HS_DCU FLIGHT MODEL

REPORT OF FUNCTIONAL TESTS AT RAL

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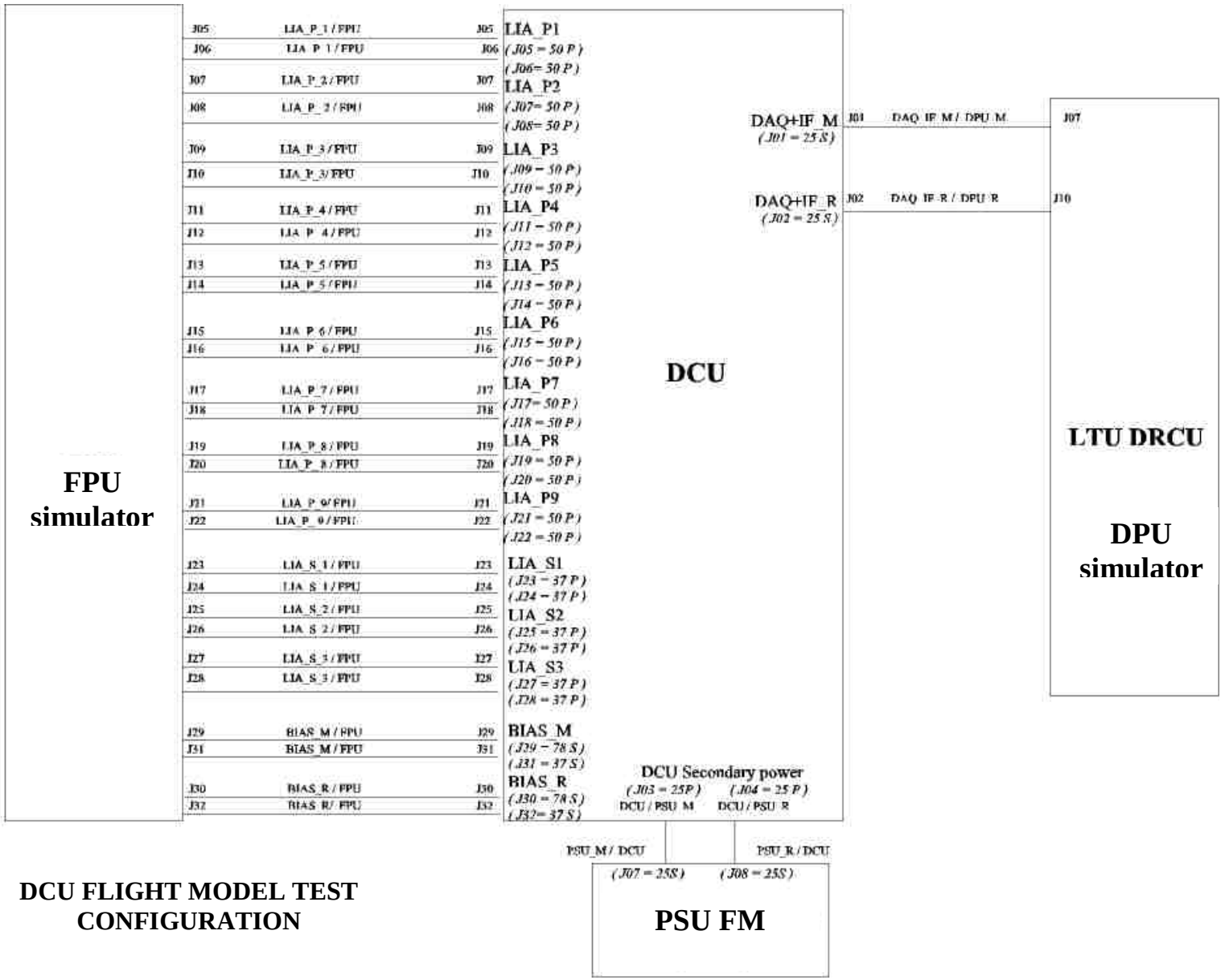
2 Test Configuration

We use the LTU in its latest software configuration, the fully assembled DCU and FCU, the FPU and the PSU Flight Model (PSU FM).

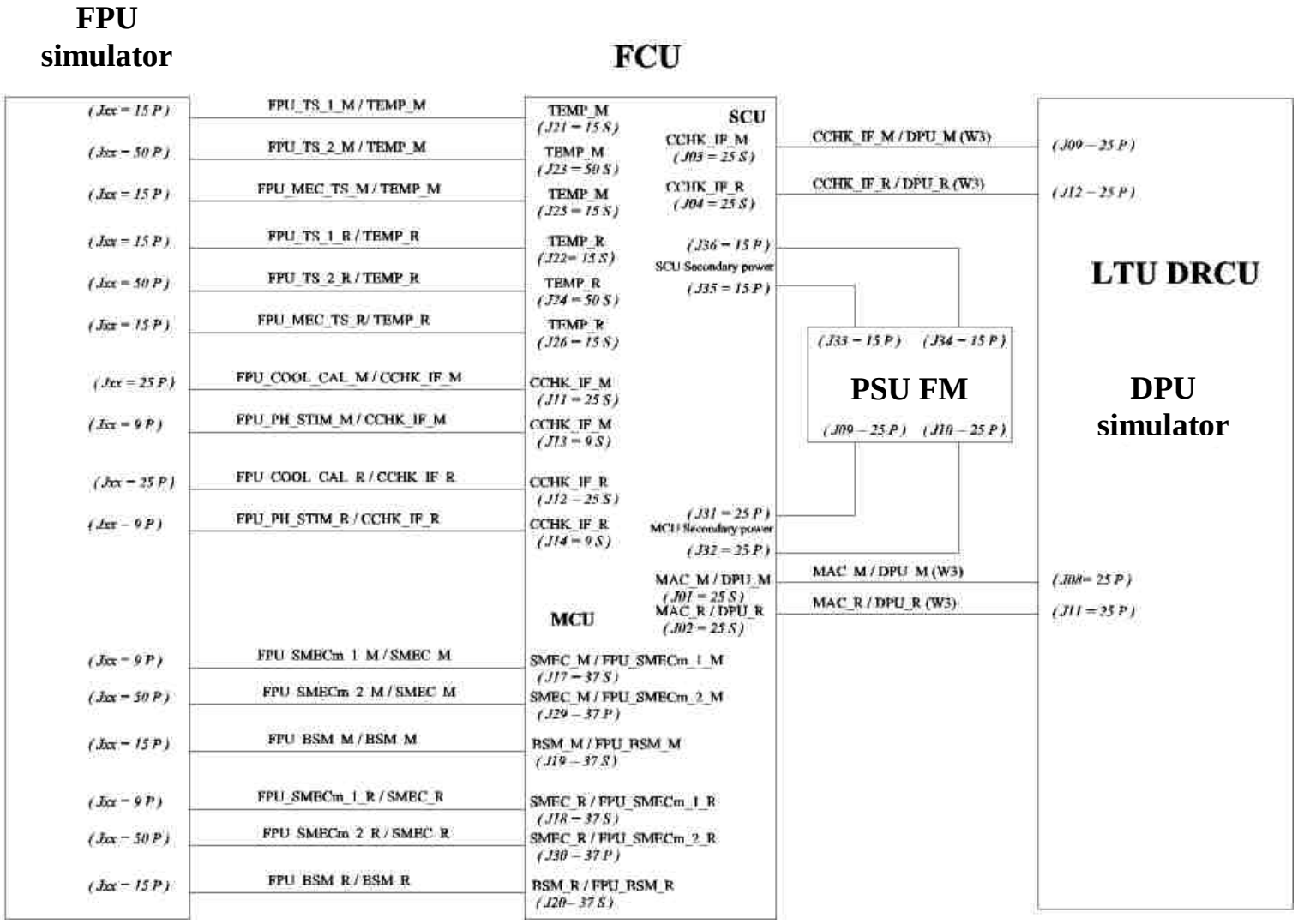
Before to connect any harness, we place savers on all connectors

Connect all harnesses as described below :

- Between DCU and FPU
- Between DCU and LTU
- Between FCU and LTU
- Between FCU and FPU
- Between DCU and PSU FM
- Between FCU and PSU FM



DCU FLIGHT MODEL TEST CONFIGURATION


FPU simulator
FCU
SCU
MCU
PSU FM
LTU DRCU
DPU simulator
FPU_TS_1_M / TEMP_M
FPU_TS_2_M / TEMP_M
FPU_MEC_TS_M / TEMP_M
FPU_TS_1_R / TEMP_R
FPU_TS_2_R / TEMP_R
FPU_MEC_TS_R/ TEMP_R
FPU_COOL_CAL_M / CCHK_IF_M
FPU_PH_STIM_M / CCHK_IF_M
FPU_COOL_CAL_R / CCHK_IF_R
FPU_PH_STIM_R / CCHK_IF_R
FPU_SMECm_1_M / SMEC_M
FPU_SMECm_2_M / SMEC_M
FPU_BSM_M / BSM_M
FPU_SMECm_1_R / SMEC_R
FPU_SMECm_2_R / SMEC_R
FPU_BSM_R / BSM_R
CCHK_IF_M / DPU_M (W3)
CCHK_IF_R / DPU_R (W3)
SCU Secondary power
MCU Secondary power
MAC_M / DPU_M (W3)
MAC_R / DPU_R (W3)

3 POWER ON : CONSUMPTION TESTS

3.1 Primary currents

We report thereafter the consumption on the primary voltage (28 V)

Conso 28 V	Main		redundant		Expected	
Power ON	400	mA	400	mA	400	mA
MCU ON	810	mA	810	mA	810	mA
MCU ON and booted	870	mA	870	mA	870	mA
LIAP ON	2060	mA	2060	mA	2100	mA
LIAS ON	1220	mA	1220	mA	1230	mA
LIAP ON and MCU OFF	1610	mA	1620	mA	1600	mA
LIAS ON and MCU OFF	750	mA	740	mA	750	mA

3.2 Conclusion

Consumption TEST	OK	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL**	

These measurements are within the specified values, we can go through the functional tests procedure.

4 Frame generation Tests

4.1 Procedure

⇨ FPU simulator switched ON but not used
⇨ Batch executed by LTU : *DCU DAQ-IF-TESTS Main Redundant.txt*
⇨ 2 x 5 TM file generated by LTU (DPU) (Main and Redundant)
⇨ Rename the files with the following extensions :

Main Side

Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_Frame_Test_Main.tm
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_Frame_Number_Main.tm
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_Photo_frequency_Main.tm
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_spectro_frequency_Main.tm
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_Time_reset_Main.tm

Redundant side

Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_Frame_Test_Redundant.tm
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_Frame_Number_Redundant.tm
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_Photo_frequency_Redundant.tm
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_spectro_frequency_Main.tm
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_Time_reset_Redundant.tm

4.2 ANALYSIS

Check consistency with specification : Labview Software (button frame_length, frame_id, frame count, sampling rate photo, sampling rate_spectro)
Open last renamed TM files (with extension ref. Frame_Test.tm to Time_reset.tm)

Frame ID and Frame length :
⇨ Check green light

	As run Main	As run Redundant
Green light OK	OK	OK
Frame ID and Frame length	OK	OK

Frame counter :
⇨ Open last renamed TM file (ref. _Frame_Number)

⇨ Enter 338 in “number of frames” box (340 is theorical value)
Check for “frame count green light led”
Stop frame count analysis

	As run Main	As run Redundant
Green light OK	OK	OK
Frame counter	OK	OK

Sampling frequencies :
Open last renamed TM file (ref. _ photo_frequency)
⇨ delta t max = 0,007 s (Criterion)
⇨ Check the "green light" (sampling rate photometer)
⇨ Stop photosampling rate analysis

	As run Main	As run Redundant
Green lights OK	OK	OK
Delta tmax < 0,00001 s	OK	OK

No error in parity Photometer sampling rate		

Open last renamed TM file (ref. _ spectro_frequency)
⇨ delta t max = 0,007 s (Criterion)
⇨ Check the "green light" (sampling rate spectrometer)
⇨ Stop spectro sampling rate analysis

	As run Main	As run Redundant
Green lights OK	OK	OK
Delta tmax < 0,000026 s	OK	OK
No error in parity spectrometer sampling rate		

Time Stamp Reset :
⇨ Open last renamed TM file (ref. _Time_Reset)
⇨ Enter manually the frequency : 50.86 Hz in “frequency box”
⇨ Check the "green light" and no error in “block time vs block number” box
Stop block time analysis

	As run Main	As run Redundant
Green light OK	OK	OK
block time vs block number	OK	OK

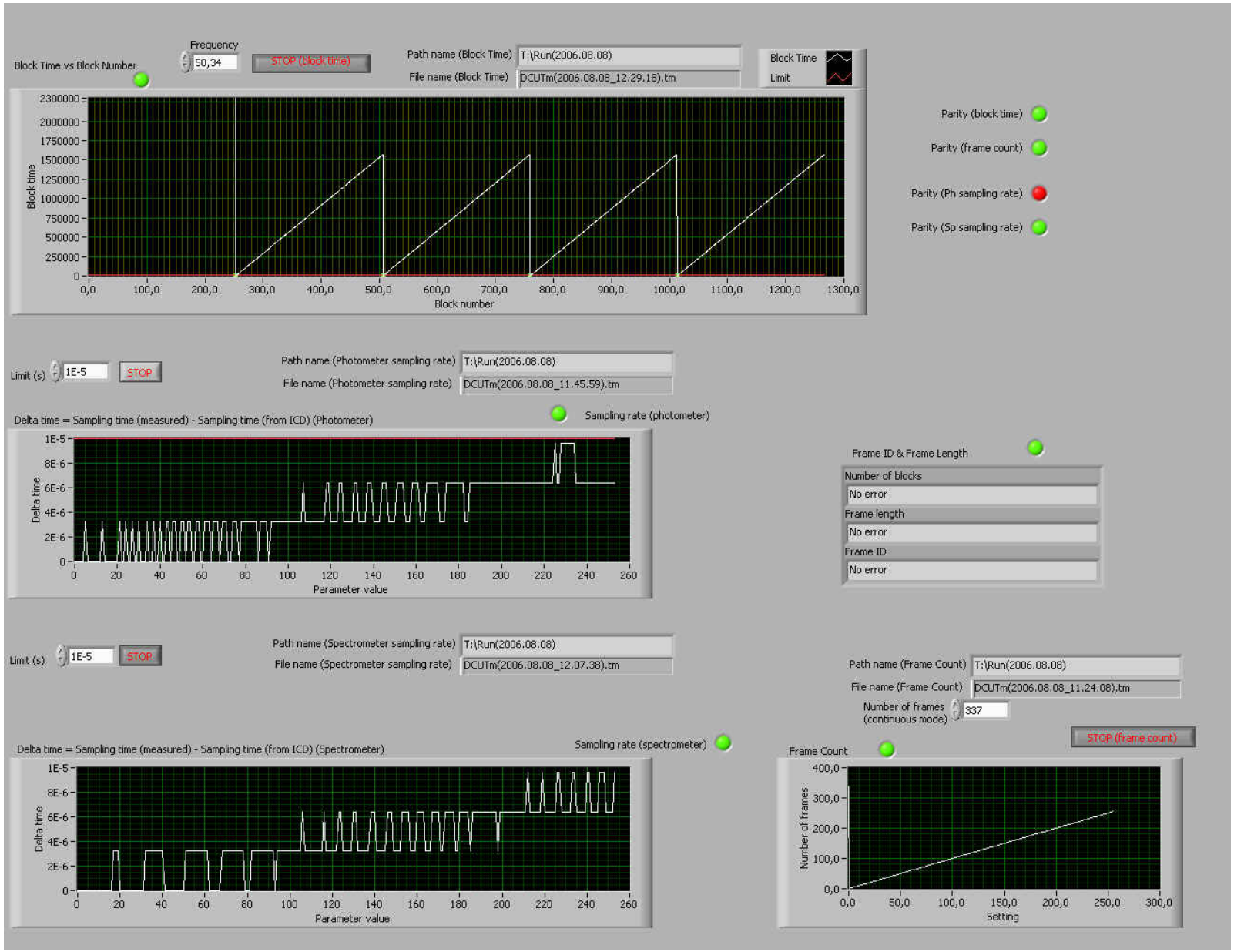
4.3 Test of the DCU frames parity

⇨ Check the 4 "green lights" associated with parity
⇨ Enter manually the frequency : 50.86 Hz
⇨ Check two "green lights" :
for the time value at time reset (Block time vs Block number)
for the parity block time

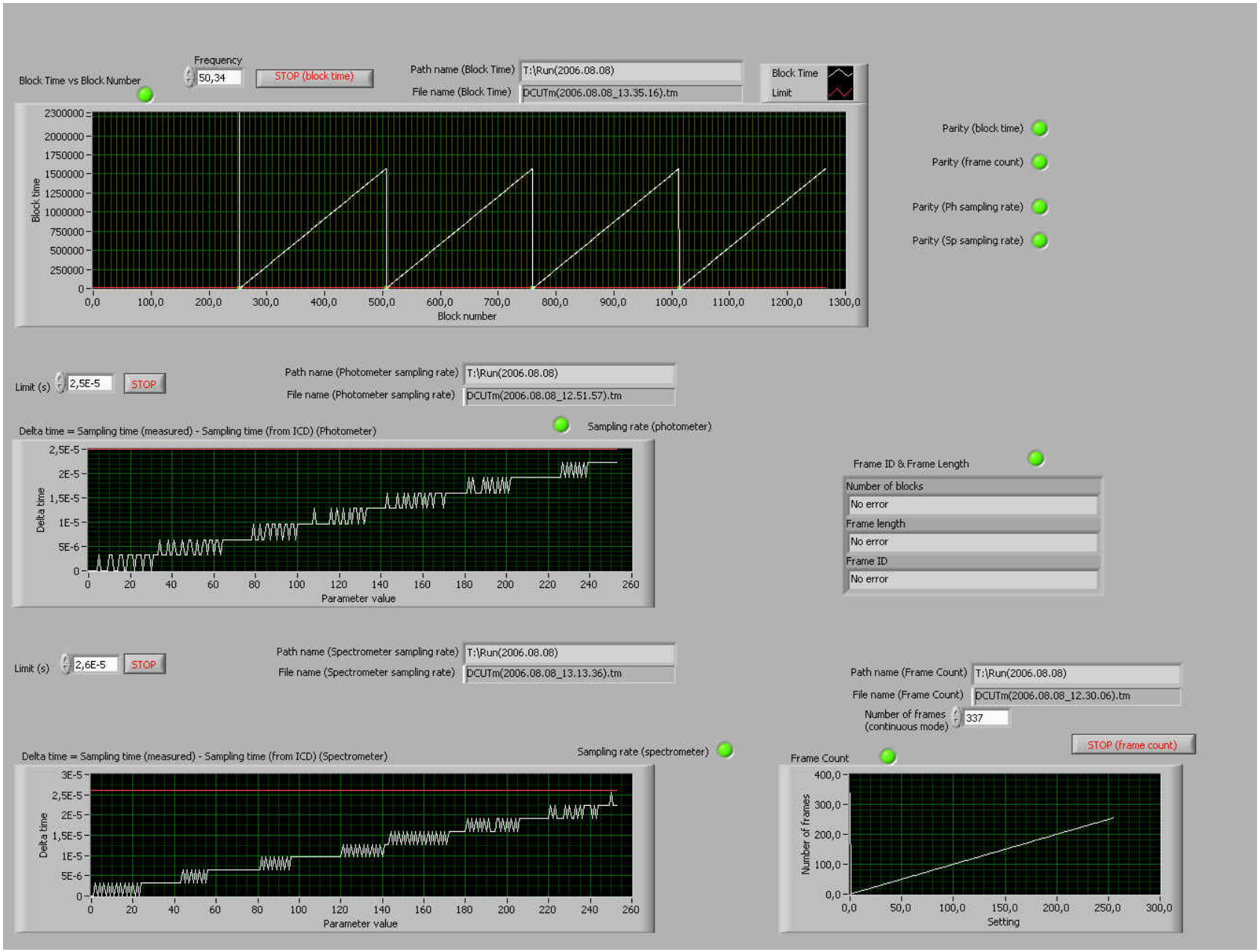
	As run Main	As run Redundant
4 Green lights OK	OK	OK

Cut and paste here after hardcopies of labview (Main and Redundant)

Main side


Block Time vs Block Number
Frequency
50,34
STOP (block time)
Path name (Block Time)
T:\Run(2006.08.08)
File name (Block Time)
DCUTm(2006.08.08_12.29.18).tm
Block Time
Limit
Block time
Block number
Parity (block time)
Parity (frame count)
Parity (Ph sampling rate)
Parity (Sp sampling rate)
Limit (s)
1E-5
STOP
Path name (Photometer sampling rate)
T:\Run(2006.08.08)
File name (Photometer sampling rate)
DCUTm(2006.08.08_11.45.59).tm
Delta time = Sampling time (measured) - Sampling time (from ICD) (Photometer)
Sampling rate (photometer)
Delta time
Parameter value
Frame ID & Frame Length
Number of blocks
No error
Frame length
No error
Frame ID
No error
Limit (s)
1E-5
STOP
Path name (Spectrometer sampling rate)
T:\Run(2006.08.08)
File name (Spectrometer sampling rate)
DCUTm(2006.08.08_12.07.38).tm
Path name (Frame Count)
T:\Run(2006.08.08)
File name (Frame Count)
DCUTm(2006.08.08_11.24.08).tm
Number of frames (continuous mode)
337
STOP (frame count)
Delta time = Sampling time (measured) - Sampling time (from ICD) (Spectrometer)
Sampling rate (spectrometer)
Delta time
Parameter value
Frame Count
Number of frames
Setting

Redundant side



4.4 Conclusion

Frame generation TEST	OK	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL**	

5 Offets

In this test, we use a simulator input file that consist in sinus signal with the same pic pic level of 0,2 mV on all channels but at different magnitude levels (id est with different offsets) within the specified range. The purpose is then to check that the automatic offset function allows reading the signal within its specified magnitude range.

