MetOp	TOTAL DOSE RADIATION TEST REPORT No. MO-RR-TLG-PM-001	Issue: 1 Rev.: Date: 29/02/2000 Page: 1/6

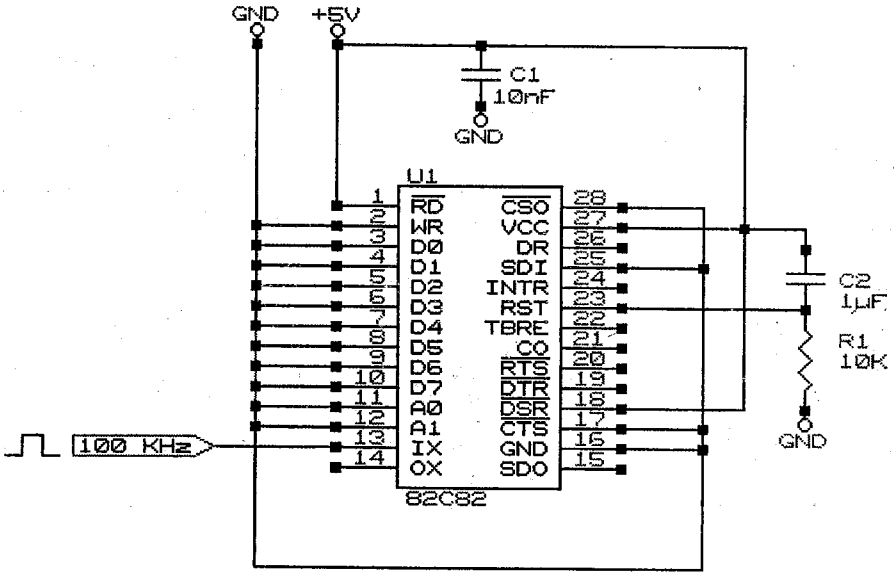
SCC Component No 5962-9581701VXC		Component Designation: MD82C52/7	Irradiation Spec. No.: MIL-STD-883 1019.4
Gen. Spec.: MIL-PRF-38535 Det. Spec.: 5962-95817 Amend.:		Evaluation: - Acceptance Diffusion: - Acceptance Lot: X	Project/Programme: METOP
Family: 08	Group: 16	Functional Assignment: DIGITAL SERIAL CONTROLLER INTERFACE	Package: DIL-28
MFR. Name: HARRIS Address: USA		Test House: TECNOLOGICA Address: MADRID (SPAIN)	Orig. house: TECNOLOGICA Address: SEVILLA (SPAIN)
Radiation Test Plan No.: MO-RP-TLG-PM-001		Sample Size: 6 Irradiation Devices: 5 Control Devices: 1	Date Code: 9903AAAK Diffusion LOT: -- Wafer No.: --
Radiation Source: Cobalt-60 Facility Name: CIEMAT Address: MADRID (SPAIN)		Energy: 1.33/1.17 MeV Dose Rate: 310 rad(Si)/h	Date of Test: 15/02/2000
Irradiation Conditions: Biased: X Unbiased: -- Test Circuit: Figure 1		Irradiation Measurements Interval: Remote test: -- In situ Test: X	Annealing Tests: 72h/25ºC Biased: X Unbiased: - Test Circuit: Figure 1

Electrical Measurements. Parameters Tested:

V_{OH}, V_{OL}, I_{IL}, I_{IH}, I_{OZL}, I_{OZH}, $I_{CC(SBY)}$, Functional test 1, Functional test 2.

Prepared by: José M. Valverde Date: 29/02/2000 Signature:	Approved by: Date: 01/03/2000 Signature: A. Fdez. Romero

FIGURE 1.-RADIATION BIAS CIRCUIT



SUMMARY

Total dose steady-state irradiation test has been carried out on a **DIGITAL SERIAL CONTROLLER INTERFACE** MD82C52 from HARRIS with date code 9903AAAK. The irradiated parts were labelled as follows: irradiated devices R2,..,R6= S/N 412 & 414 TO 417; R1= S/N 411 as control device.

