Step	Event nb / step	Number of Runs
105	60	114	101	98	161	2	500	29

- Temporal noise, fixed pattern noise and offset:

Matrix	TN	FPN	Offset
A	0.975	0.385	0.343
B	0.905	0.299	0.484
C	0.965	0.300	0.610
D	0.926	0.323	0.765

- Estimation of the fake hit rate ("middle points" thresholds + 20 uadc):  $7.2310^{-5}$  hits/frame/pixels.

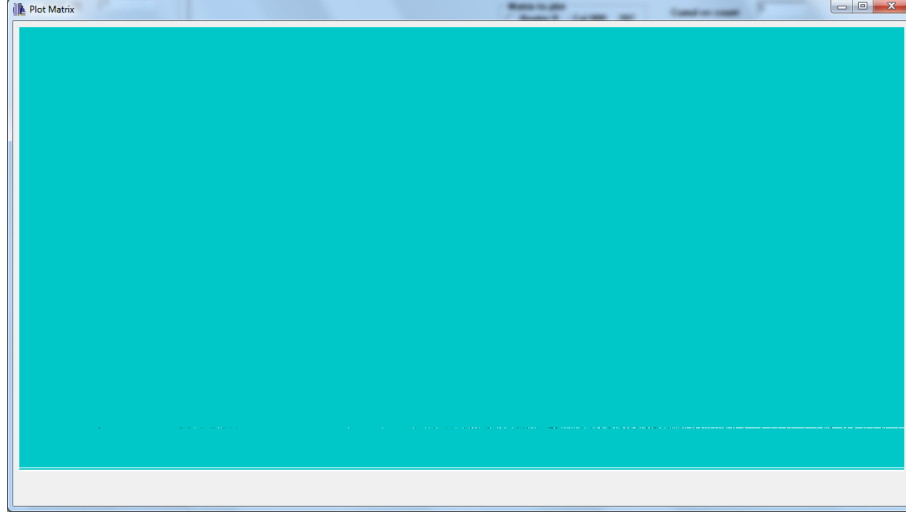


Figure 2: Discriminators output for thresholds set to 0. There is a line not working properly (pixels closed).

#### 2.2.4 Chip 3

- Estimation of the "middle points":

$V_{ref2}$	$V_{ref1A}$	$V_{ref1B}$	$V_{ref1C}$	$V_{ref1D}$
98	112	145	154	123

- Discriminators calibration:

$V_{ref1A}$ START	$V_{ref1B}$ START	$V_{ref1C}$ START	$V_{ref1D}$ START	$V_{ref2}$	$V_{ref1A}$ STOP	Step	Event nb / step	Number of Runs
84	117	117	95	98	140	2	500	29

- Temporal noise, fixed pattern noise and offset:

Matrix	TN	FPN	Offset
A	0.990	0.375	0.304
B	0.984	0.293	0.580
C	0.997	0.543	0.579
D	0.969	0.344	0.882

- Estimation of the fake hit rate ("middle points" thresholds + 20 uadc):  $9.6910^{-6}$  hits/frame/pixels.

#### 2.2.5 2

The chip was disconnected from the flex.

### 2.2.6 1

- Estimation of the "middle points":

$V_{ref2}$	$V_{ref1A}$	$V_{ref1B}$	$V_{ref1C}$	$V_{ref1D}$
98	121	97	77	146

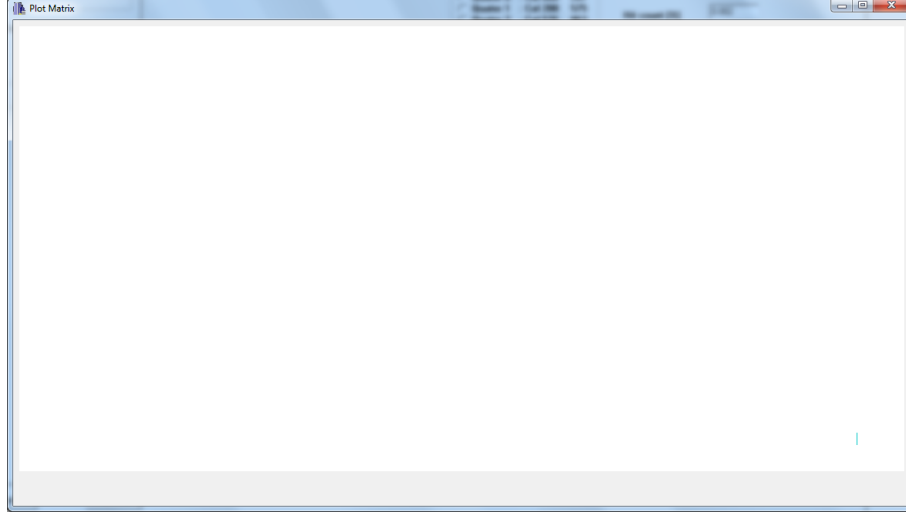


Figure 3: Discriminators output for thresholds set to 255. There is a column (few lines) on submatrix D which is opened.

- Discriminators calibration:

$V_{ref1A}$ START	$V_{ref1B}$ START	$V_{ref1C}$ START	$V_{ref1D}$ START	$V_{ref2}$	$V_{ref1A}$ STOP	Step	Event nb / step	Number of Runs
93	69	49	118	98	149	2	500	29

- Temporal noise, fixed pattern noise and offset:

Matrix	TN	FPN	Offset
A	1.054	0.407	0.397
B	1.037	0.269	0.677
C	1.039	0.598	1.046
D	1.053	0.543	1.005

- Estimation of the fake hit rate ("middle points" thresholds + 20 uadc):  $4.6710^{-5}$  hits/frame/pixels.

## 3 Fake Hit Rate