TOTAL DOSE RADIATION TEST REPORT

ESA study: "Survey of Critical Components for 150 kRad Power Systems"

ESTEC Contract N° 22831/09/NL/AF refers

Contract extension up to 400 kRad as per CCN: ATGSP-CN-0004 IS. 3

Final Report

Part Type : SOC2907A

Package : CCP-3

Description : PNP Small Signal Silicon Transistors

Manufacturer : STMicroelectronics

Alter Technology Purchase Order N° ATGSP-TL-09-JC-CO-9 dated 11/27/2009

Alter Technology Project Manager: David NUNEZ

Hirex reference :	HRX/TID/1024	Issue : 01	Date :	January 25th, 2011
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CHANGE RECORD

ISSUE	DATE	PAGE	DESCRIPTION OF CHANGES
01	January 25th, 2011	All	Original Issue

TOTAL DOSE RADIATION TEST REPORT
on
STMicroelectronics
SOC2907A
PNP Small Signal Silicon Transistors

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1 Introduction

In the scope of the ESA study: “Survey of Critical Components for 150 kRad Power Systems”, a total dose characterization test of the STMicroelectronics SOC2907A, PNP Small Signal Silicon Transistors has been performed with an accumulated dose of about 386.1 Krad(Si) at different dose rates of 36, 100 and 300rad(Si)/hour, in response to Alter Technology purchase order reference ATGSP-TL-09-JC-CO-9.

An Interim report, HRX/TID/0929 Issue 01, corresponding to the irradiation up to 163 Krad(Si) has been already provided.

The purpose of this test was to evaluate total dose withstanding of this component, to investigate its suitability for being used in space applications. This test was conducted on samples provided by Alter Technology.
Test has been performed in accordance with Hirex Engineering Radiation Test Plan HRX/ SPE/0227 issue 2 dated 06/09/2010.

A complete set of electrical measurements together with graphical representation of measured parameters with respect to total dose received, are provided for all samples.

2 Applicable and Reference Documents

2.1 Applicable Documents

- Hirex Engineering proposal: HRX/ SPE/0227 issue 2 dated 06/09/2010
- Alter Technology Group Proposal: ATGSP-OF-648/2009 Issue 1
- Minutes of Meeting: MM-SRP-ATG-0001 dated 29/10/2009
- Hirex internal specification: Total Ionizing dose test general procedure.
- ESCC detail specification: 5202-001

2.2 Reference Documents

- STMicroelectronics datasheet: Doc ID 15382 Rev 2, January 2010

3 Test Samples

13 samples of the SOC2907A device were tested (6 ON + 6 OFF + 1 control sample).

12 samples (including the 6 samples already submitted to protons test: see report HRX/TID/0942) have been biased according to the flow diagram given in Figure 1.

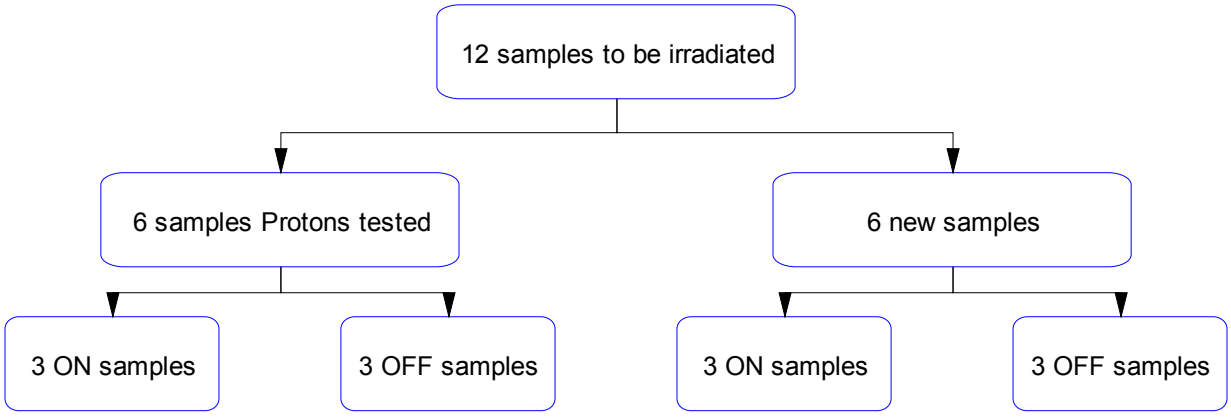


Figure 1 : Samples bias flow diagram

Samples were allocated into the bias conditions during exposures and annealing as provided in the following table. The different samples groups are also identified for an easier plots reading.

SN attributed by Hirex	Samples Allocation	Samples Group Naming
1	Control sample	REF
2	Biased ON	ON_PROTON
3	Biased ON	ON_PROTON
4	Biased ON	ON_PROTON
5	Biased OFF	OFF_PROTON
6	Biased OFF	OFF_PROTON
7	Biased OFF	OFF_PROTON
8	Biased ON	ON_TID
9	Biased ON	ON_TID
10	Biased ON	ON_TID
11	Biased OFF	OFF_TID
12	Biased OFF	OFF_TID
13	Biased OFF	OFF_TID

Identification of the SOC2907A is given below:

Part Number: SOC2907ASW

Top Marking: -

Inspection Lot: DOC01284

Date Code: -

4 Experimental Conditions

4.1 Radiation Source Dose Rate and Annealing

The dose exposures were performed at UCL in Louvain (Belgium). In this irradiation facility, a Cobalt 60 source is used with the possibility to vary the dose rate by simply adjusting the distance to the source. During the dose exposures, devices under test have been irradiated in an ambient temperature of 24°C ±6°C.

The dose received by the devices has been controlled by the measurement of one Alanine pellet dosimeter placed onto the bias board.

Resulting test conditions are provided below.

Irradiation Steps requested	Pellet dosimetry data	Dose rate	Annealing steps	Temperature
kRad	kRad	Rad/h	Hours	°C
0	0			
10	10.8	36		Room
20	25.2	36		Room
50	48.6	36		Room
100	91.8	36		Room
150	148.5	100 [1]		Room
200	196.2	300 [1]		Room
250	240.3	300 [1]		Room
300	283.5	300 [1]		Room
350	324.9	300 [1]		Room
400	386.1	300 [1]		Room
			24	Room
			168	100°C

Note [1]: Due to the maintenance period planned at UCL at the end of December and in order to perform subsequent requested exposures steps up to 400 Krad(Si), the dose rate of several steps have been changed, with ESA agreement, from 36 rad(Si)/h to 100 rad(Si)/h and from 100 rad(Si)/h to 300 rad(Si)/h as indicated.

4.2 Bias during Dose Exposures and Measurements conditions

4.2.1 Bias conditions

During exposures test board allowed to bias 6 samples in accordance with the electrical circuit provided in Figure 2.
6 other samples were biased OFF with all pins connected to ground.

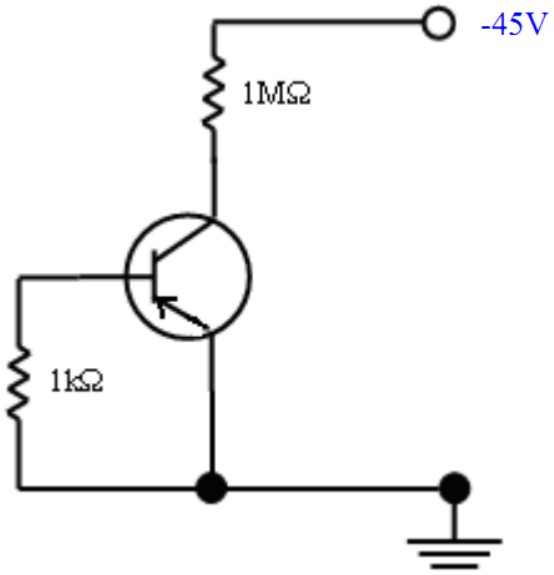


Figure 2 : Bias Conditions during Irradiation Exposures

4.2.2 Electrical Measurements

Electrical parameters test program principle for SOC2907A is provided in Figure 3.

A HP4142 DC tester and a network analyzer HP8714ES were used to perform required measurements.

A dedicated test fixture was designed to ensure proper measurement conditions. In addition a faraday cage was used to ensure optimum conditions for low level measurements.

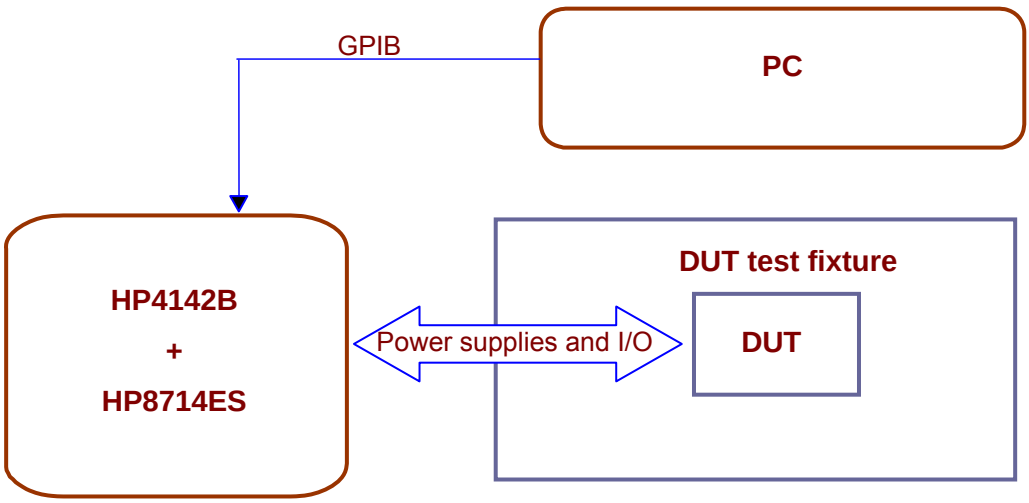


Figure 3 : SOC2907A test program principle

Electrical parameters test conditions and limits used for performing this test are given in Table 1.

Parameter	Description	Conditions	Spec		Unit
			Min	Max	
I_{CBO}	Collector-Base cut-off current	V_{CB} = -60V	-10	-	nA
I_{CEO}	Collector-Emitter cut-off current	V_{CE} = -60V, Note 2	-10	-	nA
$V_{(BR)CBO}$	Collector-Base breakdown voltage	I_C = -10µA	-	-60	V
$V_{(BR)CEO}$	Collector-Emitter breakdown voltage	I_C = -10mA Note 1	-	-60	V
$V_{(BR)EBO}$	Emitter-Base breakdown voltage	I_E = -10µA	-	-5	V
$V_{CE(SAT)}$	Collector-Emitter saturation voltage	I_C = -150mA, I_B = -15mA Note 1	-0.4	-	V
$V_{BE(SAT)}$	Base-Emitter saturation voltage	I_C = -150mA, I_B = -15mA Note 1	-1.3	-	V
H_{FE1}	DC current gain	I_C = -100µA, V_{CE} = -10V Note 1	75	-	-
H_{FE2}	DC current gain	I_C = -1mA, V_{CE} = -10V Note 1	100	-	-
H_{FE3}	DC current gain	I_C = -10mA, V_{CE} = -10V Note 1	100	-	-
H_{FE4}	DC current gain	I_C = -150mA, V_{CE} = -10V Note 1	100	300	-
F_T	Gain Bandwidth Product	I_C = -20mA, V_{CE} = -20V	200	-	MHz

Note 1: Pulse measurement: Pulse Width ≤ 300µs, duty cycle 1%.
Note 2 - This parameter has been measured at Room temperature at all steps of testing, and also at 110°C at initial step and after Annealing. No limit applicable at 110°C.

Table 1 : Measured electrical parameters

5 Conclusion

A Total Ionizing Dose characterization test was carried out by Hirex Engineering under Alter Technology contract on the STMicroelectronics SOC2907A PNP Small Signal Silicon Transistors in CCP-3 package.

12 samples plus one control sample were used during testing. They were exposed to radiation using different dose rates of 36, 100 & 300 rad(Si)/hour at room temperature.

TID samples have been tested for Iceo parameter at high temperature (110°C). Corresponding electrical measurements are provided in Appendix 1.

A summary of failed parameters is provided in the following table. The behavior of each parameter is recorded for both biased On and biased Off samples of each group.
Parameters not listed remained within specification limits all along testing, or had no limits specified.
Detail test results are presented in next section.

Parameters	Failure Level between :		Annealing Recovery [Note 1]					Comments
			NA	No	Partial	Complete	Rebound	
HFE1	ON_PROTON samples	25.2 & 48.6 kRad(Si)		X				
	ON_TID samples	48.6 & 91.8 kRad(Si)		X				
	OFF_PROTON samples	25.2 & 48.6 kRad(Si)		X				
	OFF_TID samples	48.6 & 91.8 kRad(Si)		X				
HFE2	ON_PROTON samples	48.6 & 91.8 kRad(Si)		X				
	ON_TID samples	48.6 & 91.8 kRad(Si)		X				
	OFF_PROTON samples	48.6 & 91.8 kRad(Si)		X				
	OFF_TID samples	48.6 & 91.8 kRad(Si)		X				
HFE3	ON_PROTON samples	148.5 & 196.2 kRad(Si)		X				
	ON_TID samples	196.2 & 240.3 kRad(Si)		X				
	OFF_PROTON samples	148.5 & 196.2 kRad(Si)		X				
	OFF_TID samples	196.2 & 240.3 kRad(Si)		X				

[Note 1]: **NA** = Not applicable, **No:** means no sample has recovered, **Partial:** means at least one sample has recovered, **Complete:** means all samples have recovered, **Rebound**: means rebound has been observed on at least one sample.

Table 2: Summary of parameters failure levels

6 Test Results

Test results including tables and graphics are provided in this section for each measured parameter.

Statistics are provided separately for biased ON & biased OFF samples of each group.

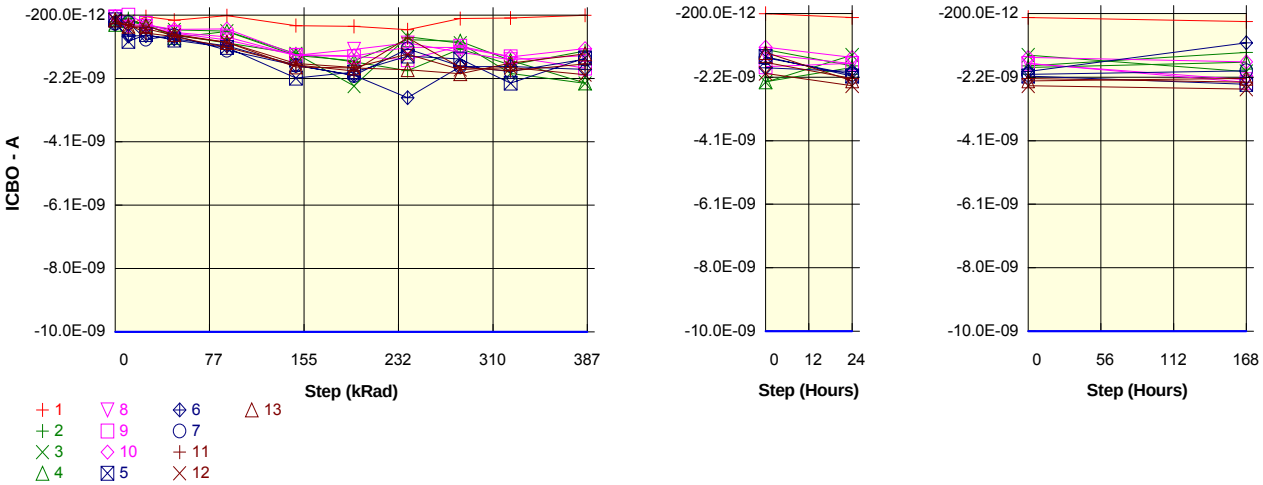
For each parameter, a drift calculation table is provided computing the drift between a given exposure step with respect to initial readings:

$$\Delta\text{(Parameter value)}=\text{(Parameter value}_{POSTRAD}\text{)} - \text{(Parameter value}_{PRERAD}\text{)}$$

For the particular case of transistors, drift calculation table for Hfe parameters will refer to 1/Hfe:

$$\Delta(1/hFE)=(1/hFE_{POSTRAD})-(1/hFE_{PRERAD})$$

Parameter : Collector-Base cut-off current : ICBO
Test conditions : Vcb = -60V
Unit : A
Spec Limit Min : -10.0E-09
Spec limits are represented in bold lines on the graphic.



Measurements

ICBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-323.4E-12	-533.6E-12	-243.9E-12	-356.5E-12	-218.8E-12	-523.2E-12	-545.7E-12	-651.8E-12	-305.9E-12	-287.0E-12	-202.8E-12	-323.6E-12	-444.4E-12
ON_PROTON samples													
2	-405.1E-12	-307.2E-12	-523.0E-12	-812.4E-12	-1.1E-09	-1.4E-09	-1.6E-09	-1.9E-09	-1.2E-09	-1.7E-09	-1.3E-09	-1.8E-09	-1.4E-09
3	-457.0E-12	-387.2E-12	-518.6E-12	-657.3E-12	-692.8E-12	-1.4E-09	-2.4E-09	-871.0E-12	-1.1E-09	-2.0E-09	-2.3E-09	-1.5E-09	-2.0E-09
4	-488.4E-12	-368.4E-12	-478.9E-12	-893.8E-12	-704.3E-12	-1.5E-09	-1.6E-09	-958.6E-12	-1.0E-09	-1.6E-09	-2.3E-09	-1.9E-09	-1.7E-09
Statistics													
Min	-488.4E-12	-387.2E-12	-523.0E-12	-893.8E-12	-1.1E-09	-1.5E-09	-2.4E-09	-1.9E-09	-1.2E-09	-2.0E-09	-2.3E-09	-1.9E-09	-2.0E-09
Max	-405.1E-12	-307.2E-12	-478.9E-12	-657.3E-12	-692.8E-12	-1.4E-09	-1.6E-09	-871.0E-12	-1.0E-09	-1.6E-09	-1.3E-09	-1.5E-09	-1.4E-09
Average	-450.2E-12	-354.3E-12	-506.8E-12	-787.8E-12	-819.2E-12	-1.4E-09	-1.9E-09	-1.2E-09	-1.1E-09	-1.8E-09	-2.0E-09	-1.7E-09	-1.7E-09
Sigma	34.4E-12	34.2E-12	19.8E-12	98.1E-12	170.6E-12	26.6E-12	359.8E-12	474.3E-12	99.7E-12	166.4E-12	470.7E-12	168.5E-12	242.9E-12

Drift Calculation

ICBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	97.9E-12	-117.9E-12	-407.3E-12	-655.3E-12	-990.5E-12	-1.2E-09	-1.5E-09	-839.5E-12	-1.3E-09	-903.1E-12	-1.4E-09	-994.5E-12
3	-	69.8E-12	-61.6E-12	-200.3E-12	-235.8E-12	-936.4E-12	-1.9E-09	-414.0E-12	-608.8E-12	-1.5E-09	-1.9E-09	-1.0E-09	-1.5E-09
4	-	120.0E-12	9.5E-12	-405.4E-12	-215.9E-12	-962.4E-12	-1.1E-09	-470.2E-12	-522.8E-12	-1.1E-09	-1.8E-09	-1.4E-09	-1.2E-09
Average	-	95.9E-12	-56.7E-12	-337.7E-12	-369.0E-12	-963.1E-12	-1.4E-09	-799.0E-12	-657.0E-12	-1.3E-09	-1.5E-09	-1.3E-09	-1.2E-09
Sigma	-	20.5E-12	52.1E-12	97.1E-12	202.6E-12	22.1E-12	357.8E-12	505.3E-12	133.7E-12	176.9E-12	439.1E-12	172.2E-12	223.2E-12

Measurements

ICBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-323.4E-12	-533.6E-12	-243.9E-12	-356.5E-12	-218.8E-12	-523.2E-12	-545.7E-12	-651.8E-12	-305.9E-12	-287.0E-12	-202.8E-12	-323.6E-12	-444.4E-12
ON_TID samples													
8	-272.8E-12	-569.8E-12	-547.0E-12	-754.4E-12	-966.6E-12	-1.4E-09	-1.3E-09	-1.1E-09	-1.3E-09	-1.6E-09	-1.5E-09	-1.7E-09	-2.2E-09
9	-247.5E-12	-201.0E-12	-456.7E-12	-736.8E-12	-876.2E-12	-1.4E-09	-1.5E-09	-1.6E-09	-1.2E-09	-1.5E-09	-1.8E-09	-1.7E-09	-2.3E-09
10	-242.8E-12	-501.0E-12	-505.4E-12	-637.3E-12	-627.5E-12	-1.4E-09	-1.5E-09	-1.2E-09	-1.2E-09	-1.5E-09	-1.2E-09	-1.6E-09	-1.7E-09
Statistics													
Min	-272.8E-12	-569.8E-12	-547.0E-12	-754.4E-12	-966.6E-12	-1.4E-09	-1.5E-09	-1.6E-09	-1.3E-09	-1.6E-09	-1.8E-09	-1.7E-09	-2.3E-09
Max	-242.8E-12	-201.0E-12	-456.7E-12	-637.3E-12	-627.5E-12	-1.4E-09	-1.3E-09	-1.1E-09	-1.2E-09	-1.5E-09	-1.2E-09	-1.6E-09	-1.7E-09
Average	-254.3E-12	-423.9E-12	-503.0E-12	-709.5E-12	-823.4E-12	-1.4E-09	-1.4E-09	-1.3E-09	-1.2E-09	-1.5E-09	-1.5E-09	-1.7E-09	-2.1E-09
Sigma	13.2E-12	160.1E-12	36.9E-12	51.6E-12	143.4E-12	9.5E-12	100.8E-12	219.2E-12	80.5E-12	40.8E-12	248.2E-12	89.2E-12	281.0E-12

