PROTONS TEST REPORT

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

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

Part Type : IS9-139ASRH

Package : FP-20

Description : Single Event Radiation Hardened Quad Voltage Comparator

Manufacturer: Intersil

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

Alter Technology Group Spain Project Manager: David NUNEZ

Hirex reference :	HRX/TID/0930	Issue : 01	Date :	June 16th, 2011
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CHANGE RECORD

ISSUE	DATE	PAGE	DESCRIPTION OF CHANGES
01	June 16th, 2011	All	Original Issue

PROTONS TEST REPORT
on
IS9-139ASRH
Single Event Radiation Hardened Quad Voltage Comparator

From Intersil

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1 Introduction

In the scope of the ESA study: “Survey of Critical Components for 150 kRad Power Systems”, a protons test of the Intersil IS9-139ASRH, Single Event Radiation Hardened Quad Voltage Comparator has been performed up to a total fluence of about 2E11 p/cm^2, in response to Alter Technology Group Spain purchase order reference ATGSP-TL-09-JC-CO-9 that refers to ESTEC contract N° 22831/09/NL/AF.

Displacement damage effects were investigated using 60 MeV protons energy. Devices were irradiated at UCL in Louvain - Belgium.

The purpose of this test was to characterize degradation due to proton displacement damage so a further mission analysis could determine their suitability for flight use. This test was conducted on samples provided by Alter Technology Group Spain.
Test has been performed in accordance with Hirex Engineering Radiation Test Plan HRX/SPE/0234 issue 3 dated 09/24/2010.

A complete set of electrical measurements together with graphical representation of measured parameters with respect to Equivalent Fluence levels received are also provided.

2 Applicable and Reference Documents

2.1 Applicable Documents

- Hirex Engineering Radiation Test Plan: HRX/SPE/0234 issue 3 dated 09/24/2010
- Alter Technology Group Proposal: ATGSP-OF-648/2009 Issue 1
- Minutes of Meeting: MM-SRP-ATG-0001 dated 29/10/2009
- Hirex specification: Total Ionizing dose test general procedure.
- SMD detail specification: 5962-01510

2.2 Reference Documents

- Intersil datasheet: Doc ID FN9000.2 dated September 2002

3 Test Samples

7 samples of the IS9-139ASRH devices were tested (6 + 1 control sample).
Allocation of samples with respect to the protons incident energy is provided in the following table.

Serial Number	Samples Allocation
1	Control sample
2	Biased OFF
3	Biased OFF
4	Biased OFF
5	Biased OFF
7	Biased OFF
14	Biased OFF

Identification of the IS9-139ASRH is given below:

Part Number: IS9-139ASRH

Top Marking: logo IS9-139ASRH delta /PROTO

Bottom Marking: -

Date Code: -

4 Experimental Conditions

4.1 Radiation Source Description

The protons exposures were performed at the UCL facility in Louvain-la-Neuve - Belgium.
The Proton Irradiation facility (Light Ion irradiation Facility or LIF) was used for this experiment. The corresponding experimental set-up is shown in Figure 1.

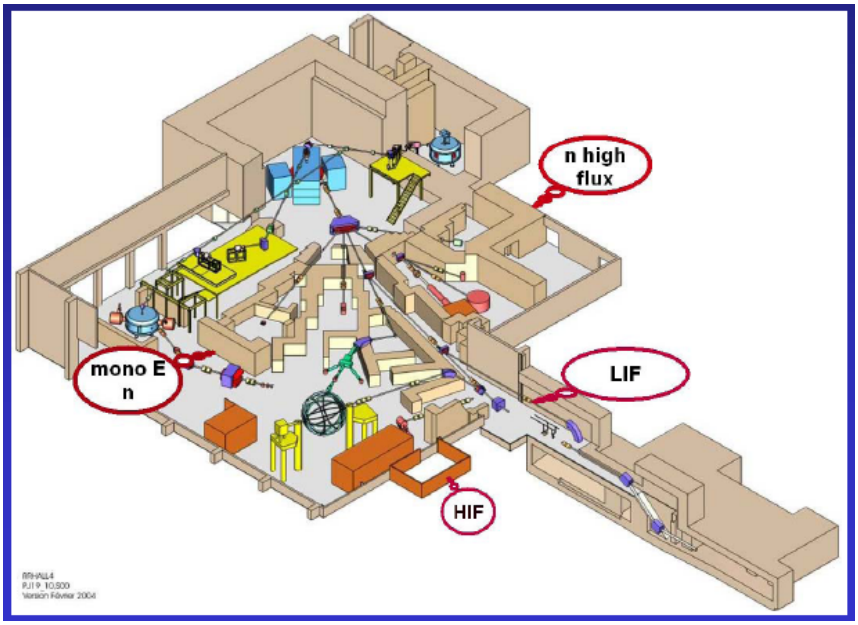


Figure 1 : LIF layout and typical experimental set-up

Light Ion irradiation Facility is characterized by the following beam parameters:
• Initial Proton Energies: 65 MeV;
• Energy Range: 9.3 – 62 MeV using energy degraders (See figure 2)
• Beam Flux at 62 MeV is between 10p/cm2/sec to 5E8 p/cm2/sec
• Irradiation Area: 8 cm diameter maximum

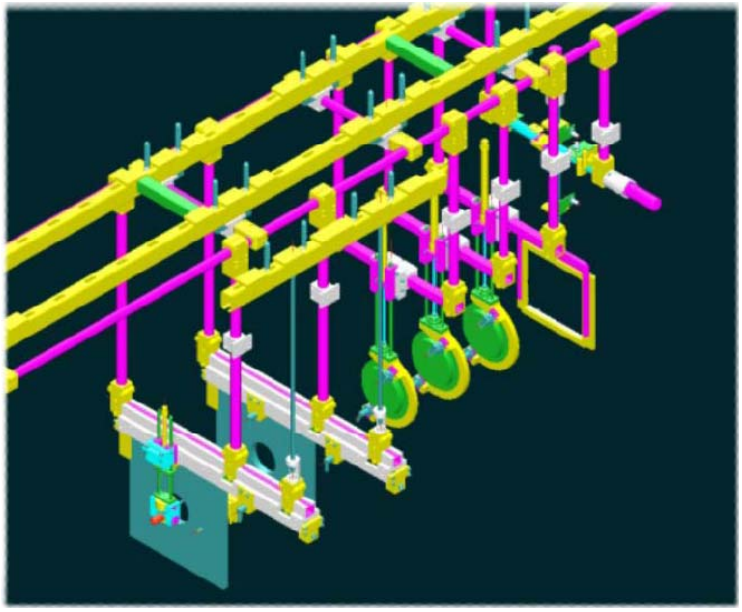


Figure 2: LIF Energy degraders

The irradiation conditions used for this test are provided in the following tables:

Fluence Steps	Total Fluence	Flux	Equivalent Total Dose	T
p/cm² @60MeV	p/cm² @60MeV	p/cm²/s	Rad (Si)	°C
0	0		0	
2E+11	2E+11	5.00E+08	27.5E+3	25

4.2 Bias during Dose Exposures and Measurements conditions

4.2.1 Bias conditions

During exposures all samples were biased OFF with all pins connected to ground.

4.2.2 Electrical Measurements

Electrical parameters test program principle for IS9-139ASRH is provided in Figure 3.

A HP4142 DC tester, a scope Infinium and a HP33120 waveform generator were used to perform required measurements.

A dedicated test fixture and a test board were designed to ensure proper measurement conditions.

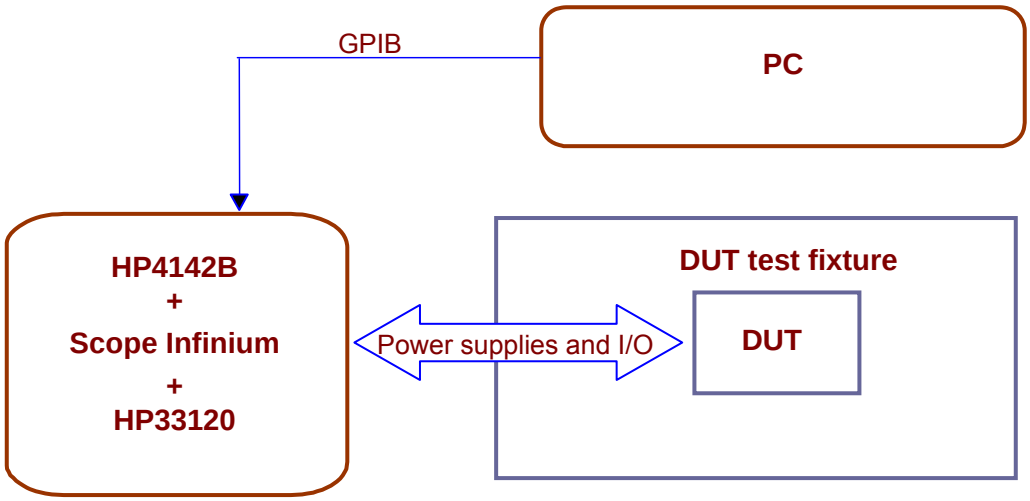


Figure 3 : IS9-139ASRH test program principle

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

Parameter	Description	Conditions VCC=9V unless otherwise specified	Spec		Unit
			Min	Max	
VIO	Input Offset Voltage	Vref = 1.4V, Output Switch Point = 1.4V, VCC= 9V to 30V	-5	5	mV
Vsat	Saturation Voltage	-VIN=1V, +Vin=0V, Isink<4mA	-	300	mV
IIO	Input Offset Current	+IN - -IN, +VCC=9V to 30V	-150	150	nA
IIB	Input Bias Current	+Iin or -Iin with output in linear range	-400	400	nA
+ICC	Total Supply Current	RL = Infinite on all comparators, VCC = 9V to 30V	-	3	mA
CMRR	Input Voltage Common Mode rejection ratio	+Vcc = 30V, RL ≥ 15K, Vcm=0V to 27.5V	70	-	dB
ICEX	Output Leakage Current	+IN>1V, -IN=0V, Vout=30V	-	0.5	µA
IOSK	Output Sink Current	-IN>1V, +IN=0V, Vout<1.5V	12	-	mA
AOL	Voltage Gain	RL>15K, VCC=15V – See note 1	25	-	V/mV
Tp_{HL}	Response Time High to Low	VIN = VIO + 5mV ; Vref = 1.4V, VRL = 5V, RL = 5.1KΩ	-	4	µs
Tp_{LH}	Response Time Low to High	VIN = VIO + 5mV ; Vref = 1.4V, VRL = 5V, RL = 5.1KΩ	-	5	µs

Note 1: AOL parameter was not measurable on these samples at initial readings and also after exposure. Further analysis has shown correct measurements on a different batch of the same part type that Hirex had in stock. This problem is more likely due to the particular behavior of these prototypes samples.

Table 1 : Measured electrical parameters

5 Conclusion

A proton displacement damage test was carried out by Hirex Engineering under Alter Technology Group Spain contract on the Intersil IS9-139ASRH Single Event Radiation Hardened Quad Voltage Comparator in FP-20 package.

Each device was exposed at room temperature to a protons flux of 60 MeV incident energy up to a total fluence of 2E+11p/cm².

All parameters remained within specification limits all along testing.

6 Test Results

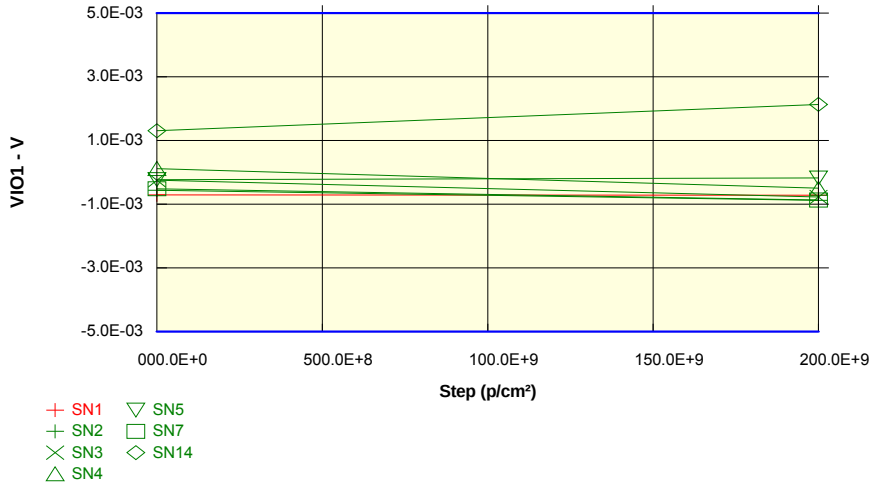
Test results including tables and graphics are provided in this section for each measured parameter.

Parameter measurements values are plotted versus Equivalent Fluence levels for 60 MeV incident energy protons. Fluences are expressed in protons/cm^2 in Silicon.

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

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

Test conditions : Protons
Parameter : Input Offset Voltage : VIO1DUT1
Vref=1.4V. VCC=9V
Unit : V
Spec Limit Min : -5.0E-03
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



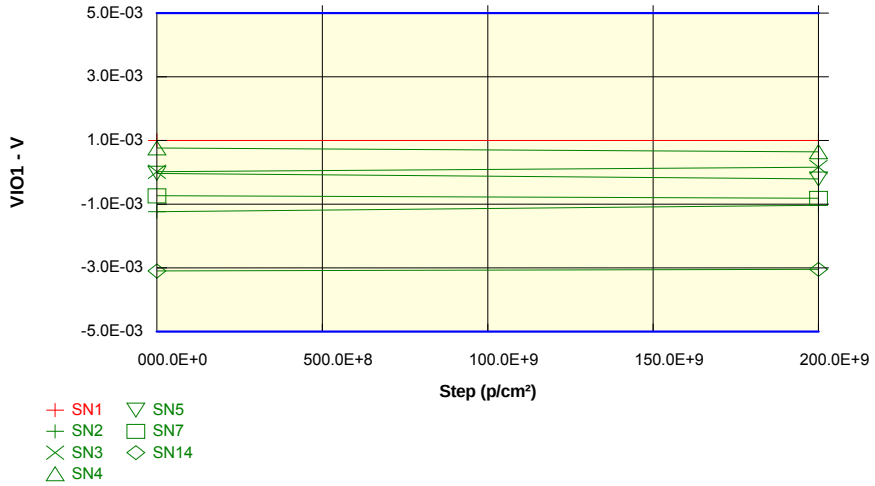
Measurements

VIO1DUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	-708.4E-06	-720.3E-06
OFF samples		
SN2	-564.4E-06	-876.9E-06
SN3	-247.9E-06	-775.2E-06
SN4	118.3E-06	-500.8E-06
SN5	-229.4E-06	-176.8E-06
SN7	-518.4E-06	-869.8E-06
SN14	1.3E-03	2.1E-03
Statistics		
Min	-564.4E-06	-876.9E-06
Max	1.3E-03	2.1E-03
Average	-22.8E-06	-178.1E-06
Sigma	634.4E-06	1.1E-03

Drift Calculation

VIO1DUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-312.52E-06
SN3	-	-527.36E-06
SN4	-	-619.12E-06
SN5	-	52.60E-06
SN7	-	-351.48E-06
SN14	-	826.04E-06
Average	-	-155.31E-06
Sigma	-	487.00E-06

Test conditions : Protons
Parameter : Input Offset Voltage : VIO1DUT2
Vref=1.4V. VCC=9V
Unit : V
Spec Limit Min : -5.0E-03
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



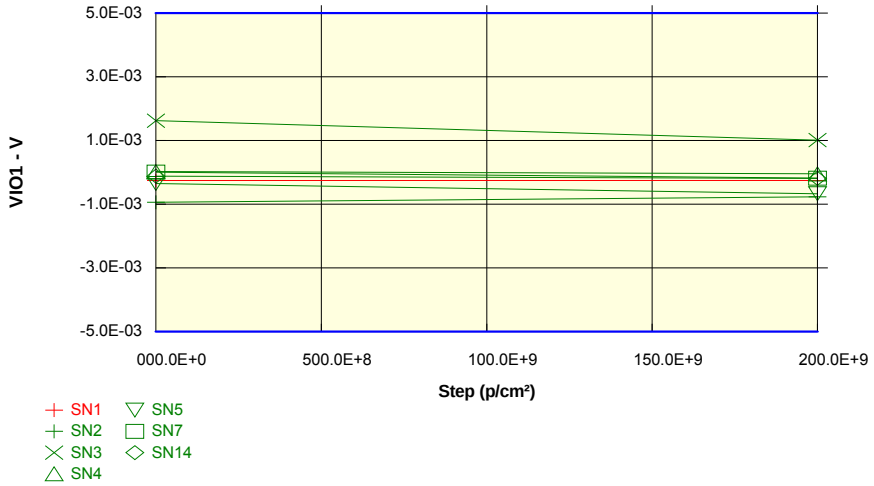
Measurements

VIO1DUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	997.9E-06	998.5E-06
OFF samples		
SN2	-1.2E-03	-1.0E-03
SN3	15.7E-06	159.6E-06
SN4	764.8E-06	647.0E-06
SN5	-31.3E-06	-207.2E-06
SN7	-737.9E-06	-815.2E-06
SN14	-3.1E-03	-3.0E-03
Statistics		
Min	-3.1E-03	-3.0E-03
Max	764.8E-06	647.0E-06
Average	-720.9E-06	-715.4E-06
Sigma	1.2E-03	1.2E-03

