ESA-QCA0008T-C

Envisat-1	TOTAL DOSE RADIATION TEST REPORT No. PO-TR-TLG-PL-2021	Issue: 1 Rev.: Date: 24/10/95 Date: Page: 1/14

SCC Component No.: M38510/13501SGA		Component Designation: OP07AJ	Irradiation Spec. No.: PO-PL-TLG-PL-0500 Iss.2
Gen. Spec.: MIL-I-38535 B Det. Spec.: MIL-M-38510/135 B Amend.:		Evaluation: - Acceptance Difussion: - Acceptance Lot: X	Project/Programme: ENVISAT-1
Family: 08	Group: 09	Functional Assignment: ULTRALOW OFFSET VOLT OP AMP	Package: TO-99
Manuf.Name: ANALOG DEVICES Address: U.S.A.		Test House: TECNOLOGICA Address: MADRID (SPAIN)	Orig.house: TECNOLOGICA Address: SEVILLA (SPAIN)
Radiation Test Plan No.: PO-PL-TLG-PL-2021		Sample Size: 5 Irradiation Devices: 4 Control Devices: 1	Date Code: 9416 Diffusion LOT: 2F17706.1 Wafer No.: —
Radiation Source: Cobalt-60 Facility Name: CIEMAT Address: MADRID (SPAIN)		Energy: 1.33/1.17 MeV Dose Rate: 18,392 Rad(Si)/h	Date of Test: 09/95
Irradiation Conditions: Biased: X Unbiased: - Test Circuit: Figure 1		Irradiation Measurements Interval: Remote test: - In situ Test: X	Annealing Tests: 24h / 25°C Ageing: 168h / 25°C Biased: X Unbiased: - Test Circuit: Figure 1

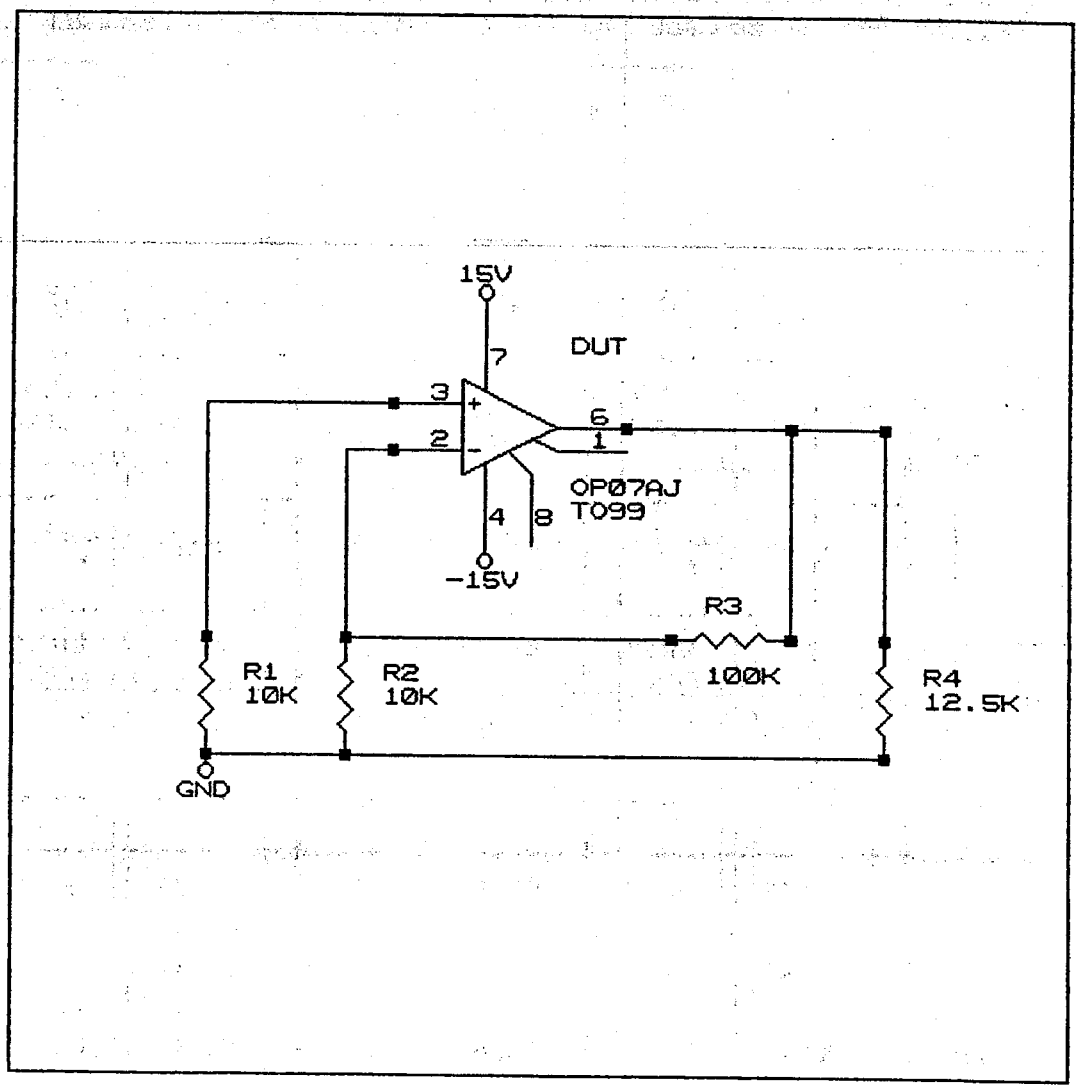
Electrical Measurements. Parameters Tested:

V_{IO} , I_{IO} , I_{IB+} , I_{IB-} , I_{CC} , A_{VS} , CMRR , PSRR+ , PSRR- .

NCR REF. PO_NC_TLG-EE-0060 APPLIES.

Irradiat. Respons.: J.M VALVERDE Date: 24/10/95 Signature:	Electr. Test Resp.: J.A. VAQUERO Date: 26/10/95 Signature:	Approved by QA: S. MAYORDOMO Date: 09/11/95 Signature:

FIGURE 1.-TEST CIRCUIT



SUMMARY

Total dose steady-state irradiation test has been carried out on ULTRALOW OFFSET VOLT. OP AMP from ANALOG DEVICES with date code 9416. The irradiated parts were labelled as follows: R2= S/N 1031, R3 = S/N 1032, R4= S/N 1033, R5= S/N 1034 irradiation devices and R1 = S/N 1030 control device.

