ISSUE 1

TOP - REL

Radiation Verification Test

Report

on

3C91C

from MITEL

Doc. N° TPR/RPT/082

Issue/ Revision	Date	Prepared	Checked	Approved
1	Dec. 97	D. Gammone	V. Thomai	G. Cucinella

CADM RELEASE
13/12/97

ISSUE	ISSUE DATE	PAGE AFFECTED	COMMENTS
1	Dec. 97	All	Initial Issue

Abstract

This report contains the following parts:

* Radiation Verification Test Plan
* Certificate of Irradiation
* Certificate of Dosimetry
* Radiation Verification Test Results including :
  - ⇒ Tables measurements
  - ⇒ Graphs

RVT Plan

RVT Plan includes all test conditions and the parameters to be measured. Parameter limits refer to Electrical Measurements Table of Detail specification SCC/5401-001.

RVT Results

Irradiation steps have been 10-20-30-50-75-100 kRads.

Dose Rate has been around 9,5Rad/s.

Test temperature has been 25°C.

Three parts have been tested and another has been used as control sample.

After irradiation (100kRad accumulated) the devices have been annealed for 24 hours at 25°C.

Lot Date Code has been 9144A.

All parameters measured during this test stay within specification limits up to 75kRads. At 100kRads one parameter IC has slightly degraded under minimum limit. After 24h annealing the parameter continued to stay out of specification limit.

Top·Rel	RADIATION VERIFICATION TEST **PLAN** **TPR/RPT/079**	ISSUE N°. 1 REV. DATE: 17/11/97 PAGE: 1/2

Component Number	Component Designation	Irradiation Spec n°. SCC/22900
540100102B	3C91C	Issue 2 Rev.

Specification	Acceptance	Sample Size 3	Project / Programme:
Generic: SCC/5000 Iss. 8A	Diffusion [ ]		LABEN REQUEST
Detail : SCC/5401-001 Iss. 3D	Lot [X]	Control Devices 1	

Family:	Group:	Package:
OPTOELECTRONICS	OPTO ISOLATOR	Metal CAN

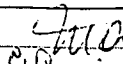
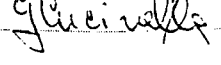
Manufacturer:	Test House:	Originator: TOP-REL
MITEL	TOP-REL	Name: V. THOMAI
Address: Jarfalla, SWEDEN	Address: Via Dei Berio,91-00155 ROMA	Telephone: +39(6)2282279

	Irradiation:	Irradiation Measurement Interval	Level of Interest:
Facility: ENEA	Single [ ]	Biased [ ] Circuit Ref.: N/A	
Source: CO60	Multiple [X]	Unbiased [X] Supply Volt.: N/A	50 kRad
		T (°C): Room Duration: 1H max	

Single Irradiation	Multiple Irradiation Steps	1	2	3	4	5	6	7	8
Dose (kRad(Si)):	Dose (kRad(Si))	0	10	20	30	50	75	100	
Dose Rate (Rad(Si)/s):	Dose Rate (Rad(Si)/s)		10	10	10	10	10	10	
Exposure Time (H):	Exposure Time (min)		16	16	16	32	40	40	

Irradiation Conditions:				Anneal Test:			
Biased (Remote Test)	[X]	Bias Circuit Ref:	see figure	Biased	[X]	Bias Circuit Ref:	
Unbiased (Remote Test)	[ ]	Supply Voltages:	see figure	Unbiased	[ ]	Supply Volt.:	
In Situ Test	[ ]	T (°C):	Room	T (°C)	[25]	Duration: 24H	

Test Step	Description	Requirement
1	Samples Serialisation	To be assigned to all devices
2	Initial Electrical Measurements	Per electrical measurement table here attached
3	Set Up of Irradiation	As required in this plan
4	Radiation Exposures	As described above
5	Intermediate, End point, Annealing measurements	Tests per el. meas. table here attached and accept. limits as specified in that table
6	Annealing	24H at room temperature (25°C)
7	Test Report	

