

TL1431-SP (5962R9962001VHA) Neutron Displacement Damage Characterization Test Report

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ABSTRACT

This report presents the effect of neutron displacement damage (NDD) on the TL1431-SP device. The results show that all devices were fully functional and within production test limits after having been irradiated up to 6.08×10^{11} n / cm² (1-MeV equivalent). A sample size of twelve units was exposed to radiation testing per (MIL-STD-883, Method 1017 for Neutron Irradiation). All devices used in the experiment were from lot date code 1319A and assembly lot 3005083MMT. Electrical testing was performed at Texas Instruments before and after neutron irradiation using the production test program for TL1431-SP.

NOTE: For questions or comments, contact hirelmarketing@list.ti.com.

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1 Overview

The TL1431 is a precision programmable reference with specified thermal stability over automotive, commercial, and military temperature ranges. The output voltage can be set to any value between $V_{I(ref)}$ (approximately 2.5 V) and 36 V with two external resistors. This device has a typical output impedance of 0.2 Ω. Active output circuitry provides a very sharp turn-on characteristic, making the device an excellent replacement for Zener diodes and other types of references in applications such as onboard regulation, adjustable power supplies, and switching power supplies.

General device information and testing conditions are listed in [Table 1](#).

Table 1. Overview Information

TI Part Number	TL1431-SP
SMD Number	5962-9962001
Device Function	Precision Programmable Reference
Die Name	STLC1431BVS
Technology	J11
A/T Lot Number / Date Code	3005083MMT / 1319A
Quantity Tested	12
Exposure Facility	Reactor Facility – FNI University of Massachusetts Lowell
Neutron Fluence (1 MeV eqv.)	$6.08 \times 10^{11} \text{ n / cm}^2$
Irradiation Temperature	25°C
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2 Test Procedures

The TL1431-SP was electrically pre-tested using the production automated test equipment program. General test procedures were IAW MIL-STD-883, Method 1017 for Neutron Irradiation of TL1431-SP as modified in [Table 2](#).

Table 2. Neutron Irradiation Conditions

Group	Sample Qty	Neutron Fluence (n / cm ²)
A	3	$6.08 \times 10^{11} \text{ n / cm}^2$
B	12	
C	3	
D	3	



Figure 1. TL1431-SP Device

3 Facility

The University of Massachusetts's Fast Neutron Irradiation (FNI) facility is an experimental facility replaces three beam ports that originally existed on the left side of the research reactor. It is designed to give a fast flux level $\geq 10^{11}$ n / cm² -s, with relatively low thermal fluence and gamma dose rates. Samples with a cross-sectional area as large as 30 cm (12 in) x 30 cm (12 in) and up to 15 cm (6 in) thick can be irradiated. The fast neutron flux is designed to be nearly uniform over the 30 cm (12 in) x 30 cm (12 in) area facing the core, and the fast fluence variation through the sample thickness is minimized via a single 180° rotation of the sample canister at the midpoint of the irradiation period. The FNI facility offers a significantly larger sample volume than previously available within the University of Massachusetts Lowell Research Reactor (UMLRR).

The fluences are calculated based on 1-MeV equivalences.

Detailed information of the radiation facility is available at the following link:

https://www.uml.edu/docs/FNI%20Brochure_tcm18-90375.pdf

4 Results

No functional failures were observed after neutron irradiation at any of the neutron dose levels used. All parametric measurements remained well within all data sheet (SLVSB44) limits for all exposure levels. All parametric measurements remained well within the production test limits which are guard banded from the data sheet limits. An overview of the largest drifts seen post-test is in the following list. The full parameter list and graphs are found in [Appendix B](#).

The largest shifts seen for various parameters are listed below.

1. 6.0 VREF @ VZ = VREF IZ = 10 MA 64x GAIN. Pre readings approximately -0.043 V, Post approximately 0.127 V, Change < 400%. This accounts for < 6% shift of Fail Limit Range.
2. 13.0 VREF @ V_{KA} = 1 MA. Pre readings approximately -9 mV, Post readings approximately 9 mV, Change < 200%. This accounts for approximately 5% shift of Fail Limit Range
3. 14.1 Z_{KA} = DELTA V / DELTA I. Pre readings approximately 0.104 Ω, Post readings approximately 0.271 Ω, Change approximately 171%. This accounts for < 0% of Fail Limit Range.

The Fail Limit range is a guard-banded limit that Texas Instruments puts into test programs to insure device performance. It is always set within the data sheet limits to insure the device meets all data sheet parameters.

Full Test Results

Table 3 provides the list of tested parameters.

Table 3. Full Test Results

Parameters		Test Conditions	TA	Data Sheet lit# SLVSB44 SMD# 5962-99620			Unit	FT Test Covered
				MIN	TYP	MAX		
$V_{I(\text{ref})}$	Reference input voltage	$V_{KA} = V_{I(\text{ref})}$	25°C	2475	2500	2540	mV	X
			Full Range	2460		2550		
$V_{I(\text{dev})}$	Deviation of reference input voltage over full temperature range	$V_{KA} = V_{I(\text{ref})}$	Full Range		17	55	mV	
$\Delta V_{I(\text{ref})} / \Delta V_{KA}$	Ratio of change in reference input voltage to the change in cathode voltage	$\Delta V_{KA} = 3 \text{ V to } 36 \text{ V}$	Full Range		-1.1	-2	mV / V	X
$I_{I(\text{ref})}$	Reference input current	$R1 = 10 \text{ k}\Omega, R2 = \infty$	25°C		1.5	2.5	μA	X
			Full Range			5		
$I_{I(\text{dev})}$	Deviation of reference input current over full temperature range	$R1 = 10 \text{ k}\Omega, R2 = \infty$	Full Range		0.5	3	μA	
I_{min}	Minimum cathode current for regulation	$V_{KA} = V_{I(\text{ref})}$	25°C		0.45	1	mA	X
I_{off}	Off-state cathode current	$V_{KA} = 36 \text{ V}, V_{I(\text{ref})} = 0$	25°C		0.18	0.5	μA	X
			Full Range			2		
Z_{KA}	Output impedance	$V_{KA} = V_{I(\text{ref})}, f \leq 1 \text{ kHz}, I_{KA} = 1 \text{ mA to } 100 \text{ mA}$	25°C		0.2	0.4	Ω	X

Test Results

[Appendix B](#) shows the detailed test results.

NDD Report (All units exposed to 6.0×10^{11} Neutron Fluence)

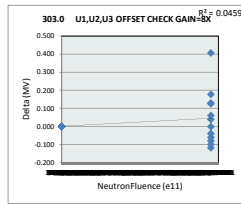
Device Name: TL1431

Delta Threshold 10.00%

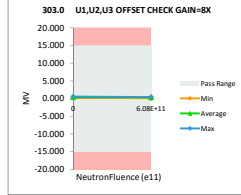
NDD Report
TL1431 NDD Report

NDD Report
TL1431 NDD Report

303.0 U1,U2,U3 OFFSET CHECK				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	MV	MV		
Max Limit	15	15		
Min Limit	-15	-15		
NeutronFluence (e11)	Serial #	Pre	2-Unit TL1431 Po	Delta
0	146	0.539	0.539	0.000
0	89	0.535	0.535	0.000
0	77	0.420	0.420	0.000
0	237	0.467	0.467	0.000
0	189	0.305	0.305	0.000
0	166	0.279	0.279	0.000
0	109	0.329	0.329	0.000
0	104	0.295	0.295	0.000
0	127	0.348	0.348	0.000
0	157	0.382	0.382	0.000
0	91	0.191	0.191	0.000
0	144	0.391	0.391	0.000
6.08E+11	2146	0.539	0.414	0.125
6.08E+11	2089	0.535	0.128	0.407
6.08E+11	2077	0.420	0.243	0.177
6.08E+11	2237	0.467	0.338	0.129
6.08E+11	2189	0.305	0.386	-0.081
6.08E+11	2166	0.279	0.398	-0.119
6.08E+11	2109	0.329	0.290	0.039
6.08E+11	2104	0.295	0.357	-0.062
6.08E+11	2127	0.348	0.350	-0.002
6.08E+11	2157	0.382	0.321	0.060
6.08E+11	2091	0.191	0.290	-0.100
6.08E+11	2144	0.391	0.431	-0.040
	Max	0.539	0.539	0.407
	Average	0.373	0.351	0.022
	Min	0.191	0.128	-0.119
	Std Dev	0.102	0.096	0.106

