MetOp	TOTAL DOSE RADIATION TEST REPORT No. MO-RR-TLG-PM-0002	Issue: 1 Rev.: Date: 04/10/99 Page: 1/5

SCC Component No 5962D9568801VGA		Component Designation: HS2-2620RH	Irradiation Spec. No.: MIL-STD-883 1019.4
Gen. Spec.: MIL-PRF-38535 Det. Spec.: 5962-95688 Amend.: --		Evaluation: - Acceptance Diffusion: - Acceptance Lot: X	Project/Programme: METOP
Family: 08	Group: 09	Functional Assignment: WIDEBAND HIGH IMPEDANCE OP. AMPLIFIER	Package: TO-99
MFR. Name:HARRIS SEMICON. Address: USA		Test House: TECNOLOGICA Address: MADRID (SPAIN)	Orig. house: TECNOLOGICA Address: SEVILLA (SPAIN)
Radiation Test Plan No.: MO-RP-TLG-PM-0002		Sample Size: 6 Irradiation Devices: 5 Control Devices: 1	Date Code: 9727AAAW Diffusion LOT: -- Wafer No.: --
Radiation Source: Cobalt-60 Facility Name: CIEMAT Address: MADRID (SPAIN)		Energy: 1.33/1.17 MeV Dose Rate: 280 rad(Si)/h	Date of Test: 27/09/99
Irradiation Conditions: Biased: X Unbiased: -- Test Circuit: Figure 1		Irradiation Measurements Interval: Remote test: -- In situ Test: X	Annealing Tests: 72h/25°C Biased: X Unbiased: - Test Circuit: Figure 1

Electrical Measurements. Parameters Tested:

Vio, +Iib, -Iib, Iio, +CMRR, -CMRR, +Vop, -Vop, +Iout, -Iout, +Icc, -Icc, +PSRR, -PSRR, +Ios, -Ios, +Avs, -Avs.

Prepared by.: Sergio Fenoy González Date: 05/10/99 Signature:	Approved by : Jose Maria Valverde Date: 09/10/99 Signature:

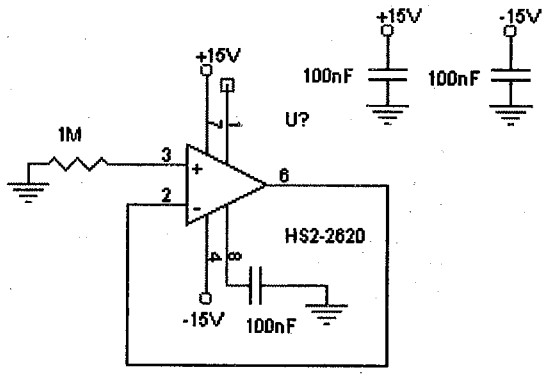


FIGURE 1.-TEST CIRCUIT

SUMMARY

Total dose steady-state irradiation test has been carried out on a WIDEBAND HIGH IMPEDANCE OP. AMPLIFIER from HARRIS SEMICONDUCTOR with date code 9727AAAW. The irradiated parts were labelled as follows: irradiated devices R2,..,R6= S/N 2517,..,2521 and R1= S/N 2516 as control device.

DEVIATION TO PLAN

- The third and fourth irradiation steps at 15 and 20 Krad have been changed to 17.5 and 23.5 Krad.
- Two parameters of the Test Plan (SR+ and SR-) haven't been measured.

RESULTS

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

	0 KRAD	6 KRAD	12 KRAD	17.5 KRAD	23.5 KRAD	ANN
VIO	PASS	PASS	PASS	PASS	PASS	PASS
IIB +, -	PASS	PASS	PASS	PASS	PASS	PASS
IIO	PASS	PASS	PASS	PASS	PASS	PASS
PSRR +, -	PASS	PASS	PASS	PASS	PASS	PASS
CMRR +, -	PASS	PASS	PASS	PASS	PASS	PASS
ICC +, -	PASS	PASS	PASS	PASS	PASS	PASS
VOP +, -	PASS	PASS	PASS	PASS	PASS	PASS
AVS +, -	PASS	PASS	FAIL	FAIL	FAIL	FAIL
IOUT +, -	PASS	PASS	PASS	PASS	PASS	PASS
IOS +, -	PASS	PASS	PASS	PASS	PASS	PASS

CONCLUSION

The results indicate that:

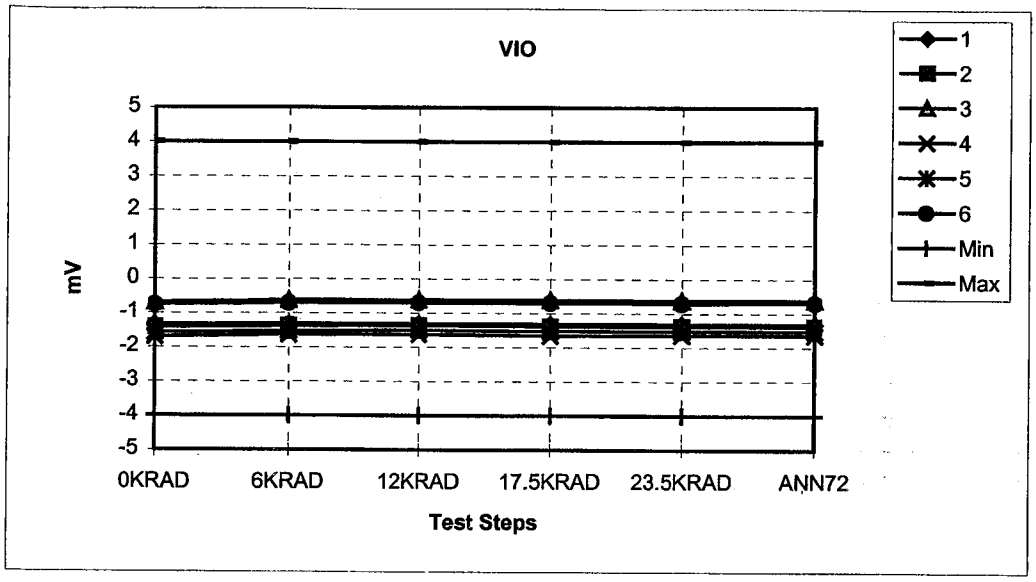
- The Positive Voltage Gain (AVS+) failed at 12 Krad in all the samples.
- The Negative Voltage Gain (AVS-) failed at 17.5 Krad in all the samples
- After annealing both parameters failed according to specification.

