TOTAL DOSE STEADY-STATE IRRADIATION

OF

3C91C (DC 9906)

OPTOELECTRONIC COMPONENT

from

MITEL

Written by	Verified by	Approved by
Name: J.F. OLIVÉ	Name: B. DOUCIN	Name: Ch. POIVEY
Date:	Date:	Date:
Visa:	Visa:	Visa:

CONTENTS

I. DOCUMENTATION

I.1 APPLICABLE DOCUMENTS:

PRO2. 001	MATRA Procedure for Total Dose Steady-State Irradiation on Active Devices.

I.2 REFERENCE DOCUMENTS:

MIL STD 883 D, Method 1019-4.....	Steady State Irradiation Procedure
ESA/SCC 22900-3.....	ESA Basic Specification For Total Dose Steady-State Irradiation
ESA/SCC 5401 001 Issue 02, amend MA 5000.....	Detail Specification

II. TEST PLAN

II.1 PARTS REFERENCES

REFERENCES		
TYPE	:	3C91C
MANUFACTURER	:	MITEL
PLACE	:	SWEDEN
FUNCTION		
OPTOELECTRONIC COMPONENT		
TECHNOLOGY		
BIPOLAR		
PARTS PROCUREMENT		
ORIGIN	:	Agligne
LEVEL	:	SCC-B
PACKAGING	:	TO 72
DATE CODE	:	9906
F.R. NUMBER	:	100104/03
WAFER LOT NUMBER	:	J11918.1 (diode) / J11969.1 (transistor)
NUMBER OF PARTS	:	11 (10 irradiated + 1 reference)
DETAIL SPECIFICATION		
ESA/SCC 5401 001 Issue 02, amend MA 5000		

II.2 ELECTRICAL MEASUREMENTS

TEST TYPE		
TYPE	:	Remote electrical measurements done at room temperature
TEST FACILITY		
PLACE	:	Matra Marconi Space (Vélizy, France)
MATERIAL	:	Analyser HP 4155, power supply Lambda LP521-FM-W, function generator HP 33120A, oscilloscope Tektronics TDS 520A
CALIBRATION DATE	:	04/99, 06/99, 10/98, 02/99

TESTED PARAMETERS

Parameter Name	Fig n°	Symbol	Test Conditions	Min	Max	Unit
Breakdown Voltage	1	Vbr	Ir= -100µA	7		V
Forward Voltage 1	2	Vf1	If= 2mA		1,3	V
Forward Voltage 2	3	Vf2	If= 50mA		1,8	V
Dark Current	4	Ice0	Vce= 5V / If= 0 mA		50	nA
Output Current	5	Ic	Vce= 5V / If= 10mA	4		mA
Collector-Emitter Breakdown Voltage	6	V(br)ce0	Ic= 10mA / If= 0mA	50		V
Collector-Emitter Saturation Voltage	7	Vce(sat)	Ic= 2mA / If= 50mA		0,4	V
Rise Time	8	tr	Ic= 2 mA : Vce= 5V		5,0	µs
Fall Time	9	tf	Ic= 2 mA : Vce= 5V		5,0	µs
Current Transfer Ratio	10	CTR (*)	CTR=Ic/If : Vce=5V / If=10 mA	0.4		

(*) : CTR parameter is calculated using the values measured on Ic parameter.

Notes:

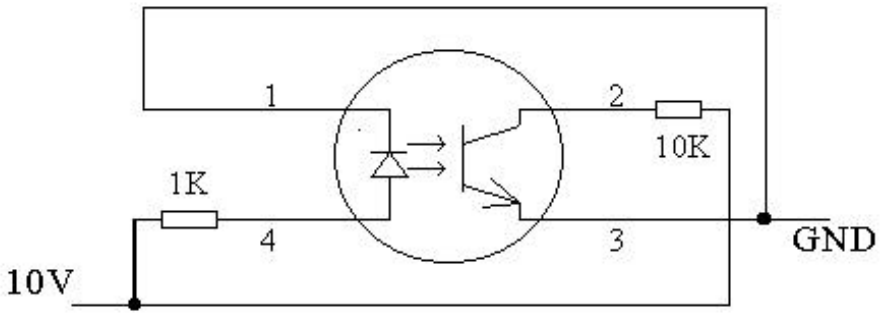
- All electrical measurements were made within one hour of termination of the irradiation step.
- Figure numbers refer to the figures showing variation and values of each parameter with total dose and annealings at the end of this document.

II.3 EXPERIMENTAL CONDITIONS

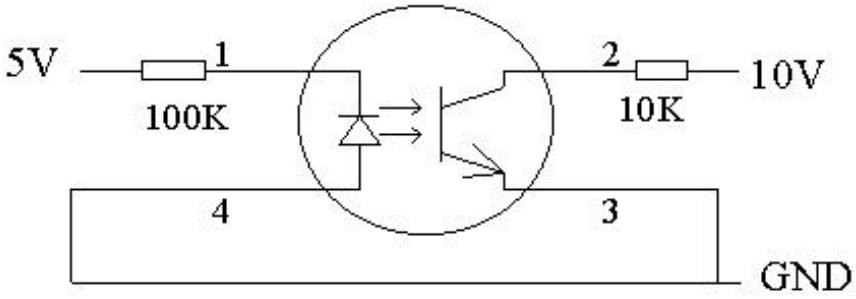
IRRADIATION FACILITY		
PLACE	:	Matra Marconi Space (Vélizy, France)
TYPE	:	SHEPHERD 484, COBALT 60
ACTIVITY	:	<= 9 Curies
CALIBRATION DATE	:	09/02/99

IRRADIATION FACILITY		
TYPE	:	Multiple Exposure
STEPS	:	0, 10, 20, 31.4, 50.6, 75.2, 100.8 kRad (Si)

BIASING CONDITIONS



Mode 1 : SN 1 to 4



Mode 2 : SN 5 to 8

COMMENTS

4 parts were biased in static ON (mode 1), 4 parts in static ON (mode 2), 2 parts in static OFF mode with all pins connected to ground.

III TEST REPORT

III.1 EXPERIMENTAL CONDITIONS

PARTS IDENTIFICATION			
MANUFACTURER MARKING : MITEL MAAJQ02B 9906 S/N			
SAMPLES DESCRIPTION			
SN Manuf.	**SN Irrad.**	**Biasing Mode**	**Comments**
517	0	REF	
506	1	ON	Static ON, mode 1
507	2	ON	Static ON, mode 1
508	3	ON	Static ON, mode 1
509	4	ON	Static ON, mode 1
510	5	ON	Static ON, mode 2
511	6	ON	Static ON, mode 2
512	7	ON	Static ON, mode 2
513	8	ON	Static ON, mode 2
514	9	OFF	
515	10	OFF	

IRRADIATION SCHEDULE						
Step N°	Date In / Out	Description	DOSE RATE [kRad(Si) / H]	IRRAD. TIME [H]	DOSE [kRad(Si)]	TOTAL DOSE [kRad(Si)]
0	09/06/99	Initial Measurements			0.00	0.0
1	09/06/99 16/06/99	Irradiation & Measurements	0.06	166.35	10.00	10.00
2	16/06/99 23/06/99	Irradiation & Measurements	0.06	167.03	10.00	10.00
3	23/06/99 28/06/99	Irradiation & Measurements	0.1	114.37	11.4	31.4
4	28/06/99 06/07/99	Irradiation & Measurements	0.1	191.25	19.2	50.6
5	06/07/99 16/07/99	Irradiation & Measurements	0.1	246.37	24.6	75.2
6	16/07/99 27/07/99	Irradiation & Measurements	0.1	256.3	25.6	100.8
7	27/07/99 03/08/99	Annealing 100°C		171	0,00	100.8

III.2 EXPERIMENTAL RESULTS

III.2.1.Parametric tests:

The evolution of each parameter as a function of the total dose and annealings is plotted at the end of the report.

