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 : SOC3700SW

Package : CCP-3

Description : Low Power NPN Bipolar 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/1025	Issue : 01	Date :	January 20th, 2012
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Approved by :	O.PERROTIN	Test lab Operations Manager		
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CHANGE RECORD

ISSUE	DATE	PAGE	DESCRIPTION OF CHANGES
01	January 12th, 2011	All	Original Issue

TOTAL DOSE RADIATION TEST REPORT
on
STMicroelectronics
SOC3700SW
Low Power NPN Bipolar Transistors

TABLE OF CONTENTS

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 SOC3700SW, Low Power NPN Bipolar 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/0945 Issue 01, corresponding to the irradiation up to 148.5 Krad(Si) step 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/0229 issue 3 dated 21/09/2010.

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 Radiation Test Plan: HRX/ SPE/0229 issue 3 dated 21/09/2010
- 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: 5201-004

2.2 Reference Documents

- STMicroelectronics datasheet: Doc ID 15354 Rev 2, January 2010

3 Test Samples

13 samples of the SOC3700SW 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/0944) have been biased according to the flow diagram given in Figure 1.

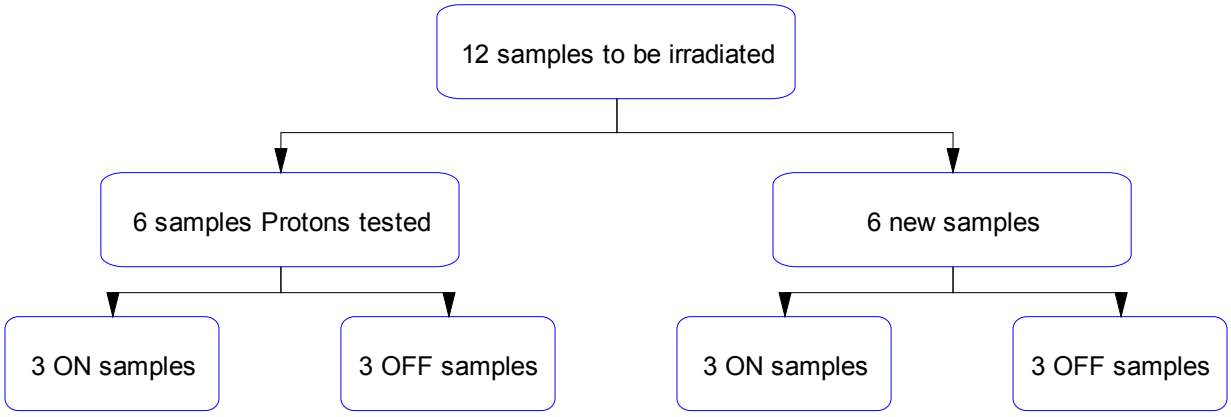


Figure 1 : Samples bias flow diagram

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 easiest 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 SOC3700SW is given below:

Part Number: SOC3700SW

Top Marking: -

Inspection Lot: DOC01285

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, in agreement with ESA, 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.

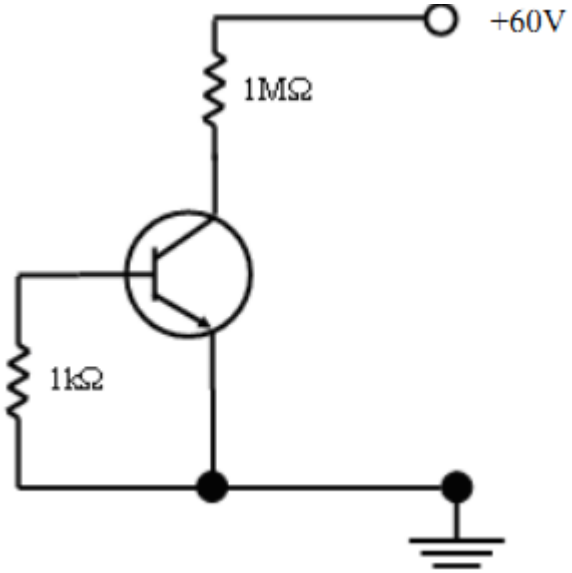


Figure 2 : Bias Conditions during Irradiation Exposures

4.2.2 Electrical Measurements

Electrical parameters test program principle for SOC3700SW 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.

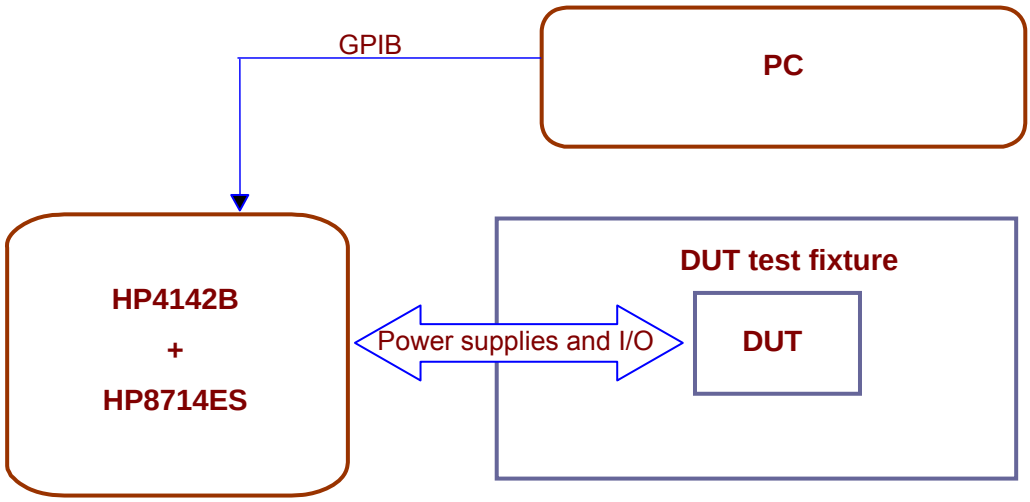


Figure 3 : SOC3700SW test program principle

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} = 90V	-	10	nA
I_{CEO}	Collector-Emitter cut-off current, Note 2	V_{CE} = 80V Note 2	-	10	nA
I_{EBO}	Emitter-Base cut-off current	V_{EB} = 5V	-	10	nA
$V_{(BR)CBO}$	Collector-Base breakdown voltage	I_C = 100µA	140	-	V
$V_{(BR)CEO}$	Collector-Emitter breakdown voltage, Note 1	I_C = 30mA	80	-	V
$V_{(BR)EBO}$	Emitter-Base breakdown voltage	I_E = 100µA	7	-	V
$V_{CE(SAT)1}$	Collector-Emitter saturation voltage, Note 1	I_C = 150mA, I_B = 15mA	-	0.2	V
$V_{CE(SAT)2}$	Collector-Emitter saturation voltage, Note 1	I_C = 500mA, I_B = 50mA	-	0.5	V
$V_{BE(SAT)}$	Base-Emitter saturation voltage, Note 1	I_C = 150mA, I_B = 15mA	-	1.1	V
H_{FE1}	DC current gain, Note 1	I_C = 1mA, V_{CE} = 10V	90	-	-
H_{FE2}	DC current gain, Note 1	I_C = 10mA, V_{CE} = 10V	90	-	-
H_{FE3}	DC current gain, Note 1	I_C = 150mA, V_{CE} = 10V	100	300	-
F_T	Gain Bandwidth Product	V_{CE} = 10V, I_C = 50mA	100	-	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 SOC3700SW Low Power NPN Bipolar 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 and 300rad(Si)/hour at room temperature.

I_{CE0} parameter has been measured at high temperature before and after testing. Corresponding results are provided in Appendix 1.

A summary of the 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	283.5 & 324.9 kRad(Si)				X		
	ON_TID samples	No Failure	X					
	OFF_PROTON samples	324.9 & 386.1 kRad(Si)				X		
	OFF_TID samples	No Failure	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.

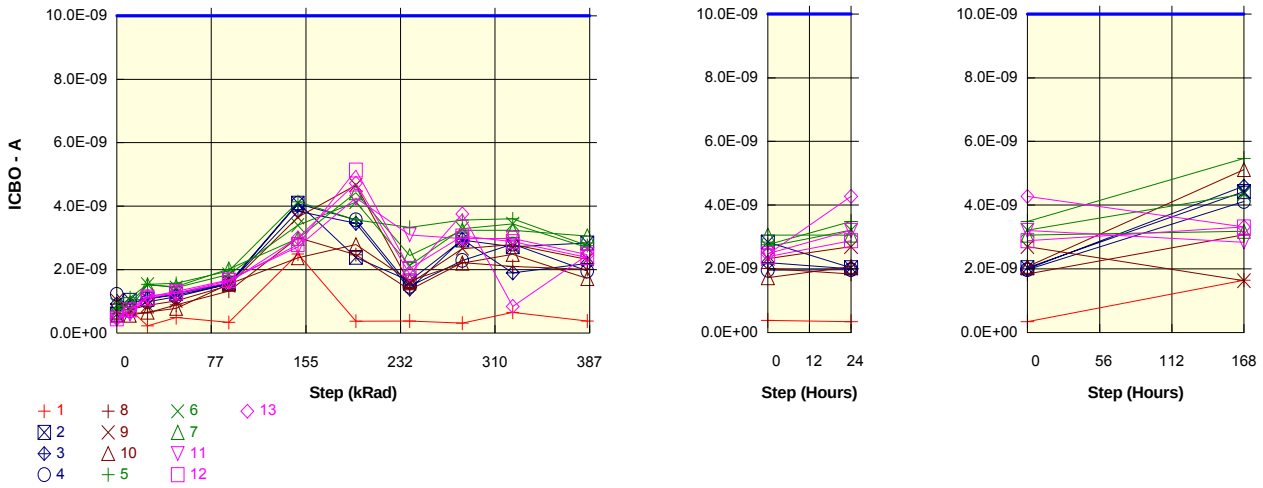
For each parameter, a drift calculation table is provided computing the drift between a given exposure step with respect to initial readings:

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

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 = 90V
Unit : A
Spec Limit Max : 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	423.7E-12	743.0E-12	226.5E-12	489.1E-12	332.9E-12	2.5E-09	373.9E-12	379.6E-12	309.5E-12	654.2E-12	377.8E-12	340.4E-12	1.6E-09
ON_PROTON samples													
2	587.2E-12	1.0E-09	1.1E-09	1.2E-09	1.6E-09	4.1E-09	2.4E-09	1.6E-09	2.9E-09	2.7E-09	2.8E-09	2.0E-09	4.4E-09
3	911.2E-12	915.0E-12	1.1E-09	1.2E-09	1.5E-09	3.8E-09	3.5E-09	1.4E-09	3.0E-09	1.9E-09	2.2E-09	2.0E-09	4.6E-09
4	1.2E-09	701.2E-12	981.6E-12	1.1E-09	1.5E-09	4.1E-09	3.6E-09	1.5E-09	2.3E-09	2.8E-09	2.0E-09	2.0E-09	4.1E-09
Statistics													
Min	587.2E-12	701.2E-12	981.6E-12	1.1E-09	1.5E-09	3.8E-09	2.4E-09	1.4E-09	2.3E-09	1.9E-09	2.0E-09	2.0E-09	4.1E-09
Max	1.2E-09	1.0E-09	1.1E-09	1.2E-09	1.6E-09	4.1E-09	3.6E-09	1.6E-09	3.0E-09	2.8E-09	2.8E-09	2.0E-09	4.6E-09
Average	907.5E-12	883.6E-12	1.0E-09	1.2E-09	1.6E-09	4.0E-09	3.1E-09	1.5E-09	2.7E-09	2.5E-09	2.3E-09	2.0E-09	4.4E-09
Sigma	260.0E-12	137.9E-12	45.0E-12	42.5E-12	12.1E-12	117.6E-12	534.0E-12	105.6E-12	307.0E-12	406.9E-12	374.4E-12	24.1E-12	199.2E-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
ON_PROTON samples													
2	-	447.4E-12	472.8E-12	659.0E-12	981.4E-12	3.5E-09	1.8E-09	1.1E-09	2.3E-09	2.1E-09	2.3E-09	1.4E-09	3.8E-09
3	-	3.8E-12	176.8E-12	282.2E-12	632.6E-12	2.9E-09	2.5E-09	474.6E-12	2.0E-09	988.0E-12	1.3E-09	1.1E-09	3.7E-09
4	-	-522.8E-12	-242.4E-12	-82.0E-12	318.0E-12	2.9E-09	2.3E-09	250.2E-12	1.1E-09	1.6E-09	729.4E-12	748.2E-12	2.9E-09
Average	-	-23.9E-12	135.7E-12	286.4E-12	644.0E-12	3.1E-09	2.2E-09	592.7E-12	1.8E-09	1.6E-09	1.4E-09	1.1E-09	3.5E-09
Sigma	-	396.6E-12	293.4E-12	302.5E-12	271.0E-12	294.1E-12	316.8E-12	338.4E-12	545.2E-12	466.3E-12	629.8E-12	284.1E-12	415.8E-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	423.7E-12	743.0E-12	226.5E-12	489.1E-12	332.9E-12	2.5E-09	373.9E-12	379.6E-12	309.5E-12	654.2E-12	377.8E-12	340.4E-12	1.6E-09
ON_TID samples													
8	605.2E-12	623.2E-12	632.2E-12	885.8E-12	1.3E-09	3.0E-09	2.5E-09	1.4E-09	2.2E-09	2.1E-09	2.0E-09	1.8E-09	3.1E-09
9	1.0E-09	735.2E-12	869.0E-12	1.0E-09	1.5E-09	3.7E-09	4.7E-09	1.6E-09	2.7E-09	2.8E-09	2.3E-09	2.7E-09	1.6E-09
10	564.4E-12	559.6E-12	657.2E-12	778.0E-12	1.5E-09	2.4E-09	2.8E-09	1.6E-09	2.2E-09	2.5E-09	1.7E-09	2.1E-09	5.1E-09
Statistics													
Min	564.4E-12	559.6E-12	632.2E-12	778.0E-12	1.3E-09	2.4E-09	2.5E-09	1.4E-09	2.2E-09	2.1E-09	1.7E-09	1.8E-09	1.6E-09
Max	1.0E-09	735.2E-12	869.0E-12	1.0E-09	1.5E-09	3.7E-09	4.7E-09	1.6E-09	2.7E-09	2.8E-09	2.3E-09	2.7E-09	5.1E-09
Average	733.7E-12	639.3E-12	719.5E-12	893.6E-12	1.5E-09	3.0E-09	3.3E-09	1.5E-09	2.4E-09	2.5E-09	2.0E-09	2.2E-09	3.3E-09
Sigma	211.2E-12	72.6E-12	106.2E-12	97.7E-12	95.8E-12	525.3E-12	969.9E-12	116.4E-12	213.9E-12	279.6E-12	247.6E-12	360.9E-12	1.4E-09

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	-	18.0E-12	27.0E-12	280.6E-12	711.6E-12	2.4E-09	1.9E-09	757.8E-12	1.6E-09	1.5E-09	1.4E-09	1.2E-09	2.5E-09
9	-	-296.2E-12	-162.4E-12	-14.4E-12	464.6E-12	2.6E-09	3.6E-09	527.8E-12	1.6E-09	1.8E-09	1.3E-09	1.7E-09	592.6E-12
10	-	-4.8E-12	92.8E-12	213.6E-12	973.2E-12	1.8E-09	2.2E-09	1.1E-09	1.6E-09	1.9E-09	1.2E-09	1.5E-09	4.6E-09
Average	-	-94.3E-12	-14.2E-12	159.9E-12	716.5E-12	2.3E-09	2.6E-09	787.2E-12	1.6E-09	1.7E-09	1.3E-09	1.5E-09	2.5E-09
Sigma	-	143.0E-12	108.2E-12	126.3E-12	207.6E-12	345.9E-12	764.8E-12	224.7E-12	8.1E-12	172.8E-12	100.1E-12	177.8E-12	1.6E-09

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	423.7E-12	743.0E-12	226.5E-12	489.1E-12	332.9E-12	2.5E-09	373.9E-12	379.6E-12	309.5E-12	654.2E-12	377.8E-12	340.4E-12	1.6E-09
OFF_PROTON samples													
5	758.6E-12	1.1E-09	1.5E-09	1.6E-09	2.0E-09	4.1E-09	3.6E-09	3.3E-09	3.6E-09	3.6E-09	2.8E-09	3.5E-09	5.5E-09
6	887.6E-12	766.0E-12	1.5E-09	1.4E-09	1.8E-09	3.4E-09	4.1E-09	2.1E-09	3.3E-09	3.4E-09	2.7E-09	3.2E-09	4.3E-09
7	674.2E-12	947.2E-12	1.5E-09	1.5E-09	2.0E-09	3.0E-09	4.4E-09	2.4E-09	3.2E-09	3.2E-09	3.1E-09	3.1E-09	3.2E-09
Statistics													
Min	674.2E-12	766.0E-12	1.5E-09	1.4E-09	1.8E-09	3.0E-09	3.6E-09	2.1E-09	3.2E-09	3.2E-09	2.7E-09	3.1E-09	3.2E-09
Max	887.6E-12	1.1E-09	1.5E-09	1.6E-09	2.0E-09	4.1E-09	4.4E-09	3.3E-09	3.6E-09	3.6E-09	3.1E-09	3.5E-09	5.5E-09
Average	773.5E-12	942.1E-12	1.5E-09	1.5E-09	1.9E-09	3.5E-09	4.0E-09	2.6E-09	3.4E-09	3.4E-09	2.8E-09	3.3E-09	4.3E-09
Sigma	87.7E-12	141.8E-12	8.7E-12	55.0E-12	68.2E-12	476.9E-12	357.3E-12	511.0E-12	143.5E-12	149.3E-12	161.4E-12	178.2E-12	937.1E-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	-	354.6E-12	777.6E-12	804.4E-12	1.2E-09	3.4E-09	2.8E-09	2.6E-09	2.8E-09	2.8E-09	2.0E-09	2.7E-09	4.7E-09
6	-	-121.6E-12	642.4E-12	546.4E-12	962.2E-12	2.5E-09	3.2E-09	1.2E-09	2.4E-09	2.6E-09	1.8E-09	2.3E-09	3.5E-09
7	-	273.0E-12	841.2E-12	791.0E-12	1.3E-09	2.3E-09	3.8E-09	1.8E-09	2.6E-09	2.6E-09	2.4E-09	2.4E-09	2.5E-09
Average	-	168.7E-12	753.7E-12	713.9E-12	1.2E-09	2.7E-09	3.3E-09	1.9E-09	2.6E-09	2.7E-09	2.1E-09	2.5E-09	3.6E-09
Sigma	-	207.9E-12	82.9E-12	118.6E-12	155.9E-12	463.7E-12	386.7E-12	549.0E-12	166.3E-12	133.7E-12	242.7E-12	178.2E-12	905.2E-12