Drift Calculation

ICBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	-297.0E-12	-274.2E-12	-481.6E-12	-693.8E-12	-1.2E-09	-986.2E-12	-787.6E-12	-1.1E-09	-1.3E-09	-1.2E-09	-1.5E-09	-2.0E-09
9	-	46.5E-12	-209.2E-12	-489.3E-12	-628.7E-12	-1.2E-09	-1.2E-09	-1.3E-09	-915.9E-12	-1.2E-09	-1.6E-09	-1.5E-09	-2.1E-09
10	-	-258.2E-12	-262.7E-12	-394.5E-12	-384.7E-12	-1.2E-09	-1.2E-09	-952.6E-12	-957.8E-12	-1.3E-09	-995.0E-12	-1.3E-09	-1.4E-09
Average	-	-169.6E-12	-248.7E-12	-455.2E-12	-569.1E-12	-1.2E-09	-1.1E-09	-1.0E-09	-983.5E-12	-1.3E-09	-1.3E-09	-1.4E-09	-1.8E-09
Sigma	-	153.6E-12	28.3E-12	43.0E-12	133.1E-12	10.1E-12	113.7E-12	227.3E-12	68.1E-12	28.1E-12	248.7E-12	81.3E-12	274.2E-12

Measurements

ICBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-323.4E-12	-533.6E-12	-243.9E-12	-356.5E-12	-218.8E-12	-523.2E-12	-545.7E-12	-651.8E-12	-305.9E-12	-287.0E-12	-202.8E-12	-323.6E-12	-444.4E-12
OFF_PROTON samples													
5	-344.9E-12	-1.0E-09	-800.2E-12	-970.8E-12	-1.2E-09	-2.1E-09	-2.0E-09	-1.5E-09	-1.6E-09	-2.3E-09	-1.5E-09	-2.1E-09	-2.4E-09
6	-470.5E-12	-844.8E-12	-831.4E-12	-933.4E-12	-1.2E-09	-1.7E-09	-2.1E-09	-2.8E-09	-1.8E-09	-1.8E-09	-1.9E-09	-2.0E-09	-1.1E-09
7	-455.2E-12	-428.4E-12	-949.0E-12	-832.4E-12	-1.3E-09	-1.8E-09	-2.1E-09	-1.2E-09	-1.8E-09	-1.9E-09	-1.6E-09	-2.1E-09	-2.0E-09
Statistics													
Min	-470.5E-12	-1.0E-09	-949.0E-12	-970.8E-12	-1.3E-09	-2.1E-09	-2.1E-09	-2.8E-09	-1.8E-09	-2.3E-09	-1.9E-09	-2.1E-09	-2.4E-09
Max	-344.9E-12	-428.4E-12	-800.2E-12	-832.4E-12	-1.2E-09	-1.7E-09	-2.0E-09	-1.2E-09	-1.6E-09	-1.8E-09	-1.5E-09	-2.0E-09	-1.1E-09
Average	-423.6E-12	-761.1E-12	-860.2E-12	-912.2E-12	-1.2E-09	-1.9E-09	-2.0E-09	-1.8E-09	-1.7E-09	-2.0E-09	-1.7E-09	-2.1E-09	-1.8E-09
Sigma	55.9E-12	244.8E-12	64.1E-12	58.5E-12	54.7E-12	188.8E-12	49.5E-12	666.0E-12	108.8E-12	217.3E-12	156.8E-12	57.6E-12	533.2E-12

Drift Calculation

ICBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	-665.3E-12	-455.3E-12	-625.9E-12	-859.3E-12	-1.8E-09	-1.6E-09	-1.1E-09	-1.2E-09	-2.0E-09	-1.2E-09	-1.8E-09	-2.0E-09
6	-	-374.3E-12	-360.9E-12	-462.9E-12	-683.1E-12	-1.3E-09	-1.6E-09	-2.3E-09	-1.3E-09	-1.3E-09	-1.4E-09	-1.5E-09	-631.5E-12
7	-	26.8E-12	-493.8E-12	-377.2E-12	-831.2E-12	-1.3E-09	-1.6E-09	-794.0E-12	-1.3E-09	-1.5E-09	-1.1E-09	-1.6E-09	-1.5E-09
Average	-	-337.6E-12	-436.6E-12	-488.6E-12	-791.2E-12	-1.5E-09	-1.6E-09	-1.4E-09	-1.3E-09	-1.6E-09	-1.2E-09	-1.6E-09	-1.4E-09
Sigma	-	283.7E-12	55.8E-12	103.2E-12	77.3E-12	244.5E-12	10.3E-12	640.9E-12	53.0E-12	272.4E-12	126.6E-12	108.7E-12	579.9E-12

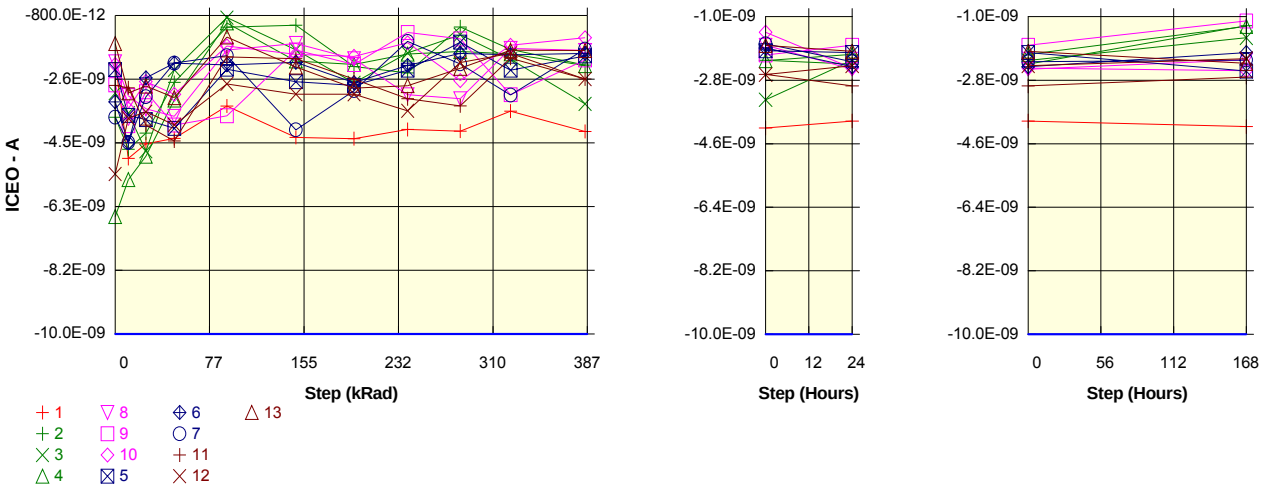
Measurements

ICBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-323.4E-12	-533.6E-12	-243.9E-12	-356.5E-12	-218.8E-12	-523.2E-12	-545.7E-12	-651.8E-12	-305.9E-12	-287.0E-12	-202.8E-12	-323.6E-12	-444.4E-12
OFF_TID samples													
11	-462.2E-12	-491.0E-12	-755.4E-12	-865.4E-12	-1.2E-09	-1.7E-09	-1.9E-09	-904.4E-12	-1.8E-09	-1.9E-09	-1.7E-09	-2.2E-09	-2.3E-09
12	-369.3E-12	-553.4E-12	-622.9E-12	-825.8E-12	-1.0E-09	-1.7E-09	-1.8E-09	-1.4E-09	-1.9E-09	-1.8E-09	-2.0E-09	-2.4E-09	-2.5E-09
13	-344.4E-12	-541.2E-12	-534.7E-12	-798.0E-12	-1.0E-09	-1.8E-09	-1.8E-09	-1.9E-09	-2.0E-09	-1.7E-09	-1.4E-09	-2.3E-09	-2.2E-09
Statistics													
Min	-462.2E-12	-553.4E-12	-755.4E-12	-865.4E-12	-1.2E-09	-1.8E-09	-1.9E-09	-1.9E-09	-2.0E-09	-1.9E-09	-2.0E-09	-2.4E-09	-2.5E-09
Max	-344.4E-12	-491.0E-12	-534.7E-12	-798.0E-12	-1.0E-09	-1.7E-09	-1.8E-09	-904.4E-12	-1.8E-09	-1.7E-09	-1.4E-09	-2.2E-09	-2.2E-09
Average	-392.0E-12	-528.5E-12	-637.7E-12	-829.7E-12	-1.1E-09	-1.7E-09	-1.9E-09	-1.4E-09	-1.9E-09	-1.8E-09	-1.7E-09	-2.3E-09	-2.3E-09
Sigma	50.7E-12	27.0E-12	90.7E-12	27.7E-12	70.7E-12	43.6E-12	46.4E-12	401.6E-12	80.3E-12	98.1E-12	263.1E-12	92.9E-12	138.2E-12

Drift Calculation

ICBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	-28.8E-12	-293.2E-12	-403.2E-12	-732.4E-12	-1.3E-09	-1.5E-09	-442.2E-12	-1.4E-09	-1.5E-09	-1.2E-09	-1.7E-09	-1.9E-09
12	-	-184.1E-12	-253.6E-12	-456.5E-12	-677.5E-12	-1.3E-09	-1.5E-09	-1.0E-09	-1.5E-09	-1.5E-09	-1.7E-09	-2.1E-09	-2.2E-09
13	-	-196.8E-12	-190.3E-12	-453.6E-12	-698.0E-12	-1.5E-09	-1.5E-09	-1.5E-09	-1.7E-09	-1.3E-09	-1.1E-09	-1.9E-09	-1.9E-09
Average	-	-136.6E-12	-245.7E-12	-437.8E-12	-702.6E-12	-1.4E-09	-1.5E-09	-1.0E-09	-1.5E-09	-1.4E-09	-1.3E-09	-1.9E-09	-2.0E-09
Sigma	-	76.4E-12	42.4E-12	24.5E-12	22.7E-12	75.4E-12	15.1E-12	450.3E-12	126.8E-12	54.7E-12	259.0E-12	130.0E-12	145.6E-12

Parameter : Collector-Emitter cut-off current : ICEO
Test conditions : Vce = -60V
Unit : A
Spec Limit Min : -10.0E-09
Spec limits are represented in bold lines on the graphic.



Measurements

ICEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-2.2E-09	-4.9E-09	-4.5E-09	-4.4E-09	-3.4E-09	-4.3E-09	-4.4E-09	-4.1E-09	-4.1E-09	-3.6E-09	-4.2E-09	-4.0E-09	-4.1E-09
ON_PROTON samples													
2	-3.7E-09	-4.7E-09	-4.2E-09	-2.7E-09	-1.1E-09	-1.1E-09	-2.3E-09	-2.5E-09	-1.1E-09	-1.8E-09	-2.2E-09	-2.3E-09	-1.3E-09
3	-3.0E-09	-3.6E-09	-4.7E-09	-2.4E-09	-864.8E-12	-1.8E-09	-2.7E-09	-1.9E-09	-1.4E-09	-2.1E-09	-3.4E-09	-2.2E-09	-1.6E-09
4	-6.6E-09	-5.5E-09	-4.9E-09	-3.2E-09	-1.0E-09	-2.1E-09	-2.2E-09	-1.9E-09	-1.8E-09	-1.9E-09	-2.2E-09	-2.1E-09	-1.3E-09
Statistics													
Min	-6.6E-09	-5.5E-09	-4.9E-09	-3.2E-09	-1.1E-09	-2.1E-09	-2.7E-09	-2.5E-09	-1.8E-09	-2.1E-09	-3.4E-09	-2.3E-09	-1.6E-09
Max	-3.0E-09	-3.6E-09	-4.2E-09	-2.4E-09	-864.8E-12	-1.1E-09	-2.2E-09	-1.9E-09	-1.1E-09	-1.8E-09	-2.2E-09	-2.1E-09	-1.3E-09
Average	-4.5E-09	-4.6E-09	-4.6E-09	-2.8E-09	-1.0E-09	-1.7E-09	-2.4E-09	-2.1E-09	-1.4E-09	-1.9E-09	-2.6E-09	-2.2E-09	-1.4E-09
Sigma	1.5E-09	784.0E-12	285.2E-12	356.8E-12	110.8E-12	430.6E-12	237.5E-12	265.5E-12	297.6E-12	114.8E-12	525.1E-12	112.4E-12	156.9E-12

Drift Calculation

ICEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	-924.0E-12	-458.4E-12	1.0E-09	2.6E-09	2.7E-09	1.5E-09	1.3E-09	2.6E-09	2.0E-09	1.5E-09	1.4E-09	2.5E-09
3	-	-576.0E-12	-1.7E-09	676.2E-12	2.2E-09	1.3E-09	300.0E-12	1.2E-09	1.7E-09	984.6E-12	-308.2E-12	803.2E-12	1.4E-09
4	-	1.1E-09	1.7E-09	3.4E-09	5.6E-09	4.5E-09	4.4E-09	4.7E-09	4.8E-09	4.7E-09	4.4E-09	4.5E-09	5.3E-09
Average	-	-142.7E-12	-127.8E-12	1.7E-09	3.5E-09	2.8E-09	2.1E-09	2.4E-09	3.0E-09	2.5E-09	1.9E-09	2.2E-09	3.1E-09
Sigma	-	870.6E-12	1.4E-09	1.2E-09	1.5E-09	1.3E-09	1.7E-09	1.6E-09	1.3E-09	1.6E-09	1.9E-09	1.6E-09	1.6E-09

Measurements

ICEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-2.2E-09	-4.9E-09	-4.5E-09	-4.4E-09	-3.4E-09	-4.3E-09	-4.4E-09	-4.1E-09	-4.1E-09	-3.6E-09	-4.2E-09	-4.0E-09	-4.1E-09
ON_TID samples													
8	-2.1E-09	-3.1E-09	-3.5E-09	-3.7E-09	-1.8E-09	-1.6E-09	-2.1E-09	-3.1E-09	-3.2E-09	-1.8E-09	-1.8E-09	-2.5E-09	-2.2E-09
9	-2.8E-09	-4.0E-09	-3.0E-09	-4.0E-09	-3.7E-09	-1.8E-09	-2.2E-09	-1.3E-09	-1.5E-09	-3.1E-09	-2.1E-09	-1.8E-09	-1.1E-09
10	-2.2E-09	-3.5E-09	-2.7E-09	-3.1E-09	-1.7E-09	-1.9E-09	-2.0E-09	-1.6E-09	-2.7E-09	-1.7E-09	-1.4E-09	-2.5E-09	-2.5E-09
Statistics													
Min	-2.8E-09	-4.0E-09	-3.5E-09	-4.0E-09	-3.7E-09	-1.9E-09	-2.2E-09	-3.1E-09	-3.2E-09	-3.1E-09	-2.1E-09	-2.5E-09	-2.5E-09
Max	-2.1E-09	-3.1E-09	-2.7E-09	-3.1E-09	-1.7E-09	-1.6E-09	-2.0E-09	-1.3E-09	-1.5E-09	-1.7E-09	-1.4E-09	-1.8E-09	-1.1E-09
Average	-2.4E-09	-3.5E-09	-3.1E-09	-3.6E-09	-2.4E-09	-1.8E-09	-2.1E-09	-2.0E-09	-2.5E-09	-2.2E-09	-1.8E-09	-2.3E-09	-2.0E-09
Sigma	295.2E-12	354.5E-12	324.7E-12	373.4E-12	922.3E-12	132.2E-12	96.3E-12	786.7E-12	723.8E-12	653.4E-12	263.2E-12	314.4E-12	603.9E-12

Drift Calculation

ICEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	-978.6E-12	-1.4E-09	-1.6E-09	341.4E-12	533.4E-12	85.4E-12	-948.6E-12	-1.1E-09	389.2E-12	328.2E-12	-352.8E-12	-80.6E-12
9	-	-1.2E-09	-202.8E-12	-1.2E-09	-894.4E-12	1.0E-09	586.4E-12	1.5E-09	1.3E-09	-289.4E-12	714.0E-12	990.6E-12	1.7E-09
10	-	-1.3E-09	-490.8E-12	-864.0E-12	532.2E-12	288.0E-12	231.8E-12	630.4E-12	-464.2E-12	554.2E-12	771.8E-12	-244.4E-12	-316.0E-12
Average	-	-1.1E-09	-682.7E-12	-1.2E-09	-6.9E-12	607.8E-12	301.2E-12	396.7E-12	-69.4E-12	218.0E-12	604.7E-12	131.1E-12	426.7E-12
Sigma	-	125.8E-12	489.4E-12	289.6E-12	632.3E-12	296.2E-12	210.3E-12	1.0E-09	1.0E-09	365.1E-12	196.9E-12	609.3E-12	889.1E-12

Measurements

ICEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-2.2E-09	-4.9E-09	-4.5E-09	-4.4E-09	-3.4E-09	-4.3E-09	-4.4E-09	-4.1E-09	-4.1E-09	-3.6E-09	-4.2E-09	-4.0E-09	-4.1E-09
OFF_PROTON samples													
5	-2.4E-09	-3.7E-09	-3.8E-09	-4.1E-09	-2.4E-09	-2.7E-09	-2.8E-09	-2.4E-09	-1.6E-09	-2.4E-09	-2.0E-09	-2.0E-09	-2.5E-09
6	-3.3E-09	-4.5E-09	-2.6E-09	-2.2E-09	-2.2E-09	-2.2E-09	-2.7E-09	-2.2E-09	-1.9E-09	-1.9E-09	-1.9E-09	-2.4E-09	-2.0E-09
7	-3.7E-09	-4.5E-09	-3.1E-09	-2.2E-09	-2.0E-09	-4.1E-09	-3.0E-09	-1.6E-09	-2.2E-09	-3.1E-09	-1.8E-09	-2.3E-09	-2.2E-09
Statistics													
Min	-3.7E-09	-4.5E-09	-3.8E-09	-4.1E-09	-2.4E-09	-4.1E-09	-3.0E-09	-2.4E-09	-2.2E-09	-3.1E-09	-2.0E-09	-2.4E-09	-2.5E-09
Max	-2.4E-09	-3.7E-09	-2.6E-09	-2.2E-09	-2.0E-09	-2.2E-09	-2.7E-09	-1.6E-09	-1.6E-09	-1.9E-09	-1.8E-09	-2.0E-09	-2.0E-09
Average	-3.1E-09	-4.2E-09	-3.2E-09	-2.8E-09	-2.2E-09	-3.0E-09	-2.8E-09	-2.1E-09	-1.9E-09	-2.5E-09	-1.9E-09	-2.2E-09	-2.3E-09
Sigma	572.6E-12	369.4E-12	492.9E-12	886.7E-12	162.2E-12	819.9E-12	97.1E-12	364.0E-12	257.9E-12	478.5E-12	80.9E-12	165.4E-12	214.7E-12

Drift Calculation

ICEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	-1.3E-09	-1.4E-09	-1.7E-09	12.2E-12	-348.6E-12	-454.6E-12	-16.6E-12	796.4E-12	-13.8E-12	397.0E-12	345.2E-12	-176.4E-12
6	-	-1.2E-09	696.2E-12	1.1E-09	1.1E-09	1.1E-09	556.6E-12	1.1E-09	1.4E-09	1.4E-09	1.4E-09	876.4E-12	1.3E-09
7	-	-728.6E-12	593.2E-12	1.6E-09	1.8E-09	-363.0E-12	765.4E-12	2.2E-09	1.5E-09	642.0E-12	2.0E-09	1.5E-09	1.5E-09
Average	-	-1.1E-09	-50.4E-12	328.3E-12	951.8E-12	144.5E-12	289.1E-12	1.1E-09	1.2E-09	662.9E-12	1.3E-09	895.1E-12	870.1E-12
Sigma	-	252.6E-12	983.9E-12	1.4E-09	724.4E-12	707.5E-12	532.8E-12	900.7E-12	322.5E-12	561.2E-12	649.7E-12	456.8E-12	746.0E-12

