# ESA-QCA9922T-C

| *Envisat-1* | TOTAL DOSE RADIATION TEST REPORT No. PO-TR-TLG-PL-2038 | Issue: 1 Rev.: Date: 27/03/96 Page: 1/10 |
|---|---|---|

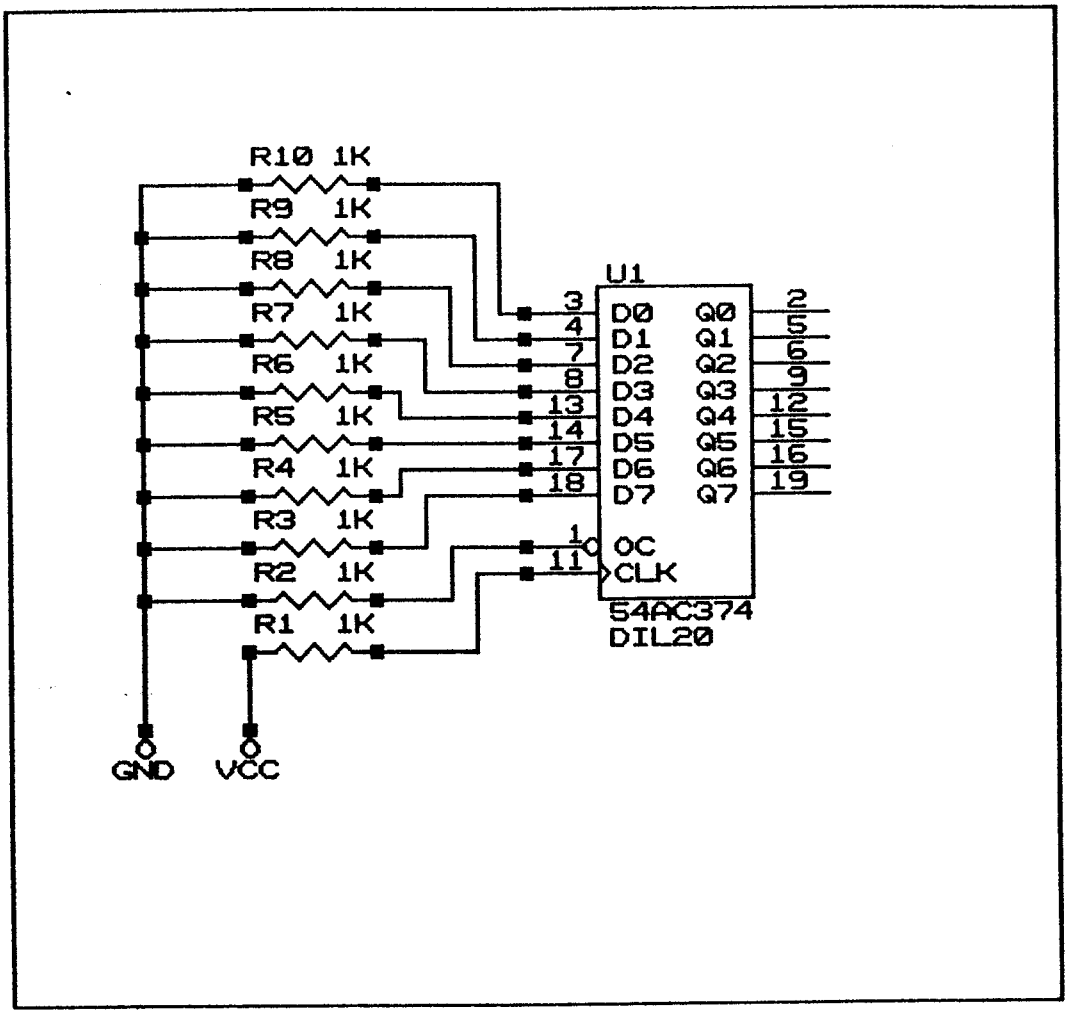
| | | |
|---|---|---|
| SCC Component No.: 920306901B | Component Designation: 54AC374 | Irradiation Spec. No.: PO-PL-TLG-PL-0500 Iss.2 |
| Gen. Spec.: SCC 9000 8D<br>Det. Spec.: SCC 9203/069 Iss.1<br>Amend.: DCR 22114 / 23718 | Evaluation: -<br>Acceptance Difussion: -<br>Acceptance Lot: X | Project/Programme: ENVISAT-1 |
| Family: 08 / Group: 01 | Functional Assignment: OCTAL D-TYPE FLIP-FLOP,3-STATE | Package: DIL-20 |
| Manuf.Name: MOTOROLA<br>Address: FRANCE | Test House: TECNOLOGICA<br>Address: MADRID (SPAIN) | Orig.house: TECNOLOGICA<br>Address: SEVILLA (SPAIN) |
| Radiation Test Plan No.: PO-PL-TLG-PL-2038 | Sample Size: 5<br>Irradiation Devices: 4<br>Control Devices: 1 | Date Code: 9511<br>Diffusion LOT: AH45716UA<br>Wafer No.: 13 |
| Radiation Source: Cobalt-60<br>Facility Name: CIEMAT<br>Address: MADRID (SPAIN) | Energy: 1.33/1.17 MeV<br>Dose Rate: 402.6 Rad(Si)/h | Date of Test: 03/96 |
| Irradiation Conditions:<br>Biased: Y<br>Unbiased: -<br>Test Circuit: Figure 1 | Irradiation Measurements Interval:<br>Remote test: -<br>In situ Test: X | Annealing Tests: 24h / 25°C<br>Ageing: 168h / 100°C<br>Biased: X<br>Unbiased: -<br>Test Circuit: Figure 1 |