RESULTS

The next table shows a results resume of the irradiation test:

	0 KRAD	6 KRAD	12 KRAD	15 KRAD	20 KRAD	ANN
FCT-1	PASS	PASS	PASS	FAIL 2	FAIL 5	FAIL 5
FCT-2	PASS	PASS	PASS	PASS	PASS	PASS
V_{OH1}	PASS	PASS	PASS	FAIL 2	FAIL 5	FAIL 4
V_{OH2}	PASS	PASS	PASS	FAIL 2	FAIL 5	FAIL 4
V_{OL}	PASS	PASS	PASS	FAIL 1	FAIL 4	FAIL 2
I_{IL}	PASS	PASS	PASS	PASS	PASS	PASS
I_{IH}	PASS	PASS	PASS	PASS	PASS	PASS
I_{OZL}	PASS	PASS	PASS	PASS	PASS	PASS
I_{OZH}	PASS	PASS	PASS	PASS	PASS	PASS
I_{CCSB}	PASS	FAIL 3	FAIL 2	FAIL 3	FAIL 5	FAIL 4

CONCLUSION

The results indicate that:

The tested lot is sensible at radiation and the the most afected parameters are the folowing:

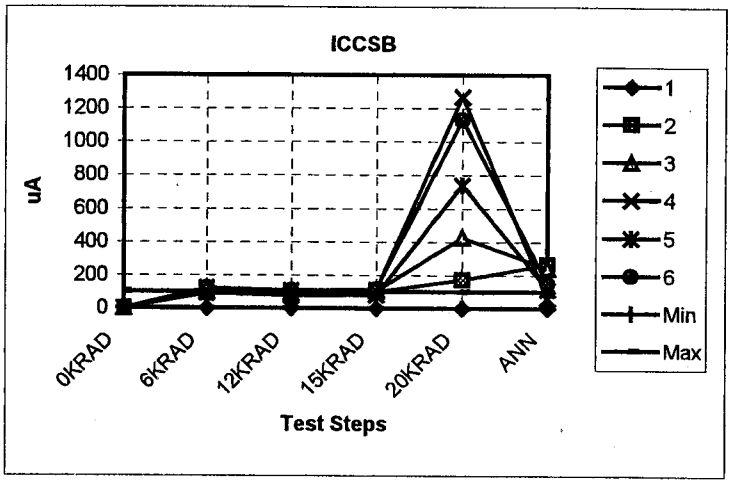
- Standby current (ICCSB): it rises quickly after the first irradiation step (6krad) and is higher than upper limit in the most of the parts.
- Functional test (FCT-1) with VCC=4.5V fails at 15krad.
- Output voltage (high and low) fail at 15Krad but these failures are due to the functionality loss (the VCCcondition for this test is 4.5V, as the functional test 1).

SCHEDULE

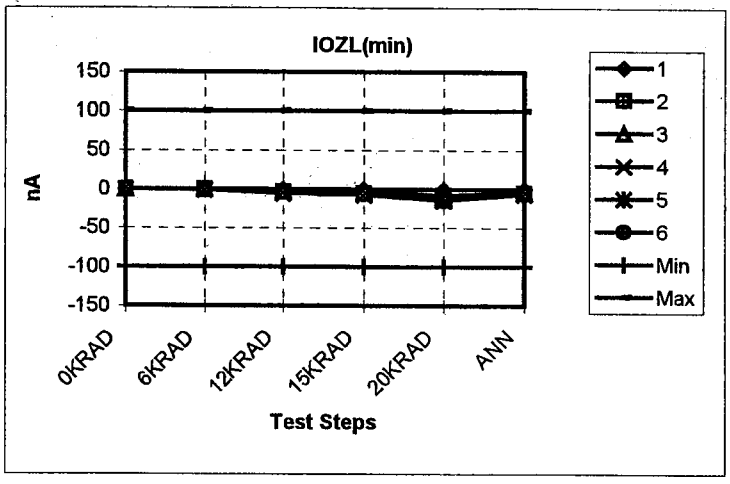
Test Step	Description	Result or Actual Test Condition	Time In	Time Out	Exposure
1	Sample serialization	CONTROL R1 IRR. DEVICES R2 to R6			
2	Initial Electrical Measurements	See 0 krad(Si) values in respective Parameter Data Tables	13:00 15/02	13:30 15/02	30m
3	Set-up of Test	Bias circuit verified according to Fig. 1			
4	Irradiation Exposure	Total Dose: 6 Krad(Si) Cumulative Dose: 6 Krad(Si) Dose Rate: 310 Rad(Si)/h	14:20 15/02	09:48 16/02	19h-28m
5	Intermediate Electrical Measurements	See 6 krad(Si) values in respective Parameter Data Tables	10:00 16/02	11:00 16/02	60min.
6	Set-up of Test	Bias circuit verified according to Fig. 1			
7	Irradiation Exposure	Total Dose: 6 Krad(Si) Cumulative Dose: 12 Krad(Si) Dose Rate: 310 Rad(Si)/h	11:42 16/02	07:30 17/02	19h 48m
8	Intermediate Electrical Measurements	See 12 krad(Si) values in respective Parameter Data Tables	07:45 17/02	08:15 17/02	30m
9	Set-up of Test	Bias circuit verified according to Fig. 1			
10	Irradiation Exposure	Total Dose: 2 Krad(Si) Cumulative Dose: 14 Krad(Si) Dose Rate: 310 Rad(Si)/h	08:30 17/02	14:52 17/02	6h-22m
11	Intermediate Electrical Measurements	See 14 krad(Si) values in respective Parameter Data Tables	15:00 17/02	15:30 17/02	30m
12	Set-up of Test	Bias circuit verified according to Fig. 1			
13	Irradiation Exposure	Total Dose: 6 Krad(Si) Cumulative Dose: 20 Krad(Si) Dose Rate: 310 Rad(Si)/h	15:40 17/02	10:42 18/02	19h- 2m
14	Intermediate Electrical Measurements	See 20 krad(Si) values in respective Parameter Data Tables	11:00 18/02	11:30 18/02	30min.