Drift Calculation

VIO1DUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	203.40E-06
SN3	-	143.88E-06
SN4	-	-117.80E-06
SN5	-	-175.92E-06
SN7	-	-77.24E-06
SN14	-	56.80E-06
Average	-	5.52E-06
Sigma	-	138.99E-06

Test conditions : Protons
Parameter : Input Offset Voltage : VIO1DUT3
Vref=1.4V. VCC=9V
Unit : V
Spec Limit Min : -5.0E-03
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



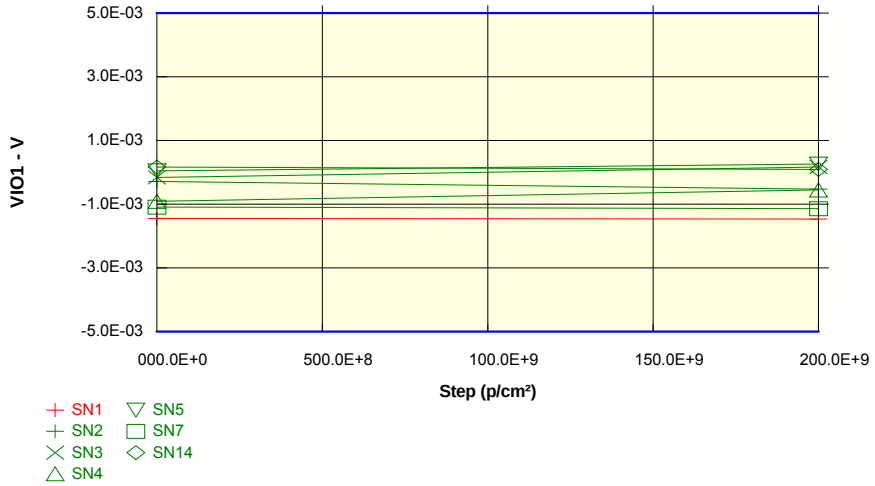
Measurements

VIO1DUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	-257.0E-06	-258.6E-06
OFF samples		
SN2	-944.4E-06	-771.5E-06
SN3	1.6E-03	1.0E-03
SN4	23.6E-06	-48.2E-06
SN5	-350.9E-06	-672.1E-06
SN7	4.1E-06	-184.5E-06
SN14	-117.9E-06	-190.8E-06
Statistics		
Min	-944.4E-06	-771.5E-06
Max	1.6E-03	1.0E-03
Average	39.0E-06	-142.1E-06
Sigma	779.3E-06	581.3E-06

Drift Calculation

VIO1DUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	172.92E-06
SN3	-	-605.40E-06
SN4	-	-71.76E-06
SN5	-	-321.24E-06
SN7	-	-188.60E-06
SN14	-	-72.84E-06
Average	-	-181.15E-06
Sigma	-	241.08E-06

Test conditions : Protons
Parameter : Input Offset Voltage : VIO1DUT4
Vref=1.4V. VCC=9V
Unit : V
Spec Limit Min : -5.0E-03
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



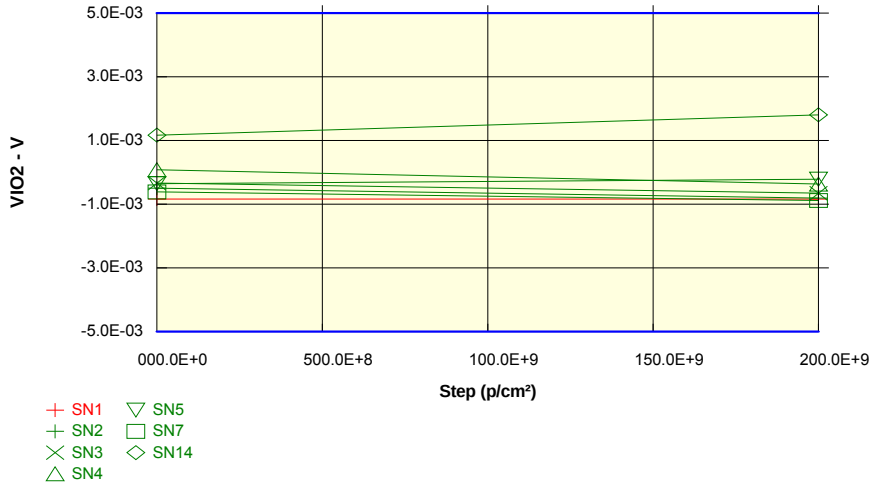
Measurements

VIO1DUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	-1.4E-03	-1.5E-03
OFF samples		
SN2	-285.0E-06	-530.2E-06
SN3	-159.7E-06	168.0E-06
SN4	-910.1E-06	-554.0E-06
SN5	46.1E-06	260.9E-06
SN7	-1.1E-03	-1.1E-03
SN14	169.5E-06	91.8E-06
Statistics		
Min	-1.1E-03	-1.1E-03
Max	169.5E-06	260.9E-06
Average	-371.9E-06	-284.4E-06
Sigma	470.7E-06	502.4E-06

Drift Calculation

VIO1DUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-245.20E-06
SN3	-	327.72E-06
SN4	-	356.08E-06
SN5	-	214.80E-06
SN7	-	-50.76E-06
SN14	-	-77.64E-06
Average	-	87.50E-06
Sigma	-	224.77E-06

Test conditions : Protons
Parameter : Input Offset Voltage : VIO2DUT1
Vref=1.4V. VCC=30V
Unit : V
Spec Limit Min : -5.0E-03
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



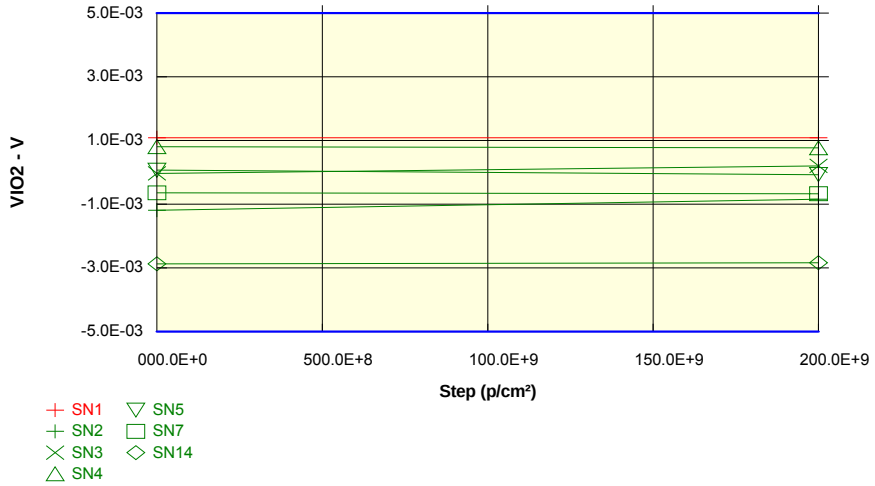
Measurements

VIO2DUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	-836.1E-06	-837.5E-06
OFF samples		
SN2	-497.5E-06	-808.5E-06
SN3	-338.6E-06	-657.3E-06
SN4	82.2E-06	-369.8E-06
SN5	-356.0E-06	-215.2E-06
SN7	-612.8E-06	-882.5E-06
SN14	1.2E-03	1.8E-03
Statistics		
Min	-612.8E-06	-882.5E-06
Max	1.2E-03	1.8E-03
Average	-92.3E-06	-187.7E-06
Sigma	603.6E-06	922.0E-06

Drift Calculation

VIO2DUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-311.00E-06
SN3	-	-318.72E-06
SN4	-	-451.92E-06
SN5	-	140.80E-06
SN7	-	-269.72E-06
SN14	-	638.00E-06
Average	-	-95.43E-06
Sigma	-	375.84E-06

Test conditions : Protons
Parameter : Input Offset Voltage : VIO2DUT2
Vref=1.4V. VCC=30V
Unit : V
Spec Limit Min : -5.0E-03
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



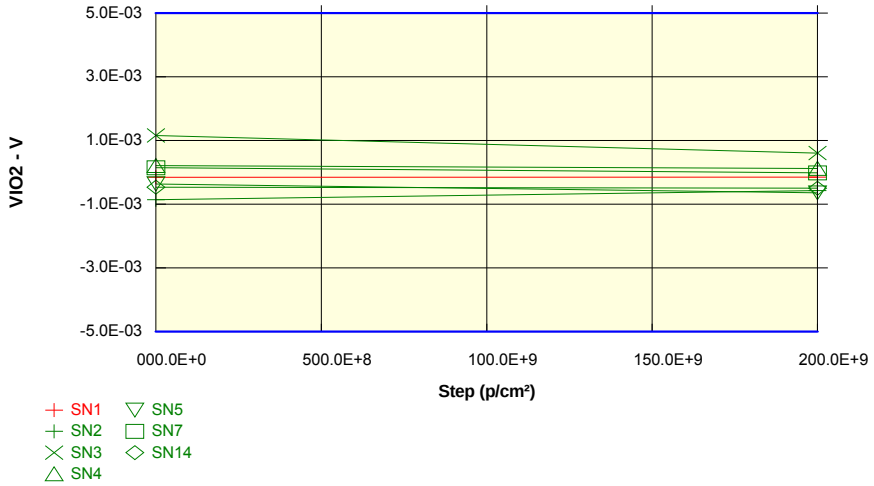
Measurements

VIO2DUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	1.1E-03	1.1E-03
OFF samples		
SN2	-1.2E-03	-845.3E-06
SN3	-35.8E-06	200.4E-06
SN4	806.4E-06	769.6E-06
SN5	66.8E-06	-71.6E-06
SN7	-641.3E-06	-671.9E-06
SN14	-2.9E-03	-2.8E-03
Statistics		
Min	-2.9E-03	-2.8E-03
Max	806.4E-06	769.6E-06
Average	-644.2E-06	-576.4E-06
Sigma	1.2E-03	1.1E-03

Drift Calculation

VIO2DUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	341.08E-06
SN3	-	236.16E-06
SN4	-	-36.80E-06
SN5	-	-138.36E-06
SN7	-	-30.60E-06
SN14	-	35.20E-06
Average	-	67.78E-06
Sigma	-	166.94E-06

Test conditions : Protons
Parameter : Input Offset Voltage : VIO2DUT3
Vref=1.4V. VCC=30V
Unit : V
Spec Limit Min : -5.0E-03
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



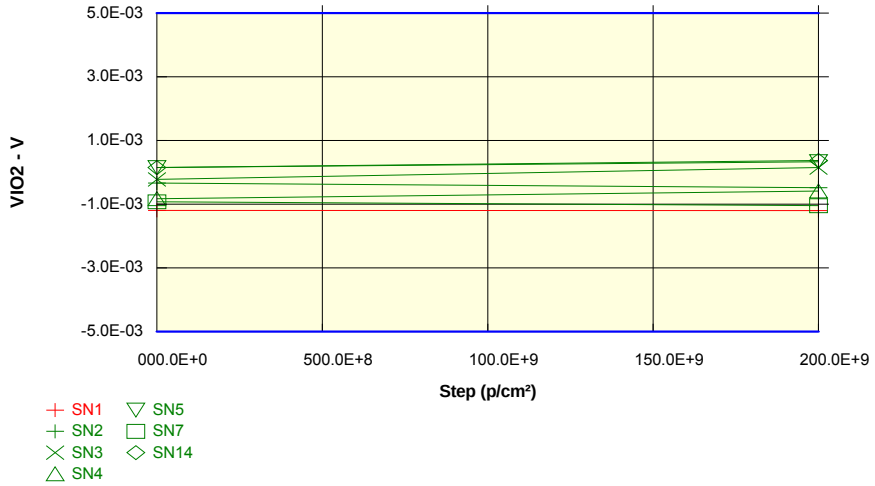
Measurements

VIO2DUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	-152.2E-06	-147.7E-06
OFF samples		
SN2	-861.0E-06	-576.2E-06
SN3	1.2E-03	604.3E-06
SN4	214.1E-06	123.9E-06
SN5	-364.6E-06	-640.8E-06
SN7	146.5E-06	-15.4E-06
SN14	-462.9E-06	-498.0E-06
Statistics		
Min	-861.0E-06	-640.8E-06
Max	1.2E-03	604.3E-06
Average	-28.8E-06	-167.0E-06
Sigma	643.5E-06	448.0E-06

Drift Calculation

VIO2DUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	284.72E-06
SN3	-	-550.52E-06
SN4	-	-90.20E-06
SN5	-	-276.12E-06
SN7	-	-161.88E-06
SN14	-	-35.08E-06
Average	-	-138.18E-06
Sigma	-	252.12E-06

Test conditions : Protons
Parameter : Input Offset Voltage : VIO2DUT4
Vref=1.4V. VCC=30V
Unit : V
Spec Limit Min : -5.0E-03
Spec Limit Max : 5.0E-03
Spec limits are represented in bold lines on the graphic.



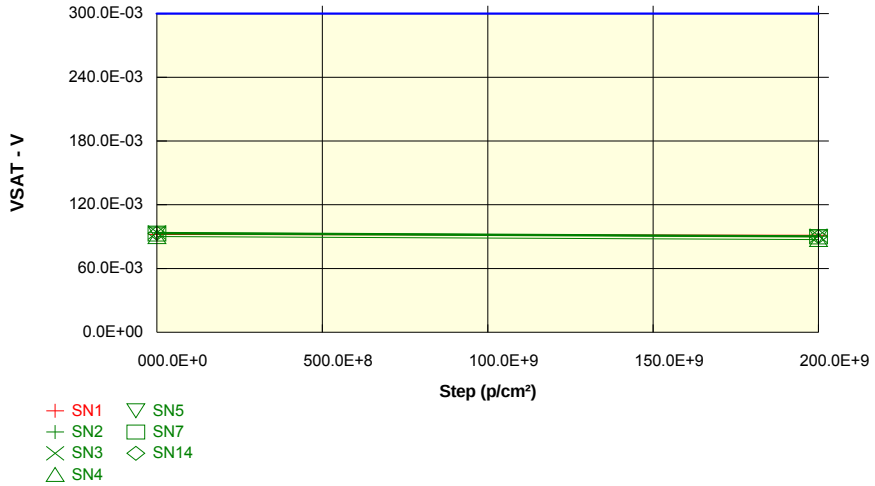
Measurements

VIO2DUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	-1.2E-03	-1.2E-03
OFF samples		
SN2	-335.8E-06	-480.8E-06
SN3	-225.3E-06	151.7E-06
SN4	-828.2E-06	-586.0E-06
SN5	152.0E-06	335.4E-06
SN7	-926.5E-06	-1.0E-03
SN14	147.2E-06	374.3E-06
Statistics		
Min	-926.5E-06	-1.0E-03
Max	152.0E-06	374.3E-06
Average	-336.1E-06	-208.6E-06
Sigma	423.2E-06	529.6E-06

Drift Calculation

VIO2DUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-144.92E-06
SN3	-	377.04E-06
SN4	-	242.16E-06
SN5	-	183.40E-06
SN7	-	-119.44E-06
SN14	-	227.08E-06
Average	-	127.55E-06
Sigma	-	193.07E-06

Test conditions : Protons
Parameter : Saturation Voltage : VSATDUT1
-VIN=1V. +VIN=0V. Isink=4mA
Unit : V
Spec Limit Max : 300.0E-03
Spec limits are represented in bold lines on the graphic.