**Electrical Measurements. Parameters Tested:**

$FT_1$ , $FT_2$ , $FT_3$ , IDD , $VOL_5$ , $VOH_5$ , VIL , VIH .

| | | |
|---|---|---|
| Irradiat. Respons.: J. A. VAQUERO<br>Date: 27/03/96<br>Signature: | Electr. Test Resp.: JOSE M. VALVERDE<br>Date: 28/03/96<br>Signature: | Approved by QA: S MAYORDOMO<br>Date: 02-04-96<br>Signature: |

**FIGURE 1.-TEST CIRCUIT**



**SUMMARY**

Total dose steady-state irradiation test has been carried out on OCTAL D-TYPE FLIP-FLOP,3-STATE from **MOTOROLA** with date code 9511. The irradiated parts were labelled as follows: R2= S/N 15, R3= S/N 58, R4= S/N 59, R5= S/N 60 irradiation devices and R1= S/N 25 control device.

**RESULTS**

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

| | 0 KRAD | 10 KRAD | 20 KRAD | 30 KRAD | ANN 168 |
|---|---|---|---|---|---|
| FT1 | PASS | PASS | PASS | PASS | PASS |
| FT2 | PASS | PASS | PASS | PASS | PASS |
| FT3 | PASS | PASS | PASS | PASS | PASS |
| IDD(Pat.1) | PASS | PASS | PASS | PASS | PASS |
| IDD(Pat.2) | PASS | PASS | PASS | PASS | PASS |
| IDD(Pat.3) | PASS | PASS | PASS | PASS | PASS |
| $VOL_5$ | PASS | PASS | PASS | PASS | PASS |
| $VOH_5$ | PASS | PASS | PASS | PASS | PASS |
| VIL | PASS | PASS | PASS | PASS | PASS |
| VIH | PASS | PASS | PASS | PASS | PASS |