SCHEDULE

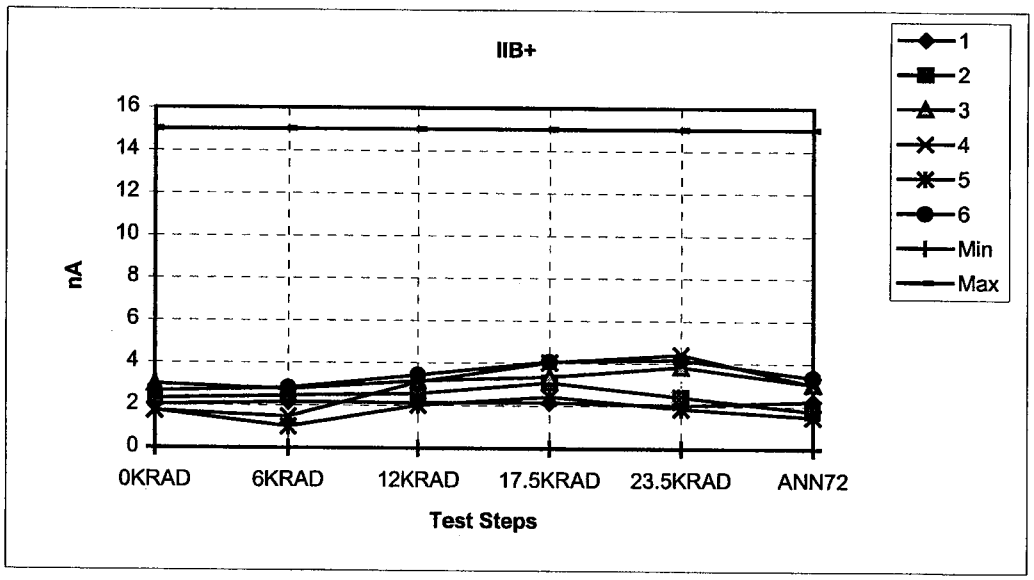
Test Step	Description	Result or Actual Test Condition	Time In	Time Out	Exposure
1	Samples serialization	CONTROL R1 IRR. DEVICES R2,.., R6.			
2	Initial Electrical Measurements	See 0 krad(Si) values in respective Parameter Data Tables	14:30 27/09	14:55 27/09	25 min.
3	Set-up of Test	Bias circuit verified according to Fig. 1			
4	Irradiation Exposure	Total Dose: 6.0 Krad(Si) Cumulative Dose: 6.0 Krad(Si) Dose Rate: 280 Rad(Si)/h Temperature: 25.3°C (average)	15:01 27/09	12:27 28/09	21h26'
5	Intermediate Electrical Measurements	See 6 Krad(Si) values in respective Parameter Data Tables	12:27 28/09	12:50 28/09	23 min.
6	Set-up of Test	Bias circuit verified according to Fig. 1			
7	Irradiation Exposure	Total Dose: 6.0 Krad(Si) Cumulative Dose: 12.0 Krad(Si) Dose Rate: 280 rad(Si)/h Temperature: 25.6°C (average)	12:57 28/09	10:23 29/09	21h26'
8	Intermediate Electrical Measurements	See 12 krad(Si) values in respective Parameter Data Tables	10:23 29/09	10:55 29/09	32 min.
9	Set-up of Test	Bias circuit verified according to Fig. 1			
10	Irradiation Exposure	Total Dose: 5.5 krad(Si) Cumulative Dose: 17.5 Krad(Si) Dose Rate: 280 rad(Si)/h Temperature: 25.5°C (average)	12:23 29/09	08:01 30/09	19h38'
11	Intermediate Electrical Measurements	See 17.5 krad(Si) values in respective Parameter Data Tables	08:01 30/09	08:35 30/09	34 min
12	Set-up of Test	Bias circuit verified according to Fig. 1			

Test Step	Description	Result or Actual Test Condition	Time In	Time Out	Exposure
13	Irradiation Exposure	Total Dose: 6 Krad(Si) Cumulative Dose: 23.5 Krad(Si) Dose Rate: 280 rad(Si)/h Temperature: 25.7◦C (average)	10:01 30/09	07:27 01/10	21h26'
14	Intermediate Electrical Measurements	See 23.5 krad(Si) values in respective Parameter Data Tables	07:27 01/10	08:00 01/10	33 min.
15	Annealing 72h	Bias circuit verified according to Fig. 1 Temperature: 25 ◦C (average)	09:00 01/10	09:00 04/10	72 H
16	Electrical Measurements	See ANN72h values in respective parameter Data Tables	09:00 04/10	09:30 04/10	30 min.