We perform signal acquisition using the FPU simulator script : SawTooth RAL.spt
Simulator frequency setting = 0.5

We obtain the following telemetry files

Main
Photometer file 2006.08.09_11.08.03
Spectrometer file 2006.08.08_17.29.56

Redundant
Photometer file 2006.08.08_17.31.32
Spectrometer file 2006.08.08_17.33.16

On LIAP as well as on LIAS boards, the same signal is sent on groups of 3 channels. On the thereafter graphics, the values of the offsets, as computed by DCU, appears on the line above.

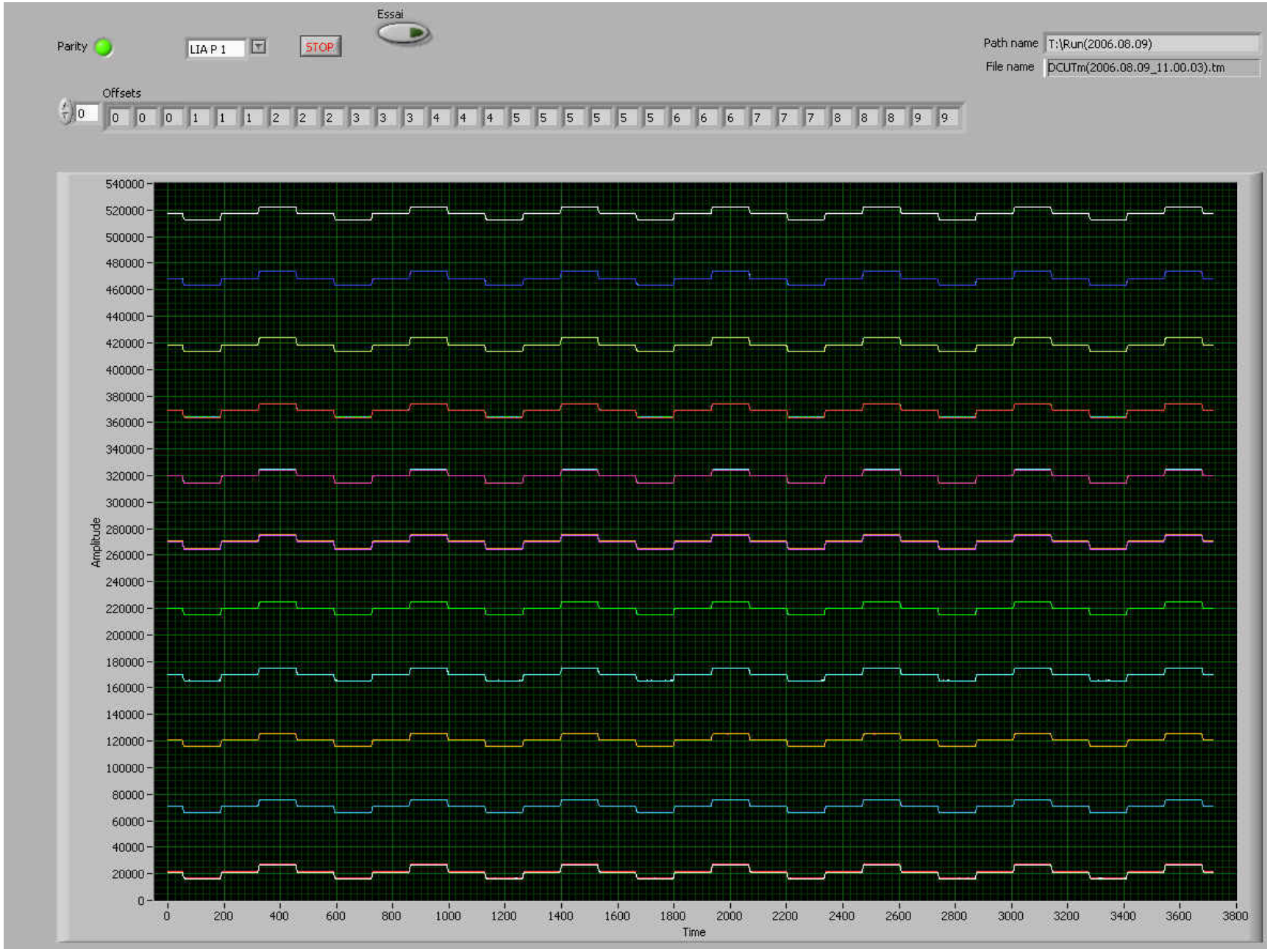
We thereafter represent the signal as read from TM files. The value of the offset has been added to the signal so as to differentiate the channels and to re create the signal.

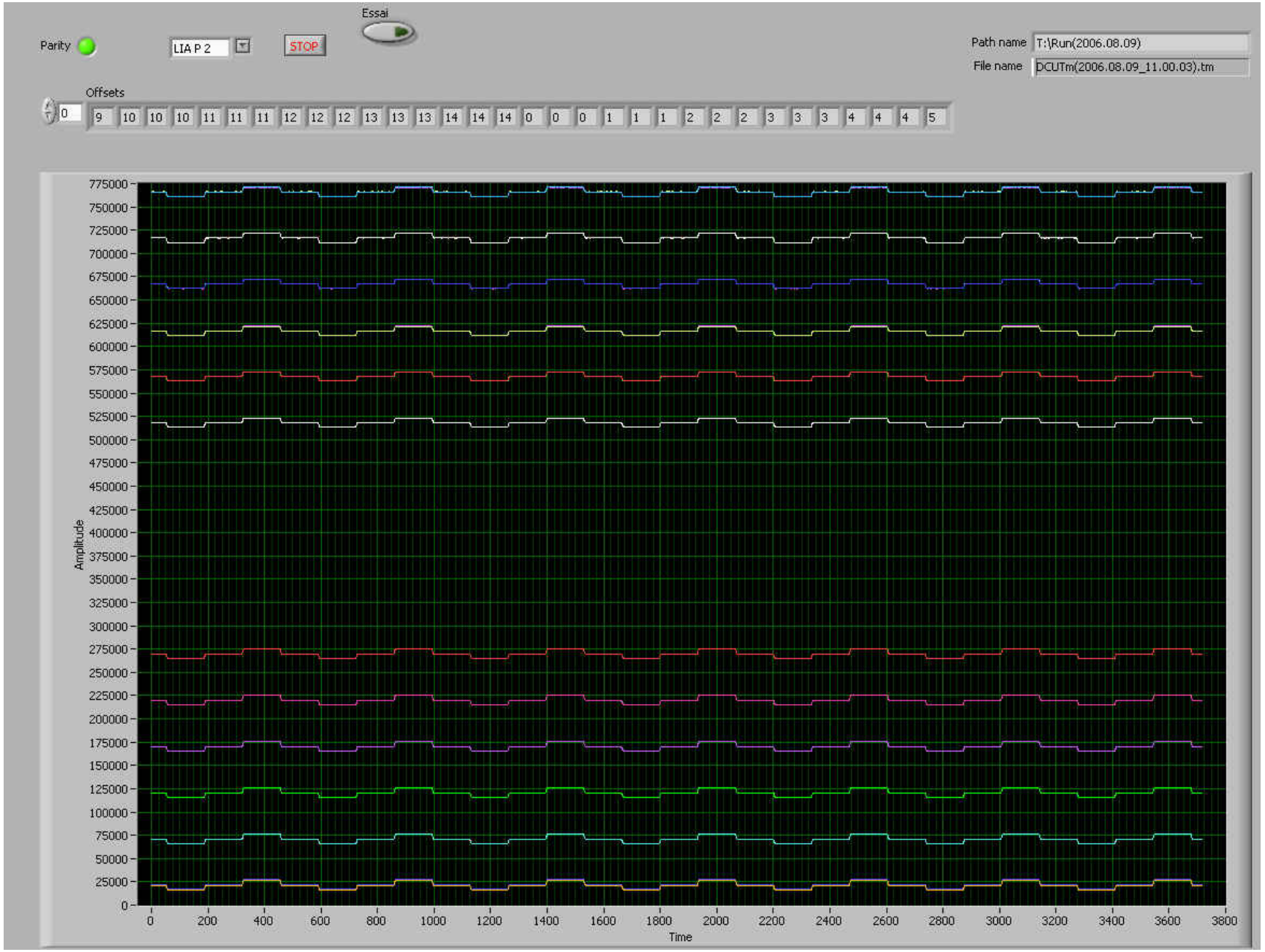
SCREEN COPIES

DCU MAIN SIDE

LIAP 1

LIAP 2


Essai
Parity
LIA P 1
STOP
Path name
T:\Run(2006.08.09)
File name
DCUTm(2006.08.09_11.00.03).tm
Offsets
Amplitude
Time

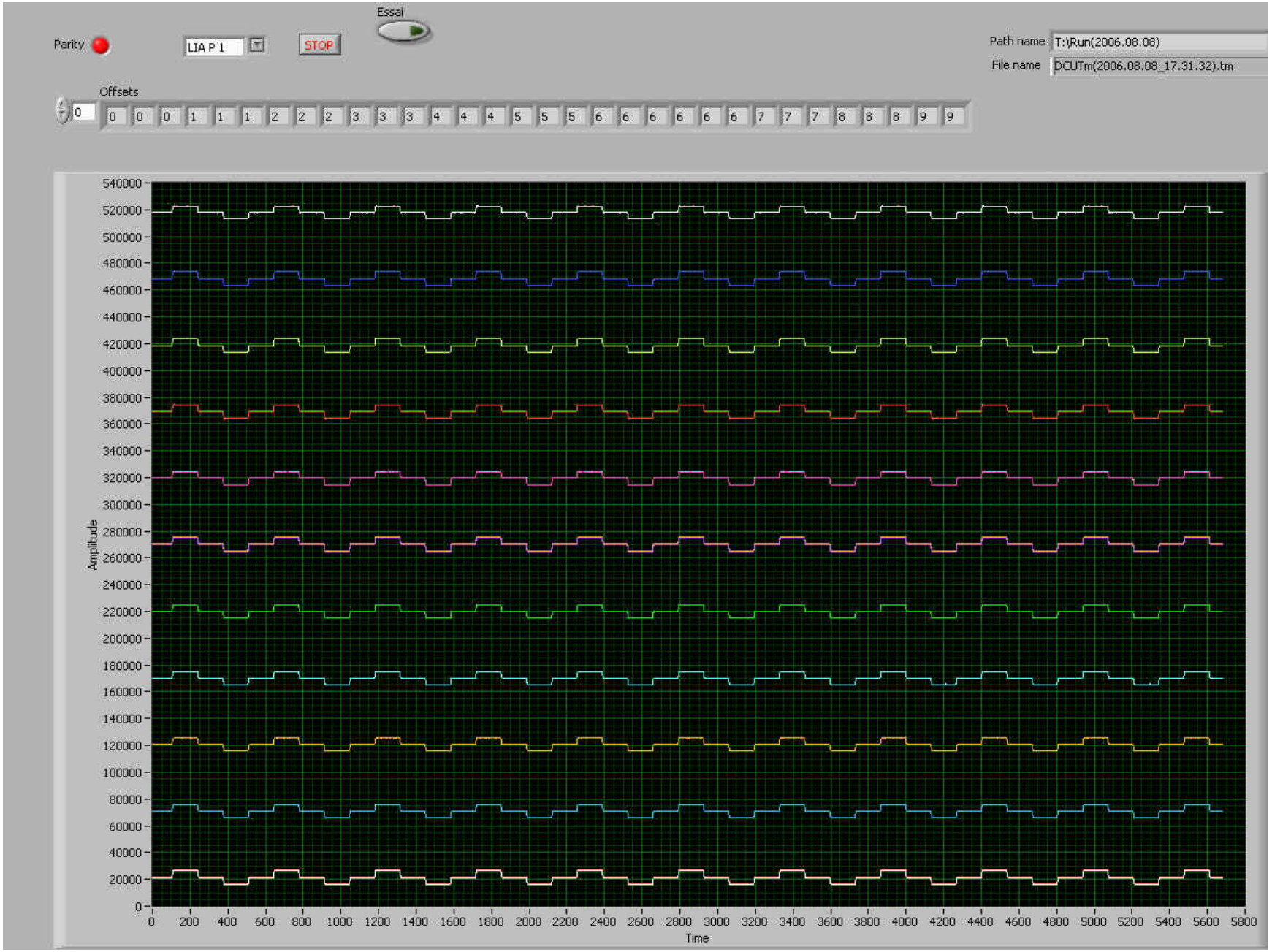

Essai
Parity
LIA P 2
STOP
Path name
T:\Run(2006.08.09)
File name
DCUTm(2006.08.09_11.00.03).tm
Offsets
0
9 10 10 10 11 11 11 12 12 12 13 13 13 14 14 14 0 0 0 1 1 1 2 2 2 3 3 3 4 4 4 5
Amplitude
775000 750000 725000 700000 675000 650000 625000 600000 575000 550000 525000 500000 475000 450000 425000 400000 375000 350000 325000 300000 275000 250000 225000 200000 175000 150000 125000 100000 75000 50000 25000 0
0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 3600 3800
Time

SCREEN COPIES

DCU REDUNDANT SIDE

LIAP 1

LIAP 2


Essai
Parity
LIA P 1
STOP
Path name
T:\Run(2006.08.08)
File name
DCUTm(2006.08.08_17.31.32).tm
Offsets
Amplitude
Time


Parity
LIA P 2
STOP
Path name
T:\Run(2006.08.08)
File name
DCUTm(2006.08.08_17.31.32).tm
Offsets
0
9 10 10 10 11 11 11 12 12 12 13 13 13 14 14 14 0 0 0 1 1 1 2 2 2 3 3 3 4 4 4 5
Amplitude
775000
750000
725000
700000
675000
650000
625000
600000
575000
550000
525000
500000
475000
450000
425000
400000
375000
350000
325000
300000
275000
250000
225000
200000
175000
150000
125000
100000
75000
50000
25000
0
0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 3600 3800 4000 4200 4400 4600 4800 5000 5200 5400 5600 5800
Time

SCREEN COPIES

DCU MAIN SIDE

LIAS 1

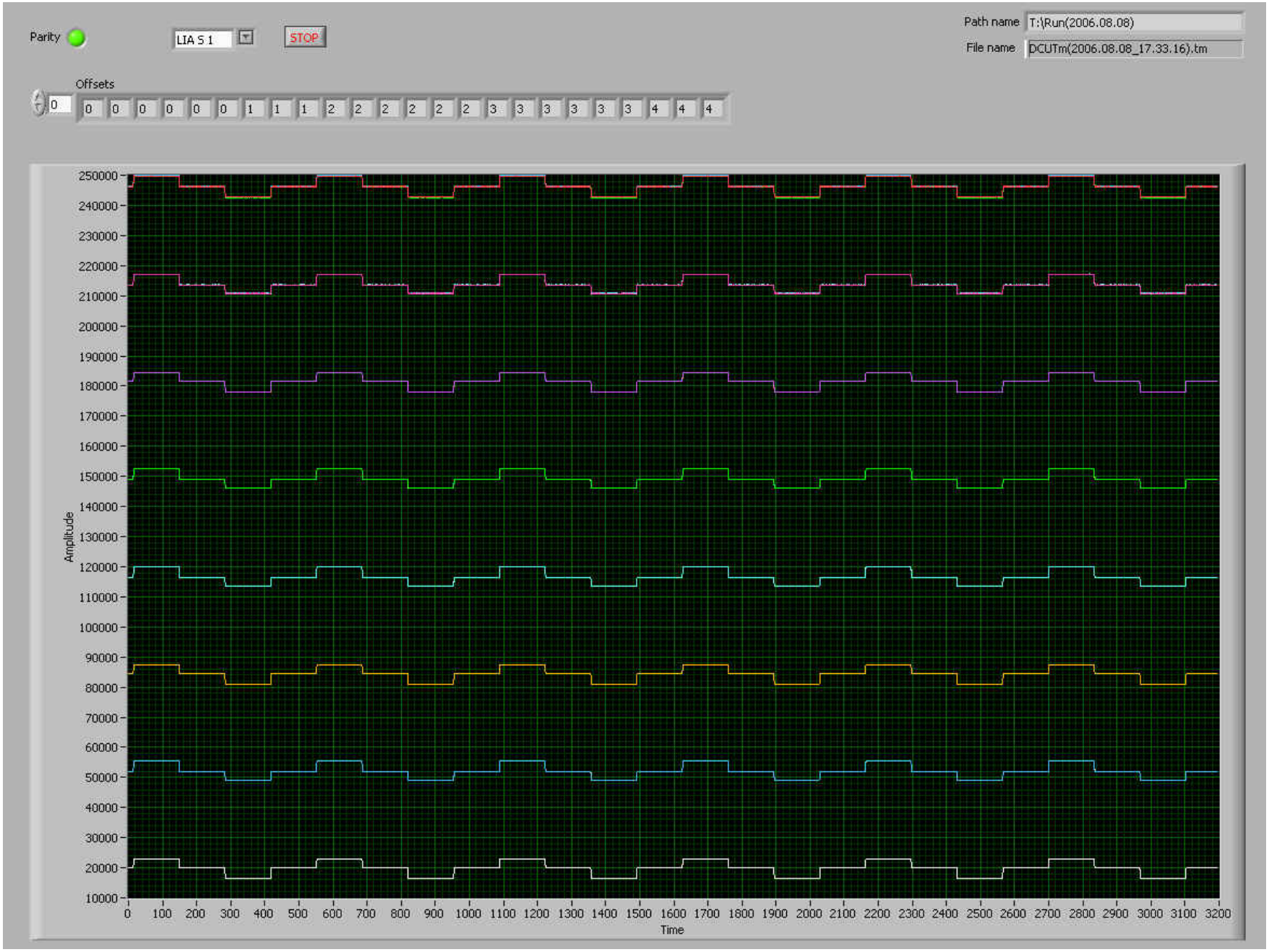

Parity
LIA S 1
STOP
Path name
T:\Run(2006.08.08)
File name
DCUTm(2006.08.08_17.29.56).tm
Offsets
Amplitude
Time

SCREEN COPIES

DCU REDUNDANT SIDE

LIAS 1

LIAS 2


Parity
LIA S 1
STOP
Path name
T:\Run(2006.08.08)
File name
DCUTm(2006.08.08_17.33.16).tm
Offsets
0 0 0 0 0 0 0 1 1 1 2 2 2 2 2 2 3 3 3 3 3 3 4 4 4
Amplitude
250000 240000 230000 220000 210000 200000 190000 180000 170000 160000 150000 140000 130000 120000 110000 100000 90000 80000 70000 60000 50000 40000 30000 20000 10000
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200
Time


Parity
LIA S 2
STOP
Path name
T:\Run(2006.08.08)
File name
DCUTm(2006.08.08_17.33.16).tm
Offsets
0
5 5 5 5 5 5 6 6 6 7 7 7 7 7 7 8 8 8 8 8 8 9 9 9
Amplitude
510000
500000
490000
480000
470000
460000
450000
440000
430000
420000
410000
400000
390000
380000
370000
360000
350000
340000
330000
320000
310000
300000
290000
280000
270000
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200
Time