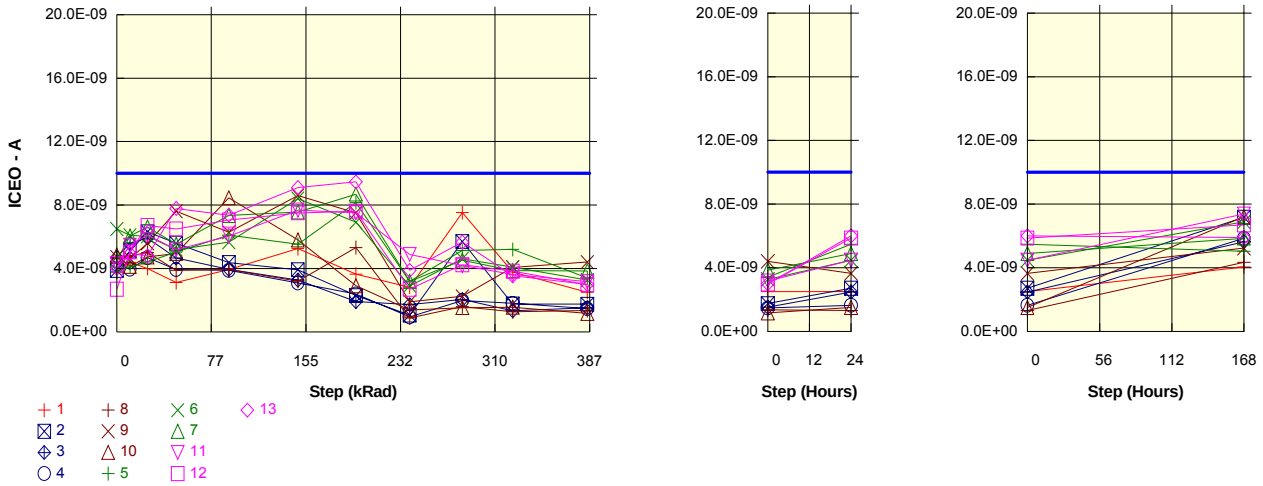
Measurements

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	423.7E-12	743.0E-12	226.5E-12	489.1E-12	332.9E-12	2.5E-09	373.9E-12	379.6E-12	309.5E-12	654.2E-12	377.8E-12	340.4E-12	1.6E-09
OFF_TID samples													
11	453.0E-12	592.8E-12	1.1E-09	1.3E-09	1.7E-09	2.7E-09	4.3E-09	3.1E-09	3.0E-09	3.0E-09	2.5E-09	3.2E-09	2.8E-09
12	446.8E-12	727.8E-12	1.1E-09	1.3E-09	1.7E-09	2.8E-09	5.1E-09	2.0E-09	3.1E-09	2.9E-09	2.4E-09	2.9E-09	3.3E-09
13	450.0E-12	736.0E-12	1.2E-09	1.3E-09	1.6E-09	3.0E-09	4.7E-09	1.9E-09	3.8E-09	840.6E-12	2.5E-09	4.3E-09	3.3E-09
Statistics													
Min	446.8E-12	592.8E-12	1.1E-09	1.3E-09	1.6E-09	2.7E-09	4.3E-09	1.9E-09	3.0E-09	840.6E-12	2.4E-09	2.9E-09	2.8E-09
Max	453.0E-12	736.0E-12	1.2E-09	1.3E-09	1.7E-09	3.0E-09	5.1E-09	3.1E-09	3.8E-09	3.0E-09	2.5E-09	4.3E-09	3.3E-09
Average	449.9E-12	685.5E-12	1.1E-09	1.3E-09	1.6E-09	2.8E-09	4.7E-09	2.3E-09	3.3E-09	2.2E-09	2.4E-09	3.5E-09	3.2E-09
Sigma	2.5E-12	65.7E-12	29.0E-12	27.4E-12	29.7E-12	118.2E-12	360.1E-12	548.5E-12	350.8E-12	987.9E-12	41.8E-12	595.5E-12	226.2E-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	-	139.8E-12	679.4E-12	861.6E-12	1.2E-09	2.3E-09	3.8E-09	2.6E-09	2.5E-09	2.5E-09	2.0E-09	2.8E-09	2.4E-09
12	-	281.0E-12	652.0E-12	814.6E-12	1.2E-09	2.3E-09	4.7E-09	1.6E-09	2.6E-09	2.4E-09	1.9E-09	2.4E-09	2.9E-09
13	-	286.0E-12	719.8E-12	802.6E-12	1.2E-09	2.5E-09	4.3E-09	1.4E-09	3.3E-09	390.6E-12	2.0E-09	3.8E-09	2.9E-09
Average	-	235.6E-12	683.7E-12	826.3E-12	1.2E-09	2.4E-09	4.3E-09	1.9E-09	2.8E-09	1.8E-09	2.0E-09	3.0E-09	2.7E-09
Sigma	-	67.8E-12	27.8E-12	25.5E-12	29.0E-12	118.8E-12	362.6E-12	546.5E-12	351.0E-12	987.8E-12	39.4E-12	594.9E-12	228.4E-12

Parameter : Collector-Emitter cut-off current : ICEO
Test conditions : Vce = 80V
Unit : A
Spec Limit Max : 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	3.8E-09	4.4E-09	4.0E-09	3.1E-09	3.9E-09	5.3E-09	3.6E-09	2.8E-09	7.5E-09	3.8E-09	2.5E-09	2.5E-09	4.1E-09
ON_PROTON samples													
2	3.9E-09	5.1E-09	6.3E-09	5.6E-09	4.4E-09	3.9E-09	2.3E-09	1.1E-09	5.7E-09	1.8E-09	1.8E-09	2.7E-09	7.2E-09
3	4.7E-09	5.6E-09	5.9E-09	4.7E-09	3.9E-09	3.3E-09	1.9E-09	1.7E-09	2.0E-09	1.3E-09	1.5E-09	2.5E-09	5.6E-09
4	4.3E-09	4.0E-09	4.7E-09	3.9E-09	3.9E-09	3.1E-09	2.4E-09	943.8E-12	2.0E-09	1.8E-09	1.5E-09	1.6E-09	5.9E-09
Statistics													
Min	3.9E-09	4.0E-09	4.7E-09	3.9E-09	3.9E-09	3.1E-09	1.9E-09	943.8E-12	2.0E-09	1.3E-09	1.5E-09	1.6E-09	5.6E-09
Max	4.7E-09	5.6E-09	6.3E-09	5.6E-09	4.4E-09	3.9E-09	2.4E-09	1.7E-09	5.7E-09	1.8E-09	1.8E-09	2.7E-09	7.2E-09
Average	4.3E-09	4.9E-09	5.6E-09	4.7E-09	4.1E-09	3.4E-09	2.2E-09	1.2E-09	3.2E-09	1.6E-09	1.6E-09	2.3E-09	6.2E-09
Sigma	335.9E-12	696.7E-12	699.8E-12	682.2E-12	216.2E-12	359.6E-12	210.4E-12	340.8E-12	1.7E-09	213.1E-12	124.9E-12	459.8E-12	680.6E-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	-	1.2E-09	2.4E-09	1.7E-09	491.8E-12	43.4E-12	-1.6E-09	-2.8E-09	1.8E-09	-2.1E-09	-2.1E-09	-1.2E-09	3.3E-09
3	-	917.4E-12	1.2E-09	-37.4E-12	-751.0E-12	-1.4E-09	-2.8E-09	-3.0E-09	-2.7E-09	-3.4E-09	-3.2E-09	-2.2E-09	932.8E-12
4	-	-326.4E-12	395.8E-12	-350.2E-12	-396.0E-12	-1.2E-09	-1.9E-09	-3.3E-09	-2.3E-09	-2.5E-09	-2.8E-09	-2.6E-09	1.6E-09
Average	-	603.0E-12	1.4E-09	442.6E-12	-218.4E-12	-860.8E-12	-2.1E-09	-3.0E-09	-1.0E-09	-2.7E-09	-2.7E-09	-2.0E-09	1.9E-09
Sigma	-	668.5E-12	837.5E-12	909.0E-12	522.7E-12	646.7E-12	515.6E-12	214.1E-12	2.0E-09	526.8E-12	437.1E-12	618.2E-12	997.6E-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	3.8E-09	4.4E-09	4.0E-09	3.1E-09	3.9E-09	5.3E-09	3.6E-09	2.8E-09	7.5E-09	3.8E-09	2.5E-09	2.5E-09	4.1E-09
ON_TID samples													
8	4.6E-09	4.8E-09	5.0E-09	3.9E-09	3.9E-09	3.2E-09	5.3E-09	876.4E-12	1.6E-09	1.3E-09	1.4E-09	1.3E-09	4.3E-09
9	4.7E-09	4.6E-09	5.6E-09	7.6E-09	6.3E-09	8.6E-09	7.5E-09	1.9E-09	2.2E-09	4.1E-09	4.4E-09	3.6E-09	5.2E-09
10	4.8E-09	4.1E-09	4.7E-09	4.9E-09	8.5E-09	5.8E-09	2.9E-09	1.4E-09	1.5E-09	1.6E-09	1.2E-09	1.5E-09	7.2E-09
Statistics													
Min	4.6E-09	4.1E-09	4.7E-09	3.9E-09	3.9E-09	3.2E-09	2.9E-09	876.4E-12	1.5E-09	1.3E-09	1.2E-09	1.3E-09	4.3E-09
Max	4.8E-09	4.8E-09	5.6E-09	7.6E-09	8.5E-09	8.6E-09	7.5E-09	1.9E-09	2.2E-09	4.1E-09	4.4E-09	3.6E-09	7.2E-09
Average	4.7E-09	4.5E-09	5.1E-09	5.5E-09	6.2E-09	5.9E-09	5.2E-09	1.4E-09	1.8E-09	2.3E-09	2.3E-09	2.2E-09	5.6E-09
Sigma	86.8E-12	285.0E-12	354.6E-12	1.6E-09	1.9E-09	2.2E-09	1.9E-09	415.4E-12	326.3E-12	1.3E-09	1.5E-09	1.1E-09	1.2E-09

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	-	164.0E-12	370.0E-12	-750.2E-12	-710.2E-12	-1.4E-09	688.2E-12	-3.8E-09	-3.1E-09	-3.4E-09	-3.3E-09	-3.3E-09	-296.0E-12
9	-	-77.2E-12	860.8E-12	2.9E-09	1.6E-09	3.9E-09	2.8E-09	-2.8E-09	-2.5E-09	-651.6E-12	-323.6E-12	-1.1E-09	508.4E-12
10	-	-713.8E-12	-111.8E-12	103.6E-12	3.6E-09	956.2E-12	-1.9E-09	-3.5E-09	-3.3E-09	-3.3E-09	-3.7E-09	-3.3E-09	2.4E-09
Average	-	-209.0E-12	373.0E-12	748.6E-12	1.5E-09	1.1E-09	515.5E-12	-3.3E-09	-2.9E-09	-2.4E-09	-2.4E-09	-2.6E-09	858.9E-12
Sigma	-	370.3E-12	397.1E-12	1.6E-09	1.8E-09	2.2E-09	1.9E-09	386.9E-12	350.8E-12	1.3E-09	1.5E-09	1.1E-09	1.1E-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	3.8E-09	4.4E-09	4.0E-09	3.1E-09	3.9E-09	5.3E-09	3.6E-09	2.8E-09	7.5E-09	3.8E-09	2.5E-09	2.5E-09	4.1E-09
OFF_PROTON samples													
5	3.8E-09	4.1E-09	4.4E-09	5.0E-09	6.1E-09	5.5E-09	8.2E-09	3.2E-09	5.1E-09	5.2E-09	3.4E-09	5.5E-09	5.0E-09
6	6.5E-09	6.1E-09	6.0E-09	5.2E-09	5.7E-09	8.4E-09	6.9E-09	2.9E-09	4.6E-09	4.1E-09	3.3E-09	4.5E-09	6.9E-09
7	4.5E-09	6.0E-09	6.6E-09	5.5E-09	7.3E-09	7.6E-09	8.7E-09	3.2E-09	4.5E-09	3.9E-09	3.8E-09	4.9E-09	5.9E-09
Statistics													
Min	3.8E-09	4.1E-09	4.4E-09	5.0E-09	5.7E-09	5.5E-09	6.9E-09	2.9E-09	4.5E-09	3.9E-09	3.3E-09	4.5E-09	5.0E-09
Max	6.5E-09	6.1E-09	6.6E-09	5.5E-09	7.3E-09	8.4E-09	8.7E-09	3.2E-09	5.1E-09	5.2E-09	3.8E-09	5.5E-09	6.9E-09
Average	4.9E-09	5.4E-09	5.7E-09	5.3E-09	6.4E-09	7.2E-09	7.9E-09	3.1E-09	4.8E-09	4.4E-09	3.5E-09	4.9E-09	5.9E-09
Sigma	1.1E-09	923.2E-12	926.7E-12	209.9E-12	707.8E-12	1.2E-09	743.9E-12	132.7E-12	269.3E-12	585.7E-12	247.2E-12	410.5E-12	752.8E-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	-	310.0E-12	622.0E-12	1.2E-09	2.3E-09	1.7E-09	4.4E-09	-614.2E-12	1.3E-09	1.4E-09	-393.6E-12	1.7E-09	1.2E-09
6	-	-400.0E-12	-454.0E-12	-1.3E-09	-824.2E-12	1.9E-09	425.4E-12	-3.6E-09	-1.9E-09	-2.4E-09	-3.2E-09	-2.0E-09	388.4E-12
7	-	1.5E-09	2.1E-09	1.0E-09	2.8E-09	3.0E-09	4.2E-09	-1.3E-09	4.4E-12	-665.6E-12	-678.4E-12	370.4E-12	1.3E-09
Average	-	477.1E-12	751.1E-12	314.1E-12	1.4E-09	2.2E-09	3.0E-09	-1.8E-09	-178.8E-12	-557.9E-12	-1.4E-09	9.4E-12	984.5E-12
Sigma	-	793.3E-12	1.0E-09	1.1E-09	1.6E-09	576.1E-12	1.8E-09	1.3E-09	1.3E-09	1.6E-09	1.3E-09	1.5E-09	423.2E-12

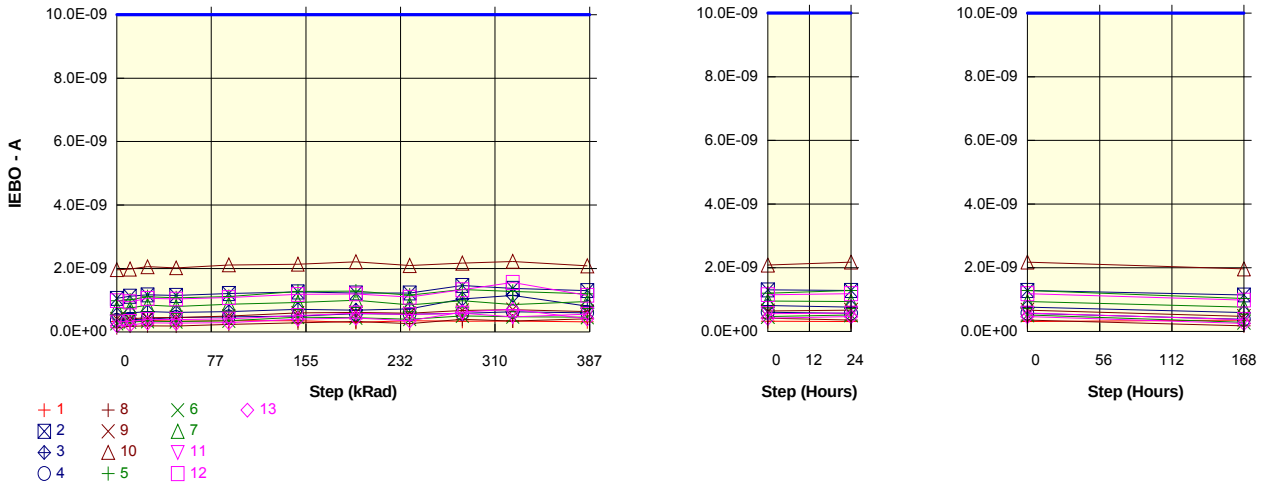
Measurements

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	3.8E-09	4.4E-09	4.0E-09	3.1E-09	3.9E-09	5.3E-09	3.6E-09	2.8E-09	7.5E-09	3.8E-09	2.5E-09	2.5E-09	4.1E-09
OFF_TID samples													
11	4.3E-09	5.5E-09	6.1E-09	5.2E-09	6.0E-09	7.7E-09	7.5E-09	4.9E-09	4.2E-09	3.6E-09	3.2E-09	4.5E-09	7.4E-09
12	2.7E-09	5.0E-09	6.7E-09	6.5E-09	7.0E-09	7.5E-09	7.6E-09	2.7E-09	4.2E-09	3.8E-09	3.0E-09	5.9E-09	6.7E-09
13	4.0E-09	4.9E-09	4.8E-09	7.8E-09	7.4E-09	9.1E-09	9.5E-09	3.9E-09	5.7E-09	3.5E-09	3.0E-09	6.0E-09	5.9E-09
Statistics													
Min	2.7E-09	4.9E-09	4.8E-09	5.2E-09	6.0E-09	7.5E-09	7.5E-09	2.7E-09	4.2E-09	3.5E-09	3.0E-09	4.5E-09	5.9E-09
Max	4.3E-09	5.5E-09	6.7E-09	7.8E-09	7.4E-09	9.1E-09	9.5E-09	4.9E-09	5.7E-09	3.8E-09	3.2E-09	6.0E-09	7.4E-09
Average	3.7E-09	5.1E-09	5.9E-09	6.5E-09	6.8E-09	8.1E-09	8.2E-09	3.8E-09	4.7E-09	3.7E-09	3.0E-09	5.4E-09	6.7E-09
Sigma	695.9E-12	223.1E-12	800.2E-12	1.1E-09	568.2E-12	716.1E-12	890.5E-12	896.2E-12	687.6E-12	121.0E-12	83.4E-12	692.8E-12	605.2E-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	-	1.2E-09	1.8E-09	891.2E-12	1.7E-09	3.4E-09	3.2E-09	597.6E-12	-113.6E-12	-674.2E-12	-1.1E-09	179.8E-12	3.1E-09
12	-	2.4E-09	4.0E-09	3.8E-09	4.4E-09	4.8E-09	4.9E-09	6.0E-12	1.5E-09	1.1E-09	293.2E-12	3.2E-09	4.0E-09
13	-	950.8E-12	804.8E-12	3.8E-09	3.4E-09	5.1E-09	5.5E-09	-123.2E-12	1.7E-09	-455.2E-12	-1.0E-09	2.0E-09	1.9E-09
Average	-	1.5E-09	2.2E-09	2.8E-09	3.2E-09	4.4E-09	4.5E-09	160.1E-12	1.0E-09	2.5E-12	-613.3E-12	1.8E-09	3.0E-09
Sigma	-	615.9E-12	1.3E-09	1.4E-09	1.1E-09	748.6E-12	952.8E-12	313.8E-12	812.1E-12	807.2E-12	643.0E-12	1.2E-09	858.0E-12

Parameter : Emitter-Base cut-off current : IEBO
Test conditions : Veb = 5V
Unit : A
Spec Limit Max : 10.0E-09
Spec limits are represented in bold lines on the graphic.