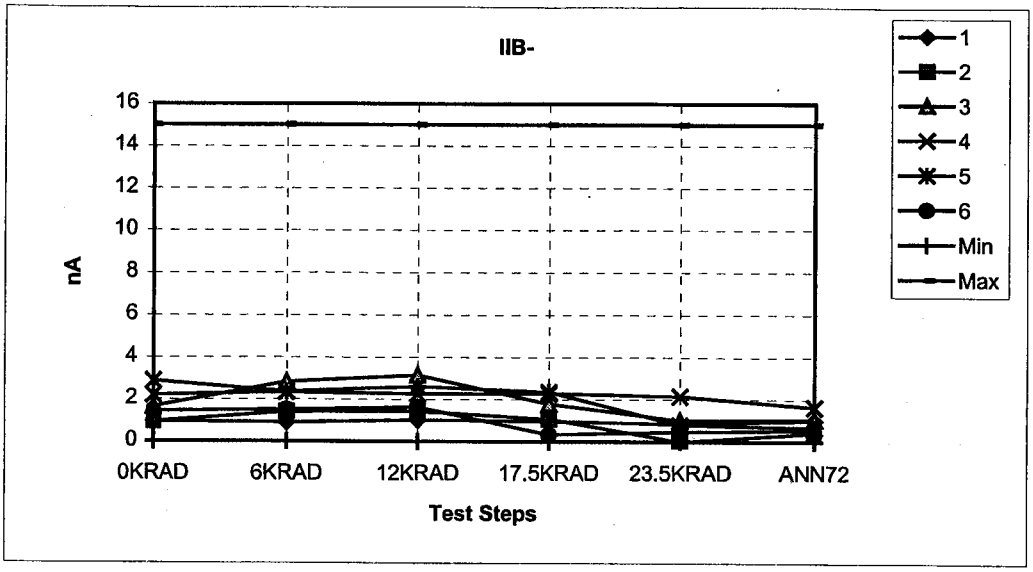
ELECTRICAL MEASUREMENT RESULTS



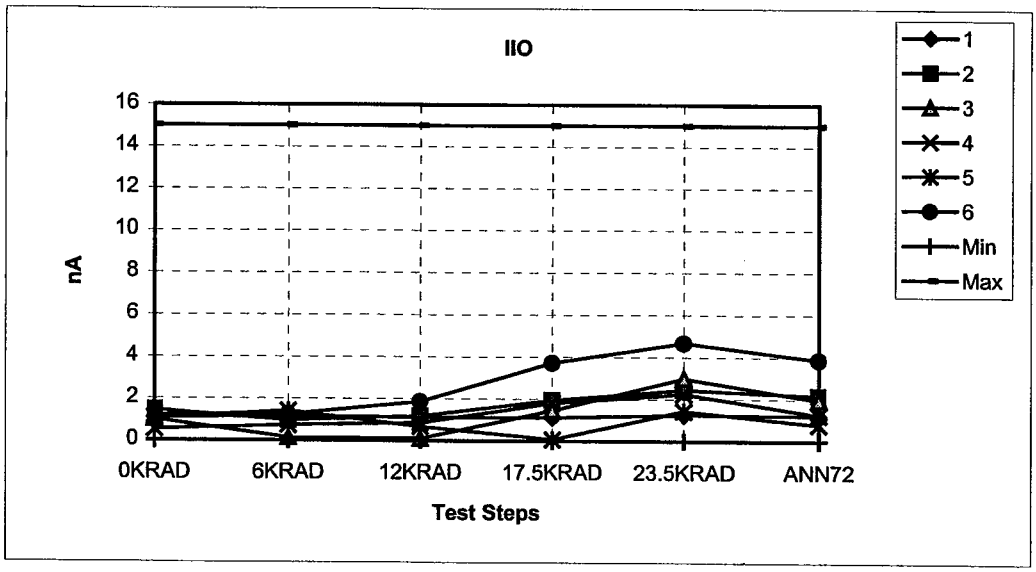
VIO	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	-1.326	-1.308	-1.305	-1.313	-1.308	-1.325
2	-1.422	-1.375	-1.372	-1.391	-1.389	-1.385
3	-0.690	-0.623	-0.610	-0.617	-0.618	-0.623
4	-1.702	-1.628	-1.623	-1.656	-1.645	-1.645
5	-1.580	-1.524	-1.501	-1.525	-1.519	-1.523
6	-0.750	-0.712	-0.694	-0.698	-0.703	-0.701
Min	-4	-4	-4	-4	-4	-4
Max	4	4	4	4	4	4
Unit	mV	mV	mV	mV	mV	mV



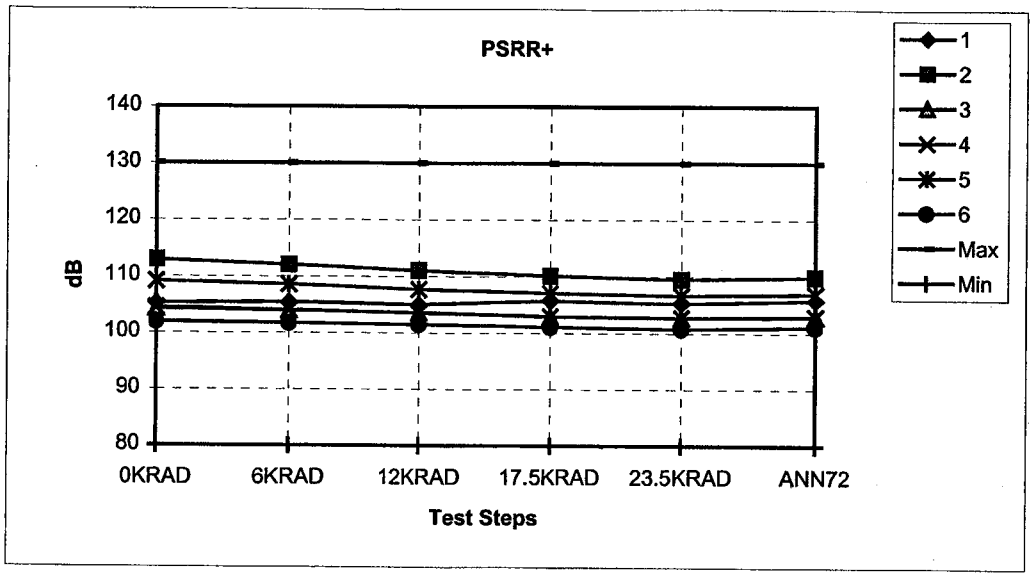
IIB+	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	2.029	2.138	2.108	2.142	2.018	2.225
2	2.311	2.446	2.556	3.073	2.412	1.753
3	2.987	2.746	3.157	3.355	3.837	3.015
4	1.741	1.462	3.101	4.023	4.409	3.000
5	1.750	0.990	2.003	2.414	1.869	1.489
6	2.658	2.808	3.421	4.055	4.159	3.334
Min	0	0	0	0	0	0
Max	15	15	15	15	15	15
Unit	nA	nA	nA	nA	nA	nA



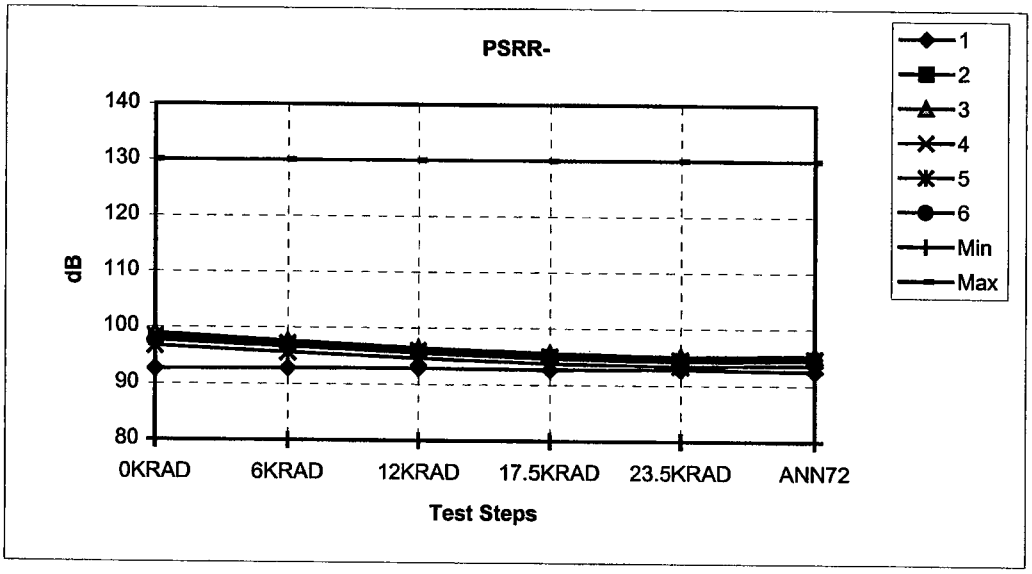
IIB-	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	0.971	0.896	1.028	0.965	0.835	1.005
2	0.948	1.406	1.434	1.075	0.004	0.420
3	1.655	2.823	3.146	1.797	1.015	1.048
4	2.199	2.343	2.265	2.285	2.157	1.637
5	2.876	2.378	2.618	2.362	0.803	0.678
6	1.437	1.513	1.632	0.329	0.468	0.552
Min	0	0	0	0	0	0
Max	15	15	15	15	15	15
Unit	nA	nA	nA	nA	nA	nA