Offsets	OK	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL**	

6 HouseKeepings

6.1 Housekeeping acquisition

We start the DCU Monitoring Mode from LTU using the batch *DRCU Monitoring Main redundant.txt*
We observe the results over a sufficient time (1 minute)

We include the hardcopy of LTU monitoring screen (DCU working on main side)

LIAP ON, main side

MONITORING

DCU

Nom Parametre	Description	Valeur C...	Min	Max	Unite
BIAS_TEMP	BIAS board Temp	20.78	-31.01	70.01	°C
LIA_S1_TEMP	LIAS board 1 Temp	19.01	-31.01	70.01	°C
LIA_S2_TEMP	LIAS board 2 Temp	19.01	-31.01	70.01	°C
LIA_S3_TEMP	LIAS board 3 Temp	19.13	-31.01	70.01	°C
LIA_P9_TEMP	LIAP board 9 Temp	18.49	-31.01	70.01	°C
LIA_P8_TEMP	LIAP board 8 Temp	18.73	-31.01	70.01	°C
LIA_P7_TEMP	LIAP board 7 Temp	18.38	-31.01	70.01	°C
LIA_P6_TEMP	LIAP board 6 Temp	18.38	-31.01	70.01	°C
LIA_P5_TEMP	LIAP board 5 Temp	18.28	-31.01	70.01	°C
LIA_P4_TEMP	LIAP board 4 Temp	18.51	-31.01	70.01	°C
LIA_P3_TEMP	LIAP board 3 Temp	18.03	-31.01	70.01	°C
LIA_P2_TEMP	LIAP board 2 Temp	18.17	-31.01	70.01	°C
LIA_P1_TEMP	LIAP board 1 Temp	18.52	-31.01	70.01	°C
DAQ_IF_TEMP	DAQ_IF board Temp	21.94	-31.01	70.01	°C
BDAQ_P5	BIAS/DAQ_IF +5V(before post regu...	5.11	4.90	5.26	V
BDAQ_P9	BIAS/DAQ_IF +9V(before post regu...	8.97	8.50	9.10	V
BDAQ_N9	BIAS/DAQ_IF -9V(before post regul...	-9.04	-9.10	-8.50	V
LIAP_P5	LIAP +5V(before post regulator)	5.17	4.90	5.27	V
LIAP_P9	LIAP +9V(before post regulator)	11.50	11.20	11.60	V
LIAP_N9	LIAP -9V(before post regulator)	-11.53	-11.60	-11.20	V
LIAS_P5	LIAS +5V(before post regulator)	0.08	4.90	5.26	V
LIAS_P9	LIAS +9V(before post regulator)	0.01	11.20	11.60	V
LIAS_N9	LIAS -9V(before post regulator)	0.01	-11.60	-11.20	V
PWR_STATUS	LIA1 to LIA12 12 +5V/+9V/-9V status	0000	0.00	0.00	hexa
T/C_1	16 bits ADC (Offset=0) 1	2207			Decimal
T/C_2	16 bits ADC (Offset=0) 2	4159			Decimal
T/C_3	16 bits ADC (Offset=0) 3	255			Decimal

LIAS ON, main side,

MONITORING

DCU

Nom Parametre	Description	Valeur C...	Min	Max	Unite
BIAS_TEMP	BIAS board Temp	20.90	-31.01	70.01	°C
LIA_S1_TEMP	LIAS board 1 Temp	19.25	-31.01	70.01	°C
LIA_S2_TEMP	LIAS board 2 Temp	19.16	-31.01	70.01	°C
LIA_S3_TEMP	LIAS board 3 Temp	19.22	-31.01	70.01	°C
LIA_P9_TEMP	LIAP board 9 Temp	18.78	-31.01	70.01	°C
LIA_P8_TEMP	LIAP board 8 Temp	19.06	-31.01	70.01	°C
LIA_P7_TEMP	LIAP board 7 Temp	18.69	-31.01	70.01	°C
LIA_P6_TEMP	LIAP board 6 Temp	18.78	-31.01	70.01	°C
LIA_P5_TEMP	LIAP board 5 Temp	18.64	-31.01	70.01	°C
LIA_P4_TEMP	LIAP board 4 Temp	18.81	-31.01	70.01	°C
LIA_P3_TEMP	LIAP board 3 Temp	18.43	-31.01	70.01	°C
LIA_P2_TEMP	LIAP board 2 Temp	18.52	-31.01	70.01	°C
LIA_P1_TEMP	LIAP board 1 Temp	18.87	-31.01	70.01	°C
DAQ_IF_TEMP	DAQ_IF board Temp	22.32	-31.01	70.01	°C
BDAQ_P5	BIAS/DAQ_IF +5V(before post regu...	5.11	4.90	5.26	V
BDAQ_P9	BIAS/DAQ_IF +9V(before post regu...	8.96	8.50	9.10	V
BDAQ_N9	BIAS/DAQ_IF -9V(before post regul...	-9.04	-9.10	-8.50	V
LIAP_P5	LIAP +5V(before post regulator)	0.20	4.90	5.27	V
LIAP_P9	LIAP +9V(before post regulator)	0.01	11.20	11.60	V
LIAP_N9	LIAP -9V(before post regulator)	0.00	-11.60	-11.20	V
LIAS_P5	LIAS +5V(before post regulator)	5.21	4.90	5.26	V
LIAS_P9	LIAS +9V(before post regulator)	11.55	11.20	11.60	V
LIAS_N9	LIAS -9V(before post regulator)	-11.55	-11.60	-11.20	V
PWR_STATUS	LIA1 to LIA12 12 +5V/+9V/-9V status	0000	0.00	0.00	hexa
T/C_1	16 bits ADC (Offset=0) 1	2207			Decimal
T/C_2	16 bits ADC (Offset=0) 2	4159			Decimal
T/C_3	16 bits ADC (Offset=0) 3	255			Decimal

LIAS ON Redundant side,

MONITORING

DCU

Nom Parametre	Description	Valeur C...	Min	Max	Unite
BIAS_TEMP	BIAS board Temp	18.72	-31.01	70.01	°C
LIA_S1_TEMP	LIAS board 1 Temp	18.20	-31.01	70.01	°C
LIA_S2_TEMP	LIAS board 2 Temp	18.23	-31.01	70.01	°C
LIA_S3_TEMP	LIAS board 3 Temp	18.11	-31.01	70.01	°C
LIA_P9_TEMP	LIAP board 9 Temp	18.14	-31.01	70.01	°C
LIA_P8_TEMP	LIAP board 8 Temp	17.85	-31.01	70.01	°C
LIA_P7_TEMP	LIAP board 7 Temp	17.83	-31.01	70.01	°C
LIA_P6_TEMP	LIAP board 6 Temp	18.15	-31.01	70.01	°C
LIA_P5_TEMP	LIAP board 5 Temp	17.94	-31.01	70.01	°C
LIA_P4_TEMP	LIAP board 4 Temp	18.14	-31.01	70.01	°C
LIA_P3_TEMP	LIAP board 3 Temp	18.05	-31.01	70.01	°C
LIA_P2_TEMP	LIAP board 2 Temp	18.34	-31.01	70.01	°C
LIA_P1_TEMP	LIAP board 1 Temp	18.08	-31.01	70.01	°C
DAQ_IF_TEMP	DAQ_IF board Temp	19.94	-31.01	70.01	°C
BDAQ_P5	BIAS/DAQ_IF +5V(before post regu...	5.10	4.90	5.26	V
BDAQ_P9	BIAS/DAQ_IF +9V(before post regu...	8.98	8.50	9.10	V
BDAQ_N9	BIAS/DAQ_IF -9V(before post regul...	-9.06	-9.10	-8.50	V
LIAP_P5	LIAP +5V(before post regulator)	0.00	4.90	5.27	V
LIAP_P9	LIAP +9V(before post regulator)	0.00	11.20	11.60	V
LIAP_N9	LIAP -9V(before post regulator)	0.00	-11.60	-11.20	V
LIAS_P5	LIAS +5V(before post regulator)	5.22	4.90	5.26	V
LIAS_P9	LIAS +9V(before post regulator)	11.55	11.20	11.60	V
LIAS_N9	LIAS -9V(before post regulator)	-11.56	-11.60	-11.20	V
PWR_STATUS	LIA1 to LIA12 12 +5V/+9V/-9V status	0000	0.00	0.00	hexa
T/C_1	16 bits ADC (Offset=0) 1	2173			Decimal
T/C_2	16 bits ADC (Offset=0) 2	255			Decimal
T/C_3	16 bits ADC (Offset=0) 3	250			Decimal

6.2 Conclusion

Housekeeping TEST	**OK**	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL**	

7 BIAS generation tests

7.1 BIAS setting

⇨ The FPU simulator must be in slave mode and generating measurement files; one can use any simulator script file (for instance, Script_Spire_01.spt), only the outcoming measurement file matters.
⇨ The Batch executed by LTU is : BIAS-TESTS Main redundant.txt
⇨ 2 times (Main and Redundant) 7 FPU simulator measurement files (14 in total) generated that contain :
1 -> Bias frequency photometer
2 -> Bias frequency spectrometer
3 -> Bias amplitudes (PhotoBiasAmpl LW,PhotoBiasAmpl MW,PhotoBiasAmpl SW,PhotoBiasAmpl TC, SpectroBiasAmpl LW,SpectroBiasAmpl SW)
4 -> JFET amplitudes Vss
PhLWJFetVSS1 0-255
PhLWJFetVSS2 0-255
PhMWJFetVSS1 0-255
PhMWJFetVSS2 0-255
PhMWJFetVSS3 0-255
PhMWJFetVSS4 0-255
PhSWJFetVSS1 0-255
PhSWJFetVSS2 0-255
PhSWJFetVSS3 0-255
PhSWJFetVSS4 0-255
PhSWJFetVSS5 0-255
PhSWJFetVSS6 0-255
PhMWJFetTC 0-255
SpLWJFetVSS 0-255
SpSWJFetVSS1 0-255
SpSWJFetVSS2 0-255
5 -> JFET On successives (Vdd)
PhSWJFetPwr Vdd1
PhSWJFetPwr Vdd2
PhSWJFetPwr Vdd3
PhSWJFetPwr Vdd4
PhSWJFetPwr Vdd5
PhSWJFetPwr Vdd6
PhMLWJFetPwr Vdd1 MW
PhMLWJFetPwr Vdd2 MW
PhMLWJFetPwr Vdd3 MW
PhMLWJFetPwr Vdd4 MW
PhMLWJFetPwr Vdd1 LW

```
            PhMLWJFetPwr Vdd2 LW
            PhMLWJFetPwr Vdd TC
            SpSLWJFetPwr Vdd SLW
            SpSLWJFetPwr Vdd1 SSW
            SpSLWJFetPwr Vdd2 SSW
            All ON
6 -> Photo Heaters
            PhotoHeater 0-255
7 -> Spectro Heaters
            SpHeater 0-255
```

The measurement files obtained are :

Script_Spire_01_080806_131252\SPIRE_test_BIAS_1_1.mes
.
.
.
Script_Spire_01_080806_131252\SPIRE_test_BIAS_7_1.mes
Script_Spire_01_080806_131252\SPIRE_test_BIAS_8_1.mes
.
.
.
Script_Spire_01_080806_131252\SPIRE_test_BIAS_14_1.mes.

7.2 ANALYSIS

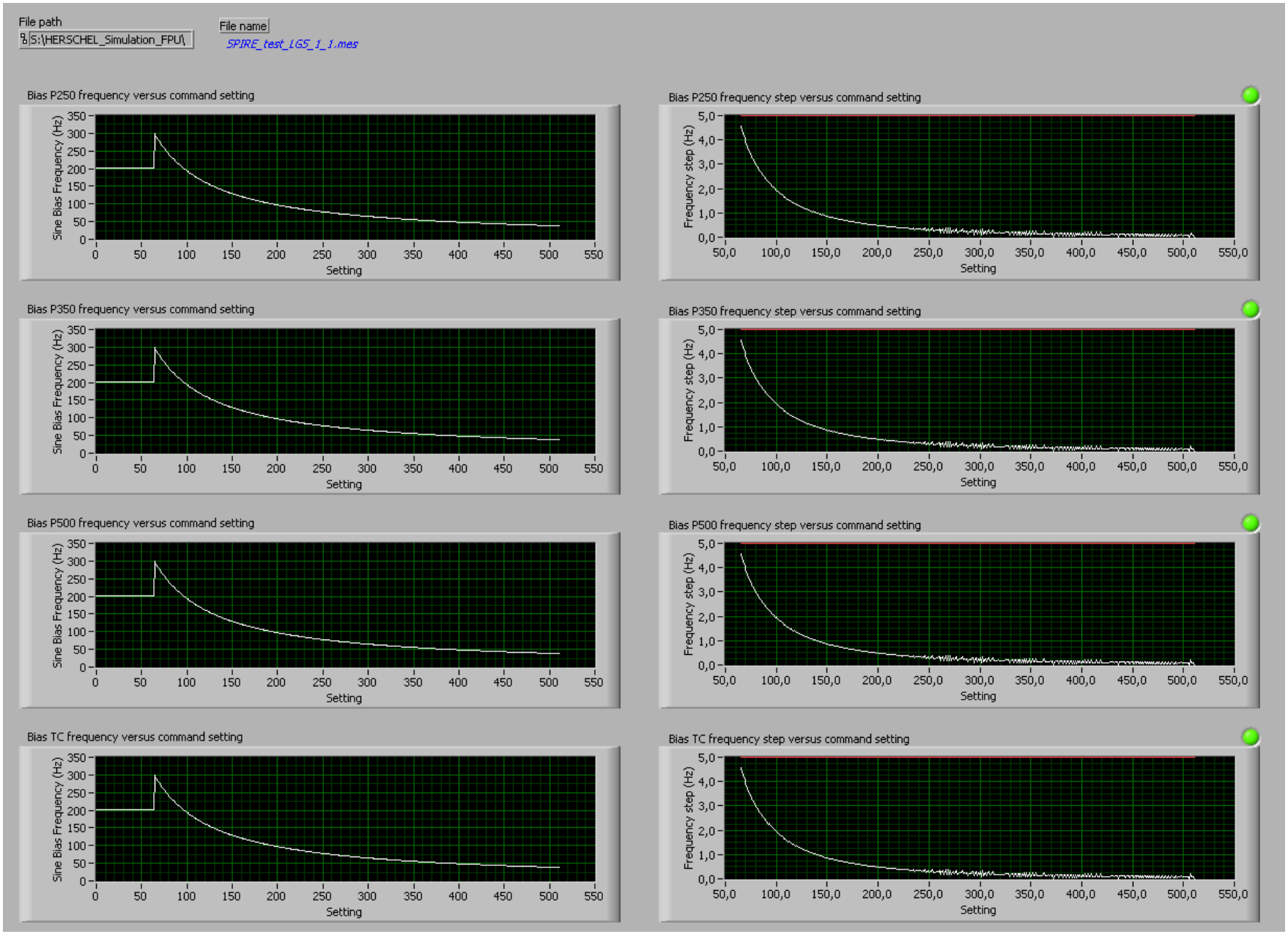
⇨ Check consistency with specification : use the Labview Software
⇨ 7 measurement files to analyze in Main as well as in redundant

7.2.1 Bias frequency photometer

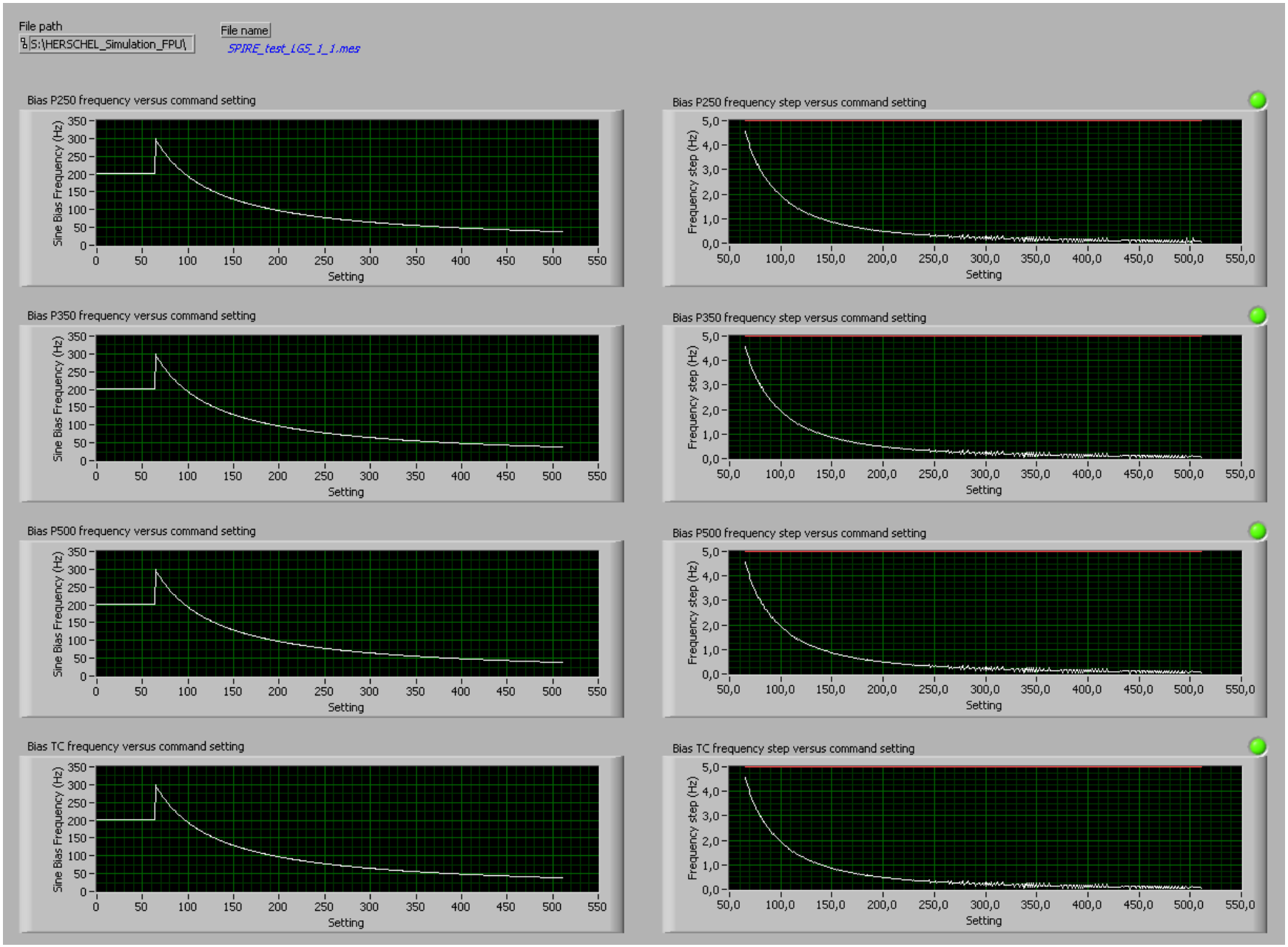
Measurement file : SPIRE_test_BIAS_1_1.mes for main (resp. SPIRE_test_BIAS_8_1.mes for redundant)
Click on photometer bias frequency button, and select the last generated file SPIRE_test_BIAS_1_1.mes for main (resp. SPIRE_test_BIAS_8_1.mes for redundant).
Check the four green lights.

