ESA-QCA9965T-C

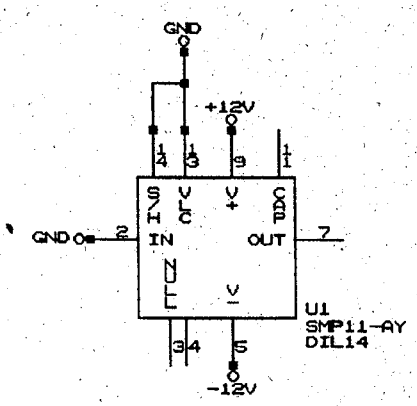
Tecnologica	TOTAL DOSE RADIATION TEST REPORT No. HUY-RR-TL-017	Issue: 1 Rev.: Date: 28/11/94 Page: 1/19

SCC Component No.: HUYTL03401B	Component Designation: SMP11 AY	Irradiation Spec. No.: ESA/SCC 22900 Iss. 3
Gen. Spec.: SCC 9000 8 Det. Spec.: HUY-SP-TL-034 2 Amend.:	Evaluation: - Acceptance Difussion: - Acceptance Lot: X	Project/Programme: HUYGENS
Family: 08 / Group: 09	Functional Assignment: PRECISION S&H AMPLIFIER	Package: DIL 14
Manuf.Name: Analog Devices Address: SANTA CLARA (USA)	Irradiation Facility: CIEMAT Address: MADRID (SPAIN)	Test House: TECNOLOGICA Address: MADRID (SPAIN)
Radiation Test Plan No.: HUY-IP-TL-017	Sample Size: 5 Irradiation Devices: 4 Control Devices: 1	Date Code: 9411A Diffusion LOT: F10112.1 Wafer Nº: 6
Radiation Source: Cobalt-60	Energy: 1,33/1,17 MeV Average Dose Rate: 10,263 Krad/h	Date of Test: 11/94

Electrical Measurements. Parameters Tested:
Input Bias Current (I_{IB1}, I_{IB2}, I_{IB3}), Voltage Gain (A_{V1}, A_{V2}), Power Supply Rejection Ratio (PSRR), Output Voltage Swing (V_{OS+}, V_{OS-}), Leakage Current (I_{DR+}, I_{DR-}), Logic Control Input Current (I_{LC}), Logic Input Current ($I_{S/H1}$, $I_{S/H2}$), Power Supply Current (I_{CC}), Acquisition Time (T_{aq1}) and Slew Rate (SR+, SR-).

Irradiation Conditions: Biased: Y Test Circuit: Figure 1	Irradiation Measurements Interval: Biased: N Test Circuit: N/A	Annealing Tests: YES Biased: Y Time: 90h / 96h Temp.: 25ºC / 25ºC Test Circuit: Figure 1

Figure 1:



Irradiat. Respons.: J.A. VAQUERO Date: 28/11/94 Signature:	Electr. Test Resp.: J.M. VALVERDE Date: 30/11/94 Signature:	Approved by QA: J. ALARCON Date: 30/11/94 Signature:

SUMMARY

Total dose steady-state irradiation test has been carried out on PRECISION S&H AMPLIFIER SMP11AY from Analog Devices date code 9411, Diffusion Lot F10112.1 and wafer Nº 6. The irradiated parts were labelled as follows: R2= S/N 27, R3= S/N 30, R4= S/N 31, R5= S/N 32, irradiation devices and R1= S/N 54 control device.

DEVIATIONS TO THE PLAN

Irradiation test has been performed at 5, 10, 15, 20 and 30 Krads. in order to better characterize the lot

First annealing measurements has been done at 90h after irradiation.

Differential Logic Threshold and Acquisition Time 2 measurements have not been performed due to tester capability.

Both Slew Rate (SR+, SR-) have been measured.

RESULTS

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

	00 KRAD	5 KRAD	10 KRAD	15 KRAD	20 KRAD	30 KRAD	ANN1	ANN2
IIB1	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
IIB2	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
IIB3	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
AV1	PASS	PASS	PASS	FAIL	FAIL	FAIL	PASS 1 FAIL 3	PASS 3 FAIL 1
AV2	PASS	PASS	PASS	FAIL	FAIL	FAIL	PASS 1 FAIL 3	PASS 3 FAIL 1
PSRR	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
VOS+	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
VOS-	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
IDR+	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
IDR-	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL

	00 KRAD	5 KRAD	10 KRAD	15 KRAD	20 KRAD	30 KRAD	ANN1	ANN2
ILC	PASS	PASS	PASS	FAIL	FAIL	FAIL	FAIL	FAIL
IS/H1	PASS	PASS	PASS	PASS	PASS	FAIL	PASS	PASS
IS/H2	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
ICC	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Taq1	PASS	PASS	PASS	FAIL	FAIL	FAIL	PASS 2 FAIL 2	PASS 3 FAIL 1
SR+	PASS	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL
SR-	PASS	PASS	PASS	FAIL	FAIL	FAIL	PASS 2 FAIL 2	PASS

CONCLUSION

The results indicates that:

- Input bias current measurements fail at 5 Krads in all devices and recover slightly during annealing.

- Open loop gain measurements fail at 15 Krads in all op amp and recover during annealing.

- Leakage current plus fails at 10 Krads and leakage current minus fail at 15 Krads. Both recover during annealing.

- Logic control input current fails at 15 Krads and recover during annealing.

- Logic input current 1 (sample mode) fails at 30 Krads and recover under spec during annealing.

- Acquisition time 1 pass at 10 Krads but the values change abruptly and fail at 15 Krads. 3 devices recover under spec after annealing.

- Slew rate + fails at 5 Krads and recover slightly during annealing. Slew rate - fails at 15 Krads and recover under spec after annealing.

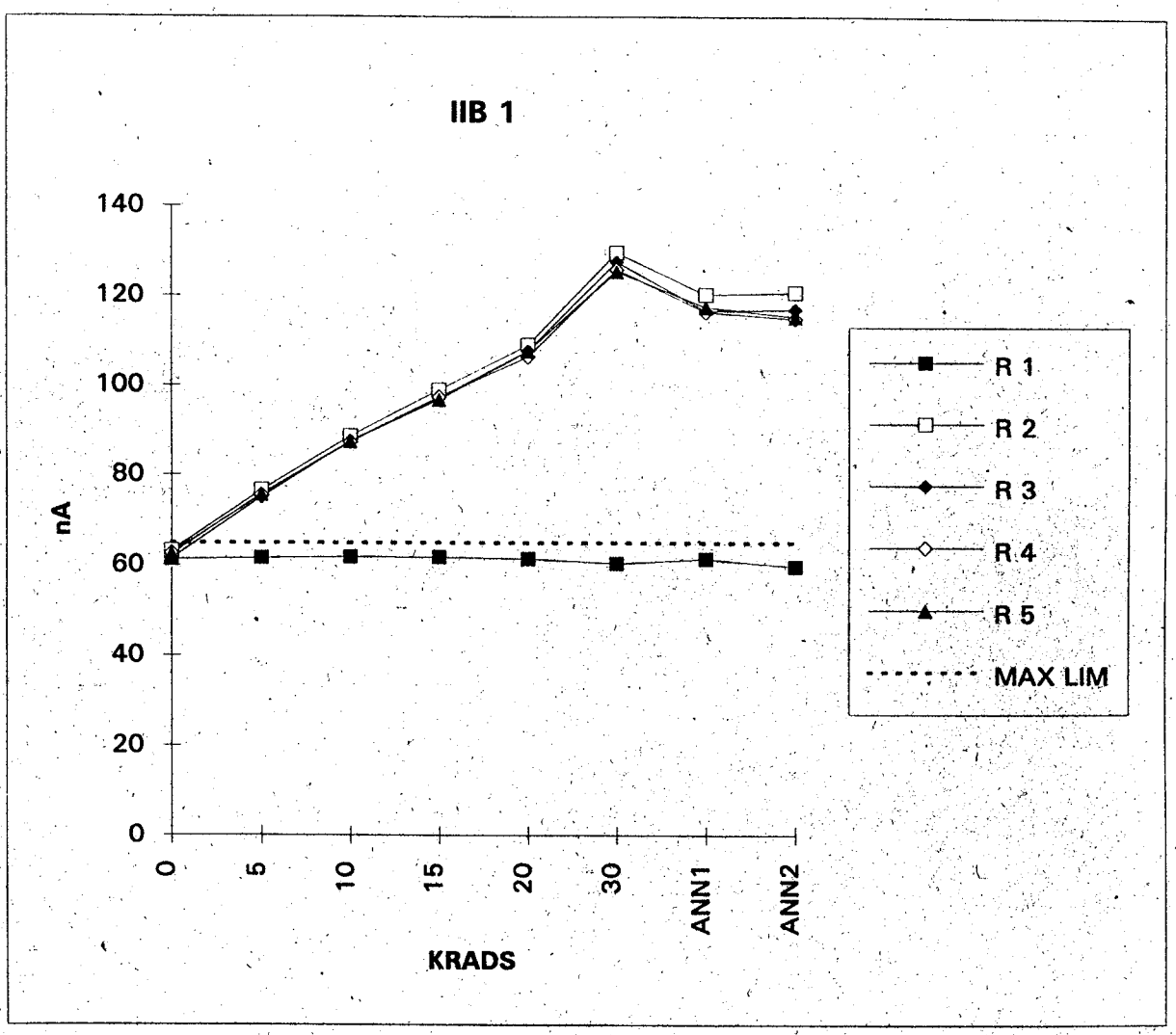
- All other measurements remains under spec during all the irradiation test.