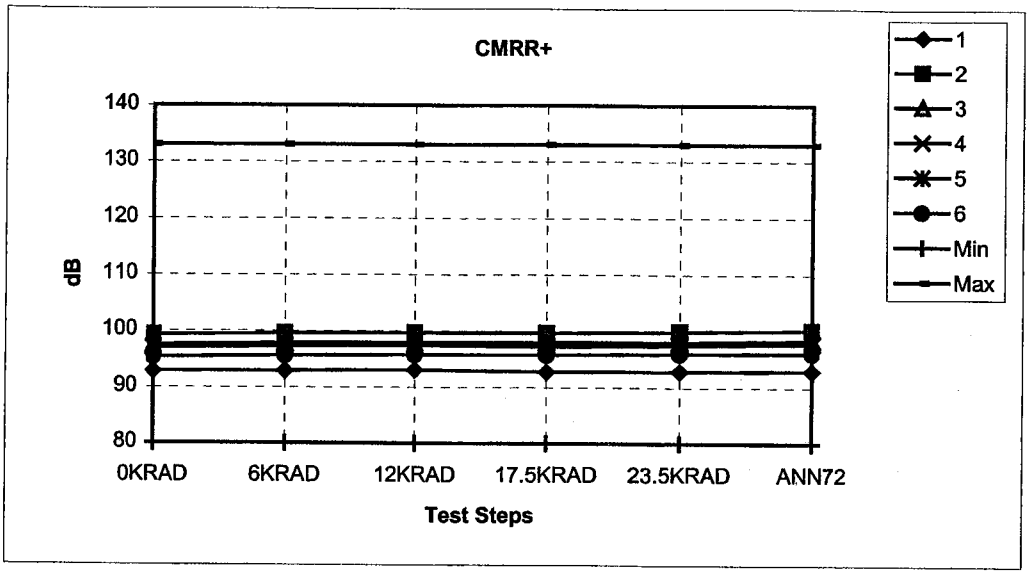
IIO	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	1.086	1.170	1.121	1.113	1.261	1.229
2	1.449	0.961	1.179	1.949	2.441	2.172
3	1.012	0.145	0.102	1.451	2.989	1.953
4	0.542	0.736	0.851	1.803	2.247	1.248
5	1.082	1.402	0.670	0.070	1.441	0.797
6	1.213	1.242	1.865	3.710	4.670	3.866
Min	0	0	0	0	0	0
Max	15	15	15	15	15	15
Unit	nA	nA	nA	nA	nA	nA



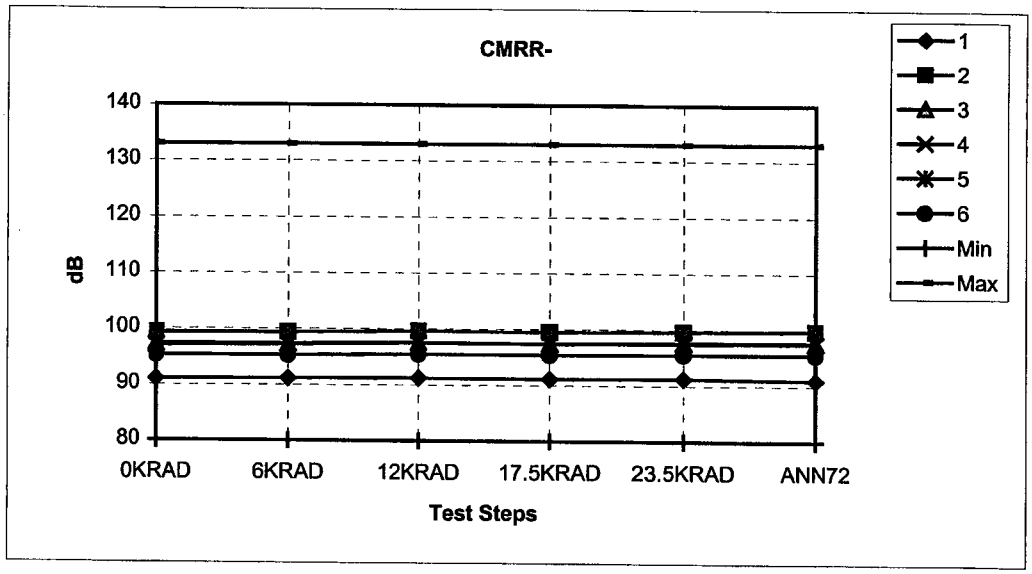
PSRR+	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	105.21	105.40	105.02	105.67	105.21	105.78
2	112.88	112.02	111.02	110.16	109.52	109.91
3	104.23	103.90	103.56	102.87	102.71	102.84
4	104.46	103.95	103.52	102.96	102.71	102.93
5	109.14	108.52	107.72	107.03	106.67	106.97
6	101.92	101.69	101.45	101.08	100.72	101.08
Min	80	80	80	80	80	80
Max	130	130	130	130	130	130
Unit	dB	dB	dB	dB	dB	dB



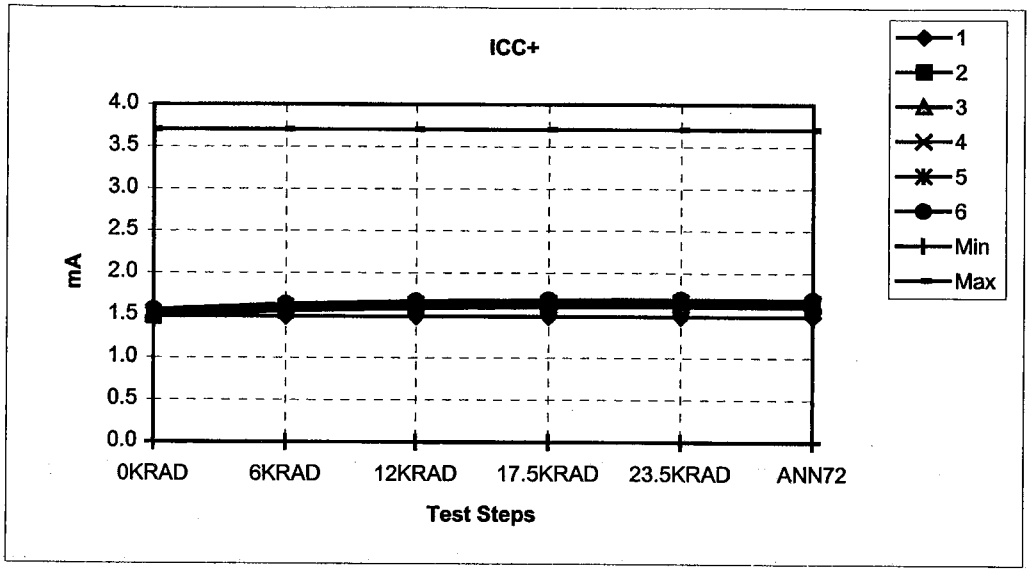
PSRR-	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	92.63	92.79	92.87	92.70	92.80	92.51
2	98.03	96.85	95.77	94.92	94.38	94.64
3	98.96	97.60	96.45	95.59	95.03	95.33
4	98.45	97.17	95.99	95.03	94.46	94.73
5	96.68	95.60	94.60	93.78	93.36	93.61
6	97.69	96.64	95.56	94.66	94.19	94.46
Min	80	80	80	80	80	80
Max	130	130	130	130	130	130
Unit	dB	dB	dB	dB	dB	dB