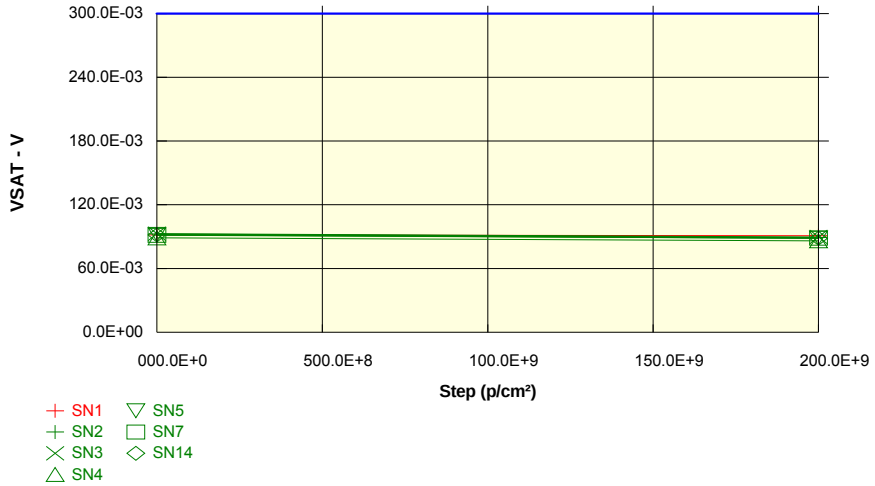
Measurements

VSATDUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	92.0E-03	91.2E-03
OFF samples		
SN2	93.6E-03	90.4E-03
SN3	94.0E-03	90.8E-03
SN4	90.0E-03	87.2E-03
SN5	93.2E-03	90.0E-03
SN7	92.4E-03	89.6E-03
SN14	93.2E-03	90.0E-03
Statistics		
Min	90.0E-03	87.2E-03
Max	94.0E-03	90.8E-03
Average	92.7E-03	89.7E-03
Sigma	1.3E-03	1.2E-03

Drift Calculation

VSATDUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-3.20E-03
SN3	-	-3.20E-03
SN4	-	-2.80E-03
SN5	-	-3.20E-03
SN7	-	-2.80E-03
SN14	-	-3.20E-03
Average	-	-3.07E-03
Sigma	-	188.56E-06

Test conditions : Protons
Parameter : Saturation Voltage : VSATDUT2
-VIN=1V. +VIN=0V. Isink=4mA
Unit : V
Spec Limit Max : 300.0E-03
Spec limits are represented in bold lines on the graphic.



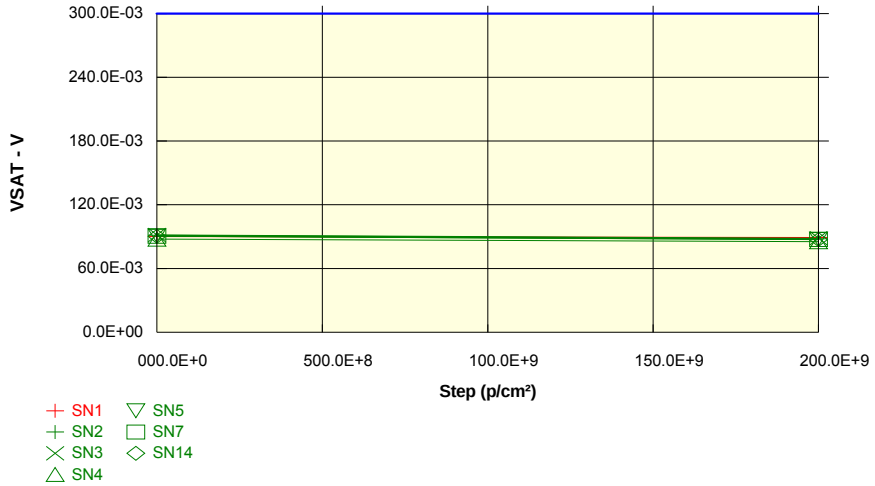
Measurements

VSATDUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	91.6E-03	90.8E-03
OFF samples		
SN2	92.4E-03	89.2E-03
SN3	92.8E-03	89.6E-03
SN4	88.8E-03	86.0E-03
SN5	92.0E-03	88.8E-03
SN7	91.2E-03	88.4E-03
SN14	91.6E-03	88.4E-03
Statistics		
Min	88.8E-03	86.0E-03
Max	92.8E-03	89.6E-03
Average	91.5E-03	88.4E-03
Sigma	1.3E-03	1.2E-03

Drift Calculation

VSATDUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-3.20E-03
SN3	-	-3.20E-03
SN4	-	-2.80E-03
SN5	-	-3.20E-03
SN7	-	-2.80E-03
SN14	-	-3.20E-03
Average	-	-3.07E-03
Sigma	-	188.56E-06

Test conditions : Protons
Parameter : Saturation Voltage : VSATDUT3
-VIN=1V. +VIN=0V. Isink=4mA
Unit : V
Spec Limit Max : 300.0E-03
Spec limits are represented in bold lines on the graphic.



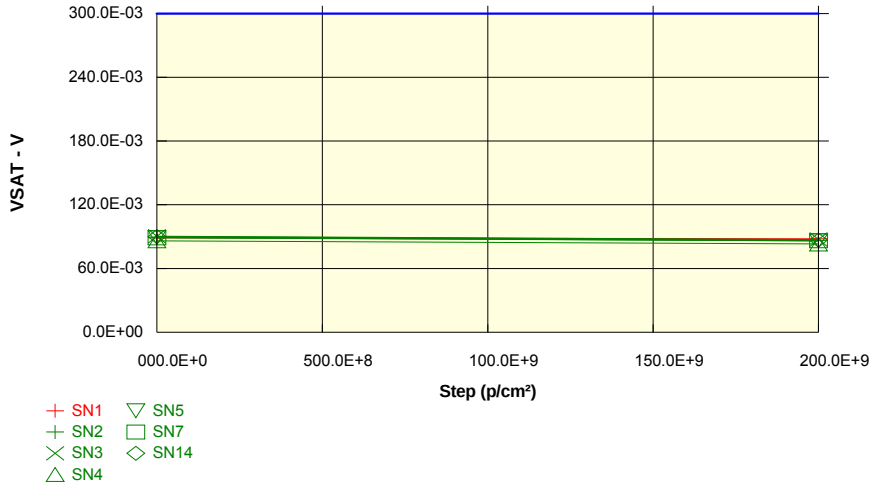
Measurements

VSATDUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	90.0E-03	89.2E-03
OFF samples		
SN2	91.2E-03	88.0E-03
SN3	91.6E-03	88.4E-03
SN4	87.6E-03	85.2E-03
SN5	90.8E-03	87.6E-03
SN7	90.4E-03	87.2E-03
SN14	90.4E-03	87.2E-03
Statistics		
Min	87.6E-03	85.2E-03
Max	91.6E-03	88.4E-03
Average	90.3E-03	87.3E-03
Sigma	1.3E-03	1.0E-03

Drift Calculation

VSATDUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-3.20E-03
SN3	-	-3.20E-03
SN4	-	-2.40E-03
SN5	-	-3.20E-03
SN7	-	-3.20E-03
SN14	-	-3.20E-03
Average	-	-3.07E-03
Sigma	-	298.14E-06

Test conditions : Protons
Parameter : Saturation Voltage : VSATDUT4
-VIN=1V. +VIN=0V. Isink=4mA
Unit : V
Spec Limit Max : 300.0E-03
Spec limits are represented in bold lines on the graphic.



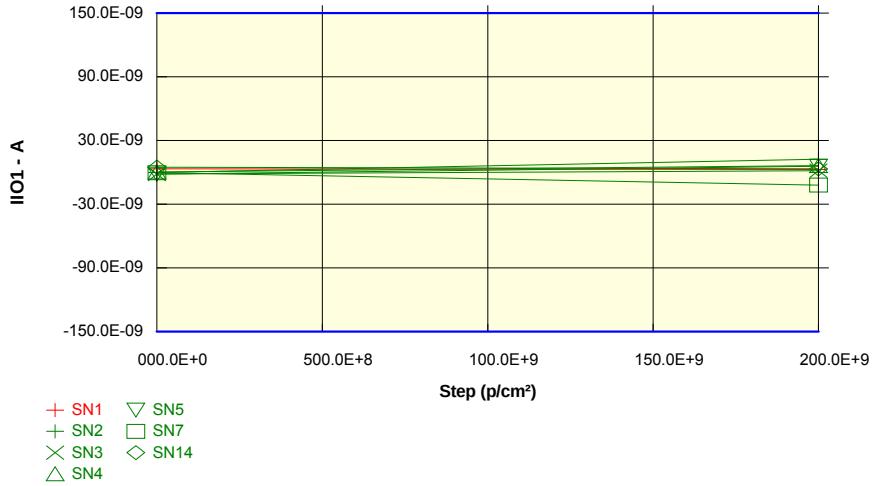
Measurements

VSATDUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	88.8E-03	88.0E-03
OFF samples		
SN2	89.6E-03	86.4E-03
SN3	90.4E-03	87.2E-03
SN4	86.0E-03	83.2E-03
SN5	89.2E-03	86.0E-03
SN7	88.8E-03	86.0E-03
SN14	90.0E-03	86.8E-03
Statistics		
Min	86.0E-03	83.2E-03
Max	90.4E-03	87.2E-03
Average	89.0E-03	85.9E-03
Sigma	1.4E-03	1.3E-03

Drift Calculation

VSATDUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-3.20E-03
SN3	-	-3.20E-03
SN4	-	-2.80E-03
SN5	-	-3.20E-03
SN7	-	-2.80E-03
SN14	-	-3.20E-03
Average	-	-3.07E-03
Sigma	-	188.56E-06

Test conditions : Protons
Parameter : Input Offset Current : IIO1DUT1
VCC=9V
Unit : A
Spec Limit Min : -150.0E-09
Spec Limit Max : 150.0E-09
Spec limits are represented in bold lines on the graphic.



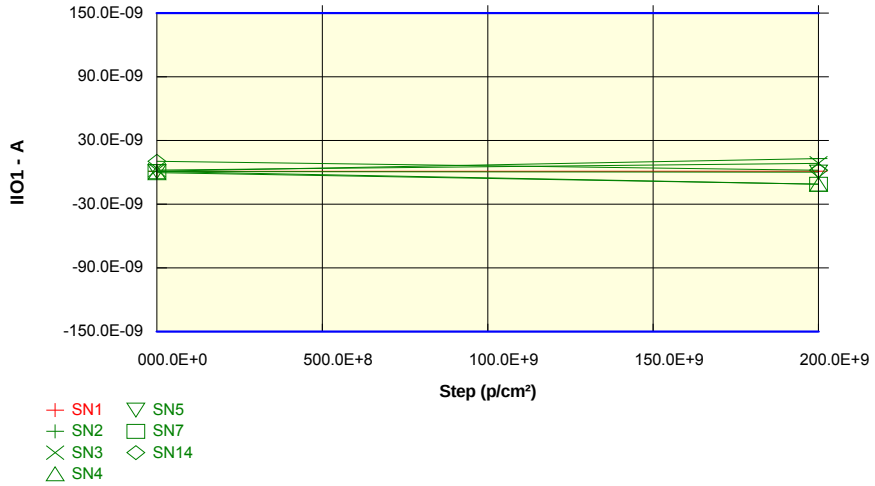
Measurements

IIO1DUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	3.2E-09	2.8E-09
OFF samples		
SN2	-138.0E-12	12.5E-09
SN3	-1.6E-09	1.5E-09
SN4	422.0E-12	6.4E-09
SN5	-1.7E-09	5.6E-09
SN7	-276.0E-12	-12.1E-09
SN14	4.8E-09	3.3E-09
Statistics		
Min	-1.7E-09	-12.1E-09
Max	4.8E-09	12.5E-09
Average	254.7E-12	2.9E-09
Sigma	2.2E-09	7.5E-09

Drift Calculation

IIO1DUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	12.60E-09
SN3	-	3.11E-09
SN4	-	5.99E-09
SN5	-	7.37E-09
SN7	-	-11.82E-09
SN14	-	-1.59E-09
Average	-	2.61E-09
Sigma	-	7.75E-09

Test conditions : Protons
Parameter : Input Offset Current : IIO1DUT2
VCC=9V
Unit : A
Spec Limit Min : -150.0E-09
Spec Limit Max : 150.0E-09
Spec limits are represented in bold lines on the graphic.



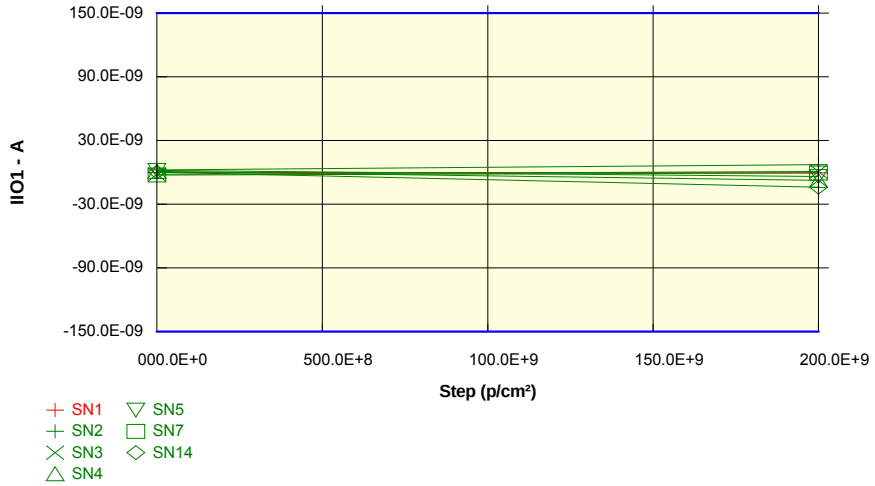
Measurements

IIO1DUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	850.0E-12	984.0E-12
OFF samples		
SN2	1.0E-09	12.9E-09
SN3	2.0E-09	8.5E-09
SN4	-372.0E-12	-11.1E-09
SN5	762.0E-12	188.0E-12
SN7	628.0E-12	-11.2E-09
SN14	10.3E-09	1.9E-09
Statistics		
Min	-372.0E-12	-11.2E-09
Max	10.3E-09	12.9E-09
Average	2.4E-09	192.3E-12
Sigma	3.6E-09	9.0E-09

Drift Calculation

IIO1DUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	11.92E-09
SN3	-	6.43E-09
SN4	-	-10.77E-09
SN5	-	-574.00E-12
SN7	-	-11.79E-09
SN14	-	-8.46E-09
Average	-	-2.21E-09
Sigma	-	8.95E-09

Test conditions : Protons
Parameter : Input Offset Current : IIO1DUT3
VCC=9V
Unit : A
Spec Limit Min : -150.0E-09
Spec Limit Max : 150.0E-09
Spec limits are represented in bold lines on the graphic.



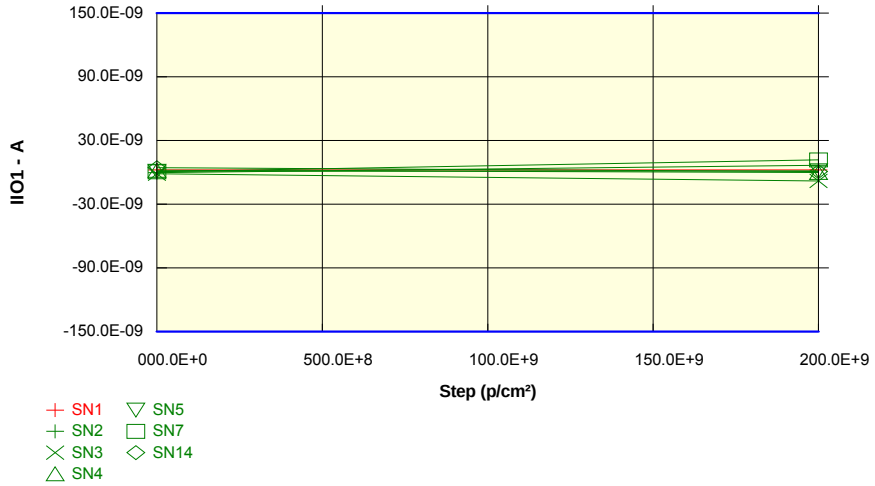
Measurements

IIO1DUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	-194.0E-12	-464.0E-12
OFF samples		
SN2	2.2E-09	7.3E-09
SN3	-2.0E-09	666.0E-12
SN4	848.0E-12	-7.5E-09
SN5	1.8E-09	-4.0E-09
SN7	-2.6E-09	-632.0E-12
SN14	240.0E-12	-13.9E-09
Statistics		
Min	-2.6E-09	-13.9E-09
Max	2.2E-09	7.3E-09
Average	89.7E-12	-3.0E-09
Sigma	1.8E-09	6.6E-09

Drift Calculation

IIO1DUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	5.10E-09
SN3	-	2.62E-09
SN4	-	-8.36E-09
SN5	-	-5.75E-09
SN7	-	1.96E-09
SN14	-	-14.12E-09
Average	-	-3.09E-09
Sigma	-	6.85E-09

Test conditions : Protons
Parameter : Input Offset Current : IIO1DUT4
VCC=9V
Unit : A
Spec Limit Min : -150.0E-09
Spec Limit Max : 150.0E-09
Spec limits are represented in bold lines on the graphic.