Measurements

IEBO	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	327.1E-12	339.3E-12	364.2E-12	339.9E-12	353.0E-12	351.5E-12	301.6E-12	350.7E-12	332.2E-12	342.4E-12	320.4E-12	312.1E-12	352.1E-12
ON_PROTON samples													
2	1.1E-09	1.1E-09	1.2E-09	1.1E-09	1.2E-09	1.3E-09	1.2E-09	1.2E-09	1.5E-09	1.4E-09	1.3E-09	1.3E-09	1.1E-09
3	538.6E-12	596.9E-12	637.6E-12	611.9E-12	637.8E-12	711.0E-12	682.3E-12	726.7E-12	1.0E-09	1.1E-09	814.5E-12	763.5E-12	591.9E-12
4	365.8E-12	386.8E-12	406.6E-12	453.2E-12	475.7E-12	499.4E-12	570.8E-12	552.7E-12	582.0E-12	637.0E-12	599.4E-12	568.6E-12	379.1E-12
Statistics													
Min	365.8E-12	386.8E-12	406.6E-12	453.2E-12	475.7E-12	499.4E-12	570.8E-12	552.7E-12	582.0E-12	637.0E-12	599.4E-12	568.6E-12	379.1E-12
Max	1.1E-09	1.1E-09	1.2E-09	1.1E-09	1.2E-09	1.3E-09	1.2E-09	1.2E-09	1.5E-09	1.4E-09	1.3E-09	1.3E-09	1.1E-09
Average	654.7E-12	703.1E-12	736.8E-12	738.1E-12	775.2E-12	823.6E-12	827.2E-12	835.1E-12	1.0E-09	1.1E-09	905.6E-12	873.1E-12	705.2E-12
Sigma	294.9E-12	310.8E-12	318.0E-12	297.8E-12	316.0E-12	320.7E-12	287.4E-12	285.4E-12	359.6E-12	307.9E-12	294.4E-12	303.3E-12	322.6E-12

Drift Calculation

IEBO	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	-	66.0E-12	106.6E-12	89.6E-12	152.6E-12	200.8E-12	169.0E-12	166.4E-12	403.0E-12	312.8E-12	243.4E-12	227.4E-12	85.0E-12
3	-	58.3E-12	99.0E-12	73.3E-12	99.2E-12	172.5E-12	143.8E-12	188.2E-12	503.8E-12	610.8E-12	275.9E-12	225.0E-12	53.4E-12
4	-	21.0E-12	40.7E-12	87.4E-12	109.8E-12	133.6E-12	204.9E-12	186.9E-12	216.2E-12	271.1E-12	233.6E-12	202.8E-12	13.3E-12
Average	-	48.4E-12	82.1E-12	83.4E-12	120.6E-12	169.0E-12	172.6E-12	180.5E-12	374.3E-12	398.3E-12	251.0E-12	218.4E-12	50.6E-12
Sigma	-	19.7E-12	29.4E-12	7.2E-12	23.1E-12	27.5E-12	25.1E-12	10.0E-12	119.2E-12	151.3E-12	18.1E-12	11.1E-12	29.3E-12

Measurements

IEBO	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	327.1E-12	339.3E-12	364.2E-12	339.9E-12	353.0E-12	351.5E-12	301.6E-12	350.7E-12	332.2E-12	342.4E-12	320.4E-12	312.1E-12	352.1E-12
ON_TID samples													
8	129.9E-12	178.9E-12	194.1E-12	185.5E-12	236.6E-12	287.0E-12	326.4E-12	260.7E-12	391.6E-12	344.8E-12	408.9E-12	348.9E-12	178.7E-12
9	404.6E-12	409.6E-12	449.7E-12	454.5E-12	495.2E-12	595.4E-12	617.5E-12	587.9E-12	678.5E-12	699.4E-12	640.3E-12	669.4E-12	470.9E-12
10	2.0E-09	2.0E-09	2.1E-09	2.0E-09	2.1E-09	2.1E-09	2.2E-09	2.1E-09	2.2E-09	2.2E-09	2.1E-09	2.2E-09	2.0E-09
Statistics													
Min	129.9E-12	178.9E-12	194.1E-12	185.5E-12	236.6E-12	287.0E-12	326.4E-12	260.7E-12	391.6E-12	344.8E-12	408.9E-12	348.9E-12	178.7E-12
Max	2.0E-09	2.0E-09	2.1E-09	2.0E-09	2.1E-09	2.1E-09	2.2E-09	2.1E-09	2.2E-09	2.2E-09	2.1E-09	2.2E-09	2.0E-09
Average	831.6E-12	856.3E-12	899.4E-12	886.4E-12	947.9E-12	1.0E-09	1.1E-09	980.2E-12	1.1E-09	1.1E-09	1.0E-09	1.1E-09	872.2E-12
Sigma	805.9E-12	800.4E-12	823.2E-12	808.5E-12	829.8E-12	807.3E-12	828.8E-12	797.4E-12	778.6E-12	814.9E-12	741.7E-12	797.6E-12	783.3E-12

Drift Calculation

IEBO	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	-	49.0E-12	64.3E-12	55.6E-12	106.7E-12	157.1E-12	196.5E-12	130.8E-12	261.7E-12	215.0E-12	279.0E-12	219.1E-12	48.9E-12
9	-	5.1E-12	45.2E-12	50.0E-12	90.6E-12	190.8E-12	212.9E-12	183.3E-12	273.9E-12	294.8E-12	235.7E-12	264.9E-12	66.3E-12
10	-	20.2E-12	94.0E-12	59.0E-12	151.6E-12	172.6E-12	251.8E-12	131.8E-12	207.6E-12	263.2E-12	125.0E-12	218.0E-12	6.8E-12
Average	-	24.8E-12	67.8E-12	54.9E-12	116.3E-12	173.5E-12	220.4E-12	148.6E-12	247.7E-12	257.7E-12	213.2E-12	234.0E-12	40.7E-12
Sigma	-	18.2E-12	20.1E-12	3.7E-12	25.8E-12	13.8E-12	23.2E-12	24.5E-12	28.8E-12	32.8E-12	64.9E-12	21.8E-12	25.0E-12

Measurements

IEBO	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	327.1E-12	339.3E-12	364.2E-12	339.9E-12	353.0E-12	351.5E-12	301.6E-12	350.7E-12	332.2E-12	342.4E-12	320.4E-12	312.1E-12	352.1E-12
OFF_PROTON samples													
5	979.0E-12	1.0E-09	1.1E-09	1.1E-09	1.1E-09	1.3E-09	1.3E-09	1.2E-09	1.3E-09	1.3E-09	1.2E-09	1.3E-09	1.0E-09
6	270.3E-12	313.7E-12	333.2E-12	329.8E-12	353.1E-12	467.2E-12	445.1E-12	399.3E-12	507.5E-12	477.9E-12	465.7E-12	513.4E-12	287.6E-12
7	747.7E-12	754.8E-12	844.5E-12	800.0E-12	868.7E-12	930.0E-12	997.4E-12	856.8E-12	982.2E-12	866.0E-12	959.3E-12	937.2E-12	760.9E-12
Statistics													
Min	270.3E-12	313.7E-12	333.2E-12	329.8E-12	353.1E-12	467.2E-12	445.1E-12	399.3E-12	507.5E-12	477.9E-12	465.7E-12	513.4E-12	287.6E-12
Max	979.0E-12	1.0E-09	1.1E-09	1.1E-09	1.1E-09	1.3E-09	1.3E-09	1.2E-09	1.3E-09	1.3E-09	1.2E-09	1.3E-09	1.0E-09
Average	665.7E-12	693.0E-12	763.2E-12	735.4E-12	779.4E-12	891.4E-12	908.8E-12	804.4E-12	943.5E-12	874.8E-12	874.3E-12	912.8E-12	692.4E-12
Sigma	295.1E-12	287.9E-12	323.0E-12	308.2E-12	317.9E-12	331.7E-12	348.2E-12	311.6E-12	341.3E-12	327.7E-12	305.0E-12	316.6E-12	306.4E-12

Drift Calculation

IEBO	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	-	31.6E-12	132.8E-12	97.4E-12	137.4E-12	298.0E-12	305.0E-12	178.2E-12	361.8E-12	301.4E-12	219.0E-12	308.8E-12	49.6E-12
6	-	43.4E-12	62.9E-12	59.5E-12	82.8E-12	196.9E-12	174.8E-12	129.0E-12	237.2E-12	207.6E-12	195.4E-12	243.1E-12	17.3E-12
7	-	7.1E-12	96.8E-12	52.4E-12	121.0E-12	182.3E-12	249.7E-12	109.2E-12	234.5E-12	118.3E-12	211.6E-12	189.5E-12	13.3E-12
Average	-	27.4E-12	97.5E-12	69.8E-12	113.7E-12	225.8E-12	243.2E-12	138.8E-12	277.9E-12	209.1E-12	208.7E-12	247.1E-12	26.7E-12
Sigma	-	15.1E-12	28.5E-12	19.8E-12	22.9E-12	51.4E-12	53.4E-12	29.0E-12	59.4E-12	74.7E-12	9.9E-12	48.8E-12	16.3E-12

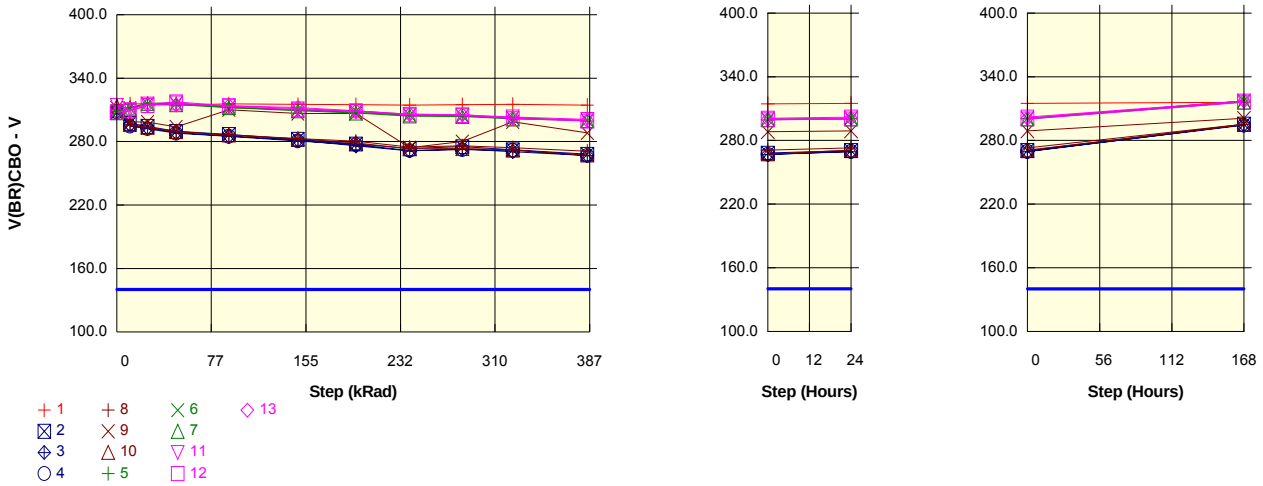
Measurements

IEBO	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	327.1E-12	339.3E-12	364.2E-12	339.9E-12	353.0E-12	351.5E-12	301.6E-12	350.7E-12	332.2E-12	342.4E-12	320.4E-12	312.1E-12	352.1E-12
OFF_TID samples													
11	315.7E-12	327.6E-12	392.7E-12	389.1E-12	408.8E-12	517.4E-12	591.9E-12	545.6E-12	592.8E-12	475.5E-12	558.4E-12	577.0E-12	372.0E-12
12	985.3E-12	946.0E-12	1.1E-09	1.0E-09	1.1E-09	1.2E-09	1.2E-09	1.1E-09	1.3E-09	1.6E-09	1.2E-09	1.2E-09	983.4E-12
13	195.6E-12	220.6E-12	283.1E-12	278.3E-12	292.7E-12	404.1E-12	435.9E-12	350.8E-12	624.0E-12	713.9E-12	411.5E-12	460.1E-12	248.4E-12
Statistics													
Min	195.6E-12	220.6E-12	283.1E-12	278.3E-12	292.7E-12	404.1E-12	435.9E-12	350.8E-12	592.8E-12	475.5E-12	411.5E-12	460.1E-12	248.4E-12
Max	985.3E-12	946.0E-12	1.1E-09	1.0E-09	1.1E-09	1.2E-09	1.2E-09	1.1E-09	1.3E-09	1.6E-09	1.2E-09	1.2E-09	983.4E-12
Average	498.8E-12	498.1E-12	577.0E-12	568.0E-12	594.8E-12	700.7E-12	741.3E-12	664.2E-12	848.9E-12	915.5E-12	708.0E-12	740.0E-12	534.6E-12
Sigma	347.4E-12	319.8E-12	341.1E-12	334.4E-12	348.3E-12	342.5E-12	327.8E-12	315.7E-12	340.3E-12	463.9E-12	321.1E-12	316.8E-12	321.4E-12

Drift Calculation

IEBO	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	-	11.9E-12	77.0E-12	73.4E-12	93.1E-12	201.7E-12	276.2E-12	229.9E-12	277.1E-12	159.9E-12	242.8E-12	261.3E-12	56.3E-12
12	-	-39.2E-12	70.0E-12	51.3E-12	97.5E-12	195.3E-12	210.7E-12	110.9E-12	344.5E-12	571.7E-12	168.9E-12	197.7E-12	-1.8E-12
13	-	25.0E-12	87.5E-12	82.7E-12	97.2E-12	208.6E-12	240.4E-12	155.2E-12	428.4E-12	518.4E-12	215.9E-12	264.5E-12	52.9E-12
Average	-	-780.0E-15	78.2E-12	69.2E-12	95.9E-12	201.9E-12	242.4E-12	165.4E-12	350.0E-12	416.6E-12	209.2E-12	241.2E-12	35.8E-12
Sigma	-	27.7E-12	7.2E-12	13.2E-12	2.0E-12	5.4E-12	26.8E-12	49.1E-12	61.9E-12	182.9E-12	30.5E-12	30.8E-12	26.6E-12

Parameter : Collector-Base breakdown oltage : V(BR)CBO
Test conditions : Ic = 100µA
Unit : V
Spec Limit Min : 140.0
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	313.6	315.73	315.82	314.49	315.82	315.1	314.99	314.41	314.91	315.32	314.47	314.88	315.97
ON_PROTON samples													
2	307.39	297.29	294.31	289.67	286.68	282.14	277.69	273.49	275.15	272.22	268.02	270.38	295.36
3	308.38	295.92	293.01	288.51	285.2	281.29	275.98	271.28	272.89	270.55	266.77	269.52	294.77
4	308.08	294.67	292.18	287.89	284.88	280.55	277.16	271.56	272.37	271.84	266.97	269.66	294.4
Statistics													
Min	307.39	294.67	292.18	287.89	284.88	280.55	275.98	271.28	272.37	270.55	266.77	269.52	294.4
Max	308.38	297.29	294.31	289.67	286.68	282.14	277.69	273.49	275.15	272.22	268.02	270.38	295.36
Average	307.95	295.96	293.17	288.69	285.59	281.33	276.94	272.11	273.47	271.54	267.25	269.85	294.84
Sigma	0.41	1.07	0.88	0.74	0.78	0.65	0.71	0.98	1.21	0.71	0.55	0.38	0.4

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	-	-10.1E+00	-13.1E+00	-17.7E+00	-20.7E+00	-25.3E+00	-29.7E+00	-33.9E+00	-32.2E+00	-35.2E+00	-39.4E+00	-37.0E+00	-12.0E+00
3	-	-12.5E+00	-15.4E+00	-19.9E+00	-23.2E+00	-27.1E+00	-32.4E+00	-37.1E+00	-35.5E+00	-37.8E+00	-41.6E+00	-38.9E+00	-13.6E+00
4	-	-13.4E+00	-15.9E+00	-20.2E+00	-23.2E+00	-27.5E+00	-30.9E+00	-36.5E+00	-35.7E+00	-36.2E+00	-41.1E+00	-38.4E+00	-13.7E+00
Average	-	-12.0E+00	-14.8E+00	-19.3E+00	-22.4E+00	-26.6E+00	-31.0E+00	-35.8E+00	-34.5E+00	-36.4E+00	-40.7E+00	-38.1E+00	-13.1E+00
Sigma	-	1.4E+00	1.2E+00	1.1E+00	1.2E+00	987.6E-03	1.1E+00	1.4E+00	1.6E+00	1.1E+00	960.0E-03	789.1E-03	761.9E-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	313.6	315.73	315.82	314.49	315.82	315.1	314.99	314.41	314.91	315.32	314.47	314.88	315.97
ON_TID samples													
8	314.77	295.66	293.39	289.43	286.35	282.89	280.32	274.87	276.04	274.17	270.88	272.88	295.43
9	312.09	298.68	298.53	293.88	310.05	306.49	306.62	274.24	279.97	298.72	288.15	288.94	300.88
10	313.42	296.1	293.6	289.44	286.07	282.67	278.91	273.18	273.38	272.27	267.22	271.04	294.98
Statistics													
Min	312.09	295.66	293.39	289.43	286.07	282.67	278.91	273.18	273.38	272.27	267.22	271.04	294.98
Max	314.77	298.68	298.53	293.88	310.05	306.49	306.62	274.87	279.97	298.72	288.15	288.94	300.88
Average	313.43	296.81	295.17	290.92	294.16	290.68	288.62	274.1	276.46	281.72	275.42	277.62	297.1
Sigma	1.09	1.33	2.38	2.1	11.24	11.18	12.74	0.7	2.71	12.05	9.13	8.04	2.68

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	-	-19.1E+00	-21.4E+00	-25.3E+00	-28.4E+00	-31.9E+00	-34.4E+00	-39.9E+00	-38.7E+00	-40.6E+00	-43.9E+00	-41.9E+00	-19.3E+00
9	-	-13.4E+00	-13.6E+00	-18.2E+00	-2.0E+00	-5.6E+00	-5.5E+00	-37.9E+00	-32.1E+00	-13.4E+00	-23.9E+00	-23.1E+00	-11.2E+00
10	-	-17.3E+00	-19.8E+00	-24.0E+00	-27.4E+00	-30.8E+00	-34.5E+00	-40.2E+00	-40.0E+00	-41.2E+00	-46.2E+00	-42.4E+00	-18.4E+00
Average	-	-16.6E+00	-18.3E+00	-22.5E+00	-19.3E+00	-22.7E+00	-24.8E+00	-39.3E+00	-37.0E+00	-31.7E+00	-38.0E+00	-35.8E+00	-16.3E+00
Sigma	-	2.4E+00	3.4E+00	3.1E+00	12.2E+00	12.1E+00	13.7E+00	1.1E+00	3.5E+00	13.0E+00	10.0E+00	9.0E+00	3.6E+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	313.6	315.73	315.82	314.49	315.82	315.1	314.99	314.41	314.91	315.32	314.47	314.88	315.97
OFF_PROTON samples													
5	308.47	312.41	316.32	316.31	312.49	310.02	307.7	304.82	304.34	302.65	299.48	300.7	317.21
6	308.12	311.72	315.68	315.92	312.28	309.99	308.56	304.92	304.31	302.26	299.9	300.74	317.19
7	307.68	311.63	315.82	314.95	312.04	309.06	306.97	304.13	303.64	301.47	300.01	300.2	316.12
Statistics													
Min	307.68	311.63	315.68	314.95	312.04	309.06	306.97	304.13	303.64	301.47	299.48	300.2	316.12
Max	308.47	312.41	316.32	316.31	312.49	310.02	308.56	304.92	304.34	302.65	300.01	300.74	317.21
Average	308.09	311.92	315.94	315.73	312.27	309.69	307.74	304.62	304.1	302.13	299.8	300.55	316.84
Sigma	0.32	0.35	0.27	0.57	0.18	0.45	0.65	0.35	0.32	0.49	0.23	0.25	0.51

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	-	3.9E+00	7.9E+00	7.8E+00	4.0E+00	1.5E+00	-770.0E-03	-3.6E+00	-4.1E+00	-5.8E+00	-9.0E+00	-7.8E+00	8.7E+00
6	-	3.6E+00	7.6E+00	7.8E+00	4.2E+00	1.9E+00	440.0E-03	-3.2E+00	-3.8E+00	-5.9E+00	-8.2E+00	-7.4E+00	9.1E+00
7	-	4.0E+00	8.1E+00	7.3E+00	4.4E+00	1.4E+00	-710.0E-03	-3.5E+00	-4.0E+00	-6.2E+00	-7.7E+00	-7.5E+00	8.4E+00
Average	-	3.8E+00	7.9E+00	7.6E+00	4.2E+00	1.6E+00	-346.7E-03	-3.5E+00	-4.0E+00	-6.0E+00	-8.3E+00	-7.5E+00	8.8E+00
Sigma	-	162.7E-03	236.8E-03	259.8E-03	139.5E-03	203.1E-03	556.8E-03	192.9E-03	134.7E-03	175.2E-03	541.4E-03	165.4E-03	257.3E-03