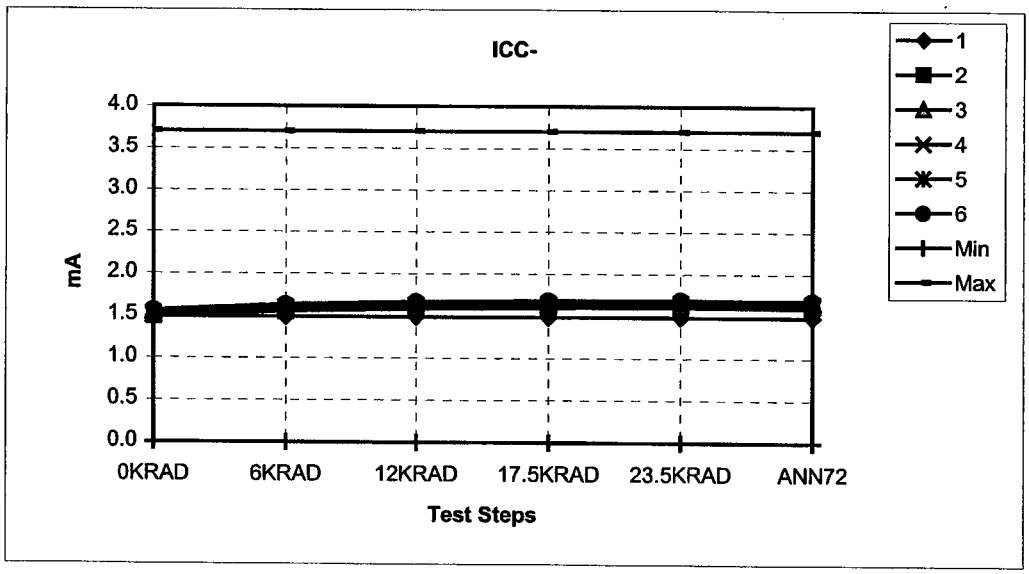
CMRR+	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	92.83	92.93	93.06	92.81	92.86	92.95
2	99.26	99.58	99.66	99.67	99.88	100.17
3	97.48	97.85	97.95	98.02	98.07	98.39
4	97.10	97.49	97.74	97.52	97.72	97.91
5	96.91	97.25	97.46	97.28	97.49	97.80
6	95.30	95.59	95.80	95.76	95.98	96.10
Min	80	80	80	80	80	80
Max	133	133	133	133	133	133
Unit	dB	dB	dB	dB	dB	dB



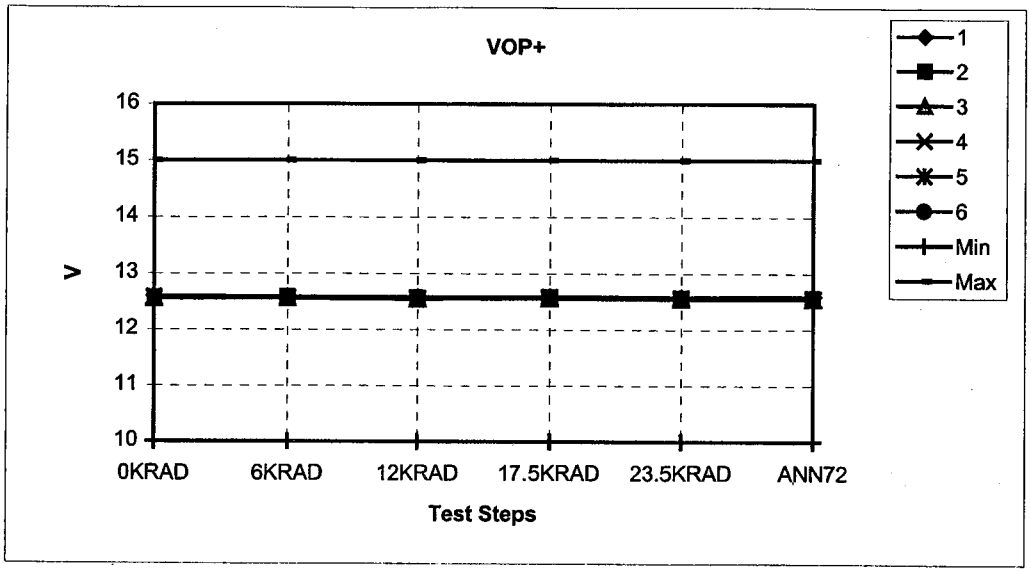
CMRR-	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	91.03	91.11	91.24	91.10	91.24	91.02
2	99.29	99.36	99.60	99.49	99.63	99.76
3	97.35	97.30	97.64	97.46	97.68	97.66
4	97.13	97.25	97.52	97.35	97.51	97.53
5	96.99	97.13	97.53	97.39	97.56	97.60
6	95.24	95.27	95.50	95.41	95.53	95.54
Min	80	80	80	80	80	80
Max	133	133	133	133	133	133
Unit	dB	dB	dB	dB	dB	dB