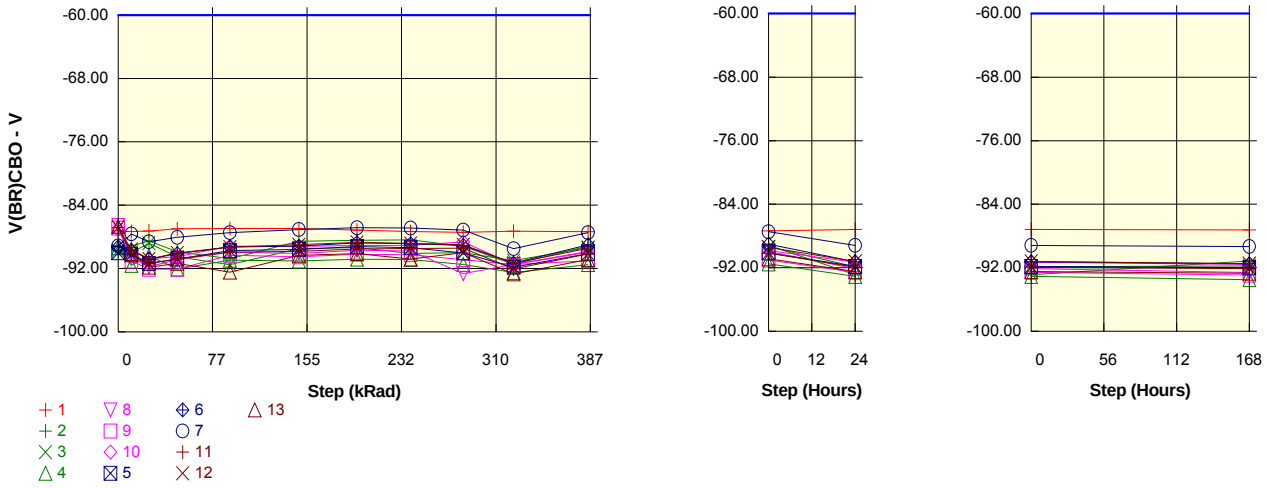
Measurements

ICEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-2.2E-09	-4.9E-09	-4.5E-09	-4.4E-09	-3.4E-09	-4.3E-09	-4.4E-09	-4.1E-09	-4.1E-09	-3.6E-09	-4.2E-09	-4.0E-09	-4.1E-09
OFF_TID samples													
11	-2.8E-09	-2.9E-09	-4.0E-09	-4.4E-09	-2.0E-09	-2.0E-09	-2.6E-09	-3.2E-09	-3.4E-09	-2.0E-09	-2.6E-09	-3.0E-09	-2.7E-09
12	-5.4E-09	-3.8E-09	-3.6E-09	-4.0E-09	-2.8E-09	-3.1E-09	-3.1E-09	-3.6E-09	-2.2E-09	-1.9E-09	-2.6E-09	-2.4E-09	-2.2E-09
13	-1.6E-09	-3.0E-09	-2.8E-09	-3.2E-09	-1.4E-09	-2.3E-09	-2.9E-09	-2.8E-09	-2.3E-09	-1.8E-09	-1.8E-09	-2.0E-09	-2.3E-09
Statistics													
Min	-5.4E-09	-3.8E-09	-4.0E-09	-4.4E-09	-2.8E-09	-3.1E-09	-3.1E-09	-3.6E-09	-3.4E-09	-2.0E-09	-2.6E-09	-3.0E-09	-2.7E-09
Max	-1.6E-09	-2.9E-09	-2.8E-09	-3.2E-09	-1.4E-09	-2.0E-09	-2.6E-09	-2.8E-09	-2.2E-09	-1.8E-09	-1.8E-09	-2.0E-09	-2.2E-09
Average	-3.3E-09	-3.2E-09	-3.5E-09	-3.9E-09	-2.1E-09	-2.5E-09	-2.9E-09	-3.2E-09	-2.6E-09	-1.9E-09	-2.4E-09	-2.4E-09	-2.4E-09
Sigma	1.6E-09	386.6E-12	467.5E-12	517.0E-12	554.5E-12	438.9E-12	178.1E-12	294.8E-12	554.8E-12	94.6E-12	388.1E-12	403.0E-12	223.4E-12

Drift Calculation

ICEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	-68.8E-12	-1.1E-09	-1.6E-09	821.0E-12	773.2E-12	177.4E-12	-387.4E-12	-592.0E-12	783.6E-12	184.8E-12	-145.4E-12	103.6E-12
12	-	1.6E-09	1.8E-09	1.4E-09	2.6E-09	2.3E-09	2.3E-09	1.8E-09	3.2E-09	3.5E-09	2.7E-09	3.0E-09	3.2E-09
13	-	-1.4E-09	-1.2E-09	-1.6E-09	188.6E-12	-677.4E-12	-1.3E-09	-1.2E-09	-713.6E-12	-193.6E-12	-202.2E-12	-369.6E-12	-714.0E-12
Average	-	37.2E-12	-194.1E-12	-584.1E-12	1.2E-09	799.1E-12	396.8E-12	73.0E-12	636.8E-12	1.4E-09	905.7E-12	823.3E-12	859.3E-12
Sigma	-	1.2E-09	1.4E-09	1.4E-09	1.0E-09	1.2E-09	1.5E-09	1.3E-09	1.8E-09	1.6E-09	1.3E-09	1.5E-09	1.7E-09

Parameter : Collector-Base breakdown voltage : V(BR)CBO
Test conditions : Ic = -10µA
Unit : V
Spec Limit Max : -60.00
Spec limits are represented in bold lines on the graphic.



Measurements

V(BR)CBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-87.24	-87.33	-87.27	-86.98	-86.95	-86.95	-87.16	-87.32	-87.42	-87.29	-87.36	-87.18	-87.24
ON_PROTON samples													
2	-89.73	-89.17	-88.52	-89.89	-90.77	-88.56	-88.42	-88.39	-89.20	-91.46	-89.18	-92.87	-91.15
3	-89.71	-90.00	-88.81	-90.54	-91.52	-89.49	-89.36	-90.10	-90.00	-91.00	-89.36	-91.85	-91.78
4	-89.37	-91.62	-90.42	-92.06	-90.95	-91.05	-90.84	-90.87	-91.49	-92.50	-91.52	-93.08	-93.50
Statistics													
Min	-89.73	-91.62	-90.42	-92.06	-91.52	-91.05	-90.84	-90.87	-91.49	-92.50	-91.52	-93.08	-93.50
Max	-89.37	-89.17	-88.52	-89.89	-90.77	-88.56	-88.42	-88.39	-89.20	-91.00	-89.18	-91.85	-91.15
Average	-89.60	-90.26	-89.25	-90.83	-91.08	-89.70	-89.54	-89.79	-90.23	-91.65	-90.02	-92.60	-92.14
Sigma	0.16	1.02	0.84	0.91	0.32	1.03	0.99	1.04	0.95	0.63	1.06	0.54	0.99

Drift Calculation

V(BR)CBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	560.0E-03	1.2E+00	-160.0E-03	-1.0E+00	1.2E+00	1.3E+00	1.3E+00	532.0E-03	-1.7E+00	552.0E-03	-3.1E+00	-1.4E+00
3	-	-292.0E-03	904.0E-03	-824.0E-03	-1.8E+00	224.0E-03	356.0E-03	-388.0E-03	-292.0E-03	-1.3E+00	352.0E-03	-2.1E+00	-2.1E+00
4	-	-2.2E+00	-1.0E+00	-2.7E+00	-1.6E+00	-1.7E+00	-1.5E+00	-1.5E+00	-2.1E+00	-3.1E+00	-2.1E+00	-3.7E+00	-4.1E+00
Average	-	-658.7E-03	356.0E-03	-1.2E+00	-1.5E+00	-97.3E-03	65.3E-03	-181.3E-03	-625.3E-03	-2.0E+00	-413.3E-03	-3.0E+00	-2.5E+00
Sigma	-	1.2E+00	1.0E+00	1.1E+00	322.0E-03	1.2E+00	1.1E+00	1.2E+00	1.1E+00	784.0E-03	1.2E+00	648.5E-03	1.2E+00

Measurements

V(BR)CBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-87.24	-87.33	-87.27	-86.98	-86.95	-86.95	-87.16	-87.32	-87.42	-87.29	-87.36	-87.18	-87.24
ON_TID samples													
8	-86.56	-90.59	-91.78	-90.90	-89.93	-90.09	-89.69	-89.79	-92.64	-91.50	-89.96	-92.11	-92.59
9	-86.90	-91.04	-92.10	-92.10	-90.32	-90.53	-90.20	-90.24	-90.90	-91.50	-91.03	-92.58	-92.93
10	-87.02	-89.77	-90.76	-90.50	-89.18	-89.22	-89.09	-89.08	-88.64	-91.50	-89.83	-91.31	-91.59
Statistics													
Min	-87.02	-91.04	-92.10	-92.10	-90.32	-90.53	-90.20	-90.24	-92.64	-91.50	-91.03	-92.58	-92.93
Max	-86.56	-89.77	-90.76	-90.50	-89.18	-89.22	-89.09	-89.08	-88.64	-91.50	-89.83	-91.31	-91.59
Average	-86.83	-90.47	-91.55	-91.17	-89.81	-89.95	-89.66	-89.71	-90.73	-91.50	-90.27	-92.00	-92.37
Sigma	0.20	0.53	0.57	0.68	0.47	0.55	0.45	0.48	1.64	0.00	0.54	0.53	0.57

Drift Calculation

V(BR)CBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	-4.0E+00	-5.2E+00	-4.3E+00	-3.4E+00	-3.5E+00	-3.1E+00	-3.2E+00	-6.1E+00	-4.9E+00	-3.4E+00	-5.6E+00	-6.0E+00
9	-	-4.1E+00	-5.2E+00	-5.2E+00	-3.4E+00	-3.6E+00	-3.3E+00	-3.3E+00	-4.0E+00	-4.6E+00	-4.1E+00	-5.7E+00	-6.0E+00
10	-	-2.7E+00	-3.7E+00	-3.5E+00	-2.2E+00	-2.2E+00	-2.1E+00	-2.1E+00	-1.6E+00	-4.5E+00	-2.8E+00	-4.3E+00	-4.6E+00
Average	-	-3.6E+00	-4.7E+00	-4.3E+00	-3.0E+00	-3.1E+00	-2.8E+00	-2.9E+00	-3.9E+00	-4.7E+00	-3.4E+00	-5.2E+00	-5.5E+00
Sigma	-	632.3E-03	689.2E-03	700.6E-03	582.1E-03	652.8E-03	543.6E-03	576.7E-03	1.8E+00	195.3E-03	536.7E-03	627.1E-03	685.4E-03

Measurements

V(BR)CBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-87.24	-87.33	-87.27	-86.98	-86.95	-86.95	-87.16	-87.32	-87.42	-87.29	-87.36	-87.18	-87.24
OFF_PROTON samples													
5	-90.02	-90.26	-91.38	-90.79	-89.74	-89.58	-89.24	-89.38	-90.05	-91.83	-90.12	-91.84	-91.99
6	-89.27	-89.68	-90.83	-90.12	-89.28	-89.17	-88.77	-88.88	-89.09	-91.31	-89.02	-91.23	-91.49
7	-89.16	-87.63	-88.63	-88.07	-87.46	-87.08	-86.86	-86.89	-87.16	-89.50	-87.46	-89.18	-89.33
Statistics													
Min	-90.02	-90.26	-91.38	-90.79	-89.74	-89.58	-89.24	-89.38	-90.05	-91.83	-90.12	-91.84	-91.99
Max	-89.16	-87.63	-88.63	-88.07	-87.46	-87.08	-86.86	-86.89	-87.16	-89.50	-87.46	-89.18	-89.33
Average	-89.48	-89.19	-90.28	-89.66	-88.83	-88.61	-88.29	-88.38	-88.77	-90.88	-88.87	-90.75	-90.94
Sigma	0.38	1.13	1.19	1.16	0.98	1.09	1.03	1.07	1.20	1.00	1.09	1.14	1.16

Drift Calculation

V(BR)CBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	-248.0E-03	-1.4E+00	-776.0E-03	280.0E-03	440.0E-03	776.0E-03	640.0E-03	-36.0E-03	-1.8E+00	-108.0E-03	-1.8E+00	-2.0E+00
6	-	-404.0E-03	-1.6E+00	-848.0E-03	-12.0E-03	104.0E-03	504.0E-03	396.0E-03	184.0E-03	-2.0E+00	256.0E-03	-2.0E+00	-2.2E+00
7	-	1.5E+00	532.0E-03	1.1E+00	1.7E+00	2.1E+00	2.3E+00	2.3E+00	2.0E+00	-340.0E-03	1.7E+00	-20.0E-03	-168.0E-03
Average	-	293.3E-03	-797.3E-03	-177.3E-03	656.0E-03	873.3E-03	1.2E+00	1.1E+00	717.3E-03	-1.4E+00	614.7E-03	-1.3E+00	-1.5E+00
Sigma	-	878.2E-03	943.4E-03	898.0E-03	747.8E-03	861.4E-03	790.4E-03	832.8E-03	914.2E-03	753.4E-03	778.9E-03	883.4E-03	914.1E-03

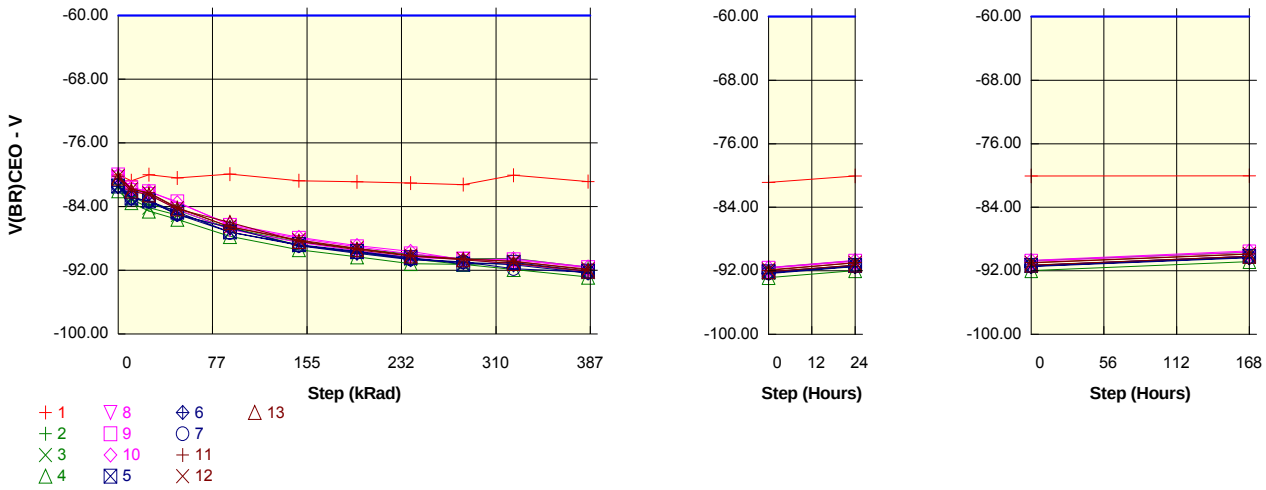
Measurements

V(BR)CBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-87.24	-87.33	-87.27	-86.98	-86.95	-86.95	-87.16	-87.32	-87.42	-87.29	-87.36	-87.18	-87.24
OFF_TID samples													
11	-86.84	-90.10	-91.35	-90.77	-89.94	-89.83	-89.53	-89.47	-89.42	-92.06	-90.15	-91.93	-92.12
12	-86.79	-89.60	-90.80	-90.04	-89.28	-88.99	-88.72	-88.82	-89.02	-91.34	-89.45	-91.22	-91.49
13	-86.68	-90.11	-91.84	-91.35	-92.46	-90.34	-90.10	-90.80	-90.00	-92.69	-90.88	-92.49	-92.69
Statistics													
Min	-86.84	-90.11	-91.84	-91.35	-92.46	-90.34	-90.10	-90.80	-90.00	-92.69	-90.88	-92.49	-92.69
Max	-86.68	-89.60	-90.80	-90.04	-89.28	-88.99	-88.72	-88.82	-89.02	-91.34	-89.45	-91.22	-91.49
Average	-86.77	-89.93	-91.33	-90.72	-90.56	-89.72	-89.45	-89.70	-89.48	-92.03	-90.16	-91.88	-92.10
Sigma	0.06	0.24	0.42	0.53	1.37	0.56	0.57	0.82	0.40	0.55	0.58	0.52	0.49

Drift Calculation

V(BR)CBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	-3.3E+00	-4.5E+00	-3.9E+00	-3.1E+00	-3.0E+00	-2.7E+00	-2.6E+00	-2.6E+00	-5.2E+00	-3.3E+00	-5.1E+00	-5.3E+00
12	-	-2.8E+00	-4.0E+00	-3.3E+00	-2.5E+00	-2.2E+00	-1.9E+00	-2.0E+00	-2.2E+00	-4.5E+00	-2.7E+00	-4.4E+00	-4.7E+00
13	-	-3.4E+00	-5.2E+00	-4.7E+00	-5.8E+00	-3.7E+00	-3.4E+00	-4.1E+00	-3.3E+00	-6.0E+00	-4.2E+00	-5.8E+00	-6.0E+00
Average	-	-3.2E+00	-4.6E+00	-4.0E+00	-3.8E+00	-2.9E+00	-2.7E+00	-2.9E+00	-2.7E+00	-5.3E+00	-3.4E+00	-5.1E+00	-5.3E+00
Sigma	-	262.8E-03	469.8E-03	576.5E-03	1.4E+00	595.4E-03	609.2E-03	875.5E-03	454.0E-03	596.7E-03	627.6E-03	563.5E-03	534.8E-03

Parameter : Collector-Emitter breakdown voltage : V(BR)CEO
Test conditions : Ic = -10mA (Pulse width 300µs. Duty cycle 1%)
Unit : V
Spec Limit Max : -60.00
Spec limits are represented in bold lines on the graphic.



Measurements

V(BR)CEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-80.01	-80.75	-80.00	-80.41	-79.94	-80.75	-80.89	-81.06	-81.23	-80.07	-80.86	-80.07	-80.04
ON_PROTON samples													
2	-81.16	-82.71	-83.76	-84.43	-86.75	-88.46	-89.28	-89.99	-90.55	-90.50	-91.61	-90.74	-89.67
3	-81.56	-83.07	-84.13	-85.06	-86.61	-88.88	-89.77	-90.57	-91.28	-91.08	-92.26	-91.36	-90.18
4	-82.02	-83.52	-84.58	-85.60	-87.76	-89.42	-90.32	-91.16	-91.26	-91.90	-92.86	-91.97	-90.84
Statistics													
Min	-82.02	-83.52	-84.58	-85.60	-87.76	-89.42	-90.32	-91.16	-91.28	-91.90	-92.86	-91.97	-90.84
Max	-81.16	-82.71	-83.76	-84.43	-86.61	-88.46	-89.28	-89.99	-90.55	-90.50	-91.61	-90.74	-89.67
Average	-81.58	-83.10	-84.16	-85.03	-87.04	-88.92	-89.79	-90.58	-91.03	-91.16	-92.24	-91.35	-90.23
Sigma	0.35	0.33	0.34	0.48	0.51	0.39	0.43	0.48	0.34	0.58	0.51	0.50	0.48

Drift Calculation

V(BR)CEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	-1.6E+00	-2.6E+00	-3.3E+00	-5.6E+00	-7.3E+00	-8.1E+00	-8.8E+00	-9.4E+00	-9.3E+00	-10.5E+00	-9.6E+00	-8.5E+00
3	-	-1.5E+00	-2.6E+00	-3.5E+00	-5.0E+00	-7.3E+00	-8.2E+00	-9.0E+00	-9.7E+00	-9.5E+00	-10.7E+00	-9.8E+00	-8.6E+00
4	-	-1.5E+00	-2.6E+00	-3.6E+00	-5.7E+00	-7.4E+00	-8.3E+00	-9.1E+00	-9.2E+00	-9.9E+00	-10.8E+00	-10.0E+00	-8.8E+00
Average	-	-1.5E+00	-2.6E+00	-3.5E+00	-5.5E+00	-7.3E+00	-8.2E+00	-9.0E+00	-9.4E+00	-9.6E+00	-10.7E+00	-9.8E+00	-8.7E+00
Sigma	-	22.9E-03	18.9E-03	129.5E-03	300.0E-03	42.5E-03	75.3E-03	127.6E-03	198.5E-03	226.7E-03	159.9E-03	152.4E-03	127.6E-03

Measurements

V(BR)CEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-80.01	-80.75	-80.00	-80.41	-79.94	-80.75	-80.89	-81.06	-81.23	-80.07	-80.86	-80.07	-80.04
ON_TID samples													
8	-80.39	-81.98	-82.47	-84.37	-86.88	-88.50	-89.54	-90.38	-90.62	-91.22	-92.17	-91.32	-90.16
9	-80.01	-81.66	-82.13	-83.40	-86.37	-88.00	-89.06	-89.93	-90.60	-90.68	-91.68	-90.81	-89.64
10	-80.01	-81.64	-82.10	-83.51	-86.20	-87.86	-88.89	-89.63	-90.67	-90.56	-91.58	-90.69	-89.49
Statistics													
Min	-80.39	-81.98	-82.47	-84.37	-86.88	-88.50	-89.54	-90.38	-90.67	-91.22	-92.17	-91.32	-90.16
Max	-80.01	-81.64	-82.10	-83.40	-86.20	-87.86	-88.89	-89.63	-90.60	-90.56	-91.58	-90.69	-89.49
Average	-80.14	-81.76	-82.23	-83.76	-86.48	-88.12	-89.17	-89.98	-90.63	-90.82	-91.81	-90.94	-89.76
Sigma	0.18	0.16	0.17	0.43	0.29	0.27	0.28	0.31	0.03	0.29	0.26	0.27	0.29

Drift Calculation

V(BR)CEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	-1.6E+00	-2.1E+00	-4.0E+00	-6.5E+00	-8.1E+00	-9.2E+00	-10.0E+00	-10.2E+00	-10.8E+00	-11.8E+00	-10.9E+00	-9.8E+00
9	-	-1.7E+00	-2.1E+00	-3.4E+00	-6.4E+00	-8.0E+00	-9.0E+00	-9.9E+00	-10.6E+00	-10.7E+00	-11.7E+00	-10.8E+00	-9.6E+00
10	-	-1.6E+00	-2.1E+00	-3.5E+00	-6.2E+00	-7.8E+00	-8.9E+00	-9.6E+00	-10.7E+00	-10.6E+00	-11.6E+00	-10.7E+00	-9.5E+00
Average	-	-1.6E+00	-2.1E+00	-3.6E+00	-6.3E+00	-8.0E+00	-9.0E+00	-9.8E+00	-10.5E+00	-10.7E+00	-11.7E+00	-10.8E+00	-9.6E+00
Sigma	-	24.7E-03	17.3E-03	256.1E-03	121.1E-03	104.7E-03	112.1E-03	161.1E-03	190.4E-03	113.2E-03	84.9E-03	101.3E-03	115.9E-03