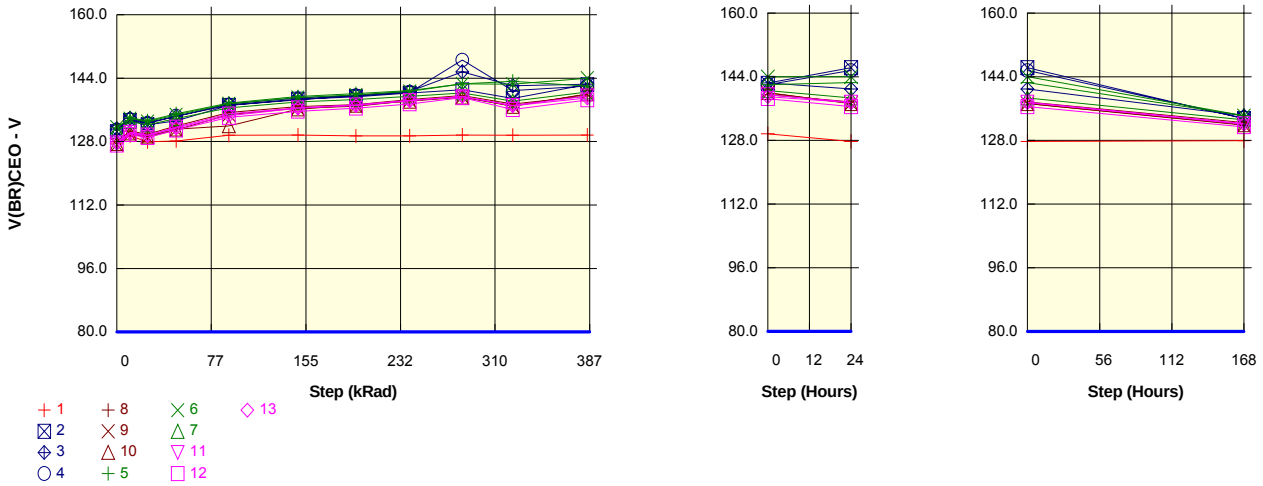
Measurements

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	313.6	315.73	315.82	314.49	315.82	315.1	314.99	314.41	314.91	315.32	314.47	314.88	315.97
OFF_TID samples													
11	314.24	310.25	315.46	317.48	313.89	311.02	308.84	305.98	305.29	303.23	301.05	302.01	317.17
12	307.86	309.11	314.21	316.42	313.38	310.04	309.01	305.11	304.69	301.69	299.48	300.3	315.93
13	307.84	308.97	314.49	314.86	314.06	312.17	309.01	305.82	305.47	302.26	299.98	300.97	317.12
Statistics													
Min	307.84	308.97	314.21	314.86	313.38	310.04	308.84	305.11	304.69	301.69	299.48	300.3	315.93
Max	314.24	310.25	315.46	317.48	314.06	312.17	309.01	305.98	305.47	303.23	301.05	302.01	317.17
Average	309.98	309.44	314.72	316.25	313.78	311.08	308.95	305.64	305.15	302.39	300.17	301.09	316.74
Sigma	3.01	0.57	0.54	1.08	0.29	0.87	0.08	0.38	0.33	0.64	0.65	0.7	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
OFF_TID samples													
11	-	-4.0E+00	1.2E+00	3.2E+00	-350.0E-03	-3.2E+00	-5.4E+00	-8.3E+00	-8.9E+00	-11.0E+00	-13.2E+00	-12.2E+00	2.9E+00
12	-	1.3E+00	6.3E+00	8.6E+00	5.5E+00	2.2E+00	1.1E+00	-2.8E+00	-3.2E+00	-6.2E+00	-8.4E+00	-7.6E+00	8.1E+00
13	-	1.1E+00	6.6E+00	7.0E+00	6.2E+00	4.3E+00	1.2E+00	-2.0E+00	-2.4E+00	-5.6E+00	-7.9E+00	-6.9E+00	9.3E+00
Average	-	-536.7E-03	4.7E+00	6.3E+00	3.8E+00	1.1E+00	-1.0E+00	-4.3E+00	-4.8E+00	-7.6E+00	-9.8E+00	-8.9E+00	6.8E+00
Sigma	-	2.4E+00	2.5E+00	2.2E+00	2.9E+00	3.2E+00	3.1E+00	2.8E+00	2.9E+00	2.4E+00	2.4E+00	2.4E+00	2.8E+00

Parameter : Collector-Emitter Breakdown voltage : V(BR)CEO
Test conditions : Ic = 30mA
Unit : V
Spec Limit Min : 80.0
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	127.64	129.48	127.93	128.19	129.59	129.66	129.42	129.47	129.64	129.62	129.65	127.74	127.94
ON_PROTON samples													
2	130.51	133.32	132.26	133.22	137.15	138.7	139.29	140.21	141.08	138.89	142.39	146.29	133.44
3	131.16	133.88	132.86	134.34	137.45	139.0	139.62	140.62	145.59	142.07	142.5	140.9	134.17
4	130.98	133.56	132.57	134.42	137.16	138.56	139.6	140.38	148.57	140.87	142.0	145.57	133.6
Statistics													
Min	130.51	133.32	132.26	133.22	137.15	138.56	139.29	140.21	141.08	138.89	142.0	140.9	133.44
Max	131.16	133.88	132.86	134.42	137.45	139.0	139.62	140.62	148.57	142.07	142.5	146.29	134.17
Average	130.88	133.58	132.56	133.99	137.25	138.75	139.5	140.4	145.08	140.61	142.3	144.25	133.74
Sigma	0.28	0.23	0.25	0.55	0.14	0.19	0.15	0.17	3.08	1.31	0.21	2.39	0.31

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	-	2.8E+00	1.7E+00	2.7E+00	6.6E+00	8.2E+00	8.8E+00	9.7E+00	10.6E+00	8.4E+00	11.9E+00	15.8E+00	2.9E+00
3	-	2.7E+00	1.7E+00	3.2E+00	6.3E+00	7.8E+00	8.5E+00	9.5E+00	14.4E+00	10.9E+00	11.3E+00	9.7E+00	3.0E+00
4	-	2.6E+00	1.6E+00	3.4E+00	6.2E+00	7.6E+00	8.6E+00	9.4E+00	17.6E+00	9.9E+00	11.0E+00	14.6E+00	2.6E+00
Average	-	2.7E+00	1.7E+00	3.1E+00	6.4E+00	7.9E+00	8.6E+00	9.5E+00	14.2E+00	9.7E+00	11.4E+00	13.4E+00	2.9E+00
Sigma	-	98.6E-03	66.6E-03	299.8E-03	199.5E-03	252.1E-03	129.0E-03	134.6E-03	2.9E+00	1.0E+00	357.3E-03	2.6E+00	170.3E-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	127.64	129.48	127.93	128.19	129.59	129.66	129.42	129.47	129.64	129.62	129.65	127.74	127.94
ON_TID samples													
8	127.99	130.67	129.84	131.97	135.35	136.86	137.34	138.63	139.63	137.45	139.5	137.67	132.49
9	127.21	129.86	129.09	130.96	134.79	136.44	136.94	138.32	139.27	136.97	140.0	137.26	131.84
10	127.53	130.2	129.35	131.14	131.98	136.2	137.16	138.19	139.2	136.93	140.0	137.26	131.94
Statistics													
Min	127.21	129.86	129.09	130.96	131.98	136.2	136.94	138.19	139.2	136.93	139.5	137.26	131.84
Max	127.99	130.67	129.84	131.97	135.35	136.86	137.34	138.63	139.63	137.45	140.0	137.67	132.49
Average	127.58	130.24	129.43	131.36	134.04	136.5	137.15	138.38	139.37	137.12	139.83	137.4	132.09
Sigma	0.32	0.33	0.31	0.44	1.47	0.27	0.17	0.19	0.19	0.24	0.24	0.19	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	-	2.7E+00	1.9E+00	4.0E+00	7.4E+00	8.9E+00	9.4E+00	10.6E+00	11.6E+00	9.5E+00	11.5E+00	9.7E+00	4.5E+00
9	-	2.7E+00	1.9E+00	3.8E+00	7.6E+00	9.2E+00	9.7E+00	11.1E+00	12.1E+00	9.8E+00	12.8E+00	10.1E+00	4.6E+00
10	-	2.7E+00	1.8E+00	3.6E+00	4.5E+00	8.7E+00	9.6E+00	10.7E+00	11.7E+00	9.4E+00	12.5E+00	9.7E+00	4.4E+00
Average	-	2.7E+00	1.9E+00	3.8E+00	6.5E+00	8.9E+00	9.6E+00	10.8E+00	11.8E+00	9.5E+00	12.3E+00	9.8E+00	4.5E+00
Sigma	-	8.2E-03	24.5E-03	151.4E-03	1.4E+00	236.7E-03	160.4E-03	216.1E-03	193.2E-03	159.3E-03	545.2E-03	165.8E-03	92.0E-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	127.64	129.48	127.93	128.19	129.59	129.66	129.42	129.47	129.64	129.62	129.65	127.74	127.94
OFF_PROTON samples													
5	131.47	134.02	133.26	135.04	137.71	139.38	140.12	140.82	142.53	143.21	142.0	142.53	134.27
6	131.62	133.8	133.06	134.76	137.52	139.12	139.8	140.65	142.53	142.48	144.0	144.03	134.18
7	130.57	133.02	132.2	133.8	136.53	137.99	138.64	139.41	140.27	138.23	140.5	138.69	133.19
Statistics													
Min	130.57	133.02	132.2	133.8	136.53	137.99	138.64	139.41	140.27	138.23	140.5	138.69	133.19
Max	131.62	134.02	133.26	135.04	137.71	139.38	140.12	140.82	142.53	143.21	144.0	144.03	134.27
Average	131.22	133.61	132.84	134.54	137.25	138.83	139.52	140.29	141.78	141.31	142.17	141.75	133.88
Sigma	0.46	0.43	0.46	0.53	0.52	0.6	0.64	0.63	1.07	2.2	1.43	2.25	0.49

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	-	2.6E+00	1.8E+00	3.6E+00	6.2E+00	7.9E+00	8.7E+00	9.4E+00	11.1E+00	11.7E+00	10.5E+00	11.1E+00	2.8E+00
6	-	2.2E+00	1.4E+00	3.1E+00	5.9E+00	7.5E+00	8.2E+00	9.0E+00	10.9E+00	10.9E+00	12.4E+00	12.4E+00	2.6E+00
7	-	2.4E+00	1.6E+00	3.2E+00	6.0E+00	7.4E+00	8.1E+00	8.8E+00	9.7E+00	7.7E+00	9.9E+00	8.1E+00	2.6E+00
Average	-	2.4E+00	1.6E+00	3.3E+00	6.0E+00	7.6E+00	8.3E+00	9.1E+00	10.6E+00	10.1E+00	10.9E+00	10.5E+00	2.7E+00
Sigma	-	161.2E-03	142.2E-03	187.6E-03	152.5E-03	220.0E-03	254.4E-03	213.2E-03	609.6E-03	1.8E+00	1.0E+00	1.8E+00	104.5E-03

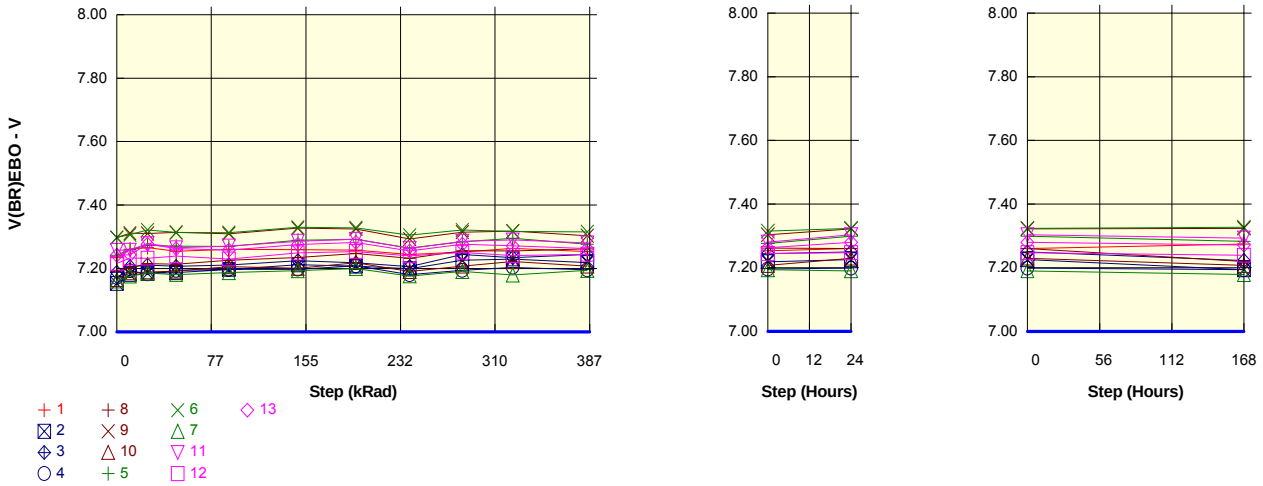
Measurements

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	127.64	129.48	127.93	128.19	129.59	129.66	129.42	129.47	129.64	129.62	129.65	127.74	127.94
OFF_TID samples													
11	127.7	130.36	129.68	131.65	134.98	136.5	137.25	138.39	139.34	137.15	139.5	137.6	132.21
12	127.16	129.79	129.01	130.94	134.1	135.66	136.41	137.49	139.06	136.12	138.5	136.52	131.45
13	127.62	130.12	129.52	131.44	134.57	136.41	137.1	138.29	139.44	137.03	139.0	137.51	132.07
Statistics													
Min	127.16	129.79	129.01	130.94	134.1	135.66	136.41	137.49	139.06	136.12	138.5	136.52	131.45
Max	127.7	130.36	129.68	131.65	134.98	136.5	137.25	138.39	139.44	137.15	139.5	137.6	132.21
Average	127.49	130.09	129.4	131.34	134.55	136.19	136.92	138.06	139.28	136.77	139.0	137.21	131.91
Sigma	0.24	0.23	0.28	0.3	0.36	0.38	0.37	0.4	0.16	0.46	0.41	0.49	0.33

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	-	2.7E+00	2.0E+00	4.0E+00	7.3E+00	8.8E+00	9.6E+00	10.7E+00	11.6E+00	9.5E+00	11.8E+00	9.9E+00	4.5E+00
12	-	2.6E+00	1.9E+00	3.8E+00	6.9E+00	8.5E+00	9.2E+00	10.3E+00	11.9E+00	9.0E+00	11.3E+00	9.4E+00	4.3E+00
13	-	2.5E+00	1.9E+00	3.8E+00	6.9E+00	8.8E+00	9.5E+00	10.7E+00	11.8E+00	9.4E+00	11.4E+00	9.9E+00	4.5E+00
Average	-	2.6E+00	1.9E+00	3.8E+00	7.1E+00	8.7E+00	9.4E+00	10.6E+00	11.8E+00	9.3E+00	11.5E+00	9.7E+00	4.4E+00
Sigma	-	68.5E-03	52.6E-03	74.1E-03	162.2E-03	138.7E-03	129.7E-03	166.6E-03	106.9E-03	223.2E-03	209.9E-03	253.2E-03	94.2E-03

Parameter : Emitter-Base breakdown oltage : V(BR)EBO
Test conditions : Ie = 100µA
Unit : V
Spec Limit Min : 7.00
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	7.234	7.26	7.266	7.254	7.26	7.26	7.258	7.244	7.252	7.264	7.253	7.26	7.274
ON_PROTON samples													
2	7.153	7.181	7.184	7.187	7.197	7.212	7.208	7.199	7.226	7.23	7.219	7.225	7.194
3	7.188	7.206	7.211	7.206	7.211	7.225	7.218	7.206	7.244	7.234	7.244	7.25	7.223
4	7.172	7.193	7.182	7.194	7.197	7.198	7.208	7.18	7.194	7.204	7.196	7.199	7.194
Statistics													
Min	7.153	7.181	7.182	7.187	7.197	7.198	7.208	7.18	7.194	7.204	7.196	7.199	7.194
Max	7.188	7.206	7.211	7.206	7.211	7.225	7.218	7.206	7.244	7.234	7.244	7.25	7.223
Average	7.171	7.193	7.193	7.196	7.202	7.211	7.211	7.195	7.221	7.223	7.219	7.225	7.204
Sigma	0.014	0.01	0.013	0.008	0.007	0.011	0.005	0.011	0.021	0.013	0.02	0.021	0.014

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	-	28.0E-03	31.6E-03	34.4E-03	44.0E-03	58.8E-03	54.8E-03	46.4E-03	73.6E-03	77.2E-03	66.0E-03	72.4E-03	41.2E-03
3	-	18.4E-03	23.6E-03	18.8E-03	23.6E-03	37.2E-03	30.4E-03	18.0E-03	56.0E-03	46.4E-03	56.4E-03	62.4E-03	35.2E-03
4	-	21.2E-03	10.8E-03	22.4E-03	25.6E-03	26.0E-03	36.8E-03	8.4E-03	22.4E-03	32.0E-03	24.0E-03	27.2E-03	22.4E-03
Average	-	22.5E-03	22.0E-03	25.2E-03	31.1E-03	40.7E-03	40.7E-03	24.3E-03	50.7E-03	51.9E-03	48.8E-03	54.0E-03	32.9E-03
Sigma	-	4.0E-03	8.6E-03	6.7E-03	9.2E-03	13.6E-03	10.3E-03	16.1E-03	21.2E-03	18.9E-03	18.0E-03	19.4E-03	7.8E-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	7.234	7.26	7.266	7.254	7.26	7.26	7.258	7.244	7.252	7.264	7.253	7.26	7.274
ON_TID samples													
8	7.192	7.202	7.215	7.213	7.226	7.234	7.248	7.232	7.256	7.255	7.262	7.26	7.22
9	7.297	7.311	7.31	7.314	7.31	7.327	7.324	7.293	7.315	7.318	7.304	7.322	7.324
10	7.165	7.186	7.189	7.191	7.206	7.201	7.218	7.19	7.208	7.222	7.208	7.23	7.208
Statistics													
Min	7.165	7.186	7.189	7.191	7.206	7.201	7.218	7.19	7.208	7.222	7.208	7.23	7.208
Max	7.297	7.311	7.31	7.314	7.31	7.327	7.324	7.293	7.315	7.318	7.304	7.322	7.324
Average	7.218	7.233	7.238	7.239	7.247	7.254	7.263	7.239	7.259	7.265	7.258	7.271	7.25
Sigma	0.057	0.055	0.052	0.053	0.045	0.053	0.045	0.042	0.044	0.04	0.039	0.038	0.052

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	-	9.2E-03	22.4E-03	20.8E-03	33.6E-03	42.0E-03	55.2E-03	40.0E-03	63.6E-03	62.8E-03	69.6E-03	68.0E-03	27.2E-03
9	-	13.6E-03	13.2E-03	16.4E-03	12.4E-03	29.6E-03	27.2E-03	-4.4E-03	17.6E-03	20.8E-03	6.4E-03	25.2E-03	26.8E-03
10	-	21.6E-03	24.4E-03	26.4E-03	41.2E-03	36.0E-03	53.2E-03	25.6E-03	42.8E-03	56.8E-03	42.8E-03	65.2E-03	42.8E-03
Average	-	14.8E-03	20.0E-03	21.2E-03	29.1E-03	35.9E-03	45.2E-03	20.4E-03	41.3E-03	46.8E-03	39.6E-03	52.8E-03	32.3E-03
Sigma	-	5.1E-03	4.9E-03	4.1E-03	12.2E-03	5.1E-03	12.8E-03	18.5E-03	18.8E-03	18.5E-03	25.9E-03	19.5E-03	7.4E-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	7.234	7.26	7.266	7.254	7.26	7.26	7.258	7.244	7.252	7.264	7.253	7.26	7.274
OFF_PROTON samples													
5	7.241	7.26	7.273	7.27	7.269	7.289	7.291	7.264	7.284	7.295	7.276	7.299	7.283
6	7.298	7.307	7.322	7.313	7.313	7.33	7.328	7.305	7.321	7.317	7.315	7.324	7.327
7	7.161	7.176	7.186	7.181	7.187	7.193	7.20	7.176	7.191	7.18	7.194	7.19	7.179
Statistics													
Min	7.161	7.176	7.186	7.181	7.187	7.193	7.20	7.176	7.191	7.18	7.194	7.19	7.179
Max	7.298	7.307	7.322	7.313	7.313	7.33	7.328	7.305	7.321	7.317	7.315	7.324	7.327
Average	7.233	7.248	7.26	7.255	7.256	7.271	7.273	7.248	7.265	7.264	7.262	7.271	7.263
Sigma	0.056	0.054	0.056	0.055	0.052	0.057	0.054	0.054	0.055	0.06	0.051	0.058	0.062

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	-	19.2E-03	31.6E-03	29.2E-03	28.0E-03	47.6E-03	50.0E-03	22.8E-03	42.8E-03	54.0E-03	35.2E-03	58.0E-03	42.0E-03
6	-	9.2E-03	24.0E-03	15.6E-03	15.2E-03	32.0E-03	30.8E-03	7.2E-03	23.6E-03	19.6E-03	17.6E-03	26.4E-03	29.6E-03
7	-	14.8E-03	24.8E-03	20.0E-03	26.0E-03	32.4E-03	38.8E-03	15.6E-03	30.0E-03	18.8E-03	32.8E-03	29.2E-03	18.0E-03
Average	-	14.4E-03	26.8E-03	21.6E-03	23.1E-03	37.3E-03	39.9E-03	15.2E-03	32.1E-03	30.8E-03	28.5E-03	37.9E-03	29.9E-03
Sigma	-	4.1E-03	3.4E-03	5.7E-03	5.6E-03	7.3E-03	7.9E-03	6.4E-03	8.0E-03	16.4E-03	7.8E-03	14.3E-03	9.8E-03