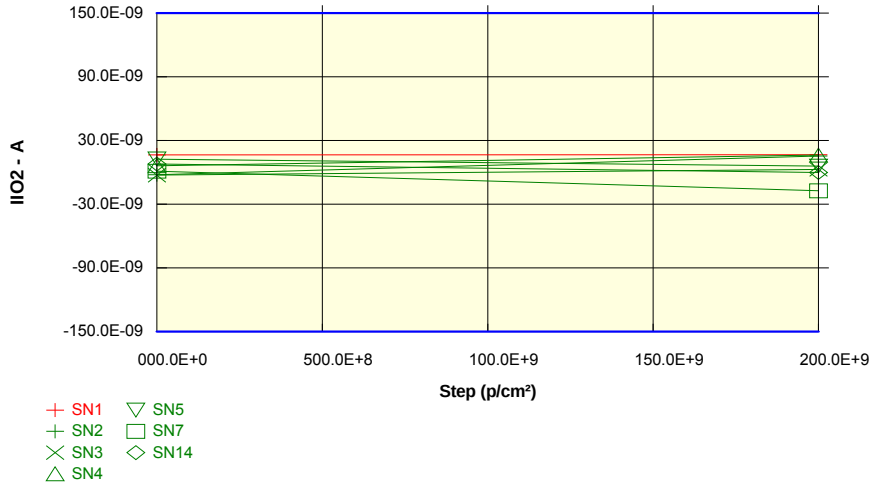
Measurements

IIO1DUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	2.3E-09	2.2E-09
OFF samples		
SN2	-304.0E-12	6.5E-09
SN3	-1.3E-09	-8.1E-09
SN4	1.8E-09	-230.0E-12
SN5	1.0E-09	1.3E-09
SN7	514.0E-12	11.8E-09
SN14	4.4E-09	640.0E-12
Statistics		
Min	-1.3E-09	-8.1E-09
Max	4.4E-09	11.8E-09
Average	1.0E-09	2.0E-09
Sigma	1.8E-09	6.1E-09

Drift Calculation

IIO1DUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	6.79E-09
SN3	-	-6.76E-09
SN4	-	-2.07E-09
SN5	-	294.00E-12
SN7	-	11.29E-09
SN14	-	-3.73E-09
Average	-	969.00E-12
Sigma	-	6.22E-09

Test conditions : Protons
Parameter : Input Offset Current : IIO2DUT1
VCC=30V
Unit : A
Spec Limit Min : -150.0E-09
Spec Limit Max : 150.0E-09
Spec limits are represented in bold lines on the graphic.



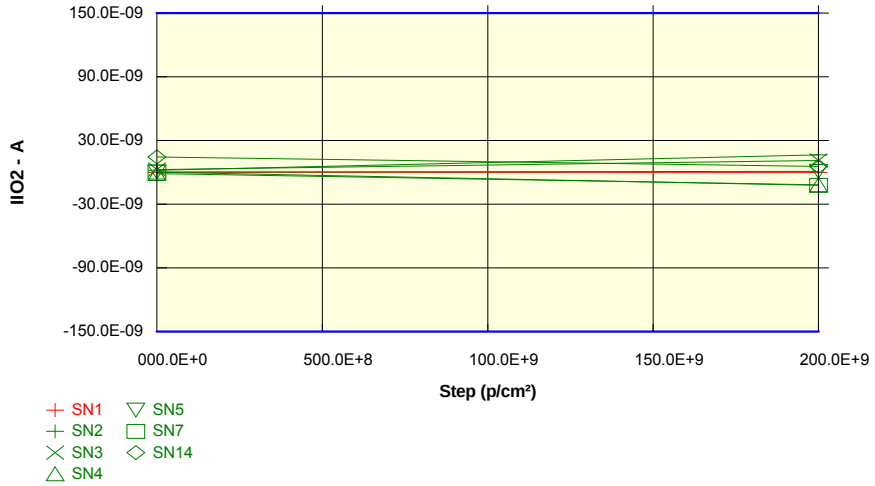
Measurements

IIO2DUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	16.4E-09	16.5E-09
OFF samples		
SN2	-2.1E-09	15.4E-09
SN3	-2.6E-09	2.8E-09
SN4	6.3E-09	16.2E-09
SN5	12.5E-09	5.9E-09
SN7	1.1E-09	-17.4E-09
SN14	7.8E-09	-132.0E-12
Statistics		
Min	-2.6E-09	-17.4E-09
Max	12.5E-09	16.2E-09
Average	3.8E-09	3.8E-09
Sigma	5.5E-09	11.3E-09

Drift Calculation

IIO2DUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	17.52E-09
SN3	-	5.49E-09
SN4	-	9.94E-09
SN5	-	-6.57E-09
SN7	-	-18.56E-09
SN14	-	-7.89E-09
Average	-	-10.00E-12
Sigma	-	12.15E-09

Test conditions : Protons
Parameter : Input Offset Current : IIO2DUT2
VCC=30V
Unit : A
Spec Limit Min : -150.0E-09
Spec Limit Max : 150.0E-09
Spec limits are represented in bold lines on the graphic.



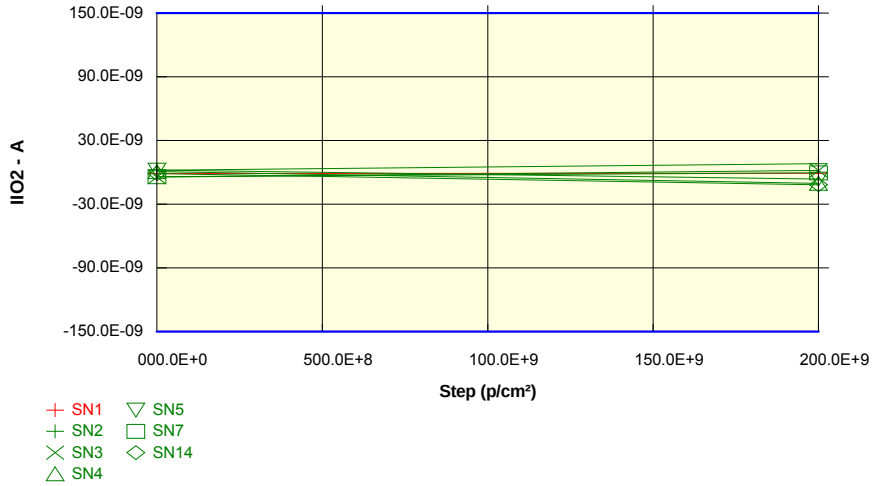
Measurements

IIO2DUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	86.0E-12	26.0E-12
OFF samples		
SN2	1.9E-09	16.5E-09
SN3	2.6E-09	11.3E-09
SN4	-1.2E-09	-11.8E-09
SN5	356.0E-12	896.0E-12
SN7	192.0E-12	-12.2E-09
SN14	14.6E-09	5.5E-09
Statistics		
Min	-1.2E-09	-12.2E-09
Max	14.6E-09	16.5E-09
Average	3.1E-09	1.7E-09
Sigma	5.3E-09	10.8E-09

Drift Calculation

IIO2DUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	14.50E-09
SN3	-	8.66E-09
SN4	-	-10.54E-09
SN5	-	540.00E-12
SN7	-	-12.37E-09
SN14	-	-9.08E-09
Average	-	-1.38E-09
Sigma	-	10.17E-09

Test conditions : Protons
Parameter : Input Offset Current : IIO2DUT3
VCC=30V
Unit : A
Spec Limit Min : -150.0E-09
Spec Limit Max : 150.0E-09
Spec limits are represented in bold lines on the graphic.



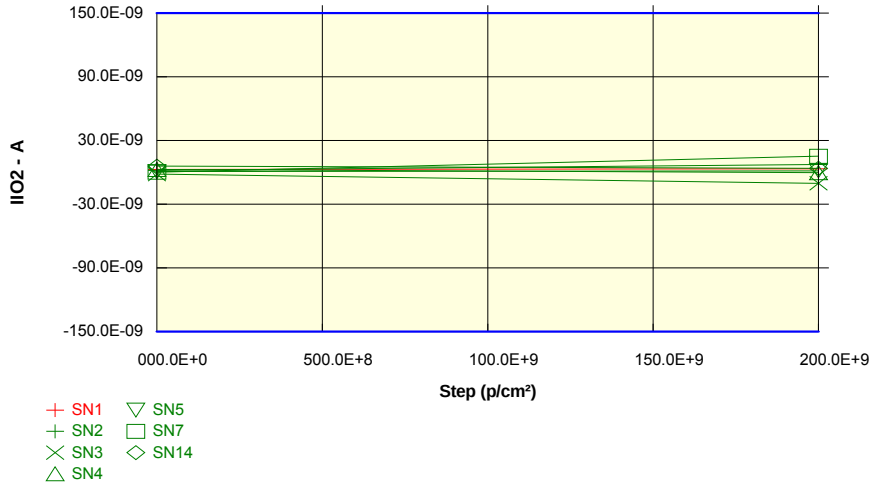
Measurements

IIO2DUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	-1.1E-09	-930.0E-12
OFF samples		
SN2	2.0E-09	8.2E-09
SN3	-4.5E-09	1.7E-09
SN4	748.0E-12	-10.3E-09
SN5	2.1E-09	-6.3E-09
SN7	-4.2E-09	-520.0E-12
SN14	-1.2E-09	-11.7E-09
Statistics		
Min	-4.5E-09	-11.7E-09
Max	2.1E-09	8.2E-09
Average	-844.3E-12	-3.2E-09
Sigma	2.7E-09	7.0E-09

Drift Calculation

IIO2DUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	6.19E-09
SN3	-	6.20E-09
SN4	-	-11.04E-09
SN5	-	-8.43E-09
SN7	-	3.66E-09
SN14	-	-10.51E-09
Average	-	-2.32E-09
Sigma	-	7.76E-09

Test conditions : Protons
Parameter : Input Offset Current : IIO2DUT4
VCC=30V
Unit : A
Spec Limit Min : -150.0E-09
Spec Limit Max : 150.0E-09
Spec limits are represented in bold lines on the graphic.



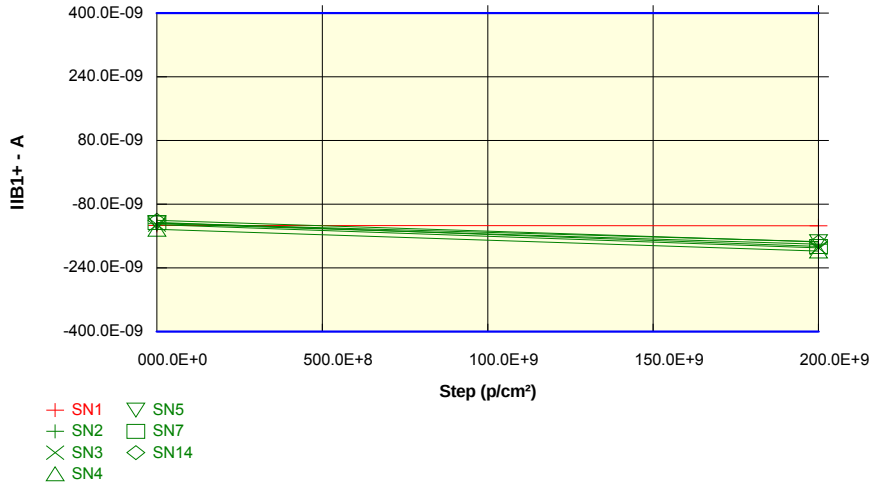
Measurements

IIO2DUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	2.8E-09	3.2E-09
OFF samples		
SN2	1.7E-09	7.5E-09
SN3	-1.7E-09	-10.3E-09
SN4	2.7E-09	-248.0E-12
SN5	626.0E-12	1.4E-09
SN7	104.0E-12	15.1E-09
SN14	5.8E-09	3.8E-09
Statistics		
Min	-1.7E-09	-10.3E-09
Max	5.8E-09	15.1E-09
Average	1.5E-09	2.9E-09
Sigma	2.3E-09	7.7E-09

Drift Calculation

IIO2DUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	5.82E-09
SN3	-	-8.66E-09
SN4	-	-2.95E-09
SN5	-	786.00E-12
SN7	-	15.01E-09
SN14	-	-1.97E-09
Average	-	1.34E-09
Sigma	-	7.49E-09

Test conditions : Protons
Parameter : Input Bias Current : IIB1+DUT1
VCC=9V
Unit : A
Spec Limit Min : -400.0E-09
Spec Limit Max : 400.0E-09
Spec limits are represented in bold lines on the graphic.



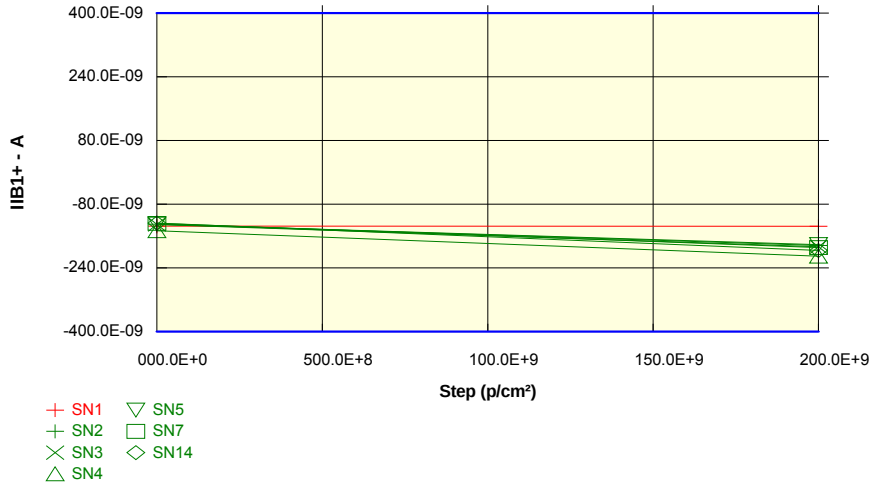
Measurements

IIB1+DUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	-133.5E-09	-134.1E-09
OFF samples		
SN2	-129.4E-09	-180.5E-09
SN3	-131.5E-09	-190.0E-09
SN4	-143.1E-09	-197.4E-09
SN5	-127.4E-09	-174.3E-09
SN7	-125.9E-09	-186.3E-09
SN14	-120.5E-09	-174.8E-09
Statistics		
Min	-143.1E-09	-197.4E-09
Max	-120.5E-09	-174.3E-09
Average	-129.6E-09	-183.9E-09
Sigma	6.9E-09	8.3E-09

Drift Calculation

IIB1+DUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-51.14E-09
SN3	-	-58.53E-09
SN4	-	-54.34E-09
SN5	-	-46.93E-09
SN7	-	-60.44E-09
SN14	-	-54.36E-09
Average	-	-54.29E-09
Sigma	-	4.47E-09

Test conditions : Protons
Parameter : Input Bias Current : IIB1+DUT2
VCC=9V
Unit : A
Spec Limit Min : -400.0E-09
Spec Limit Max : 400.0E-09
Spec limits are represented in bold lines on the graphic.



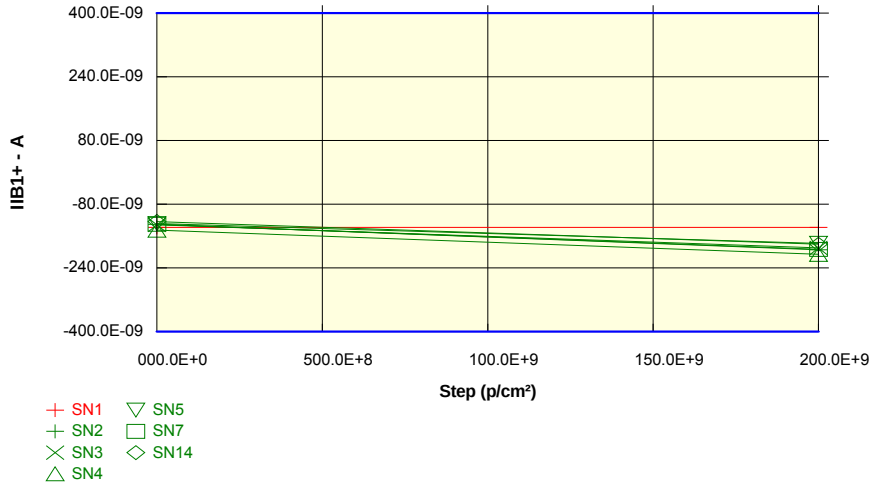
Measurements

IIB1+DUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	-135.3E-09	-135.6E-09
OFF samples		
SN2	-130.1E-09	-184.0E-09
SN3	-130.8E-09	-187.3E-09
SN4	-146.6E-09	-210.4E-09
SN5	-130.2E-09	-181.7E-09
SN7	-128.2E-09	-188.8E-09
SN14	-127.4E-09	-196.3E-09
Statistics		
Min	-146.6E-09	-210.4E-09
Max	-127.4E-09	-181.7E-09
Average	-132.2E-09	-191.4E-09
Sigma	6.5E-09	9.6E-09

Drift Calculation

IIB1+DUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-53.91E-09
SN3	-	-56.47E-09
SN4	-	-63.85E-09
SN5	-	-51.48E-09
SN7	-	-60.56E-09
SN14	-	-68.95E-09
Average	-	-59.20E-09
Sigma	-	5.97E-09

Test conditions : Protons
Parameter : Input Bias Current : IIB1+DUT3
VCC=9V
Unit : A
Spec Limit Min : -400.0E-09
Spec Limit Max : 400.0E-09
Spec limits are represented in bold lines on the graphic.