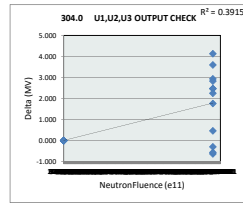


303.0 U1,U2,U3 OFFSET CHECK CH					
Test Site	CLAB	CLAB			
Tester	LTX	LTX			
Test Number	XPM16108	XPM16108			
Max Limit	15	MV			
Min Limit	-15	MV			
NeutronFluence (e	LL	Min	Average	Max	UL
	-15.000	-15.000			
		0.191	0.128		
		0.373	0.329		
		0.539	0.431		
		15.000	15.000		

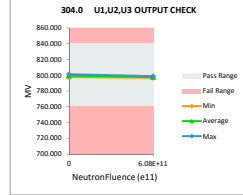


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304.0 U1,U2,U3 OUTPUT CHECK				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Unit	MV		MV	
Max Limit	840		840	
Min Limit	760		760	
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	799.455	799.455	0.000
0	89	798.238	798.238	0.000
0	77	801.240	801.240	0.000
0	237	799.451	799.451	0.000
0	189	797.841	797.841	0.000
0	166	797.805	797.805	0.000
0	109	797.722	797.722	0.000
0	104	800.577	800.577	0.000
0	127	800.420	800.420	0.000
0	157	799.555	799.555	0.000
0	91	800.113	800.113	0.000
0	144	800.825	800.825	0.000
6.08E+11	2146	799.455	796.519	-2.935
6.08E+11	2089	798.238	798.868	-0.630
6.08E+11	2077	801.240	797.111	4.129
6.08E+11	2237	799.451	796.977	2.473
6.08E+11	2189	797.841	798.400	-0.559
6.08E+11	2166	797.805	797.342	0.463
6.08E+11	2109	797.722	798.018	-0.296
6.08E+11	2104	800.577	798.810	1.767
6.08E+11	2127	800.420	796.823	3.597
6.08E+11	2157	799.555	797.080	2.475
6.08E+11	2091	800.113	797.860	2.253
6.08E+11	2144	800.825	797.992	2.833
	Max	801.240	801.240	-4.129
	Average	799.437	798.543	0.893
	Min	797.722	796.519	-0.630
	Std Dev	1.234	1.375	1.459

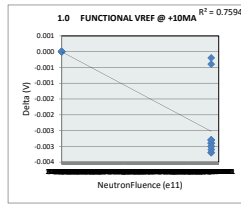


304.0 U1,U2,U3 OUTPUT CHECK		
Test Site	CLAB	
Tester	LTX	
Test Number	XPM16108	
Max Limit	840	MV
Min Limit	760	MV
NeutronFluence (e	0	6.08E+11
LL	760.000	760.000
Min	797.722	796.519
Average	799.437	797.650
Max	801.240	798.868
UL	840.000	840.000

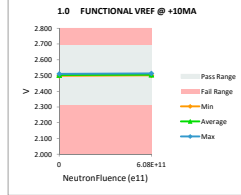


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1.0 FUNCTIONAL VREF @ +10				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Unit	V		V	
Max Limit	2.69		2.69	
Min Limit	2.31		2.31	
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	2.501	2.501	0.000
0	89	2.510	2.510	0.000
0	77	2.503	2.503	0.000
0	237	2.498	2.498	0.000
0	189	2.504	2.504	0.000
0	166	2.504	2.504	0.000
0	109	2.501	2.501	0.000
0	104	2.506	2.506	0.000
0	127	2.503	2.503	0.000
0	157	2.498	2.498	0.000
0	91	2.503	2.503	0.000
0	144	2.502	2.502	0.000
6.08E+11	2146	2.501	2.502	0.000
6.08E+11	2089	2.510	2.513	-0.003
6.08E+11	2077	2.503	2.506	-0.003
6.08E+11	2237	2.498	2.501	-0.003
6.08E+11	2189	2.504	2.507	-0.003
6.08E+11	2166	2.504	2.507	-0.003
6.08E+11	2109	2.501	2.504	-0.003
6.08E+11	2104	2.506	2.510	-0.003
6.08E+11	2127	2.503	2.506	-0.003
6.08E+11	2157	2.498	2.501	-0.003
6.08E+11	2091	2.503	2.506	-0.003
6.08E+11	2144	2.502	2.503	0.000
	Max	2.510	2.513	0.000
	Average	2.503	2.504	-0.001
	Min	2.498	2.498	-0.003
	Std Dev	0.003	0.004	0.001

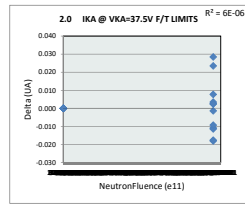


1.0 FUNCTIONAL VREF @ +				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Max Limit	2.69		V	
Min Limit	2.31		V	
NeutronFluence (e				6.08E+11
LL	2.310	2.310		
Min	2.498	2.501		
Average	2.503	2.505		
Max	2.510	2.513		
UL	2.690	2.690		

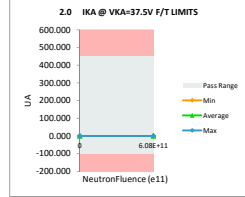


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2.0 IKA @ VKA=37.5V F/T LI				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	UA	UA		
Max Limit	450	450		
Min Limit	-100	-100		
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	0.065	0.065	0.000
0	89	0.089	0.089	0.000
0	77	0.080	0.080	0.000
0	237	0.071	0.071	0.000
0	189	0.093	0.093	0.000
0	166	0.093	0.093	0.000
0	109	0.091	0.091	0.000
0	104	0.059	0.059	0.000
0	127	0.065	0.065	0.000
0	157	0.060	0.060	0.000
0	91	0.087	0.087	0.000
0	144	0.076	0.076	0.000
6.08E+11	2146	0.065	0.083	-0.018
6.08E+11	2089	0.089	0.085	0.003
6.08E+11	2077	0.080	0.091	-0.011
6.08E+11	2237	0.071	0.072	-0.001
6.08E+11	2189	0.093	0.069	0.024
6.08E+11	2166	0.093	0.065	0.028
6.08E+11	2109	0.091	0.089	0.002
6.08E+11	2104	0.059	0.071	-0.011
6.08E+11	2127	0.065	0.083	-0.018
6.08E+11	2157	0.060	0.069	-0.009
6.08E+11	2091	0.087	0.079	0.008
6.08E+11	2144	0.076	0.074	0.002
	Max	0.093	0.093	0.028
	Average	0.077	0.077	0.000
	Min	0.059	0.059	-0.018
	Std Dev	0.013	0.011	0.010

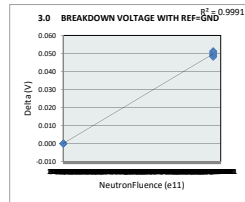


2.0 IKA @ VKA=37.5V F/T LI				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Max Limit	450	UA		
Min Limit	-100	UA		
NeutronFluence (e	0	6.08E+11		
LL	-100.000	-100.000		
Min	0.059	0.065		
Average	0.077	0.077		
Max	0.093	0.091		
UL	450.000	450.000		

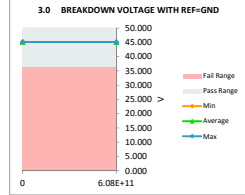


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3.0 BREAKDOWN VOLTAGE W				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Unit	V		V	
Max Limit	36.5		36.5	
Min Limit				
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	45.139	45.139	0.000
0	89	45.140	45.140	0.000
0	77	45.140	45.140	0.000
0	237	45.139	45.139	0.000
0	189	45.140	45.140	0.000
0	166	45.140	45.140	0.000
0	109	45.139	45.139	0.000
0	104	45.138	45.138	0.000
0	127	45.138	45.138	0.000
0	157	45.139	45.139	0.000
0	91	45.140	45.140	0.000
0	144	45.140	45.140	0.000
6.08E+11	2146	45.139	45.090	0.049
6.08E+11	2089	45.140	45.089	0.051
6.08E+11	2077	45.140	45.090	0.050
6.08E+11	2237	45.139	45.091	0.049
6.08E+11	2189	45.140	45.089	0.051
6.08E+11	2166	45.140	45.091	0.049
6.08E+11	2109	45.139	45.090	0.049
6.08E+11	2104	45.138	45.090	0.048
6.08E+11	2127	45.138	45.090	0.048
6.08E+11	2157	45.139	45.089	0.051
6.08E+11	2091	45.140	45.090	0.050
6.08E+11	2144	45.140	45.089	0.051
	Max	45.140	45.140	0.051
	Average	45.139	45.115	0.025
	Min	45.138	45.089	0.000
	Std Dev	0.001	0.025	0.025

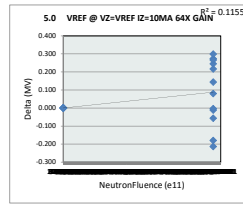


3.0 BREAKDOWN VOLTAGE				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Max Limit	36.5		V	
Min Limit	0		6.08E+11	
LL	36.500		36.500	
Min	45.138		45.089	
Average	45.139		45.090	
Max	45.140		45.091	
UL				