RESULTS

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

	0 KRAD	5 KRAD	10 KRAD	20 KRAD	30 KRAD	ANN 24	ANN 168
V_{IO}	PASS	PASS	PASS	PASS 3 FAIL 1	PASS 3 FAIL 1	PASS 3 FAIL 1	PASS
I_{IO}	PASS	PASS	PASS	PASS	PASS 3 FAIL 1	PASS 3 FAIL 1	PASS
I_{IB+}	PASS	PASS	PASS	PASS	PASS	PASS	PASS
I_{IB-}	PASS	PASS	PASS	PASS	PASS	PASS	PASS
I_{CC}	PASS	PASS	PASS	PASS	PASS	PASS	PASS
A_{VS}	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CMRR	PASS	PASS	PASS	PASS	PASS	PASS	PASS
PSRR+	PASS	PASS	PASS	PASS	PASS	PASS	PASS
PSRR-	PASS	PASS	PASS	PASS	PASS	PASS	PASS

CONCLUSION

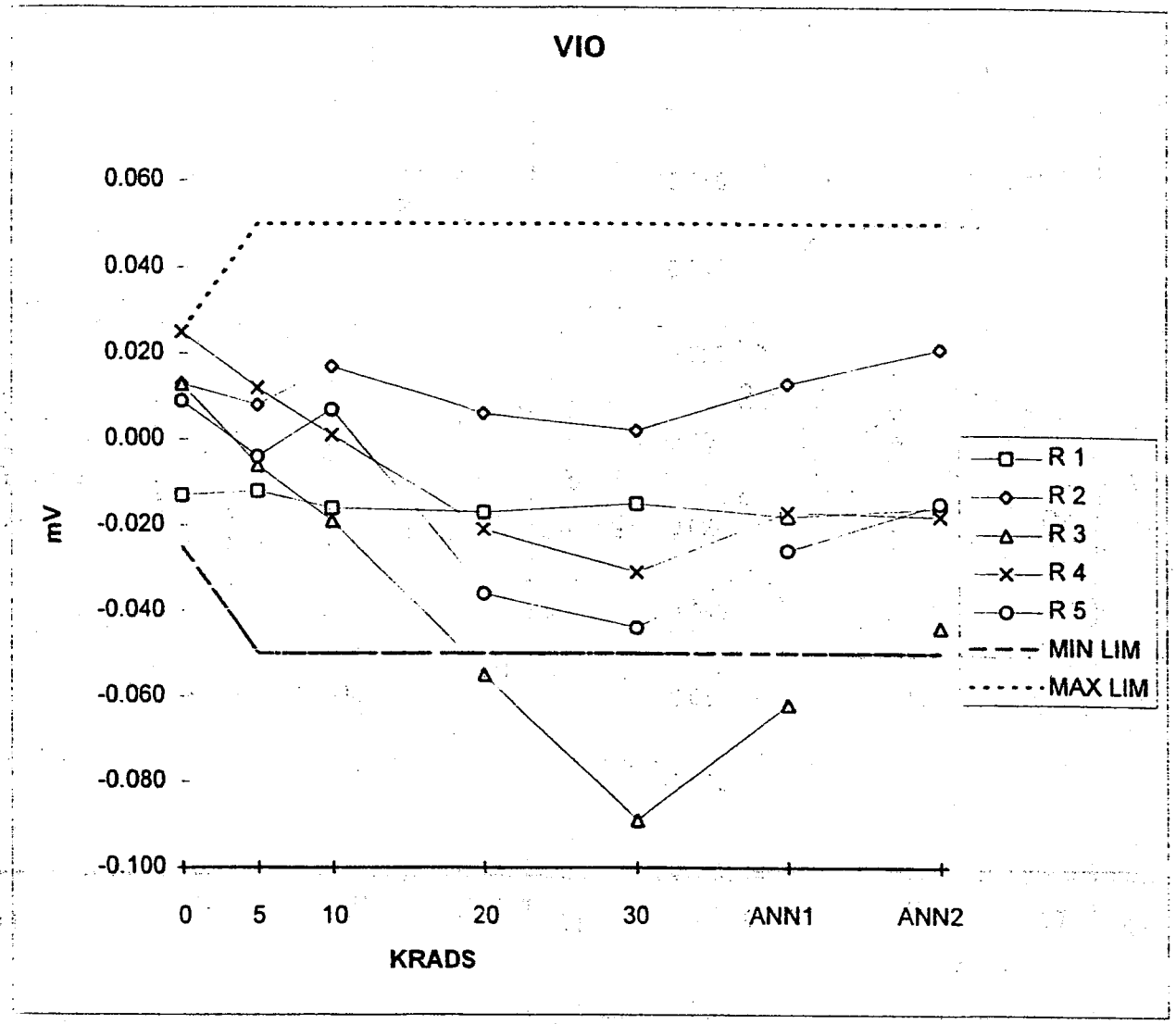
The results indicate that:

- All parameters remain under specs during irradiation test except V_{IO} and I_{IO}.
- V_{IO} is out limits from 20 Krad and only in the device R3, but recovers under limits after the annealing.
- I_{IO} is higher than limit from 20 Krad and only in the device 4, but recovers under limits after the annealing.