Test Step	Description	Result or Actual Test Condition	Time In	Time Out	Exposure
12	Set-up of Test	Bias circuit verified according to Fig. 1			
17	Annealing 72h	Bias circuit verified according to Fig. 1. Temperature: 25 °C	11:30 18/02	11:30 21/02	72h
18	Electrical Measurements	See ANN values in respective parameter Data Tables	11:30 21/02	12:00 21/02	30min

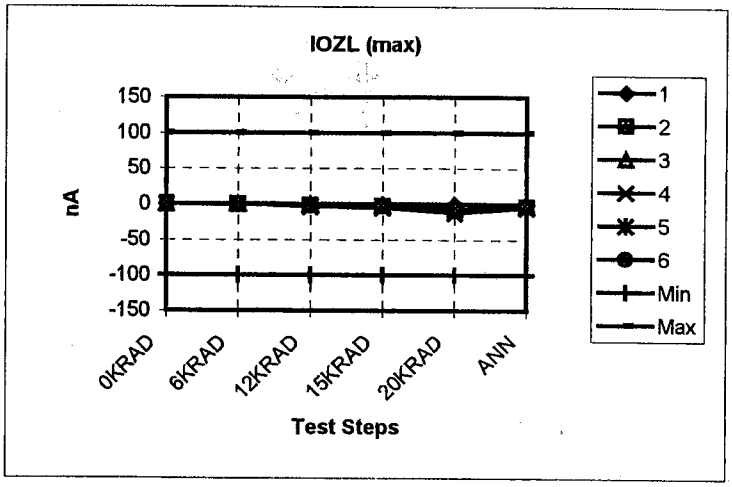
ELECTRICAL MEASUREMENT RESULTS



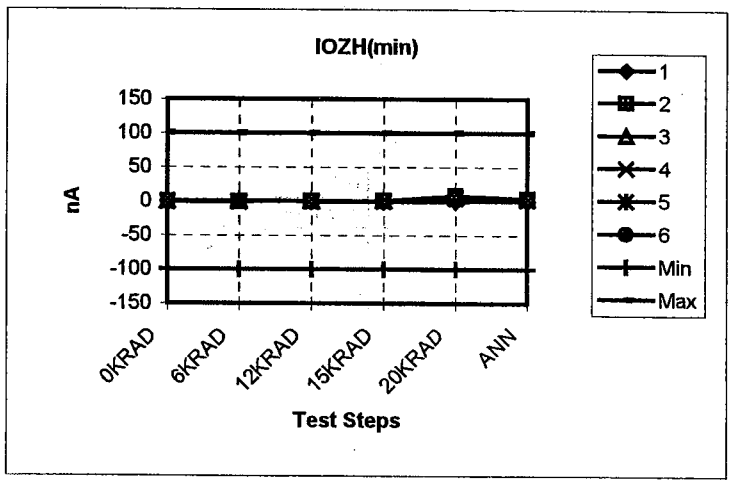
ICCSB	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	0.001	0.001	0.001	0.001	0.001	0.002
2	0.002	86.98	79.77	99.35	173.75	266.36
3	0.002	102.99	92.41	103.35	426.95	241.56
4	0.002	123.29	106.11	111.32	1270.58	59.79
5	0.001	91.51	73.04	79.59	740.00	116.19
6	0.001	123.29	107.11	115.22	1130.00	149.53
Min	0	0	0	0	0	0
Max	100	100	100	100	100	100
Unit	uA	uA	uA	uA	uA	uA