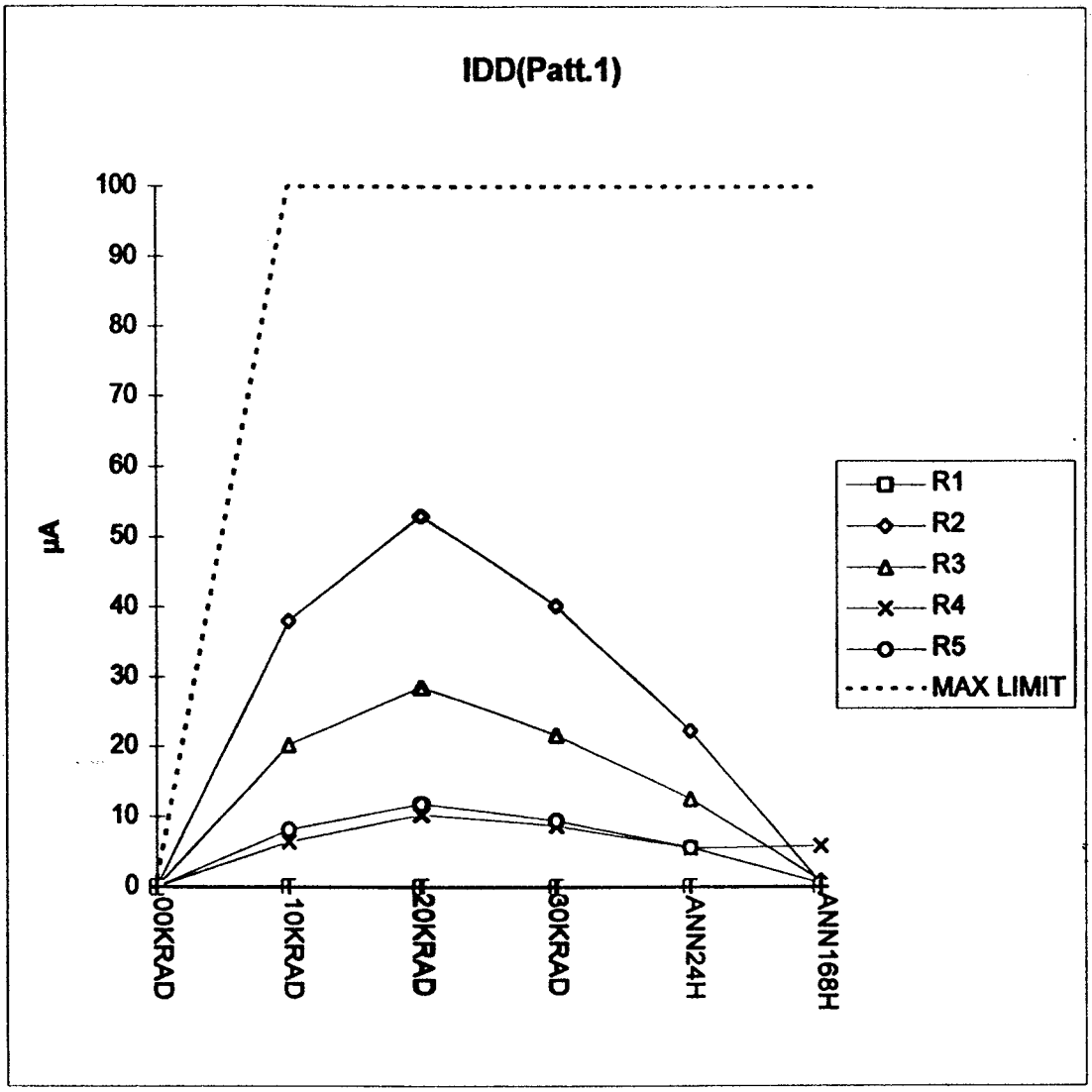
**CONCLUSION**

All parameters remain under specification.