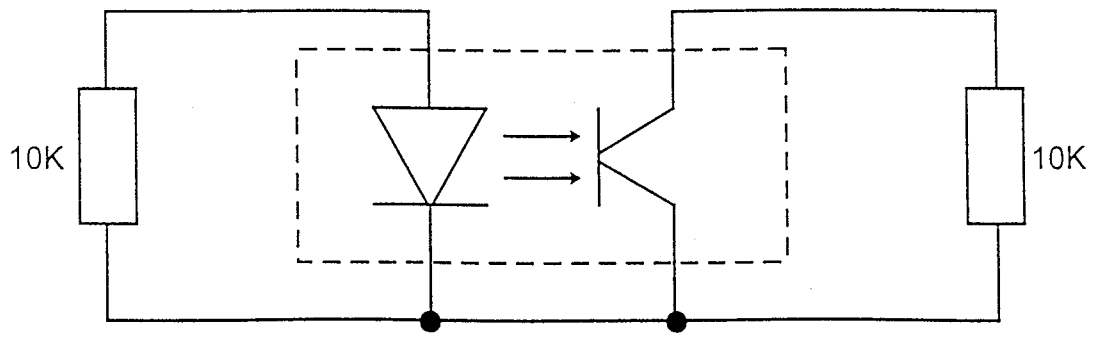
Flow	Name	Signatures	Company	Date
PREPARED	V. THOMAI		TOP-REL	17/11/97
APPROVED	G. CUCINELLA		TOP-REL	17/11/97
APPROVED				
APPROVED				

Top·Rel	RADIATION VERIFICATION TEST **PLAN** **TPR/RPT/079**	ISSUE N°. 1 REV. DATE: **17/11/97** PAGE: **2/2**
Component Number **540100102B**	Component Designation **3C91C**	Irradiation Spec n°. **SCC/22900** Issue **2** Rev.

TABLE 1: ELECTRICAL MEASUREMENTS AFTER EACH IRRADIATION STEP

N°		CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST CONDITIONS	LIMITS MIN	LIMITS MAX	UNIT
1	LED	Forward Voltage	V_F	4011	I_F = 2 mA	-	1.3	V
2	LED	Forward Voltage	V_F	4011	I_F = 50 mA	-	1.8	V
3	LED	Breakdown Voltage	V_{BR}	4021	I_R = 0.1 mA	7	-	V
4	Detector	Collector-Emitter Breakdown Voltage	V_{BRCEO}	3011	I_C = 10 mA	50	-	V
5	Detector	Dark Current	I_{CEO}	3036	V_{CE} = 5V I_F = 0 mA	-	50	nA
6	Coupled Device	Output Current	I_C	3036	V_{CE} = 5V I_F = 10 mA	4	-	mA
7	Coupled Device	Collector-Emitter Saturation Voltage	V_{CEsat}	3030	I_C = 2 mA I_F = 50 mA	-	0.4	V

FIGURE 1: RADIATION TEST BIAS CIRCUIT



ENEA INNOVAZIONE SERVIZI TECNOLOGICI IMPIANTO IRRAGGIAMENTO CALLIOPE	*Sigla di identificazione :*	*Data:* 1/12/97	*Pag./ di pag.* 1/2
	Commessa n°:	*Num.:* 5/97	*Firma Operatore:* Pasquali Angelo

CERTIFICATO DI IRRAGGIAMENTO

Descrizione campione: IRRAGGIAMENTO DI COMPONENTI ELETTRONICI

Numero ident.: 3C91C e CMP05BJ

Richiedente: TOP-REL

Documenti di riferimento: FAX TPR/3021-97 DEL 13/11/97

RIFERIMENTI DOSIMETRICI

Certificato di dosimetria : NUM. 3/97 DEL 19/11/97

Inizio irraggiamento : ORE 08.30 DEL 28/11/97

Fine irraggiamento : ORE 14.30 DEL 28/11/97

Condizioni ambientali :

temperatura : 20.9 (°C) **pressione:** 1 (atm)

tipo di atmosfera : ARIA **um.rel. :** 33.7 (%)

Note: E'STATO UTILIZZATO LA MEDIA DEI PUNTI DOSIMETRICI TROVATI.
IL RATEO UTILIZZATO E' COMPRENSIVO DEL DECADIMENTO NATURALE DELLA SORGENTE
LE DOSI ASSORBITE S'INTENDONO CUMULATE SUI SINGOLI COMPONENTI.