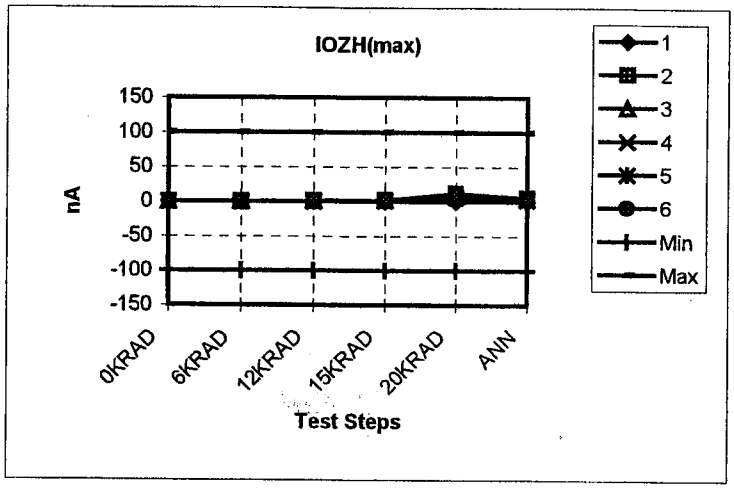
IOZL(min)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	-0.370	-0.334	-0.495	-0.397	-0.334	-0.249
2	-0.661	-0.470	-3.351	-5.375	-13.369	-5.372
3	-0.265	-0.392	-1.621	-2.868	-8.017	-3.422
4	-0.362	-0.939	-5.762	-7.347	-14.854	-7.168
5	-0.520	-0.454	-3.829	-5.088	-12.822	-5.775
6	-0.259	-0.473	-4.154	-6.608	-15.206	-7.169
Min	-100	-100	-100	-100	-100	-100
Max	100	100	100	100	100	100
Unit	nA	nA	nA	nA	nA	nA



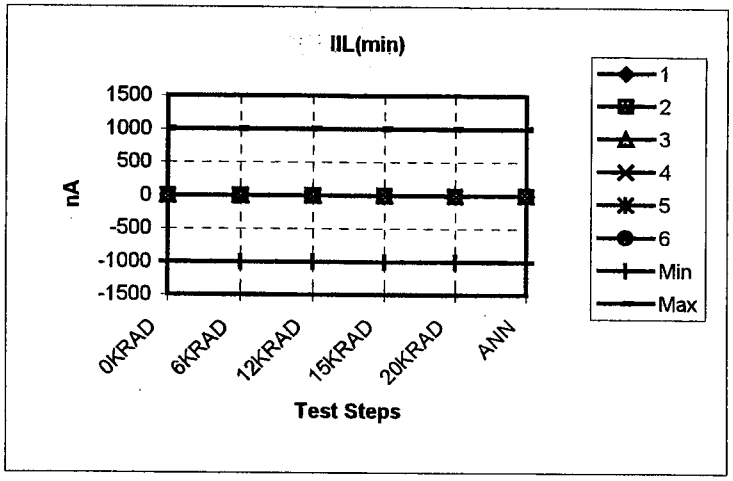
IOZL(max)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	0.367	0.252	0.281	0.231	0.152	0.017
2	0.922	0.161	-1.606	-2.531	-8.000	-3.300
3	0.137	0.153	-0.787	-1.952	-5.855	-2.583
4	0.315	0.383	-3.487	-5.451	-12.682	-5.419
5	0.300	0.091	-1.813	-3.085	-8.276	-3.760
6	0.121	0.177	-1.392	-2.344	-6.092	-2.834
Min	-100	-100	-100	-100	-100	-100
Max	100	100	100	100	100	100
Unit	nA	nA	nA	nA	nA	nA



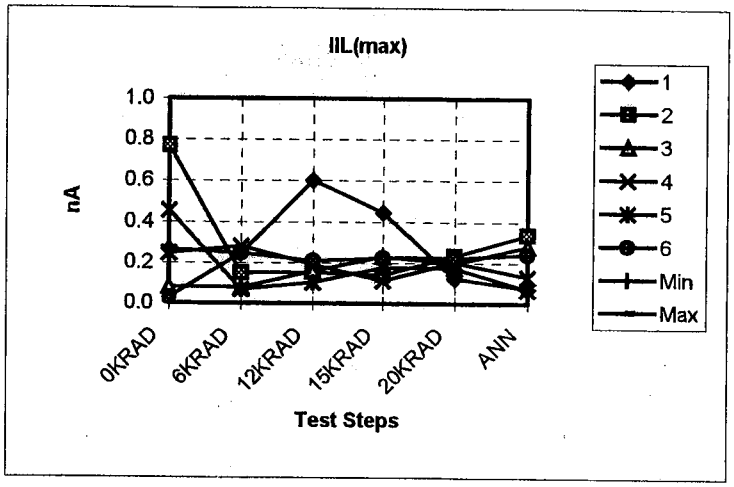
IOZH(min)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	-0.397	-0.398	-0.656	-0.490	-0.661	-0.170
2	-0.758	-0.598	0.190	1.284	8.711	4.020
3	-0.415	-0.428	0.223	1.075	8.480	3.961
4	-0.389	-0.582	-0.092	0.444	4.698	2.307
5	-0.613	-0.579	-0.199	0.930	6.177	3.147
6	-0.389	-0.683	0.048	0.830	5.280	2.824
Min	-100	-100	-100	-100	-100	-100
Max	100	100	100	100	100	100
Unit	nA	nA	nA	nA	nA	nA