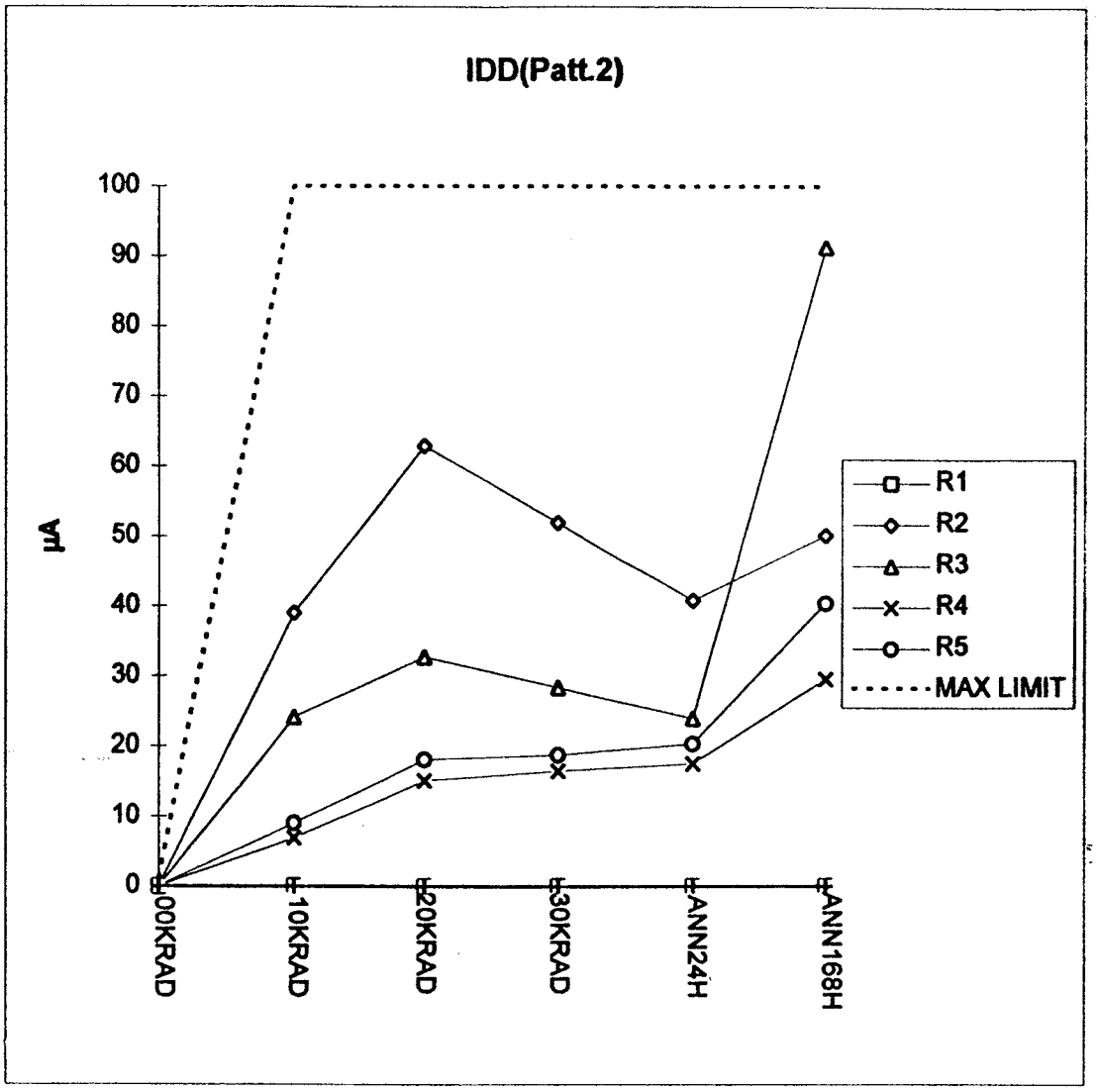
SCHEDULE

| Test Step | Description | Result or Actual Test Condition | Time In | Time Out | Exposure |
|---|---|---|---|---|---|
| 1 | Sample serialization | CONTROL R1<br>IRR. DEVICES R2, R3, R4, R5. | | | |
| 2 | Initial Electrical Measurements | See 0 krad(Si) values in respective Parameter Data Tables<br>Temperature: 24.9°C (average)<br>Humidity: 21.3% | | | |
| 3 | Set-up of Test | Bias circuit verified according to Fig. 1 | | | |
| 4 | Irradiation Exposure | Total Dose: 9761.7 rad(Si)<br>Cumulative Dose: 9761.7 rad(Si)<br>Dose Rate: 406.7 rad(Si)/h<br>Temperature: 19.0°C (average) | 12:00 11/03 | 12:00 12/03 | 24 h |
| 5 | Intermediate Electrical Measurements | See 10 krad(Si) values in respective Parameter Data Tables<br>Temperature: 24.8 °C (average)<br>Humidity: 16.0% | 12:00 12/03 | 12:20 12/03 | 20 min |
| 6 | Set-up of Test | Bias circuit verified according to Fig. 1 | | | |
| 7 | Irradiation Exposure | Total Dose: 9698.6 rad(Si)<br>Cumulative Dose: 19460.2 rad(Si)<br>Dose Rate: 404.1 rad(Si)/h<br>Temperature: 20.9°C (average) | 12:30 12/03 | 12:30 13/03 | 24 h |
| 8 | Intermediate Electrical Measurements | See 20 krad(Si) values in respective Parameter Data Tables<br>Temperature: 24.4°C (average)<br>Humidity: 24.6% | 12:35 13/03 | 13:00 13/03 | 25 min |
| 9 | Set-up of Test | Bias circuit verified according to Fig. 1 | | | |
| 10 | Irradiation Exposure | Total Dose: 9623.3 rad(Si)<br>Cumulative Dose: 29083.5 rad(Si)<br>Dose Rate: 401.0 rad(Si)/h<br>Temperature: 23.2 °C (average) | 13:10 13/03 | 13:10 14/03 | 24 h |