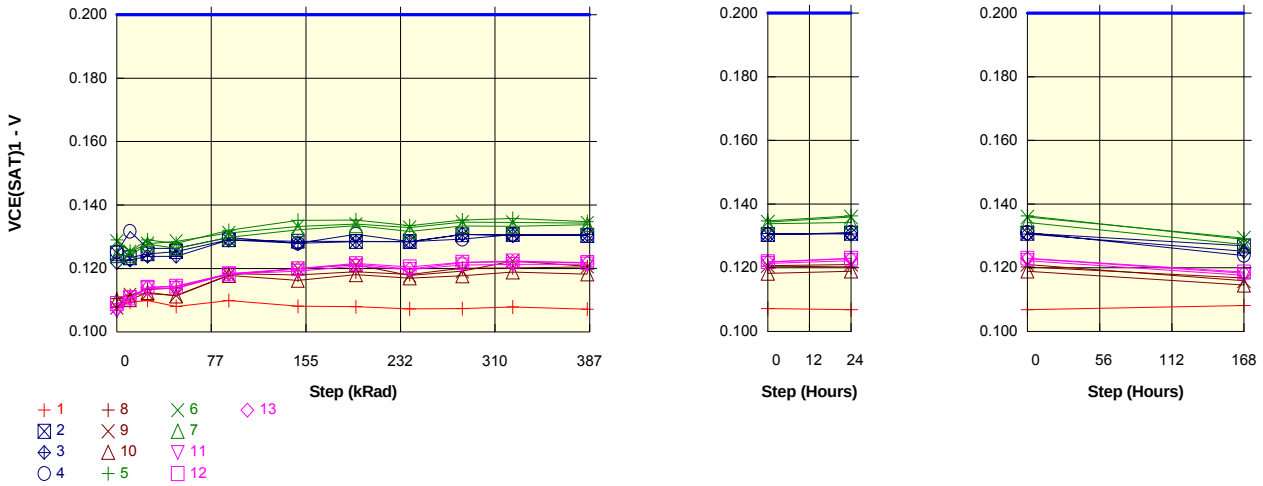
Measurements

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	7.234	7.26	7.266	7.254	7.26	7.26	7.258	7.244	7.252	7.264	7.253	7.26	7.274
OFF_TID samples													
11	7.257	7.258	7.278	7.266	7.27	7.286	7.292	7.263	7.286	7.29	7.28	7.303	7.293
12	7.216	7.233	7.232	7.239	7.23	7.249	7.254	7.24	7.251	7.24	7.245	7.247	7.239
13	7.242	7.243	7.277	7.262	7.258	7.276	7.282	7.255	7.276	7.271	7.262	7.28	7.271
Statistics													
Min	7.216	7.233	7.232	7.239	7.23	7.249	7.254	7.24	7.251	7.24	7.245	7.247	7.239
Max	7.257	7.258	7.278	7.266	7.27	7.286	7.292	7.263	7.286	7.29	7.28	7.303	7.293
Average	7.239	7.245	7.263	7.256	7.253	7.27	7.276	7.253	7.271	7.267	7.263	7.277	7.268
Sigma	0.017	0.01	0.021	0.012	0.017	0.015	0.016	0.01	0.015	0.02	0.015	0.023	0.022

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	-	800.1E-06	21.2E-03	8.4E-03	13.2E-03	28.4E-03	34.8E-03	6.0E-03	28.8E-03	32.4E-03	23.2E-03	46.0E-03	36.0E-03
12	-	16.8E-03	16.0E-03	22.8E-03	13.6E-03	32.8E-03	37.2E-03	23.2E-03	34.8E-03	24.0E-03	28.4E-03	30.8E-03	22.8E-03
13	-	800.1E-06	34.8E-03	20.4E-03	15.6E-03	33.6E-03	40.0E-03	12.8E-03	34.4E-03	28.8E-03	20.4E-03	38.0E-03	29.2E-03
Average	-	6.1E-03	24.0E-03	17.2E-03	14.1E-03	31.6E-03	37.3E-03	14.0E-03	32.7E-03	28.4E-03	24.0E-03	38.3E-03	29.3E-03
Sigma	-	7.5E-03	7.9E-03	6.3E-03	1.0E-03	2.3E-03	2.1E-03	7.1E-03	2.7E-03	3.4E-03	3.3E-03	6.2E-03	5.4E-03

Parameter : Collector-Emitter saturation voltage : VCE(SAT)1
Test conditions : Ic = 150mA ; Ib = 15mA
Unit : V
Spec Limit Max : 0.200
Spec limits are represented in bold lines on the graphic.



Measurements

VCE(SAT)1	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	0.1079	0.1094	0.1099	0.108	0.1099	0.1081	0.1079	0.1072	0.1073	0.1078	0.1072	0.1068	0.1081
ON_PROTON samples													
2	0.1248	0.1234	0.1246	0.1253	0.129	0.1286	0.1285	0.1285	0.1306	0.1307	0.1304	0.1308	0.1268
3	0.1219	0.1227	0.1238	0.1238	0.129	0.128	0.1284	0.1284	0.1308	0.1303	0.1308	0.1306	0.1252
4	0.1252	0.1317	0.1263	0.1264	0.1298	0.128	0.1308	0.1285	0.1292	0.1306	0.1304	0.131	0.1238
Statistics													
Min	0.1219	0.1227	0.1238	0.1238	0.129	0.128	0.1284	0.1284	0.1292	0.1303	0.1304	0.1306	0.1238
Max	0.1252	0.1317	0.1263	0.1264	0.1298	0.1286	0.1308	0.1285	0.1308	0.1307	0.1308	0.131	0.1268
Average	0.124	0.1259	0.1249	0.1252	0.1293	0.1282	0.1293	0.1285	0.1302	0.1306	0.1305	0.1308	0.1253
Sigma	0.0015	0.0041	0.001	0.001	0.0004	0.0003	0.0011	0.000	0.0007	0.0002	0.0002	0.0002	0.0012

Drift Calculation

VCE(SAT)1	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	-240.0E-06	480.0E-06	4.2E-03	3.8E-03	3.7E-03	3.6E-03	5.8E-03	5.9E-03	5.6E-03	6.0E-03	2.0E-03
3	-	800.0E-06	2.0E-03	2.0E-03	7.1E-03	6.1E-03	6.6E-03	6.6E-03	8.9E-03	8.4E-03	8.9E-03	8.7E-03	3.3E-03
4	-	6.5E-03	1.1E-03	1.2E-03	4.6E-03	2.8E-03	5.6E-03	3.3E-03	4.0E-03	5.4E-03	5.2E-03	5.8E-03	-1.4E-03
Average	-	1.9E-03	946.7E-06	1.2E-03	5.3E-03	4.2E-03	5.3E-03	4.5E-03	6.2E-03	6.6E-03	6.6E-03	6.8E-03	1.3E-03
Sigma	-	3.3E-03	906.5E-06	604.9E-06	1.3E-03	1.4E-03	1.2E-03	1.5E-03	2.0E-03	1.3E-03	1.6E-03	1.3E-03	2.0E-03

Measurements

VCE(SAT)1	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	0.1079	0.1094	0.1099	0.108	0.1099	0.1081	0.1079	0.1072	0.1073	0.1078	0.1072	0.1068	0.1081
ON_TID samples													
8	0.1105	0.1116	0.1134	0.1138	0.1184	0.1179	0.119	0.1181	0.1201	0.1202	0.1205	0.1202	0.1168
9	0.1076	0.1117	0.1121	0.1115	0.118	0.120	0.1212	0.1178	0.1192	0.1224	0.1206	0.121	0.1159
10	0.110	0.1102	0.1124	0.1113	0.1178	0.1162	0.118	0.117	0.1177	0.1189	0.1182	0.1189	0.1146
Statistics													
Min	0.1076	0.1102	0.1121	0.1113	0.1178	0.1162	0.118	0.117	0.1177	0.1189	0.1182	0.1189	0.1146
Max	0.1105	0.1117	0.1134	0.1138	0.1184	0.120	0.1212	0.1181	0.1201	0.1224	0.1206	0.121	0.1168
Average	0.1094	0.1111	0.1127	0.1122	0.118	0.118	0.1194	0.1176	0.119	0.1205	0.1198	0.1201	0.1157
Sigma	0.0012	0.0007	0.0005	0.0011	0.0002	0.0015	0.0013	0.0005	0.001	0.0015	0.0011	0.0009	0.0009

Drift Calculation

VCE(SAT)1	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	2.9E-03	3.3E-03	7.9E-03	7.4E-03	8.5E-03	7.6E-03	9.6E-03	9.7E-03	10.0E-03	9.8E-03	6.3E-03
9	-	4.1E-03	4.5E-03	3.9E-03	10.3E-03	12.3E-03	13.6E-03	10.2E-03	11.5E-03	14.8E-03	13.0E-03	13.4E-03	8.2E-03
10	-	200.0E-06	2.5E-03	1.4E-03	7.8E-03	6.3E-03	8.1E-03	7.0E-03	7.8E-03	8.9E-03	8.3E-03	9.0E-03	4.6E-03
Average	-	1.8E-03	3.3E-03	2.9E-03	8.7E-03	8.7E-03	10.0E-03	8.3E-03	9.6E-03	11.1E-03	10.4E-03	10.7E-03	6.4E-03
Sigma	-	1.7E-03	858.1E-06	1.1E-03	1.2E-03	2.6E-03	2.5E-03	1.4E-03	1.5E-03	2.6E-03	2.0E-03	1.9E-03	1.5E-03

Measurements

VCE(SAT)1	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	0.1079	0.1094	0.1099	0.108	0.1099	0.1081	0.1079	0.1072	0.1073	0.1078	0.1072	0.1068	0.1081
OFF_PROTON samples													
5	0.129	0.1254	0.129	0.1279	0.132	0.1352	0.1353	0.1335	0.1352	0.1358	0.1348	0.1362	0.1289
6	0.1286	0.1252	0.1278	0.1286	0.1312	0.1332	0.134	0.1329	0.1346	0.1345	0.1343	0.1359	0.1294
7	0.1241	0.1242	0.1277	0.1264	0.1298	0.1322	0.1334	0.1317	0.1334	0.1333	0.1338	0.1342	0.1273
Statistics													
Min	0.1241	0.1242	0.1277	0.1264	0.1298	0.1322	0.1334	0.1317	0.1334	0.1333	0.1338	0.1342	0.1273
Max	0.129	0.1254	0.129	0.1286	0.132	0.1352	0.1353	0.1335	0.1352	0.1358	0.1348	0.1362	0.1294
Average	0.1272	0.1249	0.1282	0.1276	0.131	0.1336	0.1342	0.1327	0.1344	0.1345	0.1343	0.1355	0.1285
Sigma	0.0022	0.0006	0.0006	0.0009	0.0009	0.0012	0.0008	0.0007	0.0008	0.001	0.0004	0.0009	0.0009

Drift Calculation

VCE(SAT)1	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	-	-3.6E-03	0.0E+00	-1.0E-03	3.0E-03	6.2E-03	6.3E-03	4.5E-03	6.3E-03	6.8E-03	5.8E-03	7.3E-03	-80.0E-06
6	-	-3.3E-03	-760.0E-06	0.0E+00	2.6E-03	4.7E-03	5.4E-03	4.4E-03	6.0E-03	6.0E-03	5.8E-03	7.4E-03	800.0E-06
7	-	40.0E-06	3.6E-03	2.2E-03	5.7E-03	8.1E-03	9.3E-03	7.6E-03	9.3E-03	9.2E-03	9.7E-03	10.1E-03	3.2E-03
Average	-	-2.3E-03	946.7E-06	400.0E-06	3.8E-03	6.3E-03	7.0E-03	5.5E-03	7.2E-03	7.3E-03	7.1E-03	8.3E-03	1.3E-03
Sigma	-	1.6E-03	1.9E-03	1.4E-03	1.3E-03	1.4E-03	1.7E-03	1.5E-03	1.5E-03	1.3E-03	1.8E-03	1.3E-03	1.4E-03

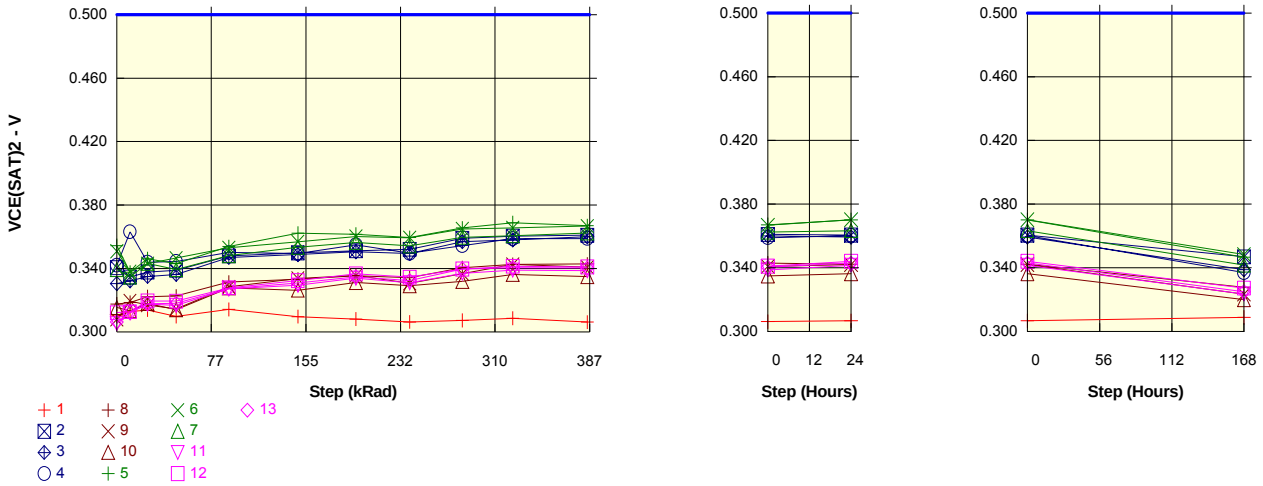
Measurements

VCE(SAT)1	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	0.1079	0.1094	0.1099	0.108	0.1099	0.1081	0.1079	0.1072	0.1073	0.1078	0.1072	0.1068	0.1081
OFF_TID samples													
11	0.1067	0.1107	0.1137	0.1137	0.1182	0.1191	0.1207	0.1197	0.1211	0.1213	0.1214	0.1222	0.1176
12	0.109	0.1107	0.114	0.1144	0.1183	0.120	0.1216	0.1205	0.1219	0.1224	0.1219	0.123	0.1186
13	0.1071	0.1106	0.114	0.1142	0.1184	0.1198	0.1213	0.1198	0.1219	0.1221	0.1218	0.1229	0.1183
Statistics													
Min	0.1067	0.1106	0.1137	0.1137	0.1182	0.1191	0.1207	0.1197	0.1211	0.1213	0.1214	0.1222	0.1176
Max	0.109	0.1107	0.114	0.1144	0.1184	0.120	0.1216	0.1205	0.1219	0.1224	0.1219	0.123	0.1186
Average	0.1076	0.1107	0.1139	0.1141	0.1183	0.1196	0.1212	0.120	0.1216	0.1219	0.1217	0.1227	0.1182
Sigma	0.001	0.0001	0.0002	0.0003	0.0001	0.0004	0.0004	0.0003	0.0004	0.0005	0.0002	0.0004	0.0004

Drift Calculation

VCE(SAT)1	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	-	4.0E-03	7.0E-03	7.0E-03	11.5E-03	12.4E-03	14.0E-03	13.0E-03	14.4E-03	14.6E-03	14.7E-03	15.5E-03	10.9E-03
12	-	1.8E-03	5.1E-03	5.5E-03	9.3E-03	11.0E-03	12.6E-03	11.5E-03	13.0E-03	13.4E-03	12.9E-03	14.0E-03	9.7E-03
13	-	3.4E-03	6.9E-03	7.1E-03	11.2E-03	12.7E-03	14.2E-03	12.7E-03	14.8E-03	15.0E-03	14.7E-03	15.8E-03	11.2E-03
Average	-	3.1E-03	6.3E-03	6.5E-03	10.7E-03	12.0E-03	13.6E-03	12.4E-03	14.1E-03	14.3E-03	14.1E-03	15.1E-03	10.6E-03
Sigma	-	965.0E-06	878.2E-06	745.0E-06	977.8E-06	741.9E-06	719.5E-06	641.9E-06	784.1E-06	666.9E-06	829.7E-06	760.6E-06	660.5E-06

Parameter : Collector-Emitter saturation voltage : VCE(SAT)2
Test conditions : Ic = 500mA ; Ib = 50mA
Unit : V
Spec Limit Max : 0.500
Spec limits are represented in bold lines on the graphic.



Measurements

VCE(SAT)2	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	0.310	0.3128	0.3138	0.3098	0.3142	0.3097	0.308	0.3063	0.3073	0.3086	0.3062	0.3066	0.3088
ON_PROTON samples													
2	0.3405	0.3345	0.3378	0.3388	0.3479	0.3498	0.3512	0.3521	0.359	0.3604	0.361	0.3605	0.3469
3	0.3304	0.3321	0.335	0.3362	0.347	0.3488	0.3504	0.3495	0.3569	0.358	0.360	0.3593	0.3388
4	0.3421	0.3631	0.3438	0.3444	0.3501	0.3495	0.3549	0.3496	0.3544	0.3588	0.3589	0.3602	0.337
Statistics													
Min	0.3304	0.3321	0.335	0.3362	0.347	0.3488	0.3504	0.3495	0.3544	0.358	0.3589	0.3593	0.337
Max	0.3421	0.3631	0.3438	0.3444	0.3501	0.3498	0.3549	0.3521	0.359	0.3604	0.361	0.3605	0.3469
Average	0.3377	0.3433	0.3389	0.3398	0.3483	0.3494	0.3522	0.3504	0.3568	0.3591	0.360	0.360	0.3409
Sigma	0.0052	0.0141	0.0037	0.0034	0.0013	0.0004	0.002	0.0012	0.0019	0.001	0.0009	0.0005	0.0043

Drift Calculation

VCE(SAT)2	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	-	-6.0E-03	-2.7E-03	-1.6E-03	7.4E-03	9.3E-03	10.7E-03	11.6E-03	18.5E-03	19.9E-03	20.5E-03	20.0E-03	6.4E-03
3	-	1.7E-03	4.5E-03	5.8E-03	16.6E-03	18.3E-03	20.0E-03	19.1E-03	26.5E-03	27.5E-03	29.6E-03	28.8E-03	8.4E-03
4	-	21.0E-03	1.8E-03	2.3E-03	8.0E-03	7.4E-03	12.8E-03	7.6E-03	12.3E-03	16.8E-03	16.8E-03	18.1E-03	-5.1E-03
Average	-	5.6E-03	1.2E-03	2.1E-03	10.7E-03	11.7E-03	14.5E-03	12.7E-03	19.1E-03	21.4E-03	22.3E-03	22.3E-03	3.2E-03
Sigma	-	11.4E-03	3.0E-03	3.0E-03	4.2E-03	4.7E-03	4.0E-03	4.8E-03	5.8E-03	4.5E-03	5.4E-03	4.7E-03	5.9E-03

Measurements

VCE(SAT)2	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	0.310	0.3128	0.3138	0.3098	0.3142	0.3097	0.308	0.3063	0.3073	0.3086	0.3062	0.3066	0.3088
ON_TID samples													
8	0.3176	0.3186	0.3222	0.3226	0.3314	0.3332	0.3354	0.3342	0.3405	0.3426	0.3428	0.3422	0.3278
9	0.3078	0.3195	0.3168	0.3145	0.3284	0.3337	0.3356	0.3306	0.3367	0.3426	0.3408	0.342	0.3234
10	0.3153	0.3134	0.318	0.314	0.3277	0.3263	0.3312	0.3291	0.3318	0.3363	0.3349	0.3362	0.3199
Statistics													
Min	0.3078	0.3134	0.3168	0.314	0.3277	0.3263	0.3312	0.3291	0.3318	0.3363	0.3349	0.3362	0.3199
Max	0.3176	0.3195	0.3222	0.3226	0.3314	0.3337	0.3356	0.3342	0.3405	0.3426	0.3428	0.3422	0.3278
Average	0.3136	0.3172	0.319	0.317	0.3292	0.3311	0.3341	0.3313	0.3363	0.3405	0.3395	0.3401	0.3237
Sigma	0.0042	0.0027	0.0023	0.0039	0.0016	0.0034	0.002	0.0021	0.0036	0.003	0.0034	0.0028	0.0032

Drift Calculation

VCE(SAT)2	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	-	1000.0E-06	4.6E-03	5.0E-03	13.8E-03	15.6E-03	17.8E-03	16.6E-03	22.9E-03	25.0E-03	25.2E-03	24.6E-03	10.2E-03
9	-	11.7E-03	9.0E-03	6.7E-03	20.6E-03	25.9E-03	27.8E-03	22.8E-03	28.9E-03	34.8E-03	33.0E-03	34.2E-03	15.6E-03
10	-	-2.0E-03	2.6E-03	-1.3E-03	12.4E-03	11.0E-03	15.9E-03	13.8E-03	16.4E-03	21.0E-03	19.6E-03	20.9E-03	4.6E-03
Average	-	3.6E-03	5.4E-03	3.5E-03	15.6E-03	17.5E-03	20.5E-03	17.8E-03	22.7E-03	26.9E-03	25.9E-03	26.6E-03	10.1E-03
Sigma	-	5.9E-03	2.7E-03	3.4E-03	3.6E-03	6.2E-03	5.2E-03	3.8E-03	5.1E-03	5.8E-03	5.5E-03	5.6E-03	4.5E-03

Measurements

VCE(SAT)2	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	0.310	0.3128	0.3138	0.3098	0.3142	0.3097	0.308	0.3063	0.3073	0.3086	0.3062	0.3066	0.3088
OFF_PROTON samples													
5	0.3544	0.3376	0.3462	0.3431	0.3538	0.3622	0.3616	0.3596	0.3655	0.3688	0.367	0.370	0.3466
6	0.3509	0.3379	0.343	0.3465	0.3531	0.3568	0.3602	0.3594	0.365	0.3656	0.3667	0.3702	0.3484
7	0.3393	0.3346	0.3432	0.3392	0.3481	0.3534	0.3564	0.3542	0.3597	0.3607	0.3623	0.3633	0.3417
Statistics													
Min	0.3393	0.3346	0.343	0.3392	0.3481	0.3534	0.3564	0.3542	0.3597	0.3607	0.3623	0.3633	0.3417
Max	0.3544	0.3379	0.3462	0.3465	0.3538	0.3622	0.3616	0.3596	0.3655	0.3688	0.367	0.3702	0.3484
Average	0.3482	0.3367	0.3441	0.3429	0.3517	0.3575	0.3594	0.3577	0.3634	0.3651	0.3653	0.3678	0.3456
Sigma	0.0065	0.0015	0.0015	0.003	0.0025	0.0036	0.0022	0.0025	0.0026	0.0033	0.0021	0.0032	0.0028

Drift Calculation

VCE(SAT)2	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	-	-16.8E-03	-8.2E-03	-11.3E-03	-560.0E-06	7.8E-03	7.2E-03	5.2E-03	11.1E-03	14.4E-03	12.6E-03	15.6E-03	-7.8E-03
6	-	-13.0E-03	-7.9E-03	-4.4E-03	2.2E-03	6.0E-03	9.3E-03	8.5E-03	14.1E-03	14.7E-03	15.8E-03	19.3E-03	-2.5E-03
7	-	-4.6E-03	3.9E-03	-40.0E-06	8.8E-03	14.1E-03	17.1E-03	15.0E-03	20.4E-03	21.4E-03	23.0E-03	24.0E-03	2.4E-03
Average	-	-11.5E-03	-4.1E-03	-5.2E-03	3.5E-03	9.3E-03	11.2E-03	9.5E-03	15.2E-03	16.9E-03	17.1E-03	19.7E-03	-2.6E-03
Sigma	-	5.1E-03	5.6E-03	4.6E-03	3.9E-03	3.5E-03	4.3E-03	4.1E-03	3.9E-03	3.2E-03	4.4E-03	3.4E-03	4.2E-03

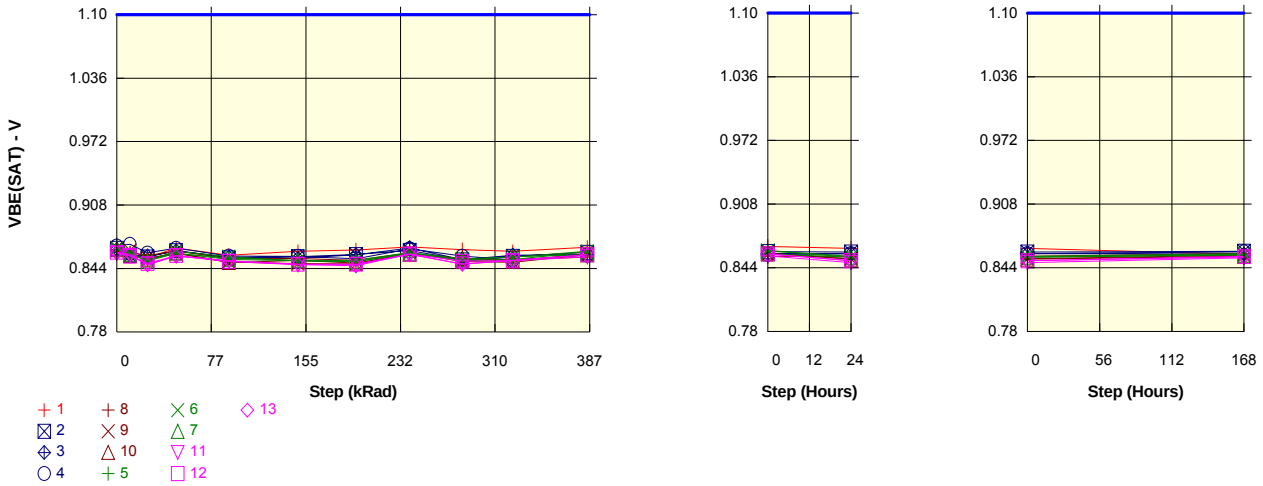
Measurements

VCE(SAT)2	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	0.310	0.3128	0.3138	0.3098	0.3142	0.3097	0.308	0.3063	0.3073	0.3086	0.3062	0.3066	0.3088
OFF_TID samples													
11	0.3052	0.3122	0.3176	0.3167	0.3271	0.3295	0.3339	0.331	0.337	0.339	0.3386	0.3416	0.3235
12	0.3121	0.3127	0.3195	0.3194	0.3278	0.3323	0.3366	0.3345	0.3396	0.3414	0.341	0.344	0.3272
13	0.3063	0.312	0.3178	0.3181	0.3273	0.3308	0.3348	0.3324	0.3397	0.3406	0.3403	0.343	0.3249
Statistics													
Min	0.3052	0.312	0.3176	0.3167	0.3271	0.3295	0.3339	0.331	0.337	0.339	0.3386	0.3416	0.3235
Max	0.3121	0.3127	0.3195	0.3194	0.3278	0.3323	0.3366	0.3345	0.3397	0.3414	0.341	0.344	0.3272
Average	0.3079	0.3123	0.3183	0.3181	0.3274	0.3309	0.3351	0.3326	0.3388	0.3403	0.340	0.3429	0.3252
Sigma	0.003	0.0003	0.0009	0.0011	0.0003	0.0012	0.0011	0.0014	0.0013	0.001	0.001	0.001	0.0015

Drift Calculation

VCE(SAT)2	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	-	7.0E-03	12.4E-03	11.5E-03	21.9E-03	24.3E-03	28.7E-03	25.8E-03	31.8E-03	33.8E-03	33.4E-03	36.4E-03	18.3E-03
12	-	640.0E-06	7.4E-03	7.3E-03	15.8E-03	20.2E-03	24.5E-03	22.4E-03	27.6E-03	29.3E-03	29.0E-03	32.0E-03	15.1E-03
13	-	5.7E-03	11.5E-03	11.8E-03	21.0E-03	24.5E-03	28.5E-03	26.1E-03	33.4E-03	34.3E-03	34.0E-03	36.7E-03	18.6E-03
Average	-	4.5E-03	10.4E-03	10.2E-03	19.6E-03	23.0E-03	27.2E-03	24.8E-03	30.9E-03	32.5E-03	32.1E-03	35.0E-03	17.4E-03
Sigma	-	2.8E-03	2.1E-03	2.1E-03	2.7E-03	2.0E-03	1.9E-03	1.7E-03	2.5E-03	2.2E-03	2.3E-03	2.2E-03	1.6E-03

Parameter : Base-Emitter saturation voltage : VBE(SAT)
Test conditions : Ic = 150mA ; Ib = 15mA
Unit : V
Spec Limit Max : 1.10
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	0.868	0.856	0.855	0.865	0.857	0.861	0.863	0.866	0.863	0.861	0.865	0.864	0.858
ON_PROTON samples													
2	0.864	0.857	0.856	0.862	0.855	0.856	0.858	0.862	0.853	0.856	0.86	0.86	0.861
3	0.863	0.857	0.856	0.862	0.855	0.854	0.858	0.865	0.853	0.857	0.858	0.858	0.858
4	0.867	0.868	0.86	0.864	0.856	0.856	0.854	0.864	0.857	0.853	0.857	0.858	0.86
Statistics													
Min	0.863	0.857	0.856	0.862	0.855	0.854	0.854	0.862	0.853	0.853	0.857	0.858	0.858
Max	0.867	0.868	0.86	0.864	0.856	0.856	0.858	0.865	0.857	0.857	0.86	0.86	0.861
Average	0.865	0.861	0.857	0.863	0.855	0.855	0.857	0.864	0.854	0.855	0.859	0.859	0.859
Sigma	0.001	0.005	0.002	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.001	0.001	0.001

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	-	-7.0E-03	-8.5E-03	-2.3E-03	-9.6E-03	-8.4E-03	-6.2E-03	-2.0E-03	-11.6E-03	-8.2E-03	-4.0E-03	-4.5E-03	-3.6E-03
3	-	-6.3E-03	-7.1E-03	-1.6E-03	-8.1E-03	-9.0E-03	-5.5E-03	1.2E-03	-10.3E-03	-6.1E-03	-5.2E-03	-5.2E-03	-5.6E-03
4	-	1.8E-03	-7.1E-03	-2.2E-03	-10.3E-03	-10.5E-03	-12.8E-03	-2.8E-03	-10.2E-03	-14.0E-03	-9.4E-03	-8.5E-03	-6.6E-03
Average	-	-3.8E-03	-7.6E-03	-2.0E-03	-9.3E-03	-9.3E-03	-8.2E-03	-1.2E-03	-10.7E-03	-9.4E-03	-6.2E-03	-6.1E-03	-5.3E-03
Sigma	-	4.0E-03	678.8E-06	322.2E-06	898.0E-06	856.1E-06	3.3E-03	1.7E-03	625.6E-06	3.4E-03	2.3E-03	1.7E-03	1.2E-03

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	0.868	0.856	0.855	0.865	0.857	0.861	0.863	0.866	0.863	0.861	0.865	0.864	0.858
ON_TID samples													
8	0.861	0.86	0.857	0.862	0.854	0.854	0.852	0.86	0.852	0.853	0.855	0.856	0.858
9	0.865	0.862	0.854	0.859	0.851	0.849	0.849	0.86	0.851	0.85	0.858	0.853	0.857
10	0.863	0.857	0.854	0.86	0.85	0.852	0.849	0.858	0.854	0.852	0.859	0.853	0.856
Statistics													
Min	0.861	0.857	0.854	0.859	0.85	0.849	0.849	0.858	0.851	0.85	0.855	0.853	0.856
Max	0.865	0.862	0.857	0.862	0.854	0.854	0.852	0.86	0.854	0.853	0.859	0.856	0.858
Average	0.863	0.86	0.855	0.86	0.851	0.852	0.85	0.859	0.852	0.852	0.857	0.854	0.857
Sigma	0.001	0.002	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.001	0.001

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	-	-1.3E-03	-4.4E-03	320.0E-06	-7.7E-03	-7.3E-03	-9.2E-03	-1.7E-03	-9.3E-03	-8.5E-03	-6.2E-03	-5.8E-03	-3.1E-03
9	-	-2.6E-03	-10.2E-03	-5.5E-03	-14.1E-03	-15.8E-03	-16.0E-03	-5.0E-03	-13.7E-03	-14.3E-03	-6.5E-03	-11.7E-03	-7.8E-03
10	-	-5.6E-03	-9.4E-03	-3.3E-03	-13.0E-03	-11.0E-03	-13.5E-03	-4.7E-03	-8.7E-03	-11.2E-03	-4.3E-03	-10.3E-03	-7.3E-03
Average	-	-3.2E-03	-8.0E-03	-2.8E-03	-11.6E-03	-11.3E-03	-12.9E-03	-3.8E-03	-10.6E-03	-11.3E-03	-5.6E-03	-9.3E-03	-6.1E-03
Sigma	-	1.8E-03	2.6E-03	2.4E-03	2.8E-03	3.5E-03	2.8E-03	1.5E-03	2.2E-03	2.4E-03	970.5E-06	2.5E-03	2.1E-03

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	0.868	0.856	0.855	0.865	0.857	0.861	0.863	0.866	0.863	0.861	0.865	0.864	0.858
OFF_PROTON samples													
5	0.868	0.859	0.853	0.859	0.854	0.852	0.851	0.859	0.852	0.853	0.861	0.855	0.857
6	0.865	0.859	0.852	0.861	0.856	0.852	0.852	0.86	0.854	0.855	0.861	0.855	0.858
7	0.864	0.858	0.852	0.86	0.853	0.852	0.851	0.859	0.852	0.856	0.858	0.855	0.857
Statistics													
Min	0.864	0.858	0.852	0.859	0.853	0.852	0.851	0.859	0.852	0.853	0.858	0.855	0.857
Max	0.868	0.859	0.853	0.861	0.856	0.852	0.852	0.86	0.854	0.856	0.861	0.855	0.858
Average	0.865	0.859	0.852	0.86	0.855	0.852	0.851	0.86	0.853	0.855	0.86	0.855	0.857
Sigma	0.002	0.00	0.00	0.001	0.001	0.00	0.001	0.00	0.001	0.001	0.002	0.00	0.001

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	-	-9.0E-03	-15.4E-03	-8.9E-03	-13.6E-03	-15.9E-03	-17.0E-03	-8.8E-03	-16.0E-03	-15.2E-03	-6.9E-03	-13.5E-03	-10.7E-03
6	-	-5.4E-03	-12.4E-03	-3.1E-03	-8.6E-03	-12.9E-03	-12.2E-03	-4.5E-03	-10.9E-03	-9.0E-03	-3.3E-03	-9.2E-03	-6.4E-03
7	-	-5.5E-03	-12.2E-03	-4.3E-03	-10.7E-03	-11.9E-03	-13.0E-03	-4.5E-03	-11.4E-03	-8.0E-03	-6.0E-03	-9.3E-03	-7.0E-03
Average	-	-6.6E-03	-13.3E-03	-5.4E-03	-11.0E-03	-13.6E-03	-14.1E-03	-5.9E-03	-12.7E-03	-10.7E-03	-5.4E-03	-10.7E-03	-8.1E-03
Sigma	-	1.7E-03	1.5E-03	2.5E-03	2.0E-03	1.7E-03	2.1E-03	2.0E-03	2.3E-03	3.1E-03	1.6E-03	2.0E-03	1.9E-03

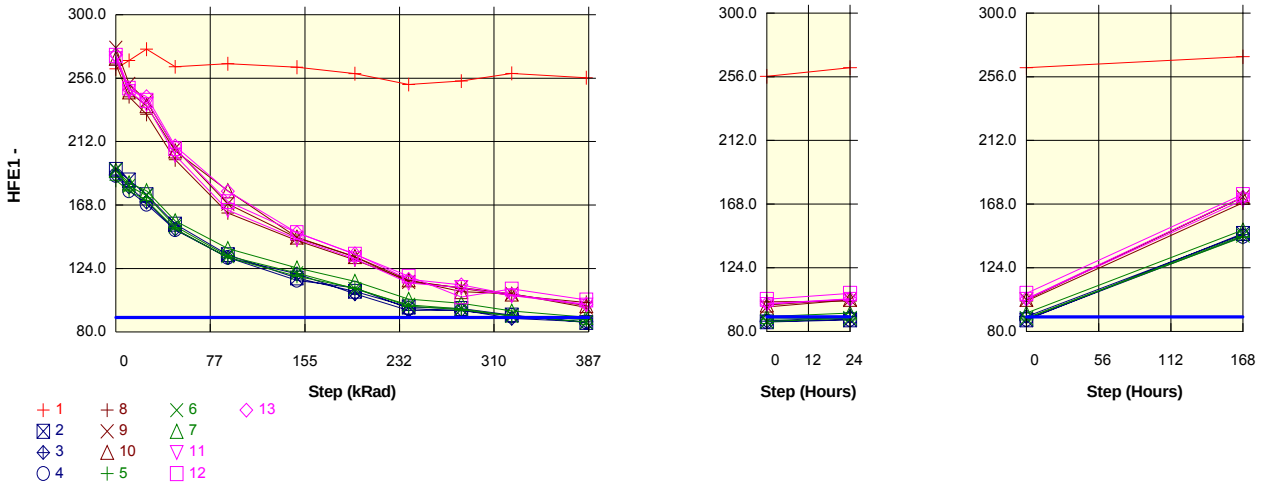
Measurements

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	0.868	0.856	0.855	0.865	0.857	0.861	0.863	0.866	0.863	0.861	0.865	0.864	0.858
OFF_TID samples													
11	0.859	0.857	0.848	0.857	0.851	0.848	0.848	0.858	0.849	0.852	0.856	0.849	0.854
12	0.86	0.856	0.849	0.857	0.851	0.848	0.848	0.859	0.851	0.852	0.858	0.851	0.855
13	0.86	0.858	0.848	0.857	0.852	0.848	0.847	0.859	0.848	0.852	0.858	0.851	0.855
Statistics													
Min	0.859	0.856	0.848	0.857	0.851	0.848	0.847	0.858	0.848	0.852	0.856	0.849	0.854
Max	0.86	0.858	0.849	0.857	0.852	0.848	0.848	0.859	0.851	0.852	0.858	0.851	0.855
Average	0.86	0.857	0.848	0.857	0.851	0.848	0.848	0.858	0.849	0.852	0.857	0.85	0.855
Sigma	0.001	0.001	0.001	0.00	0.00	0.00	0.001	0.00	0.001	0.00	0.001	0.001	0.001

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	-	-2.2E-03	-10.8E-03	-2.4E-03	-8.1E-03	-11.4E-03	-11.4E-03	-1.2E-03	-10.5E-03	-7.4E-03	-3.3E-03	-10.0E-03	-5.3E-03
12	-	-4.1E-03	-11.4E-03	-3.4E-03	-9.1E-03	-12.1E-03	-12.1E-03	-1.9E-03	-9.0E-03	-8.6E-03	-2.6E-03	-9.4E-03	-5.1E-03
13	-	-1.2E-03	-12.1E-03	-3.1E-03	-7.9E-03	-11.5E-03	-13.1E-03	-1.2E-03	-11.5E-03	-7.4E-03	-1.8E-03	-8.8E-03	-4.8E-03
Average	-	-2.5E-03	-11.4E-03	-3.0E-03	-8.4E-03	-11.7E-03	-12.2E-03	-1.4E-03	-10.3E-03	-7.8E-03	-2.6E-03	-9.4E-03	-5.1E-03
Sigma	-	1.2E-03	539.0E-06	385.1E-06	524.9E-06	284.7E-06	703.8E-06	322.2E-06	1.0E-03	575.4E-06	587.9E-06	522.9E-06	214.2E-06

Parameter : DC current gain : HFE1
Test conditions : Ic = 1mA ; Vce = 10V
Unit :
Spec Limit Min : 90.0
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	262.4	268.23	276.11	263.88	265.99	263.63	259.1	251.58	253.99	259.28	256.35	262.29	269.87
ON_PROTON samples													
2	192.78	185.33	175.14	154.78	133.58	117.35	108.19	97.29	96.15	91.7	**86.54**	**87.94**	147.69
3	188.95	180.54	170.07	151.45	131.5	120.25	106.4	94.94	95.32	**89.48**	**87.1**	90.15	146.99
4	188.56	177.88	168.63	150.83	131.59	115.78	110.47	96.25	94.65	91.4	**86.86**	**88.34**	145.59
Statistics													
Min	188.56	177.88	168.63	150.83	131.5	115.78	106.4	94.94	94.65	89.48	86.54	87.94	145.59
Max	192.78	185.33	175.14	154.78	133.58	120.25	110.47	97.29	96.15	91.7	87.1	90.15	147.69
Average	190.1	181.25	171.28	152.36	132.22	117.79	108.35	96.16	95.37	90.86	86.83	88.81	146.76
Sigma	1.9	3.08	2.79	1.74	0.96	1.85	1.67	0.96	0.62	0.98	0.23	0.96	0.88

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	-	208.4E-06	522.3E-06	1.3E-03	2.3E-03	3.3E-03	4.1E-03	5.1E-03	5.2E-03	5.7E-03	6.4E-03	6.2E-03	1.6E-03
3	-	246.6E-06	587.7E-06	1.3E-03	2.3E-03	3.0E-03	4.1E-03	5.2E-03	5.2E-03	5.9E-03	6.2E-03	5.8E-03	1.5E-03
4	-	318.4E-06	626.8E-06	1.3E-03	2.3E-03	3.3E-03	3.7E-03	5.1E-03	5.3E-03	5.6E-03	6.2E-03	6.0E-03	1.6E-03
Average	-	257.8E-06	578.9E-06	1.3E-03	2.3E-03	3.2E-03	4.0E-03	5.1E-03	5.2E-03	5.7E-03	6.3E-03	6.0E-03	1.6E-03
Sigma	-	45.6E-06	43.1E-06	22.3E-06	7.1E-06	146.3E-06	158.2E-06	71.4E-06	27.2E-06	102.3E-06	80.1E-06	157.0E-06	30.9E-06

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	262.4	268.23	276.11	263.88	265.99	263.63	259.1	251.58	253.99	259.28	256.35	262.29	269.87
ON_TID samples													
8	265.9	243.11	230.96	199.31	162.49	143.47	129.98	115.55	110.23	105.39	100.51	101.03	168.92
9	277.02	251.98	240.26	207.26	168.86	145.32	132.09	114.61	110.8	106.38	96.95	101.85	172.87
10	269.64	246.46	236.91	205.51	177.9	145.69	132.24	116.01	107.88	106.16	98.15	102.18	172.73
Statistics													
Min	265.9	243.11	230.96	199.31	162.49	143.47	129.98	114.61	107.88	105.39	96.95	101.03	168.92
Max	277.02	251.98	240.26	207.26	177.9	145.69	132.24	116.01	110.8	106.38	100.51	102.18	172.87
Average	270.85	247.18	236.04	204.03	169.75	144.83	131.44	115.39	109.64	105.98	98.54	101.69	171.5
Sigma	4.62	3.66	3.84	3.41	6.32	0.97	1.03	0.58	1.27	0.42	1.48	0.48	1.83

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	-	352.6E-06	568.9E-06	1.3E-03	2.4E-03	3.2E-03	3.9E-03	4.9E-03	5.3E-03	5.7E-03	6.2E-03	6.1E-03	2.2E-03
9	-	358.6E-06	552.3E-06	1.2E-03	2.3E-03	3.3E-03	4.0E-03	5.1E-03	5.4E-03	5.8E-03	6.7E-03	6.2E-03	2.2E-03
10	-	348.9E-06	512.3E-06	1.2E-03	1.9E-03	3.2E-03	3.9E-03	4.9E-03	5.6E-03	5.7E-03	6.5E-03	6.1E-03	2.1E-03
Average	-	353.4E-06	544.5E-06	1.2E-03	2.2E-03	3.2E-03	3.9E-03	5.0E-03	5.4E-03	5.7E-03	6.5E-03	6.1E-03	2.1E-03
Sigma	-	4.0E-06	23.7E-06	40.6E-06	210.2E-06	47.6E-06	45.4E-06	100.8E-06	102.6E-06	34.1E-06	211.3E-06	53.3E-06	41.1E-06

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	262.4	268.23	276.11	263.88	265.99	263.63	259.1	251.58	253.99	259.28	256.35	262.29	269.87
OFF_PROTON samples													
5	185.16	177.81	171.2	151.36	131.37	118.49	110.37	97.82	95.49	90.95	88.49	89.23	145.3
6	192.15	181.3	174.54	153.21	132.56	120.72	109.85	98.78	96.06	91.1	86.86	89.07	146.25
7	192.14	183.31	177.87	157.1	137.75	124.38	115.07	102.64	99.83	94.45	90.17	92.68	150.06
Statistics													
Min	185.16	177.81	171.2	151.36	131.37	118.49	109.85	97.82	95.49	90.95	86.86	89.07	145.3
Max	192.15	183.31	177.87	157.1	137.75	124.38	115.07	102.64	99.83	94.45	90.17	92.68	150.06
Average	189.82	180.81	174.54	153.89	133.89	121.2	111.76	99.75	97.13	92.17	88.51	90.33	147.2
Sigma	3.29	2.27	2.72	2.39	2.77	2.43	2.35	2.08	1.93	1.61	1.35	1.67	2.06

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	-	223.1E-06	440.4E-06	1.2E-03	2.2E-03	3.0E-03	3.7E-03	4.8E-03	5.1E-03	5.6E-03	5.9E-03	5.8E-03	1.5E-03
6	-	311.4E-06	525.2E-06	1.3E-03	2.3E-03	3.1E-03	3.9E-03	4.9E-03	5.2E-03	5.8E-03	6.3E-03	6.0E-03	1.6E-03
7	-	250.6E-06	417.5E-06	1.2E-03	2.1E-03	2.8E-03	3.5E-03	4.5E-03	4.8E-03	5.4E-03	5.9E-03	5.6E-03	1.5E-03
Average	-	261.7E-06	461.1E-06	1.2E-03	2.2E-03	3.0E-03	3.7E-03	4.8E-03	5.0E-03	5.6E-03	6.0E-03	5.8E-03	1.5E-03
Sigma	-	36.9E-06	46.3E-06	68.2E-06	116.2E-06	106.8E-06	169.5E-06	161.9E-06	163.5E-06	159.0E-06	196.2E-06	178.9E-06	77.5E-06

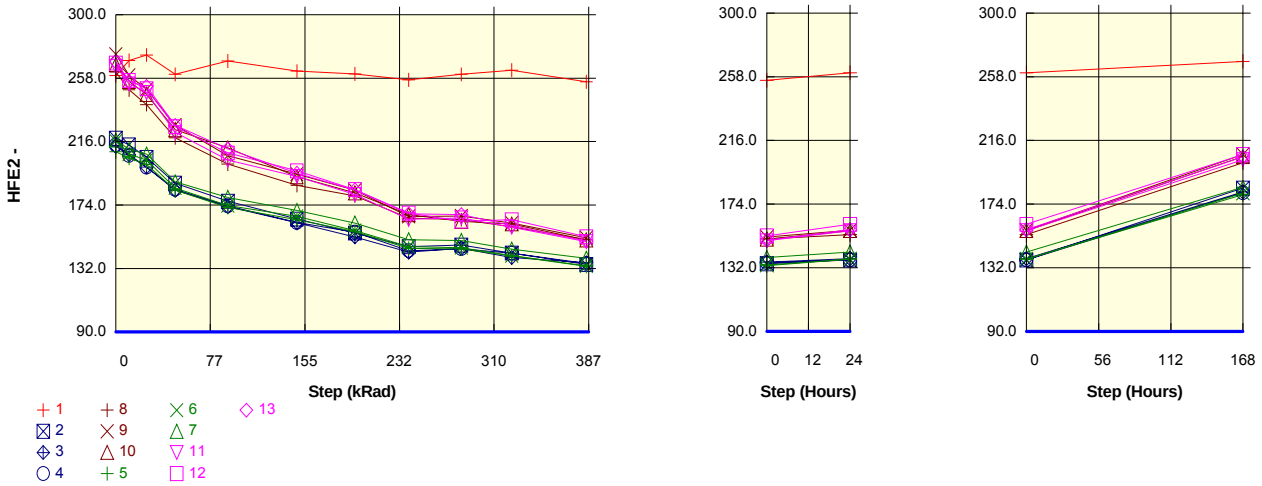
Measurements

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	262.4	268.23	276.11	263.88	265.99	263.63	259.1	251.58	253.99	259.28	256.35	262.29	269.87
OFF_TID samples													
11	269.68	246.73	237.71	202.52	164.4	144.52	130.72	113.93	110.78	105.06	98.69	102.27	170.75
12	271.79	249.14	240.66	207.13	170.37	148.83	133.92	118.62	104.25	109.73	102.13	106.26	174.68
13	272.02	248.12	243.15	208.96	177.46	148.88	134.09	116.43	112.67	105.81	99.2	102.54	172.8
Statistics													
Min	269.68	246.73	237.71	202.52	164.4	144.52	130.72	113.93	104.25	105.06	98.69	102.27	170.75
Max	272.02	249.14	243.15	208.96	177.46	148.88	134.09	118.62	112.67	109.73	102.13	106.26	174.68
Average	271.16	248.0	240.51	206.2	170.74	147.41	132.91	116.33	109.24	106.87	100.01	103.69	172.74
Sigma	1.05	0.99	2.22	2.71	5.34	2.04	1.55	1.92	3.61	2.05	1.52	1.82	1.6

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	-	344.9E-06	498.7E-06	1.2E-03	2.4E-03	3.2E-03	3.9E-03	5.1E-03	5.3E-03	5.8E-03	6.4E-03	6.1E-03	2.1E-03
12	-	334.5E-06	476.0E-06	1.1E-03	2.2E-03	3.0E-03	3.8E-03	4.8E-03	5.9E-03	5.4E-03	6.1E-03	5.7E-03	2.0E-03
13	-	354.0E-06	436.4E-06	1.1E-03	2.0E-03	3.0E-03	3.8E-03	4.9E-03	5.2E-03	5.8E-03	6.4E-03	6.1E-03	2.1E-03
Average	-	344.5E-06	470.4E-06	1.2E-03	2.2E-03	3.1E-03	3.8E-03	4.9E-03	5.5E-03	5.7E-03	6.3E-03	6.0E-03	2.1E-03
Sigma	-	8.0E-06	25.7E-06	50.0E-06	170.0E-06	80.6E-06	74.2E-06	130.1E-06	312.3E-06	169.5E-06	142.9E-06	160.9E-06	42.5E-06

Parameter : DC current gain : HFE2
Test conditions : Ic = 10mA ; Vce = 10V
Unit :
Spec Limit Min : 90.0
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	259.64	269.74	273.31	260.55	269.37	262.66	260.78	256.85	260.53	263.29	255.65	260.58	268.17
ON_PROTON samples													
2	218.25	213.81	205.53	188.42	176.48	164.71	155.41	146.4	147.48	142.21	134.68	137.08	184.49
3	212.81	207.25	199.19	183.84	173.02	162.29	152.89	142.82	145.31	139.22	135.73	138.0	182.02
4	213.78	206.69	199.1	184.32	173.45	162.44	156.03	143.81	145.05	142.22	135.29	137.23	181.54
Statistics													
Min	212.81	206.69	199.1	183.84	173.02	162.29	152.89	142.82	145.05	139.22	134.68	137.08	181.54
Max	218.25	213.81	205.53	188.42	176.48	164.71	156.03	146.4	147.48	142.22	135.73	138.0	184.49
Average	214.94	209.25	201.28	185.53	174.32	163.15	154.78	144.34	145.95	141.22	135.24	137.44	182.68
Sigma	2.37	3.23	3.01	2.06	1.54	1.1	1.36	1.51	1.09	1.41	0.43	0.4	1.29

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	-	95.1E-06	283.4E-06	725.2E-06	1.1E-03	1.5E-03	1.9E-03	2.2E-03	2.2E-03	2.4E-03	2.8E-03	2.7E-03	838.4E-06
3	-	126.0E-06	321.2E-06	740.4E-06	1.1E-03	1.5E-03	1.8E-03	2.3E-03	2.2E-03	2.5E-03	2.7E-03	2.5E-03	795.0E-06
4	-	160.5E-06	344.9E-06	747.7E-06	1.1E-03	1.5E-03	1.7E-03	2.3E-03	2.2E-03	2.4E-03	2.7E-03	2.6E-03	830.6E-06
Average	-	127.2E-06	316.5E-06	737.8E-06	1.1E-03	1.5E-03	1.8E-03	2.3E-03	2.2E-03	2.4E-03	2.7E-03	2.6E-03	821.3E-06
Sigma	-	26.7E-06	25.3E-06	9.4E-06	2.9E-06	11.0E-06	54.9E-06	22.1E-06	13.7E-06	55.2E-06	74.0E-06	68.5E-06	18.9E-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	259.64	269.74	273.31	260.55	269.37	262.66	260.78	256.85	260.53	263.29	255.65	260.58	268.17
ON_TID samples													
8	261.96	250.3	240.56	218.61	201.02	187.04	180.04	165.33	164.35	159.62	151.09	153.85	201.35
9	273.85	259.88	250.59	226.94	206.69	194.51	183.82	166.45	166.74	162.08	152.24	156.77	206.73
10	267.02	255.75	247.21	223.89	211.82	192.7	182.07	167.62	163.15	161.44	150.82	156.47	205.3
Statistics													
Min	261.96	250.3	240.56	218.61	201.02	187.04	180.04	165.33	163.15	159.62	150.82	153.85	201.35
Max	273.85	259.88	250.59	226.94	211.82	194.51	183.82	167.62	166.74	162.08	152.24	156.77	206.73
Average	267.61	255.31	246.12	223.14	206.51	191.42	181.98	166.47	164.74	161.05	151.38	155.7	204.46
Sigma	4.87	3.92	4.17	3.44	4.41	3.18	1.55	0.94	1.49	1.04	0.62	1.31	2.28

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	-	177.8E-06	339.5E-06	756.9E-06	1.2E-03	1.5E-03	1.7E-03	2.2E-03	2.3E-03	2.4E-03	2.8E-03	2.7E-03	1.1E-03
9	-	196.3E-06	338.9E-06	754.8E-06	1.2E-03	1.5E-03	1.8E-03	2.4E-03	2.3E-03	2.5E-03	2.9E-03	2.7E-03	1.2E-03
10	-	165.0E-06	300.2E-06	721.5E-06	975.9E-06	1.4E-03	1.7E-03	2.2E-03	2.4E-03	2.4E-03	2.9E-03	2.6E-03	1.1E-03
Average	-	179.7E-06	326.2E-06	744.4E-06	1.1E-03	1.5E-03	1.8E-03	2.3E-03	2.3E-03	2.5E-03	2.9E-03	2.7E-03	1.2E-03
Sigma	-	12.9E-06	18.4E-06	16.2E-06	93.1E-06	34.6E-06	22.2E-06	61.6E-06	48.8E-06	32.9E-06	48.8E-06	33.1E-06	24.6E-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	259.64	269.74	273.31	260.55	269.37	262.66	260.78	256.85	260.53	263.29	255.65	260.58	268.17
OFF_PROTON samples													
5	209.33	205.03	200.98	183.78	172.45	164.15	156.31	145.32	144.98	140.4	133.42	137.67	180.19
6	216.5	207.69	203.81	185.31	173.68	166.47	157.16	146.45	145.75	140.53	133.73	137.7	181.25
7	216.96	210.84	207.64	189.34	179.08	170.41	162.16	151.02	150.47	144.8	138.71	142.32	185.13
Statistics													
Min	209.33	205.03	200.98	183.78	172.45	164.15	156.31	145.32	144.98	140.4	133.42	137.67	180.19
Max	216.96	210.84	207.64	189.34	179.08	170.41	162.16	151.02	150.47	144.8	138.71	142.32	185.13
Average	214.26	207.85	204.15	186.14	175.07	167.01	158.54	147.6	147.07	141.91	135.29	139.23	182.19
Sigma	3.5	2.38	2.73	2.34	2.88	2.58	2.58	2.47	2.43	2.04	2.42	2.18	2.12

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	-	100.2E-06	198.3E-06	663.9E-06	1.0E-03	1.3E-03	1.6E-03	2.1E-03	2.1E-03	2.3E-03	2.7E-03	2.5E-03	772.5E-06
6	-	196.1E-06	287.6E-06	777.4E-06	1.1E-03	1.4E-03	1.7E-03	2.2E-03	2.2E-03	2.5E-03	2.9E-03	2.6E-03	898.5E-06
7	-	133.9E-06	206.8E-06	672.4E-06	975.2E-06	1.3E-03	1.6E-03	2.0E-03	2.0E-03	2.3E-03	2.6E-03	2.4E-03	792.6E-06
Average	-	143.4E-06	230.9E-06	704.6E-06	1.0E-03	1.3E-03	1.6E-03	2.1E-03	2.1E-03	2.4E-03	2.7E-03	2.5E-03	821.2E-06
Sigma	-	39.7E-06	40.2E-06	51.6E-06	68.8E-06	52.8E-06	77.4E-06	80.5E-06	84.4E-06	85.1E-06	105.6E-06	94.5E-06	55.3E-06

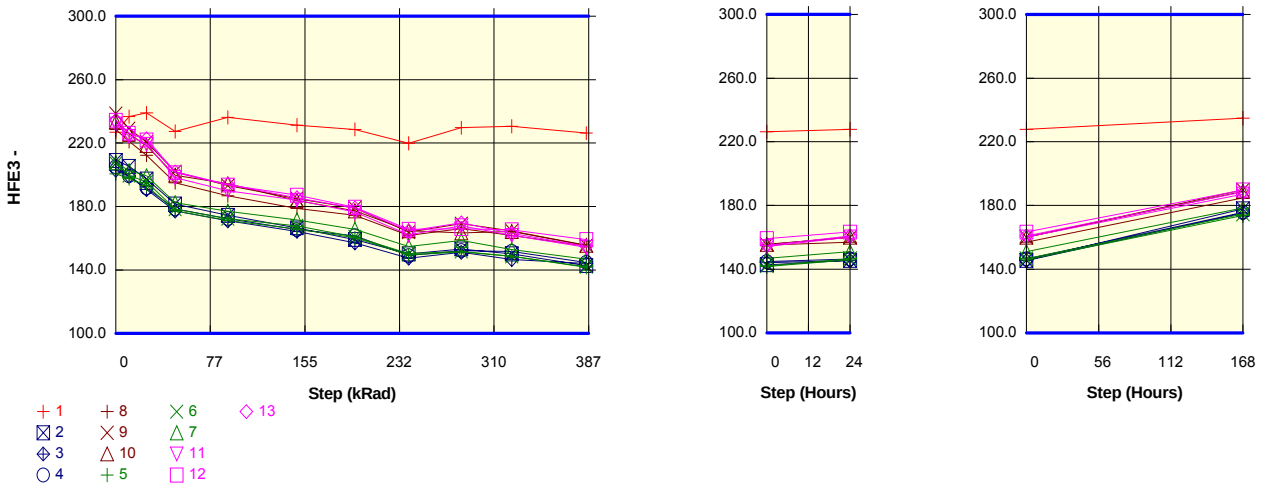
Measurements

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	259.64	269.74	273.31	260.55	269.37	262.66	260.78	256.85	260.53	263.29	255.65	260.58	268.17
OFF_TID samples													
11	265.75	254.26	248.49	222.07	203.79	192.97	180.94	164.62	165.54	159.31	149.8	156.41	203.32
12	267.98	256.47	251.06	225.92	208.51	196.63	184.23	168.69	163.38	164.19	153.0	160.59	206.61
13	268.74	255.77	252.51	226.68	211.19	195.07	184.07	168.07	167.68	160.41	150.07	157.09	205.14
Statistics													
Min	265.75	254.26	248.49	222.07	203.79	192.97	180.94	164.62	163.38	159.31	149.8	156.41	203.32
Max	268.74	256.47	252.51	226.68	211.19	196.63	184.23	168.69	167.68	164.19	153.0	160.59	206.61
Average	267.49	255.5	250.68	224.89	207.83	194.89	183.08	167.13	165.53	161.3	150.95	158.03	205.02
Sigma	1.27	0.92	1.66	2.02	3.06	1.5	1.52	1.79	1.75	2.09	1.45	1.83	1.34