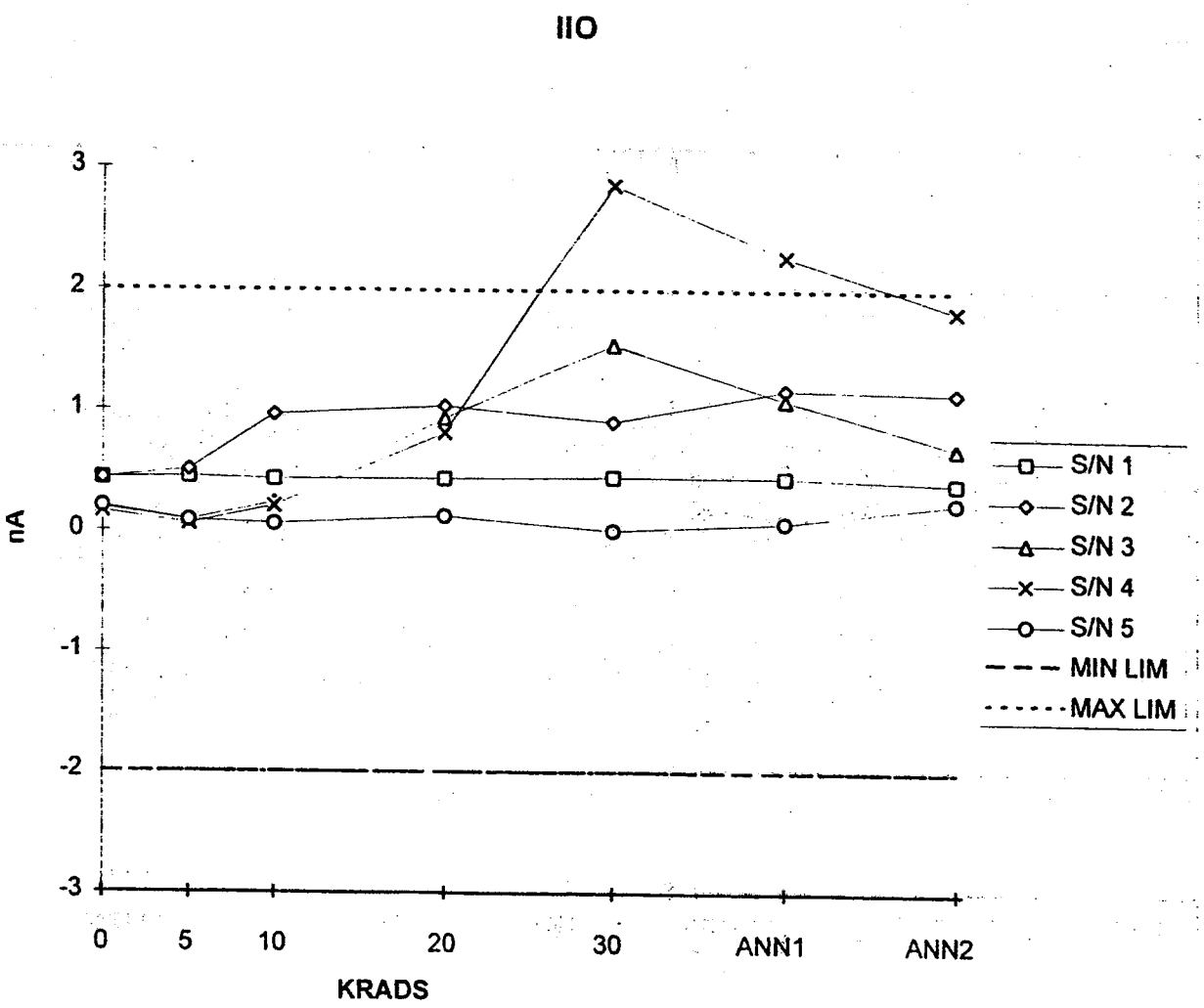
SCHEDULE

Test Step	Description	Result or Actual Test Condition	Time In	Time Out	Exposure
1	Sample serialization	CONTROL R1 IRR. DEVICES R2, R3, R4, R5.			
2	Initial Electrical Measurements	See 0 krad(Si) values in respective Parameter Data Tables Temperature: 23.0 °C (average) Humidity: 51	08:50	09:40	50 min.
3	Set-up of Test	Bias circuit verified according to Fig. 1			
4	Irradiation Exposure	Total Dose: 4,809 rad(Si) Cumulative Dose: 4,809 rad(Si) Dose Rate: 19,237 rad(Si)/h Temperature: 28.1 °C (average)	10:30 07/09	10:45 07/09	15 min.
5	Intermediate Electrical Measurements	See 05 krad(Si) values in respective Parameter Data Tables Temperature: 23.4 °C (average) Humidity: 51.7%	10:50 07/09	11:10 07/09	20 min.
6	Set-up of Test	Bias circuit verified according to Fig. 1			
7	Irradiation Exposure	Total Dose: 4,889 rad(Si) Cumulative Dose: 9,699 rad(Si) Dose Rate: 19,557 rad(Si)/h Temperature: 27.0 °C (average)	11:25 07/09	11:40 07/09	15 min.
8	Intermediate Electrical Measurements	See 10 krad(Si) values in respective Parameter Data Tables Temperature: 23.9 °C (average) Humidity: 43.6%	11:50 07/09	12:20 07/09	30 min.
9	Set-up of Test	Bias circuit verified according to Fig. 1			
10	Irradiation Exposure	Total Dose: 9,689 rad(Si) Cumulative Dose: 19,388 rad(Si) Dose Rate: 19,379 rad(Si)/h Temperature: 27.6°C (average)	12:30 07/09	13:00 07/09	30 min.

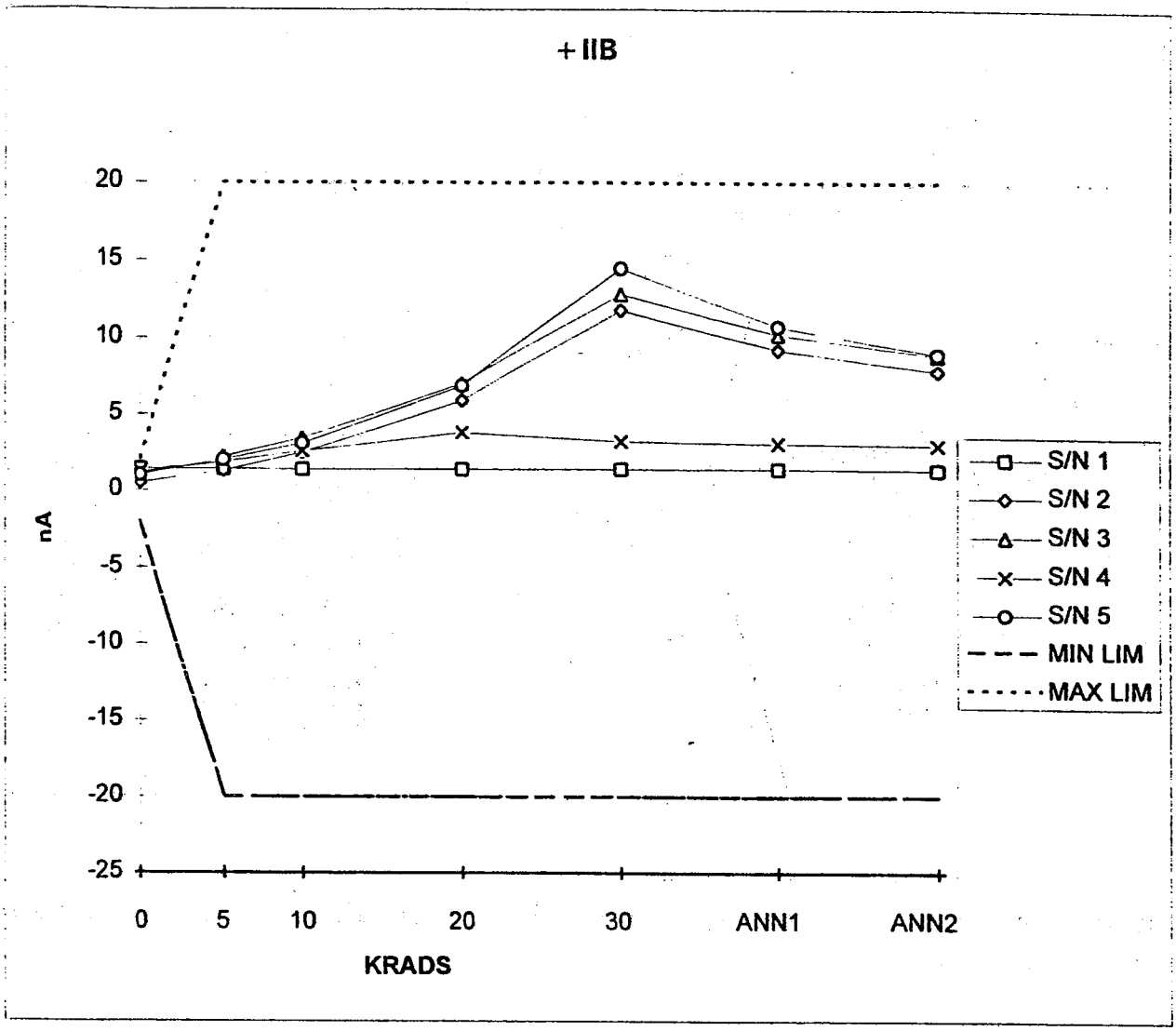
Test Step	Description	Result or Actual Test Condition	Time In	Time Out	Exposure
11	Intermediate Electrical Measurements	See 20 krad(Si) values in respective Parameter Data Tables Temperature: 24.4 °C (average) Humidity: 41.6%	13:10 07/09	13:30 07/09	20 min.
12	Set-up of Test	Bias circuit verified according to Fig. 1			
13	Irradiation Exposure	Total Dose: 9,631 rad(Si) Cumulative Dose: 29,019 rad(Si) Dose Rate: 19,261 rad(Si)/h Temperature: 28.1°C (average)	13:45 07/09	14:15 07/09	30 min.
14	Intermediate Electrical Measurements	See 30 krad(Si) values in respective Parameter Data Tables Temperature: 25.1 °C (average) Humidity: 37.0%	14:30 07/09	14:50 07/09	20 min.
15	Annealing	Bias circuit verified according to Fig. 1 Temperature: 25.5 °C (average)	15:00 07/09	15:00 08/09	24 h.
16	Electrical Measurements	See Ann. 24 h values in reapective parameter Data Tables Temperature: 25.6 °C Humidity: 35.6%	15:00 08/09	15:20 08/09	20 min.
17	Accelerated Ageing	Bias circuit verified according to Fig. 1 Temperature: 25.4 °C	15:20 08/09	15:20 08/09	168 h.
18	Final Electrical Measurements	See Age. 168 h values in respective parameter Data Tables Temperature: 25.9 °C Humidity: 23.4 %	15:30 15/09	15:50 15/09	20 min.