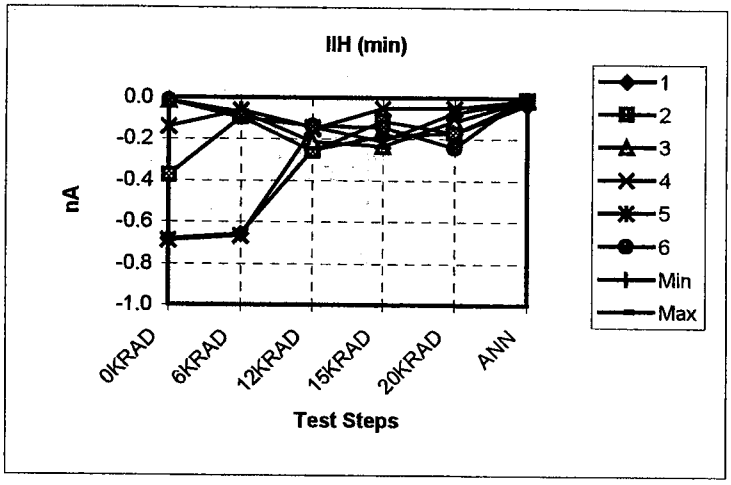
IOZH(max)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	0.407	0.305	0.144	0.172	0.050	0.028
2	0.436	0.138	1.246	1.940	12.087	5.129
3	0.022	0.071	1.014	2.163	11.164	4.949
4	0.402	0.264	0.418	1.299	6.665	3.142
5	0.174	0.128	0.547	1.902	8.672	4.031
6	0.038	0.169	0.548	1.820	8.515	4.157
Min	-100	-100	-100	-100	-100	-100
Max	100	100	100	100	100	100
Unit	nA	nA	nA	nA	nA	nA



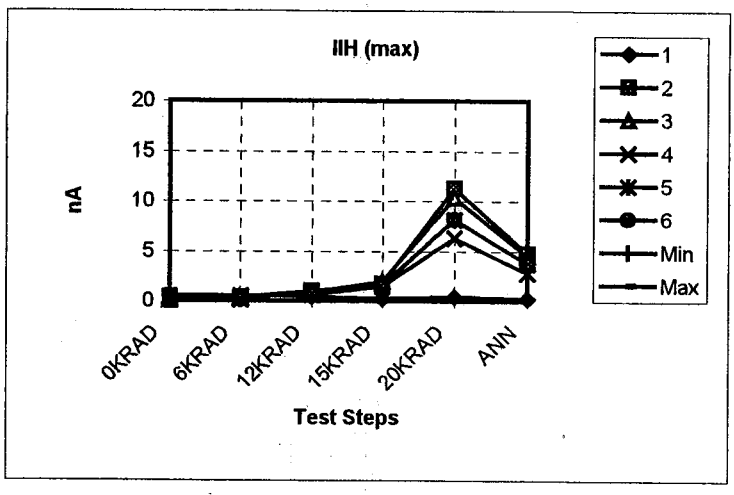
IIL(min)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	-0.439	-0.435	-0.394	-0.302	-0.244	-0.181
2	-0.420	-0.290	-3.453	-5.221	-12.870	-6.329
3	-0.175	-0.255	-1.700	-2.989	-8.390	-4.223
4	-0.419	-0.617	-5.210	-7.057	-15.437	-7.380
5	-0.320	-0.262	-3.392	-5.833	-12.742	-6.183
6	-0.153	-0.333	-4.033	-6.786	-15.960	-8.029
Min	-1000	-1000	-1000	-1000	-1000	-1000
Max	1000	1000	1000	1000	1000	1000
Unit	nA	nA	nA	nA	nA	nA