Include in as run the hardcopy off Labview analysis screen (replace typical view provided here after)

Main side :


File path
S:\HERSCHEL_Simulation_FPU\
File name
SPIRE_test_1G5_1_1.mes
Bias P250 frequency versus command setting
Sine Bias Frequency (Hz)
Setting
Bias P250 frequency step versus command setting
Frequency step (Hz)
Setting
Bias P350 frequency versus command setting
Sine Bias Frequency (Hz)
Setting
Bias P350 frequency step versus command setting
Frequency step (Hz)
Setting
Bias P500 frequency versus command setting
Sine Bias Frequency (Hz)
Setting
Bias P500 frequency step versus command setting
Frequency step (Hz)
Setting
Bias TC frequency versus command setting
Sine Bias Frequency (Hz)
Setting
Bias TC frequency step versus command setting
Frequency step (Hz)
Setting

Redundant side :



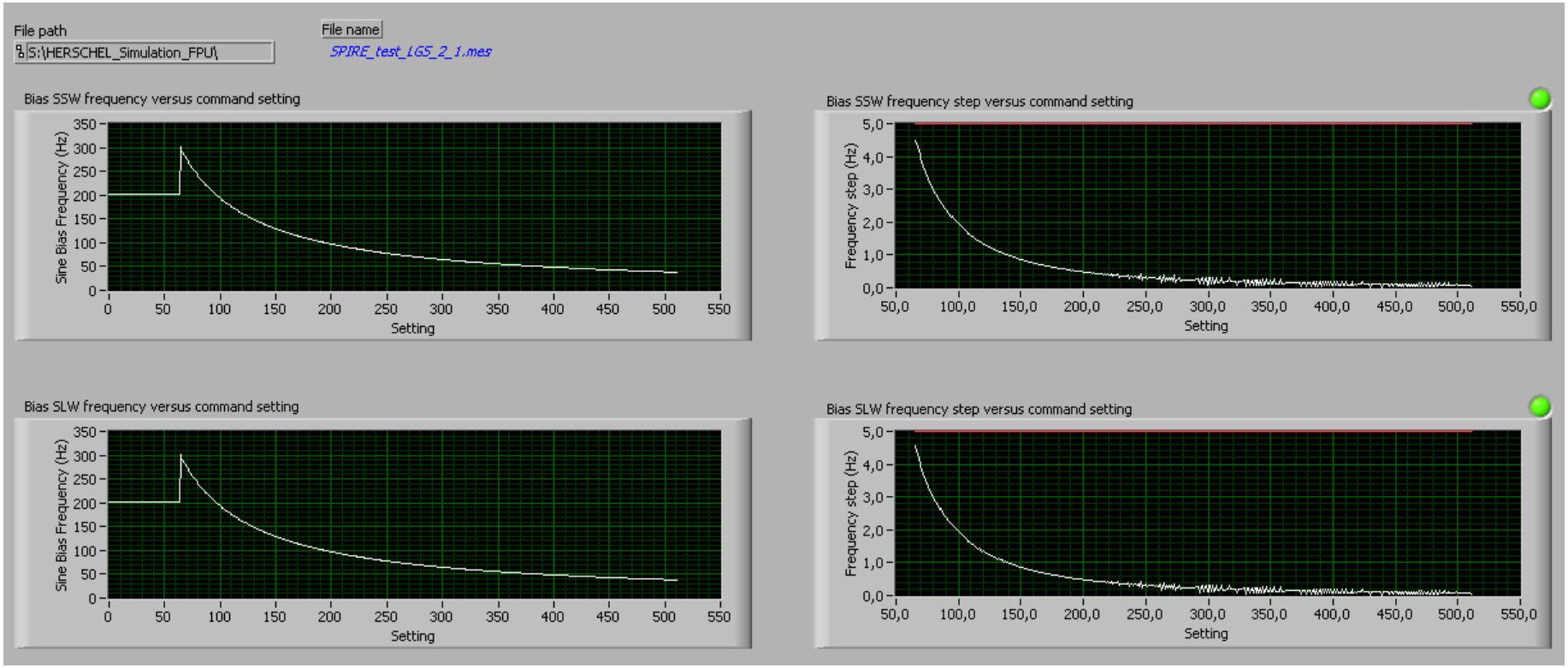
7.2.2 Bias frequency spectrometer

Measurement file : SPIRE_test_BIAS_2_1.mes for main (resp. SPIRE_test_BIAS_9_1.mes for redundant)

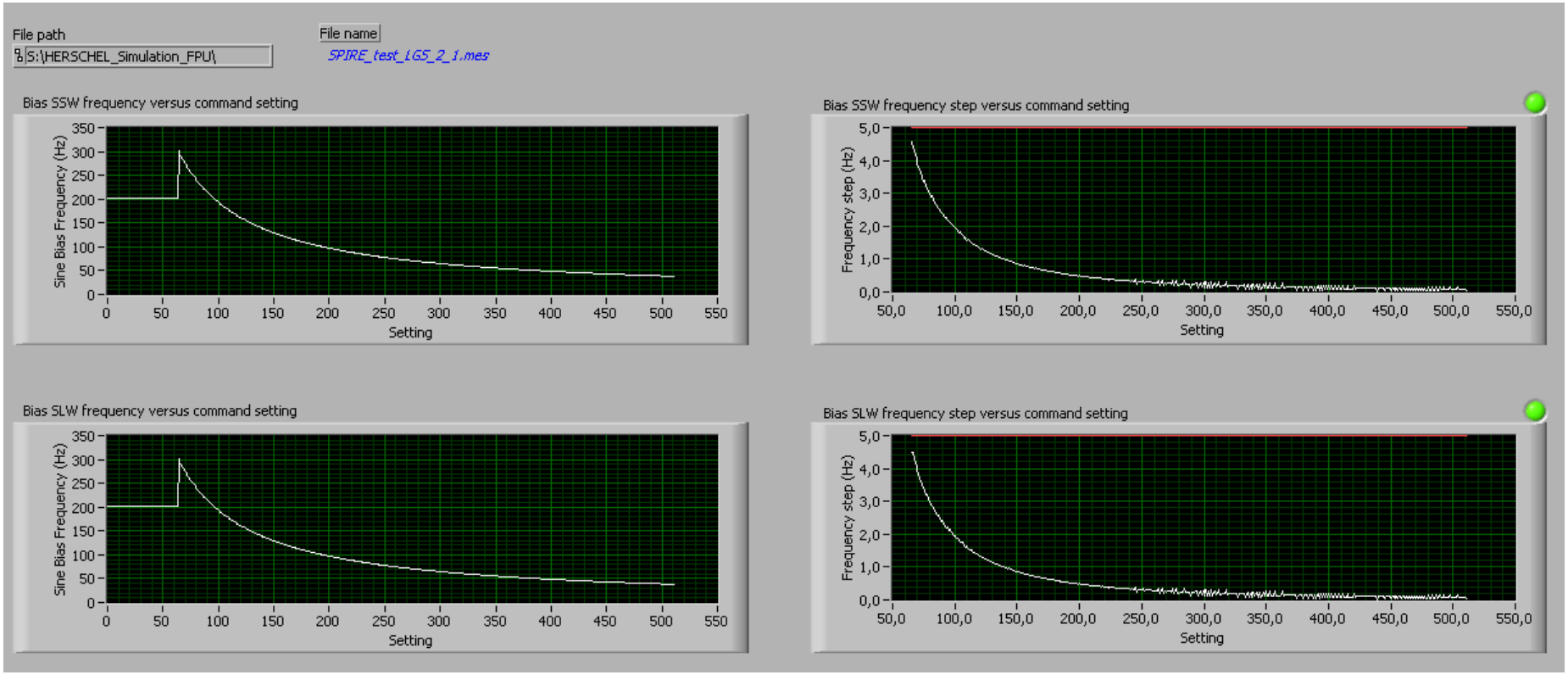
Click on spectrometer bias frequency button, and select the last generated file SPIRE_test_BIAS_2_1.mes for main (resp. SPIRE_test_BIAS_9_1.mes for redundant).
Check the two green lights.

Include in as run the hardcopy off Labview analysis screen (replace typical view provided here after)

Main side :



Redundant side :

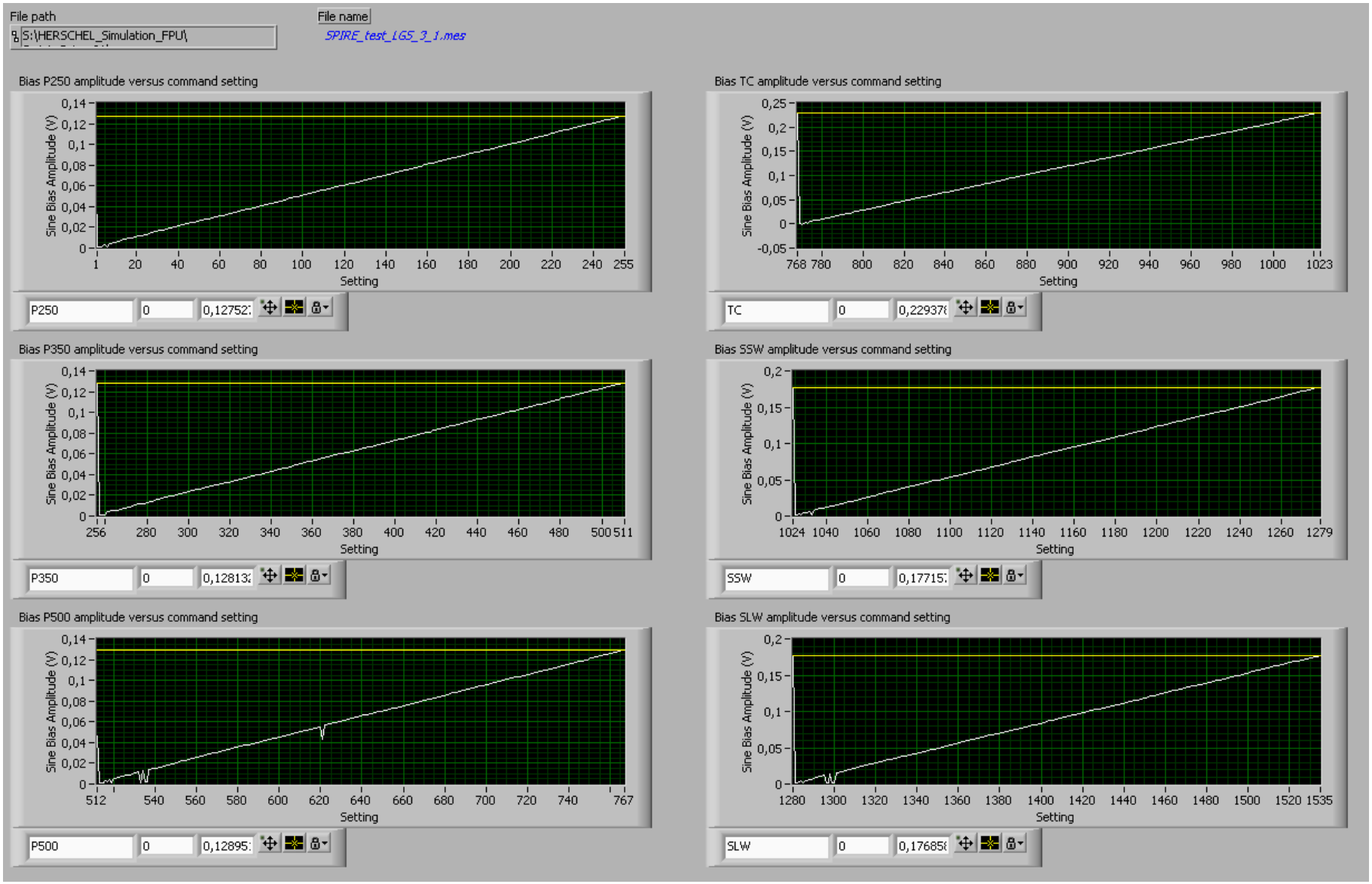


7.2.3 Bias amplitudes

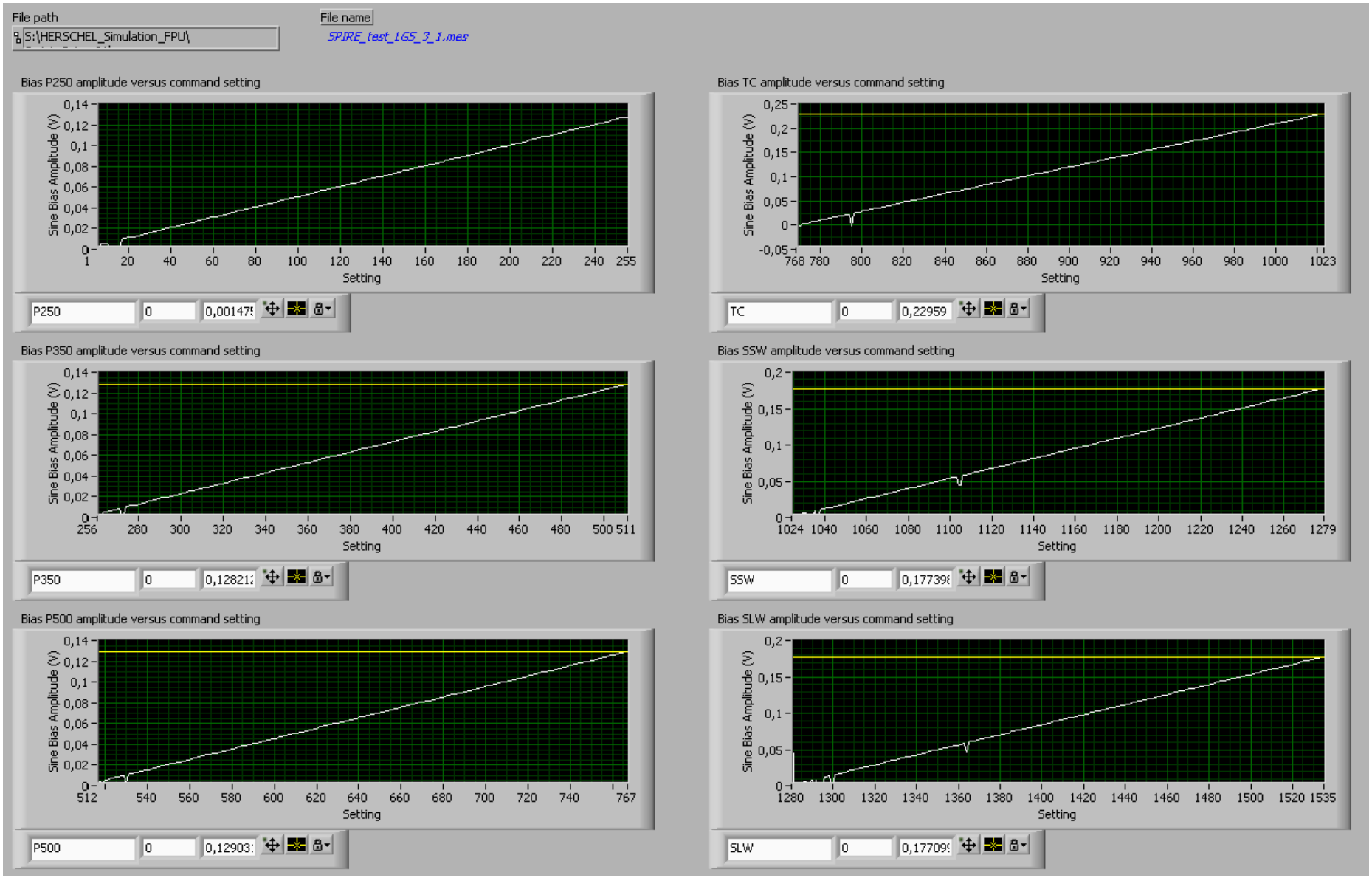
Measurement file : SPIRE_test_BIAS_3_1.mes for main (resp. SPIRE_test_BIAS_10_1.mes for redundant)
Click on photometer bias amplitude button, and select the last generated file SPIRE_test_BIAS_10_1.mes for main (resp. SPIRE_test_BIAS_8_1.mes for redundant).

Include in as run the hardcopy off Labview analysis screen (replace typical view provided here after)

Main side :


File path
S:\HERSCHEL_Simulation_FPU\
File name
SPIRE_test_1G5_3_1.mes
Bias P250 amplitude versus command setting
Sine Bias Amplitude (V)
Setting
P250
Bias TC amplitude versus command setting
TC
Bias P350 amplitude versus command setting
P350
Bias SSW amplitude versus command setting
SSW
Bias P500 amplitude versus command setting
P500
Bias SLW amplitude versus command setting
SLW

Redundant side :