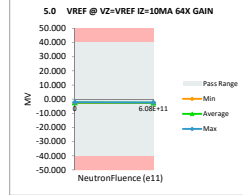


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5.0 VREF @ VZ=VREF IZ=10M				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	MV	MV		
Max Limit	40	40		
Min Limit	-40	-40		
NeutronFluence (e11)	Serial #	Pts	2-Unit_TL1431_Po	Delta
0	146	-2.166	-2.166	0.000
0	89	-2.211	-2.211	0.000
0	77	-2.395	-2.395	0.000
0	237	-2.543	-2.543	0.000
0	189	-2.359	-2.359	0.000
0	166	-2.287	-2.287	0.000
0	109	-2.263	-2.263	0.000
0	104	-2.416	-2.416	0.000
0	127	-2.555	-2.555	0.000
0	157	-2.729	-2.729	0.000
0	91	-2.335	-2.335	0.000
0	144	-2.643	-2.643	0.000
6.08E+11	2146	-2.166	-2.439	0.273
6.08E+11	2089	-2.211	-2.455	0.245
6.08E+11	2077	-2.395	-2.384	-0.011
6.08E+11	2237	-2.543	-2.362	-0.180
6.08E+11	2189	-2.359	-2.438	0.079
6.08E+11	2166	-2.287	-2.553	0.266
6.08E+11	2109	-2.263	-2.479	0.216
6.08E+11	2104	-2.416	-2.715	0.299
6.08E+11	2127	-2.555	-2.498	-0.057
6.08E+11	2157	-2.729	-2.515	-0.214
6.08E+11	2091	-2.335	-2.479	0.144
6.08E+11	2144	-2.643	-2.639	-0.004
	Max	-2.166	-2.166	0.299
	Average	-2.408	-2.452	0.044
	Min	-2.729	-2.729	-0.214
	Std Dev	0.172	0.147	0.132

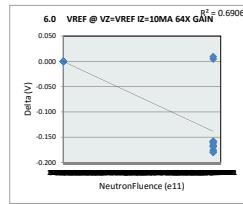


5.0 VREF @ VZ=VREF IZ=10M				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Max Limit	40	MV		
Min Limit	-40	MV		
NeutronFluence (e	0	6.08E+11		
LL	-40.000	-40.000		
Min	-2.729	-2.715		
Average	-2.408	-2.496		
Max	-2.166	-2.362		
UL	40.000	40.000		

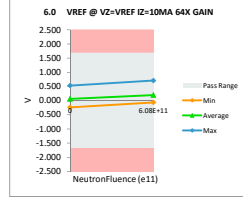


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6.0 VREF @ VZ=VREF IZ=10M				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	V	V		
Max Limit	1.68	1.68		
Min Limit	-1.68	-1.68		
NeutronFluence (e11)	Serial #	Prs	2-Unit_TL1431_Po	Delta
0	146	-0.021	-0.021	0.000
0	89	0.529	0.529	0.000
0	77	0.060	0.060	0.000
0	237	-0.238	-0.238	0.000
0	189	0.115	0.115	0.000
0	166	0.124	0.124	0.000
0	109	-0.043	-0.043	0.000
0	104	0.285	0.285	0.000
0	127	0.056	0.056	0.000
0	157	-0.226	-0.226	0.000
0	91	0.060	0.060	0.000
0	144	0.028	0.028	0.000
6.08E+11	2146	-0.021	-0.025	0.005
6.08E+11	2089	0.529	0.709	-0.180
6.08E+11	2077	0.060	0.221	-0.161
6.08E+11	2237	-0.238	-0.063	-0.175
6.08E+11	2189	0.115	0.274	-0.159
6.08E+11	2166	0.124	0.290	-0.166
6.08E+11	2109	-0.043	0.127	-0.169
6.08E+11	2104	0.285	0.464	-0.179
6.08E+11	2127	0.056	0.213	-0.158
6.08E+11	2157	-0.226	-0.058	-0.168
6.08E+11	2091	0.060	0.220	-0.159
6.08E+11	2144	0.028	0.018	0.009
	Max	0.529	0.709	0.009
	Average	0.061	0.130	-0.069
	Min	-0.238	-0.238	-0.180
	Std Dev	0.201	0.224	0.085

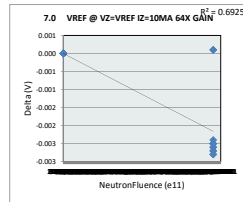


6.0 VREF @ VZ=VREF IZ=10M				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Max Limit	1.68	V		
Min Limit	-1.68	V		
NeutronFluence (e		0	6.08E+11	
LL		-1.680	-1.680	
Min		-0.239	-0.063	
Average		0.061	0.199	
Max		0.529	0.709	
UL		1.680	1.680	

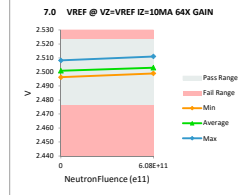


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7.0 VREF @ VZ=VREF IZ=10M				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	V	V		
Max Limit	2.523	2.523		
Min Limit	2.476	2.476		
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	2.500	2.500	0.000
0	89	2.508	2.508	0.000
0	77	2.501	2.501	0.000
0	237	2.496	2.496	0.000
0	189	2.502	2.502	0.000
0	166	2.502	2.502	0.000
0	109	2.499	2.499	0.000
0	104	2.504	2.504	0.000
0	127	2.501	2.501	0.000
0	157	2.497	2.497	0.000
0	91	2.501	2.501	0.000
0	144	2.500	2.500	0.000
6.08E+11	2146	2.500	2.500	0.000
6.08E+11	2089	2.508	2.511	-0.003
6.08E+11	2077	2.501	2.503	-0.003
6.08E+11	2237	2.496	2.499	-0.003
6.08E+11	2189	2.502	2.504	-0.003
6.08E+11	2166	2.502	2.504	-0.003
6.08E+11	2109	2.499	2.502	-0.003
6.08E+11	2104	2.504	2.507	-0.003
6.08E+11	2127	2.501	2.503	-0.002
6.08E+11	2157	2.497	2.499	-0.003
6.08E+11	2091	2.501	2.503	-0.003
6.08E+11	2144	2.500	2.500	0.000
	Max	2.508	2.511	0.000
	Average	2.501	2.502	-0.001
	Min	2.496	2.496	-0.003
	Std Dev	0.003	0.003	0.001

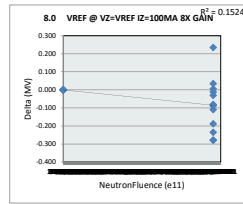


7.0 VREF @ VZ=VREF IZ=10M				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Max Limit	2.523	V		
Min Limit	2.476	V		
NeutronFluence (e				6.08E+11
LL		2.476	2.476	
Min		2.496	2.499	
Average		2.501	2.503	
Max		2.508	2.511	
UL		2.523	2.523	

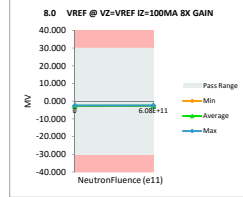


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8.0 VREF @ VZ=VREF IZ=100				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	MV	MV		
Max Limit	30	30		
Min Limit	-30	-30		
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	-2.588	-2.588	0.000
0	89	-2.450	-2.450	0.000
0	77	-2.798	-2.798	0.000
0	237	-2.523	-2.523	0.000
0	189	-2.526	-2.526	0.000
0	166	-2.500	-2.500	0.000
0	109	-2.526	-2.526	0.000
0	104	-2.736	-2.736	0.000
0	127	-2.736	-2.736	0.000
0	157	-2.626	-2.626	0.000
0	91	-2.695	-2.695	0.000
0	144	-2.779	-2.779	0.000
6.08E+11	2146	-2.588	-2.479	-0.109
6.08E+11	2089	-2.450	-2.684	0.235
6.08E+11	2077	-2.798	-2.563	-0.235
6.08E+11	2237	-2.523	-2.436	-0.087
6.08E+11	2189	-2.526	-2.532	0.006
6.08E+11	2166	-2.500	-2.534	0.034
6.08E+11	2109	-2.526	-2.515	-0.011
6.08E+11	2104	-2.736	-2.706	-0.030
6.08E+11	2127	-2.736	-2.458	-0.278
6.08E+11	2157	-2.626	-2.546	-0.080
6.08E+11	2091	-2.695	-2.508	-0.187
6.08E+11	2144	-2.779	-2.501	-0.278
	Max	-2.450	-2.436	0.235
	Average	-2.623	-2.581	-0.043
	Min	-2.798	-2.798	-0.278
	Std Dev	0.118	0.110	0.111

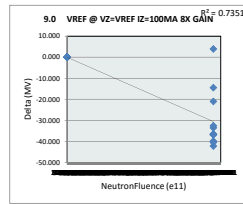


8.0 VREF @ VZ=VREF IZ=100MA EX GAIN				
Test Site	CLAB			
Tester	LTX			
Test Number	XPM16108			
Max Limit	30	MV		
Min Limit	-30	MV		
NeutronFluence (e				
LL	-30.000	-30.000		
Min	-2.798	-2.798		
Average	-2.623	-2.538		
Max	-2.450	-2.436		
UL	30.000	30.000		

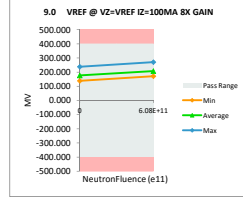


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9.0 VREF @ VZ=VREF IZ=100				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	MV	MV		
Max Limit	400	400		
Min Limit	-400	-400		
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	161.564	161.564	0.000
0	89	238.100	238.100	0.000
0	77	180.374	180.374	0.000
0	237	138.648	138.648	0.000
0	189	191.798	191.798	0.000
0	166	188.046	188.046	0.000
0	109	165.875	165.875	0.000
0	104	206.836	206.836	0.000
0	127	172.010	172.010	0.000
0	157	141.016	141.016	0.000
0	91	167.446	167.446	0.000
0	144	175.332	175.332	0.000
6.08E+11	2146	161.564	176.074	-14.509
6.08E+11	2089	238.100	271.633	-33.533
6.08E+11	2077	180.374	220.261	-39.887
6.08E+11	2237	138.648	180.885	-42.237
6.08E+11	2189	191.798	232.296	-40.498
6.08E+11	2166	188.046	224.619	-36.574
6.08E+11	2109	165.875	202.354	-36.478
6.08E+11	2104	206.836	239.399	-32.563
6.08E+11	2127	172.010	208.646	-36.636
6.08E+11	2157	141.016	177.944	-36.928
6.08E+11	2091	167.446	188.442	-20.996
6.08E+11	2144	175.332	171.414	3.918
	Max	238.100	271.633	-33.533
	Average	177.254	192.542	-15.288
	Min	138.648	138.648	-42.237
	Std Dev	26.738	32.500	18.215

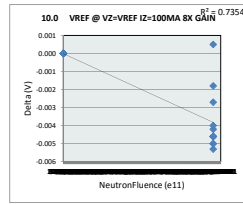


9.0 VREF @ VZ=VREF IZ=100				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Max Limit	400	MV		
Min Limit	-400	MV		
NeutronFluence (e	0	6.08E+11		
LL	-400.000	-400.000		
Min	138.648	171.414		
Average	177.254	207.831		
Max	238.101	271.633		
UL	400.000	400.000		

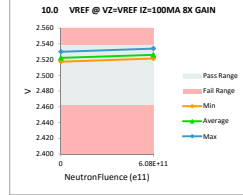


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10.0 VREF @ VZ=VREF IZ=10				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Unit	V		V	
Max Limit	2.538		2.538	
Min Limit	2.462		2.462	
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	2.520	2.520	0.000
0	89	2.530	2.530	0.000
0	77	2.523	2.523	0.000
0	237	2.517	2.517	0.000
0	189	2.524	2.524	0.000
0	166	2.523	2.523	0.000
0	109	2.521	2.521	0.000
0	104	2.526	2.526	0.000
0	127	2.522	2.522	0.000
0	157	2.518	2.518	0.000
0	91	2.521	2.521	0.000
0	144	2.522	2.522	0.000
6.08E+11	2146	2.520	2.522	-0.002
6.08E+11	2089	2.530	2.534	-0.004
6.08E+11	2077	2.523	2.527	-0.005
6.08E+11	2237	2.517	2.523	-0.005
6.08E+11	2189	2.524	2.529	-0.005
6.08E+11	2166	2.523	2.528	-0.005
6.08E+11	2109	2.521	2.525	-0.005
6.08E+11	2104	2.526	2.530	-0.004
6.08E+11	2127	2.522	2.526	-0.005
6.08E+11	2157	2.518	2.522	-0.005
6.08E+11	2091	2.521	2.524	-0.003
6.08E+11	2144	2.522	2.521	0.000
	Max	2.530	2.534	0.000
	Average	2.522	2.524	-0.002
	Min	2.517	2.517	-0.005
	Std Dev	0.003	0.004	0.002



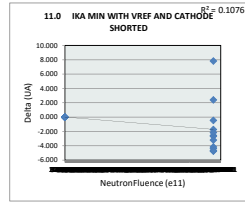
10.0 VREF @ VZ=VREF IZ=				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Max Limit	2.538		V	
Min Limit	2.462		V	
NeutronFluence (e	0	6.08E+11		
LL	2.462	2.462		
Min	2.517	2.521		
Average	2.522	2.526		
Max	2.530	2.534		
UL	2.538	2.538		



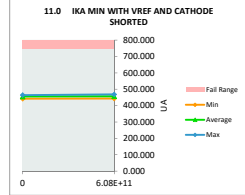
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11.0 IKA MIN WITH VREF AND CATHODE SHORTED			
Test Site	CLAB	CLAB	
Tester	LTX	LTX	
Test Number	XPM16108	XPM16108	
Unit	UA	UA	
Max Limit	750	750	
Min Limit			

NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	464.127	464.127	0.000
0	89	442.126	442.126	0.000
0	77	454.309	454.309	0.000
0	237	460.956	460.956	0.000
0	189	445.874	445.874	0.000
0	166	456.793	456.793	0.000
0	109	463.669	463.669	0.000
0	104	456.946	456.946	0.000
0	127	453.283	453.283	0.000
0	157	457.900	457.900	0.000
0	91	461.223	461.223	0.000
0	144	452.516	452.516	0.000
6.08E+11	2146	464.127	468.859	-4.732
6.08E+11	2089	442.126	444.687	-2.561
6.08E+11	2077	454.309	458.469	-4.160
6.08E+11	2237	460.956	465.345	-4.389
6.08E+11	2189	445.874	443.466	2.407
6.08E+11	2166	456.793	457.248	-0.455
6.08E+11	2109	463.669	465.383	-1.714
6.08E+11	2104	456.946	449.113	7.833
6.08E+11	2127	453.283	457.973	-4.690
6.08E+11	2157	457.900	460.571	-2.672
6.08E+11	2091	461.223	464.429	-3.206
6.08E+11	2144	452.516	454.654	-2.137
	Max	464.127	468.859	-7.833
	Average	455.810	456.663	-0.853
	Min	442.126	442.126	-4.732
	Std Dev	6.586	7.423	2.657

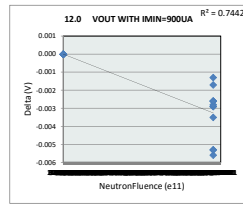


11.0 IKA MIN WITH VREF AND CATHODE SHORTED			
Test Site	CLAB	CLAB	
Tester	LTX	LTX	
Test Number	XPM16108	XPM16108	
Max Limit	750	750	
Min Limit	UA	UA	
NeutronFluence (e	0	6.08E+11	
LL	442.126	443.466	
Average	455.810	457.516	
Max	464.127	466.859	
UL	750.000	750.000	

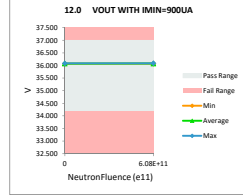


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12.0 VOUT WITH IMIN=900U				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	V	V		
Max Limit	37	37		
Min Limit	34.2	34.2		
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	36.074	36.074	0.000
0	89	36.082	36.082	0.000
0	77	36.074	36.074	0.000
0	237	36.071	36.071	0.000
0	189	36.074	36.074	0.000
0	166	36.078	36.078	0.000
0	109	36.074	36.074	0.000
0	104	36.078	36.078	0.000
0	127	36.074	36.074	0.000
0	157	36.071	36.071	0.000
0	91	36.074	36.074	0.000
0	144	36.074	36.074	0.000
6.08E+11	2146	36.074	36.076	-0.002
6.08E+11	2089	36.082	36.088	-0.006
6.08E+11	2077	36.074	36.080	-0.005
6.08E+11	2237	36.071	36.074	-0.003
6.08E+11	2189	36.074	36.078	-0.004
6.08E+11	2166	36.078	36.080	-0.001
6.08E+11	2109	36.074	36.077	-0.003
6.08E+11	2104	36.078	36.081	-0.003
6.08E+11	2127	36.074	36.080	-0.005
6.08E+11	2157	36.071	36.074	-0.003
6.08E+11	2091	36.074	36.077	-0.003
6.08E+11	2144	36.074	36.077	-0.003
	Max	36.082	36.088	0.000
	Average	36.075	36.077	-0.002
	Min	36.071	36.071	-0.006
	Std Dev	0.003	0.004	0.002



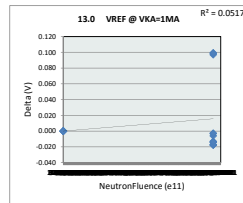
12.0 VOUT WITH IMIN=90C				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Max Limit	37	V		
Min Limit	34.2	V		
NeutronFluence (e	0	6.08E+11		
LL	34.200	34.200		
Min	36.071	36.074		
Average	36.075	36.078		
Max	36.082	36.088		
UL	37.000	37.000		



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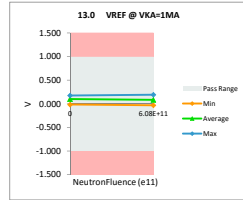
13.0 VREF @ VKA=1MA				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	V	V		
Max Limit	0.99	0.99		
Min Limit	-0.99	-0.99		

NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	0.135	0.135	0.000
0	89	0.161	0.161	0.000
0	77	-0.015	-0.015	0.000
0	237	0.101	0.101	0.000
0	189	-0.009	-0.009	0.000
0	166	0.118	0.118	0.000
0	109	0.133	0.133	0.000
0	104	0.176	0.176	0.000
0	127	0.101	0.101	0.000
0	157	0.067	0.067	0.000
0	91	0.148	0.148	0.000
0	144	0.103	0.103	0.000
6.08E+11	2146	0.135	0.138	-0.003
6.08E+11	2089	0.161	0.065	0.097
6.08E+11	2077	-0.015	0.002	-0.018
6.08E+11	2237	0.101	0.107	-0.006
6.08E+11	2189	-0.009	0.009	-0.017
6.08E+11	2166	0.118	0.131	-0.013
6.08E+11	2109	0.133	0.147	-0.014
6.08E+11	2104	0.176	0.193	-0.017
6.08E+11	2127	0.101	0.002	0.099
6.08E+11	2157	0.067	-0.032	0.099
6.08E+11	2091	0.148	0.162	-0.014
6.08E+11	2144	0.103	0.106	-0.002
	Max	0.176	0.193	0.099
	Average	0.102	0.094	0.008
	Min	-0.015	-0.032	-0.018
	Std Dev	0.060	0.067	0.035



13.0 VREF @ VKA=1MA				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Max Limit	0.99	V		
Min Limit	-0.99	V		
NeutronFluence (e	0	6.08E+11		

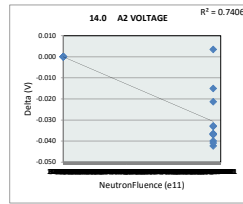
LL	-0.990	-0.990
Min	-0.015	-0.032
Average	0.102	0.086
Max	0.176	0.193
UL	0.990	0.990



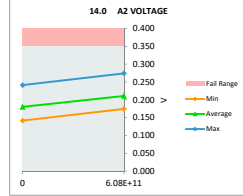
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14.0 A2 VOLTAGE			
Test Site	CLAB	CLAB	
Tester	LTX	LTX	
Test Number	XPM16108	XPM16108	
Unit	V	V	
Max Limit	0.35	0.35	
Min Limit			

NeutronFluence (e11)	Serial #	Pre	2-Unit TL1431 Po	Delta
0	146	0.164	0.164	0.000
0	89	0.241	0.241	0.000
0	77	0.183	0.183	0.000
0	237	0.142	0.142	0.000
0	189	0.195	0.195	0.000
0	166	0.191	0.191	0.000
0	109	0.169	0.169	0.000
0	104	0.210	0.210	0.000
0	127	0.175	0.175	0.000
0	157	0.144	0.144	0.000
0	91	0.170	0.170	0.000
0	144	0.178	0.178	0.000
6.08E+11	2146	0.164	0.179	-0.015
6.08E+11	2089	0.241	0.274	-0.033
6.08E+11	2077	0.183	0.223	-0.040
6.08E+11	2237	0.142	0.184	-0.042
6.08E+11	2189	0.195	0.236	-0.041
6.08E+11	2166	0.191	0.228	-0.037
6.08E+11	2109	0.169	0.205	-0.036
6.08E+11	2104	0.210	0.243	-0.033
6.08E+11	2127	0.175	0.212	-0.037
6.08E+11	2157	0.144	0.181	-0.037
6.08E+11	2091	0.170	0.191	-0.021
6.08E+11	2144	0.178	0.174	0.003
	Max	0.241	0.274	0.003
	Average	0.180	0.195	-0.015
	Min	0.142	0.142	-0.042
	Std Dev	0.027	0.033	0.018

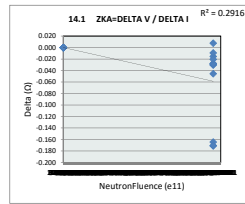


14.0 A2 VOLTAGE			
Test Site	CLAB	CLAB	
Tester	LTX	LTX	
Test Number	XPM16108	XPM16108	
Max Limit	0.35	V	
Min Limit		V	
NeutronFluence (e	0	6.08E+11	
LL	0.142	0.174	
Average	0.180	0.211	
Max	0.241	0.274	
UL	0.350	0.350	

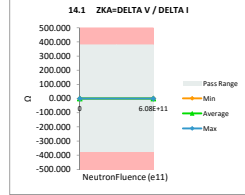


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14.1 ZKA=DELTA V / DELTA I				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	Ω	Ω		
Max Limit	380	-380		
Min Limit	-380	-380		
NeutronFluence (e11)	Serial #	Pre	2-Unit TL1431 Po	Delta
0	146	0.042	0.042	0.000
0	89	0.107	0.107	0.000
0	77	0.257	0.257	0.000
0	237	0.058	0.058	0.000
0	189	0.263	0.263	0.000
0	166	0.098	0.098	0.000
0	109	0.052	0.052	0.000
0	104	0.049	0.049	0.000
0	127	0.100	0.100	0.000
0	157	0.104	0.104	0.000
0	91	0.034	0.034	0.000
0	144	0.101	0.101	0.000
6.08E+11	2146	0.042	0.058	-0.015
6.08E+11	2089	0.107	0.271	-0.165
6.08E+11	2077	0.257	0.285	-0.028
6.08E+11	2237	0.058	0.103	-0.045
6.08E+11	2189	0.263	0.293	-0.030
6.08E+11	2166	0.098	0.128	-0.030
6.08E+11	2109	0.052	0.080	-0.028
6.08E+11	2104	0.049	0.069	-0.020
6.08E+11	2127	0.100	0.271	-0.171
6.08E+11	2157	0.104	0.275	-0.171
6.08E+11	2091	0.034	0.044	-0.009
6.08E+11	2144	0.101	0.093	0.008
	Max	0.263	0.293	0.008
	Average	0.105	0.135	-0.029
	Min	0.034	0.034	-0.171
	Std Dev	0.075	0.094	0.056

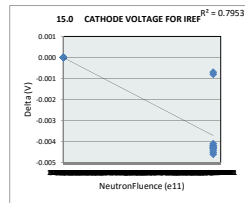


14.1 ZKA=DELTA V / DELTA I				
Test Site	CLAB			
Tester	LTX			
Test Number	XPM16108			
Max Limit	380	Ω		
Min Limit	-380	Ω		
NeutronFluence (e	Ω	6.08E+11		
LL	-380.000	-380.000		
Min	0.035	0.044		
Average	0.105	0.164		
Max	0.263	0.293		
UL	380.000	380.000		

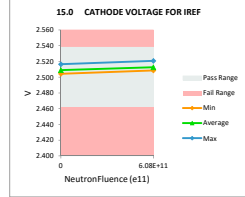


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15.0 CATHODE VOLTAGE FOR				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	V	V		
Max Limit	2.538	2.538		
Min Limit	2.462	2.462		
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	2.508	2.508	0.000
0	89	2.516	2.516	0.000
0	77	2.509	2.509	0.000
0	237	2.504	2.504	0.000
0	189	2.510	2.510	0.000
0	166	2.510	2.510	0.000
0	109	2.507	2.507	0.000
0	104	2.513	2.513	0.000
0	127	2.509	2.509	0.000
0	157	2.504	2.504	0.000
0	91	2.509	2.509	0.000
0	144	2.509	2.509	0.000
6.08E+11	2146	2.508	2.509	-0.001
6.08E+11	2089	2.516	2.521	-0.004
6.08E+11	2077	2.509	2.513	-0.004
6.08E+11	2237	2.504	2.509	-0.005
6.08E+11	2189	2.510	2.514	-0.005
6.08E+11	2166	2.510	2.514	-0.004
6.08E+11	2109	2.507	2.512	-0.004
6.08E+11	2104	2.513	2.517	-0.004
6.08E+11	2127	2.509	2.513	-0.004
6.08E+11	2157	2.504	2.509	-0.004
6.08E+11	2091	2.509	2.513	-0.004
6.08E+11	2144	2.509	2.509	-0.001
	Max	2.516	2.521	0.000
	Average	2.509	2.511	-0.002
	Min	2.504	2.504	-0.005
	Std Dev	0.003	0.004	0.002

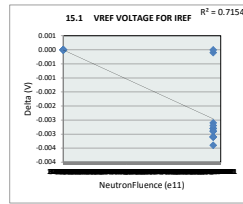


15.0 CATHODE VOLTAGE FO				
Test Site	CLAB			
Tester	LTX			
Test Number	XPM16108			
Max Limit	2.538	V		
Min Limit	2.462	V		
NeutronFluence (e	0	6.08E+11		
LL	2.462	2.462		
Min	2.504	2.509		
Average	2.509	2.513		
Max	2.517	2.521		
UL	2.538	2.538		

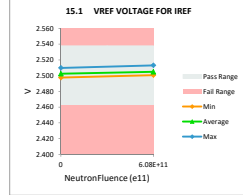


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15.1 VREF VOLTAGE FOR IREF				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Unit	V		V	
Max Limit	2.538		2.538	
Min Limit	2.462		2.462	
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	2.501	2.501	0.000
0	89	2.510	2.510	0.000
0	77	2.503	2.503	0.000
0	237	2.497	2.497	0.000
0	189	2.503	2.503	0.000
0	166	2.503	2.503	0.000
0	109	2.501	2.501	0.000
0	104	2.506	2.506	0.000
0	127	2.502	2.502	0.000
0	157	2.498	2.498	0.000
0	91	2.503	2.503	0.000
0	144	2.502	2.502	0.000
6.08E+11	2146	2.501	2.501	0.000
6.08E+11	2089	2.510	2.513	-0.003
6.08E+11	2077	2.503	2.505	-0.003
6.08E+11	2237	2.497	2.501	-0.003
6.08E+11	2189	2.503	2.506	-0.003
6.08E+11	2166	2.503	2.506	-0.003
6.08E+11	2109	2.501	2.504	-0.003
6.08E+11	2104	2.506	2.509	-0.003
6.08E+11	2127	2.502	2.505	-0.003
6.08E+11	2157	2.498	2.501	-0.003
6.08E+11	2091	2.503	2.505	-0.003
6.08E+11	2144	2.502	2.502	0.000
	Max	2.510	2.513	0.000
	Average	2.502	2.504	-0.001
	Min	2.497	2.497	-0.003
	Std Dev	0.003	0.004	0.001



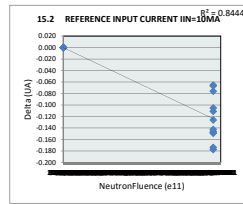
15.1 VREF VOLTAGE FOR IREF				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Max Limit	2.538		V	
Min Limit	2.462		V	
NeutronFluence (e	0	6.08E+11		
LL	2.462	2.462		
Min	2.498	2.501		
Average	2.502	2.505		
Max	2.510	2.513		
UL	2.538	2.538		



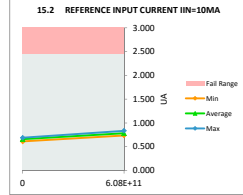
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15.2 REFERENCE INPUT CURR			
Test Site	CLAB	CLAB	
Tester	LTX	LTX	
Test Number	XPM16108	XPM16108	
Unit	UA	UA	
Max Limit	2.45	2.45	
Min Limit			

NeutronFluence (e11)	Serial #	Pre	2-Unit TL1431 Po	Delta
0	146	0.681	0.681	0.000
0	89	0.678	0.678	0.000
0	77	0.611	0.611	0.000
0	237	0.676	0.676	0.000
0	189	0.634	0.634	0.000
0	166	0.685	0.685	0.000
0	109	0.689	0.689	0.000
0	104	0.658	0.658	0.000
0	127	0.638	0.638	0.000
0	157	0.642	0.642	0.000
0	91	0.636	0.636	0.000
0	144	0.672	0.672	0.000
6.08E+11	2146	0.681	0.746	-0.065
6.08E+11	2089	0.678	0.754	-0.076
6.08E+11	2077	0.611	0.737	-0.126
6.08E+11	2237	0.676	0.823	-0.147
6.08E+11	2189	0.634	0.811	-0.177
6.08E+11	2166	0.685	0.834	-0.149
6.08E+11	2109	0.689	0.800	-0.111
6.08E+11	2104	0.658	0.763	-0.105
6.08E+11	2127	0.638	0.786	-0.149
6.08E+11	2157	0.642	0.785	-0.142
6.08E+11	2091	0.636	0.809	-0.174
6.08E+11	2144	0.672	0.739	-0.067
	Max	0.689	0.834	0.000
	Average	0.658	0.720	-0.062
	Min	0.611	0.611	-0.177
	Std Dev	0.025	0.070	0.069

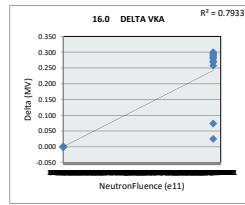


15.2 REFERENCE INPUT CURR			
Test Site	CLAB	CLAB	
Tester	LTX	LTX	
Test Number	XPM16108	XPM16108	
Max Limit	2.45	UA	
Min Limit		UA	
NeutronFluence (e	0	6.08E+11	
LL	0.611	0.737	
Average	0.658	0.782	
Max	0.689	0.834	
UL	2.450	2.450	

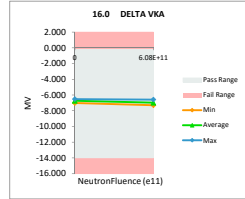


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16.0 DELTA VKA				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Unit	MV		MV	
Max Limit	-0.1		-0.1	
Min Limit	-14		-14	
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	-6.521	-6.521	0.000
0	89	-6.832	-6.832	0.000
0	77	-6.853	-6.853	0.000
0	237	-6.719	-6.719	0.000
0	189	-7.014	-7.014	0.000
0	166	-6.740	-6.740	0.000
0	109	-6.722	-6.722	0.000
0	104	-6.654	-6.654	0.000
0	127	-6.817	-6.817	0.000
0	157	-6.637	-6.637	0.000
0	91	-6.678	-6.678	0.000
0	144	-6.555	-6.555	0.000
6.08E+11	2146	-6.521	-6.555	0.074
6.08E+11	2089	-6.832	-7.132	0.300
6.08E+11	2077	-6.853	-7.122	0.269
6.08E+11	2237	-6.719	-7.001	0.282
6.08E+11	2189	-7.014	-7.295	0.281
6.08E+11	2166	-6.740	-7.037	0.296
6.08E+11	2109	-6.722	-6.994	0.272
6.08E+11	2104	-6.654	-6.946	0.292
6.08E+11	2127	-6.817	-7.086	0.269
6.08E+11	2157	-6.637	-6.894	0.258
6.08E+11	2091	-6.678	-6.966	0.288
6.08E+11	2144	-6.555	-6.581	0.025
	Max	-6.521	-6.521	0.300
	Average	-6.729	-6.850	0.121
	Min	-7.014	-7.295	0.000
	Std Dev	0.134	0.212	0.139

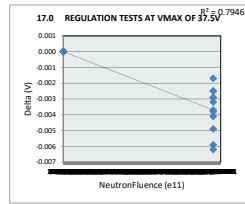


16.0 DELTA VKA			
Test Site	CLAB		
Tester	LTX		
Test Number	XPM16108		
Max Limit	-0.1 MV		
Min Limit	-14 MV		
NeutronFluence (e			
LL	-14.000	-14.000	
Min	-7.014	-7.295	
Average	-6.729	-6.971	
Max	-6.521	-6.581	
UL	-0.100	-0.100	

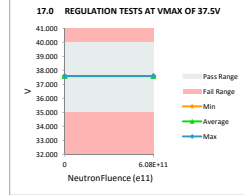


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17.0 REGULATION TESTS AT				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Unit	V		V	
Max Limit	40		40	
Min Limit	35		35	
NeutronFluence (e11)	Serial #	Prb	2-Unit_TL1431_Po	Delta
0	146	37.583	37.583	0.000
0	89	37.590	37.590	0.000
0	77	37.583	37.583	0.000
0	237	37.580	37.580	0.000
0	189	37.583	37.583	0.000
0	166	37.586	37.586	0.000
0	109	37.583	37.583	0.000
0	104	37.588	37.588	0.000
0	127	37.583	37.583	0.000
0	157	37.579	37.579	0.000
0	91	37.583	37.583	0.000
0	144	37.583	37.583	0.000
6.08E+11	2146	37.583	37.585	-0.002
6.08E+11	2089	37.590	37.595	-0.006
6.08E+11	2077	37.583	37.587	-0.004
6.08E+11	2237	37.580	37.582	-0.002
6.08E+11	2189	37.583	37.587	-0.004
6.08E+11	2166	37.586	37.591	-0.005
6.08E+11	2109	37.583	37.586	-0.003
6.08E+11	2104	37.588	37.592	-0.004
6.08E+11	2127	37.583	37.586	-0.002
6.08E+11	2157	37.579	37.585	-0.006
6.08E+11	2091	37.583	37.586	-0.003
6.08E+11	2144	37.583	37.586	-0.003
	Max	37.590	37.595	0.000
	Average	37.584	37.586	-0.002
	Min	37.579	37.579	-0.006
	Std Dev	0.003	0.004	0.002

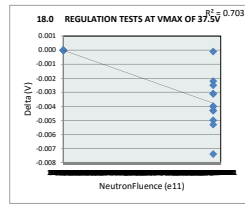


17.0 REGULATION TESTS AT				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Max Limit	40		V	
Min Limit	35		V	
NeutronFluence (e	0	6.08E+11		
LL	35.000	35.000		
Min	37.579	37.582		
Average	37.584	37.587		
Max	37.590	37.595		
UL	40.000	40.000		

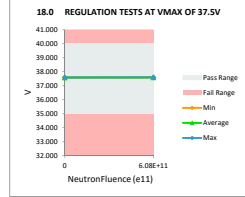


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18.0 REGULATION TESTS AT				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	V	V		
Max Limit	40	40		
Min Limit	35	35		
NeutronFluence (e11)	Serial #	Prb	2-Unit_TL1431_Po	Delta
0	146	37.586	37.586	0.000
0	89	37.593	37.593	0.000
0	77	37.585	37.585	0.000
0	237	37.580	37.580	0.000
0	189	37.585	37.585	0.000
0	166	37.586	37.586	0.000
0	109	37.585	37.585	0.000
0	104	37.591	37.591	0.000
0	127	37.585	37.585	0.000
0	157	37.581	37.581	0.000
0	91	37.587	37.587	0.000
0	144	37.585	37.585	0.000
6.08E+11	2146	37.586	37.586	0.000
6.08E+11	2089	37.593	37.598	-0.005
6.08E+11	2077	37.585	37.589	-0.004
6.08E+11	2237	37.580	37.587	-0.007
6.08E+11	2189	37.585	37.589	-0.004
6.08E+11	2166	37.586	37.590	-0.004
6.08E+11	2109	37.585	37.589	-0.003
6.08E+11	2104	37.591	37.593	-0.002
6.08E+11	2127	37.585	37.589	-0.004
6.08E+11	2157	37.581	37.586	-0.005
6.08E+11	2091	37.587	37.590	-0.003
6.08E+11	2144	37.585	37.587	-0.003
	Max	37.593	37.598	0.000
	Average	37.586	37.588	-0.002
	Min	37.580	37.580	-0.007
	Std Dev	0.004	0.004	0.002

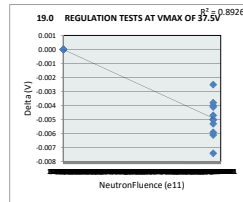


18.0 REGULATION TESTS AT				
Test Site	CLAB			
Tester	LTX			
Test Number	XPM16108			
Max Limit	40	V		
Min Limit	35	V		
NeutronFluence (e	0	6.08E+11		
LL	35.000	35.000		
Min	37.580	37.586		
Average	37.586	37.589		
Max	37.593	37.598		
UL	40.000	40.000		

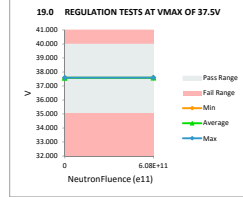


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19.0 REGULATION TESTS AT				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Unit	V		V	
Max Limit	40		40	
Min Limit	35		35	
NeutronFluence (e11)	Serial #	Prb	2-Unit_TL1431_Po	Delta
0	146	37.587	37.587	0.000
0	89	37.594	37.594	0.000
0	77	37.587	37.587	0.000
0	237	37.583	37.583	0.000
0	189	37.587	37.587	0.000
0	166	37.588	37.588	0.000
0	109	37.585	37.585	0.000
0	104	37.590	37.590	0.000
0	127	37.586	37.586	0.000
0	157	37.583	37.583	0.000
0	91	37.587	37.587	0.000
0	144	37.588	37.588	0.000
6.08E+11	2146	37.587	37.591	-0.004
6.08E+11	2089	37.594	37.599	-0.005
6.08E+11	2077	37.587	37.592	-0.005
6.08E+11	2237	37.583	37.589	-0.006
6.08E+11	2189	37.587	37.591	-0.004
6.08E+11	2166	37.588	37.593	-0.005
6.08E+11	2109	37.585	37.591	-0.005
6.08E+11	2104	37.590	37.597	-0.007
6.08E+11	2127	37.586	37.591	-0.005
6.08E+11	2157	37.583	37.587	-0.004
6.08E+11	2091	37.587	37.593	-0.006
6.08E+11	2144	37.588	37.591	-0.003
	Max	37.594	37.599	0.000
	Average	37.587	37.590	-0.002
	Min	37.583	37.583	-0.007
	Std Dev	0.003	0.004	0.003

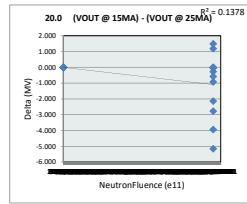


19.0 REGULATION TESTS AT				
Test Site	CLAB		CLAB	
Tester	LTX		LTX	
Test Number	XPM16108		XPM16108	
Max Limit	40		V	
Min Limit	35		V	
NeutronFluence (e	0	6.08E+11		
LL	35.000	35.000		
Min	37.583	37.587		
Average	37.587	37.592		
Max	37.594	37.599		
UL	40.000	40.000		

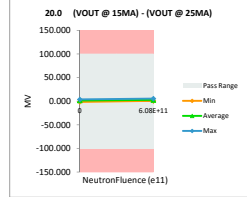


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20.0 (VOUT @ 15MA) - (VOUT @ 25MA)				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	MV	MV		
Max Limit	100	100		
Min Limit	-100	-100		
NeutronFluence (e11)	Serial #	Pre	2-Unit_TL1431_Po	Delta
0	146	1.526	1.526	0.000
0	89	0.610	0.610	0.000
0	77	2.780	2.780	0.000
0	237	2.747	2.747	0.000
0	189	2.714	2.714	0.000
0	166	2.442	2.442	0.000
0	109	0.033	0.033	0.000
0	104	-1.493	-1.493	0.000
0	127	1.254	1.254	0.000
0	157	2.408	2.408	0.000
0	91	0.000	0.000	0.000
0	144	3.663	3.663	0.000
6.08E+11	2146	1.526	5.464	-3.938
6.08E+11	2089	0.610	0.610	0.000
6.08E+11	2077	2.780	3.052	-0.272
6.08E+11	2237	2.747	1.557	1.190
6.08E+11	2189	2.714	2.747	-0.034
6.08E+11	2166	2.442	3.358	-0.916
6.08E+11	2109	0.033	2.167	-2.134
6.08E+11	2104	-1.493	3.663	-5.155
6.08E+11	2127	1.254	1.831	-0.577
6.08E+11	2157	2.408	0.916	1.493
6.08E+11	2091	0.000	2.778	-2.778
6.08E+11	2144	3.663	3.663	0.000
	Max	3.663	5.464	1.493
	Average	1.557	2.104	-0.547
	Min	-1.493	-1.493	-5.155
	Std Dev	1.481	1.508	1.505

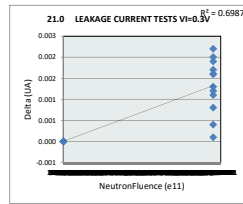


20.0 (VOUT @ 15MA) - (VOUT @ 25MA)				
Test Site	CLAB			
Tester	LTX			
Test Number	XPM16108			
Max Limit	100	MV		
Min Limit	-100	MV		
NeutronFluence (e	0	6.08E+11		
LL	-100.000	-100.000		
Min	-1.493	0.611		
Average	1.557	2.650		
Max	3.663	5.464		
UL	100.000	100.000		

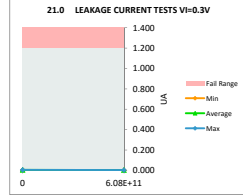


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21.0 LEAKAGE CURRENT TEST				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	UA	UA		
Max Limit	1.2	1.2		
Min Limit				
NeutronFluence (e11)	Serial #	Pre	2-Unit TL1431 Po	Delta
0	146	0.005	0.005	0.000
0	89	0.005	0.005	0.000
0	77	0.005	0.005	0.000
0	237	0.006	0.006	0.000
0	189	0.004	0.004	0.000
0	166	0.004	0.004	0.000
0	109	0.004	0.004	0.000
0	104	0.005	0.005	0.000
0	127	0.005	0.005	0.000
0	157	0.005	0.005	0.000
0	91	0.004	0.004	0.000
0	144	0.005	0.005	0.000
6.08E+11	2146	0.005	0.004	0.001
6.08E+11	2089	0.005	0.003	0.002
6.08E+11	2077	0.005	0.003	0.002
6.08E+11	2237	0.006	0.004	0.002
6.08E+11	2189	0.004	0.004	0.000
6.08E+11	2166	0.004	0.004	0.000
6.08E+11	2109	0.004	0.003	0.001
6.08E+11	2104	0.005	0.003	0.002
6.08E+11	2127	0.005	0.004	0.002
6.08E+11	2157	0.005	0.004	0.002
6.08E+11	2091	0.004	0.003	0.001
6.08E+11	2144	0.005	0.004	0.001
	Max	0.006	0.006	0.002
	Average	0.005	0.004	0.001
	Min	0.004	0.003	0.000
	Std Dev	0.001	0.001	0.001



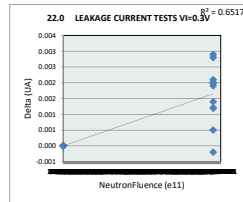
21.0 LEAKAGE CURRENT TEST		
Test Site	CLAB	
Tester	LTX	
Test Number	XPM16108	
Max Limit	1.2	UA
Min Limit		UA
NeutronFluence (e	0	6.08E+11
LL	0.004	0.003
Average	0.005	0.004
Max	0.006	0.004
UL	1.200	1.200



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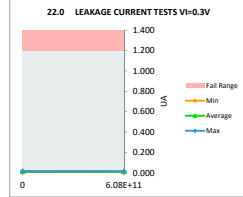
22.0 LEAKAGE CURRENT TEST				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	UA	UA		
Max Limit	1.2	1.2		
Min Limit				

NeutronFluence (e11)	Serial #	Pre	2-Unit TL1431 Po	Delta
0	146	0.014	0.014	0.000
0	89	0.014	0.014	0.000
0	77	0.015	0.015	0.000
0	237	0.016	0.016	0.000
0	189	0.014	0.014	0.000
0	166	0.014	0.014	0.000
0	109	0.014	0.014	0.000
0	104	0.016	0.016	0.000
0	127	0.015	0.015	0.000
0	157	0.015	0.015	0.000
0	91	0.014	0.014	0.000
0	144	0.015	0.015	0.000
6.08E+11	2146	0.014	0.013	0.001
6.08E+11	2089	0.014	0.012	0.002
6.08E+11	2077	0.015	0.012	0.003
6.08E+11	2237	0.016	0.013	0.003
6.08E+11	2189	0.014	0.014	0.000
6.08E+11	2166	0.014	0.013	0.001
6.08E+11	2109	0.014	0.013	0.001
6.08E+11	2104	0.016	0.014	0.002
6.08E+11	2127	0.015	0.013	0.002
6.08E+11	2157	0.015	0.013	0.002
6.08E+11	2091	0.014	0.012	0.002
6.08E+11	2144	0.015	0.014	0.001
	Max	0.016	0.016	0.003
	Average	0.015	0.014	0.001
	Min	0.014	0.012	0.000
	Std Dev	0.001	0.001	0.001



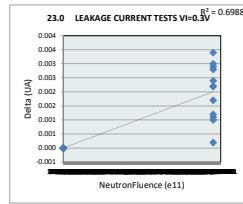
22.0 LEAKAGE CURRENT TEST				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Max Limit	1.2	UA		
Min Limit		UA		

NeutronFluence (e	0	6.08E+11
LL	0.014	0.012
Average	0.015	0.013
Max	0.016	0.014
UL	1.200	1.200

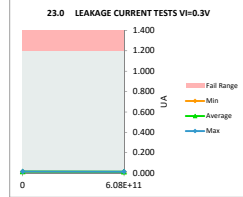


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23.0 LEAKAGE CURRENT TEST				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	UA	UA		
Max Limit	1.2	1.2		
Min Limit				
NeutronFluence (e11)	Serial #	Pre	2-Unit TL1431 Po	Delta
0	146	0.015	0.015	0.000
0	89	0.014	0.014	0.000
0	77	0.016	0.016	0.000
0	237	0.016	0.016	0.000
0	189	0.014	0.014	0.000
0	166	0.014	0.014	0.000
0	109	0.014	0.014	0.000
0	104	0.016	0.016	0.000
0	127	0.015	0.015	0.000
0	157	0.016	0.016	0.000
0	91	0.015	0.015	0.000
0	144	0.016	0.016	0.000
6.08E+11	2146	0.015	0.013	0.002
6.08E+11	2089	0.014	0.013	0.001
6.08E+11	2077	0.016	0.013	0.003
6.08E+11	2237	0.016	0.013	0.003
6.08E+11	2189	0.014	0.014	0.000
6.08E+11	2166	0.014	0.013	0.001
6.08E+11	2109	0.014	0.013	0.001
6.08E+11	2104	0.016	0.014	0.002
6.08E+11	2127	0.015	0.013	0.003
6.08E+11	2157	0.016	0.013	0.003
6.08E+11	2091	0.015	0.013	0.002
6.08E+11	2144	0.016	0.013	0.002
	Max	0.016	0.016	0.003
	Average	0.015	0.014	0.001
	Min	0.014	0.013	0.000
	Std Dev	0.001	0.001	0.001

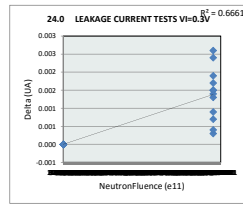


23.0 LEAKAGE CURRENT TEST				
Test Site	CLAB			
Tester	LTX			
Test Number	XPM16108			
Max Limit	1.2	UA		
Min Limit		UA		
NeutronFluence (e	0	6.08E+11		
LL		0.014	0.013	
Average		0.015	0.013	
Max		0.016	0.014	
UL		1.200	1.200	

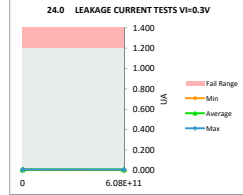


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24.0 LEAKAGE CURRENT TEST				
Test Site	CLAB	CLAB		
Tester	LTX	LTX		
Test Number	XPM16108	XPM16108		
Unit	UA	UA		
Max Limit	1.2	1.2		
Min Limit				
NeutronFluence (e11)	Serial #	Pre	2-Unit TL1431 Po	Delta
0	146	0.009	0.009	0.000
0	89	0.009	0.009	0.000
0	77	0.010	0.010	0.000
0	237	0.009	0.009	0.000
0	189	0.009	0.009	0.000
0	166	0.009	0.009	0.000
0	109	0.009	0.009	0.000
0	104	0.010	0.010	0.000
0	127	0.009	0.009	0.000
0	157	0.009	0.009	0.000
0	91	0.009	0.009	0.000
0	144	0.010	0.010	0.000
6.08E+11	2146	0.009	0.007	0.002
6.08E+11	2089	0.009	0.009	0.000
6.08E+11	2077	0.010	0.008	0.002
6.08E+11	2237	0.009	0.008	0.001
6.08E+11	2189	0.009	0.008	0.001
6.08E+11	2166	0.009	0.008	0.001
6.08E+11	2109	0.009	0.008	0.001
6.08E+11	2104	0.010	0.009	0.001
6.08E+11	2127	0.009	0.008	0.001
6.08E+11	2157	0.009	0.008	0.002
6.08E+11	2091	0.009	0.008	0.002
6.08E+11	2144	0.010	0.007	0.003
	Max	0.010	0.010	0.003
	Average	0.009	0.009	0.001
	Min	0.009	0.007	0.000
	Std Dev	0.000	0.001	0.001



24.0 LEAKAGE CURRENT TEST		
Test Site	CLAB	
Tester	LTX	
Test Number	XPM16108	
Max Limit	1.2	UA
Min Limit		UA
NeutronFluence (e	0	6.08E+11
LL	0.009	0.007
Average	0.009	0.008
Max	0.010	0.009
UL	1.200	1.200



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