ENEA INNOVAZIONE SERVIZI TECNOLOGICI IMPIANTO IRRAGGIAMENTO CALLIOPE	*Sigla di identificazione:*	*Data:* 1/12/97	*Pag. / di pag.* 1/2
	Commessa n°:	*Num.:* 5/97	*Firma Operatore:*

CERTIFICATO DI IRRAGGIAMENTO

Punto Identific.	Intensità di dose Inizio Iragg. (Gy/..)	Intensità di dose Fine Iragg. (Gy/..)	Tempo di Irraggiamento (hh:mm:ss)	Dose richiesta (Gy)	Dose assorbita (Gy)	Differenza dalla dose richiesta (%)
1	343.3	343.3	00:17:29	100	100.03	0.03
2	343.3	343.3	00:17:29	100	100.03	0.03
3	343.3	343.3	00:17:29	100	100.03	0.03
4	343.3	343.3	00:34:58	200	200.06	0.03
5	343.3	343.3	00:43:42	250	250.04	0.016
6	343.3	343.3	00:43:42	250	250.04	0.016
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

ENEA INNOVAZIONE SERVIZI TECNOLOGICI IMPIANTO IRRAGGIAMENTO CALLIOPE	Sigla di identificazione:	Data: 1/12/97	Pag. / di pag. 1/2
	Commessa n°:	Num.: 3/97	Firma Operatore: Pasquali Angelo

CERTIFICATO DI DOSIMETRIA

Dosimetria effettuata in data 19/11/97 alle ore: 09.15

Strumentazione utilizzata: Spettrofotometro UV/Vis Beckman DU-6

Tipo di dosimetro usato:

☒ Soluzione Fricke

☐ Red Perspex

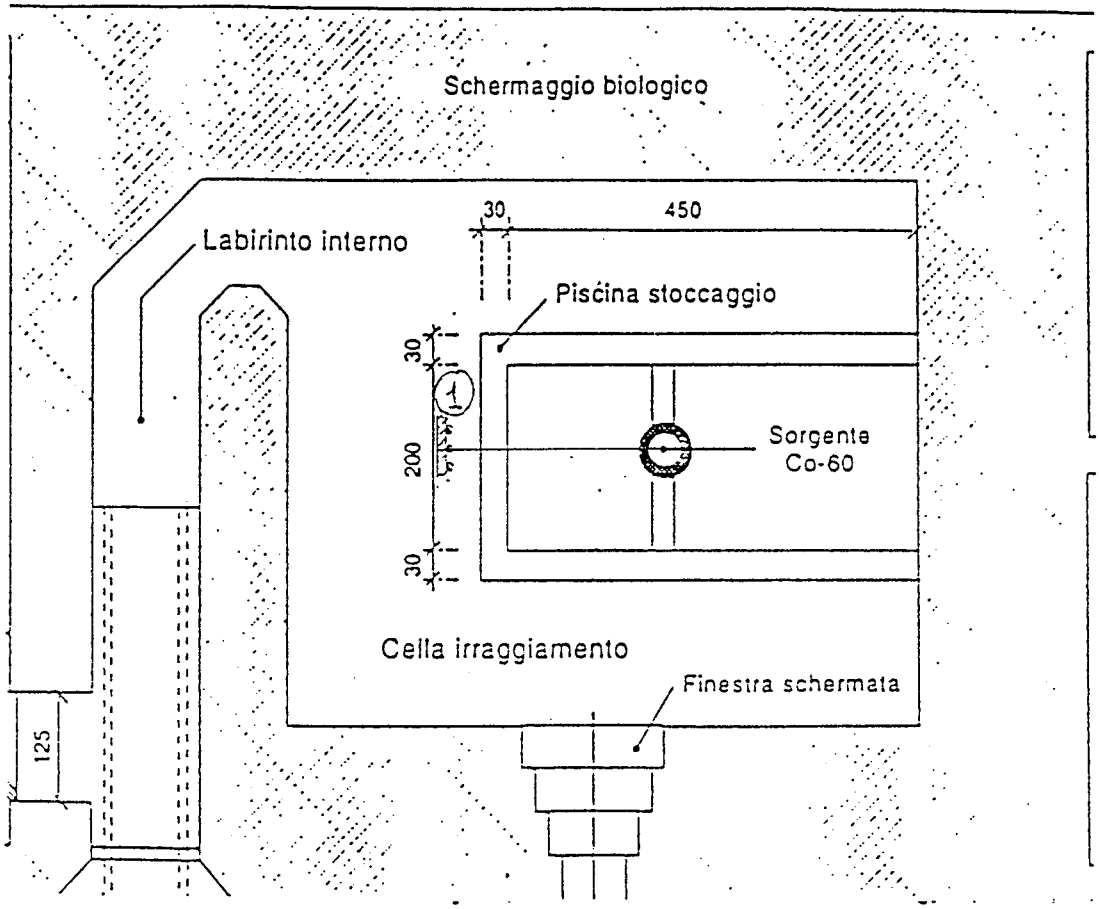
La dosimetria è stata effettuata in conformità alle specifiche riportate nel documento Enea TDI 87011A

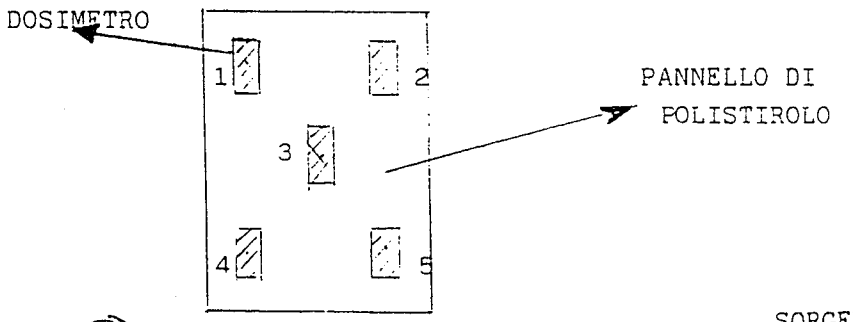
RISULTATI DOSIMETRICI

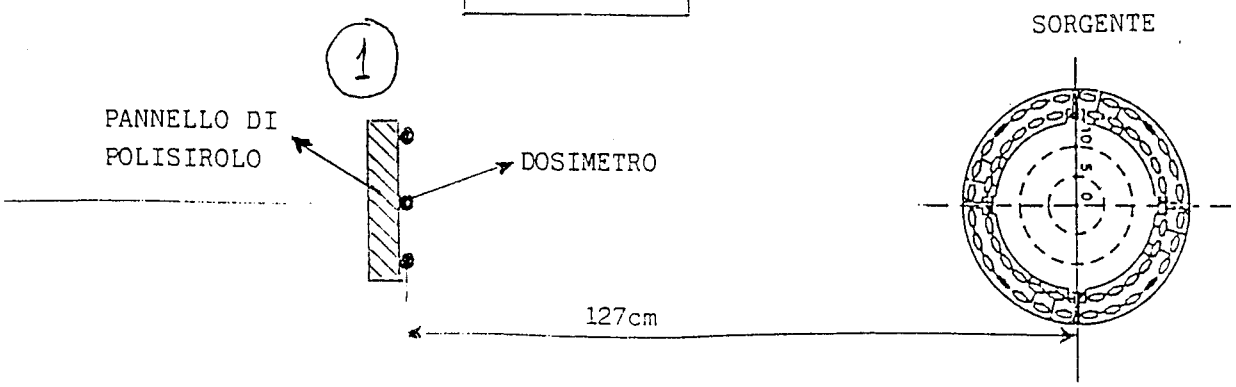
Numero dosimetro	Tempo di Irraggiamento (hh:mm:ss)	Dose assorbita (Gy)	Intensità di dose (Gy/h)
1	00 : 30 : 00	170.844	341.688
2	00 : 30 : 00	167.808	335.616
3	00 : 30 : 00	173.604	347.208
4	00 : 30 : 00	175.812	351.624
5	00 : 30 : 00	173.052	346.104
6	: :		
7	: :		
8	: :		
9	: :		
10	: :		

ENEA INNOVAZIONE SERVIZI TECNOLOGICI IMPIANTO IRRAGGIAMENTO CALLIOPE	Sigla di identificazione:	Data: 1/12/97	Pag. / di pag. 2/2
	Commessa n°:	Num.: 3/97	Firma Operatore:

CERTIFICATO DI DOSIMETRIA







Part Type : **3C91C**
Manufacturer : **ABB HAFO**
Detail Spec.: **SCC/5401-001**

Sample size : **4 (3+1)**
Irradiated Samples: **s/n 213,217,569**
Control Sample: **s/n 571**
Date Code : **9144A**

Equipment(s) : **HP4142B**
Calibration is : **VALID**
Test Prg. No.: **01**

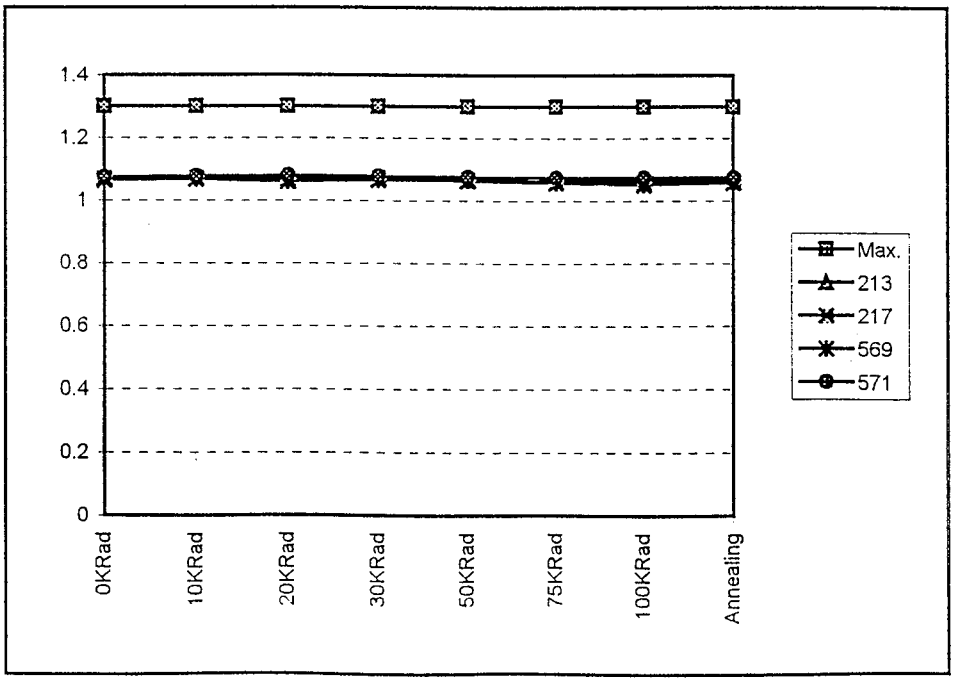
Irradiation steps : **10-20-30-50-75-100 kRad**
Annealing : **24 h**
Dose Rate : **9,5 Rad/s**
Temperature for test : **+25°C**

Operator : **D. GAMMONE**
Date : **28/11/97**

Test House : **TOP-REL**
Test Source : **CO60 Calliope / ENEA, Casaccia**

1- V_F (2mA)

	0KRad	10KRad	20KRad	30KRad	50KRad	75KRad	100KRad	Annealing
Min.	-	-	-	-	-	-	-	-
Max.	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
213	1.07272	1.07148	1.07148	1.07076	1.0664	1.06168	1.05736	1.06068
217	1.06952	1.07224	1.0682	1.07096	1.06684	1.06132	1.06216	1.06256
569	1.06368	1.06712	1.05956	1.06616	1.06232	1.05744	1.05148	1.05648
571	1.0736	1.07756	1.07908	1.0776	1.07548	1.07272	1.07348	1.07376



Part Type : **3C91C**
Manufacturer : **ABB HAFO**
Detail Spec.: **SCC/5401-001**

Sample size : **4 (3+1)**
Irradiated Samples: **s/n 213,217,569**
Control Sample: **s/n 571**
Date Code : **9144A**

Equipment(s) : **HP4142B**
Calibration is : **VALID**
Test Prg. No.: **01**

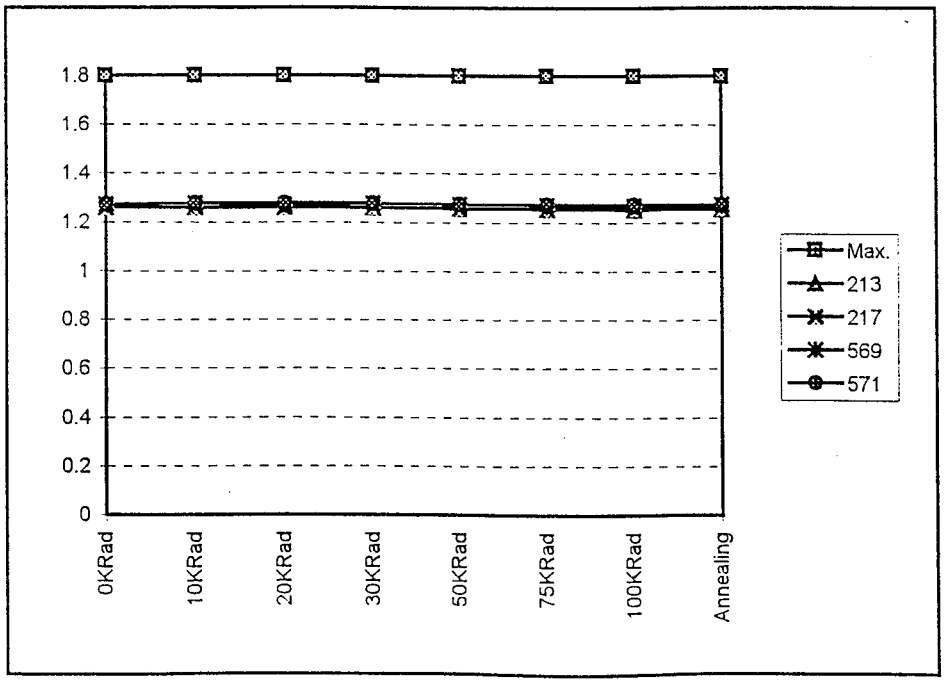
Irradiation steps : **10-20-30-50-75-100 kRad**
Annealing : **24 h**
Dose Rate : **9,5 Rad/s**
Temperature for test : **+25°C**

Operator : **D. GAMMONE**
Date : **28/11/97**

Test House : **TOP-REL**
Test Source : **CO60 Calliope / ENEA, Casaccia**

2- V_F (50mA)

	0KRad	10KRad	20KRad	30KRad	50KRad	75KRad	100KRad	Annealing
Min.	-	-	-	-	-	-	-	-
Max.	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
213	1.25956	1.25908	1.25976	1.25984	1.25728	1.2542	1.252	1.25472
217	1.25892	1.26252	1.25936	1.2626	1.2604	1.25668	1.25892	1.2592
569	1.27364	1.278	1.271	1.27848	1.2764	1.27292	1.26872	1.27552
571	1.27352	1.27764	1.27872	1.27716	1.27564	1.27244	1.27304	1.27348



Part Type : **3C91C**
Manufacturer : **ABB HAFO**
Detail Spec.: **SCC/5401-001**

Sample size : **4 (3+1)**
Irradiated Samples: **s/n 213,217,569**
Control Sample: **s/n 571**
Date Code : **9144A**

Equipment(s) : **HP4142B**
Calibration is : **VALID**
Test Prg. No.: **01**

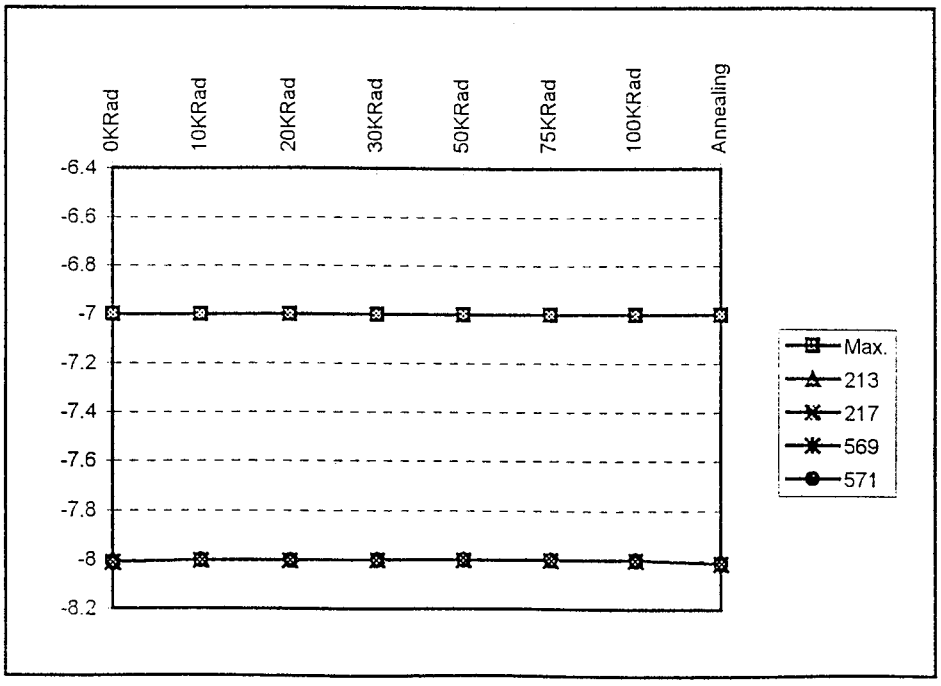
Irradiation steps : **10-20-30-50-75-100 kRad**
Annealing : **24 h**
Dose Rate : **9,5 Rad/s**
Temperature for test : **+25°C**

Operator : **D. GAMMONE**
Date : **28/11/97**

Test House : **TOP-REL**
Test Source : **CO60 Calliope / ENEA, Casaccia**

3- V_{BR}

	0KRad	10KRad	20KRad	30KRad	50KRad	75KRad	100KRad	Annealing
Min.	-	-	-	-	-	-	-	-
Max.	-7	-7	-7	-7	-7	-7	-7	-7
213	-8.0104	-8.0024	-8.0032	-8.0008	-8.0012	-8	-8.0008	-8.0132
217	-8.0104	-8.0024	-8.0032	-8.0008	-8.0012	-8.0004	-8.0008	-8.0132
569	-8.0104	-8.0024	-8.0032	-8.0008	-8.0012	-8	-8.0004	-8.0132
571	-8.0104	-8.0024	-8.0032	-8.0008	-8.0012	-8.0004	-8.0004	-8.0128



Part Type : 3C91C
Manufacturer : ABB HAFO
Detail Spec.: SCC/5401-001

Sample size : 4 (3+1)
Irradiated Samples: s/n 213,217,569
Control Sample: s/n 571
Date Code : 9144A

Equipment(s) : HP4142B
Calibration is : VALID
Test Prg. No.: 01

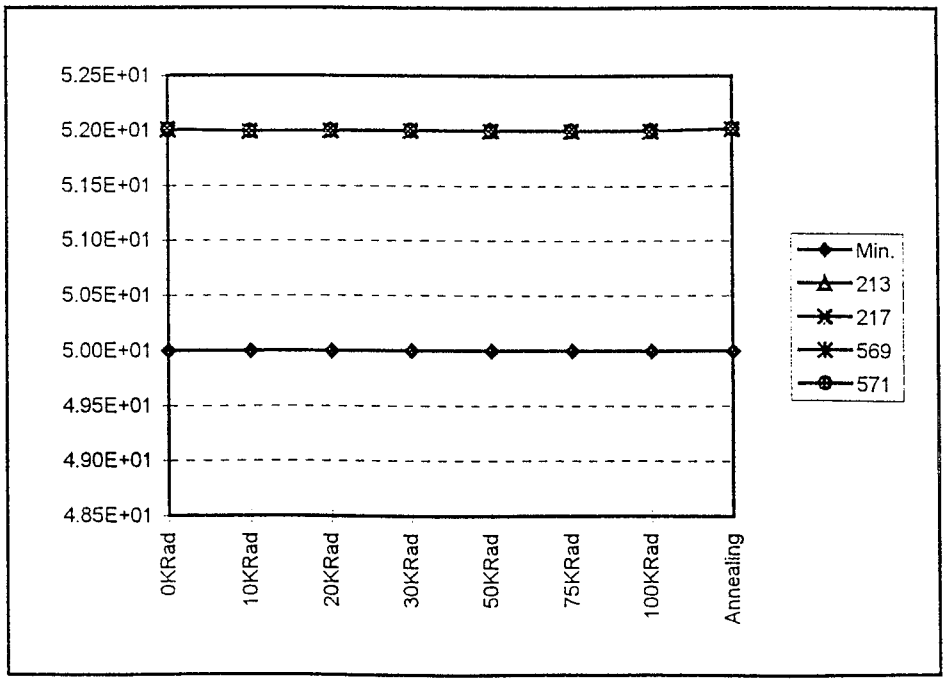
Irradiation steps : 10-20-30-50-75-100 kRad
Annealing : 24 h
Dose Rate : 9,5 Rad/s
Temperature for test : +25°C

Operator : D. GAMMONE
Date : 28/11/97

Test House : TOP-REL
Test Source : CO60 Calliope / ENEA, Casaccia

4- V_{BRCEO}

	0KRad	10KRad	20KRad	30KRad	50KRad	75KRad	100KRad	Annealing
Min.	5.00E+01	5.00E+01	5.00E+01	5.00E+01	5.00E+01	5.00E+01	5.00E+01	5.00E+01
Max.	-	-	-	-	-	-	-	-
213	52.006	51.994	51.996	51.996	51.996	51.996	51.996	52.014
217	52.008	51.994	51.996	51.996	51.996	51.996	51.996	52.014
569	52.008	51.994	51.996	51.996	51.996	51.996	51.996	52.014
571	52.006	51.994	51.996	51.996	51.996	51.996	51.996	52.014



Part Type : **3C91C**
Manufacturer : **ABB HAFO**
Detail Spec.: **SCC/5401-001**

Sample size : **4 (3+1)**
Irradiated Samples: **s/n 213,217,569**
Control Sample: **s/n 571**
Date Code : **9144A**

Equipment(s) : **HP4142B**
Calibration is : **VALID**
Test Prg. No.: **01**

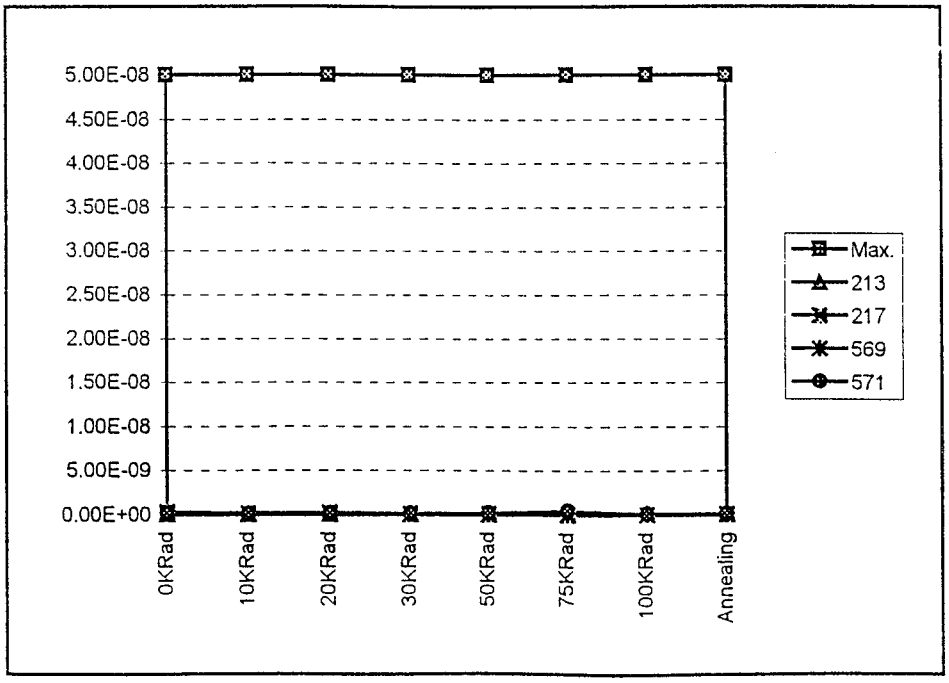
Irradiation steps : **10-20-30-50-75-100 kRad**
Annealing : **24 h**
Dose Rate : **9,5 Rad/s**
Temperature for test : **+25°C**

Operator : **D. GAMMONE**
Date : **28/11/97**

Test House : **TOP-REL**
Test Source : **CO60 Calliope / ENEA, Casaccia**

5- I_{CE}

	0KRad	10KRad	20KRad	30KRad	50KRad	75KRad	100KRad	Annealing
Min.	-	-	-	-	-	-	-	-
Max.	5.00E-08	5.00E-08	5.00E-08	5.00E-08	5.00E-08	5.00E-08	5.00E-08	5.00E-08
213	7.27E-11	5.396E-11	6.38E-11	5.632E-11	5.456E-11	5.552E-11	4.5E-11	7.874E-11
217	3.6548E-10	2.24E-10	2.5846E-10	1.715E-10	1.2822E-10	1.326E-10	9.466E-11	1.298E-10
569	1.3112E-10	8.832E-11	1.626E-10	9.038E-11	5.952E-11	6.266E-11	6.756E-11	1.182E-10
571	1.5484E-10	9.848E-11	1.4264E-10	1.5948E-10	1.9402E-10	4.7624E-10	1.574E-10	1.48E-10



Part Type : **3C91C**
Manufacturer : **ABB HAFO**
Detail Spec.: **SCC/5401-001**

Sample size : **4 (3+1)**
Irradiated Samples: **s/n 213,217,569**
Control Sample: **s/n 571**
Date Code : **9144A**

Equipment(s) : **HP4142B**
Calibration is : **VALID**
Test Prg. No.: **01**

Irradiation steps : **10-20-30-50-75-100 kRad**
Annealing : **24 h**
Dose Rate : **9,5 Rad/s**
Temperature for test : **+25°C**

Operator : **D. GAMMONE**
Date : **28/11/97**

Test House : **TOP-REL**
Test Source : **CO60 Calliope / ENEA, Casaccia**

7- V_{CESAT}

	0KRad	10KRad	20KRad	30KRad	50KRad	75KRad	100KRad	Annealing
Min.	-	-	-	-	-	-	-	-
Max.	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01
213	0.07472	0.08124	0.0834	0.0852	0.089	0.09304	0.09664	0.10036
217	0.0826	0.08652	0.08948	0.09032	0.09404	0.09836	0.1006	0.10444
569	0.08112	0.08544	0.08956	0.0896	0.09352	0.09784	0.10216	0.105
571	0.07628	0.07528	0.075	0.07528	0.07576	0.07636	0.07616	0.07628