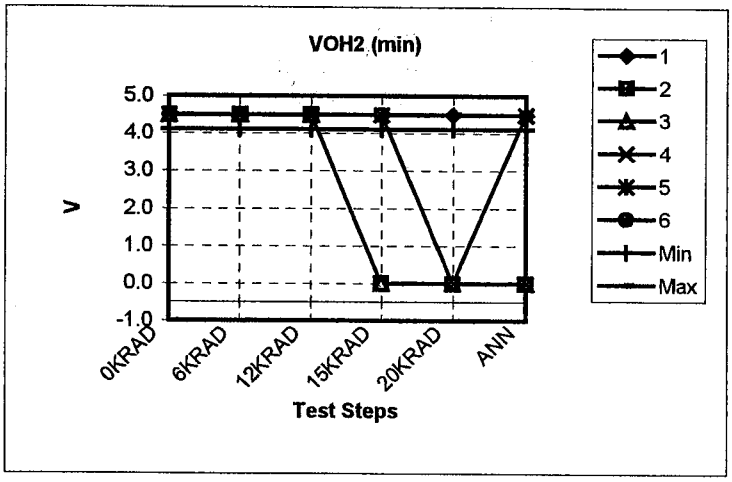
IIL(max)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	0.266	0.245	0.600	0.446	0.125	0.073
2	0.770	0.150	0.152	0.139	0.233	0.335
3	0.080	0.079	0.159	0.229	0.195	0.280
4	0.246	0.279	0.190	0.113	0.203	0.130
5	0.455	0.069	0.104	0.177	0.175	0.070
6	0.027	0.245	0.210	0.224	0.223	0.240
Min	-1000	-1000	-1000	-1000	-1000	-1000
Max	1000	1000	1000	1000	1000	1000
Unit	nA	nA	nA	nA	nA	nA



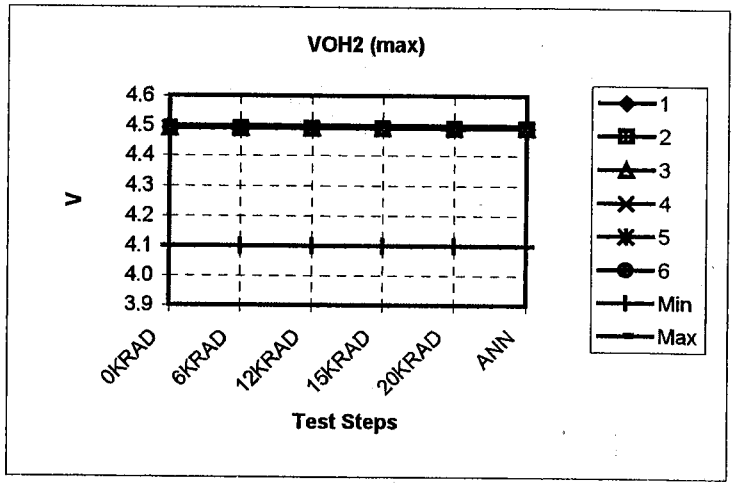
IIH(min)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	-0.683	-0.656	-0.255	-0.186	-0.172	-0.033
2	-0.376	-0.095	-0.260	-0.114	-0.171	-0.008
3	-0.016	-0.071	-0.215	-0.235	-0.113	-0.013
4	-0.688	-0.666	-0.152	-0.053	-0.048	-0.008
5	-0.141	-0.062	-0.144	-0.211	-0.073	-0.013
6	-0.016	-0.099	-0.137	-0.145	-0.242	0.017
Min	-1000	-1000	-1000	-1000	-1000	-1000
Max	1000	1000	1000	1000	1000	1000
Unit	nA	nA	nA	nA	nA	nA



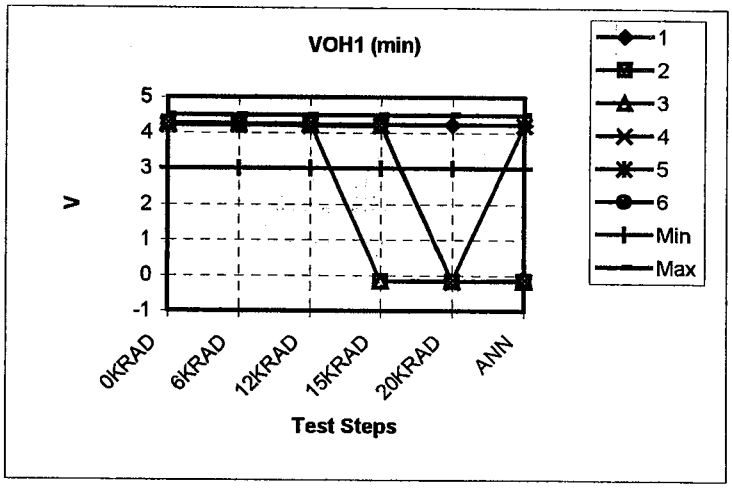
IIH (max)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	0.490	0.505	0.457	0.270	0.437	0.227
2	0.462	0.389	1.009	1.714	11.278	4.796
3	0.087	0.244	0.909	1.964	10.333	4.541
4	0.430	0.525	0.627	1.478	6.298	2.821
5	0.277	0.159	0.997	1.574	8.123	3.746
6	0.116	0.359	0.620	1.509	8.153	3.761
Min	-1000	-1000	-1000	-1000	-1000	-1000
Max	1000	1000	1000	1000	1000	1000
Unit	nA	nA	nA	nA	nA	nA