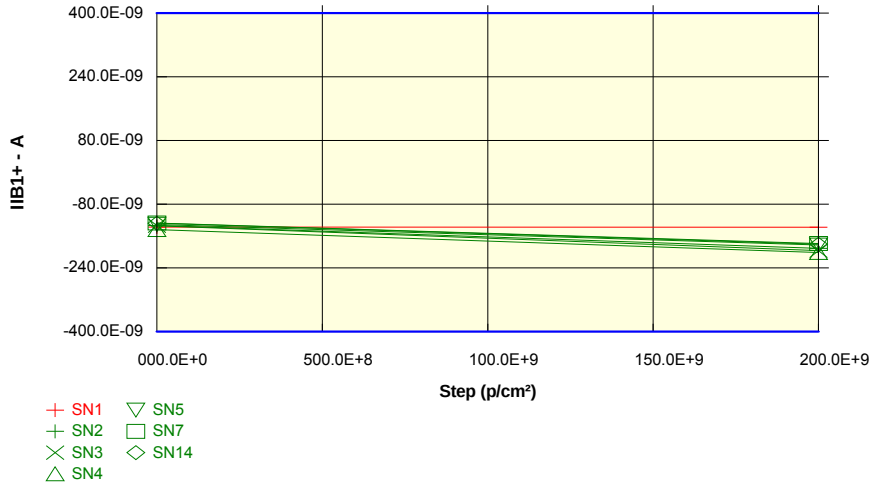
Measurements

IIB1+DUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	-138.2E-09	-138.4E-09
OFF samples		
SN2	-130.7E-09	-194.4E-09
SN3	-131.9E-09	-189.7E-09
SN4	-145.2E-09	-206.0E-09
SN5	-128.6E-09	-178.4E-09
SN7	-130.5E-09	-193.4E-09
SN14	-123.4E-09	-180.6E-09
Statistics		
Min	-145.2E-09	-206.0E-09
Max	-123.4E-09	-178.4E-09
Average	-131.7E-09	-190.4E-09
Sigma	6.6E-09	9.2E-09

Drift Calculation

IIB1+DUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-63.63E-09
SN3	-	-57.73E-09
SN4	-	-60.79E-09
SN5	-	-49.80E-09
SN7	-	-62.85E-09
SN14	-	-57.18E-09
Average	-	-58.66E-09
Sigma	-	4.62E-09

Test conditions : Protons
Parameter : Input Bias Current : IIB1+DUT4
VCC=9V
Unit : A
Spec Limit Min : -400.0E-09
Spec Limit Max : 400.0E-09
Spec limits are represented in bold lines on the graphic.



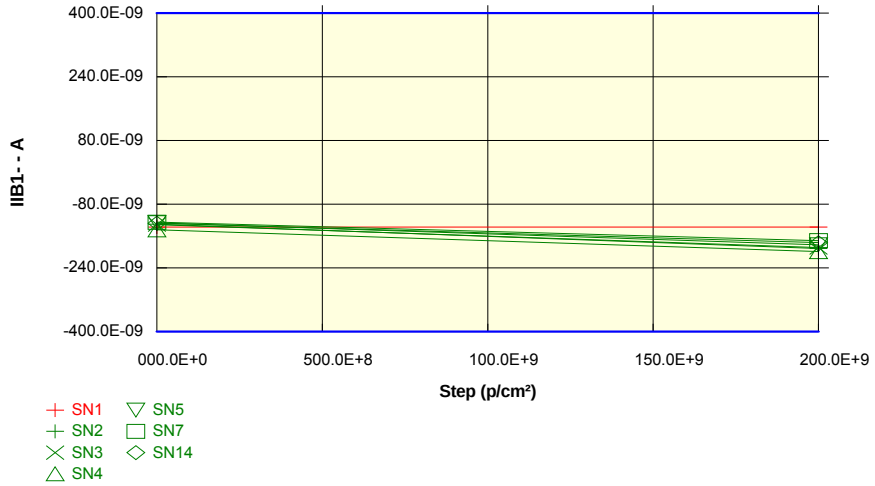
Measurements

IIB1+DUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	-137.5E-09	-137.8E-09
OFF samples		
SN2	-133.3E-09	-190.6E-09
SN3	-134.0E-09	-196.8E-09
SN4	-143.7E-09	-201.5E-09
SN5	-130.8E-09	-182.4E-09
SN7	-127.2E-09	-178.8E-09
SN14	-127.7E-09	-180.5E-09
Statistics		
Min	-143.7E-09	-201.5E-09
Max	-127.2E-09	-178.8E-09
Average	-132.8E-09	-188.4E-09
Sigma	5.5E-09	8.5E-09

Drift Calculation

IIB1+DUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-57.30E-09
SN3	-	-62.77E-09
SN4	-	-57.74E-09
SN5	-	-51.62E-09
SN7	-	-51.60E-09
SN14	-	-52.78E-09
Average	-	-55.64E-09
Sigma	-	4.06E-09

Test conditions : Protons
Parameter : Input Bias Current : IIB1-DUT1
VCC=9V
Unit : A
Spec Limit Min : -400.0E-09
Spec Limit Max : 400.0E-09
Spec limits are represented in bold lines on the graphic.



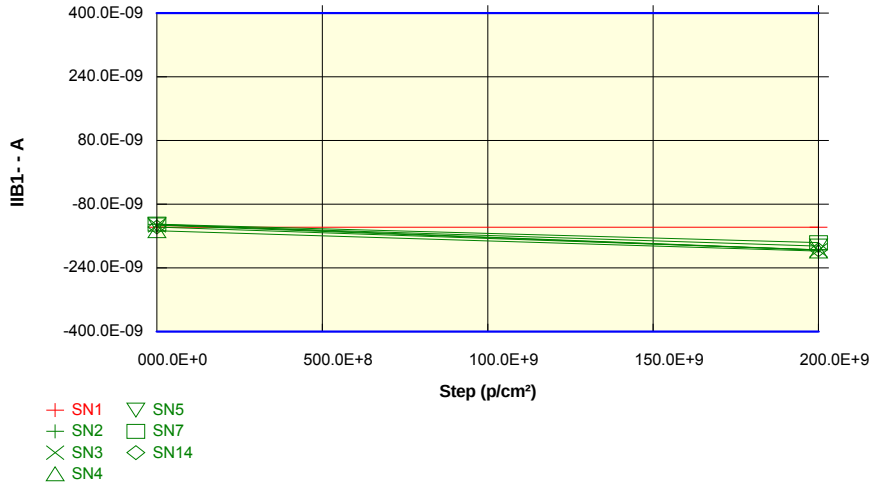
Measurements

IIB1-DUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	-137.6E-09	-137.3E-09
OFF samples		
SN2	-130.0E-09	-191.4E-09
SN3	-131.2E-09	-189.0E-09
SN4	-144.2E-09	-198.9E-09
SN5	-126.6E-09	-182.2E-09
SN7	-125.2E-09	-171.5E-09
SN14	-127.9E-09	-176.7E-09
Statistics		
Min	-144.2E-09	-198.9E-09
Max	-125.2E-09	-171.5E-09
Average	-130.9E-09	-184.9E-09
Sigma	6.3E-09	9.2E-09

Drift Calculation

IIB1-DUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-61.43E-09
SN3	-	-57.75E-09
SN4	-	-54.62E-09
SN5	-	-55.57E-09
SN7	-	-46.27E-09
SN14	-	-48.79E-09
Average	-	-54.07E-09
Sigma	-	5.15E-09

Test conditions : Protons
Parameter : Input Bias Current : IIB1-DUT2
VCC=9V
Unit : A
Spec Limit Min : -400.0E-09
Spec Limit Max : 400.0E-09
Spec limits are represented in bold lines on the graphic.



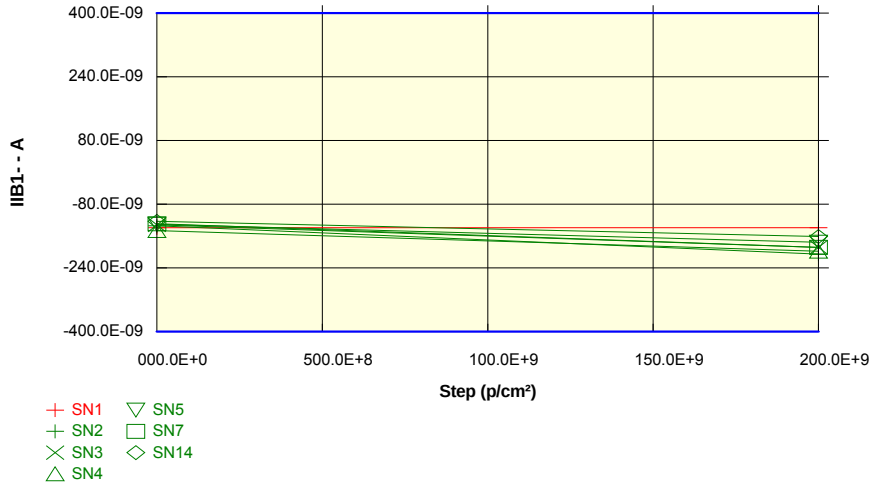
Measurements

IIB1-DUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	-137.7E-09	-137.9E-09
OFF samples		
SN2	-130.6E-09	-194.8E-09
SN3	-133.0E-09	-195.5E-09
SN4	-146.5E-09	-197.6E-09
SN5	-131.8E-09	-185.4E-09
SN7	-130.1E-09	-176.5E-09
SN14	-137.5E-09	-194.3E-09
Statistics		
Min	-146.5E-09	-197.6E-09
Max	-130.1E-09	-176.5E-09
Average	-134.9E-09	-190.7E-09
Sigma	5.7E-09	7.4E-09

Drift Calculation

IIB1-DUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-64.17E-09
SN3	-	-62.47E-09
SN4	-	-51.07E-09
SN5	-	-53.68E-09
SN7	-	-46.36E-09
SN14	-	-56.74E-09
Average	-	-55.75E-09
Sigma	-	6.21E-09

Test conditions : Protons
Parameter : Input Bias Current : IIB1-DUT3
VCC=9V
Unit : A
Spec Limit Min : -400.0E-09
Spec Limit Max : 400.0E-09
Spec limits are represented in bold lines on the graphic.



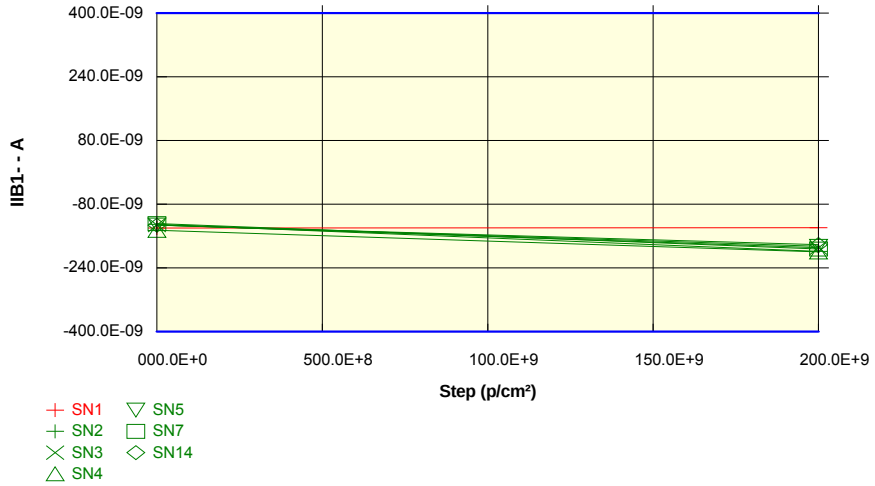
Measurements

IIB1-DUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	-139.1E-09	-139.4E-09
OFF samples		
SN2	-134.1E-09	-205.5E-09
SN3	-131.7E-09	-188.3E-09
SN4	-146.2E-09	-198.3E-09
SN5	-130.7E-09	-175.6E-09
SN7	-129.2E-09	-188.6E-09
SN14	-123.1E-09	-161.3E-09
Statistics		
Min	-146.2E-09	-205.5E-09
Max	-123.1E-09	-161.3E-09
Average	-132.5E-09	-186.3E-09
Sigma	7.0E-09	14.5E-09

Drift Calculation

IIB1-DUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-71.39E-09
SN3	-	-56.57E-09
SN4	-	-52.03E-09
SN5	-	-44.96E-09
SN7	-	-59.39E-09
SN14	-	-38.20E-09
Average	-	-53.76E-09
Sigma	-	10.59E-09

Test conditions : Protons
Parameter : Input Bias Current : IIB1-DUT4
VCC=9V
Unit : A
Spec Limit Min : -400.0E-09
Spec Limit Max : 400.0E-09
Spec limits are represented in bold lines on the graphic.



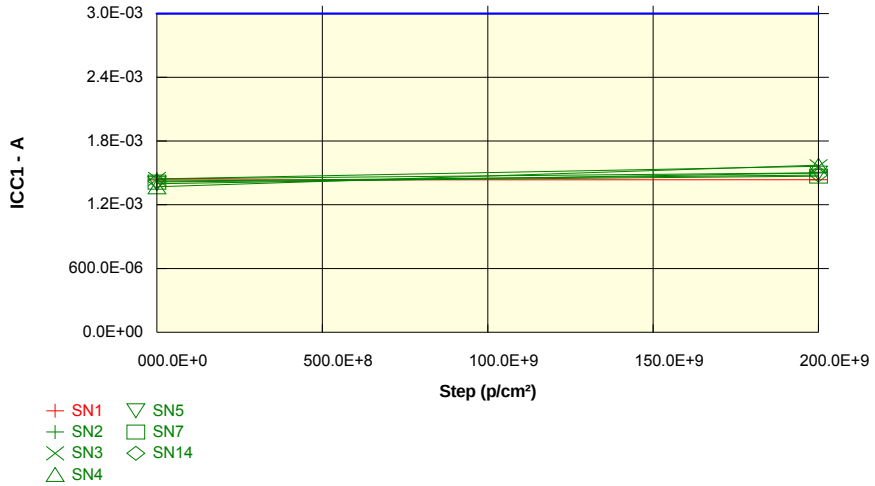
Measurements

IIB1-DUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	-139.6E-09	-139.3E-09
OFF samples		
SN2	-130.4E-09	-198.6E-09
SN3	-132.5E-09	-189.3E-09
SN4	-145.6E-09	-199.9E-09
SN5	-132.4E-09	-185.9E-09
SN7	-128.6E-09	-192.5E-09
SN14	-132.8E-09	-181.4E-09
Statistics		
Min	-145.6E-09	-199.9E-09
Max	-128.6E-09	-181.4E-09
Average	-133.7E-09	-191.2E-09
Sigma	5.5E-09	6.6E-09

Drift Calculation

IIB1-DUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-68.16E-09
SN3	-	-56.83E-09
SN4	-	-54.30E-09
SN5	-	-53.42E-09
SN7	-	-63.90E-09
SN14	-	-48.60E-09
Average	-	-57.54E-09
Sigma	-	6.60E-09

Test conditions : Protons
Parameter : Total Supply Current : ICC1
RL=Infinite. VCC=9V
Unit : A
Spec Limit Max : 3.0E-03
Spec limits are represented in bold lines on the graphic.



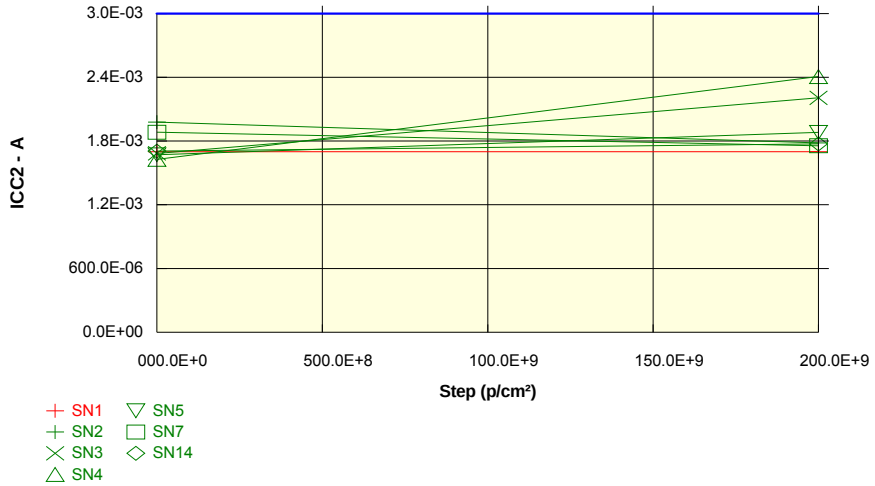
Measurements

ICC1	0 p/cm²	2E+11 p/cm²
SN1_REF	1.4E-03	1.4E-03
OFF samples		
SN2	1.4E-03	1.5E-03
SN3	1.4E-03	1.6E-03
SN4	1.4E-03	1.6E-03
SN5	1.4E-03	1.5E-03
SN7	1.4E-03	1.5E-03
SN14	1.4E-03	1.5E-03
Statistics		
Min	1.4E-03	1.5E-03
Max	1.4E-03	1.6E-03
Average	1.4E-03	1.5E-03
Sigma	25.9E-06	39.5E-06

Drift Calculation

ICC1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	56.60E-06
SN3	-	119.60E-06
SN4	-	202.20E-06
SN5	-	99.80E-06
SN7	-	56.40E-06
SN14	-	58.00E-06
Average	-	98.77E-06
Sigma	-	52.23E-06

Test conditions : Protons
Parameter : Total Supply Current : ICC2
RL=Infinite. VCC=30V
Unit : A
Spec Limit Max : 3.0E-03
Spec limits are represented in bold lines on the graphic.