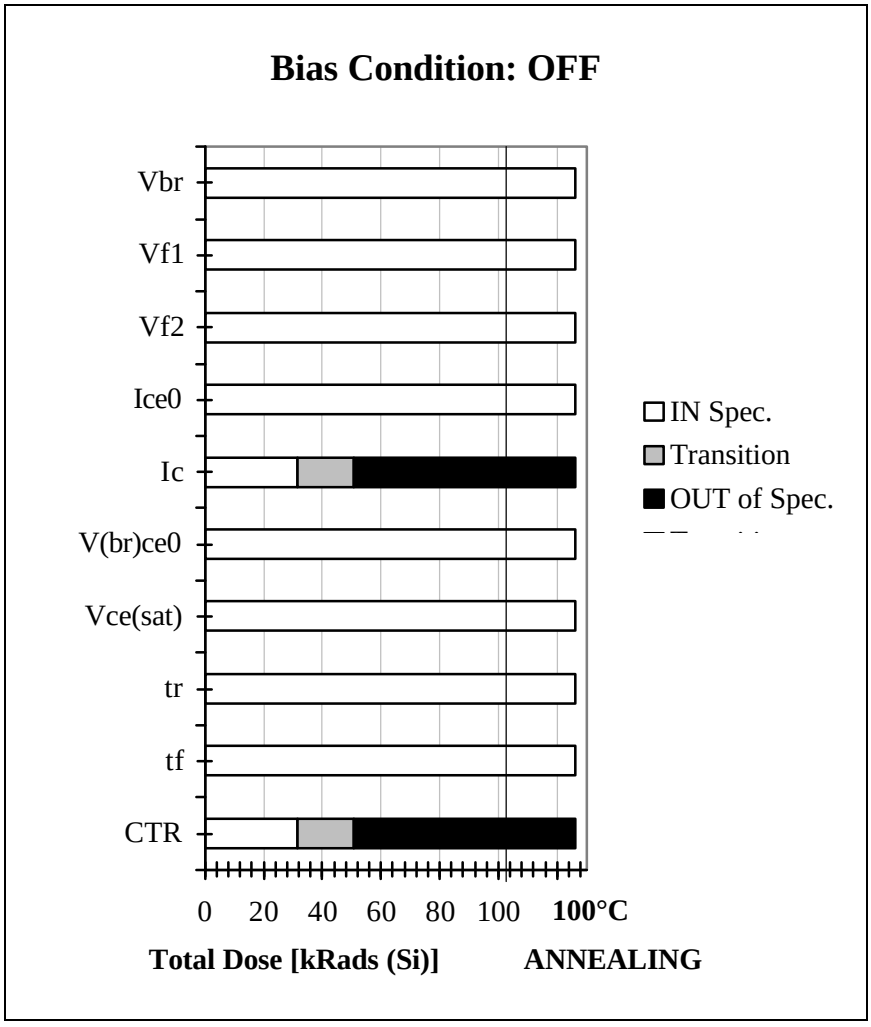
The following tables summarize the evolution of the measured parameters with irradiation and annealings (See next page) for each biasing conditions

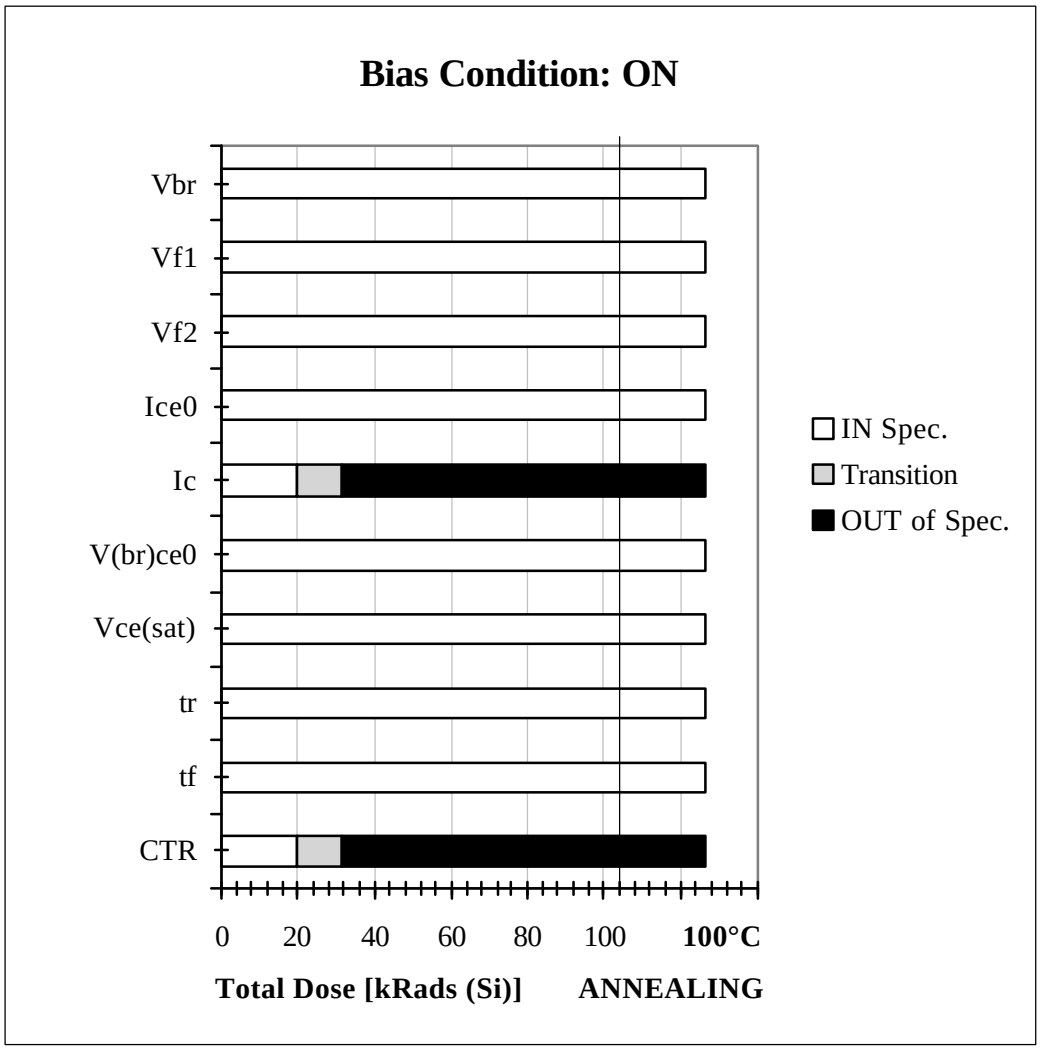
In the construction of these charts ,

1/ A parameter is considered to be out of specification if the parameter is measured out of specification on one or more devices.

2/ A parameter is considered to be in specification only up to the last step for which all irradiated devices remain inside the parameter specification.

3/ The step during which a parameter goes out of specification (or recovers) is called transition step.





III.2.2.Post irradiation effects.

Step 1.

Temperature : 100°C.
Duration : 171 h
Biasing : Parts biased as during irradiation.

Important remark : 100°C annealing results shall not be taken into account in an attempt to predict the space dose rate behavior of parts * .

III.2.3 Problems encountered / Discussion

- For breakdown voltage parameter (Vbr), all measurements are very close to the specification limit, and are considered acceptable due to the accuracy of the tester.

- An increase of V(br)ce0 parameter has been observed during irradiation. Due to the limitation of the tester, measurements are limited to 70 V for this parameter.