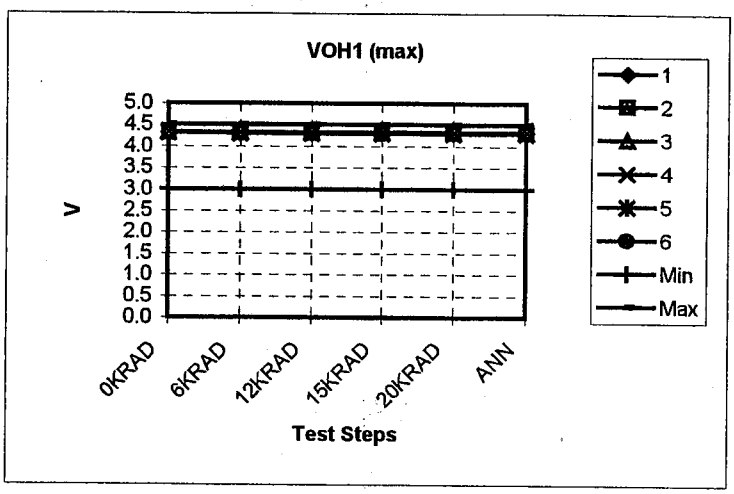
VOH2 (min)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	4.486	4.486	4.486	4.486	4.486	4.487
2	4.487	4.487	4.487	-0.005	-0.005	-0.004
3	4.487	4.486	4.486	-0.005	-0.005	-0.004
4	4.486	4.485	4.485	4.485	-0.007	-0.003
5	4.486	4.486	4.485	4.486	-0.005	4.486
6	4.486	4.486	4.486	4.486	-0.005	-0.001
Min	4.1	4.1	4.1	4.1	4.1	4.1
Max	4.5	4.5	4.5	4.5	4.5	4.5
Unit	V	V	V	V	V	V



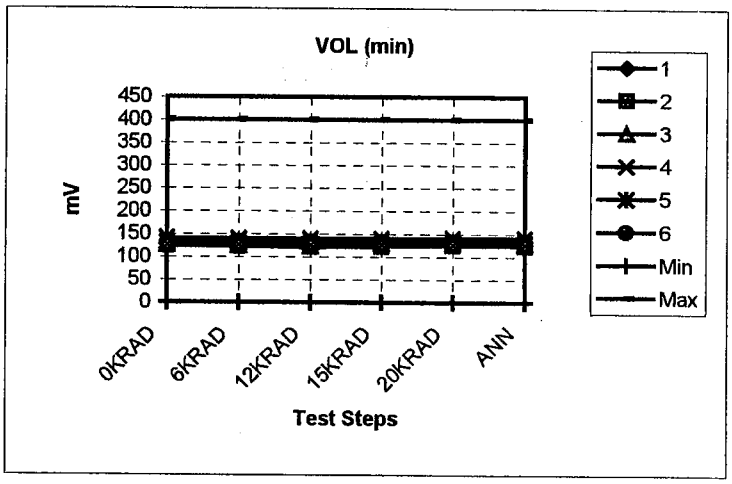
VOH2(max)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	4.491	4.491	4.491	4.491	4.490	4.491
2	4.491	4.491	4.491	4.491	4.490	4.491
3	4.491	4.491	4.491	4.490	4.490	4.491
4	4.490	4.490	4.490	4.490	4.489	4.491
5	4.491	4.491	4.491	4.490	4.490	4.491
6	4.492	4.491	4.491	4.490	4.490	4.491
Min	4.1	4.1	4.1	4.1	4.1	4.1
Max	4.5	4.5	4.5	4.5	4.5	4.5
Unit	V	V	V	V	V	V