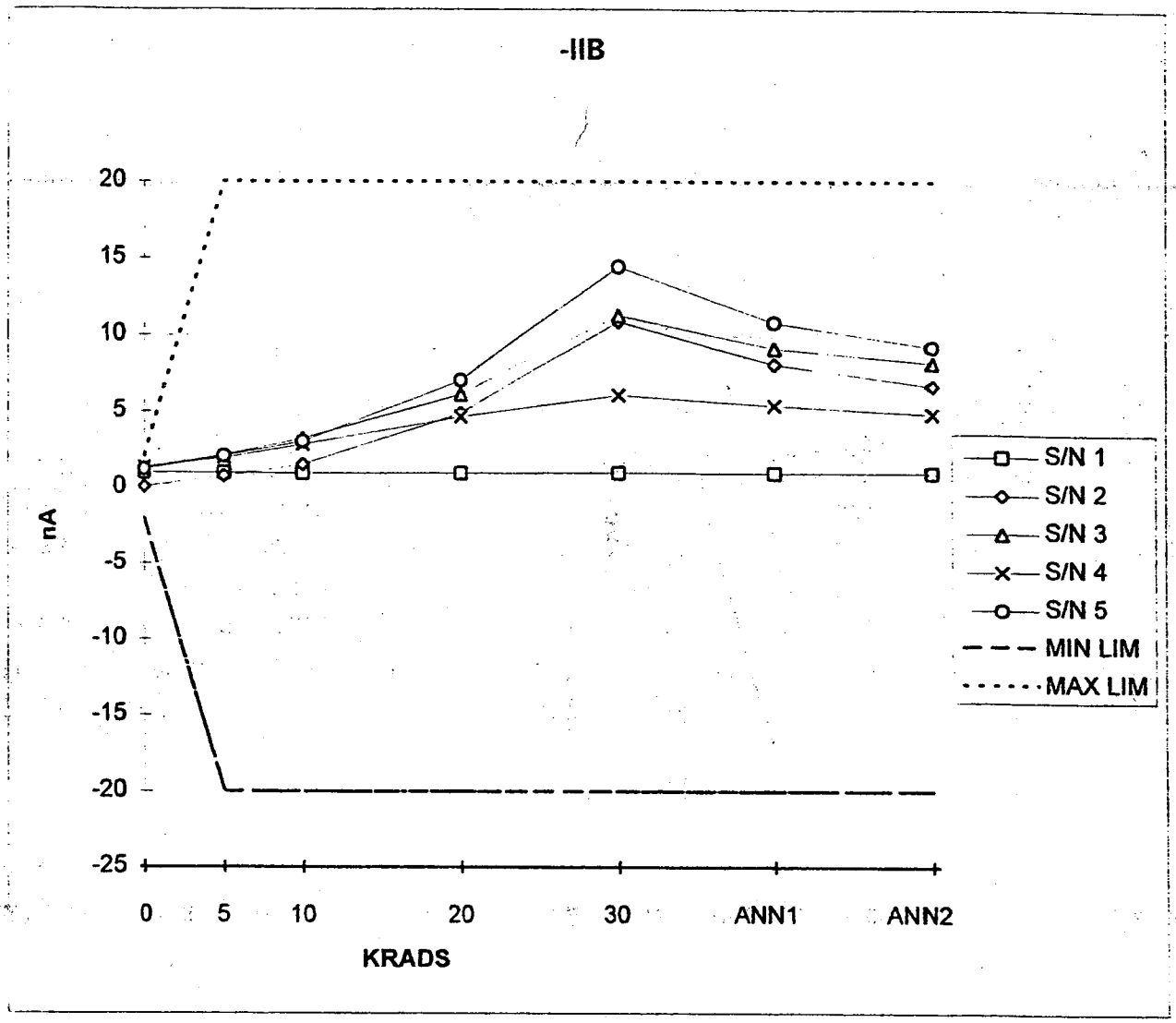
VIO	0	5	10	20	30	ANN1	ANN2
R 1	-0.013	-0.012	-0.016	-0.017	-0.015	-0.018	-0.016
R 2	0.013	0.008	0.017	0.006	0.002	0.013	0.021
R 3	0.013	-0.006	-0.019	-0.055	-0.089	-0.062	-0.044
R 4	0.025	0.012	0.001	-0.021	-0.031	-0.017	-0.018
R 5	0.009	-0.004	0.007	-0.036	-0.044	-0.026	-0.015
MAX LIM	0.025	0.050	0.050	0.050	0.050	0.050	0.050
MIN LIM	-0.025	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050