SCHEDULE

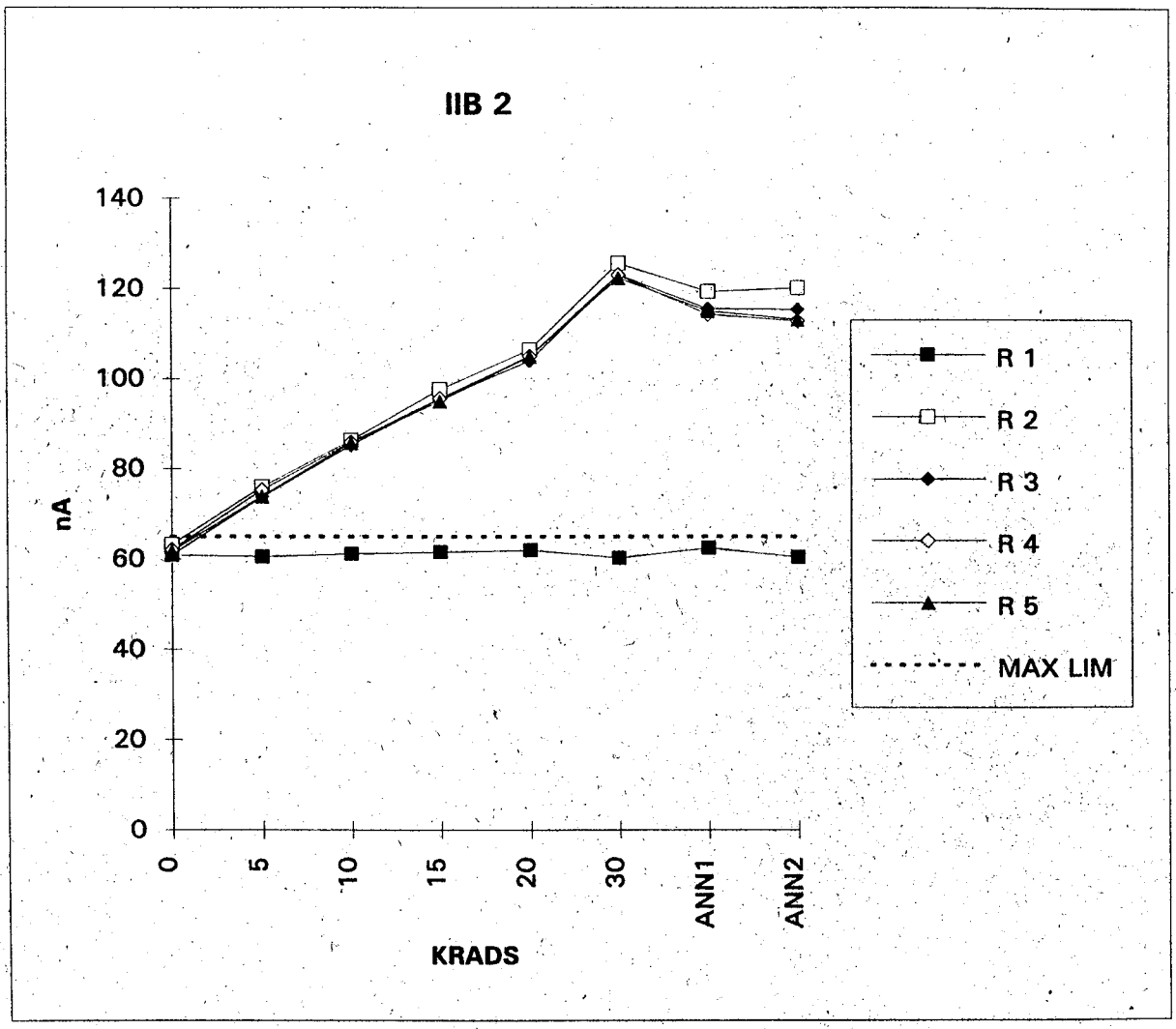
Test Step	Description	Result or Actual Test Condition	Time in	Time Out	Exposure
1	Sample serialization	CONTROL R1. IRR. DEVICES R2,R3,R4,R5.			
2	Initial Electrical Measurements	See 0 krad(Si) values in respective Parameter Data Tables Temperature: 20,1°C Humidity: 40,2%	08:45 17/11	09:20 17/11	35 min.
3	Set-up of Test	Bias circuit verified according to Fig. 1			
4	Irradiation Exposure	Dose: 5,145 Krad(Si) Cumulative Dose: 5,145 Krad(Si) Dose Rate: 10,29 Krad(Si)/h Temperature: 23,7 °C	09:35	10:05	30 min.
5	Intermediate Electrical Measurements	See 5 Krad(Si) values in respective Parameter Data Tables Temperature: 21,7°C Humidity: 36,8%	10:10	10:31	21 min.
6	Set-up of Test	Bias circuit verified according to Fig. 1			
7	Irradiation Exposure	Dose: 5,14 Krad(Si) Cumulative Dose: 10,285 Krad(Si) Dose Rate: 10,28 Krad(Si)/h Temperature: 23,5°C	10:40	11:10	30 min.
8	Intermediate Electrical Measurements	See 10 krad(Si) values in respective Parameter Data Tables Temperature: 21,9°C Humidity: 37,5%	11:15	11:40	25 min.
9	Set-up of Test	Bias circuit verified according to Fig. 1			
10	Irradiation Exposure	Dose: 5,105 Krad(Si) Cumulative Dose: 15,39 krad(Si) Dose Rate: 10,21 Rad(Si)/h Temperature: 23,6°C	11:45	12:15	30 min.

Test Step	Description	Result or Actual Test Condition	Time in	Time Out	Exposure
11	Intermediate Electrical Measurements	See 15 Krad(Si) values in respective Parameter Data Tables Temperature: 22,5°C Humidity: 35,5%	12:20	12:35	15 min.
12	Set-up of Test	Bias circuit verified according to Fig. 1			
13	Irradiation Exposure	Dose: 5,105 Krad(Si) Cumulative Dose: 20,495 Krad(Si) Dose Rate: 10,21 Rad(Si)/h Temperature: 23,7°C	12:45	13:15	30 min.
14	Intermediate Electrical Measurements	See 20 Krad(Si) values in respective Parameter Data Tables Temperature: 22,5°C Humidity: 35,8%	13:20	13:40	20 min.
15	Set-up of Test	Bias circuit verified according to Fig. 1			
16	Irradiation Exposure	Dose: 10,24 Krad(Si) Cumulative Dose: 30,735 Krad(Si) Dose Rate: 10,24 Rad(Si)/h Temperature: 23,7°C	13:46	14:46	60 min.
17	Intermediate Electrical Measurements	See 30 Krad(Si) values in respective Parameter Data Tables Temperature: 22,1°C Humidity: 40.6%	14:55	15:50	55 min.
18	Annealing	Bias circuit verified according to Fig. 1. Temperature: 19,5°C (average)	16:00 17/11	08:30 21/11	89:30 h.
19	Electrical Measurements	See Ann1 values in respective Parameter Data Tables Temperature: 16,6 °C Humidity: 43.1%	08:30	09:20	50 min.
20	Annealing	Bias circuit verified according to Fig. 1. Temperature: 18°C (average)	09:20 21/11	09:20 25/11	96 h.

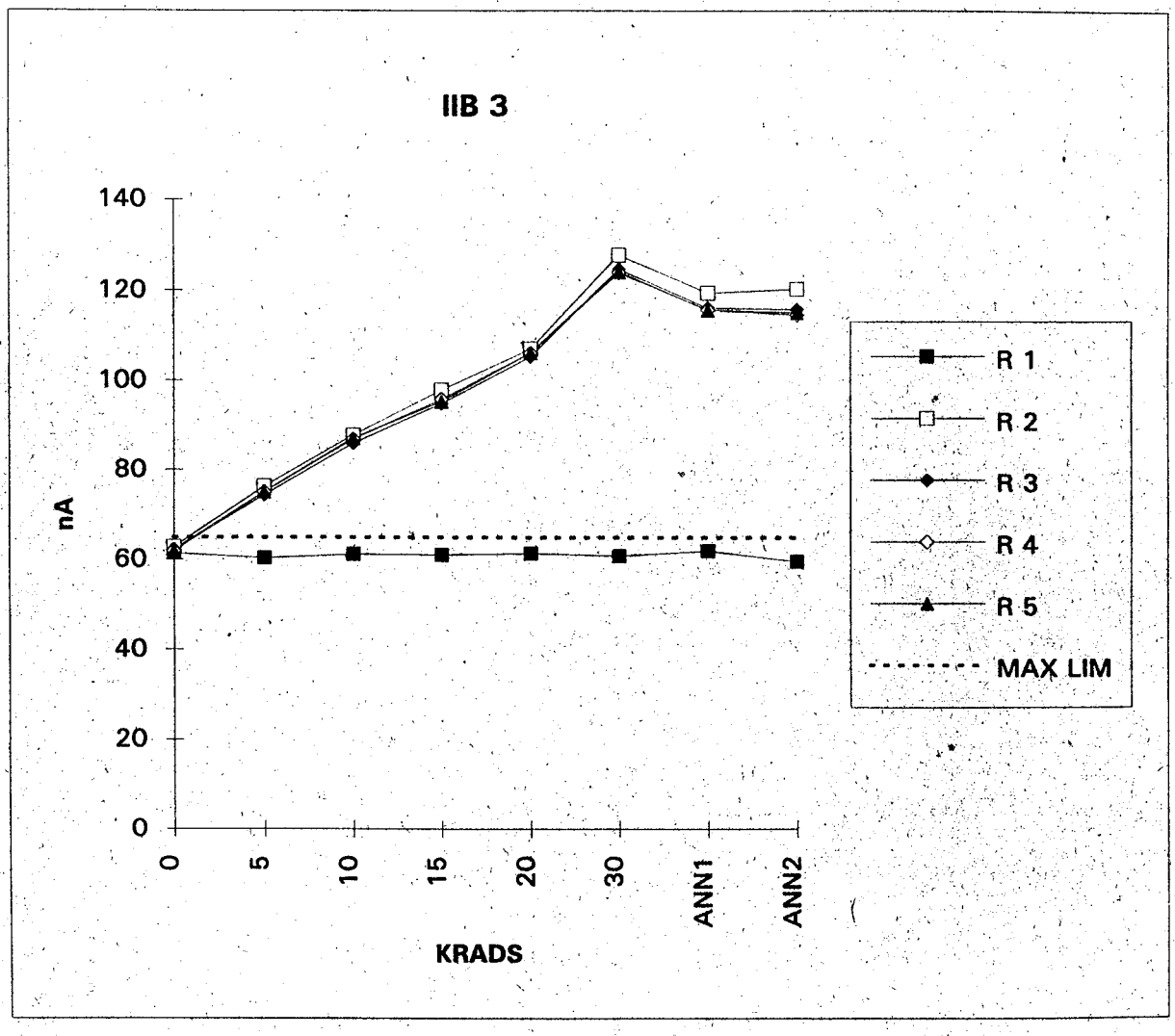
Test Step	Description	Result or Actual Test Condition	Time in	Time Out	Exposure
21	Electrical Measurements	See Ann2 values in respective Parameter Data Tables Temperature: 20°C Humidity: 40,6%	09:30	10:30	60 min.



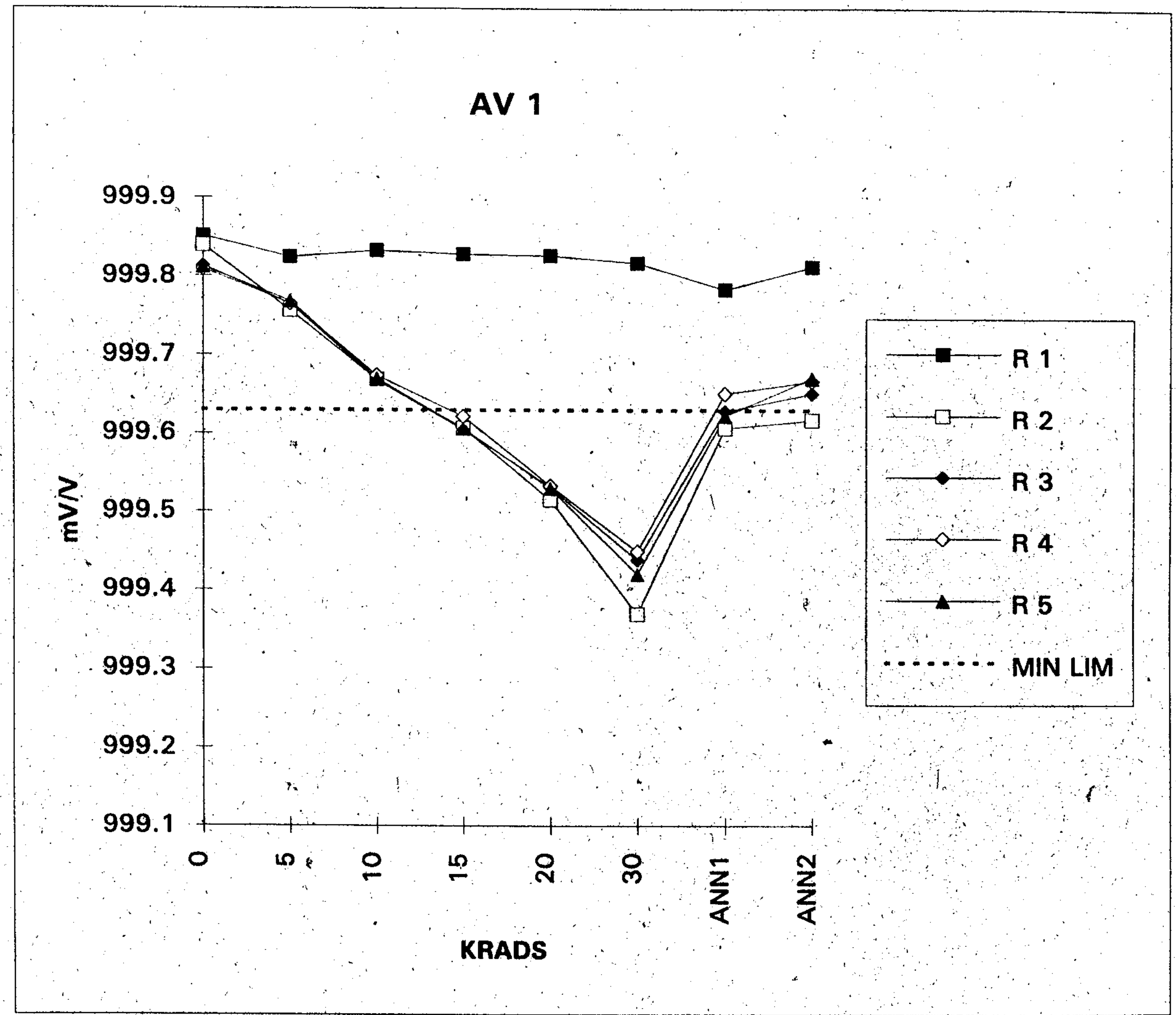
IIB 1	0	5	10	15	20	30	ANN1	ANN2
R 1	61.26	61.65	61.83	61.77	61.41	60.4	61.45	59.74
R 2	63.19	76.54	88.59	98.94	109.03	129.64	120.3	120.69
R 3	61.46	75.07	87.54	97.13	107.69	127.55	116.68	116.92
R 4	62.65	75.52	87.31	97.37	106.41	125.87	116.45	114.93
R 5	62.55	75.69	87.45	96.76	107.62	125.44	117.5	115.33
MAX LIM	65	65	65	65	65	65	65	65



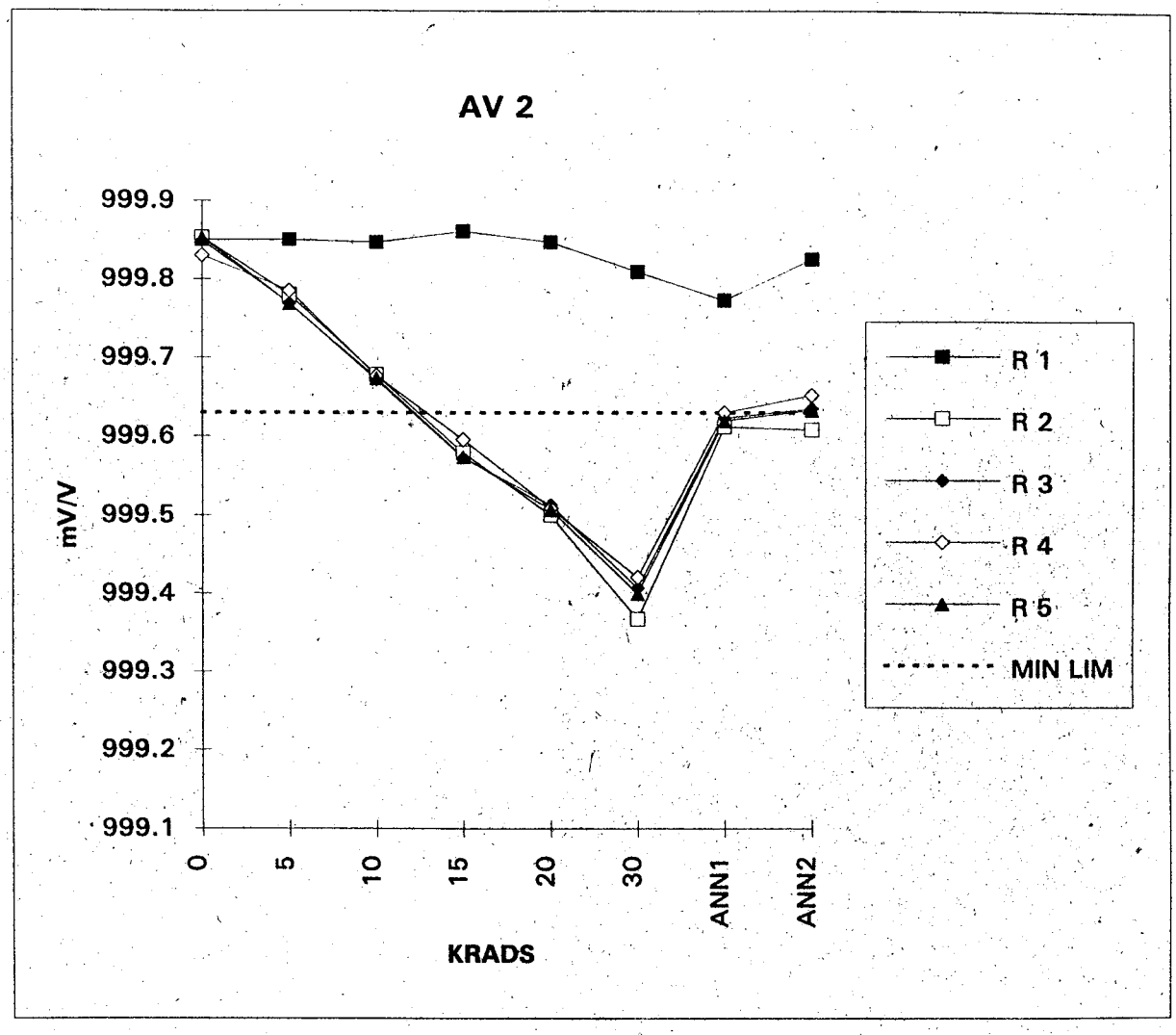
IIB 2	0	5	10	15	20	30	ANN1	ANN2
R 1	60.87	60.56	61.16	61.59	62	60.27	62.44	60.38
R 2	63.19	76.02	86.27	97.55	106.42	125.64	119.32	120.16
R 3	60.89	73.79	85.21	95.46	103.91	123.11	115.52	115.43
R 4	62.07	75.34	85.9	95.58	104.94	123.07	114.31	112.79
R 5	61.78	73.87	85.71	94.98	104.91	122.42	115.08	113.14
MAX LIM	65	65	65	65	65	65	65	65



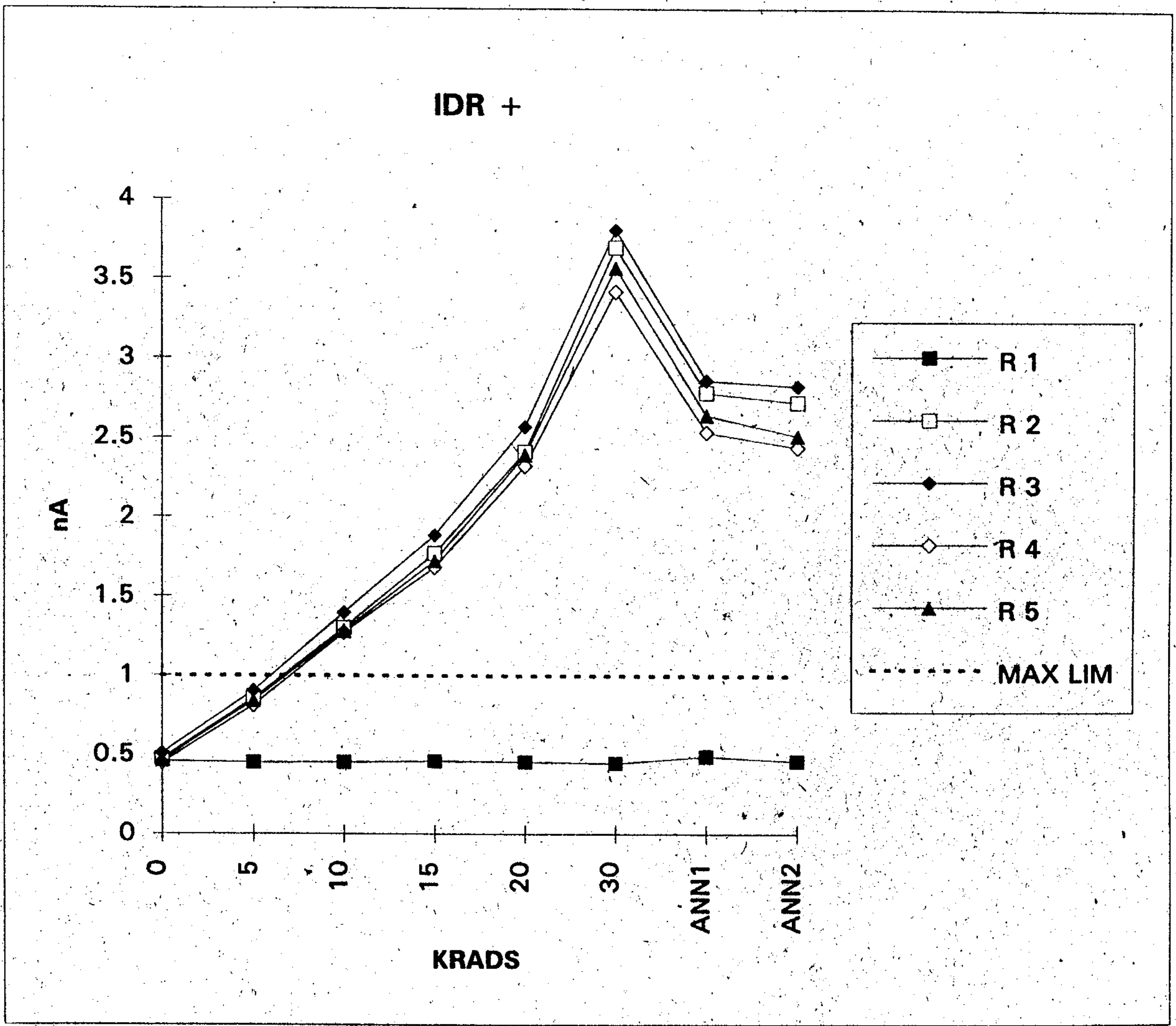
IIB 3	0	5	10	15	20	30	ANN1	ANN2
R 1	61.39	60.36	61.21	61.05	61.38	60.87	61.92	59.63
R 2	62.73	76.36	87.79	97.79	106.94	127.83	119.36	120.23
R 3	62.21	74.44	85.94	94.78	105.21	124.68	116	115.67
R 4	61.87	75.08	86.84	95.73	106.04	123.89	115.61	114.49
R 5	62	75.13	87.05	95.26	106.1	124.12	115.54	114.93
MAX LIM	65	65	65	65	65	65	65	65



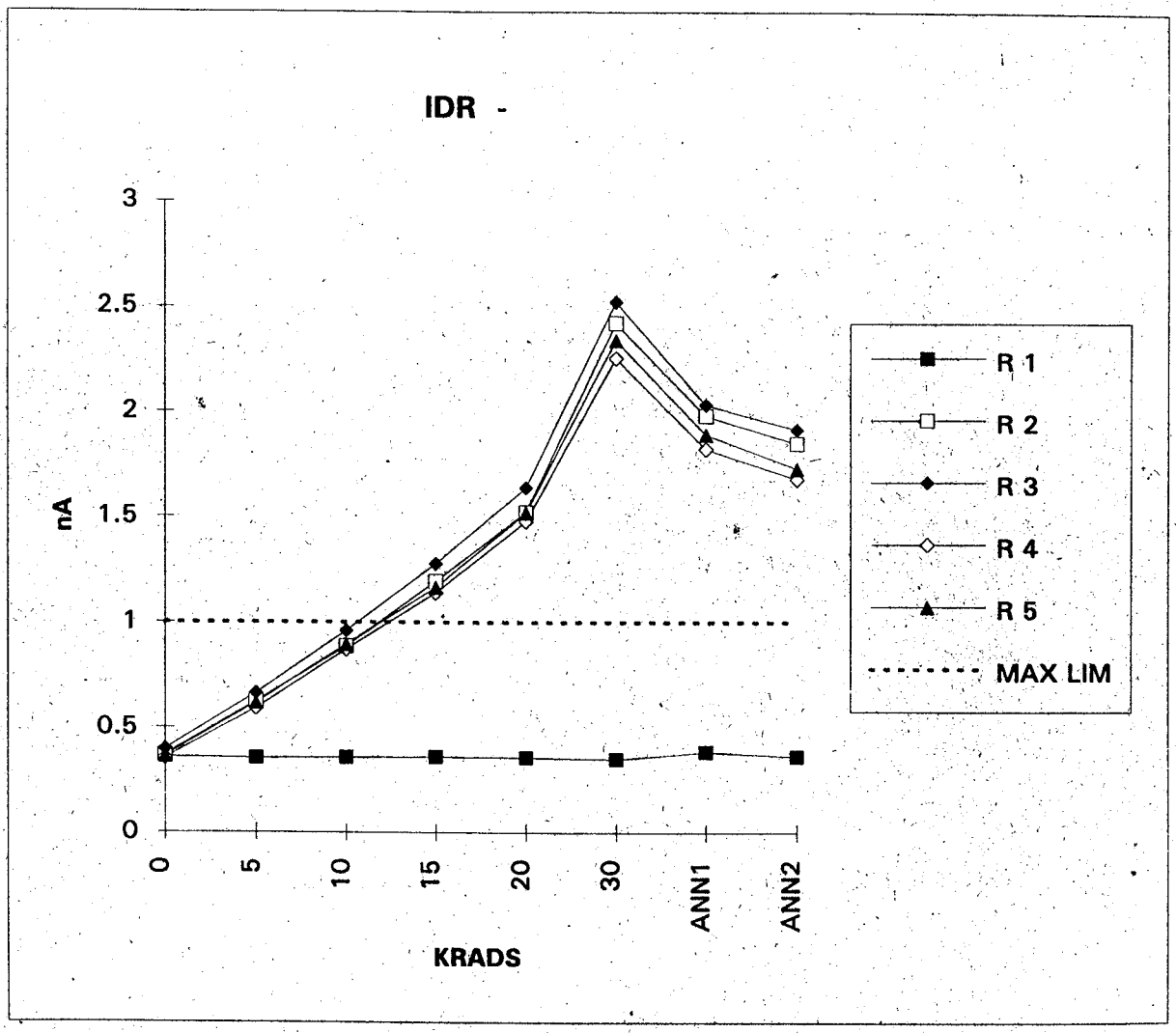
AV 1	0	5	10	15	20	30	ANN1	ANN2
R 1	999.851	999.824	999.832	999.828	999.826	999.817	999.783	999.812
R 2	999.839	999.756	999.669	999.607	999.515	999.369	999.607	999.617
R 3	999.813	999.765	999.668	999.605	999.531	999.438	999.629	999.651
R 4	999.809	999.765	999.674	999.622	999.533	999.449	999.651	999.667
R 5	999.812	999.768	999.67	999.606	999.53	999.42	999.623	999.671
MIN LIM	999.63	999.63	999.63	999.63	999.63	999.63	999.63	999.63



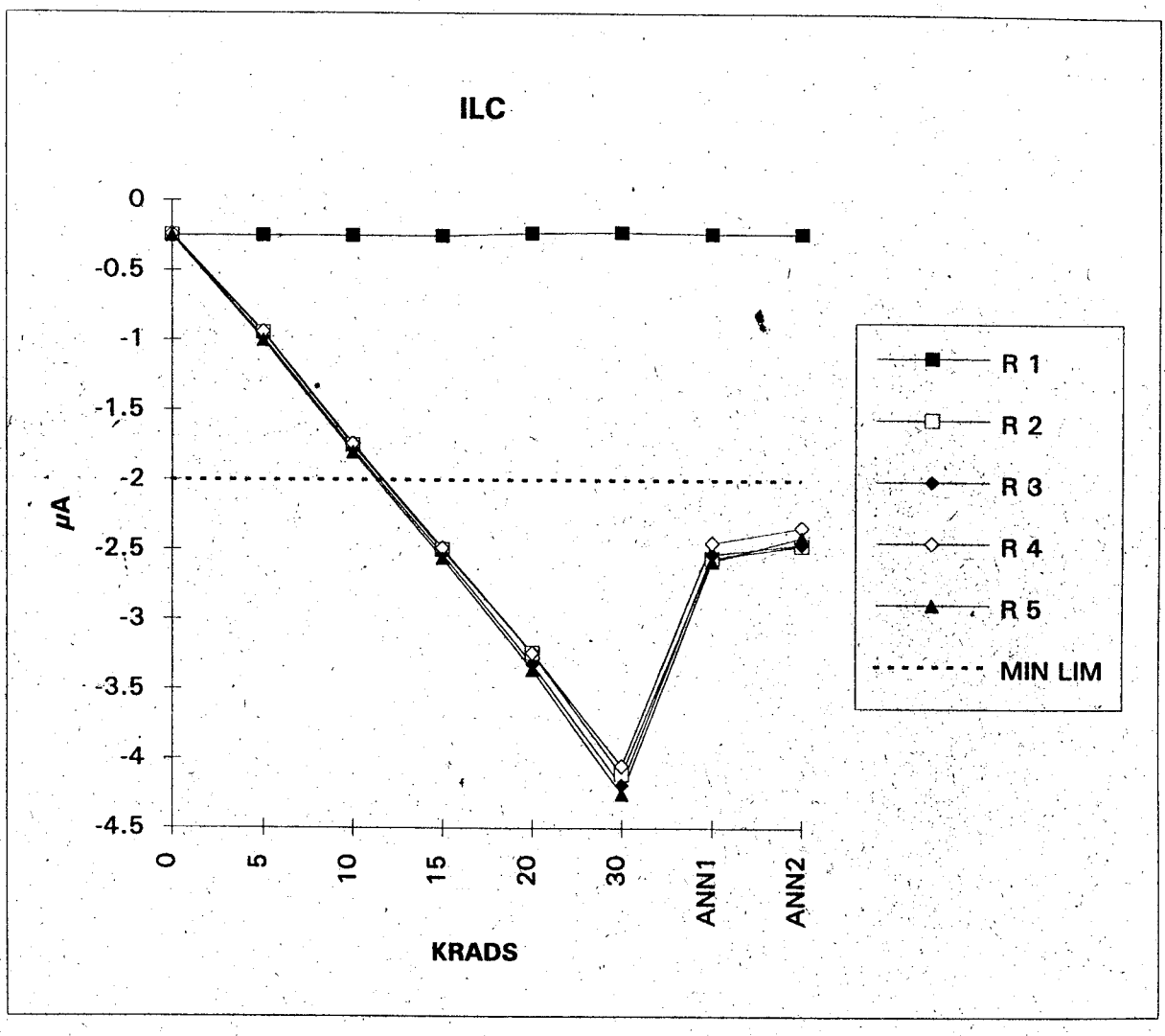
AV 2	0	5	10	15	20	30	ANN1	ANN2
R 1	999.85	999.85	999.847	999.861	999.847	999.809	999.773	999.825
R 2	999.853	999.78	999.678	999.579	999.5	999.367	999.612	999.608
R 3	999.849	999.769	999.672	999.573	999.513	999.407	999.623	999.635
R 4	999.83	999.785	999.677	999.596	999.509	999.421	999.63	999.652
R 5	999.853	999.769	999.674	999.574	999.507	999.4	999.62	999.633
MIN LIM	999.63	999.63	999.63	999.63	999.63	999.63	999.63	999.63



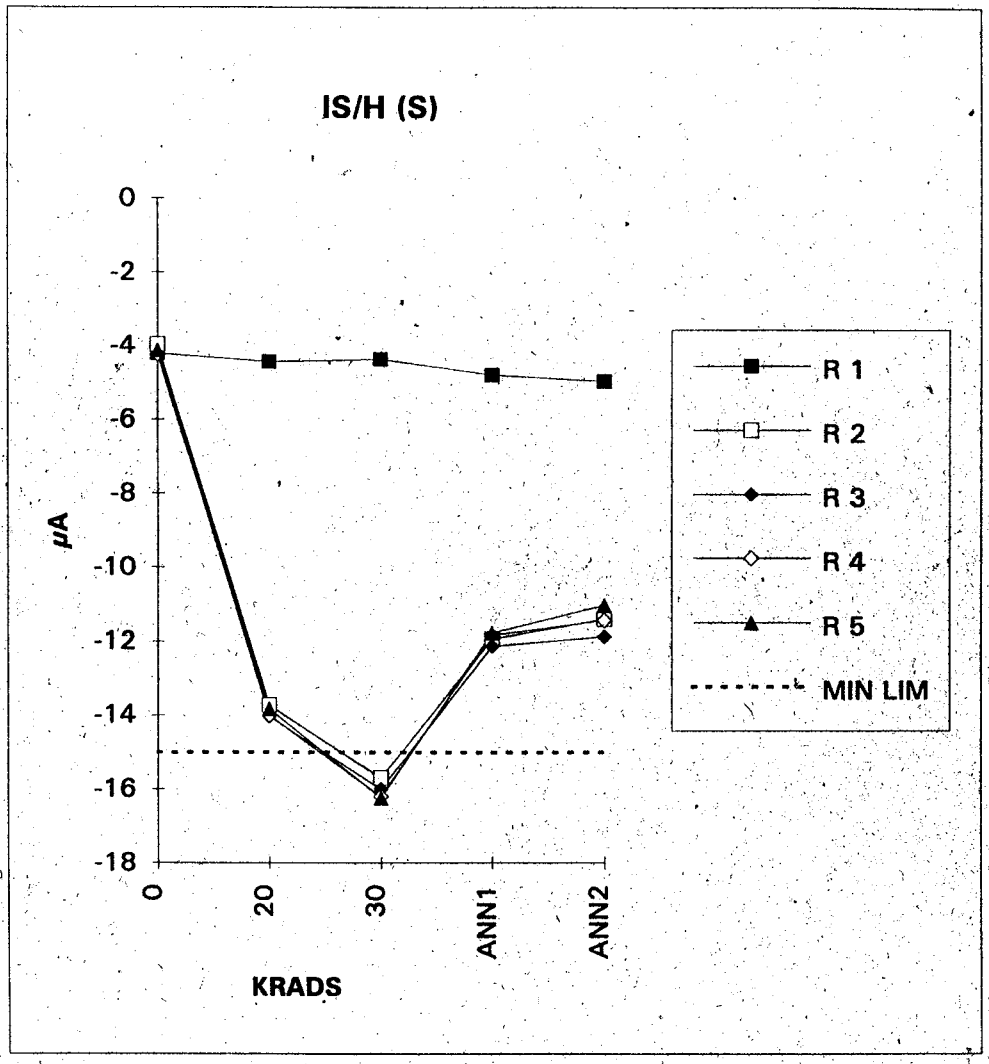
IDR +	0	5	10	15	20	30	ANN1	ANN2
R 1	0.459	0.45	0.451	0.459	0.455	0.446	0.491	0.46
R 2	0.473	0.855	1.297	1.767	2.408	3.693	2.781	2.72
R 3	0.509	0.904	1.394	1.883	2.567	3.805	2.86	2.822
R 4	0.449	0.811	1.269	1.679	2.319	3.415	2.533	2.437
R 5	0.464	0.841	1.28	1.721	2.39	3.566	2.64	2.51
MAX LIM	1	1	1	1	1	1	1	1



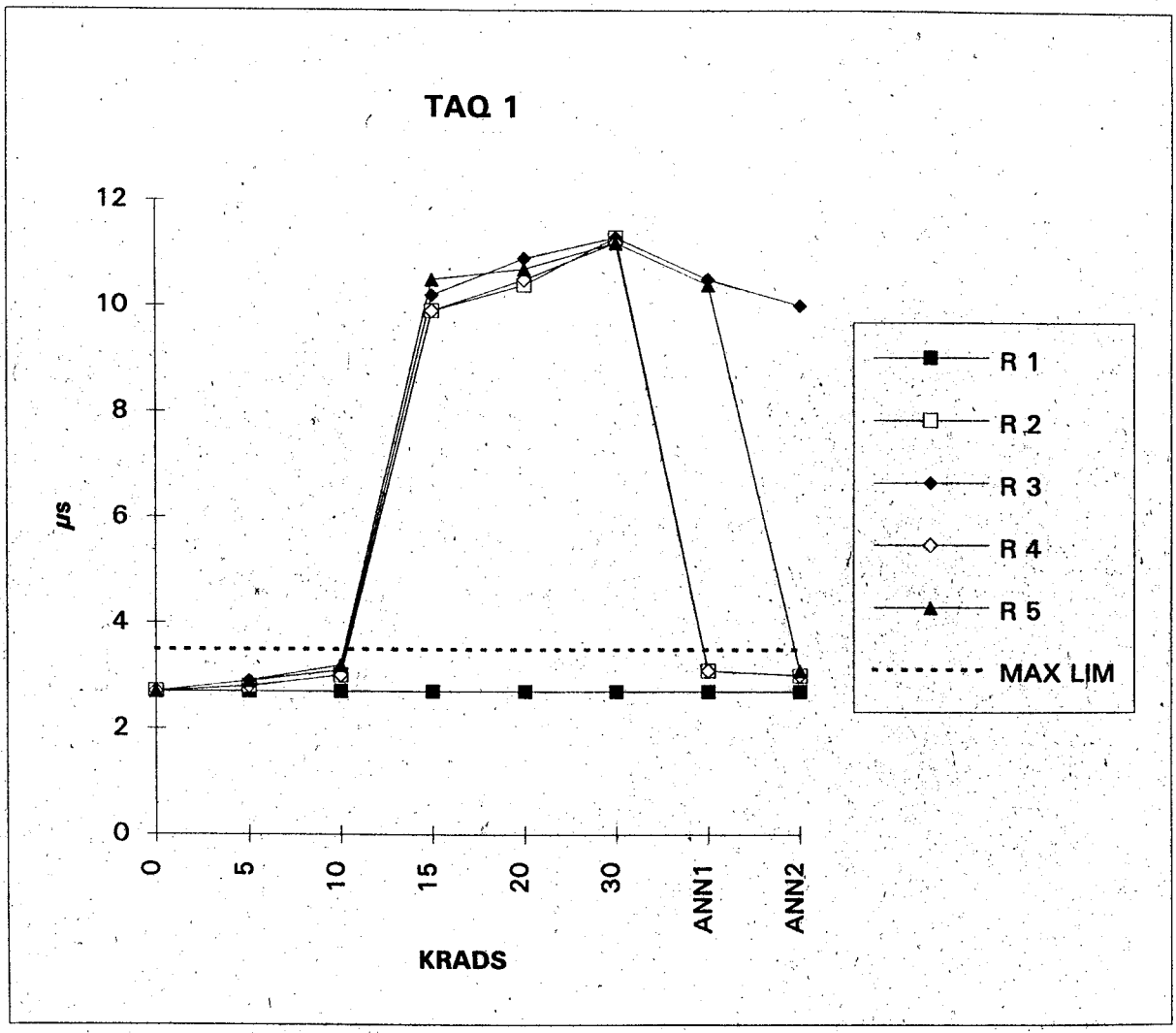
IDR -	0	5	10	15	20	30	ANN1	ANN2
R 1	0.361	0.354	0.357	0.361	0.358	0.351	0.386	0.364
R 2	0.369	0.625	0.886	1.194	1.521	2.422	1.981	1.848
R 3	0.397	0.664	0.959	1.278	1.639	2.523	2.033	1.914
R 4	0.354	0.592	0.872	1.139	1.478	2.254	1.821	1.68
R 5	0.366	0.618	0.895	1.165	1.519	2.341	1.891	1.729
MAX LIM	1	1	1	1	1	1	1	1



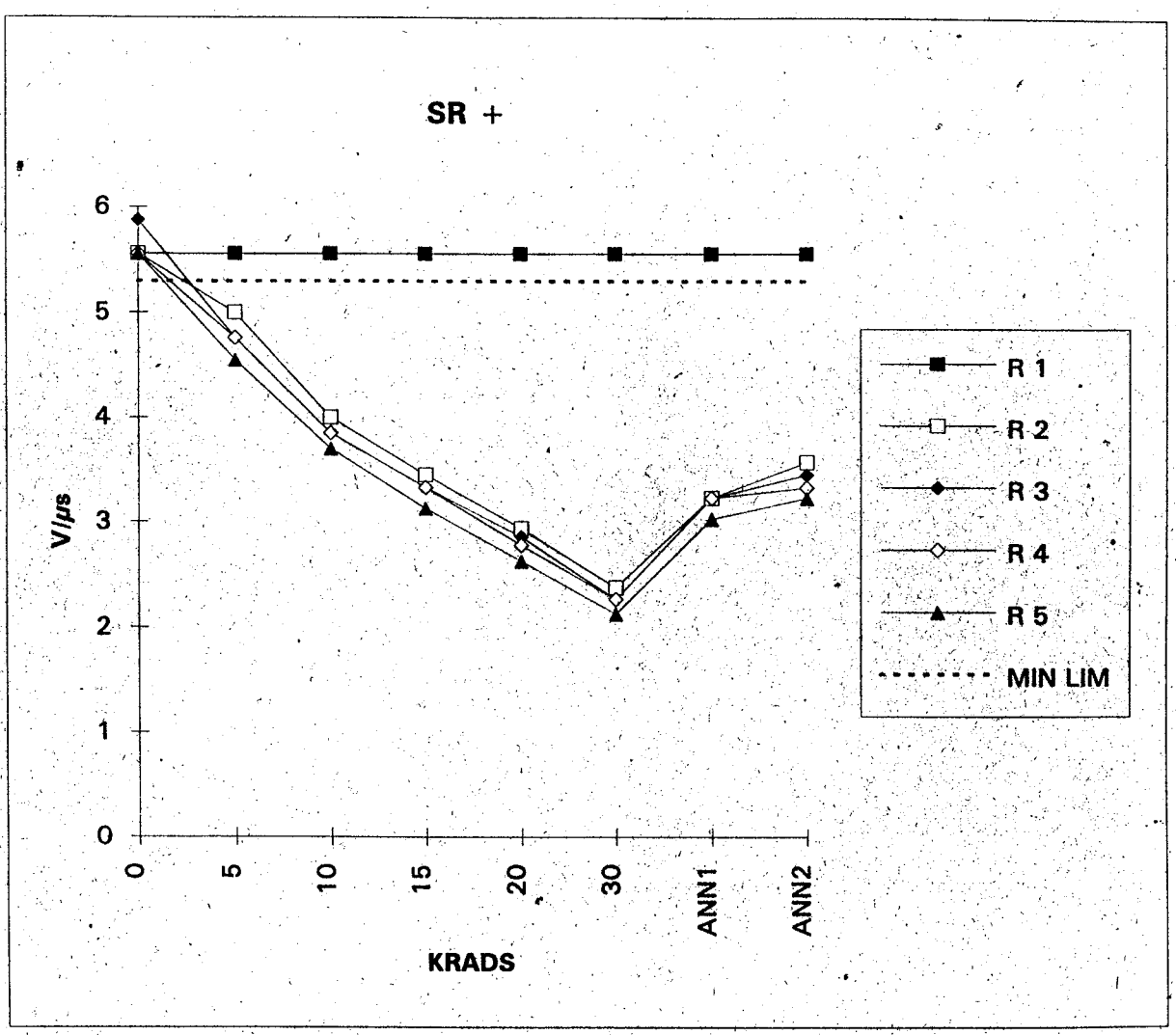
ILC	0	5	10	15	20	30	ANN1	ANN2
R 1	-0.25	-0.25	-0.25	-0.25	-0.23	-0.22	-0.23	-0.23
R 2	-0.25	-0.95	-1.75	-2.5	-3.24	-4.11	-2.56	-2.47
R 3	-0.25	-0.98	-1.78	-2.53	-3.32	-4.19	-2.53	-2.46
R 4	-0.24	-0.94	-1.74	-2.49	-3.24	-4.05	-2.45	-2.34
R 5	-0.25	-1	-1.8	-2.56	-3.36	-4.25	-2.58	-2.41
MIN LIM	-2	-2	-2	-2	-2	-2	-2	-2



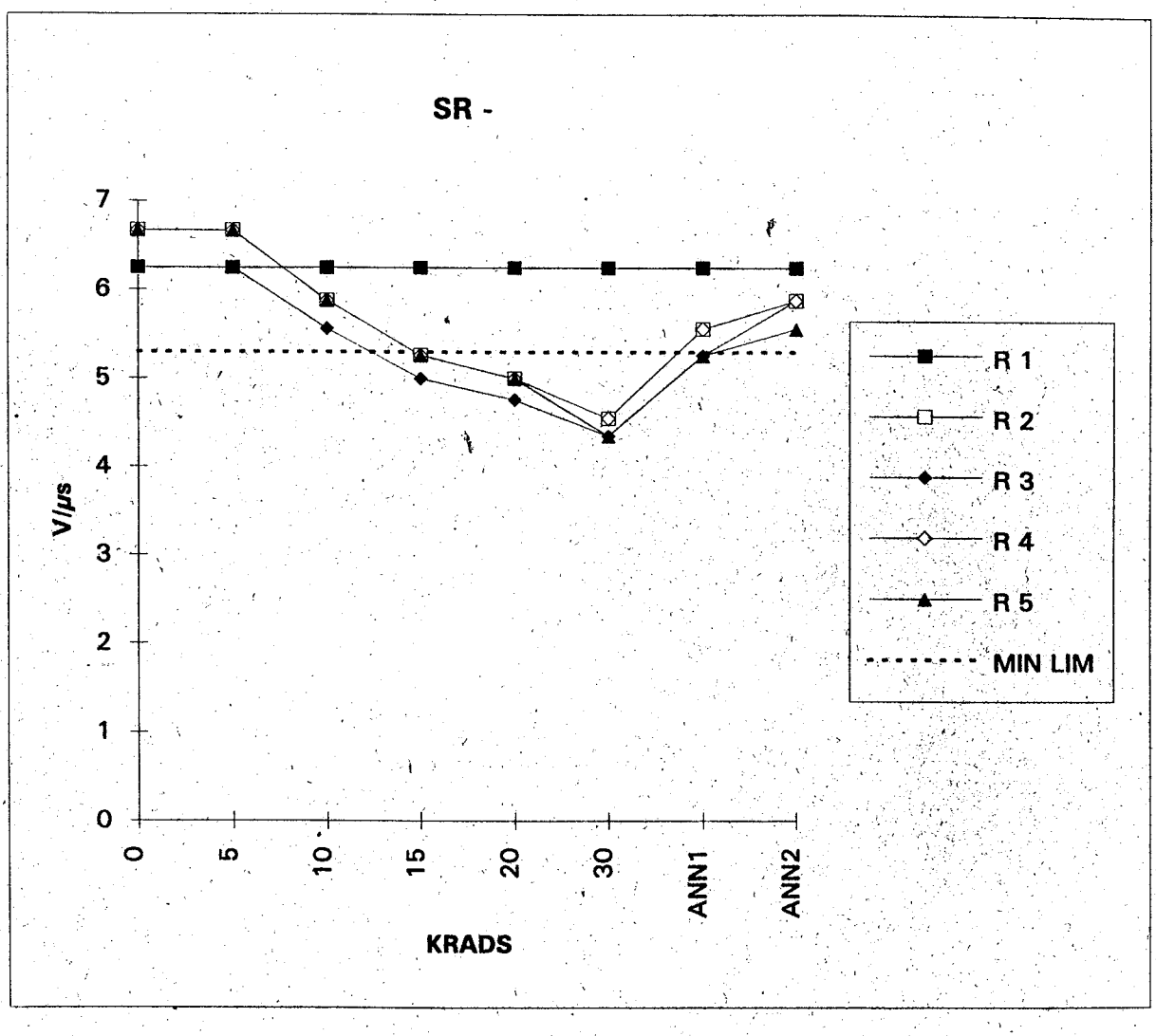
IS/H (S)	0	20	30	ANN1	ANN2
R 1	-4.21	-4.43	-4.37	-4.8	-4.97
R 2	-3.97	-13.73	-15.7	-11.93	-11.4
R 3	-4.21	-14.03	-16	-12.13	-11.87
R 4	-4.23	-14	-16.2	-11.83	-11.43
R 5	-4.12	-13.83	-16.23	-11.77	-11.03
MIN LIM	-15	-15	-15	-15	-15



TAQ 1	0	5	10	15	20	30	ANN1	ANN2
R 1	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
R 2	2.7	2.8	3	9.9	10.4	11.3	3.1	3
R 3	2.7	2.9	3.1	10.2	10.9	11.3	10.5	10
R 4	2.7	2.8	3	9.9	10.5	11.2	3.1	3
R 5	2.7	2.9	3.2	10.5	10.7	11.2	10.4	3.1
MAX LIM	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5



SR +	0	5	10	15	20	30	ANN1	ANN2
R 1	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56
R 2	5.56	5	4	3.45	2.94	2.38	3.23	3.57
R 3	5.88	4.76	3.85	3.33	2.86	2.27	3.23	3.45
R 4	5.56	4.76	3.85	3.33	2.78	2.27	3.23	3.33
R 5	5.56	4.55	3.7	3.13	2.63	2.13	3.03	3.23
MIN LIM	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3



SR -	0	5	10	15	20	30	ANN1	ANN2
R 1	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
R 2	6.67	6.67	5.88	5.26	5	4.55	5.56	5.88
R 3	6.25	6.25	5.56	5	4.76	4.35	5.26	5.88
R 4	6.67	6.67	5.88	5.26	5	4.55	5.56	5.88
R 5	6.67	6.67	5.88	5.26	5	4.35	5.26	5.56
MIN LIM	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3