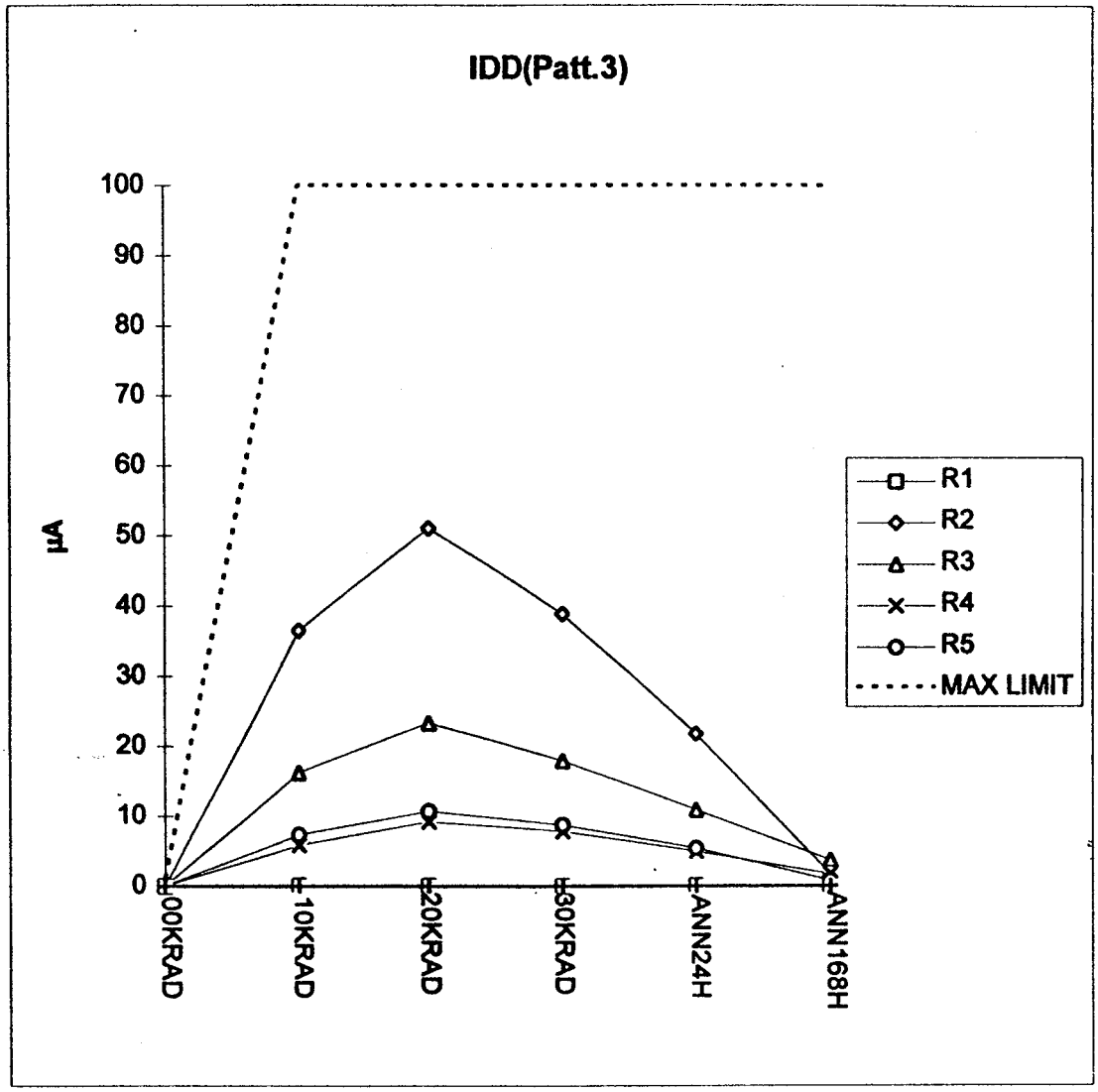
| Test Step | Description | Result or Actual Test Condition | Time In | Time Out | Exposure |
|---|---|---|---|---|---|
| 11 | Intermediate Electrical Measurements | See 30 krad(Si) values in respective Parameter Data Tables<br>Temperature: 25.0°C (average)<br>Humidity: 28.0% | 13:15 14/03 | 13:40 14/03 | 20 min |
| 12 | Annealing | Bias circuit verified according to Fig. 1<br>Temperature: 25.3°C (average) | 13:50 14/03 | 13:50 15/03 | 24 h |
| 13 | Electrical Measurements | See ANN24H values in respective Parameter Data Tables<br>Temperature: 25.0°C (average)<br>Humidity: 21.0% | 14:00 15/03 | 14:20 15/03 | 20 min |
| 14 | Accelerated Ageing | Bias circuit verified according to Fig. 1<br>Temperature: 100°C | 14:30 15/03 | 14:30 22/03 | 168 h. |
| 15 | Final Electrical Measurements | See ANN168H values in respective parameter Data Tables<br>Temperature: 30.5°C (average)<br>Humidity: 26.0% | 14:35 22/03 | 15:00 22/03 | |