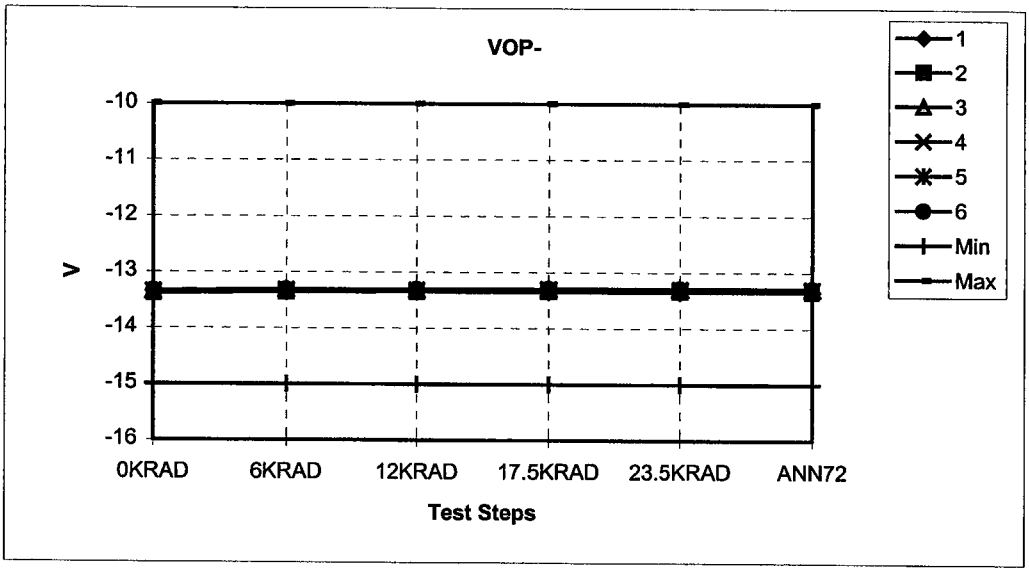
ICC+	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	1.483	1.483	1.483	1.483	1.483	1.483
2	1.480	1.546	1.579	1.594	1.603	1.596
3	1.548	1.616	1.647	1.662	1.671	1.665
4	1.496	1.569	1.603	1.619	1.628	1.620
5	1.522	1.596	1.630	1.646	1.654	1.647
6	1.563	1.634	1.667	1.682	1.691	1.685
Min	0	0	0	0	0	0
Max	3.7	3.7	3.7	3.7	3.7	3.7
Unit	mA	mA	mA	mA	mA	mA



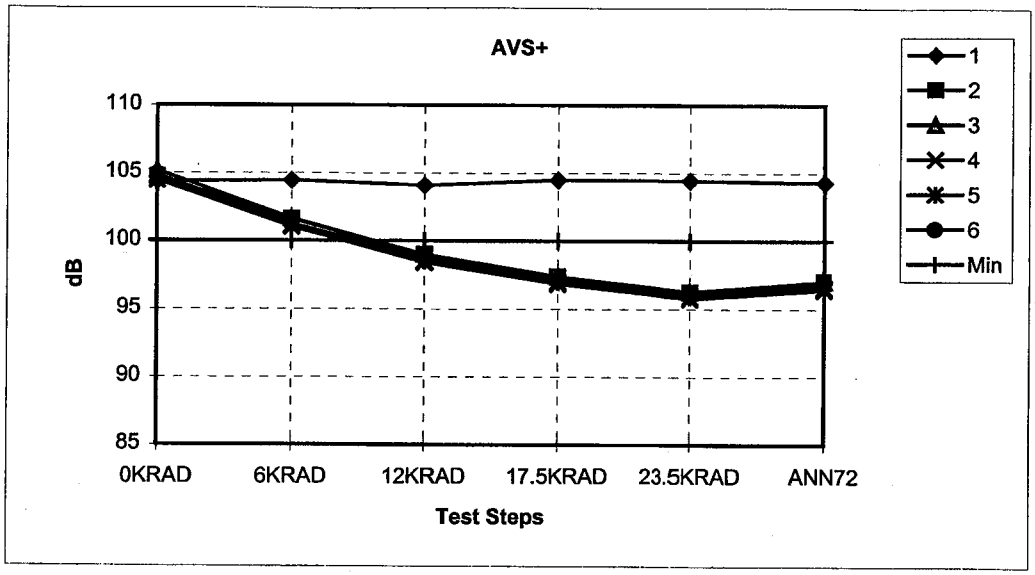
ICC-	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	1.483	1.483	1.483	1.483	1.483	1.484
2	1.480	1.546	1.579	1.595	1.604	1.600
3	1.547	1.615	1.647	1.663	1.671	1.667
4	1.496	1.570	1.603	1.620	1.629	1.623
5	1.522	1.596	1.630	1.646	1.655	1.649
6	1.562	1.633	1.667	1.683	1.692	1.688
Min	0	0	0	0	0	0
Max	3.7	3.7	3.7	3.7	3.7	3.7
Unit	mA	mA	mA	mA	mA	mA



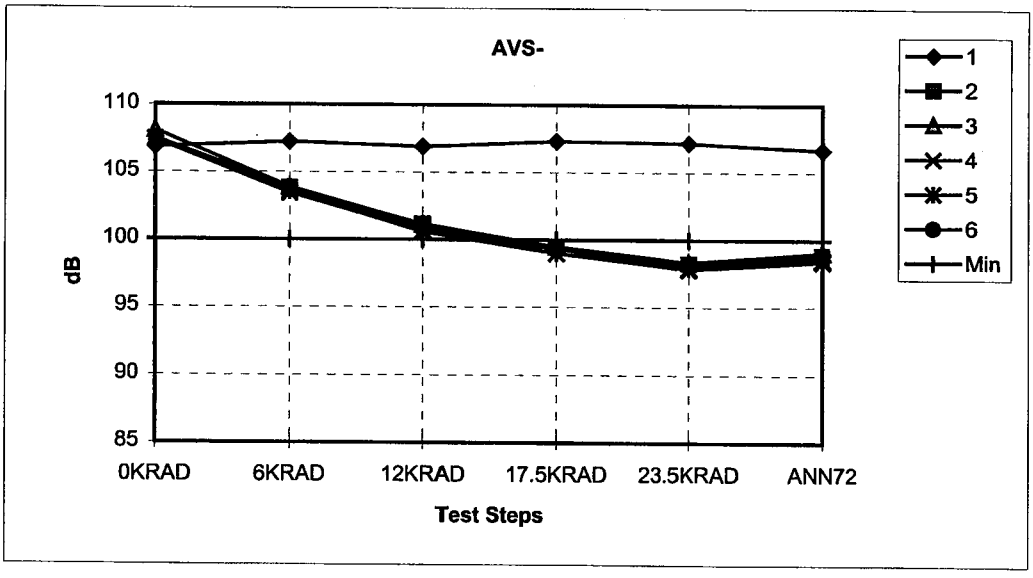
VOP+	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	12.596	12.585	12.579	12.590	12.584	12.598
2	12.569	12.574	12.565	12.578	12.564	12.563
3	12.555	12.558	12.549	12.558	12.545	12.545
4	12.570	12.571	12.560	12.574	12.557	12.558
5	12.574	12.572	12.561	12.580	12.562	12.559
6	12.564	12.564	12.554	12.564	12.551	12.549
Min	10	10	10	10	10	10
Max	15	15	15	15	15	15
Unit	V	V	V	V	V	V