Measurements

V(BR)CEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-80.01	-80.75	-80.00	-80.41	-79.94	-80.75	-80.89	-81.06	-81.23	-80.07	-80.86	-80.07	-80.04
OFF_PROTON samples													
5	-81.42	-82.91	-83.28	-84.69	-87.20	-88.78	-89.63	-90.41	-91.22	-91.02	-92.12	-91.30	-90.17
6	-81.48	-82.96	-83.33	-84.98	-86.66	-88.92	-89.86	-90.66	-90.98	-91.32	-92.35	-91.47	-90.36
7	-81.36	-82.90	-83.26	-84.96	-87.21	-88.88	-89.70	-90.56	-90.96	-91.80	-92.25	-91.40	-90.28
Statistics													
Min	-81.48	-82.96	-83.33	-84.98	-87.21	-88.92	-89.86	-90.66	-91.22	-91.80	-92.35	-91.47	-90.36
Max	-81.36	-82.90	-83.26	-84.69	-86.66	-88.78	-89.63	-90.41	-90.96	-91.02	-92.12	-91.30	-90.17
Average	-81.42	-82.92	-83.29	-84.88	-87.02	-88.86	-89.73	-90.55	-91.05	-91.38	-92.24	-91.39	-90.27
Sigma	0.05	0.03	0.03	0.13	0.26	0.06	0.10	0.10	0.12	0.32	0.10	0.07	0.08

Drift Calculation

V(BR)CEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	-1.5E+00	-1.9E+00	-3.3E+00	-5.8E+00	-7.4E+00	-8.2E+00	-9.0E+00	-9.8E+00	-9.6E+00	-10.7E+00	-9.9E+00	-8.8E+00
6	-	-1.5E+00	-1.9E+00	-3.5E+00	-5.2E+00	-7.4E+00	-8.4E+00	-9.2E+00	-9.5E+00	-9.8E+00	-10.9E+00	-10.0E+00	-8.9E+00
7	-	-1.5E+00	-1.9E+00	-3.6E+00	-5.9E+00	-7.5E+00	-8.3E+00	-9.2E+00	-9.6E+00	-10.4E+00	-10.9E+00	-10.0E+00	-8.9E+00
Average	-	-1.5E+00	-1.9E+00	-3.5E+00	-5.6E+00	-7.4E+00	-8.3E+00	-9.1E+00	-9.6E+00	-10.0E+00	-10.8E+00	-10.0E+00	-8.9E+00
Sigma	-	26.4E-03	23.6E-03	140.4E-03	299.7E-03	63.7E-03	74.3E-03	96.7E-03	124.1E-03	354.6E-03	88.1E-03	70.2E-03	73.5E-03

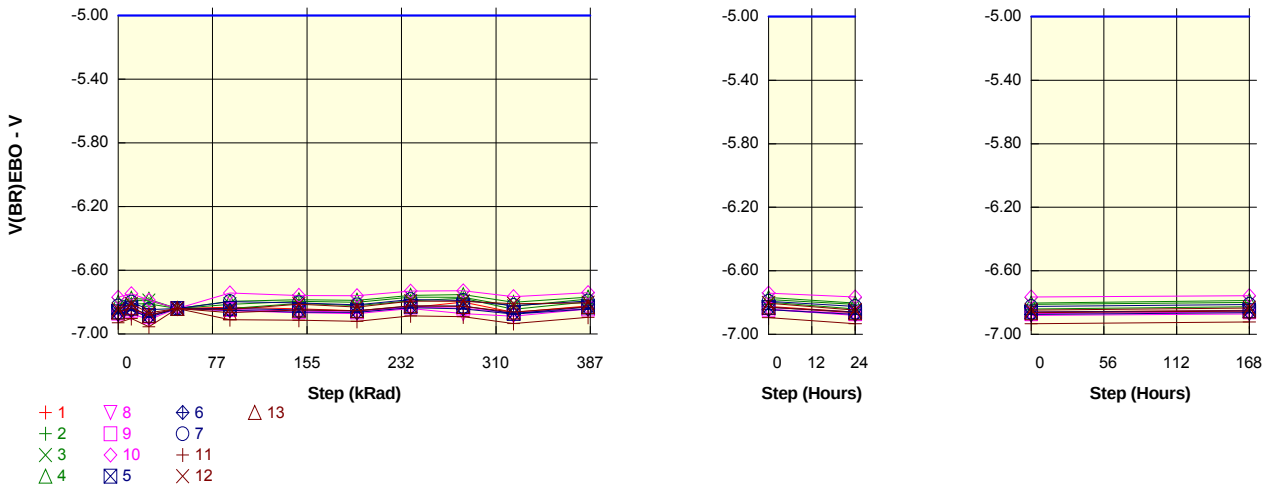
Measurements

V(BR)CEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-80.01	-80.75	-80.00	-80.41	-79.94	-80.75	-80.89	-81.06	-81.23	-80.07	-80.86	-80.07	-80.04
OFF_TID samples													
11	-80.17	-81.81	-82.26	-84.12	-86.56	-88.30	-89.29	-90.20	-90.60	-90.85	-91.95	-90.97	-89.87
12	-80.19	-81.84	-82.32	-84.20	-86.52	-88.22	-89.25	-90.15	-90.58	-90.92	-91.86	-91.02	-89.89
13	-80.44	-82.05	-82.55	-84.30	-86.00	-88.40	-89.42	-90.21	-90.68	-91.14	-92.12	-91.29	-90.17
Statistics													
Min	-80.44	-82.05	-82.55	-84.30	-86.56	-88.40	-89.42	-90.21	-90.68	-91.14	-92.12	-91.29	-90.17
Max	-80.17	-81.81	-82.26	-84.12	-86.00	-88.22	-89.25	-90.15	-90.58	-90.85	-91.86	-90.97	-89.87
Average	-80.27	-81.90	-82.38	-84.21	-86.36	-88.31	-89.32	-90.19	-90.62	-90.97	-91.98	-91.09	-89.98
Sigma	0.12	0.11	0.13	0.07	0.25	0.07	0.07	0.03	0.04	0.13	0.11	0.14	0.14

Drift Calculation

V(BR)CEO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	-1.6E+00	-2.1E+00	-4.0E+00	-6.4E+00	-8.1E+00	-9.1E+00	-10.0E+00	-10.4E+00	-10.7E+00	-11.8E+00	-10.8E+00	-9.7E+00
12	-	-1.6E+00	-2.1E+00	-4.0E+00	-6.3E+00	-8.0E+00	-9.1E+00	-10.0E+00	-10.4E+00	-10.7E+00	-11.7E+00	-10.8E+00	-9.7E+00
13	-	-1.6E+00	-2.1E+00	-3.9E+00	-5.6E+00	-8.0E+00	-9.0E+00	-9.8E+00	-10.2E+00	-10.7E+00	-11.7E+00	-10.9E+00	-9.7E+00
Average	-	-1.6E+00	-2.1E+00	-3.9E+00	-6.1E+00	-8.0E+00	-9.1E+00	-9.9E+00	-10.4E+00	-10.7E+00	-11.7E+00	-10.8E+00	-9.7E+00
Sigma	-	13.6E-03	16.8E-03	59.3E-03	371.3E-03	71.0E-03	57.2E-03	109.6E-03	80.9E-03	21.4E-03	46.5E-03	21.3E-03	17.0E-03

Parameter : Emitter-Base breakdown voltage : V(BR)EBO
Test conditions : Ie = -10µA
Unit : V
Spec Limit Max : -5.00
Spec limits are represented in bold lines on the graphic.



Measurements

V(BR)EBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-6.86	-6.85	-6.89	-6.84	-6.83	-6.84	-6.85	-6.83	-6.80	-6.86	-6.82	-6.86	-6.85
ON_PROTON samples													
2	-6.84	-6.81	-6.81	-6.84	-6.84	-6.81	-6.82	-6.79	-6.78	-6.85	-6.80	-6.84	-6.83
3	-6.81	-6.79	-6.79	-6.84	-6.81	-6.80	-6.80	-6.77	-6.77	-6.83	-6.78	-6.81	-6.80
4	-6.80	-6.78	-6.78	-6.84	-6.80	-6.79	-6.79	-6.76	-6.75	-6.80	-6.77	-6.80	-6.79
Statistics													
Min	-6.84	-6.81	-6.81	-6.84	-6.84	-6.81	-6.82	-6.79	-6.78	-6.85	-6.80	-6.84	-6.83
Max	-6.80	-6.78	-6.78	-6.84	-6.80	-6.79	-6.79	-6.76	-6.75	-6.80	-6.77	-6.80	-6.79
Average	-6.82	-6.79	-6.79	-6.84	-6.82	-6.80	-6.80	-6.77	-6.77	-6.82	-6.78	-6.82	-6.80
Sigma	0.02	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02

Drift Calculation

V(BR)EBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	28.8E-03	28.0E-03	-800.1E-06	-800.1E-06	31.2E-03	17.2E-03	47.2E-03	63.2E-03	-6.0E-03	42.0E-03	-1.2E-03	13.2E-03
3	-	23.6E-03	22.4E-03	-27.2E-03	-1.2E-03	17.2E-03	12.0E-03	43.6E-03	42.4E-03	-14.0E-03	32.4E-03	2.0E-03	13.6E-03
4	-	23.2E-03	16.8E-03	-40.4E-03	4.0E-03	14.4E-03	11.6E-03	42.4E-03	47.2E-03	-2.0E-03	31.2E-03	-3.6E-03	12.8E-03
Average	-	25.2E-03	22.4E-03	-22.8E-03	666.6E-06	20.9E-03	13.6E-03	44.4E-03	50.9E-03	-7.3E-03	35.2E-03	-933.3E-06	13.2E-03
Sigma	-	2.6E-03	4.6E-03	16.5E-03	2.4E-03	7.3E-03	2.6E-03	2.0E-03	8.9E-03	5.0E-03	4.8E-03	2.3E-03	326.5E-06

Measurements

V(BR)EBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-6.86	-6.85	-6.89	-6.84	-6.83	-6.84	-6.85	-6.83	-6.80	-6.86	-6.82	-6.86	-6.85
ON_TID samples													
8	-6.89	-6.87	-6.91	-6.84	-6.85	-6.87	-6.87	-6.84	-6.87	-6.89	-6.84	-6.88	-6.87
9	-6.87	-6.85	-6.89	-6.84	-6.85	-6.86	-6.86	-6.83	-6.84	-6.87	-6.84	-6.87	-6.86
10	-6.77	-6.75	-6.79	-6.84	-6.74	-6.76	-6.76	-6.73	-6.73	-6.77	-6.74	-6.76	-6.76
Statistics													
Min	-6.89	-6.87	-6.91	-6.84	-6.85	-6.87	-6.87	-6.84	-6.87	-6.89	-6.84	-6.88	-6.87
Max	-6.77	-6.75	-6.79	-6.84	-6.74	-6.76	-6.76	-6.73	-6.73	-6.77	-6.74	-6.76	-6.76
Average	-6.84	-6.82	-6.86	-6.84	-6.81	-6.83	-6.83	-6.80	-6.81	-6.84	-6.81	-6.84	-6.83
Sigma	0.05	0.05	0.05	0.00	0.05	0.05	0.05	0.05	0.06	0.05	0.05	0.05	0.05

Drift Calculation

V(BR)EBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	13.6E-03	-24.0E-03	45.6E-03	31.6E-03	19.2E-03	12.8E-03	46.0E-03	12.8E-03	-2.8E-03	42.4E-03	4.8E-03	14.0E-03
9	-	18.8E-03	-19.2E-03	29.2E-03	23.6E-03	12.4E-03	7.2E-03	38.4E-03	31.2E-03	2.0E-03	27.2E-03	-399.6E-06	11.2E-03
10	-	21.6E-03	-18.4E-03	-71.2E-03	26.0E-03	10.8E-03	9.2E-03	37.6E-03	40.0E-03	2.8E-03	28.4E-03	4.0E-03	12.0E-03
Average	-	18.0E-03	-20.5E-03	1.2E-03	27.1E-03	14.1E-03	9.7E-03	40.7E-03	28.0E-03	666.8E-06	32.7E-03	2.8E-03	12.4E-03
Sigma	-	3.3E-03	2.5E-03	51.6E-03	3.4E-03	3.6E-03	2.3E-03	3.8E-03	11.3E-03	2.5E-03	6.9E-03	2.3E-03	1.2E-03

Measurements

V(BR)EBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-6.86	-6.85	-6.89	-6.84	-6.83	-6.84	-6.85	-6.83	-6.80	-6.86	-6.82	-6.86	-6.85
OFF_PROTON samples													
5	-6.86	-6.84	-6.88	-6.84	-6.84	-6.85	-6.85	-6.83	-6.82	-6.87	-6.83	-6.86	-6.85
6	-6.87	-6.85	-6.90	-6.84	-6.85	-6.86	-6.86	-6.84	-6.84	-6.88	-6.84	-6.87	-6.86
7	-6.82	-6.80	-6.85	-6.84	-6.80	-6.80	-6.82	-6.78	-6.79	-6.82	-6.79	-6.82	-6.81
Statistics													
Min	-6.87	-6.85	-6.90	-6.84	-6.85	-6.86	-6.86	-6.84	-6.84	-6.88	-6.84	-6.87	-6.86
Max	-6.82	-6.80	-6.85	-6.84	-6.80	-6.80	-6.82	-6.78	-6.79	-6.82	-6.79	-6.82	-6.81
Average	-6.85	-6.83	-6.88	-6.84	-6.83	-6.84	-6.85	-6.81	-6.82	-6.86	-6.82	-6.85	-6.84
Sigma	0.02	0.02	0.02	0.00	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Drift Calculation

V(BR)EBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	23.2E-03	-22.4E-03	20.8E-03	21.6E-03	11.2E-03	6.8E-03	35.6E-03	36.8E-03	-10.0E-03	30.0E-03	1.6E-03	10.0E-03
6	-	21.6E-03	-21.6E-03	33.6E-03	22.0E-03	10.4E-03	9.2E-03	38.4E-03	31.6E-03	-2.0E-03	29.6E-03	-400.1E-06	9.2E-03
7	-	23.6E-03	-24.0E-03	-16.4E-03	26.8E-03	19.2E-03	6.4E-03	40.0E-03	34.0E-03	2.4E-03	30.8E-03	-800.1E-06	12.0E-03
Average	-	22.8E-03	-22.7E-03	12.7E-03	23.5E-03	13.6E-03	7.5E-03	38.0E-03	34.1E-03	-3.2E-03	30.1E-03	133.2E-06	10.4E-03
Sigma	-	864.0E-06	997.9E-06	21.2E-03	2.4E-03	4.0E-03	1.2E-03	1.8E-03	2.1E-03	5.1E-03	498.8E-06	1.0E-03	1.2E-03

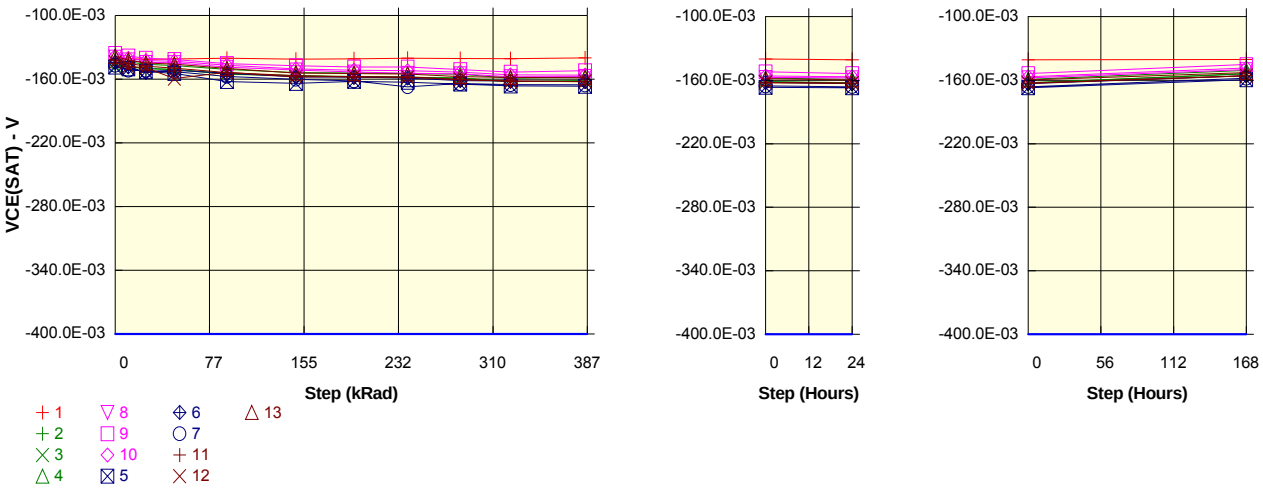
Measurements

V(BR)EBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-6.86	-6.85	-6.89	-6.84	-6.83	-6.84	-6.85	-6.83	-6.80	-6.86	-6.82	-6.86	-6.85
OFF_TID samples													
11	-6.93	-6.90	-6.96	-6.84	-6.91	-6.91	-6.92	-6.89	-6.89	-6.93	-6.89	-6.93	-6.92
12	-6.85	-6.81	-6.87	-6.84	-6.85	-6.81	-6.83	-6.79	-6.79	-6.81	-6.80	-6.85	-6.83
13	-6.86	-6.84	-6.88	-6.84	-6.87	-6.85	-6.85	-6.82	-6.83	-6.86	-6.83	-6.86	-6.85
Statistics													
Min	-6.93	-6.90	-6.96	-6.84	-6.91	-6.91	-6.92	-6.89	-6.89	-6.93	-6.89	-6.93	-6.92
Max	-6.85	-6.81	-6.87	-6.84	-6.85	-6.81	-6.83	-6.79	-6.79	-6.81	-6.80	-6.85	-6.83
Average	-6.88	-6.85	-6.90	-6.84	-6.87	-6.86	-6.87	-6.83	-6.84	-6.87	-6.84	-6.88	-6.87
Sigma	0.04	0.04	0.04	0.00	0.03	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.04

Drift Calculation

V(BR)EBO	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	26.8E-03	-26.0E-03	89.6E-03	19.6E-03	15.6E-03	8.8E-03	43.6E-03	37.2E-03	-4.4E-03	34.8E-03	-3.2E-03	8.0E-03
12	-	34.0E-03	-22.0E-03	6.0E-03	0.0E+00	33.6E-03	15.6E-03	51.6E-03	51.2E-03	36.0E-03	42.0E-03	-1.2E-03	12.0E-03
13	-	27.2E-03	-19.6E-03	23.2E-03	-3.6E-03	14.0E-03	9.2E-03	40.4E-03	36.0E-03	1.6E-03	34.8E-03	-1.2E-03	9.2E-03
Average	-	29.3E-03	-22.5E-03	39.6E-03	5.3E-03	21.1E-03	11.2E-03	45.2E-03	41.5E-03	11.1E-03	37.2E-03	-1.9E-03	9.7E-03
Sigma	-	3.3E-03	2.6E-03	36.0E-03	10.2E-03	8.9E-03	3.1E-03	4.7E-03	6.9E-03	17.8E-03	3.4E-03	943.0E-06	1.7E-03

Parameter : Collector-Emitter saturation voltage : VCE(SAT)
Test conditions : Ic = -150mA ; Ib = -15mA (Pulse width 300µs. Duty cycle 1%)
Unit : V
Spec Limit Min : -400.0E-03
Spec limits are represented in bold lines on the graphic.