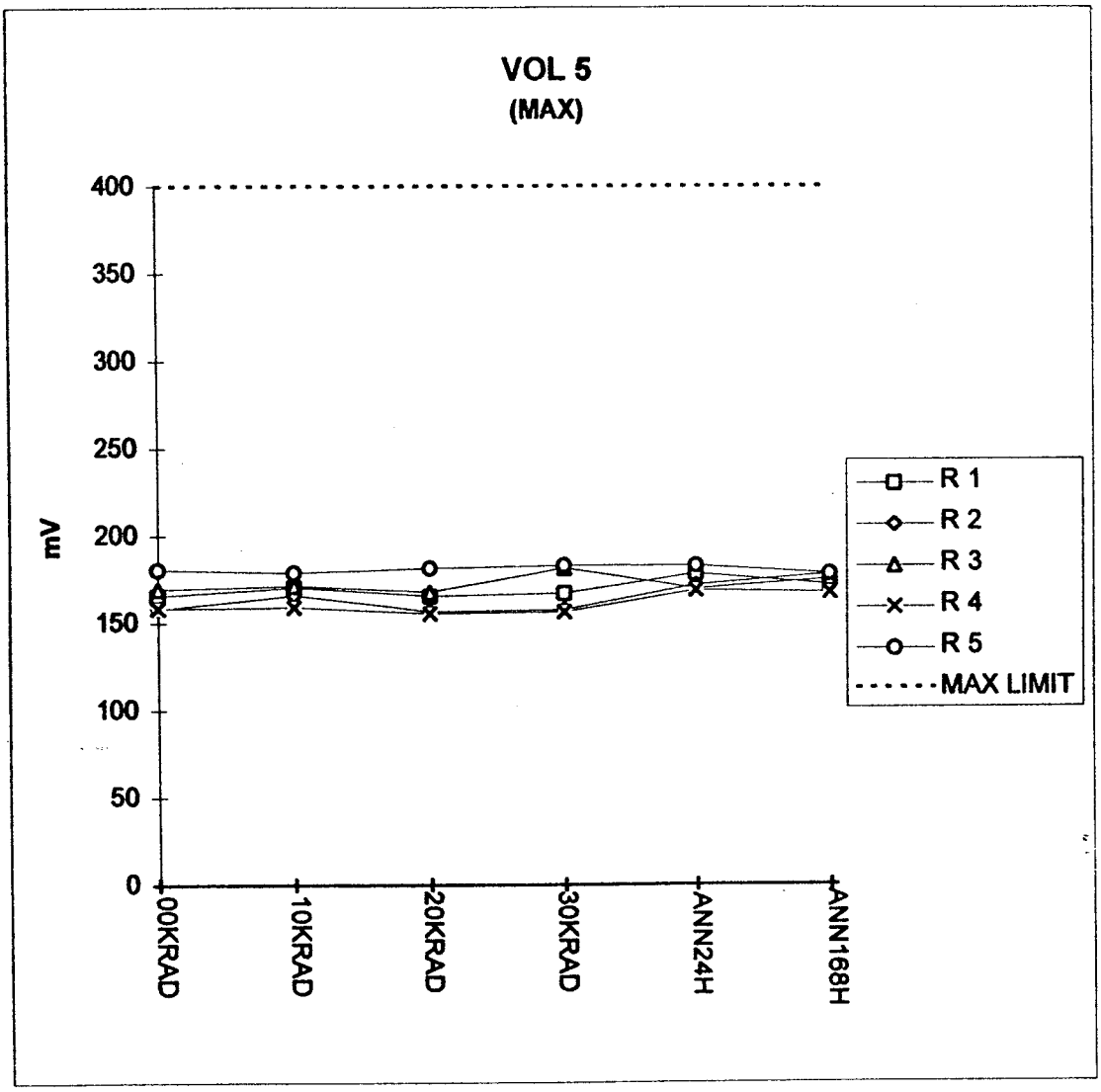

| IDD(Patt.1) | 00KRAD | 10KRAD | 20KRAD | 30KRAD | ANN24H | ANN168H |
|---|---|---|---|---|---|---|
| R1 | 0.007 | 0.036 | 0.025 | 0.005 | 0.025 | 0.033 |
| R2 | 0.006 | 38.006 | 52.975 | 40.162 | 22.248 | 0.441 |
| R3 | 0.008 | 20.258 | 28.469 | 21.677 | 12.538 | 0.868 |
| R4 | 0.007 | 6.408 | 10.294 | 8.723 | 5.498 | 5.845 |
| R5 | 0.012 | 8.159 | 11.835 | 9.447 | 5.575 | 0.520 |
| MAX LIMIT | 1 | 100 | 100 | 100 | 100 | 100 |