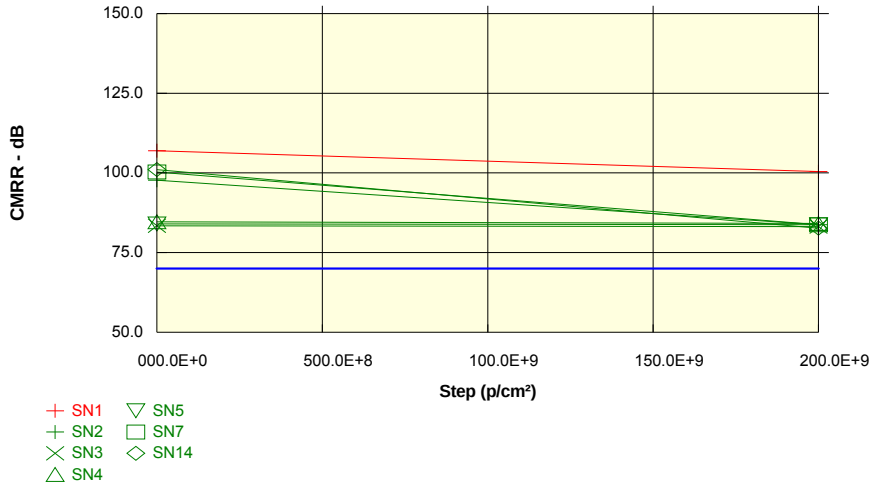
Measurements

ICC2	0 p/cm²	2E+11 p/cm²
SN1_REF	1.7E-03	1.7E-03
OFF samples		
SN2	2.0E-03	1.8E-03
SN3	1.7E-03	2.2E-03
SN4	1.6E-03	2.4E-03
SN5	1.7E-03	1.9E-03
SN7	1.9E-03	1.8E-03
SN14	1.7E-03	1.8E-03
Statistics		
Min	1.6E-03	1.8E-03
Max	2.0E-03	2.4E-03
Average	1.8E-03	2.0E-03
Sigma	126.9E-06	250.3E-06

Drift Calculation

ICC2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-195.40E-06
SN3	-	524.00E-06
SN4	-	779.20E-06
SN5	-	210.20E-06
SN7	-	-127.20E-06
SN14	-	67.20E-06
Average	-	209.67E-06
Sigma	-	346.66E-06

Test conditions : Protons
Parameter : Input Voltage Common Mode Rejection Ratio : CMRRDUT1
VCC=30V. VCM=0V to 27.5V
Unit : dB
Spec Limit Min : 70.0
Spec limits are represented in bold lines on the graphic.



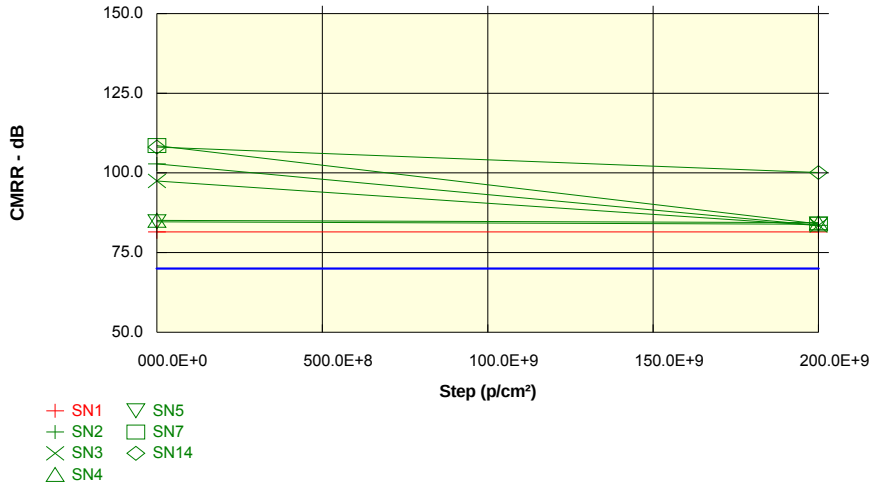
Measurements

CMRRDUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	106.9	100.4
OFF samples		
SN2	97.7	83.8
SN3	83.4	83.2
SN4	84.7	84.2
SN5	84.0	83.7
SN7	100.3	83.7
SN14	101.0	82.7
Statistics		
Min	83.4	82.7
Max	101.0	84.2
Average	91.9	83.5
Sigma	7.9	0.5

Drift Calculation

CMRRDUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-13.96E+00
SN3	-	-253.36E-03
SN4	-	-515.10E-03
SN5	-	-254.89E-03
SN7	-	-16.60E+00
SN14	-	-18.37E+00
Average	-	-8.33E+00
Sigma	-	8.09E+00

Test conditions : Protons
Parameter : Input Voltage Common Mode Rejection Ratio : CMRRDUT2
VCC=30V. VCM=0V to 27.5V
Unit : dB
Spec Limit Min : 70.0
Spec limits are represented in bold lines on the graphic.



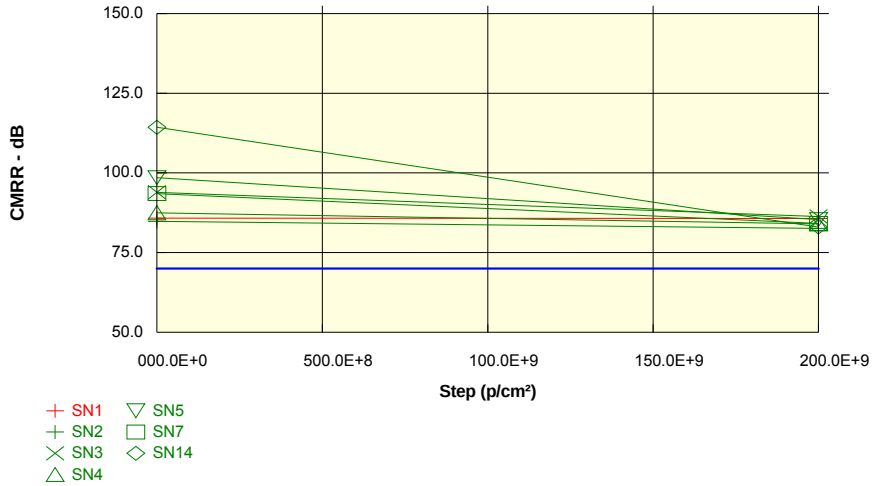
Measurements

CMRRDUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	81.5	81.5
OFF samples		
SN2	102.8	83.6
SN3	97.5	83.5
SN4	85.1	84.4
SN5	84.7	83.9
SN7	108.6	84.0
SN14	108.1	100.1
Statistics		
Min	84.7	83.5
Max	108.6	100.1
Average	97.8	86.6
Sigma	9.8	6.1

Drift Calculation

CMRRDUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-19.27E+00
SN3	-	-14.00E+00
SN4	-	-729.72E-03
SN5	-	-737.75E-03
SN7	-	-24.59E+00
SN14	-	-7.98E+00
Average	-	-11.22E+00
Sigma	-	8.96E+00

Test conditions : Protons
Parameter : Input Voltage Common Mode Rejection Ratio : CMRRDUT3
VCC=30V. VCM=0V to 27.5V
Unit : dB
Spec Limit Min : 70.0
Spec limits are represented in bold lines on the graphic.



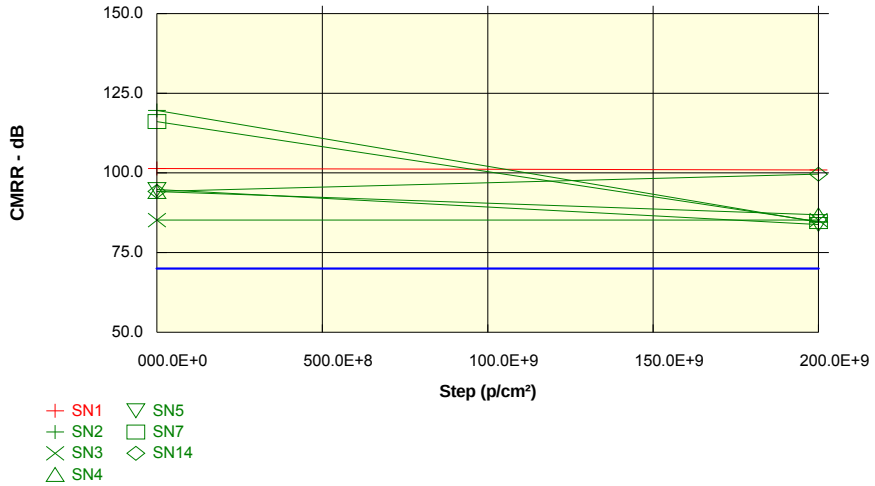
Measurements

CMRRDUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	85.8	85.7
OFF samples		
SN2	84.8	82.6
SN3	93.9	86.3
SN4	87.5	84.0
SN5	98.5	85.3
SN7	93.5	84.2
SN14	114.3	83.0
Statistics		
Min	84.8	82.6
Max	114.3	86.3
Average	95.4	84.2
Sigma	9.6	1.3

Drift Calculation

CMRRDUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-2.19E+00
SN3	-	-7.59E+00
SN4	-	-3.53E+00
SN5	-	-13.17E+00
SN7	-	-9.37E+00
SN14	-	-31.35E+00
Average	-	-11.20E+00
Sigma	-	9.72E+00

Test conditions : Protons
Parameter : Input Voltage Common Mode Rejection Ratio : CMRRDUT4
VCC=30V. VCM=0V to 27.5V
Unit : dB
Spec Limit Min : 70.0
Spec limits are represented in bold lines on the graphic.



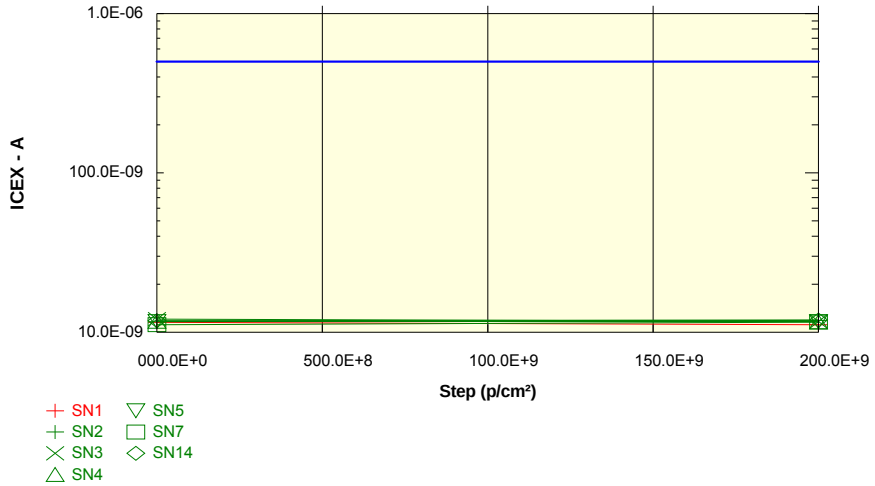
Measurements

CMRRDUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	101.4	101.0
OFF samples		
SN2	119.6	84.5
SN3	85.2	85.2
SN4	94.1	86.8
SN5	94.8	83.8
SN7	116.1	84.7
SN14	94.2	99.6
Statistics		
Min	85.2	83.8
Max	119.6	99.6
Average	100.7	87.4
Sigma	12.6	5.5

Drift Calculation

CMRRDUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-35.05E+00
SN3	-	2.53E-03
SN4	-	-7.30E+00
SN5	-	-10.96E+00
SN7	-	-31.36E+00
SN14	-	5.41E+00
Average	-	-13.21E+00
Sigma	-	15.10E+00

Test conditions : Protons
Parameter : Output Leakage Current : ICEXDUT1
+IN>1V. -IN=0V. VOUT=30V
Unit : A
Spec Limit Max : 500.0E-09
Spec limits are represented in bold lines on the graphic.



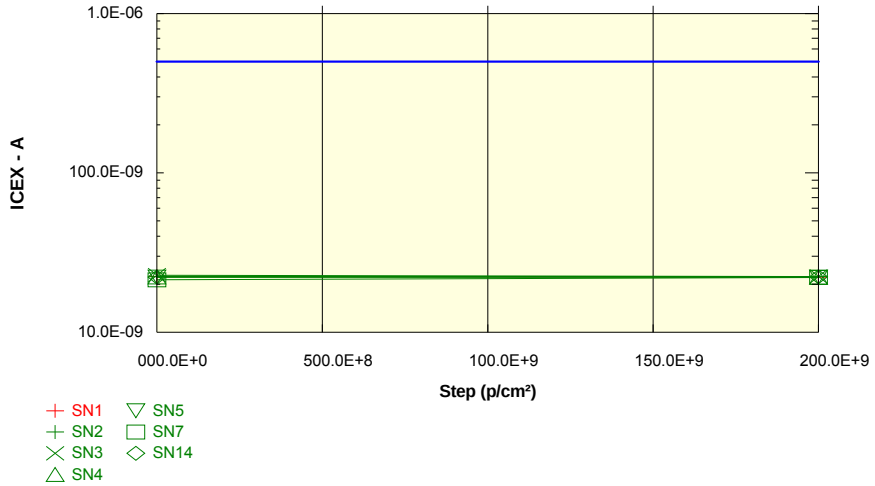
Measurements

ICEXDUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	11.5E-09	11.2E-09
OFF samples		
SN2	11.6E-09	11.8E-09
SN3	12.1E-09	11.7E-09
SN4	11.7E-09	11.6E-09
SN5	11.7E-09	11.7E-09
SN7	11.1E-09	11.6E-09
SN14	11.8E-09	11.9E-09
Statistics		
Min	11.1E-09	11.6E-09
Max	12.1E-09	11.9E-09
Average	11.7E-09	11.7E-09
Sigma	278.5E-12	130.9E-12

Drift Calculation

ICEXDUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	198.00E-12
SN3	-	-390.00E-12
SN4	-	-94.00E-12
SN5	-	-10.00E-12
SN7	-	412.00E-12
SN14	-	134.00E-12
Average	-	41.67E-12
Sigma	-	250.84E-12

Test conditions : Protons
Parameter : Output Leakage Current : ICEXDUT2
+IN>1V. -IN=0V. VOUT=30V
Unit : A
Spec Limit Max : 500.0E-09
Spec limits are represented in bold lines on the graphic.



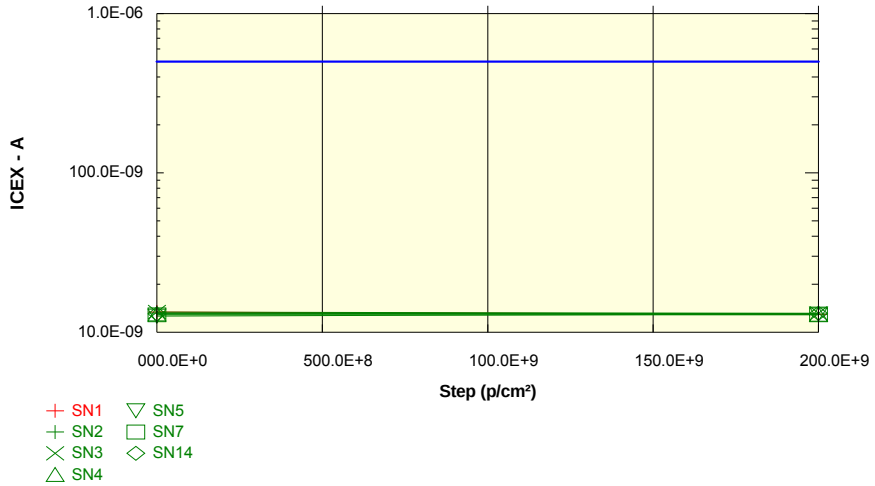
Measurements

ICEXDUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	22.4E-09	22.1E-09
OFF samples		
SN2	22.3E-09	22.3E-09
SN3	22.8E-09	22.3E-09
SN4	22.3E-09	22.2E-09
SN5	22.2E-09	22.2E-09
SN7	21.3E-09	22.1E-09
SN14	22.2E-09	22.3E-09
Statistics		
Min	21.3E-09	22.1E-09
Max	22.8E-09	22.3E-09
Average	22.2E-09	22.2E-09
Sigma	437.3E-12	100.8E-12

Drift Calculation

ICEXDUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	60.00E-12
SN3	-	-448.00E-12
SN4	-	-102.00E-12
SN5	-	12.00E-12
SN7	-	764.00E-12
SN14	-	108.00E-12
Average	-	65.67E-12
Sigma	-	361.56E-12

Test conditions : Protons
Parameter : Output Leakage Current : ICEXDUT3
+IN>1V. -IN=0V. VOUT=30V
Unit : A
Spec Limit Max : 500.0E-09
Spec limits are represented in bold lines on the graphic.



