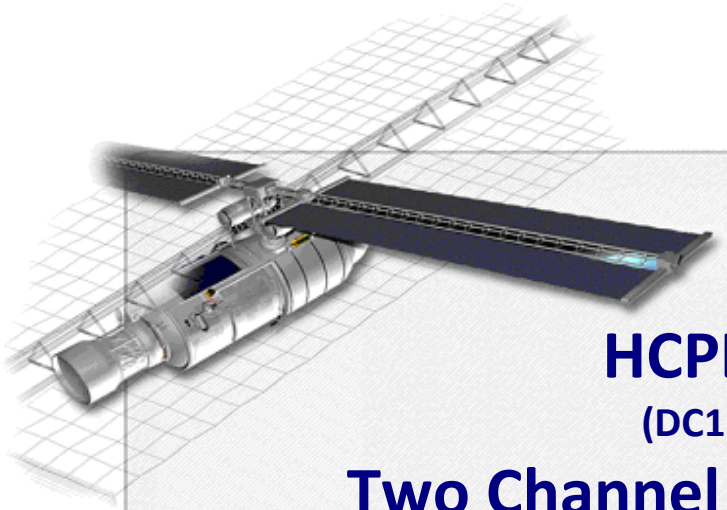
TOTAL IONIZING DOSE TEST REPORT



HCPL5431

(DC1116)

Two Channel Optocoupler

From

AVAGO

TRAD/TN/HCPL5431/XXX1/ESA/YP/1104		Labège, April 19th, 2012
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Issue : 0		
To: Marc POIZAT	Project/Program:	ESA Contract N°4000102571/10/NL/AF-Radiation Characterization of Laplace RH optocouplers, sensors and detectors

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1 INTRODUCTION

This report includes the test results of HCPL5431, a Two Channel Optocoupler from AVAGO, to evaluate Total Ionizing Dose (TID) effects under ^{60}Co irradiation. Between November 2011 and February 2012, TRAD characterized this device for TID sensitivity at the UCL Facility in Belgium using their Gamma irradiation Facility.
The objectives of this test are:

- to detect and measure the degradation of device parameters as a function of TID,
- to determine if device parameters are within specified limits after exposure to final TID level.

2 DOCUMENTS

2.1 Applicable Documents

AD	1.	ESA contract	N°4000102571/10/NL/AF-Radiation Characterization of Laplace RH optocouplers, sensors and detectors
AD	2.	Irradiation Test Plan	ITP-TE-HCPL5431-AVA-ESA-1115, Issue 5 of 15/09/2011

2.2 Reference Documents

RD	1.	Datasheet HCPL5431	Hermetically Sealed, Very High Speed, Logic Gate Optocouplers dated 21/06/2007
RD	2.	AVAGO certificate of conformance dated 09/05/2011	

3 DEVICE INFORMATION

3.1 Device description

The HCPL5431 is a hermetically sealed, Very High Speed Logic Gate optocoupler.
It is a two channel optocoupler with an AlGaAs light emitting diode coupled to an integrated high gain photon detector.

Type	HCPL5431 – 5962-8957101PC
Manufacturer	AVAGO
Function	Optocoupler
Package	DIP8
Inspection lot	HS1115111
Date Code	1116
Sample size	16 parts (15 + 1 control sample)

3.2 Procurement information

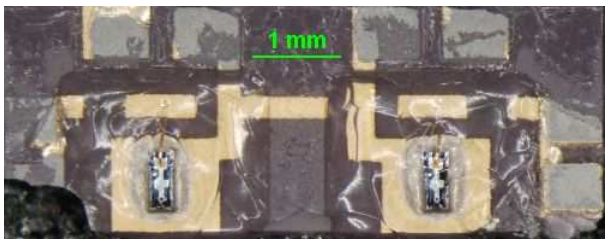
75 parts HCPL5431 were procured from AVAGO (through ACAL BFI, Germany) with full MIL-PRF-38534 Class Level H testing. Parts were delivered with a certificate of conformance [RD2].
The class H is identifiable by the digit 1 at the end of each reference.

3.3 External view

Figure 1: package marking

Figure 2: package back side

3.4 Internal view



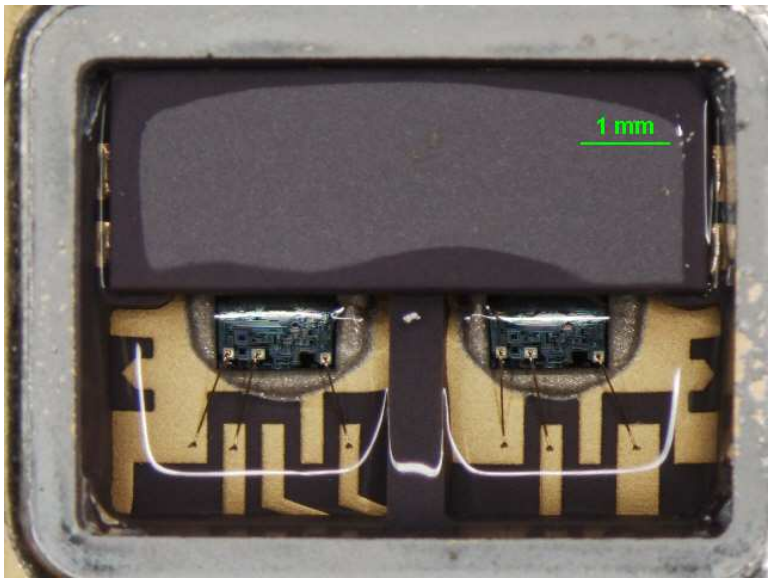


Figure 3: Internal view

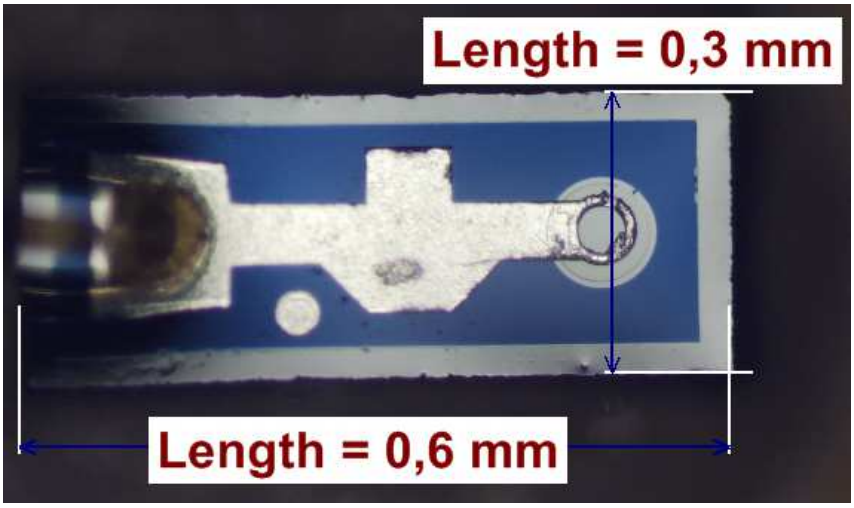


Figure 4: AlGaAs light emitting diode

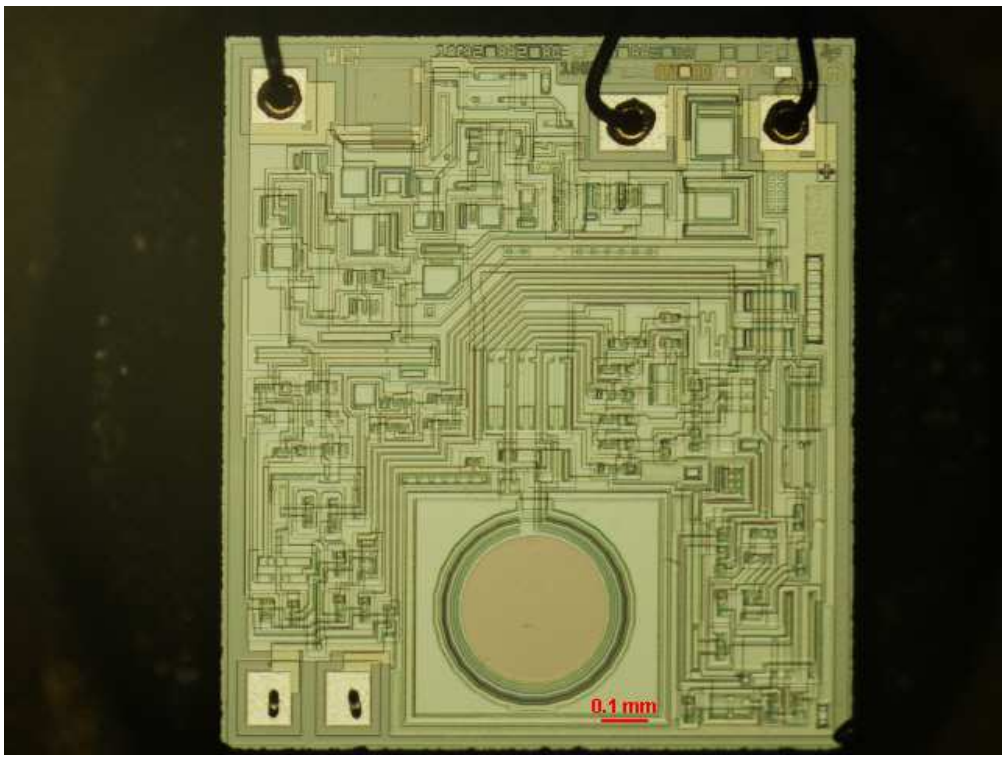


Figure 5: high gain photon detector

3.5 Serialization

Each part is serialized to enable pre and post test identification and comparison.

Serial Number	Control sample	Test samples														
Serialization	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Ref	Bias1	Bias1	Bias1	Bias1	Bias1	Bias2	Bias2	Bias2	Bias2	Bias2	OFF	OFF	OFF	OFF	OFF

4 IRRADIATION MEANS AND CONDITIONS

4.1 UCL irradiation facility (Belgium)

Gamma irradiations are performed with Cobalt 60 source.
Gamma emitted radiation energies are 1.17 and 1.33 MeV.
Dose rates is equal 15 kRad(Si) / h at the source centre .
Moreover the irradiation chamber is a cylindrical room with a radius of 2m.
Then dose rate usable vary from 1.8 kRad(Si) / h to 80 Rad(Si) / h for normal irradiation positions and direct field. No temperature control is available

4.2 Dose measurement

Alanine dosimeters are used for each test set up to control Total Ionizing Dose.

4.3 Experimental conditions

An Accumulated dose of 200 krad(Si) of ^{60}Co is required [AD2] for this TID (Total Ionizing Dose) evaluation test.

Following steps were planned to determine the component degradation under ^{60}Co irradiation and devices were exposed to the following dose rates:

	Step1	Step2	Step3	Step4	Step5	Step6	Step7	Step8
Accumulated dose krad(Si)	10	19	49	65	101	130	152	203
Dose rate (Si)/h	36	36	36	36	310	310	310	310

Two annealing steps were performed after ^{60}Co irradiation:

Duration (h)	24	168
Temperature (°C)	25	100

5 ELECTRICAL TESTS

Electrical parameters to be measured in pre and post exposure tests are described in the following table. Electrical tests are performed on each part using the test set-up hereunder. All required data are recorded for each device. Test conditions and limits are given in the applicable irradiation test plan [AD2] and shown hereafter.

5.1 Test set-up

TEST BOARD	TRAD/CT1/E/HCPL5431/DIL14/BR/1107
TEST PROGRAM	HCPL5431_TE_XXX1_B1_V10.llb

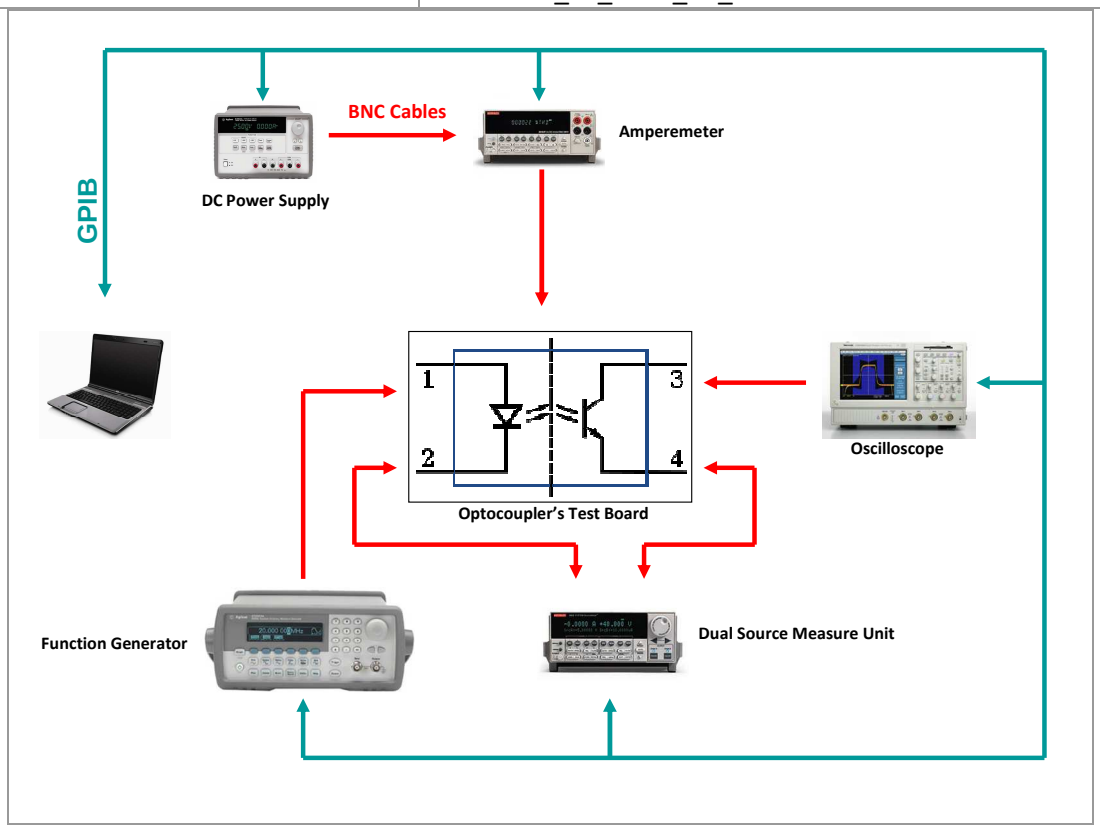


Figure 6: test principle

5.2 Test configuration

Samples were exposed to irradiation in three different modes - two on-modes (Figure 7 and Figure 8) and one in off-mode (all terminal leads short-circuited) –

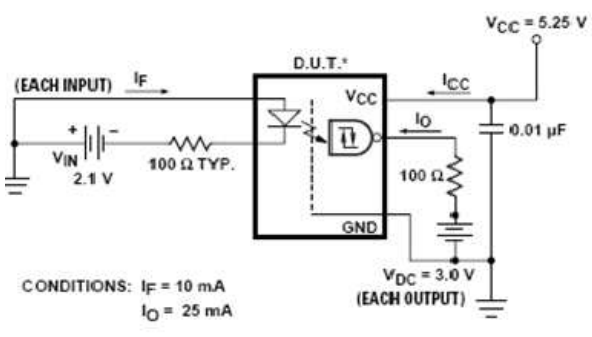


Figure 7: ON bias1

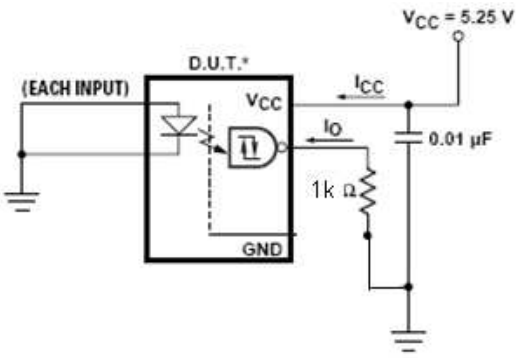


Figure 8: ON bias2

5.3 Electrical parameters

PARAMETER	SYMBOL	TEST CONDITION	MIN	MAX	UNIT
Low Level Output Voltage	V_{OL}	I_{OL} = 8.0 mA (5 TTL Loads)		0,5	V
High Level Output Voltage	V_{OH}	I_{OH} = -4.0 mA	2,4		V
Output Leakage Current	I_{OHH}	V_O = 5.25V, V_F = 0.7V		100	µA
Logic High Supply Current	I_{CCH}	V_{CC}=5.25V, Ve = 0V		52	mA
Logic Low Supply Current	I_{CCL}	V_{CC}=5.25V, Ve = 0V		52	mA
Input Forward Voltage	V_F	I_F = 10 mA	1	1,85	V
Input Reverse Breakdown Voltage	V_R	I_R = 10 µA	3		V
Propagation Delay Time Logic Low Output	t_{PHL}	note 1		60	ns
Propagation Delay Time Logic High Output	t_{PLH}	note 1		60	ns
Output Rise Time	tr*				ns
Output Fall Time	tf*				ns

(*) tr Typ. Value: 15 ns
(*) tf Typ. Value: 10 ns

Note 1: tPHL propagation delay is measured from the 50% point on the rising edge of the input current pulse to the 1.5 V point on the falling edge of the output pulse. The tPLH propagation delay is measured from the 50% point on the falling edge of the input current pulse to the 1.5 V point on the rising edge of the output pulse.

Min/ Max values are those specified in the reference data-sheet [RD1].

Test measurements are performed at 25°C ± 10°C.

6 TEST HISTORY

Initially, 7 steps were planned for this test sequence, as described hereunder:

	Step1	Step2	Step3	Step4	Step5	Step6	Step7
Accumulated dose krad(Si)	10	20	50	100	120	150	200
Dose rate (Si)/h	36	36	36	36	310	310	310

Due to irradiation facility maintenance, tests were stopped for 48 hours between Step 3 and Step 4 (50 krad(Si) and 100 krad(Si). Total Ionizing Dose was estimated at this step to 74 krad(Si).
During this time period, parts were stocked in a cold chamber at -30°C.

7 SUMMARY RESULTS

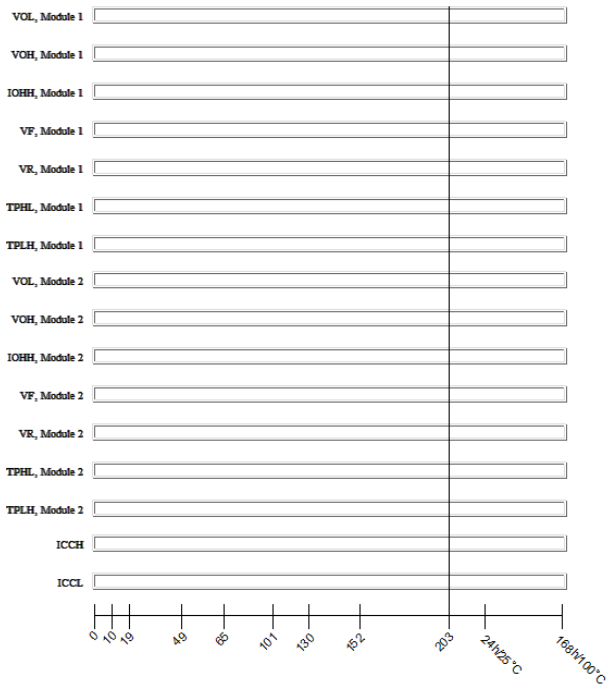


Figure 9 : ON Bias 1

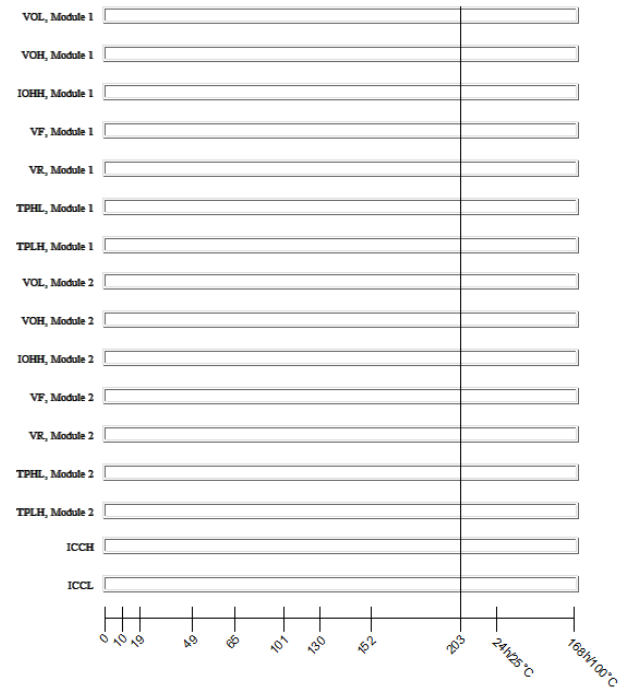


Figure 10: ON Bias 2

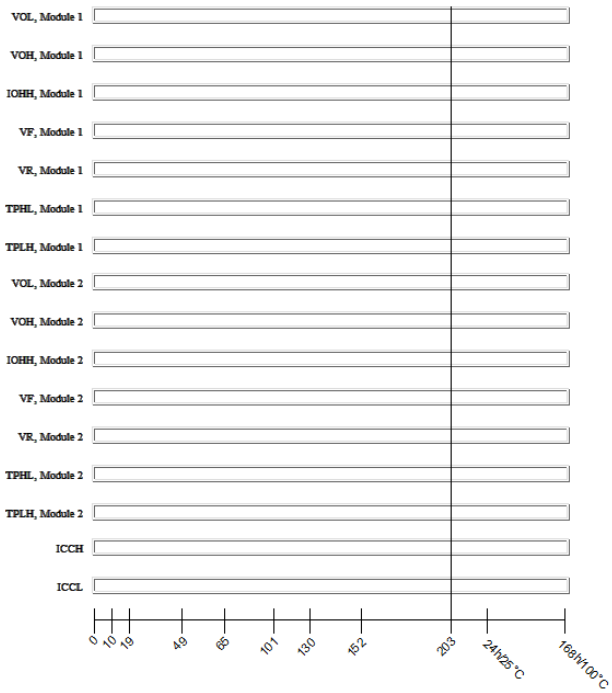
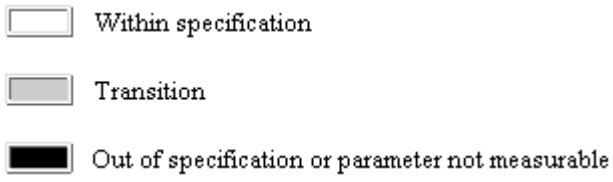


Figure 11 : OFF Bias



All specified parameters are compliant to the data-sheet [RD1] up to 203 kRad(Si).

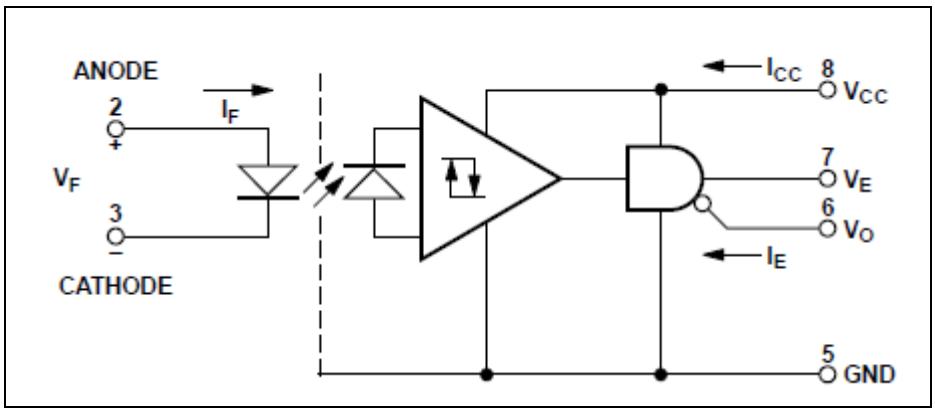
8 CONCLUSION

Total Ionizing Dose steady-state irradiation test using Gamma ray was performed on **HCPL5431 Hermetically Sealed, Very High Speed, Logic Gate Optocouplers** from **Avago** up to 200krad(Si) under three bias configurations.

Final test results are:

- All parameters are within specifications at total dose level.
- No CTR comparison is preformed due to the device technology.

Indeed each channel contains an AlGaAs light emitting diode which is optically coupled to an integrated high gain photon detector. Opposite to the Input Diode current, the On state collector current cannot be measured.



9 DETAILED TESTS RESULTS

The pre and post radiation test results are shown graphically in the following pages (9-2 to 9-61). The data is displayed in the following tables and graphs.

These graphs show parameter's shifts observed during the total ionizing dose sequence. The Control sample results are shown on each graph (black curve).

When available in the device data-sheet/specification, the maximum/minimum/typical values are also shown (red dotted line).

The tables include drift calculation between each measurement step and the "0" kRad(Si) step.

For CTR values, the formula used is:

$$\text{Drift} = \frac{1}{\text{measurement (X kRad(Si))}} - \frac{1}{\text{measurement (0 kRad(Si))}}$$

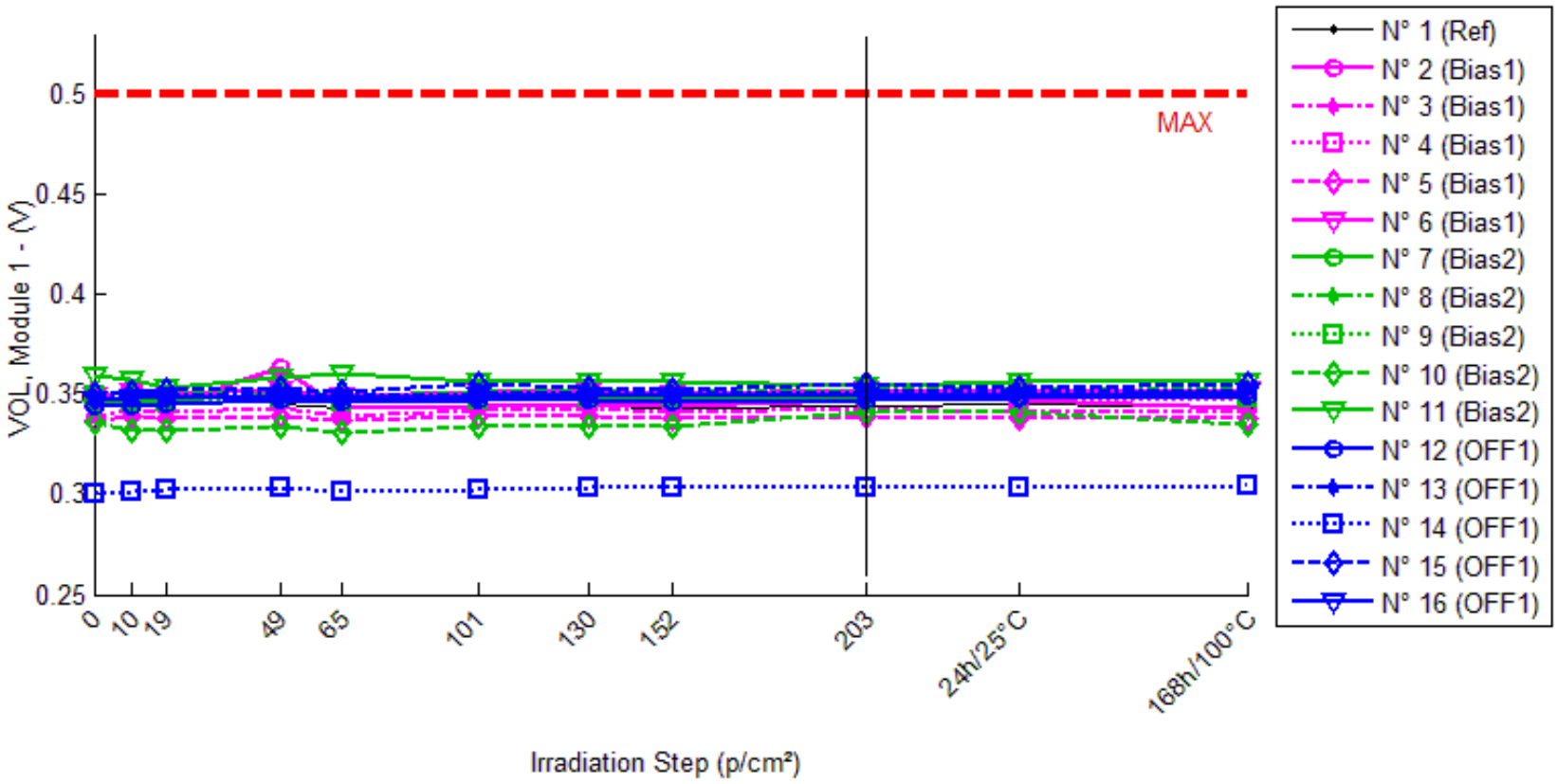
For other parameters, the formula used is:

Drift value= measurement (X kRad(Si)) - measurement (0 kRad(Si))

CONTENTS

1. VOL module 1

Ta = 25°C; Iol = 8 mA



VOL, Module 1 . (V) **Max = 0.5**

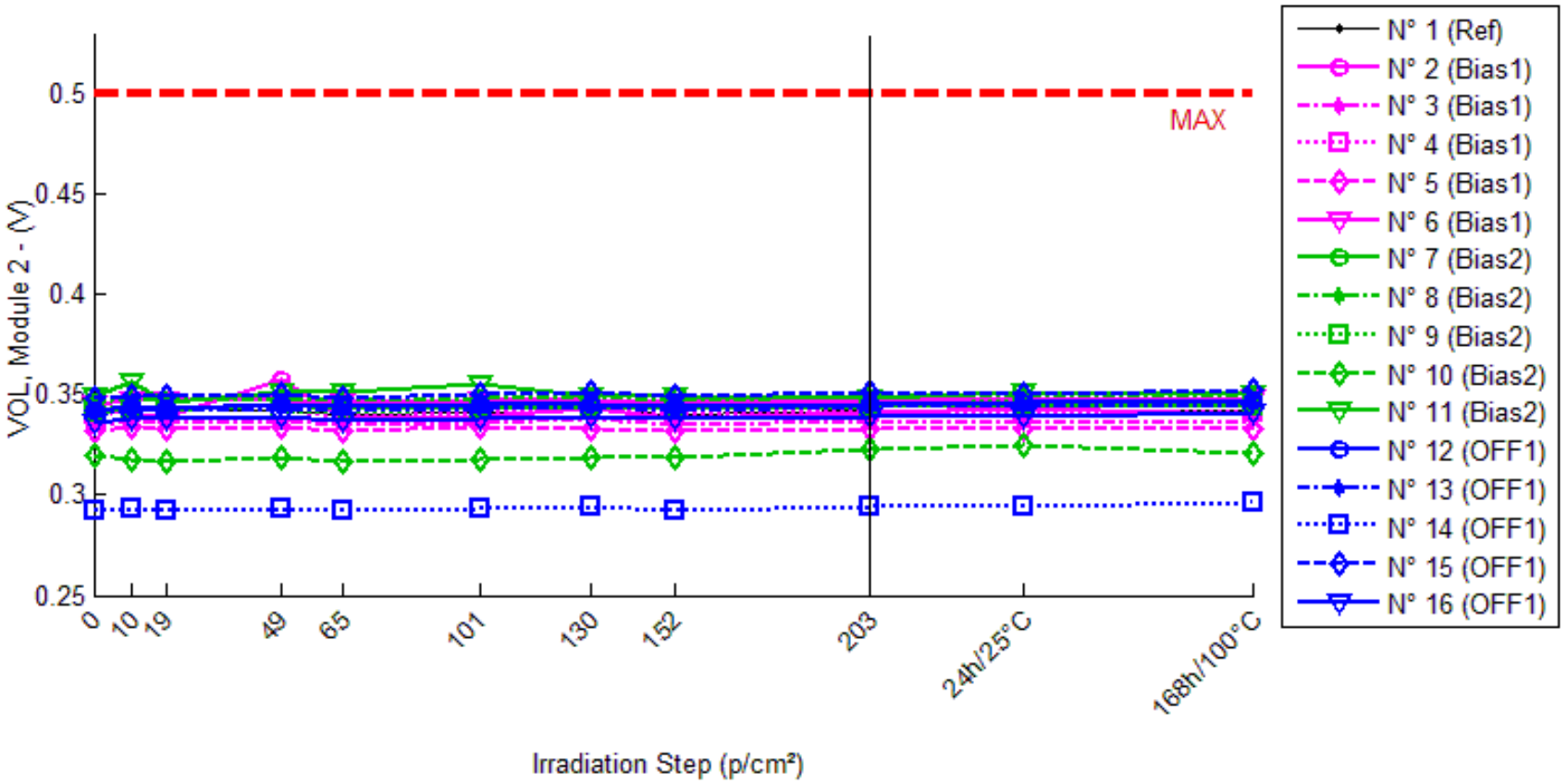
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.345	0.344	0.350	0.345	0.343	0.344	0.344	0.343	0.344	0.345	0.343
N° 2 (Bias1)	0.351	0.344	0.344	0.364	0.343	0.344	0.344	0.344	0.347	0.347	0.343
N° 3 (Bias1)	0.339	0.342	0.341	0.343	0.339	0.342	0.343	0.341	0.343	0.341	0.341
N° 4 (Bias1)	0.347	0.348	0.349	0.349	0.346	0.348	0.352	0.347	0.349	0.347	0.348
N° 5 (Bias1)	0.337	0.339	0.338	0.339	0.337	0.339	0.339	0.338	0.339	0.338	0.338
N° 6 (Bias1)	0.349	0.351	0.350	0.352	0.349	0.351	0.351	0.350	0.352	0.351	0.352
N° 7 (Bias2)	0.345	0.346	0.347	0.350	0.347	0.348	0.348	0.347	0.349	0.348	0.350
N° 8 (Bias2)	0.349	0.350	0.350	0.352	0.349	0.351	0.352	0.351	0.352	0.352	0.353
N° 9 (Bias2)	0.349	0.346	0.346	0.348	0.346	0.347	0.348	0.348	0.349	0.352	0.348
N° 10 (Bias2)	0.336	0.332	0.332	0.334	0.331	0.334	0.334	0.334	0.341	0.341	0.335
N° 11 (Bias2)	0.359	0.357	0.353	0.358	0.360	0.356	0.356	0.356	0.354	0.356	0.356
N° 12 (OFF1)	0.344	0.344	0.345	0.347	0.346	0.347	0.347	0.346	0.347	0.348	0.349
N° 13 (OFF1)	0.348	0.349	0.349	0.351	0.349	0.350	0.351	0.350	0.351	0.351	0.352
N° 14 (OFF1)	0.300	0.301	0.302	0.303	0.301	0.302	0.303	0.303	0.303	0.303	0.304
N° 15 (OFF1)	0.350	0.351	0.352	0.353	0.351	0.355	0.353	0.352	0.355	0.353	0.355
N° 16 (OFF1)	0.347	0.348	0.348	0.349	0.348	0.349	0.349	0.349	0.349	0.349	0.351