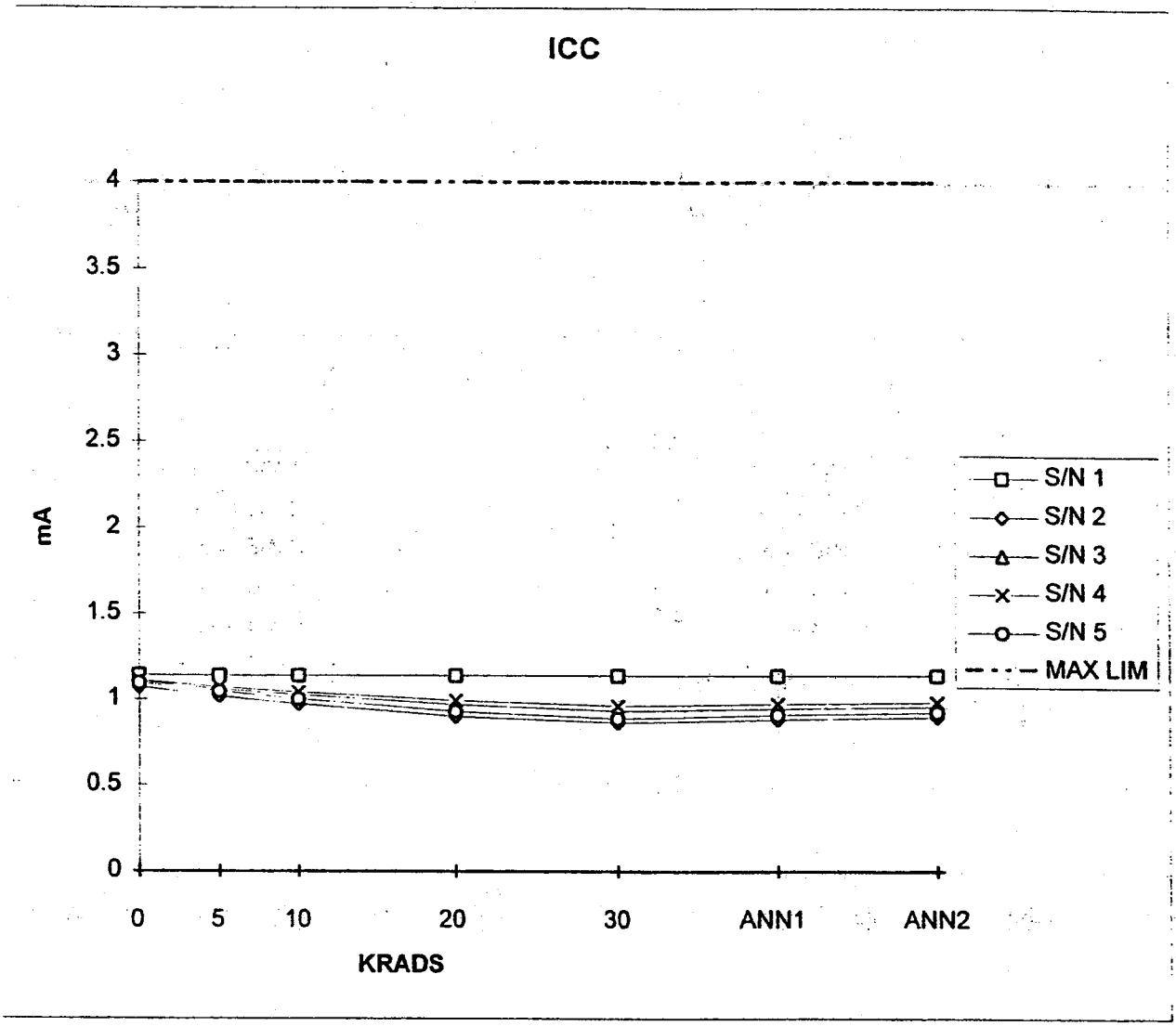
IIO	0	5	10	20	30	ANN1	ANN2
S/N 1	0.434	0.445	0.430	0.436	0.446	0.446	0.401
S/N 2	0.431	0.503	0.968	1.041	0.908	1.176	1.153
S/N 3	0.190	0.088	0.237	0.938	1.547	1.094	0.694
S/N 4	0.158	0.057	0.207	0.818	2.862	2.280	1.831
S/N 5	0.203	0.088	0.062	0.127	0.008	0.075	0.241
MAX LIM	2.000	2.000	2.000	2.000	2.000	2.000	2.000
MIN LIM	-2	-2	-2	-2	-2	-2	-2