* "Hardness-Assurance and Testing Issues for Bipolar/BiCMOS Devices"
R. Nathan Nowlin, D.M. Fleetwood, R.D. Schrimpf, R.L. Pease, W.E. Combs
IEEE Transactions on Nuclear Science, Vol.40, N°6, p1686, December 1993

IV CONCLUSION

Total dose steady-state irradiation test using gamma rays from Cobalt 60 has been carried out on 10 parts (4 parts biased in Static 1 On mode, 4 parts in Static 2 On mode and 2 Off) OPTOELECTRONIC COMPONENT 3C91C (DC 9906) from MITEL up to 100.8 kRads test at low dose rate (≤ 360 Rad/h).

The results indicate that :

- All the parameters stay within specification up to 25 kRads (by interpolation from the figures).
- The first parameters which overstep the specification are Ic and CTR.

The following table shows the tolerance in kRad of parameters affected by irradiation (by interpolation from the figures) :

	Tolerance	
Parameter	**Static On**	**Static Off**
Ic / CTR(*)	25 kRads	50 kRads

(*) : CTR parameter is calculated using values measured for Ic parameter.

- Biasing mode effect : No particular biasing mode effect is observed. As the drifts measured on parts biased ON and OFF are similar, the diffrence observed on total dose tolerance is due to the initial values.

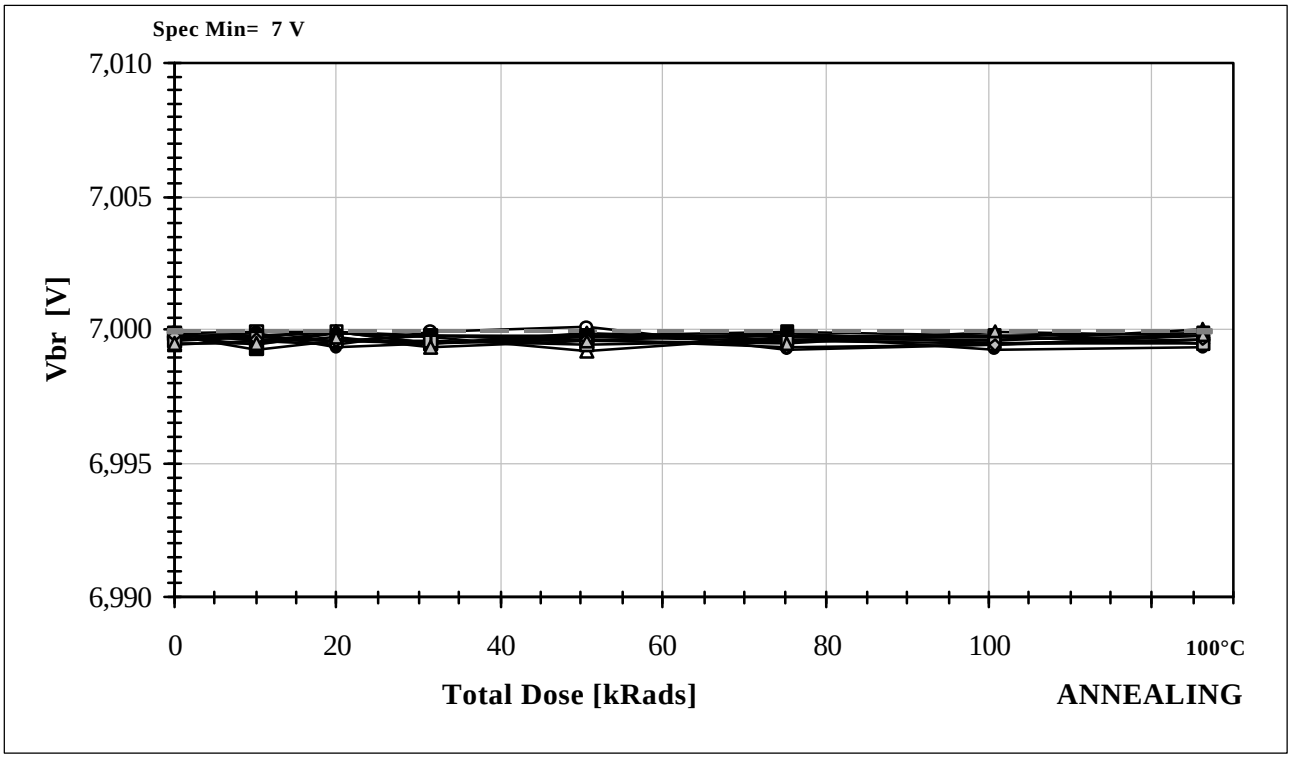
- Annealing effect : An annealing effect is observed on Ic, V(br)ce0 and CTR parameters. Nevertheless, the parts remain out of specification on Ic and CTR parameters after 100°C annealing.

In the following table, a comparison is made with other date codes from the same manufacturer, already tested :

Date code	**Diffusion lot**	**Tolerance (in kRad)**	**Report ref.**
9906	J11918.1 (diode) J11969.1 (transistor)	25 ON, 50 OFF	RA-59-1999
9806	826-5 (diode) 403231-33 (transistor)	37 ON, 45 OFF	DAT/DTR/RP 8.334
9631	822-8 (diode) 90493-18 (transistor)	47	DOF/DEC/RP 8.011
9441	817-6 (diode) 90492-8 (transistor)	15	DOF/DEC/RP 8.010

Date : 03/08/99	**Device Type :**	**3C91C**	**Figure** 1

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON / REF
Test	Parameter :	**Vbr**	Conditions :	Ir=-100µA

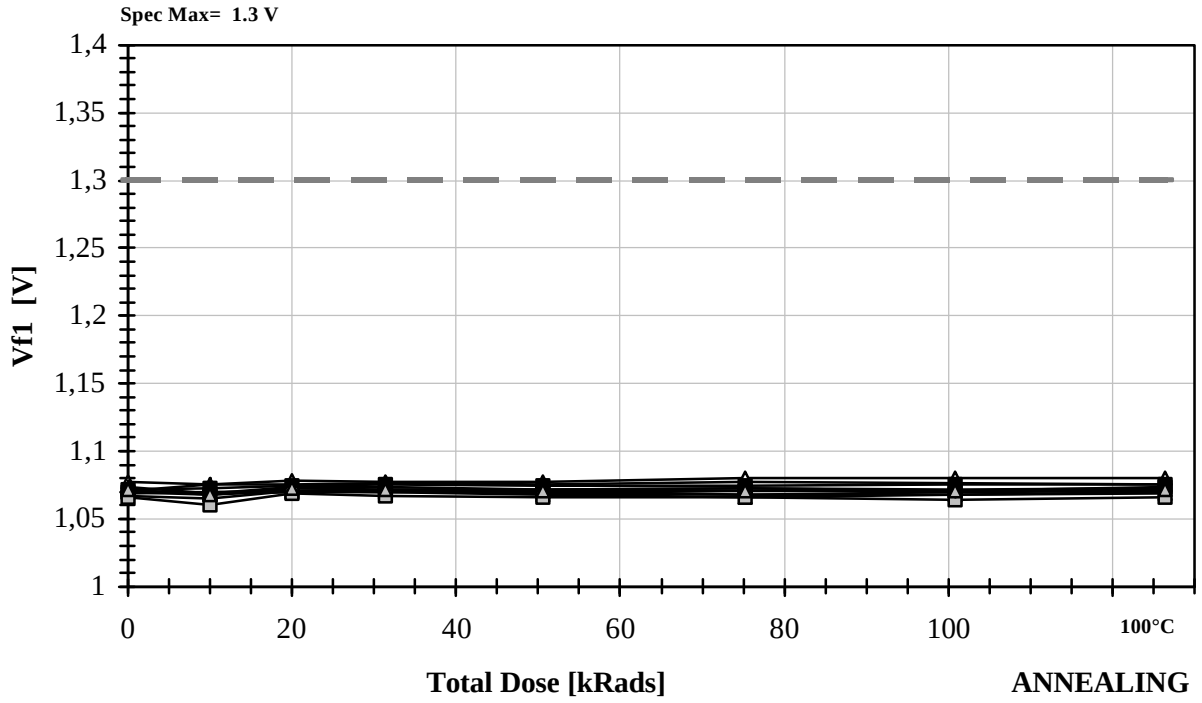


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]			0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF		**6,9998**	**6,9997**	**6,9996**	**6,9995**	**6,9997**	**6,9994**	**6,9995**	**6,9997**
10	OFF		**6,9995**	**6,9995**	**6,9997**	**6,9994**	**6,9996**	**6,9995**	**6,9999**	**6,9998**
1	ON Mode 1		**6,9997**	**6,9997**	**6,9999**	**6,9998**	**6,9997**	**6,9996**	**6,9998**	**6,9995**
2	ON Mode 1		**6,9995**	**6,9996**	**6,9999**	**6,9997**	**6,9992**	**6,9997**	**6,9996**	7,0001
3	ON Mode 1		**6,9999**	**6,9996**	**6,9995**	**6,9999**	7,0001	**6,9993**	**6,9995**	**6,9998**
4	ON Mode 1		**6,9998**	**6,9993**	**6,9996**	**6,9998**	**6,9998**	7,0000	**6,9998**	**6,9999**
5	ON Mode 2		**6,9997**	**6,9995**	**6,9999**	**6,9998**	**6,9996**	**6,9999**	**6,9995**	**6,9997**
6	ON Mode 2		**6,9998**	**6,9998**	**6,9999**	**6,9995**	**6,9999**	**6,9997**	**6,9997**	**6,9998**
7	ON Mode 2		**6,9997**	**6,9999**	**6,9993**	**6,9995**	**6,9998**	**6,9998**	**6,9993**	**6,9994**
8	ON Mode 2		**6,9996**	**6,9997**	**6,9996**	**6,9996**	**6,9995**	**6,9996**	**6,9995**	**6,9995**
Avg	REF		6,9999	7,0000	6,9999	6,9995	6,9997	6,9998	6,9997	6,9995

Date : 03/08/99	Device Type :	3C91C	Figure 2

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON Mode 1 / ON Mode 2 / REF
Test	Parameter :	**Vf1**	Conditions :	If=2mA

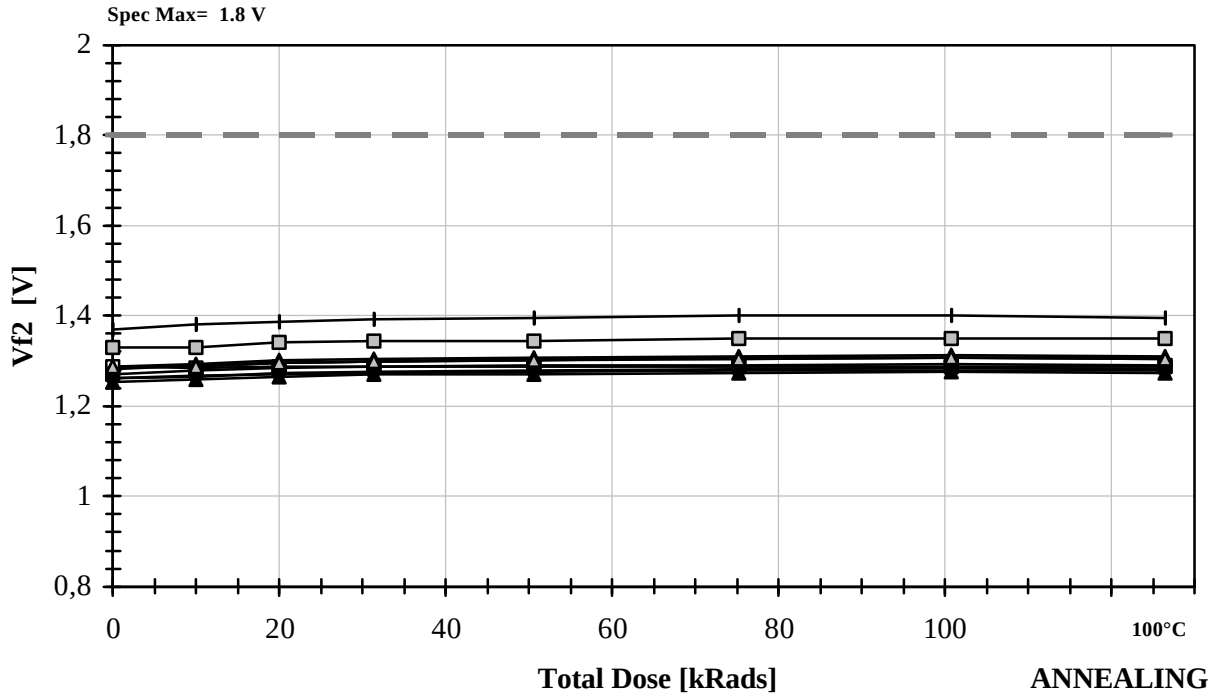


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]		0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF	1,073552	1,068592	1,073568	1,073084	1,071376	1,07238	1,070896	1,072584
10	OFF	1,07184	1,06776	1,07238	1,071992	1,0711	1,071128	1,070696	1,071632
1	ON Mode 1	1,070272	1,074948	1,075652	1,076692	1,074972	1,077444	1,07608	1,075532
2	ON Mode 1	1,077424	1,075288	1,078544	1,077528	1,076884	1,079708	1,080448	1,080244
3	ON Mode 1	1,067368	1,064896	1,071012	1,071428	1,071204	1,072444	1,071932	1,072136
4	ON Mode 1	1,071568	1,072468	1,074484	1,07536	1,07408	1,074856	1,07532	1,07578
5	ON Mode 2	1,069728	1,070124	1,070808	1,069692	1,070216	1,067724	1,069872	1,07038
6	ON Mode 2	1,070112	1,069088	1,0702	1,06952	1,067604	1,066248	1,06804	1,06866
7	ON Mode 2	1,069224	1,070068	1,069504	1,070908	1,068548	1,06808	1,068172	1,069652
8	ON Mode 2	1,066164	1,060028	1,068828	1,06684	1,06558	1,066316	1,064436	1,065908
Avg	REF	1,069366	1,068052	1,07055	1,070598	1,070158	1,070658	1,071132	1,073104

Date : 03/08/99	**Device Type :**	**3C91C**	**Figure** 3

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON Mode 1 / ON Mode 2 / REF
Test	Parameter :	**Vf2**	Conditions :	If=50mA

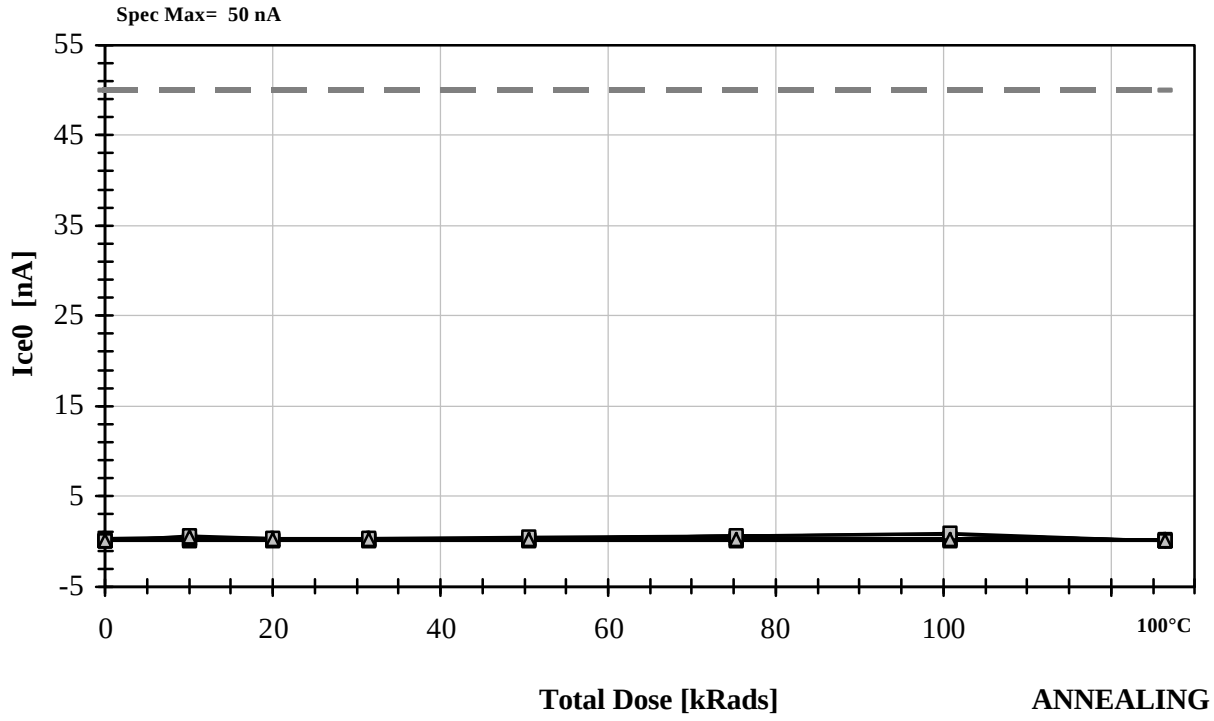


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]		0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF	1,28664	1,286852	1,295748	1,299224	1,302032	1,306492	1,30786	1,306752
10	OFF	1,286208	1,286896	1,29522	1,297936	1,300808	1,30402	1,305752	1,304988
1	ON Mode 1	1,369124	1,381084	1,387892	1,393432	1,395136	1,399516	1,399496	1,395564
2	ON Mode 1	1,2881	1,29278	1,300856	1,303872	1,306548	1,310796	1,312432	1,309296
3	ON Mode 1	1,262396	1,264728	1,27298	1,276504	1,279232	1,282316	1,283232	1,281224
4	ON Mode 1	1,271224	1,277772	1,283748	1,28754	1,288984	1,290948	1,29214	1,289768
5	ON Mode 2	1,281556	1,289884	1,295672	1,298988	1,30296	1,30366	1,307264	1,304712
6	ON Mode 2	1,254552	1,260268	1,265676	1,26882	1,270548	1,272184	1,274508	1,272032
7	ON Mode 2	1,26098	1,266104	1,269948	1,274144	1,275844	1,277724	1,279548	1,278548
8	ON Mode 2	1,33016	1,33008	1,341556	1,342832	1,344932	1,348456	1,34892	1,34866
Avg	REF	1,285948	1,284926	1,286754	1,28681	1,286446	1,286678	1,287108	1,288648

Date : 03/08/99	Device Type :	3C91C	Figure 4

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON / REF
Test	Parameter :	**Ice0**	Conditions :	Vce=5V/If=0mA

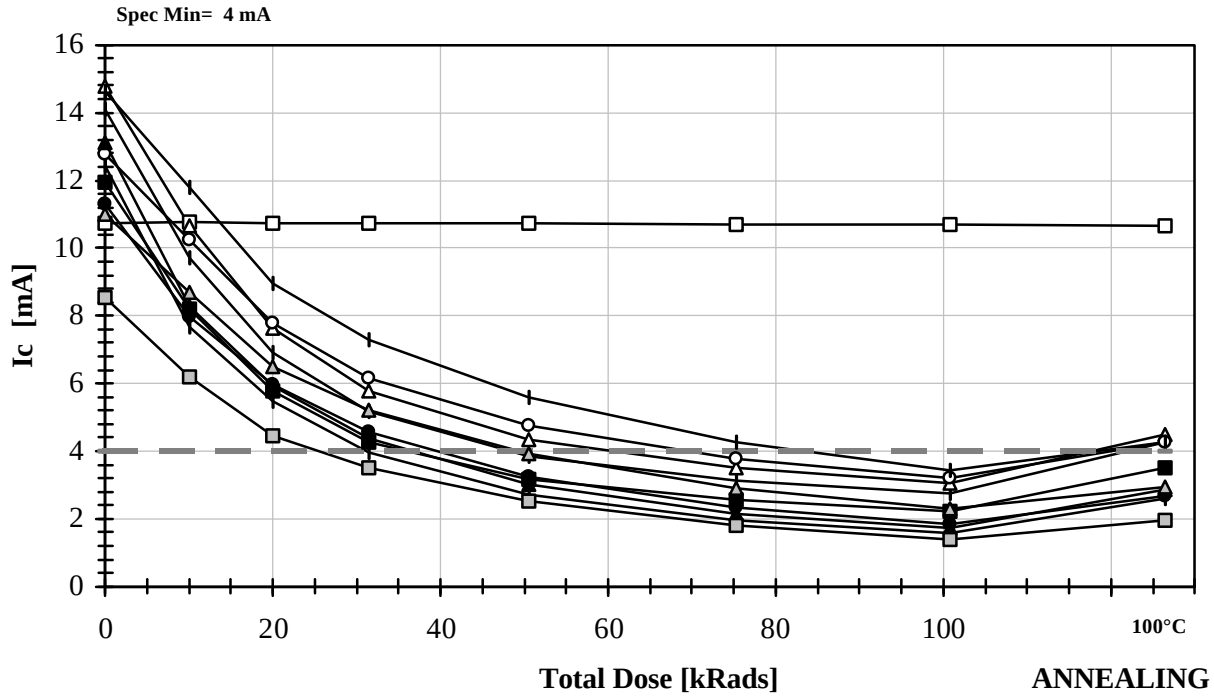


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]			0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF		0,00093	0,30834	0,23483	0,20244	0,18914	0,19517	0,25794	0,10120
10	OFF		0,06297	0,42924	0,27120	0,22533	0,18403	0,18924	0,23292	0,10071
1	ON Mode 1		0,24378	0,21710	0,22557	0,19642	0,25688	0,27089	0,39642	0,27115
2	ON Mode 1		0,20347	0,34132	0,25495	0,28982	0,31066	0,29676	0,34404	0,23523
3	ON Mode 1		0,04700	0,32013	0,21911	0,29691	0,32898	0,30399	0,36138	0,23166
4	ON Mode 1		0,14404	0,24020	0,21800	0,20030	0,24025	0,29957	0,37581	0,20334
5	ON Mode 2		0,14325	0,28088	0,18050	0,20009	0,32339	0,67711	0,79977	0,07882
6	ON Mode 2		0,13700	0,32047	0,21065	0,21546	0,37486	0,66836	0,81381	0,12081
7	ON Mode 2		0,32633	0,45383	0,35075	0,26915	0,41084	0,63321	0,81014	0,10723
8	ON Mode 2		0,07642	0,67338	0,28737	0,37464	0,49529	0,62618	0,87742	0,11923
Avg	REF		0,08021	0,09637	0,06275	0,06349	0,05458	0,06528	0,04167	0,02337

Date : 03/08/99	Device Type :	3C91C	Figure 5

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON Mode 1 / ON Mode 2 / REF
Test	Parameter :	**Ic**	Conditions :	Vce=5V/If=10mA

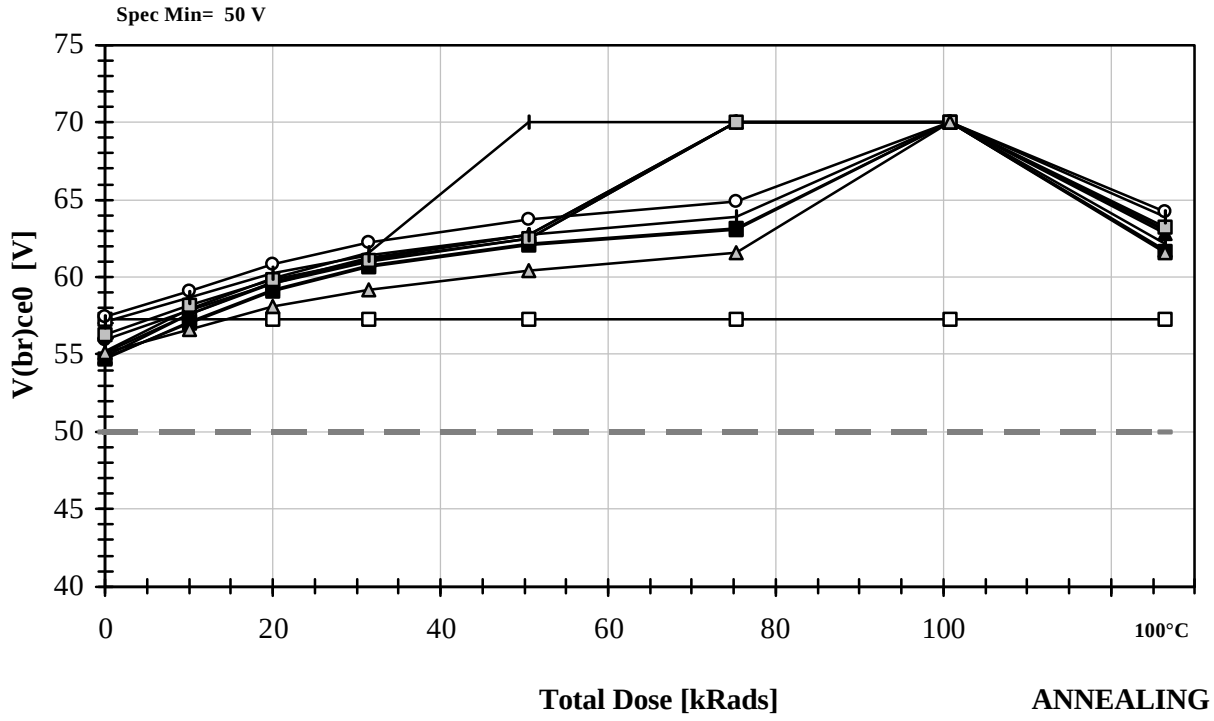


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]			0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF		14,636	11,785	8,9532	7,2796	5,5717	4,2721	**3,4466**	4,2751
10	OFF		11,009	8,695	6,4903	5,2274	**3,9282**	**2,892**	**2,2916**	**2,946**
1	ON Mode 1		14,114	9,7083	6,9277	5,1587	**3,8626**	**3,1436**	**2,7548**	4,2597
2	ON Mode 1		14,77	10,644	7,6476	5,7593	4,3361	**3,5168**	**3,0688**	4,4778
3	ON Mode 1		12,782	10,2372	7,7861	6,1642	4,7397	**3,7686**	**3,2149**	4,2622
4	ON Mode 1		11,925	8,2044	5,7611	4,2681	**3,1763**	**2,5569**	**2,2341**	**3,4905**
5	ON Mode 2		12,435	7,6624	5,4788	**3,9763**	**2,7214**	**1,9604**	**1,5723**	**2,595**
6	ON Mode 2		13,119	8,2738	5,9268	4,3623	**3,0025**	**2,1468**	**1,7477**	**2,8763**
7	ON Mode 2		11,291	7,953	5,9563	4,56	**3,2332**	**2,3442**	**1,838**	**2,6659**
8	ON Mode 2		8,521	6,2093	4,452	**3,5043**	**2,5285**	**1,8106**	**1,3934**	**1,9697**
Avg	REF		10,735	10,7665	10,733	10,726	10,7375	10,708	10,713	10,64915

Date : 03/08/99	Device Type :	3C91C	Figure 6

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON Mode 1 / ON Mode 2 / REF
Test	Parameter :	**V(br)ce0**	Conditions :	Ic=10mA/If=0mA

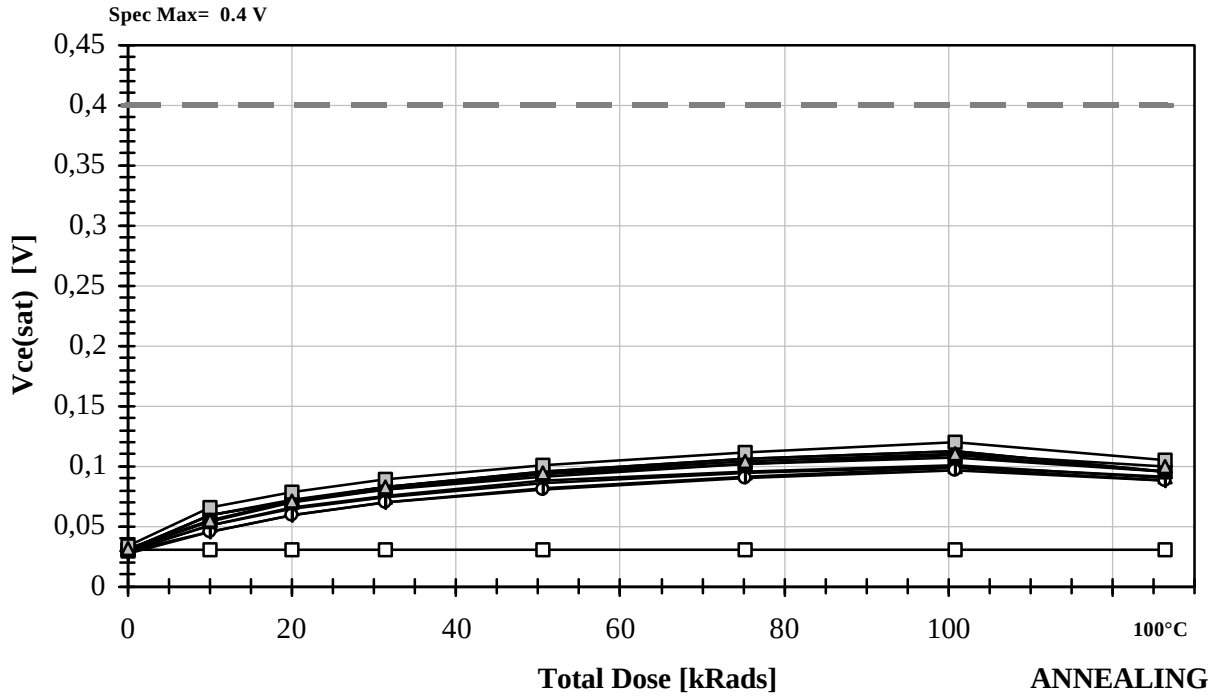


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]			0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF		57,135	58,671	60,276	61,432	62,766	63,93	70,001	63,898
10	OFF		55,106	56,574	58,096	59,173	60,436	61,584	70,002	61,541
1	ON Mode 1		55,112	57,614	59,672	61,279	62,751	70,001	70,001	62,181
2	ON Mode 1		54,783	57,057	59,058	60,627	62,081	63,04	70,001	61,766
3	ON Mode 1		57,471	59,093	60,815	62,221	63,713	64,904	70,001	64,217
4	ON Mode 1		54,684	57,123	59,163	60,731	62,172	63,109	70,001	61,649
5	ON Mode 2		55,166	57,975	59,948	61,545	70,002	70	70	63,021
6	ON Mode 2		54,906	57,628	59,63	61,153	62,751	69,999	70,001	62,815
7	ON Mode 2		55,965	57,867	59,608	60,983	62,526	70	69,999	63,088
8	ON Mode 2		56,284	58,153	59,839	61,044	62,462	69,998	70,001	63,271
Avg	REF		57,2705	57,2695	57,2655	57,2645	57,2645	57,2665	57,2615	57,262

Date : 03/08/99	**Device Type :**	**3C91C**	**Figure** 7

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON Mode 1 / ON Mode 2 / REF
Test	Parameter :	**Vce(sat)**	Conditions :	Ic=2mA/If=50mA

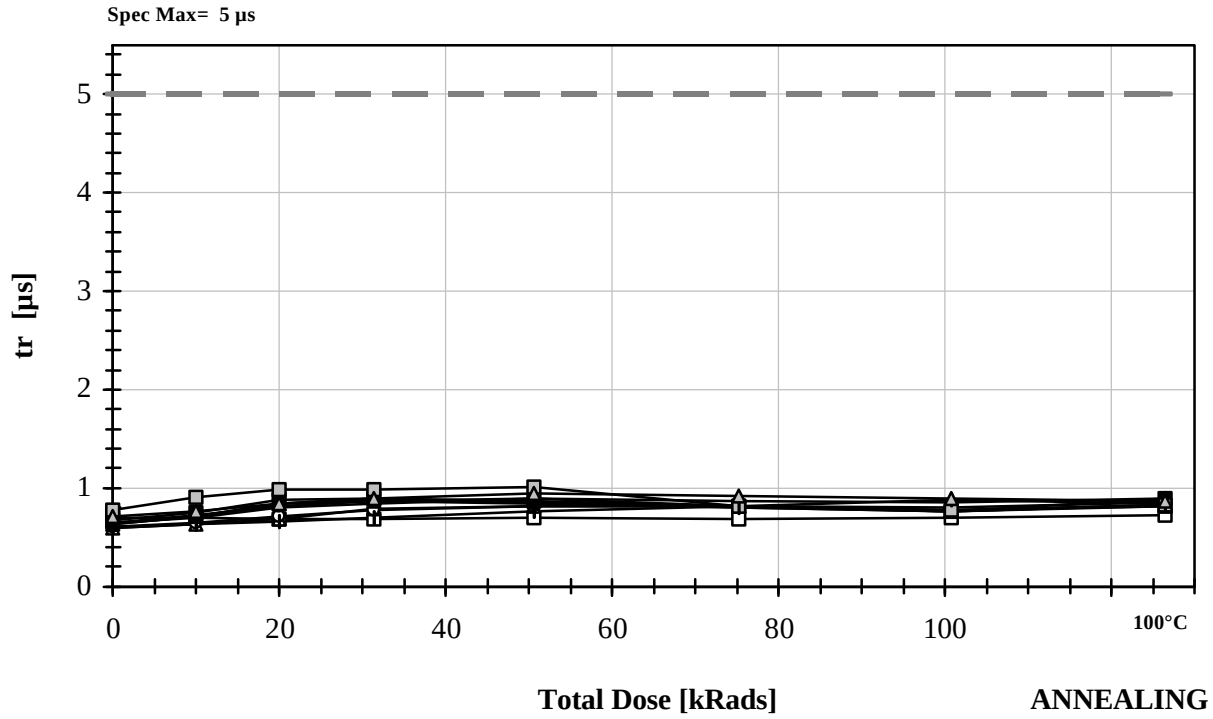


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]		0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF	0,027128	0,045076	0,059076	0,070422	0,082044	0,091332	0,098472	0,08753
10	OFF	0,03113	0,0546	0,070836	0,082352	0,094222	0,10375	0,110796	0,099848
1	ON Mode 1	0,029766	0,05098	0,065364	0,075502	0,08761	0,095726	0,101188	0,09052
2	ON Mode 1	0,030046	0,050452	0,064674	0,074618	0,086354	0,094584	0,099942	0,090782
3	ON Mode 1	0,02917	0,045904	0,059816	0,06978	0,080954	0,08992	0,096142	0,088496
4	ON Mode 1	0,030056	0,054392	0,06988	0,080946	0,093072	0,10148	0,107012	0,095878
5	ON Mode 2	0,029216	0,059384	0,071526	0,082554	0,09519	0,10566	0,112842	0,095662
6	ON Mode 2	0,030626	0,059416	0,071614	0,082242	0,095292	0,105864	0,112936	0,0959
7	ON Mode 2	0,030644	0,058946	0,071148	0,080274	0,091672	0,10133	0,109152	0,095502
8	ON Mode 2	0,033514	0,06591	0,078462	0,088896	0,101256	0,111792	0,120438	0,105164
Avg	REF	0,030438	0,030462	0,03031	0,030307	0,030408	0,030262	0,030224	0,030178

Date : 03/08/99	**Device Type :**	**3C91C**	**Figure** 8

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON Mode 1 / ON Mode 2 / REF
Test	Parameter :	**tr**	Conditions :	Ic=2 mA; Vce=5V

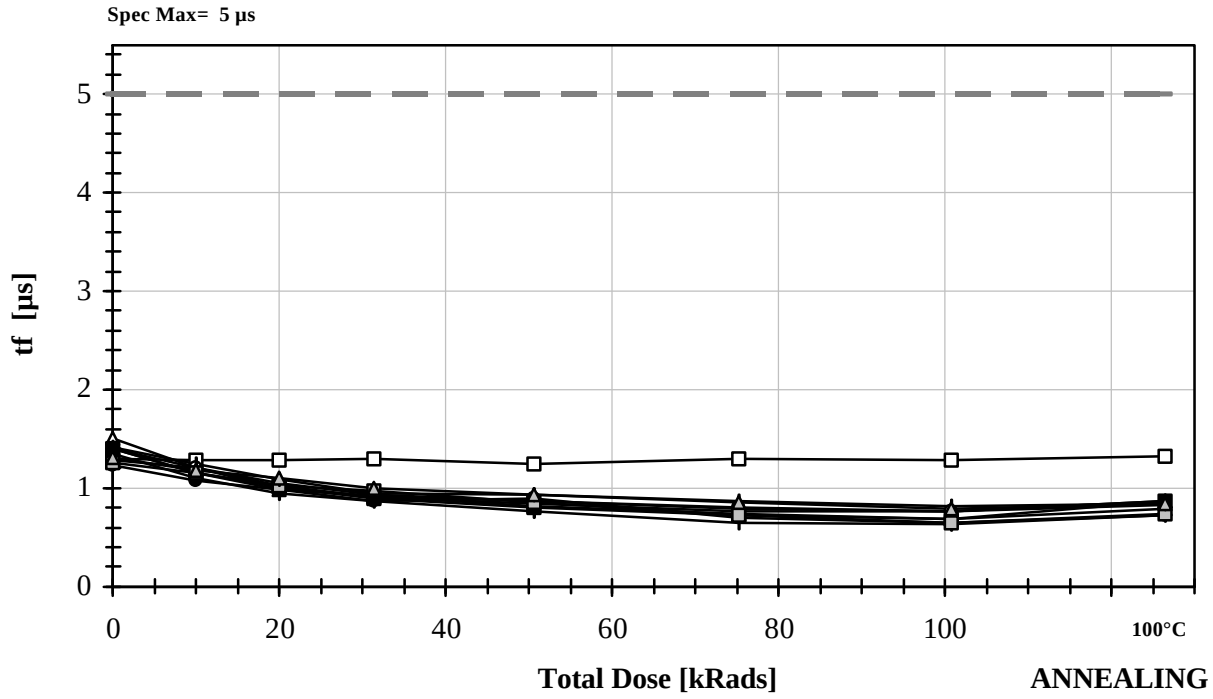


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]			0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF		0,6	0,63	0,66	0,7	0,77	0,82	0,88	0,84
10	OFF		0,71	0,76	0,84	0,9	0,95	0,92	0,9	0,87
1	ON Mode 1		0,65	0,7	0,8	0,84	0,89	0,87	0,85	0,89
2	ON Mode 1		0,6	0,63	0,69	0,79	0,81	0,81	0,78	0,81
3	ON Mode 1		0,61	0,65	0,71	0,78	0,82	0,82	0,8	0,85
4	ON Mode 1		0,67	0,75	0,88	0,9	0,87	0,82	0,77	0,89
5	ON Mode 2		0,64	0,71	0,84	0,9	0,85	0,8	0,77	0,83
6	ON Mode 2		0,64	0,71	0,84	0,87	0,9	0,82	0,77	0,83
7	ON Mode 2		0,65	0,73	0,81	0,87	0,84	0,8	0,77	0,81
8	ON Mode 2		0,78	0,91	0,98	0,99	1,01	0,82	0,78	0,83
Avg	REF		0,7	0,7	0,69	0,69	0,7	0,69	0,7	0,72

Date : 03/08/99	**Device Type :**	**3C91C**	**Figure 9**

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON Mode 1 / ON Mode 2 / REF
Test	Parameter :	**tf**	Conditions :	Ic=2 mA; Vce=5V

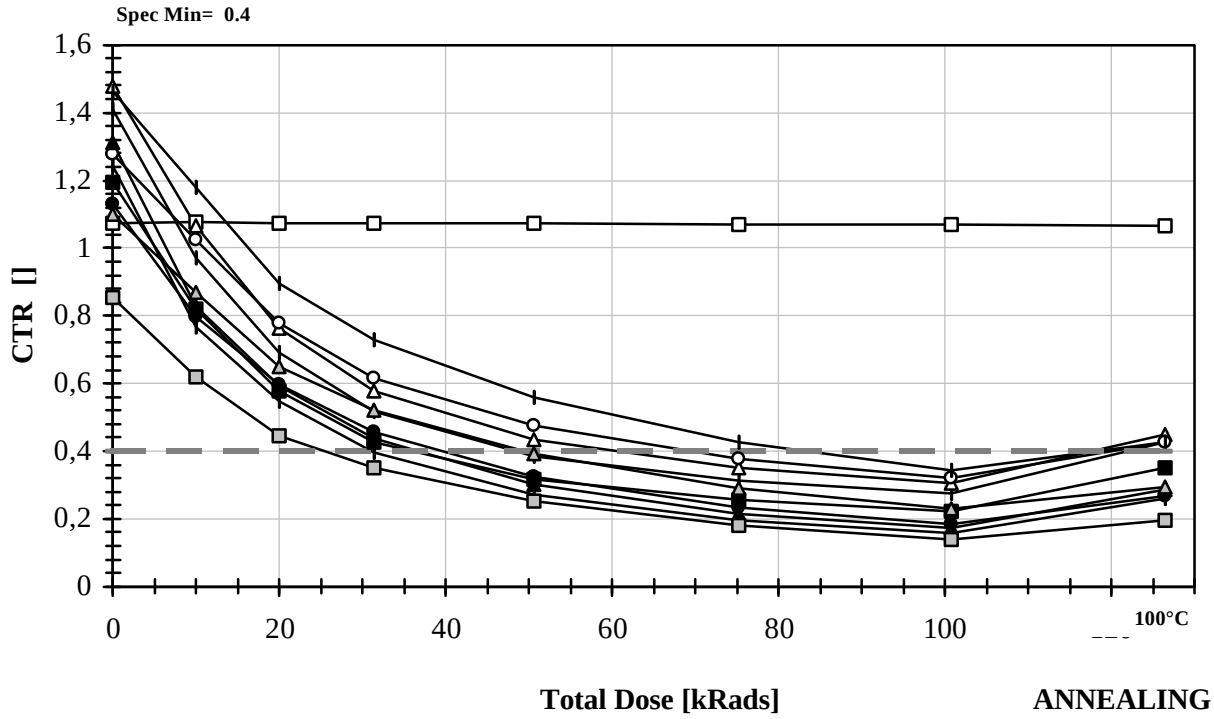


Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]			0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF		1,41	1,25	1,09	0,95	0,93	0,87	0,82	0,84
10	OFF		1,31	1,18	1,1	1	0,93	0,85	0,79	0,84
1	ON Mode 1		1,4	1,2	1,05	0,93	0,87	0,79	0,77	0,87
2	ON Mode 1		1,5	1,2	1,03	0,91	0,84	0,76	0,76	0,87
3	ON Mode 1		1,28	1,2	1	0,92	0,87	0,8	0,77	0,83
4	ON Mode 1		1,4	1,15	1,01	0,9	0,8	0,73	0,68	0,87
5	ON Mode 2		1,35	1,1	0,94	0,87	0,77	0,65	0,64	0,73
6	ON Mode 2		1,4	1,15	0,99	0,92	0,81	0,74	0,69	0,79
7	ON Mode 2		1,23	1,07	0,99	0,87	0,89	0,7	0,65	0,73
8	ON Mode 2		1,26	1,15	1,02	0,97	0,86	0,72	0,65	0,74
Avg	REF		1,3	1,28	1,28	1,3	1,24	1,3	1,29	1,32

Date : 03/08/99	**Device Type :**	**3C91C**	**Figure** 10

Component	Date Code :	**9906**	Manufacturer :	MITEL
Irradiation	Dose Rate :	<= 0.36 kRad / h	Conditions :	OFF / ON Mode 1 / ON Mode 2 / REF
Test	Parameter :	**CTR**	Conditions :	CTR=Ic/If; Vce=5V / If=10 mA



Comments : *The last step correspond to the post annealing measurements*

Total Dose [kRad(Si)]			0	10	20	31,4	50,6	75,2	100,8	100°C
9	OFF		1,4636	1,1785	0,89532	0,72796	0,55717	0,42721	**0,34466**	0,42751
10	OFF		1,1009	0,8695	0,64903	0,52274	**0,39282**	**0,2892**	**0,22916**	**0,2946**
1	ON Mode 1		1,4114	0,97083	0,69277	0,51587	**0,38626**	**0,31436**	**0,27548**	0,42597
2	ON Mode 1		1,477	1,0644	0,76476	0,57593	0,43361	**0,35168**	**0,30688**	0,44778
3	ON Mode 1		1,2782	1,02372	0,77861	0,61642	0,47397	**0,37686**	**0,32149**	0,42622
4	ON Mode 1		1,1925	0,82044	0,57611	0,42681	**0,31763**	**0,25569**	**0,22341**	**0,34905**
5	ON Mode 2		1,2435	0,76624	0,54788	**0,39763**	**0,27214**	**0,19604**	**0,15723**	**0,2595**
6	ON Mode 2		1,3119	0,82738	0,59268	0,43623	**0,30025**	**0,21468**	**0,17477**	**0,28763**
7	ON Mode 2		1,1291	0,7953	0,59563	0,456	**0,32332**	**0,23442**	**0,1838**	**0,26659**
8	ON Mode 2		0,8521	0,62093	0,4452	**0,35043**	**0,25285**	**0,18106**	**0,13934**	**0,19697**
Avg	REF		1,0735	1,07665	1,0733	1,0726	1,07375	1,0708	1,0713	1,064915

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