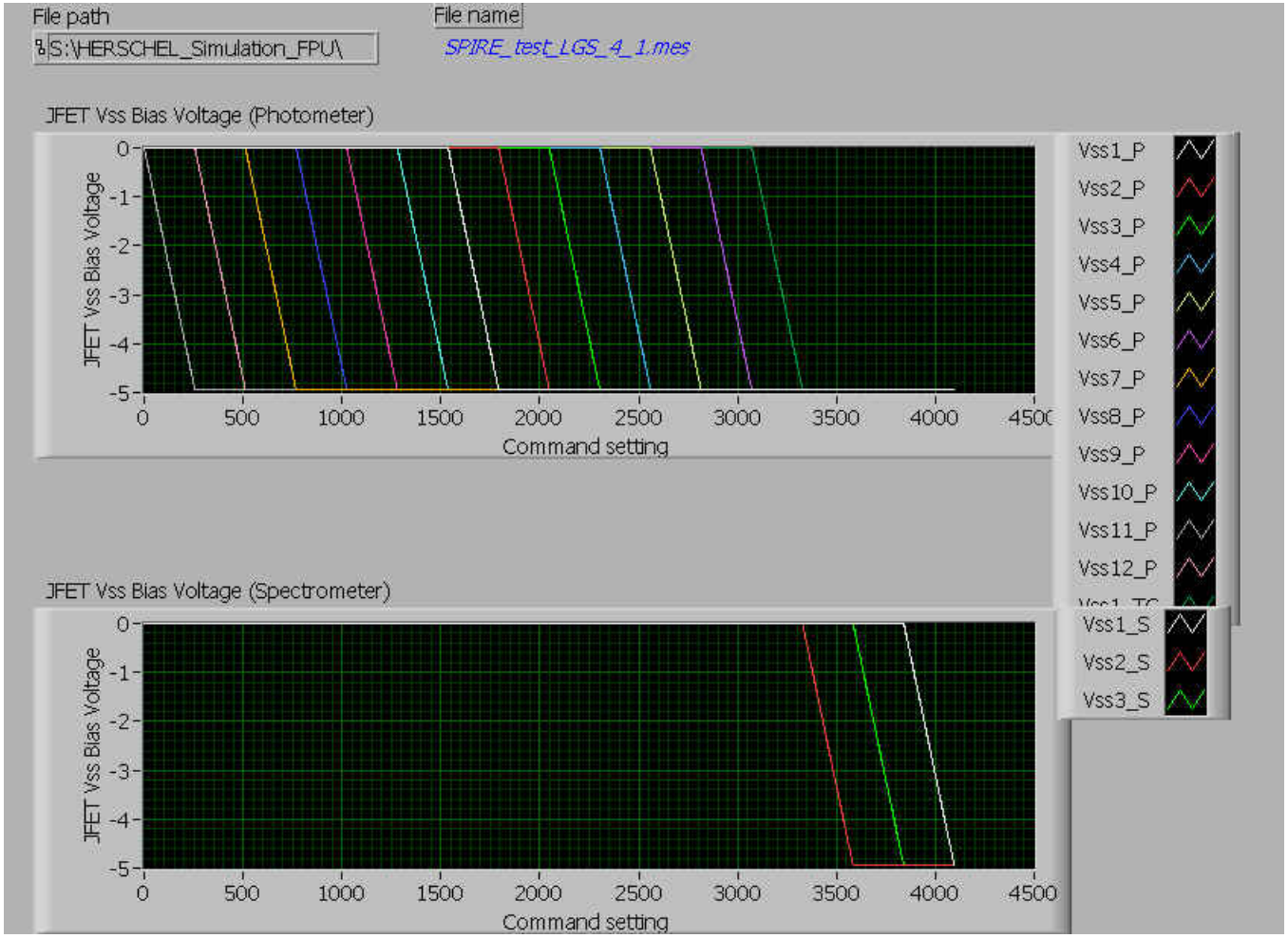


7.2.4 JFET amplitudes Vss

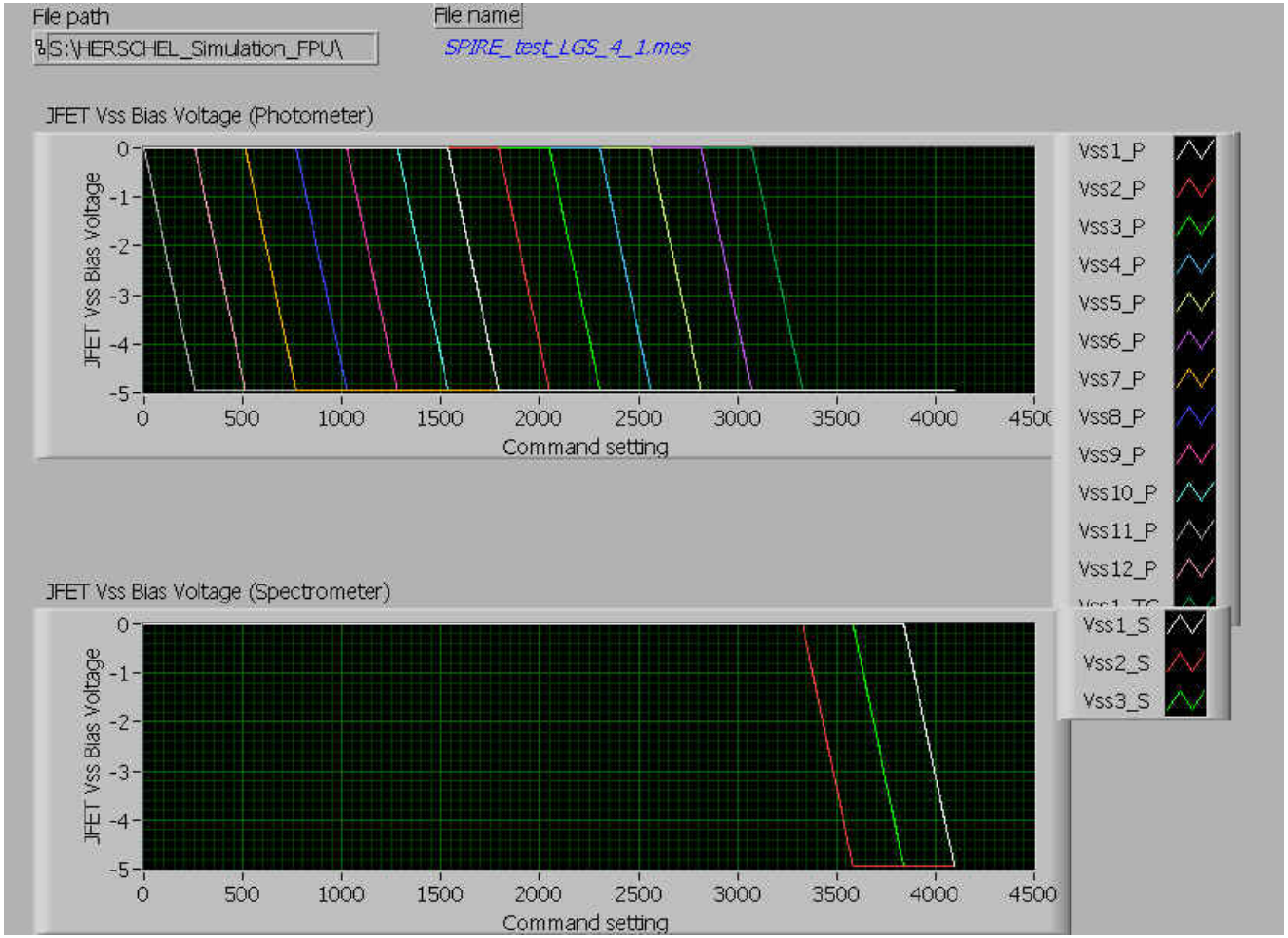
Measurement file : SPIRE_test_BIAS_4_1.mes for main (resp. SPIRE_test_BIAS_11_1.mes for redundant)

Click on JFET Vss bias button, and select the last generated file SPIRE_test_BIAS_4_1.mes for main (resp. SPIRE_test_BIAS_11_1.mes for redundant).

Main side :



Redundant side :



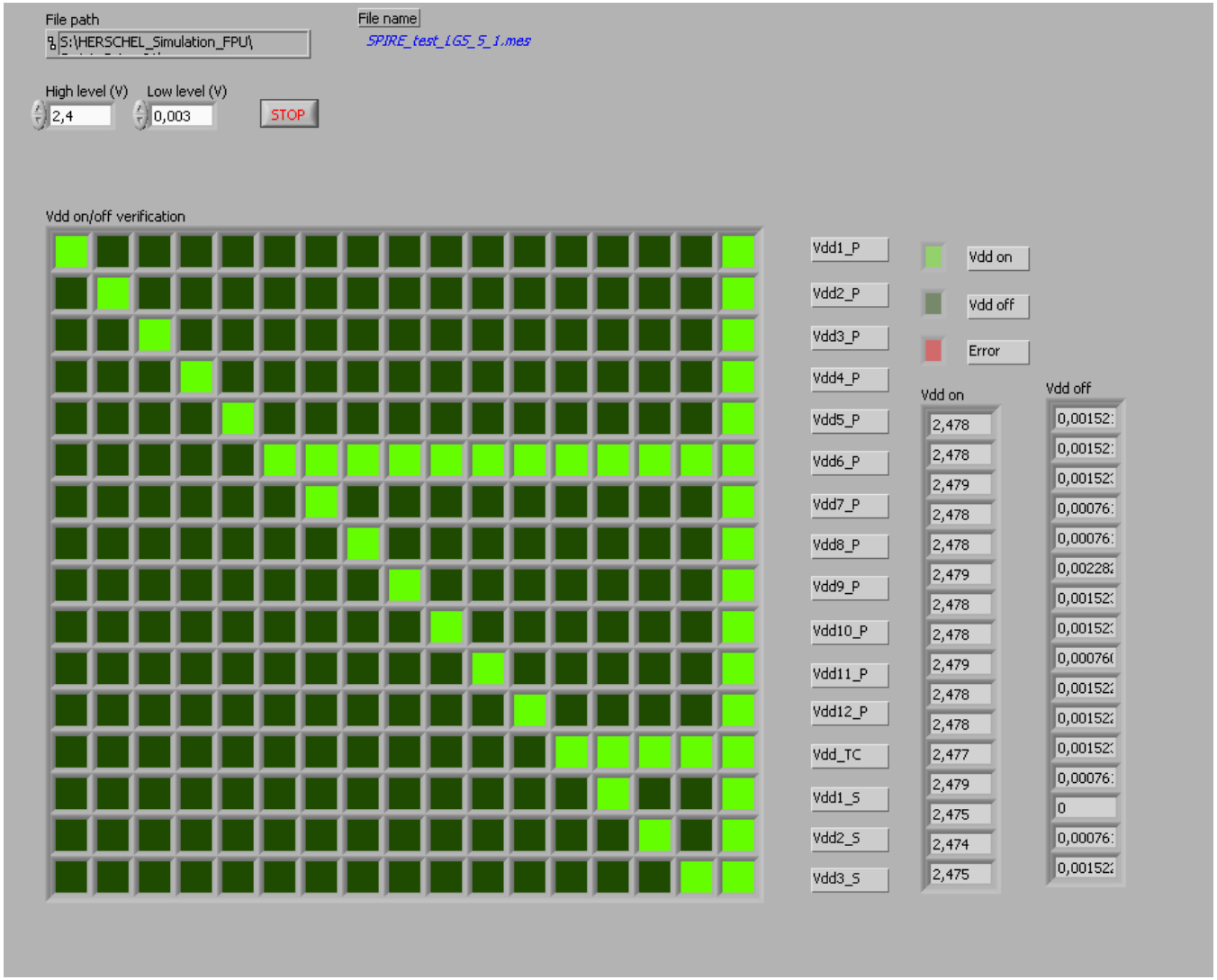
7.2.5 JFET On successives (Vdd)

Measurement file : SPIRE_test_BIAS_5_1.mes for main (resp. SPIRE_test_BIAS_12_1.mes for redundant)

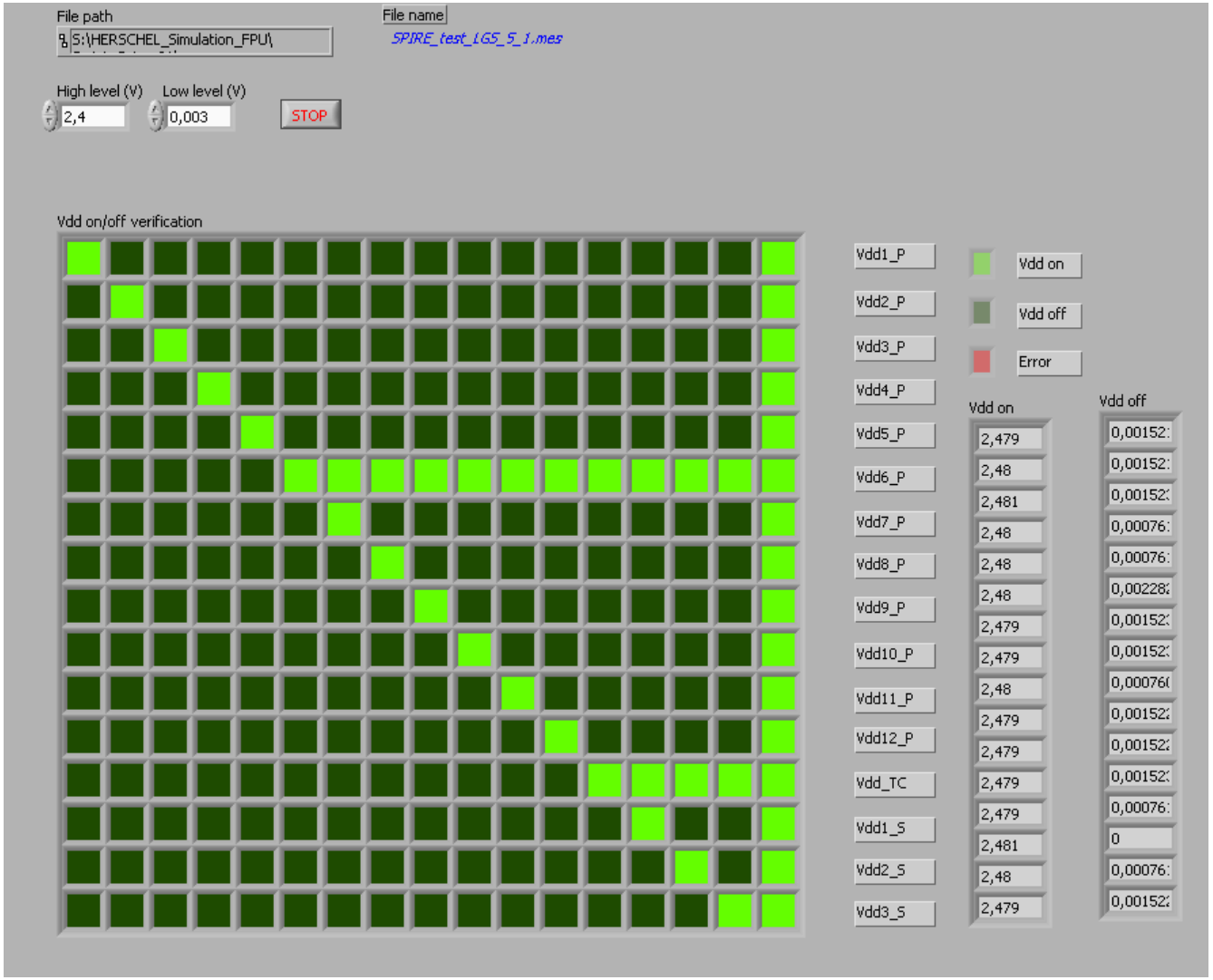
Click on JFET VDD bias button, Enter low level 0,0023V and select the last generated file SPIRE_test_BIAS_5_1.mes for main (resp. SPIRE_test_BIAS_12_1.mes for redundant).

Include in as run the hardcopy off Labview analysis screen (replace typical view provided here after)

Main side :


File path
S:\HERSCHEL_Simulation_FPU\
File name
SPIRE_test_LG5_5_1.mes
High level (V)
2,4
Low level (V)
0,003
STOP
Vdd on/off verification
Vdd1_P
Vdd2_P
Vdd3_P
Vdd4_P
Vdd5_P
Vdd6_P
Vdd7_P
Vdd8_P
Vdd9_P
Vdd10_P
Vdd11_P
Vdd12_P
Vdd_TC
Vdd1_S
Vdd2_S
Vdd3_S
Vdd on
Vdd off
Error
Vdd on
2,478
2,478
2,479
2,478
2,478
2,479
2,478
2,478
2,479
2,478
2,478
2,477
2,479
2,475
2,474
2,475
Vdd off
0,00152:
0,00152:
0,00152:
0,00076:
0,00076:
0,00228:
0,00152:
0,00152:
0,00076(
0,00152:
0,00152:
0,00152:
0,00076:
0
0,00076:
0,00152:

Redundant side :



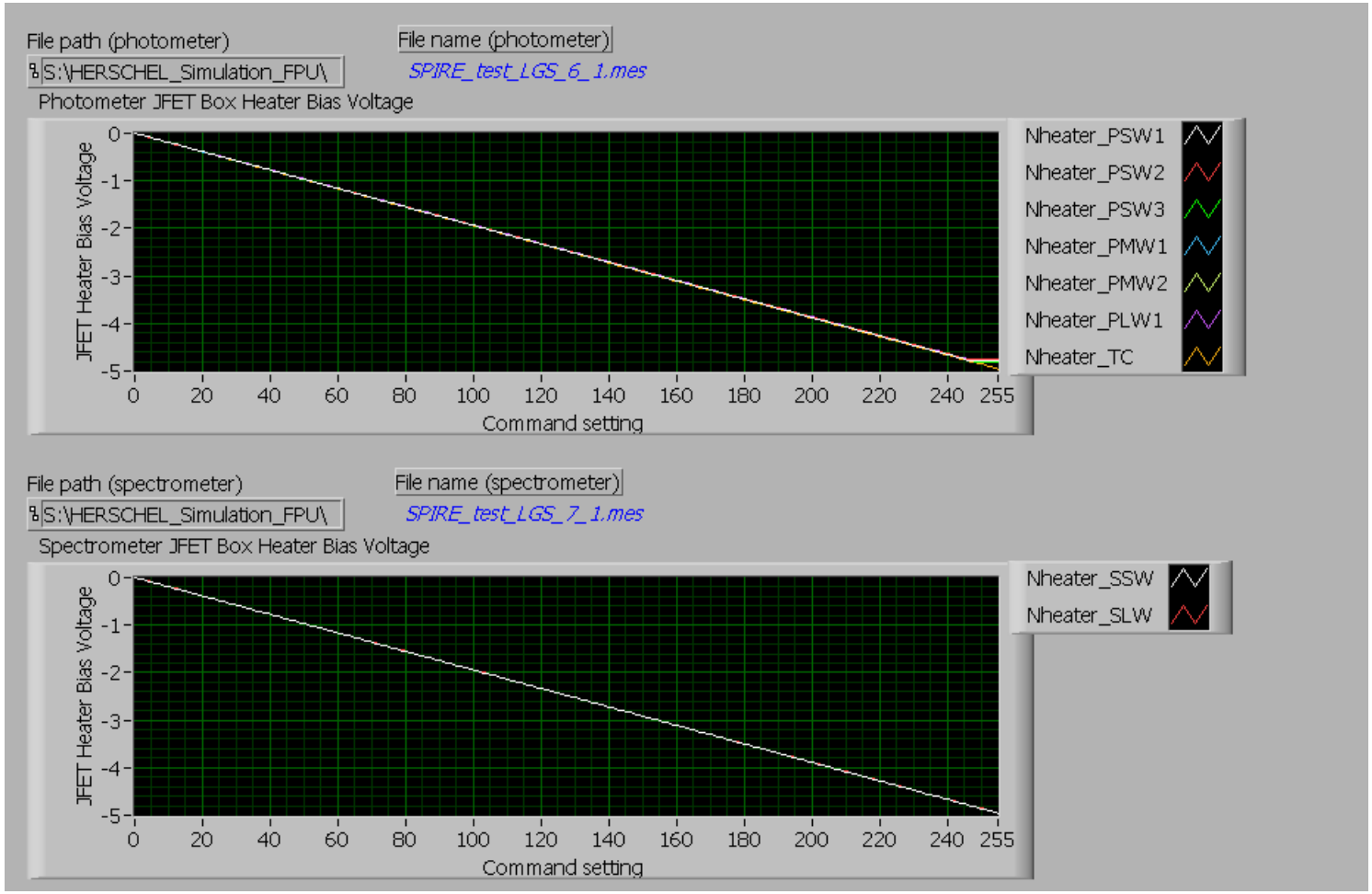
7.2.6 Photo Heaters and Spectro Heaters

Measurement file : SPIRE_test_BIAS_6_1.mes for main (resp. SPIRE_test_BIAS_13_1.mes for redundant)
Measurement file : SPIRE_test_BIAS_7_1.mes for main (resp. SPIRE_test_BIAS_14_1.mes for redundant)

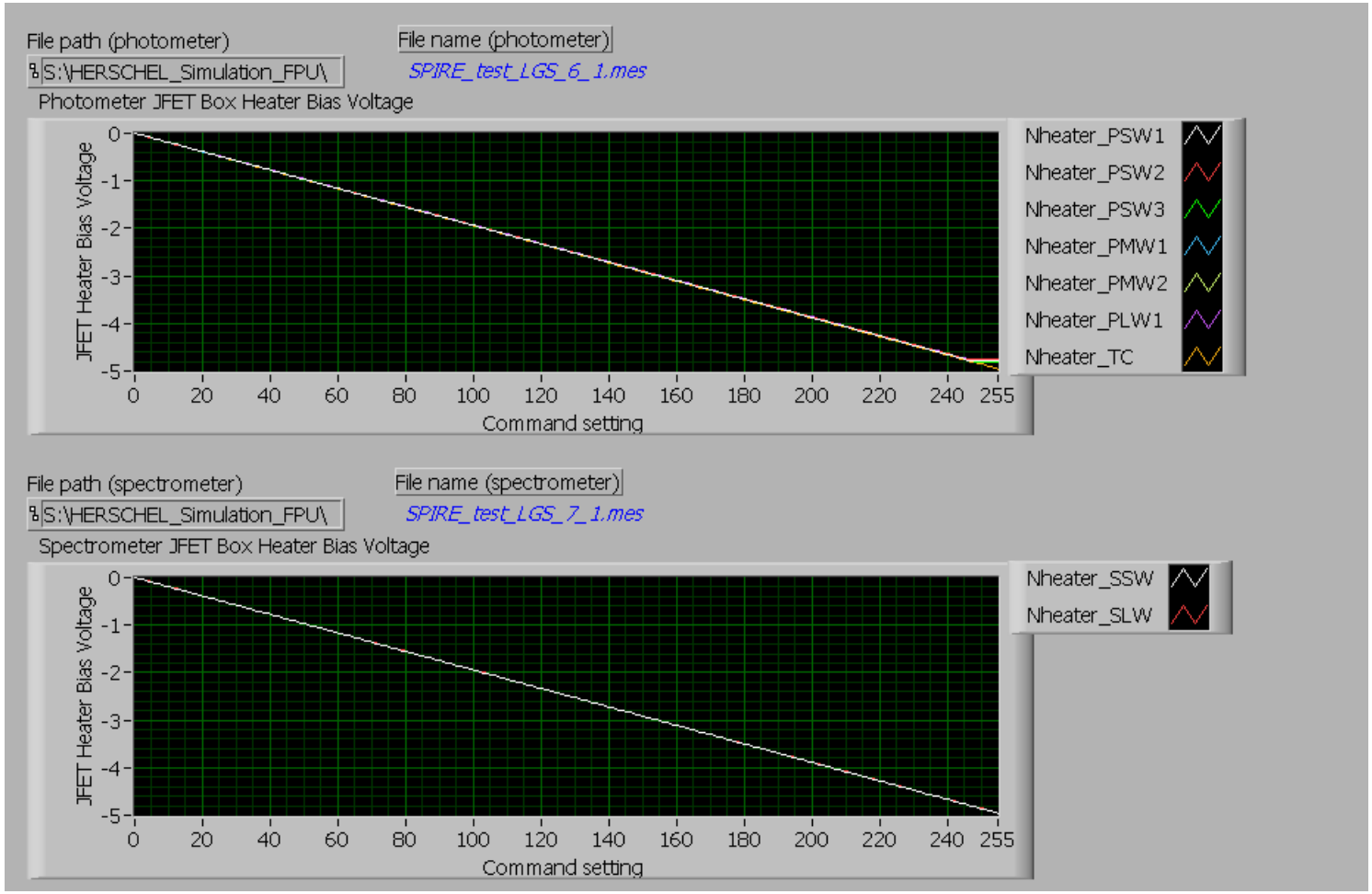
Click on photometer & spectrometer & JFET heater bias button, and select the last generated file SPIRE_test_BIAS_6_1.mes & SPIRE_test_BIAS_7_1.mes for main (resp. SPIRE_test_BIAS_13_1.mes and SPIRE_test_BIAS_14_1.mes for redundant)

Include in as run the hardcopy off Labview analysis screen (replace typical view provided here after)

Main side :


File path (photometer)
S:\HERSCHEL_Simulation_FPU\
File name (photometer)
SPIRE_test_LGS_6_1.mes
Photometer JFET Box Heater Bias Voltage
JFET Heater Bias Voltage
0
-1
-2
-3
-4
-5
0 20 40 60 80 100 120 140 160 180 200 220 240 255
Command setting
Nheater_PSW1
Nheater_PSW2
Nheater_PSW3
Nheater_PMW1
Nheater_PMW2
Nheater_PLW1
Nheater_TC
File path (spectrometer)
S:\HERSCHEL_Simulation_FPU\
File name (spectrometer)
SPIRE_test_LGS_7_1.mes
Spectrometer JFET Box Heater Bias Voltage
JFET Heater Bias Voltage
0
-1
-2
-3
-4
-5
0 20 40 60 80 100 120 140 160 180 200 220 240 255
Command setting
Nheater_SSW
Nheater_SLW

Redundant side :



7.3 Conclusion

BIAS TEST	**OK**	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL**	

8 BIAS test in stand alone mode : Monitoring of BIAS

When in SLAVE mode, we can check all the BIAS on a given working point. We the use the test sequence BIAS-TEST(stand alone).txt. (FPU simul in standalone, automatique, measure at 1Hz (script_spire_BIAS.spt)
Check the measurement file on the FPU simulator : Values of all the BIAS at a given level (refer to the batch)
The measurement file obtained is : Script_Spire_01_130606_092942\SPIRE_test_BIAS_1_1.mes.

We set the DAC to their maximum (test sequence : DCU BIAS-TEST(half level)Main Redundant.txt) and measure the BIAS at simulator level. The results are the following :
Refer to file : SPIRE_test_BIAS_1_1.mes

Check BIAS amplitudes
Check consistency with FPU simulator input files

Note : When the half maximum amplitude level is sent by the BIAS boars, the FPU simulator should measure about the following BIAS amplitude (to upate) :

	Main	*Red*	*Expected*
PhotoBiasAmpl SW : Level 80 (HEXA), 128 (dec) :	*64,341 mV*	*64,341 mV*	*64,341 mV*
PhotoBiasAmpl MW : Level 80 (HEXA), 128 (dec) :	*64,656 mV*	*64,736 mV*	*64,736 mV*
PhotoBiasAmpl LW : Level 80 (HEXA), 128 (dec) :	*65,139 mV*	*65,139 mV*	*65,139 mV*
PhotoBiasAmpl TC : Level 80 (HEXA), 128 (dec) :	*128,069 mV*	*128,069 mV*	*128,069 mV*
SpectroBiasAmpl SW: Level 80 (HEXA), 128 (dec) :	*89,154 mV*	*89,154 mV*	*89,154 mV*
SpectroBiasAmpl LW: Level 80 (HEXA), 128 (dec):	*89,001 mV*	*89,001 mV*	*89,001 mV*

These new values are therefore the ones to set in the simulator input files :

GainInputAmplMiMax(05mv_Offset0)FM RAL.in
Cross_Talk_Ampl_MiMax(05mv_Offset0)FM RAL.in

The associated script files are :

Script_Spire_GainInputAmplMiMax(05mv_Offset0)FM RAL.spt
Script_Spire_Cross_Ampl_MiMax(05mv_Offset0)FM RAL.spt

9 Demodulation Tests

9.1 Procedure

Check LIAP LIAS are both OFF and

	As run
Check LIAP & LIAS OFF	OK

⇨ FPU simulator switched ON in stand alone
⇨ Run the Script *Script_Spire_GainInputAmplMiMax(05mv_Offset0)FM RAL.spt*
⇨ Signal frequency = 1 Hz ⇨ simulator setting = 32 Hz
Note : The test is performed with a BIAS frequency of 203 Hz (photo and spectro)
⇨ Batch executed by LTU : *"4 DCU DEMODULATION Main redundant.txt"*
⇨ 4 TM file generated by LTU (DPU) (Photometer and spectrometer in Main and Redundant)

Note : If the FCU is not there, we need to switch ON the LIAP and the LIAS using the resistor load box. There need to proceed then in two steps (demodulation for photometer and demodulation for spectrometer).

⇨ Rename the files as follows :

	As run (Photometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss) _demod_photo_main

	As run (Spectrometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss) _demod_spectro_main

	As run (Photometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss) _demod_photo_redundant

	As run (Spectrometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss) _demod_spectro_redundant

Check LIAP and LIAS are OFF at the end of the test sequence

	As run
Check LIAP & LIAS OFF	OK

9.2 Data analysis

⇨ Analysis of the two TM files (photo or spectro) with the Labview software that computes the optimal phases (button demodulation analysis, with photometer and spectrometer selected); select the two TM files renamed above (spectro first, photo last). Wait for end of data analysis by labview (lights “psw completed”, “pmw completed”, “plw completed”, “tc_completed”, “ssw completed” and “slw completed”)

Optimal Phase/setting Channel group	Main Side Optimal phase (°)	 Optimal setting	Redundant Side Optimal phase (°)	 Optimal setting
PSW	5,23	4	5,33	4
PMW	5,22	4	5,22	4
PLW	5,49	4	5,61	4
PTC	5,57	4	5,7	4
SSW	1,72	1	1,69	1
SLW	2,48	2	2,45	1

Check the criterions :
channel dispersion < 0,3°
mean optimal phase in [0°;+20°]

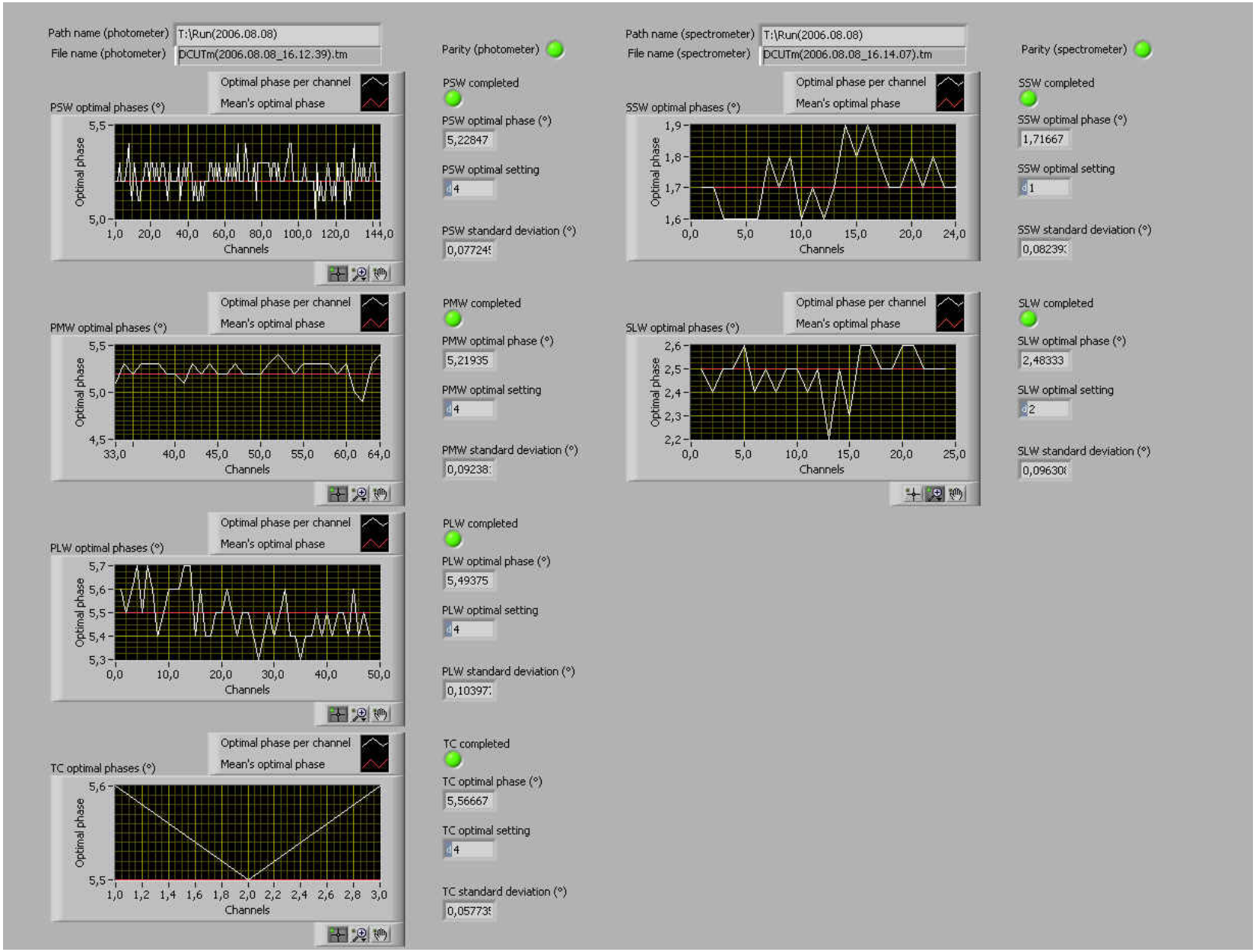
9.3 Batch edition

⇨ Set the optimal photometer and spectrometer demodulation values in the test sequences :

DCU ACQUISITIONS (Offsets a zero) Main redundant RAL 080806.txt

```
Example : set the xx, yy, zz, tt values to the computed ones
//---------------------------------------
/ Réglage des paramètres de démodulation
//---------------------------------------
/ SetPhotoDemodSW 17 tempo0
# D 0 41A 00xx 0000
/ SetPhotoDemodMW 17 tempo0
# D 0 41B 00yy 0000
/ SetPhotoDemodLW 17 tempo0
# D 0 41C 00zz 0000
/ SetPhotoDemodTC 17 tempo0
# D 0 41D 00tt 0000
```

Main side


Path name (photometer)
T:\Run(2006.08.08)
File name (photometer)
DCUTm(2006.08.08_16.12.39).tm
Parity (photometer)
PSW completed
PSW optimal phase (°)
5,22847
PSW optimal setting
4
PSW standard deviation (°)
0,07724
PSW optimal phases (°)
Optimal phase per channel
Mean's optimal phase
Optimal phase
Channels
Path name (spectrometer)
T:\Run(2006.08.08)
File name (spectrometer)
DCUTm(2006.08.08_16.14.07).tm
Parity (spectrometer)
SSW completed
SSW optimal phase (°)
1,71667
SSW optimal setting
1
SSW standard deviation (°)
0,08239
SSW optimal phases (°)
PMW completed
PMW optimal phase (°)
5,21935
PMW optimal setting
4
PMW standard deviation (°)
0,09238
PMW optimal phases (°)
SLW completed
SLW optimal phase (°)
2,48333
SLW optimal setting
2
SLW standard deviation (°)
0,09630
SLW optimal phases (°)
PLW completed
PLW optimal phase (°)
5,49375
PLW optimal setting
4
PLW standard deviation (°)
0,10397
PLW optimal phases (°)
TC completed
TC optimal phase (°)
5,56667
TC optimal setting
4
TC standard deviation (°)
0,05773
TC optimal phases (°)

Redundant side

9.4 Conclusion

Demodulation TEST	**OK**	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL** **We note that the optimal demodulation phase on LIA S 3 is 2 instead of 1 as measured in Saclay.** **This has been shown to be due to the FPU simulator that does not sent a correct signal on LIA S 3**	

10 Gain Tests

10.1 Procedure

Check LIAP and LIAS are both OFF

	As run
Check LIAP & LIAS OFF	OK

⇨ FPU simulator switched ON in stand alone mode

⇨ Run the Script *Script_Spire_GainInput _Ampl_MiMax(05mv_Offset0)FM RAL.spt* : sinusoidal signal with magnitude 0,5 mv pic pic. The FPU simulator sends on all channels a sinusoïdal signal with a magnitude of 0,5 mV pic pic modulated at 100 % (Offset = 0)

⇨ We use a signal at 0,1 Hz ⇨ simulator frequency = 3,2 Hz

⇨ Batch executed by LTU : use the batch edited in previous § (*5 DCU ACQUISITIONS (Offsets a zero) Main redundant.txt*) : the LTU sets all offsets at 0 and performs TM acquisitions.

⇨ 4 TM file generated by LTU (DPU) (Photometer and spectrometer in Main and Redundant)

⇨ Rename the files as follows :

	As run (Photometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss) _gain_photo_main

	As run (Spectrometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_gain_spectro_main

	As run (Photometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss) _gain_photo_redundant

	As run (Spectrometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_gain_spectro_redundant

Check LIAP and LIAS are both OFF at the end of the test sequence

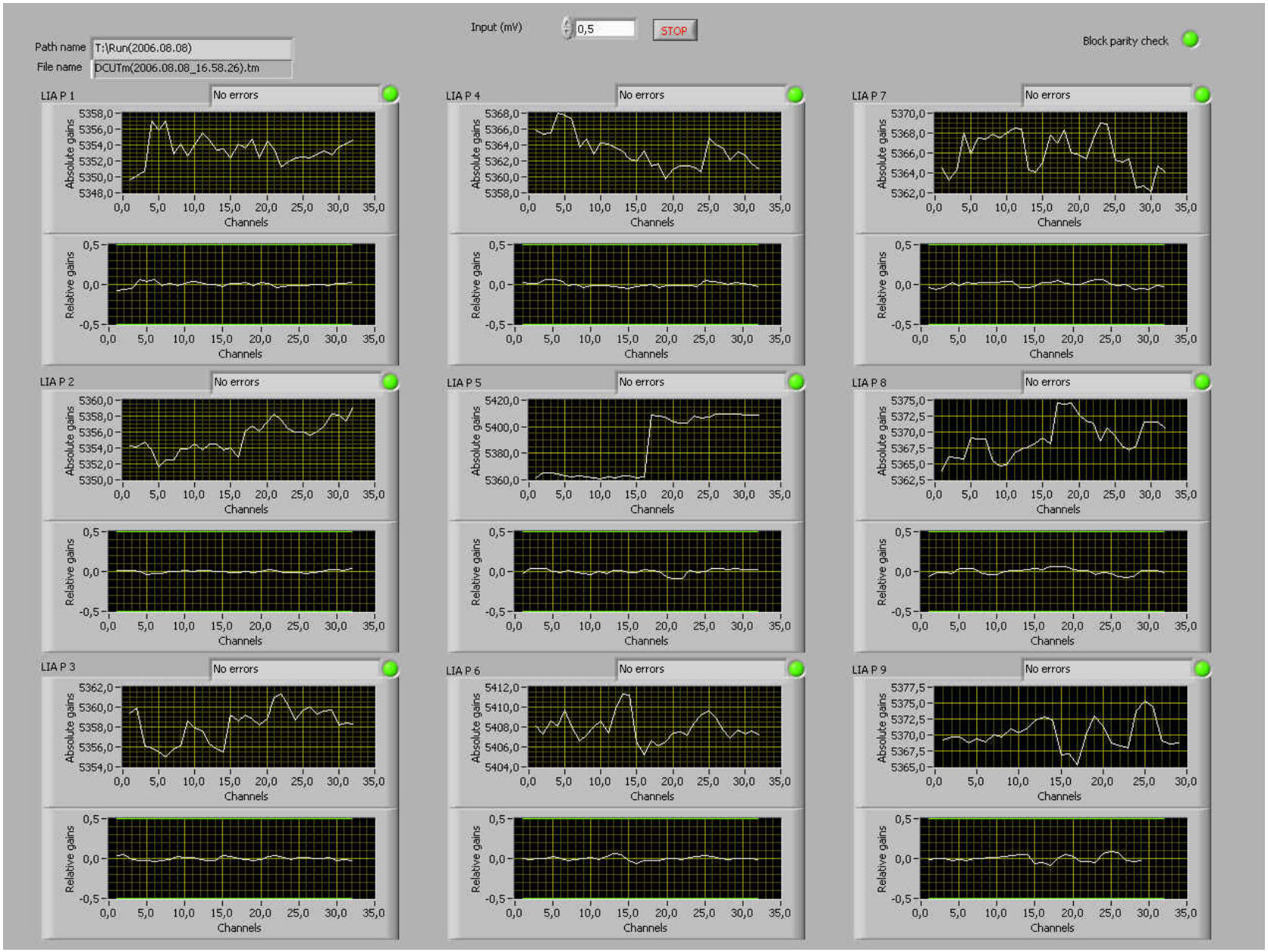
10.2 Data analysis

10.2.1 Photometer

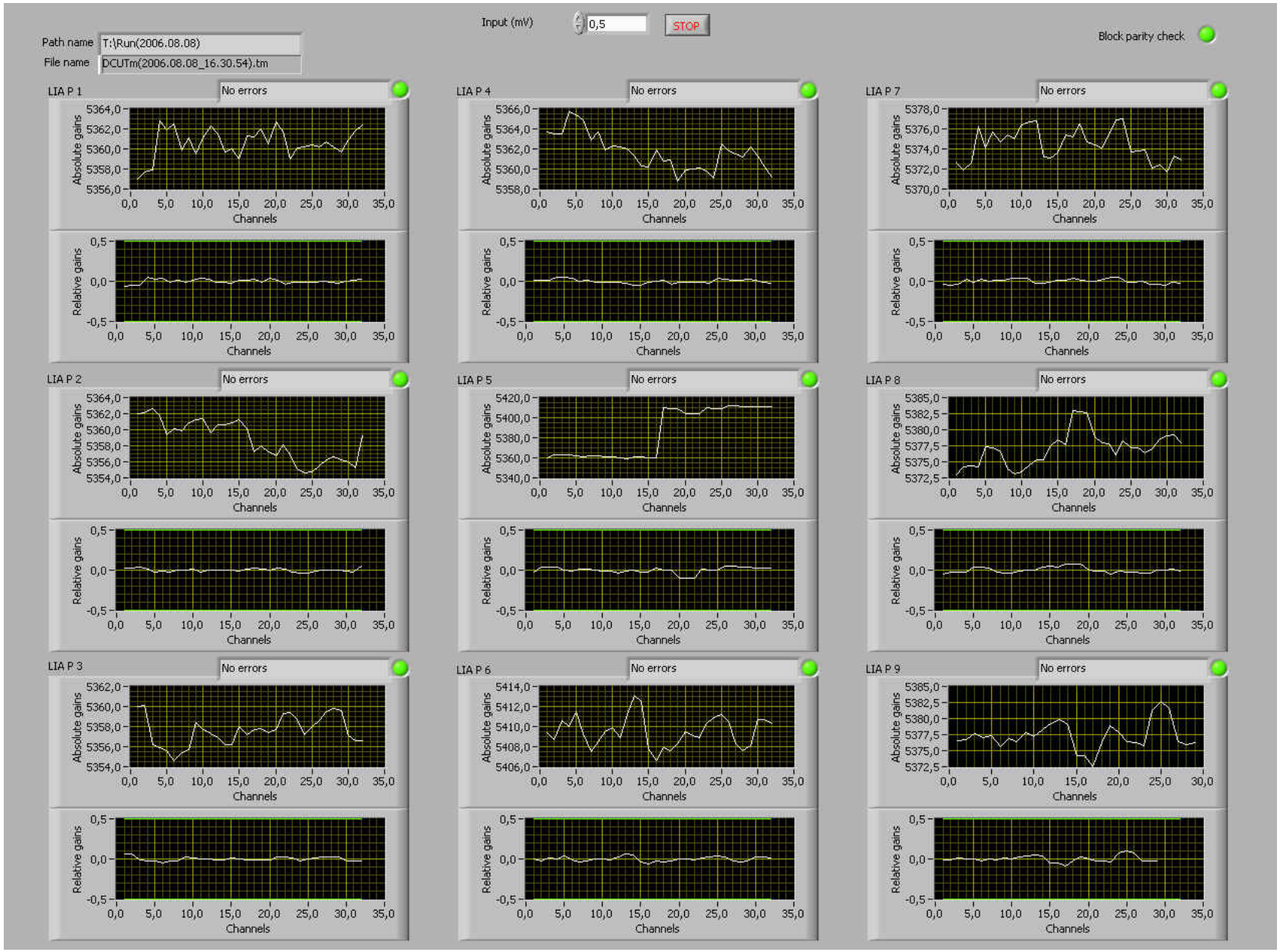
⇨ Analysis of the TM files with the Labview software (photometer gain button and select last renamed TM files)