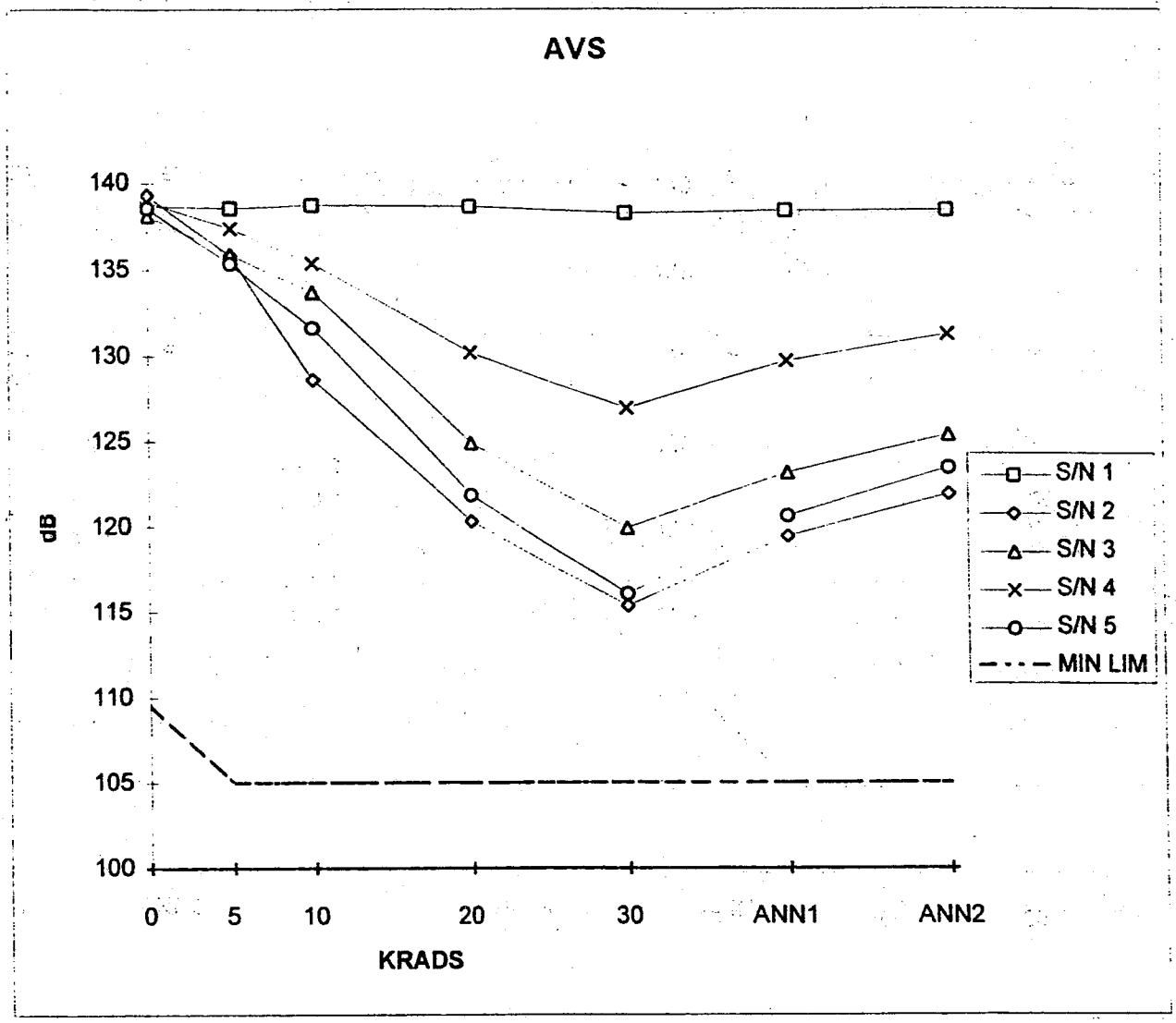
+IIB	0	5	10	20	30	ANN1	ANN2
S/N 1	1.428	1.420	1.399	1.408	1.414	1.424	1.357
S/N 2	0.496	1.289	2.521	5.907	11.780	9.237	7.835
S/N 3	1.087	2.231	3.472	7.039	12.829	10.235	8.873
S/N 4	1.168	1.872	2.619	3.815	3.239	3.101	2.990
S/N 5	1.011	2.035	3.119	6.882	14.478	10.752	8.937
MAX LIM	2	20	20	20	20	20	20
MIN LIM	-2	-20	-20	-20	-20	-20	-20



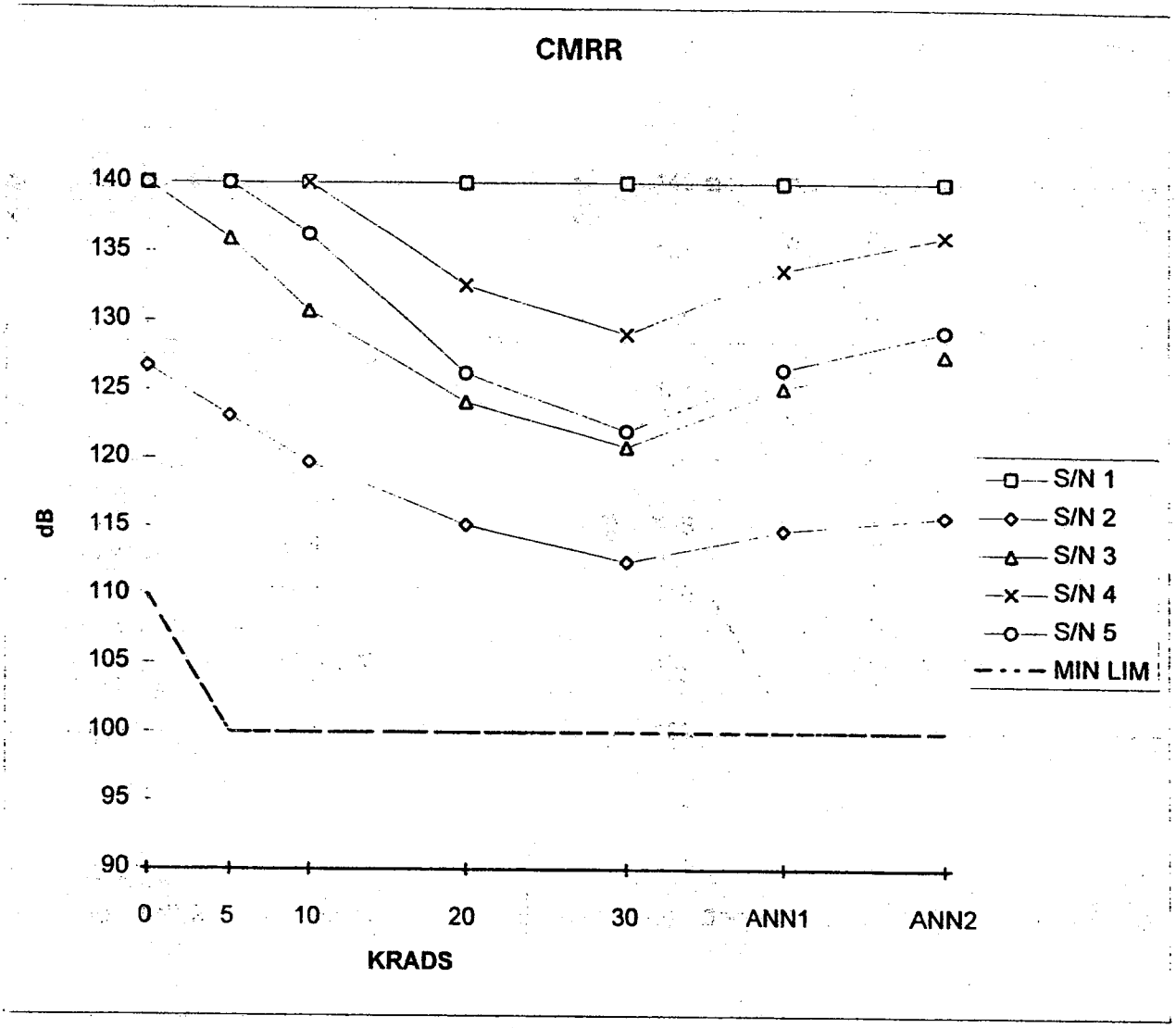
-IIB	0	5	10	20	30	ANN1	ANN2
S/N 1	0.99	0.970	0.954	0.965	0.979	0.964	0.956
S/N 2	0.060	0.773	1.531	4.889	10.870	8.066	6.677
S/N 3	1.273	2.126	3.232	6.129	11.275	9.117	8.172
S/N 4	1.329	1.945	2.835	4.649	6.073	5.394	4.831
S/N 5	1.213	2.087	3.044	7.034	14.472	10.809	9.193
MAX LIM	2	20	20	20	20	20	20
MIN LIM	-2	-20	-20	-20	-20	-20	-20