Delta [VOL, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-1.387E-3	5.437E-3	1.909E-4	-1.771E-3	-6.801E-4	-8.296E-4	-1.720E-3	-6.960E-4	-1.387E-4	-1.472E-3
N° 2 (Bias1)	---	-6.498E-3	-7.060E-3	1.321E-2	-8.204E-3	-7.089E-3	-6.295E-3	-6.911E-3	-3.665E-3	-3.452E-3	-7.476E-3
N° 3 (Bias1)	---	3.043E-3	2.118E-3	3.813E-3	5.110E-5	3.169E-3	4.325E-3	1.699E-3	3.795E-3	1.644E-3	1.793E-3
N° 4 (Bias1)	---	1.498E-3	1.936E-3	2.403E-3	-8.079E-4	1.846E-3	4.978E-3	5.493E-4	2.290E-3	-7.560E-5	9.228E-4
N° 5 (Bias1)	---	2.263E-3	1.171E-3	2.562E-3	3.168E-4	1.748E-3	1.815E-3	1.376E-3	2.060E-3	1.183E-3	1.268E-3
N° 6 (Bias1)	---	1.849E-3	1.551E-3	2.780E-3	3.973E-4	2.327E-3	2.289E-3	1.334E-3	2.928E-3	1.678E-3	3.163E-3
N° 7 (Bias2)	---	1.482E-3	1.921E-3	4.826E-3	2.030E-3	2.942E-3	3.532E-3	2.573E-3	4.403E-3	3.117E-3	4.730E-3
N° 8 (Bias2)	---	1.342E-3	1.235E-3	3.149E-3	7.582E-4	2.739E-3	3.734E-3	2.308E-3	3.777E-3	3.381E-3	4.265E-3
N° 9 (Bias2)	---	-2.085E-3	-2.289E-3	-1.019E-3	-2.892E-3	-1.396E-3	-3.410E-5	-8.910E-5	7.816E-4	3.813E-3	-3.681E-4
N° 10 (Bias2)	---	-4.339E-3	-4.567E-3	-2.709E-3	-4.969E-3	-2.752E-3	-2.220E-3	-1.907E-3	4.702E-3	4.312E-3	-1.551E-3
N° 11 (Bias2)	---	-1.674E-3	-6.231E-3	-9.543E-4	8.686E-4	-2.386E-3	-2.512E-3	-2.727E-3	-4.591E-3	-2.498E-3	-3.187E-3
N° 12 (OFF1)	---	4.576E-4	1.491E-3	3.164E-3	1.734E-3	2.662E-3	3.046E-3	2.377E-3	3.441E-3	3.801E-3	5.171E-3
N° 13 (OFF1)	---	1.377E-3	1.416E-3	2.870E-3	1.329E-3	2.250E-3	3.252E-3	2.031E-3	3.328E-3	3.222E-3	4.238E-3
N° 14 (OFF1)	---	5.440E-4	1.145E-3	2.359E-3	8.004E-4	1.892E-3	2.587E-3	2.216E-3	3.102E-3	2.770E-3	4.104E-3
N° 15 (OFF1)	---	8.783E-4	1.647E-3	2.715E-3	9.811E-4	4.940E-3	2.854E-3	1.855E-3	4.952E-3	2.993E-3	5.152E-3
N° 16 (OFF1)	---	1.138E-3	1.362E-3	2.612E-3	9.337E-4	2.109E-3	2.513E-3	1.908E-3	2.496E-3	2.178E-3	4.514E-3
Average (OFF1)	---	4.311E-4	-5.684E-5	4.954E-3	-1.649E-3	4.002E-4	1.422E-3	-3.906E-4	1.482E-3	1.957E-4	-6.580E-5
σ (OFF1)	---	3.916E-3	3.932E-3	4.648E-3	3.695E-3	4.224E-3	4.515E-3	3.670E-3	2.955E-3	2.159E-3	4.229E-3
Average+3 σ (OFF1)	---	1.218E-2	1.174E-2	1.890E-2	9.436E-3	1.307E-2	1.497E-2	1.062E-2	1.035E-2	6.673E-3	1.262E-2
Average-3σ (OFF1)	---	-1.132E-2	-1.185E-2	-8.991E-3	-1.273E-2	-1.227E-2	-1.212E-2	-1.140E-2	-7.383E-3	-6.282E-3	-1.275E-2
Average (Bias1)	---	-1.055E-3	-1.986E-3	6.585E-4	-8.408E-4	-1.706E-4	4.999E-4	3.164E-5	1.814E-3	2.425E-3	7.778E-4
σ (Bias1)	---	2.470E-3	3.550E-3	3.175E-3	2.957E-3	2.794E-3	3.017E-3	2.399E-3	3.904E-3	2.789E-3	3.544E-3
Average+3 σ (Bias1)	---	6.356E-3	8.664E-3	1.018E-2	8.029E-3	8.211E-3	9.551E-3	7.230E-3	1.353E-2	1.079E-2	1.141E-2
Average-3σ (Bias1)	---	-8.466E-3	-1.264E-2	-8.867E-3	-9.711E-3	-8.553E-3	-8.551E-3	-7.166E-3	-9.899E-3	-5.942E-3	-9.854E-3
Average (Bias2)	---	8.788E-4	1.412E-3	2.744E-3	1.156E-3	2.771E-3	2.850E-3	2.077E-3	3.464E-3	2.993E-3	4.636E-3
σ (Bias2)	---	3.887E-4	1.839E-4	2.994E-4	3.776E-4	1.245E-3	3.092E-4	2.174E-4	9.084E-4	5.956E-4	5.023E-4
Average+3 σ (Bias2)	---	2.045E-3	1.964E-3	3.642E-3	2.288E-3	6.505E-3	3.778E-3	2.730E-3	6.189E-3	4.780E-3	6.143E-3
Average-3σ (Bias2)	---	-2.872E-4	8.604E-4	1.846E-3	2.286E-5	-9.637E-4	1.923E-3	1.425E-3	7.385E-4	1.206E-3	3.129E-3

2. VOL module 2

Ta = 25°C; Iol = 8 mA



VOL, Module 2 . (V) **Max = 0.5**

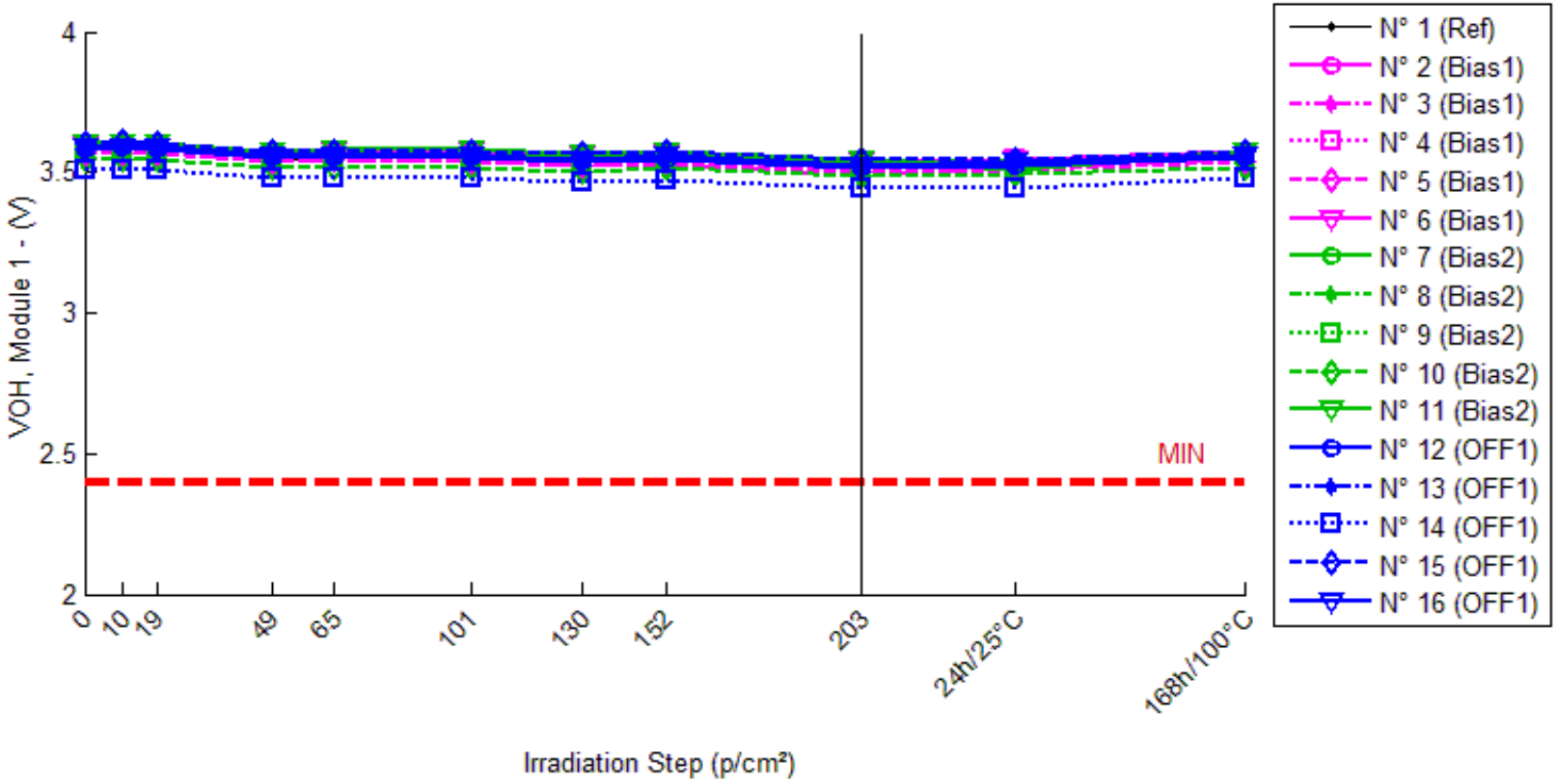
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.342	0.342	0.343	0.342	0.340	0.341	0.342	0.340	0.342	0.342	0.342
N° 2 (Bias1)	0.344	0.340	0.339	0.357	0.338	0.339	0.343	0.338	0.341	0.343	0.340
N° 3 (Bias1)	0.334	0.337	0.336	0.337	0.335	0.336	0.338	0.335	0.337	0.336	0.337
N° 4 (Bias1)	0.340	0.342	0.342	0.342	0.339	0.341	0.344	0.340	0.342	0.341	0.341
N° 5 (Bias1)	0.332	0.334	0.333	0.334	0.332	0.334	0.333	0.332	0.333	0.333	0.333
N° 6 (Bias1)	0.345	0.347	0.347	0.347	0.346	0.347	0.347	0.346	0.347	0.347	0.348
N° 7 (Bias2)	0.341	0.343	0.342	0.345	0.343	0.343	0.344	0.343	0.344	0.344	0.345
N° 8 (Bias2)	0.346	0.348	0.347	0.348	0.347	0.348	0.349	0.347	0.349	0.349	0.350
N° 9 (Bias2)	0.343	0.343	0.342	0.342	0.341	0.343	0.343	0.343	0.344	0.347	0.344
N° 10 (Bias2)	0.320	0.318	0.317	0.319	0.317	0.318	0.319	0.319	0.323	0.325	0.321
N° 11 (Bias2)	0.349	0.356	0.346	0.351	0.351	0.355	0.349	0.349	0.348	0.351	0.350
N° 12 (OFF1)	0.342	0.344	0.343	0.345	0.344	0.345	0.345	0.344	0.345	0.346	0.347
N° 13 (OFF1)	0.341	0.342	0.342	0.343	0.342	0.343	0.344	0.342	0.344	0.344	0.345
N° 14 (OFF1)	0.292	0.293	0.292	0.293	0.292	0.293	0.294	0.292	0.294	0.294	0.296
N° 15 (OFF1)	0.348	0.349	0.349	0.350	0.348	0.350	0.351	0.349	0.351	0.350	0.352
N° 16 (OFF1)	0.336	0.338	0.338	0.339	0.337	0.338	0.339	0.338	0.339	0.339	0.341

Delta [VOL, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	4.906E-4	7.582E-4	7.380E-5	-1.504E-3	-6.200E-4	-3.243E-4	-1.751E-3	-2.482E-4	-2.650E-5	-2.841E-4
N° 2 (Bias1)	---	-4.209E-3	-5.218E-3	1.338E-2	-6.363E-3	-5.248E-3	-6.916E-4	-5.540E-3	-3.266E-3	-5.813E-4	-3.833E-3
N° 3 (Bias1)	---	3.226E-3	2.088E-3	3.141E-3	5.162E-4	2.389E-3	3.620E-3	1.306E-3	3.179E-3	2.144E-3	2.598E-3
N° 4 (Bias1)	---	1.750E-3	1.547E-3	1.818E-3	-8.971E-4	9.616E-4	4.029E-3	1.020E-5	1.629E-3	8.808E-4	1.214E-3
N° 5 (Bias1)	---	1.596E-3	5.876E-4	1.477E-3	-2.600E-5	1.530E-3	1.050E-3	2.474E-4	1.143E-3	6.600E-4	1.039E-3
N° 6 (Bias1)	---	2.121E-3	1.351E-3	1.385E-3	4.650E-4	1.803E-3	1.622E-3	5.351E-4	1.898E-3	1.346E-3	3.202E-3
N° 7 (Bias2)	---	1.506E-3	1.031E-3	3.714E-3	1.371E-3	1.683E-3	2.553E-3	1.244E-3	2.905E-3	2.251E-3	4.025E-3
N° 8 (Bias2)	---	1.407E-3	9.613E-4	2.265E-3	9.744E-4	2.163E-3	2.876E-3	1.329E-3	3.055E-3	2.715E-3	3.939E-3
N° 9 (Bias2)	---	-5.259E-4	-1.626E-3	-7.215E-4	-2.246E-3	-6.310E-4	1.910E-5	-1.319E-4	6.399E-4	3.697E-3	6.708E-4
N° 10 (Bias2)	---	-2.382E-3	-2.937E-3	-1.642E-3	-3.344E-3	-2.000E-3	-8.245E-4	-1.191E-3	3.130E-3	5.006E-3	9.864E-4
N° 11 (Bias2)	---	6.784E-3	-2.485E-3	2.060E-3	2.296E-3	6.268E-3	6.270E-4	4.910E-5	-6.328E-4	2.008E-3	1.135E-3
N° 12 (OFF1)	---	1.398E-3	1.174E-3	2.449E-3	1.668E-3	2.580E-3	2.769E-3	1.649E-3	3.253E-3	4.038E-3	5.126E-3
N° 13 (OFF1)	---	1.677E-3	1.264E-3	2.295E-3	1.425E-3	2.171E-3	3.027E-3	1.466E-3	3.262E-3	3.448E-3	4.617E-3
N° 14 (OFF1)	---	1.328E-3	9.643E-4	1.762E-3	6.784E-4	1.435E-3	2.358E-3	9.323E-4	2.536E-3	2.732E-3	4.343E-3
N° 15 (OFF1)	---	1.392E-3	1.150E-3	1.990E-3	5.056E-4	2.089E-3	3.025E-3	9.211E-4	3.626E-3	2.299E-3	4.641E-3
N° 16 (OFF1)	---	1.509E-3	1.383E-3	2.302E-3	7.877E-4	1.788E-3	2.375E-3	1.386E-3	2.881E-3	2.819E-3	4.806E-3
Average (OFF1)	---	8.970E-4	7.136E-5	4.241E-3	-1.261E-3	2.870E-4	1.926E-3	-6.881E-4	9.165E-4	8.901E-4	8.440E-4
σ (OFF1)	---	2.924E-3	3.005E-3	5.159E-3	2.908E-3	3.137E-3	1.937E-3	2.756E-3	2.457E-3	1.000E-3	2.770E-3
Average+3 σ (OFF1)	---	9.670E-3	9.087E-3	1.972E-2	7.463E-3	9.697E-3	7.736E-3	7.578E-3	8.286E-3	3.890E-3	9.154E-3
Average-3σ (OFF1)	---	-7.876E-3	-8.944E-3	-1.124E-2	-9.985E-3	-9.123E-3	-3.884E-3	-8.955E-3	-6.453E-3	-2.110E-3	-7.466E-3
Average (Bias1)	---	1.358E-3	-1.011E-3	1.135E-3	-1.898E-4	1.497E-3	1.050E-3	2.598E-4	1.820E-3	3.135E-3	2.151E-3
σ (Bias1)	---	3.428E-3	1.892E-3	2.233E-3	2.457E-3	3.162E-3	1.609E-3	1.050E-3	1.720E-3	1.230E-3	1.680E-3
Average+3 σ (Bias1)	---	1.164E-2	4.665E-3	7.834E-3	7.182E-3	1.098E-2	5.876E-3	3.411E-3	6.979E-3	6.824E-3	7.191E-3
Average-3σ (Bias1)	---	-8.926E-3	-6.687E-3	-5.564E-3	-7.562E-3	-7.991E-3	-3.775E-3	-2.891E-3	-3.340E-3	-5.535E-4	-2.888E-3
Average (Bias2)	---	1.461E-3	1.187E-3	2.159E-3	1.013E-3	2.012E-3	2.711E-3	1.271E-3	3.112E-3	3.067E-3	4.707E-3
σ (Bias2)	---	1.372E-4	1.544E-4	2.783E-4	5.046E-4	4.293E-4	3.314E-4	3.283E-4	4.161E-4	6.802E-4	2.876E-4
Average+3 σ (Bias2)	---	1.872E-3	1.650E-3	2.994E-3	2.527E-3	3.300E-3	3.705E-3	2.256E-3	4.360E-3	5.108E-3	5.569E-3
Average-3σ (Bias2)	---	1.049E-3	7.237E-4	1.325E-3	-5.010E-4	7.244E-4	1.717E-3	2.859E-4	1.863E-3	1.027E-3	3.844E-3

3. VOH module 1

Ta = 25°C; Ioh = -4 mA



VOH, Module 1 . (V) **Min = 2.4**

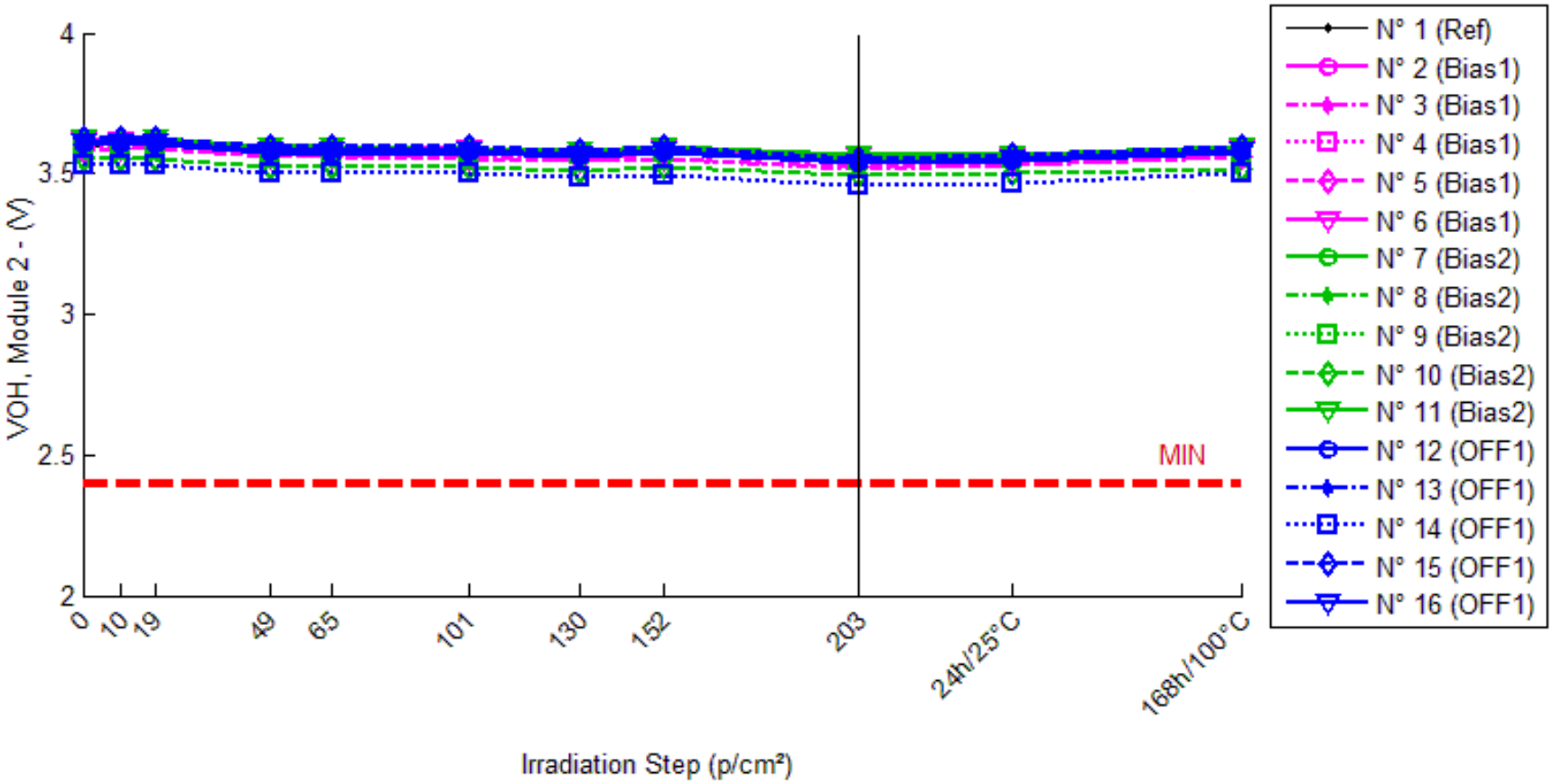
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	3.580	3.586	3.583	3.549	3.556	3.555	3.547	3.550	3.535	3.546	3.558
N° 2 (Bias1)	3.589	3.591	3.594	3.562	3.564	3.564	3.552	3.558	3.526	3.542	3.571
N° 3 (Bias1)	3.569	3.567	3.570	3.539	3.544	3.537	3.522	3.532	3.490	3.514	3.544
N° 4 (Bias1)	3.592	3.593	3.595	3.565	3.570	3.564	3.549	3.559	3.528	3.544	3.568
N° 5 (Bias1)	3.566	3.566	3.569	3.540	3.543	3.537	3.526	3.532	3.503	3.511	3.541
N° 6 (Bias1)	3.598	3.603	3.602	3.572	3.575	3.571	3.561	3.565	3.540	3.543	3.572
N° 7 (Bias2)	3.590	3.592	3.591	3.563	3.564	3.561	3.551	3.557	3.531	3.533	3.563
N° 8 (Bias2)	3.596	3.598	3.601	3.569	3.572	3.569	3.555	3.563	3.539	3.540	3.570
N° 9 (Bias2)	3.583	3.586	3.584	3.555	3.556	3.556	3.542	3.553	3.524	3.529	3.559
N° 10 (Bias2)	3.544	3.546	3.546	3.517	3.517	3.517	3.504	3.513	3.485	3.491	3.517
N° 11 (Bias2)	3.606	3.606	3.607	3.578	3.580	3.581	3.567	3.576	3.548	3.506	3.578
N° 12 (OFF1)	3.582	3.587	3.582	3.553	3.552	3.551	3.540	3.549	3.519	3.522	3.552
N° 13 (OFF1)	3.588	3.591	3.589	3.560	3.560	3.560	3.549	3.557	3.526	3.530	3.561
N° 14 (OFF1)	3.508	3.512	3.507	3.479	3.479	3.479	3.467	3.474	3.444	3.447	3.479
N° 15 (OFF1)	3.606	3.608	3.605	3.578	3.577	3.576	3.569	3.574	3.542	3.543	3.578
N° 16 (OFF1)	3.590	3.591	3.591	3.563	3.562	3.560	3.549	3.558	3.524	3.535	3.562

Delta [VOH, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	5.811E-3	2.227E-3	-3.149E-2	-2.439E-2	-2.564E-2	-3.335E-2	-3.018E-2	-4.531E-2	-3.416E-2	-2.217E-2
N° 2 (Bias1)	---	1.874E-3	4.090E-3	-2.787E-2	-2.501E-2	-2.550E-2	-3.739E-2	-3.139E-2	-6.352E-2	-4.732E-2	-1.861E-2
N° 3 (Bias1)	---	-1.411E-3	7.590E-4	-3.021E-2	-2.432E-2	-3.173E-2	-4.630E-2	-3.699E-2	-7.922E-2	-5.475E-2	-2.500E-2
N° 4 (Bias1)	---	1.644E-3	3.346E-3	-2.624E-2	-2.219E-2	-2.779E-2	-4.235E-2	-3.317E-2	-6.356E-2	-4.741E-2	-2.371E-2
N° 5 (Bias1)	---	-3.100E-4	3.236E-3	-2.614E-2	-2.316E-2	-2.897E-2	-4.003E-2	-3.403E-2	-6.323E-2	-5.447E-2	-2.492E-2
N° 6 (Bias1)	---	4.770E-3	3.724E-3	-2.657E-2	-2.368E-2	-2.735E-2	-3.727E-2	-3.319E-2	-5.877E-2	-5.513E-2	-2.649E-2
N° 7 (Bias2)	---	2.253E-3	8.120E-4	-2.691E-2	-2.577E-2	-2.877E-2	-3.895E-2	-3.306E-2	-5.886E-2	-5.721E-2	-2.741E-2
N° 8 (Bias2)	---	1.798E-3	5.649E-3	-2.665E-2	-2.360E-2	-2.705E-2	-4.056E-2	-3.246E-2	-5.705E-2	-5.543E-2	-2.553E-2
N° 9 (Bias2)	---	2.534E-3	1.192E-3	-2.833E-2	-2.771E-2	-2.679E-2	-4.092E-2	-3.076E-2	-5.929E-2	-5.393E-2	-2.438E-2
N° 10 (Bias2)	---	1.801E-3	1.281E-3	-2.723E-2	-2.705E-2	-2.699E-2	-4.032E-2	-3.109E-2	-5.923E-2	-5.376E-2	-2.791E-2
N° 11 (Bias2)	---	3.100E-4	9.910E-4	-2.777E-2	-2.649E-2	-2.552E-2	-3.917E-2	-3.026E-2	-5.778E-2	-9.962E-2	-2.817E-2
N° 12 (OFF1)	---	4.748E-3	-3.890E-4	-2.971E-2	-3.082E-2	-3.137E-2	-4.256E-2	-3.363E-2	-6.390E-2	-6.037E-2	-3.001E-2
N° 13 (OFF1)	---	2.187E-3	1.400E-4	-2.849E-2	-2.889E-2	-2.859E-2	-3.912E-2	-3.121E-2	-6.258E-2	-5.858E-2	-2.734E-2
N° 14 (OFF1)	---	3.389E-3	-1.095E-3	-2.908E-2	-2.955E-2	-2.898E-2	-4.119E-2	-3.484E-2	-6.465E-2	-6.120E-2	-2.955E-2
N° 15 (OFF1)	---	2.619E-3	-9.320E-4	-2.832E-2	-2.862E-2	-2.993E-2	-3.693E-2	-3.227E-2	-6.421E-2	-6.265E-2	-2.826E-2
N° 16 (OFF1)	---	1.393E-3	1.188E-3	-2.713E-2	-2.759E-2	-2.981E-2	-4.106E-2	-3.135E-2	-6.523E-2	-5.495E-2	-2.788E-2
Average (OFF1)	---	1.313E-3	3.031E-3	-2.741E-2	-2.367E-2	-2.827E-2	-4.067E-2	-3.376E-2	-6.566E-2	-5.182E-2	-2.375E-2
σ (OFF1)	---	2.368E-3	1.314E-3	1.714E-3	1.078E-3	2.304E-3	3.782E-3	2.050E-3	7.844E-3	4.071E-3	3.037E-3
Average+3 σ (OFF1)	---	8.417E-3	6.973E-3	-2.227E-2	-2.044E-2	-2.136E-2	-2.932E-2	-2.761E-2	-4.213E-2	-3.961E-2	-1.464E-2
Average-3σ (OFF1)	---	-5.791E-3	-9.106E-4	-3.255E-2	-2.691E-2	-3.518E-2	-5.201E-2	-3.991E-2	-8.919E-2	-6.403E-2	-3.285E-2
Average (Bias1)	---	1.739E-3	1.985E-3	-2.738E-2	-2.613E-2	-2.702E-2	-3.998E-2	-3.153E-2	-5.844E-2	-6.399E-2	-2.668E-2
σ (Bias1)	---	8.581E-4	2.056E-3	6.755E-4	1.582E-3	1.157E-3	8.725E-4	1.181E-3	9.897E-4	1.997E-2	1.648E-3
Average+3 σ (Bias1)	---	4.314E-3	8.154E-3	-2.535E-2	-2.138E-2	-2.355E-2	-3.737E-2	-2.798E-2	-5.547E-2	-4.083E-3	-2.173E-2
Average-3σ (Bias1)	---	-8.352E-4	-4.184E-3	-2.940E-2	-3.087E-2	-3.049E-2	-4.260E-2	-3.507E-2	-6.141E-2	-1.239E-1	-3.162E-2
Average (Bias2)	---	2.867E-3	-2.176E-4	-2.854E-2	-2.909E-2	-2.974E-2	-4.017E-2	-3.266E-2	-6.411E-2	-5.955E-2	-2.861E-2
σ (Bias2)	---	1.275E-3	9.237E-4	9.615E-4	1.198E-3	1.072E-3	2.185E-3	1.553E-3	9.954E-4	2.964E-3	1.130E-3
Average+3 σ (Bias2)	---	6.694E-3	2.554E-3	-2.566E-2	-2.550E-2	-2.652E-2	-3.362E-2	-2.800E-2	-6.113E-2	-5.066E-2	-2.522E-2
Average-3σ (Bias2)	---	-9.592E-4	-2.989E-3	-3.143E-2	-3.269E-2	-3.295E-2	-4.673E-2	-3.732E-2	-6.710E-2	-6.844E-2	-3.200E-2