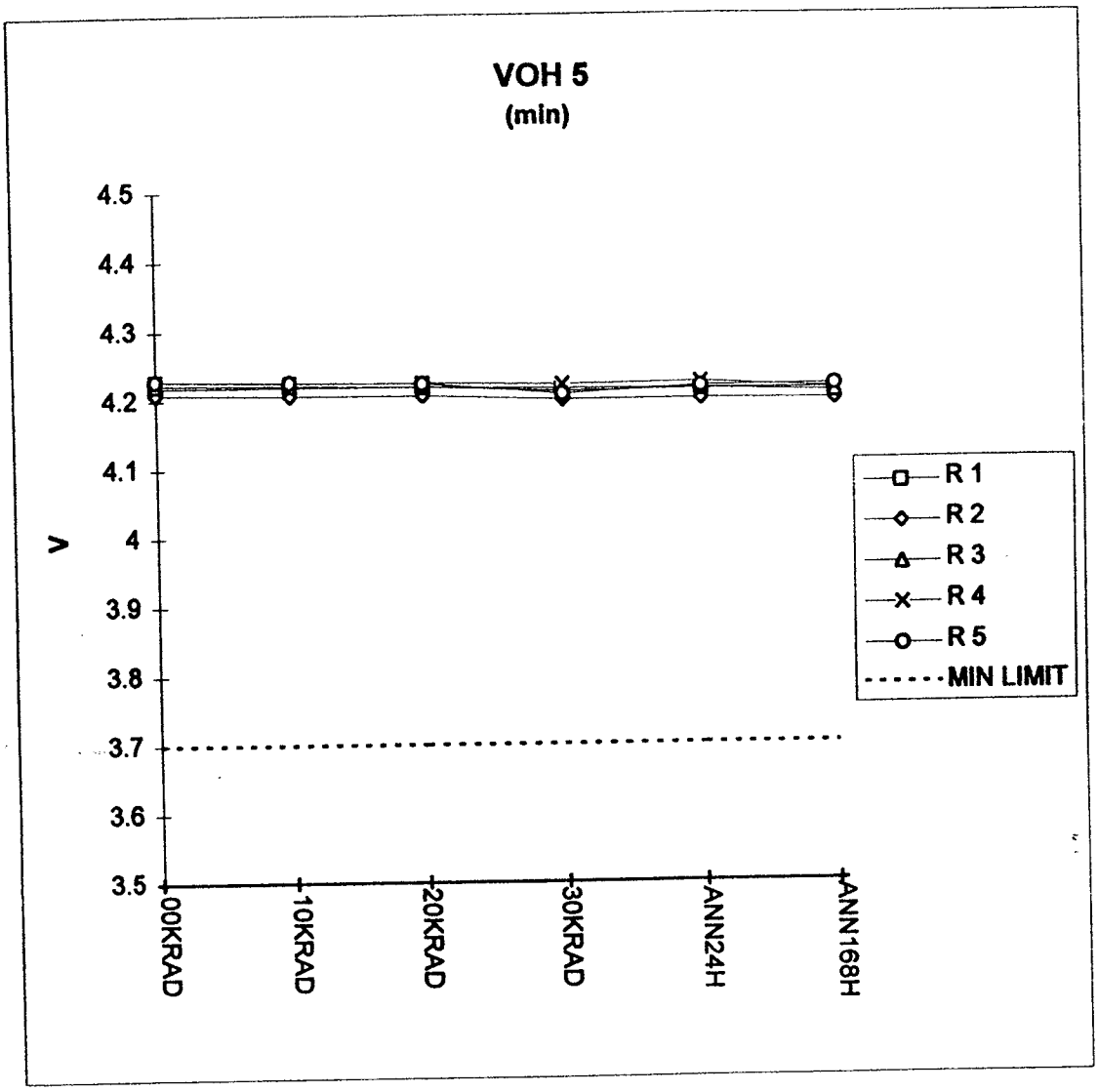

| IDD(Patt.2) | 00KRAD | 10KRAD | 20KRAD | 30KRAD | ANN24H | ANN168H |
|---|---|---|---|---|---|---|
| R1 | 0.044 | 0.084 | 0.015 | 0.073 | 0.063 | 0.050 |
| R2 | 0.023 | 39.045 | 62.935 | 51.955 | 40.803 | 50.110 |
| R3 | 0.021 | 24.171 | 32.719 | 28.381 | 23.935 | 91.300 |
| R4 | 0.035 | 6.923 | 15.090 | 16.510 | 17.518 | 29.514 |
| R5 | 0.030 | 9.066 | 18.115 | 18.811 | 20.342 | 40.395 |
| MAX LIMIT | 1 | 100 | 100 | 100 | 100 | 100 |




| IDD(Patt.3) | 00KRAD | 10KRAD | 20KRAD | 30KRAD | ANN24H | ANN168H |
|---|---|---|---|---|---|---|
| R1 | 0.018 | 0.099 | 0.054 | 0.009 | 0.027 | 0.045 |
| R2 | 0.019 | 36.469 | 51.064 | 38.858 | 21.734 | 1.703 |
| R3 | 0.022 | 16.222 | 23.349 | 17.921 | 10.890 | 3.638 |
| R4 | 0.026 | 5.844 | 9.194 | 7.806 | 4.895 | 1.675 |
| R5 | 0.040 | 7.324 | 10.673 | 8.753 | 5.360 | 0.765 |
| MAX LIMIT | 1 | 100 | 100 | 100 | 100 | 100 |




| VOL 5 | | 00KRAD | 10KRAD | 20KRAD | 30KRAD | ANN24H | ANN168H |
|---|---|---|---|---|---|---|---|
| R 1 | min | 146.200 | 148.000 | 145.350 | 149.000 | 152.750 | 153.050 |
| | MAX | 165.65 | 170.300 | 165.200 | 166.900 | 177.950 | 171.700 |
| R 2 | min | 145.650 | 150.250 | 144.450 | 147.300 | 147.950 | 161.800 |
| | MAX | 158.000 | 165.800 | 156.350 | 157.450 | 171.350 | 177.700 |