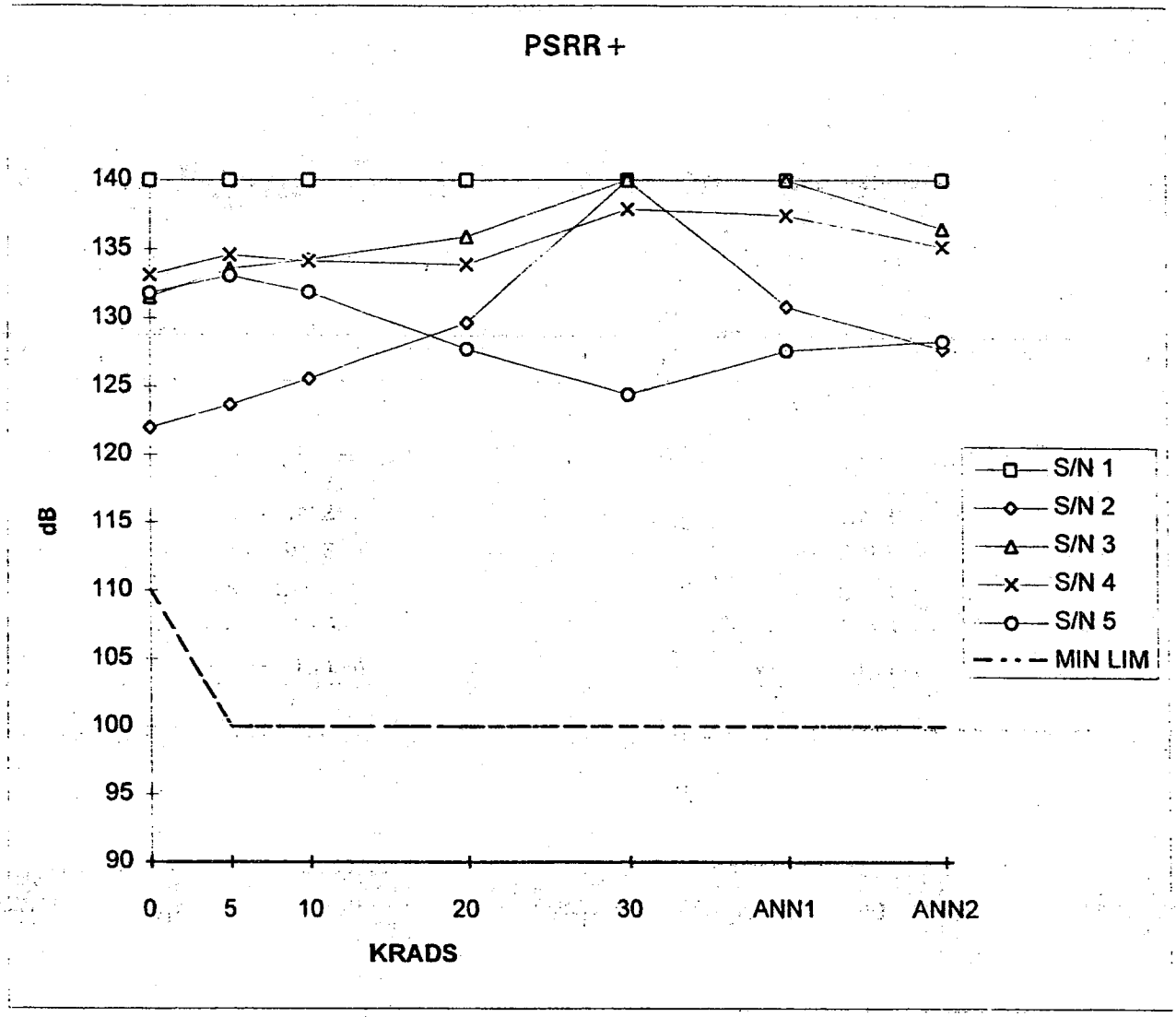
ICC	0	5	10	20	30	ANN1	ANN2
S/N 1	1.141	1.138	1.137	1.138	1.138	1.138	1.137
S/N 2	1.072	1.017	0.972	0.899	0.863	0.883	0.896
S/N 3	1.103	1.059	1.025	0.968	0.932	0.946	0.957
S/N 4	1.110	1.070	1.041	0.992	0.962	0.974	0.983
S/N 5	1.095	1.047	1.002	0.928	0.888	0.909	0.923
MAX LIM	4	4	4	4	4	4	4