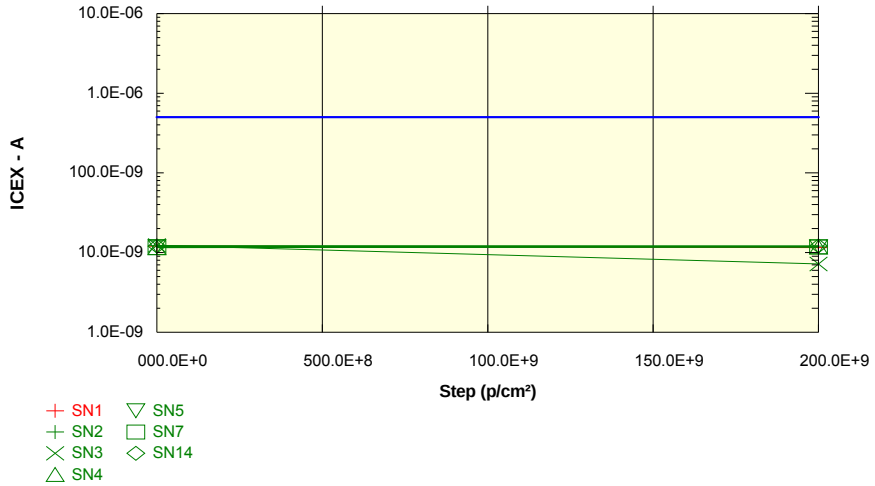
Measurements

ICEXDUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	13.4E-09	13.0E-09
OFF samples		
SN2	13.2E-09	13.0E-09
SN3	13.4E-09	13.1E-09
SN4	13.0E-09	13.0E-09
SN5	12.6E-09	13.0E-09
SN7	12.9E-09	12.9E-09
SN14	13.0E-09	13.1E-09
Statistics		
Min	12.6E-09	12.9E-09
Max	13.4E-09	13.1E-09
Average	13.0E-09	13.0E-09
Sigma	238.2E-12	95.9E-12

Drift Calculation

ICEXDUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-194.00E-12
SN3	-	-258.00E-12
SN4	-	-58.00E-12
SN5	-	352.00E-12
SN7	-	-8.00E-12
SN14	-	108.00E-12
Average	-	-9.67E-12
Sigma	-	201.09E-12

Test conditions : Protons
Parameter : Output Leakage Current : ICEXDUT4
+IN>1V. -IN=0V. VOUT=30V
Unit : A
Spec Limit Max : 500.0E-09
Spec limits are represented in bold lines on the graphic.



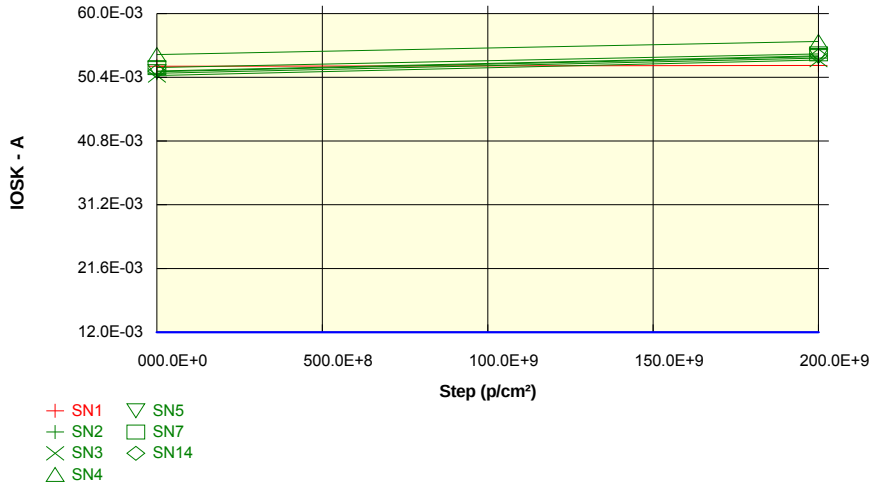
Measurements

ICEXDUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	12.0E-09	11.5E-09
OFF samples		
SN2	12.2E-09	12.0E-09
SN3	12.3E-09	7.2E-09
SN4	11.5E-09	11.8E-09
SN5	11.9E-09	11.9E-09
SN7	11.5E-09	11.7E-09
SN14	12.0E-09	12.1E-09
Statistics		
Min	11.5E-09	7.2E-09
Max	12.3E-09	12.1E-09
Average	11.9E-09	11.1E-09
Sigma	299.1E-12	1.8E-09

Drift Calculation

ICEXDUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-210.00E-12
SN3	-	-5.09E-09
SN4	-	248.00E-12
SN5	-	-42.00E-12
SN7	-	214.00E-12
SN14	-	52.00E-12
Average	-	-804.67E-12
Sigma	-	1.92E-09

Test conditions : Protons
Parameter : Output Sink Current : IOSKDUT1
-IN>1V. +IN=0V. VOUT<1.5V
Unit : A
Spec Limit Min : 12.0E-03
Spec limits are represented in bold lines on the graphic.



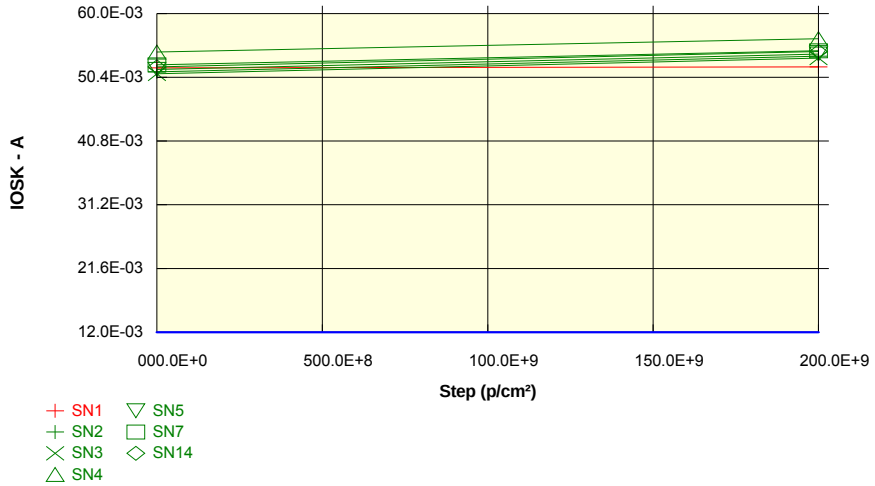
Measurements

IOSKDUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	52.1E-03	52.2E-03
OFF samples		
SN2	51.0E-03	53.3E-03
SN3	50.7E-03	53.0E-03
SN4	53.8E-03	55.8E-03
SN5	51.3E-03	53.5E-03
SN7	51.9E-03	53.9E-03
SN14	51.3E-03	53.6E-03
Statistics		
Min	50.7E-03	53.0E-03
Max	53.8E-03	55.8E-03
Average	51.7E-03	53.9E-03
Sigma	1.0E-03	909.2E-06

Drift Calculation

IOSKDUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	2.30E-03
SN3	-	2.33E-03
SN4	-	1.97E-03
SN5	-	2.25E-03
SN7	-	2.07E-03
SN14	-	2.28E-03
Average	-	2.20E-03
Sigma	-	132.66E-06

Test conditions : Protons
Parameter : Output Sink Current : IOSKDUT2
-IN>1V. +IN=0V. VOUT<1.5V
Unit : A
Spec Limit Min : 12.0E-03
Spec limits are represented in bold lines on the graphic.



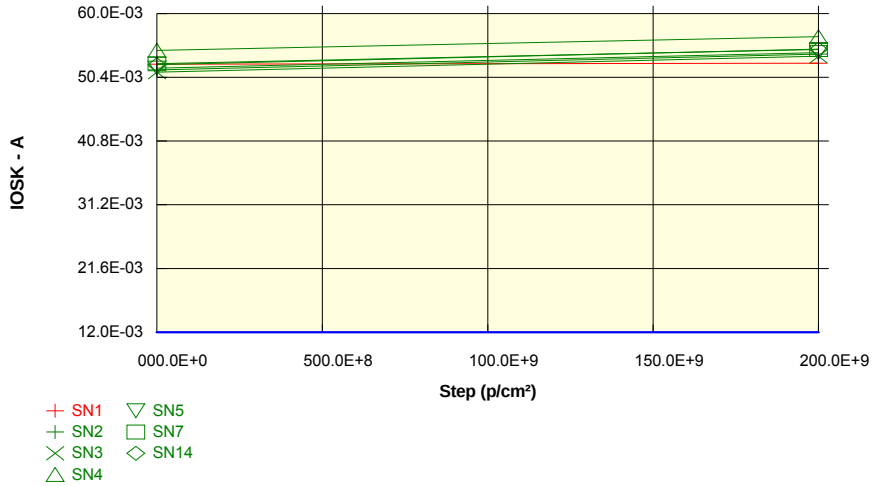
Measurements

IOSKDUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	51.8E-03	52.0E-03
OFF samples		
SN2	51.2E-03	53.6E-03
SN3	50.9E-03	53.3E-03
SN4	54.2E-03	56.2E-03
SN5	51.6E-03	53.9E-03
SN7	52.3E-03	54.4E-03
SN14	52.0E-03	54.3E-03
Statistics		
Min	50.9E-03	53.3E-03
Max	54.2E-03	56.2E-03
Average	52.0E-03	54.3E-03
Sigma	1.1E-03	946.1E-06

Drift Calculation

IOSKDUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	2.36E-03
SN3	-	2.38E-03
SN4	-	2.02E-03
SN5	-	2.31E-03
SN7	-	2.11E-03
SN14	-	2.33E-03
Average	-	2.25E-03
Sigma	-	135.33E-06

Test conditions : Protons
Parameter : Output Sink Current : IOSKDUT3
-IN>1V. +IN=0V. VOUT<1.5V
Unit : A
Spec Limit Min : 12.0E-03
Spec limits are represented in bold lines on the graphic.



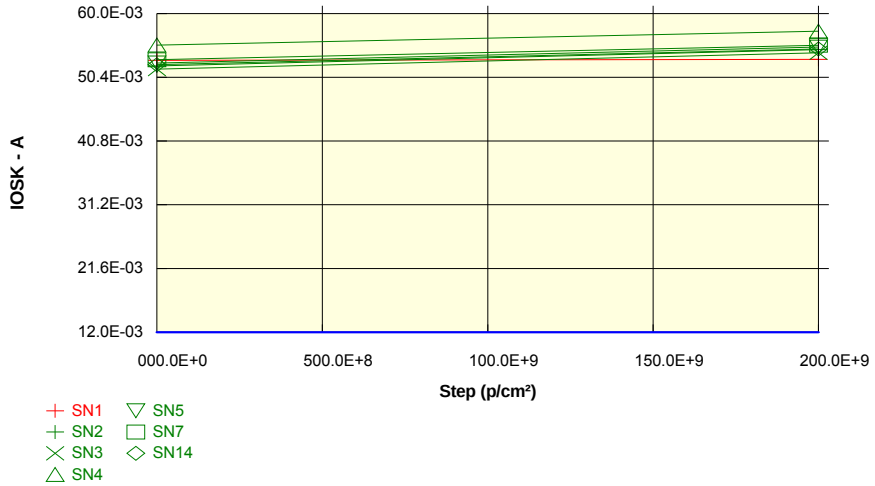
Measurements

IOSKDUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	52.4E-03	52.5E-03
OFF samples		
SN2	51.5E-03	53.9E-03
SN3	51.2E-03	53.6E-03
SN4	54.5E-03	56.5E-03
SN5	51.8E-03	54.1E-03
SN7	52.4E-03	54.6E-03
SN14	52.3E-03	54.7E-03
Statistics		
Min	51.2E-03	53.6E-03
Max	54.5E-03	56.5E-03
Average	52.3E-03	54.6E-03
Sigma	1.1E-03	948.0E-06

Drift Calculation

IOSKDUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	2.40E-03
SN3	-	2.42E-03
SN4	-	2.06E-03
SN5	-	2.35E-03
SN7	-	2.14E-03
SN14	-	2.36E-03
Average	-	2.29E-03
Sigma	-	136.46E-06

Test conditions : Protons
Parameter : Output Sink Current : IOSKDUT4
-IN>1V. +IN=0V. VOUT<1.5V
Unit : A
Spec Limit Min : 12.0E-03
Spec limits are represented in bold lines on the graphic.



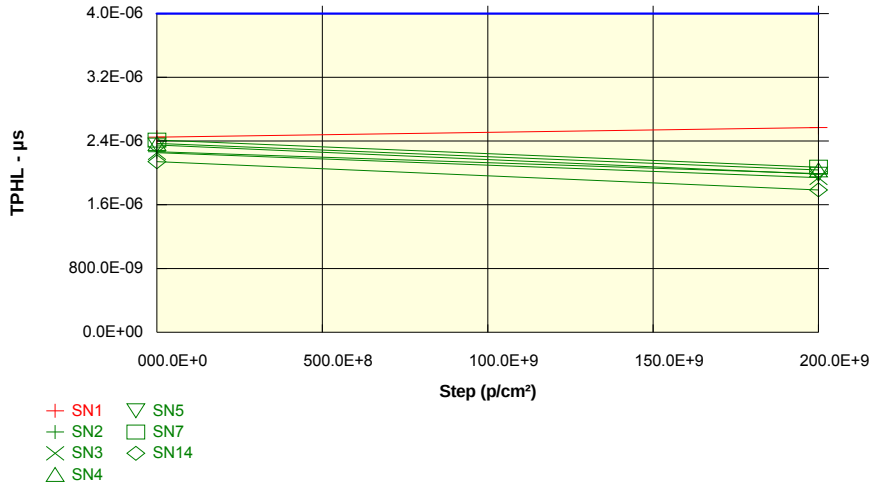
Measurements

IOSKDUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	53.0E-03	53.1E-03
OFF samples		
SN2	52.1E-03	54.6E-03
SN3	51.6E-03	54.1E-03
SN4	55.3E-03	57.4E-03
SN5	52.5E-03	55.0E-03
SN7	53.1E-03	55.2E-03
SN14	52.3E-03	54.7E-03
Statistics		
Min	51.6E-03	54.1E-03
Max	55.3E-03	57.4E-03
Average	52.8E-03	55.1E-03
Sigma	1.2E-03	1.0E-03

Drift Calculation

IOSKDUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	2.44E-03
SN3	-	2.46E-03
SN4	-	2.09E-03
SN5	-	2.41E-03
SN7	-	2.17E-03
SN14	-	2.37E-03
Average	-	2.32E-03
Sigma	-	141.70E-06

Test conditions : Protons
Parameter : Response Time High To Low : TPHLDUT1
VIN=VIO+5mV. Vref=1.4V. VRL=5V. RL=5.1K
Unit : µs
Spec Limit Max : 4.0E-06
Spec limits are represented in bold lines on the graphic.



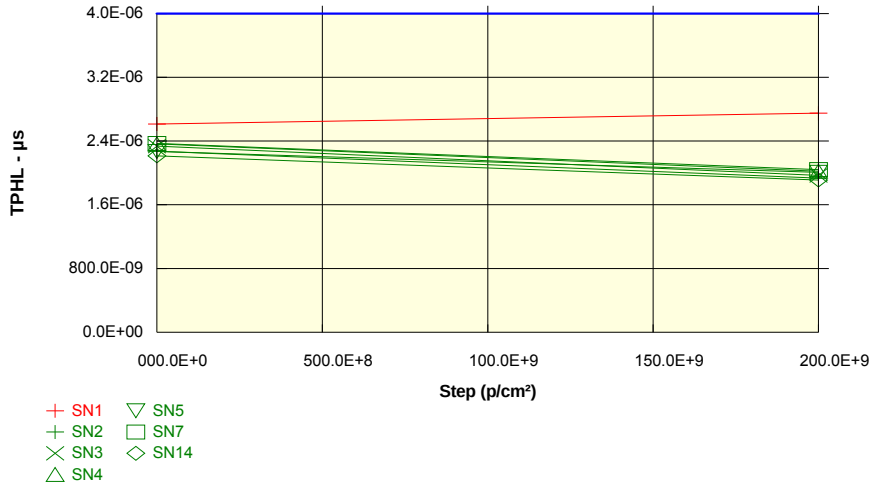
Measurements

TPHLDUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	2.4E-06	2.6E-06
OFF samples		
SN2	2.3E-06	2.0E-06
SN3	2.3E-06	1.9E-06
SN4	2.4E-06	2.0E-06
SN5	2.4E-06	2.0E-06
SN7	2.4E-06	2.1E-06
SN14	2.1E-06	1.8E-06
Statistics		
Min	2.1E-06	1.8E-06
Max	2.4E-06	2.1E-06
Average	2.3E-06	2.0E-06
Sigma	90.2E-09	91.6E-09

Drift Calculation

TPHLDUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-276.96E-09
SN3	-	-312.81E-09
SN4	-	-333.15E-09
SN5	-	-366.73E-09
SN7	-	-340.67E-09
SN14	-	-355.05E-09
Average	-	-330.90E-09
Sigma	-	29.45E-09

Test conditions : Protons
Parameter : Response Time High To Low : TPHLDUT2
VIN=VIO+5mV. Vref=1.4V. VRL=5V. RL=5.1K
Unit : µs
Spec Limit Max : 4.0E-06
Spec limits are represented in bold lines on the graphic.



