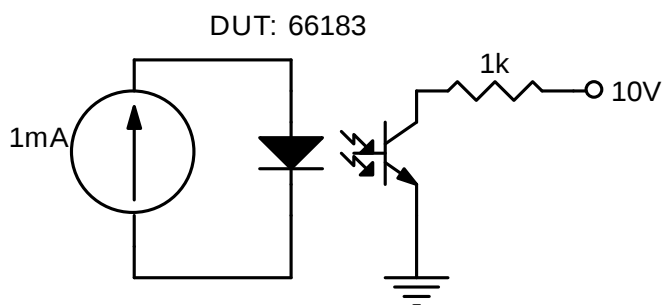


Component No 66183-105		Component Designation: 66183-105	Irradiation Spec. No.: ESCC 22900 Issue 4
Gen. Spec.: -- Det. Spec.: MFR Datasheet Amend.: --		Evaluation: X Acceptance Wafer: - Acceptance Lot: -	Project/Programme: LDT (ESA) AO / 1-6172 / 09 / F / WE
Family: 18	Group: 01	Functional Assignment: Proton Radiation Tolerant 6Pin Optocoupler	Package: LCC-6
Manuf.Name: MICROPAC INDUSTRIES Address: USA		Test House: ATN Address: SEVILLA (SPAIN)	Orig.house: ATN Address: SEVILLA (SPAIN)
Radiation Test Plan No.: ATGSP-RP-80 Iss1		Sample Size: 22 Irradiation Devices: 20 Control Devices: 2	Date Code: 1112 Diffusion Lot: See summary. Diffusion Run: See summary. Wafer Lot: See summary.
Radiation Source: Cobalt-60 Facility Name: ESA (ESTEC) Address: NOORDWIJK (HOLLAND)		Energy: 1.33/1.17 MeV Dose Rate: 35.4 & 323.7 rad(Si)/h	Interest level: 100krad(Si) Maximum Test Level: 100krad(Si)
Irradiation Conditions: Biased: X (10 samples) Unbiased: X (10 samples) Test Circuit: Figure 1		Irradiation Measurements Interval: Remote test: X In situ Test: --	Annealing Tests: 24h@25°C, 168h@100°C Biased: X (10 samples) Unbiased: X (10 samples) Test Circuit: Figure 1
Electrical Measurements. Parameters Tested: I_R , V_F , I_{CEO} , $I_{C(ON)}$, $V_{CE(SAT)}$, CTR1, CTR2, CTR3, CTR4, CTR5, CTR6, CTR7, $V_{(BR)CBO}$, $V_{(BR)CEO}$, $V_{(BR)EBO}$.			
Prepared by.: Antonio Romero Mallén Date: 2012/11/12 Signature: 		Approved by.: Eugenio Muñoz Plaza Date: 2012/11/12 Signature: 	

DOCUMENT CHANGE CONTROL

Edition / Revision	Date	Affected Edition / Revision	Affected Paragraph / Modification
ATN-RR-004/2012 Iss.1	2012/07/10	--	First edition of this document.
ATN-RR-004/2012 Iss.2	2012/11/12	ATN-RR-004/2012 Iss.1	Footer on the pages updated with new issue of document format. Company's logo updated. Test house name updated. Electrical measurements at room temperature conditions included as ANNEX III. Deviations to plan included in ANNEX III.

FIGURE 1.-RADIATION BIAS CIRCUITS



Notes:

1. Ten parts(5 ELDR+5 LDR) were irradiated biased ON, in accordance with the radiation bias circuit shown in Figure 1.
2. Ten parts(5 ELDR+ 5 LDR) were irradiated biased OFF: the pins are short circuited and connected to ground.
3. The samples were soldered in a PCB in order to adapt the package to the test fixture socket.

SUMMARY

In order to evaluate the behaviour of the samples between ELDR, LDR, ON and OFF biased, a total dose steady-state irradiation test has been carried out on a Proton Radiation Tolerant Optocoupler, manufactured by Micropac Industries, USA. The test was performed using two dose rate (35.4 rad(Si)/h and 323.7rad (Si)/h) until a total accumulated dose of 100krad(Si). The irradiated parts were labelled as follows:

Serial Number	Bias condition	Dose rate
R1	Control device	ELDR
R2	ON	
R3		
R4		
R5		
R6		
R7	OFF	
R8		
R9		
R10		
R11		
R1	Control device	LDR
R2	ON	
R3		
R4		
R5		
R6		
R7	OFF	
R8		
R9		
R10		
R11		

WAFER LOT NUMBER

LED: LOT# 49TCD, TRACE# C00613
DET: LOT# 2301-1, TRACE# E00240

RESULTS

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

ELDR									
	0Krad	6Krad	13Krad	20Krad	30Krad	50Krad	100Krad	ANN24	ANN168
I_R	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
V_F	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
I_{CEO}	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
$I_{C(ON)}$	PASS	PASS	PASS	PASS	PASS	PASS	(1)	(1)	PASS
$V_{CE(SAT)}$	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR1	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR2	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR3	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR4	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR5	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR6	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR7	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
$V_{(BR)CBO}$	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
$V_{(BR)CEO}$	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
$V_{(BR)EBO}$	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
LDR									
	0Krad	6Krad	13Krad	20Krad	30Krad	50Krad	100Krad	ANN24	ANN168
I_R	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
V_F	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
I_{CEO}	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
$I_{C(ON)}$	PASS	PASS	PASS	PASS	PASS	(1)	(1)	(1)	PASS
$V_{CE(SAT)}$	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR1	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR2	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR3	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR4	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR5	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR6	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
CTR7	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
$V_{(BR)CBO}$	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
$V_{(BR)CEO}$	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
$V_{(BR)EBO}$	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

(1) Values out of limits.

The values measured and graphs with the evolution of the previous parameters during the irradiation test and annealing sequence are available in ANNEX I.

	TOTAL DOSE RADIATION TEST REPORT No. ATN-RR-004/2012	Issue: 2/Rev:	Page: 6/11
		Date: 2012/11/12	
		R.L: 2011902917 / 2011902918	

CONCLUSION

The results obtained during the irradiation test, show that this lot is sensitive to the cumulative radiation dose when tested at dose rates of 35.4 rad(Si)/h and 323.7 rad(Si)/h up to a cumulative dose of 100krad(Si).

The most affected parameters are the IC(ON), VCE(SAT), CTR's, VCBO, and VCEO(BR). The IC(ON) parameter starts to be out of limits at 50krad step for LDR and at 100krad step for ELDR. The other parameters remain within specification limits. The samples tend to recover their initial values during the annealing process.

-IC(ON): The results show a higher degradation in the samples biased OFF than the biased ON. A slight difference between LDR and ELDR in the samples biased On is observed at 100krad and annealing 24h steps.

-VCE(SAT): The results show a higher degradation in the samples biased OFF than the biased ON. A slight difference between LDR and ELDR in the samples biased On is observed at 100krad step.

-CTR's: The results show a higher degradation in the samples biased OFF than the biased ON. A slight difference between LDR and ELDR in the samples biased On is observed at 100krad and annealing 24h steps.

-VCBO: The results show a higher degradation in the samples biased ON at ELDR.

-VCEO(BR): The results show a higher degradation in the samples biased OFF than the biased ON.

For the rest of the parameters, it is not observed a clear differentiate behaviour between ELDR, LDR, On and Off biased parts

SCHEDULE

ELDR Average Dose Rate (1)	LDR Average Dose Rate (2)	Cummulative ELDR Total Dose	ELDR Measurement date	Cummulative LDR Total Dose	LDR Measurement date	Step Deviation ELDR vs LDR (%)
rad(Si)/h	rad(Si)/h	krad(Si)	--	krad(Si)	--	
--	--	0	2012/02/15	0	2012/06/04	--
35.41	323.7	5240	2012/02/21	5707	2012/06/05	8.9
		12168	2012/02/29	13362	2012/06/06	9.8
		19201	2012/03/08	20644	2012/06/07	7.5
		28612	2012/03/19	28167	2012/06/08	-1.5
		48417	2012/04/11	48498	2012/06/11	0.1
		106074	2012/06/18	102360	2012/06/18	-3.7
Annealing						
ann24h @25°C	24	--	2012/06/19	--	2012/06/19	
ann168h @100°C	168	--	2012/06/26	--	2012/06/26	

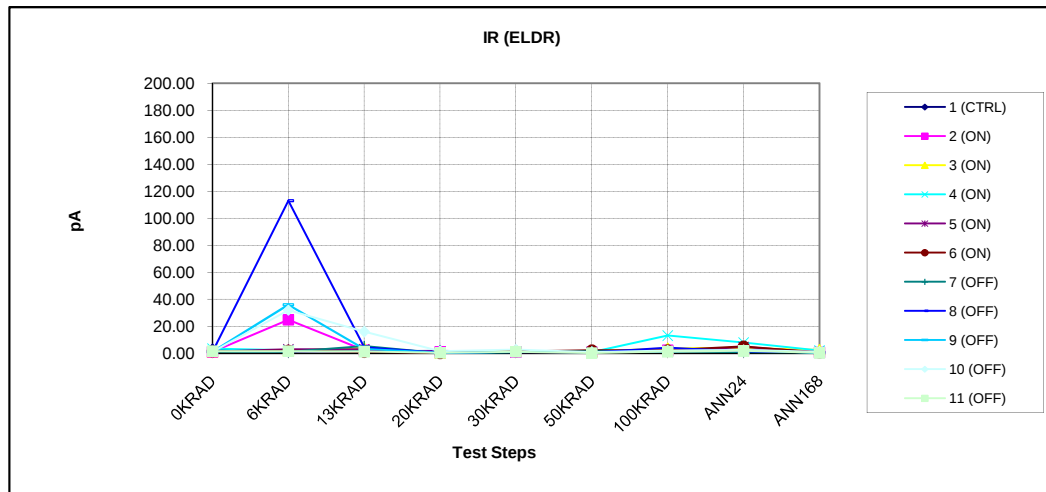
(1) The minimum and maximum dose rate registered were 18.6rad (Si)/h and 38.9rad (Si)/h respectively.

(2) The minimum and maximum dose rate registered were 271.2 rad(Si)/h and 360.6 rad(Si)/h respectively.

ELECTRICAL MEASUREMENTS EQUIPMENT LIST

REF INVENT	DESCRIPTION	MFR	MODEL	CALIBRATION DUE	USAGE
LE0304.000	UNIVERSAL TEST SYSTEM	SZ	M-3000	2012/08/15	0,6,13,20,35,50,100Krad, ANN24, ANN168
LE0393.003	TEST ADAPTER	SZ	UNIVERSAL FRONT ADAPTER	--	0,6,13,20,35,50,100Krad, ANN24, ANN168
LE080.008	TEST ADAPTER	SZ	TA06B	--	0,6,13,20,35,50,100Krad, ANN24, ANN168
LE0389.002	TEST ADAPTER	SZ	UNIVERSAL FRONT ADAPTER	--	0,6,13,20,35,50,100Krad, ANN24, ANN168
LE0389.003	TEST ADAPTER	SZ	TA07B	--	0,6,13,20,35,50,100Krad, ANN24, ANN168
LE0400.000	HIGH RESISTANCE METER	AGILENT	4339B	2012/09/21	0,6,13,20,35,50,100Krad, ANN24, ANN168

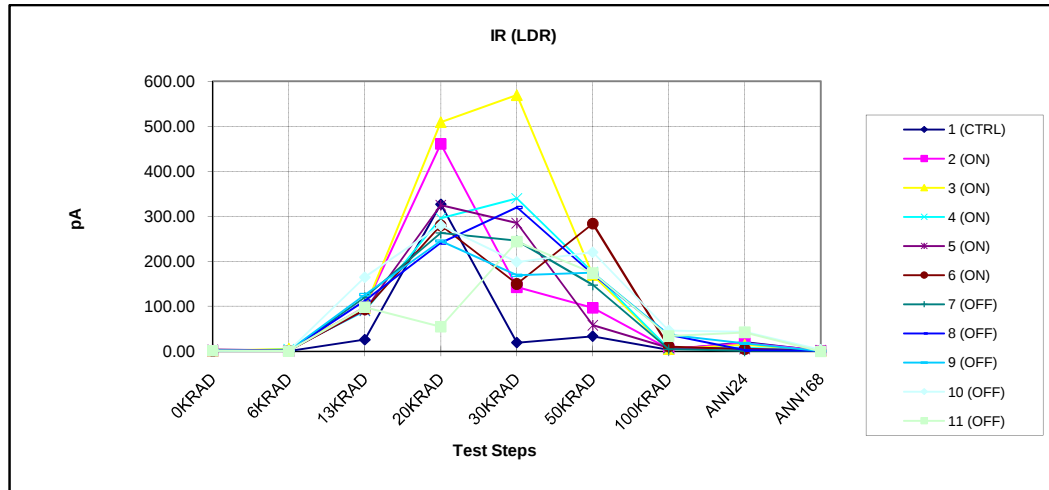
ANNEX I ELECTRICAL MEASUREMENTS GRAPHS



IR (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06
Unit	pA	pA	pA	pA	pA	pA	pA	pA	pA
Control Results									
1 (CTRL)	3.0	1.4	1.8	1.9	1.1	1.3	2.1	2.9	0.7

Bias on results									
2 (ON)	1.2	25.0	2.4	1.1	1.1	1.0	2.4	2.9	0.7
3 (ON)	1.3	2.1	4.0	0.4	1.9	1.5	3.8	4.1	2.6
4 (ON)	3.5	2.5	1.7	0.6	1.2	0.9	13.2	8.0	2.0
5 (ON)	1.5	3.0	3.2	0.4	1.3	1.0	1.3	4.7	0.9
6 (ON)	1.5	2.1	1.1	0.2	1.5	2.4	2.4	5.3	0.5
Statistics bias on									
min result	1.2	2.1	1.1	0.2	1.1	0.9	1.3	2.9	0.5
max result	3.5	25.0	4.0	1.1	1.9	2.4	13.2	8.0	2.6
average	1.8	6.9	2.5	0.5	1.4	1.3	4.6	5.0	1.4
sigma	0.9	10.1	1.1	0.3	0.3	0.6	4.9	1.9	0.9

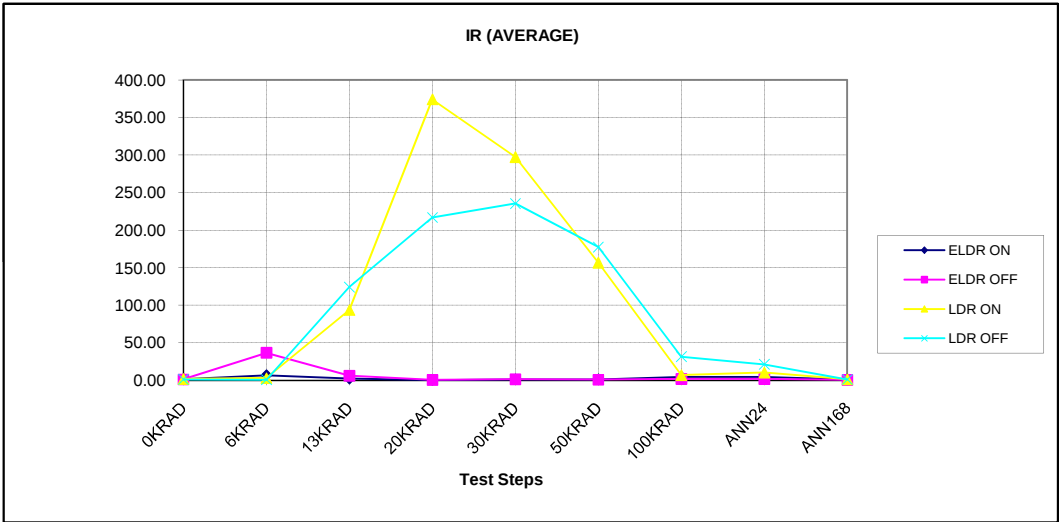
Bias off results									
7 (OFF)	1.3	1.1	5.5	0.3	1.0	1.6	1.4	1.0	0.8
8 (OFF)	1.3	113.0	4.4	0.4	1.2	0.7	4.3	1.4	0.9
9 (OFF)	1.3	36.0	3.4	0.4	1.1	0.9	1.5	2.6	0.3
10 (OFF)	1.3	32.0	16.0	1.6	2.9	0.9	2.1	2.7	1.2
11 (OFF)	1.8	1.7	1.3	0.5	1.2	0.3	1.4	1.8	0.4
Statistics bias off									
min result	1.3	1.1	1.3	0.3	1.0	0.3	1.4	1.0	0.3
max result	1.8	113.0	16.0	1.6	2.9	1.6	4.3	2.7	1.2
average	1.4	36.8	6.1	0.6	1.5	0.9	2.1	1.9	0.7
sigma	0.2	45.6	5.7	0.6	0.8	0.5	1.2	0.7	0.4



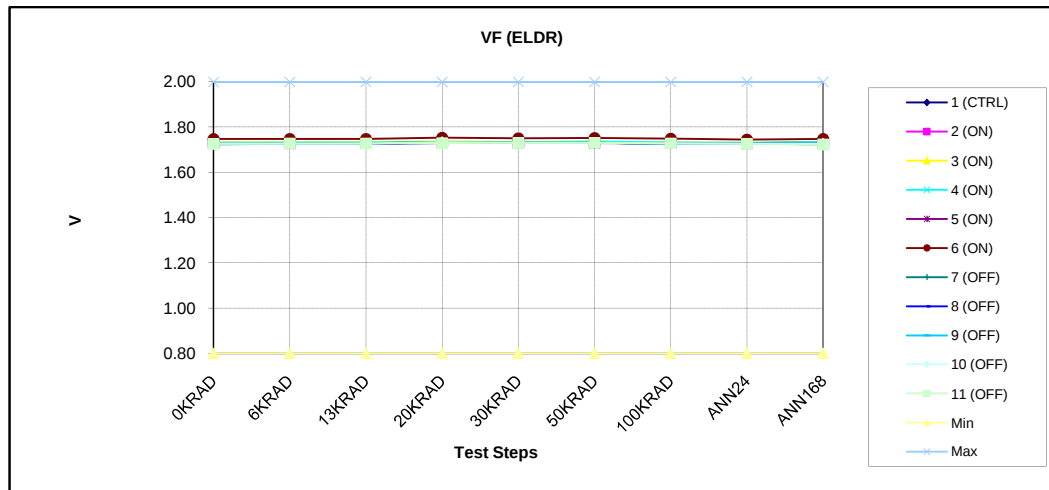
IR (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06	10.0E+06
Unit	pA	pA	pA	pA	pA	pA	pA	pA	pA
Control Results									
1 (CTRL)	1.7	0.8	26.1	327.0	19.5	33.6	3.9	20.5	1.2

Bias on results									
2 (ON)	1.5	1.1	98.3	461.0	142.9	96.8	5.1	18.5	1.8
3 (ON)	1.6	6.2	96.1	509.0	569.4	169.3	4.9	15.0	1.0
4 (ON)	1.7	4.9	90.1	296.0	339.9	176.1	6.9	8.9	1.0
5 (ON)	3.8	1.8	91.2	325.0	285.0	58.1	7.8	5.3	2.8
6 (ON)	1.3	1.5	93.3	280.0	150.0	283.9	11.3	5.1	1.0
Statistics bias on									
min result	1.3	1.1	90.1	280.0	142.9	58.1	4.9	5.1	1.0
max result	3.8	6.2	98.3	509.0	569.4	283.9	11.3	18.5	2.8
average	2.0	3.1	93.8	374.2	297.4	156.8	7.2	10.5	1.5
sigma	1.0	2.3	3.4	103.8	174.3	86.6	2.6	6.0	0.8

Bias off results									
7 (OFF)	1.1	0.5	120.3	263.0	245.8	147.4	4.6	1.5	1.4
8 (OFF)	1.3	0.5	112.2	241.0	320.0	171.0	36.5	2.6	1.1
9 (OFF)	1.8	1.5	125.8	245.0	168.8	174.8	36.5	17.4	0.5
10 (OFF)	1.6	1.5	164.7	280.0	198.6	220.2	46.5	43.2	3.4
11 (OFF)	1.6	0.6	98.2	55.0	244.0	174.1	34.4	42.4	0.3
Statistics bias off									
min result	1.1	0.5	98.2	55.0	168.8	147.4	4.6	1.5	0.3
max result	1.8	1.5	164.7	280.0	320.0	220.2	46.5	43.2	3.4
average	1.5	0.9	124.2	216.8	235.4	177.5	31.7	21.4	1.3
sigma	0.3	0.5	24.9	91.8	57.3	26.4	15.9	20.5	1.2



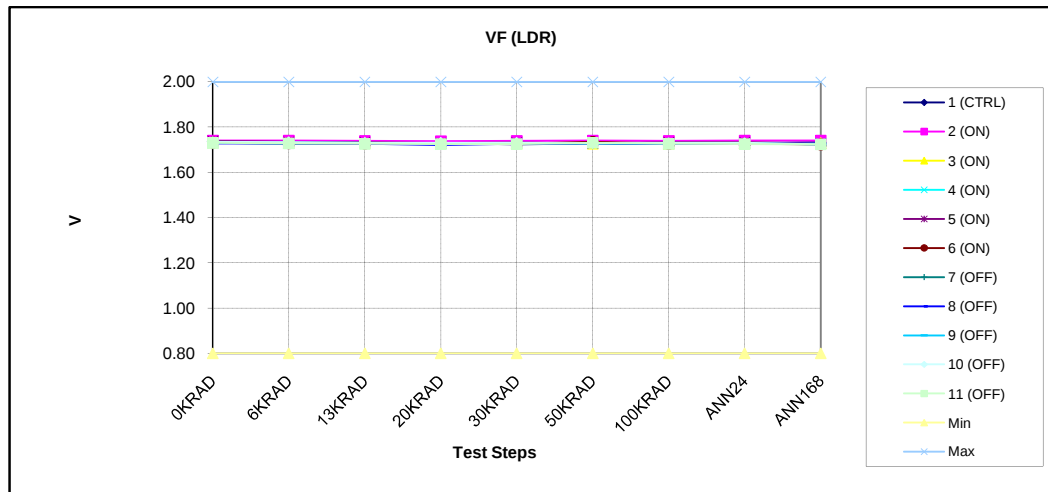
IR (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	1.8	6.9	2.5	0.5	1.4	1.3	4.6	5.0	1.4
ELDR OFF	1.4	36.8	6.1	0.6	1.5	0.9	2.1	1.9	0.7
LDR ON	2.0	3.1	93.8	374.2	297.4	156.8	7.2	10.5	1.5
LDR OFF	1.5	0.9	124.2	216.8	235.4	177.5	31.7	21.4	1.3



VF (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Max	2	2	2	2	2	2	2	2	2
Unit	V	V	V	V	V	V	V	V	V
Control Results									
1 (CTRL)	1.728	1.728	1.727	1.732	1.730	1.730	1.727	1.729	1.734

Bias on results									
2 (ON)	1.731	1.729	1.730	1.735	1.732	1.733	1.730	1.729	1.730
3 (ON)	1.732	1.732	1.733	1.737	1.735	1.736	1.731	1.731	1.732
4 (ON)	1.731	1.732	1.732	1.735	1.733	1.736	1.732	1.731	1.733
5 (ON)	1.727	1.728	1.729	1.732	1.731	1.729	1.728	1.726	1.727
6 (ON)	1.747	1.748	1.748	1.753	1.751	1.752	1.749	1.745	1.748
Statistics bias on									
min result	1.727	1.728	1.729	1.732	1.731	1.729	1.728	1.726	1.727
max result	1.747	1.748	1.748	1.753	1.751	1.752	1.749	1.745	1.748
average	1.734	1.734	1.734	1.738	1.736	1.737	1.734	1.732	1.734
sigma	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.007	0.008

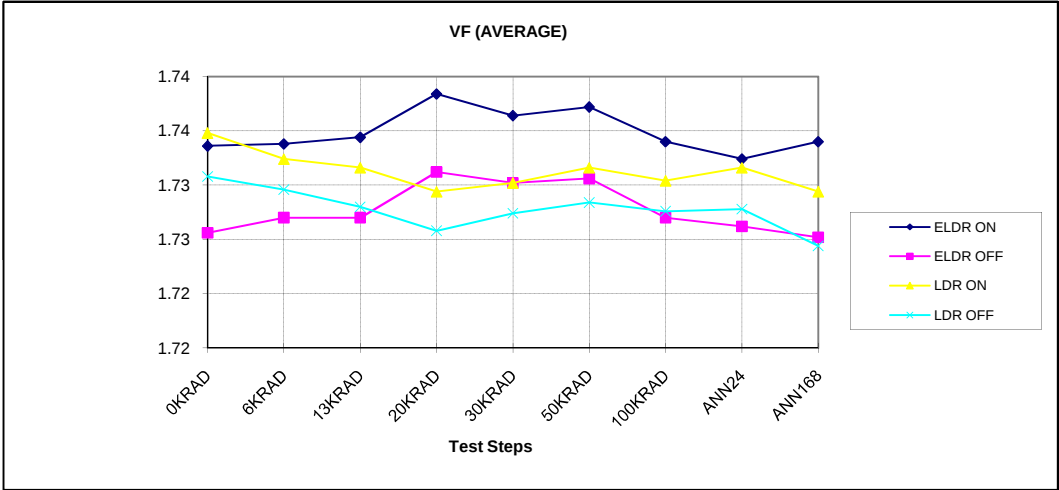
Bias off results									
7 (OFF)	1.724	1.727	1.727	1.732	1.729	1.730	1.726	1.726	1.723
8 (OFF)	1.725	1.727	1.725	1.729	1.731	1.730	1.726	1.726	1.727
9 (OFF)	1.726	1.726	1.728	1.733	1.731	1.731	1.727	1.726	1.727
10 (OFF)	1.727	1.727	1.727	1.733	1.730	1.731	1.728	1.726	1.726
11 (OFF)	1.726	1.728	1.728	1.729	1.730	1.731	1.728	1.727	1.723
Statistics bias off									
min result	1.724	1.726	1.725	1.729	1.729	1.730	1.726	1.726	1.723
max result	1.727	1.728	1.728	1.733	1.731	1.731	1.728	1.727	1.727
average	1.726	1.727	1.727	1.731	1.730	1.731	1.727	1.726	1.725
sigma	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.000	0.002



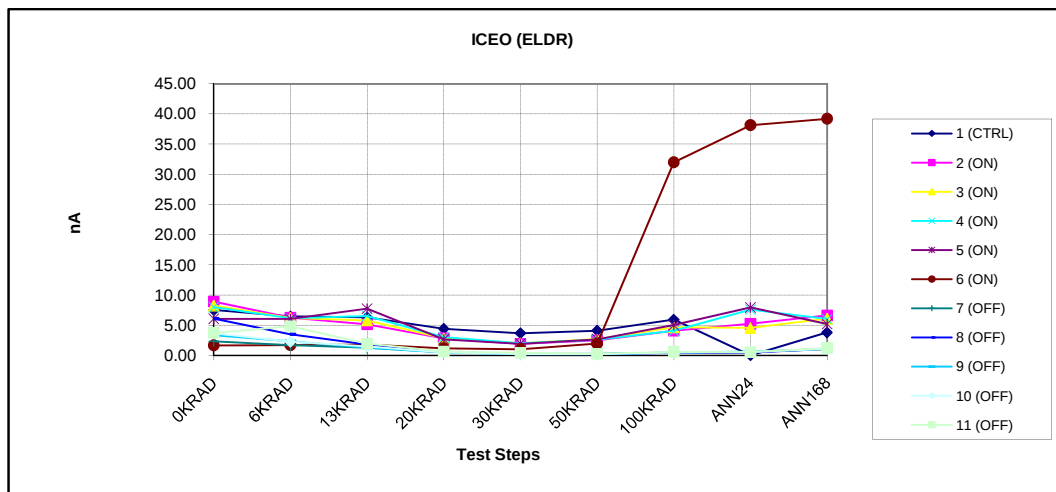
VF (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Max	2	2	2	2	2	2	2	2	2
Unit	V	V	V	V	V	V	V	V	V
Control Results									
1 (CTRL)	1.738	1.736	1.727	1.729	1.724	1.728	1.727	1.729	1.734

Bias on results									
2 (ON)	1.741	1.740	1.739	1.738	1.739	1.740	1.739	1.741	1.740
3 (ON)	1.732	1.730	1.730	1.728	1.727	1.727	1.727	1.729	1.729
4 (ON)	1.730	1.728	1.728	1.726	1.727	1.728	1.726	1.728	1.728
5 (ON)	1.739	1.735	1.734	1.729	1.732	1.728	1.734	1.733	1.727
6 (ON)	1.732	1.729	1.727	1.726	1.726	1.735	1.726	1.727	1.723
Statistics bias on									
min result	1.730	1.728	1.727	1.726	1.726	1.727	1.726	1.727	1.723
max result	1.741	1.740	1.739	1.738	1.739	1.740	1.739	1.741	1.740
average	1.735	1.732	1.732	1.729	1.730	1.732	1.730	1.732	1.729
sigma	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.006

Bias off results									
7 (OFF)	1.731	1.727	1.727	1.727	1.727	1.727	1.727	1.728	1.723
8 (OFF)	1.728	1.728	1.727	1.721	1.726	1.728	1.726	1.726	1.728
9 (OFF)	1.730	1.732	1.730	1.726	1.729	1.728	1.728	1.729	1.723
10 (OFF)	1.735	1.733	1.730	1.730	1.730	1.728	1.731	1.731	1.724
11 (OFF)	1.730	1.728	1.726	1.725	1.725	1.731	1.726	1.725	1.724
Statistics bias off									
min result	1.728	1.727	1.726	1.721	1.725	1.727	1.726	1.725	1.723
max result	1.735	1.733	1.730	1.730	1.730	1.731	1.731	1.731	1.728
average	1.731	1.730	1.728	1.726	1.727	1.728	1.728	1.728	1.724
sigma	0.003	0.003	0.002	0.003	0.002	0.002	0.002	0.002	0.002



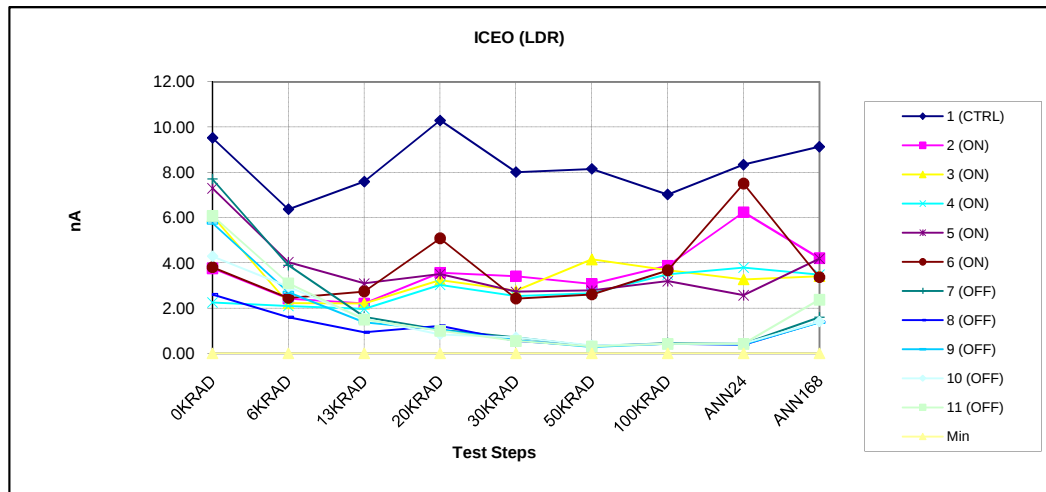
VF (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	1.734	1.734	1.734	1.738	1.736	1.737	1.734	1.732	1.734
ELDR OFF	1.726	1.727	1.727	1.731	1.730	1.731	1.727	1.726	1.725
LDR ON	1.735	1.732	1.732	1.729	1.730	1.732	1.730	1.732	1.729
LDR OFF	1.731	1.730	1.728	1.726	1.727	1.728	1.728	1.728	1.724



ICEO (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	100	100	100	100	100	100	100	100	100
Unit	nA	nA	nA	nA	nA	nA	nA	nA	nA
Control Results									
1 (CTRL)	7.51	6.44	6.29	4.40	3.68	4.10	5.91	0.01	3.80

Bias on results									
2 (ON)	8.91	6.27	5.15	2.84	1.92	2.48	4.10	5.24	6.61
3 (ON)	8.28	6.22	5.80	2.85	2.00	2.68	4.65	4.57	6.09
4 (ON)	8.01	6.14	6.54	2.98	1.99	2.57	4.07	7.61	6.02
5 (ON)	6.05	6.04	7.73	2.65	1.92	2.67	5.01	7.93	5.18
6 (ON)	1.67	1.70	1.84	1.19	1.02	1.95	32.00	38.15	39.21
Statistics bias on									
min result	1.67	1.70	1.84	1.19	1.02	1.95	4.07	4.57	5.18
max result	8.91	6.27	7.73	2.98	2.00	2.68	32.00	38.15	39.21
average	6.58	5.27	5.41	2.50	1.77	2.47	9.97	12.70	12.62
sigma	2.95	2.00	2.21	0.74	0.42	0.30	12.32	14.30	14.87

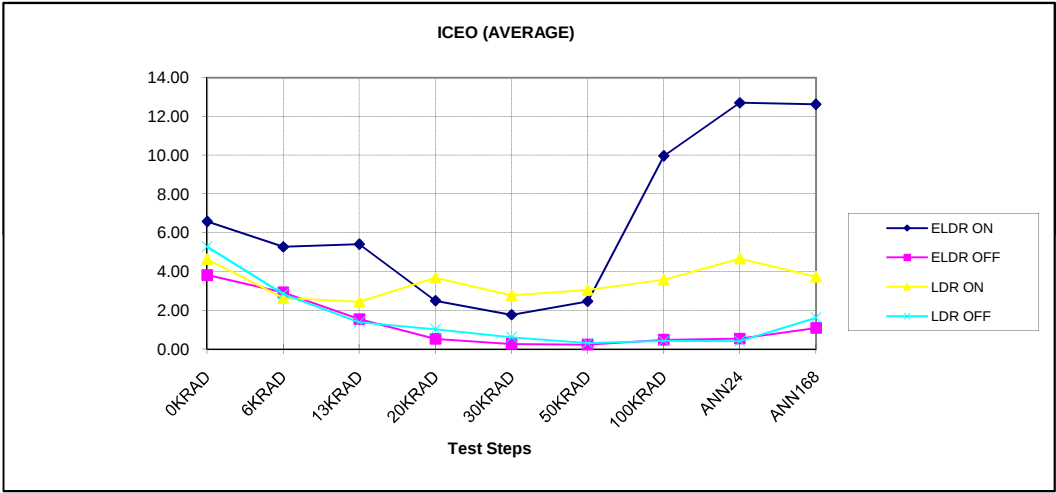
Bias off results									
7 (OFF)	2.33	1.68	1.26	0.53	0.25	0.25	0.47	0.49	1.07
8 (OFF)	6.10	3.52	1.80	0.55	0.24	0.23	0.44	0.49	1.09
9 (OFF)	3.34	2.36	1.30	0.46	0.24	0.22	0.47	0.65	1.06
10 (OFF)	3.64	2.26	1.47	0.50	0.23	0.23	0.47	0.59	1.06
11 (OFF)	3.72	4.82	1.94	0.61	0.40	0.26	0.59	0.50	1.23
Statistics bias off									
min result	2.33	1.68	1.26	0.46	0.23	0.22	0.44	0.49	1.06
max result	6.10	4.82	1.94	0.61	0.40	0.26	0.59	0.65	1.23
average	3.83	2.93	1.55	0.53	0.27	0.24	0.49	0.55	1.10
sigma	1.39	1.25	0.30	0.06	0.07	0.02	0.06	0.07	0.07



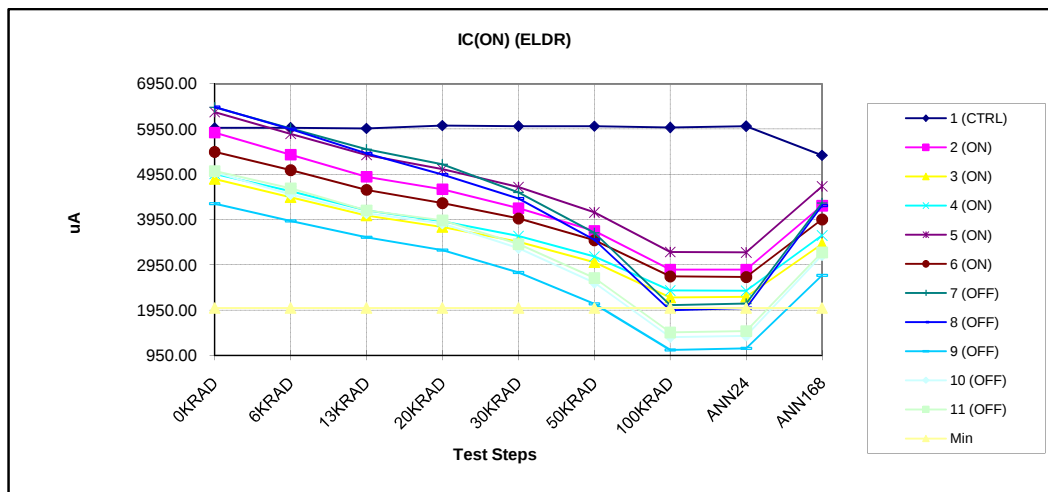
ICEO (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	0	0	0	0	0	0	0	0	0
Max	100	100	100	100	100	100	100	100	100
Unit	nA	nA	nA	nA	nA	nA	nA	nA	nA
Control Results									
1 (CTRL)	9.52	6.37	7.59	10.29	8.01	8.15	7.02	8.34	9.13

Bias on results									
2 (ON)	3.76	2.42	2.21	3.57	3.41	3.07	3.88	6.24	4.21
3 (ON)	6.07	2.22	2.20	3.24	2.76	4.16	3.68	3.27	3.41
4 (ON)	2.25	2.09	1.97	3.03	2.53	2.66	3.49	3.79	3.48
5 (ON)	7.30	4.03	3.09	3.51	2.72	2.78	3.19	2.57	4.19
6 (ON)	3.80	2.45	2.73	5.08	2.42	2.60	3.67	7.50	3.36
Statistics bias on									
min result	2.25	2.09	1.97	3.03	2.42	2.60	3.19	2.57	3.36
max result	7.30	4.03	3.09	5.08	3.41	4.16	3.88	7.50	4.21
average	4.64	2.64	2.44	3.69	2.77	3.05	3.58	4.67	3.73
sigma	2.02	0.79	0.46	0.81	0.38	0.64	0.26	2.10	0.43

Bias off results									
7 (OFF)	7.70	3.89	1.61	1.05	0.70	0.32	0.45	0.42	1.59
8 (OFF)	2.60	1.60	0.93	1.22	0.56	0.33	0.43	0.38	1.38
9 (OFF)	5.76	2.70	1.37	1.05	0.58	0.29	0.42	0.40	1.38
10 (OFF)	4.29	2.95	1.54	0.83	0.70	0.35	0.42	0.43	1.40
11 (OFF)	6.08	3.10	1.50	1.00	0.55	0.31	0.42	0.42	2.37
Statistics bias off									
min result	2.60	1.60	0.93	0.83	0.55	0.29	0.42	0.38	1.38
max result	7.70	3.89	1.61	1.22	0.70	0.35	0.45	0.43	2.37
average	5.29	2.85	1.39	1.03	0.62	0.32	0.43	0.41	1.62
sigma	1.93	0.83	0.27	0.14	0.08	0.02	0.01	0.02	0.43



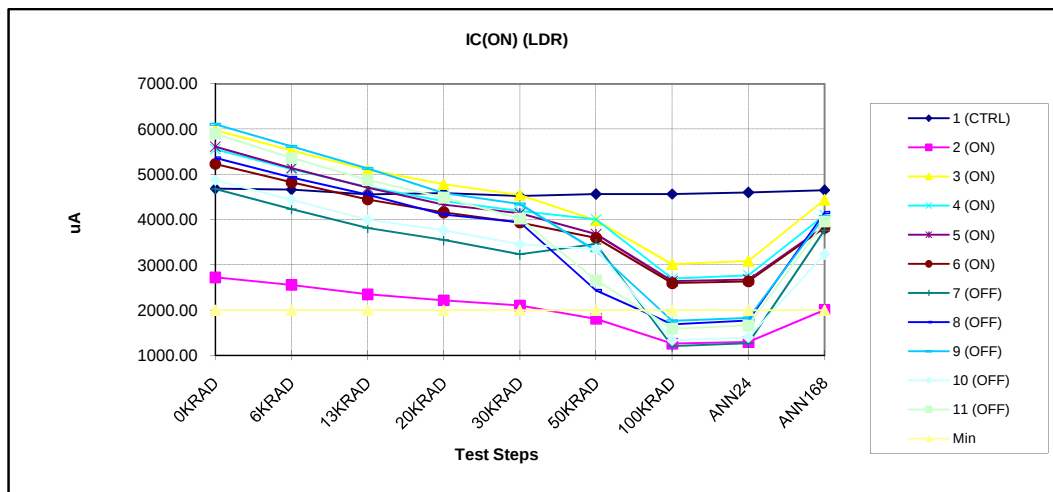
EO (AVERAG	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	6.584	5.274	5.412	2.502	1.770	2.470	9.966	12.700	12.622
ELDR OFF	3.826	2.928	1.554	0.530	0.272	0.238	0.488	0.545	1.102
LDR ON	4.636	2.642	2.440	3.686	2.768	3.053	3.582	4.674	3.730
LDR OFF	5.286	2.848	1.391	1.031	0.618	0.319	0.428	0.410	1.624



C(ON) (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	2000	2000	2000	2000	2000	2000	2000	2000	2000
Max	--	--	--	--	--	--	--	--	--
Unit	uA	uA	uA	uA	uA	uA	uA	uA	uA
Control Results									
1 (CTRL)	5979.0	5975.5	5965.4	6027.9	6012.4	6016.2	5983.7	6012.7	5372.0

Bias on results									
2 (ON)	5873.9	5384.7	4898.0	4621.2	4205.7	3697.4	2842.2	2847.0	4256.4
3 (ON)	4847.5	4443.5	4041.2	3788.9	3457.7	3005.4	2229.0	2243.5	3410.9
4 (ON)	4962.0	4578.9	4152.7	3911.7	3584.2	3133.4	2382.5	2377.7	3599.9
5 (ON)	6327.7	5846.2	5378.4	5063.9	4668.9	4110.2	3234.9	3223.9	4684.0
6 (ON)	5445.9	5041.7	4606.9	4313.7	3975.5	3493.9	2693.4	2681.7	3953.2
Statistics bias on									
min result	4847.5	4443.5	4041.2	3788.9	3457.7	3005.4	2229.0	2243.5	3410.9
max result	6327.7	5846.2	5378.4	5063.9	4668.9	4110.2	3234.9	3223.9	4684.0
average	5491.4	5059.0	4615.4	4339.8	3978.4	3488.0	2676.4	2674.7	3980.8
sigma	621.0	577.8	549.1	522.2	488.6	444.3	395.7	389.1	510.2

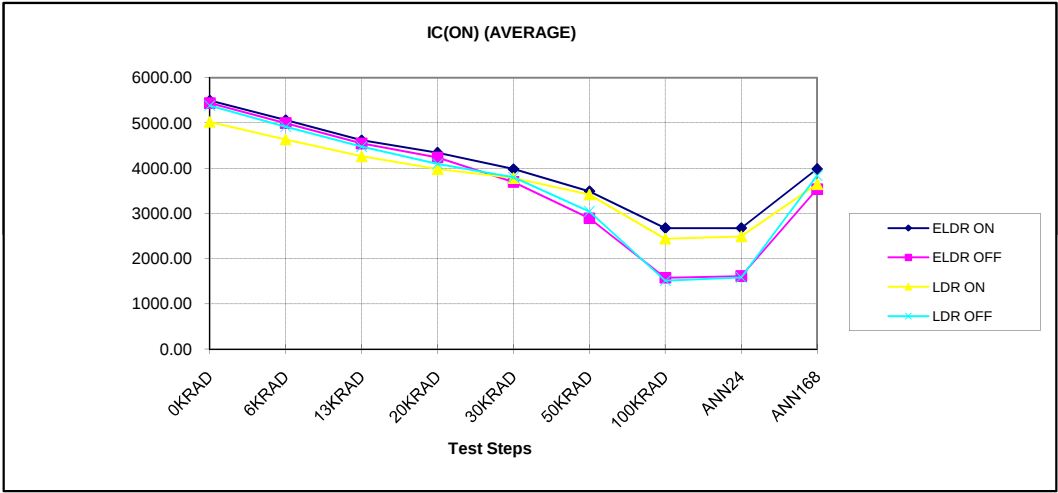
Bias off results									
7 (OFF)	6432.5	5962.7	5504.0	5171.2	4550.4	3657.4	2058.0	2096.5	4316.4
8 (OFF)	6439.0	5950.2	5414.4	4947.9	4416.9	3504.7	1944.2	1994.9	4259.5
9 (OFF)	4301.4	3922.9	3562.7	3279.2	2780.0	2091.7	1069.7	1104.5	2718.5
10 (OFF)	4998.0	4507.5	4089.4	3862.4	3315.9	2551.9	1352.9	1380.4	3162.4
11 (OFF)	5024.2	4640.5	4156.4	3931.5	3407.4	2659.4	1457.7	1489.5	3226.2
Statistics bias off									
min result	4301.4	3922.9	3562.7	3279.2	2780.0	2091.7	1069.7	1104.5	2718.5
max result	6439.0	5962.7	5504.0	5171.2	4550.4	3657.4	2058.0	2096.5	4316.4
average	5439.0	4996.7	4545.3	4238.4	3694.1	2893.0	1576.5	1613.1	3536.6
sigma	955.0	916.7	865.9	795.2	761.0	665.5	414.7	420.6	713.5



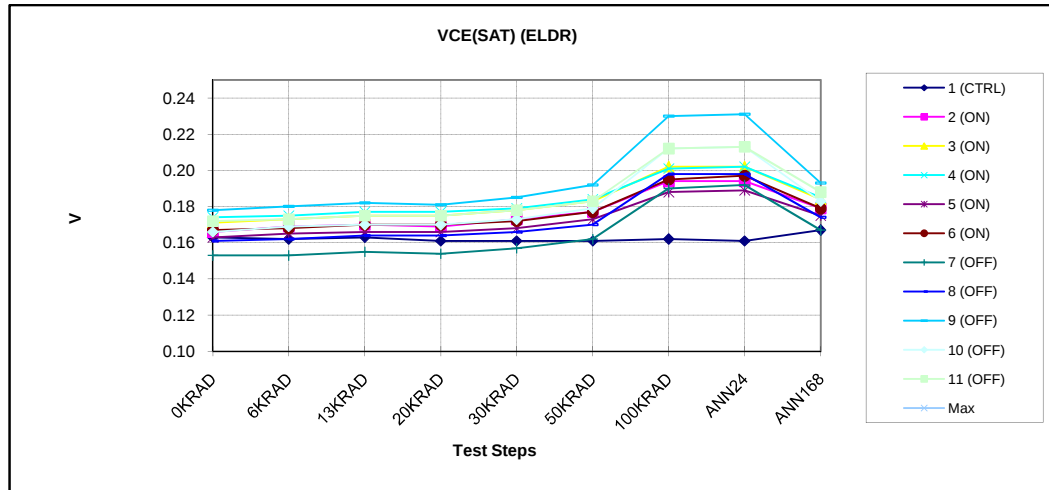
IC(ON) (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	2000	2000	2000	2000	2000	2000	2000	2000	2000
Max	--	--	--	--	--	--	--	--	--
Unit	uA	uA	uA	uA	uA	uA	uA	uA	uA
Control Results									
1 (CTRL)	4682.0	4660.7	4558.9	4584.5	4522.0	4561.2	4567.5	4598.4	4648.4

Bias on results									
2 (ON)	2723.7	2558.5	2348.9	2216.4	2099.7	1809.4	1260.0	1296.0	2005.2
3 (ON)	5981.9	5527.7	5102.2	4785.2	4544.2	3987.0	3015.4	3087.5	4433.9
4 (ON)	5557.2	5114.0	4717.4	4409.7	4188.7	4007.0	2699.5	2768.4	4099.7
5 (ON)	5613.7	5137.7	4705.5	4328.7	4140.9	3676.7	2638.2	2676.9	3851.4
6 (ON)	5229.5	4823.2	4444.0	4158.5	3935.5	3595.9	2597.2	2634.5	3820.4
Statistics bias on									
min result	2723.7	2558.5	2348.9	2216.4	2099.7	1809.4	1260.0	1296.0	2005.2
max result	5981.9	5527.7	5102.2	4785.2	4544.2	4007.0	3015.4	3087.5	4433.9
average	5021.2	4632.2	4263.6	3979.7	3781.8	3415.2	2442.0	2492.6	3642.1
sigma	1311.8	1186.0	1095.8	1012.0	965.5	916.1	680.9	692.1	947.5

Bias off results									
7 (OFF)	4680.4	4232.9	3816.9	3551.9	3231.2	3463.2	1204.2	1272.0	3763.7
8 (OFF)	5362.2	4931.2	4553.0	4109.2	3943.4	2434.5	1684.2	1768.9	4157.2
9 (OFF)	6104.4	5617.7	5131.2	4584.5	4342.2	3314.4	1762.5	1827.7	4067.4
10 (OFF)	4871.4	4437.5	4000.9	3763.5	3454.0	3348.4	1334.7	1398.7	3231.4
11 (OFF)	5897.2	5360.0	4872.0	4483.0	4024.4	2661.5	1588.4	1662.5	3956.7
Statistics bias off									
min result	4680.4	4232.9	3816.9	3551.9	3231.2	2434.5	1204.2	1272.0	3231.4
max result	6104.4	5617.7	5131.2	4584.5	4342.2	3463.2	1762.5	1827.7	4157.2
average	5383.1	4915.8	4474.8	4098.4	3799.0	3044.4	1514.8	1585.9	3835.2
sigma	620.6	588.5	559.5	445.9	449.5	463.5	236.9	240.5	368.1



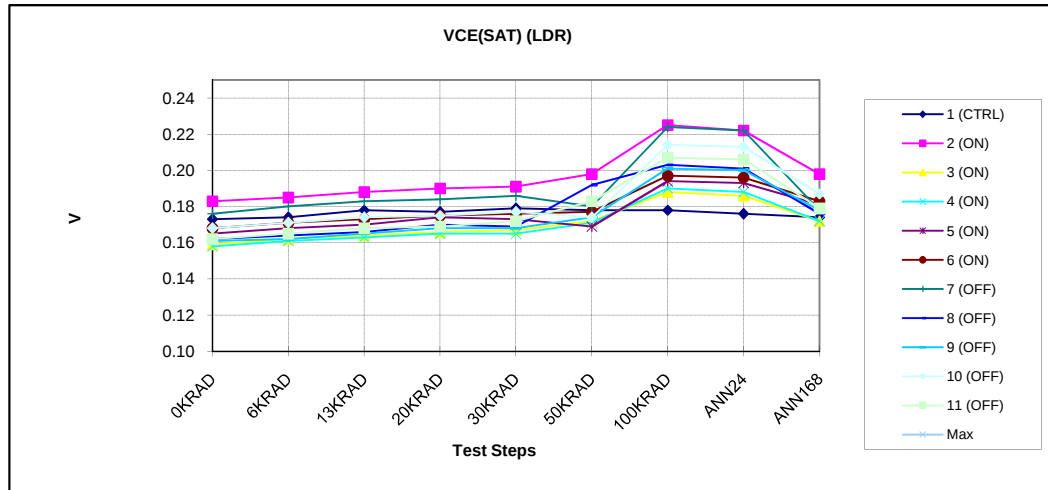
ON) (AVERAC	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	5491.4	5059.0	4615.4	4339.8	3978.4	3488.0	2676.4	2674.7	3980.8
ELDR OFF	5439.0	4996.7	4545.3	4238.4	3694.1	2893.0	1576.5	1613.1	3536.6
LDR ON	5021.2	4632.2	4263.6	3979.7	3781.8	3415.2	2442.0	2492.6	3642.1
LDR OFF	5383.1	4915.8	4474.8	4098.4	3799.0	3044.4	1514.8	1585.9	3835.2



VCE(SAT) (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Unit	V	V	V	V	V	V	V	V	V
Control Results									
1 (CTRL)	0.163	0.162	0.163	0.161	0.161	0.161	0.162	0.161	0.167

Bias on results									
2 (ON)	0.166	0.169	0.17	0.169	0.173	0.177	0.194	0.194	0.179
3 (ON)	0.171	0.173	0.175	0.175	0.178	0.183	0.202	0.202	0.184
4 (ON)	0.174	0.175	0.177	0.177	0.179	0.184	0.201	0.202	0.185
5 (ON)	0.163	0.165	0.166	0.166	0.168	0.173	0.188	0.189	0.175
6 (ON)	0.167	0.168	0.17	0.17	0.172	0.177	0.195	0.197	0.179
Statistics bias on									
min result	0.163	0.165	0.166	0.166	0.168	0.173	0.188	0.189	0.175
max result	0.174	0.175	0.177	0.177	0.179	0.184	0.202	0.202	0.185
average	0.168	0.170	0.172	0.171	0.174	0.179	0.196	0.197	0.180
sigma	0.004	0.004	0.004	0.005	0.005	0.005	0.006	0.006	0.004

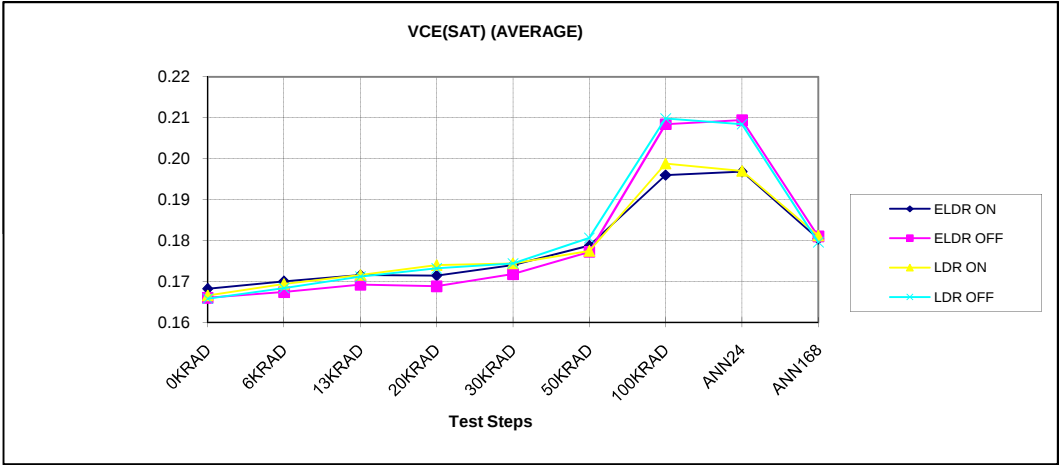
Bias off results									
7 (OFF)	0.153	0.153	0.155	0.154	0.157	0.162	0.19	0.192	0.167
8 (OFF)	0.161	0.162	0.164	0.164	0.166	0.17	0.198	0.198	0.174
9 (OFF)	0.178	0.18	0.182	0.181	0.185	0.192	0.23	0.231	0.193
10 (OFF)	0.166	0.169	0.17	0.17	0.173	0.179	0.212	0.213	0.183
11 (OFF)	0.172	0.173	0.175	0.175	0.178	0.183	0.212	0.213	0.188
Statistics bias off									
min result	0.153	0.153	0.155	0.154	0.157	0.162	0.190	0.192	0.167
max result	0.178	0.180	0.182	0.181	0.185	0.192	0.230	0.231	0.193
average	0.166	0.167	0.169	0.169	0.172	0.177	0.208	0.209	0.181
sigma	0.010	0.010	0.010	0.010	0.011	0.012	0.015	0.015	0.011



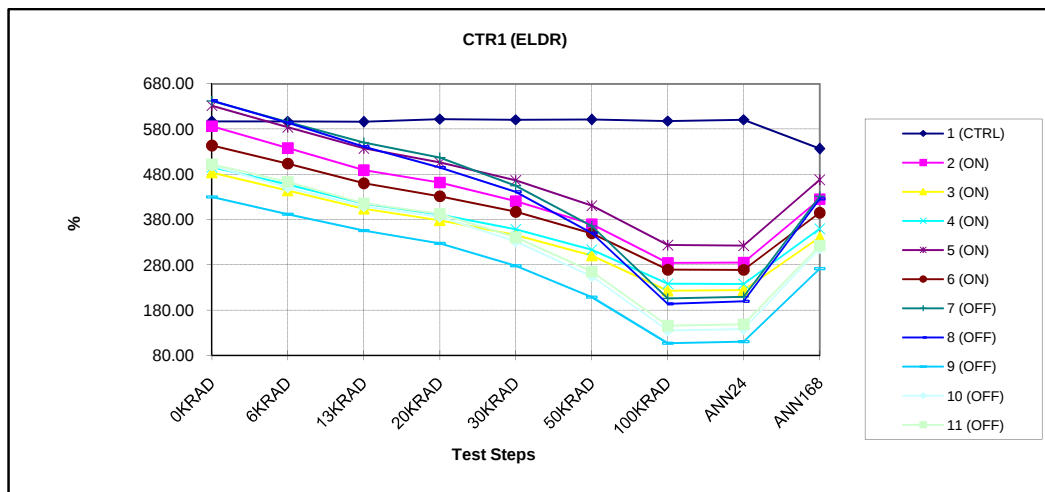
CE(SAT) (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Unit	V	V	V	V	V	V	V	V	V
Control Results									
1 (CTRL)	0.173	0.174	0.178	0.177	0.179	0.178	0.178	0.176	0.174

Bias on results									
2 (ON)	0.183	0.185	0.188	0.19	0.191	0.198	0.225	0.222	0.198
3 (ON)	0.159	0.162	0.164	0.166	0.167	0.172	0.188	0.186	0.172
4 (ON)	0.158	0.161	0.163	0.165	0.165	0.171	0.19	0.188	0.172
5 (ON)	0.165	0.168	0.17	0.174	0.173	0.169	0.194	0.193	0.181
6 (ON)	0.168	0.171	0.173	0.175	0.176	0.177	0.197	0.196	0.183
Statistics bias on									
min result	0.158	0.161	0.163	0.165	0.165	0.169	0.188	0.186	0.172
max result	0.183	0.185	0.188	0.190	0.191	0.198	0.225	0.222	0.198
average	0.167	0.169	0.172	0.174	0.174	0.177	0.199	0.197	0.181
sigma	0.010	0.010	0.010	0.010	0.010	0.012	0.015	0.015	0.011

Bias off results									
7 (OFF)	0.176	0.18	0.183	0.184	0.186	0.18	0.224	0.222	0.178
8 (OFF)	0.162	0.164	0.166	0.17	0.169	0.192	0.203	0.201	0.176
9 (OFF)	0.161	0.162	0.165	0.168	0.168	0.174	0.201	0.2	0.178
10 (OFF)	0.168	0.171	0.174	0.175	0.177	0.174	0.214	0.213	0.187
11 (OFF)	0.162	0.165	0.168	0.169	0.172	0.183	0.207	0.206	0.179
Statistics bias off									
min result	0.161	0.162	0.165	0.168	0.168	0.174	0.201	0.200	0.176
max result	0.176	0.180	0.183	0.184	0.186	0.192	0.224	0.222	0.187
average	0.166	0.168	0.171	0.173	0.174	0.181	0.210	0.208	0.180
sigma	0.006	0.007	0.007	0.007	0.007	0.007	0.009	0.009	0.004



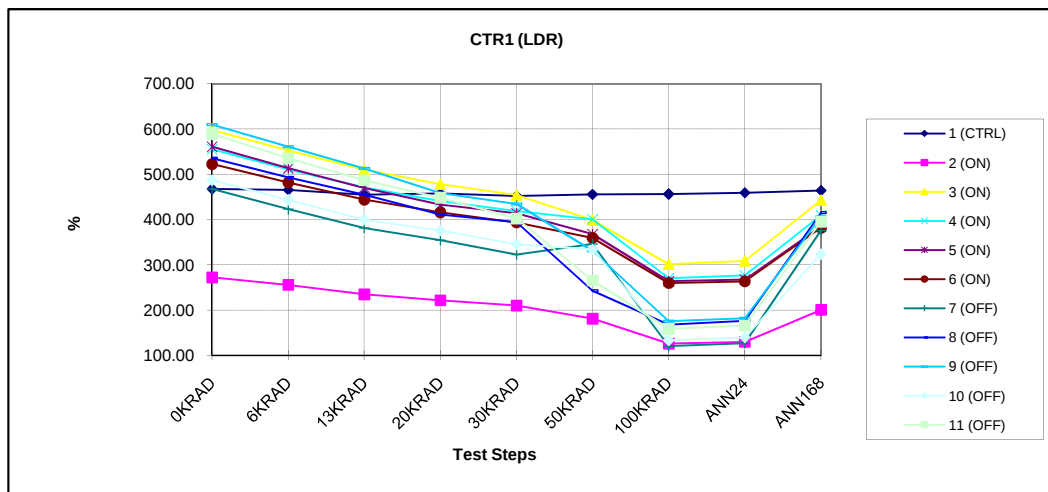
(SAT) (AVERA	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	0.168	0.170	0.172	0.171	0.174	0.179	0.196	0.197	0.180
ELDR OFF	0.166	0.167	0.169	0.169	0.172	0.177	0.208	0.209	0.181
LDR ON	0.167	0.169	0.172	0.174	0.174	0.177	0.199	0.197	0.181
LDR OFF	0.166	0.168	0.171	0.173	0.174	0.181	0.210	0.208	0.180



CTR1 (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	596.9	597.0	595.9	602.2	600.6	600.9	597.8	600.5	536.7

Bias on results									
2 (ON)	586.6	538.1	489.4	462.2	420.6	369.7	284.3	284.7	425.3
3 (ON)	484.0	444.1	403.9	378.7	345.8	300.6	223.0	224.5	341.0
4 (ON)	495.5	457.5	415.2	391.2	358.4	313.4	238.3	237.8	359.8
5 (ON)	631.6	584.1	537.4	506.3	466.7	410.9	323.7	322.5	468.0
6 (ON)	543.7	503.7	460.5	431.5	397.4	349.5	269.4	268.9	395.0
Statistics bias on									
min result	484.0	444.1	403.9	378.7	345.8	300.6	223.0	224.5	341.0
max result	631.6	584.1	537.4	506.3	466.7	410.9	323.7	322.5	468.0
average	548.3	505.5	461.3	434.0	397.8	348.8	267.7	267.7	397.8
sigma	61.9	57.7	54.8	52.2	48.8	44.3	39.6	38.9	50.9

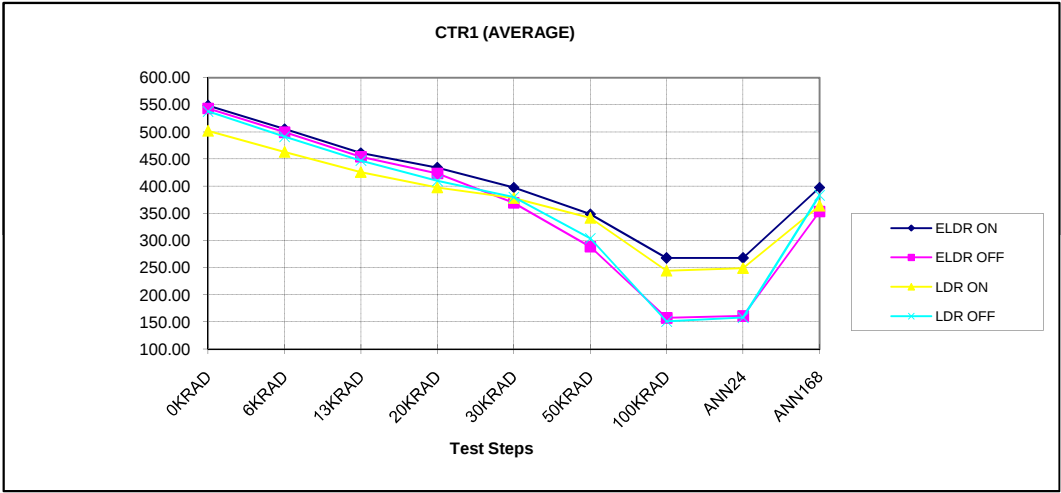
Bias off results									
7 (OFF)	642.3	595.8	550.1	516.9	455.1	365.4	205.8	209.5	431.4
8 (OFF)	642.9	594.4	541.0	495.1	441.7	349.9	194.2	199.3	425.7
9 (OFF)	429.7	392.0	355.8	327.6	277.9	208.7	106.9	110.3	271.8
10 (OFF)	499.2	450.6	409.1	386.1	331.6	254.5	135.1	137.6	316.3
11 (OFF)	502.0	463.5	415.7	392.6	340.7	265.3	145.4	148.7	322.6
Statistics bias off									
min result	429.7	392.0	355.8	327.6	277.9	208.7	106.9	110.3	271.8
max result	642.9	595.8	550.1	516.9	455.1	365.4	205.8	209.5	431.4
average	543.2	499.3	454.4	423.7	369.4	288.8	157.5	161.1	353.6
sigma	95.2	91.5	86.5	79.7	76.2	66.6	41.5	42.1	71.2



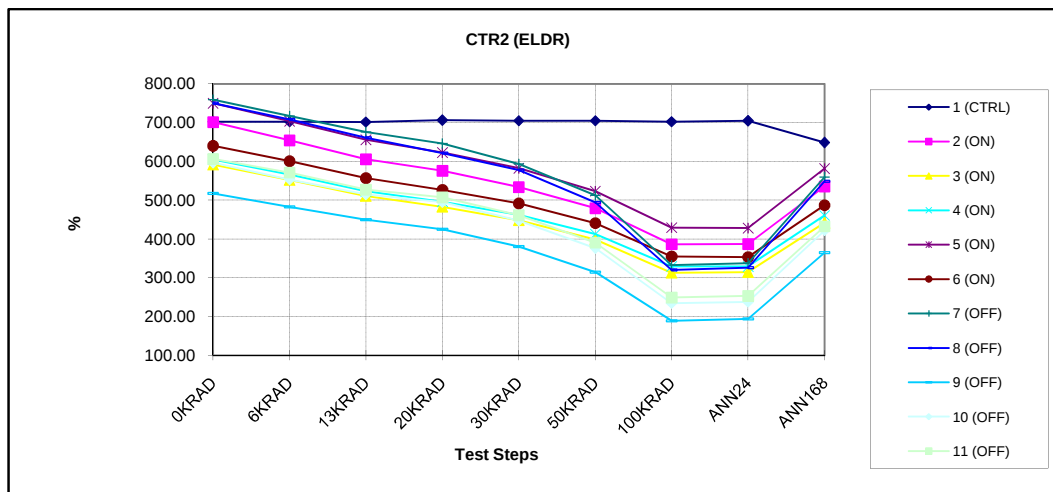
CTR1 (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	467.6	465.8	455.3	458.1	452.0	455.8	456.4	459.4	464.4

Bias on results									
2 (ON)	272.3	255.9	234.9	221.7	210.1	181.1	126.1	129.7	200.6
3 (ON)	597.6	552.3	509.9	478.2	454.3	398.8	301.7	308.8	443.0
4 (ON)	555.2	511.0	471.5	440.7	419.0	400.7	270.1	276.8	409.6
5 (ON)	560.8	513.6	470.2	432.7	414.0	367.7	263.9	267.8	384.8
6 (ON)	522.6	482.0	444.2	415.8	393.5	359.6	259.9	263.5	381.9
Statistics bias on									
min result	272.3	255.9	234.9	221.7	210.1	181.1	126.1	129.7	200.6
max result	597.6	552.3	509.9	478.2	454.3	400.7	301.7	308.8	443.0
average	501.7	463.0	426.1	397.8	378.2	341.6	244.3	249.3	364.0
sigma	131.0	118.4	109.4	101.1	96.5	91.5	68.1	69.2	94.6

Bias off results									
7 (OFF)	467.6	423.2	381.5	354.8	322.9	346.3	120.3	127.0	376.1
8 (OFF)	535.6	492.9	455.0	410.9	393.9	243.0	168.1	176.5	415.5
9 (OFF)	609.6	561.4	512.9	458.7	434.2	331.5	175.8	182.3	406.5
10 (OFF)	486.8	443.4	400.2	375.9	345.1	334.3	133.1	139.4	323.2
11 (OFF)	589.2	535.5	487.1	448.1	402.5	265.7	158.4	165.9	395.2
Statistics bias off									
min result	467.6	423.2	381.5	354.8	322.9	243.0	120.3	127.0	323.2
max result	609.6	561.4	512.9	458.7	434.2	346.3	175.8	182.3	415.5
average	537.8	491.3	447.3	409.7	379.7	304.2	151.2	158.2	383.3
sigma	61.9	58.8	55.9	44.8	45.0	46.5	23.6	24.0	36.7



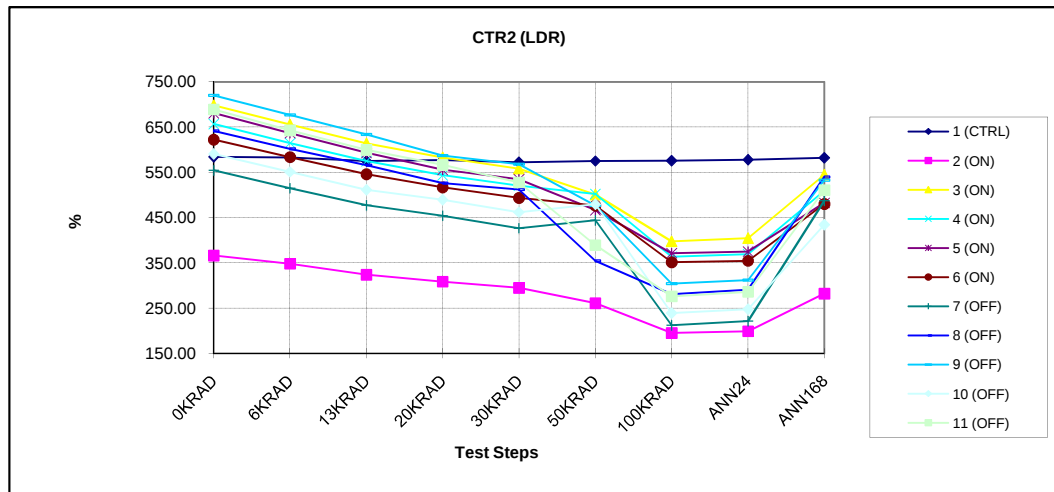
CTR1 (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	548.3	505.5	461.3	434.0	397.8	348.8	267.7	267.7	397.8
ELDR OFF	543.2	499.3	454.4	423.7	369.4	288.8	157.5	161.1	353.6
LDR ON	501.7	463.0	426.1	397.8	378.2	341.6	244.3	249.3	364.0
LDR OFF	537.8	491.3	447.3	409.7	379.7	304.2	151.2	158.2	383.3



CTR2 (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	702.2	702.3	701.8	706.1	704.8	705.0	702.5	704.6	648.5

Bias on results									
2 (ON)	701.3	654.4	605.6	575.9	533.6	479.4	386.4	386.8	535.4
3 (ON)	591.5	552.0	510.6	482.9	448.2	398.8	312.8	314.2	441.2
4 (ON)	604.7	566.4	523.0	496.4	462.0	412.9	329.4	329.0	460.7
5 (ON)	750.1	703.5	655.7	622.8	582.3	523.5	429.3	428.2	581.6
6 (ON)	640.0	600.7	556.9	526.7	491.8	441.1	355.1	353.7	487.3
Statistics bias on									
min result	591.5	552.0	510.6	482.9	448.2	398.8	312.8	314.2	441.2
max result	750.1	703.5	655.7	622.8	582.3	523.5	429.3	428.2	581.6
average	657.5	615.4	570.4	541.0	503.6	451.2	362.6	362.4	501.2
sigma	67.0	63.1	60.3	58.1	54.8	50.8	46.5	45.9	57.2

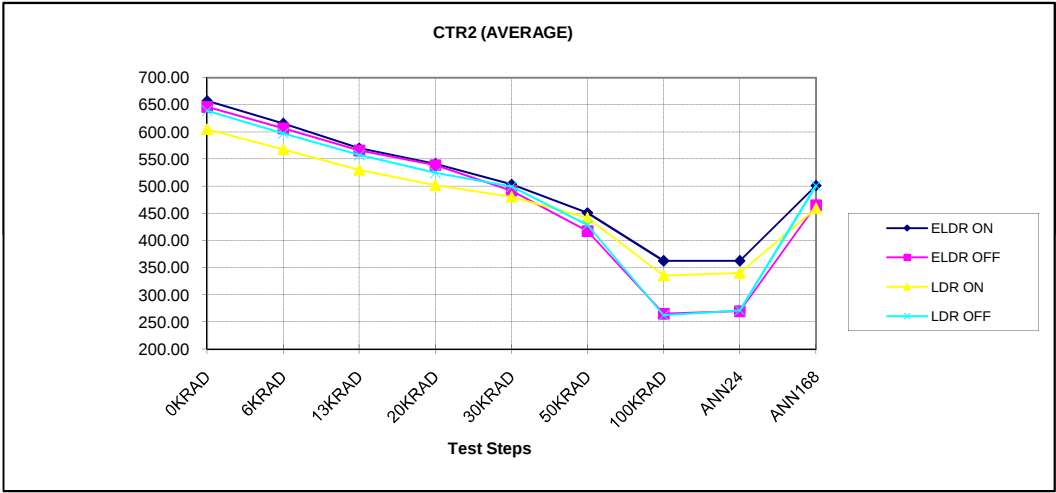
Bias off results									
7 (OFF)	759.2	717.1	675.7	646.5	593.3	512.5	333.0	337.9	559.5
8 (OFF)	750.3	707.7	661.1	621.6	577.4	494.6	320.3	326.1	548.9
9 (OFF)	517.7	483.2	450.0	424.7	380.4	314.7	188.9	194.4	364.5
10 (OFF)	596.3	553.0	514.7	495.1	447.5	376.0	234.6	238.1	421.8
11 (OFF)	606.5	571.1	527.3	507.2	461.3	390.5	249.3	253.3	432.6
Statistics bias off									
min result	517.7	483.2	450.0	424.7	380.4	314.7	188.9	194.4	364.5
max result	759.2	717.1	675.7	646.5	593.3	512.5	333.0	337.9	559.5
average	646.0	606.4	565.8	539.0	492.0	417.7	265.2	270.0	465.4
sigma	105.1	102.2	98.3	92.7	90.7	83.7	60.5	60.8	85.1



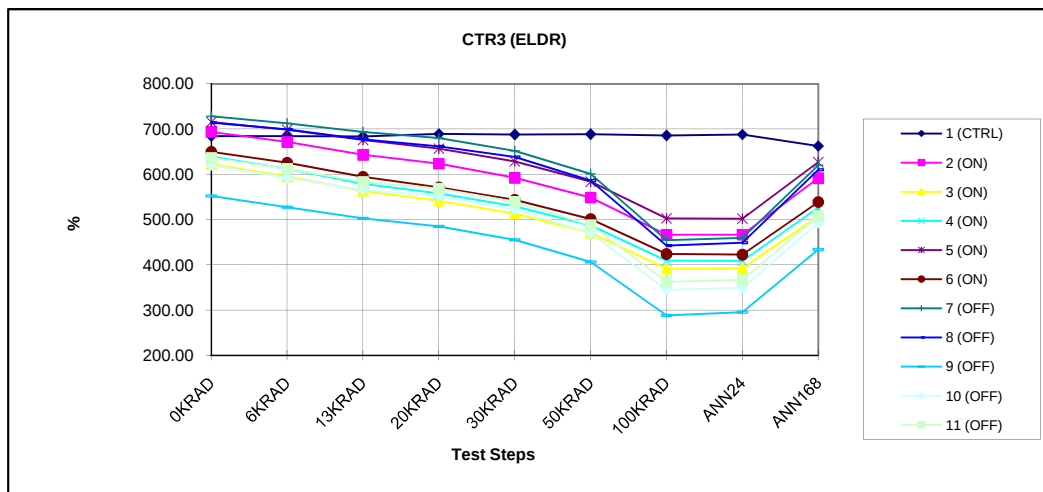
CTR2 (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	584.1	582.7	574.8	576.9	572.1	575.1	575.5	577.8	581.8

Bias on results									
2 (ON)	366.2	348.2	323.8	308.6	294.7	260.9	195.2	199.0	281.9
3 (ON)	698.2	655.7	613.8	582.5	557.8	500.6	397.7	404.3	544.3
4 (ON)	657.0	614.8	574.8	543.6	520.7	502.3	363.4	369.5	509.3
5 (ON)	681.0	636.6	593.1	555.8	534.7	466.8	371.5	375.1	482.4
6 (ON)	622.1	583.8	545.7	516.7	493.6	476.5	351.4	354.7	479.9
Statistics bias on									
min result	366.2	348.2	323.8	308.6	294.7	260.9	195.2	199.0	281.9
max result	698.2	655.7	613.8	582.5	557.8	502.3	397.7	404.3	544.3
average	604.9	567.8	530.2	501.4	480.3	441.4	335.8	340.5	459.6
sigma	136.4	125.6	118.1	110.4	106.3	102.1	80.4	81.1	102.6

Bias off results									
7 (OFF)	554.3	515.0	477.3	454.1	426.7	443.9	212.0	221.1	487.1
8 (OFF)	641.5	601.7	566.2	526.0	511.7	354.2	280.6	290.9	539.9
9 (OFF)	720.0	676.9	633.9	586.8	567.6	476.6	304.2	312.0	532.3
10 (OFF)	590.4	551.0	511.1	489.4	461.9	479.4	238.9	247.3	434.1
11 (OFF)	689.2	642.6	599.5	566.3	527.8	389.3	275.9	285.9	511.0
Statistics bias off									
min result	554.3	515.0	477.3	454.1	426.7	354.2	212.0	221.1	434.1
max result	720.0	676.9	633.9	586.8	567.6	479.4	304.2	312.0	539.9
average	639.1	597.4	557.6	524.5	499.2	428.7	262.3	271.5	500.9
sigma	68.2	65.8	63.8	54.4	55.4	55.2	36.6	36.6	42.6



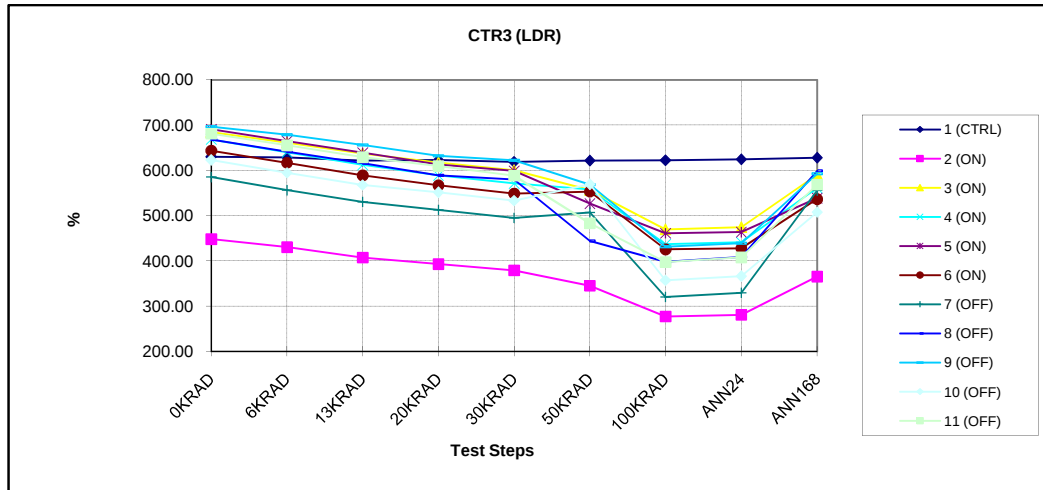
CTR2 (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	657.5	615.4	570.4	541.0	503.6	451.2	362.6	362.4	501.2
ELDR OFF	646.0	606.4	565.8	539.0	492.0	417.7	265.2	270.0	465.4
LDR ON	604.9	567.8	530.2	501.4	480.3	441.4	335.8	340.5	459.6
LDR OFF	639.1	597.4	557.6	524.5	499.2	428.7	262.3	271.5	500.9



CTR3 (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	684.5	684.4	683.5	689.5	687.9	688.5	685.5	688.2	662.5

Bias on results									
2 (ON)	693.9	671.3	643.1	623.7	592.3	548.8	466.7	466.9	591.7
3 (ON)	622.9	595.2	563.8	541.5	513.3	470.6	391.6	392.5	506.8
4 (ON)	638.9	612.3	579.3	557.7	529.5	486.8	409.3	408.8	526.8
5 (ON)	715.7	698.7	675.9	657.0	628.8	583.7	502.9	502.1	626.8
6 (ON)	650.1	625.5	594.3	571.6	543.9	501.3	424.0	422.7	538.9
Statistics bias on									
min result	622.9	595.2	563.8	541.5	513.3	470.6	391.6	392.5	506.8
max result	715.7	698.7	675.9	657.0	628.8	583.7	502.9	502.1	626.8
average	664.3	640.6	611.3	590.3	561.5	518.2	438.9	438.6	558.2
sigma	39.0	43.0	46.8	48.4	47.8	46.8	45.3	45.0	49.6

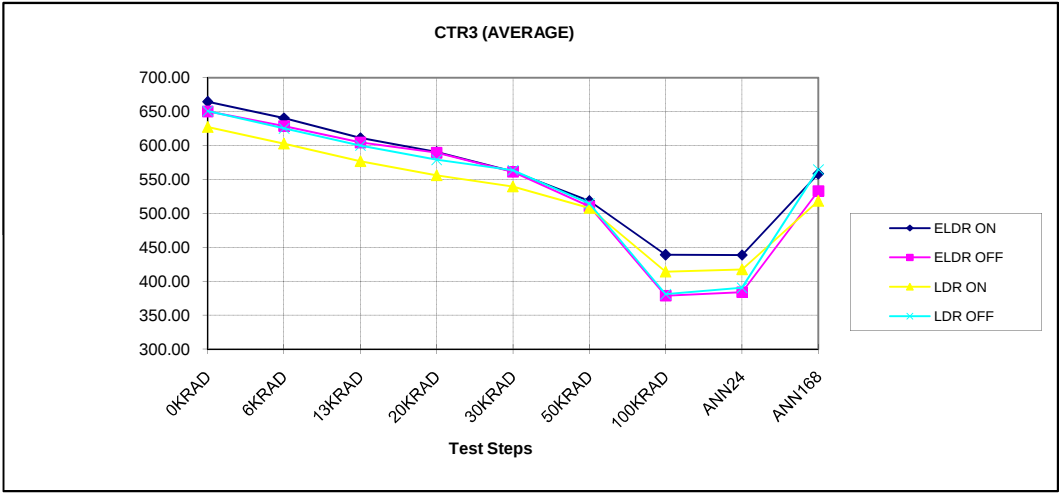
Bias off results									
7 (OFF)	727.9	713.0	693.4	680.2	651.9	600.7	454.6	459.7	620.1
8 (OFF)	714.0	699.2	677.6	662.0	638.6	586.1	442.9	448.8	610.0
9 (OFF)	552.3	527.3	502.4	484.7	455.6	406.7	288.7	295.4	434.0
10 (OFF)	620.1	592.3	565.9	551.7	521.8	470.5	345.2	349.5	493.1
11 (OFF)	636.0	612.3	583.3	568.2	539.1	487.9	362.4	366.8	508.0
Statistics bias off									
min result	552.3	527.3	502.4	484.7	455.6	406.7	288.7	295.4	434.0
max result	727.9	713.0	693.4	680.2	651.9	600.7	454.6	459.7	620.1
average	650.1	628.8	604.5	589.4	561.4	510.4	378.7	384.0	533.0
sigma	72.1	77.4	80.0	81.1	82.8	81.8	69.6	69.4	79.9



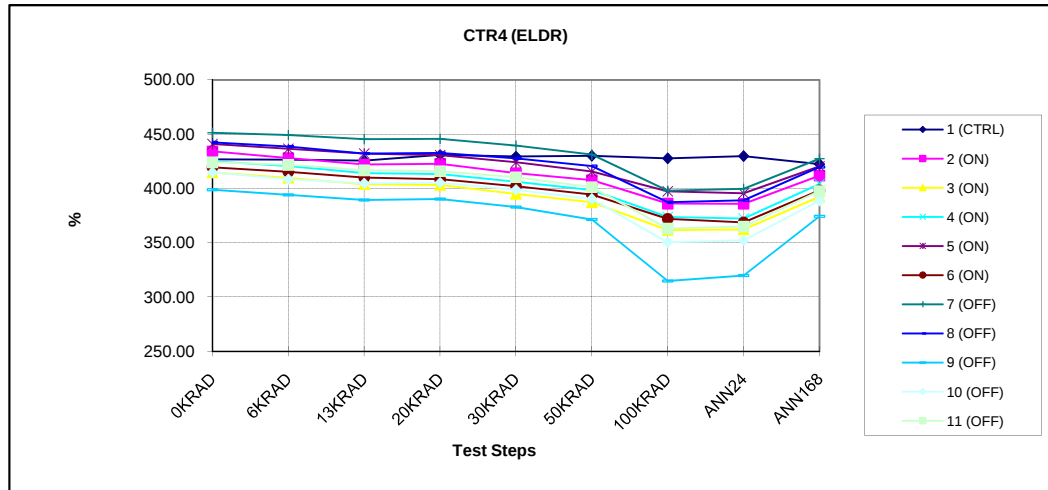
CTR3 (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	629.8	628.5	621.2	623.2	618.6	621.4	621.9	624.1	627.7

Bias on results									
2 (ON)	447.9	430.4	407.4	392.8	379.1	345.2	277.3	280.6	365.1
3 (ON)	684.7	661.4	637.2	617.1	600.1	556.5	469.2	474.4	590.1
4 (ON)	668.2	640.0	612.1	588.8	570.9	557.9	436.7	441.3	561.2
5 (ON)	690.9	664.7	639.0	613.2	598.9	526.7	461.0	463.6	538.4
6 (ON)	643.7	616.7	588.9	567.0	548.7	552.9	425.6	427.8	536.4
Statistics bias on									
min result	447.9	430.4	407.4	392.8	379.1	345.2	277.3	280.6	365.1
max result	690.9	664.7	639.0	617.1	600.1	557.9	469.2	474.4	590.1
average	627.1	602.6	576.9	555.8	539.6	507.8	413.9	417.5	518.3
sigma	101.8	98.2	97.0	93.3	92.2	91.8	78.4	78.7	88.3

Bias off results									
7 (OFF)	585.3	556.4	530.3	512.9	494.9	507.1	320.4	329.6	555.4
8 (OFF)	668.0	641.1	615.7	589.2	579.4	444.1	398.1	408.6	598.5
9 (OFF)	696.4	678.8	656.4	632.4	622.3	568.5	431.5	439.1	592.7
10 (OFF)	622.5	594.8	567.9	551.3	533.1	569.0	357.0	366.1	507.7
11 (OFF)	680.9	655.1	629.1	609.7	588.4	483.1	397.6	407.9	568.5
Statistics bias off									
min result	585.3	556.4	530.3	512.9	494.9	444.1	320.4	329.6	507.7
max result	696.4	678.8	656.4	632.4	622.3	569.0	431.5	439.1	598.5
average	650.6	625.2	599.9	579.1	563.6	514.4	380.9	390.3	564.6
sigma	45.7	49.2	50.4	47.5	49.9	54.5	42.9	42.7	36.3



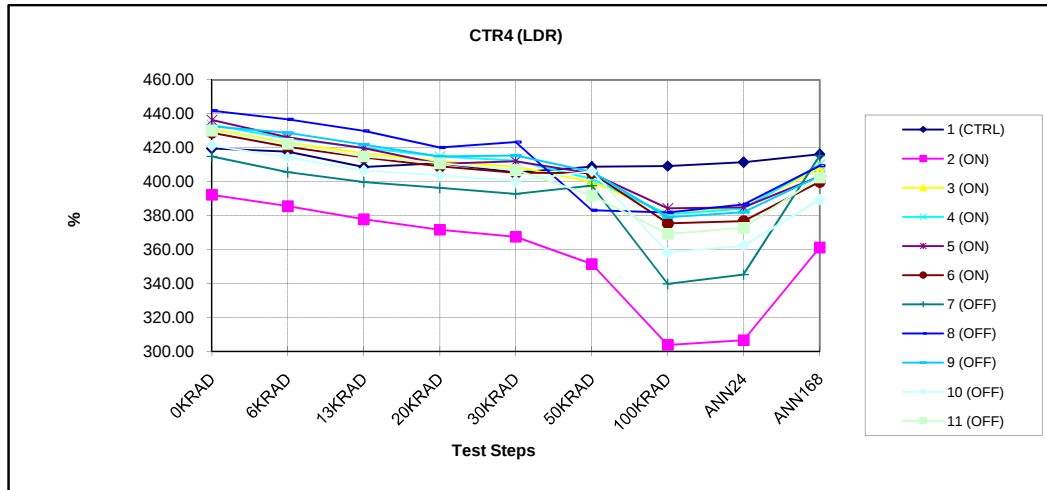
TR3 (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	664.3	640.6	611.3	590.3	561.5	518.2	438.9	438.6	558.2
ELDR OFF	650.1	628.8	604.5	589.4	561.4	510.4	378.7	384.0	533.0
LDR ON	627.1	602.6	576.9	555.8	539.6	507.8	413.9	417.5	518.3
LDR OFF	650.6	625.2	599.9	579.1	563.6	514.4	380.9	390.3	564.6



CTR4 (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	426.8	426.6	425.6	431.0	429.6	430.0	427.5	429.6	422.3

Bias on results									
2 (ON)	434.2	427.9	422.0	422.8	414.0	407.7	386.0	385.8	411.9
3 (ON)	414.6	409.7	403.8	403.2	395.1	387.3	361.6	362.1	392.4
4 (ON)	425.0	420.7	414.1	413.1	406.3	398.4	373.6	372.4	404.1
5 (ON)	440.9	436.4	432.2	430.7	424.1	415.5	397.4	395.7	420.3
6 (ON)	419.6	415.4	410.0	408.5	402.1	394.4	372.0	368.7	398.4
Statistics bias on									
min result	414.6	409.7	403.8	403.2	395.1	387.3	361.6	362.1	392.4
max result	440.9	436.4	432.2	430.7	424.1	415.5	397.4	395.7	420.3
average	426.9	422.0	416.4	415.7	408.3	400.6	378.1	377.0	405.4
sigma	10.7	10.4	11.0	11.1	11.2	11.1	13.8	13.6	11.0

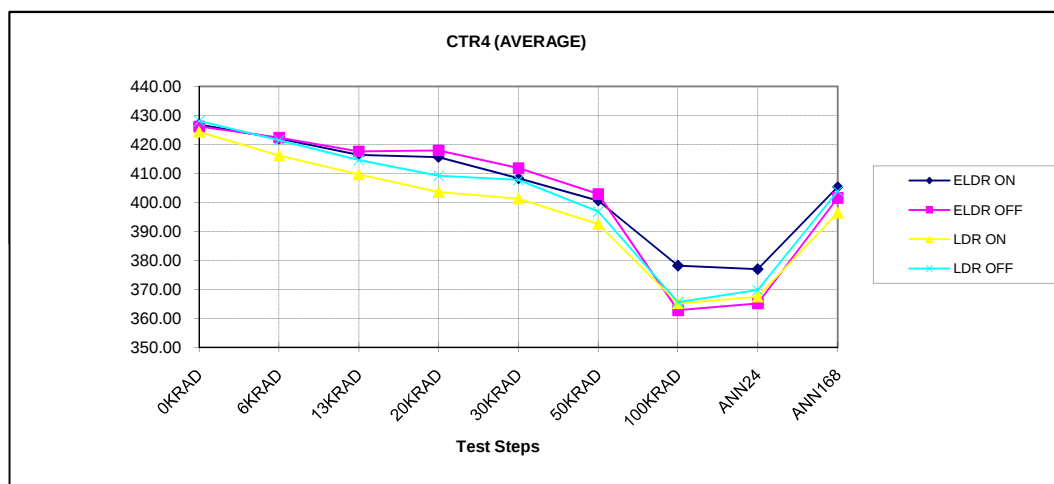
Bias off results									
7 (OFF)	451.1	449.2	445.4	445.7	439.3	431.2	398.1	399.8	427.4
8 (OFF)	442.3	438.6	432.0	432.7	427.8	420.5	387.3	389.1	419.8
9 (OFF)	398.8	394.0	389.4	390.2	383.0	371.5	314.9	319.8	374.4
10 (OFF)	414.7	408.6	404.8	405.4	398.9	390.2	350.5	352.3	388.6
11 (OFF)	424.1	421.7	416.7	416.0	410.4	401.2	363.0	365.0	397.6
Statistics bias off									
min result	398.8	394.0	389.4	390.2	383.0	371.5	314.9	319.8	374.4
max result	451.1	449.2	445.4	445.7	439.3	431.2	398.1	399.8	427.4
average	426.2	422.4	417.7	418.0	411.9	402.9	362.8	365.2	401.6
sigma	21.0	22.3	22.0	21.9	22.4	23.8	32.7	31.6	21.9



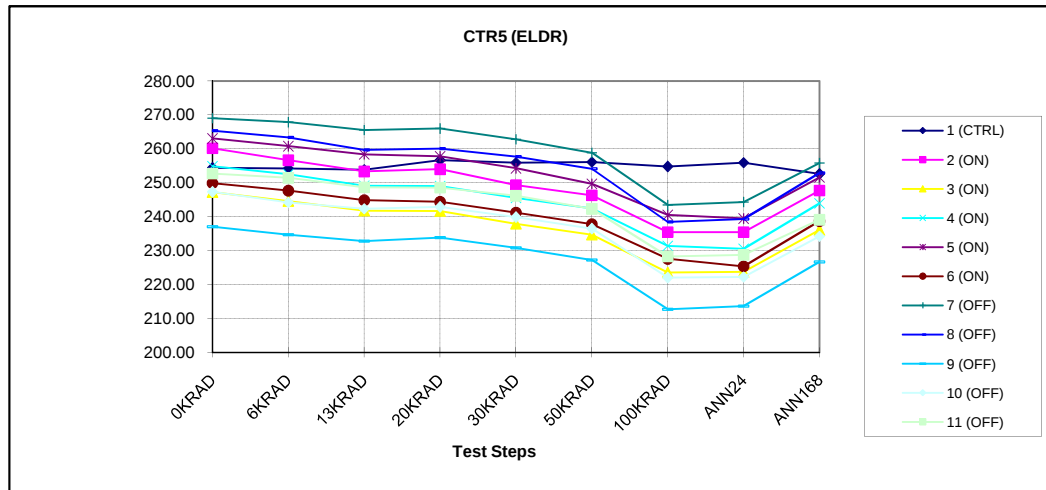
CTR4 (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	419.5	417.8	408.6	410.9	405.4	408.8	409.2	411.4	416.1

Bias on results									
2 (ON)	392.3	385.6	377.8	371.7	367.6	351.6	303.8	306.6	361.3
3 (ON)	431.0	423.0	416.7	412.0	408.8	399.8	381.5	384.8	407.9
4 (ON)	433.5	425.5	420.0	414.9	412.4	401.6	380.7	384.0	410.0
5 (ON)	436.3	426.2	419.7	410.6	412.1	404.9	384.4	384.9	403.1
6 (ON)	428.9	420.6	414.2	409.0	405.2	405.1	375.4	376.8	399.9
Statistics bias on									
min result	392.3	385.6	377.8	371.7	367.6	351.6	303.8	306.6	361.3
max result	436.3	426.2	420.0	414.9	412.4	405.1	384.4	384.9	410.0
average	424.4	416.2	409.7	403.6	401.2	392.6	365.2	367.4	396.4
sigma	18.2	17.2	18.0	18.0	19.0	23.0	34.4	34.2	20.0

Bias off results									
7 (OFF)	414.9	405.6	399.7	396.4	392.8	397.7	339.7	345.3	415.3
8 (OFF)	441.9	436.6	430.0	420.2	423.3	383.1	381.8	386.5	409.3
9 (OFF)	432.6	428.8	421.8	414.8	415.4	405.7	379.0	382.1	403.3
10 (OFF)	421.2	414.3	406.5	403.7	400.5	406.1	358.3	362.2	389.4
11 (OFF)	430.1	422.3	414.9	410.9	406.9	391.8	369.2	372.8	402.6
Statistics bias off									
min result	414.9	405.6	399.7	396.4	392.8	383.1	339.7	345.3	389.4
max result	441.9	436.6	430.0	420.2	423.3	406.1	381.8	386.5	415.3
average	428.1	421.5	414.6	409.2	407.8	396.9	365.6	369.8	404.0
sigma	10.5	12.1	12.0	9.4	12.0	9.7	17.2	16.6	9.6



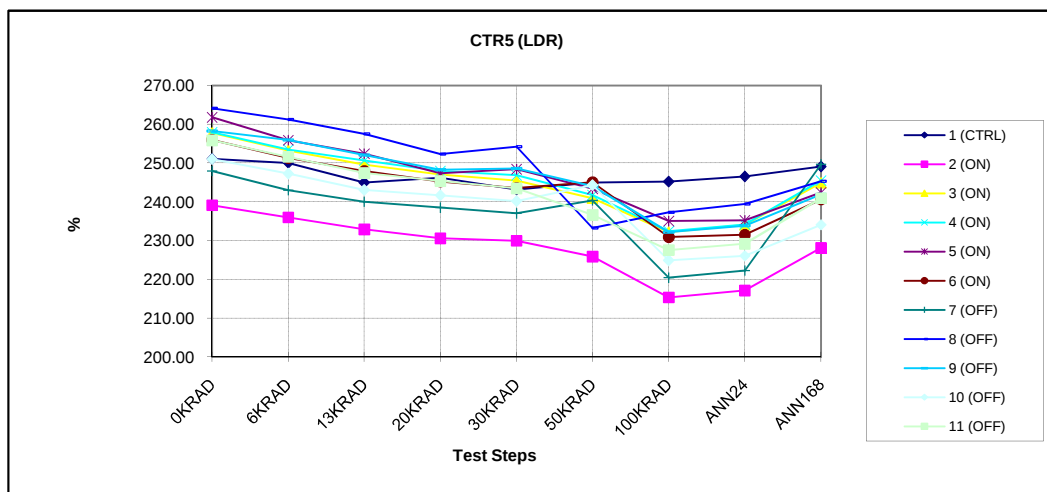
CTR4 (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	426.9	422.0	416.4	415.7	408.3	400.6	378.1	377.0	405.4
ELDR OFF	426.2	422.4	417.7	418.0	411.9	402.9	362.8	365.2	401.6
LDR ON	424.4	416.2	409.7	403.6	401.2	392.6	365.2	367.4	396.4
LDR OFF	428.1	421.5	414.6	409.2	407.8	396.9	365.6	369.8	404.0



CTR5 (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	254.4	254.3	253.9	256.6	256.0	256.1	254.7	256.0	252.6

Bias on results									
2 (ON)	260.2	256.6	253.3	254.0	249.3	246.3	235.5	235.5	247.7
3 (ON)	247.3	244.6	241.8	241.7	237.9	234.7	223.6	223.7	236.1
4 (ON)	254.9	252.5	249.1	249.1	245.6	242.4	231.4	230.6	244.0
5 (ON)	263.1	260.8	258.4	257.8	254.3	249.7	240.5	239.5	251.6
6 (ON)	249.9	247.7	244.9	244.4	241.2	237.8	227.6	225.4	238.7
Statistics bias on									
min result	247.3	244.6	241.8	241.7	237.9	234.7	223.6	223.7	236.1
max result	263.1	260.8	258.4	257.8	254.3	249.7	240.5	239.5	251.6
average	255.1	252.5	249.5	249.4	245.7	242.2	231.7	230.9	243.6
sigma	6.7	6.6	6.6	6.6	6.5	6.1	6.6	6.6	6.4

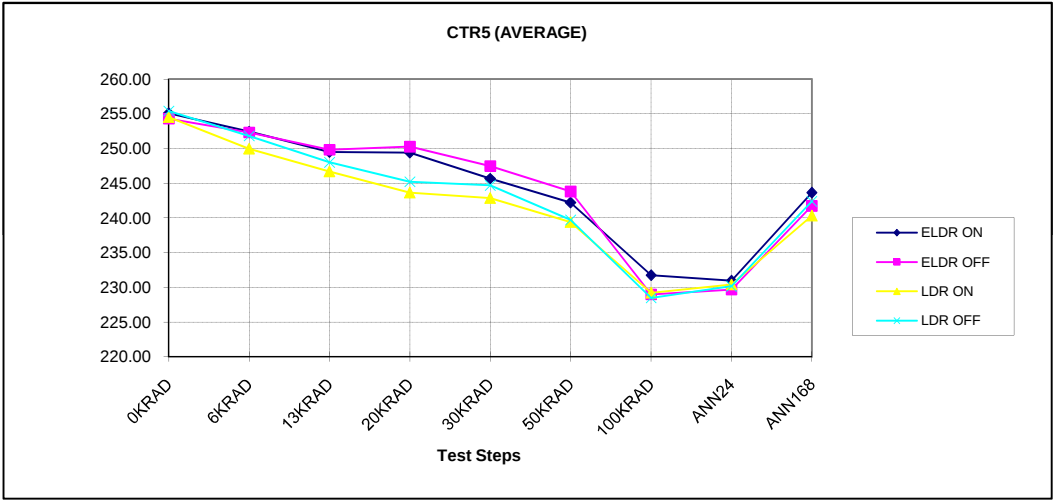
Bias off results									
7 (OFF)	269.1	267.9	265.6	266.0	262.8	258.8	243.4	244.3	255.8
8 (OFF)	265.3	263.3	259.7	260.1	257.7	254.1	238.4	239.3	252.9
9 (OFF)	237.1	234.7	232.8	233.9	230.9	227.3	212.7	213.7	226.6
10 (OFF)	247.3	244.2	242.4	242.9	239.9	236.5	222.0	222.3	234.2
11 (OFF)	252.7	251.5	248.7	248.6	246.2	242.3	228.3	228.8	239.1
Statistics bias off									
min result	237.1	234.7	232.8	233.9	230.9	227.3	212.7	213.7	226.6
max result	269.1	267.9	265.6	266.0	262.8	258.8	243.4	244.3	255.8
average	254.3	252.3	249.8	250.3	247.5	243.8	229.0	229.7	241.7
sigma	13.1	13.6	13.1	12.9	13.0	12.9	12.4	12.5	12.4



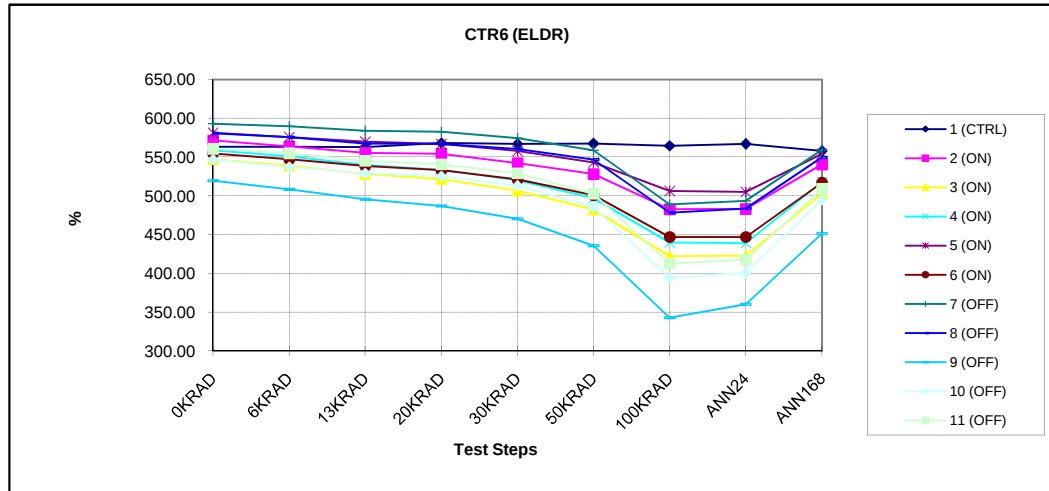
CTR5 (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	251.0	250.0	245.0	246.2	243.1	245.0	245.2	246.5	249.1

Bias on results									
2 (ON)	239.1	236.0	232.9	230.6	230.0	225.9	215.4	217.1	228.1
3 (ON)	257.8	253.2	249.6	247.0	245.4	241.0	232.2	234.1	244.9
4 (ON)	257.9	253.5	250.7	247.9	246.8	241.8	232.4	234.2	245.5
5 (ON)	261.8	255.9	252.4	247.4	248.4	243.4	235.0	235.2	242.4
6 (ON)	255.9	251.3	247.9	245.2	243.5	245.1	230.9	231.5	240.6
Statistics bias on									
min result	239.1	236.0	232.9	230.6	230.0	225.9	215.4	217.1	228.1
max result	261.8	255.9	252.4	247.9	248.4	245.1	235.0	235.2	245.5
average	254.5	250.0	246.7	243.6	242.8	239.4	229.2	230.4	240.3
sigma	8.9	8.0	7.9	7.4	7.4	7.7	7.9	7.6	7.1

Bias off results									
7 (OFF)	248.0	243.0	240.0	238.5	237.0	240.3	220.4	222.3	249.7
8 (OFF)	264.1	261.2	257.5	252.3	254.2	233.2	237.3	239.4	245.3
9 (OFF)	258.2	256.0	252.1	248.3	248.6	244.1	232.2	233.8	241.9
10 (OFF)	251.0	247.3	243.1	241.6	240.2	244.3	224.9	226.1	234.1
11 (OFF)	255.8	251.6	247.4	245.4	243.4	236.6	227.6	229.2	240.9
Statistics bias off									
min result	248.0	243.0	240.0	238.5	237.0	233.2	220.4	222.3	234.1
max result	264.1	261.2	257.5	252.3	254.2	244.3	237.3	239.4	249.7
average	255.4	251.8	248.0	245.2	244.7	239.7	228.5	230.2	242.4
sigma	6.3	7.2	7.0	5.4	6.8	4.8	6.5	6.7	5.8



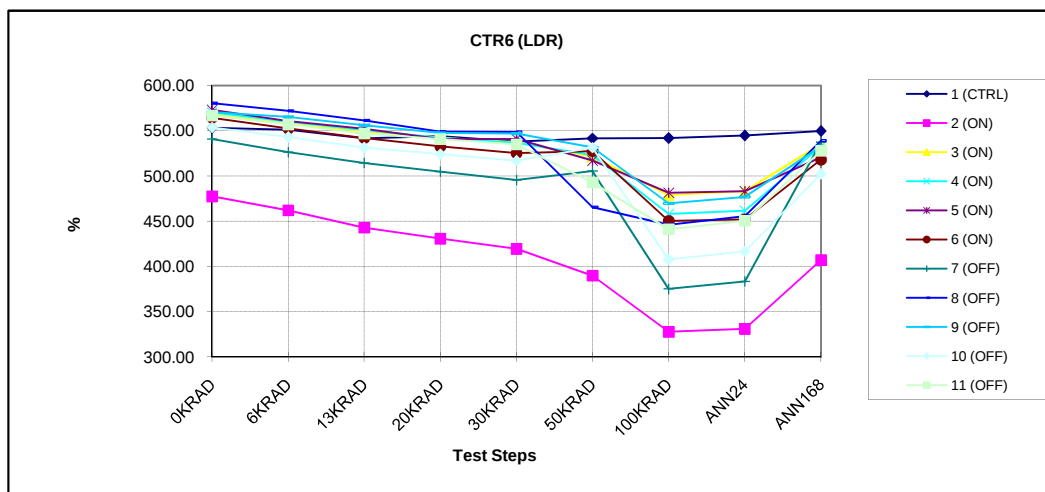
TR5 (AVERAG	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	255.1	252.5	249.5	249.4	245.7	242.2	231.7	230.9	243.6
ELDR OFF	254.3	252.3	249.8	250.3	247.5	243.8	229.0	229.7	241.7
LDR ON	254.5	250.0	246.7	243.6	242.8	239.4	229.2	230.4	240.3
LDR OFF	255.4	251.8	248.0	245.2	244.7	239.7	228.5	230.2	242.4



CTR6 (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	563.3	563.3	562.8	568.3	566.7	567.3	564.5	566.8	557.8

Bias on results									
2 (ON)	571.5	563.6	555.3	554.2	542.0	527.9	482.7	483.1	540.4
3 (ON)	547.2	538.8	528.2	521.7	506.7	482.4	421.9	422.8	502.8
4 (ON)	558.6	550.9	539.5	533.5	519.9	497.3	439.7	439.1	517.7
5 (ON)	581.2	575.8	569.8	566.8	557.7	543.1	506.2	505.1	554.1
6 (ON)	554.6	547.1	538.6	533.0	521.1	500.7	446.9	447.0	517.1
Statistics bias on									
min result	547.2	538.8	528.2	521.7	506.7	482.4	421.9	422.8	502.8
max result	581.2	575.8	569.8	566.8	557.7	543.1	506.2	505.1	554.1
average	562.6	555.2	546.3	541.9	529.5	510.3	459.5	459.4	526.4
sigma	13.6	14.5	16.3	18.2	20.2	24.7	34.2	33.8	20.5

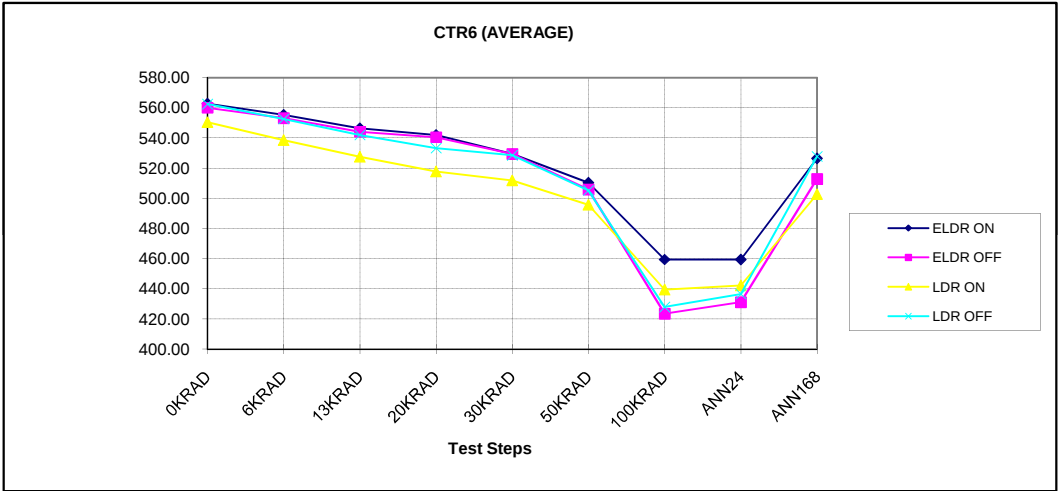
Bias off results									
7 (OFF)	592.9	589.6	583.8	582.6	574.3	558.6	489.1	493.4	559.2
8 (OFF)	580.5	575.5	567.2	567.0	560.2	546.8	478.2	483.5	549.5
9 (OFF)	519.3	508.4	495.3	487.0	470.4	435.6	343.0	360.3	451.6
10 (OFF)	546.7	537.4	529.1	525.3	512.7	485.6	394.2	401.0	494.8
11 (OFF)	560.5	554.8	545.1	540.5	529.0	502.7	412.7	417.8	509.1
Statistics bias off									
min result	519.3	508.4	495.3	487.0	470.4	435.6	343.0	360.3	451.6
max result	592.9	589.6	583.8	582.6	574.3	558.6	489.1	493.4	559.2
average	560.0	553.2	544.1	540.5	529.4	505.9	423.4	431.2	512.8
sigma	28.9	32.0	34.3	37.3	41.0	49.5	60.7	56.4	43.6



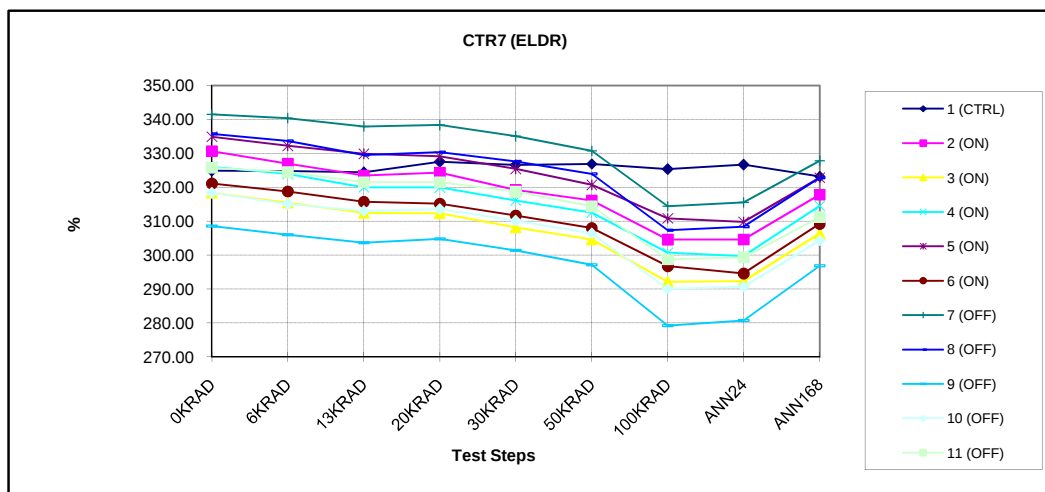
CTR6 (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	553.1	551.2	541.4	543.8	538.0	541.6	541.8	544.5	549.5

Bias on results									
2 (ON)	477.4	462.1	442.9	430.8	419.4	389.8	327.9	331.0	407.2
3 (ON)	567.6	557.7	549.1	542.3	537.1	521.5	479.0	483.0	535.2
4 (ON)	570.2	559.7	550.9	542.2	536.4	523.0	458.1	461.7	532.6
5 (ON)	572.9	560.6	552.2	540.7	541.0	517.1	481.5	483.0	520.7
6 (ON)	564.2	552.4	542.0	532.7	525.2	527.4	450.3	452.1	518.0
Statistics bias on									
min result	477.4	462.1	442.9	430.8	419.4	389.8	327.9	331.0	407.2
max result	572.9	560.6	552.2	542.3	541.0	527.4	481.5	483.0	535.2
average	550.5	538.5	527.4	517.7	511.8	495.8	439.4	442.2	502.8
sigma	41.0	42.8	47.4	48.8	52.0	59.3	63.7	63.6	53.9

Bias off results									
7 (OFF)	540.9	526.3	514.3	504.8	495.7	505.4	375.3	383.6	537.2
8 (OFF)	580.4	571.8	561.5	548.8	548.7	465.4	445.9	455.7	538.9
9 (OFF)	570.5	565.0	556.1	547.5	546.7	531.5	469.6	476.6	532.7
10 (OFF)	553.7	542.9	531.1	524.2	516.6	531.4	407.8	416.7	502.1
11 (OFF)	566.8	556.9	546.8	540.9	534.9	492.9	441.2	450.3	527.7
Statistics bias off									
min result	540.9	526.3	514.3	504.8	495.7	465.4	375.3	383.6	502.1
max result	580.4	571.8	561.5	548.8	548.7	531.5	469.6	476.6	538.9
average	562.5	552.6	542.0	533.2	528.5	505.3	428.0	436.6	527.7
sigma	15.4	18.2	19.3	18.7	22.4	27.9	36.8	36.6	15.0



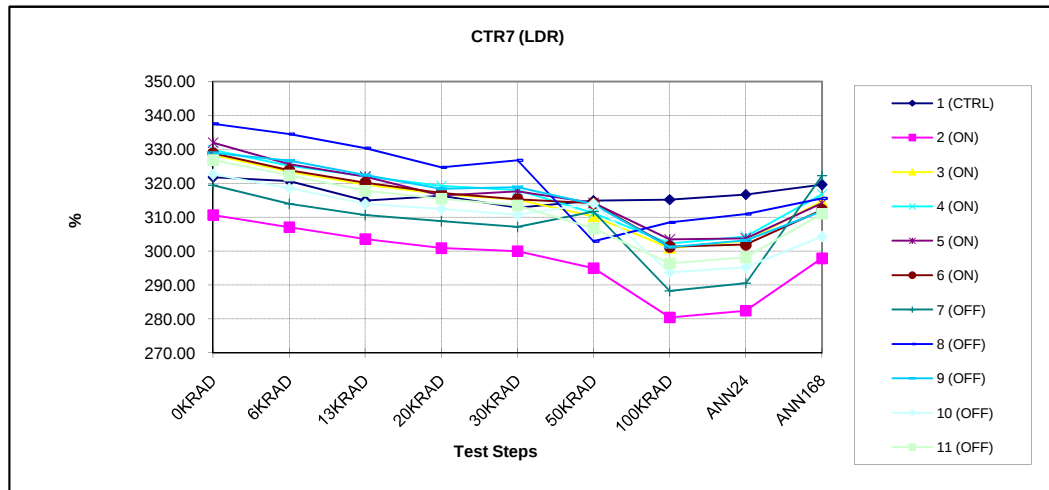
TR6 (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	562.6	555.2	546.3	541.9	529.5	510.3	459.5	459.4	526.4
ELDR OFF	560.0	553.2	544.1	540.5	529.4	505.9	423.4	431.2	512.8
LDR ON	550.5	538.5	527.4	517.7	511.8	495.8	439.4	442.2	502.8
LDR OFF	562.5	552.6	542.0	533.2	528.5	505.3	428.0	436.6	527.7



CTR7 (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	324.8	324.8	324.4	327.5	326.6	326.9	325.3	326.6	323.2

Bias on results									
2 (ON)	330.7	326.9	323.5	324.3	319.3	316.1	304.6	304.6	317.8
3 (ON)	318.3	315.5	312.4	312.3	308.2	304.6	292.1	292.4	306.4
4 (ON)	326.0	323.9	320.0	319.9	316.1	312.6	300.7	299.7	314.5
5 (ON)	334.9	332.2	329.8	329.1	325.4	320.7	310.9	309.8	322.8
6 (ON)	321.1	318.8	315.7	315.1	311.7	308.0	296.8	294.6	309.2
Statistics bias on									
min result	318.3	315.5	312.4	312.3	308.2	304.6	292.1	292.4	306.4
max result	334.9	332.2	329.8	329.1	325.4	320.7	310.9	309.8	322.8
average	326.2	323.5	320.3	320.2	316.1	312.4	301.0	300.2	314.1
sigma	6.8	6.6	6.8	6.8	6.7	6.4	7.2	7.2	6.6

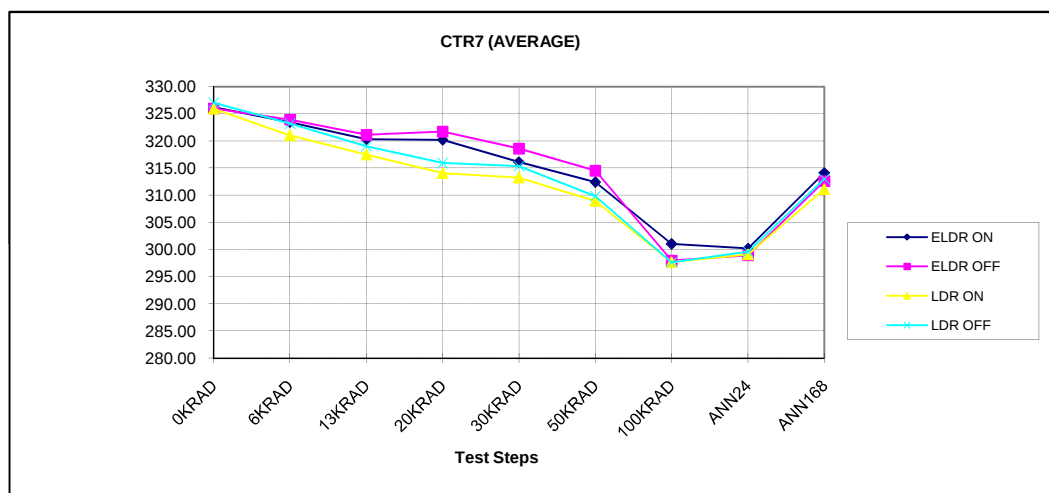
Bias off results									
7 (OFF)	341.5	340.4	337.9	338.3	335.0	330.7	314.4	315.6	327.8
8 (OFF)	335.7	333.7	329.5	330.4	327.7	324.0	307.3	308.3	322.8
9 (OFF)	308.6	306.0	303.7	304.8	301.4	297.1	279.2	280.7	296.9
10 (OFF)	318.4	315.0	313.0	313.6	310.1	306.4	290.1	290.8	304.3
11 (OFF)	325.7	324.5	321.5	321.5	318.7	314.4	298.8	299.3	311.2
Statistics bias off									
min result	308.6	306.0	303.7	304.8	301.4	297.1	279.2	280.7	296.9
max result	341.5	340.4	337.9	338.3	335.0	330.7	314.4	315.6	327.8
average	326.0	323.9	321.1	321.7	318.6	314.5	298.0	298.9	312.6
sigma	13.2	13.8	13.5	13.3	13.4	13.4	13.9	13.8	12.7



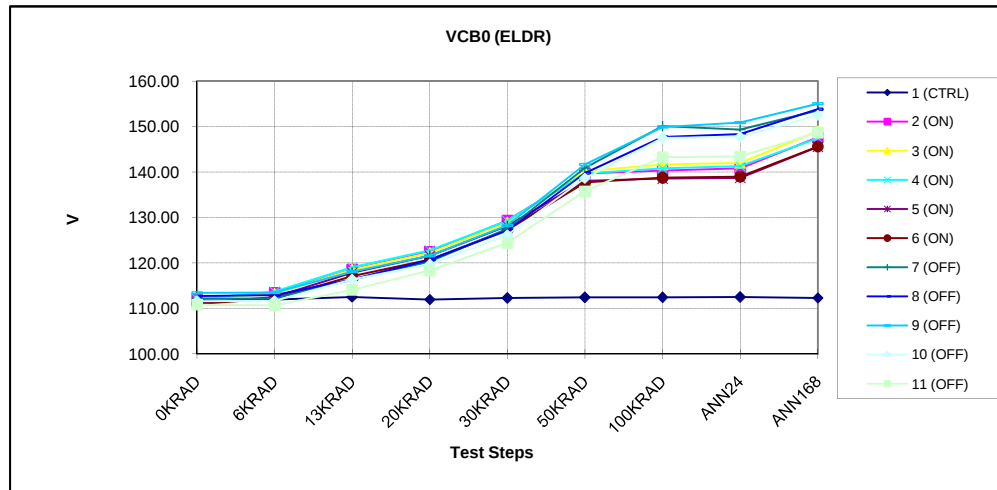
CTR7 (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	--	--	--	--	--	--	--	--	--
Max	--	--	--	--	--	--	--	--	--
Unit	%	%	%	%	%	%	%	%	%
Control Results									
1 (CTRL)	321.8	320.6	314.8	316.3	312.8	314.9	315.2	316.7	319.6

Bias on results									
2 (ON)	310.6	307.1	303.6	300.9	300.0	295.0	280.5	282.5	297.9
3 (ON)	328.4	323.3	319.6	316.8	315.2	310.2	300.9	303.0	314.7
4 (ON)	329.8	325.1	322.1	319.2	318.0	311.2	302.3	304.3	316.7
5 (ON)	332.0	325.6	321.9	316.4	317.7	314.3	303.5	303.8	314.2
6 (ON)	328.9	323.8	320.2	317.1	315.3	314.1	301.3	301.9	312.2
Statistics bias on									
min result	310.6	307.1	303.6	300.9	300.0	295.0	280.5	282.5	297.884
max result	332.0	325.6	322.1	319.2	318.0	314.3	303.5	304.3	316.721
average	325.9	321.0	317.5	314.1	313.2	309.0	297.7	299.1	311.133
sigma	8.7	7.8	7.8	7.4	7.5	8.0	9.7	9.3	7.581

Bias off results									
7 (OFF)	319.4	313.9	310.6	308.8	307.1	311.7	288.3	290.6	322.3
8 (OFF)	337.5	334.5	330.4	324.7	326.8	302.9	308.4	310.9	315.5
9 (OFF)	329.0	326.6	322.4	318.4	318.8	313.8	301.2	303.1	311.8
10 (OFF)	322.6	318.6	313.9	312.4	310.7	314.0	293.8	295.2	304.3
11 (OFF)	326.8	322.3	317.8	315.5	313.4	306.7	296.4	298.2	311.0
Statistics bias off									
min result	319.4	313.9	310.6	308.8	307.1	302.9	288.3	290.6	304.3
max result	337.5	334.5	330.4	324.7	326.8	314.0	308.4	310.9	322.3
average	327.1	323.2	319.0	315.9	315.4	309.8	297.6	299.6	313.0
sigma	6.9	7.9	7.7	6.0	7.7	4.9	7.6	7.8	6.6



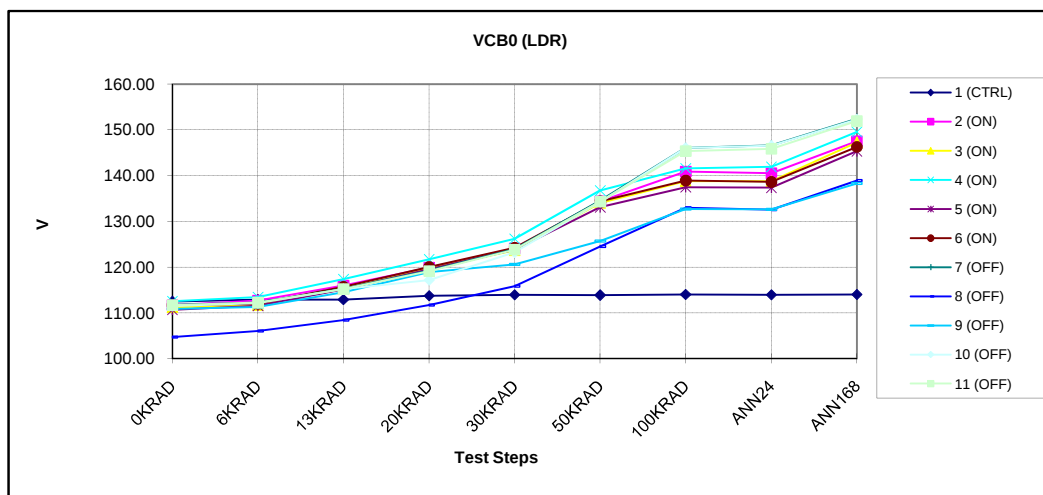
CTR7 (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	326.2	323.5	320.3	320.2	316.1	312.4	301.0	300.2	314.1
ELDR OFF	326.0	323.9	321.1	321.7	318.6	314.5	298.0	298.9	312.6
LDR ON	325.9	321.0	317.5	314.1	313.2	309.0	297.7	299.1	311.1
LDR OFF	327.1	323.2	319.0	315.9	315.4	309.8	297.6	299.6	313.0



VCB0 (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	45	45	45	45	45	45	45	45	45
Max	--	--	--	--	--	--	--	--	--
Unit	V	V	V	V	V	V	V	V	V
Control Results									
1 (CTRL)	111.6	111.9	112.6	112.0	112.3	112.4	112.5	112.5	112.3

Bias on results									
2 (ON)	112.1	113.4	118.6	122.5	129.3	139.7	140.3	140.8	147.6
3 (ON)	112.0	113.2	118.5	122.3	129.0	140.2	141.7	142.0	149.0
4 (ON)	112.1	113.7	119.1	122.8	129.3	139.7	140.8	141.3	147.4
5 (ON)	111.2	112.5	117.9	121.6	128.1	138.1	138.5	138.7	145.5
6 (ON)	111.0	112.2	117.1	120.8	127.3	137.7	138.7	139.0	145.6
Statistics bias on									
min result	111.0	112.2	117.1	120.8	127.3	137.7	138.5	138.7	145.5
max result	112.1	113.7	119.1	122.8	129.3	140.2	141.7	142.0	149.0
average	111.7	113.0	118.2	122.0	128.6	139.1	140.0	140.4	147.0
sigma	0.6	0.7	0.8	0.8	0.9	1.1	1.4	1.4	1.5

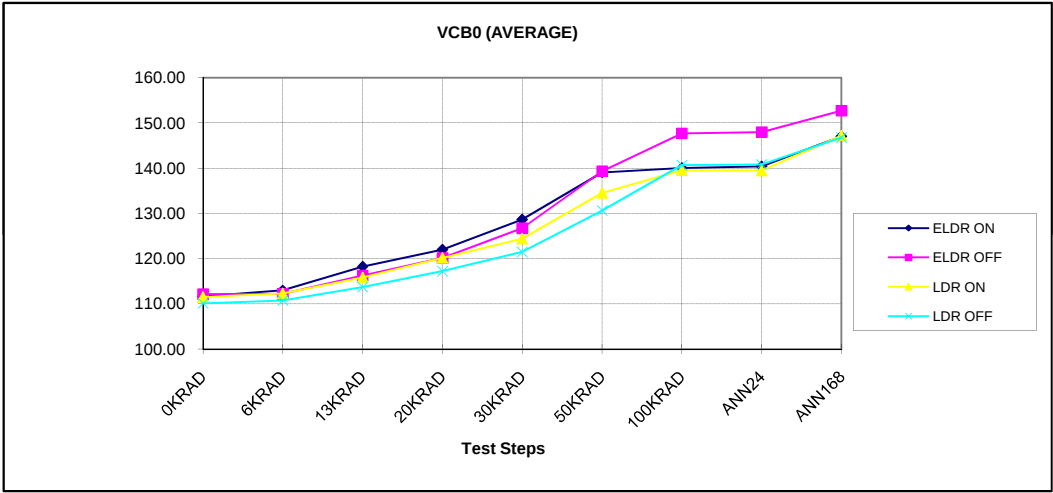
Bias off results									
7 (OFF)	112.1	112.3	116.3	120.3	127.5	140.9	150.1	149.4	153.5
8 (OFF)	112.7	113.0	116.4	120.7	127.1	139.8	147.7	148.4	153.8
9 (OFF)	113.5	113.5	118.1	121.6	128.3	141.7	149.9	150.9	155.0
10 (OFF)	111.6	111.7	116.4	119.7	126.2	138.7	147.5	147.7	152.5
11 (OFF)	110.9	110.7	114.1	118.4	124.4	135.7	143.3	143.4	148.7
Statistics bias off									
min result	110.9	110.7	114.1	118.4	124.4	135.7	143.3	143.4	148.7
max result	113.5	113.5	118.1	121.6	128.3	141.7	150.1	150.9	155.0
average	112.2	112.2	116.3	120.1	126.7	139.3	147.7	147.9	152.7
sigma	1.0	1.1	1.4	1.2	1.5	2.3	2.8	2.8	2.4



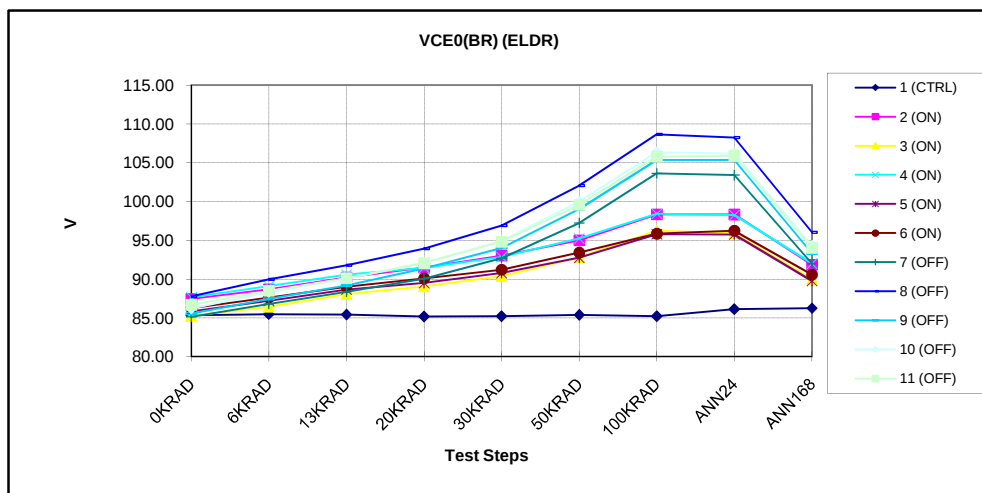
VCB0 (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	45	45	45	45	45	45	45	45	45
Max	--	--	--	--	--	--	--	--	--
Unit	V	V	V	V	V	V	V	V	V
Control Results									
1 (CTRL)	112.4	112.9	112.9	113.7	113.9	113.9	114.0	113.9	114.0

Bias on results									
2 (ON)	111.7	112.7	116.0	119.9	124.1	134.4	140.9	140.5	147.5
3 (ON)	111.2	111.7	115.2	119.7	123.6	134.0	138.8	138.8	147.2
4 (ON)	112.5	113.5	117.3	121.7	126.2	136.7	141.6	141.9	149.6
5 (ON)	110.7	111.5	115.1	119.5	123.8	133.1	137.4	137.3	145.3
6 (ON)	111.7	112.0	115.7	120.0	124.2	134.4	138.9	138.6	146.3
Statistics bias on									
min result	110.7	111.5	115.1	119.5	123.6	133.1	137.4	137.3	145.3
max result	112.5	113.5	117.3	121.7	126.2	136.7	141.6	141.9	149.6
average	111.6	112.3	115.9	120.2	124.4	134.5	139.5	139.4	147.2
sigma	0.7	0.8	0.9	0.9	1.0	1.3	1.7	1.8	1.6

Bias off results									
7 (OFF)	111.8	112.3	115.3	119.2	123.9	134.5	146.0	146.6	152.4
8 (OFF)	104.7	106.0	108.4	111.7	115.8	124.5	133.0	132.5	138.9
9 (OFF)	110.9	111.3	114.5	118.9	120.6	125.7	132.7	132.6	138.3
10 (OFF)	111.5	112.1	115.2	117.2	123.2	134.2	146.1	146.6	152.3
11 (OFF)	111.7	112.2	115.2	119.1	123.8	134.3	145.4	145.8	151.9
Statistics bias off									
min result	104.7	106.0	108.4	111.7	115.8	124.5	132.7	132.5	138.3
max result	111.8	112.3	115.3	119.2	123.9	134.5	146.1	146.6	152.4
average	110.1	110.8	113.7	117.2	121.5	130.6	140.6	140.8	146.8
sigma	3.0	2.7	3.0	3.2	3.5	5.1	7.1	7.5	7.5



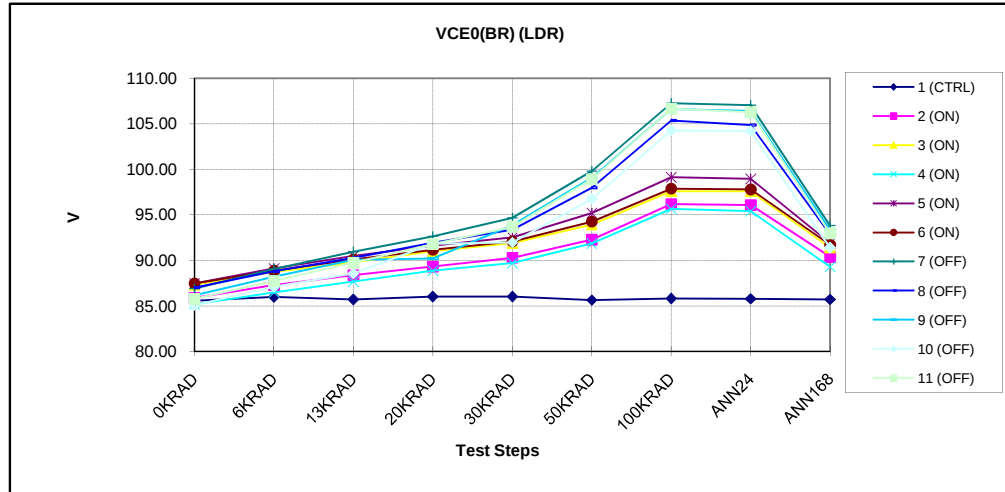
VCB0 (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	111.7	113.0	118.2	122.0	128.6	139.1	140.0	140.4	147.0
ELDR OFF	112.2	112.2	116.3	120.1	126.7	139.3	147.7	147.9	152.7
LDR ON	111.6	112.3	115.9	120.2	124.4	134.5	139.5	139.4	147.2
LDR OFF	110.1	110.8	113.7	117.2	121.5	130.6	140.6	140.8	146.8



VCE0(BR) (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	40	40	40	40	40	40	40	40	40
Max	--	--	--	--	--	--	--	--	--
Unit	V	V	V	V	V	V	V	V	V
Control Results									
1 (CTRL)	85.3	85.5	85.4	85.2	85.2	85.4	85.2	86.1	86.2

Bias on results									
2 (ON)	87.4	88.7	90.2	91.5	93.0	95.0	98.3	98.3	91.8
3 (ON)	85.3	86.4	88.1	89.0	90.4	92.8	96.2	95.9	90.0
4 (ON)	87.6	89.1	90.6	91.4	92.8	95.2	98.4	98.2	92.0
5 (ON)	85.8	87.2	88.6	89.5	90.8	92.8	95.8	95.7	89.8
6 (ON)	86.2	87.6	89.0	90.1	91.2	93.4	95.8	96.2	90.6
Statistics bias on									
min result	85.3	86.4	88.1	89.0	90.4	92.8	95.8	95.7	89.8
max result	87.6	89.1	90.6	91.5	93.0	95.2	98.4	98.3	92.0
average	86.5	87.8	89.3	90.3	91.6	93.8	96.9	96.9	90.8
sigma	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.3	1.0

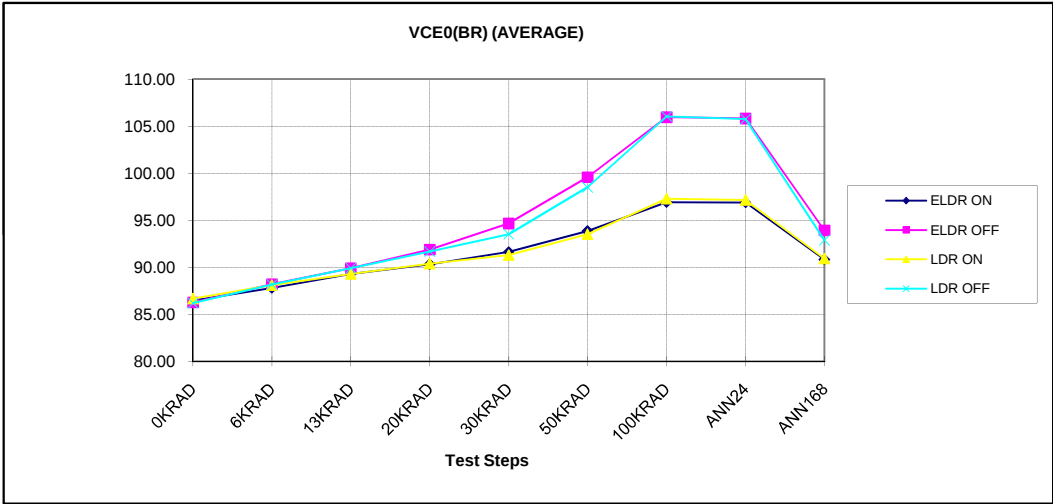
Bias off results									
7 (OFF)	85.1	86.8	88.3	90.0	92.7	97.2	103.6	103.4	92.0
8 (OFF)	87.8	90.0	91.8	93.9	96.9	102.0	108.6	108.3	96.0
9 (OFF)	85.5	87.4	89.2	91.4	94.0	99.0	105.4	105.4	93.3
10 (OFF)	86.2	88.3	90.0	92.1	94.9	100.0	106.4	106.2	94.3
11 (OFF)	86.7	88.5	90.1	92.0	94.8	99.6	105.8	105.9	94.0
Statistics bias off									
min result	85.1	86.8	88.3	90.0	92.7	97.2	103.6	103.4	92.0
max result	87.8	90.0	91.8	93.9	96.9	102.0	108.6	108.3	96.0
average	86.3	88.2	89.9	91.9	94.7	99.6	106.0	105.8	93.9
sigma	1.0	1.2	1.3	1.4	1.5	1.7	1.8	1.7	1.5



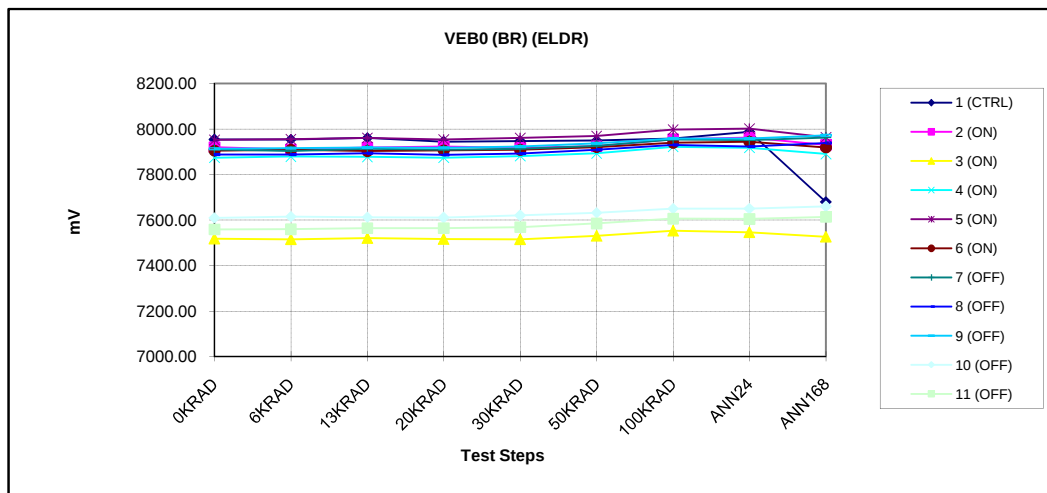
CE0(BR) (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	40	40	40	40	40	40	40	40	40
Max	--	--	--	--	--	--	--	--	--
Unit	V	V	V	V	V	V	V	V	V
Control Results									
1 (CTRL)	85.6	86.0	85.7	86.0	86.0	85.6	85.8	85.8	85.7

Bias on results									
2 (ON)	85.9	87.3	88.4	89.3	90.3	92.3	96.2	96.1	90.4
3 (ON)	87.3	88.7	89.8	91.0	91.9	93.9	97.6	97.6	91.4
4 (ON)	85.2	86.5	87.7	88.9	89.7	91.9	95.7	95.4	89.3
5 (ON)	87.5	89.1	90.5	91.6	92.5	95.2	99.1	99.0	91.9
6 (ON)	87.5	88.9	90.1	91.2	92.1	94.3	97.9	97.8	91.7
Statistics bias on									
min result	85.2	86.5	87.7	88.9	89.7	91.9	95.7	95.4	89.3
max result	87.5	89.1	90.5	91.6	92.5	95.2	99.1	99.0	91.9
average	86.7	88.1	89.3	90.4	91.3	93.5	97.3	97.2	90.9
sigma	1.1	1.1	1.2	1.2	1.2	1.4	1.4	1.4	1.1

Bias off results									
7 (OFF)	86.9	89.1	90.9	92.6	94.7	99.8	107.3	107.1	93.8
8 (OFF)	87.0	88.8	90.3	91.9	93.4	98.0	105.4	104.9	92.8
9 (OFF)	86.2	88.2	90.1	90.2	93.9	99.1	106.6	106.4	93.4
10 (OFF)	85.1	87.1	88.5	91.8	92.0	96.8	104.3	104.2	91.4
11 (OFF)	85.8	87.7	89.8	91.8	93.7	98.9	106.7	106.3	93.0
Statistics bias off									
min result	85.1	87.1	88.5	90.2	92.0	96.8	104.3	104.2	91.4
max result	87.0	89.1	90.9	92.6	94.7	99.8	107.3	107.1	93.8
average	86.2	88.2	89.9	91.7	93.5	98.5	106.0	105.8	92.9
sigma	0.8	0.8	0.9	0.9	1.0	1.2	1.2	1.2	0.9



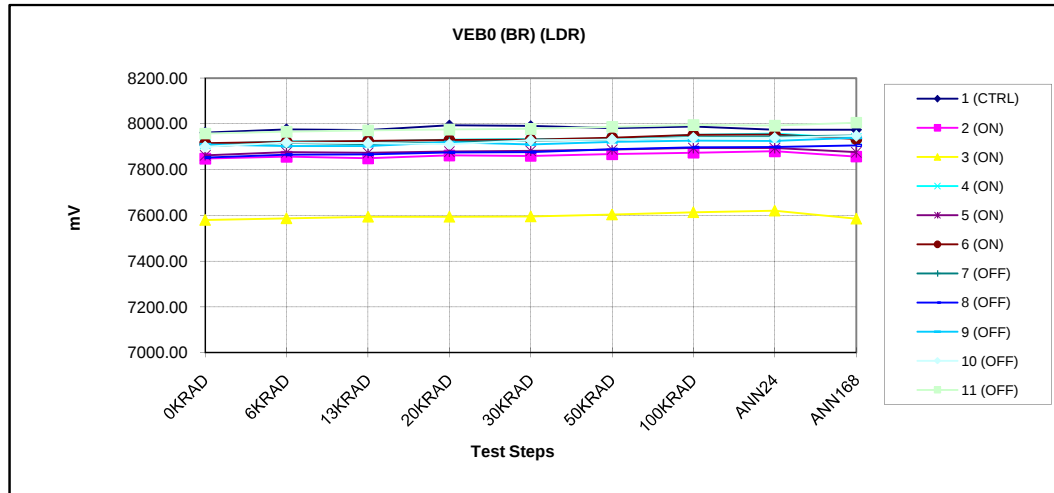
VCE0(BR) (AVERAGE)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	86.5	87.8	89.3	90.3	91.6	93.8	96.9	96.9	90.8
ELDR OFF	86.3	88.2	89.9	91.9	94.7	99.6	106.0	105.8	93.9
LDR ON	86.7	88.1	89.3	90.4	91.3	93.5	97.3	97.2	90.9
LDR OFF	86.2	88.2	89.9	91.7	93.5	98.5	106.0	105.8	92.9



B0 (BR) (ELDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	7000	7000	7000	7000	7000	7000	7000	7000	7000
Max	--	--	--	--	--	--	--	--	--
Unit	mV	mV	mV	mV	mV	mV	mV	mV	mV
Control Results									
1 (CTRL)	7954.1	7954.6	7961.7	7944.0	7946.6	7950.3	7958.2	7988.5	7680.6

Bias on results									
2 (ON)	7921.1	7911.4	7919.6	7923.9	7917.8	7925.1	7956.2	7962.3	7930.4
3 (ON)	7518.1	7515.4	7520.6	7516.0	7515.9	7530.2	7553.0	7546.6	7526.9
4 (ON)	7874.3	7879.4	7877.6	7874.2	7881.5	7893.5	7922.2	7917.9	7890.8
5 (ON)	7952.8	7955.2	7961.5	7954.7	7961.0	7969.1	7997.8	8002.3	7964.6
6 (ON)	7905.7	7909.1	7903.5	7907.1	7908.7	7921.2	7939.9	7944.3	7919.2
Statistics bias on									
min result	7518.1	7515.4	7520.6	7516.0	7515.9	7530.2	7553.0	7546.6	7526.9
max result	7952.8	7955.2	7961.5	7954.7	7961.0	7969.1	7997.8	8002.3	7964.6
average	7834.4	7834.1	7836.6	7835.2	7837.0	7847.8	7873.8	7874.7	7846.4
sigma	179.0	180.2	179.3	180.8	181.8	179.6	181.5	185.9	180.5

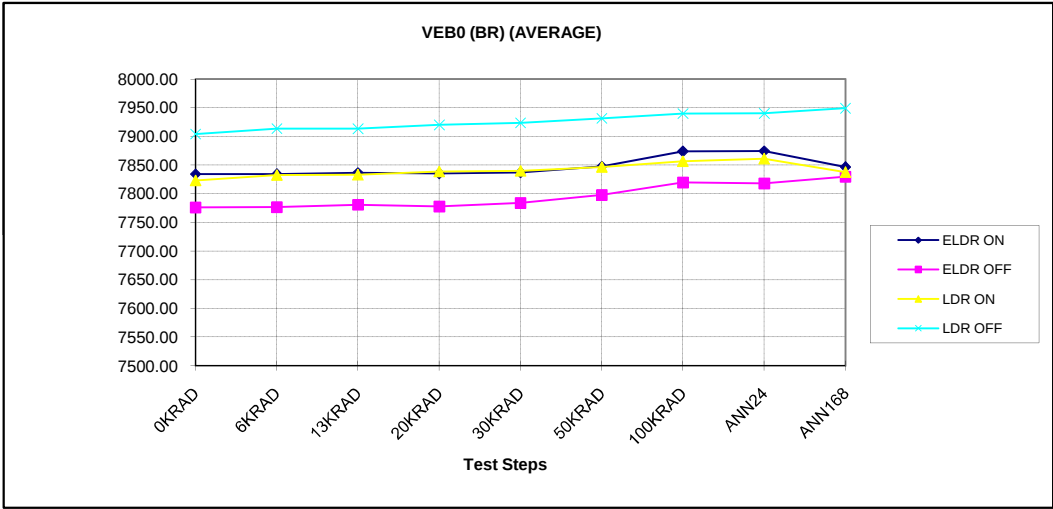
Bias off results									
7 (OFF)	7910.6	7904.3	7913.6	7908.9	7913.8	7925.9	7953.6	7951.9	7963.1
8 (OFF)	7888.4	7887.6	7894.3	7887.3	7892.3	7908.8	7929.9	7923.9	7939.0
9 (OFF)	7913.1	7916.2	7919.4	7917.7	7923.9	7937.1	7957.9	7958.3	7972.6
10 (OFF)	7609.9	7615.4	7613.0	7610.3	7620.5	7632.2	7651.0	7650.8	7659.8
11 (OFF)	7559.3	7560.2	7564.6	7564.5	7568.9	7585.3	7606.3	7604.9	7614.4
Statistics bias off									
min result	7559.3	7560.2	7564.6	7564.5	7568.9	7585.3	7606.3	7604.9	7614.4
max result	7913.1	7916.2	7919.4	7917.7	7923.9	7937.1	7957.9	7958.3	7972.6
average	7776.2	7776.7	7781.0	7777.7	7783.9	7797.8	7819.7	7818.0	7829.8
sigma	176.2	173.9	176.5	174.9	174.0	173.7	175.5	174.8	177.0



EB0 (BR) (LDR)	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
Min	7000	7000	7000	7000	7000	7000	7000	7000	7000
Max	--	--	--	--	--	--	--	--	--
Unit	mV	mV	mV	mV	mV	mV	mV	mV	mV
Control Results									
1 (CTRL)	7961.3	7975.3	7972.4	7994.4	7991.3	7981.8	7988.5	7974.4	7973.9

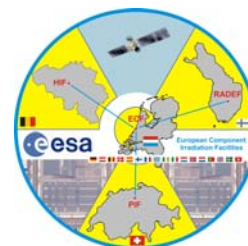
Bias on results									
2 (ON)	7847.8	7856.4	7849.6	7862.1	7859.5	7867.4	7873.6	7879.8	7857.2
3 (ON)	7579.0	7587.2	7593.6	7593.5	7594.8	7603.8	7612.7	7620.3	7584.9
4 (ON)	7911.3	7924.2	7922.8	7930.1	7933.0	7935.0	7951.7	7957.2	7936.9
5 (ON)	7862.9	7876.1	7873.4	7878.8	7882.1	7887.8	7894.2	7894.1	7876.1
6 (ON)	7915.1	7920.5	7925.3	7930.1	7931.5	7939.8	7951.4	7953.2	7933.1
Statistics bias on									
min result	7579.0	7587.2	7593.6	7593.5	7594.8	7603.8	7612.7	7620.3	7584.9
max result	7915.1	7924.2	7925.3	7930.1	7933.0	7939.8	7951.7	7957.2	7936.9
average	7823.2	7832.9	7832.9	7838.9	7840.2	7846.7	7856.7	7860.9	7837.7
sigma	139.7	140.4	137.6	140.5	140.8	139.2	140.7	138.9	145.5

Bias off results									
7 (OFF)	7902.1	7916.3	7911.9	7919.4	7925.9	7931.3	7941.8	7944.8	7949.1
8 (OFF)	7851.9	7865.0	7865.8	7874.8	7876.6	7889.4	7897.1	7899.1	7905.3
9 (OFF)	7910.1	7903.3	7902.8	7920.2	7910.5	7920.5	7926.8	7925.7	7938.8
10 (OFF)	7899.9	7918.4	7915.1	7911.4	7927.5	7930.7	7939.4	7939.6	7947.2
11 (OFF)	7957.5	7965.4	7971.6	7975.4	7978.3	7986.9	7994.7	7991.8	8005.4
Statistics bias off									
min result	7851.9	7865.0	7865.8	7874.8	7876.6	7889.4	7897.1	7899.1	7905.3
max result	7957.5	7965.4	7971.6	7975.4	7978.3	7986.9	7994.7	7991.8	8005.4
average	7904.3	7913.7	7913.4	7920.2	7923.8	7931.7	7939.9	7940.2	7949.2
sigma	37.5	36.0	38.0	36.0	36.7	35.2	35.4	33.8	36.1



0 (BR) (AVER	0KRAD	6KRAD	13KRAD	20KRAD	30KRAD	50KRAD	100KRAD	ANN24	ANN168
ELDR ON	7834.4	7834.1	7836.6	7835.2	7837.0	7847.8	7873.8	7874.7	7846.4
ELDR OFF	7776.2	7776.7	7781.0	7777.7	7783.9	7797.8	7819.7	7818.0	7829.8
LDR ON	7823.2	7832.9	7832.9	7838.9	7840.2	7846.7	7856.7	7860.9	7837.7
LDR OFF	7904.3	7913.7	7913.4	7920.2	7923.8	7931.7	7939.9	7940.2	7949.2

ANNEX II DOSIMETRY



RADIATION TEST SUMMARY

Irradiation Test Report Number : **20139**

Date : **18 June 2012**

<i>Test Requester :</i>	<i>Name</i>	Alter Technology
	<i>Address</i>	Avd. Tomas Alba Edison, 4 41092 Seville (SPAIN)
	<i>Personnel present :</i>	E Munoz Plaza, J Jimenez Carreira, E Bernabeu Torres
	<i>Project/Cost Code :</i>	TRP
<i>Devices/Components irradiated :</i>		Linear Devices AD565AT,OP470,AD584,PM139X,REF02,OP27,UC1843
<i>Device/Component details :</i>		AD565AT,OP470,OP27,AD565AT,OLH249,OLH449 66183-105,AD565AT,PM139X,PM139X,SOC5551,UC1846
	<i>(conditions and identification)</i>	

Dosimetry Chain used : B
Dosimeter : Farmer model 2680 – s/n 109
Gas Ionisation Chamber : NE Type 2571 – s/n 3322
Measured Dosimetry : Total Ionising Dose in [Gy] (water)

Dosimetry Procedure : ESCC 22900 section 4.1.1
TEC-QEC/PR001 - Appendix D
(Total Ionising Dose accredited by RvA according to ISO/IEC 17025.2005
Certificate No. L517)

(With the exception of the above specified dosimetry equipment, ESTEC ⁶⁰Co Facility does not assume any liability for the calibration status of any other equipment lent to the requester)

Irradiation Test Campaign Details

Source Activity : 79.8 TBq

on date : 15 February 2012

	units	Min.	Max.	Time-weighted Average	Dosimeter position relative to ⁶⁰ Co source		
Temperature	°C	24.10	25.70	24.99	X	cm	130
Pressure	mbar	982.60	1036.30	1014.74	Y	cm	736
Relative Humidity	%	22.20	42.90	32.08	Z	cm	62

<i>Run</i>	<i>Start Date & Time (CET)</i>	<i>End Date & Time (CET)</i>	<i>Total Ionising Dose [Gy] (water)</i>	<i>Dose Rate [mGy/h] (water)</i>
1	15/02/2012 15:18	15/02/2012 15:54	0.25	0.41
2	15/02/2012 16:16	16/02/2012 09:13	7.02	0.41
3	16/02/2012 09:18	16/02/2012 11:10	0.77	0.41
4	16/02/2012 11:20	17/02/2012 13:28	10.80	0.41

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5	17/02/2012 13:33	17/02/2012 15:33	0.82	0.41
6	17/02/2012 15:42	20/02/2012 09:08	27.02	0.41
7	20/02/2012 09:18	20/02/2012 11:11	0.78	0.41
8	20/02/2012 11:23	20/02/2012 13:49	1.00	0.41
9	20/02/2012 13:55	20/02/2012 15:16	0.55	0.41
10	20/02/2012 15:21	21/02/2012 09:36	7.47	0.41
11	21/02/2012 09:43	21/02/2012 10:58	0.52	0.41
12	21/02/2012 11:02	21/02/2012 14:00	1.22	0.41
13	21/02/2012 14:16	21/02/2012 16:14		
14	21/02/2012 16:35	22/02/2012 13:18	8.54	0.41
15	22/02/2012 13:28	22/02/2012 15:09	0.69	0.41
16	22/02/2012 15:17	23/02/2012 09:18	7.43	0.41
17	23/02/2012 09:25	23/02/2012 10:20	0.38	0.41
18	23/02/2012 11:09	24/02/2012 18:31	12.94	0.41
19	24/02/2012 18:33	27/02/2012 08:33	25.58	0.41
20	27/02/2012 08:47	27/02/2012 10:06	0.49	0.37
21	27/02/2012 10:12	27/02/2012 11:09	0.36	0.38
22	27/02/2012 11:11	27/02/2012 13:07	0.73	0.38
23	27/02/2012 13:10	27/02/2012 15:12	0.77	0.38
24	27/02/2012 15:16	27/02/2012 16:28	0.46	0.38
25	27/02/2012 16:31	28/02/2012 13:00	8.44	0.41
26	28/02/2012 13:10	28/02/2012 16:33	1.33	0.39
27	28/02/2012 16:36	28/02/2012 19:40	1.21	0.39
28	28/02/2012 19:42	29/02/2012 08:44	5.13	0.39
29	29/02/2012 08:48	29/02/2012 13:16	1.83	0.41
30	29/02/2012 13:18	29/02/2012 14:53	0.65	0.41
31	29/02/2012 15:06	29/02/2012 16:50		
32	29/02/2012 17:10	01/03/2012 08:36	6.30	0.41
33	01/03/2012 09:08	01/03/2012 14:03	2.01	0.41
34	01/03/2012 14:15	01/03/2012 16:29	0.92	0.41
35	01/03/2012 16:32	02/03/2012 08:50	6.70	0.41
36	02/03/2012 08:58	02/03/2012 17:29	3.53	0.41
37	02/03/2012 17:47	06/03/2012 09:02	37.75	0.43
38	06/03/2012 09:14	06/03/2012 09:15	0.00	0.31
39	06/03/2012 09:18	06/03/2012 10:36	0.51	0.39
40	06/03/2012 10:39	06/03/2012 11:44	0.43	0.40
41	06/03/2012 11:47	06/03/2012 13:56	0.85	0.39
42	06/03/2012 13:59	06/03/2012 14:49	0.33	0.39

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43	06/03/2012 14:52	06/03/2012 16:29	0.64	0.39
44	06/03/2012 16:35	06/03/2012 18:30	0.76	0.40
45	06/03/2012 18:33	07/03/2012 08:57	5.68	0.39
46	07/03/2012 09:01	07/03/2012 10:16	0.51	0.41
47	07/03/2012 10:23	08/03/2012 08:56	9.23	0.41
48	08/03/2012 09:06	08/03/2012 14:16	2.00	0.39
49	08/03/2012 14:29	08/03/2012 16:10		
50	08/03/2012 16:27	09/03/2012 09:19	6.90	0.41
51	09/03/2012 09:22	09/03/2012 11:40	0.94	0.41
52	09/03/2012 11:42	12/03/2012 13:22	30.14	0.41
53	12/03/2012 13:25	12/03/2012 15:53	1.01	0.41
54	12/03/2012 15:55	13/03/2012 09:04	7.00	0.41
55	13/03/2012 09:14	14/03/2012 08:49	9.23	0.39
56	14/03/2012 08:56	14/03/2012 11:37	1.05	0.39
57	14/03/2012 11:43	14/03/2012 17:04	2.09	0.39
58	14/03/2012 17:09	15/03/2012 09:02	6.48	0.41
59	15/03/2012 09:08	15/03/2012 09:37	0.19	0.39
60	15/03/2012 09:42	15/03/2012 15:00	2.07	0.39
61	15/03/2012 15:05	15/03/2012 17:14	0.88	0.41
62	15/03/2012 17:21	16/03/2012 10:24	6.68	0.39
63	16/03/2012 10:31	16/03/2012 16:01	2.15	0.39
64	16/03/2012 16:15	19/03/2012 09:08	26.46	0.41
65	19/03/2012 09:33	19/03/2012 09:35	0.01	0.40
66	19/03/2012 09:37	19/03/2012 10:23	0.31	0.41
67*	19/03/2012 11:22	19/03/2012 13:44	0.96	0.41
68	19/03/2012 14:02	19/03/2012 15:39		
69	19/03/2012 15:58	20/03/2012 10:19	7.32	0.41
70	20/03/2012 10:27	20/03/2012 10:47	0.14	0.40
71	20/03/2012 10:50	20/03/2012 11:09	0.13	0.41
72	20/03/2012 11:12	20/03/2012 12:45	0.62	0.40
73	20/03/2012 12:47	20/03/2012 13:39	0.35	0.41
74	20/03/2012 13:42	20/03/2012 16:29	1.10	0.40
75	20/03/2012 16:31	20/03/2012 17:40	0.47	0.41
76	20/03/2012 17:43	21/03/2012 09:08	6.13	0.40
77	21/03/2012 09:11	21/03/2012 10:22	0.49	0.41
78	21/03/2012 10:28	21/03/2012 10:45	0.12	0.40
79	21/03/2012 10:47	21/03/2012 11:27	0.27	0.41
80	21/03/2012 11:30	21/03/2012 11:52	0.15	0.40

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81	21/03/2012 11:54	21/03/2012 12:44	0.34	0.41
82	21/03/2012 12:47	21/03/2012 13:40	0.35	0.40
83	21/03/2012 13:42	21/03/2012 14:36	0.37	0.41
84	21/03/2012 14:38	21/03/2012 15:42	0.42	0.40
85	21/03/2012 15:44	21/03/2012 16:19	0.24	0.41
86	21/03/2012 16:21	21/03/2012 17:01	0.26	0.40
87	21/03/2012 17:05	30/03/2012 09:14	84.22	0.41
88	30/03/2012 09:24	30/03/2012 11:16	0.76	0.41
89	30/03/2012 11:20	30/03/2012 11:22	0.01	0.40
90	30/03/2012 11:26	30/03/2012 14:01	1.05	0.41
91	30/03/2012 14:05	30/03/2012 15:52	0.72	0.41
92	30/03/2012 15:56	30/03/2012 19:24	1.42	0.41
93	30/03/2012 20:03	30/03/2012 20:06	0.02	0.39
94	30/03/2012 20:09	30/03/2012 20:24	0.11	0.41
95	30/03/2012 20:27	30/03/2012 20:30	0.03	0.40
96	30/03/2012 20:32	30/03/2012 20:45	0.09	0.41
97	30/03/2012 20:49	30/03/2012 20:57	0.05	0.40
98	30/03/2012 21:21	02/04/2012 08:58	24.41	0.41
99	02/04/2012 09:01	03/04/2012 14:04	11.87	0.41
100	03/04/2012 14:22	03/04/2012 19:59	2.30	0.41
101	03/04/2012 20:05	03/04/2012 20:51	0.32	0.41
102	03/04/2012 20:57	04/04/2012 11:04	5.77	0.41
103	04/04/2012 11:07	04/04/2012 11:57	0.34	0.41
104	04/04/2012 12:02	05/04/2012 10:31	9.19	0.41
105	05/04/2012 10:37	05/04/2012 13:51	1.32	0.41
106	05/04/2012 14:11	05/04/2012 16:02	0.76	0.41
107	05/04/2012 16:04	10/04/2012 16:04	48.96	0.41
108	10/04/2012 17:38	11/04/2012 11:00	7.08	0.41
109	11/04/2012 13:32	11/04/2012 15:31	0.81	0.41
110	11/04/2012 15:34	12/04/2012 09:45	7.40	0.41
111	12/04/2012 11:06	12/04/2012 13:07	0.82	0.41
112	12/04/2012 13:35	12/04/2012 15:36	0.82	0.41
113	12/04/2012 15:52	12/04/2012 17:53	0.82	0.41
114	12/04/2012 18:08	13/04/2012 08:30	5.84	0.41
115	13/04/2012 08:45	13/04/2012 10:45	0.81	0.41
116	13/04/2012 10:57	13/04/2012 12:57	0.81	0.41
117	13/04/2012 13:10	13/04/2012 15:10	0.81	0.41
118	13/04/2012 15:24	13/04/2012 17:27	0.83	0.41

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119	13/04/2012 17:40	16/04/2012 08:39	25.59	0.41
120	16/04/2012 08:50	17/04/2012 15:26	12.41	0.41
121	17/04/2012 15:45	20/04/2012 10:10	26.90	0.40
122	20/04/2012 10:23	20/04/2012 10:24	0.01	0.38
123	20/04/2012 10:27	20/04/2012 10:37	0.07	0.39
124	20/04/2012 10:40	20/04/2012 10:41	0.01	0.39
125	20/04/2012 10:45	24/04/2012 11:20	39.04	0.40
126	24/04/2012 11:41	24/04/2012 13:39	0.80	0.40
127	24/04/2012 13:42	27/04/2012 11:00	28.03	0.40
128	27/04/2012 11:06	03/05/2012 11:36	58.37	0.40
129	03/05/2012 11:56	03/05/2012 13:20	0.55	0.40
130	03/05/2012 13:27	04/05/2012 10:15	8.38	0.40
131	04/05/2012 10:24	07/05/2012 13:22	30.16	0.40
132	07/05/2012 13:35	07/05/2012 17:30	1.57	0.40
133	07/05/2012 17:53	07/05/2012 18:50	0.38	0.40
134	07/05/2012 18:53	08/05/2012 10:58	6.46	0.40
135	08/05/2012 11:26	08/05/2012 12:46	0.54	0.40
136	08/05/2012 12:50	08/05/2012 17:00	1.67	0.40
137	08/05/2012 17:19	08/05/2012 18:25	0.44	0.40
138	08/05/2012 18:47	09/05/2012 10:51	6.47	0.40
139	09/05/2012 10:53	09/05/2012 12:02	0.46	0.40
140	09/05/2012 12:07	10/05/2012 14:36	10.62	0.40
141	10/05/2012 14:41	10/05/2012 16:12	0.60	0.40
142	10/05/2012 16:15	11/05/2012 14:19	8.86	0.40
143	11/05/2012 14:46	14/05/2012 15:41	29.25	0.40
144	14/05/2012 15:51	14/05/2012 16:15	0.16	0.40
145	14/05/2012 16:19	21/05/2012 12:34	65.65	0.40
146	21/05/2012 12:37	21/05/2012 15:36	1.20	0.40
147*	21/05/2012 16:11	21/05/2012 18:34	0.96	0.40
148	21/05/2012 19:39	23/05/2012 16:53	18.15	0.40
149	23/05/2012 17:14	25/05/2012 11:55	17.18	0.40
150	25/05/2012 11:57	29/05/2012 10:35	38.04	0.40
151	29/05/2012 10:38	29/05/2012 13:27	1.13	0.40
152	29/05/2012 13:34	29/05/2012 14:32	0.39	0.40
153	29/05/2012 14:35	31/05/2012 08:20	16.77	0.40
154	31/05/2012 08:23	04/06/2012 10:18	40.48	0.41
155	04/06/2012 10:31	04/06/2012 11:05	0.19	0.33
156	04/06/2012 11:08	04/06/2012 13:43	2.87	0.40

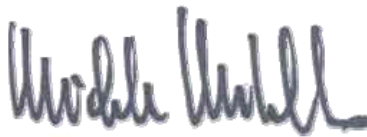
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157	04/06/2012 13:48	04/06/2012 15:27	1.14	0.33
158	04/06/2012 17:08	05/06/2012 08:58	6.04	0.40
159	05/06/2012 09:12	05/06/2012 11:04	0.41	0.40
160	05/06/2012 11:23	05/06/2012 13:45	0.54	0.33
161	05/06/2012 13:47	05/06/2012 17:24	1.04	0.29
162	05/06/2012 17:30	06/06/2012 08:45	3.83	0.25
163	06/06/2012 09:00	06/06/2012 10:06	0.24	0.22
164	06/06/2012 10:09	06/06/2012 11:12	0.24	0.23
165	06/06/2012 11:34	06/06/2012 14:16	0.59	0.22
166	06/06/2012 14:26	07/06/2012 08:44	3.73	0.21
167	07/06/2012 09:01	07/06/2012 11:04	0.78	0.38
168	07/06/2012 11:28	07/06/2012 16:33	1.93	0.38
169	07/06/2012 16:43	07/06/2012 18:23	0.70	0.42
170	07/06/2012 18:29	08/06/2012 11:03	6.40	0.39
171	08/06/2012 11:16	08/06/2012 13:01	0.67	0.38
172	08/06/2012 13:23	08/06/2012 17:54	1.72	0.38
173	08/06/2012 17:59	11/06/2012 08:54	27.18	0.43
174	11/06/2012 09:10	11/06/2012 11:09	0.80	0.40
175	11/06/2012 11:31	11/06/2012 13:21	0.73	0.40
176	11/06/2012 13:24	11/06/2012 14:21	0.38	0.40
177	11/06/2012 14:30	11/06/2012 14:55	0.15	0.37
178	11/06/2012 14:58	12/06/2012 08:45	6.70	0.38
179	12/06/2012 08:49	12/06/2012 09:30	0.25	0.37
180	12/06/2012 09:32	12/06/2012 11:11	0.62	0.38
181	12/06/2012 11:13	12/06/2012 11:53	0.25	0.37
182	12/06/2012 11:55	12/06/2012 13:50	0.72	0.38
183	12/06/2012 13:53	12/06/2012 14:51	0.37	0.38
184	12/06/2012 14:54	12/06/2012 16:40	0.67	0.38
185	12/06/2012 16:43	12/06/2012 17:32	0.32	0.39
186	12/06/2012 17:37	13/06/2012 13:55	8.06	0.40
187	13/06/2012 14:28	14/06/2012 10:15	7.89	0.40
188	14/06/2012 10:23	14/06/2012 11:20	0.38	0.40
189	14/06/2012 11:38	15/06/2012 09:55	8.89	0.40
190	15/06/2012 10:03	15/06/2012 10:53	0.33	0.40
191	15/06/2012 11:06	18/06/2012 09:24	28.04	0.40

Note: The uncertainty budgets (according to TEC-QEC/PR001 section 12) are: 4.2 % (k=2) for absorbed dose to water and 4.4% (k=2) for absorbed dose rate to water

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Notes: * Runs 67 & 147 without dosimetry. Dose rate taken from previous run with dosimetry.
Runs 13,31,49 & 68 – no dosimetry – devices out for measurements



Bob Nickson/Michele Muschitiello
(TEC-QEC Radiation Test Engineer)



Ali Zadeh
(TEC-QEC Section Head)

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RADIATION TEST SUMMARY

Irradiation Test Report Number : **20139b**

Date : **18 June 2012**

Test Requester : Name **Alter Technology**

Address Avd. Tomas Alba Edison, 4
41092 Seville (SPAIN)

Personnel present : E Munoz Plaza, J Jimenez Carreira, E Bernabeu Torres

Project/Cost Code : TRP

Devices/Components irradiated : Linear Devices

Device/Component details :

(conditions and identification)

Dosimetry Chain used : A

Dosimeter: Farmer model 2680 – s/n 390

Gas Ionisation Chamber : NE Type 2571 – s/n 2915

Measured Dosimetry : Total Ionising Dose in [Gy] (water)

ESCC 22900 section 4.1.1

Dosimetry Procedure : TEC-QEC/PR001 - Appendix D

(Total Ionising Dose accredited by RvA according to ISO/IEC 17025:2005
Certificate No. L517)

(With the exception of the above specified dosimetry equipment, ESTEC ⁶⁰Co Facility does not assume any liability for the calibration status of any other equipment lent to the requester)

Irradiation Test Campaign Details

Source Activity : 76.7 TBq

on date : 4 June 2012

	units	Min.	Max.	Time-weighted Average
<i>Temperature</i>	°C	25.00	25.60	25.43
<i>Pressure</i>	mbar	996.40	1019.10	1008.25
<i>Relative Humidity</i>	%	31.20	40.50	35.64

Dosimeter position relative to ^{60}Co source		
X	cm	-10
Y	cm	231
Z	cm	0

<i>Run</i>	<i>Start Date & Time (CET)</i>	<i>End Date & Time (CET)</i>	<i>Total Ionising Dose [Gy] (water)</i>	<i>Dose Rate [mGy/h] (water)</i>
1	04/06/2012 17:08	05/06/2012 08:58	63.56	4.02
2	05/06/2012 09:12	05/06/2012 11:04		
3	05/06/2012 11:23	05/06/2012 13:45	9.47	4.01
4	05/06/2012 13:47	05/06/2012 17:24	14.52	4.02

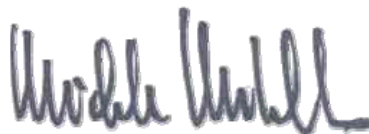
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5	05/06/2012 17:30	06/06/2012 08:45	61.25	4.02
6	06/06/2012 09:00	06/06/2012 10:06		
7	06/06/2012 10:09	06/06/2012 11:12		
8	06/06/2012 11:34	06/06/2012 14:16	9.51	3.52
9	06/06/2012 14:26	07/06/2012 08:44	71.58	3.97
10	07/06/2012 09:01	07/06/2012 11:04		
11	07/06/2012 11:28	07/06/2012 16:33	18.63	3.67
12	07/06/2012 16:43	07/06/2012 18:23	6.15	3.68
13	07/06/2012 18:29	08/06/2012 11:03	59.00	3.56
14	08/06/2012 11:16	08/06/2012 13:01		
15	08/06/2012 13:23	08/06/2012 17:54	13.66	3.02
16	08/06/2012 17:59	11/06/2012 08:54	212.74	3.38
17	11/06/2012 09:10	11/06/2012 11:09		
18	11/06/2012 11:31	11/06/2012 13:21	6.15	3.35
19	11/06/2012 13:24	11/06/2012 14:21	3.42	3.63
20	11/06/2012 14:30	11/06/2012 14:55	1.35	3.29
21	11/06/2012 14:58	12/06/2012 08:45	64.80	3.64
22	12/06/2012 08:49	12/06/2012 09:30	2.27	3.35
23	12/06/2012 09:32	12/06/2012 11:11	5.96	3.64
24	12/06/2012 11:13	12/06/2012 11:53	2.12	3.24
25	12/06/2012 11:55	12/06/2012 13:50	6.95	3.64
26	12/06/2012 13:53	12/06/2012 14:51	3.23	3.33
27	12/06/2012 14:54	12/06/2012 16:40	6.40	3.64
28	12/06/2012 16:43	12/06/2012 17:32	2.74	3.34
29	12/06/2012 17:37	13/06/2012 13:55	73.87	3.64
30	13/06/2012 14:28	14/06/2012 10:15	72.86	3.68
31	14/06/2012 10:23	14/06/2012 11:20	3.48	3.66
32	14/06/2012 11:38	15/06/2012 09:55	81.99	3.68
33	15/06/2012 10:03	15/06/2012 10:53	3.07	3.66
34	15/06/2012 11:06	18/06/2012 09:24	259.13	3.69

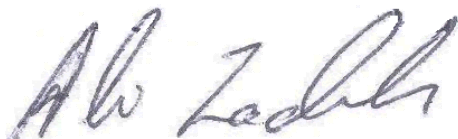
Note: The uncertainty budgets (according to TEC-QEC/PR001 section 12) are: 4.2 % (k=2) for absorbed dose to water and 4.4% (k=2) for absorbed dose rate to water

Notes: Runs 2,6,7,10,14 & 17 – no dosimetry – devices out for measurements

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ANNEX III ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE CONDITIONS

ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

Nº	SYMBOL	CONDITIONS (T _A =25°C)	LIMITS		UNIT
			MIN.	MAX.	
1	I _R	V _R =2V.	--	10	µA
2	V _F	I _F =10mA.	0.8	2.0	V
3	I _{CEO}	V _{CE} =20V, I _F =0, I _B =0.	--	100	nA
4	I _{C(ON)}	V _{CE} =5V, I _F =1mA, I _B =0.	2.0	--	mA
5	V _{CE(SAT)}	I _F =2mA, I _C =2mA.	--	0.3	V
6	CTR1	I _F =1mA, V _{CE} =5V, I _B =0. Note 4.	--	--	--
7	CTR2	I _F =2mA, V _{CE} =5V, I _B =0. Note 4.	--	--	--
8	CTR3	I _F =5mA, V _{CE} =5V, I _B =0. Note 4.	--	--	--
9	CTR4	I _F =10mA, V _{CE} =5V, I _B =0. Note 4.	--	--	--
10	CTR5	I _F =20mA, V _{CE} =5V, I _B =0. Note 4.	--	--	--
11	CTR6	I _F =10mA, V _{CE} =10V, I _B =0. Note 4.	--	--	--
12	CTR7	I _F =20mA, V _{CE} =10V, I _B =0. Note 4.	--	--	--

Notes:

1. The limits included above are included herein for reference purposes only.
2. The standard microcircuit drawing also specifies post irradiation limits. They are not applicable to this characterization because the specified dose rate is out of range, but they will be considered in the final assessment, together with the limits included above.
3. ATN reserves the right to solder the parts to a substrate for the purposes of testing.
4. This parameter is not specified in the manufacturer datasheet, but is has been added according to customer requirements.

DEVIATION TO PLAN

The V(BR)CBO, V(BR)CEO and V(BR)EBO parameters have been added to the RVT test in accordance with the conditions and limits showed in table below:

Nº	SYMBOL	CONDITIONS (T _A =25°C)	LIMITS		UNIT
			MIN.	MAX.	
1	V(BR)CBO	I _C =100µA	45	--	V
2	V(BR)CEO	I _C =1mA	40	--	V
3	V(BR)EBO	I _E =100µA	7	--	V