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	-	170.1E-06	261.4E-06	740.1E-06	1.1E-03	1.4E-03	1.8E-03	2.3E-03	2.3E-03	2.5E-03	2.9E-03	2.6E-03	1.2E-03
12	-	167.5E-06	251.4E-06	694.6E-06	1.1E-03	1.4E-03	1.7E-03	2.2E-03	2.4E-03	2.4E-03	2.8E-03	2.5E-03	1.1E-03
13	-	188.6E-06	239.2E-06	690.4E-06	1.0E-03	1.4E-03	1.7E-03	2.2E-03	2.2E-03	2.5E-03	2.9E-03	2.6E-03	1.2E-03
Average	-	175.4E-06	250.7E-06	708.4E-06	1.1E-03	1.4E-03	1.7E-03	2.2E-03	2.3E-03	2.5E-03	2.9E-03	2.6E-03	1.1E-03
Sigma	-	9.4E-06	9.1E-06	22.5E-06	53.6E-06	28.0E-06	28.9E-06	48.5E-06	62.3E-06	73.0E-06	59.5E-06	67.3E-06	21.8E-06

Parameter : DC current gain : HFE3
Test conditions : Ic = 150mA ; Vce = 10V
Unit :
Spec Limit Min : 100.0
Spec Limit Max : 300.0
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	226.93	236.69	238.99	227.35	236.2	231.26	228.61	219.93	229.66	230.63	226.29	227.83	234.81
ON_PROTON samples													
2	209.02	205.32	197.32	181.57	174.4	166.5	159.23	150.12	153.27	150.15	142.75	145.56	177.81
3	202.89	199.15	190.71	177.06	171.0	164.31	157.09	147.41	151.11	146.53	144.09	145.36	175.25
4	205.05	199.28	191.71	178.45	172.37	165.45	161.52	149.08	152.26	151.64	144.8	146.41	175.59
Statistics													
Min	202.89	199.15	190.71	177.06	171.0	164.31	157.09	147.41	151.11	146.53	142.75	145.36	175.25
Max	209.02	205.32	197.32	181.57	174.4	166.5	161.52	150.12	153.27	151.64	144.8	146.41	177.81
Average	205.65	201.25	193.25	179.03	172.59	165.42	159.28	148.87	152.21	149.44	143.88	145.78	176.21
Sigma	2.54	2.88	2.91	1.89	1.4	0.89	1.81	1.11	0.88	2.15	0.85	0.46	1.14

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	-	86.3E-06	283.8E-06	723.3E-06	949.7E-06	1.2E-03	1.5E-03	1.9E-03	1.7E-03	1.9E-03	2.2E-03	2.1E-03	839.9E-06
3	-	92.5E-06	314.7E-06	719.0E-06	919.1E-06	1.2E-03	1.4E-03	1.9E-03	1.7E-03	1.9E-03	2.0E-03	2.0E-03	777.4E-06
4	-	141.2E-06	339.3E-06	726.9E-06	924.7E-06	1.2E-03	1.3E-03	1.8E-03	1.7E-03	1.7E-03	2.0E-03	2.0E-03	818.3E-06
Average	-	106.7E-06	312.6E-06	723.0E-06	931.2E-06	1.2E-03	1.4E-03	1.9E-03	1.7E-03	1.8E-03	2.1E-03	2.0E-03	811.8E-06
Sigma	-	24.6E-06	22.7E-06	3.2E-06	13.3E-06	28.4E-06	75.7E-06	19.0E-06	23.7E-06	79.7E-06	95.0E-06	63.0E-06	25.9E-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	226.93	236.69	238.99	227.35	236.2	231.26	228.61	219.93	229.66	230.63	226.29	227.83	234.81
ON_TID samples													
8	228.57	221.12	212.32	195.02	186.74	178.8	174.46	161.68	166.07	161.72	155.04	156.9	184.82
9	238.53	229.06	220.63	201.96	193.17	184.93	179.08	163.84	169.15	164.59	155.51	159.99	189.79
10	233.35	225.84	218.44	199.75	194.38	183.77	177.29	164.7	163.36	164.23	155.49	160.2	188.87
Statistics													
Min	228.57	221.12	212.32	195.02	186.74	178.8	174.46	161.68	163.36	161.72	155.04	156.9	184.82
Max	238.53	229.06	220.63	201.96	194.38	184.93	179.08	164.7	169.15	164.59	155.51	160.2	189.79
Average	233.49	225.34	217.13	198.91	191.43	182.5	176.94	163.41	166.2	163.51	155.35	159.03	187.83
Sigma	4.07	3.26	3.52	2.9	3.35	2.66	1.9	1.27	2.36	1.28	0.22	1.51	2.16

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	-	147.4E-06	335.0E-06	752.7E-06	980.0E-06	1.2E-03	1.4E-03	1.8E-03	1.6E-03	1.8E-03	2.1E-03	2.0E-03	1.0E-03
9	-	173.3E-06	340.2E-06	759.2E-06	984.4E-06	1.2E-03	1.4E-03	1.9E-03	1.7E-03	1.9E-03	2.2E-03	2.1E-03	1.1E-03
10	-	142.6E-06	292.6E-06	720.8E-06	859.1E-06	1.2E-03	1.4E-03	1.8E-03	1.8E-03	1.8E-03	2.1E-03	2.0E-03	1.0E-03
Average	-	154.4E-06	322.6E-06	744.2E-06	941.2E-06	1.2E-03	1.4E-03	1.8E-03	1.7E-03	1.8E-03	2.2E-03	2.0E-03	1.0E-03
Sigma	-	13.5E-06	21.3E-06	16.8E-06	58.1E-06	28.5E-06	17.0E-06	54.2E-06	78.0E-06	36.5E-06	66.9E-06	41.6E-06	27.8E-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	226.93	236.69	238.99	227.35	236.2	231.26	228.61	219.93	229.66	230.63	226.29	227.83	234.81
OFF_PROTON samples													
5	200.59	197.65	193.27	177.31	171.2	165.76	160.28	149.5	151.36	148.61	141.6	145.85	173.75
6	207.37	199.54	195.6	178.34	172.41	167.8	160.8	150.37	151.62	148.61	142.08	146.62	174.59
7	207.72	202.67	199.42	182.43	177.01	171.61	165.68	154.76	158.59	152.83	146.77	151.08	178.44
Statistics													
Min	200.59	197.65	193.27	177.31	171.2	165.76	160.28	149.5	151.36	148.61	141.6	145.85	173.75
Max	207.72	202.67	199.42	182.43	177.01	171.61	165.68	154.76	158.59	152.83	146.77	151.08	178.44
Average	205.22	199.95	196.1	179.36	173.54	168.39	162.25	151.55	153.86	150.02	143.48	147.85	175.59
Sigma	3.28	2.07	2.54	2.21	2.5	2.42	2.43	2.3	3.35	1.99	2.33	2.3	2.04

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	-	74.2E-06	188.8E-06	654.5E-06	855.8E-06	1.0E-03	1.3E-03	1.7E-03	1.6E-03	1.7E-03	2.1E-03	1.9E-03	770.1E-06
6	-	189.3E-06	290.0E-06	785.0E-06	977.9E-06	1.1E-03	1.4E-03	1.8E-03	1.8E-03	1.9E-03	2.2E-03	2.0E-03	905.5E-06
7	-	119.8E-06	200.3E-06	667.3E-06	835.2E-06	1.0E-03	1.2E-03	1.6E-03	1.5E-03	1.7E-03	2.0E-03	1.8E-03	790.0E-06
Average	-	127.8E-06	226.4E-06	702.3E-06	889.6E-06	1.1E-03	1.3E-03	1.7E-03	1.6E-03	1.8E-03	2.1E-03	1.9E-03	821.9E-06
Sigma	-	47.3E-06	45.2E-06	58.7E-06	63.0E-06	52.3E-06	76.0E-06	75.5E-06	115.2E-06	80.5E-06	89.8E-06	80.1E-06	59.7E-06

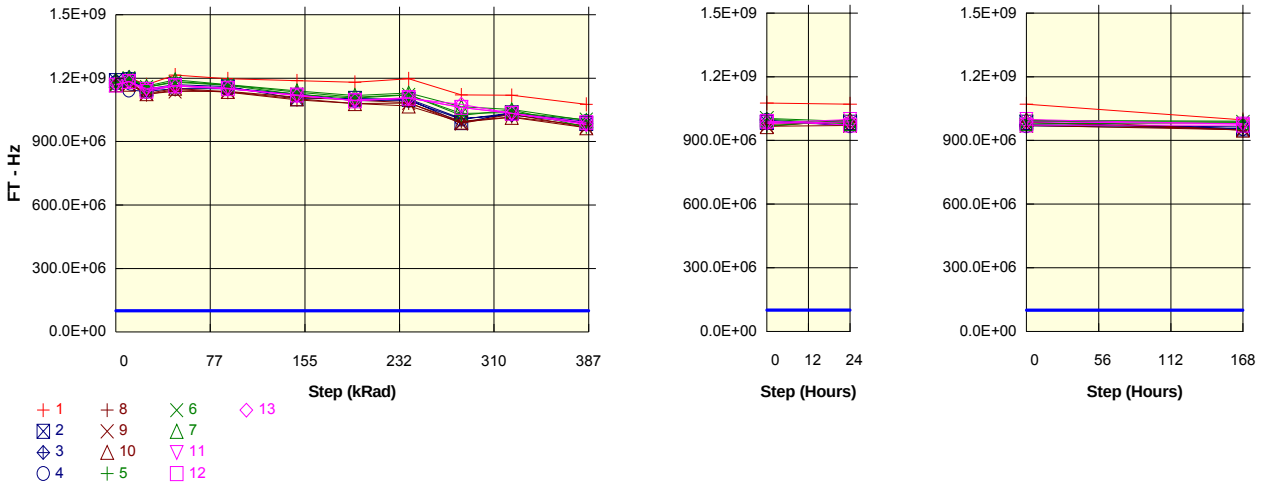
Measurements

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	226.93	236.69	238.99	227.35	236.2	231.26	228.61	219.93	229.66	230.63	226.29	227.83	234.81
OFF_TID samples													
11	231.97	224.24	219.31	198.21	189.86	184.02	176.39	162.14	167.79	161.79	154.2	160.2	187.2
12	234.37	226.28	221.96	201.33	193.52	187.16	179.54	165.65	166.0	165.27	159.22	163.33	189.73
13	234.33	225.92	222.61	201.83	193.99	185.52	179.04	164.65	169.7	163.06	154.87	160.91	188.51
Statistics													
Min	231.97	224.24	219.31	198.21	189.86	184.02	176.39	162.14	166.0	161.79	154.2	160.2	187.2
Max	234.37	226.28	222.61	201.83	193.99	187.16	179.54	165.65	169.7	165.27	159.22	163.33	189.73
Average	233.56	225.48	221.29	200.46	192.46	185.57	178.33	164.15	167.83	163.37	156.1	161.48	188.48
Sigma	1.12	0.89	1.43	1.6	1.85	1.28	1.38	1.48	1.51	1.44	2.23	1.34	1.03

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	-	148.6E-06	249.0E-06	734.3E-06	956.1E-06	1.1E-03	1.4E-03	1.9E-03	1.6E-03	1.9E-03	2.2E-03	1.9E-03	1.0E-03
12	-	152.5E-06	238.6E-06	700.2E-06	900.6E-06	1.1E-03	1.3E-03	1.8E-03	1.8E-03	1.8E-03	2.0E-03	1.9E-03	1.0E-03
13	-	158.8E-06	224.7E-06	687.2E-06	887.3E-06	1.1E-03	1.3E-03	1.8E-03	1.6E-03	1.9E-03	2.2E-03	1.9E-03	1.0E-03
Average	-	153.3E-06	237.4E-06	707.2E-06	914.7E-06	1.1E-03	1.3E-03	1.8E-03	1.7E-03	1.8E-03	2.1E-03	1.9E-03	1.0E-03
Sigma	-	4.2E-06	10.0E-06	19.8E-06	29.8E-06	22.0E-06	23.4E-06	35.6E-06	57.5E-06	39.5E-06	79.5E-06	39.8E-06	14.5E-06

Parameter : Gain bandwidth product : FT
Test conditions : Vce = 10V ; Ic = 50mA
Unit : Hz
Spec Limit Min : 100.0E+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	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	997.1E+06
ON_PROTON samples													
2	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	988.8E+06	1.0E+09	985.9E+06	985.9E+06	953.5E+06
3	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	1.0E+09	985.2E+06	974.3E+06	964.3E+06
4	1.2E+09	1.1E+09	1.1E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	1.0E+09	995.5E+06	969.3E+06	956.4E+06
Statistics													
Min	1.2E+09	1.1E+09	1.1E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	988.8E+06	1.0E+09	985.2E+06	969.3E+06	953.5E+06
Max	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	1.0E+09	995.5E+06	985.9E+06	964.3E+06
Average	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	1.0E+09	988.9E+06	976.5E+06	958.1E+06
Sigma	5.5E+06	26.1E+06	4.7E+06	7.4E+06	4.1E+06	9.7E+06	4.5E+06	2.8E+06	9.2E+06	5.0E+06	4.7E+06	7.0E+06	4.6E+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	-	4.9E+06	-40.4E+06	-20.1E+06	-28.9E+06	-85.4E+06	-84.4E+06	-89.0E+06	-199.7E+06	-151.9E+06	-202.7E+06	-202.7E+06	-235.1E+06
3	-	14.0E+06	-45.9E+06	-26.3E+06	-35.8E+06	-62.6E+06	-93.0E+06	-87.5E+06	-178.1E+06	-163.1E+06	-203.4E+06	-214.2E+06	-224.2E+06
4	-	-33.7E+06	-40.2E+06	-26.3E+06	-27.1E+06	-56.6E+06	-82.8E+06	-82.3E+06	-171.5E+06	-141.7E+06	-181.4E+06	-207.6E+06	-220.5E+06
Average	-	-4.9E+06	-42.2E+06	-24.2E+06	-30.6E+06	-68.2E+06	-86.8E+06	-86.3E+06	-183.1E+06	-152.2E+06	-195.8E+06	-208.2E+06	-226.6E+06
Sigma	-	20.7E+06	2.6E+06	2.9E+06	3.8E+06	12.4E+06	4.5E+06	2.8E+06	12.1E+06	8.8E+06	10.2E+06	4.7E+06	6.2E+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	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	997.1E+06
ON_TID samples													
8	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	995.7E+06	1.0E+09	975.1E+06	985.8E+06	948.9E+06
9	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	985.4E+06	1.0E+09	967.2E+06	970.6E+06	950.0E+06
10	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	991.8E+06	1.0E+09	965.5E+06	998.6E+06	949.1E+06
Statistics													
Min	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	985.4E+06	1.0E+09	965.5E+06	970.6E+06	948.9E+06
Max	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	995.7E+06	1.0E+09	975.1E+06	998.6E+06	950.0E+06
Average	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	991.0E+06	1.0E+09	969.2E+06	985.0E+06	949.4E+06
Sigma	4.9E+06	6.9E+06	2.2E+06	5.9E+06	1.8E+06	5.7E+06	7.8E+06	7.2E+06	4.2E+06	6.5E+06	4.2E+06	11.4E+06	472.3E+03

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	-	6.8E+06	-56.9E+06	-33.5E+06	-46.0E+06	-81.7E+06	-99.8E+06	-97.0E+06	-183.3E+06	-162.3E+06	-204.0E+06	-193.2E+06	-230.1E+06
9	-	3.2E+06	-42.3E+06	-31.1E+06	-31.1E+06	-57.2E+06	-72.2E+06	-84.2E+06	-182.8E+06	-138.5E+06	-201.0E+06	-197.6E+06	-218.2E+06
10	-	1.9E+06	-41.8E+06	-17.4E+06	-32.6E+06	-66.4E+06	-89.3E+06	-101.1E+06	-177.2E+06	-153.9E+06	-203.6E+06	-170.4E+06	-219.9E+06
Average	-	4.0E+06	-47.0E+06	-27.3E+06	-36.6E+06	-68.4E+06	-87.1E+06	-94.1E+06	-181.1E+06	-151.5E+06	-202.9E+06	-187.1E+06	-222.7E+06
Sigma	-	2.1E+06	7.0E+06	7.1E+06	6.7E+06	10.1E+06	11.4E+06	7.2E+06	2.8E+06	9.8E+06	1.3E+06	11.9E+06	5.3E+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	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	997.1E+06
OFF_PROTON samples													
5	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	1.0E+09	968.3E+06	994.4E+06	990.7E+06
6	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	1.0E+09	1.0E+09	989.2E+06	986.6E+06
7	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	978.5E+06	985.0E+06
Statistics													
Min	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	1.0E+09	968.3E+06	978.5E+06	985.0E+06
Max	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	994.4E+06	990.7E+06
Average	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	1.0E+09	990.8E+06	987.4E+06	987.4E+06
Sigma	8.5E+06	2.0E+06	2.2E+06	4.7E+06	914.2E+03	6.9E+06	5.5E+06	4.1E+06	17.2E+06	5.9E+06	16.0E+06	6.6E+06	2.4E+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
OFF_PROTON samples													
5	-	18.1E+06	-21.8E+06	5.7E+06	-11.3E+06	-45.3E+06	-68.5E+06	-56.7E+06	-154.2E+06	-129.9E+06	-210.4E+06	-184.3E+06	-188.1E+06
6	-	31.3E+06	-9.9E+06	12.2E+06	-1.1E+06	-45.1E+06	-62.8E+06	-47.2E+06	-134.9E+06	-130.1E+06	-164.0E+06	-178.7E+06	-181.4E+06
7	-	12.9E+06	-26.8E+06	2.7E+06	-19.8E+06	-49.3E+06	-70.4E+06	-58.7E+06	-124.4E+06	-137.5E+06	-188.8E+06	-210.4E+06	-203.9E+06
Average	-	20.8E+06	-19.5E+06	6.9E+06	-10.7E+06	-46.6E+06	-67.2E+06	-54.2E+06	-137.8E+06	-132.5E+06	-187.7E+06	-191.2E+06	-191.1E+06
Sigma	-	7.8E+06	7.1E+06	3.9E+06	7.7E+06	2.0E+06	3.2E+06	5.0E+06	12.4E+06	3.6E+06	19.0E+06	13.8E+06	9.4E+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	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	997.1E+06
OFF_TID samples													
11	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	982.7E+06	999.1E+06	977.1E+06
12	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	990.4E+06	972.2E+06	971.9E+06
13	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	980.2E+06	986.6E+06	979.1E+06
Statistics													
Min	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	980.2E+06	972.2E+06	971.9E+06
Max	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	990.4E+06	999.1E+06	979.1E+06
Average	1.2E+09	1.2E+09	1.1E+09	1.2E+09	1.2E+09	1.1E+09	1.1E+09	1.1E+09	1.1E+09	1.0E+09	984.5E+06	986.0E+06	976.0E+06
Sigma	2.0E+06	715.5E+03	5.4E+06	1.6E+06	1.2E+06	1.2E+06	1.4E+06	1.7E+06	7.0E+06	296.9E+03	4.3E+06	11.0E+06	3.0E+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	-	17.9E+06	-21.0E+06	-1.3E+06	-14.2E+06	-49.4E+06	-71.4E+06	-59.2E+06	-105.9E+06	-132.9E+06	-184.4E+06	-168.1E+06	-190.1E+06
12	-	16.5E+06	-29.5E+06	-3.8E+06	-17.1E+06	-46.6E+06	-74.6E+06	-61.5E+06	-105.4E+06	-133.6E+06	-176.7E+06	-194.9E+06	-195.2E+06
13	-	11.9E+06	-20.6E+06	-9.4E+06	-20.1E+06	-53.0E+06	-76.7E+06	-67.6E+06	-95.2E+06	-137.7E+06	-191.2E+06	-184.8E+06	-192.4E+06
Average	-	15.4E+06	-23.7E+06	-4.8E+06	-17.1E+06	-49.7E+06	-74.2E+06	-62.7E+06	-102.1E+06	-134.7E+06	-184.1E+06	-182.6E+06	-192.6E+06
Sigma	-	2.5E+06	4.1E+06	3.4E+06	2.4E+06	2.6E+06	2.2E+06	3.5E+06	4.9E+06	2.1E+06	5.9E+06	11.1E+06	2.1E+06

Appendix 1 Temperature measurements

SN	Iceo [A]
8	35.0E-6
9	35.9E-6
10	45.3E-6
11	43.9E-6
12	47.2E-6
13	41.3E-6

Table 3 : Initial measurements at High temperature (100°C) on TID Samples

SN	Iceo [A]
8	36.88E-6
9	37.81E-6
10	39.39E-6
11	41.87E-6
12	44.02E-6
13	36.36E-6

Table 4 : Finial measurements at High temperature (100°C) on TID Samples