Measurements

VCE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-141.1E-03	-140.4E-03	-141.4E-03	-141.0E-03	-140.4E-03	-141.2E-03	-140.8E-03	-140.3E-03	-140.5E-03	-140.7E-03	-140.0E-03	-140.8E-03	-140.6E-03
ON_PROTON samples													
2	-146.9E-03	-148.3E-03	-150.2E-03	-151.0E-03	-155.4E-03	-156.9E-03	-157.8E-03	-158.3E-03	-158.8E-03	-162.2E-03	-161.7E-03	-162.8E-03	-153.8E-03
3	-147.5E-03	-148.1E-03	-149.6E-03	-151.0E-03	-154.6E-03	-156.8E-03	-157.4E-03	-158.0E-03	-159.3E-03	-162.3E-03	-161.2E-03	-162.3E-03	-154.0E-03
4	-142.8E-03	-143.8E-03	-146.0E-03	-147.2E-03	-150.8E-03	-153.7E-03	-154.2E-03	-154.8E-03	-155.2E-03	-159.2E-03	-157.9E-03	-159.2E-03	-150.8E-03
Statistics													
Min	-147.5E-03	-148.3E-03	-150.2E-03	-151.0E-03	-155.4E-03	-156.9E-03	-157.8E-03	-158.3E-03	-159.3E-03	-162.3E-03	-161.7E-03	-162.8E-03	-154.0E-03
Max	-142.8E-03	-143.8E-03	-146.0E-03	-147.2E-03	-150.8E-03	-153.7E-03	-154.2E-03	-154.8E-03	-155.2E-03	-159.2E-03	-157.9E-03	-159.2E-03	-150.8E-03
Average	-145.7E-03	-146.7E-03	-148.6E-03	-149.7E-03	-153.6E-03	-155.8E-03	-156.5E-03	-157.1E-03	-157.8E-03	-161.2E-03	-160.3E-03	-161.4E-03	-152.9E-03
Sigma	2.1E-03	2.1E-03	1.8E-03	1.8E-03	2.0E-03	1.5E-03	1.6E-03	1.6E-03	1.8E-03	1.5E-03	1.7E-03	1.6E-03	1.5E-03

Drift Calculation

VCE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	-1.4E-03	-3.2E-03	-4.1E-03	-8.5E-03	-10.0E-03	-10.9E-03	-11.4E-03	-11.9E-03	-15.3E-03	-14.8E-03	-15.8E-03	-6.9E-03
3	-	-600.0E-06	-2.1E-03	-3.6E-03	-7.2E-03	-9.3E-03	-10.0E-03	-10.6E-03	-11.8E-03	-14.8E-03	-13.7E-03	-14.8E-03	-6.6E-03
4	-	-1.0E-03	-3.2E-03	-4.4E-03	-8.0E-03	-11.0E-03	-11.4E-03	-12.0E-03	-12.5E-03	-16.4E-03	-15.2E-03	-16.5E-03	-8.0E-03
Average	-	-1.0E-03	-2.9E-03	-4.0E-03	-7.9E-03	-10.1E-03	-10.8E-03	-11.3E-03	-12.1E-03	-15.5E-03	-14.5E-03	-15.7E-03	-7.1E-03
Sigma	-	326.6E-06	546.8E-06	349.2E-06	548.8E-06	690.0E-06	598.7E-06	606.0E-06	296.3E-06	652.4E-06	606.9E-06	674.9E-06	617.4E-06

Measurements

VCE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-141.1E-03	-140.4E-03	-141.4E-03	-141.0E-03	-140.4E-03	-141.2E-03	-140.8E-03	-140.3E-03	-140.5E-03	-140.7E-03	-140.0E-03	-140.8E-03	-140.6E-03
ON_TID samples													
8	-139.3E-03	-141.8E-03	-144.2E-03	-144.5E-03	-148.8E-03	-151.4E-03	-153.2E-03	-154.5E-03	-155.0E-03	-157.8E-03	-157.5E-03	-157.8E-03	-150.0E-03
9	-135.9E-03	-138.2E-03	-140.4E-03	-141.5E-03	-145.4E-03	-147.4E-03	-148.6E-03	-148.7E-03	-151.0E-03	-153.4E-03	-152.1E-03	-153.8E-03	-145.3E-03
10	-138.2E-03	-140.5E-03	-142.6E-03	-143.0E-03	-146.9E-03	-150.3E-03	-151.5E-03	-152.0E-03	-153.4E-03	-156.0E-03	-156.1E-03	-156.8E-03	-148.4E-03
Statistics													
Min	-139.3E-03	-141.8E-03	-144.2E-03	-144.5E-03	-148.8E-03	-151.4E-03	-153.2E-03	-154.5E-03	-155.0E-03	-157.8E-03	-157.5E-03	-157.8E-03	-150.0E-03
Max	-135.9E-03	-138.2E-03	-140.4E-03	-141.5E-03	-145.4E-03	-147.4E-03	-148.6E-03	-148.7E-03	-151.0E-03	-153.4E-03	-152.1E-03	-153.8E-03	-145.3E-03
Average	-137.8E-03	-140.2E-03	-142.4E-03	-143.0E-03	-147.0E-03	-149.7E-03	-151.1E-03	-151.7E-03	-153.1E-03	-155.7E-03	-155.2E-03	-156.1E-03	-147.9E-03
Sigma	1.4E-03	1.5E-03	1.6E-03	1.2E-03	1.4E-03	1.7E-03	1.9E-03	2.4E-03	1.6E-03	1.8E-03	2.3E-03	1.7E-03	2.0E-03

Drift Calculation

VCE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	-2.6E-03	-5.0E-03	-5.2E-03	-9.5E-03	-12.2E-03	-13.9E-03	-15.2E-03	-15.7E-03	-18.5E-03	-18.2E-03	-18.6E-03	-10.7E-03
9	-	-2.3E-03	-4.4E-03	-5.6E-03	-9.5E-03	-11.5E-03	-12.6E-03	-12.8E-03	-15.0E-03	-17.5E-03	-16.2E-03	-17.8E-03	-9.4E-03
10	-	-2.2E-03	-4.3E-03	-4.8E-03	-8.6E-03	-12.1E-03	-13.2E-03	-13.8E-03	-15.2E-03	-17.7E-03	-17.9E-03	-18.6E-03	-10.2E-03
Average	-	-2.4E-03	-4.6E-03	-5.2E-03	-9.2E-03	-11.9E-03	-13.3E-03	-13.9E-03	-15.3E-03	-17.9E-03	-17.4E-03	-18.3E-03	-10.1E-03
Sigma	-	136.0E-06	277.8E-06	310.4E-06	396.0E-06	303.5E-06	522.9E-06	1.0E-03	277.8E-06	444.6E-06	877.2E-06	349.2E-06	558.1E-06

Measurements

VCE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-141.1E-03	-140.4E-03	-141.4E-03	-141.0E-03	-140.4E-03	-141.2E-03	-140.8E-03	-140.3E-03	-140.5E-03	-140.7E-03	-140.0E-03	-140.8E-03	-140.6E-03
OFF_PROTON samples													
5	-148.6E-03	-150.2E-03	-152.8E-03	-154.6E-03	-162.2E-03	-163.9E-03	-162.0E-03	-162.9E-03	-164.6E-03	-166.3E-03	-166.7E-03	-167.1E-03	-159.6E-03
6	-144.4E-03	-148.4E-03	-153.6E-03	-151.5E-03	-154.5E-03	-158.0E-03	-158.2E-03	-158.9E-03	-161.3E-03	-162.0E-03	-162.2E-03	-163.3E-03	-155.9E-03
7	-147.1E-03	-151.7E-03	-151.9E-03	-152.8E-03	-157.3E-03	-160.2E-03	-161.8E-03	-167.3E-03	-164.2E-03	-165.2E-03	-165.4E-03	-166.2E-03	-158.2E-03
Statistics													
Min	-148.6E-03	-151.7E-03	-153.6E-03	-154.6E-03	-162.2E-03	-163.9E-03	-162.0E-03	-167.3E-03	-164.6E-03	-166.3E-03	-166.7E-03	-167.1E-03	-159.6E-03
Max	-144.4E-03	-148.4E-03	-151.9E-03	-151.5E-03	-154.5E-03	-158.0E-03	-158.2E-03	-158.9E-03	-161.3E-03	-162.0E-03	-162.2E-03	-163.3E-03	-155.9E-03
Average	-146.7E-03	-150.1E-03	-152.8E-03	-153.0E-03	-158.0E-03	-160.7E-03	-160.6E-03	-163.0E-03	-163.4E-03	-164.5E-03	-164.8E-03	-165.5E-03	-157.9E-03
Sigma	1.7E-03	1.3E-03	702.2E-06	1.3E-03	3.2E-03	2.5E-03	1.8E-03	3.4E-03	1.5E-03	1.8E-03	1.9E-03	1.6E-03	1.5E-03

Drift Calculation

VCE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	-1.7E-03	-4.2E-03	-6.0E-03	-13.6E-03	-15.4E-03	-13.4E-03	-14.3E-03	-16.1E-03	-17.8E-03	-18.2E-03	-18.5E-03	-11.0E-03
6	-	-4.1E-03	-9.3E-03	-7.2E-03	-10.1E-03	-13.6E-03	-13.8E-03	-14.5E-03	-17.0E-03	-17.6E-03	-17.8E-03	-19.0E-03	-11.6E-03
7	-	-4.6E-03	-4.8E-03	-5.7E-03	-10.2E-03	-13.0E-03	-14.6E-03	-20.2E-03	-17.1E-03	-18.0E-03	-18.3E-03	-19.1E-03	-11.1E-03
Average	-	-3.4E-03	-6.1E-03	-6.3E-03	-11.3E-03	-14.0E-03	-14.0E-03	-16.3E-03	-16.7E-03	-17.8E-03	-18.1E-03	-18.9E-03	-11.2E-03
Sigma	-	1.3E-03	2.3E-03	617.4E-06	1.6E-03	988.5E-06	502.8E-06	2.7E-03	445.8E-06	181.8E-06	204.0E-06	240.7E-06	247.3E-06

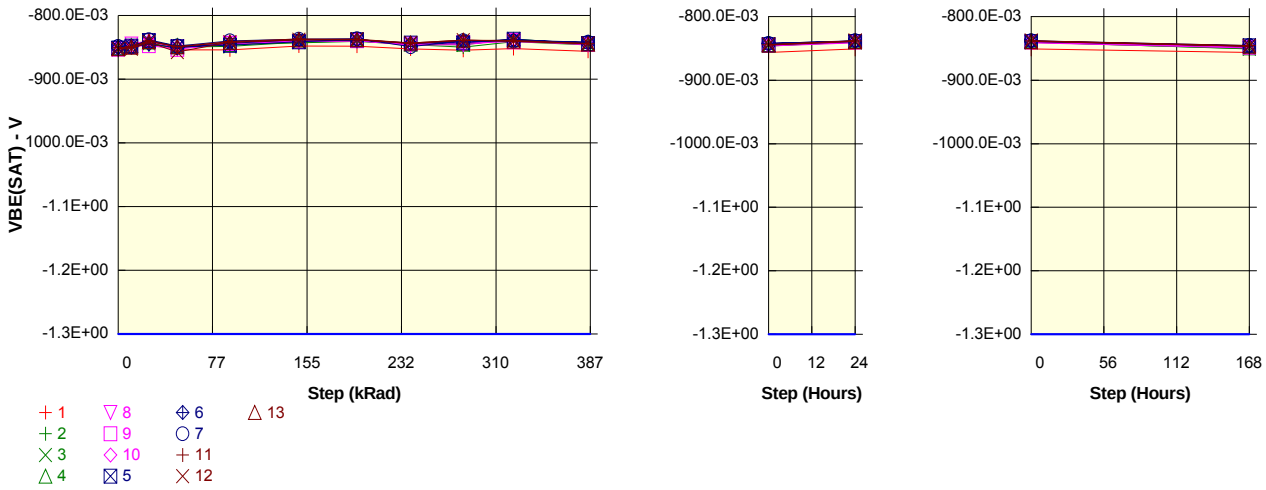
Measurements

VCE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-141.1E-03	-140.4E-03	-141.4E-03	-141.0E-03	-140.4E-03	-141.2E-03	-140.8E-03	-140.3E-03	-140.5E-03	-140.7E-03	-140.0E-03	-140.8E-03	-140.6E-03
OFF_TID samples													
11	-142.2E-03	-145.2E-03	-147.7E-03	-149.6E-03	-153.8E-03	-156.6E-03	-157.8E-03	-157.9E-03	-160.4E-03	-162.0E-03	-162.4E-03	-162.8E-03	-155.7E-03
12	-144.1E-03	-148.0E-03	-149.2E-03	-159.4E-03	-153.6E-03	-158.0E-03	-157.5E-03	-158.2E-03	-160.4E-03	-161.9E-03	-162.2E-03	-162.9E-03	-155.9E-03
13	-138.6E-03	-142.0E-03	-144.8E-03	-145.8E-03	-150.0E-03	-154.2E-03	-154.9E-03	-155.1E-03	-157.6E-03	-158.4E-03	-158.7E-03	-159.9E-03	-152.8E-03
Statistics													
Min	-144.1E-03	-148.0E-03	-149.2E-03	-159.4E-03	-153.8E-03	-158.0E-03	-157.8E-03	-158.2E-03	-160.4E-03	-162.0E-03	-162.4E-03	-162.9E-03	-155.9E-03
Max	-138.6E-03	-142.0E-03	-144.8E-03	-145.8E-03	-150.0E-03	-154.2E-03	-154.9E-03	-155.1E-03	-157.6E-03	-158.4E-03	-158.7E-03	-159.9E-03	-152.8E-03
Average	-141.7E-03	-145.1E-03	-147.2E-03	-151.6E-03	-152.5E-03	-156.3E-03	-156.7E-03	-157.1E-03	-159.5E-03	-160.8E-03	-161.1E-03	-161.9E-03	-154.8E-03
Sigma	2.3E-03	2.5E-03	1.9E-03	5.7E-03	1.7E-03	1.5E-03	1.3E-03	1.4E-03	1.3E-03	1.7E-03	1.7E-03	1.4E-03	1.4E-03

Drift Calculation

VCE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	-3.0E-03	-5.5E-03	-7.4E-03	-11.6E-03	-14.4E-03	-15.6E-03	-15.7E-03	-18.2E-03	-19.8E-03	-20.2E-03	-20.6E-03	-13.5E-03
12	-	-3.9E-03	-5.1E-03	-15.3E-03	-9.5E-03	-13.8E-03	-13.4E-03	-14.1E-03	-16.2E-03	-17.8E-03	-18.0E-03	-18.8E-03	-11.8E-03
13	-	-3.3E-03	-6.1E-03	-7.1E-03	-11.4E-03	-15.6E-03	-16.2E-03	-16.5E-03	-18.9E-03	-19.8E-03	-20.0E-03	-21.2E-03	-14.1E-03
Average	-	-3.4E-03	-5.6E-03	-9.9E-03	-10.8E-03	-14.6E-03	-15.1E-03	-15.4E-03	-17.8E-03	-19.1E-03	-19.4E-03	-20.2E-03	-13.1E-03
Sigma	-	381.3E-06	411.0E-06	3.8E-03	936.9E-06	730.5E-06	1.2E-03	997.8E-06	1.1E-03	924.0E-06	982.7E-06	1.0E-03	983.2E-06

Parameter : Base-Emitter saturation voltage : VBE(SAT)
Test conditions : Ic = -150mA ; Ib = -15mA (Pulse width 300µs. Duty cycle 1%)
Unit : V
Spec Limit Min : -1.30
Spec limits are represented in bold lines on the graphic.



Measurements

VBE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-854.6E-03	-847.2E-03	-841.5E-03	-854.0E-03	-853.9E-03	-847.8E-03	-848.2E-03	-852.6E-03	-854.6E-03	-851.8E-03	-856.4E-03	-850.8E-03	-856.3E-03
ON_PROTON samples													
2	-853.8E-03	-847.9E-03	-846.3E-03	-849.4E-03	-845.4E-03	-842.9E-03	-840.7E-03	-845.5E-03	-849.7E-03	-841.4E-03	-846.2E-03	-839.8E-03	-850.7E-03
3	-852.9E-03	-847.5E-03	-844.0E-03	-849.6E-03	-848.5E-03	-841.8E-03	-839.8E-03	-845.2E-03	-846.2E-03	-836.9E-03	-845.8E-03	-840.4E-03	-850.2E-03
4	-850.8E-03	-847.1E-03	-841.5E-03	-847.2E-03	-845.5E-03	-840.4E-03	-839.3E-03	-845.0E-03	-845.1E-03	-838.2E-03	-845.0E-03	-838.2E-03	-849.2E-03
Statistics													
Min	-853.8E-03	-847.9E-03	-846.3E-03	-849.6E-03	-848.5E-03	-842.9E-03	-840.7E-03	-845.5E-03	-849.7E-03	-841.4E-03	-846.2E-03	-840.4E-03	-850.7E-03
Max	-850.8E-03	-847.1E-03	-841.5E-03	-847.2E-03	-845.4E-03	-840.4E-03	-839.3E-03	-845.0E-03	-845.1E-03	-836.9E-03	-845.0E-03	-838.2E-03	-849.2E-03
Average	-852.5E-03	-847.5E-03	-843.9E-03	-848.7E-03	-846.5E-03	-841.7E-03	-839.9E-03	-845.2E-03	-847.0E-03	-838.8E-03	-845.7E-03	-839.4E-03	-850.0E-03
Sigma	1.3E-03	327.1E-06	2.0E-03	1.1E-03	1.5E-03	1.0E-03	577.8E-06	231.7E-06	2.0E-03	1.9E-03	481.1E-06	942.1E-06	648.5E-06

Drift Calculation

VBE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	5.9E-03	7.5E-03	4.4E-03	8.4E-03	10.9E-03	13.1E-03	8.3E-03	4.1E-03	12.4E-03	7.6E-03	14.0E-03	3.1E-03
3	-	5.4E-03	9.0E-03	3.3E-03	4.4E-03	11.1E-03	13.1E-03	7.8E-03	6.7E-03	16.0E-03	7.1E-03	12.5E-03	2.7E-03
4	-	3.7E-03	9.3E-03	3.5E-03	5.2E-03	10.4E-03	11.5E-03	5.8E-03	5.7E-03	12.6E-03	5.7E-03	12.6E-03	1.6E-03
Average	-	5.0E-03	8.6E-03	3.8E-03	6.0E-03	10.8E-03	12.6E-03	7.3E-03	5.5E-03	13.7E-03	6.8E-03	13.1E-03	2.5E-03
Sigma	-	957.2E-06	765.5E-06	487.7E-06	1.7E-03	317.2E-06	773.1E-06	1.1E-03	1.1E-03	1.7E-03	797.6E-06	698.4E-06	630.2E-06

Measurements

VBE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-854.6E-03	-847.2E-03	-841.5E-03	-854.0E-03	-853.9E-03	-847.8E-03	-848.2E-03	-852.6E-03	-854.6E-03	-851.8E-03	-856.4E-03	-850.8E-03	-856.3E-03
ON_TID samples													
8	-852.0E-03	-844.7E-03	-839.6E-03	-849.4E-03	-843.8E-03	-840.6E-03	-839.6E-03	-846.6E-03	-845.6E-03	-839.2E-03	-846.1E-03	-841.2E-03	-849.4E-03
9	-852.7E-03	-848.9E-03	-847.2E-03	-853.1E-03	-844.2E-03	-840.8E-03	-839.6E-03	-844.4E-03	-842.6E-03	-841.3E-03	-844.9E-03	-839.7E-03	-848.2E-03
10	-851.6E-03	-848.3E-03	-840.7E-03	-850.7E-03	-843.3E-03	-840.1E-03	-839.9E-03	-845.6E-03	-843.3E-03	-840.0E-03	-844.2E-03	-840.5E-03	-847.7E-03
Statistics													
Min	-852.7E-03	-848.9E-03	-847.2E-03	-853.1E-03	-844.2E-03	-840.8E-03	-839.9E-03	-846.6E-03	-845.6E-03	-841.3E-03	-846.1E-03	-841.2E-03	-849.4E-03
Max	-851.6E-03	-844.7E-03	-839.6E-03	-849.4E-03	-843.3E-03	-840.1E-03	-839.6E-03	-844.4E-03	-842.6E-03	-839.2E-03	-844.2E-03	-839.7E-03	-847.7E-03
Average	-852.1E-03	-847.3E-03	-842.5E-03	-851.1E-03	-843.7E-03	-840.5E-03	-839.7E-03	-845.6E-03	-843.8E-03	-840.2E-03	-845.1E-03	-840.5E-03	-848.4E-03
Sigma	445.8E-06	1.9E-03	3.4E-03	1.6E-03	359.8E-06	296.3E-06	142.3E-06	898.6E-06	1.3E-03	859.3E-06	806.9E-06	604.9E-06	742.8E-06

Drift Calculation

VBE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	7.3E-03	12.4E-03	2.7E-03	8.3E-03	11.4E-03	12.4E-03	5.4E-03	6.4E-03	12.8E-03	5.9E-03	10.8E-03	2.6E-03
9	-	3.8E-03	5.5E-03	-400.0E-06	8.6E-03	12.0E-03	13.1E-03	8.3E-03	10.1E-03	11.4E-03	7.8E-03	13.0E-03	4.6E-03
10	-	3.3E-03	10.9E-03	920.0E-06	8.4E-03	11.6E-03	11.7E-03	6.0E-03	8.4E-03	11.6E-03	7.5E-03	11.1E-03	4.0E-03
Average	-	4.8E-03	9.6E-03	1.1E-03	8.4E-03	11.6E-03	12.4E-03	6.6E-03	8.3E-03	11.9E-03	7.1E-03	11.7E-03	3.7E-03
Sigma	-	1.8E-03	3.0E-03	1.3E-03	117.8E-06	235.5E-06	571.6E-06	1.2E-03	1.5E-03	611.3E-06	821.3E-06	959.1E-06	820.0E-06

Measurements

VBE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-854.6E-03	-847.2E-03	-841.5E-03	-854.0E-03	-853.9E-03	-847.8E-03	-848.2E-03	-852.6E-03	-854.6E-03	-851.8E-03	-856.4E-03	-850.8E-03	-856.3E-03
OFF_PROTON samples													
5	-851.2E-03	-848.2E-03	-839.7E-03	-849.2E-03	-846.8E-03	-841.2E-03	-838.2E-03	-843.2E-03	-843.0E-03	-837.2E-03	-844.2E-03	-839.2E-03	-846.0E-03
6	-850.0E-03	-849.8E-03	-844.8E-03	-850.7E-03	-843.6E-03	-838.1E-03	-838.6E-03	-843.8E-03	-839.9E-03	-838.8E-03	-841.9E-03	-838.6E-03	-846.4E-03
7	-848.6E-03	-849.2E-03	-838.2E-03	-848.1E-03	-840.0E-03	-837.4E-03	-836.6E-03	-849.0E-03	-839.7E-03	-840.4E-03	-842.3E-03	-837.8E-03	-845.6E-03
Statistics													
Min	-851.2E-03	-849.8E-03	-844.8E-03	-850.7E-03	-846.8E-03	-841.2E-03	-838.6E-03	-849.0E-03	-843.0E-03	-840.4E-03	-844.2E-03	-839.2E-03	-846.4E-03
Max	-848.6E-03	-848.2E-03	-838.2E-03	-848.1E-03	-840.0E-03	-837.4E-03	-836.6E-03	-843.2E-03	-839.7E-03	-837.2E-03	-841.9E-03	-837.8E-03	-845.6E-03
Average	-849.9E-03	-849.1E-03	-840.9E-03	-849.3E-03	-843.5E-03	-838.9E-03	-837.8E-03	-845.3E-03	-840.9E-03	-838.8E-03	-842.8E-03	-838.5E-03	-846.0E-03
Sigma	1.0E-03	630.8E-06	2.8E-03	1.1E-03	2.8E-03	1.7E-03	895.0E-06	2.6E-03	1.5E-03	1.3E-03	1.0E-03	590.6E-06	327.1E-06

Drift Calculation

VBE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	2.9E-03	11.5E-03	2.0E-03	4.3E-03	9.9E-03	13.0E-03	7.9E-03	8.2E-03	13.9E-03	7.0E-03	12.0E-03	5.2E-03
6	-	200.0E-06	5.2E-03	-760.0E-06	6.4E-03	11.9E-03	11.3E-03	6.2E-03	10.1E-03	11.1E-03	8.1E-03	11.4E-03	3.6E-03
7	-	-600.0E-06	10.5E-03	560.0E-06	8.6E-03	11.2E-03	12.1E-03	-399.9E-06	8.9E-03	8.2E-03	6.4E-03	10.9E-03	3.0E-03
Average	-	840.0E-06	9.0E-03	600.0E-06	6.4E-03	11.0E-03	12.1E-03	4.6E-03	9.1E-03	11.1E-03	7.1E-03	11.4E-03	3.9E-03
Sigma	-	1.5E-03	2.8E-03	1.1E-03	1.8E-03	812.6E-06	670.1E-06	3.6E-03	789.5E-06	2.3E-03	712.8E-06	441.8E-06	920.5E-06

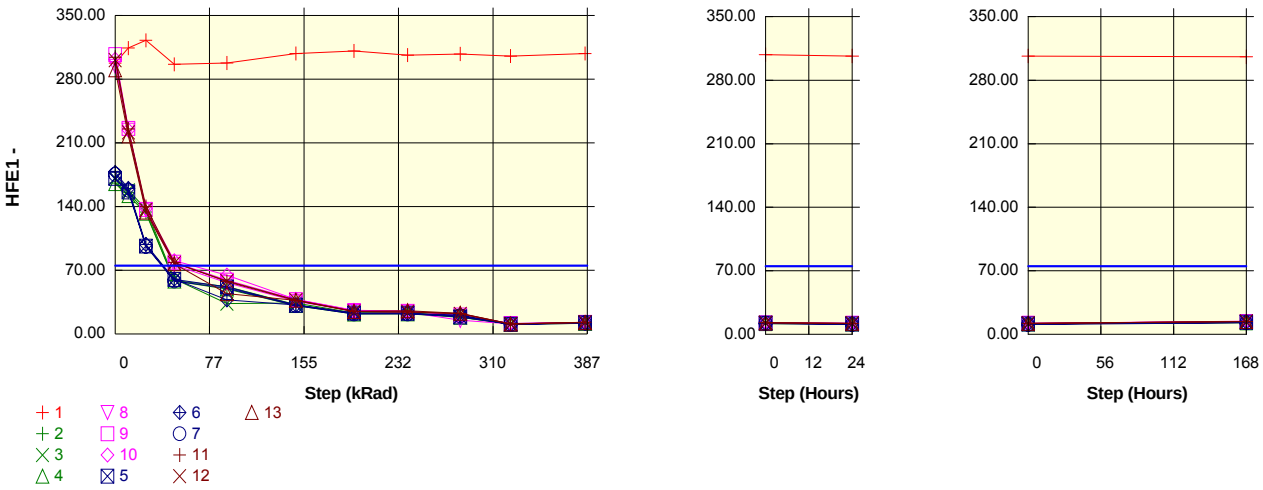
Measurements

VBE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	-854.6E-03	-847.2E-03	-841.5E-03	-854.0E-03	-853.9E-03	-847.8E-03	-848.2E-03	-852.6E-03	-854.6E-03	-851.8E-03	-856.4E-03	-850.8E-03	-856.3E-03
OFF_TID samples													
11	-851.0E-03	-848.9E-03	-839.7E-03	-849.4E-03	-841.0E-03	-837.2E-03	-837.5E-03	-844.3E-03	-839.1E-03	-839.3E-03	-844.1E-03	-838.2E-03	-845.6E-03
12	-852.7E-03	-852.3E-03	-842.1E-03	-857.5E-03	-842.0E-03	-838.1E-03	-837.4E-03	-843.5E-03	-838.8E-03	-840.1E-03	-843.9E-03	-837.9E-03	-846.5E-03
13	-852.1E-03	-849.8E-03	-841.1E-03	-849.1E-03	-842.2E-03	-838.3E-03	-838.2E-03	-843.4E-03	-838.8E-03	-840.4E-03	-844.8E-03	-839.2E-03	-846.8E-03
Statistics													
Min	-852.7E-03	-852.3E-03	-842.1E-03	-857.5E-03	-842.2E-03	-838.3E-03	-838.2E-03	-844.3E-03	-839.1E-03	-840.4E-03	-844.8E-03	-839.2E-03	-846.8E-03
Max	-851.0E-03	-848.9E-03	-839.7E-03	-849.1E-03	-841.0E-03	-837.2E-03	-837.4E-03	-843.4E-03	-838.8E-03	-839.3E-03	-843.9E-03	-837.9E-03	-845.6E-03
Average	-851.9E-03	-850.3E-03	-841.0E-03	-852.0E-03	-841.7E-03	-837.9E-03	-837.7E-03	-843.7E-03	-838.9E-03	-839.9E-03	-844.2E-03	-838.4E-03	-846.3E-03
Sigma	698.4E-06	1.4E-03	999.7E-06	3.9E-03	512.6E-06	500.0E-06	352.2E-06	416.1E-06	150.8E-06	444.6E-06	376.7E-06	525.6E-06	512.6E-06

Drift Calculation

VBE(SAT)	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	2.1E-03	11.3E-03	1.6E-03	10.0E-03	13.8E-03	13.5E-03	6.7E-03	11.9E-03	11.7E-03	6.9E-03	12.8E-03	5.4E-03
12	-	400.0E-06	10.6E-03	-4.8E-03	10.7E-03	14.6E-03	15.3E-03	9.2E-03	13.9E-03	12.6E-03	8.8E-03	14.8E-03	6.2E-03
13	-	2.3E-03	11.0E-03	3.0E-03	9.9E-03	13.8E-03	14.0E-03	8.7E-03	13.3E-03	11.8E-03	7.4E-03	13.0E-03	5.4E-03
Average	-	1.6E-03	11.0E-03	-53.3E-06	10.2E-03	14.1E-03	14.3E-03	8.2E-03	13.0E-03	12.0E-03	7.7E-03	13.5E-03	5.7E-03
Sigma	-	861.8E-06	313.8E-06	3.4E-03	378.5E-06	368.1E-06	766.2E-06	1.1E-03	842.4E-06	397.3E-06	802.9E-06	899.4E-06	378.5E-06

Parameter : DC current gain : HFE1
Test conditions : Ic = -100µA ; Vce = -10V (Pulse width 300µs. Duty cycle 1%)
Unit :
Spec Limit Min : 75.00
Spec limits are represented in bold lines on the graphic.



Measurements

HFE1	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	297.47	314.13	322.64	296.34	297.82	308.11	311.03	306.41	307.68	305.35	308.24	306.64	305.71
ON_PROTON samples													
2	165.86	155.64	133.97	58.84	52.21	32.14	22.80	23.63	18.65	10.80	12.28	11.66	13.12
3	171.31	157.92	137.27	60.50	33.46	33.93	23.13	23.26	19.00	11.40	12.28	11.60	13.39
4	165.26	152.04	132.80	58.10	49.54	31.15	21.97	22.14	18.39	10.61	11.73	11.43	12.74
Statistics													
Min	165.26	152.04	132.80	58.10	33.46	31.15	21.97	22.14	18.39	10.61	11.73	11.43	12.74
Max	171.31	157.92	137.27	60.50	52.21	33.93	23.13	23.63	19.00	11.40	12.28	11.66	13.39
Average	167.48	155.20	134.68	59.15	45.07	32.41	22.63	23.01	18.68	10.94	12.10	11.56	13.08
Sigma	2.72	2.42	1.89	1.00	8.28	1.15	0.49	0.63	0.25	0.34	0.26	0.10	0.26

Drift Calculation

HFE1	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	395.9E-06	1.4E-03	11.0E-03	13.1E-03	25.1E-03	37.8E-03	36.3E-03	47.6E-03	86.6E-03	75.4E-03	79.7E-03	70.2E-03
3	-	494.7E-06	1.4E-03	10.7E-03	24.0E-03	23.6E-03	37.4E-03	37.1E-03	46.8E-03	81.9E-03	75.6E-03	80.4E-03	68.9E-03
4	-	526.2E-06	1.5E-03	11.2E-03	14.1E-03	26.1E-03	39.5E-03	39.1E-03	48.3E-03	88.2E-03	79.2E-03	81.4E-03	72.4E-03
Average	-	472.3E-06	1.5E-03	10.9E-03	17.1E-03	24.9E-03	38.2E-03	37.5E-03	47.6E-03	85.5E-03	76.7E-03	80.5E-03	70.5E-03
Sigma	-	55.5E-06	18.6E-06	192.0E-06	4.9E-03	995.3E-06	894.7E-06	1.2E-03	621.3E-06	2.7E-03	1.8E-03	702.4E-06	1.5E-03

Measurements

HFE1	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	297.47	314.13	322.64	296.34	297.82	308.11	311.03	306.41	307.68	305.35	308.24	306.64	305.71
ON_TID samples													
8	294.09	223.82	136.19	75.82	56.28	36.06	24.72	24.00	15.00	11.13	12.22	11.83	13.55
9	307.06	225.97	137.01	78.83	59.14	37.91	25.69	24.97	20.99	11.47	12.70	12.29	14.20
10	301.99	224.08	137.88	80.39	64.58	37.98	25.91	25.12	20.30	11.45	12.84	12.19	14.45
Statistics													
Min	294.09	223.82	136.19	75.82	56.28	36.06	24.72	24.00	15.00	11.13	12.22	11.83	13.55
Max	307.06	225.97	137.88	80.39	64.58	37.98	25.91	25.12	20.99	11.47	12.84	12.29	14.45
Average	301.05	224.62	137.03	78.35	60.00	37.32	25.44	24.70	18.76	11.35	12.59	12.10	14.07
Sigma	5.33	0.96	0.69	1.89	3.45	0.89	0.52	0.50	2.68	0.15	0.27	0.20	0.38

Drift Calculation

HFE1	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	1.1E-03	3.9E-03	9.8E-03	14.4E-03	24.3E-03	37.0E-03	38.3E-03	63.3E-03	86.4E-03	78.4E-03	81.1E-03	70.4E-03
9	-	1.2E-03	4.0E-03	9.4E-03	13.7E-03	23.1E-03	35.7E-03	36.8E-03	44.4E-03	83.9E-03	75.5E-03	78.1E-03	67.1E-03
10	-	1.2E-03	3.9E-03	9.1E-03	12.2E-03	23.0E-03	35.3E-03	36.5E-03	46.0E-03	84.0E-03	74.6E-03	78.7E-03	65.9E-03
Average	-	1.1E-03	4.0E-03	9.4E-03	13.4E-03	23.5E-03	36.0E-03	37.2E-03	51.2E-03	84.8E-03	76.1E-03	79.3E-03	67.8E-03
Sigma	-	44.2E-06	47.2E-06	269.6E-06	915.0E-06	596.9E-06	757.5E-06	774.7E-06	8.6E-03	1.1E-03	1.6E-03	1.3E-03	1.9E-03

Measurements

HFE1	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	297.47	314.13	322.64	296.34	297.82	308.11	311.03	306.41	307.68	305.35	308.24	306.64	305.71
OFF_PROTON samples													
5	170.98	156.16	96.61	59.96	51.73	31.69	23.01	22.69	18.76	10.74	12.35	11.49	13.42
6	177.58	159.93	98.38	60.27	37.45	31.85	22.46	22.49	20.70	10.51	11.83	11.46	13.15
7	175.33	157.93	96.34	58.19	50.37	31.16	21.94	21.88	19.71	10.72	12.12	10.86	12.72
Statistics													
Min	170.98	156.16	96.34	58.19	37.45	31.16	21.94	21.88	18.76	10.51	11.83	10.86	12.72
Max	177.58	159.93	98.38	60.27	51.73	31.85	23.01	22.69	20.70	10.74	12.35	11.49	13.42
Average	174.63	158.01	97.11	59.47	46.52	31.57	22.47	22.35	19.72	10.66	12.10	11.27	13.10
Sigma	2.74	1.54	0.91	0.92	6.43	0.30	0.44	0.34	0.80	0.10	0.21	0.29	0.29

Drift Calculation

HFE1	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	555.0E-06	4.5E-03	10.8E-03	13.5E-03	25.7E-03	37.6E-03	38.2E-03	47.5E-03	87.2E-03	75.1E-03	81.2E-03	68.7E-03
6	-	621.7E-06	4.5E-03	11.0E-03	21.1E-03	25.8E-03	38.9E-03	38.8E-03	42.7E-03	89.5E-03	78.9E-03	81.6E-03	70.4E-03
7	-	628.2E-06	4.7E-03	11.5E-03	14.1E-03	26.4E-03	39.9E-03	40.0E-03	45.0E-03	87.6E-03	76.8E-03	86.4E-03	72.9E-03
Average	-	601.6E-06	4.6E-03	11.1E-03	16.2E-03	26.0E-03	38.8E-03	39.0E-03	45.1E-03	88.1E-03	76.9E-03	83.1E-03	70.7E-03
Sigma	-	33.1E-06	76.0E-06	282.4E-06	3.4E-03	311.9E-06	931.3E-06	734.7E-06	2.0E-03	996.5E-06	1.5E-03	2.3E-03	1.7E-03

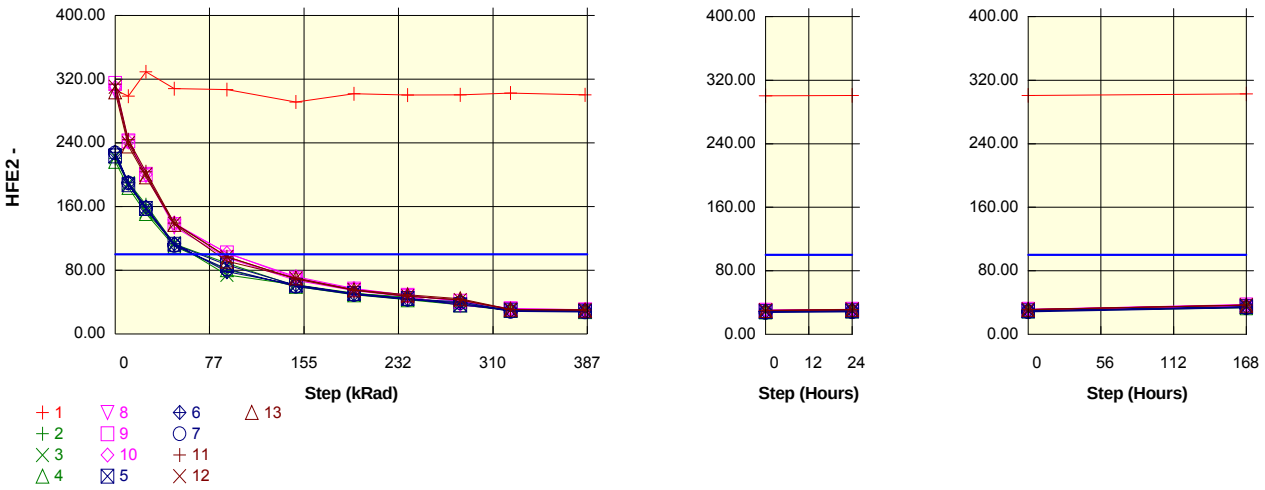
Measurements

HFE1	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	297.47	314.13	322.64	296.34	297.82	308.11	311.03	306.41	307.68	305.35	308.24	306.64	305.71
OFF_TID samples													
11	304.17	225.24	140.03	78.71	57.56	36.81	24.57	24.30	22.55	11.06	12.98	12.23	14.21
12	300.85	221.41	136.12	77.96	58.08	37.23	24.84	24.24	22.10	10.96	12.81	12.11	14.14
13	290.35	217.75	134.08	77.02	44.21	37.05	24.86	25.57	22.73	11.11	12.55	12.23	14.14
Statistics													
Min	290.35	217.75	134.08	77.02	44.21	36.81	24.57	24.24	22.10	10.96	12.55	12.11	14.14
Max	304.17	225.24	140.03	78.71	58.08	37.23	24.86	25.57	22.73	11.11	12.98	12.23	14.21
Average	298.46	221.47	136.74	77.90	53.29	37.03	24.76	24.70	22.46	11.05	12.78	12.19	14.17
Sigma	5.89	3.06	2.47	0.69	6.42	0.17	0.13	0.61	0.26	0.07	0.18	0.05	0.03

Drift Calculation

HFE1	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	1.2E-03	3.9E-03	9.4E-03	14.1E-03	23.9E-03	37.4E-03	37.9E-03	41.1E-03	87.1E-03	73.8E-03	78.5E-03	67.1E-03
12	-	1.2E-03	4.0E-03	9.5E-03	13.9E-03	23.5E-03	36.9E-03	37.9E-03	41.9E-03	87.9E-03	74.7E-03	79.2E-03	67.4E-03
13	-	1.1E-03	4.0E-03	9.5E-03	19.2E-03	23.5E-03	36.8E-03	35.7E-03	40.6E-03	86.5E-03	76.2E-03	78.3E-03	67.3E-03
Average	-	1.2E-03	4.0E-03	9.5E-03	15.7E-03	23.7E-03	37.0E-03	37.2E-03	41.2E-03	87.2E-03	74.9E-03	78.7E-03	67.2E-03
Sigma	-	20.0E-06	77.7E-06	51.2E-06	2.4E-03	158.9E-06	265.3E-06	1.1E-03	559.9E-06	582.3E-06	1.0E-03	392.9E-06	133.7E-06

Parameter : DC current gain : HFE2
Test conditions : Ic = -1mA ; Vce = -10V (Pulse width 300µs. Duty cycle 1%)
Unit :
Spec Limit Min : 100.00
Spec limits are represented in bold lines on the graphic.



Measurements

HFE2	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	306.49	298.65	329.19	308.08	306.88	291.34	301.60	300.13	300.36	302.52	300.37	300.70	302.70
ON_PROTON samples													
2	220.51	190.68	162.39	112.78	**88.73**	**60.23**	**50.57**	**46.50**	**36.96**	**29.97**	**28.95**	**29.90**	**34.34**
3	222.20	189.45	153.82	113.98	**74.30**	**61.67**	**51.30**	**44.83**	**37.29**	**31.12**	**29.13**	**29.85**	**34.88**
4	216.90	183.99	151.24	110.09	**80.61**	**59.82**	**49.22**	**43.06**	**36.64**	**29.44**	**28.07**	**29.35**	**33.50**
Statistics													
Min	216.90	183.99	151.24	110.09	74.30	59.82	49.22	43.06	36.64	29.44	28.07	29.35	33.50
Max	222.20	190.68	162.39	113.98	88.73	61.67	51.30	46.50	37.29	31.12	29.13	29.90	34.88
Average	219.87	188.04	155.82	112.29	81.21	60.57	50.36	44.80	36.96	30.18	28.72	29.70	34.24
Sigma	2.21	2.91	4.77	1.63	5.91	0.80	0.86	1.40	0.27	0.70	0.46	0.25	0.57

Drift Calculation

HFE2	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	709.3E-06	1.6E-03	4.3E-03	6.7E-03	12.1E-03	15.2E-03	17.0E-03	22.5E-03	28.8E-03	30.0E-03	28.9E-03	24.6E-03
3	-	778.2E-06	2.0E-03	4.3E-03	9.0E-03	11.7E-03	15.0E-03	17.8E-03	22.3E-03	27.6E-03	29.8E-03	29.0E-03	24.2E-03
4	-	824.6E-06	2.0E-03	4.5E-03	7.8E-03	12.1E-03	15.7E-03	18.6E-03	22.7E-03	29.4E-03	31.0E-03	29.5E-03	25.2E-03
Average	-	770.7E-06	1.9E-03	4.4E-03	7.8E-03	12.0E-03	15.3E-03	17.8E-03	22.5E-03	28.6E-03	30.3E-03	29.1E-03	24.7E-03
Sigma	-	47.4E-06	178.2E-06	83.9E-06	908.1E-06	176.8E-06	296.6E-06	669.2E-06	149.9E-06	721.0E-06	520.9E-06	238.8E-06	442.5E-06

Measurements

HFE2	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	306.49	298.65	329.19	308.08	306.88	291.34	301.60	300.13	300.36	302.52	300.37	300.70	302.70
ON_TID samples													
8	305.09	241.35	199.21	134.58	**95.54**	**67.33**	**54.48**	**46.85**	**36.21**	**30.91**	**29.39**	**30.50**	**35.59**
9	314.82	242.63	200.53	137.42	101.90	**70.20**	**56.38**	**48.42**	**41.05**	**31.75**	**30.41**	**31.51**	**37.04**
10	309.72	241.49	200.38	139.21	101.35	**71.96**	**57.05**	**48.70**	**40.90**	**31.79**	**30.56**	**31.44**	**37.49**
Statistics													
Min	305.09	241.35	199.21	134.58	95.54	67.33	54.48	46.85	36.21	30.91	29.39	30.50	35.59
Max	314.82	242.63	200.53	139.21	101.90	71.96	57.05	48.70	41.05	31.79	30.56	31.51	37.49
Average	309.87	241.83	200.04	137.07	99.60	69.83	55.97	47.99	39.39	31.48	30.12	31.15	36.71
Sigma	3.97	0.57	0.59	1.91	2.88	1.91	1.09	0.82	2.25	0.41	0.52	0.46	0.81