Enter the input signal level in the box “input(mV)” : 0,5
Check green lights for LIAP and paste the hard copy of labview screen here after

Main side :


Input (mV)
0,5
STOP
Block parity check
Path name
T:\Run(2006.08.08)
File name
DCUTm(2006.08.08_16.58.26).tm
LIA P 1
No errors
LIA P 4
No errors
LIA P 7
No errors
LIA P 2
No errors
LIA P 5
No errors
LIA P 8
No errors
LIA P 3
No errors
LIA P 6
No errors
LIA P 9
No errors
Absolute gains
Relative gains
Channels

Redundant side :

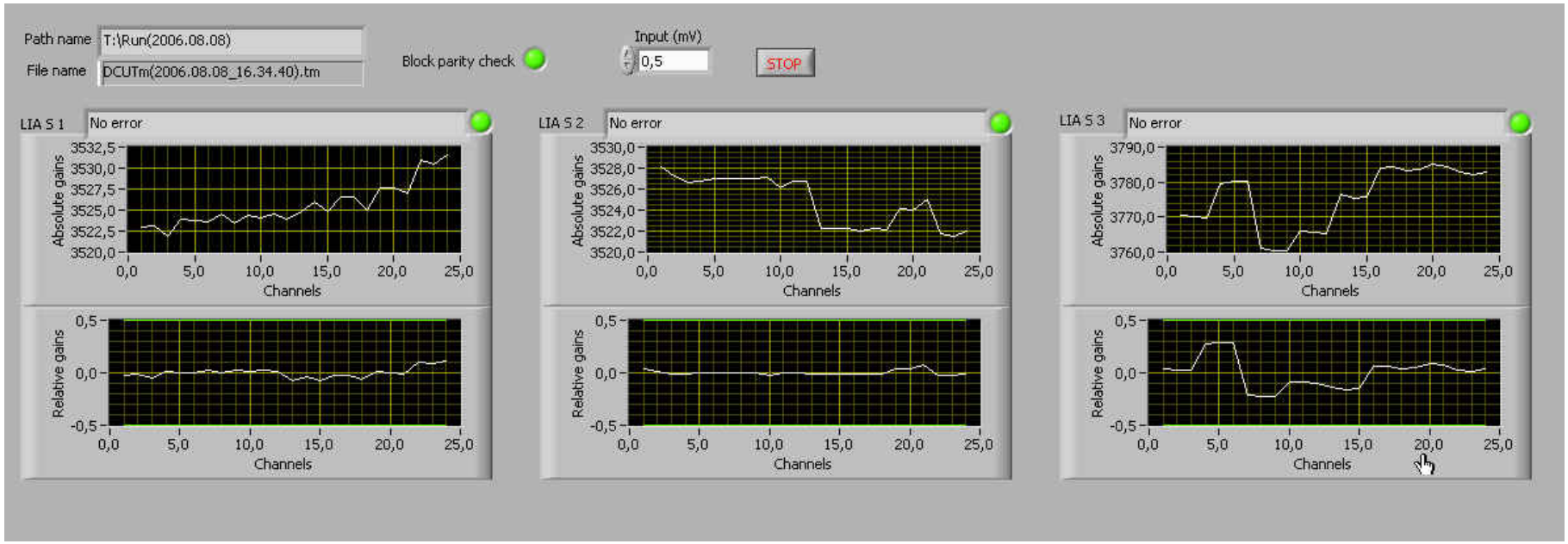


10.2.2 Spectrometer

⇨ Analysis of the TM files with the Labview software (spectrometer gain button and select last renamed TM files)

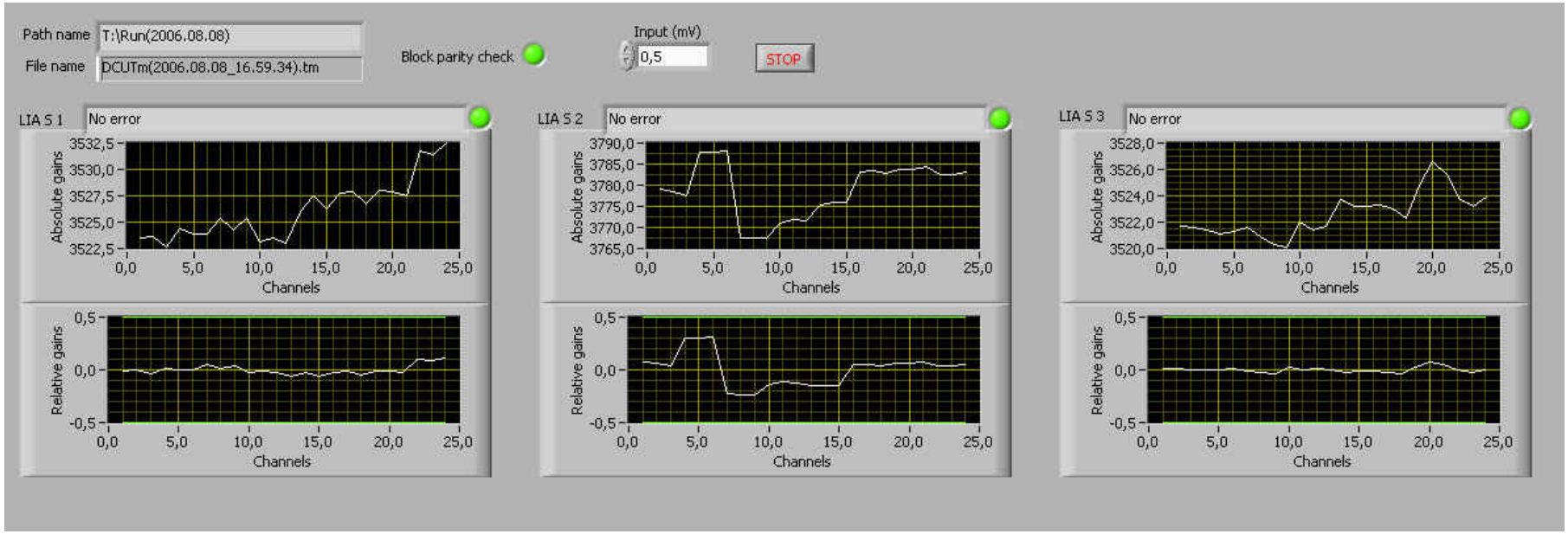
Enter the input signal level in the box “input(mV)” : 0,5
Check green lights for LIAS and paste the hard copy of labview screen here after

Main side

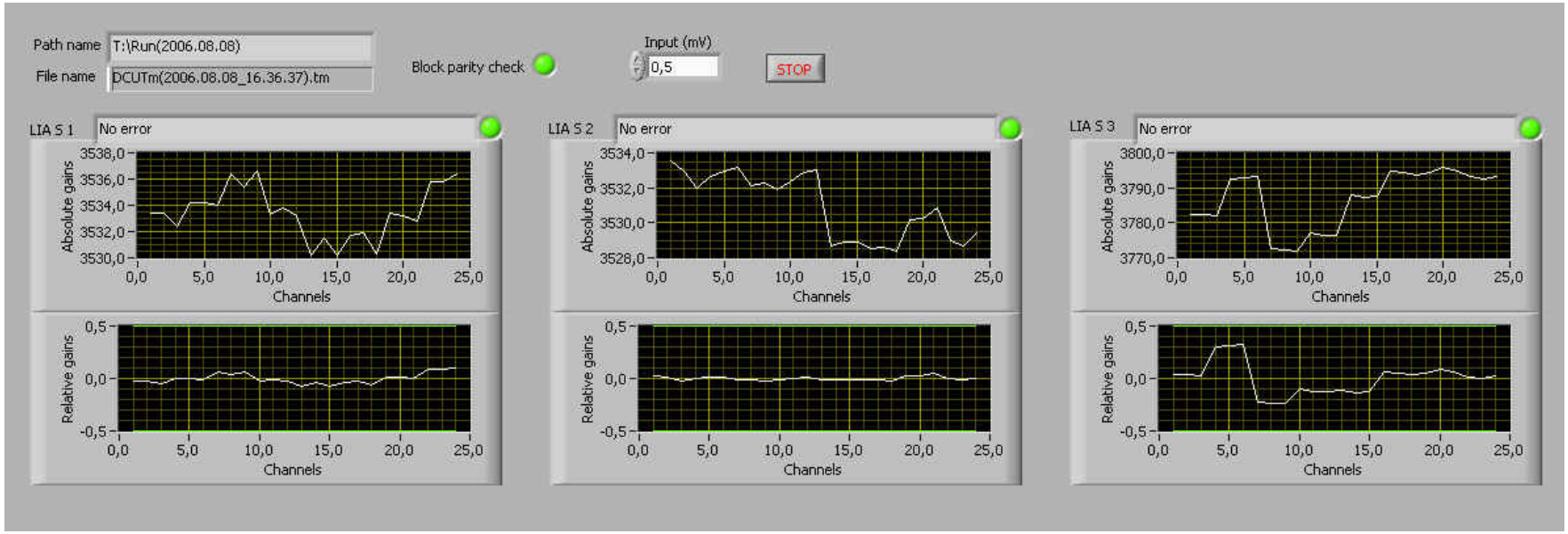


We observe that the signals on LIAS 3 channels did saturate, which means that their magnitude is too high.
On the above graphic, the gain values are thus consistent for LIAP 1 and 2.
It has been shown to be due to the FPU simulator that sends a too high level signal (with respect to what is specified on the input file) on LIAS 3 channels. To proove this, we have inverted the connectors of the LIAS 2 and LIAS 3 at DCU level. We then obtain the thereafter gain values.

On the thereafter graphic, the gain values are thus consistent for LIAP 1 and 3.

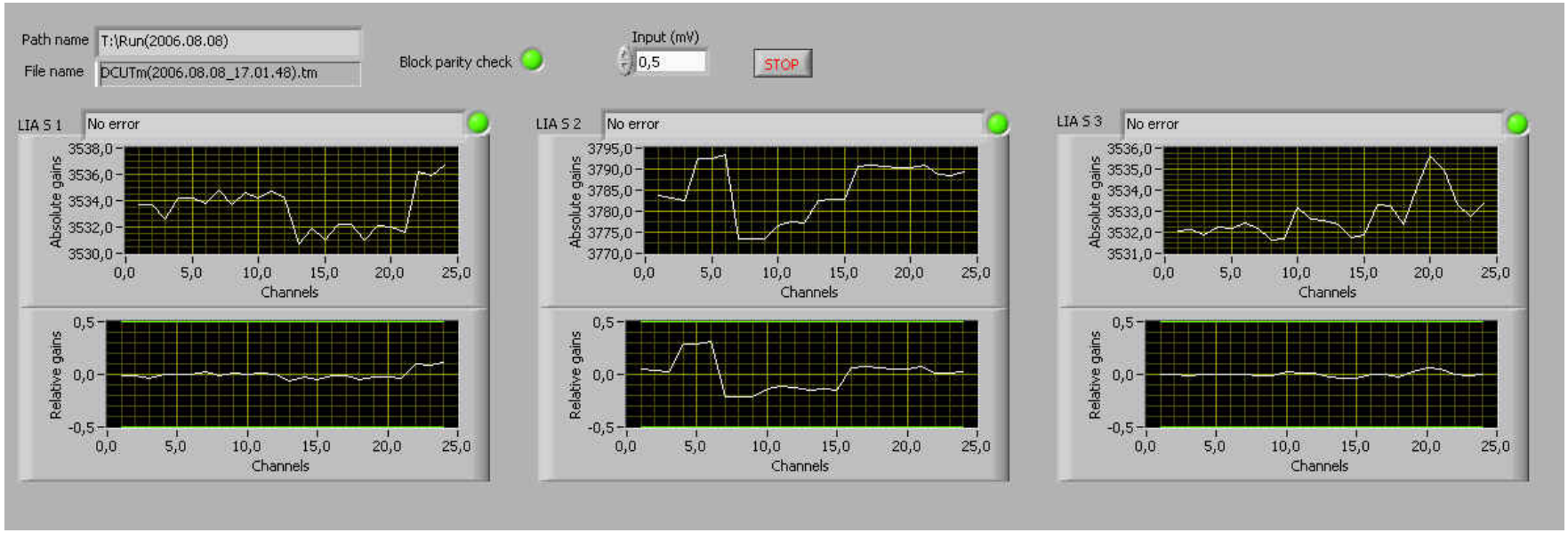

Path name
T:\Run(2006.08.08)
File name
DCUTm(2006.08.08_16.59.34).tm
Block parity check
Input (mV)
0,5
STOP
LIA S 1
No error
Absolute gains
3532,5
3530,0
3527,5
3525,0
3522,5
0,0
5,0
10,0
15,0
20,0
25,0
Channels
Relative gains
0,5
0,0
-0,5
LIA S 2
No error
3790,0
3785,0
3780,0
3775,0
3770,0
3765,0
LIA S 3
No error
3528,0
3526,0
3524,0
3522,0
3520,0

Redundant Side



We observe that the signals on LIAS 3 channels did saturate, which means that their magnitude is too high.
On the above graphic, the gain values are thus consistent for LIAP 1 and 2.
It has been shown to be due to the FPU simulator that sends a too high level signal (with respect to what is specified on the input file) on LIAS 3 channels. To proove this, we have inverted the connectors of the LIAS 2 and LIAS 3 at DCU level. We then obtain the thereafter gain values.

On the thereafter graphic, the gain values are thus consistent for LIAP 1 and 3.


Path name
T:\Run(2006.08.08)
File name
DCUTm(2006.08.08_17.01.48).tm
Block parity check
Input (mV)
0,5
STOP
LIA S 1
No error
LIA S 2
No error
LIA S 3
No error
Absolute gains
Relative gains
Channels

10.3 Conclusion

Gain TEST	**OK**	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL**	

11 Cross Talk

11.1 Procedure

11.1.1 Photometer

Check LIAP LIAS are both OFF

	As run
Check LIAP & LIAS OFF	OK

Switch LIAP ON.

⇨ FPU simulator switched ON in stand alone mode
⇨ Run the Script *Scrip_Spire_Cross_Ampl_MiMax(05mv_Offset0)FM RAL.spt* : sinusoidal signal with magnitude 1 mv (1 mV pic pic 0,3536 rms)
⇨ We use a signal at 1 Hz => simulator frequency = 32 Hz
⇨ The FPU simulator sends on some channels a sinusoïdal signal with a magnitude of 1mV pic pic modulated at 100 % (Offset = 0). The illuminated channels are indicated below (Y) :

Index	0	1	2	3	4	5	6	7
LIAP 1								
0	Y	Y	Y	N	N	N	N	N
8	N	N	N	N	N	N	N	Y
16	Y	Y	N	N	N	N	N	N
24	N	N	N	N	N	N	Y	Y
LIAP 2								
32	Y	N	N	N	N	N	N	N
40	N	N	N	N	N	Y	Y	Y
48	Y	Y	Y	N	N	N	N	N
56	N	N	N	N	N	N	N	Y
LIAP 3								
64	Y	Y	N	N	N	N	N	N
72	N	N	N	N	N	N	Y	Y

80	Y	N	N	N	N	N	N	N
88	N	N	N	N	N	Y	Y	Y
LIAP 4								
96	Y	N	N	N	N	N	N	N
104	N	N	N	N	N	Y	Y	Y
112	Y	Y	Y	N	N	N	N	N
120	N	N	N	N	N	N	N	Y
LIAP 5								
128	Y	N	N	N	N	N	N	N
136	N	N	N	N	N	Y	Y	Y
144	Y	Y	Y	N	N	N	N	N
152	N	N	N	N	N	N	N	Y
LIAP 6								
160	Y	Y	N	N	N	N	N	N
168	N	N	N	N	N	N	Y	Y
176	Y	N	N	N	N	N	N	N
184	N	N	N	N	N	Y	Y	Y
LIAP 7								
192	Y	N	N	N	N	N	N	N
200	N	N	N	N	N	Y	Y	Y
208	Y	Y	Y	N	N	N	N	N
216	N	N	N	N	N	N	N	Y
LIAP8								
224	Y	N	N	N	N	N	N	N
232	N	N	N	N	N	Y	Y	Y
240	Y	Y	Y	N	N	N	N	N
248	N	N	N	N	N	N	N	Y
LIAP9								
256	Y	Y	N	N	N	N	N	N
264	N	N	N	N	N	N	Y	Y
272	Y	N	N	N	N	N	N	N
280	N	N	N	N	N	Y	Y	Y

Index	0	1	2	3	4	5	6	7
LIAS 1								
0	Y	Y	Y	N	N	N	N	N
8	N	N	N	N	N	N	N	Y
16	Y	Y	N	N	N	N	N	N
LIAS 2								
24 Y	Y	Y	N	N	N	N	N	
32 N	Y	Y	Y	Y	Y	Y	N	
40 N	N	N	N	N	N	N	N	
LIAS 3								
48 Y	Y	Y	N	N	N	N	N	
56 N	Y	Y	Y	Y	Y	Y	N	
64 N	N	N	N	N	N	N	N	

⇨ Batch executed by LTU : use the batch edited in § 9.3 (*5 DCU ACQUISITIONS (Offsets a zero) Main redundant.txt*): the LTU sets all offsets at 0 and performs TM acquisitions.
⇨ 4 TM file generated by LTU (DPU) (Photometer and spectrometer in Main and Redundant)

⇨ Rename the files as follows :

	As run (Photometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_cross_photo_main

	As run (Spectrometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_cross_spectro_main

	As run (Photometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_cross_photo_redundant

	As run (Spectrometer)
Renamed TM file	DCUTm(yyyy.mm.dd_hh.mm.ss)_cross_spectro_redundant

Check LIAP LIAS are both OFF at the end of the procedure

11.2 Data analysis

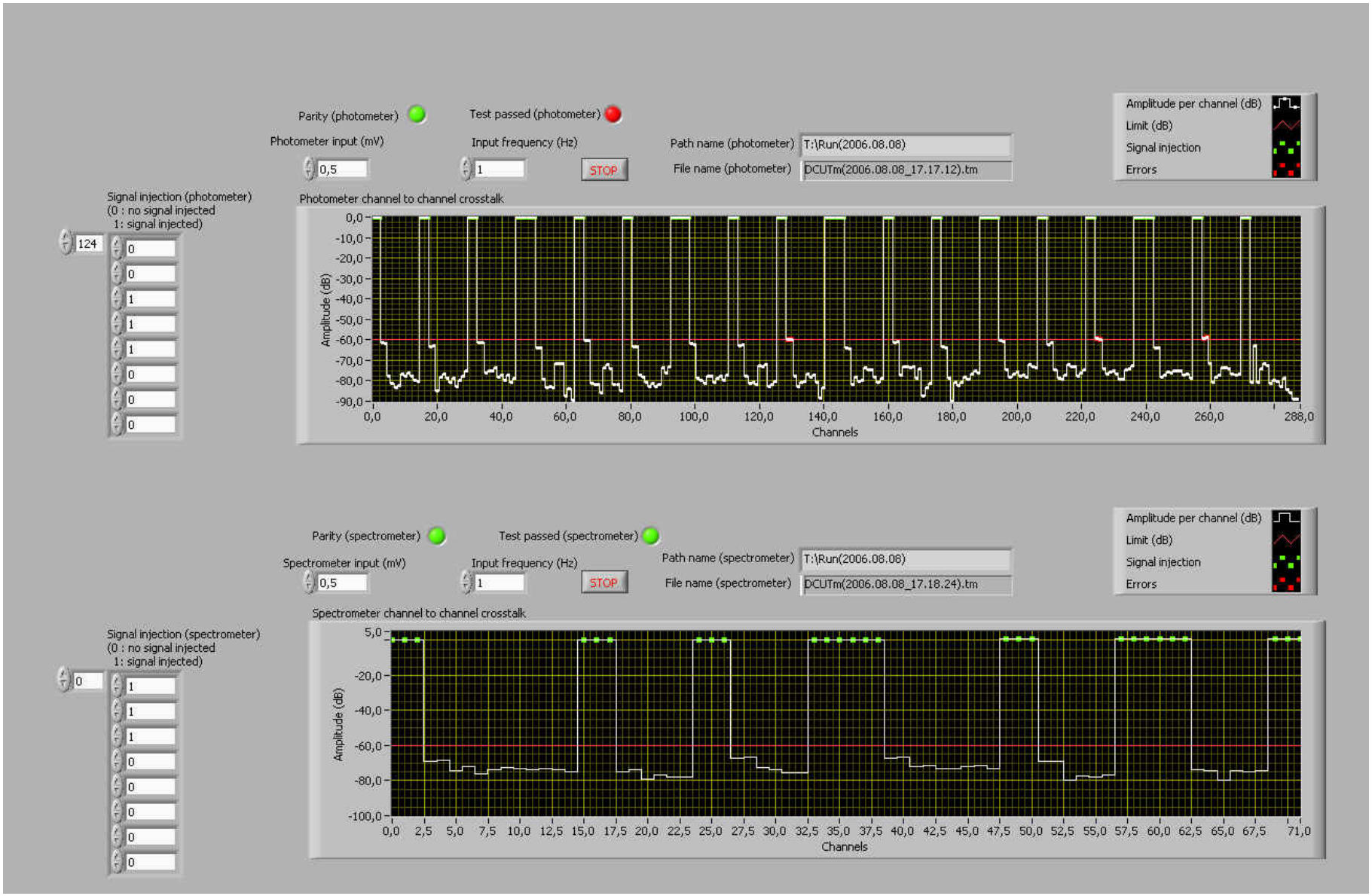
⇨ Analysis of the two TM files (photo and spectro) with the Labview software (button cross talk with photometer and spectrometer selected)

Fill the “Photometer input (V)” box with value=0,5, and Input frequency box” with value=1.
Fill the “Spectrometer input (V)” box with value=0,5, and Input frequency box” with value=1.