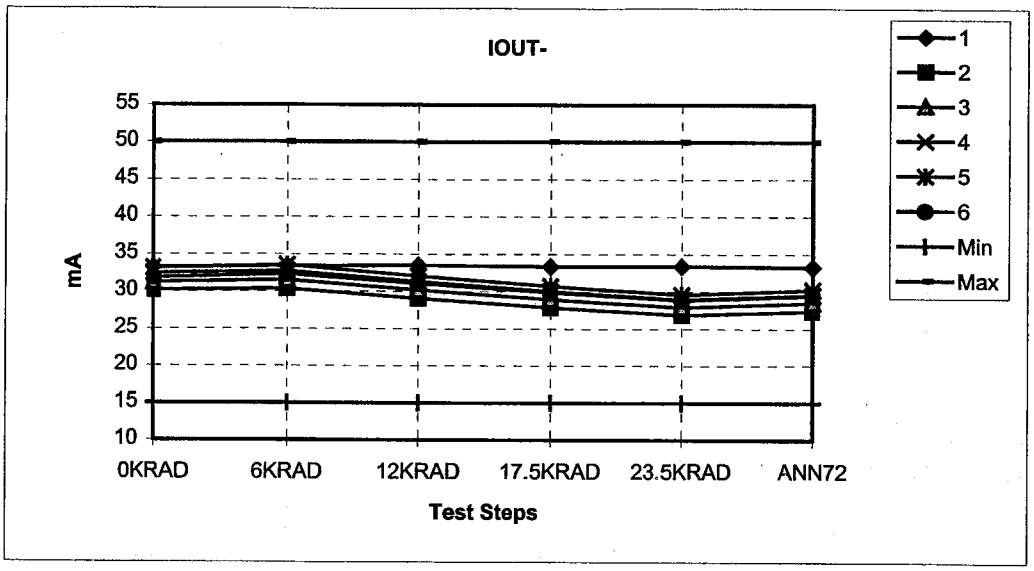
VOP-	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	-13.347	-13.349	-13.352	-13.348	-13.351	-13.347
2	-13.386	-13.361	-13.352	-13.340	-13.340	-13.338
3	-13.343	-13.318	-13.310	-13.299	-13.298	-13.296
4	-13.351	-13.324	-13.314	-13.300	-13.300	-13.298
5	-13.348	-13.324	-13.314	-13.298	-13.299	-13.299
6	-13.335	-13.312	-13.302	-13.290	-13.289	-13.287
Min	-15	-15	-15	-15	-15	-15
Max	-10	-10	-10	-10	-10	-10
Unit	V	V	V	V	V	V



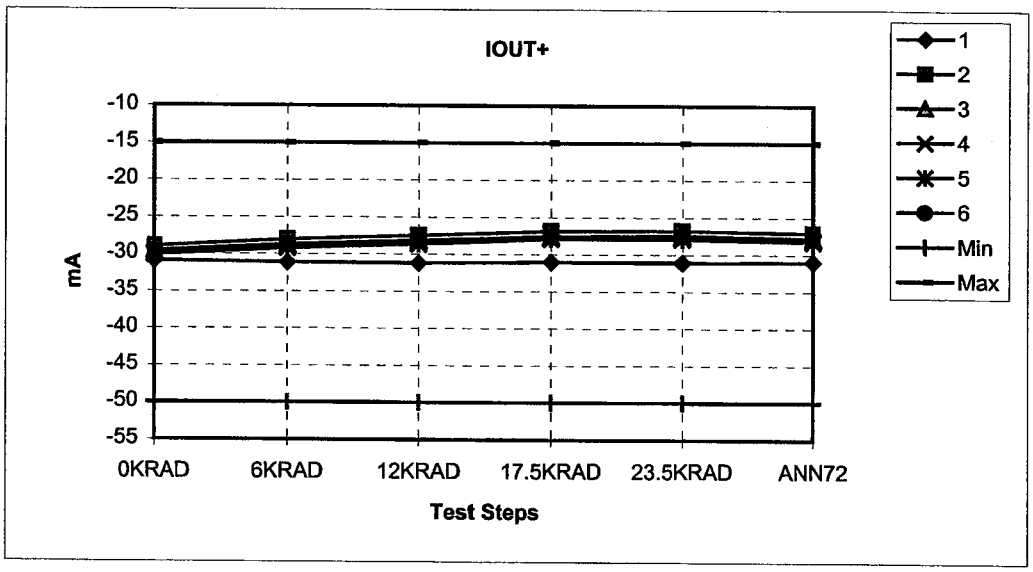
AVS+	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	104.39	104.47	104.11	104.50	104.45	104.31
2	104.75	101.60	99.01	97.40	96.23	97.04
3	105.20	101.65	99.02	97.38	96.28	97.02
4	104.49	101.04	98.41	96.83	95.74	96.42
5	104.72	101.15	98.52	96.97	95.89	96.57
6	104.90	101.28	98.78	97.08	96.07	96.81
Min	100	100	100	100	100	100
Max	124	124	124	124	124	124
Unit	dB	dB	dB	dB	dB	dB



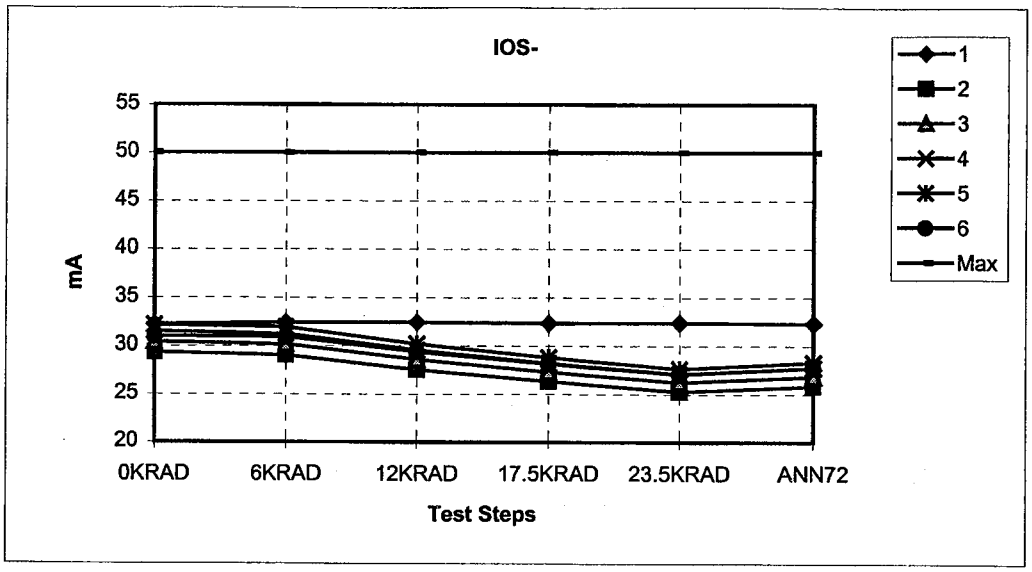
AVS-	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	106.88	107.25	106.90	107.32	107.21	106.70
2	107.40	103.80	101.15	99.45	98.24	98.87
3	108.10	103.89	101.11	99.51	98.33	99.07
4	107.40	103.45	100.65	99.00	97.81	98.41
5	107.44	103.57	100.57	98.99	97.89	98.53
6	107.54	103.87	100.86	99.31	98.11	98.68
Min	100	100	100	100	100	100
Max	124	124	124	124	124	124
Unit	dB	dB	dB	dB	dB	dB