Drift Calculation

HFE2	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	865.6E-06	1.7E-03	4.2E-03	7.2E-03	11.6E-03	15.1E-03	18.1E-03	24.3E-03	29.1E-03	30.7E-03	29.5E-03	24.8E-03
9	-	945.0E-06	1.8E-03	4.1E-03	6.6E-03	11.1E-03	14.6E-03	17.5E-03	21.2E-03	28.3E-03	29.7E-03	28.6E-03	23.8E-03
10	-	912.1E-06	1.8E-03	4.0E-03	6.6E-03	10.7E-03	14.3E-03	17.3E-03	21.2E-03	28.2E-03	29.5E-03	28.6E-03	23.4E-03
Average	-	907.6E-06	1.8E-03	4.1E-03	6.8E-03	11.1E-03	14.6E-03	17.6E-03	22.2E-03	28.5E-03	30.0E-03	28.9E-03	24.0E-03
Sigma	-	32.6E-06	28.7E-06	83.8E-06	260.0E-06	370.6E-06	323.4E-06	327.0E-06	1.5E-03	378.6E-06	547.1E-06	444.3E-06	580.9E-06

Measurements

HFE2	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	306.49	298.65	329.19	308.08	306.88	291.34	301.60	300.13	300.36	302.52	300.37	300.70	302.70
OFF_PROTON samples													
5	223.79	187.45	157.81	112.56	86.75	61.10	50.88	44.51	36.62	29.89	28.73	29.58	34.86
6	228.17	189.61	159.45	113.33	78.08	61.63	50.20	43.82	40.64	29.42	28.56	29.48	34.37
7	227.31	189.72	157.56	110.96	81.61	59.72	49.56	43.13	39.14	28.25	27.51	28.28	33.52
Statistics													
Min	223.79	187.45	157.56	110.96	78.08	59.72	49.56	43.13	36.62	28.25	27.51	28.28	33.52
Max	228.17	189.72	159.45	113.33	86.75	61.63	50.88	44.51	40.64	29.89	28.73	29.58	34.86
Average	226.42	188.93	158.28	112.28	82.15	60.82	50.21	43.82	38.80	29.19	28.27	29.12	34.25
Sigma	1.90	1.04	0.84	0.99	3.56	0.81	0.54	0.56	1.66	0.69	0.54	0.59	0.55

Drift Calculation

HFE2	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	866.2E-06	1.9E-03	4.4E-03	7.1E-03	11.9E-03	15.2E-03	18.0E-03	22.8E-03	29.0E-03	30.3E-03	29.3E-03	24.2E-03
6	-	891.2E-06	1.9E-03	4.4E-03	8.4E-03	11.8E-03	15.5E-03	18.4E-03	20.2E-03	29.6E-03	30.6E-03	29.5E-03	24.7E-03
7	-	871.6E-06	1.9E-03	4.6E-03	7.9E-03	12.3E-03	15.8E-03	18.8E-03	21.2E-03	31.0E-03	31.9E-03	31.0E-03	25.4E-03
Average	-	876.3E-06	1.9E-03	4.5E-03	7.8E-03	12.0E-03	15.5E-03	18.4E-03	21.4E-03	29.9E-03	31.0E-03	29.9E-03	24.8E-03
Sigma	-	10.8E-06	33.6E-06	88.0E-06	560.1E-06	225.4E-06	243.6E-06	322.3E-06	1.1E-03	842.4E-06	700.6E-06	723.7E-06	498.1E-06

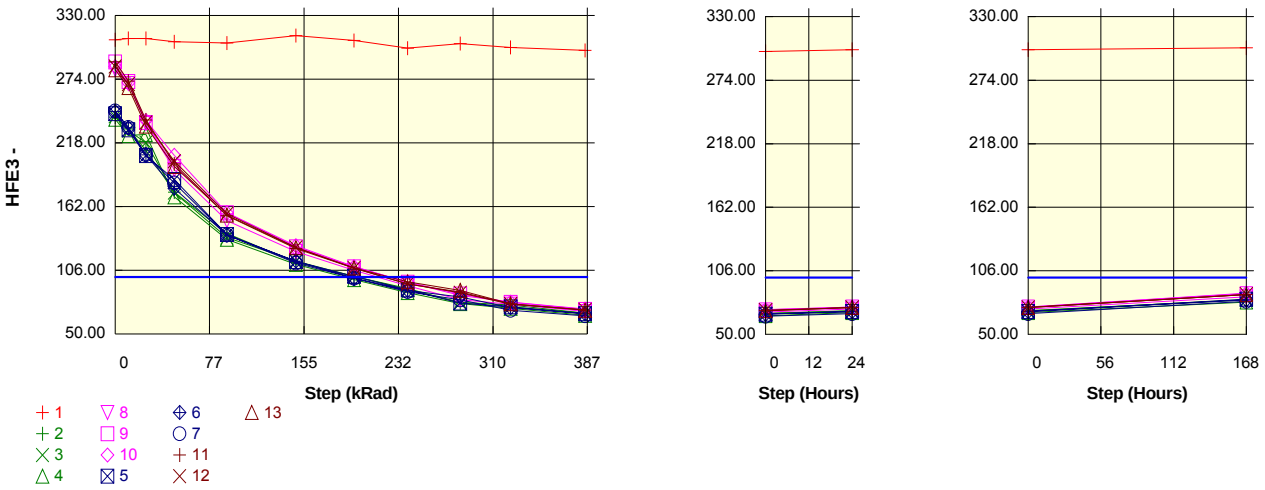
Measurements

HFE2	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	306.49	298.65	329.19	308.08	306.88	291.34	301.60	300.13	300.36	302.52	300.37	300.70	302.70
OFF_TID samples													
11	313.72	243.93	203.79	139.37	96.93	68.91	55.00	47.32	42.90	30.87	30.08	31.13	36.80
12	310.36	239.52	200.14	138.61	96.81	69.55	55.17	47.40	42.47	30.67	30.14	31.14	36.79
13	303.91	236.16	197.18	137.61	91.47	70.28	55.37	49.24	44.06	31.08	29.97	31.35	36.75
Statistics													
Min	303.91	236.16	197.18	137.61	91.47	68.91	55.00	47.32	42.47	30.67	29.97	31.13	36.75
Max	313.72	243.93	203.79	139.37	96.93	70.28	55.37	49.24	44.06	31.08	30.14	31.35	36.80
Average	309.33	239.87	200.37	138.53	95.07	69.58	55.18	47.99	43.14	30.87	30.06	31.21	36.78
Sigma	4.07	3.18	2.70	0.72	2.55	0.56	0.15	0.89	0.67	0.17	0.07	0.10	0.02

Drift Calculation

HFE2	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	912.0E-06	1.7E-03	4.0E-03	7.1E-03	11.3E-03	15.0E-03	17.9E-03	20.1E-03	29.2E-03	30.1E-03	28.9E-03	24.0E-03
12	-	953.0E-06	1.8E-03	4.0E-03	7.1E-03	11.2E-03	14.9E-03	17.9E-03	20.3E-03	29.4E-03	30.0E-03	28.9E-03	24.0E-03
13	-	943.9E-06	1.8E-03	4.0E-03	7.6E-03	10.9E-03	14.8E-03	17.0E-03	19.4E-03	28.9E-03	30.1E-03	28.6E-03	23.9E-03
Average	-	936.3E-06	1.8E-03	4.0E-03	7.3E-03	11.1E-03	14.9E-03	17.6E-03	19.9E-03	29.2E-03	30.0E-03	28.8E-03	24.0E-03
Sigma	-	17.6E-06	27.7E-06	6.8E-06	247.0E-06	158.2E-06	92.5E-06	421.0E-06	394.9E-06	208.3E-06	53.5E-06	148.3E-06	28.0E-06

Parameter : DC current gain : HFE3
Test conditions : Ic = -10mA ; Vce = -10V (Pulse width 300µs. Duty cycle 1%)
Unit :
Spec Limit Min : 100.00
Spec limits are represented in bold lines on the graphic.



Measurements

HFE3	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	308.55	309.81	309.68	306.92	305.70	312.36	307.91	301.22	305.31	301.85	299.28	300.83	302.45
ON_PROTON samples													
2	240.69	230.31	211.44	174.68	138.37	112.85	100.49	**89.95**	**77.41**	**73.90**	**68.34**	**70.99**	**80.33**
3	241.29	228.81	218.22	174.21	134.87	114.08	100.63	**88.91**	**77.78**	**75.41**	**68.36**	**70.60**	**80.72**
4	238.85	224.53	225.43	170.57	133.20	111.24	**97.88**	**86.37**	**76.79**	**72.51**	**66.40**	**69.27**	**78.49**
Statistics													
Min	238.85	224.53	211.44	170.57	133.20	111.24	97.88	86.37	76.79	72.51	66.40	69.27	78.49
Max	241.29	230.31	225.43	174.68	138.37	114.08	100.63	89.95	77.78	75.41	68.36	70.99	80.72
Average	240.28	227.88	218.36	173.16	135.48	112.72	99.66	88.41	77.33	73.94	67.70	70.29	79.85
Sigma	1.04	2.45	5.71	1.84	2.15	1.16	1.26	1.51	0.41	1.18	0.92	0.74	0.97

Drift Calculation

HFE3	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	187.3E-06	574.9E-06	1.6E-03	3.1E-03	4.7E-03	5.8E-03	7.0E-03	8.8E-03	9.4E-03	10.5E-03	9.9E-03	8.3E-03
3	-	226.0E-06	438.2E-06	1.6E-03	3.3E-03	4.6E-03	5.8E-03	7.1E-03	8.7E-03	9.1E-03	10.5E-03	10.0E-03	8.2E-03
4	-	266.9E-06	249.2E-06	1.7E-03	3.3E-03	4.8E-03	6.0E-03	7.4E-03	8.8E-03	9.6E-03	10.9E-03	10.2E-03	8.6E-03
Average	-	226.8E-06	420.8E-06	1.6E-03	3.2E-03	4.7E-03	5.9E-03	7.2E-03	8.8E-03	9.4E-03	10.6E-03	10.1E-03	8.4E-03
Sigma	-	32.5E-06	133.6E-06	45.0E-06	107.1E-06	74.0E-06	110.6E-06	179.0E-06	50.7E-06	199.5E-06	185.3E-06	133.8E-06	136.0E-06

Measurements

HFE3	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	308.55	309.81	309.68	306.92	305.70	312.36	307.91	301.22	305.31	301.85	299.28	300.83	302.45
ON_TID samples													
8	282.60	270.26	235.08	194.56	149.63	122.40	106.04	**92.40**	**80.17**	**76.22**	**69.73**	**72.29**	**83.16**
9	289.21	271.91	235.83	197.40	156.47	126.67	109.10	**95.57**	**85.06**	**77.85**	**71.64**	**74.14**	**85.87**
10	285.13	270.75	237.71	207.09	156.53	127.64	109.29	**95.44**	**83.94**	**77.94**	**71.83**	**74.07**	**86.40**
Statistics													
Min	282.60	270.26	235.08	194.56	149.63	122.40	106.04	92.40	80.17	76.22	69.73	72.29	83.16
Max	289.21	271.91	237.71	207.09	156.53	127.64	109.29	95.57	85.06	77.94	71.83	74.14	86.40
Average	285.65	270.97	236.21	199.68	154.21	125.57	108.14	94.47	83.05	77.34	71.07	73.50	85.14
Sigma	2.72	0.69	1.10	5.36	3.24	2.27	1.49	1.47	2.09	0.79	0.95	0.86	1.42

Drift Calculation

HFE3	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	161.6E-06	715.3E-06	1.6E-03	3.1E-03	4.6E-03	5.9E-03	7.3E-03	8.9E-03	9.6E-03	10.8E-03	10.3E-03	8.5E-03
9	-	220.0E-06	782.7E-06	1.6E-03	2.9E-03	4.4E-03	5.7E-03	7.0E-03	8.3E-03	9.4E-03	10.5E-03	10.0E-03	8.2E-03
10	-	186.3E-06	699.7E-06	1.3E-03	2.9E-03	4.3E-03	5.6E-03	7.0E-03	8.4E-03	9.3E-03	10.4E-03	10.0E-03	8.1E-03
Average	-	189.3E-06	732.5E-06	1.5E-03	3.0E-03	4.5E-03	5.7E-03	7.1E-03	8.5E-03	9.4E-03	10.6E-03	10.1E-03	8.2E-03
Sigma	-	24.0E-06	36.0E-06	133.5E-06	113.9E-06	125.5E-06	105.4E-06	140.2E-06	278.1E-06	109.8E-06	165.8E-06	134.6E-06	176.2E-06

Measurements

HFE3	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	308.55	309.81	309.68	306.92	305.70	312.36	307.91	301.22	305.31	301.85	299.28	300.83	302.45
OFF_PROTON samples													
5	243.58	229.49	206.81	185.82	137.42	113.74	100.71	88.81	77.25	73.82	67.83	70.21	81.01
6	245.58	231.23	207.45	178.17	136.87	114.14	99.16	88.35	82.48	73.13	67.70	69.95	80.41
7	246.06	231.60	207.61	182.79	137.08	112.24	98.96	87.19	79.90	70.73	65.99	68.29	79.06
Statistics													
Min	243.58	229.49	206.81	178.17	136.87	112.24	98.96	87.19	77.25	70.73	65.99	68.29	79.06
Max	246.06	231.60	207.61	185.82	137.42	114.14	100.71	88.81	82.48	73.82	67.83	70.21	81.01
Average	245.07	230.77	207.29	182.26	137.12	113.37	99.61	88.12	79.88	72.56	67.17	69.48	80.16
Sigma	1.07	0.92	0.34	3.15	0.22	0.81	0.78	0.68	2.14	1.33	0.84	0.85	0.81

Drift Calculation

HFE3	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	252.0E-06	729.9E-06	1.3E-03	3.2E-03	4.7E-03	5.8E-03	7.2E-03	8.8E-03	9.4E-03	10.6E-03	10.1E-03	8.2E-03
6	-	252.8E-06	748.5E-06	1.5E-03	3.2E-03	4.7E-03	6.0E-03	7.2E-03	8.1E-03	9.6E-03	10.7E-03	10.2E-03	8.4E-03
7	-	253.8E-06	752.7E-06	1.4E-03	3.2E-03	4.8E-03	6.0E-03	7.4E-03	8.5E-03	10.1E-03	11.1E-03	10.6E-03	8.6E-03
Average	-	252.9E-06	743.7E-06	1.4E-03	3.2E-03	4.7E-03	6.0E-03	7.3E-03	8.4E-03	9.7E-03	10.8E-03	10.3E-03	8.4E-03
Sigma	-	733.3E-09	9.9E-06	108.0E-06	28.7E-06	74.0E-06	96.4E-06	103.2E-06	321.4E-06	269.2E-06	199.9E-06	191.2E-06	142.5E-06

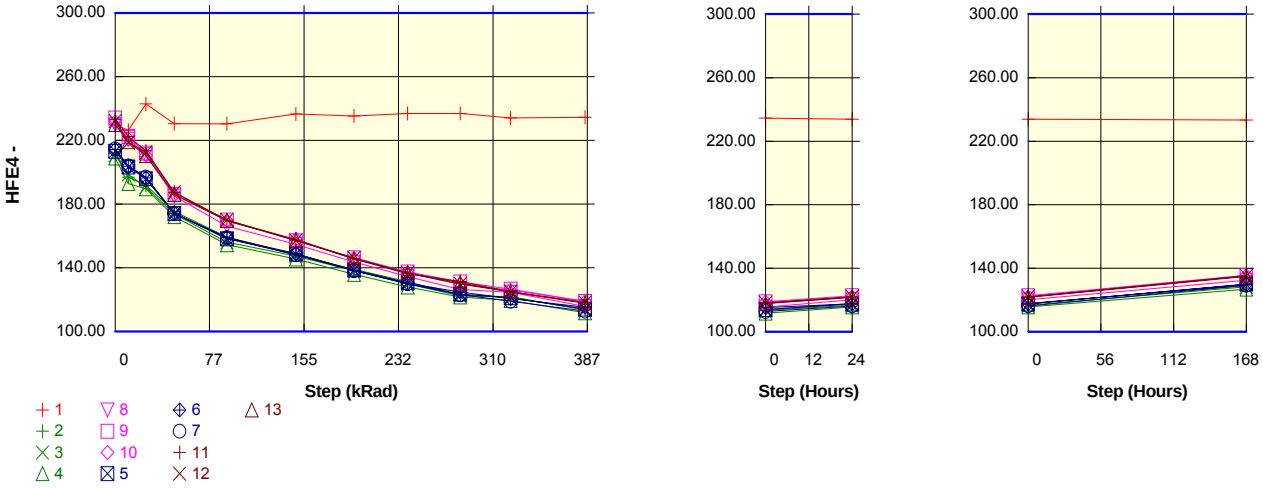
Measurements

HFE3	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	308.55	309.81	309.68	306.92	305.70	312.36	307.91	301.22	305.31	301.85	299.28	300.83	302.45
OFF_TID samples													
11	289.34	272.20	238.16	199.51	153.91	125.09	107.80	93.88	86.92	76.34	70.92	73.53	85.08
12	285.20	269.63	235.85	201.89	155.79	126.10	108.00	94.18	86.27	76.17	71.18	73.60	85.24
13	282.27	266.68	232.71	197.27	154.43	125.81	108.11	95.90	88.36	76.62	70.76	73.73	85.08
Statistics													
Min	282.27	266.68	232.71	197.27	153.91	125.09	107.80	93.88	86.27	76.17	70.76	73.53	85.08
Max	289.34	272.20	238.16	201.89	155.79	126.10	108.11	95.90	88.36	76.62	71.18	73.73	85.24
Average	285.60	269.50	235.57	199.56	154.71	125.67	107.97	94.65	87.18	76.38	70.95	73.62	85.13
Sigma	2.90	2.25	2.23	1.88	0.79	0.43	0.13	0.89	0.87	0.18	0.17	0.08	0.08

Drift Calculation

HFE3	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	217.7E-06	742.7E-06	1.6E-03	3.0E-03	4.5E-03	5.8E-03	7.2E-03	8.0E-03	9.6E-03	10.6E-03	10.1E-03	8.3E-03
12	-	202.4E-06	733.6E-06	1.4E-03	2.9E-03	4.4E-03	5.8E-03	7.1E-03	8.1E-03	9.6E-03	10.5E-03	10.1E-03	8.2E-03
13	-	207.1E-06	754.5E-06	1.5E-03	2.9E-03	4.4E-03	5.7E-03	6.9E-03	7.8E-03	9.5E-03	10.6E-03	10.0E-03	8.2E-03
Average	-	209.0E-06	743.6E-06	1.5E-03	3.0E-03	4.5E-03	5.8E-03	7.1E-03	8.0E-03	9.6E-03	10.6E-03	10.1E-03	8.2E-03
Sigma	-	6.4E-06	8.5E-06	46.2E-06	56.6E-06	58.7E-06	46.5E-06	131.0E-06	138.8E-06	59.1E-06	41.5E-06	50.3E-06	37.5E-06

Parameter : DC current gain : HFE4
Test conditions : Ic = -150mA ; Vce = -10V (Pulse width 300µs. Duty cycle 1%)
Unit :
Spec Limit Min : 100.00
Spec Limit Max : 300.00
Spec limits are represented in bold lines on the graphic.



Measurements

HFE4	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	229.77	226.38	242.84	230.47	230.36	236.54	235.35	236.93	236.95	233.99	234.47	233.75	233.34
ON_PROTON samples													
2	212.01	196.85	191.69	175.38	159.34	147.93	138.93	131.31	122.70	121.23	113.89	117.94	129.27
3	210.69	198.63	190.75	173.81	156.05	147.40	138.03	129.87	122.42	121.91	113.45	116.68	128.36
4	208.91	192.92	189.53	172.14	154.44	145.55	135.89	127.91	121.62	119.49	111.72	115.72	126.84
Statistics													
Min	208.91	192.92	189.53	172.14	154.44	145.55	135.89	127.91	121.62	119.49	111.72	115.72	126.84
Max	212.01	198.63	191.69	175.38	159.34	147.93	138.93	131.31	122.70	121.91	113.89	117.94	129.27
Average	210.54	196.13	190.66	173.78	156.61	146.96	137.61	129.69	122.25	120.88	113.02	116.78	128.16
Sigma	1.27	2.39	0.88	1.32	2.04	1.02	1.28	1.39	0.46	1.02	0.94	0.91	1.01

Drift Calculation

HFE4	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	363.2E-06	500.0E-06	985.2E-06	1.6E-03	2.0E-03	2.5E-03	2.9E-03	3.4E-03	3.5E-03	4.1E-03	3.8E-03	3.0E-03
3	-	288.3E-06	496.4E-06	1.0E-03	1.7E-03	2.0E-03	2.5E-03	3.0E-03	3.4E-03	3.5E-03	4.1E-03	3.8E-03	3.0E-03
4	-	396.8E-06	489.5E-06	1.0E-03	1.7E-03	2.1E-03	2.6E-03	3.0E-03	3.4E-03	3.6E-03	4.2E-03	3.9E-03	3.1E-03
Average	-	349.4E-06	495.3E-06	1.0E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03	3.5E-03	4.1E-03	3.8E-03	3.1E-03
Sigma	-	45.4E-06	4.4E-06	15.3E-06	55.9E-06	20.6E-06	39.5E-06	54.4E-06	5.7E-06	51.5E-06	46.4E-06	38.4E-06	32.8E-06

Measurements

HFE4	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	229.77	226.38	242.84	230.47	230.36	236.54	235.35	236.93	236.95	233.99	234.47	233.75	233.34
ON_TID samples													
8	229.78	220.71	210.99	185.10	166.12	154.68	143.59	134.47	126.37	124.56	115.58	120.17	132.52
9	233.97	222.32	212.00	186.20	169.87	156.91	146.34	137.37	131.17	126.58	118.90	122.74	135.57
10	231.59	220.85	210.56	185.87	169.49	157.95	145.92	136.68	129.62	125.95	118.81	122.02	135.47
Statistics													
Min	229.78	220.71	210.56	185.10	166.12	154.68	143.59	134.47	126.37	124.56	115.58	120.17	132.52
Max	233.97	222.32	212.00	186.20	169.87	157.95	146.34	137.37	131.17	126.58	118.90	122.74	135.57
Average	231.78	221.29	211.18	185.73	168.50	156.52	145.28	136.17	129.05	125.70	117.76	121.64	134.52
Sigma	1.72	0.73	0.61	0.46	1.69	1.36	1.21	1.24	2.00	0.84	1.54	1.08	1.42

Drift Calculation

HFE4	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	178.8E-06	387.6E-06	1.1E-03	1.7E-03	2.1E-03	2.6E-03	3.1E-03	3.6E-03	3.7E-03	4.3E-03	4.0E-03	3.2E-03
9	-	224.1E-06	442.9E-06	1.1E-03	1.6E-03	2.1E-03	2.6E-03	3.0E-03	3.3E-03	3.6E-03	4.1E-03	3.9E-03	3.1E-03
10	-	209.9E-06	431.3E-06	1.1E-03	1.6E-03	2.0E-03	2.5E-03	3.0E-03	3.4E-03	3.6E-03	4.1E-03	3.9E-03	3.1E-03
Average	-	204.3E-06	420.6E-06	1.1E-03	1.6E-03	2.1E-03	2.6E-03	3.0E-03	3.4E-03	3.6E-03	4.2E-03	3.9E-03	3.1E-03
Sigma	-	18.9E-06	23.8E-06	19.6E-06	35.5E-06	44.2E-06	32.3E-06	39.0E-06	90.7E-06	24.7E-06	87.3E-06	44.6E-06	54.8E-06

Measurements

HFE4	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	229.77	226.38	242.84	230.47	230.36	236.54	235.35	236.93	236.95	233.99	234.47	233.75	233.34
OFF_PROTON samples													
5	213.09	203.23	195.84	174.02	158.16	148.63	138.60	130.56	123.46	121.15	114.03	117.53	130.04
6	214.25	203.78	196.36	174.27	159.03	148.90	138.19	130.25	124.68	120.75	115.21	117.62	129.90
7	214.66	203.92	196.88	174.12	158.70	148.09	138.30	129.87	123.15	119.01	112.75	116.32	129.24
Statistics													
Min	213.09	203.23	195.84	174.02	158.16	148.09	138.19	129.87	123.15	119.01	112.75	116.32	129.24
Max	214.66	203.92	196.88	174.27	159.03	148.90	138.60	130.56	124.68	121.15	115.21	117.62	130.04
Average	214.00	203.64	196.36	174.14	158.63	148.54	138.36	130.23	123.76	120.30	114.00	117.16	129.73
Sigma	0.66	0.30	0.42	0.10	0.36	0.34	0.17	0.28	0.66	0.93	1.00	0.59	0.35

Drift Calculation

HFE4	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	227.7E-06	413.5E-06	1.1E-03	1.6E-03	2.0E-03	2.5E-03	3.0E-03	3.4E-03	3.6E-03	4.1E-03	3.8E-03	3.0E-03
6	-	239.8E-06	425.3E-06	1.1E-03	1.6E-03	2.0E-03	2.6E-03	3.0E-03	3.4E-03	3.6E-03	4.0E-03	3.8E-03	3.0E-03
7	-	245.3E-06	420.6E-06	1.1E-03	1.6E-03	2.1E-03	2.6E-03	3.0E-03	3.5E-03	3.7E-03	4.2E-03	3.9E-03	3.1E-03
Average	-	237.6E-06	419.8E-06	1.1E-03	1.6E-03	2.1E-03	2.6E-03	3.0E-03	3.4E-03	3.6E-03	4.1E-03	3.9E-03	3.0E-03
Sigma	-	7.4E-06	4.9E-06	12.6E-06	9.0E-06	25.2E-06	22.9E-06	30.7E-06	44.1E-06	76.7E-06	82.2E-06	54.0E-06	33.6E-06

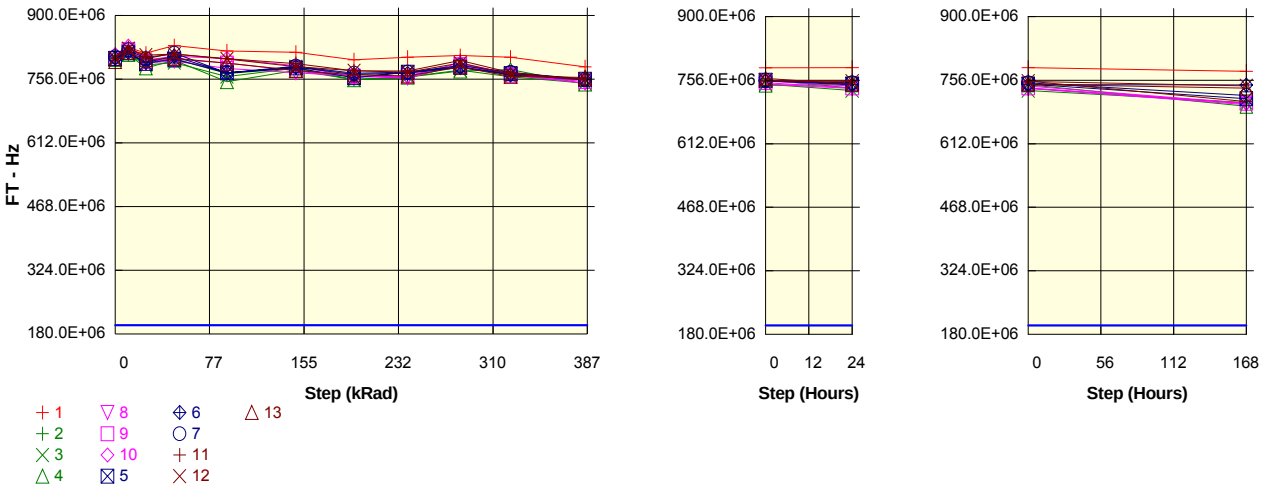
Measurements

HFE4	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	229.77	226.38	242.84	230.47	230.36	236.54	235.35	236.93	236.95	233.99	234.47	233.75	233.34
OFF_TID samples													
11	233.26	222.40	213.42	187.41	169.40	157.39	145.68	136.19	131.36	124.97	118.04	121.95	135.20
12	232.06	218.59	212.48	187.37	170.03	157.10	146.08	136.68	129.77	124.95	118.20	122.01	135.22
13	229.88	219.14	210.38	186.04	169.67	157.47	145.50	136.88	130.42	124.79	117.75	121.67	134.96
Statistics													
Min	229.88	218.59	210.38	186.04	169.40	157.10	145.50	136.19	129.77	124.79	117.75	121.67	134.96
Max	233.26	222.40	213.42	187.41	170.03	157.47	146.08	136.88	131.36	124.97	118.20	122.01	135.22
Average	231.74	220.04	212.10	186.94	169.70	157.32	145.75	136.58	130.51	124.90	118.00	121.88	135.13
Sigma	1.40	1.68	1.27	0.64	0.26	0.16	0.24	0.29	0.66	0.08	0.19	0.15	0.12

Drift Calculation

HFE4	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	209.5E-06	398.5E-06	1.0E-03	1.6E-03	2.1E-03	2.6E-03	3.1E-03	3.3E-03	3.7E-03	4.2E-03	3.9E-03	3.1E-03
12	-	265.7E-06	397.1E-06	1.0E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03	3.7E-03	4.2E-03	3.9E-03	3.1E-03
13	-	213.3E-06	403.2E-06	1.0E-03	1.5E-03	2.0E-03	2.5E-03	3.0E-03	3.3E-03	3.7E-03	4.1E-03	3.9E-03	3.1E-03
Average	-	229.5E-06	399.6E-06	1.0E-03	1.6E-03	2.0E-03	2.5E-03	3.0E-03	3.3E-03	3.7E-03	4.2E-03	3.9E-03	3.1E-03
Sigma	-	25.6E-06	2.6E-06	10.6E-06	29.8E-06	29.1E-06	23.1E-06	40.9E-06	35.7E-06	21.3E-06	18.1E-06	18.1E-06	20.4E-06

Parameter : Gain bandwidth product : FT
Test conditions : Ic = -20mA ; Vce = -20V
Unit : Hz
Spec Limit Min : 200.0E+06
Spec limits are represented in bold lines on the graphic.



Measurements

FT	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	809.5E+06	827.8E+06	814.7E+06	831.8E+06	819.6E+06	816.8E+06	799.8E+06	805.7E+06	809.3E+06	805.8E+06	784.0E+06	784.3E+06	776.1E+06
ON_PROTON samples													
2	806.9E+06	811.0E+06	792.7E+06	803.0E+06	768.6E+06	780.9E+06	754.2E+06	758.6E+06	788.9E+06	769.0E+06	757.2E+06	737.9E+06	703.2E+06
3	799.1E+06	811.9E+06	788.1E+06	793.4E+06	761.9E+06	780.9E+06	754.9E+06	761.6E+06	776.2E+06	761.6E+06	747.0E+06	732.7E+06	705.3E+06
4	800.9E+06	812.1E+06	781.4E+06	798.5E+06	750.4E+06	776.1E+06	754.7E+06	760.5E+06	774.1E+06	777.7E+06	744.7E+06	745.6E+06	696.9E+06
Statistics													
Min	799.1E+06	811.0E+06	781.4E+06	793.4E+06	750.4E+06	776.1E+06	754.2E+06	758.6E+06	774.1E+06	761.6E+06	744.7E+06	732.7E+06	696.9E+06
Max	806.9E+06	812.1E+06	792.7E+06	803.0E+06	768.6E+06	780.9E+06	754.9E+06	761.6E+06	788.9E+06	777.7E+06	757.2E+06	745.6E+06	705.3E+06
Average	802.3E+06	811.6E+06	787.4E+06	798.3E+06	760.3E+06	779.3E+06	754.6E+06	760.2E+06	779.7E+06	769.4E+06	749.6E+06	738.7E+06	701.8E+06
Sigma	3.3E+06	490.4E+03	4.6E+06	3.9E+06	7.5E+06	2.3E+06	295.3E+03	1.2E+06	6.5E+06	6.6E+06	5.4E+06	5.3E+06	3.6E+06

Drift Calculation

FT	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_PROTON samples													
2	-	4.1E+06	-14.2E+06	-3.9E+06	-38.3E+06	-26.0E+06	-52.6E+06	-48.3E+06	-18.0E+06	-37.9E+06	-49.7E+06	-69.0E+06	-103.6E+06
3	-	12.8E+06	-11.0E+06	-5.7E+06	-37.2E+06	-18.2E+06	-44.2E+06	-37.5E+06	-22.9E+06	-37.5E+06	-52.1E+06	-66.4E+06	-93.8E+06
4	-	11.1E+06	-19.5E+06	-2.4E+06	-50.5E+06	-24.9E+06	-46.2E+06	-40.4E+06	-26.8E+06	-23.3E+06	-56.2E+06	-55.4E+06	-104.0E+06
Average	-	9.3E+06	-14.9E+06	-4.0E+06	-42.0E+06	-23.0E+06	-47.7E+06	-42.1E+06	-22.6E+06	-32.9E+06	-52.7E+06	-63.6E+06	-100.5E+06
Sigma	-	3.8E+06	3.5E+06	1.3E+06	6.0E+06	3.4E+06	3.6E+06	4.5E+06	3.6E+06	6.8E+06	2.7E+06	5.9E+06	4.7E+06

Measurements

FT	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	809.5E+06	827.8E+06	814.7E+06	831.8E+06	819.6E+06	816.8E+06	799.8E+06	805.7E+06	809.3E+06	805.8E+06	784.0E+06	784.3E+06	776.1E+06
ON_TID samples													
8	801.5E+06	817.5E+06	792.7E+06	796.9E+06	780.0E+06	770.7E+06	762.6E+06	758.4E+06	788.9E+06	765.8E+06	747.0E+06	737.2E+06	700.5E+06
9	803.3E+06	822.6E+06	795.6E+06	801.1E+06	792.5E+06	775.0E+06	761.6E+06	763.3E+06	785.4E+06	764.7E+06	750.6E+06	738.2E+06	703.4E+06
10	811.3E+06	830.6E+06	798.7E+06	808.2E+06	802.6E+06	786.3E+06	760.7E+06	762.8E+06	792.3E+06	768.1E+06	754.0E+06	742.7E+06	703.4E+06
Statistics													
Min	801.5E+06	817.5E+06	792.7E+06	796.9E+06	780.0E+06	770.7E+06	760.7E+06	758.4E+06	785.4E+06	764.7E+06	747.0E+06	737.2E+06	700.5E+06
Max	811.3E+06	830.6E+06	798.7E+06	808.2E+06	802.6E+06	786.3E+06	762.6E+06	763.3E+06	792.3E+06	768.1E+06	754.0E+06	742.7E+06	703.4E+06
Average	805.4E+06	823.6E+06	795.7E+06	802.1E+06	791.7E+06	777.3E+06	761.6E+06	761.5E+06	788.9E+06	766.2E+06	750.5E+06	739.4E+06	702.4E+06
Sigma	4.3E+06	5.4E+06	2.5E+06	4.6E+06	9.2E+06	6.6E+06	788.6E+03	2.2E+06	2.8E+06	1.4E+06	2.9E+06	2.4E+06	1.4E+06

Drift Calculation

FT	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
ON_TID samples													
8	-	16.0E+06	-8.8E+06	-4.6E+06	-21.5E+06	-30.8E+06	-38.9E+06	-43.1E+06	-12.6E+06	-35.7E+06	-54.5E+06	-64.3E+06	-101.0E+06
9	-	19.3E+06	-7.7E+06	-2.2E+06	-10.8E+06	-28.3E+06	-41.8E+06	-40.0E+06	-17.9E+06	-38.6E+06	-52.8E+06	-65.1E+06	-99.9E+06
10	-	19.3E+06	-12.6E+06	-3.2E+06	-8.7E+06	-25.0E+06	-50.7E+06	-48.6E+06	-19.0E+06	-43.3E+06	-57.3E+06	-68.7E+06	-107.9E+06
Average	-	18.2E+06	-9.7E+06	-3.3E+06	-13.7E+06	-28.0E+06	-43.8E+06	-43.9E+06	-16.5E+06	-39.2E+06	-54.9E+06	-66.0E+06	-103.0E+06
Sigma	-	1.5E+06	2.1E+06	979.7E+03	5.6E+06	2.4E+06	5.0E+06	3.5E+06	2.8E+06	3.1E+06	1.9E+06	1.9E+06	3.5E+06

Measurements

FT	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	809.5E+06	827.8E+06	814.7E+06	831.8E+06	819.6E+06	816.8E+06	799.8E+06	805.7E+06	809.3E+06	805.8E+06	784.0E+06	784.3E+06	776.1E+06
OFF_PROTON samples													
5	802.6E+06	815.6E+06	791.8E+06	801.3E+06	770.2E+06	781.3E+06	759.5E+06	771.8E+06	782.9E+06	768.6E+06	755.8E+06	747.1E+06	714.0E+06
6	803.5E+06	816.4E+06	794.3E+06	808.0E+06	770.0E+06	783.1E+06	766.5E+06	769.3E+06	782.3E+06	765.4E+06	754.2E+06	745.8E+06	745.2E+06
7	806.7E+06	822.1E+06	802.2E+06	814.7E+06	770.0E+06	785.6E+06	769.5E+06	771.8E+06	786.5E+06	771.3E+06	755.3E+06	750.1E+06	721.4E+06
Statistics													
Min	802.6E+06	815.6E+06	791.8E+06	801.3E+06	770.0E+06	781.3E+06	759.5E+06	769.3E+06	782.3E+06	765.4E+06	754.2E+06	745.8E+06	714.0E+06
Max	806.7E+06	822.1E+06	802.2E+06	814.7E+06	770.2E+06	785.6E+06	769.5E+06	771.8E+06	786.5E+06	771.3E+06	755.8E+06	750.1E+06	745.2E+06
Average	804.3E+06	818.0E+06	796.1E+06	808.0E+06	770.1E+06	783.3E+06	765.1E+06	771.0E+06	783.9E+06	768.4E+06	755.1E+06	747.7E+06	726.9E+06
Sigma	1.7E+06	2.9E+06	4.5E+06	5.5E+06	83.6E+03	1.8E+06	4.2E+06	1.2E+06	1.8E+06	2.4E+06	650.5E+03	1.8E+06	13.3E+06

Drift Calculation

FT	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_PROTON samples													
5	-	13.0E+06	-10.8E+06	-1.3E+06	-32.4E+06	-21.3E+06	-43.2E+06	-30.8E+06	-19.7E+06	-34.0E+06	-46.8E+06	-55.5E+06	-88.6E+06
6	-	12.9E+06	-9.2E+06	4.5E+06	-33.5E+06	-20.5E+06	-37.0E+06	-34.2E+06	-21.2E+06	-38.1E+06	-49.3E+06	-57.8E+06	-58.3E+06
7	-	15.4E+06	-4.4E+06	8.0E+06	-36.7E+06	-21.1E+06	-37.2E+06	-34.9E+06	-20.2E+06	-35.4E+06	-51.4E+06	-56.6E+06	-85.2E+06
Average	-	13.8E+06	-8.2E+06	3.7E+06	-34.2E+06	-21.0E+06	-39.1E+06	-33.3E+06	-20.4E+06	-35.8E+06	-49.2E+06	-56.6E+06	-77.4E+06
Sigma	-	1.1E+06	2.7E+06	3.8E+06	1.8E+06	368.2E+03	2.8E+06	1.8E+06	611.6E+03	1.7E+06	1.9E+06	938.8E+03	13.6E+06

Measurements

FT	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
1_REF	809.5E+06	827.8E+06	814.7E+06	831.8E+06	819.6E+06	816.8E+06	799.8E+06	805.7E+06	809.3E+06	805.8E+06	784.0E+06	784.3E+06	776.1E+06
OFF_TID samples													
11	803.2E+06	826.0E+06	805.6E+06	812.6E+06	802.6E+06	791.0E+06	774.8E+06	774.1E+06	798.4E+06	770.9E+06	754.4E+06	753.7E+06	707.1E+06
12	803.7E+06	824.9E+06	810.2E+06	812.6E+06	801.5E+06	784.2E+06	775.0E+06	771.3E+06	792.3E+06	766.7E+06	755.6E+06	753.2E+06	743.2E+06
13	795.8E+06	816.4E+06	800.0E+06	803.2E+06	792.0E+06	775.5E+06	765.6E+06	763.0E+06	783.2E+06	762.3E+06	760.0E+06	746.6E+06	737.9E+06
Statistics													
Min	795.8E+06	816.4E+06	800.0E+06	803.2E+06	792.0E+06	775.5E+06	765.6E+06	763.0E+06	783.2E+06	762.3E+06	754.4E+06	746.6E+06	707.1E+06
Max	803.7E+06	826.0E+06	810.2E+06	812.6E+06	802.6E+06	791.0E+06	775.0E+06	774.1E+06	798.4E+06	770.9E+06	760.0E+06	753.7E+06	743.2E+06
Average	800.9E+06	822.4E+06	805.3E+06	809.5E+06	798.7E+06	783.6E+06	771.8E+06	769.4E+06	791.3E+06	766.6E+06	756.7E+06	751.2E+06	729.4E+06
Sigma	3.6E+06	4.3E+06	4.2E+06	4.5E+06	4.8E+06	6.3E+06	4.4E+06	4.7E+06	6.2E+06	3.5E+06	2.4E+06	3.2E+06	15.9E+06

Drift Calculation

FT	0 kRad	10.8 kRad	25.2 kRad	48.6 kRad	91.8 kRad	148.5 kRad	196.2 kRad	240.3 kRad	283.5 kRad	324.9 kRad	386.1 kRad	24 Hours	168 Hours
OFF_TID samples													
11	-	22.9E+06	2.4E+06	9.5E+06	-554.6E+03	-12.1E+06	-28.3E+06	-29.1E+06	-4.8E+06	-32.3E+06	-48.8E+06	-49.5E+06	-96.0E+06
12	-	21.2E+06	6.5E+06	8.9E+06	-2.2E+06	-19.6E+06	-28.7E+06	-32.5E+06	-11.4E+06	-37.1E+06	-48.1E+06	-50.5E+06	-60.5E+06
13	-	20.6E+06	4.2E+06	7.4E+06	-3.8E+06	-20.3E+06	-30.2E+06	-32.8E+06	-12.5E+06	-33.5E+06	-35.8E+06	-49.2E+06	-57.9E+06
Average	-	21.6E+06	4.4E+06	8.6E+06	-2.2E+06	-17.3E+06	-29.1E+06	-31.4E+06	-9.6E+06	-34.3E+06	-44.2E+06	-49.7E+06	-71.5E+06
Sigma	-	967.0E+03	1.7E+06	899.4E+03	1.3E+06	3.7E+06	802.3E+03	1.7E+06	3.4E+06	2.0E+06	6.0E+06	584.7E+03	17.4E+06

Appendix 1 : Temperature measurements.

SN	Temp [°C]	ICEO [A]
spec min		
spec max		
1	Room	-4.5E-9
8	110	-1.2E-6
9	110	-1.0E-6
10	110	-1.4E-6
11	110	-2.5E-6
12	110	-2.1E-6
13	110	-2.1E-6

min	-2.5E-6
max	-1.0E-6
moy	-1.3E-6

Table 3 : Initial measurements at High temperature on TID Samples

SN	Temp [°C]	ICEO [A]
spec min		
spec max		
1	Room	-4.7E-9
8	110	-907.2E-9
9	110	-1.2E-6
10	110	-1.3E-6
11	110	-3.1E-6
12	110	-2.8E-6
13	110	-2.4E-6

min	-3.1E-6
max	-907.2E-9
moy	-1.5E-6

Table 4 : Final measurements at High temperature on TID Samples