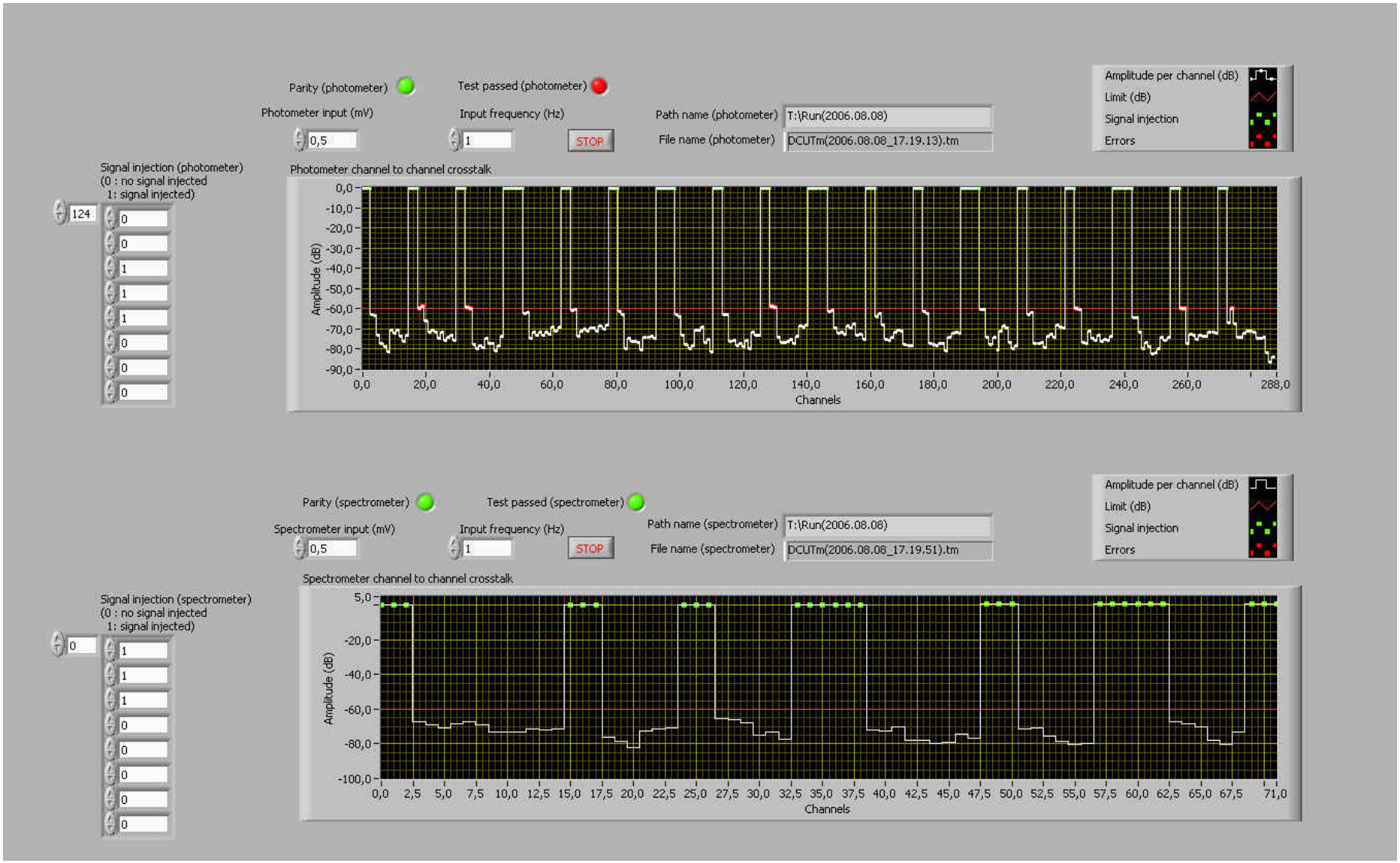
⇨ The labview sofware represents the results, check green light (note that the global green light is not functional since some LIAS boars are missing).

Paste the hard copy of labview screen here after :

Main side


Parity (photometer)
Test passed (photometer)
Photometer input (mV)
Input frequency (Hz)
STOP
Path name (photometer)
T:\Run(2006.08.08)
File name (photometer)
DCUTm(2006.08.08_17.17.12).tm
Amplitude per channel (dB)
Limit (dB)
Signal injection
Errors
Signal injection (photometer)
(0 : no signal injected
1: signal injected)
Photometer channel to channel crosstalk
Amplitude (dB)
Channels
Parity (spectrometer)
Test passed (spectrometer)
Spectrometer input (mV)
Input frequency (Hz)
STOP
Path name (spectrometer)
T:\Run(2006.08.08)
File name (spectrometer)
DCUTm(2006.08.08_17.18.24).tm
Amplitude per channel (dB)
Limit (dB)
Signal injection
Errors
Signal injection (spectrometer)
(0 : no signal injected
1: signal injected)
Spectrometer channel to channel crosstalk
Amplitude (dB)
Channels

Redundant side



11.3 Conclusion

Cross talk TEST	OK	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL**	

12 Noise

The noise measurements have not performed at RAL. The measurements performed at INTESPACE on the flight model are presented thereafter.

We placed the short circuits on the DCU LIAP and DCU LIAS connectors and perform signal acquisition.

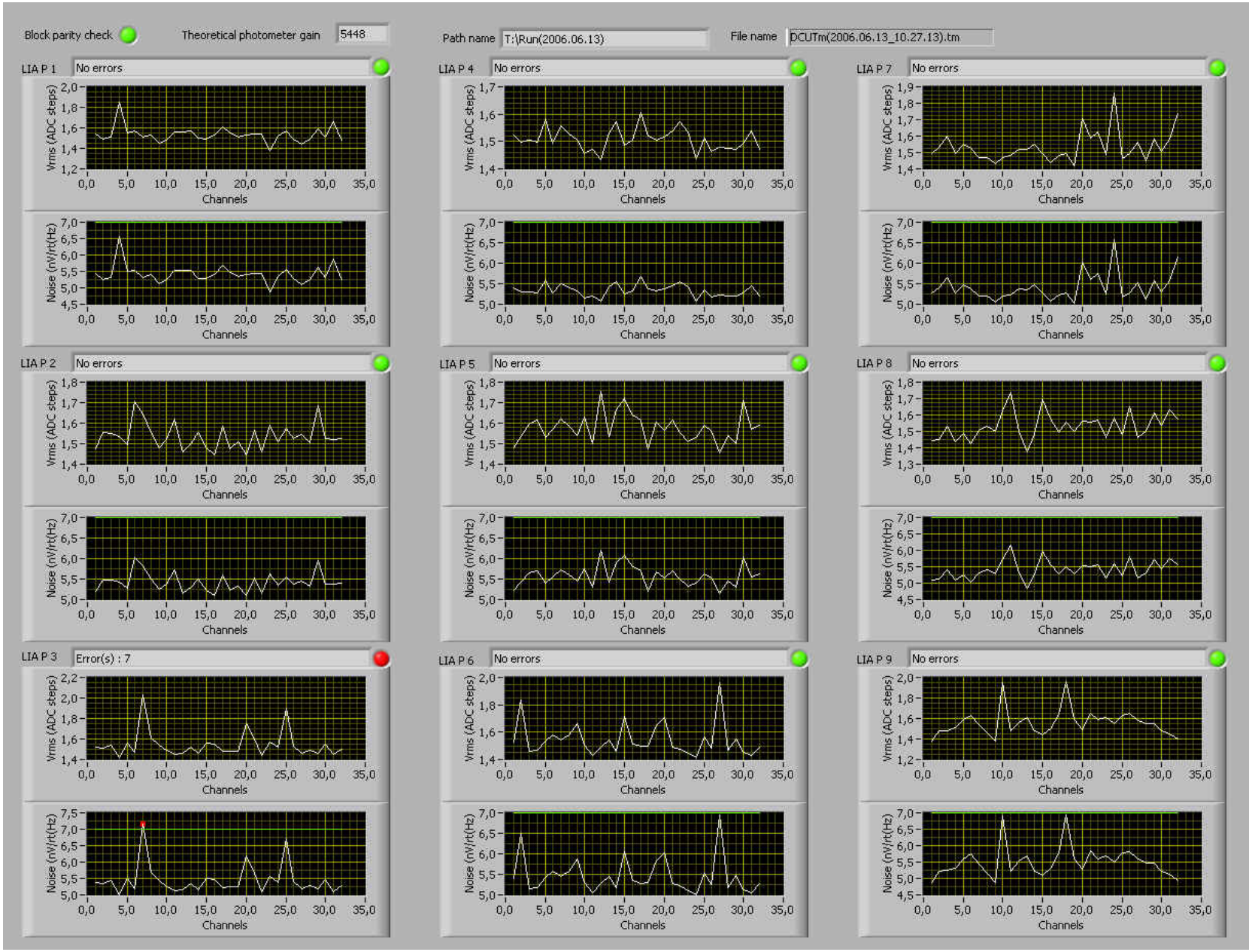
We represent the noise, expresses in ADC steps rms values and in nV/sqrt(Hz). This latter value is computed taking into account the gain value as well as the cut off frequencies associated with photometer and spectrometer channels.

We use the following formula, applicable to the kind of differential signal the DCU generates :

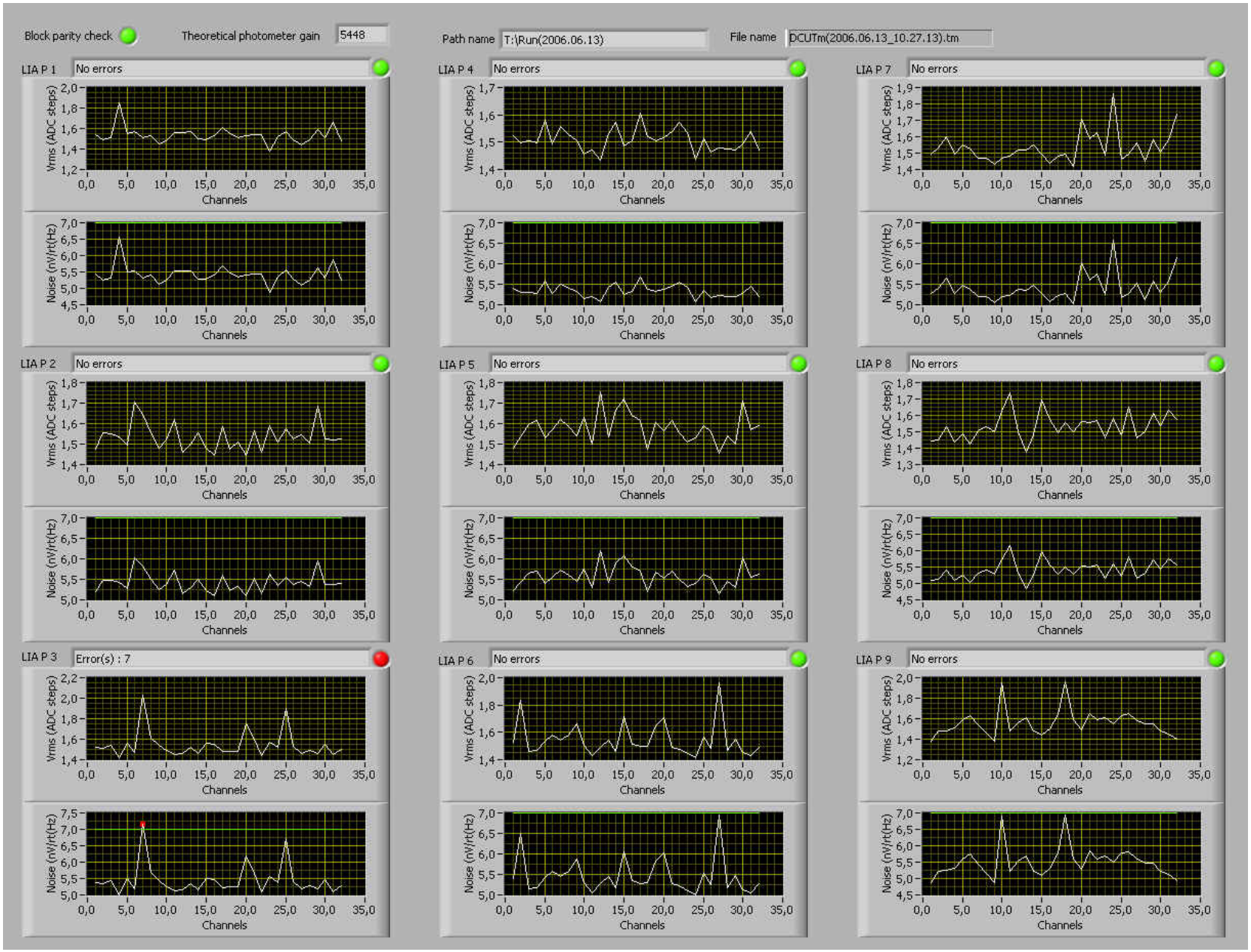
Noise$(nV/\sqrt{Hz}) = 10^9.\sigma_{ADC}$ (rms value) / [(*ADCsteps range*/*Voltage range*) . Gain . sqrt($\pi . f_{cut\ off}$(Hz))]

ADCsteps range = 65535
Voltage range = 5 V
Gain = 5448 (photometer)
Gain = 3528 (spectrometer)
$f_{cut\ off}$ = 5 Hz (photometer)
$f_{cut\ off}$ = 25 Hz (spectrometer)

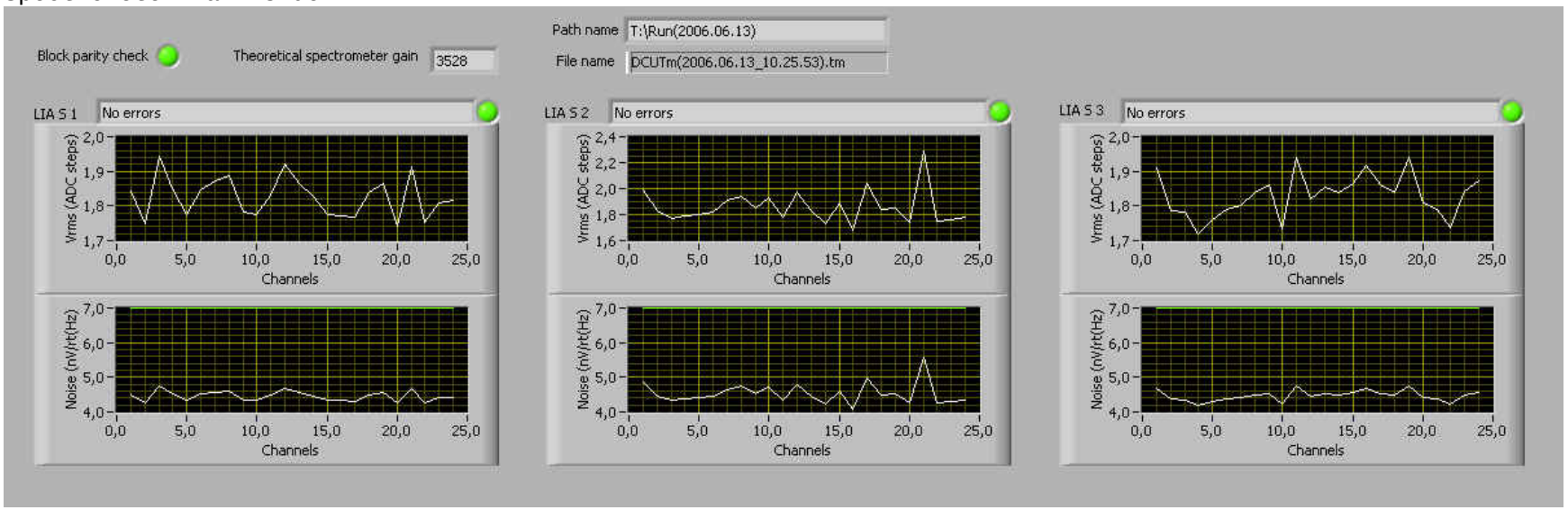
Photometer Main side



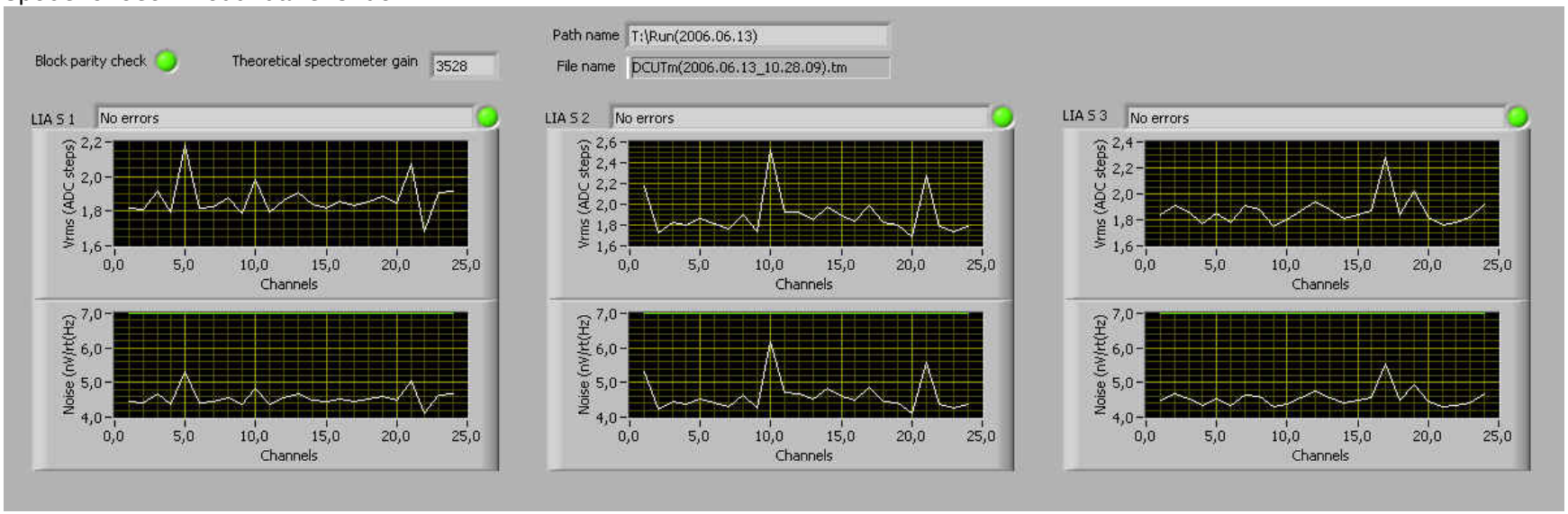
Photometer Redundant side



Spectrometer Main side



Spectrometer Redundant side



12.1 Conclusion

Noise	OK	NON OK
Test responsible Henri TRIOU Technical specialist Quality	Comments : **TEST SUCCESSFULL**	