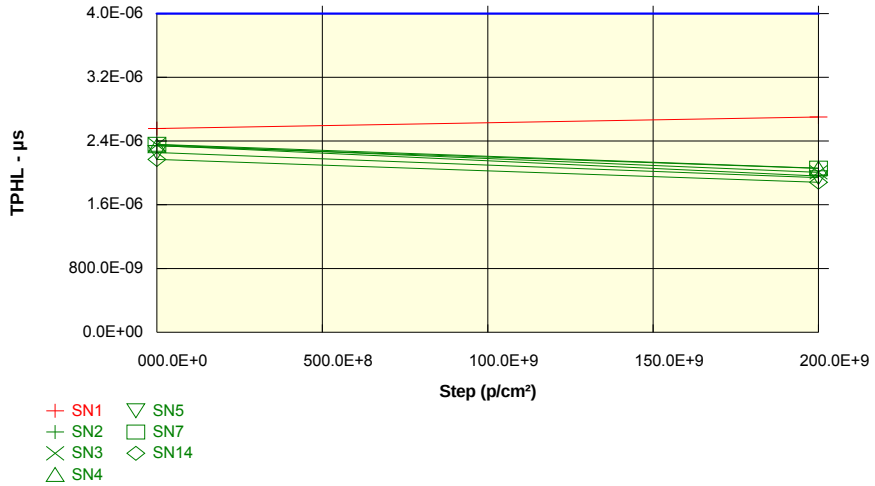
Measurements

TPHLDUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	2.6E-06	2.7E-06
OFF samples		
SN2	2.3E-06	1.9E-06
SN3	2.3E-06	2.0E-06
SN4	2.4E-06	2.0E-06
SN5	2.3E-06	2.0E-06
SN7	2.4E-06	2.0E-06
SN14	2.2E-06	1.9E-06
Statistics		
Min	2.2E-06	1.9E-06
Max	2.4E-06	2.0E-06
Average	2.3E-06	2.0E-06
Sigma	56.7E-09	47.1E-09

Drift Calculation

TPHLDUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-337.40E-09
SN3	-	-365.96E-09
SN4	-	-341.81E-09
SN5	-	-263.82E-09
SN7	-	-328.51E-09
SN14	-	-302.58E-09
Average	-	-323.35E-09
Sigma	-	32.55E-09

Test conditions : Protons
Parameter : Response Time High To Low : TPHLDUT3
VIN=VIO+5mV. Vref=1.4V. VRL=5V. RL=5.1K
Unit : µs
Spec Limit Max : 4.0E-06
Spec limits are represented in bold lines on the graphic.



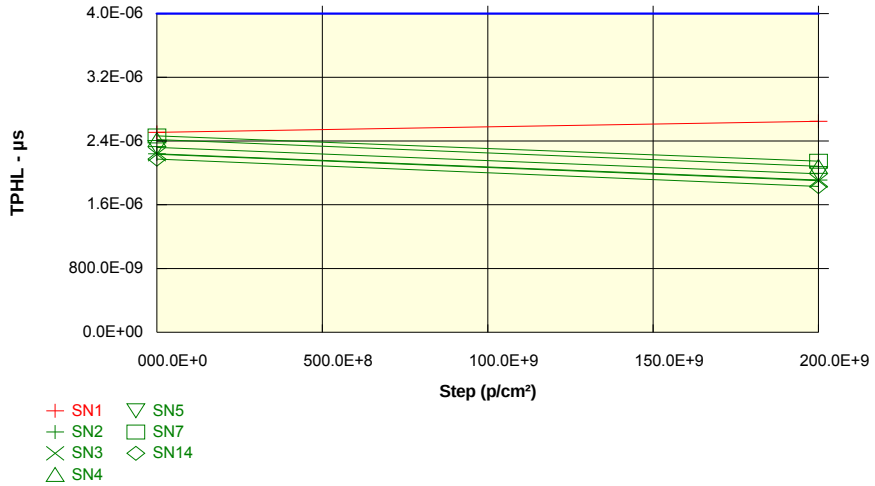
Measurements

TPHLDUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	2.6E-06	2.7E-06
OFF samples		
SN2	2.3E-06	2.0E-06
SN3	2.4E-06	2.0E-06
SN4	2.3E-06	2.1E-06
SN5	2.3E-06	1.9E-06
SN7	2.4E-06	2.1E-06
SN14	2.2E-06	1.9E-06
Statistics		
Min	2.2E-06	1.9E-06
Max	2.4E-06	2.1E-06
Average	2.3E-06	2.0E-06
Sigma	69.7E-09	63.6E-09

Drift Calculation

TPHLDUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-383.64E-09
SN3	-	-346.55E-09
SN4	-	-282.78E-09
SN5	-	-315.18E-09
SN7	-	-300.00E-09
SN14	-	-285.44E-09
Average	-	-318.93E-09
Sigma	-	35.94E-09

Test conditions : Protons
Parameter : Response Time High To Low : TPHLDUT4
VIN=VIO+5mV. Vref=1.4V. VRL=5V. RL=5.1K
Unit : µs
Spec Limit Max : 4.0E-06
Spec limits are represented in bold lines on the graphic.



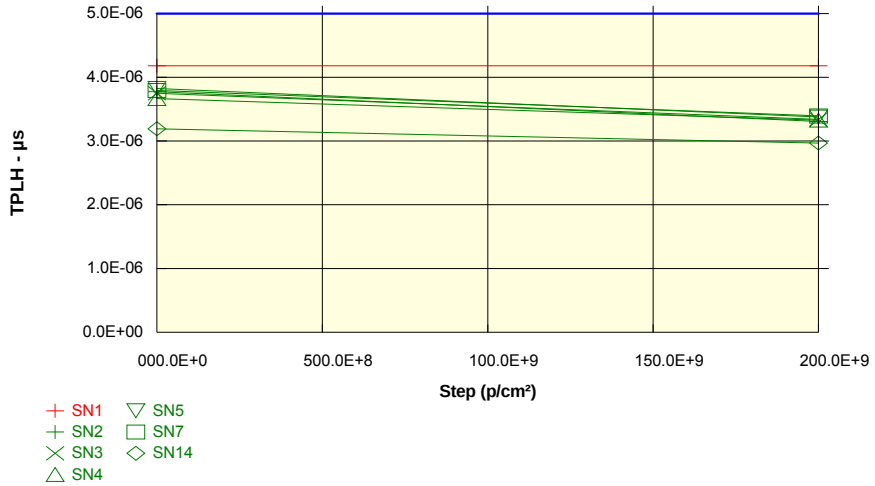
Measurements

TPHLDUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	2.5E-06	2.6E-06
OFF samples		
SN2	2.2E-06	1.9E-06
SN3	2.2E-06	1.9E-06
SN4	2.4E-06	2.1E-06
SN5	2.3E-06	2.0E-06
SN7	2.5E-06	2.1E-06
SN14	2.2E-06	1.8E-06
Statistics		
Min	2.2E-06	1.8E-06
Max	2.5E-06	2.1E-06
Average	2.3E-06	2.0E-06
Sigma	104.2E-09	110.0E-09

Drift Calculation

TPHLDUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-329.21E-09
SN3	-	-334.48E-09
SN4	-	-335.02E-09
SN5	-	-330.61E-09
SN7	-	-317.68E-09
SN14	-	-343.68E-09
Average	-	-331.78E-09
Sigma	-	7.81E-09

Test conditions : Protons
Parameter : Response Time Low To High : TPLHDUT1
VIN=VIO+5mV. Vref=1.4V. VRL=5V. RL=5.1K
Unit : µs
Spec Limit Max : 5.0E-06
Spec limits are represented in bold lines on the graphic.



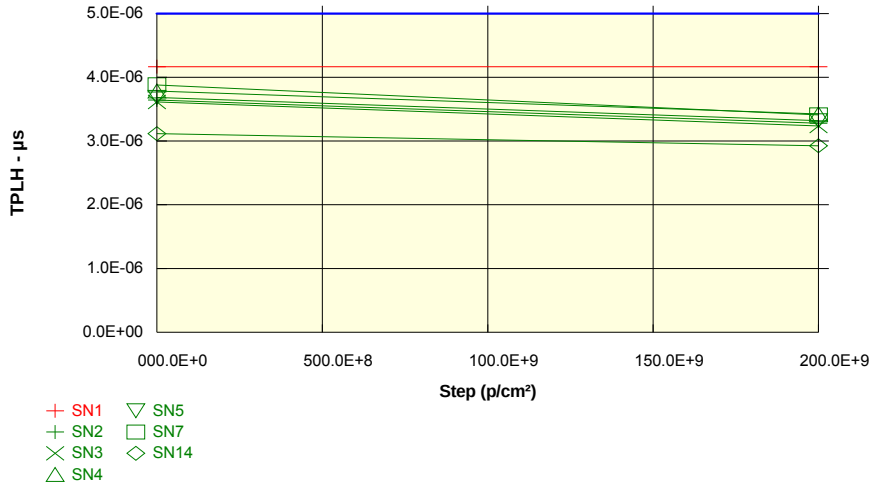
Measurements

TPLHDUT1	0 p/cm²	2E+11 p/cm²
SN1_REF	4.2E-06	4.2E-06
OFF samples		
SN2	3.8E-06	3.3E-06
SN3	3.8E-06	3.3E-06
SN4	3.7E-06	3.3E-06
SN5	3.8E-06	3.4E-06
SN7	3.8E-06	3.4E-06
SN14	3.2E-06	3.0E-06
Statistics		
Min	3.2E-06	3.0E-06
Max	3.8E-06	3.4E-06
Average	3.7E-06	3.3E-06
Sigma	218.0E-09	144.1E-09

Drift Calculation

TPLHDUT1	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-465.77E-09
SN3	-	-410.04E-09
SN4	-	-337.73E-09
SN5	-	-448.71E-09
SN7	-	-401.12E-09
SN14	-	-222.00E-09
Average	-	-380.89E-09
Sigma	-	81.83E-09

Test conditions : Protons
Parameter : Response Time Low To High : TPLHDUT2
VIN=VIO+5mV. Vref=1.4V. VRL=5V. RL=5.1K
Unit : µs
Spec Limit Max : 5.0E-06
Spec limits are represented in bold lines on the graphic.



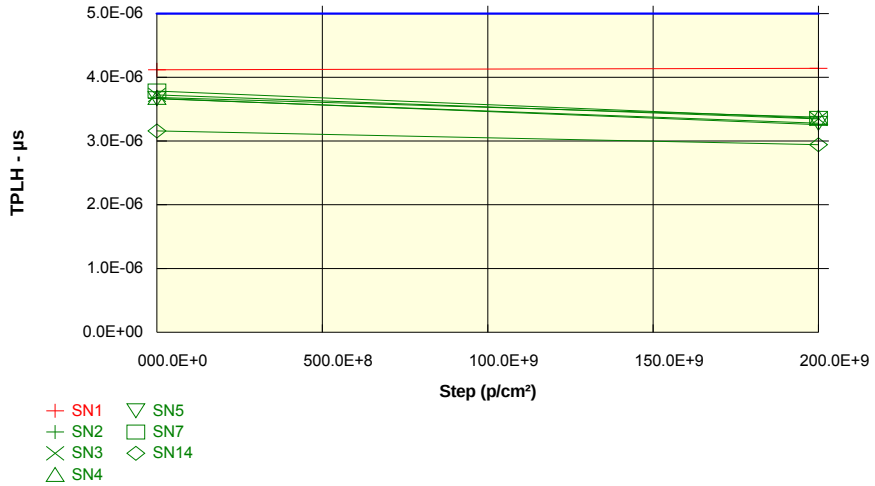
Measurements

TPLHDUT2	0 p/cm²	2E+11 p/cm²
SN1_REF	4.2E-06	4.2E-06
OFF samples		
SN2	3.6E-06	3.3E-06
SN3	3.6E-06	3.2E-06
SN4	3.8E-06	3.4E-06
SN5	3.7E-06	3.3E-06
SN7	3.9E-06	3.4E-06
SN14	3.1E-06	2.9E-06
Statistics		
Min	3.1E-06	2.9E-06
Max	3.9E-06	3.4E-06
Average	3.6E-06	3.3E-06
Sigma	243.3E-09	166.7E-09

Drift Calculation

TPLHDUT2	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-366.13E-09
SN3	-	-378.00E-09
SN4	-	-357.82E-09
SN5	-	-365.64E-09
SN7	-	-469.79E-09
SN14	-	-189.49E-09
Average	-	-354.48E-09
Sigma	-	83.01E-09

Test conditions : Protons
Parameter : Response Time Low To High : TPLHDUT3
VIN=VIO+5mV. Vref=1.4V. VRL=5V. RL=5.1K
Unit : µs
Spec Limit Max : 5.0E-06
Spec limits are represented in bold lines on the graphic.



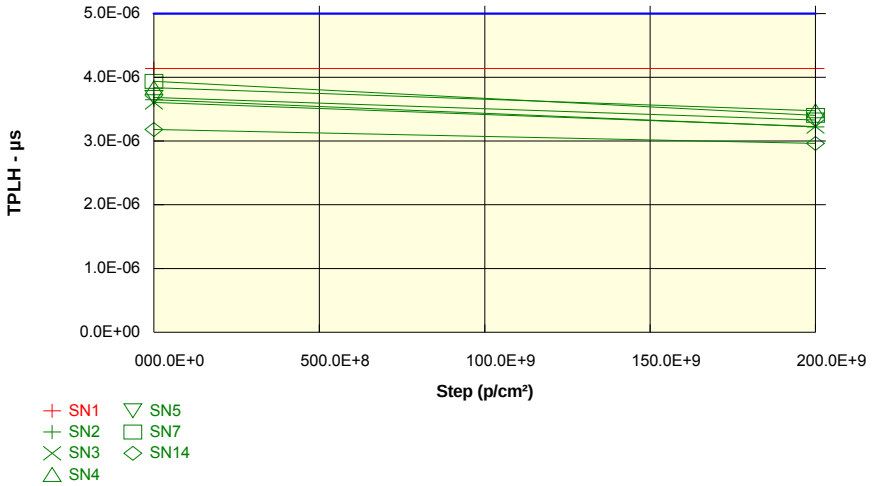
Measurements

TPLHDUT3	0 p/cm²	2E+11 p/cm²
SN1_REF	4.1E-06	4.1E-06
OFF samples		
SN2	3.7E-06	3.3E-06
SN3	3.7E-06	3.3E-06
SN4	3.7E-06	3.4E-06
SN5	3.7E-06	3.3E-06
SN7	3.8E-06	3.4E-06
SN14	3.2E-06	2.9E-06
Statistics		
Min	3.2E-06	2.9E-06
Max	3.8E-06	3.4E-06
Average	3.6E-06	3.3E-06
Sigma	208.0E-09	147.6E-09

Drift Calculation

TPLHDUT3	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-414.51E-09
SN3	-	-376.78E-09
SN4	-	-311.22E-09
SN5	-	-383.60E-09
SN7	-	-427.01E-09
SN14	-	-214.95E-09
Average	-	-354.68E-09
Sigma	-	72.51E-09

Test conditions : Protons
Parameter : Response Time Low To High : TPLHDUT4
VIN=VIO+5mV. Vref=1.4V. VRL=5V. RL=5.1K
Unit : µs
Spec Limit Max : 5.0E-06
Spec limits are represented in bold lines on the graphic.



Measurements

TPLHDUT4	0 p/cm²	2E+11 p/cm²
SN1_REF	4.1E-06	4.1E-06
OFF samples		
SN2	3.6E-06	3.2E-06
SN3	3.6E-06	3.2E-06
SN4	3.8E-06	3.5E-06
SN5	3.7E-06	3.3E-06
SN7	3.9E-06	3.4E-06
SN14	3.2E-06	3.0E-06
Statistics		
Min	3.2E-06	3.0E-06
Max	3.9E-06	3.5E-06
Average	3.6E-06	3.3E-06
Sigma	238.0E-09	164.2E-09

Drift Calculation

TPLHDUT4	0 p/cm²	2E+11 p/cm²
OFF samples		
SN2	-	-426.05E-09
SN3	-	-379.29E-09
SN4	-	-361.65E-09
SN5	-	-353.74E-09
SN7	-	-533.17E-09
SN14	-	-217.65E-09
Average	-	-378.59E-09
Sigma	-	93.95E-09