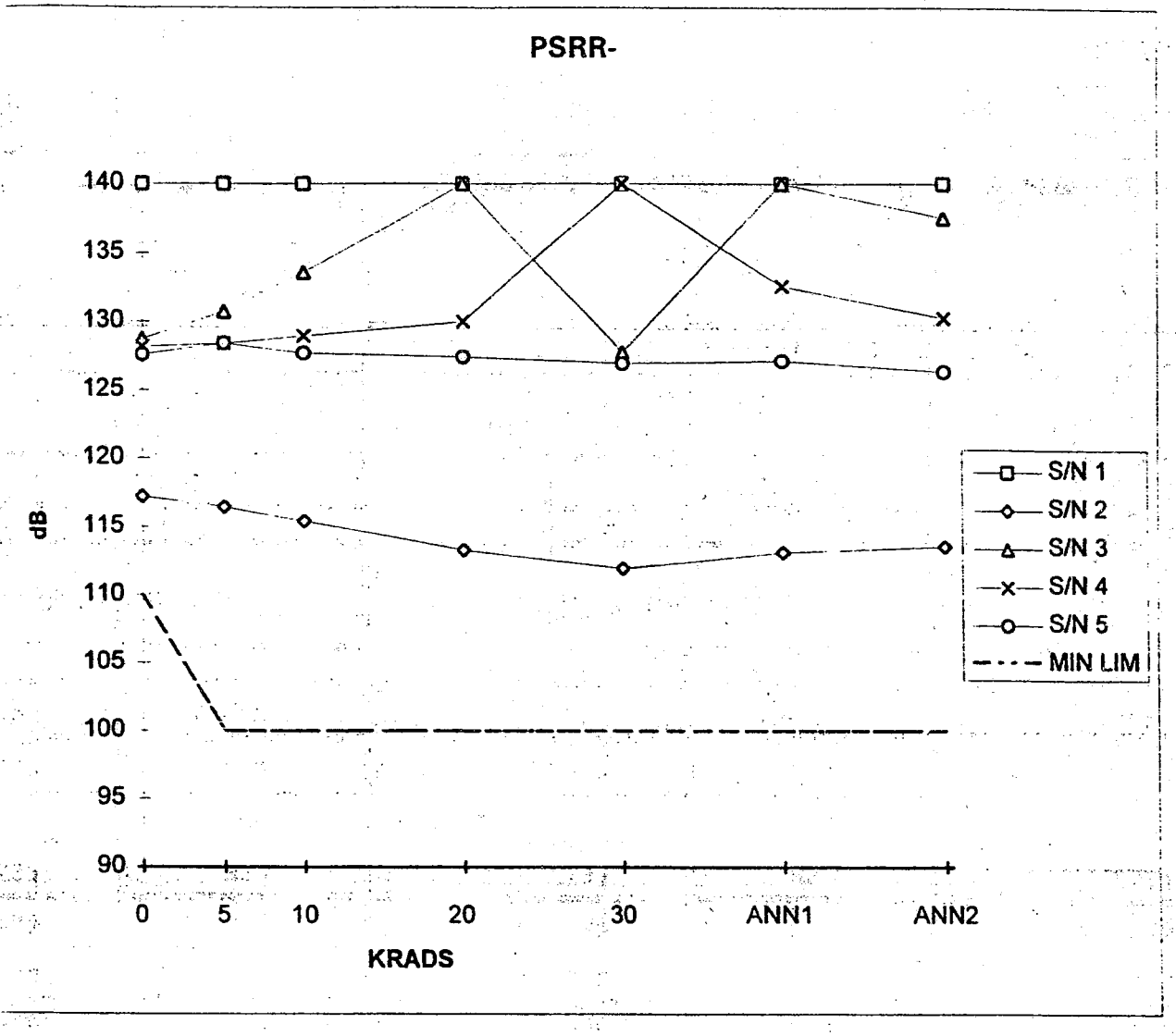
AVS	0	5	10	20	30	ANN1	ANN2
S/N 1	138.655	138.547	138.721	138.631	138.233	138.399	138.408
S/N 2	139.308	135.817	128.614	120.309	115.351	119.421	121.876
S/N 3	138.130	135.886	133.708	124.897	119.914	123.145	125.366
S/N 4	138.925	137.386	135.359	130.183	126.915	129.686	131.217
S/N 5	138.559	135.343	131.613	121.856	116.061	120.620	123.418
MIN LIM	109.5	105	105	105	105	105	105



CMRR	0	5	10	20	30	ANN1	ANN2
S/N 1	>140	>140	>140	>140	>140	>140	>140
S/N 2	126.735	123.117	119.717	115.163	112.450	114.771	115.789
S/N 3	>140	135.961	130.753	124.154	120.850	125.197	127.586
S/N 4	>140	>140	>140	132.603	129.068	133.713	136.127
S/N 5	>140	>140	136.261	126.258	122.010	126.555	129.280
MIN LIM	110	100	100	100	100	100	100



PSRR+	0	5	10	20	30	ANN1	ANN2
S/N 1	>140	>140	>140	>140	>140	>140	>140
S/N 2	121.984	123.648	125.546	129.651	>140	130.798	127.688
S/N 3	131.539	133.591	134.221	135.884	>140	>140	136.473
S/N 4	133.139	134.586	134.102	133.864	137.871	137.427	135.125
S/N 5	131.822	133.094	131.876	127.729	124.367	127.584	128.263
MIN LIM	110	100	100	100	100	100	100



PSRR-	0	5	10	20	30	ANN1	ANN2
S/N 1	>140	>140	>140	>140	>140	>140	>140
S/N 2	117.222	116.451	115.408	113.291	111.938	113.12	113.539
S/N 3	128.718	130.749	133.585	>140	127.743	>140	137.533
S/N 4	128.168	128.393	128.957	130.011	>140	132.565	130.234
S/N 5	127.591	128.426	127.714	127.428	126.951	127.115	126.349
MIN LIM	110	100	100	100	100	100	100

DOSIMETRIA

TASA DE DOSIS		
rad(Si)/h	rad(Si)/min.	R/min
20,000	333.3	385.36
Corrección por posicionamiento	5%	366.09
corrección por temperatura	27°	359.99

TIEMPO DE IRRADIACION	30 min.

	Rad(F)	Rad(F)/h	R/h	Rad(Si)/h
0.310	8,542	8,807	7,618	254
0.360	9,920	10,227	8,846	295
0.396	10,912	11,250	9,731	324
0.381	10,499	10,824	9,362	312
0.360	9,920	10,227	8,846	295
0.319	8,790	9,062	7,839	261

TASA DE DOSIS MEDIA	
Rad(Si)/h	Rad(Si)/h
306.5	18,390

Tecnologica

RADIATION TRAVELLER SHEET

Envisat-1

L.I.N: 8GOP07AXX300 **P.O.: PT000-053-02** **R.L.**

LOT DATA

Part Type.:	OP07AJ	**Qty.:**	
Comp. Num.:	M38510/13501SGA	**D.C.:**	9416
G. Spec.:	MIL-I-38535 B	**Date arrived.:**	
D. Spec.:	MIL-M-38510/135 B	**Date radiation.:**	
Amend.:		**Sesión.:**	
MFR.:	AND U	**Acepatance lot.:**	X
S/N'S Rad.:		**Evaluation.:**	

RADIACION (UNICA O COMPARTIDA): UNICA [ ] COMPARTIDA [X]

SI COMPARTIDA, Nº LOTES 4 **Gº DE OCUPACION POR SESION** 8~~4~~5 %

PASOS	FECHA	RESPO.	TIEMPO	IMPORTE
PREPARACION DEL PLAN Referencia.: PO-PL-TLG-PL-2021	27/09/94	TII 39	2h	
PREPACION PROGRAMA DE TEST				
PREPARACION PLACA DE POLARIZACION	16/05/95	TII 48	0 h	
COSTE MATERIAL	16/05/95	TII 48		0
PREPARACION DE MISION		TII 49	0'5 h	
MISIONES:		TII 49	16 h	11.404
Referencias: %				
1.- 118/95 14'3	6/09/95			
2.- 124/95 14'3	15/05/95	TII 49	8 h	6.166
3.-				
FACTURA CIEMAT %				
Referencia.: 0981/641/95 14'3	29/05/95	TII 49	-	22.882
PREPACION INFORME: Referencia.: PO-TR-TLG-PL-2021	26/10/95	TII 49	8h	
COSTE TOTAL				

COMENTARIOS:

VISTO BUENO:

Firma:

Fecha: