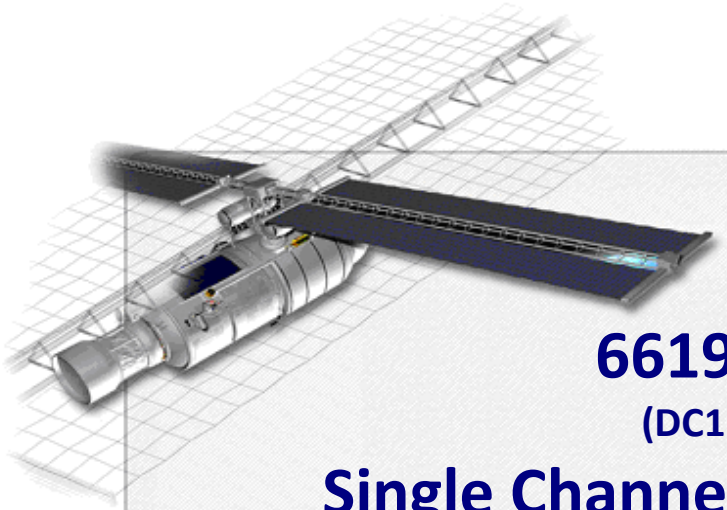
TOTAL IONIZING DOSE TEST REPORT



66193-002

(DC1120)

Single Channel Optocoupler

From

MICROPAC

TRAD/TE/66193/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 66193-002, a Single Channel Optocoupler from MICROPAC to evaluate Total Ionizing Dose (TID) effects under Co60 irradiation. Between November 2011 and February 2012, this testing was performed at the UCL Facility, Belgium using their Gamma irradiation Facility.
The objectives of the 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 OCUMENTS

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-66193-MIC-ESA-1115, Iss.2, 16/06/11

2.2 Reference Documents

RD	1.	Datasheet 66193 by MICROPAC	SINGLE CHANNEL OPTOCOUPLERS REPLACEMENT FOR 3C91C
RD	2.	MICROPAC certificate of traceability and conformance dated 25/07/2011	

3 DEVICE INFORMATION

3.1 Device description

The 66193-002 device is a proton radiation tolerant single channel optocoupler (replacement for 3C91C optocoupler). It contains a proton tolerant 660nm GaAlAs LED optically coupled to a silicon planar phototransistor. It is hermetically sealed in a TO46 metallic package. The internal base connection has been eliminated for improved noise immunity.

Type	66193-002
Manufacturer	MICROPAC
Function	Optocoupler
Package	TO46
Date Code	1120
Sample size	16 parts (15 + 1 control sample)

3.2 Procurement information

75 parts reference 66193-002 were procured by TRAD and delivered by MICROPAC through its French distributor ISOTOPE ELECTRONICS.
Their quality level defined by the 002 extension number corresponds to a commercial standard operating in the temperature range of -55° to +100°C and temperature tested (hot & cold temperature) by the manufacturer prior delivery.
One single lot of 75 parts, date-code 1120, was delivered with a Certificate of Conformance [RD2].

3.3 External view

Figure 1: package marking

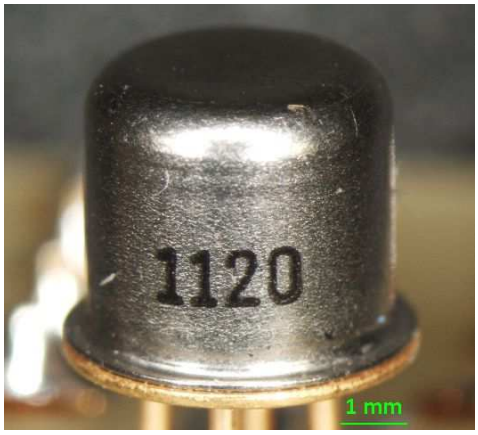


Figure 2: package marking - date code

3.4 Internal view

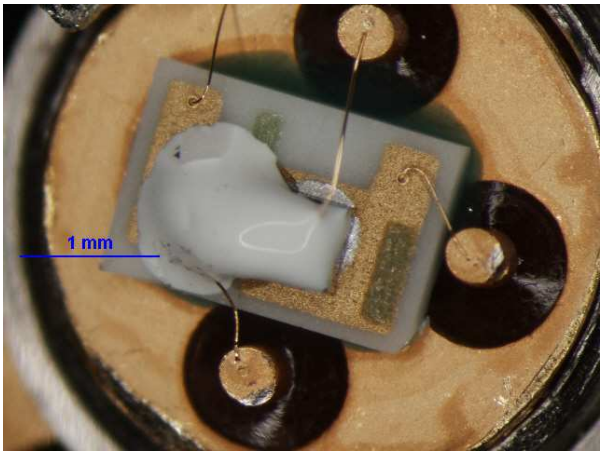


Figure 3: Internal view

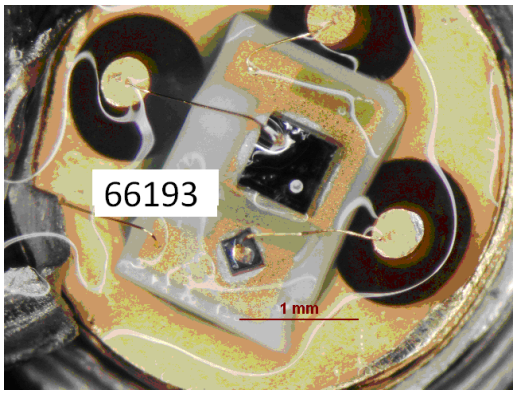


Figure 4: Internal view without potting

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 a Cobalt 60 source.
Gamma emitted radiation energies are 1.17 and 1.33 MeV.
Dose rate is equal 15 kRad(Si)/h at the source centre. Moreover the irradiation chamber is a cylindrical room with a radius of 2m. Then usable dose rates vary from 1.8 kRad(Si)/h to 80 Rad(Si)/h for normal irradiation positions and direct field.

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, as described in [AD2], was required for this TID (Total Ionizing Dose) evaluation test.

The test devices have been exposed to ^{60}Co irradiation according to the following steps and respective dose rates:

	Step1	Step2	Step3	Step4	Step5	Step6	Step7	Step8
Accumulated dose krad(Si)	10	20	50	74	102	123	152	203
Dose rate (Si)/h	36	36	36	36	310	310	310	310

Parts have been then submitted to the following annealing sequence:

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/OPTO/ZIP14/BR/1108
TEST PROGRAM	66193_TE_XXX1_B1_V10.llb

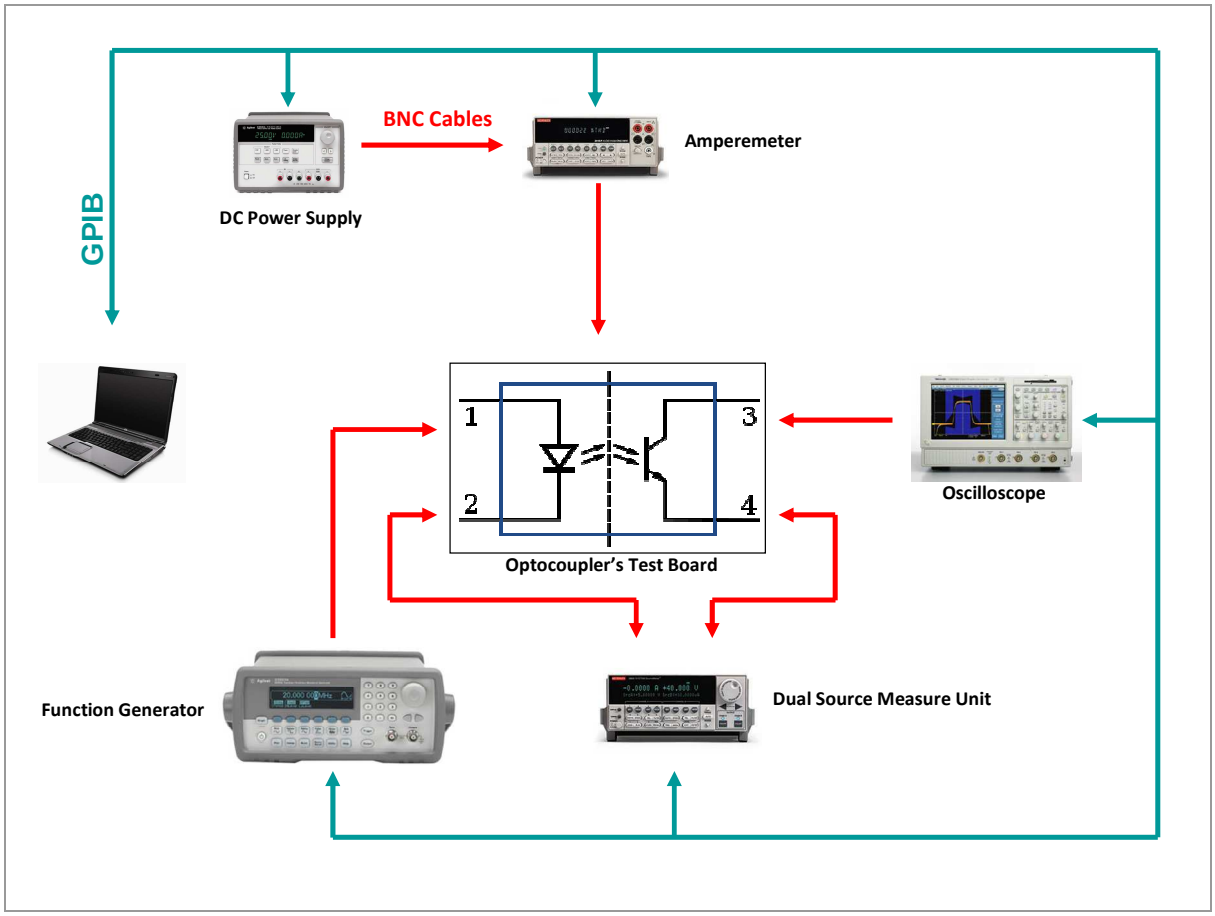


Figure 5: test principle

5.2 Test configuration

Samples were exposed to irradiation in three different modes - two on-modes (Figure 6 and Figure 7) and one in off-mode (all terminal leads short-circuited) –

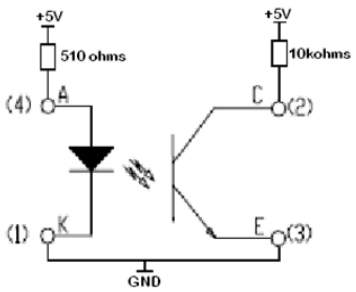


Figure 6: ON bias1

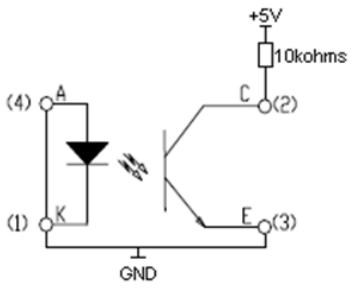


Figure 7: ON bias2

5.3 Electrical parameters

PARAMETER	SYMBOL	TEST CONDITION	MIN	MAX	UNIT
Input Diode Static Reverse Current	I_R	V_R = 3V		1	µA
Input Diode Static Forward Voltage	V_{F1}	I_F = 10mA		2	V
	V_{F2}	I_F = 20mA		2,2	V
Reverse Breakdown Voltage	B_{VR}	I_R = 100µA	7		V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 1mA, I_b = 0, I_F = 0	50		
Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	I_C = 10µA	7		
Collector-Emitter Dark Current	I_{CEO1}	V_{CE} = 50V, I_F = 0mA		100	nA
	I_{CEO2}	V_{CE} = 5V, I_F = 0mA		10	nA
On State Collector Current	$I_{C(ON)1}$	V_{CE} = 5V, I_F = 10mA	4		mA
	$I_{C(ON)2}$	V_{CE} = 0.4V, I_F = 10mA	3		mA
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	I_F = 50mA, I_C = 10mA		0,4	V
Rise Time	tr	V_{CE} = 5V, I_F = 2mA, R_L = 100Ω		5	µs
Fall Time	tf	V_{CE} = 5V, I_F = 2mA, R_L = 100Ω		5	µs
Current Transfer Ratio	CTR1	V_{CE} = 5V, I_F = 1mA			%
	CTR2	V_{CE} = 5V, I_F = 2mA			%
	CTR3	V_{CE} = 5V, I_F = 10mA	40		%
	CTR4	V_{CE} = 5V, I_F = 20mA			%
	CTR5	V_{CE} = 30V, I_F = 10mA			%

Min/ Max values are those specified in the data-sheet [RD1].
Test measurements are performed at 20°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, between Step 3 and Step 4, the irradiation was stopped for 48 hours. Total Ionizing Dose at this step was 74 krad(Si).
During this time period, parts were electrically measured and then stocked in a cold chamber at a temperature of -30°C.

7 SUMMARY RESULTS

Only parameters with applicable test limits are shown hereunder.

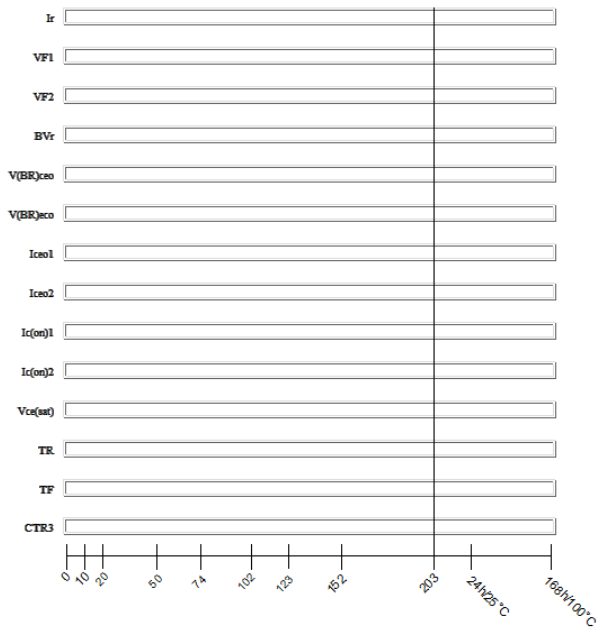


Figure 8: ON Bias 1

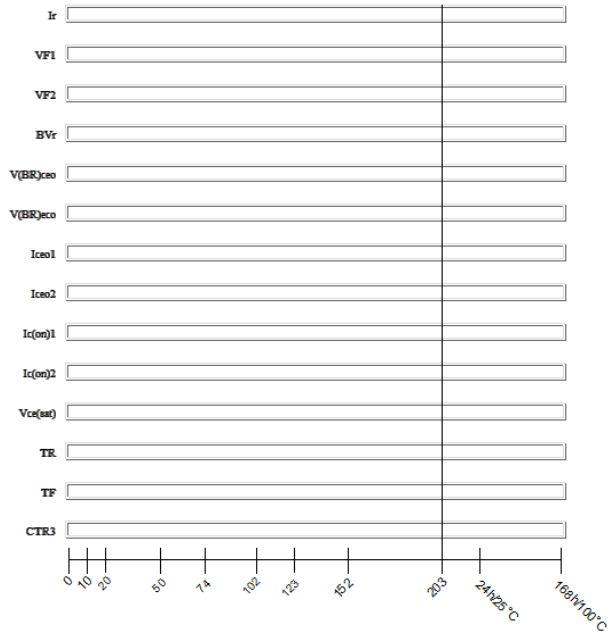


Figure 9 : ON Bias 2

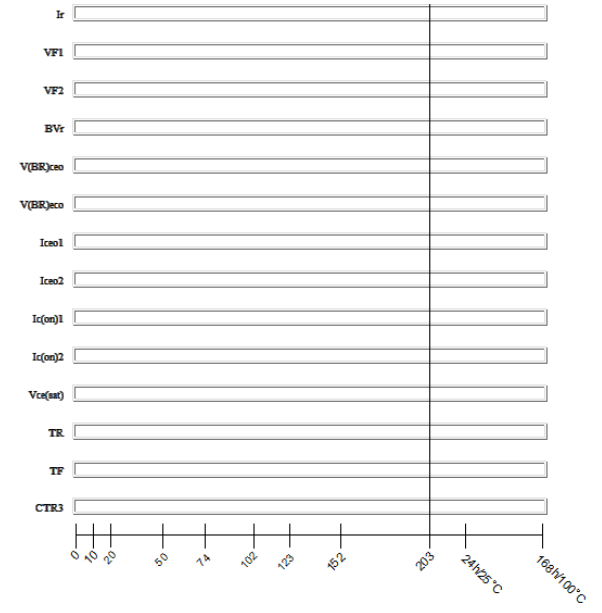
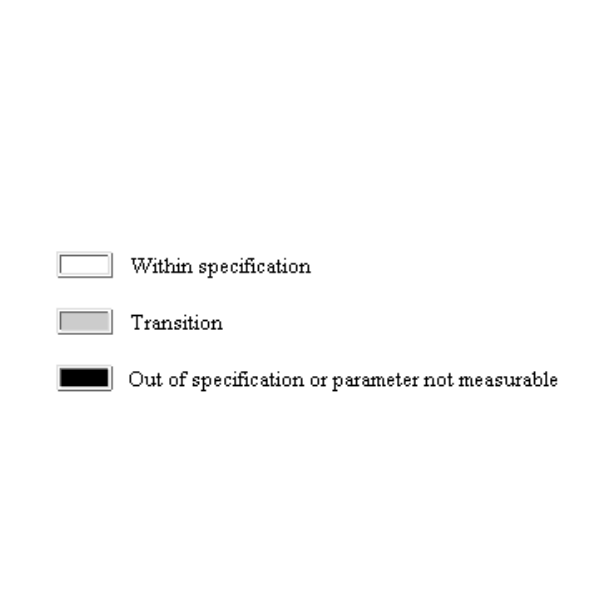


Figure 10: OFF Bias



All defined parameters [RD1] are within the specified values up to a total dose of 203 kRad(Si).

8 CONCLUSION

Total Ionizing Dose steady-state irradiation test using Gamma ray has been applied on 66193-002, a Single Channel Optocoupler from MICROPAC up to 200krad(Si).

Final test results are:

- All parameters are within specifications at total dose level.
- Average drift current transfer ratio are described in next Figure, function of the applied Bias mode and CTR configuration.

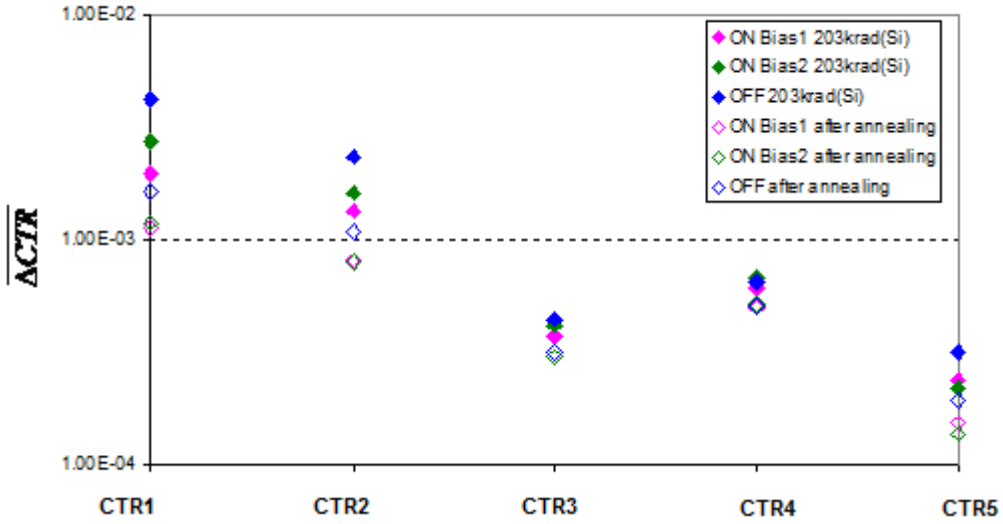


Figure 11: Average drift current transfer ratio function of the Bias condition and CTR configuration

- The least sensitive configuration up to 203 krad(Si) total dose is the CTR5 configuration (Vce=30V; If=10mA)
- Conversely, CRT1 configuration (Vce=5V; If=1mA) exhibits the greatest parameter degradation up to 203krad (Si) total dose.
- ON Bias1 configuration is the least sensitive configuration for all CTR configurations.
- OFF mode is the most sensitive configuration.

However CTR3 (V_{CE} = 5V, I_F = 10mA), which is the only CTR configuration for which a specification limit is indicated in the data-sheet, remains within this limit at total dose level.

As shown in previous figure, after annealing, average drift Current Transfer Ratio decrease.

9 DETAILED TESTS RESULTS

The pre and post radiation test results are shown graphically in the following pages (9-2 to 9-37). 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:

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

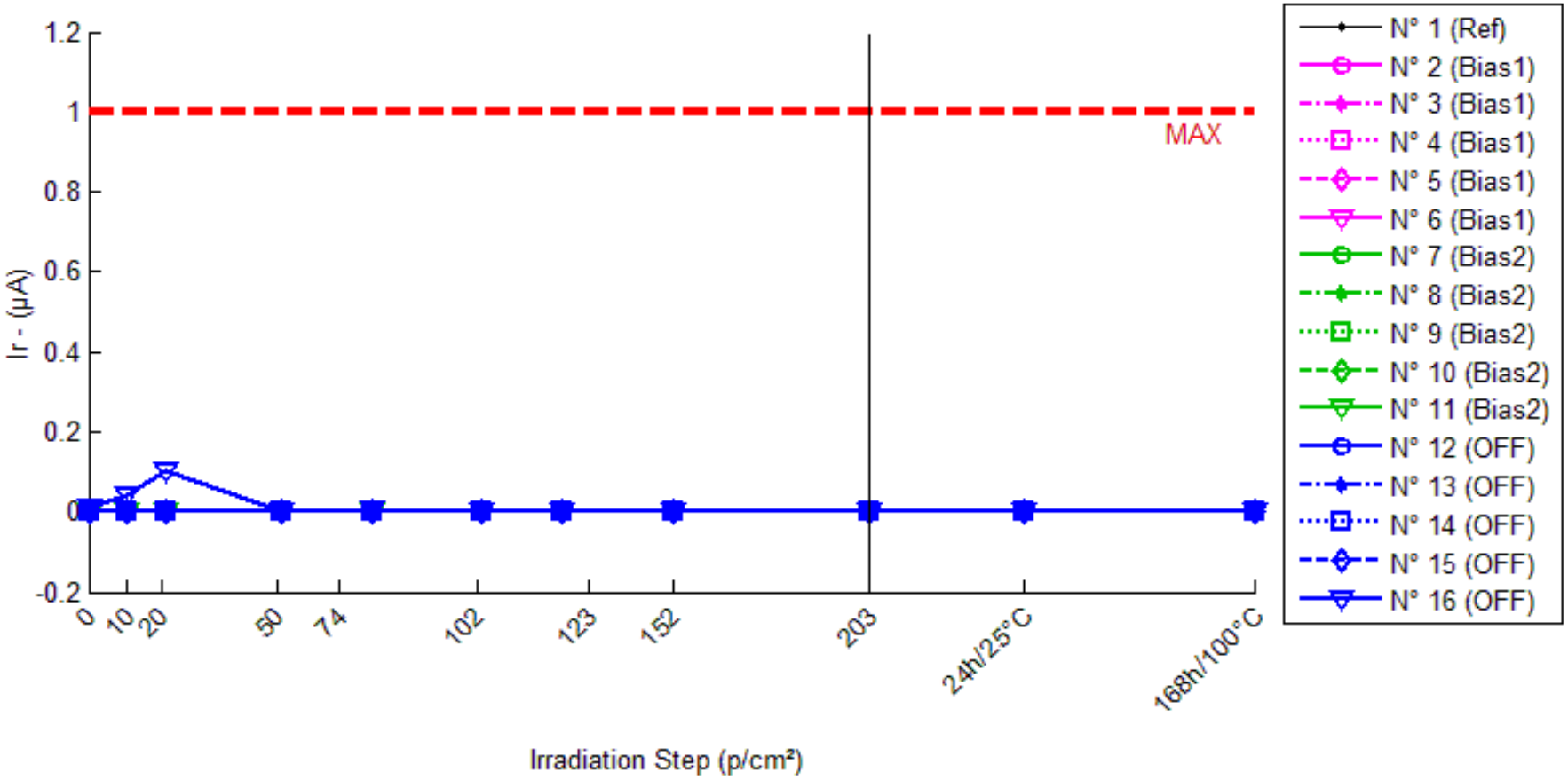
For other parameters, the formula used is:

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

CONTENTS

1. Ir

Ta=25°C; Vr = 3V



Ir . (µA) **Max = 1.0**

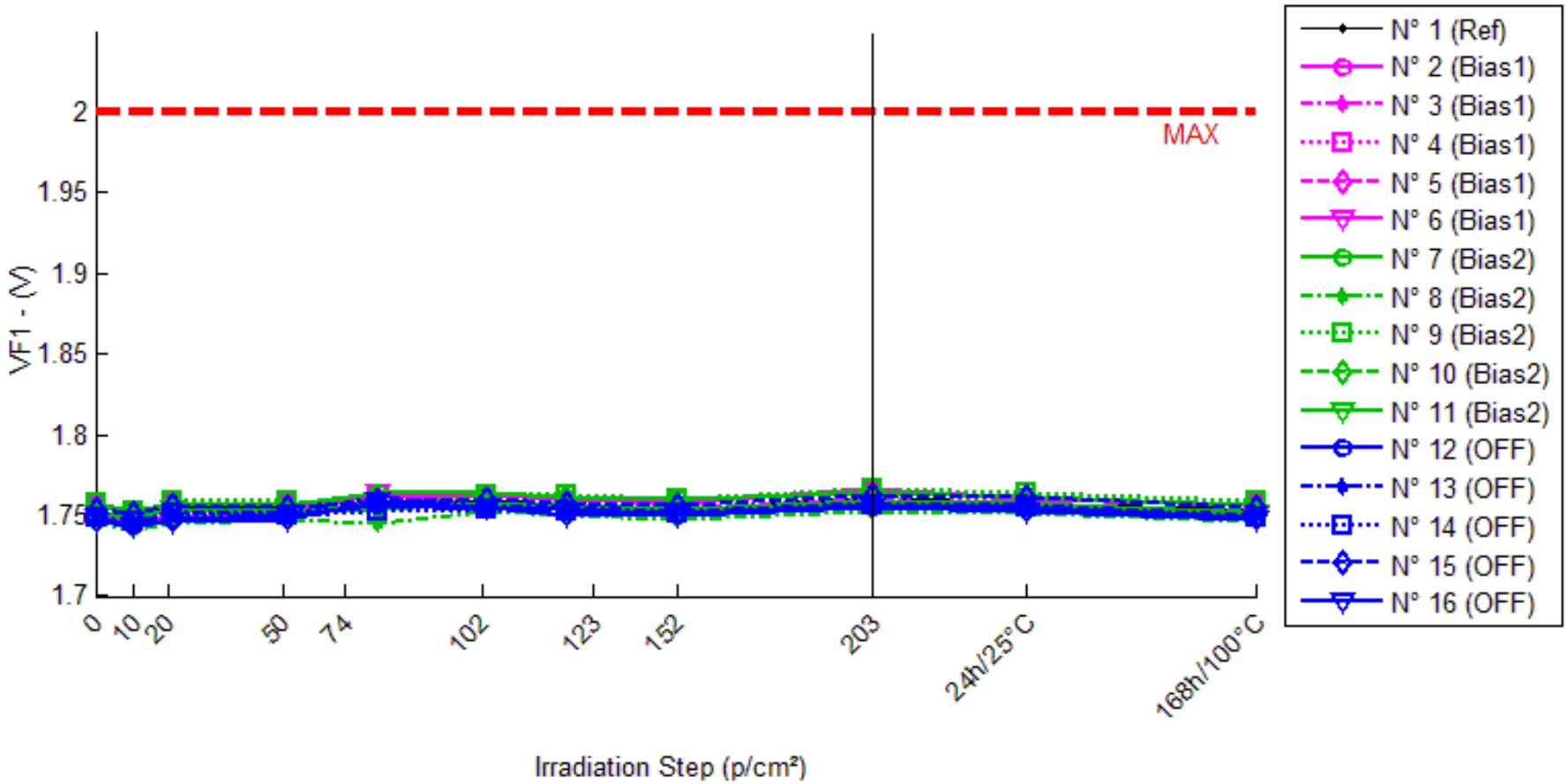
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.576E-4	7.624E-5	1.030E-4	7.108E-5	6.605E-5	8.471E-5	6.854E-5	7.954E-5	9.654E-5	7.806E-5	6.241E-5
N° 2 (Bias1)	1.583E-4	7.214E-5	1.003E-4	6.964E-5	6.715E-5	8.174E-5	6.664E-5	8.069E-5	1.005E-4	7.425E-5	5.793E-5
N° 3 (Bias1)	1.543E-4	7.142E-5	1.042E-4	7.087E-5	6.736E-5	8.082E-5	6.389E-5	8.001E-5	5.684E-4	7.667E-5	5.860E-5
N° 4 (Bias1)	1.512E-4	7.209E-5	1.001E-4	7.214E-5	6.317E-5	7.494E-5	7.996E-5	7.946E-5	1.622E-4	7.265E-5	6.063E-5
N° 5 (Bias1)	1.564E-4	7.057E-5	1.018E-4	6.689E-5	6.313E-5	7.862E-5	6.406E-5	7.895E-5	1.381E-4	7.049E-5	6.186E-5
N° 6 (Bias1)	1.566E-4	7.006E-5	1.012E-4	7.315E-5	6.596E-5	7.912E-5	6.613E-5	8.047E-5	1.022E-4	6.948E-5	6.068E-5
N° 7 (Bias2)	1.566E-4	7.011E-5	9.942E-5	6.795E-5	6.377E-5	7.697E-5	6.220E-5	8.081E-5	1.008E-4	7.472E-5	5.860E-5
N° 8 (Bias2)	1.525E-4	7.142E-5	9.675E-5	6.837E-5	6.326E-5	7.667E-5	6.491E-5	7.718E-5	1.055E-4	7.324E-5	5.949E-5
N° 9 (Bias2)	1.571E-4	6.989E-5	9.798E-5	7.358E-5	6.622E-5	7.959E-5	6.508E-5	7.252E-5	1.010E-4	7.514E-5	5.700E-5
N° 10 (Bias2)	1.577E-4	7.159E-5	2.684E-4	6.740E-5	6.778E-5	7.781E-5	6.474E-5	7.798E-5	1.323E-4	7.417E-5	6.093E-5
N° 11 (Bias2)	1.561E-4	7.019E-5	1.142E-4	6.892E-5	6.520E-5	7.921E-5	6.334E-5	7.874E-5	9.849E-5	7.290E-5	5.788E-5
N° 12 (OFF)	1.524E-4	6.913E-5	1.179E-4	6.935E-5	6.279E-5	7.950E-5	6.376E-5	7.574E-5	9.176E-5	7.206E-5	6.017E-5
N° 13 (OFF)	1.539E-4	6.867E-5	1.097E-4	7.100E-5	6.161E-5	7.963E-5	6.241E-5	7.726E-5	8.457E-5	7.349E-5	6.084E-5
N° 14 (OFF)	1.552E-4	7.023E-5	1.072E-4	6.888E-5	6.262E-5	7.819E-5	6.491E-5	7.760E-5	8.466E-5	7.447E-5	5.886E-5
N° 15 (OFF)	1.574E-4	6.998E-5	1.064E-4	6.867E-5	6.525E-5	7.781E-5	6.664E-5	7.633E-5	8.144E-5	7.142E-5	5.907E-5
N° 16 (OFF)	1.186E-2	4.228E-2	1.018E-1	2.411E-3	4.083E-3	6.442E-4	3.396E-3	1.337E-3	1.205E-3	2.028E-4	5.941E-5

Delta [Ir]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-8.137E-5	-5.464E-5	-8.653E-5	-9.156E-5	-7.291E-5	-8.907E-5	-7.807E-5	-6.107E-5	-7.955E-5	-9.520E-5
N° 2 (Bias1)	---	-8.615E-5	-5.794E-5	-8.864E-5	-9.114E-5	-7.654E-5	-9.165E-5	-7.760E-5	-5.777E-5	-8.403E-5	-1.004E-4
N° 3 (Bias1)	---	-8.290E-5	-5.012E-5	-8.345E-5	-8.696E-5	-7.350E-5	-9.043E-5	-7.431E-5	4.141E-4	-7.765E-5	-9.571E-5
N° 4 (Bias1)	---	-7.910E-5	-5.114E-5	-7.906E-5	-8.802E-5	-7.626E-5	-7.123E-5	-7.174E-5	1.102E-5	-7.855E-5	-9.056E-5
N° 5 (Bias1)	---	-8.586E-5	-5.460E-5	-8.954E-5	-9.330E-5	-7.781E-5	-9.237E-5	-7.748E-5	-1.836E-5	-8.594E-5	-9.457E-5
N° 6 (Bias1)	---	-8.653E-5	-5.536E-5	-8.345E-5	-9.063E-5	-7.748E-5	-9.046E-5	-7.612E-5	-5.443E-5	-8.712E-5	-9.592E-5
N° 7 (Bias2)	---	-8.649E-5	-5.718E-5	-8.865E-5	-9.283E-5	-7.963E-5	-9.440E-5	-7.579E-5	-5.579E-5	-8.188E-5	-9.799E-5
N° 8 (Bias2)	---	-8.109E-5	-5.575E-5	-8.413E-5	-8.925E-5	-7.583E-5	-8.760E-5	-7.533E-5	-4.696E-5	-7.926E-5	-9.301E-5
N° 9 (Bias2)	---	-8.717E-5	-5.908E-5	-8.349E-5	-9.085E-5	-7.748E-5	-9.199E-5	-8.454E-5	-5.608E-5	-8.192E-5	-1.001E-4
N° 10 (Bias2)	---	-8.611E-5	1.107E-4	-9.029E-5	-8.991E-5	-7.988E-5	-9.296E-5	-7.972E-5	-2.542E-5	-8.352E-5	-9.677E-5
N° 11 (Bias2)	---	-8.590E-5	-4.187E-5	-8.717E-5	-9.089E-5	-7.689E-5	-9.275E-5	-7.735E-5	-5.761E-5	-8.319E-5	-9.821E-5
N° 12 (OFF)	---	-8.328E-5	-3.456E-5	-8.307E-5	-8.963E-5	-7.292E-5	-8.865E-5	-7.668E-5	-6.066E-5	-8.036E-5	-9.225E-5
N° 13 (OFF)	---	-8.519E-5	-4.420E-5	-8.286E-5	-9.225E-5	-7.423E-5	-9.144E-5	-7.660E-5	-6.928E-5	-8.036E-5	-9.301E-5
N° 14 (OFF)	---	-8.501E-5	-4.801E-5	-8.637E-5	-9.262E-5	-7.706E-5	-9.034E-5	-7.765E-5	-7.059E-5	-8.078E-5	-9.639E-5
N° 15 (OFF)	---	-8.742E-5	-5.096E-5	-8.873E-5	-9.215E-5	-7.959E-5	-9.076E-5	-8.107E-5	-7.596E-5	-8.598E-5	-9.833E-5
N° 16 (OFF)	---	3.042E-2	8.995E-2	-9.450E-3	-7.778E-3	-1.122E-2	-8.465E-3	-1.052E-2	-1.066E-2	-1.166E-2	-1.180E-2
Average (OFF)	---	-8.411E-5	-5.383E-5	-8.483E-5	-9.001E-5	-7.632E-5	-8.723E-5	-7.545E-5	5.891E-5	-8.266E-5	-9.543E-5
σ (OFF)	---	3.149E-6	3.194E-6	4.297E-6	2.537E-6	1.700E-6	8.979E-6	2.465E-6	2.005E-4	4.317E-6	3.503E-6
Average+3σ (OFF)	---	-7.466E-5	-4.425E-5	-7.194E-5	-8.240E-5	-7.122E-5	-6.029E-5	-6.806E-5	6.605E-4	-6.971E-5	-8.492E-5
Average-3σ (OFF)	---	-9.356E-5	-6.341E-5	-9.772E-5	-9.762E-5	-8.142E-5	-1.142E-4	-8.284E-5	-5.427E-4	-9.561E-5	-1.059E-4
Average (Bias1)	---	-8.535E-5	-2.064E-5	-8.675E-5	-9.074E-5	-7.794E-5	-9.194E-5	-7.854E-5	-4.837E-5	-8.196E-5	-9.721E-5
σ (Bias1)	---	2.433E-6	7.374E-5	2.909E-6	1.354E-6	1.762E-6	2.579E-6	3.765E-6	1.349E-5	1.677E-6	2.627E-6
Average+3σ (Bias1)	---	-7.805E-5	2.006E-4	-7.802E-5	-8.668E-5	-7.266E-5	-8.420E-5	-6.725E-5	-7.887E-6	-7.693E-5	-8.933E-5
Average-3σ (Bias1)	---	-9.265E-5	-2.418E-4	-9.547E-5	-9.481E-5	-8.323E-5	-9.967E-5	-8.984E-5	-8.885E-5	-8.698E-5	-1.051E-4
Average (Bias2)	---	6.017E-3	1.795E-2	-1.958E-3	-1.629E-3	-2.304E-3	-1.765E-3	-2.167E-3	-2.186E-3	-2.397E-3	-2.436E-3
σ (Bias2)	---	1.364E-2	4.025E-2	4.188E-3	3.437E-3	4.982E-3	3.745E-3	4.672E-3	4.734E-3	5.177E-3	5.235E-3
Average+3σ (Bias2)	---	4.695E-2	1.387E-1	1.061E-2	8.683E-3	1.264E-2	9.471E-3	1.185E-2	1.202E-2	1.313E-2	1.327E-2
Average-3σ (Bias2)	---	-3.492E-2	-1.028E-1	-1.452E-2	-1.194E-2	-1.725E-2	-1.300E-2	-1.618E-2	-1.639E-2	-1.793E-2	-1.814E-2

2. VF1

Ta=25°C; If = 10 mA



VF1 . (V) **Max = 2.0**

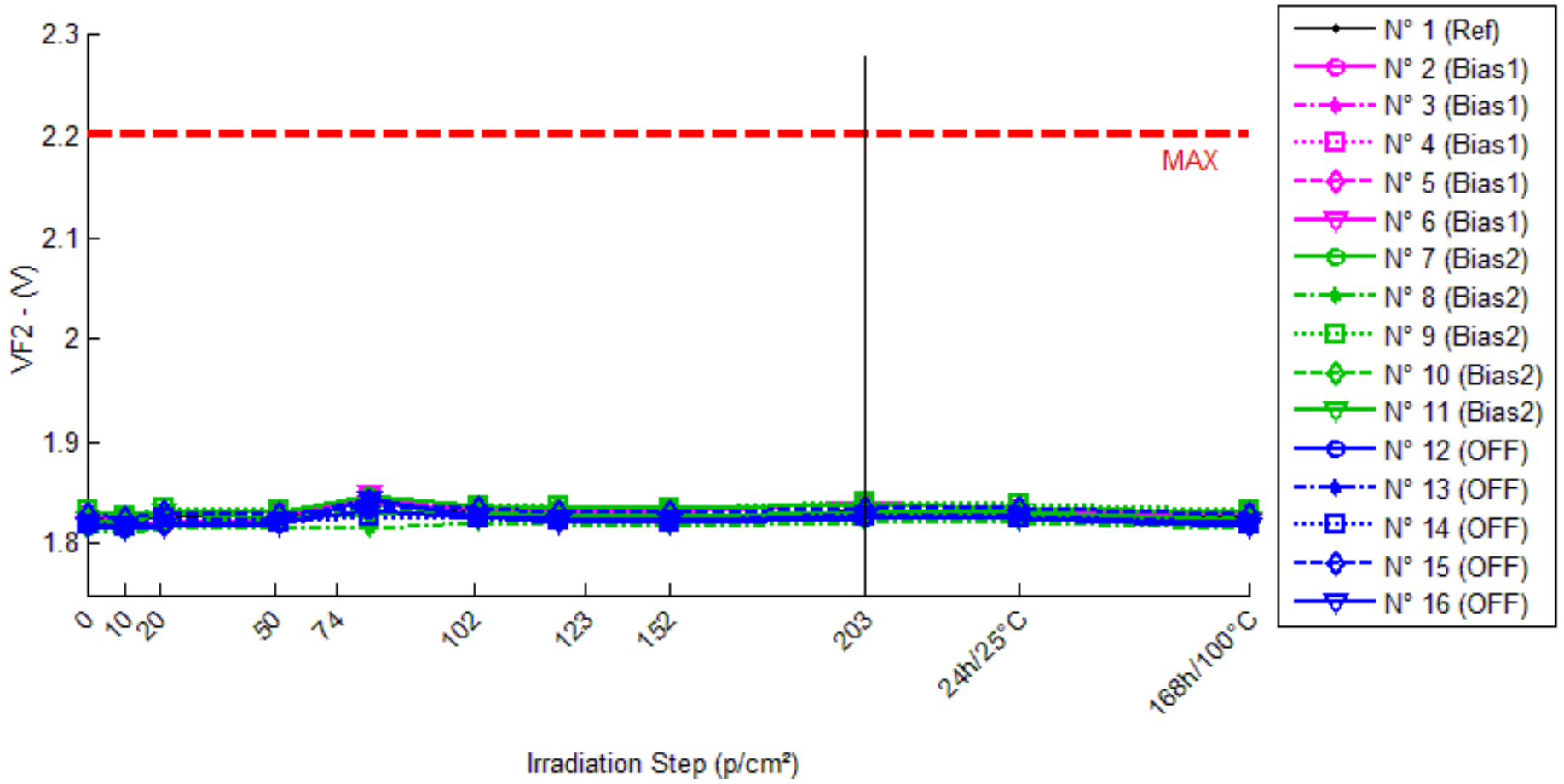
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.753	1.750	1.755	1.755	1.759	1.759	1.758	1.754	1.761	1.758	1.754
N° 2 (Bias1)	1.756	1.754	1.757	1.757	1.762	1.763	1.760	1.758	1.767	1.760	1.756
N° 3 (Bias1)	1.751	1.745	1.751	1.752	1.754	1.758	1.755	1.755	1.760	1.755	1.752
N° 4 (Bias1)	1.755	1.752	1.756	1.756	1.763	1.761	1.757	1.759	1.763	1.760	1.756
N° 5 (Bias1)	1.751	1.748	1.751	1.753	1.757	1.758	1.756	1.754	1.759	1.757	1.752
N° 6 (Bias1)	1.749	1.746	1.749	1.751	1.764	1.755	1.754	1.751	1.757	1.755	1.750
N° 7 (Bias2)	1.755	1.754	1.757	1.757	1.764	1.764	1.761	1.760	1.764	1.762	1.757
N° 8 (Bias2)	1.745	1.741	1.745	1.747	1.745	1.752	1.750	1.748	1.752	1.751	1.746
N° 9 (Bias2)	1.758	1.752	1.759	1.759	1.758	1.763	1.763	1.760	1.766	1.764	1.759
N° 10 (Bias2)	1.751	1.748	1.750	1.752	1.758	1.757	1.756	1.753	1.758	1.757	1.752
N° 11 (Bias2)	1.751	1.749	1.754	1.753	1.754	1.758	1.756	1.754	1.759	1.758	1.751
N° 12 (OFF)	1.749	1.744	1.748	1.750	1.756	1.754	1.754	1.751	1.756	1.755	1.749
N° 13 (OFF)	1.750	1.745	1.751	1.751	1.762	1.755	1.755	1.752	1.758	1.756	1.750
N° 14 (OFF)	1.749	1.746	1.751	1.750	1.753	1.754	1.753	1.751	1.757	1.755	1.749
N° 15 (OFF)	1.754	1.751	1.756	1.755	1.759	1.760	1.758	1.757	1.763	1.761	1.755
N° 16 (OFF)	1.746	1.744	1.746	1.748	1.759	1.755	1.750	1.750	1.755	1.753	1.747

Delta [VF1]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-3.087E-3	1.536E-3	1.480E-3	5.988E-3	5.707E-3	4.532E-3	1.434E-3	8.221E-3	5.274E-3	1.246E-3
N° 2 (Bias1)	---	-1.234E-3	8.760E-4	1.387E-3	6.202E-3	6.804E-3	4.719E-3	2.155E-3	1.158E-2	3.821E-3	5.860E-4
N° 3 (Bias1)	---	-5.586E-3	3.870E-4	1.211E-3	3.553E-3	7.027E-3	4.803E-3	4.103E-3	9.704E-3	4.053E-3	1.158E-3
N° 4 (Bias1)	---	-3.138E-3	6.390E-4	1.452E-3	8.257E-3	6.345E-3	2.322E-3	3.593E-3	7.932E-3	4.822E-3	8.110E-4
N° 5 (Bias1)	---	-3.734E-3	-5.700E-4	1.623E-3	5.945E-3	6.633E-3	4.526E-3	2.727E-3	7.485E-3	5.265E-3	5.960E-4
N° 6 (Bias1)	---	-3.305E-3	1.360E-4	1.929E-3	1.488E-2	5.833E-3	5.045E-3	2.243E-3	7.970E-3	5.882E-3	1.037E-3
N° 7 (Bias2)	---	-1.571E-3	1.335E-3	1.878E-3	8.773E-3	8.628E-3	5.364E-3	5.045E-3	8.923E-3	6.703E-3	1.730E-3
N° 8 (Bias2)	---	-3.980E-3	5.900E-5	2.613E-3	3.240E-4	6.981E-3	5.219E-3	3.201E-3	7.835E-3	6.866E-3	1.403E-3
N° 9 (Bias2)	---	-5.340E-3	9.410E-4	1.027E-3	-1.620E-4	4.746E-3	4.927E-3	2.502E-3	7.980E-3	6.241E-3	1.564E-3
N° 10 (Bias2)	---	-3.109E-3	-8.490E-4	1.127E-3	6.948E-3	5.747E-3	4.745E-3	1.363E-3	7.127E-3	5.815E-3	5.610E-4
N° 11 (Bias2)	---	-2.471E-3	2.910E-3	1.669E-3	2.365E-3	7.191E-3	4.724E-3	2.405E-3	7.623E-3	6.630E-3	-4.820E-4
N° 12 (OFF)	---	-4.352E-3	-1.078E-3	9.390E-4	7.526E-3	5.701E-3	4.920E-3	2.639E-3	7.084E-3	5.818E-3	2.900E-4
N° 13 (OFF)	---	-4.137E-3	9.040E-4	1.006E-3	1.271E-2	4.990E-3	4.920E-3	2.123E-3	7.897E-3	6.158E-3	1.210E-4
N° 14 (OFF)	---	-3.152E-3	1.774E-3	9.220E-4	3.987E-3	5.577E-3	4.007E-3	2.176E-3	7.882E-3	6.167E-3	-9.700E-5
N° 15 (OFF)	---	-3.345E-3	1.235E-3	1.147E-3	5.162E-3	6.218E-3	3.225E-3	2.689E-3	8.264E-3	6.825E-3	3.280E-4
N° 16 (OFF)	---	-1.299E-3	3.810E-4	2.682E-3	1.371E-2	9.716E-3	4.017E-3	4.668E-3	9.219E-3	7.829E-3	1.194E-3
Average (OFF)	---	-3.399E-3	2.936E-4	1.520E-3	7.767E-3	6.528E-3	4.283E-3	2.964E-3	8.935E-3	4.769E-3	8.376E-4
σ (OFF)	---	1.554E-3	5.563E-4	2.719E-4	4.310E-3	4.617E-4	1.112E-3	8.549E-4	1.706E-3	8.513E-4	2.573E-4
Average+3σ (OFF)	---	1.263E-3	1.962E-3	2.336E-3	2.070E-2	7.914E-3	7.619E-3	5.529E-3	1.405E-2	7.323E-3	1.609E-3
Average-3σ (OFF)	---	-8.061E-3	-1.375E-3	7.047E-4	-5.164E-3	5.143E-3	9.472E-4	3.995E-4	3.817E-3	2.215E-3	6.572E-5
Average (Bias1)	---	-3.294E-3	8.792E-4	1.663E-3	3.650E-3	6.659E-3	4.996E-3	2.903E-3	7.898E-3	6.451E-3	9.552E-4
σ (Bias1)	---	1.444E-3	1.414E-3	6.404E-4	4.011E-3	1.479E-3	2.859E-4	1.365E-3	6.579E-4	4.232E-4	9.209E-4
Average+3σ (Bias1)	---	1.037E-3	5.121E-3	3.584E-3	1.568E-2	1.110E-2	5.853E-3	6.999E-3	9.871E-3	7.721E-3	3.718E-3
Average-3σ (Bias1)	---	-7.625E-3	-3.362E-3	-2.585E-4	-8.385E-3	2.220E-3	4.138E-3	-1.193E-3	5.924E-3	5.181E-3	-1.808E-3
Average (Bias2)	---	-3.257E-3	6.432E-4	1.339E-3	8.619E-3	6.440E-3	4.218E-3	2.859E-3	8.069E-3	6.559E-3	3.672E-4
σ (Bias2)	---	1.207E-3	1.087E-3	7.559E-4	4.395E-3	1.882E-3	7.170E-4	1.044E-3	7.738E-4	7.980E-4	4.917E-4
Average+3σ (Bias2)	---	3.636E-4	3.905E-3	3.607E-3	2.180E-2	1.209E-2	6.369E-3	5.990E-3	1.039E-2	8.953E-3	1.842E-3
Average-3 σ (Bias2)	---	-6.878E-3	-2.618E-3	-9.284E-4	-4.565E-3	7.930E-4	2.067E-3	-2.724E-4	5.748E-3	4.165E-3	-1.108E-3

3. VF2

Ta=25°C; If = 20mA



VF2 . (V) **Max = 2.2**

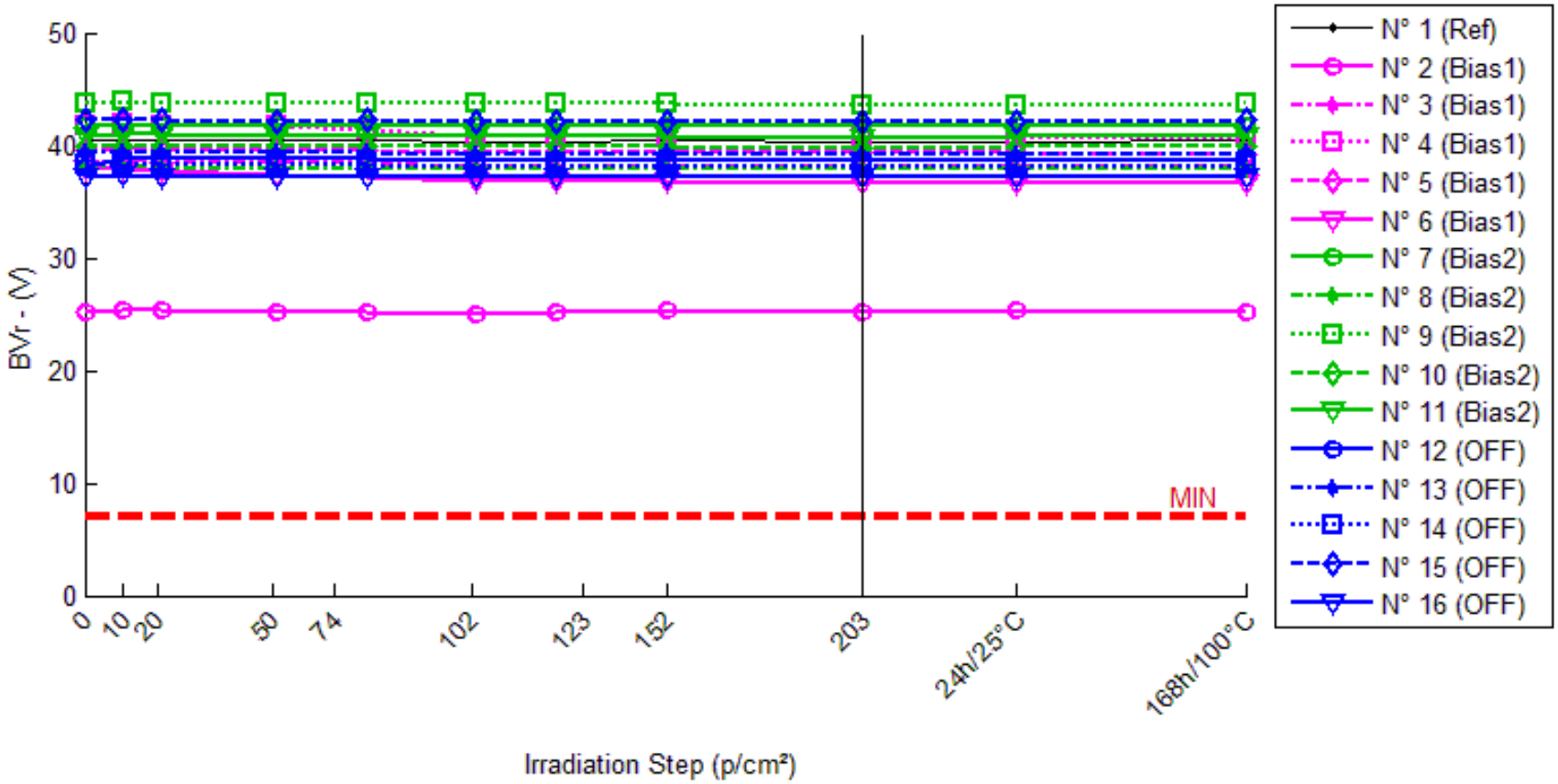
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.825	1.822	1.827	1.826	1.838	1.830	1.829	1.826	1.833	1.830	1.826
N° 2 (Bias1)	1.828	1.827	1.830	1.830	1.839	1.835	1.833	1.831	1.840	1.832	1.829
N° 3 (Bias1)	1.822	1.816	1.822	1.823	1.831	1.829	1.826	1.826	1.831	1.826	1.823
N° 4 (Bias1)	1.827	1.824	1.828	1.829	1.843	1.833	1.830	1.831	1.835	1.832	1.828
N° 5 (Bias1)	1.823	1.819	1.823	1.825	1.835	1.829	1.827	1.826	1.830	1.828	1.823
N° 6 (Bias1)	1.819	1.816	1.820	1.821	1.849	1.825	1.824	1.822	1.827	1.825	1.820
N° 7 (Bias2)	1.829	1.828	1.831	1.831	1.847	1.837	1.834	1.834	1.838	1.835	1.831
N° 8 (Bias2)	1.813	1.810	1.814	1.816	1.814	1.820	1.819	1.817	1.821	1.820	1.815
N° 9 (Bias2)	1.832	1.827	1.835	1.833	1.832	1.837	1.837	1.834	1.840	1.838	1.833
N° 10 (Bias2)	1.823	1.820	1.823	1.824	1.837	1.829	1.828	1.824	1.830	1.829	1.824
N° 11 (Bias2)	1.823	1.821	1.831	1.825	1.828	1.830	1.828	1.826	1.831	1.830	1.823
N° 12 (OFF)	1.820	1.815	1.819	1.821	1.832	1.825	1.824	1.822	1.826	1.825	1.820
N° 13 (OFF)	1.821	1.817	1.824	1.822	1.844	1.825	1.825	1.823	1.828	1.827	1.821
N° 14 (OFF)	1.819	1.816	1.824	1.820	1.826	1.825	1.823	1.821	1.827	1.825	1.819
N° 15 (OFF)	1.828	1.824	1.830	1.829	1.837	1.834	1.831	1.830	1.835	1.834	1.828
N° 16 (OFF)	1.816	1.815	1.817	1.819	1.842	1.826	1.820	1.821	1.825	1.824	1.817

Delta [VF2]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-2.867E-3	1.781E-3	1.486E-3	1.348E-2	5.474E-3	4.323E-3	1.307E-3	7.900E-3	5.012E-3	1.175E-3
N° 2 (Bias1)	---	-1.041E-3	1.553E-3	1.550E-3	1.067E-2	6.713E-3	4.706E-3	2.308E-3	1.129E-2	3.805E-3	6.410E-4
N° 3 (Bias1)	---	-5.165E-3	7.380E-4	1.399E-3	9.295E-3	6.995E-3	4.815E-3	4.226E-3	9.520E-3	4.128E-3	1.266E-3
N° 4 (Bias1)	---	-2.924E-3	1.227E-3	1.555E-3	1.566E-2	6.268E-3	2.513E-3	3.523E-3	7.669E-3	4.713E-3	7.370E-4
N° 5 (Bias1)	---	-3.401E-3	-1.570E-4	1.823E-3	1.249E-2	6.605E-3	4.553E-3	2.793E-3	7.296E-3	5.259E-3	6.420E-4
N° 6 (Bias1)	---	-3.071E-3	4.000E-4	2.067E-3	3.005E-2	5.814E-3	5.027E-3	2.224E-3	7.733E-3	5.818E-3	1.059E-3
N° 7 (Bias2)	---	-1.416E-3	1.952E-3	1.944E-3	1.796E-2	8.422E-3	5.221E-3	4.878E-3	8.591E-3	6.528E-3	1.721E-3
N° 8 (Bias2)	---	-3.700E-3	7.180E-4	2.660E-3	7.580E-4	6.853E-3	5.086E-3	3.079E-3	7.525E-3	6.667E-3	1.394E-3
N° 9 (Bias2)	---	-5.009E-3	3.118E-3	1.117E-3	1.990E-4	4.665E-3	4.771E-3	2.404E-3	7.654E-3	6.060E-3	1.542E-3
N° 10 (Bias2)	---	-2.886E-3	-4.000E-5	1.216E-3	1.405E-2	5.607E-3	4.610E-3	1.274E-3	6.818E-3	5.645E-3	5.830E-4
N° 11 (Bias2)	---	-2.261E-3	7.614E-3	1.726E-3	4.583E-3	7.014E-3	4.585E-3	2.330E-3	7.284E-3	6.454E-3	-4.070E-4
N° 12 (OFF)	---	-4.081E-3	-3.430E-4	1.021E-3	1.284E-2	5.552E-3	4.783E-3	2.511E-3	6.765E-3	5.638E-3	3.000E-4
N° 13 (OFF)	---	-3.860E-3	3.367E-3	1.095E-3	2.345E-2	4.917E-3	4.771E-3	2.009E-3	7.541E-3	5.957E-3	1.350E-4
N° 14 (OFF)	---	-2.913E-3	4.580E-3	1.038E-3	6.910E-3	5.500E-3	3.887E-3	2.067E-3	7.566E-3	6.023E-3	2.000E-6
N° 15 (OFF)	---	-3.120E-3	2.325E-3	1.200E-3	9.417E-3	6.056E-3	3.128E-3	2.551E-3	7.919E-3	6.629E-3	3.240E-4
N° 16 (OFF)	---	-1.189E-3	7.580E-4	2.683E-3	2.536E-2	9.397E-3	3.971E-3	4.443E-3	8.811E-3	7.571E-3	1.185E-3
Average (OFF)	---	-3.120E-3	7.522E-4	1.679E-3	1.563E-2	6.479E-3	4.323E-3	3.015E-3	8.702E-3	4.745E-3	8.690E-4
σ (OFF)	---	1.468E-3	6.741E-4	2.654E-4	8.404E-3	4.538E-4	1.026E-3	8.514E-4	1.684E-3	8.187E-4	2.805E-4
Average+3σ (OFF)	---	1.285E-3	2.774E-3	2.475E-3	4.085E-2	7.840E-3	7.402E-3	5.569E-3	1.376E-2	7.201E-3	1.710E-3
Average-3σ (OFF)	---	-7.525E-3	-1.270E-3	8.827E-4	-9.578E-3	5.118E-3	1.244E-3	4.607E-4	3.648E-3	2.289E-3	2.760E-5
Average (Bias1)	---	-3.054E-3	2.672E-3	1.733E-3	7.509E-3	6.512E-3	4.855E-3	2.793E-3	7.574E-3	6.271E-3	9.666E-4
σ (Bias1)	---	1.377E-3	3.013E-3	6.226E-4	8.054E-3	1.436E-3	2.860E-4	1.332E-3	6.517E-4	4.162E-4	8.827E-4
Average+3σ (Bias1)	---	1.075E-3	1.171E-2	3.600E-3	3.167E-2	1.082E-2	5.713E-3	6.790E-3	9.529E-3	7.519E-3	3.615E-3
Average-3σ (Bias1)	---	-7.184E-3	-6.367E-3	-1.353E-4	-1.665E-2	2.205E-3	3.996E-3	-1.204E-3	5.619E-3	5.022E-3	-1.682E-3
Average (Bias2)	---	-3.033E-3	2.137E-3	1.407E-3	1.560E-2	6.284E-3	4.108E-3	2.716E-3	7.720E-3	6.364E-3	3.892E-4
σ (Bias2)	---	1.141E-3	1.973E-3	7.165E-4	8.340E-3	1.786E-3	6.934E-4	9.966E-4	7.412E-4	7.642E-4	4.637E-4
Average+3σ (Bias2)	---	3.894E-4	8.056E-3	3.557E-3	4.062E-2	1.164E-2	6.188E-3	5.706E-3	9.944E-3	8.656E-3	1.780E-3
Average-3σ (Bias2)	---	-6.455E-3	-3.781E-3	-7.421E-4	-9.425E-3	9.258E-4	2.028E-3	-2.736E-4	5.497E-3	4.071E-3	-1.002E-3

4. BVr

Ta=25°C; Ir = 100 µA



BVr . (V) **Min = 7.0**

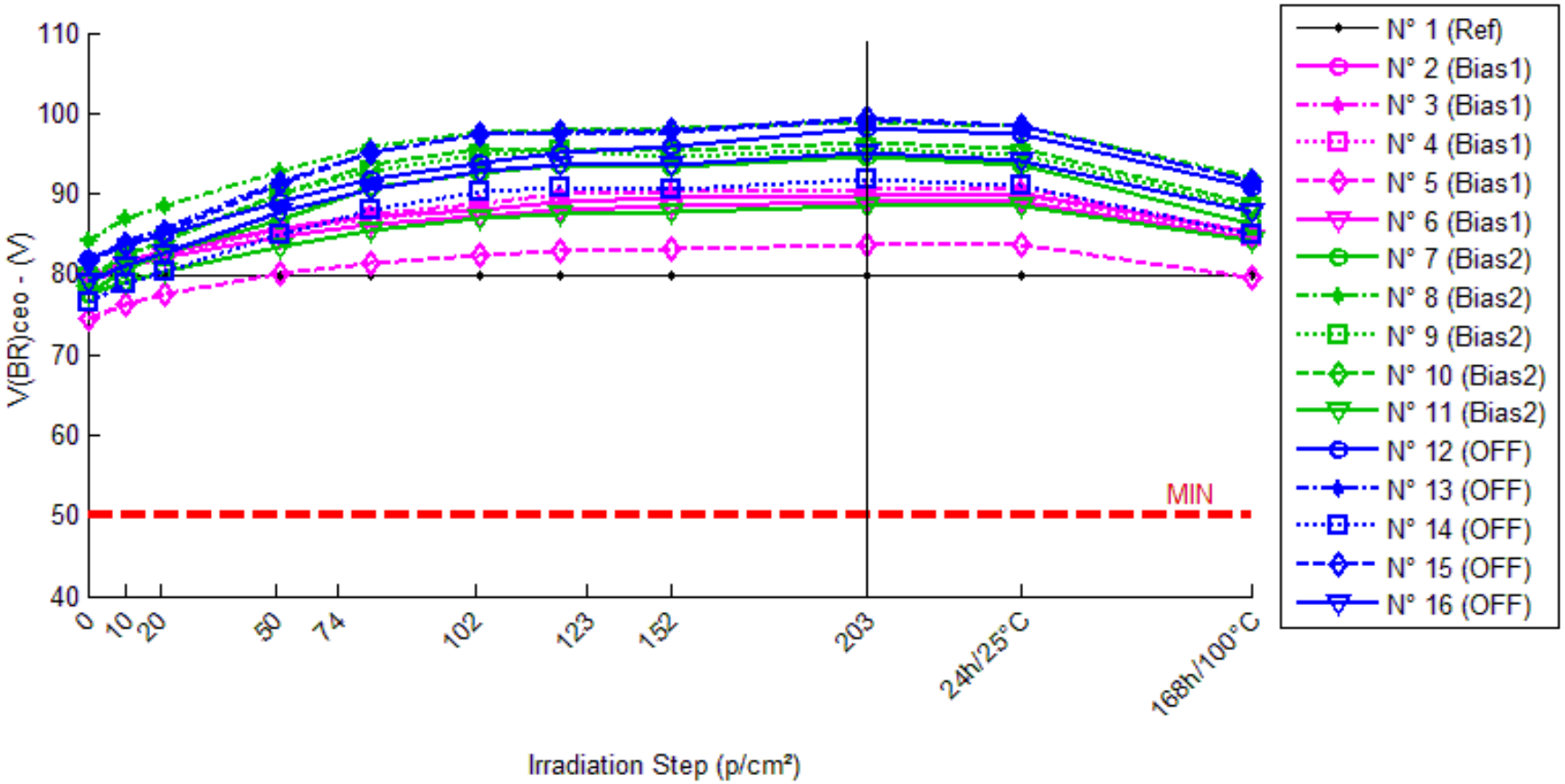
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	40.42	40.48	40.40	40.39	40.43	40.31	40.34	40.39	40.28	40.33	40.41
N° 2 (Bias1)	25.25	25.33	25.32	25.17	25.16	25.06	25.21	25.30	25.24	25.33	25.17
N° 3 (Bias1)	38.54	38.68	38.56	38.44	38.41	38.12	38.15	38.16	38.05	38.15	38.09
N° 4 (Bias1)	41.75	41.86	41.77	41.64	41.29	40.83	40.83	40.80	40.63	40.68	40.69
N° 5 (Bias1)	39.59	39.69	39.60	39.55	39.61	39.38	39.43	39.45	39.30	39.34	39.22
N° 6 (Bias1)	37.83	37.93	37.79	37.38	37.17	36.79	36.79	36.76	36.61	36.64	36.63
N° 7 (Bias2)	41.80	41.81	41.77	41.76	41.82	41.65	41.71	41.70	41.65	41.68	41.77
N° 8 (Bias2)	38.01	38.08	38.02	37.96	38.02	37.88	37.92	37.95	37.86	37.89	38.00
N° 9 (Bias2)	43.74	43.84	43.75	43.72	43.76	43.65	43.65	43.70	43.59	43.62	43.72
N° 10 (Bias2)	39.94	39.99	39.96	39.91	39.95	39.83	39.85	39.92	39.80	39.83	39.93
N° 11 (Bias2)	40.88	40.92	40.91	40.84	40.88	40.73	40.78	40.82	40.72	40.76	40.90
N° 12 (OFF)	38.12	38.89	38.84	38.79	38.80	38.69	38.72	38.75	38.67	38.70	38.81
N° 13 (OFF)	39.35	39.43	39.38	39.34	39.34	39.26	39.27	39.31	39.21	39.25	39.36
N° 14 (OFF)	38.22	38.27	38.24	38.20	38.21	38.12	38.15	38.18	38.09	38.12	38.23
N° 15 (OFF)	42.21	42.28	42.20	42.18	42.19	42.07	42.14	42.15	42.04	42.07	42.21
N° 16 (OFF)	37.27	37.29	37.26	37.22	37.24	37.10	37.20	37.18	37.11	37.14	37.25

Delta [BVr]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	5.892E-2	-2.062E-2	-3.086E-2	7.390E-3	-1.087E-1	-7.673E-2	-2.818E-2	-1.347E-1	-9.301E-2	-9.050E-3
N° 2 (Bias1)	---	7.690E-2	7.151E-2	-7.746E-2	-9.538E-2	-1.883E-1	-4.368E-2	4.863E-2	-1.285E-2	7.852E-2	-8.199E-2
N° 3 (Bias1)	---	1.344E-1	1.222E-2	-1.026E-1	-1.374E-1	-4.239E-1	-3.944E-1	-3.869E-1	-4.939E-1	-3.972E-1	-4.500E-1
N° 4 (Bias1)	---	1.077E-1	1.754E-2	-1.149E-1	-4.616E-1	-9.217E-1	-9.279E-1	-9.531E-1	-1.124E+0	-1.073E+0	-1.062E+0
N° 5 (Bias1)	---	9.848E-2	9.910E-3	-4.230E-2	1.414E-2	-2.078E-1	-1.587E-1	-1.425E-1	-2.883E-1	-2.490E-1	-3.755E-1
N° 6 (Bias1)	---	1.018E-1	-4.251E-2	-4.526E-1	-6.537E-1	-1.037E+0	-1.035E+0	-1.066E+0	-1.220E+0	-1.185E+0	-1.195E+0
N° 7 (Bias2)	---	1.609E-2	-2.155E-2	-3.404E-2	2.238E-2	-1.443E-1	-8.390E-2	-9.776E-2	-1.454E-1	-1.119E-1	-2.049E-2
N° 8 (Bias2)	---	7.094E-2	5.370E-3	-5.221E-2	4.780E-3	-1.326E-1	-9.254E-2	-6.402E-2	-1.468E-1	-1.229E-1	-1.609E-2
N° 9 (Bias2)	---	9.889E-2	1.405E-2	-2.095E-2	1.729E-2	-9.180E-2	-8.543E-2	-3.883E-2	-1.457E-1	-1.178E-1	-1.923E-2
N° 10 (Bias2)	---	5.592E-2	1.900E-2	-2.176E-2	9.450E-3	-1.069E-1	-8.917E-2	-1.997E-2	-1.340E-1	-1.034E-1	-9.510E-3
N° 11 (Bias2)	---	4.356E-2	2.891E-2	-3.672E-2	-8.100E-4	-1.485E-1	-9.399E-2	-5.471E-2	-1.542E-1	-1.211E-1	1.893E-2
N° 12 (OFF)	---	7.651E-1	7.164E-1	6.630E-1	6.766E-1	5.688E-1	5.969E-1	6.280E-1	5.489E-1	5.782E-1	6.866E-1
N° 13 (OFF)	---	7.422E-2	2.500E-2	-1.432E-2	-1.331E-2	-9.384E-2	-8.158E-2	-4.435E-2	-1.386E-1	-1.010E-1	1.064E-2
N° 14 (OFF)	---	5.258E-2	1.739E-2	-1.937E-2	-6.920E-3	-1.017E-1	-6.905E-2	-3.959E-2	-1.333E-1	-1.022E-1	1.018E-2
N° 15 (OFF)	---	6.819E-2	-8.460E-3	-3.157E-2	-1.746E-2	-1.361E-1	-6.704E-2	-6.224E-2	-1.651E-1	-1.357E-1	1.900E-4
N° 16 (OFF)	---	1.637E-2	-7.360E-3	-5.334E-2	-2.812E-2	-1.724E-1	-7.216E-2	-8.543E-2	-1.606E-1	-1.300E-1	-2.300E-2
Average (OFF)	---	1.039E-1	1.373E-2	-1.580E-1	-2.668E-1	-5.557E-1	-5.119E-1	-5.001E-1	-6.277E-1	-5.650E-1	-6.330E-1
σ (OFF)	---	2.068E-2	4.041E-2	1.670E-1	2.796E-1	3.995E-1	4.484E-1	4.919E-1	5.262E-1	5.441E-1	4.753E-1
Average+3σ (OFF)	---	1.659E-1	1.350E-1	3.431E-1	5.720E-1	6.429E-1	8.333E-1	9.756E-1	9.510E-1	1.067E+0	7.929E-1
Average-3σ (OFF)	---	4.185E-2	-1.075E-1	-6.591E-1	-1.106E+0	-1.754E+0	-1.857E+0	-1.976E+0	-2.206E+0	-2.197E+0	-2.059E+0
Average (Bias1)	---	5.708E-2	9.156E-3	-3.314E-2	1.062E-2	-1.248E-1	-8.901E-2	-5.506E-2	-1.452E-1	-1.154E-1	-9.278E-3
σ (Bias1)	---	3.084E-2	1.916E-2	1.280E-2	9.340E-3	2.456E-2	4.365E-3	2.915E-2	7.220E-3	7.910E-3	1.633E-2
Average+3σ (Bias1)	---	1.496E-1	6.663E-2	5.265E-3	3.864E-2	-5.115E-2	-7.591E-2	3.239E-2	-1.236E-1	-9.168E-2	3.972E-2
Average-3σ (Bias1)	---	-3.544E-2	-4.832E-2	-7.154E-2	-1.740E-2	-1.985E-1	-1.021E-1	-1.425E-1	-1.669E-1	-1.391E-1	-5.827E-2
Average (Bias2)	---	1.953E-1	1.486E-1	1.089E-1	1.222E-1	1.295E-2	6.141E-2	7.927E-2	-9.740E-3	2.183E-2	1.369E-1
σ (Bias2)	---	3.193E-1	3.177E-1	3.101E-1	3.100E-1	3.123E-1	2.994E-1	3.073E-1	3.126E-1	3.114E-1	3.076E-1
Average+3σ (Bias2)	---	1.153E+0	1.102E+0	1.039E+0	1.052E+0	9.498E-1	9.596E-1	1.001E+0	9.280E-1	9.560E-1	1.060E+0
Average-3σ (Bias2)	---	-7.627E-1	-8.047E-1	-8.215E-1	-8.079E-1	-9.239E-1	-8.368E-1	-8.425E-1	-9.475E-1	-9.124E-1	-7.858E-1

5. V(BR)ceo

Ta=25°C; Ic = 1 mA; Ib = 0; If = 0



V(BR)ceo . (V) **Min = 50.0**

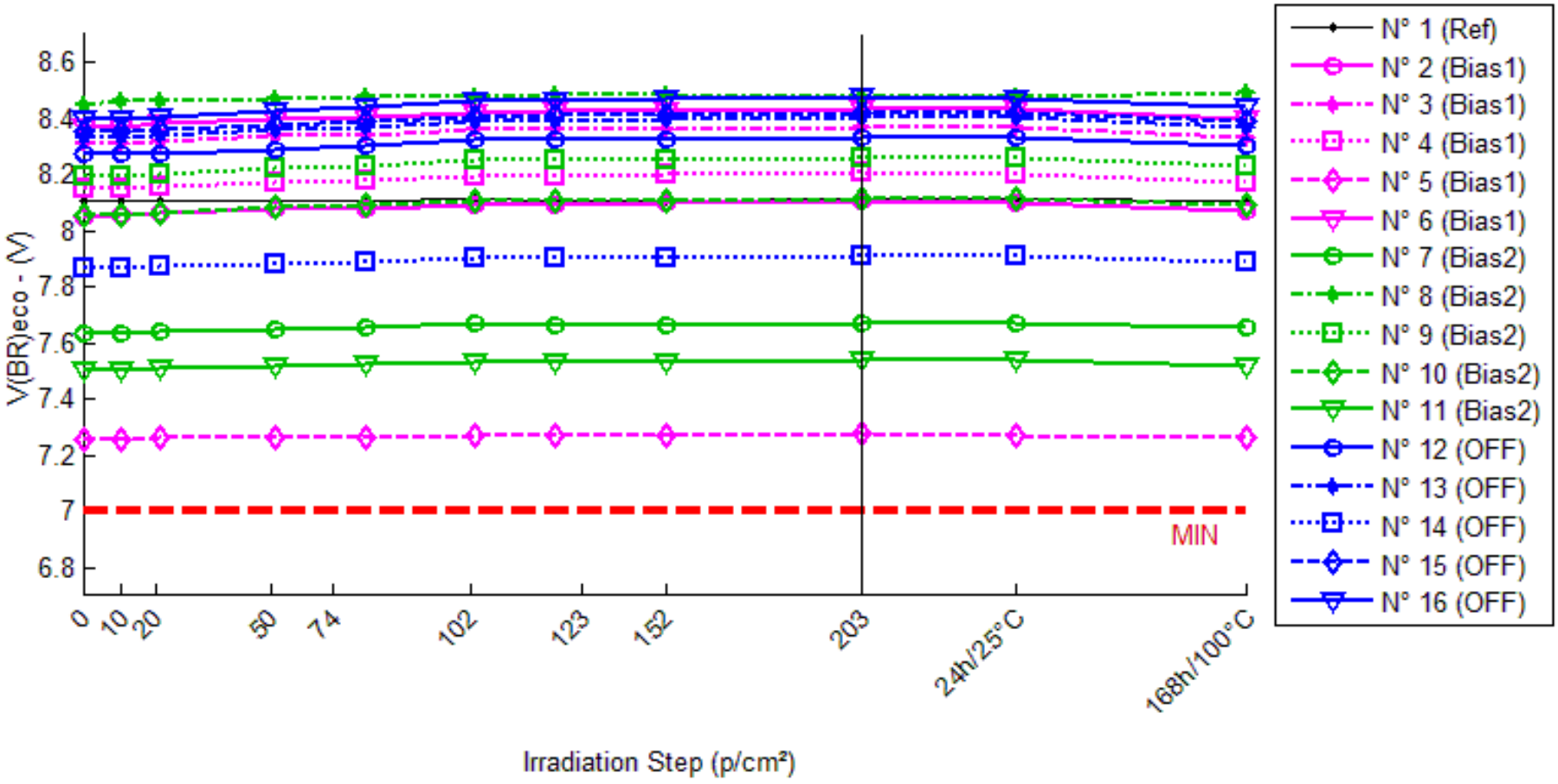
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	79.82	79.96	79.90	79.90	79.93	79.86	79.86	79.90	79.82	79.85	79.93
N° 2 (Bias1)	79.69	81.55	82.96	85.70	87.10	88.04	88.91	89.53	89.88	90.08	85.22
N° 3 (Bias1)	79.93	81.52	82.72	85.71	87.57	88.79	90.02	90.24	90.44	90.72	85.07
N° 4 (Bias1)	78.94	81.07	82.52	85.37	87.00	87.97	89.03	89.58	89.73	89.75	84.56
N° 5 (Bias1)	74.54	76.30	77.60	80.05	81.31	82.30	82.82	83.23	83.56	83.53	79.49
N° 6 (Bias1)	79.05	80.75	82.09	84.73	86.24	87.24	88.01	88.39	89.04	89.07	84.35
N° 7 (Bias2)	77.58	80.58	82.56	86.67	90.77	92.68	93.63	93.32	94.72	93.51	86.08
N° 8 (Bias2)	84.22	86.86	88.50	92.93	95.82	97.74	98.03	98.18	98.81	98.33	92.00
N° 9 (Bias2)	79.51	82.33	84.21	89.93	92.88	94.95	95.30	94.68	95.60	94.91	88.19
N° 10 (Bias2)	79.39	82.27	84.15	90.13	93.65	95.56	95.41	95.46	96.48	95.66	88.67
N° 11 (Bias2)	77.46	79.14	80.25	83.37	85.39	87.00	87.35	87.74	88.59	88.38	84.08
N° 12 (OFF)	81.95	83.67	84.86	89.02	91.78	93.82	95.22	95.91	98.12	97.44	90.88
N° 13 (OFF)	81.73	84.13	85.80	91.51	95.04	97.35	97.36	97.76	99.20	98.32	91.65
N° 14 (OFF)	76.50	78.75	80.22	84.98	88.05	90.23	90.67	90.51	91.74	91.05	84.92
N° 15 (OFF)	81.53	83.71	85.28	91.17	95.07	97.45	97.66	97.96	99.34	98.50	91.63
N° 16 (OFF)	78.97	81.09	82.62	87.68	90.54	92.79	93.55	93.47	95.21	94.14	87.78

Delta [V(BR)ceo]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.428E-1	7.321E-2	7.649E-2	1.106E-1	3.792E-2	4.244E-2	8.055E-2	-3.590E-3	3.100E-2	1.103E-1
N° 2 (Bias1)	---	1.856E+0	3.266E+0	6.004E+0	7.405E+0	8.347E+0	9.216E+0	9.843E+0	1.019E+1	1.039E+1	5.524E+0
N° 3 (Bias1)	---	1.593E+0	2.786E+0	5.783E+0	7.641E+0	8.858E+0	1.008E+1	1.031E+1	1.051E+1	1.079E+1	5.142E+0
N° 4 (Bias1)	---	2.123E+0	3.577E+0	6.422E+0	8.052E+0	9.027E+0	1.008E+1	1.064E+1	1.078E+1	1.081E+1	5.619E+0
N° 5 (Bias1)	---	1.760E+0	3.058E+0	5.507E+0	6.771E+0	7.763E+0	8.282E+0	8.694E+0	9.022E+0	8.989E+0	4.950E+0
N° 6 (Bias1)	---	1.700E+0	3.040E+0	5.680E+0	7.189E+0	8.192E+0	8.958E+0	9.333E+0	9.989E+0	1.002E+1	5.300E+0
N° 7 (Bias2)	---	3.005E+0	4.978E+0	9.091E+0	1.320E+1	1.510E+1	1.605E+1	1.574E+1	1.714E+1	1.594E+1	8.497E+0
N° 8 (Bias2)	---	2.645E+0	4.284E+0	8.719E+0	1.161E+1	1.353E+1	1.381E+1	1.396E+1	1.460E+1	1.411E+1	7.789E+0
N° 9 (Bias2)	---	2.819E+0	4.698E+0	1.041E+1	1.336E+1	1.544E+1	1.579E+1	1.517E+1	1.609E+1	1.540E+1	8.677E+0
N° 10 (Bias2)	---	2.887E+0	4.760E+0	1.074E+1	1.427E+1	1.617E+1	1.603E+1	1.607E+1	1.710E+1	1.627E+1	9.284E+0
N° 11 (Bias2)	---	1.685E+0	2.788E+0	5.908E+0	7.936E+0	9.545E+0	9.891E+0	1.028E+1	1.113E+1	1.093E+1	6.619E+0
N° 12 (OFF)	---	1.715E+0	2.913E+0	7.072E+0	9.832E+0	1.187E+1	1.326E+1	1.396E+1	1.617E+1	1.549E+1	8.930E+0
N° 13 (OFF)	---	2.399E+0	4.075E+0	9.781E+0	1.331E+1	1.562E+1	1.563E+1	1.603E+1	1.747E+1	1.659E+1	9.920E+0
N° 14 (OFF)	---	2.253E+0	3.716E+0	8.479E+0	1.155E+1	1.373E+1	1.416E+1	1.401E+1	1.524E+1	1.455E+1	8.418E+0
N° 15 (OFF)	---	2.181E+0	3.754E+0	9.643E+0	1.354E+1	1.592E+1	1.613E+1	1.642E+1	1.781E+1	1.697E+1	1.010E+1
N° 16 (OFF)	---	2.120E+0	3.651E+0	8.715E+0	1.157E+1	1.383E+1	1.459E+1	1.450E+1	1.624E+1	1.518E+1	8.817E+0
Average (OFF)	---	1.806E+0	3.146E+0	5.879E+0	7.411E+0	8.437E+0	9.324E+0	9.763E+0	1.010E+1	1.020E+1	5.307E+0
σ (OFF)	---	2.011E-1	2.952E-1	3.526E-1	4.803E-1	5.115E-1	7.717E-1	7.736E-1	6.741E-1	7.496E-1	2.733E-1
Average+3σ (OFF)	---	2.409E+0	4.031E+0	6.937E+0	8.852E+0	9.972E+0	1.164E+1	1.208E+1	1.212E+1	1.245E+1	6.127E+0
Average-3σ (OFF)	---	1.203E+0	2.260E+0	4.821E+0	5.971E+0	6.903E+0	7.009E+0	7.442E+0	8.076E+0	7.950E+0	4.487E+0
Average (Bias1)	---	2.608E+0	4.302E+0	8.974E+0	1.207E+1	1.396E+1	1.431E+1	1.424E+1	1.521E+1	1.453E+1	8.173E+0
σ (Bias1)	---	5.322E-1	8.824E-1	1.915E+0	2.503E+0	2.649E+0	2.643E+0	2.356E+0	2.502E+0	2.175E+0	1.019E+0
Average+3σ (Bias1)	---	4.205E+0	6.949E+0	1.472E+1	1.958E+1	2.190E+1	2.224E+1	2.131E+1	2.272E+1	2.105E+1	1.123E+1
Average-3σ (Bias1)	---	1.012E+0	1.654E+0	3.229E+0	4.564E+0	6.009E+0	6.385E+0	7.175E+0	7.704E+0	8.004E+0	5.115E+0
Average (Bias2)	---	2.134E+0	3.622E+0	8.738E+0	1.196E+1	1.419E+1	1.476E+1	1.499E+1	1.659E+1	1.576E+1	9.236E+0
σ (Bias2)	---	2.563E-1	4.287E-1	1.090E+0	1.512E+0	1.640E+0	1.148E+0	1.161E+0	1.047E+0	1.004E+0	7.323E-1
Average+3σ (Bias2)	---	2.903E+0	4.908E+0	1.201E+1	1.650E+1	1.911E+1	1.820E+1	1.847E+1	1.973E+1	1.877E+1	1.143E+1
Average-3σ (Bias2)	---	1.365E+0	2.336E+0	5.469E+0	7.424E+0	9.274E+0	1.131E+1	1.150E+1	1.344E+1	1.274E+1	7.039E+0

6. V(BR)eco

Ta=25°C; Ic = 10 µA



V(BR)eco . (V) **Min = 7.0**

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	8.109	8.105	8.109	8.109	8.106	8.112	8.110	8.109	8.114	8.112	8.107
N° 2 (Bias1)	8.050	8.053	8.061	8.076	8.080	8.094	8.095	8.097	8.107	8.099	8.073
N° 3 (Bias1)	8.309	8.308	8.319	8.337	8.342	8.359	8.361	8.365	8.372	8.366	8.336
N° 4 (Bias1)	8.148	8.149	8.159	8.176	8.181	8.194	8.195	8.199	8.206	8.203	8.172
N° 5 (Bias1)	7.259	7.255	7.260	7.265	7.263	7.273	7.271	7.270	7.276	7.273	7.262
N° 6 (Bias1)	8.367	8.370	8.380	8.399	8.404	8.419	8.424	8.426	8.434	8.431	8.396
N° 7 (Bias2)	7.637	7.636	7.641	7.652	7.653	7.668	7.665	7.667	7.671	7.669	7.654
N° 8 (Bias2)	8.450	8.463	8.467	8.473	8.481	8.479	8.482	8.485	8.481	8.481	8.496
N° 9 (Bias2)	8.193	8.192	8.201	8.224	8.234	8.250	8.251	8.252	8.259	8.257	8.233
N° 10 (Bias2)	8.055	8.055	8.062	8.083	8.092	8.107	8.107	8.107	8.115	8.113	8.090
N° 11 (Bias2)	7.506	7.504	7.508	7.520	7.522	7.534	7.533	7.532	7.538	7.537	7.520
N° 12 (OFF)	8.272	8.271	8.277	8.291	8.303	8.322	8.325	8.328	8.336	8.334	8.303
N° 13 (OFF)	8.335	8.335	8.342	8.359	8.372	8.390	8.394	8.396	8.404	8.402	8.370
N° 14 (OFF)	7.868	7.867	7.872	7.884	7.891	7.903	7.905	7.906	7.913	7.911	7.888
N° 15 (OFF)	8.353	8.353	8.360	8.377	8.390	8.408	8.410	8.414	8.422	8.420	8.388
N° 16 (OFF)	8.398	8.400	8.407	8.427	8.442	8.464	8.463	8.468	8.476	8.474	8.440

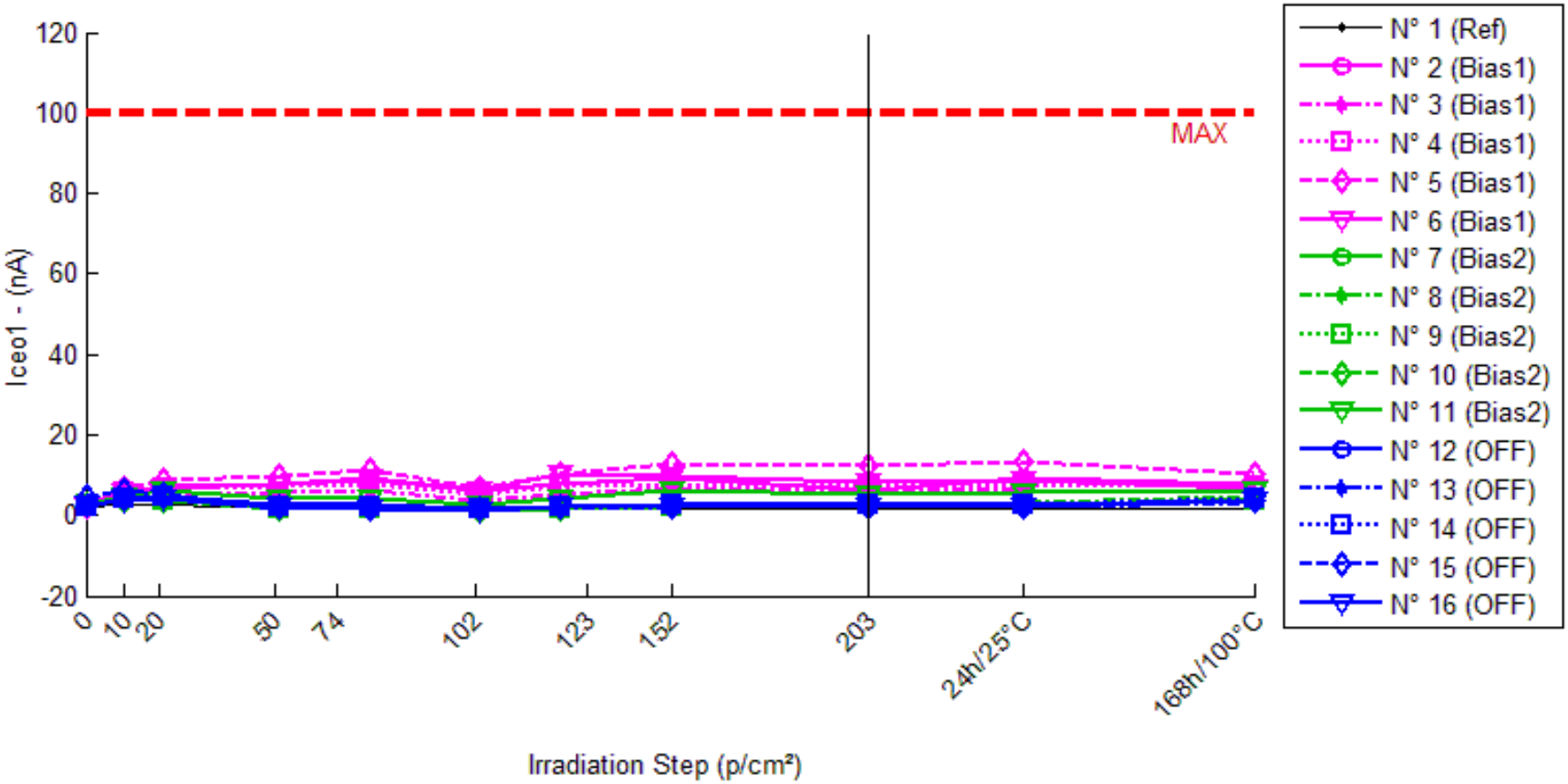
Delta [V(BR)eco]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-4.688E-3	-1.100E-5	-2.520E-4	-2.939E-3	3.048E-3	1.123E-3	-3.750E-4	4.397E-3	2.494E-3	-1.901E-3
N° 2 (Bias1)	---	3.063E-3	1.101E-2	2.611E-2	3.012E-2	4.427E-2	4.548E-2	4.675E-2	5.675E-2	4.872E-2	2.281E-2
N° 3 (Bias1)	---	-7.480E-4	1.059E-2	2.763E-2	3.329E-2	4.962E-2	5.198E-2	5.643E-2	6.351E-2	5.686E-2	2.665E-2
N° 4 (Bias1)	---	1.705E-3	1.141E-2	2.844E-2	3.314E-2	4.644E-2	4.719E-2	5.191E-2	5.851E-2	5.531E-2	2.437E-2
N° 5 (Bias1)	---	-3.886E-3	1.295E-3	6.341E-3	4.694E-3	1.408E-2	1.209E-2	1.157E-2	1.710E-2	1.395E-2	3.038E-3
N° 6 (Bias1)	---	2.599E-3	1.265E-2	3.165E-2	3.672E-2	5.198E-2	5.627E-2	5.872E-2	6.650E-2	6.337E-2	2.913E-2
N° 7 (Bias2)	---	-7.190E-4	4.286E-3	1.470E-2	1.598E-2	3.040E-2	2.787E-2	2.996E-2	3.429E-2	3.151E-2	1.682E-2
N° 8 (Bias2)	---	1.314E-2	1.693E-2	2.277E-2	3.157E-2	2.941E-2	3.257E-2	3.522E-2	3.171E-2	3.125E-2	4.586E-2
N° 9 (Bias2)	---	-1.155E-3	8.328E-3	3.056E-2	4.079E-2	5.646E-2	5.809E-2	5.901E-2	6.633E-2	6.418E-2	4.009E-2
N° 10 (Bias2)	---	-2.800E-5	7.140E-3	2.845E-2	3.706E-2	5.197E-2	5.260E-2	5.273E-2	6.001E-2	5.801E-2	3.536E-2
N° 11 (Bias2)	---	-1.580E-3	2.285E-3	1.374E-2	1.644E-2	2.856E-2	2.680E-2	2.649E-2	3.256E-2	3.085E-2	1.444E-2
N° 12 (OFF)	---	-1.308E-3	4.902E-3	1.949E-2	3.120E-2	4.974E-2	5.336E-2	5.644E-2	6.428E-2	6.211E-2	3.063E-2
N° 13 (OFF)	---	-6.740E-4	6.279E-3	2.329E-2	3.699E-2	5.414E-2	5.836E-2	6.025E-2	6.900E-2	6.648E-2	3.481E-2
N° 14 (OFF)	---	-9.760E-4	4.195E-3	1.611E-2	2.312E-2	3.537E-2	3.721E-2	3.887E-2	4.577E-2	4.363E-2	2.032E-2
N° 15 (OFF)	---	-2.010E-4	7.462E-3	2.383E-2	3.682E-2	5.553E-2	5.726E-2	6.109E-2	6.942E-2	6.720E-2	3.517E-2
N° 16 (OFF)	---	2.038E-3	8.875E-3	2.892E-2	4.316E-2	6.524E-2	6.483E-2	7.001E-2	7.784E-2	7.567E-2	4.170E-2
Average (OFF)	---	5.466E-4	9.391E-3	2.403E-2	2.760E-2	4.128E-2	4.260E-2	4.508E-2	5.247E-2	4.764E-2	2.120E-2
σ (OFF)	---	2.881E-3	4.591E-3	1.010E-2	1.301E-2	1.549E-2	1.757E-2	1.928E-2	2.015E-2	1.954E-2	1.043E-2
Average+3σ (OFF)	---	9.191E-3	2.316E-2	5.432E-2	6.664E-2	8.774E-2	9.531E-2	1.029E-1	1.129E-1	1.063E-1	5.249E-2
Average-3σ (OFF)	---	-8.098E-3	-4.381E-3	-6.252E-3	-1.145E-2	-5.184E-3	-1.011E-2	-1.277E-2	-7.981E-3	-1.099E-2	-1.009E-2
Average (Bias1)	---	1.931E-3	7.794E-3	2.204E-2	2.837E-2	3.936E-2	3.958E-2	4.068E-2	4.498E-2	4.316E-2	3.051E-2
σ (Bias1)	---	6.291E-3	5.632E-3	7.695E-3	1.157E-2	1.367E-2	1.468E-2	1.438E-2	1.678E-2	1.652E-2	1.411E-2
Average+3σ (Bias1)	---	2.080E-2	2.469E-2	4.513E-2	6.309E-2	8.037E-2	8.362E-2	8.382E-2	9.532E-2	9.271E-2	7.285E-2
Average-3σ (Bias1)	---	-1.694E-2	-9.101E-3	-1.041E-3	-6.358E-3	-1.652E-3	-4.448E-3	-2.455E-3	-5.363E-3	-6.391E-3	-1.183E-2
Average (Bias2)	---	-2.242E-4	6.343E-3	2.233E-2	3.426E-2	5.200E-2	5.420E-2	5.733E-2	6.526E-2	6.302E-2	3.253E-2
σ (Bias2)	---	1.329E-3	1.895E-3	4.830E-3	7.526E-3	1.089E-2	1.036E-2	1.146E-2	1.194E-2	1.190E-2	7.887E-3
Average+3σ (Bias2)	---	3.761E-3	1.203E-2	3.682E-2	5.684E-2	8.466E-2	8.528E-2	9.171E-2	1.011E-1	9.871E-2	5.619E-2
Average-3σ (Bias2)	---	-4.210E-3	6.589E-4	7.836E-3	1.168E-2	1.934E-2	2.313E-2	2.295E-2	2.944E-2	2.732E-2	8.866E-3

c

7. Iceo1

Ta=25°C; Vce = 50V; If = 0



Iceo1 . (nA) **Max = 100.0**

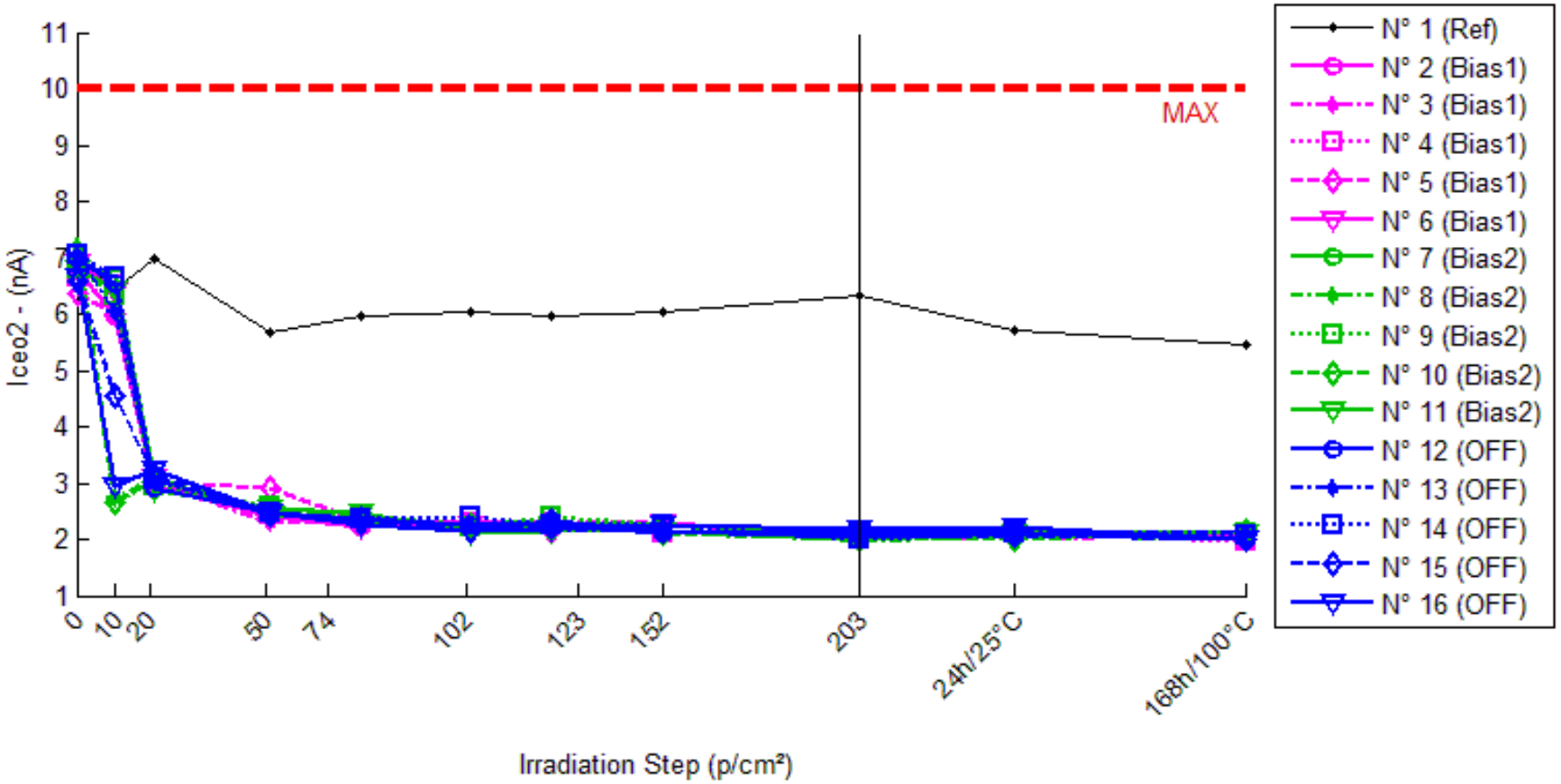
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.015	2.759	2.852	1.884	1.852	1.436	1.600	1.589	1.873	1.422	1.537
N° 2 (Bias1)	2.215	5.622	7.355	7.853	8.759	6.042	7.807	9.198	6.265	9.173	7.848
N° 3 (Bias1)	1.892	4.619	5.382	5.774	6.180	3.913	5.155	6.654	6.031	6.334	5.849
N° 4 (Bias1)	2.752	5.892	6.920	7.173	7.526	5.333	7.021	7.578	7.166	7.508	7.254
N° 5 (Bias1)	1.892	6.699	8.621	9.722	11.562	6.914	10.420	13.001	12.400	13.439	10.507
N° 6 (Bias1)	2.284	5.634	6.930	7.583	9.284	6.336	10.114	9.745	8.470	8.662	6.909
N° 7 (Bias2)	1.904	3.941	3.644	2.396	1.890	1.356	1.739	1.966	2.200	2.363	4.393
N° 8 (Bias2)	2.474	4.222	4.416	2.295	2.171	1.571	2.111	2.736	2.899	2.949	4.582
N° 9 (Bias2)	2.783	4.116	3.599	1.754	1.705	1.418	1.803	2.349	2.443	2.457	3.646
N° 10 (Bias2)	2.570	3.785	3.723	1.732	1.662	1.336	1.716	2.177	2.342	2.236	3.551
N° 11 (Bias2)	2.481	4.484	6.015	4.277	4.246	2.850	4.292	6.014	5.424	5.941	6.258
N° 12 (OFF)	1.958	4.147	4.559	2.718	2.486	1.867	2.323	2.659	2.513	2.594	3.748
N° 13 (OFF)	1.984	3.875	3.962	1.890	1.718	1.423	1.795	2.186	2.179	2.220	3.091
N° 14 (OFF)	2.286	4.005	4.488	2.350	2.038	1.540	2.101	2.589	2.538	2.713	4.156
N° 15 (OFF)	4.891	6.217	5.084	2.097	1.823	1.417	1.897	2.153	2.205	2.189	3.435
N° 16 (OFF)	2.477	3.797	4.115	1.917	1.819	1.355	2.012	2.158	2.132	2.292	3.533

Delta [Iceo1]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	7.439E-1	8.368E-1	-1.306E-1	-1.627E-1	-5.784E-1	-4.152E-1	-4.260E-1	-1.420E-1	-5.929E-1	-4.780E-1
N° 2 (Bias1)	---	3.407E+0	5.139E+0	5.638E+0	6.544E+0	3.827E+0	5.592E+0	6.983E+0	4.050E+0	6.958E+0	5.633E+0
N° 3 (Bias1)	---	2.727E+0	3.490E+0	3.882E+0	4.288E+0	2.021E+0	3.263E+0	4.762E+0	4.139E+0	4.442E+0	3.957E+0
N° 4 (Bias1)	---	3.140E+0	4.168E+0	4.421E+0	4.773E+0	2.580E+0	4.269E+0	4.825E+0	4.414E+0	4.756E+0	4.502E+0
N° 5 (Bias1)	---	4.807E+0	6.729E+0	7.830E+0	9.669E+0	5.022E+0	8.527E+0	1.111E+1	1.051E+1	1.155E+1	8.614E+0
N° 6 (Bias1)	---	3.350E+0	4.645E+0	5.299E+0	6.999E+0	4.052E+0	7.830E+0	7.460E+0	6.186E+0	6.378E+0	4.624E+0
N° 7 (Bias2)	---	2.037E+0	1.740E+0	4.926E-1	-1.323E-2	-5.477E-1	-1.648E-1	6.195E-2	2.966E-1	4.592E-1	2.490E+0
N° 8 (Bias2)	---	1.749E+0	1.942E+0	-1.784E-1	-3.030E-1	-9.029E-1	-3.626E-1	2.621E-1	4.251E-1	4.755E-1	2.108E+0
N° 9 (Bias2)	---	1.333E+0	8.164E-1	-1.029E+0	-1.078E+0	-1.365E+0	-9.797E-1	-4.338E-1	-3.406E-1	-3.262E-1	8.629E-1
N° 10 (Bias2)	---	1.216E+0	1.153E+0	-8.376E-1	-9.074E-1	-1.234E+0	-8.543E-1	-3.925E-1	-2.279E-1	-3.338E-1	9.810E-1
N° 11 (Bias2)	---	2.003E+0	3.534E+0	1.796E+0	1.765E+0	3.688E-1	1.811E+0	3.534E+0	2.943E+0	3.460E+0	3.777E+0
N° 12 (OFF)	---	2.189E+0	2.602E+0	7.598E-1	5.279E-1	-9.057E-2	3.656E-1	7.010E-1	5.550E-1	6.366E-1	1.790E+0
N° 13 (OFF)	---	1.891E+0	1.978E+0	-9.414E-2	-2.660E-1	-5.616E-1	-1.888E-1	2.015E-1	1.950E-1	2.356E-1	1.107E+0
N° 14 (OFF)	---	1.720E+0	2.203E+0	6.462E-2	-2.474E-1	-7.461E-1	-1.850E-1	3.033E-1	2.529E-1	4.274E-1	1.870E+0
N° 15 (OFF)	---	1.326E+0	1.931E-1	-2.794E+0	-3.068E+0	-3.473E+0	-2.994E+0	-2.738E+0	-2.686E+0	-2.702E+0	-1.456E+0
N° 16 (OFF)	---	1.320E+0	1.638E+0	-5.602E-1	-6.576E-1	-1.122E+0	-4.653E-1	-3.188E-1	-3.454E-1	-1.850E-1	1.056E+0
Average (OFF)	---	3.486E+0	4.834E+0	5.414E+0	6.455E+0	3.500E+0	5.896E+0	7.028E+0	5.859E+0	6.816E+0	5.466E+0
σ (OFF)	---	7.852E-1	1.222E+0	1.519E+0	2.131E+0	1.200E+0	2.255E+0	2.590E+0	2.740E+0	2.849E+0	1.861E+0
Average+3σ (OFF)	---	5.842E+0	8.500E+0	9.971E+0	1.285E+1	7.101E+0	1.266E+1	1.480E+1	1.408E+1	1.536E+1	1.105E+1
Average-3σ (OFF)	---	1.131E+0	1.168E+0	8.565E-1	6.208E-2	-1.002E-1	-8.684E-1	-7.413E-1	-2.362E+0	-1.731E+0	-1.176E-1
Average (Bias1)	---	1.667E+0	1.837E+0	4.882E-2	-1.073E-1	-7.361E-1	-1.102E-1	6.063E-1	6.192E-1	7.470E-1	2.044E+0
σ (Bias1)	---	3.782E-1	1.050E+0	1.146E+0	1.133E+0	6.942E-1	1.125E+0	1.663E+0	1.340E+0	1.568E+0	1.197E+0
Average+3σ (Bias1)	---	2.802E+0	4.988E+0	3.486E+0	3.292E+0	1.346E+0	3.266E+0	5.595E+0	4.638E+0	5.452E+0	5.635E+0
Average-3σ (Bias1)	---	5.327E-1	-1.313E+0	-3.388E+0	-3.506E+0	-2.819E+0	-3.486E+0	-4.383E+0	-3.400E+0	-3.958E+0	-1.547E+0
Average (Bias2)	---	1.689E+0	1.723E+0	-5.248E-1	-7.422E-1	-1.199E+0	-6.936E-1	-3.702E-1	-4.056E-1	-3.175E-1	8.735E-1
σ (Bias2)	---	3.742E-1	9.240E-1	1.354E+0	1.369E+0	1.325E+0	1.321E+0	1.373E+0	1.315E+0	1.367E+0	1.355E+0
Average+3σ (Bias2)	---	2.812E+0	4.495E+0	3.537E+0	3.366E+0	2.775E+0	3.270E+0	3.748E+0	3.540E+0	3.784E+0	4.939E+0
Average-3σ (Bias2)	---	5.666E-1	-1.049E+0	-4.587E+0	-4.850E+0	-5.173E+0	-4.657E+0	-4.488E+0	-4.351E+0	-4.419E+0	-3.192E+0

8. Iceo2

Ta=25°C; Vce = 5V; If = 0



Iceo2 . (nA) **Max = 10.0**

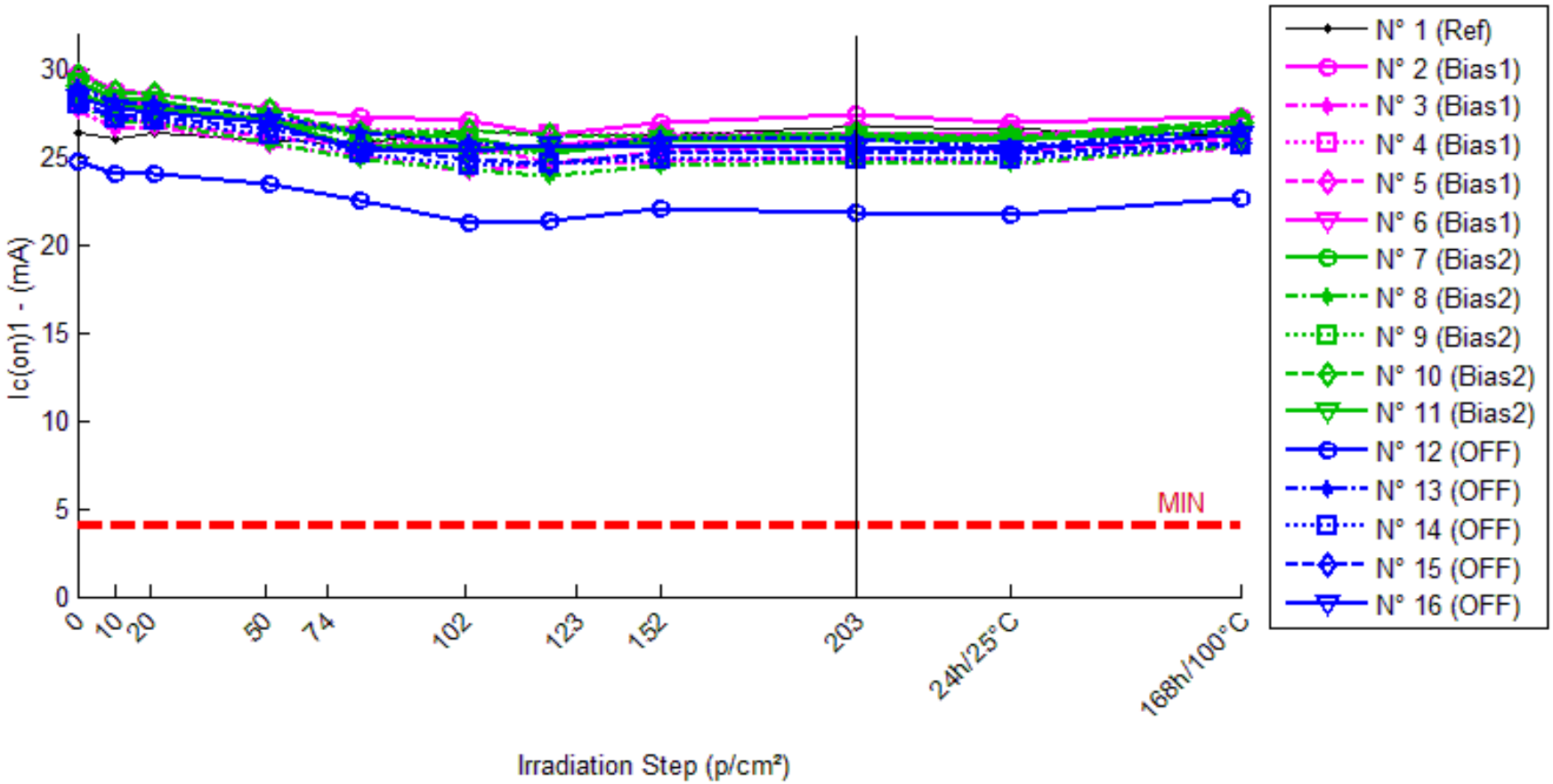
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	7.027	6.447	6.975	5.670	5.981	6.035	5.959	6.020	3.319	5.710	5.441
N° 2 (Bias1)	6.747	5.972	2.935	2.409	2.205	2.242	2.173	2.265	2.105	2.109	2.120
N° 3 (Bias1)	6.767	6.014	3.024	2.287	2.326	2.294	2.316	2.294	2.076	2.014	2.096
N° 4 (Bias1)	6.666	6.526	3.070	2.441	2.345	2.276	2.284	2.127	2.112	2.123	1.970
N° 5 (Bias1)	6.355	6.012	3.018	5.921	2.337	2.232	2.155	2.144	2.123	2.080	2.073
N° 6 (Bias1)	6.919	6.411	3.102	2.430	2.235	2.237	2.184	2.282	2.022	2.020	2.127
N° 7 (Bias2)	6.913	6.637	3.076	2.445	2.332	2.244	2.301	2.264	2.133	2.118	1.995
N° 8 (Bias2)	7.191	2.723	3.080	2.475	2.358	2.213	2.240	2.241	1.952	2.089	1.987
N° 9 (Bias2)	6.784	6.333	2.931	2.568	2.382	2.228	2.402	2.253	2.132	2.117	2.122
N° 10 (Bias2)	6.907	2.664	3.051	2.455	2.393	2.253	2.299	2.118	2.013	1.999	2.139
N° 11 (Bias2)	6.807	6.428	2.861	2.554	2.480	2.111	2.142	2.144	1.983	2.109	2.113
N° 12 (OFF)	6.983	6.556	2.900	2.462	2.371	2.268	2.260	2.125	2.146	2.121	1.988
N° 13 (OFF)	7.044	6.032	3.045	2.474	2.340	2.263	2.183	2.135	2.022	2.124	2.105
N° 14 (OFF)	7.055	6.648	3.053	2.465	2.352	2.383	2.264	2.266	2.000	2.123	2.074
N° 15 (OFF)	6.589	4.531	3.132	2.444	2.353	2.135	2.319	2.134	2.030	2.085	2.009
N° 16 (OFF)	6.649	2.956	3.231	2.488	2.262	2.144	2.187	2.251	2.168	2.231	2.001

Delta [Iceo2]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-5.799E-1	-5.217E-2	-1.356E+0	-1.046E+0	-9.915E-1	-1.067E+0	-1.007E+0	-3.708E+0	-1.316E+0	-1.586E+0
N° 2 (Bias1)	---	-7.747E-1	-3.812E+0	-4.337E+0	-4.542E+0	-4.505E+0	-4.573E+0	-4.482E+0	-4.642E+0	-4.638E+0	-4.627E+0
N° 3 (Bias1)	---	-7.531E-1	-3.743E+0	-4.480E+0	-4.441E+0	-4.473E+0	-4.451E+0	-4.473E+0	-4.691E+0	-4.753E+0	-4.671E+0
N° 4 (Bias1)	---	-1.396E-1	-3.596E+0	-4.225E+0	-4.321E+0	-4.390E+0	-4.381E+0	-4.539E+0	-4.554E+0	-4.543E+0	-4.696E+0
N° 5 (Bias1)	---	-3.425E-1	-3.337E+0	-4.337E-1	-4.018E+0	-4.123E+0	-4.200E+0	-4.211E+0	-4.232E+0	-4.275E+0	-4.282E+0
N° 6 (Bias1)	---	-5.078E-1	-3.817E+0	-4.489E+0	-4.684E+0	-4.682E+0	-4.735E+0	-4.637E+0	-4.897E+0	-4.899E+0	-4.792E+0
N° 7 (Bias2)	---	-2.757E-1	-3.837E+0	-4.468E+0	-4.580E+0	-4.669E+0	-4.611E+0	-4.649E+0	-4.780E+0	-4.795E+0	-4.917E+0
N° 8 (Bias2)	---	-4.467E+0	-4.110E+0	-4.716E+0	-4.833E+0	-4.977E+0	-4.951E+0	-4.949E+0	-5.238E+0	-5.101E+0	-5.203E+0
N° 9 (Bias2)	---	-4.514E-1	-3.853E+0	-4.216E+0	-4.403E+0	-4.556E+0	-4.382E+0	-4.531E+0	-4.652E+0	-4.667E+0	-4.662E+0
N° 10 (Bias2)	---	-4.243E+0	-3.856E+0	-4.452E+0	-4.514E+0	-4.654E+0	-4.607E+0	-4.788E+0	-4.893E+0	-4.908E+0	-4.767E+0
N° 11 (Bias2)	---	-3.790E-1	-3.946E+0	-4.253E+0	-4.326E+0	-4.696E+0	-4.665E+0	-4.663E+0	-4.823E+0	-4.698E+0	-4.693E+0
N° 12 (OFF)	---	-4.276E-1	-4.083E+0	-4.521E+0	-4.612E+0	-4.715E+0	-4.723E+0	-4.858E+0	-4.837E+0	-4.862E+0	-4.996E+0
N° 13 (OFF)	---	-1.012E+0	-3.999E+0	-4.570E+0	-4.704E+0	-4.781E+0	-4.861E+0	-4.909E+0	-5.022E+0	-4.920E+0	-4.939E+0
N° 14 (OFF)	---	-4.068E-1	-4.002E+0	-4.590E+0	-4.702E+0	-4.672E+0	-4.791E+0	-4.789E+0	-5.054E+0	-4.931E+0	-4.980E+0
N° 15 (OFF)	---	-2.058E+0	-3.457E+0	-4.145E+0	-4.236E+0	-4.454E+0	-4.270E+0	-4.455E+0	-4.559E+0	-4.504E+0	-4.580E+0
N° 16 (OFF)	---	-3.693E+0	-3.418E+0	-4.161E+0	-4.387E+0	-4.505E+0	-4.462E+0	-4.398E+0	-4.481E+0	-4.418E+0	-4.648E+0
Average (OFF)	---	-5.036E-1	-3.661E+0	-3.593E+0	-4.401E+0	-4.435E+0	-4.468E+0	-4.468E+0	-4.603E+0	-4.622E+0	-4.614E+0
σ (OFF)	---	2.712E-1	2.018E-1	1.770E+0	2.523E-1	2.042E-1	2.013E-1	1.581E-1	2.427E-1	2.350E-1	1.950E-1
Average+3σ (OFF)	---	3.101E-1	-3.056E+0	1.715E+0	-3.645E+0	-3.822E+0	-3.864E+0	-3.994E+0	-3.875E+0	-3.916E+0	-4.028E+0
Average-3σ (OFF)	---	-1.317E+0	-4.266E+0	-8.902E+0	-5.158E+0	-5.047E+0	-5.072E+0	-4.943E+0	-5.331E+0	-5.327E+0	-5.199E+0
Average (Bias1)	---	-1.963E+0	-3.921E+0	-4.421E+0	-4.531E+0	-4.710E+0	-4.643E+0	-4.716E+0	-4.877E+0	-4.834E+0	-4.849E+0
σ (Bias1)	---	2.186E+0	1.145E-1	2.001E-1	1.951E-1	1.583E-1	2.036E-1	1.591E-1	2.202E-1	1.767E-1	2.214E-1
Average+3σ (Bias1)	---	4.594E+0	-3.577E+0	-3.821E+0	-3.946E+0	-4.235E+0	-4.033E+0	-4.239E+0	-4.217E+0	-4.304E+0	-4.185E+0
Average-3σ (Bias1)	---	-8.520E+0	-4.264E+0	-5.021E+0	-5.116E+0	-5.185E+0	-5.254E+0	-5.193E+0	-5.538E+0	-5.364E+0	-5.513E+0
Average (Bias2)	---	-1.519E+0	-3.792E+0	-4.397E+0	-4.528E+0	-4.625E+0	-4.621E+0	-4.682E+0	-4.791E+0	-4.727E+0	-4.829E+0
σ (Bias2)	---	1.388E+0	3.254E-1	2.244E-1	2.083E-1	1.401E-1	2.477E-1	2.377E-1	2.619E-1	2.464E-1	1.985E-1
Average+3σ (Bias2)	---	2.643E+0	-2.816E+0	-3.724E+0	-3.903E+0	-4.205E+0	-3.878E+0	-3.969E+0	-4.005E+0	-3.988E+0	-4.233E+0
Average-3σ (Bias2)	---	-5.682E+0	-4.768E+0	-5.071E+0	-5.153E+0	-5.046E+0	-5.365E+0	-5.395E+0	-5.577E+0	-5.466E+0	-5.424E+0

9. Ic(on)1

Ta=25°C; Vce = 5V; If = 10 mA



Ic(on)1 . (mA) **Min = 4.0**

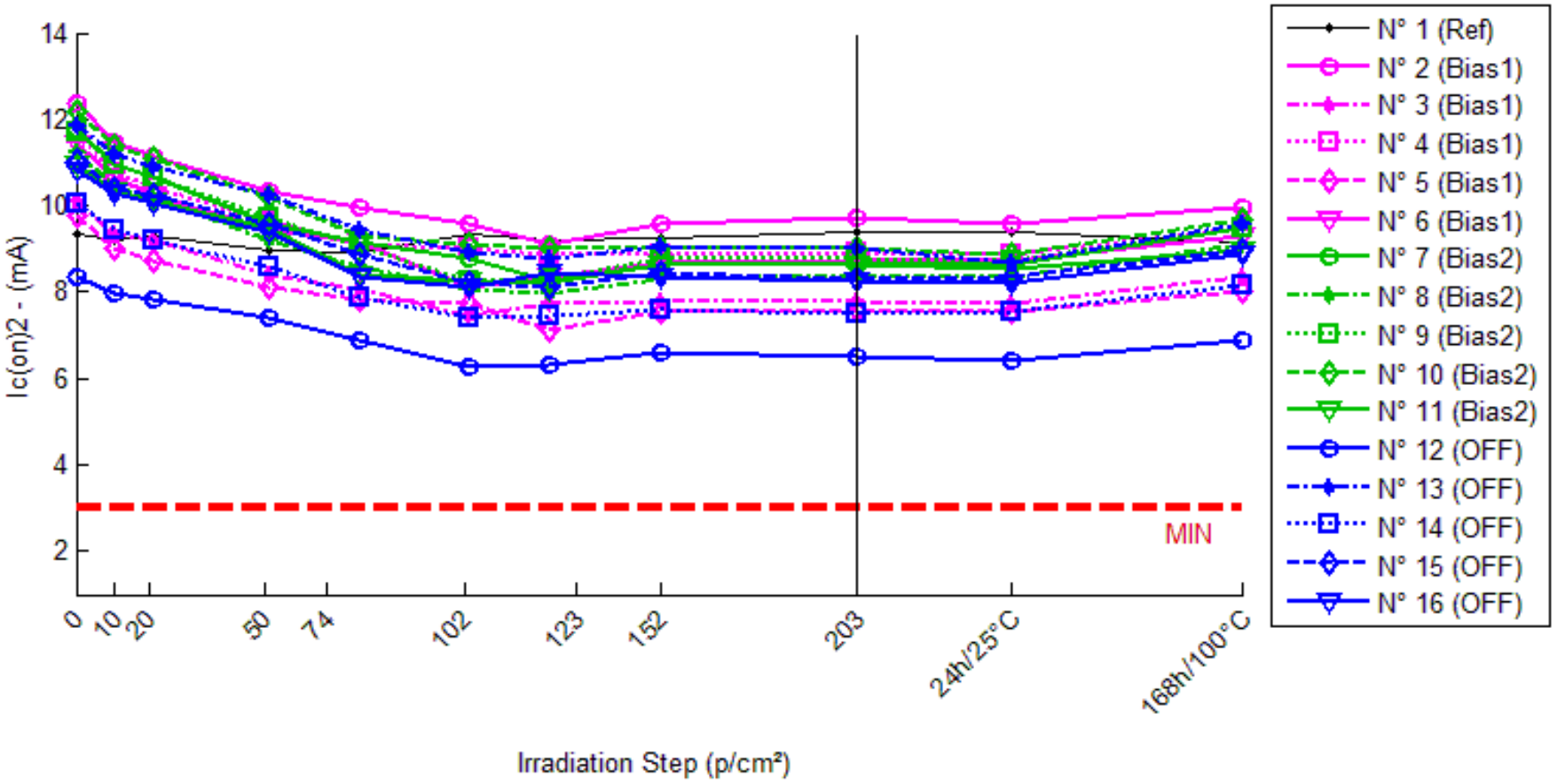
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	26.328	26.012	26.309	25.847	25.758	26.530	26.261	26.244	26.673	26.565	26.081
N° 2 (Bias1)	29.709	28.828	28.601	27.771	27.319	27.076	26.298	26.949	27.446	26.938	27.289
N° 3 (Bias1)	27.681	26.645	26.675	25.664	25.063	24.090	24.650	24.710	24.918	24.589	25.584
N° 4 (Bias1)	29.228	28.186	27.997	27.140	26.452	26.526	26.263	26.193	26.402	26.230	26.892
N° 5 (Bias1)	28.198	27.208	26.987	26.153	25.691	25.735	24.575	25.305	25.521	25.365	25.961
N° 6 (Bias1)	29.130	28.243	27.968	27.098	26.616	25.174	25.606	26.075	26.351	26.240	26.856
N° 7 (Bias2)	29.242	28.391	28.213	26.988	26.371	26.143	25.218	25.840	25.973	25.905	26.946
N° 8 (Bias2)	28.031	27.035	26.943	25.803	24.840	24.223	23.860	24.520	24.754	24.646	25.683
N° 9 (Bias2)	29.147	28.212	28.100	27.057	26.164	25.137	25.211	25.929	26.127	25.954	26.880
N° 10 (Bias2)	29.593	28.724	28.530	27.579	26.408	26.419	26.204	26.166	26.375	26.117	27.062
N° 11 (Bias2)	28.535	27.840	27.702	27.061	25.587	25.590	25.445	26.065	26.195	26.028	26.434
N° 12 (OFF)	24.683	24.077	23.975	23.461	22.515	21.218	21.373	22.007	21.846	21.648	22.589
N° 13 (OFF)	28.905	28.118	27.970	27.324	26.320	25.778	25.540	25.971	26.051	25.505	26.612
N° 14 (OFF)	27.964	27.175	27.013	26.231	25.177	24.532	24.557	24.793	24.828	24.786	25.665
N° 15 (OFF)	28.093	27.308	27.326	26.600	25.661	24.835	24.627	25.155	25.138	25.138	25.830
N° 16 (OFF)	28.364	27.757	27.578	26.890	25.344	25.321	25.637	25.555	25.524	25.439	26.245

Delta [Ic(on)1]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-3.162E-1	-1.930E-2	-4.812E-1	-5.702E-1	2.015E-1	-6.736E-2	-8.402E-2	3.449E-1	2.364E-1	-2.470E-1
N° 2 (Bias1)	---	-8.810E-1	-1.108E+0	-1.938E+0	-2.391E+0	-2.633E+0	-3.411E+0	-2.761E+0	-2.264E+0	-2.771E+0	-2.420E+0
N° 3 (Bias1)	---	-1.036E+0	-1.007E+0	-2.017E+0	-2.618E+0	-3.591E+0	-3.032E+0	-2.971E+0	-2.764E+0	-3.093E+0	-2.097E+0
N° 4 (Bias1)	---	-1.041E+0	-1.231E+0	-2.088E+0	-2.776E+0	-2.702E+0	-2.965E+0	-3.035E+0	-2.825E+0	-2.998E+0	-2.336E+0
N° 5 (Bias1)	---	-9.893E-1	-1.211E+0	-2.045E+0	-2.507E+0	-2.462E+0	-3.623E+0	-2.892E+0	-2.676E+0	-2.833E+0	-2.236E+0
N° 6 (Bias1)	---	-8.873E-1	-1.162E+0	-2.033E+0	-2.514E+0	-3.956E+0	-3.524E+0	-3.055E+0	-2.779E+0	-2.891E+0	-2.275E+0
N° 7 (Bias2)	---	-8.513E-1	-1.029E+0	-2.255E+0	-2.871E+0	-3.099E+0	-4.024E+0	-3.402E+0	-3.270E+0	-3.337E+0	-2.296E+0
N° 8 (Bias2)	---	-9.963E-1	-1.088E+0	-2.228E+0	-3.191E+0	-3.808E+0	-4.171E+0	-3.511E+0	-3.277E+0	-3.385E+0	-2.348E+0
N° 9 (Bias2)	---	-9.344E-1	-1.046E+0	-2.090E+0	-2.983E+0	-4.009E+0	-3.935E+0	-3.217E+0	-3.020E+0	-3.193E+0	-2.267E+0
N° 10 (Bias2)	---	-8.684E-1	-1.062E+0	-2.014E+0	-3.184E+0	-3.174E+0	-3.389E+0	-3.427E+0	-3.218E+0	-3.476E+0	-2.530E+0
N° 11 (Bias2)	---	-6.947E-1	-8.326E-1	-1.474E+0	-2.947E+0	-2.945E+0	-3.090E+0	-2.470E+0	-2.340E+0	-2.507E+0	-2.101E+0
N° 12 (OFF)	---	-6.065E-1	-7.082E-1	-1.222E+0	-2.168E+0	-3.465E+0	-3.311E+0	-2.676E+0	-2.837E+0	-3.035E+0	-2.094E+0
N° 13 (OFF)	---	-7.875E-1	-9.352E-1	-1.581E+0	-2.585E+0	-3.127E+0	-3.365E+0	-2.934E+0	-2.854E+0	-3.400E+0	-2.293E+0
N° 14 (OFF)	---	-7.886E-1	-9.512E-1	-1.733E+0	-2.787E+0	-3.432E+0	-3.407E+0	-3.171E+0	-3.136E+0	-3.178E+0	-2.299E+0
N° 15 (OFF)	---	-7.854E-1	-7.673E-1	-1.494E+0	-2.432E+0	-3.258E+0	-3.466E+0	-2.938E+0	-2.955E+0	-2.956E+0	-2.263E+0
N° 16 (OFF)	---	-6.079E-1	-7.864E-1	-1.475E+0	-3.021E+0	-3.043E+0	-2.728E+0	-2.809E+0	-2.841E+0	-2.925E+0	-2.119E+0
Average (OFF)	---	-9.670E-1	-1.144E+0	-2.024E+0	-2.561E+0	-3.069E+0	-3.311E+0	-2.943E+0	-2.662E+0	-2.917E+0	-2.273E+0
σ (OFF)	---	7.834E-2	9.020E-2	5.469E-2	1.446E-1	6.617E-1	2.961E-1	1.198E-1	2.289E-1	1.290E-1	1.204E-1
Average+3σ (OFF)	---	-7.320E-1	-8.731E-1	-1.860E+0	-2.127E+0	-1.084E+0	-2.423E+0	-2.583E+0	-1.975E+0	-2.530E+0	-1.912E+0
Average-3σ (OFF)	---	-1.202E+0	-1.414E+0	-2.188E+0	-2.995E+0	-5.054E+0	-4.199E+0	-3.302E+0	-3.348E+0	-3.304E+0	-2.634E+0
Average (Bias1)	---	-8.690E-1	-1.012E+0	-2.012E+0	-3.035E+0	-3.407E+0	-3.722E+0	-3.205E+0	-3.025E+0	-3.180E+0	-2.309E+0
σ (Bias1)	---	1.131E-1	1.024E-1	3.167E-1	1.447E-1	4.707E-1	4.608E-1	4.249E-1	3.969E-1	3.897E-1	1.547E-1
Average+3σ (Bias1)	---	-5.297E-1	-7.045E-1	-1.062E+0	-2.601E+0	-1.995E+0	-2.340E+0	-1.931E+0	-1.834E+0	-2.011E+0	-1.845E+0
Average-3σ (Bias1)	---	-1.208E+0	-1.319E+0	-2.962E+0	-3.470E+0	-4.819E+0	-5.104E+0	-4.480E+0	-4.216E+0	-4.349E+0	-2.772E+0
Average (Bias2)	---	-7.152E-1	-8.296E-1	-1.501E+0	-2.599E+0	-3.265E+0	-3.255E+0	-2.906E+0	-2.925E+0	-3.099E+0	-2.214E+0
σ (Bias2)	---	9.858E-2	1.077E-1	1.863E-1	3.266E-1	1.847E-1	3.004E-1	1.831E-1	1.279E-1	1.948E-1	9.900E-2
Average+3σ (Bias2)	---	-4.194E-1	-5.065E-1	-9.420E-1	-1.619E+0	-2.711E+0	-2.354E+0	-2.356E+0	-2.541E+0	-2.514E+0	-1.917E+0
Average-3σ (Bias2)	---	-1.011E+0	-1.153E+0	-2.060E+0	-3.578E+0	-3.819E+0	-4.156E+0	-3.455E+0	-3.308E+0	-3.683E+0	-2.511E+0

10.Ic(on)2

Ta=25°C; Vce = 0.4V; If = 10 mA



Ic(on)2 . (mA) **Min = 3.0**

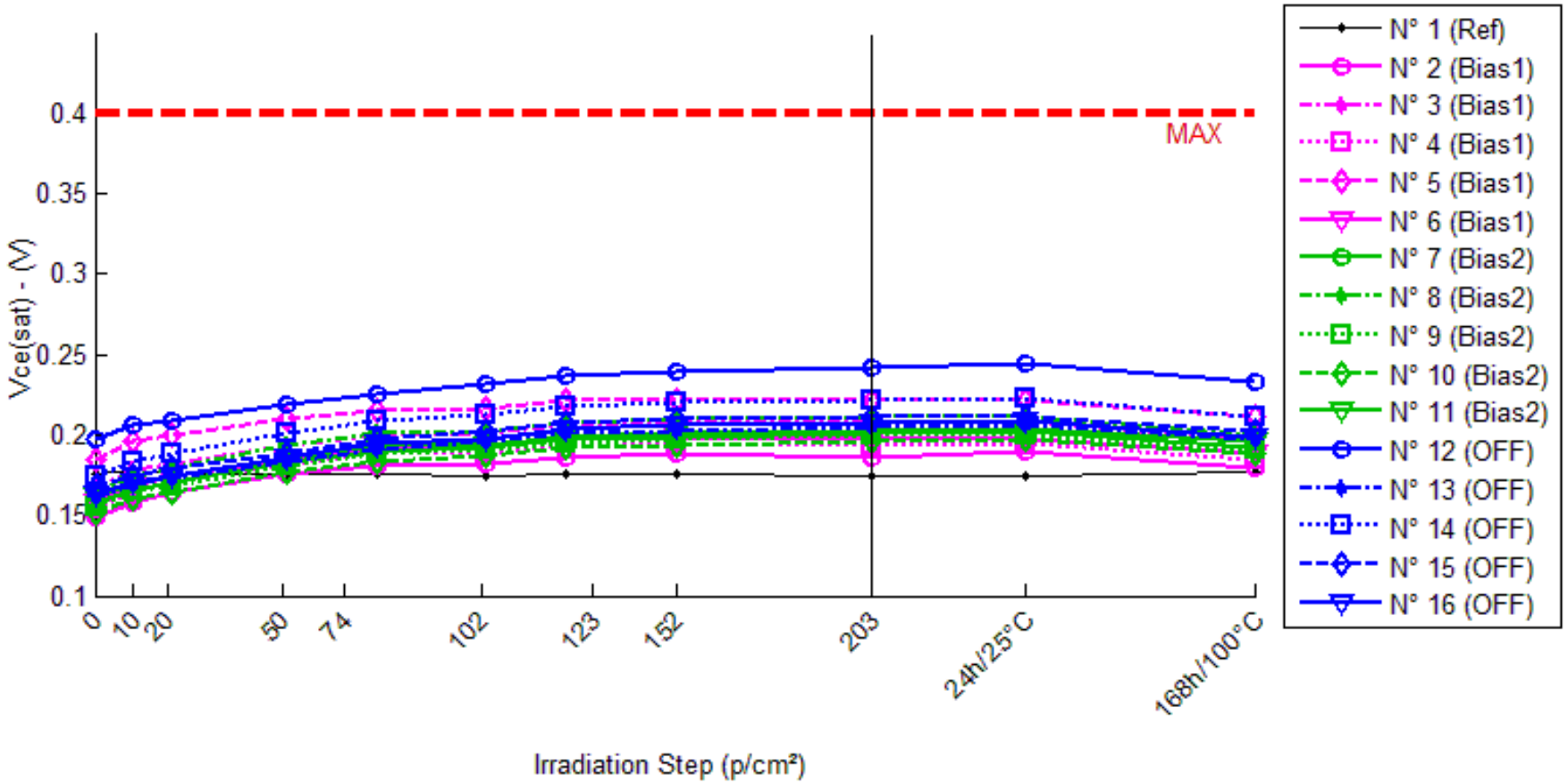
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	9.340	9.215	9.315	8.970	8.934	9.330	9.195	9.233	9.399	9.398	9.170
N° 2 (Bias1)	12.370	11.485	11.133	10.333	9.967	9.584	9.125	9.587	9.744	9.585	9.966
N° 3 (Bias1)	10.104	9.357	9.180	8.410	8.050	7.452	7.736	7.763	7.806	7.718	8.373
N° 4 (Bias1)	11.671	10.767	10.411	9.607	9.121	9.020	8.888	8.849	8.901	8.857	9.473
N° 5 (Bias1)	9.778	9.024	8.742	8.105	7.843	7.739	7.140	7.550	7.601	7.559	8.008
N° 6 (Bias1)	11.445	10.649	10.252	9.454	9.148	8.124	8.349	8.668	8.748	8.733	9.317
N° 7 (Bias2)	11.748	10.935	10.658	9.574	9.161	8.783	8.275	8.632	8.651	8.651	9.485
N° 8 (Bias2)	11.257	10.421	10.195	9.198	8.577	8.081	7.952	8.300	8.378	8.330	9.106
N° 9 (Bias2)	11.700	10.949	10.648	9.714	9.058	8.271	8.314	8.774	8.791	8.711	9.484
N° 10 (Bias2)	12.162	11.385	11.082	10.173	9.282	9.103	8.994	9.002	9.026	8.875	9.676
N° 11 (Bias2)	10.935	10.336	10.123	9.464	8.408	8.259	8.220	8.639	8.617	8.531	8.985
N° 12 (OFF)	8.352	7.961	7.810	7.427	6.892	6.277	6.334	6.591	6.488	6.416	6.903
N° 13 (OFF)	11.861	11.192	10.923	10.262	9.424	8.917	8.762	9.071	8.996	8.662	9.595
N° 14 (OFF)	10.041	9.424	9.203	8.564	7.866	7.421	7.444	7.587	7.522	7.526	8.158
N° 15 (OFF)	11.064	10.404	10.258	9.602	8.880	8.201	8.100	8.425	8.307	8.337	8.944
N° 16 (OFF)	10.825	10.283	10.041	9.393	8.346	8.108	8.423	8.335	8.237	8.206	8.872

Delta [Ic(on)2]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-1.252E-1	-2.486E-2	-3.701E-1	-4.060E-1	-9.821E-3	-1.450E-1	-1.072E-1	5.889E-2	5.828E-2	-1.699E-1
N° 2 (Bias1)	---	-8.845E-1	-1.237E+0	-2.037E+0	-2.403E+0	-2.786E+0	-3.245E+0	-2.783E+0	-2.625E+0	-2.785E+0	-2.403E+0
N° 3 (Bias1)	---	-7.473E-1	-9.243E-1	-1.694E+0	-2.055E+0	-2.652E+0	-2.368E+0	-2.341E+0	-2.298E+0	-2.386E+0	-1.731E+0
N° 4 (Bias1)	---	-9.037E-1	-1.260E+0	-2.064E+0	-2.550E+0	-2.650E+0	-2.783E+0	-2.822E+0	-2.770E+0	-2.814E+0	-2.198E+0
N° 5 (Bias1)	---	-7.545E-1	-1.036E+0	-1.674E+0	-1.936E+0	-2.039E+0	-2.639E+0	-2.229E+0	-2.177E+0	-2.220E+0	-1.770E+0
N° 6 (Bias1)	---	-7.958E-1	-1.193E+0	-1.991E+0	-2.296E+0	-3.320E+0	-3.095E+0	-2.777E+0	-2.697E+0	-2.712E+0	-2.128E+0
N° 7 (Bias2)	---	-8.124E-1	-1.090E+0	-2.173E+0	-2.587E+0	-2.964E+0	-3.473E+0	-3.115E+0	-3.097E+0	-3.097E+0	-2.262E+0
N° 8 (Bias2)	---	-8.361E-1	-1.062E+0	-2.059E+0	-2.680E+0	-3.175E+0	-3.305E+0	-2.957E+0	-2.879E+0	-2.926E+0	-2.151E+0
N° 9 (Bias2)	---	-7.508E-1	-1.052E+0	-1.987E+0	-2.643E+0	-3.429E+0	-3.386E+0	-2.926E+0	-2.909E+0	-2.990E+0	-2.216E+0
N° 10 (Bias2)	---	-7.771E-1	-1.080E+0	-1.989E+0	-2.880E+0	-3.059E+0	-3.168E+0	-3.160E+0	-3.136E+0	-3.287E+0	-2.486E+0
N° 11 (Bias2)	---	-5.996E-1	-8.119E-1	-1.471E+0	-2.527E+0	-2.677E+0	-2.715E+0	-2.297E+0	-2.318E+0	-2.404E+0	-1.950E+0
N° 12 (OFF)	---	-3.911E-1	-5.415E-1	-9.249E-1	-1.460E+0	-2.075E+0	-2.018E+0	-1.761E+0	-1.864E+0	-1.936E+0	-1.449E+0
N° 13 (OFF)	---	-6.691E-1	-9.384E-1	-1.599E+0	-2.437E+0	-2.944E+0	-3.099E+0	-2.791E+0	-2.865E+0	-3.199E+0	-2.266E+0
N° 14 (OFF)	---	-6.178E-1	-8.383E-1	-1.478E+0	-2.176E+0	-2.620E+0	-2.597E+0	-2.455E+0	-2.520E+0	-2.515E+0	-1.883E+0
N° 15 (OFF)	---	-6.595E-1	-8.062E-1	-1.462E+0	-2.184E+0	-2.862E+0	-2.963E+0	-2.638E+0	-2.757E+0	-2.727E+0	-2.120E+0
N° 16 (OFF)	---	-5.427E-1	-7.841E-1	-1.432E+0	-2.479E+0	-2.717E+0	-2.403E+0	-2.491E+0	-2.588E+0	-2.620E+0	-1.953E+0
Average (OFF)	---	-8.172E-1	-1.130E+0	-1.892E+0	-2.248E+0	-2.690E+0	-2.826E+0	-2.590E+0	-2.514E+0	-2.583E+0	-2.046E+0
σ (OFF)	---	7.296E-2	1.443E-1	1.916E-1	2.511E-1	4.564E-1	3.518E-1	2.820E-1	2.605E-1	2.651E-1	2.883E-1
Average+3σ (OFF)	---	-5.983E-1	-6.971E-1	-1.317E+0	-1.494E+0	-1.320E+0	-1.771E+0	-1.744E+0	-1.732E+0	-1.788E+0	-1.181E+0
Average-3σ (OFF)	---	-1.036E+0	-1.563E+0	-2.467E+0	-3.001E+0	-4.059E+0	-3.881E+0	-3.436E+0	-3.295E+0	-3.379E+0	-2.911E+0
Average (Bias1)	---	-7.552E-1	-1.019E+0	-1.936E+0	-2.663E+0	-3.061E+0	-3.210E+0	-2.891E+0	-2.868E+0	-2.941E+0	-2.213E+0
σ (Bias1)	---	9.291E-2	1.168E-1	2.707E-1	1.341E-1	2.763E-1	2.982E-1	3.470E-1	3.272E-1	3.298E-1	1.939E-1
Average+3σ (Bias1)	---	-4.765E-1	-6.687E-1	-1.124E+0	-2.261E+0	-2.232E+0	-2.315E+0	-1.850E+0	-1.886E+0	-1.951E+0	-1.632E+0
Average-3σ (Bias1)	---	-1.034E+0	-1.370E+0	-2.748E+0	-3.066E+0	-3.890E+0	-4.104E+0	-3.932E+0	-3.849E+0	-3.930E+0	-2.795E+0
Average (Bias2)	---	-5.760E-1	-7.817E-1	-1.379E+0	-2.147E+0	-2.644E+0	-2.616E+0	-2.427E+0	-2.519E+0	-2.600E+0	-1.934E+0
σ (Bias2)	---	1.148E-1	1.467E-1	2.618E-1	4.087E-1	3.419E-1	4.351E-1	3.955E-1	3.908E-1	4.538E-1	3.095E-1
Average+3σ (Bias2)	---	-2.318E-1	-3.416E-1	-5.938E-1	-9.209E-1	-1.618E+0	-1.311E+0	-1.240E+0	-1.347E+0	-1.238E+0	-1.005E+0
Average-3σ (Bias2)	---	-9.203E-1	-1.222E+0	-2.165E+0	-3.373E+0	-3.669E+0	-3.921E+0	-3.614E+0	-3.691E+0	-3.961E+0	-2.863E+0

11.Vce(sat)

Ta=25°C; If = 50 mA; Ic = 10 mA



Vce(sat) . (V) **Max = 0.4**

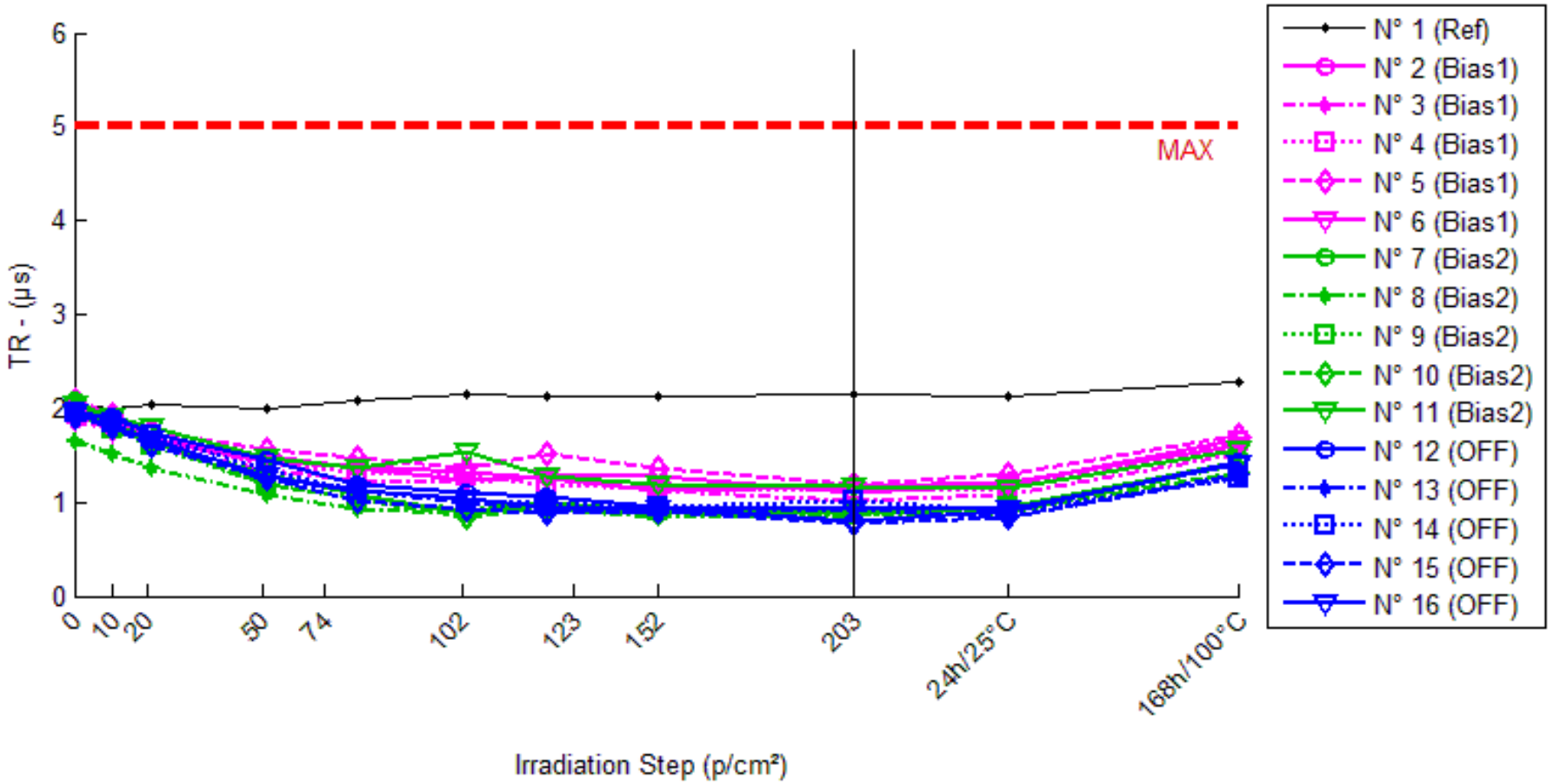
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	0.176	0.178	0.176	0.176	0.176	0.175	0.176	0.176	0.174	0.175	0.177
N° 2 (Bias1)	0.149	0.158	0.164	0.176	0.181	0.182	0.186	0.188	0.186	0.190	0.180
N° 3 (Bias1)	0.167	0.178	0.182	0.194	0.200	0.201	0.206	0.208	0.207	0.209	0.196
N° 4 (Bias1)	0.154	0.165	0.171	0.182	0.188	0.189	0.195	0.195	0.194	0.195	0.185
N° 5 (Bias1)	0.185	0.196	0.200	0.210	0.215	0.217	0.221	0.222	0.221	0.222	0.212
N° 6 (Bias1)	0.158	0.168	0.174	0.185	0.191	0.193	0.197	0.199	0.198	0.198	0.188
N° 7 (Bias2)	0.158	0.166	0.171	0.183	0.190	0.192	0.197	0.199	0.201	0.202	0.192
N° 8 (Bias2)	0.164	0.174	0.179	0.193	0.201	0.203	0.208	0.210	0.211	0.212	0.200
N° 9 (Bias2)	0.156	0.165	0.168	0.181	0.188	0.191	0.195	0.198	0.200	0.200	0.191
N° 10 (Bias2)	0.151	0.160	0.164	0.177	0.184	0.187	0.192	0.194	0.196	0.197	0.188
N° 11 (Bias2)	0.162	0.170	0.174	0.186	0.193	0.194	0.199	0.201	0.202	0.204	0.196
N° 12 (OFF)	0.198	0.206	0.209	0.219	0.226	0.232	0.237	0.239	0.242	0.244	0.233
N° 13 (OFF)	0.162	0.170	0.173	0.184	0.191	0.196	0.201	0.203	0.205	0.206	0.197
N° 14 (OFF)	0.175	0.184	0.188	0.201	0.209	0.213	0.218	0.220	0.222	0.223	0.211
N° 15 (OFF)	0.168	0.175	0.179	0.189	0.198	0.202	0.208	0.210	0.212	0.212	0.203
N° 16 (OFF)	0.163	0.171	0.175	0.186	0.195	0.198	0.204	0.206	0.208	0.209	0.199

Delta [Vce(sat)]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	2.095E-3	5.052E-4	9.323E-4	9.544E-4	-9.931E-4	2.228E-4	6.650E-4	-1.197E-3	-1.008E-3	1.945E-3
N° 2 (Bias1)	---	9.598E-3	1.565E-2	2.718E-2	3.212E-2	3.329E-2	3.723E-2	3.891E-2	3.723E-2	4.066E-2	3.078E-2
N° 3 (Bias1)	---	1.060E-2	1.456E-2	2.625E-2	3.236E-2	3.405E-2	3.874E-2	4.025E-2	3.951E-2	4.140E-2	2.906E-2
N° 4 (Bias1)	---	1.066E-2	1.628E-2	2.770E-2	3.335E-2	3.470E-2	4.070E-2	4.018E-2	3.968E-2	4.068E-2	3.075E-2
N° 5 (Bias1)	---	1.030E-2	1.465E-2	2.472E-2	2.997E-2	3.136E-2	3.580E-2	3.639E-2	3.530E-2	3.650E-2	2.710E-2
N° 6 (Bias1)	---	1.013E-2	1.580E-2	2.735E-2	3.292E-2	3.530E-2	3.927E-2	4.099E-2	4.015E-2	4.050E-2	3.056E-2
N° 7 (Bias2)	---	8.366E-3	1.261E-2	2.535E-2	3.216E-2	3.398E-2	3.903E-2	4.078E-2	4.285E-2	4.361E-2	3.371E-2
N° 8 (Bias2)	---	9.918E-3	1.472E-2	2.917E-2	3.657E-2	3.885E-2	4.331E-2	4.570E-2	4.674E-2	4.753E-2	3.572E-2
N° 9 (Bias2)	---	8.898E-3	1.257E-2	2.540E-2	3.217E-2	3.530E-2	3.922E-2	4.187E-2	4.383E-2	4.467E-2	3.495E-2
N° 10 (Bias2)	---	8.598E-3	1.304E-2	2.584E-2	3.319E-2	3.604E-2	4.058E-2	4.335E-2	4.498E-2	4.643E-2	3.665E-2
N° 11 (Bias2)	---	8.127E-3	1.240E-2	2.398E-2	3.119E-2	3.262E-2	3.737E-2	3.889E-2	4.055E-2	4.207E-2	3.435E-2
N° 12 (OFF)	---	7.888E-3	1.104E-2	2.036E-2	2.811E-2	3.345E-2	3.885E-2	4.090E-2	4.372E-2	4.541E-2	3.443E-2
N° 13 (OFF)	---	7.668E-3	1.139E-2	2.179E-2	2.921E-2	3.380E-2	3.859E-2	4.101E-2	4.323E-2	4.410E-2	3.496E-2
N° 14 (OFF)	---	8.513E-3	1.273E-2	2.535E-2	3.418E-2	3.809E-2	4.309E-2	4.498E-2	4.718E-2	4.780E-2	3.609E-2
N° 15 (OFF)	---	7.546E-3	1.096E-2	2.179E-2	3.048E-2	3.434E-2	4.008E-2	4.206E-2	4.449E-2	4.490E-2	3.512E-2
N° 16 (OFF)	---	7.201E-3	1.158E-2	2.237E-2	3.128E-2	3.433E-2	4.036E-2	4.228E-2	4.501E-2	4.578E-2	3.536E-2
Average (OFF)	---	1.026E-2	1.539E-2	2.664E-2	3.214E-2	3.374E-2	3.835E-2	3.934E-2	3.838E-2	3.995E-2	2.965E-2
σ (OFF)	---	4.286E-4	7.495E-4	1.202E-3	1.310E-3	1.529E-3	1.890E-3	1.815E-3	2.055E-3	1.957E-3	1.593E-3
Average+3σ (OFF)	---	1.154E-2	1.764E-2	3.024E-2	3.607E-2	3.833E-2	4.402E-2	4.479E-2	4.454E-2	4.582E-2	3.443E-2
Average-3σ (OFF)	---	8.973E-3	1.314E-2	2.303E-2	2.821E-2	2.915E-2	3.268E-2	3.390E-2	3.221E-2	3.408E-2	2.487E-2
Average (Bias1)	---	8.781E-3	1.307E-2	2.595E-2	3.306E-2	3.536E-2	3.990E-2	4.212E-2	4.379E-2	4.486E-2	3.508E-2
σ (Bias1)	---	6.964E-4	9.529E-4	1.933E-3	2.087E-3	2.350E-3	2.221E-3	2.577E-3	2.317E-3	2.177E-3	1.150E-3
Average+3σ (Bias1)	---	1.087E-2	1.593E-2	3.174E-2	3.932E-2	4.241E-2	4.656E-2	4.985E-2	5.074E-2	5.139E-2	3.853E-2
Average-3σ (Bias1)	---	6.692E-3	1.021E-2	2.015E-2	2.679E-2	2.831E-2	3.324E-2	3.439E-2	3.684E-2	3.833E-2	3.163E-2
Average (Bias2)	---	7.763E-3	1.154E-2	2.233E-2	3.065E-2	3.480E-2	4.019E-2	4.225E-2	4.472E-2	4.560E-2	3.519E-2
σ (Bias2)	---	4.875E-4	7.118E-4	1.842E-3	2.315E-3	1.878E-3	1.789E-3	1.645E-3	1.535E-3	1.381E-3	6.061E-4
Average+3σ (Bias2)	---	9.226E-3	1.367E-2	2.786E-2	3.760E-2	4.044E-2	4.556E-2	4.718E-2	4.933E-2	4.974E-2	3.701E-2
Average-3σ (Bias2)	---	6.301E-3	9.403E-3	1.680E-2	2.371E-2	2.917E-2	3.482E-2	3.731E-2	4.012E-2	4.145E-2	3.337E-2

12.TR

Ta=25°C; Vce = 5V; If = 2 mA; RL = 100 Ohms



TR . (µs) **Max = 5.0**

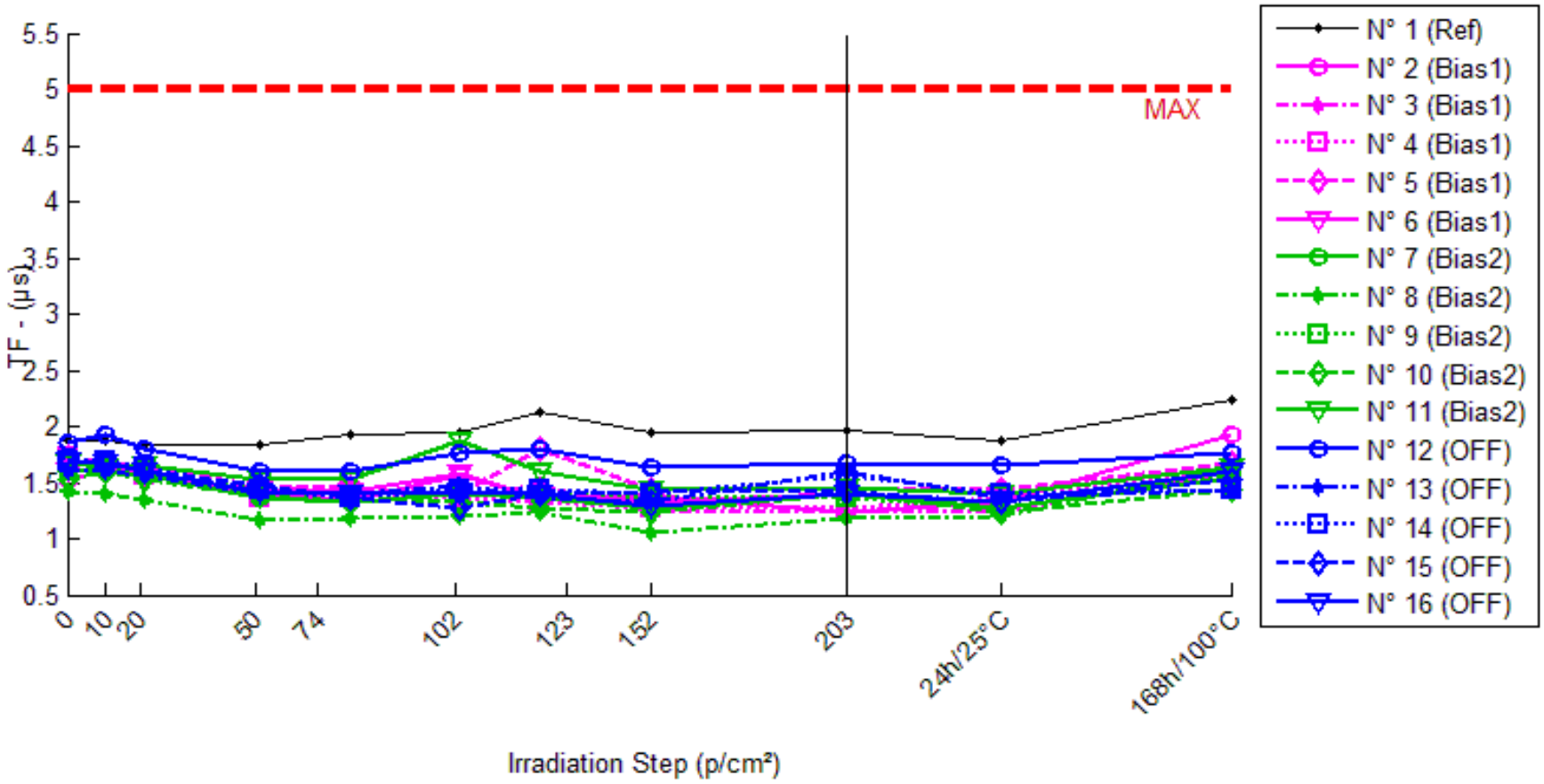
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	2.04	2.00	2.04	2.00	2.08	2.16	2.12	2.12	2.16	2.12	2.28
N° 2 (Bias1)	2.00	1.88	1.68	1.50	1.36	1.24	1.28	1.28	1.10	1.20	1.68
N° 3 (Bias1)	1.84	1.80	1.60	1.34	1.24	1.22	1.28	1.12	1.02	1.08	1.52
N° 4 (Bias1)	2.00	1.80	1.64	1.40	1.32	1.28	1.20	1.14	1.12	1.14	1.64
N° 5 (Bias1)	2.08	1.94	1.76	1.56	1.48	1.36	1.52	1.36	1.20	1.30	1.72
N° 6 (Bias1)	1.96	1.76	1.68	1.44	1.38	1.32	1.26	1.12	1.16	1.22	1.60
N° 7 (Bias2)	2.08	1.84	1.64	1.30	1.08	0.88	0.98	0.92	0.88	0.94	1.44
N° 8 (Bias2)	1.64	1.52	1.36	1.08	0.92	0.88	0.92	0.84	0.86	0.88	1.40
N° 9 (Bias2)	1.96	1.78	1.60	1.20	1.04	0.92	1.00	0.90	0.86	0.96	1.40
N° 10 (Bias2)	2.00	1.80	1.64	1.20	1.04	0.84	0.96	0.88	0.92	0.90	1.32
N° 11 (Bias2)	2.04	1.90	1.80	1.48	1.36	1.54	1.28	1.18	1.16	1.14	1.56
N° 12 (OFF)	1.96	1.92	1.74	1.46	1.20	1.10	1.06	0.96	0.80	0.90	1.42
N° 13 (OFF)	1.92	1.80	1.66	1.24	1.12	1.00	0.92	0.88	0.92	0.84	1.28
N° 14 (OFF)	1.96	1.84	1.72	1.34	1.12	1.00	1.00	0.96	1.02	0.90	1.26
N° 15 (OFF)	1.90	1.80	1.60	1.26	1.02	0.92	0.88	0.90	0.78	0.84	1.30
N° 16 (OFF)	1.96	1.80	1.66	1.28	1.12	1.04	0.94	0.92	0.92	0.92	1.40

Delta [TR]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	-4.000E-2	0.000E+0	-4.000E-2	4.000E-2	1.200E-1	8.000E-2	8.000E-2	1.200E-1	8.000E-2	2.400E-1
N° 2 (Bias1)	---	-1.200E-1	-3.200E-1	-5.000E-1	-6.400E-1	-7.600E-1	-7.200E-1	-7.200E-1	-9.000E-1	-8.000E-1	-3.200E-1
N° 3 (Bias1)	---	-4.000E-2	-2.400E-1	-5.000E-1	-6.000E-1	-6.200E-1	-5.600E-1	-7.200E-1	-8.200E-1	-7.600E-1	-3.200E-1
N° 4 (Bias1)	---	-2.000E-1	-3.600E-1	-6.000E-1	-6.800E-1	-7.200E-1	-8.000E-1	-8.600E-1	-8.800E-1	-8.600E-1	-3.600E-1
N° 5 (Bias1)	---	-1.400E-1	-3.200E-1	-5.200E-1	-6.000E-1	-7.200E-1	-5.600E-1	-7.200E-1	-8.800E-1	-7.800E-1	-3.600E-1
N° 6 (Bias1)	---	-2.000E-1	-2.800E-1	-5.200E-1	-5.800E-1	-6.400E-1	-7.000E-1	-8.400E-1	-8.000E-1	-7.400E-1	-3.600E-1
N° 7 (Bias2)	---	-2.400E-1	-4.400E-1	-7.800E-1	-1.000E+0	-1.200E+0	-1.100E+0	-1.160E+0	-1.200E+0	-1.140E+0	-6.400E-1
N° 8 (Bias2)	---	-1.200E-1	-2.800E-1	-5.600E-1	-7.200E-1	-7.600E-1	-7.200E-1	-8.000E-1	-7.800E-1	-7.600E-1	-2.400E-1
N° 9 (Bias2)	---	-1.800E-1	-3.600E-1	-7.600E-1	-9.200E-1	-1.040E+0	-9.600E-1	-1.060E+0	-1.100E+0	-1.000E+0	-5.600E-1
N° 10 (Bias2)	---	-2.000E-1	-3.600E-1	-8.000E-1	-9.600E-1	-1.160E+0	-1.040E+0	-1.120E+0	-1.080E+0	-1.100E+0	-6.800E-1
N° 11 (Bias2)	---	-1.400E-1	-2.400E-1	-5.600E-1	-6.800E-1	-5.000E-1	-7.600E-1	-8.600E-1	-8.800E-1	-9.000E-1	-4.800E-1
N° 12 (OFF)	---	-4.000E-2	-2.200E-1	-5.000E-1	-7.600E-1	-8.600E-1	-9.000E-1	-1.000E+0	-1.160E+0	-1.060E+0	-5.400E-1
N° 13 (OFF)	---	-1.200E-1	-2.600E-1	-6.800E-1	-8.000E-1	-9.200E-1	-1.000E+0	-1.040E+0	-1.000E+0	-1.080E+0	-6.400E-1
N° 14 (OFF)	---	-1.200E-1	-2.400E-1	-6.200E-1	-8.400E-1	-9.600E-1	-9.600E-1	-1.000E+0	-9.400E-1	-1.060E+0	-7.000E-1
N° 15 (OFF)	---	-1.000E-1	-3.000E-1	-6.400E-1	-8.800E-1	-9.800E-1	-1.020E+0	-1.000E+0	-1.120E+0	-1.060E+0	-6.000E-1
N° 16 (OFF)	---	-1.600E-1	-3.000E-1	-6.800E-1	-8.400E-1	-9.200E-1	-1.020E+0	-1.040E+0	-1.040E+0	-1.040E+0	-5.600E-1
Average (OFF)	---	-1.400E-1	-3.040E-1	-5.280E-1	-6.200E-1	-6.920E-1	-6.680E-1	-7.720E-1	-8.560E-1	-7.880E-1	-3.440E-1
σ (OFF)	---	6.633E-2	4.561E-2	4.147E-2	4.000E-2	5.933E-2	1.055E-1	7.155E-2	4.336E-2	4.604E-2	2.191E-2
Average+3σ (OFF)	---	5.900E-2	-1.672E-1	-4.036E-1	-5.000E-1	-5.140E-1	-3.516E-1	-5.573E-1	-7.259E-1	-6.499E-1	-2.783E-1
Average-3σ (OFF)	---	-3.390E-1	-4.408E-1	-6.524E-1	-7.400E-1	-8.700E-1	-9.844E-1	-9.867E-1	-9.861E-1	-9.261E-1	-4.097E-1
Average (Bias1)	---	-1.760E-1	-3.360E-1	-6.920E-1	-8.560E-1	-9.320E-1	-9.160E-1	-1.000E+0	-1.008E+0	-9.800E-1	-5.200E-1
σ (Bias1)	---	4.775E-2	7.797E-2	1.213E-1	1.459E-1	2.965E-1	1.688E-1	1.606E-1	1.724E-1	1.543E-1	1.744E-1
Average+3σ (Bias1)	---	-3.275E-2	-1.021E-1	-3.280E-1	-4.184E-1	-4.246E-2	-4.097E-1	-5.181E-1	-4.908E-1	-5.172E-1	3.068E-3
Average-3σ (Bias1)	---	-3.192E-1	-5.699E-1	-1.056E+0	-1.294E+0	-1.822E+0	-1.422E+0	-1.482E+0	-1.525E+0	-1.443E+0	-1.043E+0
Average (Bias2)	---	-1.080E-1	-2.640E-1	-6.240E-1	-8.240E-1	-9.280E-1	-9.800E-1	-1.016E+0	-1.052E+0	-1.060E+0	-6.080E-1
σ (Bias2)	---	4.382E-2	3.578E-2	7.403E-2	4.561E-2	4.604E-2	5.099E-2	2.191E-2	8.899E-2	1.414E-2	6.419E-2
Average+3σ (Bias2)	---	2.345E-2	-1.567E-1	-4.019E-1	-6.872E-1	-7.899E-1	-8.270E-1	-9.503E-1	-7.850E-1	-1.018E+0	-4.154E-1
Average-3σ (Bias2)	---	-2.395E-1	-3.713E-1	-8.461E-1	-9.608E-1	-1.066E+0	-1.133E+0	-1.082E+0	-1.319E+0	-1.102E+0	-8.006E-1

13.TF

Ta=25°C; Vce = 5V; If = 2 mA; RL = 100 Ohms



TF . (µs) **Max = 5.0**

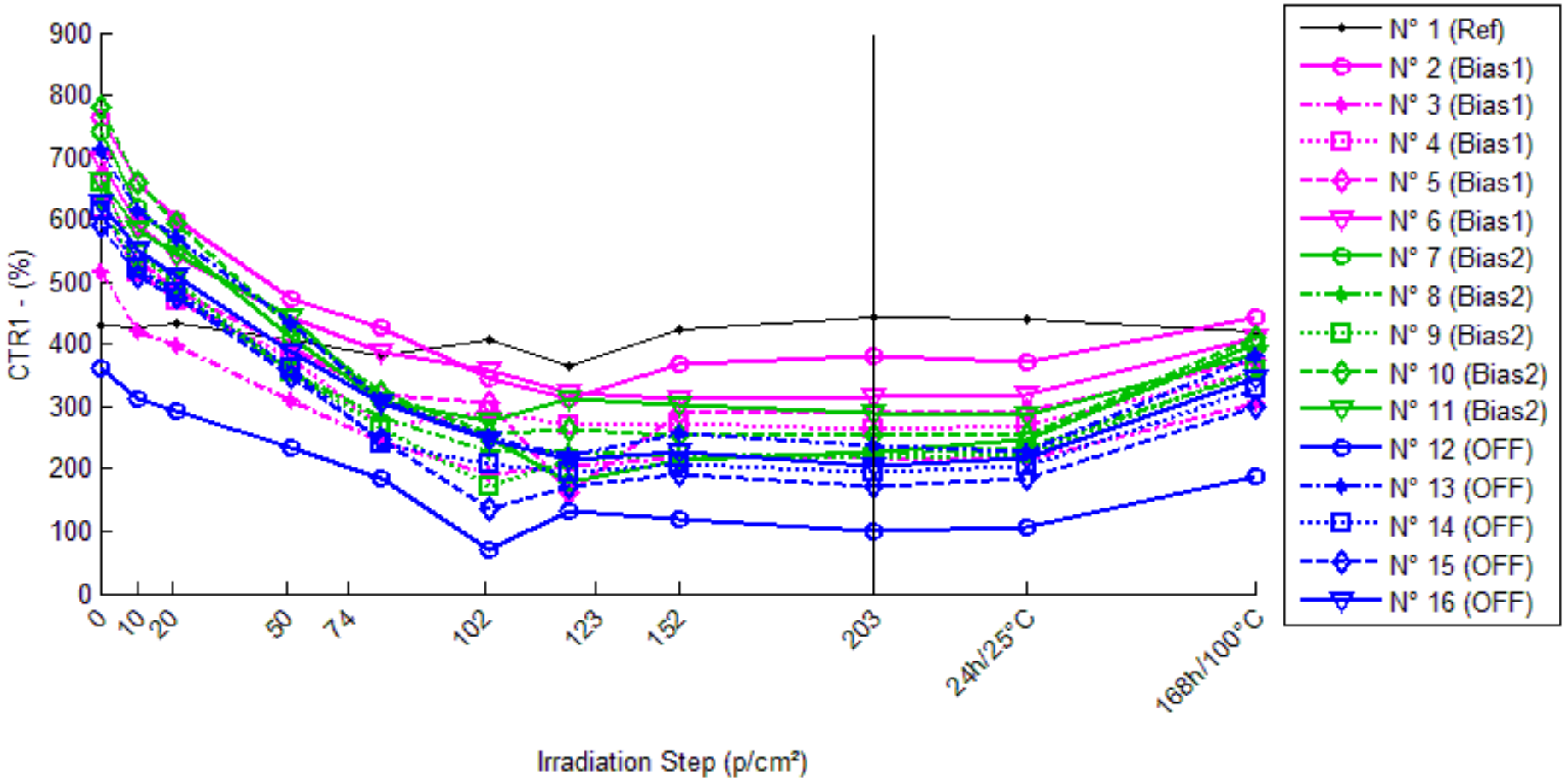
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	1.88	1.88	1.84	1.84	1.92	1.94	2.12	1.94	1.96	1.88	2.24
N° 2 (Bias1)	1.52	1.60	1.56	1.40	1.34	1.56	1.36	1.38	1.24	1.32	1.92
N° 3 (Bias1)	1.68	1.68	1.54	1.46	1.44	1.40	1.48	1.24	1.24	1.24	1.60
N° 4 (Bias1)	1.72	1.66	1.56	1.36	1.42	1.36	1.32	1.28	1.28	1.36	1.60
N° 5 (Bias1)	1.72	1.68	1.64	1.48	1.46	1.40	1.80	1.44	1.44	1.44	1.68
N° 6 (Bias1)	1.60	1.64	1.56	1.44	1.42	1.58	1.36	1.32	1.40	1.32	1.60
N° 7 (Bias2)	1.60	1.60	1.56	1.36	1.32	1.40	1.36	1.28	1.40	1.28	1.54
N° 8 (Bias2)	1.42	1.40	1.34	1.16	1.18	1.20	1.24	1.06	1.18	1.20	1.64
N° 9 (Bias2)	1.68	1.64	1.60	1.44	1.36	1.40	1.44	1.36	1.36	1.28	1.58
N° 10 (Bias2)	1.52	1.60	1.52	1.38	1.32	1.32	1.28	1.24	1.40	1.24	1.44
N° 11 (Bias2)	1.68	1.64	1.66	1.52	1.52	1.88	1.60	1.44	1.46	1.40	1.64
N° 12 (OFF)	1.86	1.92	1.80	1.60	1.60	1.76	1.80	1.64	1.68	1.66	1.76
N° 13 (OFF)	1.60	1.60	1.56	1.40	1.40	1.48	1.36	1.32	1.60	1.36	1.44
N° 14 (OFF)	1.70	1.70	1.64	1.44	1.36	1.44	1.44	1.40	1.56	1.40	1.44
N° 15 (OFF)	1.70	1.68	1.60	1.48	1.36	1.28	1.40	1.42	1.42	1.32	1.52
N° 16 (OFF)	1.70	1.68	1.60	1.42	1.40	1.42	1.40	1.30	1.40	1.32	1.60

Delta [TF]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	0.000E+0	-4.000E-2	-4.000E-2	4.000E-2	6.000E-2	2.400E-1	6.000E-2	8.000E-2	0.000E+0	3.600E-1
N° 2 (Bias1)	---	8.000E-2	4.000E-2	-1.200E-1	-1.800E-1	4.000E-2	-1.600E-1	-1.400E-1	-2.800E-1	-2.000E-1	4.000E-1
N° 3 (Bias1)	---	0.000E+0	-1.400E-1	-2.200E-1	-2.400E-1	-2.800E-1	-2.000E-1	-4.400E-1	-4.400E-1	-4.400E-1	-8.000E-2
N° 4 (Bias1)	---	-6.000E-2	-1.600E-1	-3.600E-1	-3.000E-1	-3.600E-1	-4.000E-1	-4.400E-1	-4.400E-1	-3.600E-1	-1.200E-1
N° 5 (Bias1)	---	-4.000E-2	-8.000E-2	-2.400E-1	-2.600E-1	-3.200E-1	8.000E-2	-2.800E-1	-2.800E-1	-2.800E-1	-4.000E-2
N° 6 (Bias1)	---	4.000E-2	-4.000E-2	-1.600E-1	-1.800E-1	-2.000E-2	-2.400E-1	-2.800E-1	-2.000E-1	-2.800E-1	0.000E+0
N° 7 (Bias2)	---	0.000E+0	-4.000E-2	-2.400E-1	-2.800E-1	-2.000E-1	-2.400E-1	-3.200E-1	-2.000E-1	-3.200E-1	-6.000E-2
N° 8 (Bias2)	---	-2.000E-2	-8.000E-2	-2.600E-1	-2.400E-1	-2.200E-1	-1.800E-1	-3.600E-1	-2.400E-1	-2.200E-1	2.200E-1
N° 9 (Bias2)	---	-4.000E-2	-8.000E-2	-2.400E-1	-3.200E-1	-2.800E-1	-2.400E-1	-3.200E-1	-3.200E-1	-4.000E-1	-1.000E-1
N° 10 (Bias2)	---	8.000E-2	0.000E+0	-1.400E-1	-2.000E-1	-2.000E-1	-2.400E-1	-2.800E-1	-1.200E-1	-2.800E-1	-8.000E-2
N° 11 (Bias2)	---	-4.000E-2	-2.000E-2	-1.600E-1	-1.600E-1	2.000E-1	-8.000E-2	-2.400E-1	-2.200E-1	-2.800E-1	-4.000E-2
N° 12 (OFF)	---	6.000E-2	-6.000E-2	-2.600E-1	-2.600E-1	-1.000E-1	-6.000E-2	-2.200E-1	-1.800E-1	-2.000E-1	-1.000E-1
N° 13 (OFF)	---	0.000E+0	-4.000E-2	-2.000E-1	-2.000E-1	-1.200E-1	-2.400E-1	-2.800E-1	0.000E+0	-2.400E-1	-1.600E-1
N° 14 (OFF)	---	0.000E+0	-6.000E-2	-2.600E-1	-3.400E-1	-2.600E-1	-2.600E-1	-3.000E-1	-1.400E-1	-3.000E-1	-2.600E-1
N° 15 (OFF)	---	-2.000E-2	-1.000E-1	-2.200E-1	-3.400E-1	-4.200E-1	-3.000E-1	-2.800E-1	-2.800E-1	-3.800E-1	-1.800E-1
N° 16 (OFF)	---	-2.000E-2	-1.000E-1	-2.800E-1	-3.000E-1	-2.800E-1	-3.000E-1	-4.000E-1	-3.000E-1	-3.800E-1	-1.000E-1
Average (OFF)	---	4.000E-3	-7.600E-2	-2.200E-1	-2.320E-1	-1.880E-1	-1.840E-1	-3.160E-1	-3.280E-1	-3.120E-1	3.200E-2
σ (OFF)	---	5.727E-2	8.050E-2	9.165E-2	5.215E-2	1.842E-1	1.734E-1	1.268E-1	1.073E-1	9.121E-2	2.105E-1
Average+3σ (OFF)	---	1.758E-1	1.655E-1	5.495E-2	-7.554E-2	3.645E-1	3.363E-1	6.442E-2	-6.006E-3	-3.836E-2	6.636E-1
Average-3σ (OFF)	---	-1.678E-1	-3.175E-1	-4.950E-1	-3.885E-1	-7.405E-1	-7.043E-1	-6.964E-1	-6.500E-1	-5.856E-1	-5.996E-1
Average (Bias1)	---	-4.000E-3	-4.400E-2	-2.080E-1	-2.400E-1	-1.400E-1	-1.960E-1	-3.040E-1	-2.200E-1	-3.000E-1	-1.200E-2
σ (Bias1)	---	4.980E-2	3.578E-2	5.404E-2	6.325E-2	1.929E-1	6.986E-2	4.561E-2	7.211E-2	6.633E-2	1.316E-1
Average+3σ (Bias1)	---	1.454E-1	6.333E-2	-4.589E-2	-5.026E-2	4.386E-1	1.357E-2	-1.672E-1	-3.667E-3	-1.010E-1	3.828E-1
Average-3σ (Bias1)	---	-1.534E-1	-1.513E-1	-3.701E-1	-4.297E-1	-7.186E-1	-4.056E-1	-4.408E-1	-4.363E-1	-4.990E-1	-4.068E-1
Average (Bias2)	---	4.000E-3	-7.200E-2	-2.440E-1	-2.880E-1	-2.360E-1	-2.320E-1	-2.960E-1	-1.800E-1	-3.000E-1	-1.600E-1
σ (Bias2)	---	3.286E-2	2.683E-2	3.286E-2	5.933E-2	1.307E-1	9.960E-2	6.542E-2	1.208E-1	8.124E-2	6.633E-2
Average+3σ (Bias2)	---	1.026E-1	8.498E-3	-1.454E-1	-1.100E-1	1.561E-1	6.680E-2	-9.973E-2	1.825E-1	-5.628E-2	3.900E-2
Average-3σ (Bias2)	---	-9.459E-2	-1.525E-1	-3.426E-1	-4.660E-1	-6.281E-1	-5.308E-1	-4.923E-1	-5.425E-1	-5.437E-1	-3.590E-1

14.CTR1

Ta=25°C; Vce = 5V; If = 1 mA



CTR1 . (%)

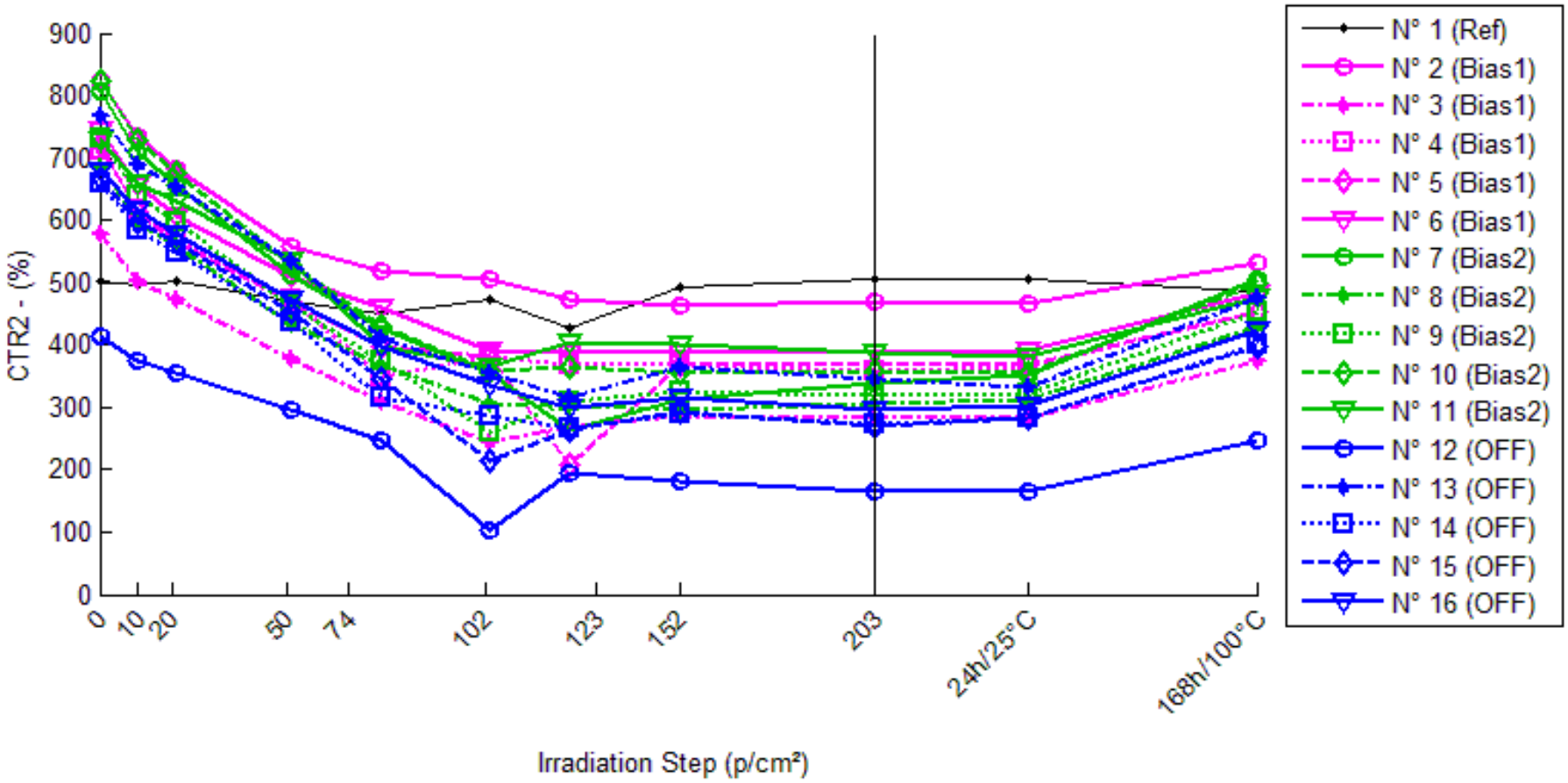
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	430.29	425.65	433.28	406.16	380.76	408.90	364.18	423.21	442.28	439.98	420.02
N° 2 (Bias1)	763.62	660.13	602.17	473.17	427.75	246.89	211.23	368.97	381.28	371.76	444.74
N° 3 (Bias1)	513.92	420.07	397.57	308.31	243.13	190.48	203.93	217.79	216.50	213.71	305.52
N° 4 (Bias1)	617.44	515.91	470.63	377.69	266.85	291.56	271.18	271.84	264.45	270.73	355.78
N° 5 (Bias1)	665.42	533.96	485.38	393.73	319.98	306.42	160.76	289.73	290.04	292.47	374.23
N° 6 (Bias1)	696.33	591.55	542.34	441.92	386.23	159.87	321.30	312.97	314.94	319.99	411.22
N° 7 (Bias2)	741.42	621.12	560.93	411.02	310.76	250.20	178.75	214.66	228.78	246.50	401.31
N° 8 (Bias2)	628.04	521.29	482.64	354.50	282.50	228.50	227.49	220.11	225.75	233.44	356.04
N° 9 (Bias2)	658.25	545.40	498.56	355.07	266.08	173.21	213.14	223.01	217.67	223.09	358.79
N° 10 (Bias2)	779.51	659.65	595.19	426.77	322.62	256.13	262.03	252.18	252.78	254.94	411.18
N° 11 (Bias2)	662.52	582.58	544.42	443.93	309.90	276.21	310.97	301.75	290.89	287.86	383.78
N° 12 (OFF)	360.08	311.76	294.43	233.19	183.99	70.85	132.91	119.33	101.33	104.96	187.56
N° 13 (OFF)	713.38	614.39	570.26	434.81	310.35	251.95	222.35	255.67	237.43	228.78	380.83
N° 14 (OFF)	613.10	520.49	482.70	361.85	242.12	209.21	194.73	209.28	193.42	203.06	328.57
N° 15 (OFF)	591.19	509.67	477.73	349.88	246.34	137.19	170.65	189.87	170.36	184.63	300.64
N° 16 (OFF)	625.18	552.26	508.37	388.94	305.38	247.66	214.60	226.78	204.74	216.48	344.50

1/Delta [CTR1]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	2.536E-5	-1.602E-5	1.381E-4	3.023E-4	1.216E-4	4.219E-4	3.891E-5	-6.297E-5	-5.117E-5	5.686E-5
N° 2 (Bias1)	---	2.053E-4	3.511E-4	8.039E-4	1.028E-3	2.741E-3	3.425E-3	1.401E-3	1.313E-3	1.380E-3	9.390E-4
N° 3 (Bias1)	---	4.348E-4	5.694E-4	1.298E-3	2.167E-3	3.304E-3	2.958E-3	2.646E-3	2.673E-3	2.733E-3	1.327E-3
N° 4 (Bias1)	---	3.187E-4	5.052E-4	1.028E-3	2.128E-3	1.810E-3	2.068E-3	2.059E-3	2.162E-3	2.074E-3	1.191E-3
N° 5 (Bias1)	---	3.700E-4	5.574E-4	1.037E-3	1.622E-3	1.761E-3	4.718E-3	1.949E-3	1.945E-3	1.916E-3	1.169E-3
N° 6 (Bias1)	---	2.544E-4	4.078E-4	8.267E-4	1.153E-3	4.819E-3	1.676E-3	1.759E-3	1.739E-3	1.689E-3	9.957E-4
N° 7 (Bias2)	---	2.612E-4	4.340E-4	1.084E-3	1.869E-3	2.648E-3	4.246E-3	3.310E-3	3.022E-3	2.708E-3	1.143E-3
N° 8 (Bias2)	---	3.261E-4	4.797E-4	1.229E-3	1.948E-3	2.784E-3	2.804E-3	2.951E-3	2.837E-3	2.691E-3	1.216E-3
N° 9 (Bias2)	---	3.143E-4	4.866E-4	1.297E-3	2.239E-3	4.254E-3	3.173E-3	2.965E-3	3.075E-3	2.963E-3	1.268E-3
N° 10 (Bias2)	---	2.331E-4	3.973E-4	1.060E-3	1.817E-3	2.621E-3	2.533E-3	2.683E-3	2.673E-3	2.640E-3	1.149E-3
N° 11 (Bias2)	---	2.071E-4	3.274E-4	7.432E-4	1.717E-3	2.111E-3	1.706E-3	1.805E-3	1.928E-3	1.964E-3	1.096E-3
N° 12 (OFF)	---	4.305E-4	6.193E-4	1.511E-3	2.658E-3	1.134E-2	4.747E-3	5.603E-3	7.092E-3	6.750E-3	2.554E-3
N° 13 (OFF)	---	2.259E-4	3.518E-4	8.981E-4	1.820E-3	2.567E-3	3.096E-3	2.510E-3	2.810E-3	2.969E-3	1.224E-3
N° 14 (OFF)	---	2.902E-4	4.406E-4	1.133E-3	2.499E-3	3.149E-3	3.504E-3	3.147E-3	3.539E-3	3.294E-3	1.412E-3
N° 15 (OFF)	---	2.705E-4	4.017E-4	1.167E-3	2.368E-3	5.597E-3	4.169E-3	3.575E-3	4.178E-3	3.725E-3	1.635E-3
N° 16 (OFF)	---	2.112E-4	3.675E-4	9.716E-4	1.675E-3	2.438E-3	3.060E-3	2.810E-3	3.285E-3	3.020E-3	1.303E-3
Average (OFF)	---	3.166E-4	4.782E-4	9.987E-4	1.620E-3	2.887E-3	2.969E-3	1.963E-3	1.966E-3	1.959E-3	1.124E-3
σ (OFF)	---	9.094E-5	9.546E-5	1.995E-4	5.304E-4	1.261E-3	1.199E-3	4.564E-4	5.041E-4	5.056E-4	1.570E-4
Average+3σ (OFF)	---	5.895E-4	7.646E-4	1.597E-3	3.211E-3	6.669E-3	6.565E-3	3.332E-3	3.479E-3	3.475E-3	1.595E-3
Average-3σ (OFF)	---	4.380E-5	1.918E-4	4.001E-4	2.841E-5	-8.949E-4	-6.275E-4	5.933E-4	4.542E-4	4.418E-4	6.535E-4
Average (Bias1)	---	2.684E-4	4.250E-4	1.083E-3	1.918E-3	2.884E-3	2.892E-3	2.743E-3	2.707E-3	2.593E-3	1.175E-3
σ (Bias1)	---	5.121E-5	6.549E-5	2.139E-4	1.980E-4	8.077E-4	9.292E-4	5.697E-4	4.635E-4	3.733E-4	6.754E-5
Average+3σ (Bias1)	---	4.220E-4	6.215E-4	1.724E-3	2.512E-3	5.307E-3	5.680E-3	4.452E-3	4.098E-3	3.713E-3	1.377E-3
Average-3σ (Bias1)	---	1.147E-4	2.285E-4	4.410E-4	1.324E-3	4.607E-4	1.048E-4	1.034E-3	1.317E-3	1.474E-3	9.719E-4
Average (Bias2)	---	2.857E-4	4.362E-4	1.136E-3	2.204E-3	5.018E-3	3.715E-3	3.529E-3	4.181E-3	3.952E-3	1.626E-3
σ (Bias2)	---	8.708E-5	1.079E-4	2.374E-4	4.321E-4	3.756E-3	7.292E-4	1.225E-3	1.701E-3	1.593E-3	5.416E-4
Average+3σ (Bias2)	---	5.469E-4	7.599E-4	1.848E-3	3.500E-3	1.629E-2	5.903E-3	7.205E-3	9.283E-3	8.731E-3	3.250E-3
Average-3σ (Bias2)	---	2.441E-5	1.125E-4	4.239E-4	9.077E-4	-6.250E-3	1.528E-3	-1.471E-4	-9.211E-4	-8.276E-4	9.990E-7

15.CTR2

Ta=25°C; Vce = 5V; If = 2 mA



CTR2 . (%)

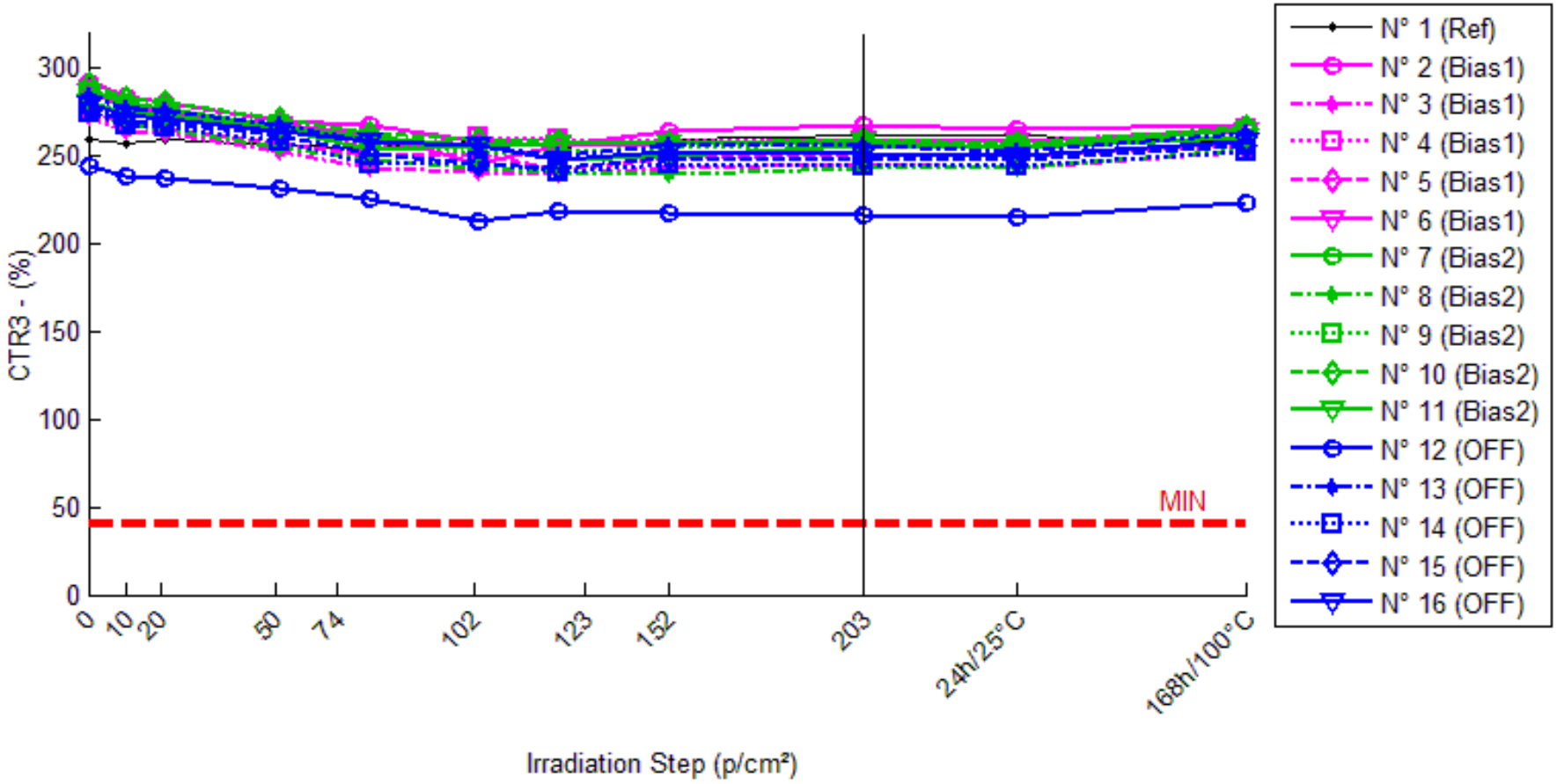
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	500.80	496.61	500.97	471.21	449.72	472.21	426.56	492.88	504.81	505.33	485.90
N° 2 (Bias1)	822.03	734.72	683.00	556.44	518.00	305.99	272.10	462.66	469.75	466.65	531.66
N° 3 (Bias1)	578.69	502.47	473.10	377.95	308.82	244.75	268.38	286.78	284.07	283.18	374.23
N° 4 (Bias1)	712.64	617.11	571.46	473.89	348.43	381.74	367.94	367.54	358.07	365.85	452.06
N° 5 (Bias1)	721.66	612.90	564.89	470.04	396.47	380.69	208.61	368.69	367.08	369.72	453.25
N° 6 (Bias1)	743.80	655.55	607.78	508.47	459.30	192.06	387.54	386.56	386.91	392.14	481.11
N° 7 (Bias2)	805.54	709.01	656.47	511.23	426.60	353.90	264.95	312.62	337.39	352.66	504.01
N° 8 (Bias2)	685.45	596.90	558.88	434.29	366.82	304.93	303.94	297.57	305.37	311.06	431.79
N° 9 (Bias2)	730.99	640.04	595.71	462.23	374.91	260.06	310.10	326.29	320.49	323.38	453.68
N° 10 (Bias2)	821.79	729.80	676.60	528.61	430.97	359.39	364.14	356.50	359.34	354.87	500.52
N° 11 (Bias2)	728.11	660.88	630.34	533.66	398.16	363.51	405.44	401.32	388.81	381.54	476.20
N° 12 (OFF)	414.88	373.38	355.61	296.44	248.63	103.03	194.55	182.49	164.13	166.24	246.56
N° 13 (OFF)	766.46	690.53	651.31	534.36	410.96	356.02	315.59	365.23	346.77	330.86	476.08
N° 14 (OFF)	658.70	582.68	548.61	437.85	315.92	287.67	267.31	290.64	273.37	281.66	400.22
N° 15 (OFF)	664.80	596.57	565.70	451.88	346.70	213.90	262.17	292.52	269.87	284.44	396.49
N° 16 (OFF)	677.81	615.76	578.30	472.43	397.19	336.08	298.63	316.91	294.70	303.84	424.19

1/Delta [CTR2]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.684E-5	-6.557E-7	1.254E-4	2.268E-4	1.209E-4	3.475E-4	3.210E-5	-1.584E-5	-1.790E-5	6.123E-5
N° 2 (Bias1)	---	1.446E-4	2.476E-4	5.806E-4	7.140E-4	2.052E-3	2.459E-3	9.449E-4	9.123E-4	9.264E-4	6.644E-4
N° 3 (Bias1)	---	2.621E-4	3.857E-4	9.178E-4	1.510E-3	2.358E-3	1.998E-3	1.759E-3	1.792E-3	1.803E-3	9.441E-4
N° 4 (Bias1)	---	2.172E-4	3.467E-4	7.070E-4	1.467E-3	1.216E-3	1.315E-3	1.318E-3	1.390E-3	1.330E-3	8.089E-4
N° 5 (Bias1)	---	2.459E-4	3.846E-4	7.418E-4	1.137E-3	1.241E-3	3.408E-3	1.327E-3	1.338E-3	1.319E-3	8.206E-4
N° 6 (Bias1)	---	1.810E-4	3.009E-4	6.222E-4	8.328E-4	3.862E-3	1.236E-3	1.242E-3	1.240E-3	1.206E-3	7.341E-4
N° 7 (Bias2)	---	1.690E-4	2.819E-4	7.147E-4	1.103E-3	1.584E-3	2.533E-3	1.957E-3	1.723E-3	1.594E-3	7.427E-4
N° 8 (Bias2)	---	2.164E-4	3.304E-4	8.437E-4	1.267E-3	1.821E-3	1.831E-3	1.902E-3	1.816E-3	1.756E-3	8.571E-4
N° 9 (Bias2)	---	1.944E-4	3.107E-4	7.954E-4	1.299E-3	2.477E-3	1.857E-3	1.697E-3	1.752E-3	1.724E-3	8.362E-4
N° 10 (Bias2)	---	1.534E-4	2.611E-4	6.749E-4	1.103E-3	1.566E-3	1.529E-3	1.588E-3	1.566E-3	1.601E-3	7.811E-4
N° 11 (Bias2)	---	1.397E-4	2.130E-4	5.004E-4	1.138E-3	1.378E-3	1.093E-3	1.118E-3	1.199E-3	1.248E-3	7.266E-4
N° 12 (OFF)	---	2.679E-4	4.017E-4	9.631E-4	1.612E-3	7.295E-3	2.730E-3	3.069E-3	3.683E-3	3.605E-3	1.645E-3
N° 13 (OFF)	---	1.435E-4	2.307E-4	5.667E-4	1.129E-3	1.504E-3	1.864E-3	1.433E-3	1.579E-3	1.718E-3	7.958E-4
N° 14 (OFF)	---	1.981E-4	3.046E-4	7.658E-4	1.647E-3	1.958E-3	2.223E-3	1.922E-3	2.140E-3	2.032E-3	9.805E-4
N° 15 (OFF)	---	1.720E-4	2.635E-4	7.088E-4	1.380E-3	3.171E-3	2.310E-3	1.914E-3	2.201E-3	2.011E-3	1.018E-3
N° 16 (OFF)	---	1.487E-4	2.539E-4	6.414E-4	1.042E-3	1.500E-3	1.873E-3	1.680E-3	1.918E-3	1.816E-3	8.821E-4
Average (OFF)	---	2.102E-4	3.331E-4	7.139E-4	1.132E-3	2.146E-3	2.083E-3	1.318E-3	1.335E-3	1.317E-3	7.944E-4
σ (OFF)	---	4.790E-5	5.903E-5	1.309E-4	3.603E-4	1.082E-3	8.960E-4	2.913E-4	3.161E-4	3.168E-4	1.047E-4
Average+3σ (OFF)	---	3.539E-4	5.102E-4	1.107E-3	2.213E-3	5.392E-3	4.771E-3	2.192E-3	2.283E-3	2.267E-3	1.108E-3
Average-3σ (OFF)	---	6.645E-5	1.560E-4	3.211E-4	5.112E-5	-1.100E-3	-6.051E-4	4.442E-4	3.861E-4	3.664E-4	4.804E-4
Average (Bias1)	---	1.746E-4	2.794E-4	7.058E-4	1.182E-3	1.765E-3	1.769E-3	1.652E-3	1.611E-3	1.585E-3	7.887E-4
σ (Bias1)	---	3.098E-5	4.561E-5	1.325E-4	9.409E-5	4.280E-4	5.267E-4	3.341E-4	2.482E-4	2.018E-4	5.693E-5
Average+3σ (Bias1)	---	2.675E-4	4.163E-4	1.103E-3	1.464E-3	3.049E-3	3.349E-3	2.655E-3	2.356E-3	2.190E-3	9.595E-4
Average-3σ (Bias1)	---	8.165E-5	1.426E-4	3.082E-4	8.999E-4	4.809E-4	1.887E-4	6.503E-4	8.664E-4	9.793E-4	6.179E-4
Average (Bias2)	---	1.860E-4	2.909E-4	7.291E-4	1.362E-3	3.086E-3	2.200E-3	2.004E-3	2.304E-3	2.236E-3	1.064E-3
σ (Bias2)	---	5.062E-5	6.749E-5	1.505E-4	2.742E-4	2.450E-3	3.581E-4	6.286E-4	8.081E-4	7.765E-4	3.362E-4
Average+3σ (Bias2)	---	3.379E-4	4.934E-4	1.181E-3	2.185E-3	1.044E-2	3.274E-3	3.890E-3	4.729E-3	4.566E-3	2.073E-3
Average-3σ (Bias2)	---	3.417E-5	8.841E-5	2.777E-4	5.395E-4	-4.265E-3	1.126E-3	1.182E-4	-1.203E-4	-9.304E-5	5.564E-5

16.CTR3

Ta=25°C; Vce = 5V; If = 10mA



CTR3 . (%)

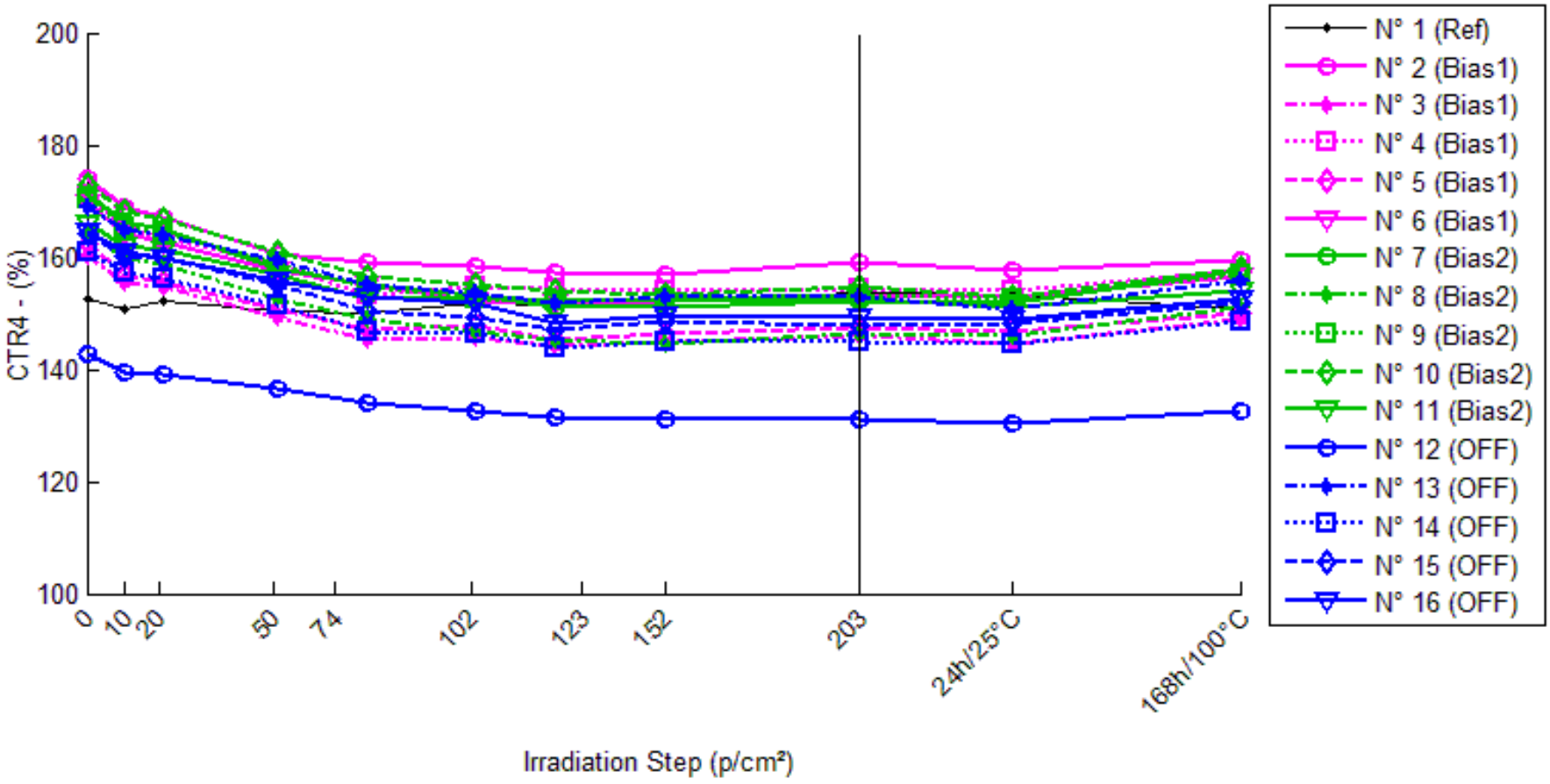
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	259.32	256.48	258.92	255.36	253.69	257.88	254.31	259.10	261.79	260.85	256.57
N° 2 (Bias1)	291.22	283.03	280.11	269.42	266.96	257.49	255.80	263.40	267.51	264.45	267.14
N° 3 (Bias1)	271.99	263.85	262.61	252.47	242.86	239.78	239.59	243.17	244.70	242.26	251.75
N° 4 (Bias1)	286.92	276.85	274.86	266.68	254.23	259.75	258.64	257.96	258.64	257.87	264.31
N° 5 (Bias1)	276.72	267.33	264.83	257.04	249.34	251.10	241.50	248.91	250.44	249.20	255.32
N° 6 (Bias1)	286.15	277.44	274.91	266.75	262.10	245.41	255.55	256.44	258.49	257.80	264.14
N° 7 (Bias2)	287.05	279.34	276.79	265.56	260.15	255.92	247.51	249.84	254.94	254.18	265.29
N° 8 (Bias2)	275.33	267.00	264.95	254.41	247.39	242.38	240.50	239.64	242.95	242.11	252.53
N° 9 (Bias2)	286.05	277.42	276.11	266.51	258.99	250.49	252.50	254.81	256.18	254.89	263.90
N° 10 (Bias2)	290.37	282.46	280.04	270.05	262.51	258.85	257.50	256.33	259.06	256.36	265.96
N° 11 (Bias2)	280.21	273.46	272.57	265.17	253.48	255.29	256.63	256.74	257.17	254.79	260.09
N° 12 (OFF)	243.21	237.54	236.60	230.82	225.10	212.52	218.47	217.19	215.83	214.60	222.75
N° 13 (OFF)	283.59	276.85	274.90	267.28	257.67	255.67	249.73	255.65	255.83	251.72	262.21
N° 14 (OFF)	274.31	267.47	265.73	257.43	245.20	245.60	239.98	244.37	243.93	243.63	252.33
N° 15 (OFF)	276.15	269.65	268.68	260.93	250.96	244.77	242.82	248.06	246.85	247.59	254.99
N° 16 (OFF)	278.75	272.81	271.02	264.01	258.07	255.89	247.45	251.55	250.52	250.02	258.09

1/Delta [CTR3]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	4.263E-5	5.852E-6	5.980E-5	8.556E-5	2.155E-5	7.589E-5	3.225E-6	-3.648E-5	-2.266E-5	4.132E-5
N° 2 (Bias1)	---	9.937E-5	1.362E-4	2.778E-4	3.120E-4	4.497E-4	4.755E-4	3.626E-4	3.044E-4	3.476E-4	3.095E-4
N° 3 (Bias1)	---	1.134E-4	1.313E-4	2.842E-4	4.409E-4	4.938E-4	4.972E-4	4.357E-4	4.101E-4	4.511E-4	2.955E-4
N° 4 (Bias1)	---	1.268E-4	1.530E-4	2.645E-4	4.482E-4	3.646E-4	3.810E-4	3.913E-4	3.811E-4	3.926E-4	2.981E-4
N° 5 (Bias1)	---	1.270E-4	1.622E-4	2.767E-4	3.968E-4	3.687E-4	5.270E-4	4.037E-4	3.792E-4	3.991E-4	3.030E-4
N° 6 (Bias1)	---	1.097E-4	1.429E-4	2.541E-4	3.207E-4	5.802E-4	4.184E-4	4.048E-4	3.740E-4	3.844E-4	2.913E-4
N° 7 (Bias2)	---	9.610E-5	1.291E-4	2.819E-4	3.602E-4	4.237E-4	5.564E-4	5.188E-4	4.387E-4	4.504E-4	2.857E-4
N° 8 (Bias2)	---	1.133E-4	1.423E-4	2.987E-4	4.101E-4	4.937E-4	5.260E-4	5.409E-4	4.841E-4	4.983E-4	3.279E-4
N° 9 (Bias2)	---	1.087E-4	1.258E-4	2.563E-4	3.652E-4	4.963E-4	4.645E-4	4.286E-4	4.075E-4	4.273E-4	2.934E-4
N° 10 (Bias2)	---	9.642E-5	1.271E-4	2.592E-4	3.656E-4	4.194E-4	4.396E-4	4.573E-4	4.163E-4	4.570E-4	3.161E-4
N° 11 (Bias2)	---	8.808E-5	9.997E-5	2.023E-4	3.762E-4	3.483E-4	3.279E-4	3.263E-4	3.197E-4	3.561E-4	2.761E-4
N° 12 (OFF)	---	9.814E-5	1.149E-4	2.209E-4	3.308E-4	5.938E-4	4.656E-4	4.926E-4	5.216E-4	5.482E-4	3.776E-4
N° 13 (OFF)	---	8.583E-5	1.115E-4	2.152E-4	3.547E-4	3.851E-4	4.781E-4	3.854E-4	3.827E-4	4.465E-4	2.876E-4
N° 14 (OFF)	---	9.311E-5	1.176E-4	2.390E-4	4.328E-4	4.260E-4	5.215E-4	4.465E-4	4.539E-4	4.590E-4	3.175E-4
N° 15 (OFF)	---	8.719E-5	1.006E-4	2.111E-4	3.634E-4	4.642E-4	4.970E-4	4.100E-4	4.298E-4	4.177E-4	3.004E-4
N° 16 (OFF)	---	7.800E-5	1.023E-4	2.003E-4	2.874E-4	3.204E-4	4.537E-4	3.878E-4	4.043E-4	4.122E-4	2.871E-4
Average (OFF)	---	1.152E-4	1.451E-4	2.715E-4	3.837E-4	4.514E-4	4.598E-4	3.996E-4	3.698E-4	3.950E-4	2.995E-4
σ (OFF)	---	1.179E-5	1.256E-5	1.204E-5	6.464E-5	9.052E-5	5.932E-5	2.638E-5	3.917E-5	3.718E-5	7.027E-6
Average+3σ (OFF)	---	1.506E-4	1.828E-4	3.076E-4	5.777E-4	7.230E-4	6.378E-4	4.788E-4	4.873E-4	5.065E-4	3.206E-4
Average-3σ (OFF)	---	7.987E-5	1.075E-4	2.353E-4	1.898E-4	1.799E-4	2.819E-4	3.205E-4	2.522E-4	2.834E-4	2.784E-4
Average (Bias1)	---	1.005E-4	1.249E-4	2.597E-4	3.755E-4	4.363E-4	4.629E-4	4.544E-4	4.133E-4	4.378E-4	2.998E-4
σ (Bias1)	---	1.028E-5	1.539E-5	3.646E-5	2.024E-5	6.142E-5	8.876E-5	8.474E-5	6.012E-5	5.240E-5	2.153E-5
Average+3σ (Bias1)	---	1.314E-4	1.710E-4	3.691E-4	4.362E-4	6.205E-4	7.292E-4	7.086E-4	5.936E-4	5.950E-4	3.644E-4
Average-3σ (Bias1)	---	6.969E-5	7.869E-5	1.503E-4	3.147E-4	2.520E-4	1.966E-4	2.002E-4	2.329E-4	2.806E-4	2.352E-4
Average (Bias2)	---	8.846E-5	1.094E-4	2.173E-4	3.538E-4	4.379E-4	4.832E-4	4.245E-4	4.385E-4	4.567E-4	3.140E-4
σ (Bias2)	---	7.638E-6	7.582E-6	1.428E-5	5.309E-5	1.021E-4	2.675E-5	4.529E-5	5.366E-5	5.473E-5	3.765E-5
Average+3σ (Bias2)	---	1.114E-4	1.321E-4	2.601E-4	5.131E-4	7.443E-4	5.634E-4	5.603E-4	5.994E-4	6.209E-4	4.270E-4
Average-3σ (Bias2)	---	6.554E-5	8.664E-5	1.745E-4	1.946E-4	1.315E-4	4.029E-4	2.886E-4	2.775E-4	2.925E-4	2.011E-4

17.CTR4

Ta=25°C; Vce = 5V; If = 20 mA



CTR4 . (%)

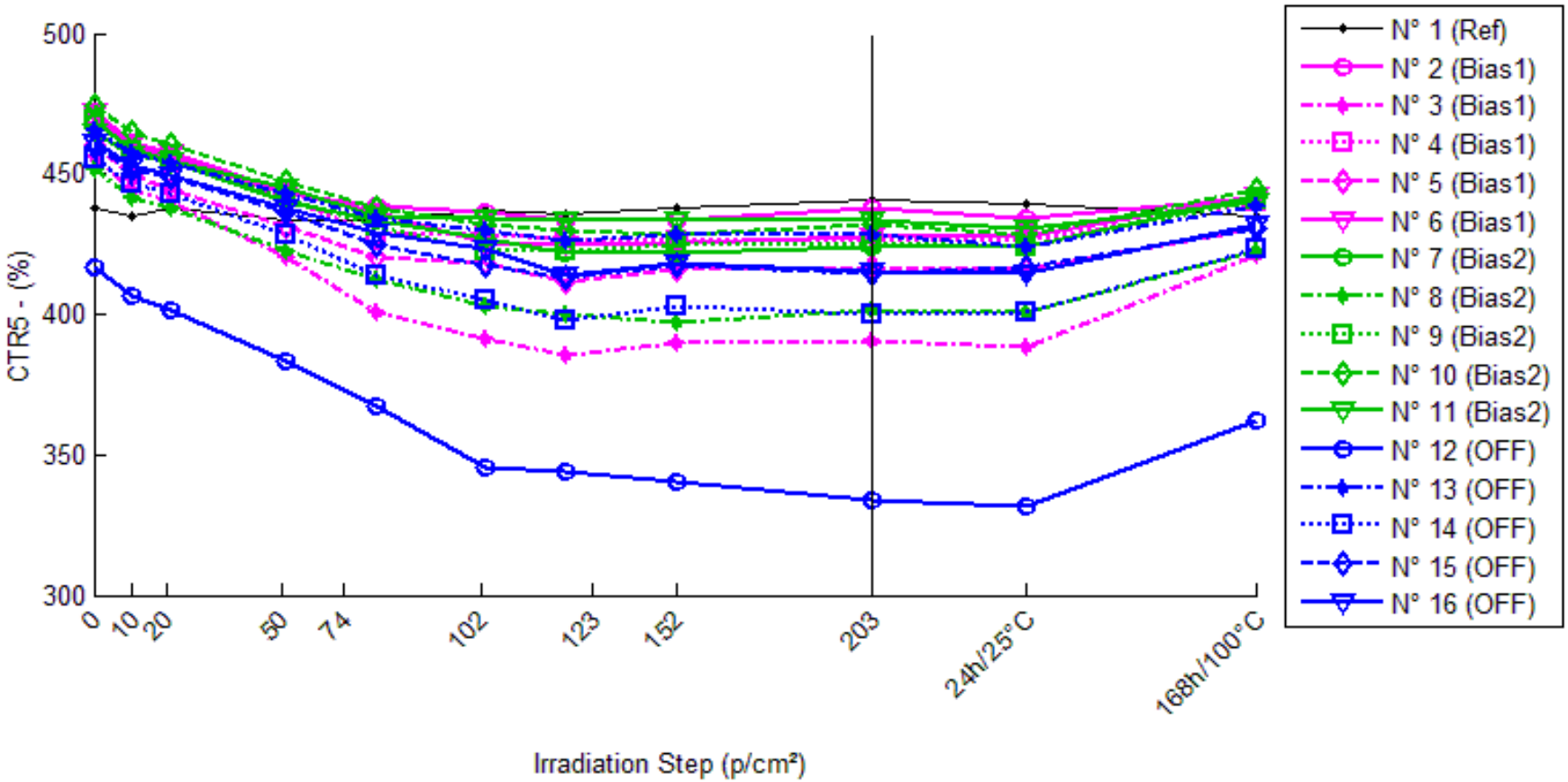
	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	152.46	150.87	152.18	150.24	150.08	151.78	151.29	152.27	153.71	153.24	150.83
N° 2 (Bias1)	173.83	168.90	166.96	160.68	159.01	158.30	157.14	156.97	159.22	157.63	159.60
N° 3 (Bias1)	160.21	155.53	154.67	149.28	145.34	145.58	144.25	145.00	145.94	144.52	149.07
N° 4 (Bias1)	170.99	164.98	163.59	158.64	153.45	154.82	154.21	153.84	154.25	153.88	157.56
N° 5 (Bias1)	162.43	157.02	155.45	150.83	147.09	147.69	145.31	146.53	147.40	146.72	150.11
N° 6 (Bias1)	169.51	164.33	162.62	157.70	155.22	152.18	151.73	152.15	153.29	152.94	156.59
N° 7 (Bias2)	170.92	166.42	164.75	158.03	155.23	153.28	150.94	150.98	152.25	151.74	157.55
N° 8 (Bias2)	164.68	159.91	158.58	152.42	148.74	146.88	145.43	144.63	146.35	145.83	151.12
N° 9 (Bias2)	170.37	165.41	164.47	158.82	154.84	152.59	152.06	152.49	153.20	152.44	157.03
N° 10 (Bias2)	172.75	168.18	166.60	160.85	156.61	155.11	153.93	153.11	154.58	152.99	158.04
N° 11 (Bias2)	165.96	161.99	161.33	156.97	152.44	152.89	152.09	152.25	152.43	151.04	153.83
N° 12 (OFF)	142.57	139.53	139.06	136.37	133.94	132.47	131.63	131.25	131.19	130.42	132.61
N° 13 (OFF)	168.89	164.97	163.72	159.30	155.05	153.78	151.80	152.79	152.86	150.81	155.96
N° 14 (OFF)	161.04	157.18	156.15	151.43	146.85	146.20	143.94	145.03	144.93	144.66	148.49
N° 15 (OFF)	164.13	160.33	159.67	155.20	150.53	149.29	147.27	148.54	147.91	148.26	151.68
N° 16 (OFF)	164.51	161.08	159.98	155.92	152.86	151.96	148.05	149.62	149.17	148.78	152.44

1/Delta [CTR4]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	6.902E-5	1.204E-5	9.658E-5	1.037E-4	2.915E-5	5.052E-5	8.021E-6	-5.334E-5	-3.358E-5	7.062E-5
N° 2 (Bias1)	---	1.679E-4	2.369E-4	4.707E-4	5.362E-4	5.644E-4	6.110E-4	6.180E-4	5.280E-4	5.912E-4	5.131E-4
N° 3 (Bias1)	---	1.879E-4	2.236E-4	4.571E-4	6.388E-4	6.271E-4	6.905E-4	6.546E-4	6.103E-4	6.775E-4	4.664E-4
N° 4 (Bias1)	---	2.130E-4	2.646E-4	4.554E-4	6.687E-4	6.109E-4	6.366E-4	6.520E-4	6.348E-4	6.502E-4	4.987E-4
N° 5 (Bias1)	---	2.123E-4	2.764E-4	4.738E-4	6.423E-4	6.144E-4	7.253E-4	6.681E-4	6.277E-4	6.595E-4	5.053E-4
N° 6 (Bias1)	---	1.857E-4	2.500E-4	4.416E-4	5.431E-4	6.718E-4	6.913E-4	6.731E-4	6.242E-4	6.390E-4	4.867E-4
N° 7 (Bias2)	---	1.584E-4	2.192E-4	4.775E-4	5.916E-4	6.736E-4	7.746E-4	7.728E-4	7.177E-4	7.399E-4	4.967E-4
N° 8 (Bias2)	---	1.810E-4	2.335E-4	4.884E-4	6.509E-4	7.360E-4	8.036E-4	8.418E-4	7.608E-4	7.849E-4	5.451E-4
N° 9 (Bias2)	---	1.758E-4	2.106E-4	4.270E-4	5.888E-4	6.838E-4	7.069E-4	6.884E-4	6.580E-4	6.906E-4	4.986E-4
N° 10 (Bias2)	---	1.574E-4	2.137E-4	4.283E-4	5.965E-4	6.583E-4	7.080E-4	7.427E-4	6.805E-4	7.477E-4	5.388E-4
N° 11 (Bias2)	---	1.476E-4	1.727E-4	3.449E-4	5.345E-4	5.152E-4	5.492E-4	5.423E-4	5.347E-4	5.952E-4	4.749E-4
N° 12 (OFF)	---	1.526E-4	1.770E-4	3.185E-4	4.517E-4	5.344E-4	5.828E-4	6.047E-4	6.085E-4	6.535E-4	5.265E-4
N° 13 (OFF)	---	1.408E-4	1.872E-4	3.564E-4	5.284E-4	5.820E-4	6.668E-4	6.240E-4	6.208E-4	7.098E-4	4.909E-4
N° 14 (OFF)	---	1.524E-4	1.946E-4	3.943E-4	5.999E-4	6.304E-4	7.377E-4	6.857E-4	6.903E-4	7.032E-4	5.249E-4
N° 15 (OFF)	---	1.444E-4	1.703E-4	3.507E-4	5.507E-4	6.056E-4	6.977E-4	6.396E-4	6.680E-4	6.521E-4	5.002E-4
N° 16 (OFF)	---	1.295E-4	1.720E-4	3.348E-4	4.630E-4	5.020E-4	6.756E-4	6.047E-4	6.252E-4	6.426E-4	4.812E-4
Average (OFF)	---	1.934E-4	2.503E-4	4.597E-4	6.058E-4	6.177E-4	6.709E-4	6.532E-4	6.050E-4	6.435E-4	4.941E-4
σ (OFF)	---	1.925E-5	2.109E-5	1.295E-5	6.155E-5	3.844E-5	4.617E-5	2.159E-5	4.396E-5	3.244E-5	1.824E-5
Average+3σ (OFF)	---	2.511E-4	3.136E-4	4.986E-4	7.905E-4	7.330E-4	8.094E-4	7.179E-4	7.369E-4	7.408E-4	5.488E-4
Average-3σ (OFF)	---	1.356E-4	1.870E-4	4.209E-4	4.212E-4	5.024E-4	5.324E-4	5.884E-4	4.731E-4	5.462E-4	4.394E-4
Average (Bias1)	---	1.641E-4	2.100E-4	4.332E-4	5.925E-4	6.534E-4	7.084E-4	7.176E-4	6.703E-4	7.117E-4	5.108E-4
σ (Bias1)	---	1.392E-5	2.262E-5	5.672E-5	4.125E-5	8.258E-5	9.846E-5	1.125E-4	8.526E-5	7.325E-5	3.000E-5
Average+3σ (Bias1)	---	2.058E-4	2.778E-4	6.034E-4	7.162E-4	9.011E-4	1.004E-3	1.055E-3	9.261E-4	9.314E-4	6.008E-4
Average-3σ (Bias1)	---	1.223E-4	1.421E-4	2.631E-4	4.687E-4	4.056E-4	4.131E-4	3.800E-4	4.145E-4	4.919E-4	4.208E-4
Average (Bias2)	---	1.439E-4	1.802E-4	3.509E-4	5.188E-4	5.708E-4	6.721E-4	6.317E-4	6.426E-4	6.722E-4	5.047E-4
σ (Bias2)	---	9.547E-6	1.037E-5	2.837E-5	6.189E-5	5.231E-5	5.696E-5	3.356E-5	3.488E-5	3.164E-5	2.029E-5
Average+3σ (Bias2)	---	1.725E-4	2.113E-4	4.360E-4	7.044E-4	7.278E-4	8.430E-4	7.324E-4	7.472E-4	7.671E-4	5.656E-4
Average-3σ (Bias2)	---	1.153E-4	1.491E-4	2.658E-4	3.331E-4	4.139E-4	5.012E-4	5.311E-4	5.379E-4	5.773E-4	4.439E-4

18.CTR5

Ta=25°C; Vce = 30V; If = 10 mA



CTR5 . (%)

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	437.95	435.10	437.65	433.74	433.26	436.79	435.58	437.71	440.63	439.60	434.99
N° 2 (Bias1)	469.81	460.40	456.15	442.90	438.27	436.09	433.61	433.23	437.50	434.30	441.57
N° 3 (Bias1)	455.70	444.38	440.30	420.05	400.91	391.04	385.42	389.86	390.32	388.10	421.20
N° 4 (Bias1)	469.57	457.84	454.08	441.18	428.24	428.47	426.77	426.32	426.26	425.97	440.00
N° 5 (Bias1)	460.51	449.22	444.46	430.99	420.08	418.42	411.50	415.72	416.88	415.85	430.48
N° 6 (Bias1)	471.98	461.39	457.17	443.89	436.69	425.30	424.86	425.79	427.89	427.62	441.91
N° 7 (Bias2)	468.47	459.05	454.63	440.16	433.21	426.94	421.93	421.86	424.34	423.76	441.89
N° 8 (Bias2)	451.83	441.74	437.59	422.69	412.39	403.13	400.03	397.13	401.48	400.60	422.39
N° 9 (Bias2)	468.90	458.24	454.83	441.12	431.17	422.79	422.66	424.43	425.79	424.29	440.60
N° 10 (Bias2)	474.38	464.61	460.34	447.35	437.55	432.03	429.96	428.39	431.84	428.11	444.59
N° 11 (Bias2)	464.81	456.86	454.67	444.92	435.17	434.39	433.36	433.67	433.80	430.84	439.83
N° 12 (OFF)	416.85	406.54	401.81	383.32	366.92	345.10	343.73	340.48	334.07	331.80	362.06
N° 13 (OFF)	465.74	457.52	453.92	443.11	434.05	430.13	426.15	428.69	428.60	423.96	438.70
N° 14 (OFF)	455.45	446.50	442.65	428.18	413.68	404.90	398.04	403.24	399.89	400.53	423.50
N° 15 (OFF)	459.77	451.50	448.91	436.56	424.60	417.80	413.32	417.56	414.62	416.55	430.79
N° 16 (OFF)	461.16	453.27	449.60	437.66	429.43	423.60	413.55	418.36	415.21	414.89	432.22

1/Delta [CTR5]

	0krad(Si)	10krad(Si)	20krad(Si)	50krad(Si)	74krad(Si)	102krad(Si)	123krad(Si)	152krad(Si)	203krad(Si)	24h/25°C	168h/100°C
N° 1 (Ref)	---	1.493E-5	1.522E-6	2.216E-5	2.470E-5	6.044E-6	1.238E-5	1.229E-6	-1.390E-5	-8.589E-6	1.549E-5
N° 2 (Bias1)	---	4.350E-5	6.377E-5	1.294E-4	1.532E-4	1.646E-4	1.777E-4	1.797E-4	1.572E-4	1.740E-4	1.362E-4
N° 3 (Bias1)	---	5.590E-5	7.673E-5	1.862E-4	2.999E-4	3.628E-4	4.001E-4	3.706E-4	3.675E-4	3.822E-4	1.797E-4
N° 4 (Bias1)	---	5.453E-5	7.266E-5	1.370E-4	2.055E-4	2.043E-4	2.136E-4	2.160E-4	2.164E-4	2.180E-4	1.431E-4
N° 5 (Bias1)	---	5.460E-5	7.845E-5	1.488E-4	2.090E-4	2.184E-4	2.587E-4	2.340E-4	2.273E-4	2.332E-4	1.515E-4
N° 6 (Bias1)	---	4.862E-5	6.864E-5	1.341E-4	1.712E-4	2.325E-4	2.350E-4	2.299E-4	2.184E-4	2.198E-4	1.442E-4
N° 7 (Bias2)	---	4.380E-5	6.498E-5	1.373E-4	1.738E-4	2.077E-4	2.354E-4	2.358E-4	2.220E-4	2.252E-4	1.284E-4
N° 8 (Bias2)	---	5.056E-5	7.203E-5	1.525E-4	2.117E-4	2.674E-4	2.866E-4	3.049E-4	2.776E-4	2.830E-4	1.543E-4
N° 9 (Bias2)	---	4.963E-5	6.595E-5	1.343E-4	1.866E-4	2.326E-4	2.333E-4	2.234E-4	2.159E-4	2.242E-4	1.370E-4
N° 10 (Bias2)	---	4.434E-5	6.433E-5	1.274E-4	1.775E-4	2.067E-4	2.178E-4	2.263E-4	2.076E-4	2.278E-4	1.413E-4
N° 11 (Bias2)	---	3.740E-5	4.796E-5	9.613E-5	1.465E-4	1.506E-4	1.561E-4	1.545E-4	1.538E-4	1.696E-4	1.222E-4
N° 12 (OFF)	---	6.088E-5	8.978E-5	2.099E-4	3.265E-4	4.988E-4	5.103E-4	5.381E-4	5.945E-4	6.149E-4	3.630E-4
N° 13 (OFF)	---	3.857E-5	5.587E-5	1.096E-4	1.567E-4	1.777E-4	1.994E-4	1.856E-4	1.861E-4	2.116E-4	1.323E-4
N° 14 (OFF)	---	4.400E-5	6.351E-5	1.398E-4	2.217E-4	2.741E-4	3.167E-4	2.843E-4	3.051E-4	3.010E-4	1.656E-4
N° 15 (OFF)	---	3.985E-5	5.261E-5	1.157E-4	1.801E-4	2.185E-4	2.445E-4	2.199E-4	2.369E-4	2.257E-4	1.463E-4
N° 16 (OFF)	---	3.774E-5	5.574E-5	1.164E-4	1.603E-4	1.923E-4	2.496E-4	2.219E-4	2.400E-4	2.418E-4	1.452E-4
Average (OFF)	---	5.143E-5	7.205E-5	1.471E-4	2.078E-4	2.365E-4	2.570E-4	2.460E-4	2.373E-4	2.455E-4	1.509E-4
σ (OFF)	---	5.251E-6	5.989E-6	2.301E-5	5.657E-5	7.501E-5	8.535E-5	7.284E-5	7.790E-5	7.962E-5	1.699E-5
Average+3σ (OFF)	---	6.718E-5	9.002E-5	2.161E-4	3.775E-4	4.616E-4	5.131E-4	4.646E-4	4.711E-4	4.843E-4	2.019E-4
Average-3σ (OFF)	---	3.568E-5	5.408E-5	7.806E-5	3.806E-5	1.150E-5	9.661E-7	2.752E-5	3.635E-6	6.598E-6	9.996E-5
Average (Bias1)	---	4.515E-5	6.305E-5	1.295E-4	1.792E-4	2.130E-4	2.259E-4	2.290E-4	2.154E-4	2.260E-4	1.366E-4
σ (Bias1)	---	5.288E-6	8.974E-6	2.082E-5	2.350E-5	4.272E-5	4.682E-5	5.338E-5	4.406E-5	4.011E-5	1.234E-5
Average+3σ (Bias1)	---	6.101E-5	8.997E-5	1.920E-4	2.497E-4	3.411E-4	3.663E-4	3.891E-4	3.476E-4	3.463E-4	1.736E-4
Average-3σ (Bias1)	---	2.928E-5	3.613E-5	6.709E-5	1.087E-4	8.483E-5	8.540E-5	6.886E-5	8.321E-5	1.056E-4	9.958E-5
Average (Bias2)	---	4.421E-5	6.350E-5	1.383E-4	2.091E-4	2.723E-4	3.041E-4	2.899E-4	3.125E-4	3.190E-4	1.905E-4
σ (Bias2)	---	9.626E-6	1.523E-5	4.164E-5	7.054E-5	1.319E-4	1.226E-4	1.432E-4	1.632E-4	1.689E-4	9.717E-5
Average+3σ (Bias2)	---	7.309E-5	1.092E-4	2.632E-4	4.207E-4	6.679E-4	6.720E-4	7.196E-4	8.021E-4	8.256E-4	4.820E-4
Average-3σ (Bias2)	---	1.533E-5	1.782E-5	1.336E-5	-2.551E-6	-1.233E-4	-6.379E-5	-1.397E-4	-1.771E-4	-1.876E-4	-1.010E-4