4. VOH module 2

Ta = 25°C; Ioh = -4 mA



VOH, Module 2 . (V) **Min = 2.4**

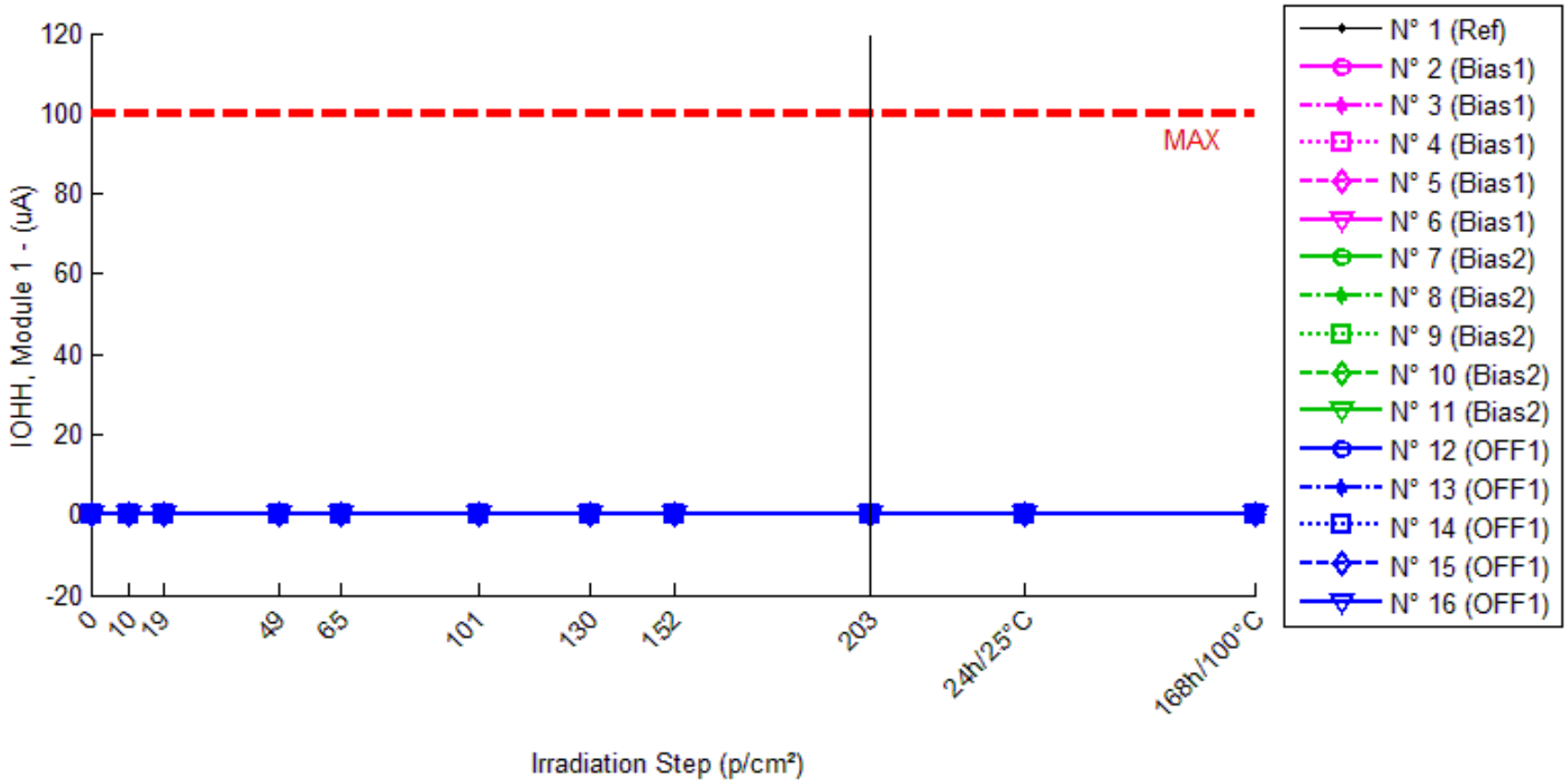
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	3.600	3.601	3.601	3.572	3.574	3.575	3.560	3.572	3.552	3.547	3.574
N° 2 (Bias1)	3.606	3.604	3.608	3.579	3.579	3.580	3.550	3.575	3.536	3.553	3.580
N° 3 (Bias1)	3.588	3.588	3.590	3.561	3.562	3.561	3.545	3.554	3.519	3.533	3.560
N° 4 (Bias1)	3.607	3.609	3.612	3.582	3.583	3.583	3.568	3.576	3.546	3.556	3.582
N° 5 (Bias1)	3.582	3.588	3.589	3.561	3.559	3.555	3.546	3.553	3.525	3.531	3.560
N° 6 (Bias1)	3.618	3.620	3.622	3.596	3.593	3.592	3.581	3.587	3.561	3.563	3.587
N° 7 (Bias2)	3.605	3.608	3.610	3.581	3.580	3.581	3.569	3.577	3.551	3.551	3.579
N° 8 (Bias2)	3.615	3.616	3.619	3.590	3.588	3.589	3.577	3.586	3.558	3.562	3.589
N° 9 (Bias2)	3.601	3.603	3.604	3.576	3.575	3.575	3.564	3.575	3.544	3.550	3.577
N° 10 (Bias2)	3.553	3.552	3.553	3.525	3.525	3.525	3.511	3.523	3.492	3.499	3.519
N° 11 (Bias2)	3.624	3.605	3.626	3.599	3.598	3.579	3.585	3.597	3.566	3.569	3.595
N° 12 (OFF1)	3.604	3.604	3.604	3.576	3.570	3.572	3.561	3.572	3.537	3.542	3.573
N° 13 (OFF1)	3.605	3.605	3.605	3.578	3.574	3.576	3.564	3.575	3.537	3.545	3.575
N° 14 (OFF1)	3.530	3.529	3.529	3.502	3.499	3.500	3.485	3.497	3.460	3.466	3.499
N° 15 (OFF1)	3.624	3.624	3.625	3.597	3.596	3.596	3.583	3.595	3.556	3.568	3.597
N° 16 (OFF1)	3.609	3.608	3.609	3.582	3.579	3.579	3.567	3.579	3.540	3.550	3.580

Delta [VOH, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	7.860E-4	1.168E-3	-2.842E-2	-2.610E-2	-2.477E-2	-4.007E-2	-2.768E-2	-4.814E-2	-5.352E-2	-2.635E-2
N° 2 (Bias1)	---	-2.295E-3	2.084E-3	-2.715E-2	-2.693E-2	-2.643E-2	-5.567E-2	-3.118E-2	-6.964E-2	-5.316E-2	-2.633E-2
N° 3 (Bias1)	---	-7.000E-5	2.232E-3	-2.690E-2	-2.645E-2	-2.751E-2	-4.272E-2	-3.425E-2	-6.860E-2	-5.551E-2	-2.766E-2
N° 4 (Bias1)	---	1.967E-3	5.088E-3	-2.463E-2	-2.355E-2	-2.379E-2	-3.898E-2	-3.056E-2	-6.071E-2	-5.052E-2	-2.475E-2
N° 5 (Bias1)	---	5.467E-3	7.375E-3	-2.133E-2	-2.266E-2	-2.716E-2	-3.650E-2	-2.953E-2	-5.756E-2	-5.093E-2	-2.213E-2
N° 6 (Bias1)	---	1.820E-3	4.255E-3	-2.150E-2	-2.502E-2	-2.595E-2	-3.627E-2	-3.048E-2	-5.670E-2	-5.445E-2	-3.062E-2
N° 7 (Bias2)	---	3.013E-3	5.074E-3	-2.321E-2	-2.480E-2	-2.316E-2	-3.550E-2	-2.734E-2	-5.390E-2	-5.390E-2	-2.510E-2
N° 8 (Bias2)	---	1.665E-3	4.058E-3	-2.415E-2	-2.671E-2	-2.517E-2	-3.800E-2	-2.877E-2	-5.640E-2	-5.276E-2	-2.541E-2
N° 9 (Bias2)	---	1.462E-3	2.925E-3	-2.506E-2	-2.606E-2	-2.616E-2	-3.755E-2	-2.629E-2	-5.764E-2	-5.077E-2	-2.389E-2
N° 10 (Bias2)	---	-9.270E-4	1.790E-4	-2.780E-2	-2.809E-2	-2.729E-2	-4.182E-2	-2.945E-2	-6.081E-2	-5.404E-2	-3.342E-2
N° 11 (Bias2)	---	-1.901E-2	2.062E-3	-2.541E-2	-2.631E-2	-4.542E-2	-3.935E-2	-2.719E-2	-5.869E-2	-5.561E-2	-2.917E-2
N° 12 (OFF1)	---	2.170E-4	7.890E-4	-2.755E-2	-3.310E-2	-3.185E-2	-4.223E-2	-3.124E-2	-6.614E-2	-6.140E-2	-3.036E-2
N° 13 (OFF1)	---	2.860E-4	-8.400E-5	-2.707E-2	-3.083E-2	-2.960E-2	-4.147E-2	-3.041E-2	-6.769E-2	-6.009E-2	-2.975E-2
N° 14 (OFF1)	---	-1.294E-3	-9.500E-4	-2.843E-2	-3.124E-2	-3.049E-2	-4.552E-2	-3.312E-2	-7.058E-2	-6.441E-2	-3.115E-2
N° 15 (OFF1)	---	-2.480E-4	7.060E-4	-2.666E-2	-2.785E-2	-2.848E-2	-4.105E-2	-2.897E-2	-6.775E-2	-5.648E-2	-2.715E-2
N° 16 (OFF1)	---	-5.580E-4	-1.300E-5	-2.723E-2	-2.952E-2	-2.962E-2	-4.230E-2	-3.020E-2	-6.859E-2	-5.847E-2	-2.857E-2
Average (OFF1)	---	1.378E-3	4.207E-3	-2.430E-2	-2.492E-2	-2.617E-2	-4.203E-2	-3.120E-2	-6.264E-2	-5.291E-2	-2.630E-2
σ (OFF1)	---	2.866E-3	2.192E-3	2.813E-3	1.830E-3	1.461E-3	8.056E-3	1.807E-3	6.111E-3	2.171E-3	3.175E-3
Average+3 σ (OFF1)	---	9.975E-3	1.078E-2	-1.586E-2	-1.943E-2	-2.178E-2	-1.786E-2	-2.578E-2	-4.431E-2	-4.640E-2	-1.677E-2
Average-3σ (OFF1)	---	-7.219E-3	-2.370E-3	-3.274E-2	-3.041E-2	-3.055E-2	-6.620E-2	-3.662E-2	-8.098E-2	-5.943E-2	-3.582E-2
Average (Bias1)	---	-2.759E-3	2.860E-3	-2.513E-2	-2.639E-2	-2.944E-2	-3.844E-2	-2.781E-2	-5.749E-2	-5.342E-2	-2.740E-2
σ (Bias1)	---	9.193E-3	1.882E-3	1.723E-3	1.186E-3	9.062E-3	2.339E-3	1.280E-3	2.578E-3	1.794E-3	3.903E-3
Average+3 σ (Bias1)	---	2.482E-2	8.505E-3	-1.996E-2	-2.284E-2	-2.252E-3	-3.143E-2	-2.397E-2	-4.976E-2	-4.804E-2	-1.569E-2
Average-3σ (Bias1)	---	-3.034E-2	-2.786E-3	-3.030E-2	-2.995E-2	-5.663E-2	-4.546E-2	-3.165E-2	-6.523E-2	-5.880E-2	-3.911E-2
Average (Bias2)	---	-3.194E-4	8.960E-5	-2.739E-2	-3.051E-2	-3.001E-2	-4.251E-2	-3.079E-2	-6.815E-2	-6.017E-2	-2.940E-2
σ (Bias2)	---	6.454E-4	7.054E-4	6.667E-4	1.962E-3	1.252E-3	1.760E-3	1.538E-3	1.622E-3	3.000E-3	1.570E-3
Average+3 σ (Bias2)	---	1.617E-3	2.206E-3	-2.539E-2	-2.462E-2	-2.625E-2	-3.723E-2	-2.617E-2	-6.328E-2	-5.117E-2	-2.468E-2
Average-3σ (Bias2)	---	-2.256E-3	-2.027E-3	-2.939E-2	-3.639E-2	-3.376E-2	-4.779E-2	-3.540E-2	-7.302E-2	-6.917E-2	-3.411E-2

5. IOHH module 1

Ta = 25°C; Vo = 5.25 V ; Vf = 0.7 V



IOHH, Module 1 . (uA) **Max = 100.0**

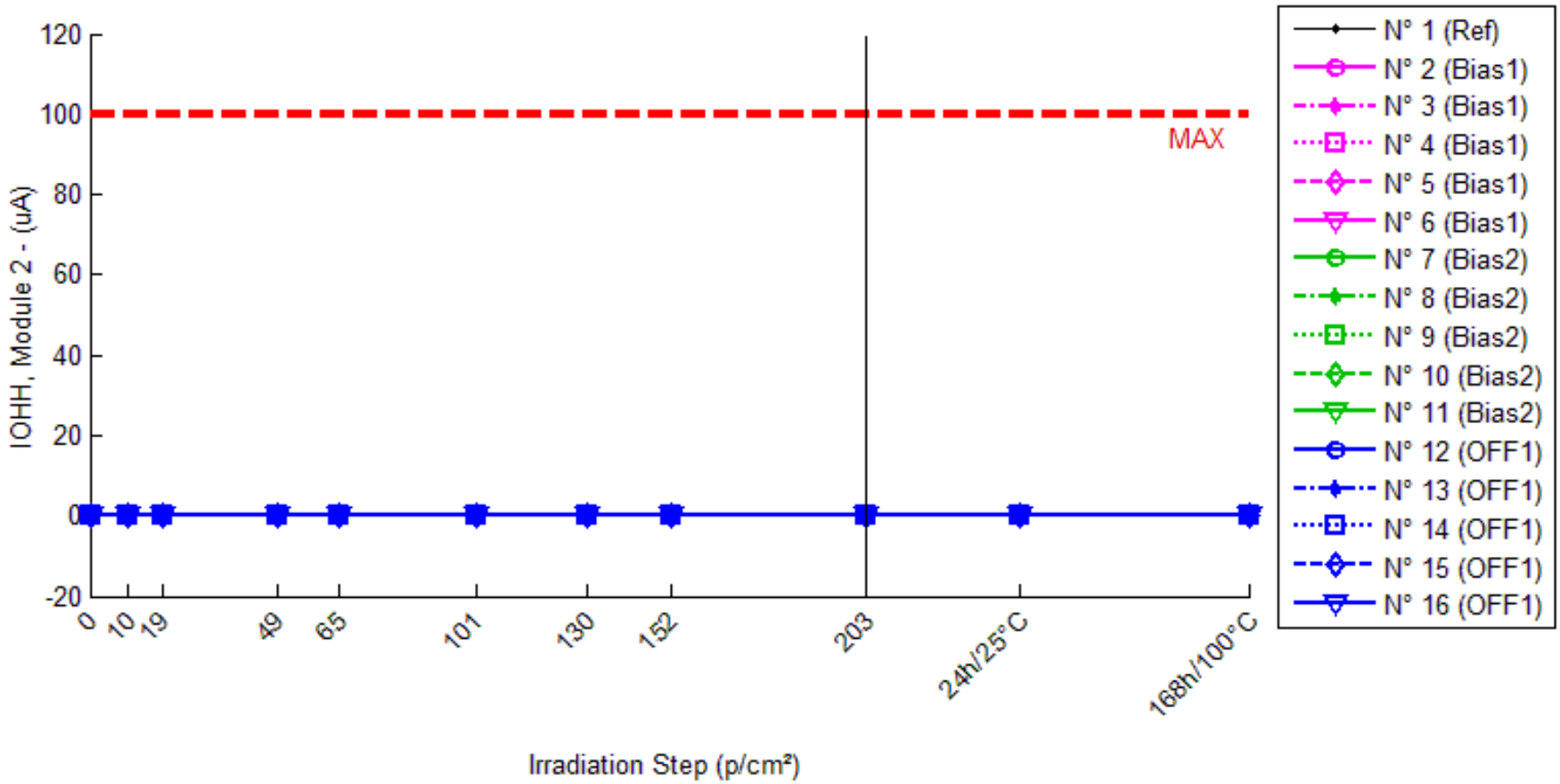
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.953E-3	2.296E-3	1.055E-3	8.966E-4	9.540E-4	9.010E-4	7.060E-4	6.970E-4	8.181E-4	8.483E-4	9.116E-4
N° 2 (Bias1)	2.528E-3	2.038E-3	1.166E-3	9.664E-4	1.110E-3	1.080E-3	6.088E-4	8.733E-4	6.897E-4	1.372E-3	1.223E-3
N° 3 (Bias1)	2.280E-3	1.905E-3	1.063E-3	8.878E-4	1.136E-3	8.973E-4	6.972E-4	8.169E-4	8.015E-4	1.134E-3	9.761E-4
N° 4 (Bias1)	2.824E-3	2.134E-3	1.328E-3	1.127E-3	1.328E-3	1.145E-3	8.968E-4	1.073E-3	1.116E-3	1.701E-3	1.243E-3
N° 5 (Bias1)	2.763E-3	1.793E-3	1.048E-3	9.242E-4	9.614E-4	8.878E-4	7.603E-4	8.121E-4	9.032E-4	1.076E-3	8.933E-4
N° 6 (Bias1)	2.739E-3	2.106E-3	1.306E-3	1.088E-3	1.250E-3	1.118E-3	9.861E-4	1.041E-3	1.105E-3	1.335E-3	9.434E-4
N° 7 (Bias2)	2.594E-3	2.183E-3	1.276E-3	1.111E-3	1.162E-3	1.142E-3	9.443E-4	1.040E-3	1.116E-3	1.323E-3	1.002E-3
N° 8 (Bias2)	2.621E-3	2.186E-3	1.383E-3	1.176E-3	1.245E-3	1.239E-3	9.614E-4	1.068E-3	1.242E-3	1.379E-3	1.070E-3
N° 9 (Bias2)	2.486E-3	2.022E-3	1.170E-3	9.797E-4	1.077E-3	1.122E-3	8.597E-4	9.485E-4	1.110E-3	1.216E-3	9.764E-4
N° 10 (Bias2)	2.128E-3	1.745E-3	9.814E-4	8.056E-4	8.863E-4	8.456E-4	7.278E-4	7.632E-4	9.451E-4	9.933E-4	6.963E-4
N° 11 (Bias2)	2.687E-3	2.239E-3	1.460E-3	1.188E-3	1.322E-3	1.308E-3	1.076E-3	1.136E-3	1.490E-3	1.278E-3	1.152E-3
N° 12 (OFF1)	2.362E-3	2.128E-3	1.174E-3	1.005E-3	9.821E-4	1.095E-3	9.160E-4	9.243E-4	1.170E-3	1.109E-3	9.282E-4
N° 13 (OFF1)	2.407E-3	2.101E-3	1.223E-3	1.066E-3	1.148E-3	1.235E-3	1.029E-3	1.018E-3	1.301E-3	1.247E-3	1.064E-3
N° 14 (OFF1)	1.816E-3	1.478E-3	7.054E-4	6.195E-4	6.598E-4	7.147E-4	5.741E-4	5.527E-4	7.155E-4	7.379E-4	5.383E-4
N° 15 (OFF1)	2.604E-3	2.274E-3	1.347E-3	1.188E-3	1.309E-3	1.344E-3	1.153E-3	1.123E-3	1.457E-3	1.370E-3	1.190E-3
N° 16 (OFF1)	2.412E-3	2.036E-3	1.191E-3	1.073E-3	1.154E-3	1.201E-3	9.782E-4	1.016E-3	1.329E-3	1.310E-3	1.055E-3

Delta [IOHH, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-6.572E-4	-1.898E-3	-2.057E-3	-1.999E-3	-2.052E-3	-2.247E-3	-2.256E-3	-2.135E-3	-2.105E-3	-2.042E-3
N° 2 (Bias1)	---	-4.900E-4	-1.363E-3	-1.562E-3	-1.419E-3	-1.448E-3	-1.920E-3	-1.655E-3	-1.839E-3	-1.157E-3	-1.305E-3
N° 3 (Bias1)	---	-3.750E-4	-1.217E-3	-1.392E-3	-1.144E-3	-1.383E-3	-1.583E-3	-1.463E-3	-1.479E-3	-1.147E-3	-1.304E-3
N° 4 (Bias1)	---	-6.897E-4	-1.496E-3	-1.696E-3	-1.496E-3	-1.679E-3	-1.927E-3	-1.751E-3	-1.707E-3	-1.123E-3	-1.581E-3
N° 5 (Bias1)	---	-9.701E-4	-1.715E-3	-1.839E-3	-1.801E-3	-1.875E-3	-2.002E-3	-1.951E-3	-1.859E-3	-1.686E-3	-1.869E-3
N° 6 (Bias1)	---	-6.325E-4	-1.433E-3	-1.651E-3	-1.489E-3	-1.621E-3	-1.753E-3	-1.698E-3	-1.634E-3	-1.404E-3	-1.795E-3
N° 7 (Bias2)	---	-4.107E-4	-1.317E-3	-1.483E-3	-1.432E-3	-1.452E-3	-1.649E-3	-1.554E-3	-1.477E-3	-1.271E-3	-1.591E-3
N° 8 (Bias2)	---	-4.348E-4	-1.238E-3	-1.445E-3	-1.376E-3	-1.382E-3	-1.660E-3	-1.553E-3	-1.379E-3	-1.242E-3	-1.551E-3
N° 9 (Bias2)	---	-4.648E-4	-1.316E-3	-1.507E-3	-1.410E-3	-1.364E-3	-1.627E-3	-1.538E-3	-1.376E-3	-1.271E-3	-1.510E-3
N° 10 (Bias2)	---	-3.839E-4	-1.147E-3	-1.323E-3	-1.242E-3	-1.283E-3	-1.401E-3	-1.365E-3	-1.183E-3	-1.135E-3	-1.432E-3
N° 11 (Bias2)	---	-4.484E-4	-1.228E-3	-1.500E-3	-1.365E-3	-1.380E-3	-1.611E-3	-1.551E-3	-1.197E-3	-1.409E-3	-1.536E-3
N° 12 (OFF1)	---	-2.340E-4	-1.188E-3	-1.357E-3	-1.380E-3	-1.267E-3	-1.446E-3	-1.438E-3	-1.192E-3	-1.253E-3	-1.434E-3
N° 13 (OFF1)	---	-3.062E-4	-1.184E-3	-1.341E-3	-1.259E-3	-1.172E-3	-1.378E-3	-1.389E-3	-1.106E-3	-1.160E-3	-1.343E-3
N° 14 (OFF1)	---	-3.378E-4	-1.111E-3	-1.197E-3	-1.156E-3	-1.101E-3	-1.242E-3	-1.263E-3	-1.101E-3	-1.078E-3	-1.278E-3
N° 15 (OFF1)	---	-3.296E-4	-1.257E-3	-1.416E-3	-1.295E-3	-1.260E-3	-1.451E-3	-1.481E-3	-1.147E-3	-1.234E-3	-1.414E-3
N° 16 (OFF1)	---	-3.756E-4	-1.220E-3	-1.338E-3	-1.258E-3	-1.210E-3	-1.433E-3	-1.396E-3	-1.082E-3	-1.102E-3	-1.357E-3
Average (OFF1)	---	-6.314E-4	-1.445E-3	-1.628E-3	-1.470E-3	-1.601E-3	-1.837E-3	-1.703E-3	-1.704E-3	-1.303E-3	-1.571E-3
σ (OFF1)	---	2.257E-4	1.831E-4	1.654E-4	2.344E-4	1.952E-4	1.687E-4	1.756E-4	1.566E-4	2.426E-4	2.652E-4
Average+3 σ (OFF1)	---	4.576E-5	-8.953E-4	-1.132E-3	-7.666E-4	-1.016E-3	-1.331E-3	-1.177E-3	-1.234E-3	-5.757E-4	-7.754E-4
Average-3σ (OFF1)	---	-1.309E-3	-1.994E-3	-2.124E-3	-2.173E-3	-2.187E-3	-2.343E-3	-2.230E-3	-2.173E-3	-2.031E-3	-2.367E-3
Average (Bias1)	---	-4.285E-4	-1.249E-3	-1.452E-3	-1.365E-3	-1.372E-3	-1.590E-3	-1.512E-3	-1.323E-3	-1.265E-3	-1.524E-3
σ (Bias1)	---	3.188E-5	7.105E-5	7.578E-5	7.359E-5	6.046E-5	1.073E-4	8.248E-5	1.277E-4	9.775E-5	5.929E-5
Average+3 σ (Bias1)	---	-3.329E-4	-1.036E-3	-1.224E-3	-1.144E-3	-1.191E-3	-1.268E-3	-1.265E-3	-9.396E-4	-9.723E-4	-1.346E-3
Average-3σ (Bias1)	---	-5.241E-4	-1.462E-3	-1.679E-3	-1.586E-3	-1.554E-3	-1.911E-3	-1.760E-3	-1.706E-3	-1.559E-3	-1.702E-3
Average (Bias2)	---	-3.166E-4	-1.192E-3	-1.330E-3	-1.270E-3	-1.202E-3	-1.390E-3	-1.393E-3	-1.126E-3	-1.165E-3	-1.365E-3
σ (Bias2)	---	5.255E-5	5.416E-5	8.072E-5	8.053E-5	6.828E-5	8.775E-5	8.161E-5	4.404E-5	7.759E-5	6.194E-5
Average+3 σ (Bias2)	---	-1.590E-4	-1.030E-3	-1.088E-3	-1.028E-3	-9.973E-4	-1.127E-3	-1.149E-3	-9.934E-4	-9.326E-4	-1.179E-3
Average-3σ (Bias2)	---	-4.743E-4	-1.355E-3	-1.572E-3	-1.511E-3	-1.407E-3	-1.653E-3	-1.638E-3	-1.258E-3	-1.398E-3	-1.551E-3

6. IOHH module 2

Ta = 25°C; Vo = 5.25 V ; Vf = 0.7 V



IOHH, Module 2 . (uA) **Max = 100.0**

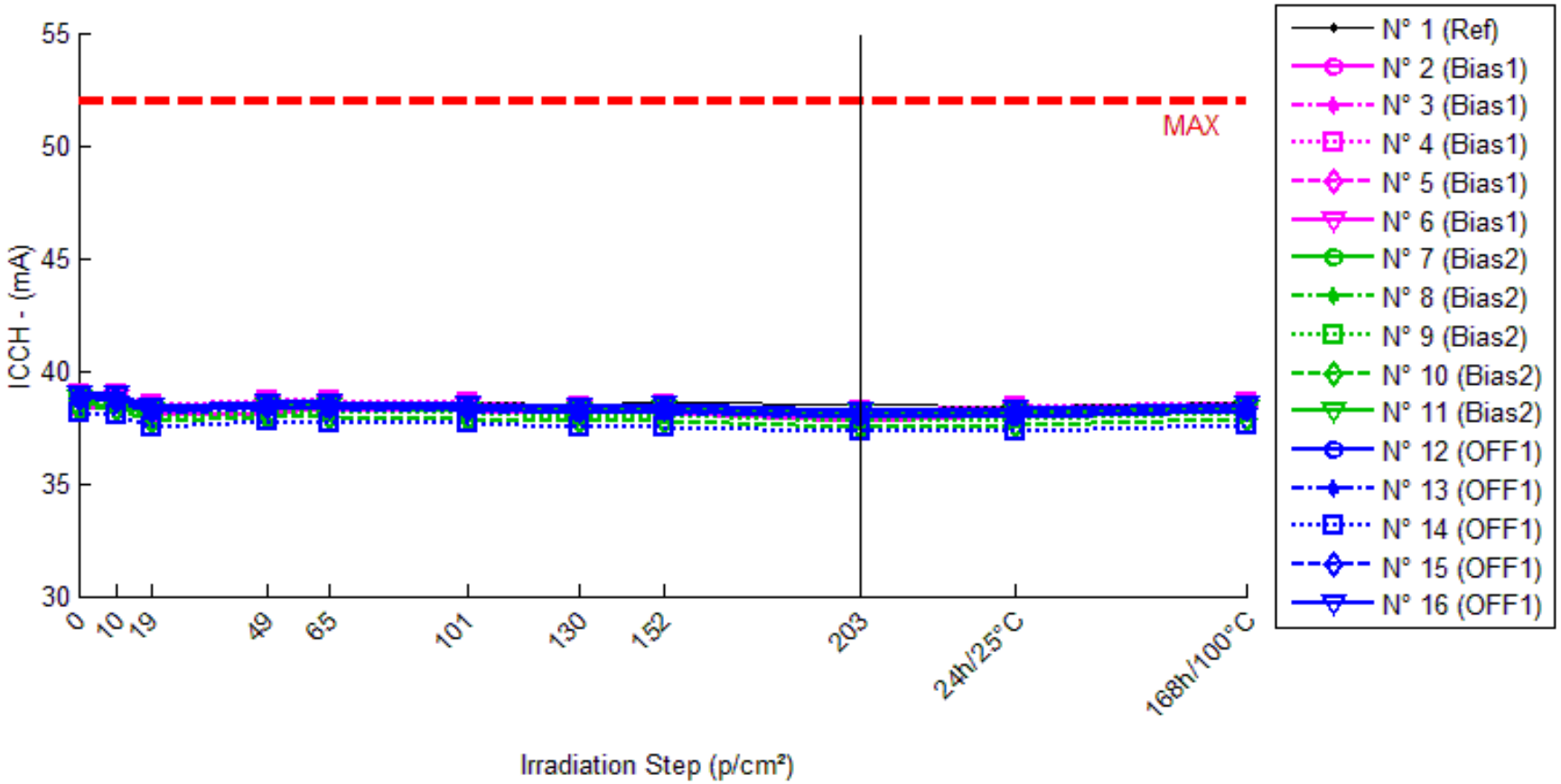
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	4.284E-3	3.552E-3	2.219E-3	2.020E-3	2.134E-3	2.024E-3	1.561E-3	1.736E-3	1.860E-3	1.853E-3	1.821E-3
N° 2 (Bias1)	4.000E-3	3.353E-3	2.305E-3	2.115E-3	2.251E-3	2.206E-3	1.467E-3	1.963E-3	1.776E-3	2.434E-3	2.087E-3
N° 3 (Bias1)	3.729E-3	3.223E-3	2.184E-3	1.999E-3	2.202E-3	2.111E-3	1.621E-3	1.905E-3	1.859E-3	2.341E-3	1.922E-3
N° 4 (Bias1)	4.467E-3	3.746E-3	2.800E-3	2.469E-3	2.790E-3	2.723E-3	2.110E-3	2.530E-3	2.601E-3	3.185E-3	2.495E-3
N° 5 (Bias1)	4.114E-3	3.115E-3	2.135E-3	1.940E-3	2.032E-3	1.747E-3	1.634E-3	1.924E-3	2.034E-3	2.379E-3	1.881E-3
N° 6 (Bias1)	4.584E-3	3.788E-3	2.837E-3	2.821E-3	2.753E-3	2.658E-3	2.352E-3	2.583E-3	2.776E-3	3.163E-3	2.076E-3
N° 7 (Bias2)	4.294E-3	3.738E-3	2.757E-3	2.454E-3	2.547E-3	2.655E-3	2.102E-3	2.521E-3	2.667E-3	2.999E-3	2.163E-3
N° 8 (Bias2)	4.693E-3	4.064E-3	3.108E-3	2.771E-3	2.788E-3	2.947E-3	2.411E-3	2.816E-3	3.015E-3	3.397E-3	2.509E-3
N° 9 (Bias2)	4.069E-3	3.480E-3	2.489E-3	2.233E-3	2.377E-3	2.362E-3	2.029E-3	2.348E-3	2.528E-3	2.840E-3	2.147E-3
N° 10 (Bias2)	3.410E-3	2.764E-3	1.814E-3	1.602E-3	1.742E-3	1.773E-3	1.435E-3	1.689E-3	1.874E-3	2.054E-3	1.254E-3
N° 11 (Bias2)	4.775E-3	4.153E-3	3.141E-3	2.829E-3	3.051E-3	2.685E-3	2.438E-3	2.895E-3	3.257E-3	2.710E-3	2.445E-3
N° 12 (OFF1)	4.179E-3	3.550E-3	2.543E-3	2.288E-3	2.177E-3	2.355E-3	2.090E-3	2.319E-3	2.611E-3	2.441E-3	2.096E-3
N° 13 (OFF1)	4.299E-3	3.699E-3	2.589E-3	2.414E-3	2.427E-3	2.655E-3	2.197E-3	2.449E-3	2.671E-3	2.688E-3	2.231E-3
N° 14 (OFF1)	3.016E-3	2.388E-3	1.462E-3	1.358E-3	1.398E-3	1.581E-3	1.214E-3	1.389E-3	1.564E-3	1.593E-3	1.214E-3
N° 15 (OFF1)	4.664E-3	3.939E-3	2.915E-3	2.659E-3	2.891E-3	3.007E-3	2.398E-3	2.741E-3	3.037E-3	3.204E-3	2.655E-3
N° 16 (OFF1)	4.411E-3	3.699E-3	2.606E-3	2.437E-3	2.572E-3	2.760E-3	2.205E-3	2.494E-3	2.745E-3	2.830E-3	2.406E-3

Delta [IOHH, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-7.318E-4	-2.064E-3	-2.263E-3	-2.150E-3	-2.259E-3	-2.722E-3	-2.547E-3	-2.423E-3	-2.431E-3	-2.463E-3
N° 2 (Bias1)	---	-6.474E-4	-1.695E-3	-1.886E-3	-1.749E-3	-1.794E-3	-2.534E-3	-2.037E-3	-2.224E-3	-1.566E-3	-1.914E-3
N° 3 (Bias1)	---	-5.068E-4	-1.545E-3	-1.730E-3	-1.527E-3	-1.619E-3	-2.108E-3	-1.825E-3	-1.870E-3	-1.389E-3	-1.807E-3
N° 4 (Bias1)	---	-7.203E-4	-1.667E-3	-1.998E-3	-1.677E-3	-1.744E-3	-2.357E-3	-1.937E-3	-1.866E-3	-1.282E-3	-1.972E-3
N° 5 (Bias1)	---	-9.985E-4	-1.979E-3	-2.174E-3	-2.082E-3	-2.367E-3	-2.480E-3	-2.189E-3	-2.080E-3	-1.735E-3	-2.233E-3
N° 6 (Bias1)	---	-7.957E-4	-1.746E-3	-1.763E-3	-1.831E-3	-1.926E-3	-2.232E-3	-2.000E-3	-1.808E-3	-1.421E-3	-2.508E-3
N° 7 (Bias2)	---	-5.558E-4	-1.537E-3	-1.840E-3	-1.747E-3	-1.639E-3	-2.192E-3	-1.773E-3	-1.626E-3	-1.295E-3	-2.131E-3
N° 8 (Bias2)	---	-6.284E-4	-1.584E-3	-1.922E-3	-1.905E-3	-1.745E-3	-2.281E-3	-1.876E-3	-1.678E-3	-1.296E-3	-2.184E-3
N° 9 (Bias2)	---	-5.891E-4	-1.580E-3	-1.836E-3	-1.693E-3	-1.707E-3	-2.041E-3	-1.722E-3	-1.542E-3	-1.230E-3	-1.922E-3
N° 10 (Bias2)	---	-6.462E-4	-1.596E-3	-1.808E-3	-1.667E-3	-1.637E-3	-1.975E-3	-1.721E-3	-1.536E-3	-1.356E-3	-2.155E-3
N° 11 (Bias2)	---	-6.218E-4	-1.634E-3	-1.946E-3	-1.724E-3	-2.089E-3	-2.337E-3	-1.880E-3	-1.518E-3	-2.065E-3	-2.329E-3
N° 12 (OFF1)	---	-6.289E-4	-1.637E-3	-1.891E-3	-2.002E-3	-1.825E-3	-2.089E-3	-1.860E-3	-1.568E-3	-1.738E-3	-2.083E-3
N° 13 (OFF1)	---	-6.000E-4	-1.710E-3	-1.885E-3	-1.872E-3	-1.645E-3	-2.102E-3	-1.850E-3	-1.628E-3	-1.611E-3	-2.068E-3
N° 14 (OFF1)	---	-6.272E-4	-1.554E-3	-1.658E-3	-1.618E-3	-1.435E-3	-1.801E-3	-1.627E-3	-1.452E-3	-1.423E-3	-1.801E-3
N° 15 (OFF1)	---	-7.243E-4	-1.749E-3	-2.005E-3	-1.773E-3	-1.656E-3	-2.265E-3	-1.923E-3	-1.627E-3	-1.460E-3	-2.009E-3
N° 16 (OFF1)	---	-7.113E-4	-1.805E-3	-1.974E-3	-1.839E-3	-1.650E-3	-2.205E-3	-1.916E-3	-1.666E-3	-1.580E-3	-2.005E-3
Average (OFF1)	---	-7.338E-4	-1.727E-3	-1.910E-3	-1.773E-3	-1.890E-3	-2.342E-3	-1.998E-3	-1.970E-3	-1.479E-3	-2.087E-3
σ (OFF1)	---	1.824E-4	1.593E-4	1.817E-4	2.055E-4	2.884E-4	1.753E-4	1.341E-4	1.759E-4	1.757E-4	2.828E-4
Average+3 σ (OFF1)	---	-1.866E-4	-1.249E-3	-1.365E-3	-1.156E-3	-1.025E-3	-1.816E-3	-1.595E-3	-1.442E-3	-9.517E-4	-1.238E-3
Average-3σ (OFF1)	---	-1.281E-3	-2.205E-3	-2.455E-3	-2.390E-3	-2.755E-3	-2.868E-3	-2.400E-3	-2.497E-3	-2.006E-3	-2.935E-3
Average (Bias1)	---	-6.082E-4	-1.586E-3	-1.870E-3	-1.747E-3	-1.764E-3	-2.165E-3	-1.794E-3	-1.580E-3	-1.448E-3	-2.144E-3
σ (Bias1)	---	3.587E-5	3.488E-5	6.021E-5	9.312E-5	1.879E-4	1.545E-4	7.922E-5	6.877E-5	3.475E-4	1.461E-4
Average+3 σ (Bias1)	---	-5.006E-4	-1.481E-3	-1.690E-3	-1.468E-3	-1.200E-3	-1.702E-3	-1.557E-3	-1.374E-3	-4.057E-4	-1.706E-3
Average-3σ (Bias1)	---	-7.159E-4	-1.691E-3	-2.051E-3	-2.027E-3	-2.327E-3	-2.629E-3	-2.032E-3	-1.786E-3	-2.491E-3	-2.583E-3
Average (Bias2)	---	-6.583E-4	-1.691E-3	-1.883E-3	-1.821E-3	-1.642E-3	-2.093E-3	-1.835E-3	-1.588E-3	-1.562E-3	-1.993E-3
σ (Bias2)	---	5.567E-5	9.794E-5	1.361E-4	1.408E-4	1.384E-4	1.785E-4	1.209E-4	8.386E-5	1.261E-4	1.129E-4
Average+3 σ (Bias2)	---	-4.913E-4	-1.397E-3	-1.474E-3	-1.398E-3	-1.227E-3	-1.557E-3	-1.472E-3	-1.336E-3	-1.184E-3	-1.655E-3
Average-3σ (Bias2)	---	-8.253E-4	-1.985E-3	-2.291E-3	-2.243E-3	-2.057E-3	-2.628E-3	-2.198E-3	-1.840E-3	-1.941E-3	-2.332E-3

7. ICCH

Ta = 25°C; Vcc = 5.25 V ; Ve = 0



ICCH . (mA) **Max = 52.0**

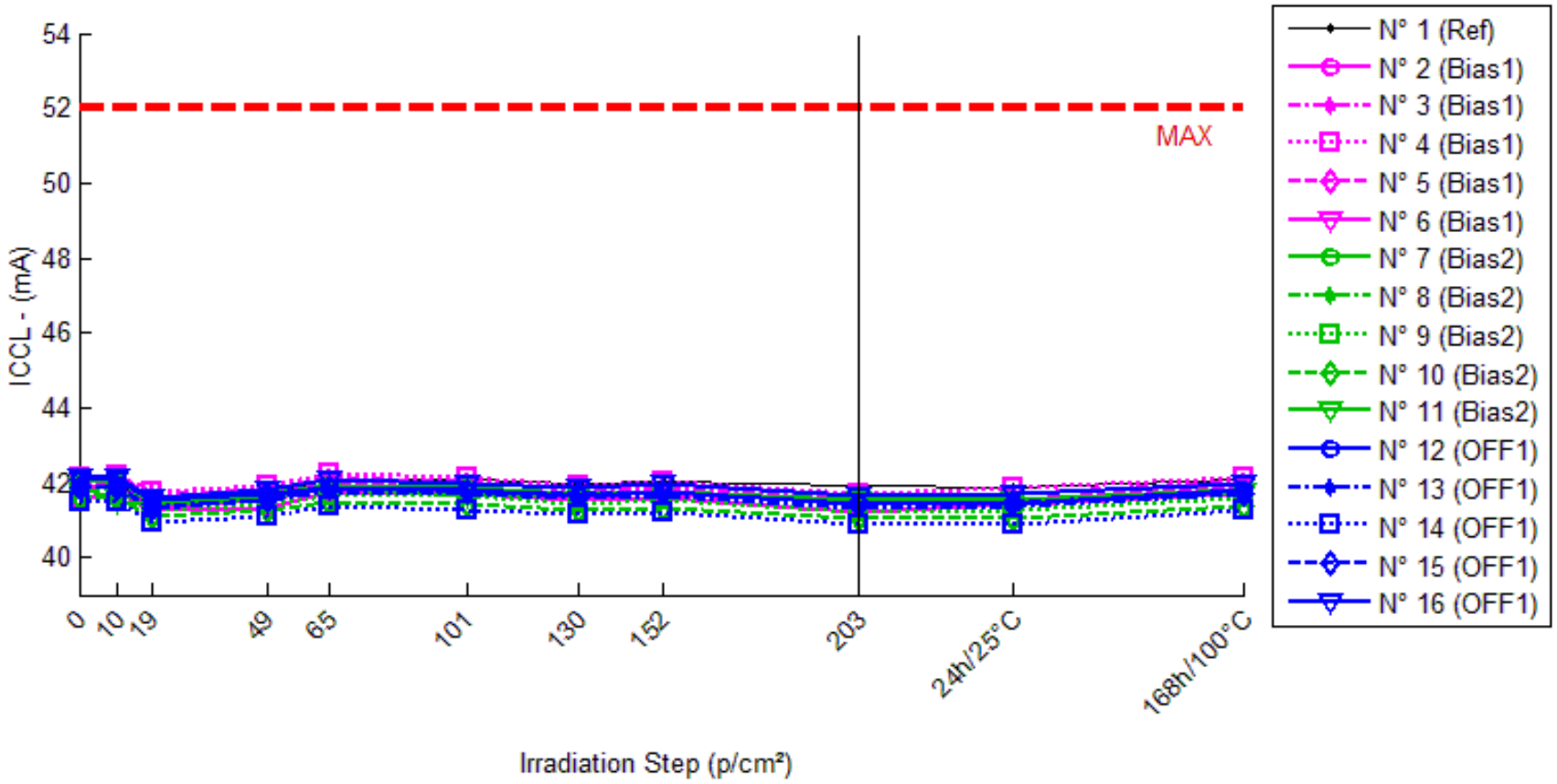
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	38.608	38.817	38.302	38.565	38.627	38.598	38.497	38.571	38.475	38.449	38.618
N° 2 (Bias1)	38.347	38.520	38.062	38.169	38.295	38.236	38.093	38.136	37.798	38.010	38.240
N° 3 (Bias1)	38.718	38.793	38.335	38.504	38.548	38.413	38.226	38.297	38.009	38.168	38.456
N° 4 (Bias1)	38.932	38.933	38.459	38.659	38.718	38.588	38.411	38.500	38.257	38.402	38.615
N° 5 (Bias1)	38.789	38.759	38.283	38.475	38.457	38.357	38.205	38.235	37.999	38.086	38.421
N° 6 (Bias1)	38.751	38.748	38.254	38.461	38.477	38.412	38.301	38.334	38.135	38.190	38.363
N° 7 (Bias2)	38.741	38.713	38.212	38.420	38.420	38.357	38.221	38.265	38.059	38.094	38.308
N° 8 (Bias2)	38.699	38.674	38.204	38.393	38.393	38.336	38.181	38.244	38.042	38.088	38.312
N° 9 (Bias2)	38.498	38.482	37.977	38.172	38.158	38.120	37.946	38.009	37.779	37.819	38.111
N° 10 (Bias2)	38.302	38.286	37.791	37.979	37.966	37.894	37.747	37.796	37.539	37.589	37.851
N° 11 (Bias2)	38.755	38.186	38.246	38.437	38.419	38.218	38.258	38.321	38.133	38.137	38.322
N° 12 (OFF1)	38.790	38.782	38.231	38.422	38.344	38.276	38.148	38.206	37.936	37.964	38.265
N° 13 (OFF1)	38.674	38.649	38.142	38.342	38.296	38.241	38.123	38.179	37.927	37.959	38.223
N° 14 (OFF1)	38.092	38.067	37.543	37.735	37.716	37.637	37.497	37.532	37.277	37.314	37.608
N° 15 (OFF1)	38.728	38.709	38.195	38.420	38.435	38.363	38.272	38.322	38.073	38.117	38.288
N° 16 (OFF1)	38.941	38.913	38.415	38.628	38.610	38.545	38.418	38.493	38.253	38.307	38.498

Delta [ICCH]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	2.094E-1	-3.056E-1	-4.286E-2	1.890E-2	-9.710E-3	-1.112E-1	-3.655E-2	-1.328E-1	-1.585E-1	1.045E-2
N° 2 (Bias1)	---	1.727E-1	-2.850E-1	-1.781E-1	-5.207E-2	-1.110E-1	-2.545E-1	-2.114E-1	-5.491E-1	-3.369E-1	-1.073E-1
N° 3 (Bias1)	---	7.528E-2	-3.825E-1	-2.140E-1	-1.696E-1	-3.053E-1	-4.921E-1	-4.213E-1	-7.087E-1	-5.496E-1	-2.614E-1
N° 4 (Bias1)	---	3.900E-4	-4.728E-1	-2.737E-1	-2.143E-1	-3.445E-1	-5.208E-1	-4.322E-1	-6.751E-1	-5.305E-1	-3.174E-1
N° 5 (Bias1)	---	-3.014E-2	-5.054E-1	-3.139E-1	-3.322E-1	-4.316E-1	-5.839E-1	-5.535E-1	-7.901E-1	-7.028E-1	-3.674E-1
N° 6 (Bias1)	---	-3.010E-3	-4.973E-1	-2.899E-1	-2.743E-1	-3.389E-1	-4.499E-1	-4.165E-1	-6.158E-1	-5.609E-1	-3.875E-1
N° 7 (Bias2)	---	-2.769E-2	-5.292E-1	-3.212E-1	-3.215E-1	-3.844E-1	-5.198E-1	-4.757E-1	-6.825E-1	-6.471E-1	-4.336E-1
N° 8 (Bias2)	---	-2.495E-2	-4.951E-1	-3.060E-1	-3.066E-1	-3.636E-1	-5.179E-1	-4.551E-1	-6.570E-1	-6.114E-1	-3.869E-1
N° 9 (Bias2)	---	-1.574E-2	-5.206E-1	-3.256E-1	-3.402E-1	-3.777E-1	-5.525E-1	-4.893E-1	-7.187E-1	-6.786E-1	-3.872E-1
N° 10 (Bias2)	---	-1.592E-2	-5.112E-1	-3.231E-1	-3.366E-1	-4.086E-1	-5.553E-1	-5.058E-1	-7.637E-1	-7.130E-1	-4.511E-1
N° 11 (Bias2)	---	-5.683E-1	-5.084E-1	-3.181E-1	-3.363E-1	-5.370E-1	-4.969E-1	-4.341E-1	-6.214E-1	-6.175E-1	-4.324E-1
N° 12 (OFF1)	---	-8.450E-3	-5.593E-1	-3.677E-1	-4.455E-1	-5.138E-1	-6.425E-1	-5.839E-1	-8.536E-1	-8.260E-1	-5.247E-1
N° 13 (OFF1)	---	-2.519E-2	-5.321E-1	-3.324E-1	-3.788E-1	-4.333E-1	-5.514E-1	-4.955E-1	-7.478E-1	-7.153E-1	-4.510E-1
N° 14 (OFF1)	---	-2.549E-2	-5.496E-1	-3.577E-1	-3.759E-1	-4.549E-1	-5.952E-1	-5.606E-1	-8.154E-1	-7.783E-1	-4.845E-1
N° 15 (OFF1)	---	-1.895E-2	-5.333E-1	-3.088E-1	-2.932E-1	-3.650E-1	-4.567E-1	-4.064E-1	-6.550E-1	-6.118E-1	-4.406E-1
N° 16 (OFF1)	---	-2.796E-2	-5.261E-1	-3.125E-1	-3.302E-1	-3.953E-1	-5.230E-1	-4.475E-1	-6.876E-1	-6.332E-1	-4.429E-1
Average (OFF1)	---	4.304E-2	-4.286E-1	-2.539E-1	-2.085E-1	-3.063E-1	-4.602E-1	-4.070E-1	-6.678E-1	-5.362E-1	-2.882E-1
σ (OFF1)	---	8.238E-2	9.398E-2	5.618E-2	1.068E-1	1.187E-1	1.249E-1	1.232E-1	9.149E-2	1.307E-1	1.122E-1
Average+3 σ (OFF1)	---	2.902E-1	-1.467E-1	-8.539E-2	1.120E-1	4.979E-2	-8.544E-2	-3.751E-2	-3.933E-1	-1.441E-1	4.854E-2
Average-3σ (OFF1)	---	-2.041E-1	-7.105E-1	-4.224E-1	-5.290E-1	-6.623E-1	-8.350E-1	-7.764E-1	-9.422E-1	-9.282E-1	-6.249E-1
Average (Bias1)	---	-1.305E-1	-5.129E-1	-3.188E-1	-3.282E-1	-4.143E-1	-5.285E-1	-4.720E-1	-6.887E-1	-6.535E-1	-4.183E-1
σ (Bias1)	---	2.448E-1	1.291E-2	7.652E-3	1.404E-2	7.050E-2	2.488E-2	2.820E-2	5.499E-2	4.266E-2	2.941E-2
Average+3 σ (Bias1)	---	6.039E-1	-4.742E-1	-2.958E-1	-2.861E-1	-2.028E-1	-4.539E-1	-3.874E-1	-5.237E-1	-5.255E-1	-3.300E-1
Average-3σ (Bias1)	---	-8.649E-1	-5.516E-1	-3.418E-1	-3.704E-1	-6.258E-1	-6.031E-1	-5.566E-1	-8.536E-1	-7.815E-1	-5.065E-1
Average (Bias2)	---	-2.121E-2	-5.401E-1	-3.358E-1	-3.647E-1	-4.325E-1	-5.538E-1	-4.988E-1	-7.519E-1	-7.129E-1	-4.687E-1
σ (Bias2)	---	7.868E-3	1.381E-2	2.638E-2	5.736E-2	5.713E-2	7.063E-2	7.455E-2	8.354E-2	9.173E-2	3.590E-2
Average+3 σ (Bias2)	---	2.397E-3	-4.986E-1	-2.567E-1	-1.926E-1	-2.611E-1	-3.419E-1	-2.751E-1	-5.013E-1	-4.378E-1	-3.610E-1
Average-3σ (Bias2)	---	-4.481E-2	-5.815E-1	-4.149E-1	-5.368E-1	-6.039E-1	-7.657E-1	-7.225E-1	-1.002E+0	-9.881E-1	-5.764E-1

8. ICCL

Ta = 25°C; Vcc = 5.25 V ; Ve = 0 ; If = 8 mA



ICCL . (mA) **Max = 52.0**

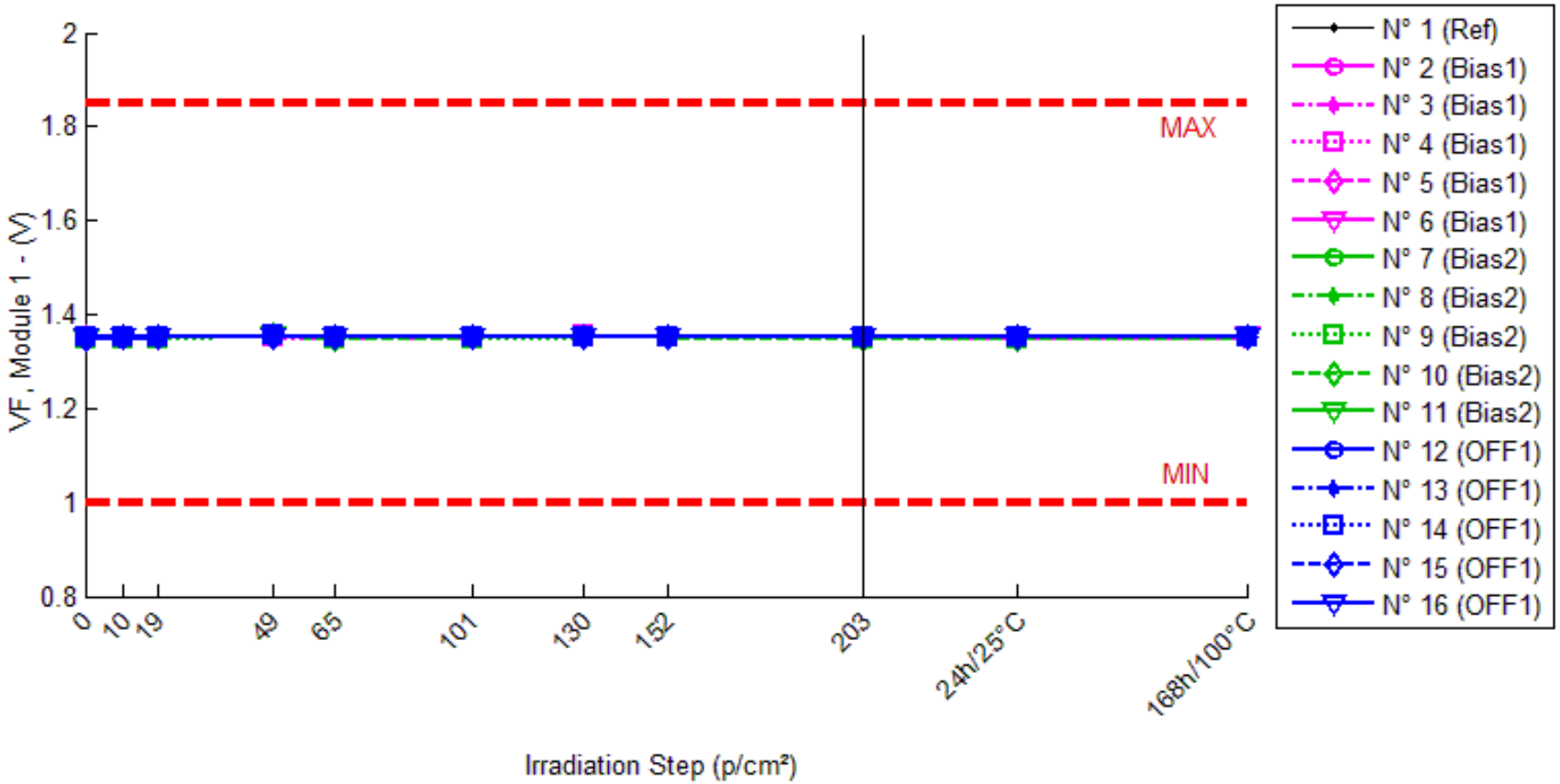
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	41.775	41.993	41.481	41.699	42.106	42.067	41.951	42.051	41.902	41.885	42.090
N° 2 (Bias1)	41.537	41.730	41.277	41.310	41.769	41.713	41.557	41.614	41.218	41.421	41.697
N° 3 (Bias1)	42.085	42.159	41.701	41.829	42.138	42.001	41.805	41.883	41.540	41.696	42.017
N° 4 (Bias1)	42.147	42.212	41.748	41.896	42.254	42.115	41.924	42.019	41.721	41.864	42.123
N° 5 (Bias1)	42.026	41.992	41.536	41.674	41.963	41.858	41.696	41.732	41.442	41.529	41.895
N° 6 (Bias1)	41.879	41.878	41.381	41.549	41.870	41.805	41.683	41.722	41.474	41.524	41.750
N° 7 (Bias2)	42.036	42.007	41.515	41.677	41.922	41.860	41.720	41.769	41.513	41.539	41.801
N° 8 (Bias2)	41.895	41.871	41.414	41.555	41.876	41.820	41.656	41.727	41.472	41.515	41.783
N° 9 (Bias2)	41.793	41.785	41.290	41.443	41.661	41.625	41.447	41.519	41.230	41.267	41.597
N° 10 (Bias2)	41.596	41.591	41.094	41.254	41.505	41.439	41.285	41.345	41.021	41.072	41.375
N° 11 (Bias2)	41.939	41.456	41.442	41.593	41.863	41.620	41.704	41.781	41.530	41.544	41.761
N° 12 (OFF1)	42.071	42.066	41.521	41.673	41.874	41.807	41.670	41.745	41.410	41.447	41.789
N° 13 (OFF1)	41.905	41.881	41.375	41.536	41.781	41.723	41.597	41.670	41.345	41.390	41.704
N° 14 (OFF1)	41.476	41.455	40.932	41.089	41.358	41.283	41.141	41.190	40.867	40.905	41.239
N° 15 (OFF1)	41.864	41.850	41.339	41.524	41.852	41.774	41.675	41.743	41.420	41.480	41.686
N° 16 (OFF1)	42.146	42.117	41.609	41.794	42.064	41.997	41.862	41.951	41.641	41.710	41.948

Delta [ICCL]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	2.175E-1	-2.943E-1	-7.655E-2	3.305E-1	2.921E-1	1.755E-1	2.764E-1	1.269E-1	1.096E-1	3.154E-1
N° 2 (Bias1)	---	1.930E-1	-2.601E-1	-2.277E-1	2.319E-1	1.760E-1	1.997E-2	7.636E-2	-3.197E-1	-1.161E-1	1.596E-1
N° 3 (Bias1)	---	7.397E-2	-3.840E-1	-2.558E-1	5.298E-2	-8.427E-2	-2.796E-1	-2.017E-1	-5.445E-1	-3.891E-1	-6.825E-2
N° 4 (Bias1)	---	6.501E-2	-3.988E-1	-2.508E-1	1.078E-1	-3.154E-2	-2.230E-1	-1.276E-1	-4.258E-1	-2.824E-1	-2.315E-2
N° 5 (Bias1)	---	-3.438E-2	-4.907E-1	-3.526E-1	-6.388E-2	-1.690E-1	-3.305E-1	-2.940E-1	-5.843E-1	-4.976E-1	-1.314E-1
N° 6 (Bias1)	---	-1.510E-3	-4.988E-1	-3.301E-1	-8.820E-3	-7.446E-2	-1.961E-1	-1.571E-1	-4.048E-1	-3.556E-1	-1.292E-1
N° 7 (Bias2)	---	-2.816E-2	-5.206E-1	-3.584E-1	-1.137E-1	-1.759E-1	-3.152E-1	-2.667E-1	-5.226E-1	-4.969E-1	-2.347E-1
N° 8 (Bias2)	---	-2.344E-2	-4.806E-1	-3.396E-1	-1.860E-2	-7.480E-2	-2.390E-1	-1.676E-1	-4.233E-1	-3.800E-1	-1.118E-1
N° 9 (Bias2)	---	-8.740E-3	-5.037E-1	-3.501E-1	-1.321E-1	-1.686E-1	-3.464E-1	-2.743E-1	-5.636E-1	-5.263E-1	-1.962E-1
N° 10 (Bias2)	---	-4.980E-3	-5.022E-1	-3.418E-1	-9.061E-2	-1.568E-1	-3.105E-1	-2.504E-1	-5.750E-1	-5.241E-1	-2.209E-1
N° 11 (Bias2)	---	-4.825E-1	-4.968E-1	-3.461E-1	-7.523E-2	-3.189E-1	-2.349E-1	-1.579E-1	-4.091E-1	-3.946E-1	-1.774E-1
N° 12 (OFF1)	---	-5.780E-3	-5.506E-1	-3.988E-1	-1.973E-1	-2.640E-1	-4.016E-1	-3.261E-1	-6.615E-1	-6.242E-1	-2.821E-1
N° 13 (OFF1)	---	-2.388E-2	-5.301E-1	-3.688E-1	-1.242E-1	-1.814E-1	-3.079E-1	-2.353E-1	-5.601E-1	-5.146E-1	-2.005E-1
N° 14 (OFF1)	---	-2.125E-2	-5.444E-1	-3.877E-1	-1.181E-1	-1.936E-1	-3.358E-1	-2.865E-1	-6.098E-1	-5.712E-1	-2.375E-1
N° 15 (OFF1)	---	-1.475E-2	-5.253E-1	-3.409E-1	-1.267E-2	-9.028E-2	-1.891E-1	-1.214E-1	-4.449E-1	-3.848E-1	-1.781E-1
N° 16 (OFF1)	---	-2.905E-2	-5.369E-1	-3.525E-1	-8.234E-2	-1.494E-1	-2.841E-1	-1.952E-1	-5.052E-1	-4.368E-1	-1.983E-1
Average (OFF1)	---	5.922E-2	-4.065E-1	-2.834E-1	6.400E-2	-3.664E-2	-2.018E-1	-1.408E-1	-4.558E-1	-3.282E-1	-3.848E-2
σ (OFF1)	---	8.746E-2	9.696E-2	5.454E-2	1.139E-1	1.289E-1	1.344E-1	1.367E-1	1.077E-1	1.416E-1	1.196E-1
Average+3 σ (OFF1)	---	3.216E-1	-1.156E-1	-1.198E-1	4.057E-1	3.500E-1	2.014E-1	2.694E-1	-1.327E-1	9.673E-2	3.202E-1
Average-3σ (OFF1)	---	-2.032E-1	-6.974E-1	-4.470E-1	-2.777E-1	-4.233E-1	-6.051E-1	-5.510E-1	-7.789E-1	-7.531E-1	-3.972E-1
Average (Bias1)	---	-1.096E-1	-5.008E-1	-3.472E-1	-8.605E-2	-1.790E-1	-2.892E-1	-2.234E-1	-4.987E-1	-4.644E-1	-1.882E-1
σ (Bias1)	---	2.087E-1	1.436E-2	7.458E-3	4.351E-2	8.808E-2	4.968E-2	5.613E-2	7.797E-2	7.151E-2	4.808E-2
Average+3 σ (Bias1)	---	5.166E-1	-4.577E-1	-3.248E-1	4.448E-2	8.525E-2	-1.401E-1	-5.496E-2	-2.648E-1	-2.498E-1	-4.396E-2
Average-3σ (Bias1)	---	-7.357E-1	-5.439E-1	-3.696E-1	-2.166E-1	-4.433E-1	-4.382E-1	-3.918E-1	-7.326E-1	-6.789E-1	-3.324E-1
Average (Bias2)	---	-1.894E-2	-5.375E-1	-3.697E-1	-1.069E-1	-1.757E-1	-3.037E-1	-2.329E-1	-5.563E-1	-5.063E-1	-2.193E-1
σ (Bias2)	---	8.982E-3	1.029E-2	2.398E-2	6.722E-2	6.351E-2	7.772E-2	7.971E-2	8.511E-2	9.717E-2	4.115E-2
Average+3 σ (Bias2)	---	8.004E-3	-5.066E-1	-2.978E-1	9.474E-2	1.480E-2	-7.054E-2	6.223E-3	-3.010E-1	-2.148E-1	-9.586E-2
Average-3σ (Bias2)	---	-4.589E-2	-5.683E-1	-4.417E-1	-3.086E-1	-3.663E-1	-5.369E-1	-4.721E-1	-8.116E-1	-7.978E-1	-3.428E-1

9. VF module 1

Ta = 25°C; If = 10 mA



VF, Module 1 . (V) **Min = 1.0 Max = 1.85**

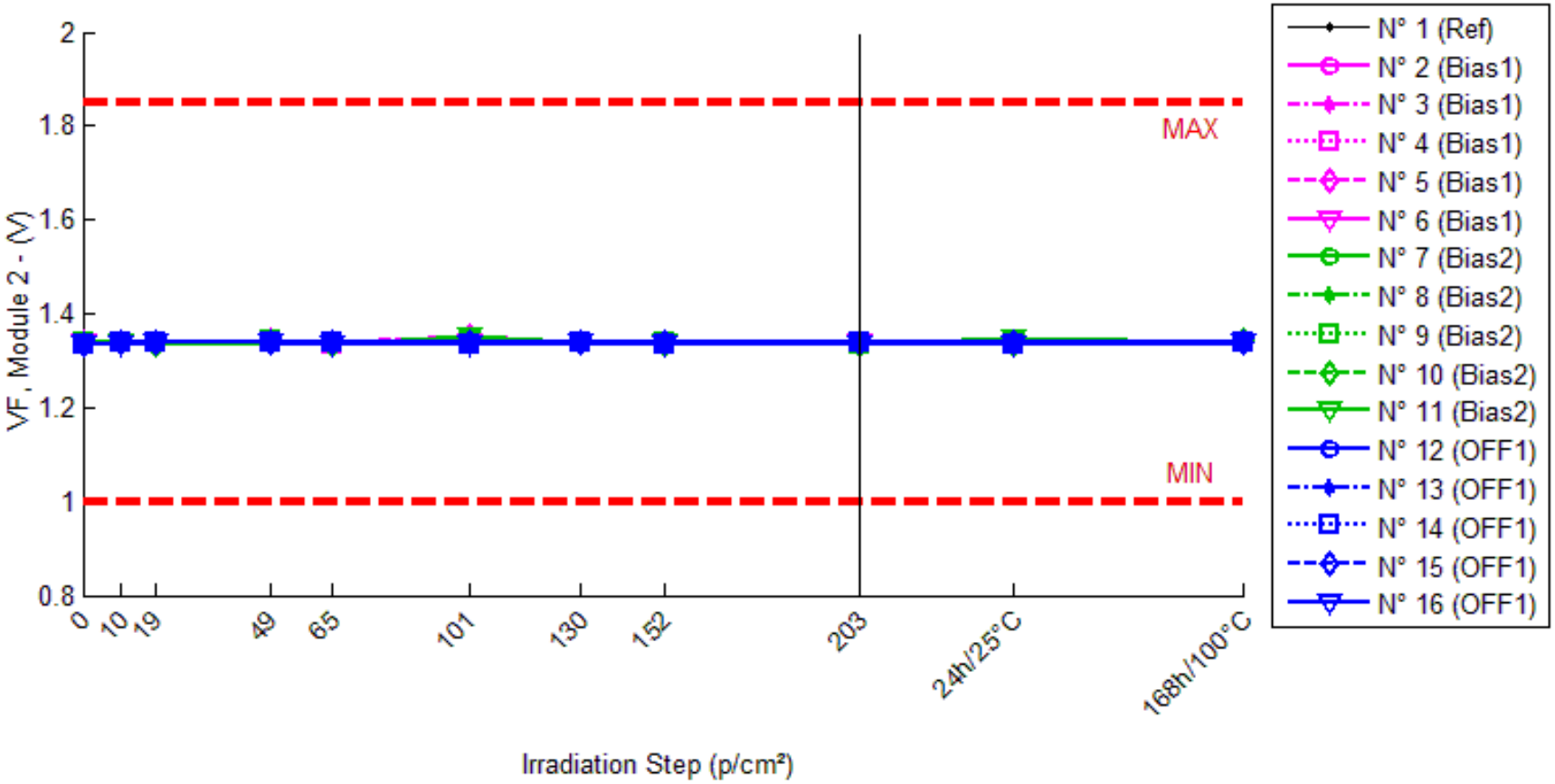
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.352	1.350	1.353	1.356	1.351	1.352	1.353	1.354	1.352	1.352	1.352
N° 2 (Bias1)	1.351	1.353	1.352	1.356	1.350	1.351	1.358	1.353	1.357	1.347	1.349
N° 3 (Bias1)	1.351	1.354	1.353	1.355	1.349	1.351	1.356	1.354	1.355	1.350	1.352
N° 4 (Bias1)	1.351	1.353	1.352	1.354	1.349	1.353	1.355	1.353	1.352	1.346	1.352
N° 5 (Bias1)	1.352	1.354	1.352	1.355	1.350	1.353	1.354	1.353	1.352	1.350	1.353
N° 6 (Bias1)	1.352	1.352	1.352	1.355	1.351	1.353	1.353	1.353	1.353	1.350	1.355
N° 7 (Bias2)	1.351	1.351	1.352	1.355	1.351	1.352	1.354	1.353	1.352	1.350	1.354
N° 8 (Bias2)	1.350	1.351	1.351	1.355	1.350	1.351	1.354	1.353	1.351	1.350	1.354
N° 9 (Bias2)	1.347	1.348	1.349	1.355	1.348	1.348	1.351	1.351	1.348	1.347	1.350
N° 10 (Bias2)	1.349	1.350	1.350	1.355	1.349	1.350	1.352	1.351	1.349	1.348	1.353
N° 11 (Bias2)	1.349	1.351	1.351	1.357	1.351	1.350	1.353	1.353	1.350	1.353	1.354
N° 12 (OFF1)	1.350	1.348	1.352	1.357	1.352	1.351	1.352	1.353	1.352	1.352	1.354
N° 13 (OFF1)	1.351	1.351	1.353	1.356	1.351	1.351	1.352	1.353	1.350	1.351	1.354
N° 14 (OFF1)	1.351	1.350	1.353	1.355	1.351	1.350	1.352	1.353	1.351	1.350	1.354
N° 15 (OFF1)	1.349	1.350	1.352	1.354	1.351	1.351	1.351	1.353	1.350	1.351	1.353
N° 16 (OFF1)	1.351	1.352	1.353	1.354	1.351	1.351	1.352	1.353	1.350	1.350	1.354