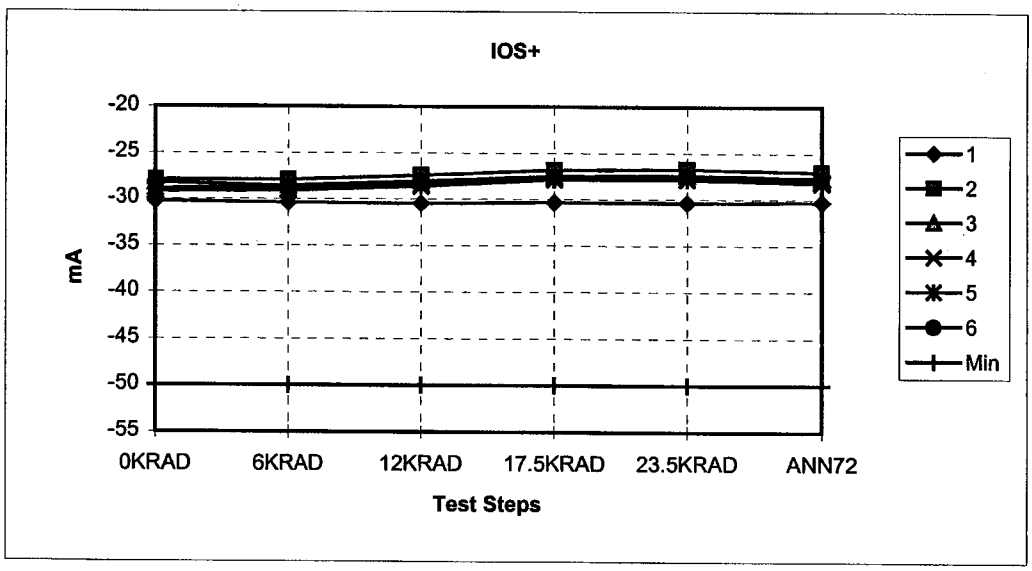
IOUT-	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	33.220	33.403	33.470	33.330	33.390	33.237
2	30.183	30.343	29.037	27.840	26.830	27.373
3	31.237	31.523	30.167	28.933	27.887	28.477
4	32.417	32.743	31.303	30.007	28.913	29.530
5	33.117	33.537	32.050	30.693	29.587	30.227
6	31.830	32.310	31.060	29.863	28.823	29.460
Min	15	15	15	15	15	15
Max	50	50	50	50	50	50
Unit	mA	mA	mA	mA	mA	mA



IOUT+	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	-30.920	-31.133	-31.190	-31.030	-31.087	-30.980
2	-28.987	-28.050	-27.497	-26.880	-26.773	-27.093
3	-29.547	-28.690	-28.140	-27.573	-27.457	-27.767
4	-30.010	-29.067	-28.523	-27.877	-27.813	-28.103
5	-30.127	-29.190	-28.660	-27.920	-27.903	-28.260
6	-29.697	-28.743	-28.193	-27.617	-27.500	-27.840
Min	-50	-50	-50	-50	-50	-50
Max	-15	-15	-15	-15	-15	-15
Unit	mA	mA	mA	mA	mA	mA



IOS-	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	32.257	32.401	32.464	32.337	32.401	32.301
2	29.347	29.034	27.541	26.314	25.247	25.821
3	30.397	30.161	28.584	27.304	26.217	26.831
4	31.524	31.254	29.571	28.207	27.091	27.724
5	32.157	31.954	30.191	28.787	27.641	28.297
6	31.001	30.937	29.411	28.134	27.067	27.714
Min	0	0	0	0	0	0
Max	50	50	50	50	50	50
Unit	mA	mA	mA	mA	mA	mA



IOS+	0KRAD	6KRAD	12KRAD	17.5KRAD	23.5KRAD	ANN72
1	-30.224	-30.404	-30.481	-30.337	-30.384	-30.301
2	-27.967	-27.947	-27.447	-26.831	-26.744	-27.054
3	-28.251	-28.564	-28.071	-27.517	-27.401	-27.717
4	-28.894	-28.977	-28.461	-27.817	-27.771	-28.061
5	-29.204	-29.121	-28.601	-27.874	-27.861	-28.221
6	-28.887	-28.664	-28.151	-27.557	-27.461	-27.804
Min	-50	-50	-50	-50	-50	-50
Max	0	0	0	0	0	0
Unit	mA	mA	mA	mA	mA	mA

DOSIMETRY

User:Tecnológica S.A.
Ref.: Tecnológica
Date: 17/09/99

REQUIREMENTS

Krad(Si)/h	Rad(Si)/min	R/min
0.25	4.17	4.82

CORRECTIONS

Presion (mm)	706
Temperature (ºC)	28.1
Probe Position	0.95
Calibration	1.008
Final Equip. reading (R/min)	4.50

FRICKE DOSIMETRY

Irradiation time (h)	48
Spectrometer temp.(ºC)	25.7
Coeficiente de ex. Molar	2181
Factor de conversión	27422.62

Dosimeter	Fricke Reading	Rad (Fricke)	Rad (Fricke)/min	R/min	Rad(Si)/ min	Krad(Si)/h
D-1	0.520	14259.76	4.95	5.10	4.41	0.26
D-2	0.529	14506.57	5.04	5.20	4.50	0.27
D-3	0.541	14835.64	5.15	5.31	4.59	0.28
PROBE				5.24	4.53	0.27
D-4	0.554	15192.13	5.28	5.44	4.71	0.28
D-5	0.553	15164.71	5.27	5.43	4.70	0.28
D-6	0.554	15192.13	5.28	5.44	4.71	0.28

DOSE RATE (AVERAGE): D2-D5

Rad(Si)/min	4.61
Rad(Si)/h	280
Non Uniformity (%)	4.56