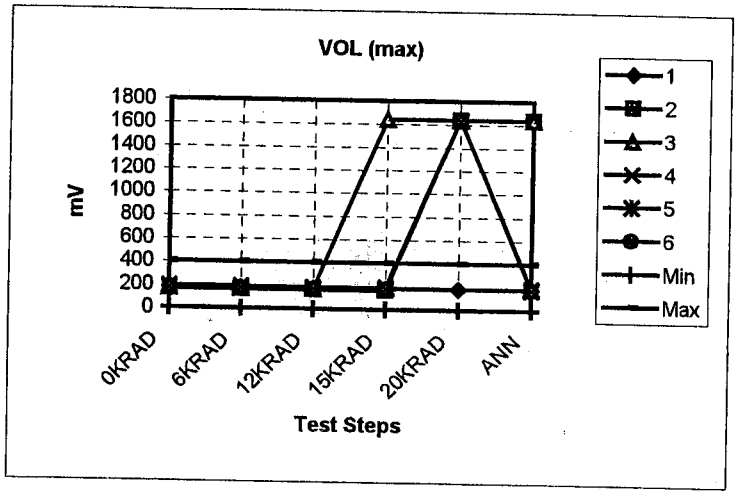
VOH1 (min)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	4.239	4.239	4.239	4.238	4.240	4.241
2	4.267	4.262	4.256	-0.158	-0.159	-0.158
3	4.263	4.257	4.250	-0.162	-0.162	-0.162
4	4.222	4.214	4.206	4.201	-0.184	-0.139
5	4.243	4.236	4.229	4.225	-0.169	4.220
6	4.256	4.250	4.244	4.240	-0.166	-0.124
Min	3	3	3	3	3	3
Max	4.5	4.5	4.5	4.5	4.5	4.5
Unit	V	V	V	V	V	V



VOH1 (max)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	4.317	4.318	4.317	4.317	4.317	4.319
2	4.334	4.333	4.330	4.328	4.325	4.327
3	4.330	4.328	4.325	4.324	4.321	4.323
4	4.305	4.302	4.300	4.298	4.295	4.298
5	4.320	4.318	4.316	4.314	4.312	4.314
6	4.329	4.327	4.325	4.323	4.321	4.323
Min	3	3	3	3	3	3
Max	4.5	4.5	4.5	4.5	4.5	4.5
Unit	V	V	V	V	V	V



VOL (min)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	134.950	134.500	134.800	135.300	134.800	134.800
2	123.450	121.850	121.400	122.000	125.350	123.200
3	126.450	125.000	124.300	130.400	130.050	131.250
4	142.350	140.450	139.950	140.950	142.100	141.750
5	132.250	130.900	130.200	131.100	133.400	132.000
6	128.000	126.350	125.800	126.500	128.300	127.550
Min	0	0	0	0	0	0
Max	400	400	400	400	400	400
Unit	mV	mV	mV	mV	mV	mV



VOL (max)	0KRAD	6KRAD	12KRAD	15KRAD	20KRAD	ANN
1	183.400	183.150	183.300	184.150	183.250	182.900
2	167.450	165.000	164.250	165.200	1638.350	1638.350
3	171.850	169.250	168.250	1638.350	1638.350	1638.350
4	193.700	190.750	189.700	191.400	1638.350	192.650
5	177.450	175.100	174.150	175.400	1638.350	176.650
6	175.250	172.700	171.750	173.000	1638.350	174.200
Min	0	0	0	0	0	0
Max	400	400	400	400	400	400
Unit	mV	mV	mV	mV	mV	mV

DOSIMETRY

MetOp	TOTAL DOSE RADIATION TEST REPORT No. MO-RR-TLG-PM-001	Issue: 1 Rev.: Date: 29/02/2000 ANNEX II

User:Tecnológica S.A.
Ref.: Tecnológica
Date: 15/02/00

REQUIREMENTS

Krad(Si)/h	Rad(Si)/min	R/min
0.280	4.67	5.39

CORRECTIONS

Presion (mm)	714
Temperature (ºC)	22.2
Probe Position	0.95
Final Equip. reading (R/min)	4.90
	4.81

FRICKE DOSIMETRY

Irradiation time (h)	18
Spectrometer temp.(ºC)	25.0
Molar coefficient.	2181
Conversion factor.	27555.78

Dosimeter	Fricke Reading	Rad (Fricke)	Rad (Fricke)/min	R/min	Rad(Si)/min	Krad(Si)/h
D-1	0.228	6282.72	5.82	6.00	5.19	0.31
D-2	0.228	6282.72	5.82	6.00	5.19	0.31
D-3	0.232	6392.94	5.92	6.10	5.28	0.32
PROBE				5.53	4.78	0.29
D-4	0.230	6337.83	5.87	6.05	5.23	0.31
D-5	0.229	6310.27	5.84	6.02	5.21	0.31
D-6	0.228	6282.72	5.82	6.00	5.19	0.31

DOSE RATE (AVERAGE): D2-D5

Rad(Si)/min	5.14
Rad(Si)/h	0.31
Non Uniformity (%)	9.73