Delta [VF, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-2.281E-3	1.164E-3	3.739E-3	-1.386E-3	1.800E-5	1.513E-3	2.416E-3	-1.900E-4	-3.410E-4	1.640E-4
N° 2 (Bias1)	---	2.497E-3	1.377E-3	4.889E-3	-8.460E-4	3.130E-4	7.128E-3	2.438E-3	6.454E-3	-3.982E-3	-1.495E-3
N° 3 (Bias1)	---	3.191E-3	2.145E-3	4.314E-3	-2.291E-3	-1.500E-5	4.884E-3	3.467E-3	3.666E-3	-1.320E-3	9.850E-4
N° 4 (Bias1)	---	2.442E-3	1.461E-3	3.659E-3	-1.300E-3	2.226E-3	4.288E-3	2.542E-3	1.812E-3	-4.407E-3	1.048E-3
N° 5 (Bias1)	---	1.877E-3	3.320E-4	3.020E-3	-1.804E-3	9.600E-4	1.507E-3	1.198E-3	1.700E-5	-2.357E-3	7.640E-4
N° 6 (Bias1)	---	2.570E-4	5.470E-4	3.760E-3	-1.109E-3	1.106E-3	1.538E-3	1.693E-3	1.029E-3	-1.556E-3	3.036E-3
N° 7 (Bias2)	---	1.660E-4	1.705E-3	4.439E-3	5.320E-4	1.606E-3	3.106E-3	2.371E-3	1.705E-3	-5.790E-4	3.443E-3
N° 8 (Bias2)	---	9.700E-4	2.850E-4	4.829E-3	-1.430E-4	9.180E-4	3.408E-3	2.284E-3	6.220E-4	-5.580E-4	3.136E-3
N° 9 (Bias2)	---	1.139E-3	2.103E-3	7.292E-3	1.129E-3	1.028E-3	3.939E-3	3.603E-3	9.210E-4	-3.400E-5	2.789E-3
N° 10 (Bias2)	---	1.449E-3	1.489E-3	6.253E-3	8.380E-4	1.570E-3	3.042E-3	2.853E-3	5.870E-4	-2.220E-4	4.376E-3
N° 11 (Bias2)	---	2.037E-3	2.079E-3	7.326E-3	1.992E-3	6.020E-4	3.905E-3	3.825E-3	5.920E-4	3.558E-3	4.616E-3
N° 12 (OFF1)	---	-1.353E-3	2.242E-3	7.033E-3	2.713E-3	1.408E-3	2.799E-3	3.488E-3	2.242E-3	2.450E-3	4.345E-3
N° 13 (OFF1)	---	2.430E-4	2.031E-3	5.600E-3	7.870E-4	-6.000E-6	1.333E-3	1.973E-3	-5.520E-4	5.210E-4	2.908E-3
N° 14 (OFF1)	---	-2.420E-4	2.251E-3	4.803E-3	4.920E-4	-6.810E-4	1.439E-3	2.315E-3	5.140E-4	-3.480E-4	3.167E-3
N° 15 (OFF1)	---	4.000E-4	2.829E-3	4.757E-3	1.301E-3	1.113E-3	1.295E-3	3.255E-3	3.240E-4	1.798E-3	3.632E-3
N° 16 (OFF1)	---	1.028E-3	2.111E-3	3.837E-3	4.880E-4	4.200E-4	1.969E-3	2.668E-3	-8.820E-4	-2.250E-4	3.170E-3
Average (OFF1)	---	2.053E-3	1.172E-3	3.928E-3	-1.470E-3	9.180E-4	3.869E-3	2.268E-3	2.596E-3	-2.724E-3	8.676E-4
σ (OFF1)	---	1.107E-3	7.363E-4	7.067E-4	5.775E-4	8.638E-4	2.390E-3	8.685E-4	2.537E-3	1.404E-3	1.608E-3
Average+3 σ (OFF1)	---	5.373E-3	3.381E-3	6.048E-3	2.626E-4	3.509E-3	1.104E-2	4.873E-3	1.021E-2	1.488E-3	5.691E-3
Average-3σ (OFF1)	---	-1.268E-3	-1.036E-3	1.808E-3	-3.203E-3	-1.673E-3	-3.300E-3	-3.379E-4	-5.016E-3	-6.936E-3	-3.956E-3
Average (Bias1)	---	1.152E-3	1.532E-3	6.028E-3	8.696E-4	1.145E-3	3.480E-3	2.987E-3	8.854E-4	4.330E-4	3.672E-3
σ (Bias1)	---	6.850E-4	7.436E-4	1.351E-3	7.854E-4	4.339E-4	4.267E-4	7.024E-4	4.789E-4	1.762E-3	7.915E-4
Average+3 σ (Bias1)	---	3.207E-3	3.763E-3	1.008E-2	3.226E-3	2.447E-3	4.760E-3	5.094E-3	2.322E-3	5.719E-3	6.047E-3
Average-3σ (Bias1)	---	-9.028E-4	-6.987E-4	1.976E-3	-1.487E-3	-1.570E-4	2.200E-3	8.801E-4	-5.514E-4	-4.853E-3	1.297E-3
Average (Bias2)	---	1.520E-5	2.293E-3	5.206E-3	1.156E-3	4.508E-4	1.767E-3	2.740E-3	3.292E-4	8.392E-4	3.444E-3
σ (Bias2)	---	8.894E-4	3.136E-4	1.197E-3	9.312E-4	8.434E-4	6.373E-4	6.322E-4	1.218E-3	1.241E-3	5.671E-4
Average+3 σ (Bias2)	---	2.683E-3	3.234E-3	8.797E-3	3.950E-3	2.981E-3	3.679E-3	4.636E-3	3.984E-3	4.561E-3	5.146E-3
Average-3σ (Bias2)	---	-2.653E-3	1.352E-3	1.615E-3	-1.637E-3	-2.079E-3	-1.449E-4	8.431E-4	-3.326E-3	-2.883E-3	1.743E-3

10.VF module 2

Ta = 25°C; If = 10 mA



VF, Module 2 . (V) **Min = 1.0 Max = 1.85**

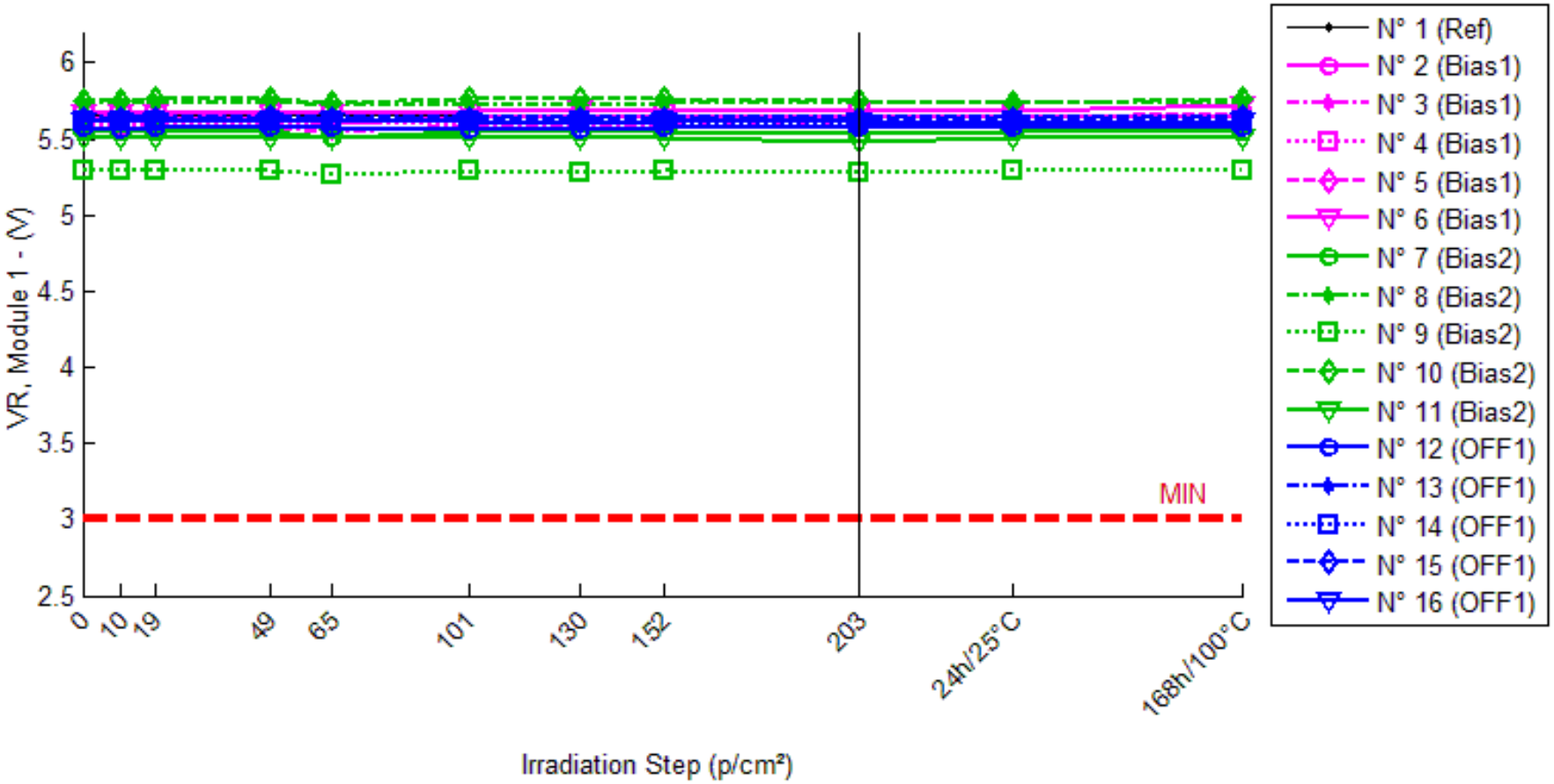
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.338	1.340	1.340	1.342	1.338	1.339	1.341	1.340	1.339	1.340	1.342
N° 2 (Bias1)	1.339	1.341	1.339	1.342	1.338	1.338	1.344	1.339	1.341	1.337	1.340
N° 3 (Bias1)	1.338	1.340	1.339	1.341	1.337	1.353	1.341	1.340	1.340	1.337	1.340
N° 4 (Bias1)	1.339	1.339	1.337	1.340	1.336	1.336	1.339	1.338	1.337	1.334	1.339
N° 5 (Bias1)	1.339	1.339	1.338	1.342	1.338	1.353	1.341	1.338	1.338	1.335	1.339
N° 6 (Bias1)	1.337	1.338	1.337	1.338	1.336	1.337	1.339	1.337	1.337	1.335	1.341
N° 7 (Bias2)	1.337	1.337	1.336	1.340	1.336	1.336	1.338	1.336	1.336	1.334	1.340
N° 8 (Bias2)	1.336	1.338	1.337	1.340	1.337	1.336	1.338	1.336	1.336	1.337	1.339
N° 9 (Bias2)	1.337	1.338	1.337	1.342	1.337	1.337	1.338	1.337	1.336	1.335	1.339
N° 10 (Bias2)	1.335	1.337	1.336	1.340	1.336	1.338	1.338	1.336	1.336	1.335	1.342
N° 11 (Bias2)	1.335	1.339	1.337	1.341	1.336	1.352	1.339	1.337	1.336	1.346	1.341
N° 12 (OFF1)	1.335	1.337	1.337	1.341	1.338	1.337	1.338	1.337	1.338	1.338	1.339
N° 13 (OFF1)	1.336	1.337	1.338	1.341	1.338	1.337	1.338	1.336	1.337	1.339	1.340
N° 14 (OFF1)	1.335	1.338	1.337	1.340	1.337	1.336	1.338	1.336	1.338	1.336	1.339
N° 15 (OFF1)	1.336	1.338	1.337	1.340	1.337	1.337	1.338	1.337	1.337	1.337	1.339
N° 16 (OFF1)	1.334	1.336	1.337	1.338	1.335	1.335	1.337	1.336	1.336	1.335	1.338

Delta [VF, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.610E-3	1.830E-3	3.481E-3	-1.150E-4	9.620E-4	3.127E-3	2.048E-3	1.006E-3	1.666E-3	3.135E-3
N° 2 (Bias1)	---	2.654E-3	6.600E-4	3.870E-3	-6.890E-4	-1.980E-4	4.956E-3	8.610E-4	2.615E-3	-1.461E-3	1.806E-3
N° 3 (Bias1)	---	2.520E-3	1.453E-3	3.617E-3	-6.550E-4	1.523E-2	3.388E-3	1.904E-3	2.507E-3	-7.500E-4	2.606E-3
N° 4 (Bias1)	---	-1.410E-4	-1.569E-3	7.630E-4	-3.136E-3	-2.318E-3	3.990E-4	-1.200E-3	-1.836E-3	-4.599E-3	-2.050E-4
N° 5 (Bias1)	---	-1.390E-4	-1.392E-3	2.095E-3	-1.683E-3	1.387E-2	1.008E-3	-1.495E-3	-1.831E-3	-4.203E-3	-1.910E-4
N° 6 (Bias1)	---	1.529E-3	3.650E-4	1.336E-3	-4.180E-4	4.140E-4	1.937E-3	3.940E-4	-1.900E-4	-2.082E-3	4.608E-3
N° 7 (Bias2)	---	7.200E-4	-5.300E-5	3.229E-3	-1.580E-4	-7.850E-4	1.787E-3	-5.240E-4	-7.550E-4	-2.328E-3	3.032E-3
N° 8 (Bias2)	---	1.221E-3	5.180E-4	3.773E-3	7.740E-4	6.000E-6	2.075E-3	9.800E-5	-2.990E-4	3.700E-4	3.050E-3
N° 9 (Bias2)	---	1.478E-3	8.210E-4	5.311E-3	2.040E-4	6.600E-4	1.643E-3	6.230E-4	-4.140E-4	-1.679E-3	2.552E-3
N° 10 (Bias2)	---	2.260E-3	1.674E-3	5.625E-3	9.070E-4	2.855E-3	3.208E-3	9.580E-4	9.170E-4	6.510E-4	6.865E-3
N° 11 (Bias2)	---	3.728E-3	1.375E-3	5.420E-3	8.730E-4	1.663E-2	3.723E-3	1.499E-3	5.870E-4	1.017E-2	5.158E-3
N° 12 (OFF1)	---	1.483E-3	1.454E-3	6.032E-3	3.077E-3	1.709E-3	2.416E-3	1.326E-3	2.207E-3	2.753E-3	4.090E-3
N° 13 (OFF1)	---	1.598E-3	1.885E-3	5.339E-3	1.982E-3	7.310E-4	2.277E-3	7.080E-4	1.135E-3	3.479E-3	4.135E-3
N° 14 (OFF1)	---	2.144E-3	2.028E-3	4.553E-3	1.447E-3	1.900E-4	3.057E-3	7.930E-4	2.122E-3	1.040E-3	3.477E-3
N° 15 (OFF1)	---	2.226E-3	1.910E-3	4.074E-3	9.960E-4	1.176E-3	2.959E-3	1.375E-3	1.424E-3	1.535E-3	3.103E-3
N° 16 (OFF1)	---	2.043E-3	2.093E-3	3.578E-3	1.014E-3	4.090E-4	2.813E-3	1.686E-3	1.267E-3	1.055E-3	3.361E-3
Average (OFF1)	---	1.285E-3	-9.660E-5	2.336E-3	-1.316E-3	5.401E-3	2.338E-3	9.280E-5	2.530E-4	-2.619E-3	1.725E-3
σ (OFF1)	---	1.371E-3	1.326E-3	1.372E-3	1.127E-3	8.430E-3	1.847E-3	1.428E-3	2.211E-3	1.699E-3	2.030E-3
Average+3 σ (OFF1)	---	5.398E-3	3.881E-3	6.451E-3	2.066E-3	3.069E-2	7.879E-3	4.376E-3	6.887E-3	2.479E-3	7.816E-3
Average-3σ (OFF1)	---	-2.829E-3	-4.075E-3	-1.779E-3	-4.698E-3	-1.989E-2	-3.203E-3	-4.190E-3	-6.381E-3	-7.717E-3	-4.366E-3
Average (Bias1)	---	1.881E-3	8.670E-4	4.672E-3	5.200E-4	3.872E-3	2.487E-3	5.308E-4	7.200E-6	1.437E-3	4.131E-3
σ (Bias1)	---	1.173E-3	6.855E-4	1.092E-3	4.739E-4	7.256E-3	9.246E-4	7.792E-4	7.099E-4	5.047E-3	1.830E-3
Average+3 σ (Bias1)	---	5.400E-3	2.923E-3	7.946E-3	1.942E-3	2.564E-2	5.261E-3	2.868E-3	2.137E-3	1.658E-2	9.622E-3
Average-3σ (Bias1)	---	-1.637E-3	-1.189E-3	1.397E-3	-9.018E-4	-1.790E-2	-2.866E-4	-1.807E-3	-2.123E-3	-1.371E-2	-1.359E-3
Average (Bias2)	---	1.899E-3	1.874E-3	4.715E-3	1.703E-3	8.430E-4	2.704E-3	1.178E-3	1.631E-3	1.972E-3	3.633E-3
σ (Bias2)	---	3.359E-4	2.497E-4	9.815E-4	8.669E-4	6.099E-4	3.416E-4	4.147E-4	4.986E-4	1.093E-3	4.583E-4
Average+3 σ (Bias2)	---	2.907E-3	2.623E-3	7.660E-3	4.304E-3	2.673E-3	3.729E-3	2.422E-3	3.127E-3	5.252E-3	5.008E-3
Average-3σ (Bias2)	---	8.911E-4	1.125E-3	1.771E-3	-8.974E-4	-9.868E-4	1.680E-3	-6.650E-5	1.353E-4	-1.308E-3	2.258E-3

11.VR module 1

Ta = 25°C; Ir = 10 µA



VR, Module 1 . (V) **Min = 3.0**

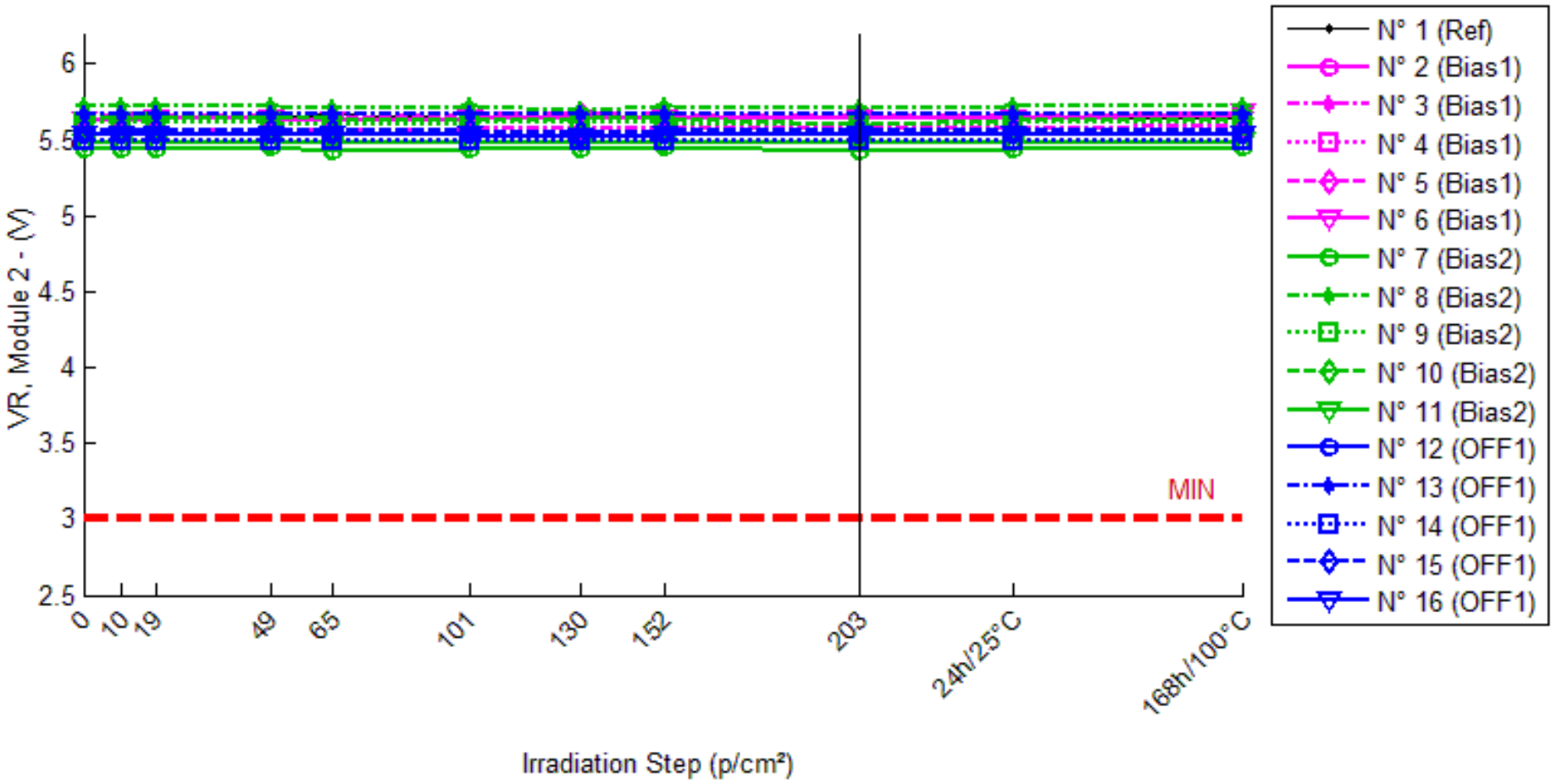
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	5.658	5.654	5.659	5.660	5.661	5.657	5.650	5.660	5.651	5.657	5.658
N° 2 (Bias1)	5.630	5.634	5.634	5.640	5.605	5.643	5.652	5.647	5.652	5.639	5.660
N° 3 (Bias1)	5.557	5.561	5.563	5.573	5.554	5.583	5.590	5.586	5.587	5.580	5.603
N° 4 (Bias1)	5.588	5.590	5.592	5.605	5.601	5.620	5.624	5.622	5.616	5.614	5.645
N° 5 (Bias1)	5.639	5.637	5.637	5.642	5.620	5.645	5.648	5.647	5.640	5.641	5.662
N° 6 (Bias1)	5.669	5.669	5.671	5.679	5.672	5.683	5.691	5.687	5.683	5.686	5.728
N° 7 (Bias2)	5.544	5.543	5.545	5.547	5.505	5.545	5.545	5.547	5.538	5.541	5.549
N° 8 (Bias2)	5.741	5.740	5.741	5.744	5.726	5.741	5.723	5.742	5.732	5.738	5.745
N° 9 (Bias2)	5.287	5.287	5.290	5.293	5.266	5.288	5.277	5.292	5.272	5.286	5.293
N° 10 (Bias2)	5.755	5.755	5.757	5.759	5.734	5.757	5.758	5.759	5.750	5.742	5.762
N° 11 (Bias2)	5.502	5.503	5.504	5.507	5.505	5.502	5.502	5.507	5.481	5.510	5.508
N° 12 (OFF1)	5.569	5.566	5.571	5.573	5.574	5.562	5.567	5.573	5.569	5.570	5.575
N° 13 (OFF1)	5.645	5.644	5.647	5.649	5.647	5.641	5.647	5.647	5.643	5.644	5.648
N° 14 (OFF1)	5.611	5.611	5.614	5.615	5.613	5.611	5.611	5.615	5.607	5.609	5.615
N° 15 (OFF1)	5.631	5.631	5.634	5.636	5.634	5.632	5.632	5.630	5.630	5.630	5.635
N° 16 (OFF1)	5.612	5.612	5.615	5.616	5.612	5.612	5.600	5.614	5.610	5.606	5.615

Delta [VR, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-3.507E-3	1.331E-3	2.617E-3	2.893E-3	-9.080E-4	-8.067E-3	2.387E-3	-6.646E-3	-3.970E-4	2.560E-4
N° 2 (Bias1)	---	3.630E-3	3.390E-3	9.455E-3	-2.514E-2	1.254E-2	2.137E-2	1.700E-2	2.218E-2	8.966E-3	2.997E-2
N° 3 (Bias1)	---	3.926E-3	5.271E-3	1.523E-2	-3.479E-3	2.600E-2	3.205E-2	2.855E-2	2.950E-2	2.269E-2	4.543E-2
N° 4 (Bias1)	---	2.256E-3	4.255E-3	1.695E-2	1.262E-2	3.153E-2	3.574E-2	3.402E-2	2.817E-2	2.572E-2	5.640E-2
N° 5 (Bias1)	---	-1.286E-3	-1.307E-3	3.323E-3	-1.870E-2	6.230E-3	9.048E-3	8.659E-3	1.069E-3	2.225E-3	2.387E-2
N° 6 (Bias1)	---	-2.410E-4	1.812E-3	1.038E-2	3.178E-3	1.371E-2	2.165E-2	1.823E-2	1.390E-2	1.665E-2	5.878E-2
N° 7 (Bias2)	---	-1.645E-3	8.950E-4	2.597E-3	-3.964E-2	3.380E-4	8.540E-4	2.560E-3	-6.318E-3	-2.903E-3	4.850E-3
N° 8 (Bias2)	---	-6.340E-4	5.000E-4	2.915E-3	-1.504E-2	5.600E-5	-1.789E-2	1.869E-3	-8.394E-3	-2.557E-3	4.532E-3
N° 9 (Bias2)	---	-3.400E-5	2.503E-3	5.319E-3	-2.162E-2	7.340E-4	-1.002E-2	4.430E-3	-1.561E-2	-1.160E-3	5.733E-3
N° 10 (Bias2)	---	3.790E-4	1.608E-3	4.413E-3	-2.079E-2	2.235E-3	3.235E-3	3.951E-3	-4.963E-3	-1.306E-2	7.462E-3
N° 11 (Bias2)	---	1.053E-3	2.235E-3	5.771E-3	2.896E-3	1.900E-5	1.220E-4	5.200E-3	-2.081E-2	8.616E-3	6.774E-3
N° 12 (OFF1)	---	-2.689E-3	2.315E-3	4.432E-3	5.363E-3	-6.776E-3	-1.569E-3	4.499E-3	-3.760E-4	1.143E-3	5.737E-3
N° 13 (OFF1)	---	-1.103E-3	2.285E-3	3.936E-3	2.304E-3	-3.817E-3	1.909E-3	2.336E-3	-1.813E-3	-8.170E-4	3.622E-3
N° 14 (OFF1)	---	-9.450E-4	2.538E-3	3.836E-3	1.702E-3	-5.910E-4	-3.540E-4	3.141E-3	-4.253E-3	-2.083E-3	3.966E-3
N° 15 (OFF1)	---	-7.400E-4	2.654E-3	4.116E-3	2.157E-3	8.440E-4	3.600E-4	-1.409E-3	-1.217E-3	-9.580E-4	3.872E-3
N° 16 (OFF1)	---	-4.520E-4	2.746E-3	3.630E-3	-9.400E-5	7.600E-5	-1.264E-2	1.720E-3	-2.527E-3	-5.912E-3	3.099E-3
Average (OFF1)	---	1.657E-3	2.684E-3	1.107E-2	-6.305E-3	1.800E-2	2.397E-2	2.129E-2	1.896E-2	1.525E-2	4.289E-2
σ (OFF1)	---	2.327E-3	2.566E-3	5.360E-3	1.553E-2	1.042E-2	1.047E-2	1.003E-2	1.175E-2	9.697E-3	1.558E-2
Average+3 σ (OFF1)	---	8.639E-3	1.038E-2	2.715E-2	4.028E-2	4.925E-2	5.539E-2	5.137E-2	5.420E-2	4.434E-2	8.962E-2
Average-3σ (OFF1)	---	-5.325E-3	-5.015E-3	-5.014E-3	-5.289E-2	-1.325E-2	-7.446E-3	-8.783E-3	-1.628E-2	-1.384E-2	-3.834E-3
Average (Bias1)	---	-1.762E-4	1.548E-3	4.203E-3	-1.884E-2	6.764E-4	-4.740E-3	3.602E-3	-1.122E-2	-2.213E-3	5.870E-3
σ (Bias1)	---	1.025E-3	8.533E-4	1.413E-3	1.526E-2	9.171E-4	8.935E-3	1.365E-3	6.753E-3	7.692E-3	1.245E-3
Average+3 σ (Bias1)	---	2.900E-3	4.108E-3	8.442E-3	2.693E-2	3.428E-3	2.206E-2	7.696E-3	9.040E-3	2.086E-2	9.605E-3
Average-3σ (Bias1)	---	-3.253E-3	-1.012E-3	-3.602E-5	-6.461E-2	-2.075E-3	-3.154E-2	-4.922E-4	-3.148E-2	-2.529E-2	2.135E-3
Average (Bias2)	---	-1.186E-3	2.508E-3	3.990E-3	2.286E-3	-2.053E-3	-2.459E-3	2.057E-3	-2.037E-3	-1.725E-3	4.059E-3
σ (Bias2)	---	8.749E-4	2.036E-4	3.031E-4	1.968E-3	3.181E-3	5.830E-3	2.199E-3	1.469E-3	2.612E-3	9.965E-4
Average+3 σ (Bias2)	---	1.439E-3	3.118E-3	4.899E-3	8.190E-3	7.491E-3	1.503E-2	8.654E-3	2.370E-3	6.112E-3	7.049E-3
Average-3σ (Bias2)	---	-3.810E-3	1.897E-3	3.081E-3	-3.617E-3	-1.160E-2	-1.995E-2	-4.540E-3	-6.444E-3	-9.562E-3	1.070E-3

12.VR module 2

Ta = 25°C; Ir = 10 µA



VR, Module 2 . (V) **Min = 3.0**

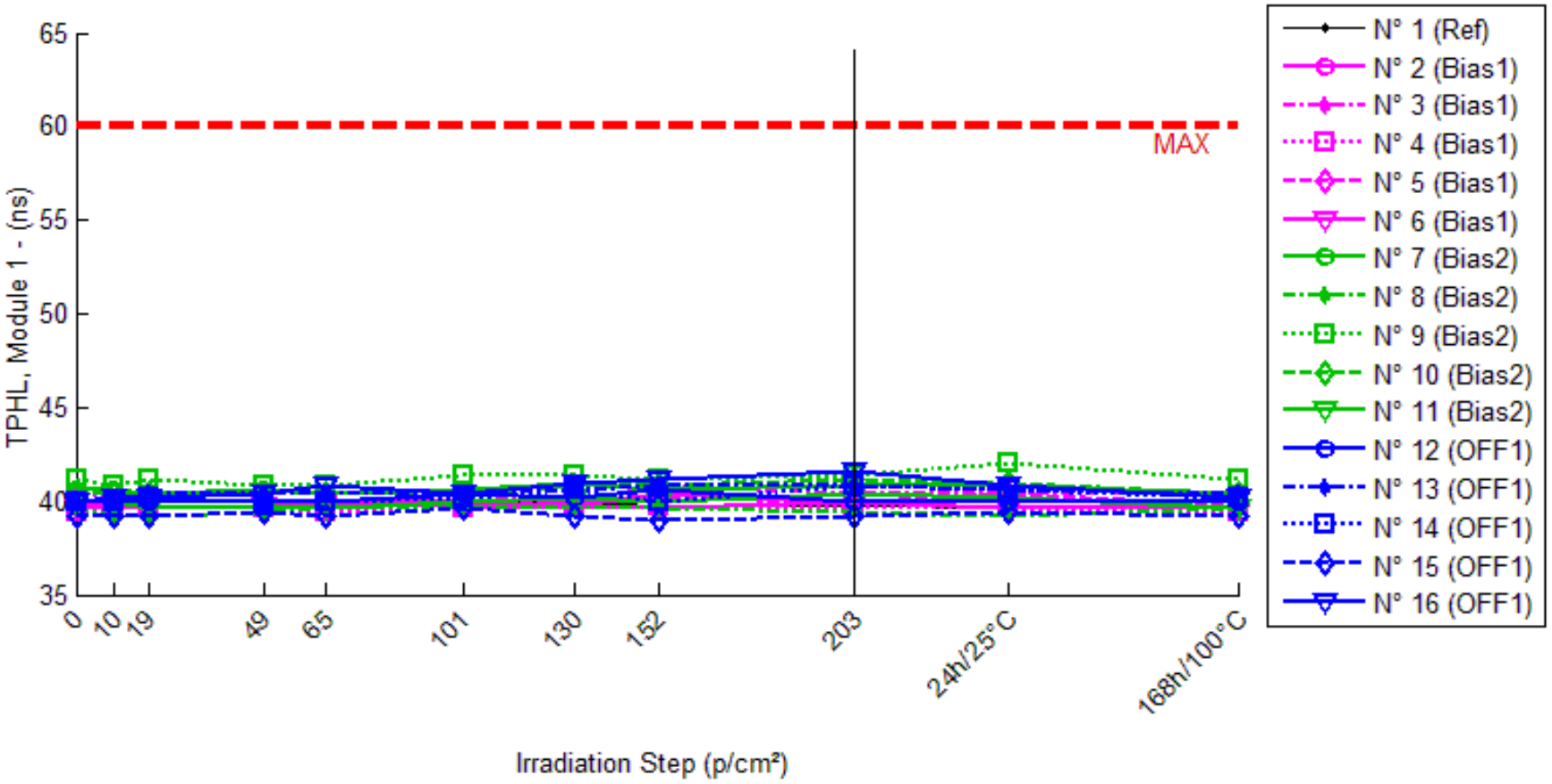
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	5.645	5.645	5.647	5.647	5.663	5.646	5.650	5.648	5.646	5.646	5.648
N° 2 (Bias1)	5.632	5.636	5.635	5.640	5.628	5.645	5.652	5.648	5.651	5.644	5.665
N° 3 (Bias1)	5.555	5.558	5.559	5.567	5.563	5.576	5.580	5.579	5.579	5.575	5.597
N° 4 (Bias1)	5.539	5.540	5.541	5.549	5.532	5.556	5.560	5.558	5.555	5.554	5.581
N° 5 (Bias1)	5.660	5.658	5.659	5.663	5.640	5.672	5.673	5.669	5.659	5.660	5.682
N° 6 (Bias1)	5.633	5.634	5.635	5.639	5.634	5.648	5.647	5.648	5.635	5.645	5.685
N° 7 (Bias2)	5.446	5.445	5.446	5.448	5.433	5.445	5.445	5.447	5.430	5.442	5.451
N° 8 (Bias2)	5.723	5.723	5.723	5.725	5.706	5.722	5.696	5.724	5.715	5.719	5.727
N° 9 (Bias2)	5.619	5.619	5.620	5.621	5.596	5.619	5.619	5.620	5.604	5.615	5.623
N° 10 (Bias2)	5.635	5.637	5.638	5.640	5.637	5.631	5.639	5.637	5.600	5.633	5.645
N° 11 (Bias2)	5.482	5.483	5.484	5.486	5.481	5.483	5.478	5.484	5.482	5.486	5.490
N° 12 (OFF1)	5.533	5.533	5.534	5.536	5.537	5.533	5.527	5.535	5.532	5.534	5.538
N° 13 (OFF1)	5.668	5.668	5.670	5.671	5.671	5.666	5.669	5.668	5.667	5.667	5.672
N° 14 (OFF1)	5.495	5.496	5.497	5.498	5.497	5.494	5.496	5.495	5.494	5.494	5.499
N° 15 (OFF1)	5.557	5.559	5.560	5.561	5.559	5.558	5.554	5.556	5.557	5.555	5.561
N° 16 (OFF1)	5.533	5.534	5.536	5.537	5.533	5.534	5.524	5.533	5.533	5.533	5.537

Delta [VR, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	7.990E-4	2.310E-3	2.800E-3	1.790E-2	1.114E-3	5.233E-3	3.294E-3	1.150E-3	1.376E-3	3.605E-3
N° 2 (Bias1)	---	4.315E-3	3.468E-3	8.448E-3	-3.512E-3	1.365E-2	1.980E-2	1.649E-2	1.880E-2	1.255E-2	3.321E-2
N° 3 (Bias1)	---	2.993E-3	4.483E-3	1.224E-2	7.560E-3	2.107E-2	2.519E-2	2.424E-2	2.454E-2	2.050E-2	4.228E-2
N° 4 (Bias1)	---	1.059E-3	1.859E-3	1.011E-2	-6.886E-3	1.679E-2	2.026E-2	1.856E-2	1.579E-2	1.454E-2	4.187E-2
N° 5 (Bias1)	---	-2.503E-3	-1.576E-3	3.114E-3	-2.063E-2	1.137E-2	1.249E-2	8.685E-3	-1.250E-3	-1.280E-4	2.162E-2
N° 6 (Bias1)	---	1.005E-3	1.936E-3	5.712E-3	5.950E-4	1.488E-2	1.400E-2	1.460E-2	1.879E-3	1.218E-2	5.189E-2
N° 7 (Bias2)	---	-1.050E-3	-4.500E-4	1.543E-3	-1.337E-2	-1.261E-3	-1.563E-3	4.540E-4	-1.656E-2	-4.260E-3	4.887E-3
N° 8 (Bias2)	---	1.620E-4	4.830E-4	2.108E-3	-1.693E-2	-3.520E-4	-2.672E-2	8.260E-4	-8.022E-3	-4.068E-3	4.473E-3
N° 9 (Bias2)	---	2.600E-5	9.870E-4	2.512E-3	-2.323E-2	3.230E-4	2.820E-4	8.550E-4	-1.472E-2	-3.742E-3	3.854E-3
N° 10 (Bias2)	---	1.540E-3	2.699E-3	4.287E-3	2.012E-3	-3.880E-3	3.884E-3	1.954E-3	-3.523E-2	-1.973E-3	1.007E-2
N° 11 (Bias2)	---	6.710E-4	1.940E-3	3.449E-3	-8.120E-4	1.114E-3	-4.282E-3	2.011E-3	-5.010E-4	3.646E-3	7.473E-3
N° 12 (OFF1)	---	2.860E-4	1.716E-3	3.375E-3	4.812E-3	1.160E-4	-5.651E-3	2.347E-3	-8.060E-4	1.185E-3	5.336E-3
N° 13 (OFF1)	---	-1.000E-6	2.351E-3	2.939E-3	3.057E-3	-1.462E-3	1.774E-3	8.140E-4	-4.160E-4	-4.100E-4	4.830E-3
N° 14 (OFF1)	---	9.540E-4	2.639E-3	3.140E-3	2.621E-3	-7.260E-4	1.459E-3	4.760E-4	-3.170E-4	-7.970E-4	4.367E-3
N° 15 (OFF1)	---	1.129E-3	2.407E-3	3.900E-3	1.093E-3	2.510E-4	-3.150E-3	-1.397E-3	-3.380E-4	-2.890E-3	3.807E-3
N° 16 (OFF1)	---	1.286E-3	3.412E-3	3.545E-3	-2.230E-4	5.440E-4	-9.279E-3	-4.120E-4	3.000E-4	-4.660E-4	4.073E-3
Average (OFF1)	---	1.374E-3	2.034E-3	7.924E-3	-4.575E-3	1.555E-2	1.835E-2	1.651E-2	1.195E-2	1.193E-2	3.817E-2
σ (OFF1)	---	2.576E-3	2.298E-3	3.594E-3	1.047E-2	3.657E-3	5.139E-3	5.674E-3	1.113E-2	7.520E-3	1.137E-2
Average+3 σ (OFF1)	---	9.101E-3	8.929E-3	1.871E-2	2.683E-2	2.652E-2	3.377E-2	3.354E-2	4.535E-2	3.449E-2	7.229E-2
Average-3σ (OFF1)	---	-6.353E-3	-4.861E-3	-2.859E-3	-3.598E-2	4.581E-3	2.931E-3	-5.071E-4	-2.145E-2	-1.063E-2	4.062E-3
Average (Bias1)	---	2.698E-4	1.132E-3	2.780E-3	-1.047E-2	-8.112E-4	-5.680E-3	1.220E-3	-1.501E-2	-2.079E-3	6.152E-3
σ (Bias1)	---	9.470E-4	1.230E-3	1.092E-3	1.075E-2	1.925E-3	1.213E-2	7.141E-4	1.295E-2	3.327E-3	2.589E-3
Average+3 σ (Bias1)	---	3.111E-3	4.822E-3	6.057E-3	2.178E-2	4.964E-3	3.071E-2	3.362E-3	2.384E-2	7.900E-3	1.392E-2
Average-3σ (Bias1)	---	-2.571E-3	-2.559E-3	-4.970E-4	-4.271E-2	-6.586E-3	-4.207E-2	-9.222E-4	-5.385E-2	-1.206E-2	-1.614E-3
Average (Bias2)	---	7.308E-4	2.505E-3	3.380E-3	2.272E-3	-2.554E-4	-2.969E-3	3.656E-4	-3.154E-4	-6.756E-4	4.483E-3
σ (Bias2)	---	5.590E-4	6.116E-4	3.707E-4	1.924E-3	8.232E-4	4.721E-3	1.401E-3	3.969E-4	1.457E-3	6.096E-4
Average+3 σ (Bias2)	---	2.408E-3	4.340E-3	4.492E-3	8.044E-3	2.214E-3	1.119E-2	4.568E-3	8.752E-4	3.696E-3	6.311E-3
Average-3σ (Bias2)	---	-9.463E-4	6.701E-4	2.268E-3	-3.500E-3	-2.725E-3	-1.713E-2	-3.837E-3	-1.506E-3	-5.047E-3	2.654E-3

13.TPHL module 1

Ta = 25°C; Vcc = 5 V ; If = 8 mA



TPHL, Module 1 . (ns) **Max = 60.0**

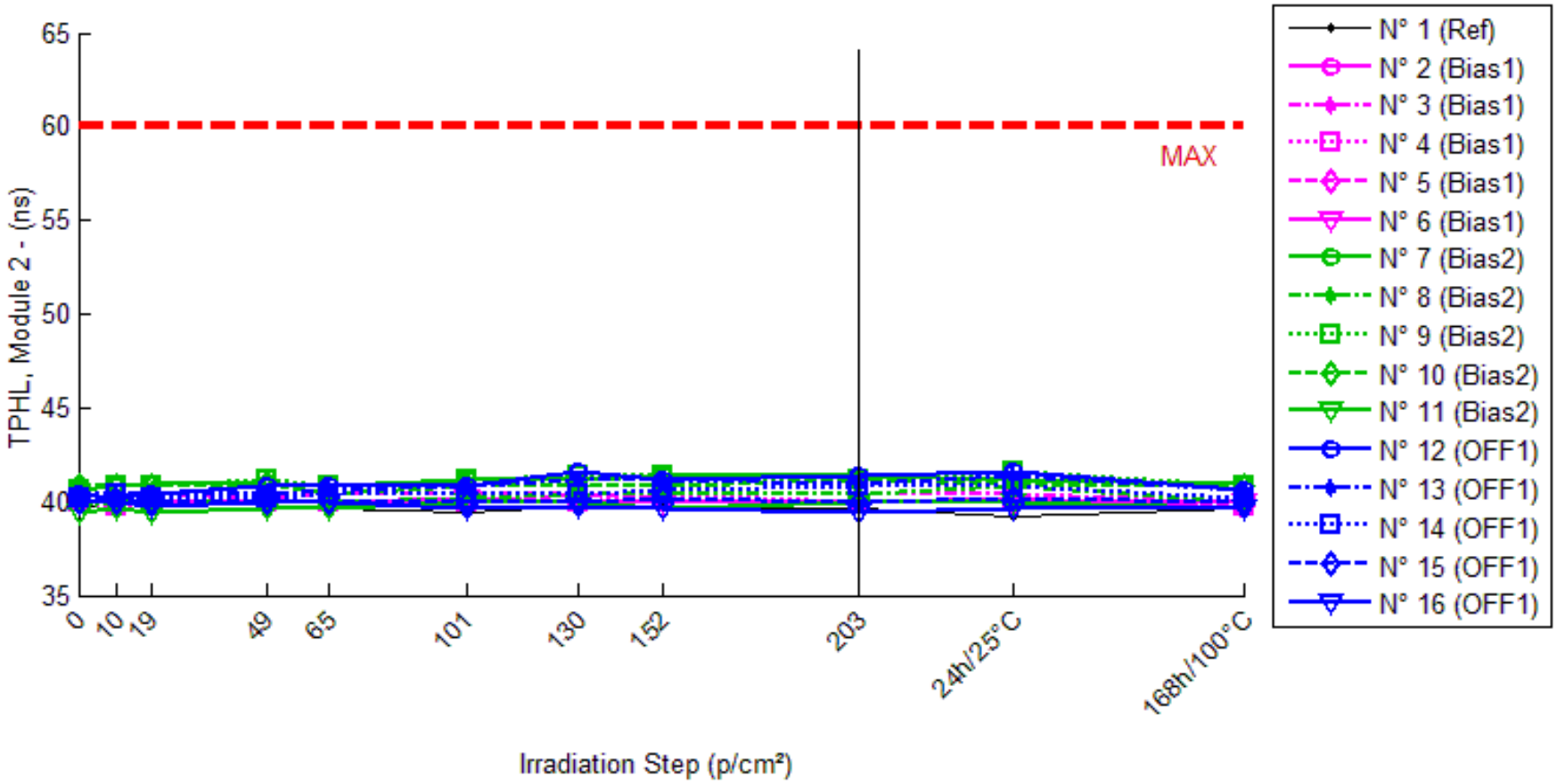
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	39.8	39.6	39.6	39.6	40.0	40.0	40.0	39.8	39.8	39.6	39.6
N° 2 (Bias1)	39.8	39.8	39.6	39.6	39.8	39.8	39.6	39.6	40.0	40.0	40.0
N° 3 (Bias1)	40.4	40.2	40.2	40.4	40.4	40.4	40.0	40.8	40.4	40.4	40.4
N° 4 (Bias1)	39.4	39.6	39.6	39.6	39.4	39.6	39.6	39.8	39.6	39.6	39.4
N° 5 (Bias1)	40.0	39.8	40.2	40.0	40.0	40.0	40.0	40.2	40.0	40.4	39.8
N° 6 (Bias1)	39.6	39.8	39.6	39.8	40.0	40.0	39.8	40.4	40.0	39.6	39.6
N° 7 (Bias2)	40.6	40.6	40.4	40.6	40.4	40.6	41.0	40.6	40.8	40.8	40.4
N° 8 (Bias2)	39.6	39.2	39.2	39.4	39.6	39.8	39.6	39.6	39.4	39.2	39.6
N° 9 (Bias2)	41.2	40.8	41.2	40.8	40.8	41.4	41.4	41.2	41.4	42.0	41.2
N° 10 (Bias2)	40.4	40.4	40.4	40.4	40.4	40.4	40.8	40.8	41.2	41.0	40.4
N° 11 (Bias2)	40.0	40.0	39.6	39.6	39.6	40.0	40.2	40.0	40.4	40.2	39.6
N° 12 (OFF1)	40.0	40.0	40.0	40.0	40.0	40.4	40.2	40.6	40.0	40.0	40.0
N° 13 (OFF1)	40.0	40.0	40.4	40.4	40.4	40.4	40.6	40.8	40.8	40.6	40.4
N° 14 (OFF1)	40.0	40.0	40.2	40.0	40.0	40.2	40.6	40.0	40.8	40.6	40.2
N° 15 (OFF1)	39.2	39.2	39.2	39.4	39.2	39.6	39.2	39.0	39.2	39.4	39.2
N° 16 (OFF1)	40.0	40.2	40.2	40.4	40.8	40.4	41.0	41.2	41.6	40.8	40.2

Delta [TPHL, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-2.000E-1	-2.000E-1	-2.000E-1	2.000E-1	2.000E-1	2.000E-1	0.000E+0	0.000E+0	-2.000E-1	-2.000E-1
N° 2 (Bias1)	---	0.000E+0	-2.000E-1	-2.000E-1	0.000E+0	0.000E+0	-2.000E-1	-2.000E-1	2.000E-1	2.000E-1	2.000E-1
N° 3 (Bias1)	---	-2.000E-1	-2.000E-1	0.000E+0	0.000E+0	0.000E+0	-4.000E-1	4.000E-1	0.000E+0	0.000E+0	0.000E+0
N° 4 (Bias1)	---	2.000E-1	2.000E-1	2.000E-1	0.000E+0	2.000E-1	2.000E-1	4.000E-1	2.000E-1	2.000E-1	0.000E+0
N° 5 (Bias1)	---	-2.000E-1	2.000E-1	0.000E+0	0.000E+0	0.000E+0	0.000E+0	2.000E-1	0.000E+0	4.000E-1	-2.000E-1
N° 6 (Bias1)	---	2.000E-1	0.000E+0	2.000E-1	4.000E-1	4.000E-1	2.000E-1	8.000E-1	4.000E-1	0.000E+0	0.000E+0
N° 7 (Bias2)	---	0.000E+0	-2.000E-1	0.000E+0	-2.000E-1	0.000E+0	4.000E-1	0.000E+0	2.000E-1	2.000E-1	-2.000E-1
N° 8 (Bias2)	---	-4.000E-1	-4.000E-1	-2.000E-1	0.000E+0	2.000E-1	0.000E+0	0.000E+0	-2.000E-1	-4.000E-1	0.000E+0
N° 9 (Bias2)	---	-4.000E-1	0.000E+0	-4.000E-1	-4.000E-1	2.000E-1	2.000E-1	0.000E+0	2.000E-1	8.000E-1	0.000E+0
N° 10 (Bias2)	---	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	4.000E-1	4.000E-1	8.000E-1	6.000E-1	0.000E+0
N° 11 (Bias2)	---	0.000E+0	-4.000E-1	-4.000E-1	-4.000E-1	0.000E+0	2.000E-1	0.000E+0	4.000E-1	2.000E-1	-4.000E-1
N° 12 (OFF1)	---	0.000E+0	0.000E+0	0.000E+0	0.000E+0	4.000E-1	2.000E-1	6.000E-1	0.000E+0	0.000E+0	0.000E+0
N° 13 (OFF1)	---	0.000E+0	4.000E-1	4.000E-1	4.000E-1	4.000E-1	6.000E-1	8.000E-1	8.000E-1	6.000E-1	4.000E-1
N° 14 (OFF1)	---	0.000E+0	2.000E-1	0.000E+0	0.000E+0	2.000E-1	6.000E-1	0.000E+0	8.000E-1	6.000E-1	2.000E-1
N° 15 (OFF1)	---	0.000E+0	0.000E+0	2.000E-1	0.000E+0	4.000E-1	0.000E+0	-2.000E-1	0.000E+0	2.000E-1	0.000E+0
N° 16 (OFF1)	---	2.000E-1	2.000E-1	4.000E-1	8.000E-1	4.000E-1	1.000E+0	1.200E+0	1.600E+0	8.000E-1	2.000E-1
Average (OFF1)	---	0.000E+0	2.842E-15	4.000E-2	8.000E-2	1.200E-1	-4.000E-2	3.200E-1	1.600E-1	1.600E-1	0.000E+0
σ (OFF1)	---	2.000E-1	2.000E-1	1.673E-1	1.789E-1	1.789E-1	2.608E-1	3.633E-1	1.673E-1	1.673E-1	1.414E-1
Average+3 σ (OFF1)	---	6.000E-1	6.000E-1	5.420E-1	6.167E-1	6.567E-1	7.423E-1	1.410E+0	6.620E-1	6.620E-1	4.243E-1
Average-3σ (OFF1)	---	-6.000E-1	-6.000E-1	-4.620E-1	-4.567E-1	-4.167E-1	-8.223E-1	-7.700E-1	-3.420E-1	-3.420E-1	-4.243E-1
Average (Bias1)	---	-1.600E-1	-2.000E-1	-2.000E-1	-2.000E-1	8.000E-2	2.400E-1	8.000E-2	2.800E-1	2.800E-1	-1.200E-1
σ (Bias1)	---	2.191E-1	2.000E-1	2.000E-1	2.000E-1	1.095E-1	1.673E-1	1.789E-1	3.633E-1	4.604E-1	1.789E-1
Average+3 σ (Bias1)	---	4.973E-1	4.000E-1	4.000E-1	4.000E-1	4.086E-1	7.420E-1	6.167E-1	1.370E+0	1.661E+0	4.167E-1
Average-3σ (Bias1)	---	-8.173E-1	-8.000E-1	-8.000E-1	-8.000E-1	-2.486E-1	-2.620E-1	-4.567E-1	-8.100E-1	-1.101E+0	-6.567E-1
Average (Bias2)	---	4.000E-2	1.600E-1	2.000E-1	2.400E-1	3.600E-1	4.800E-1	4.800E-1	6.400E-1	4.400E-1	1.600E-1
σ (Bias2)	---	8.944E-2	1.673E-1	2.000E-1	3.578E-1	8.944E-2	3.899E-1	5.762E-1	6.693E-1	3.286E-1	1.673E-1
Average+3 σ (Bias2)	---	3.083E-1	6.620E-1	8.000E-1	1.313E+0	6.283E-1	1.650E+0	2.209E+0	2.648E+0	1.426E+0	6.620E-1
Average-3σ (Bias2)	---	-2.283E-1	-3.420E-1	-4.000E-1	-8.333E-1	9.167E-2	-6.896E-1	-1.249E+0	-1.368E+0	-5.459E-1	-3.420E-1

14.TPHL module 2

Ta = 25°C; Vcc = 5 V ; If = 8 mA



TPHL, Module 2 . (ns) **Max = 60.0**

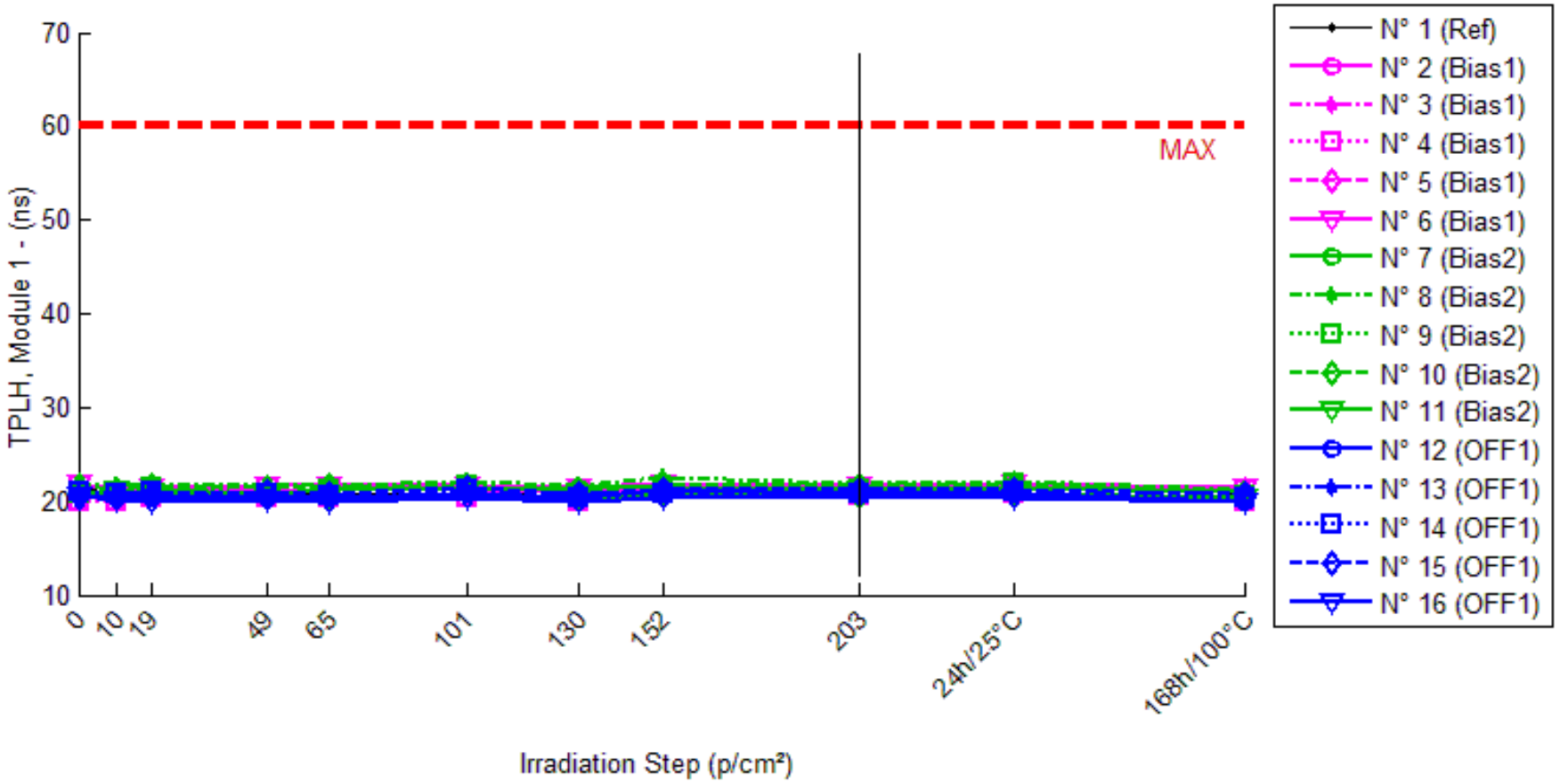
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	39.8	39.6	39.4	39.6	39.6	39.4	39.8	39.6	39.6	39.2	39.6
N° 2 (Bias1)	40.0	40.0	39.8	40.0	40.0	40.0	40.0	40.0	40.0	40.2	39.6
N° 3 (Bias1)	40.4	40.2	40.4	40.2	40.4	40.4	40.4	40.4	40.4	40.4	40.0
N° 4 (Bias1)	40.0	39.8	40.0	40.0	40.0	40.0	40.0	40.4	40.0	40.2	39.8
N° 5 (Bias1)	40.2	40.0	40.0	40.0	40.0	40.0	40.4	40.2	40.0	40.0	39.8
N° 6 (Bias1)	40.0	40.0	40.0	40.0	40.0	40.2	40.0	40.0	40.0	40.0	40.0
N° 7 (Bias2)	40.6	40.8	41.0	41.0	40.8	41.2	41.2	41.4	41.4	41.2	41.0
N° 8 (Bias2)	39.8	40.0	40.0	40.0	40.0	40.2	40.4	40.4	40.4	40.8	40.0
N° 9 (Bias2)	40.6	40.8	40.8	41.2	40.8	41.2	41.4	41.4	41.2	41.6	40.8
N° 10 (Bias2)	40.8	40.8	40.8	41.0	40.4	40.8	40.8	40.8	41.2	41.0	40.8
N° 11 (Bias2)	39.4	39.6	39.4	39.6	39.6	40.0	40.0	39.6	40.0	40.0	39.6
N° 12 (OFF1)	40.4	40.2	40.4	40.8	40.8	40.8	41.6	41.2	41.4	41.6	40.6
N° 13 (OFF1)	40.4	40.4	40.4	40.4	40.6	40.8	41.2	41.2	41.0	41.4	40.6
N° 14 (OFF1)	40.2	40.4	40.2	40.2	40.4	40.4	40.4	40.6	40.8	40.8	40.2
N° 15 (OFF1)	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.2	40.0	40.2	40.0
N° 16 (OFF1)	40.0	40.0	39.8	40.0	40.0	39.6	39.8	39.6	39.4	39.6	39.6

Delta [TPHL, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-2.000E-1	-4.000E-1	-2.000E-1	-2.000E-1	-4.000E-1	0.000E+0	-2.000E-1	-2.000E-1	-6.000E-1	-2.000E-1
N° 2 (Bias1)	---	0.000E+0	-2.000E-1	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	2.000E-1	-4.000E-1
N° 3 (Bias1)	---	-2.000E-1	0.000E+0	-2.000E-1	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	-4.000E-1
N° 4 (Bias1)	---	-2.000E-1	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	4.000E-1	0.000E+0	2.000E-1	-2.000E-1
N° 5 (Bias1)	---	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	2.000E-1	0.000E+0	-2.000E-1	-2.000E-1	-4.000E-1
N° 6 (Bias1)	---	0.000E+0	0.000E+0	0.000E+0	0.000E+0	2.000E-1	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0
N° 7 (Bias2)	---	2.000E-1	4.000E-1	4.000E-1	2.000E-1	6.000E-1	6.000E-1	8.000E-1	8.000E-1	6.000E-1	4.000E-1
N° 8 (Bias2)	---	2.000E-1	2.000E-1	2.000E-1	2.000E-1	4.000E-1	6.000E-1	6.000E-1	6.000E-1	1.000E+0	2.000E-1
N° 9 (Bias2)	---	2.000E-1	2.000E-1	6.000E-1	2.000E-1	6.000E-1	8.000E-1	8.000E-1	6.000E-1	1.000E+0	2.000E-1
N° 10 (Bias2)	---	0.000E+0	0.000E+0	2.000E-1	-4.000E-1	0.000E+0	0.000E+0	0.000E+0	4.000E-1	2.000E-1	0.000E+0
N° 11 (Bias2)	---	2.000E-1	0.000E+0	2.000E-1	2.000E-1	6.000E-1	6.000E-1	2.000E-1	6.000E-1	6.000E-1	2.000E-1
N° 12 (OFF1)	---	-2.000E-1	0.000E+0	4.000E-1	4.000E-1	4.000E-1	1.200E+0	8.000E-1	1.000E+0	1.200E+0	2.000E-1
N° 13 (OFF1)	---	0.000E+0	0.000E+0	0.000E+0	2.000E-1	4.000E-1	8.000E-1	8.000E-1	6.000E-1	1.000E+0	2.000E-1
N° 14 (OFF1)	---	2.000E-1	0.000E+0	0.000E+0	2.000E-1	2.000E-1	2.000E-1	4.000E-1	6.000E-1	6.000E-1	0.000E+0
N° 15 (OFF1)	---	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	2.000E-1	0.000E+0	2.000E-1	0.000E+0
N° 16 (OFF1)	---	0.000E+0	-2.000E-1	0.000E+0	0.000E+0	-4.000E-1	-2.000E-1	-4.000E-1	-6.000E-1	-4.000E-1	-4.000E-1
Average (OFF1)	---	-1.200E-1	-8.000E-2	-8.000E-2	-4.000E-2	0.000E+0	4.000E-2	8.000E-2	-4.000E-2	4.000E-2	-2.800E-1
σ (OFF1)	---	1.095E-1	1.095E-1	1.095E-1	8.944E-2	1.414E-1	8.944E-2	1.789E-1	8.944E-2	1.673E-1	1.789E-1
Average+3 σ (OFF1)	---	2.086E-1	2.486E-1	2.486E-1	2.283E-1	4.243E-1	3.083E-1	6.167E-1	2.283E-1	5.420E-1	2.567E-1
Average-3σ (OFF1)	---	-4.486E-1	-4.086E-1	-4.086E-1	-3.083E-1	-4.243E-1	-2.283E-1	-4.567E-1	-3.083E-1	-4.620E-1	-8.167E-1
Average (Bias1)	---	1.600E-1	1.600E-1	3.200E-1	8.000E-2	4.400E-1	5.200E-1	4.800E-1	6.000E-1	6.800E-1	2.000E-1
σ (Bias1)	---	8.944E-2	1.673E-1	1.789E-1	2.683E-1	2.608E-1	3.033E-1	3.633E-1	1.414E-1	3.347E-1	1.414E-1
Average+3 σ (Bias1)	---	4.283E-1	6.620E-1	8.567E-1	8.850E-1	1.222E+0	1.430E+0	1.570E+0	1.024E+0	1.684E+0	6.243E-1
Average-3σ (Bias1)	---	-1.083E-1	-3.420E-1	-2.167E-1	-7.250E-1	-3.423E-1	-3.899E-1	-6.100E-1	1.757E-1	-3.240E-1	-2.243E-1
Average (Bias2)	---	0.000E+0	-4.000E-2	8.000E-2	1.600E-1	1.200E-1	4.000E-1	3.600E-1	3.200E-1	5.200E-1	1.421E-15
σ (Bias2)	---	1.414E-1	8.944E-2	1.789E-1	1.673E-1	3.347E-1	5.831E-1	4.980E-1	6.261E-1	6.419E-1	2.449E-1
Average+3 σ (Bias2)	---	4.243E-1	2.283E-1	6.167E-1	6.620E-1	1.124E+0	2.149E+0	1.854E+0	2.198E+0	2.446E+0	7.348E-1
Average-3σ (Bias2)	---	-4.243E-1	-3.083E-1	-4.567E-1	-3.420E-1	-8.840E-1	-1.349E+0	-1.134E+0	-1.558E+0	-1.406E+0	-7.348E-1

15.TPLH module 1

Ta = 25°C; Vcc = 5 V ; If = 8 mA



TPLH, Module 1 . (ns) **Max = 60.0**

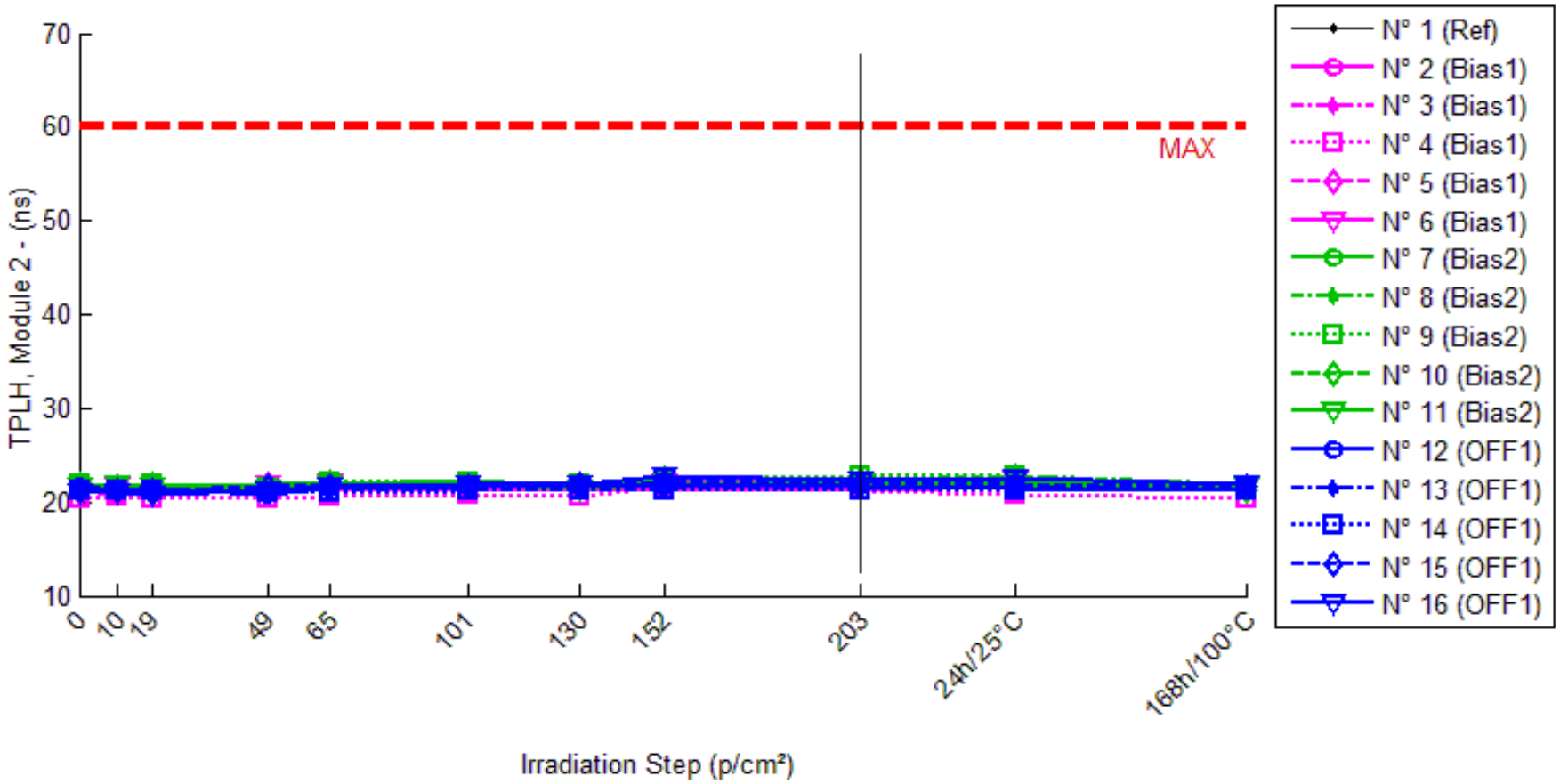
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	21.2	21.4	21.0	21.0	20.8	20.8	20.6	21.0	20.8	21.6	20.8
N° 2 (Bias1)	20.8	20.8	21.0	21.0	21.2	21.2	21.0	21.4	20.8	21.6	21.0
N° 3 (Bias1)	20.8	20.8	20.8	21.0	21.2	21.2	21.2	21.8	21.2	22.0	21.2
N° 4 (Bias1)	20.0	20.0	20.4	20.4	20.4	20.4	20.0	20.8	20.6	20.8	20.0
N° 5 (Bias1)	20.8	21.0	21.2	21.4	21.2	21.4	21.2	21.8	21.6	22.0	21.2
N° 6 (Bias1)	21.8	21.2	21.4	21.6	21.6	21.6	21.4	21.8	21.6	21.8	21.4
N° 7 (Bias2)	21.2	20.6	21.2	20.8	21.2	21.2	21.4	21.4	21.2	21.4	21.0
N° 8 (Bias2)	21.6	21.6	21.6	21.6	21.6	22.2	21.6	22.6	22.0	22.2	21.2
N° 9 (Bias2)	20.8	20.8	21.4	20.8	21.2	21.6	20.8	21.4	21.2	22.0	20.6
N° 10 (Bias2)	21.6	21.2	21.6	21.4	21.6	21.4	21.0	21.6	21.6	21.8	20.8
N° 11 (Bias2)	20.6	21.2	20.8	20.4	20.6	20.4	20.4	20.8	20.4	20.8	20.4
N° 12 (OFF1)	20.6	20.4	20.4	20.4	20.4	20.8	20.4	21.2	20.8	20.8	20.0
N° 13 (OFF1)	21.0	20.8	20.8	20.4	20.4	21.0	20.8	21.0	20.8	20.8	21.0
N° 14 (OFF1)	21.0	20.8	21.0	20.8	20.6	21.2	20.4	20.8	20.8	21.0	20.4
N° 15 (OFF1)	20.4	20.6	20.8	21.0	20.8	21.4	20.8	21.2	21.2	21.2	20.8
N° 16 (OFF1)	20.6	20.2	20.0	20.2	20.0	20.4	20.0	20.4	20.6	20.4	20.0

Delta [TPLH, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	2.000E-1	-2.000E-1	-2.000E-1	-4.000E-1	-4.000E-1	-6.000E-1	-2.000E-1	-4.000E-1	4.000E-1	-4.000E-1
N° 2 (Bias1)	---	0.000E+0	2.000E-1	2.000E-1	4.000E-1	4.000E-1	2.000E-1	6.000E-1	0.000E+0	8.000E-1	2.000E-1
N° 3 (Bias1)	---	0.000E+0	0.000E+0	2.000E-1	4.000E-1	4.000E-1	4.000E-1	1.000E+0	4.000E-1	1.200E+0	4.000E-1
N° 4 (Bias1)	---	0.000E+0	4.000E-1	4.000E-1	4.000E-1	4.000E-1	0.000E+0	8.000E-1	6.000E-1	8.000E-1	0.000E+0
N° 5 (Bias1)	---	2.000E-1	4.000E-1	6.000E-1	4.000E-1	6.000E-1	4.000E-1	1.000E+0	8.000E-1	1.200E+0	4.000E-1
N° 6 (Bias1)	---	-6.000E-1	-4.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	-4.000E-1	0.000E+0	-2.000E-1	0.000E+0	-4.000E-1
N° 7 (Bias2)	---	-6.000E-1	0.000E+0	-4.000E-1	0.000E+0	0.000E+0	2.000E-1	2.000E-1	0.000E+0	2.000E-1	-2.000E-1
N° 8 (Bias2)	---	0.000E+0	0.000E+0	0.000E+0	0.000E+0	6.000E-1	0.000E+0	1.000E+0	4.000E-1	6.000E-1	-4.000E-1
N° 9 (Bias2)	---	0.000E+0	6.000E-1	0.000E+0	4.000E-1	8.000E-1	0.000E+0	6.000E-1	4.000E-1	1.200E+0	-2.000E-1
N° 10 (Bias2)	---	-4.000E-1	0.000E+0	-2.000E-1	0.000E+0	-2.000E-1	-6.000E-1	0.000E+0	0.000E+0	2.000E-1	-8.000E-1
N° 11 (Bias2)	---	6.000E-1	2.000E-1	-2.000E-1	0.000E+0	-2.000E-1	-2.000E-1	2.000E-1	-2.000E-1	2.000E-1	-2.000E-1
N° 12 (OFF1)	---	-2.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	2.000E-1	-2.000E-1	6.000E-1	2.000E-1	2.000E-1	-6.000E-1
N° 13 (OFF1)	---	-2.000E-1	-2.000E-1	-6.000E-1	-6.000E-1	0.000E+0	-2.000E-1	0.000E+0	-2.000E-1	-2.000E-1	0.000E+0
N° 14 (OFF1)	---	-2.000E-1	0.000E+0	-2.000E-1	-4.000E-1	2.000E-1	-6.000E-1	-2.000E-1	-2.000E-1	0.000E+0	-6.000E-1
N° 15 (OFF1)	---	2.000E-1	4.000E-1	6.000E-1	4.000E-1	1.000E+0	4.000E-1	8.000E-1	8.000E-1	8.000E-1	4.000E-1
N° 16 (OFF1)	---	-4.000E-1	-6.000E-1	-4.000E-1	-6.000E-1	-2.000E-1	-6.000E-1	-2.000E-1	0.000E+0	-2.000E-1	-6.000E-1
Average (OFF1)	---	-8.000E-2	1.200E-1	2.400E-1	2.800E-1	3.200E-1	1.200E-1	6.800E-1	3.200E-1	8.000E-1	1.200E-1
σ (OFF1)	---	3.033E-1	3.347E-1	2.966E-1	2.683E-1	3.033E-1	3.347E-1	4.147E-1	4.147E-1	4.899E-1	3.347E-1
Average+3 σ (OFF1)	---	8.299E-1	1.124E+0	1.130E+0	1.085E+0	1.230E+0	1.124E+0	1.924E+0	1.564E+0	2.270E+0	1.124E+0
Average-3σ (OFF1)	---	-9.899E-1	-8.840E-1	-6.499E-1	-5.250E-1	-5.899E-1	-8.840E-1	-5.642E-1	-9.242E-1	-6.697E-1	-8.840E-1
Average (Bias1)	---	-8.000E-2	1.600E-1	-1.600E-1	8.000E-2	2.000E-1	-1.200E-1	4.000E-1	1.200E-1	4.800E-1	-3.600E-1
σ (Bias1)	---	4.604E-1	2.608E-1	1.673E-1	1.789E-1	4.690E-1	3.033E-1	4.000E-1	2.683E-1	4.382E-1	2.608E-1
Average+3 σ (Bias1)	---	1.301E+0	9.423E-1	3.420E-1	6.167E-1	1.607E+0	7.899E-1	1.600E+0	9.250E-1	1.795E+0	4.223E-1
Average-3σ (Bias1)	---	-1.461E+0	-6.223E-1	-6.620E-1	-4.567E-1	-1.207E+0	-1.030E+0	-8.000E-1	-6.850E-1	-8.345E-1	-1.142E+0
Average (Bias2)	---	-1.600E-1	-1.200E-1	-1.600E-1	-2.800E-1	2.400E-1	-2.400E-1	2.000E-1	1.200E-1	1.200E-1	-2.800E-1
σ (Bias2)	---	2.191E-1	3.633E-1	4.561E-1	4.147E-1	4.561E-1	4.099E-1	4.690E-1	4.147E-1	4.147E-1	4.604E-1
Average+3 σ (Bias2)	---	4.973E-1	9.700E-1	1.208E+0	9.642E-1	1.608E+0	9.896E-1	1.607E+0	1.364E+0	1.364E+0	1.101E+0
Average-3σ (Bias2)	---	-8.173E-1	-1.210E+0	-1.528E+0	-1.524E+0	-1.128E+0	-1.470E+0	-1.207E+0	-1.124E+0	-1.124E+0	-1.661E+0

16.TPLH module 2

Ta = 25°C; Vcc = 5 V ; If = 8 mA



TPLH, Module 2 . (ns) **Max = 60.0**

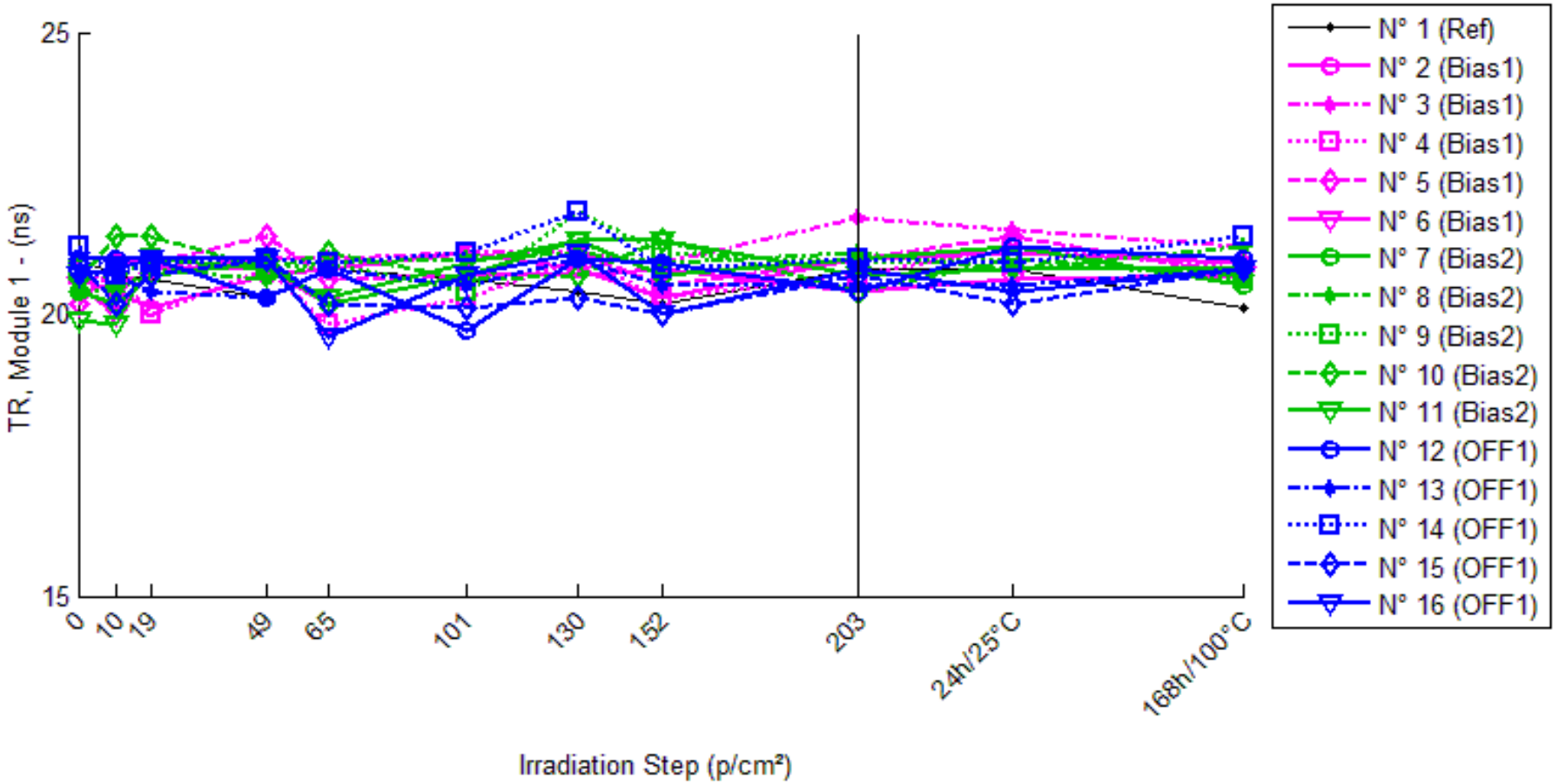
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	21.6	21.2	21.6	21.2	21.2	21.2	21.2	21.8	21.2	21.6	21.4
N° 2 (Bias1)	21.2	20.8	21.2	21.2	21.4	21.2	21.2	21.4	21.2	21.6	21.6
N° 3 (Bias1)	21.2	21.2	21.6	21.6	21.6	21.6	21.6	21.8	21.8	22.0	21.8
N° 4 (Bias1)	20.4	20.6	20.4	20.4	20.6	20.8	20.6	21.6	21.2	20.8	20.4
N° 5 (Bias1)	21.0	21.4	21.6	21.8	21.8	21.8	22.0	22.2	22.4	22.2	21.6
N° 6 (Bias1)	21.6	21.6	21.6	22.0	22.2	22.0	22.0	22.2	22.4	22.4	21.8
N° 7 (Bias2)	21.8	21.6	21.6	22.0	22.0	22.4	21.6	22.2	21.8	22.2	21.6
N° 8 (Bias2)	21.8	21.6	21.6	21.8	21.8	22.0	22.0	22.2	22.0	22.8	21.8
N° 9 (Bias2)	22.0	21.6	22.0	21.4	22.2	22.2	22.0	22.4	22.8	22.8	21.2
N° 10 (Bias2)	21.8	21.6	21.8	21.6	22.2	21.6	22.0	22.6	22.4	22.8	21.2
N° 11 (Bias2)	21.6	22.0	21.6	21.4	22.0	21.8	21.4	21.8	21.6	22.0	21.6
N° 12 (OFF1)	21.6	21.2	21.4	20.8	21.4	21.6	21.6	21.6	21.6	21.4	21.2
N° 13 (OFF1)	21.6	21.4	21.2	21.2	21.2	21.4	21.2	21.4	21.4	21.6	21.2
N° 14 (OFF1)	21.2	21.2	21.2	21.0	21.0	21.2	21.2	21.2	21.2	21.2	21.2
N° 15 (OFF1)	21.2	21.2	21.2	21.6	21.6	21.6	21.8	22.2	22.2	22.0	21.6
N° 16 (OFF1)	21.0	21.0	20.8	21.2	21.6	22.0	22.0	22.8	22.4	22.6	21.8

Delta [TPLH, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-4.000E-1	0.000E+0	-4.000E-1	-4.000E-1	-4.000E-1	-4.000E-1	2.000E-1	-4.000E-1	0.000E+0	-2.000E-1
N° 2 (Bias1)	---	-4.000E-1	0.000E+0	0.000E+0	2.000E-1	0.000E+0	0.000E+0	2.000E-1	0.000E+0	4.000E-1	4.000E-1
N° 3 (Bias1)	---	0.000E+0	4.000E-1	4.000E-1	4.000E-1	4.000E-1	4.000E-1	6.000E-1	6.000E-1	8.000E-1	6.000E-1
N° 4 (Bias1)	---	2.000E-1	0.000E+0	0.000E+0	2.000E-1	4.000E-1	2.000E-1	1.200E+0	8.000E-1	4.000E-1	0.000E+0
N° 5 (Bias1)	---	4.000E-1	6.000E-1	8.000E-1	8.000E-1	8.000E-1	1.000E+0	1.200E+0	1.400E+0	1.200E+0	6.000E-1
N° 6 (Bias1)	---	0.000E+0	0.000E+0	4.000E-1	6.000E-1	4.000E-1	4.000E-1	6.000E-1	8.000E-1	8.000E-1	2.000E-1
N° 7 (Bias2)	---	-2.000E-1	-2.000E-1	2.000E-1	2.000E-1	6.000E-1	-2.000E-1	4.000E-1	0.000E+0	4.000E-1	-2.000E-1
N° 8 (Bias2)	---	-2.000E-1	-2.000E-1	0.000E+0	0.000E+0	2.000E-1	2.000E-1	4.000E-1	2.000E-1	1.000E+0	0.000E+0
N° 9 (Bias2)	---	-4.000E-1	0.000E+0	-6.000E-1	2.000E-1	2.000E-1	0.000E+0	4.000E-1	8.000E-1	8.000E-1	-8.000E-1
N° 10 (Bias2)	---	-2.000E-1	0.000E+0	-2.000E-1	4.000E-1	-2.000E-1	2.000E-1	8.000E-1	6.000E-1	1.000E+0	-6.000E-1
N° 11 (Bias2)	---	4.000E-1	0.000E+0	-2.000E-1	4.000E-1	2.000E-1	-2.000E-1	2.000E-1	0.000E+0	4.000E-1	0.000E+0
N° 12 (OFF1)	---	-4.000E-1	-2.000E-1	-8.000E-1	-2.000E-1	0.000E+0	0.000E+0	0.000E+0	0.000E+0	-2.000E-1	-4.000E-1
N° 13 (OFF1)	---	-2.000E-1	-4.000E-1	-4.000E-1	-4.000E-1	-2.000E-1	-4.000E-1	-2.000E-1	-2.000E-1	0.000E+0	-4.000E-1
N° 14 (OFF1)	---	0.000E+0	0.000E+0	-2.000E-1	-2.000E-1	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0
N° 15 (OFF1)	---	0.000E+0	0.000E+0	4.000E-1	4.000E-1	4.000E-1	6.000E-1	1.000E+0	1.000E+0	8.000E-1	4.000E-1
N° 16 (OFF1)	---	0.000E+0	-2.000E-1	2.000E-1	6.000E-1	1.000E+0	1.000E+0	1.800E+0	1.400E+0	1.600E+0	8.000E-1
Average (OFF1)	---	4.000E-2	2.000E-1	3.200E-1	4.400E-1	4.000E-1	4.000E-1	7.600E-1	7.200E-1	7.200E-1	3.600E-1
σ (OFF1)	---	2.966E-1	2.828E-1	3.347E-1	2.608E-1	2.828E-1	3.742E-1	4.336E-1	5.020E-1	3.347E-1	2.608E-1
Average+3 σ (OFF1)	---	9.299E-1	1.049E+0	1.324E+0	1.222E+0	1.249E+0	1.522E+0	2.061E+0	2.226E+0	1.724E+0	1.142E+0
Average-3σ (OFF1)	---	-8.499E-1	-6.485E-1	-6.840E-1	-3.423E-1	-4.485E-1	-7.225E-1	-5.408E-1	-7.860E-1	-2.840E-1	-4.223E-1
Average (Bias1)	---	-1.200E-1	-8.000E-2	-1.600E-1	2.400E-1	2.000E-1	-7.105E-16	4.400E-1	3.200E-1	7.200E-1	-3.200E-1
σ (Bias1)	---	3.033E-1	1.095E-1	2.966E-1	1.673E-1	2.828E-1	2.000E-1	2.191E-1	3.633E-1	3.033E-1	3.633E-1
Average+3 σ (Bias1)	---	7.899E-1	2.486E-1	7.299E-1	7.420E-1	1.049E+0	6.000E-1	1.097E+0	1.410E+0	1.630E+0	7.700E-1
Average-3σ (Bias1)	---	-1.030E+0	-4.086E-1	-1.050E+0	-2.620E-1	-6.485E-1	-6.000E-1	-2.173E-1	-7.700E-1	-1.899E-1	-1.410E+0
Average (Bias2)	---	-1.200E-1	-1.600E-1	-1.600E-1	4.000E-2	2.400E-1	2.400E-1	5.200E-1	4.400E-1	4.400E-1	8.000E-2
σ (Bias2)	---	1.789E-1	1.673E-1	4.775E-1	4.336E-1	4.775E-1	5.550E-1	8.556E-1	7.127E-1	7.537E-1	5.215E-1
Average+3 σ (Bias2)	---	4.167E-1	3.420E-1	1.272E+0	1.341E+0	1.672E+0	1.905E+0	3.087E+0	2.578E+0	2.701E+0	1.645E+0
Average-3σ (Bias2)	---	-6.567E-1	-6.620E-1	-1.592E+0	-1.261E+0	-1.192E+0	-1.425E+0	-2.047E+0	-1.698E+0	-1.821E+0	-1.485E+0

17.TR module 1

Ta = 25°C; Vcc = 5 V ; If = 8 mA



TR, Module 1 . (ns)

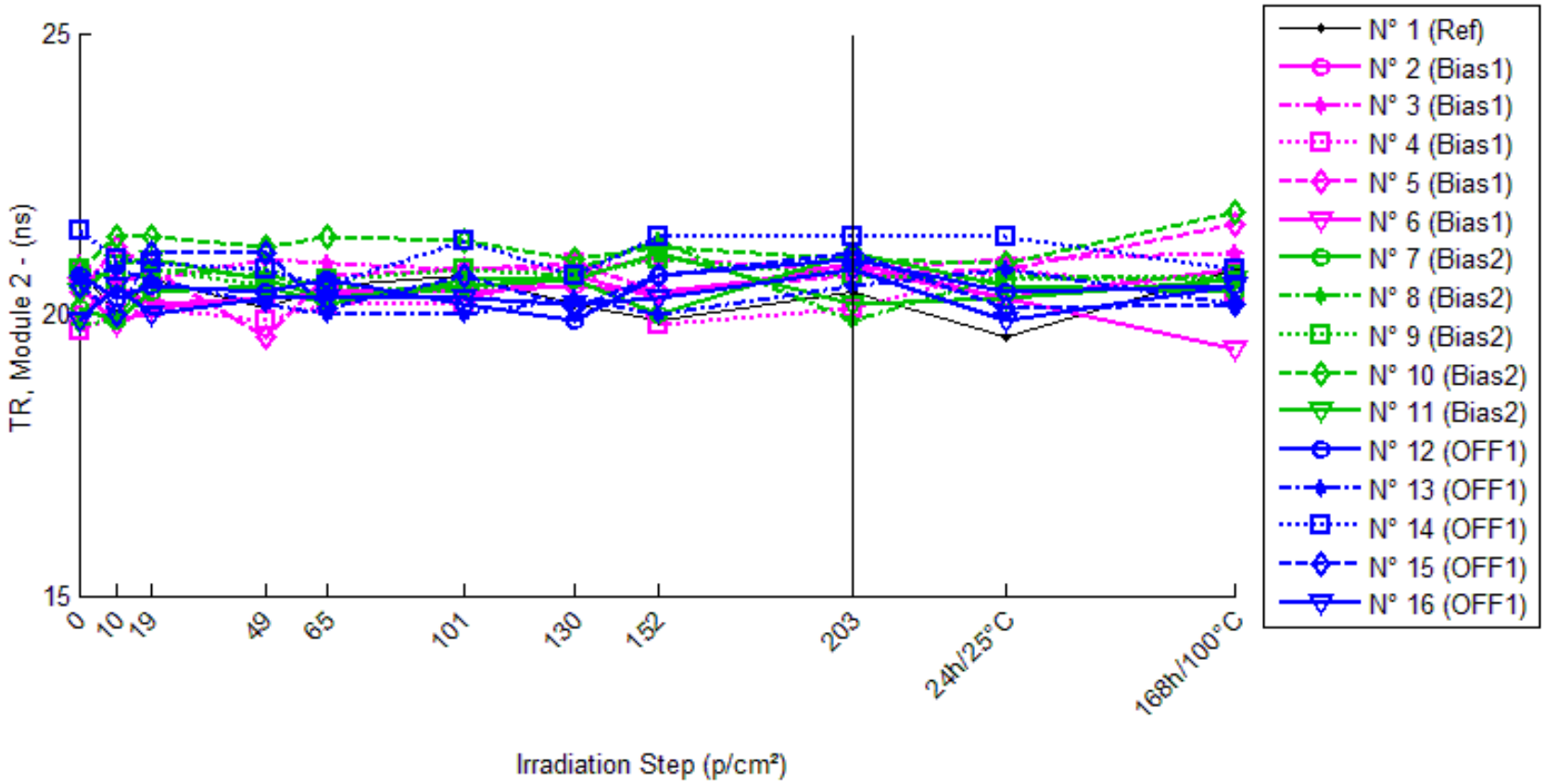
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	21.0	20.7	20.6	20.3	20.8	20.6	20.4	20.2	20.8	20.8	20.1
N° 2 (Bias1)	20.6	20.4	20.1	20.7	20.8	21.1	20.8	20.3	21.0	21.1	20.9
N° 3 (Bias1)	20.8	20.5	20.8	21.0	21.0	21.1	21.1	20.9	21.7	21.5	21.2
N° 4 (Bias1)	20.7	20.7	20.0	20.8	19.8	20.3	21.0	20.3	20.7	21.2	20.8
N° 5 (Bias1)	20.2	20.9	20.9	21.4	20.6	20.7	21.1	20.5	21.0	21.4	20.7
N° 6 (Bias1)	20.5	20.0	20.8	20.8	20.2	20.7	20.7	20.8	20.4	20.6	20.7
N° 7 (Bias2)	20.4	20.2	20.7	20.9	20.2	20.7	21.3	20.7	21.0	21.2	20.5
N° 8 (Bias2)	20.4	20.4	20.8	20.6	20.9	21.0	21.1	20.9	21.1	20.8	21.2
N° 9 (Bias2)	20.8	20.6	21.0	20.8	20.9	20.4	21.8	21.1	20.9	21.0	20.6
N° 10 (Bias2)	20.6	21.4	21.4	20.8	21.1	20.6	20.7	21.3	20.4	21.0	20.7
N° 11 (Bias2)	19.9	19.8	21.0	20.8	20.3	20.9	21.3	21.3	20.7	20.8	20.8
N° 12 (OFF1)	21.0	21.0	21.0	20.3	20.8	19.7	21.0	20.9	20.4	21.2	21.0
N° 13 (OFF1)	20.7	20.7	20.4	20.3	20.8	20.5	21.0	20.5	20.5	20.5	20.8
N° 14 (OFF1)	21.2	20.7	20.9	21.0	20.9	21.1	21.8	20.8	21.0	20.9	21.4
N° 15 (OFF1)	20.9	20.2	20.7	21.0	20.2	20.1	20.3	20.0	20.7	20.2	20.8
N° 16 (OFF1)	20.7	20.8	21.0	21.0	19.6	20.7	21.1	20.0	20.8	20.4	20.8

Delta [TR, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-3.000E-1	-4.000E-1	-7.000E-1	-2.000E-1	-4.000E-1	-6.000E-1	-8.000E-1	-2.000E-1	-2.000E-1	-9.000E-1
N° 2 (Bias1)	---	-2.000E-1	-5.000E-1	1.000E-1	2.000E-1	5.000E-1	2.000E-1	-3.000E-1	4.000E-1	5.000E-1	3.000E-1
N° 3 (Bias1)	---	-3.000E-1	0.000E+0	2.000E-1	2.000E-1	3.000E-1	3.000E-1	1.000E-1	9.000E-1	7.000E-1	4.000E-1
N° 4 (Bias1)	---	0.000E+0	-7.000E-1	1.000E-1	-9.000E-1	-4.000E-1	3.000E-1	-4.000E-1	0.000E+0	5.000E-1	1.000E-1
N° 5 (Bias1)	---	7.000E-1	7.000E-1	1.200E+0	4.000E-1	5.000E-1	9.000E-1	3.000E-1	8.000E-1	1.200E+0	5.000E-1
N° 6 (Bias1)	---	-5.000E-1	3.000E-1	3.000E-1	-3.000E-1	2.000E-1	2.000E-1	3.000E-1	-1.000E-1	1.000E-1	2.000E-1
N° 7 (Bias2)	---	-2.000E-1	3.000E-1	5.000E-1	-2.000E-1	3.000E-1	9.000E-1	3.000E-1	6.000E-1	8.000E-1	1.000E-1
N° 8 (Bias2)	---	0.000E+0	4.000E-1	2.000E-1	5.000E-1	6.000E-1	7.000E-1	5.000E-1	7.000E-1	4.000E-1	8.000E-1
N° 9 (Bias2)	---	-2.000E-1	2.000E-1	0.000E+0	1.000E-1	-4.000E-1	1.000E+0	3.000E-1	1.000E-1	2.000E-1	-2.000E-1
N° 10 (Bias2)	---	8.000E-1	8.000E-1	2.000E-1	5.000E-1	0.000E+0	1.000E-1	7.000E-1	-2.000E-1	4.000E-1	1.000E-1
N° 11 (Bias2)	---	-1.000E-1	1.100E+0	9.000E-1	4.000E-1	1.000E+0	1.400E+0	1.400E+0	8.000E-1	9.000E-1	9.000E-1
N° 12 (OFF1)	---	0.000E+0	0.000E+0	-7.000E-1	-2.000E-1	-1.300E+0	0.000E+0	-1.000E-1	-6.000E-1	2.000E-1	0.000E+0
N° 13 (OFF1)	---	0.000E+0	-3.000E-1	-4.000E-1	1.000E-1	-2.000E-1	3.000E-1	-2.000E-1	-2.000E-1	-2.000E-1	1.000E-1
N° 14 (OFF1)	---	-5.000E-1	-3.000E-1	-2.000E-1	-3.000E-1	-1.000E-1	6.000E-1	-4.000E-1	-2.000E-1	-3.000E-1	2.000E-1
N° 15 (OFF1)	---	-7.000E-1	-2.000E-1	1.000E-1	-7.000E-1	-8.000E-1	-6.000E-1	-9.000E-1	-2.000E-1	-7.000E-1	-1.000E-1
N° 16 (OFF1)	---	1.000E-1	3.000E-1	3.000E-1	-1.100E+0	0.000E+0	4.000E-1	-7.000E-1	1.000E-1	-3.000E-1	1.000E-1
Average (OFF1)	---	-6.000E-2	-4.000E-2	3.800E-1	-8.000E-2	2.200E-1	3.800E-1	0.000E+0	4.000E-1	6.000E-1	3.000E-1
σ (OFF1)	---	4.615E-1	5.727E-1	4.658E-1	5.263E-1	3.701E-1	2.950E-1	3.317E-1	4.528E-1	4.000E-1	1.581E-1
Average+3 σ (OFF1)	---	1.325E+0	1.678E+0	1.777E+0	1.499E+0	1.330E+0	1.265E+0	9.950E-1	1.758E+0	1.800E+0	7.743E-1
Average-3σ (OFF1)	---	-1.445E+0	-1.758E+0	-1.017E+0	-1.659E+0	-8.904E-1	-5.049E-1	-9.950E-1	-9.583E-1	-6.000E-1	-1.743E-1
Average (Bias1)	---	6.000E-2	5.600E-1	3.600E-1	2.600E-1	3.000E-1	8.200E-1	6.400E-1	4.000E-1	5.400E-1	3.400E-1
σ (Bias1)	---	4.219E-1	3.782E-1	3.507E-1	3.050E-1	5.385E-1	4.764E-1	4.561E-1	4.301E-1	2.966E-1	4.827E-1
Average+3 σ (Bias1)	---	1.326E+0	1.694E+0	1.412E+0	1.175E+0	1.916E+0	2.249E+0	2.008E+0	1.690E+0	1.430E+0	1.788E+0
Average-3σ (Bias1)	---	-1.206E+0	-5.745E-1	-6.921E-1	-6.549E-1	-1.316E+0	-6.093E-1	-7.282E-1	-8.903E-1	-3.499E-1	-1.108E+0
Average (Bias2)	---	-2.200E-1	-1.000E-1	-1.800E-1	-4.400E-1	-4.800E-1	1.400E-1	-4.600E-1	-2.200E-1	-2.600E-1	6.000E-2
σ (Bias2)	---	3.564E-1	2.550E-1	3.962E-1	4.669E-1	5.541E-1	4.669E-1	3.362E-1	2.490E-1	3.209E-1	1.140E-1
Average+3 σ (Bias2)	---	8.491E-1	6.649E-1	1.009E+0	9.607E-1	1.182E+0	1.541E+0	5.485E-1	5.270E-1	7.028E-1	4.021E-1
Average-3σ (Bias2)	---	-1.289E+0	-8.649E-1	-1.369E+0	-1.841E+0	-2.142E+0	-1.261E+0	-1.468E+0	-9.670E-1	-1.223E+0	-2.821E-1

18.TR module 2

Ta = 25°C; Vcc = 5 V ; If = 8 mA



TR, Module 2 . (ns)

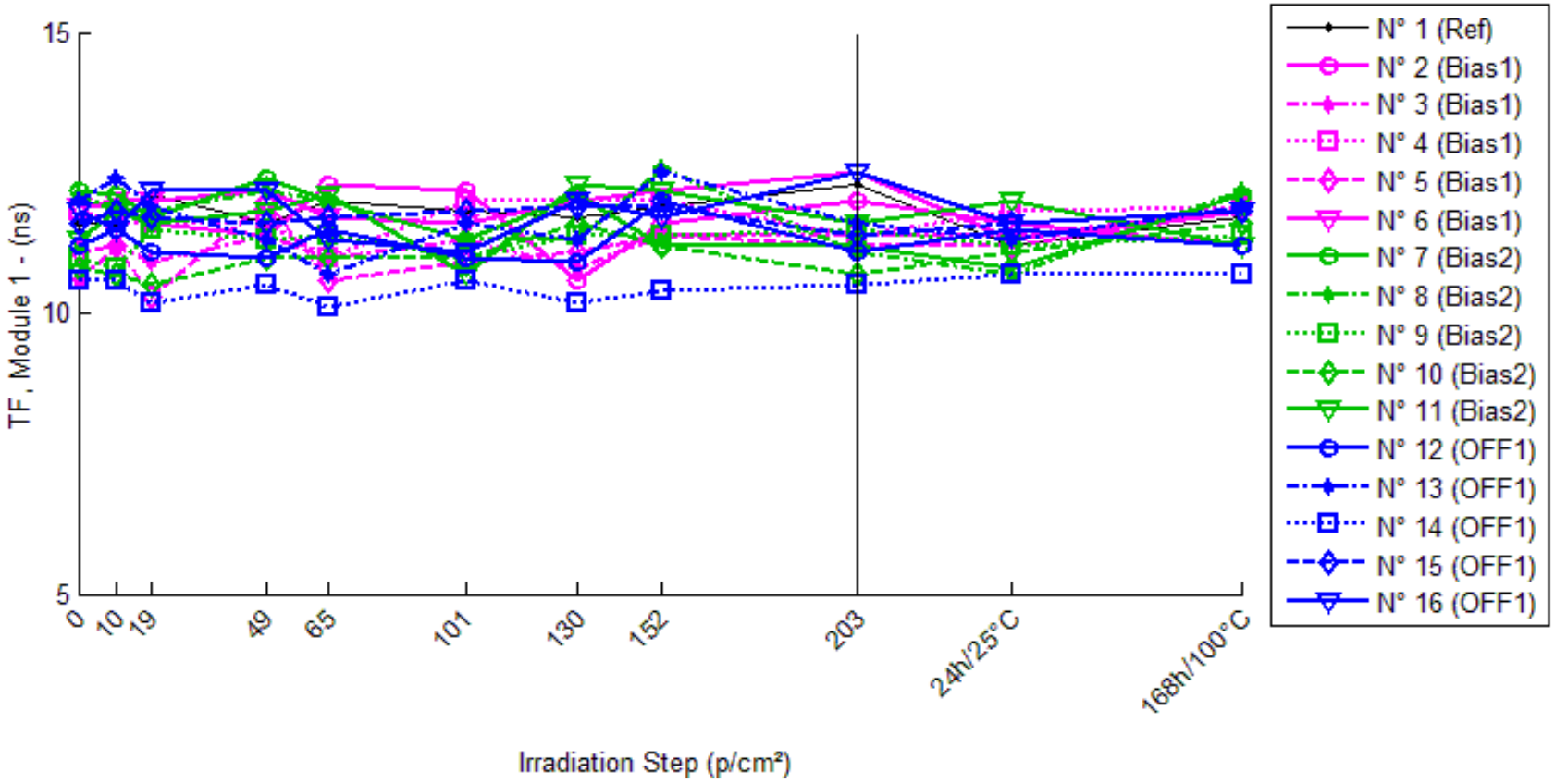
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	20.8	20.0	20.6	20.1	20.5	20.7	20.2	19.9	20.4	19.6	20.8
N° 2 (Bias1)	20.0	20.5	20.2	20.3	20.4	20.4	20.5	20.4	20.8	20.3	20.8
N° 3 (Bias1)	20.9	20.6	20.6	21.0	20.9	20.8	20.8	21.0	20.8	21.0	21.1
N° 4 (Bias1)	19.7	20.0	20.1	19.9	20.2	20.2	20.9	19.8	20.1	20.8	20.4
N° 5 (Bias1)	20.4	21.2	20.8	19.6	20.7	20.8	20.9	20.4	20.7	20.8	21.6
N° 6 (Bias1)	20.5	19.8	20.1	20.3	20.4	20.3	20.7	20.3	20.9	20.3	19.4
N° 7 (Bias2)	20.1	19.9	20.4	20.5	20.2	20.6	20.6	20.0	21.1	20.5	20.4
N° 8 (Bias2)	19.8	19.9	20.8	20.7	20.5	20.4	20.8	21.3	19.9	20.7	20.6
N° 9 (Bias2)	20.8	20.6	20.8	20.5	20.6	20.8	20.7	21.0	20.7	20.6	20.7
N° 10 (Bias2)	20.8	21.4	21.4	21.2	21.4	21.3	21.0	21.2	21.0	20.9	21.8
N° 11 (Bias2)	20.4	20.9	21.0	20.6	20.3	20.5	20.6	21.1	20.2	20.3	20.6
N° 12 (OFF1)	20.7	20.3	20.5	20.4	20.6	20.2	19.9	20.7	21.0	20.4	20.5
N° 13 (OFF1)	20.7	20.8	20.6	20.2	20.0	20.0	20.3	20.0	20.5	20.8	20.2
N° 14 (OFF1)	21.5	21.0	20.9	20.8	20.5	21.3	20.7	21.4	21.4	21.4	20.8
N° 15 (OFF1)	20.5	20.0	21.1	21.1	20.1	20.7	20.1	20.7	21.1	20.1	20.2
N° 16 (OFF1)	19.9	20.5	20.0	20.3	20.3	20.3	20.2	20.3	20.8	19.9	20.5

Delta [TR, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-8.000E-1	-2.000E-1	-7.000E-1	-3.000E-1	-1.000E-1	-6.000E-1	-9.000E-1	-4.000E-1	-1.200E+0	0.000E+0
N° 2 (Bias1)	---	5.000E-1	2.000E-1	3.000E-1	4.000E-1	4.000E-1	5.000E-1	4.000E-1	8.000E-1	3.000E-1	8.000E-1
N° 3 (Bias1)	---	-3.000E-1	-3.000E-1	1.000E-1	0.000E+0	-1.000E-1	-1.000E-1	1.000E-1	-1.000E-1	1.000E-1	2.000E-1
N° 4 (Bias1)	---	3.000E-1	4.000E-1	2.000E-1	5.000E-1	5.000E-1	1.200E+0	1.000E-1	4.000E-1	1.100E+0	7.000E-1
N° 5 (Bias1)	---	8.000E-1	4.000E-1	-8.000E-1	3.000E-1	4.000E-1	5.000E-1	0.000E+0	3.000E-1	4.000E-1	1.200E+0
N° 6 (Bias1)	---	-7.000E-1	-4.000E-1	-2.000E-1	-1.000E-1	-2.000E-1	2.000E-1	-2.000E-1	4.000E-1	-2.000E-1	-1.100E+0
N° 7 (Bias2)	---	-2.000E-1	3.000E-1	4.000E-1	1.000E-1	5.000E-1	5.000E-1	-1.000E-1	1.000E+0	4.000E-1	3.000E-1
N° 8 (Bias2)	---	1.000E-1	1.000E+0	9.000E-1	7.000E-1	6.000E-1	1.000E+0	1.500E+0	1.000E-1	9.000E-1	8.000E-1
N° 9 (Bias2)	---	-2.000E-1	0.000E+0	-3.000E-1	-2.000E-1	0.000E+0	-1.000E-1	2.000E-1	-1.000E-1	-2.000E-1	-1.000E-1
N° 10 (Bias2)	---	6.000E-1	6.000E-1	4.000E-1	6.000E-1	5.000E-1	2.000E-1	4.000E-1	2.000E-1	1.000E-1	1.000E+0
N° 11 (Bias2)	---	5.000E-1	6.000E-1	2.000E-1	-1.000E-1	1.000E-1	2.000E-1	7.000E-1	-2.000E-1	-1.000E-1	2.000E-1
N° 12 (OFF1)	---	-4.000E-1	-2.000E-1	-3.000E-1	-1.000E-1	-5.000E-1	-8.000E-1	0.000E+0	3.000E-1	-3.000E-1	-2.000E-1
N° 13 (OFF1)	---	1.000E-1	-1.000E-1	-5.000E-1	-7.000E-1	-7.000E-1	-4.000E-1	-7.000E-1	-2.000E-1	1.000E-1	-5.000E-1
N° 14 (OFF1)	---	-5.000E-1	-6.000E-1	-7.000E-1	-1.000E+0	-2.000E-1	-8.000E-1	-1.000E-1	-1.000E-1	-1.000E-1	-7.000E-1
N° 15 (OFF1)	---	-5.000E-1	6.000E-1	6.000E-1	-4.000E-1	2.000E-1	-4.000E-1	2.000E-1	6.000E-1	-4.000E-1	-3.000E-1
N° 16 (OFF1)	---	6.000E-1	1.000E-1	4.000E-1	4.000E-1	4.000E-1	3.000E-1	4.000E-1	9.000E-1	0.000E+0	6.000E-1
Average (OFF1)	---	1.200E-1	6.000E-2	-8.000E-2	2.200E-1	2.000E-1	4.600E-1	8.000E-2	3.600E-1	3.400E-1	3.600E-1
σ (OFF1)	---	6.099E-1	3.847E-1	4.438E-1	2.588E-1	3.240E-1	4.827E-1	2.168E-1	3.209E-1	4.827E-1	8.905E-1
Average+3 σ (OFF1)	---	1.950E+0	1.214E+0	1.252E+0	9.965E-1	1.172E+0	1.908E+0	7.304E-1	1.323E+0	1.788E+0	3.032E+0
Average-3σ (OFF1)	---	-1.710E+0	-1.094E+0	-1.412E+0	-5.565E-1	-7.721E-1	-9.881E-1	-5.704E-1	-6.028E-1	-1.108E+0	-2.312E+0
Average (Bias1)	---	1.600E-1	5.000E-1	3.200E-1	2.200E-1	3.400E-1	3.600E-1	5.400E-1	2.000E-1	2.200E-1	4.400E-1
σ (Bias1)	---	3.782E-1	3.742E-1	4.324E-1	4.087E-1	2.702E-1	4.159E-1	6.107E-1	4.743E-1	4.438E-1	4.506E-1
Average+3 σ (Bias1)	---	1.294E+0	1.622E+0	1.617E+0	1.446E+0	1.151E+0	1.608E+0	2.372E+0	1.623E+0	1.552E+0	1.792E+0
Average-3σ (Bias1)	---	-9.745E-1	-6.225E-1	-9.773E-1	-1.006E+0	-4.706E-1	-8.878E-1	-1.292E+0	-1.223E+0	-1.112E+0	-9.117E-1
Average (Bias2)	---	-1.400E-1	-4.000E-2	-1.000E-1	-3.600E-1	-1.600E-1	-4.200E-1	-4.000E-2	3.000E-1	-1.400E-1	-2.200E-1
σ (Bias2)	---	4.827E-1	4.393E-1	5.701E-1	5.413E-1	4.615E-1	4.494E-1	4.159E-1	4.637E-1	2.074E-1	4.970E-1
Average+3 σ (Bias2)	---	1.308E+0	1.278E+0	1.610E+0	1.264E+0	1.225E+0	9.283E-1	1.208E+0	1.691E+0	4.821E-1	1.271E+0
Average-3σ (Bias2)	---	-1.588E+0	-1.358E+0	-1.810E+0	-1.984E+0	-1.545E+0	-1.768E+0	-1.288E+0	-1.091E+0	-7.621E-1	-1.711E+0

19.TF module 1

Ta = 25°C; Vcc = 5V ; If = 8 mA



TF, Module 1 . (ns)

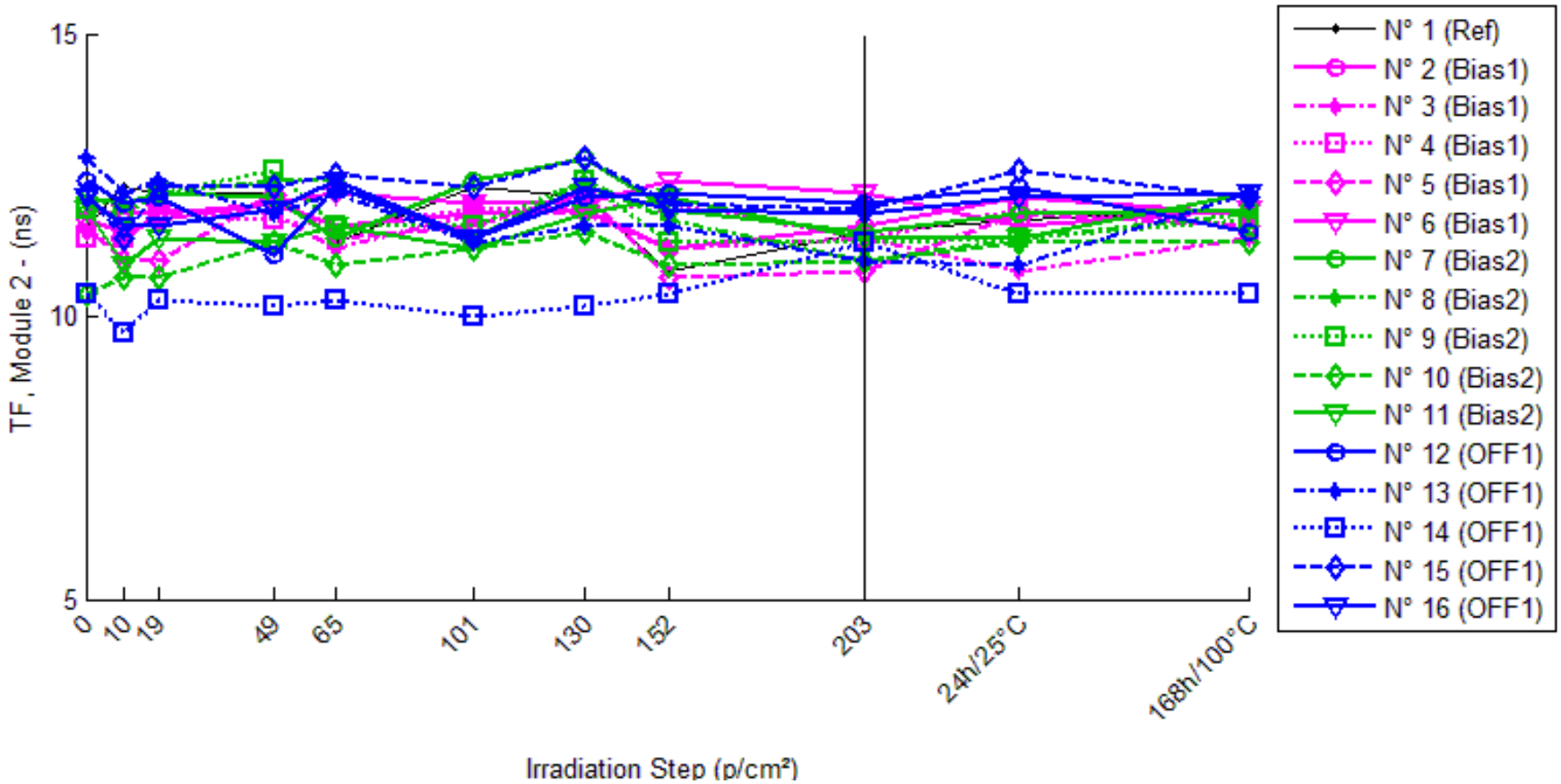
	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	11.6	11.6	12.1	11.6	12.0	11.8	11.7	11.9	12.3	11.2	11.7
N° 2 (Bias1)	11.9	11.9	11.6	11.4	12.3	12.2	10.6	11.6	12.0	11.6	11.2
N° 3 (Bias1)	10.6	11.2	10.9	11.4	11.0	11.3	10.8	11.4	11.4	11.4	11.8
N° 4 (Bias1)	11.8	11.6	11.6	11.6	11.0	12.0	12.0	12.0	11.4	11.8	11.9
N° 5 (Bias1)	11.1	11.2	10.3	12.0	10.6	10.9	11.1	11.4	11.2	11.2	11.8
N° 6 (Bias1)	11.9	12.0	12.0	12.2	11.7	11.6	12.0	12.2	12.5	11.3	11.8
N° 7 (Bias2)	12.2	12.1	11.7	12.4	12.0	11.3	12.1	11.2	11.2	10.8	12.1
N° 8 (Bias2)	12.1	11.8	11.8	12.2	12.0	11.3	11.3	12.6	11.1	10.7	12.2
N° 9 (Bias2)	11.0	10.8	11.5	11.3	11.4	11.0	11.4	11.4	11.5	11.2	11.4
N° 10 (Bias2)	10.8	10.7	10.5	11.0	11.0	11.0	11.6	11.2	10.7	11.1	11.6
N° 11 (Bias2)	11.3	11.8	11.6	11.8	12.1	10.7	12.3	12.2	11.6	12.0	11.2
N° 12 (OFF1)	11.2	11.5	11.1	11.0	11.5	11.0	10.9	12.0	11.1	11.5	11.2
N° 13 (OFF1)	12.0	12.4	11.9	11.3	10.7	11.6	11.3	12.5	11.6	11.3	11.9
N° 14 (OFF1)	10.6	10.6	10.2	10.5	10.1	10.6	10.2	10.4	10.5	10.7	10.7
N° 15 (OFF1)	11.6	11.8	11.7	11.6	11.7	11.8	11.9	11.9	11.4	11.6	11.8
N° 16 (OFF1)	11.8	11.5	12.2	12.2	11.3	11.1	12.0	11.7	12.5	11.6	11.8

Delta [TF, Module 1]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	0.000E+0	5.000E-1	0.000E+0	4.000E-1	2.000E-1	1.000E-1	3.000E-1	7.000E-1	-4.000E-1	1.000E-1
N° 2 (Bias1)	---	0.000E+0	-3.000E-1	-5.000E-1	4.000E-1	3.000E-1	-1.300E+0	-3.000E-1	1.000E-1	-3.000E-1	-7.000E-1
N° 3 (Bias1)	---	6.000E-1	3.000E-1	8.000E-1	4.000E-1	7.000E-1	2.000E-1	8.000E-1	8.000E-1	8.000E-1	1.200E+0
N° 4 (Bias1)	---	-2.000E-1	-2.000E-1	-2.000E-1	-8.000E-1	2.000E-1	2.000E-1	2.000E-1	-4.000E-1	0.000E+0	1.000E-1
N° 5 (Bias1)	---	1.000E-1	-8.000E-1	9.000E-1	-5.000E-1	-2.000E-1	0.000E+0	3.000E-1	1.000E-1	1.000E-1	7.000E-1
N° 6 (Bias1)	---	1.000E-1	1.000E-1	3.000E-1	-2.000E-1	-3.000E-1	1.000E-1	3.000E-1	6.000E-1	-6.000E-1	-1.000E-1
N° 7 (Bias2)	---	-1.000E-1	-5.000E-1	2.000E-1	-2.000E-1	-9.000E-1	-1.000E-1	-1.000E+0	-1.000E+0	-1.400E+0	-1.000E-1
N° 8 (Bias2)	---	-3.000E-1	-3.000E-1	1.000E-1	-1.000E-1	-8.000E-1	-8.000E-1	5.000E-1	-1.000E+0	-1.400E+0	1.000E-1
N° 9 (Bias2)	---	-2.000E-1	5.000E-1	3.000E-1	4.000E-1	0.000E+0	4.000E-1	4.000E-1	5.000E-1	2.000E-1	4.000E-1
N° 10 (Bias2)	---	-1.000E-1	-3.000E-1	2.000E-1	2.000E-1	2.000E-1	8.000E-1	4.000E-1	-1.000E-1	3.000E-1	8.000E-1
N° 11 (Bias2)	---	5.000E-1	3.000E-1	5.000E-1	8.000E-1	-6.000E-1	1.000E+0	9.000E-1	3.000E-1	7.000E-1	-1.000E-1
N° 12 (OFF1)	---	3.000E-1	-1.000E-1	-2.000E-1	3.000E-1	-2.000E-1	-3.000E-1	8.000E-1	-1.000E-1	3.000E-1	0.000E+0
N° 13 (OFF1)	---	4.000E-1	-1.000E-1	-7.000E-1	-1.300E+0	-4.000E-1	-7.000E-1	5.000E-1	-4.000E-1	-7.000E-1	-1.000E-1
N° 14 (OFF1)	---	0.000E+0	-4.000E-1	-1.000E-1	-5.000E-1	0.000E+0	-4.000E-1	-2.000E-1	-1.000E-1	1.000E-1	1.000E-1
N° 15 (OFF1)	---	2.000E-1	1.000E-1	0.000E+0	1.000E-1	2.000E-1	3.000E-1	3.000E-1	-2.000E-1	0.000E+0	2.000E-1
N° 16 (OFF1)	---	-3.000E-1	4.000E-1	4.000E-1	-5.000E-1	-7.000E-1	2.000E-1	-1.000E-1	7.000E-1	-2.000E-1	0.000E+0
Average (OFF1)	---	1.200E-1	-1.800E-1	2.600E-1	-1.400E-1	1.400E-1	-1.600E-1	2.600E-1	2.400E-1	0.000E+0	2.400E-1
σ (OFF1)	---	2.950E-1	4.207E-1	6.107E-1	5.367E-1	4.037E-1	6.427E-1	3.912E-1	4.722E-1	5.244E-1	7.335E-1
Average+3 σ (OFF1)	---	1.005E+0	1.082E+0	2.092E+0	1.470E+0	1.351E+0	1.768E+0	1.433E+0	1.657E+0	1.573E+0	2.440E+0
Average-3σ (OFF1)	---	-7.649E-1	-1.442E+0	-1.572E+0	-1.750E+0	-1.071E+0	-2.088E+0	-9.135E-1	-1.177E+0	-1.573E+0	-1.960E+0
Average (Bias1)	---	-4.000E-2	-6.000E-2	2.600E-1	2.200E-1	-4.200E-1	2.600E-1	2.400E-1	-2.600E-1	-3.200E-1	2.200E-1
σ (Bias1)	---	3.130E-1	4.336E-1	1.517E-1	4.025E-1	4.919E-1	7.266E-1	7.232E-1	7.092E-1	1.003E+0	3.834E-1
Average+3 σ (Bias1)	---	8.991E-1	1.241E+0	7.150E-1	1.427E+0	1.056E+0	2.440E+0	2.410E+0	1.868E+0	2.690E+0	1.370E+0
Average-3σ (Bias1)	---	-9.791E-1	-1.361E+0	-1.950E-1	-9.875E-1	-1.896E+0	-1.920E+0	-1.930E+0	-2.388E+0	-3.330E+0	-9.302E-1
Average (Bias2)	---	1.200E-1	-2.000E-2	-1.200E-1	-3.800E-1	-2.200E-1	-1.800E-1	2.600E-1	-2.000E-2	-1.000E-1	4.000E-2
σ (Bias2)	---	2.775E-1	2.950E-1	3.962E-1	6.261E-1	3.493E-1	4.207E-1	4.159E-1	4.207E-1	3.808E-1	1.140E-1
Average+3 σ (Bias2)	---	9.525E-1	8.649E-1	1.069E+0	1.498E+0	8.279E-1	1.082E+0	1.508E+0	1.242E+0	1.042E+0	3.821E-1
Average-3σ (Bias2)	---	-7.125E-1	-9.049E-1	-1.309E+0	-2.258E+0	-1.268E+0	-1.442E+0	-9.878E-1	-1.282E+0	-1.242E+0	-3.021E-1

20.TF module 2

Ta = 25°C; Vcc = 5 V ; If = 8 mA



TF, Module 2 . (ns)

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	11.6	12.3	12.2	12.2	11.3	12.3	12.1	10.8	11.5	11.7	11.9
N° 2 (Bias1)	11.7	11.5	11.7	12.0	11.6	11.8	11.9	11.2	11.6	12.1	11.8
N° 3 (Bias1)	11.5	11.3	11.9	11.8	11.2	11.8	11.8	11.2	11.4	10.8	11.4
N° 4 (Bias1)	11.4	11.4	11.8	11.7	11.6	11.9	11.9	12.0	11.4	11.9	11.6
N° 5 (Bias1)	11.6	11.0	11.0	12.2	11.4	11.6	12.2	10.7	10.8	11.8	11.6
N° 6 (Bias1)	11.9	11.8	11.8	12.0	12.2	12.0	12.0	12.4	12.2	11.6	11.9
N° 7 (Bias2)	12.1	12.0	12.2	12.1	11.4	12.4	12.8	11.9	11.5	11.8	11.9
N° 8 (Bias2)	12.0	12.0	12.2	12.4	12.4	11.4	12.4	11.7	11.0	11.4	11.8
N° 9 (Bias2)	11.9	11.8	12.2	12.6	11.6	11.6	12.4	11.3	11.3	11.4	11.7
N° 10 (Bias2)	10.4	10.7	10.7	11.3	10.9	11.2	11.5	10.9	11.0	11.3	11.3
N° 11 (Bias2)	11.9	10.9	11.4	11.3	11.6	11.2	11.8	12.1	11.4	11.4	12.2
N° 12 (OFF1)	12.4	12.0	12.1	11.1	12.3	11.4	12.1	12.2	12.0	12.3	11.5
N° 13 (OFF1)	12.8	12.2	12.4	11.8	12.2	11.3	11.6	11.6	11.0	10.9	12.2
N° 14 (OFF1)	10.4	9.7	10.3	10.2	10.3	10.0	10.2	10.4	11.3	10.4	10.4
N° 15 (OFF1)	12.2	11.4	12.3	12.3	12.5	12.3	12.8	12.0	11.9	12.6	12.1
N° 16 (OFF1)	12.1	11.6	11.6	11.9	12.4	11.4	12.3	11.9	11.8	12.1	12.2

Delta [TF, Module 2]

	0krad(Si)	10krad(Si)	19krad(Si)	49krad(Si)	65krad(Si)	101krad(Si)	130krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	7.000E-1	6.000E-1	6.000E-1	-3.000E-1	7.000E-1	5.000E-1	-8.000E-1	-1.000E-1	1.000E-1	3.000E-1
N° 2 (Bias1)	---	-2.000E-1	0.000E+0	3.000E-1	-1.000E-1	1.000E-1	2.000E-1	-5.000E-1	-1.000E-1	4.000E-1	1.000E-1
N° 3 (Bias1)	---	-2.000E-1	4.000E-1	3.000E-1	-3.000E-1	3.000E-1	3.000E-1	-3.000E-1	-1.000E-1	-7.000E-1	-1.000E-1
N° 4 (Bias1)	---	0.000E+0	4.000E-1	3.000E-1	2.000E-1	5.000E-1	5.000E-1	6.000E-1	0.000E+0	5.000E-1	2.000E-1
N° 5 (Bias1)	---	-6.000E-1	-6.000E-1	6.000E-1	-2.000E-1	0.000E+0	6.000E-1	-9.000E-1	-8.000E-1	2.000E-1	0.000E+0
N° 6 (Bias1)	---	-1.000E-1	-1.000E-1	1.000E-1	3.000E-1	1.000E-1	1.000E-1	5.000E-1	3.000E-1	-3.000E-1	0.000E+0
N° 7 (Bias2)	---	-1.000E-1	1.000E-1	0.000E+0	-7.000E-1	3.000E-1	7.000E-1	-2.000E-1	-6.000E-1	-3.000E-1	-2.000E-1
N° 8 (Bias2)	---	0.000E+0	2.000E-1	4.000E-1	4.000E-1	-6.000E-1	4.000E-1	-3.000E-1	-1.000E+0	-6.000E-1	-2.000E-1
N° 9 (Bias2)	---	-1.000E-1	3.000E-1	7.000E-1	-3.000E-1	-3.000E-1	5.000E-1	-6.000E-1	-6.000E-1	-5.000E-1	-2.000E-1
N° 10 (Bias2)	---	3.000E-1	3.000E-1	9.000E-1	5.000E-1	8.000E-1	1.100E+0	5.000E-1	6.000E-1	9.000E-1	9.000E-1
N° 11 (Bias2)	---	-1.000E+0	-5.000E-1	-6.000E-1	-3.000E-1	-7.000E-1	-1.000E-1	2.000E-1	-5.000E-1	-5.000E-1	3.000E-1
N° 12 (OFF1)	---	-4.000E-1	-3.000E-1	-1.300E+0	-1.000E-1	-1.000E+0	-3.000E-1	-2.000E-1	-4.000E-1	-1.000E-1	-9.000E-1
N° 13 (OFF1)	---	-6.000E-1	-4.000E-1	-1.000E+0	-6.000E-1	-1.500E+0	-1.200E+0	-1.200E+0	-1.800E+0	-1.900E+0	-6.000E-1
N° 14 (OFF1)	---	-7.000E-1	-1.000E-1	-2.000E-1	-1.000E-1	-4.000E-1	-2.000E-1	0.000E+0	9.000E-1	0.000E+0	0.000E+0
N° 15 (OFF1)	---	-8.000E-1	1.000E-1	1.000E-1	3.000E-1	1.000E-1	6.000E-1	-2.000E-1	-3.000E-1	4.000E-1	-1.000E-1
N° 16 (OFF1)	---	-5.000E-1	-5.000E-1	-2.000E-1	3.000E-1	-7.000E-1	2.000E-1	-2.000E-1	-3.000E-1	0.000E+0	1.000E-1
Average (OFF1)	---	-2.200E-1	2.000E-2	3.200E-1	-2.000E-2	2.000E-1	3.400E-1	-1.200E-1	-1.400E-1	2.000E-2	4.000E-2
σ (OFF1)	---	2.280E-1	4.147E-1	1.789E-1	2.588E-1	2.000E-1	2.074E-1	6.496E-1	4.037E-1	5.070E-1	1.140E-1
Average+3 σ (OFF1)	---	4.641E-1	1.264E+0	8.567E-1	7.565E-1	8.000E-1	9.621E-1	1.829E+0	1.071E+0	1.541E+0	3.821E-1
Average-3σ (OFF1)	---	-9.041E-1	-1.224E+0	-2.167E-1	-7.965E-1	-4.000E-1	-2.821E-1	-2.069E+0	-1.351E+0	-1.501E+0	-3.021E-1
Average (Bias1)	---	-1.800E-1	8.000E-2	2.800E-1	-8.000E-2	-1.000E-1	5.200E-1	-8.000E-2	-4.200E-1	-2.000E-1	1.200E-1
σ (Bias1)	---	4.868E-1	3.347E-1	5.975E-1	5.119E-1	6.364E-1	4.382E-1	4.324E-1	6.017E-1	6.245E-1	4.868E-1
Average+3 σ (Bias1)	---	1.280E+0	1.084E+0	2.072E+0	1.456E+0	1.809E+0	1.835E+0	1.217E+0	1.385E+0	1.673E+0	1.580E+0
Average-3σ (Bias1)	---	-1.640E+0	-9.240E-1	-1.512E+0	-1.616E+0	-2.009E+0	-7.945E-1	-1.377E+0	-2.225E+0	-2.073E+0	-1.340E+0
Average (Bias2)	---	-6.000E-1	-2.400E-1	-5.200E-1	-4.000E-2	-7.000E-1	-1.800E-1	-3.600E-1	-3.800E-1	-3.200E-1	-3.000E-1
σ (Bias2)	---	1.581E-1	2.408E-1	5.975E-1	3.715E-1	6.042E-1	6.723E-1	4.775E-1	9.576E-1	9.039E-1	4.301E-1
Average+3 σ (Bias2)	---	-1.257E-1	4.825E-1	1.272E+0	1.074E+0	1.112E+0	1.837E+0	1.072E+0	2.493E+0	2.392E+0	9.903E-1
Average-3σ (Bias2)	---	-1.074E+0	-9.625E-1	-2.312E+0	-1.154E+0	-2.512E+0	-2.197E+0	-1.792E+0	-3.253E+0	-3.032E+0	-1.590E+0