| R 3 | min | 154.300 | 155.500 | 151.850 | 157.250 | 152.500 | 154.950 |
| | MAX | 169.400 | 171.200 | 167.600 | 181.300 | 169.300 | 174.700 |
| R 4 | min | 145.250 | 142.750 | 141.600 | 143.600 | 144.300 | 146.050 |
| | MAX | 158.250 | 158.850 | 155.200 | 156.200 | 168.350 | 167.100 |
| R 5 | min | 141.150 | 141.000 | 142.050 | 144.050 | 146.550 | 143.300 |
| | MAX | 180.450 | 178.750 | 181.250 | 182.650 | 182.500 | 177.850 |
| MAX LIMIT | | 400 | 400 | 400 | 400 | 400 | 400 |




| VOH 5 | | 00KRAD | 10KRAD | 20KRAD | 30KRAD | ANN24H | ANN168H |
|---|---|---|---|---|---|---|---|
| R 1 | min | 4.219 | 4.219 | 4.218 | 4.215 | 4.214 | 4.212 |
| | MAX | 4.231 | 4.229 | 4.229 | 4.229 | 4.226 | 4.224 |
| R 2 | min | 4.209 | 4.206 | 4.205 | 4.199 | 4.199 | 4.197 |
| | MAX | 4.223 | 4.222 | 4.219 | 4.216 | 4.217 | 4.212 |
| R 3 | min | 4.223 | 4.221 | 4.218 | 4.211 | 4.213 | 4.208 |
| | MAX | 4.231 | 4.229 | 4.226 | 4.221 | 4.223 | 4.217 |
| R 4 | min | 4.229 | 4.225 | 4.224 | 4.221 | 4.223 | 4.213 |
| | MAX | 4.243 | 4.235 | 4.238 | 4.234 | 4.236 | 4.226 |
| R 5 | min | 4.229 | 4.226 | 4.223 | 4.207 | 4.217 | 4.218 |
| | MAX | 4.239 | 4.237 | 4.234 | 4.229 | 4.226 | 4.225 |
| MIN LIMIT | | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |