

Neutron Irradiation Test Results of the RH1498MW 10MHz, 6V/ μ s, Dual Rail-to-Rail Input and Output Precision C-Load Op Amps

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Neutron Radiation Testing of the RH1498MW 10MHz, 6V/ μ s, Dual Rail-to-Rail Input and Output Precision C-Load Op Amps

Part Type Tested: RH1498MW 10MHz, 6V/ μ s, Dual Rail-to-Rail Input and Output Precision C-Load Op Amps.

Traceability Information: Fab Lot# W10739896.1, Assembly Lot# 533036.1; Wafer # 9. See photograph of unit under test in Appendix A.

Quantity of Units: 7 units received, 2 units for control, and 5 units for unbiased irradiation. Leads of devices, serial numbers 16 to 20, were shorted together using anti-static foam during irradiation. Serial numbers 13 and 14 were used as control. See Appendix B for the radiation bias connection tables.

Radiation Dose: Total fluence of 1E12 neutron/cm².

Radiation Test Standard: MIL-STD-883 TM1017 and Linear Technology RH1498M specifications (<http://www.linear.com/product/RH1498M>).

Test Hardware and Software: LTX test program RAD1498.04

Facility and Radiation Source: University of Massachusetts, Lowell and Reactor Facility-FNI.

Irradiation and Test Temperature: Room temperature controlled to 24°C \pm 6°C per MIL-STD-883 and MIL-STD-750.

SUMMARY

ALL SEVEN PARTS PASSED THE ELECTRICAL TEST LIMITS AS SPECIFIED IN THE DATASHEET AFTER IRRADIATION TO 1E12 N/cm². ADDITIONAL INFORMATION CAN BE PROVIDED PER REQUEST.

1.0 Overview and Background

Neutron particles incident on semiconductor materials lose energy along their paths. The energy loss produces electron-hole pairs (ionization) and displaces atoms in the material lattice (displacement damage defects or DDD). DDD induces a mixture of isolated and clustered defects or broken bonds. Such defects elevate the energy level of the material and consequently change material and electrical properties. The altering energy level creates the combination of any of the following processes, thermal generation of electron-hole pairs, recombination, trapping, compensation, tunneling, affecting the device's basic features. We run the electrical tests after we had made sure that the parts are not radioactive anymore to be shipped to LTC.

Bipolar technology is susceptible to neutron displacement damage around a fluence level of $1E12$ neutron/cm². The neutron radiation test for the RH1498MW determines the change in device performance as a function of neutron's fluence.

2.0 Radiation Facility:

Five samples were irradiated unbiased at the University of Massachusetts, Lowell, using the Reactor Facility-FNI. The neutron flux was determined by system S/P-32, method ASTM E-265, to be $4.05E9$ N/cm²-s (1MeV equivalent) for each irradiation step. Refer to Appendix C for the certificate of dosimetry.

3.0 Test Conditions

Five samples and two control units were electrically tested at 25°C prior to irradiation. The testing was performed on the two control units to confirm the operation of the test system prior to the electrical testing of the 7 units (5 irradiated and 2 control). During irradiation, devices leads were shorted together using anti-static foam and devices then were placed into an anti-static bag. Devices were then vertically aligned with the radiation source.

The criteria to pass the neutron displacement damage test is that five irradiated samples must pass the datasheet limits. If any of the tested parameters of these five units do not meet the required limits then a failure-analysis of the part should be conducted in accordance with method 5003, MIL-STD-883, and if valid the lot will be scrapped.

4.0 Tested Parameters

The following parameters were measured pre- and post-irradiations, $V_s = \pm 15V$, and $V_{cm} = V_{out} = 0V$, unless otherwise noted.

- A side V_{OS} @ $V_s = \pm 15V$, $V_{cm} = -15V$
- B side V_{OS} @ $V_s = \pm 15V$, $V_{cm} = -15V$
- A side V_{OS} @ $V_s = \pm 15V$, $V_{cm} = +15V$
- B side V_{OS} @ $V_s = \pm 15V$, $V_{cm} = +15V$
- A side I_B^- @ $V_s = \pm 15V$, $V_{cm} = -15V$
- B side I_B^- @ $V_s = \pm 15V$, $V_{cm} = -15V$
- A side I_B^- @ $V_s = \pm 15V$, $V_{cm} = +15V$
- B side I_B^- @ $V_s = \pm 15V$, $V_{cm} = +15V$
- A side I_B^+ @ $V_s = \pm 15V$, $V_{cm} = -15V$
- B side I_B^+ @ $V_s = \pm 15V$, $V_{cm} = -15V$
- A side I_B^+ @ $V_s = \pm 15V$, $V_{cm} = +15V$
- B side I_B^+ @ $V_s = \pm 15V$, $V_{cm} = +15V$
- A side I_{OS} @ $V_s = \pm 15V$, $V_{cm} = -15V$
- B side I_{OS} @ $V_s = \pm 15V$, $V_{cm} = -15V$
- A side I_{OS} @ $V_s = \pm 15V$, $V_{cm} = +15V$
- B side I_{OS} @ $V_s = \pm 15V$, $V_{cm} = +15V$
- A side Gain ($R_1 = 10K\Omega$) @ $V_o = -14.5V$ to $14.5V$
- B side Gain ($R_1 = 10K\Omega$) @ $V_o = -14.5V$ to $14.5V$
- A side Gain ($R_1 = 2K\Omega$) @ $V_o = -10V$ to $10V$
- B side Gain ($R_1 = 2K\Omega$) @ $V_o = -10V$ to $10V$
- A side CMRR @ $V_{cm} = 15V$ to $-15V$
- B side CMRR @ $V_{cm} = 15V$ to $-15V$
- CMRR Match @ $V_{cm} = 15V$ to $-15V$
- A side PSRR @ $V_s = \pm 2V$ to $\pm 16V$
- B side PSRR @ $V_s = \pm 2V$ to $\pm 16V$
- PSRR Match @ $V_s = \pm 2V$ to $\pm 16V$
- A side V_{OL} @ $V_s = \pm 15V$, No Load
- B side V_{OL} @ $V_s = \pm 15V$, No Load
- A side V_{OL} @ $V_s = \pm 15V$, $I_{SINK} = 1mA$
- B side V_{OL} @ $V_s = \pm 15V$, $I_{SINK} = 1mA$
- A side V_{OL} @ $V_s = \pm 15V$, $I_{SINK} = 10mA$
- B side V_{OL} @ $V_s = \pm 15V$, $I_{SINK} = 10mA$
- A side V_{OH} @ $V_s = \pm 15V$, No Load
- B side V_{OH} @ $V_s = \pm 15V$, No Load
- A side V_{OH} @ $V_s = \pm 15V$, $I_{SINK} = 1mA$
- B side V_{OH} @ $V_s = \pm 15V$, $I_{SINK} = 1mA$
- A side V_{OH} @ $V_s = \pm 15V$, $I_{SINK} = 10mA$
- B side V_{OH} @ $V_s = \pm 15V$, $I_{SINK} = 10mA$
- A side I_{SC}^+
- B side I_{SC}^+
- A side I_{SC}^-
- B side I_{SC}^-
- I_s @ $15V$
- A side GBWP @ $f = 100 KHz$
- B side GBWP @ $f = 100 KHz$

- A side Slew Rate (falling)
- B side Slew Rate (falling)
- A side Slew Rate (rising)
- B side Slew Rate (rising)

The following parameters were measured pre- and post-irradiations, $V_s = 5V$, and $V_{cm} = V_{out} =$ half supply, unless otherwise noted.

- A side V_{OS} @ $V_s = 5V$, $V_{cm} = 5V$
- B side V_{OS} @ $V_s = 5V$, $V_{cm} = 5V$
- A side V_{OS} @ $V_s = 5V$, $V_{cm} = 0V$
- B side V_{OS} @ $V_s = 5V$, $V_{cm} = 0V$
- A side $I_B -$ @ $V_s = 5V$, $V_{cm} = 5V$
- B side $I_B -$ @ $V_s = 5V$, $V_{cm} = 5V$
- A side $I_B -$ @ $V_s = 5V$, $V_{cm} = 0V$
- B side $I_B -$ @ $V_s = 5V$, $V_{cm} = 0V$
- A side $I_B +$ @ $V_s = 5V$, $V_{cm} = 5V$
- B side $I_B +$ @ $V_s = 5V$, $V_{cm} = 5V$
- A side $I_B +$ @ $V_s = 5V$, $V_{cm} = 0V$
- B side $I_B +$ @ $V_s = 5V$, $V_{cm} = 0V$
- A side I_{OS} @ $V_s = 5V$, $V_{cm} = 5V$
- B side I_{OS} @ $V_s = 5V$, $V_{cm} = 5V$
- A side I_{OS} @ $V_s = 5V$, $V_{cm} = 0V$
- B side I_{OS} @ $V_s = 5V$, $V_{cm} = 0V$
- A side Gain ($R_1 = 10K\Omega$) @ $V_o = 75mV$ to $4.8V$
- B side Gain ($R_1 = 10K\Omega$) @ $V_o = 75mV$ to $4.8V$
- A side CMRR @ $V_{cm} = 0V$ to $5V$
- B side CMRR @ $V_{cm} = 0V$ to $5V$
- CMRR Match @ $V_{cm} = 0V$ to $5V$
- A side PSRR @ $V_s = 4.5V$ to $12V$
- B side PSRR @ $V_s = 4.5V$ to $12V$
- PSRR Match @ $V_s = 4.5V$ to $12V$
- A side V_{OL} @ $V_s = 5V$, No Load
- B side V_{OL} @ $V_s = 5V$, No Load
- A side V_{OL} @ $V_s = 5V$, $I_{SINK} = 1mA$
- B side V_{OL} @ $V_s = 5V$, $I_{SINK} = 1mA$
- A side V_{OL} @ $V_s = 5V$, $I_{SINK} = 2.5mA$
- B side V_{OL} @ $V_s = 5V$, $I_{SINK} = 2.5mA$
- A side V_{OH} @ $V_s = 5V$, No Load
- B side V_{OH} @ $V_s = 5V$, No Load
- A side V_{OH} @ $V_s = 5V$, $I_{SINK} = 1mA$
- B side V_{OH} @ $V_s = 5V$, $I_{SINK} = 1mA$
- A side V_{OH} @ $V_s = 5V$, $I_{SINK} = 2.5mA$
- B side V_{OH} @ $V_s = 5V$, $I_{SINK} = 2.5mA$
- A side $I_{SC} +$
- B side $I_{SC} +$
- A side $I_{SC} -$
- B side $I_{SC} -$
- I_s @ $5V$
- A side Slew Rate (falling)
- B side Slew Rate (falling)

- A side Slew Rate (rising)
- B side Slew Rate (rising)

Appendix D details the test conditions, minimum and maximum values at different accumulated doses.

5.0 Test Results

All five samples passed the post-irradiation electrical tests. All measurements of the 92 listed parameters in section 4.0 are within the specification limits.

The used statistics in this report are based on the tolerance limits, which are bounds to gage the quality of the manufactured products. It assumes that if the quality of the items is normally distributed with known mean and known standard deviation, the two-sided tolerance limits can be calculated as follows:

$$+K_{TL} = \text{mean} + (K_{TL}) (\text{standard deviation})$$

$$-K_{TL} = \text{mean} - (K_{TL}) (\text{standard deviation})$$

Where $+K_{TL}$ is the upper tolerance limit and $-K_{TL}$ is the lower tolerance limit. These tolerance limits are defined in a table of inverse normal probability distribution.

However, in most cases, mean and standard deviations are unknown and therefore it is practical to estimate both of them from a sample. Hence the tolerance limit depends greatly on the sample size. The $P_{s90\%/90\%}$ K_{TL} factor for a lot quality P of 0.9, confidence C of 0.9 with a sample size of 5, can be found from the tabulated table (MIL-HDBK-814, page 94, table IX-B). The K_{TL} factor in this report is 2.742.

In the plots, the dashed lines with X-markers are the measured data points of five post-irradiated samples. The solid lines with square symbols are the computed KTL values of five post-irradiated samples with the application of the K_{TL} statistics. The orange solid lines with circle markers are the datasheet specification limits.

The post-irradiation test limits are using Linear Technology datasheets 10 Krads(Si) specification limits.

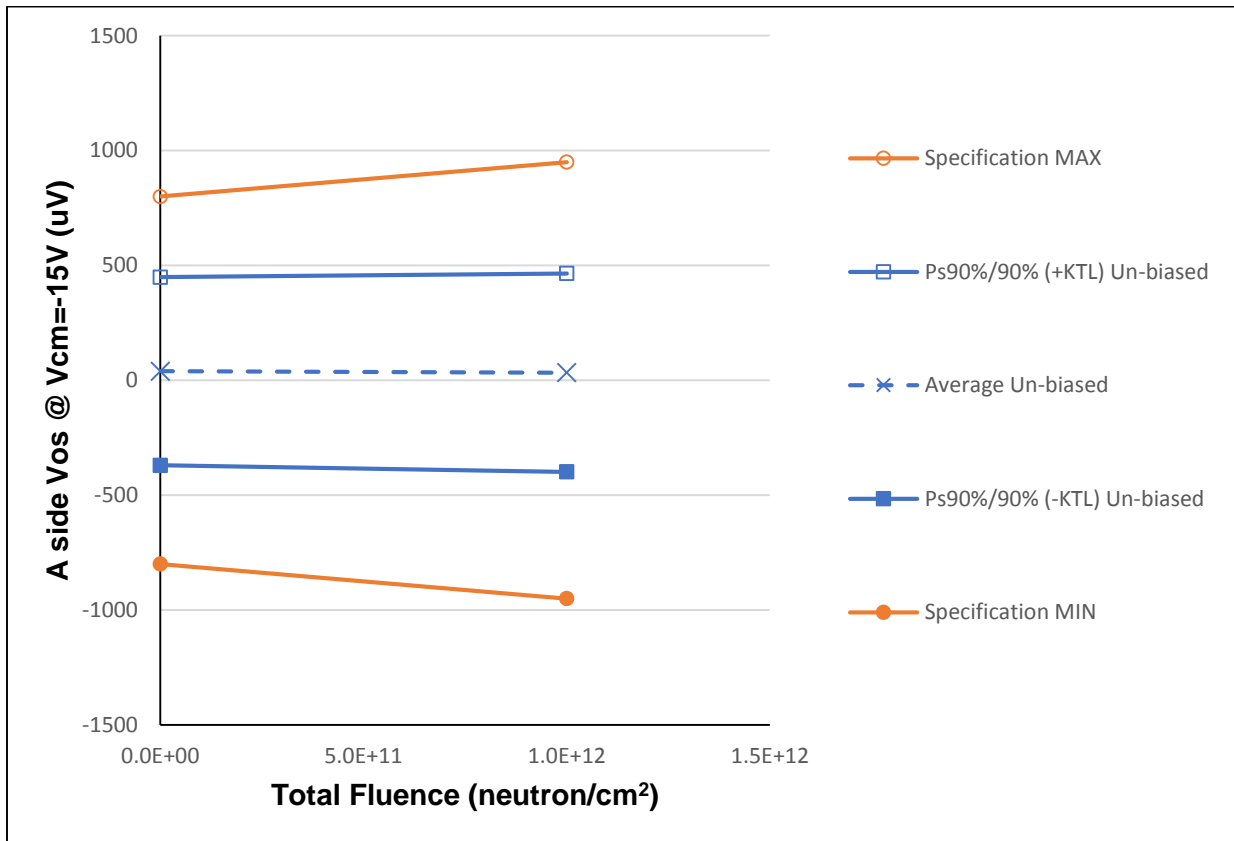


Figure 5.1 Plot of Offset Voltage V_{os} (A side) @ $V_{cm} = -15V$ versus Total Fluence

All measured data are within the datasheet specification limits

Table 5.1: Raw data table for V_{os} (A side with $V_{cm} = -15V$) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	A Vos @ $V_s = \pm 15V$, $V_{cm} = -15V$	Total Fluence (neutron/ cm^2)	
		0	1.E+12
Units	(uV)		
16	Un-biased Irradiation	101.389	71.010
17	Un-biased Irradiation	75.193	80.831
18	Un-biased Irradiation	239.566	254.229
19	Un-biased Irradiation	-100.328	-120.558
20	Un-biased Irradiation	-117.147	-118.513
13	Control Unit	117.963	119.903
14	Control Unit	123.580	123.681
	Un-biased Irradiation Statistics		
	Average Un-biased	39.735	33.400
	Std Dev Un-biased	149.349	157.488
	Ps90%/90% (+KTL) Un-biased	449.250	465.232
	Ps90%/90% (-KTL) Un-biased	-369.780	-398.433
	Specification MIN	-800	-950
	Status (Measurements)	PASS	PASS
	Specification MAX	800	950
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

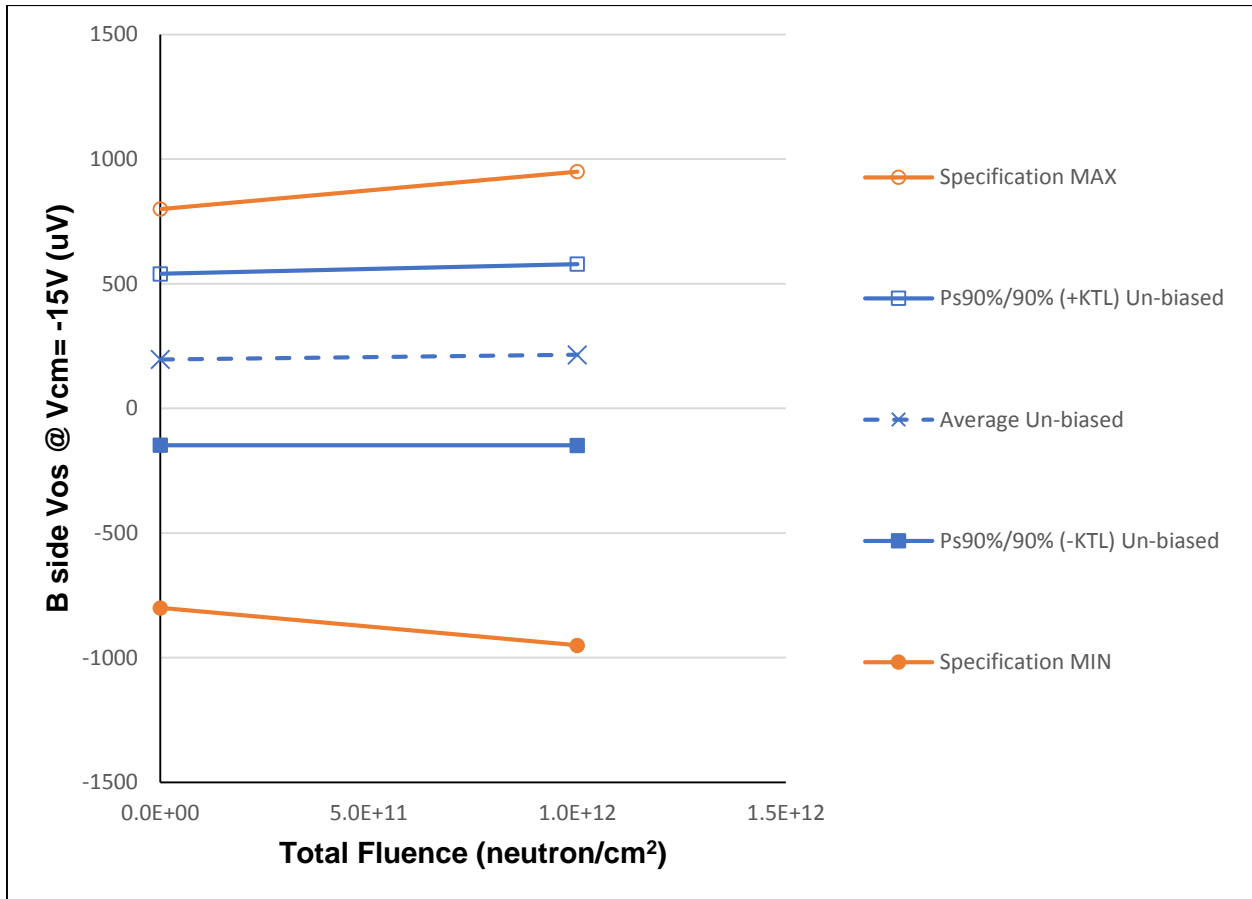


Figure 5.2: Plot of Offset Voltage V_{OS} (side B) @ $V_{cm} = -15\text{V}$ versus Total Fluence

All measured data are within the datasheet specification limits.

Table 5.2: Raw data table for V_{OS} (B side with $V_{cm} = -15V$) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	B Vos @ $V_s = \pm 15V$, $V_{cm} = -15V$	Total Fluence ($neutron/cm^2$)	
		0	1.E+12
Units	(μV)		
16	Un-biased Irradiation	296.494	379.221
17	Un-biased Irradiation	195.537	214.463
18	Un-biased Irradiation	16.925	55.434
19	Un-biased Irradiation	143.931	119.117
20	Un-biased Irradiation	330.045	308.305
13	Control Unit	36.826	37.005
14	Control Unit	-97.528	-98.786
Un-biased Irradiation Statistics			
	Average Un-biased	196.586	215.308
	Std Dev Un-biased	125.344	132.598
	Ps90%/90% (+KTL) Un-biased	540.280	578.891
	Ps90%/90% (-KTL) Un-biased	-147.107	-148.275
	Specification MIN	-800	-950
	Status (Measurements)	PASS	PASS
	Specification MAX	800	950
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

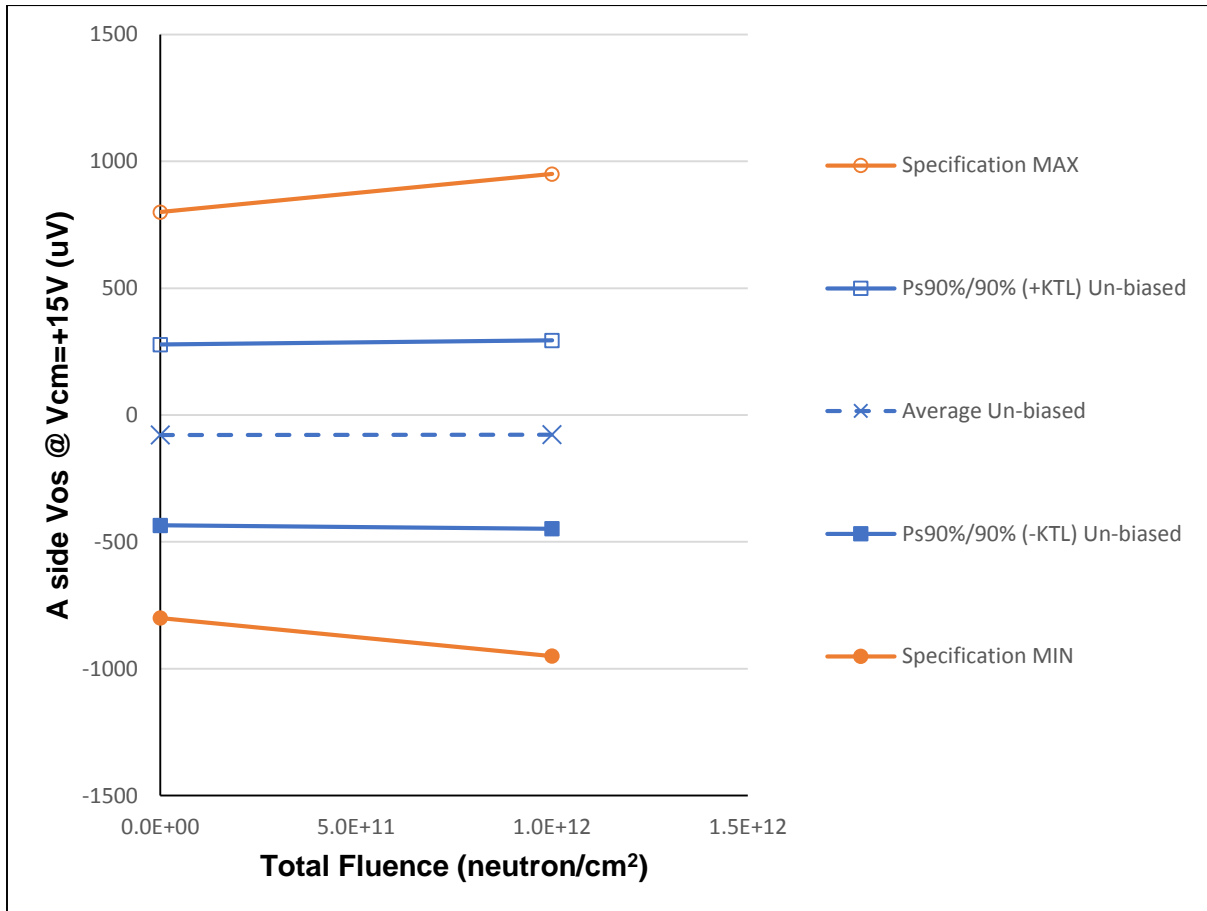


Figure 5.3: Plot of Offset Voltage V_{OS} (side A) @ $V_{cm} = +15V$ versus Total Fluence

All measured data points of A-side Offset Voltage parameter are within datasheet specification limits.

Table 5.3: Raw data table for V_{OS} (A side with $V_{cm} = +15V$) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	A Vos @ $V_s = \pm 15V$, $V_{cm} = +15V$	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(μV)		
16	Un-biased Irradiation	-22.350	-49.893
17	Un-biased Irradiation	-2.693	14.768
18	Un-biased Irradiation	64.174	82.426
19	Un-biased Irradiation	-196.262	-219.253
20	Un-biased Irradiation	-234.872	-212.988
13	Control Unit	12.835	13.379
14	Control Unit	-56.322	-57.951
Un-biased Irradiation Statistics			
	Average Un-biased	-78.401	-76.988
	Std Dev Un-biased	129.976	135.371
	Ps90%/90% (+KTL) Un-biased	277.994	294.200
	Ps90%/90% (-KTL) Un-biased	-434.796	-448.176
	Specification MIN	-800	-950
	Status (Measurements)	PASS	PASS
	Specification MAX	800	950
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

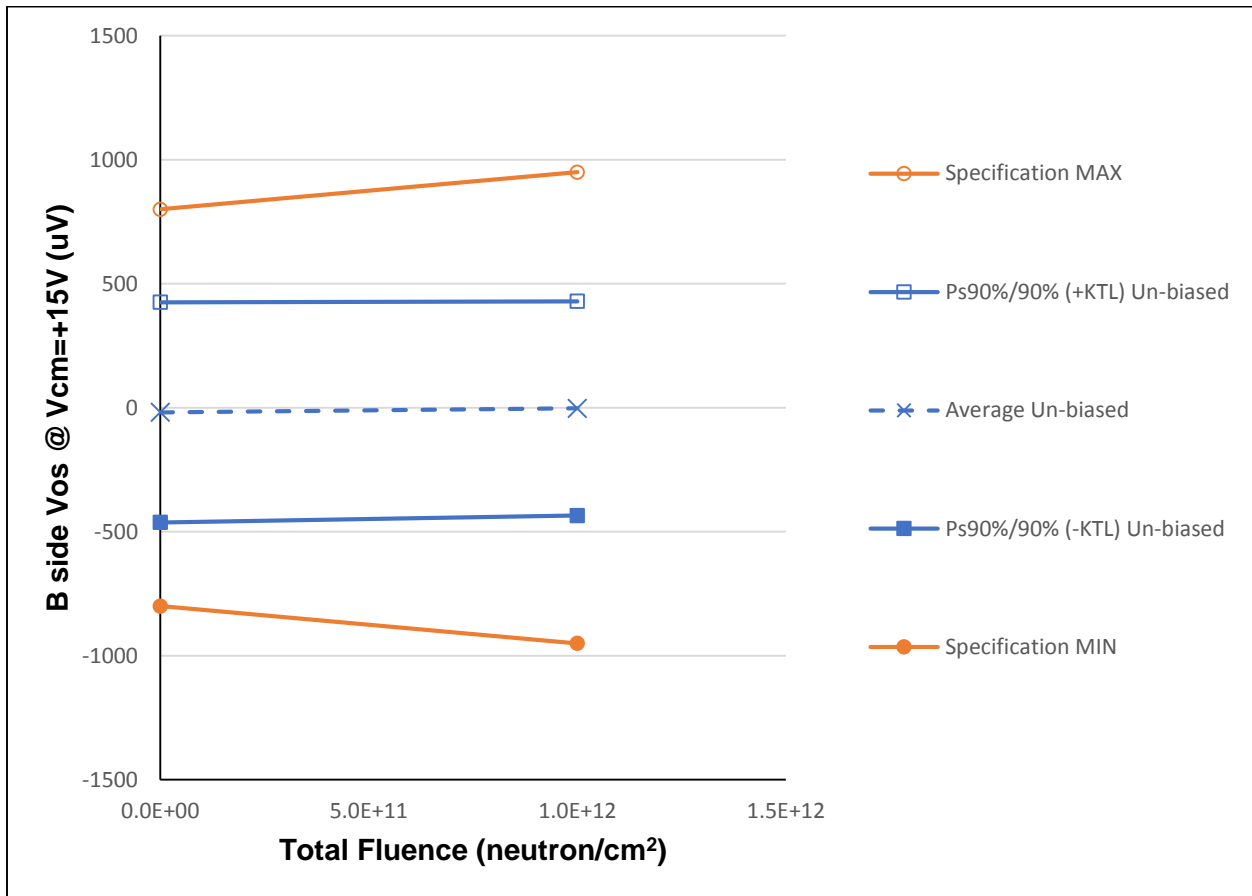


Figure 5.4: Plot of V_{OS} (side B) @ $V_{cm} = +15V$ versus Total Fluence

All post-irradiation measured values of B-side V_{OS} are within datasheet specification limits.

Table 5.4: Raw data table for V_{OS} (B side with $V_{cm} = +15V$) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	B Vos @ $V_s = \pm 15V$, $V_{cm} = +15V$	Total Fluence (neutron/ cm^2)	
		0	1.E+12
Units	(μV)		
16	Un-biased Irradiation	-29.348	38.218
17	Un-biased Irradiation	-129.913	-127.983
18	Un-biased Irradiation	-150.111	-116.148
19	Un-biased Irradiation	-38.191	-60.087
20	Un-biased Irradiation	254.709	253.603
13	Control Unit	-34.834	-34.325
14	Control Unit	-138.665	-139.583
Un-biased Irradiation Statistics			
	Average Un-biased	-18.571	-2.480
	Std Dev Un-biased	161.928	157.500
	Ps90%/90% (+KTL) Un-biased	425.435	429.385
	Ps90%/90% (-KTL) Un-biased	-462.577	-434.344
	Specification MIN	-800	-950
	Status (Measurements)	PASS	PASS
	Specification MAX	800	950
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

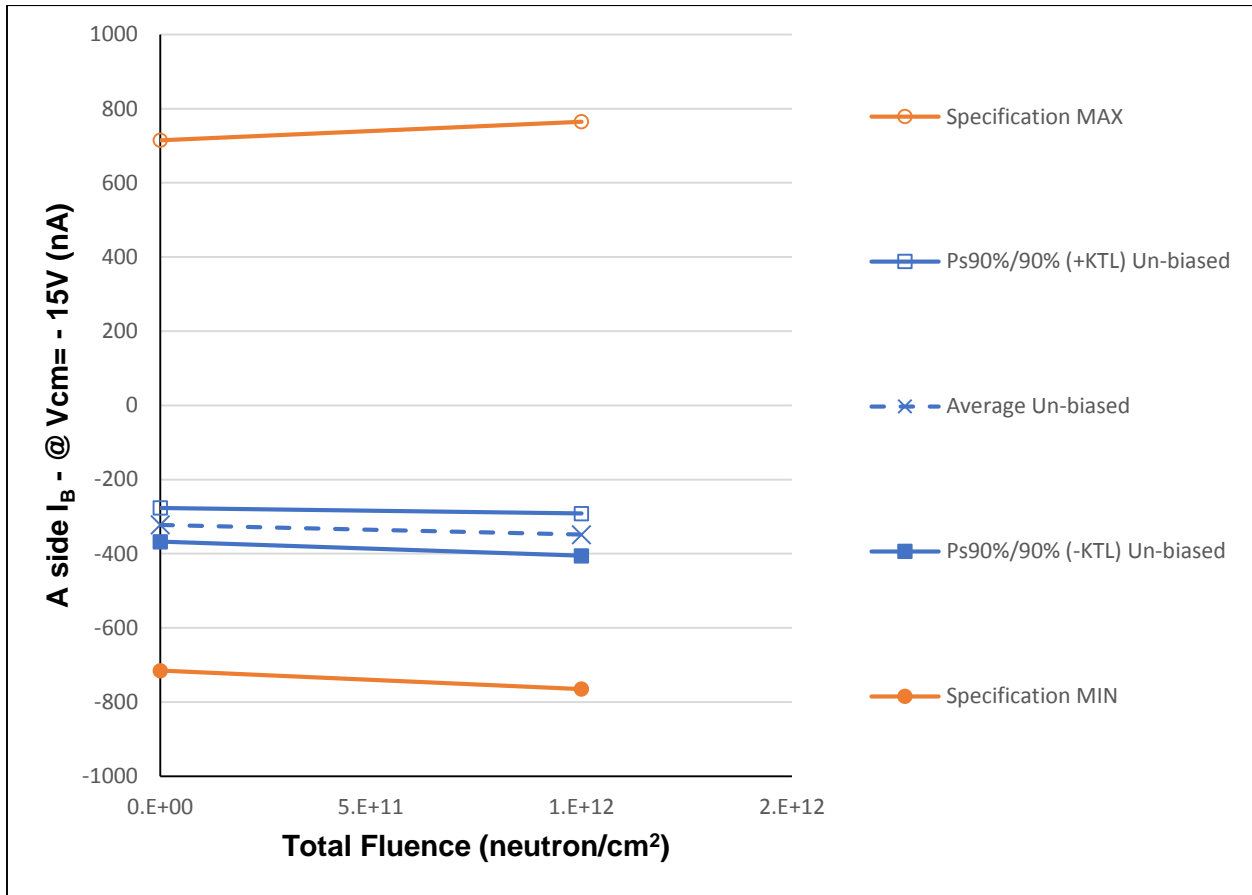


Figure 5.5: Plot of Negative Input Bias Current (side A) @ $V_{cm} = -15V$ versus Total Fluence

All measured post-irradiation data points are within datasheet specification limits.

Table 5.5: Raw data table for A-side I_B - (@ V_{cm} = -15V) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A I _B - @ Vs=+-15V, Vcm= -15V	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-309.259	-329.806
17	Un-biased Irradiation	-307.904	-337.286
18	Un-biased Irradiation	-313.200	-333.655
19	Un-biased Irradiation	-335.967	-367.886
20	Un-biased Irradiation	-343.575	-373.937
13	Control Unit	-298.408	-299.014
14	Control Unit	-306.699	-306.418
Un-biased Irradiation Statistics			
	Average Un-biased	-321.981	-348.514
	Std Dev Un-biased	16.576	20.727
	Ps90%/90% (+KTL) Un-biased	-276.530	-291.680
	Ps90%/90% (-KTL) Un-biased	-367.432	-405.348
	Specification MIN	-715	-765
	Status (Measurements)	PASS	PASS
	Specification MAX	715	765
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

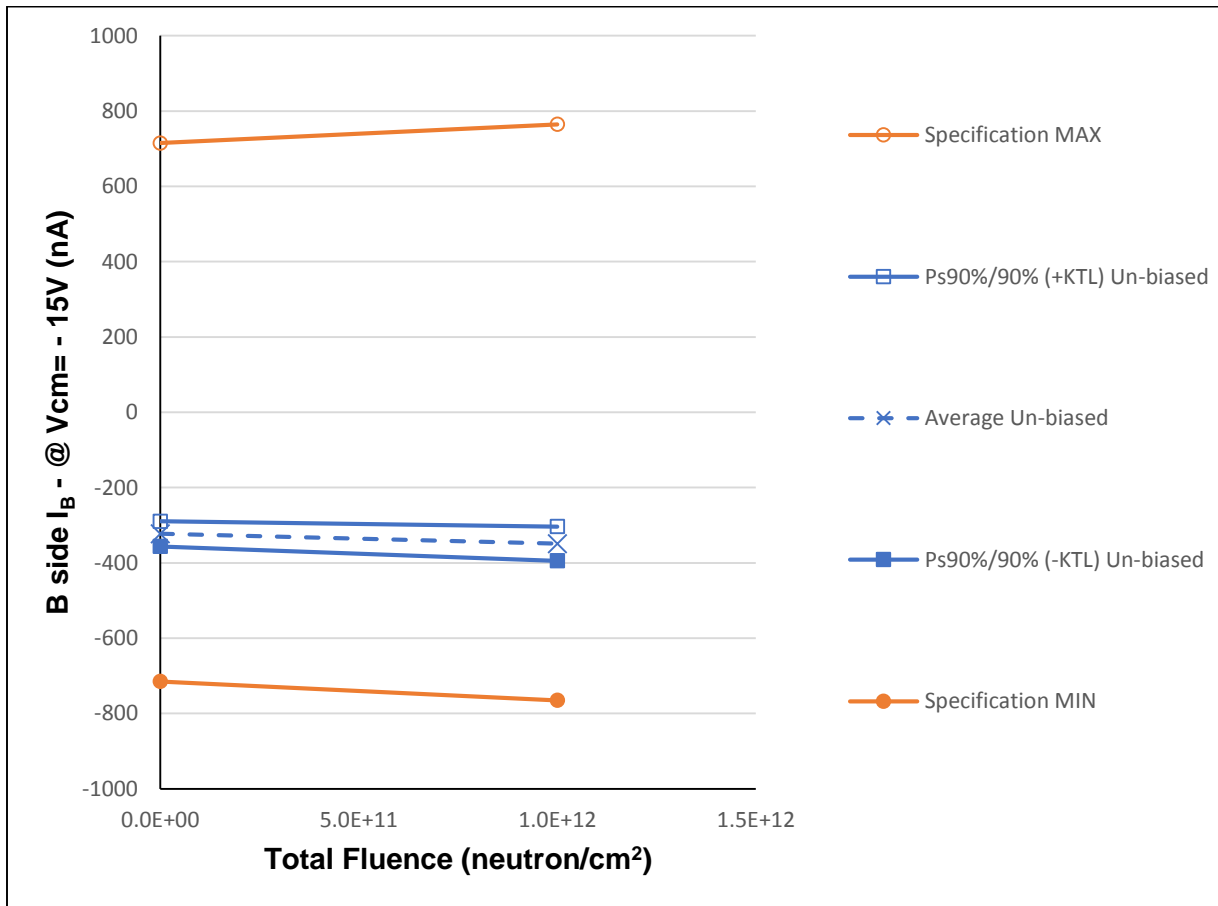


Figure 5.6: Plot of Negative Input Bias Current (side B) @ Vcm = - 15V versus Total Fluence
 All five samples pass the post-irradiation test.

Table 5.6: Raw data table for I_B – (side B) @ $V_{cm} = -15V$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B I_B - @ $V_s = \pm 15V$, $V_{cm} = -15V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-309.919	-333.105
17	Un-biased Irradiation	-317.935	-342.088
18	Un-biased Irradiation	-314.627	-336.096
19	Un-biased Irradiation	-335.994	-361.878
20	Un-biased Irradiation	-335.387	-370.641
13	Control Unit	-291.223	-292.030
14	Control Unit	-303.921	-304.053
Un-biased Irradiation Statistics			
	Average Un-biased	-322.772	-348.762
	Std Dev Un-biased	12.134	16.590
	Ps90%/90% (+KTL) Un-biased	-289.502	-303.273
	Ps90%/90% (-KTL) Un-biased	-356.043	-394.250
	Specification MIN	-715	-765
	Status (Measurements)	PASS	PASS
	Specification MAX	715	765
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

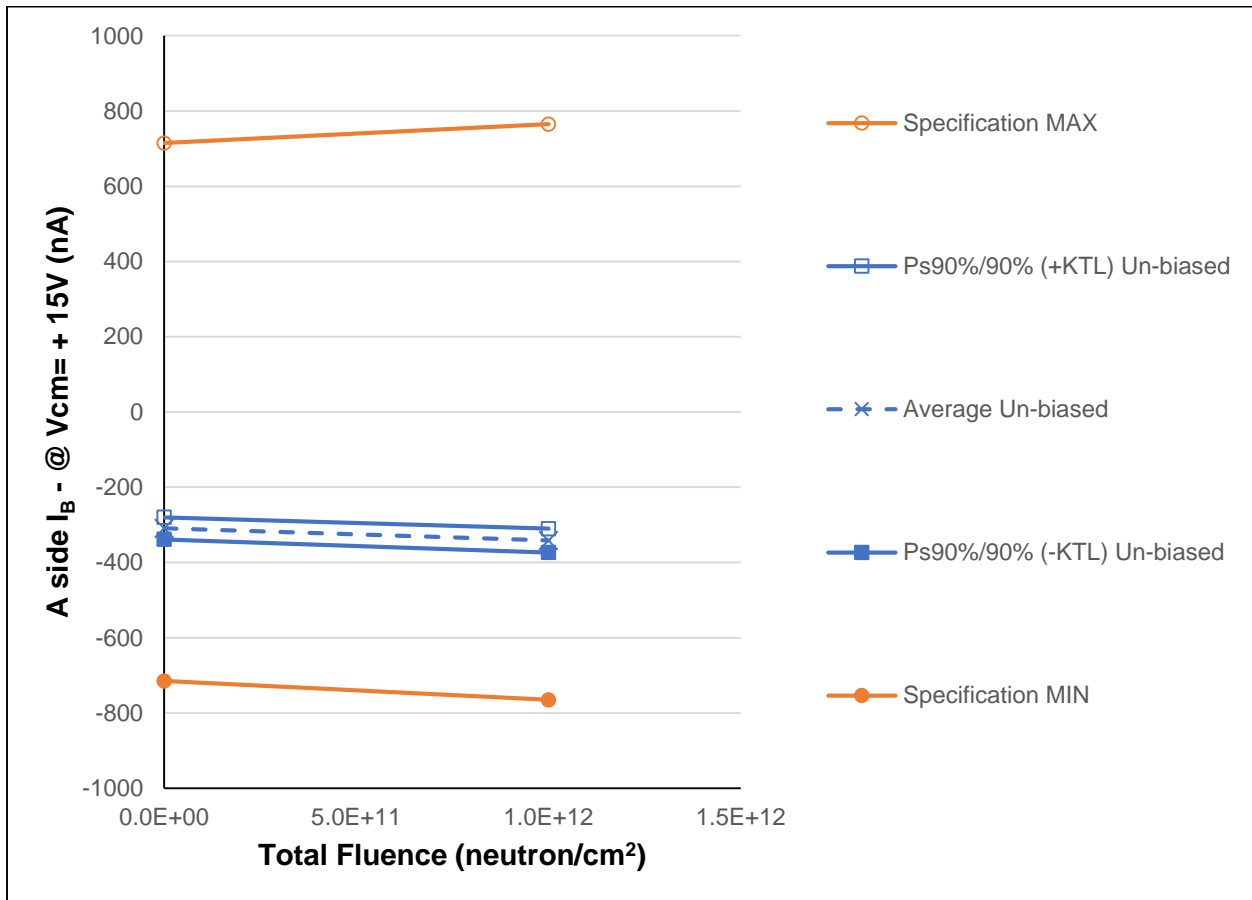


Figure 5.7: Plot of Negative Input Bias Current @ Vcm = + 15V (side A) versus Total Fluence

All measured data points pass datasheet limits.

Table 5.7: Raw data table for A-side I_B - @ V_{cm} = +15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A I _B - @ V _s =+/-15V, V _{cm} = + 15V	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-302.921	-331.728
17	Un-biased Irradiation	-295.717	-329.558
18	Un-biased Irradiation	-309.053	-343.767
19	Un-biased Irradiation	-316.276	-345.720
20	Un-biased Irradiation	-322.879	-357.984
13	Control Unit	-304.138	-304.549
14	Control Unit	-313.204	-313.307
Un-biased Irradiation Statistics			
	Average Un-biased	-309.369	-341.751
	Std Dev Un-biased	10.704	11.538
	Ps90%/90% (+KTL) Un-biased	-280.020	-310.115
	Ps90%/90% (-KTL) Un-biased	-338.718	-373.388
	Specification MIN	-715	-765
	Status (Measurements)	PASS	PASS
	Specification MAX	715	765
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

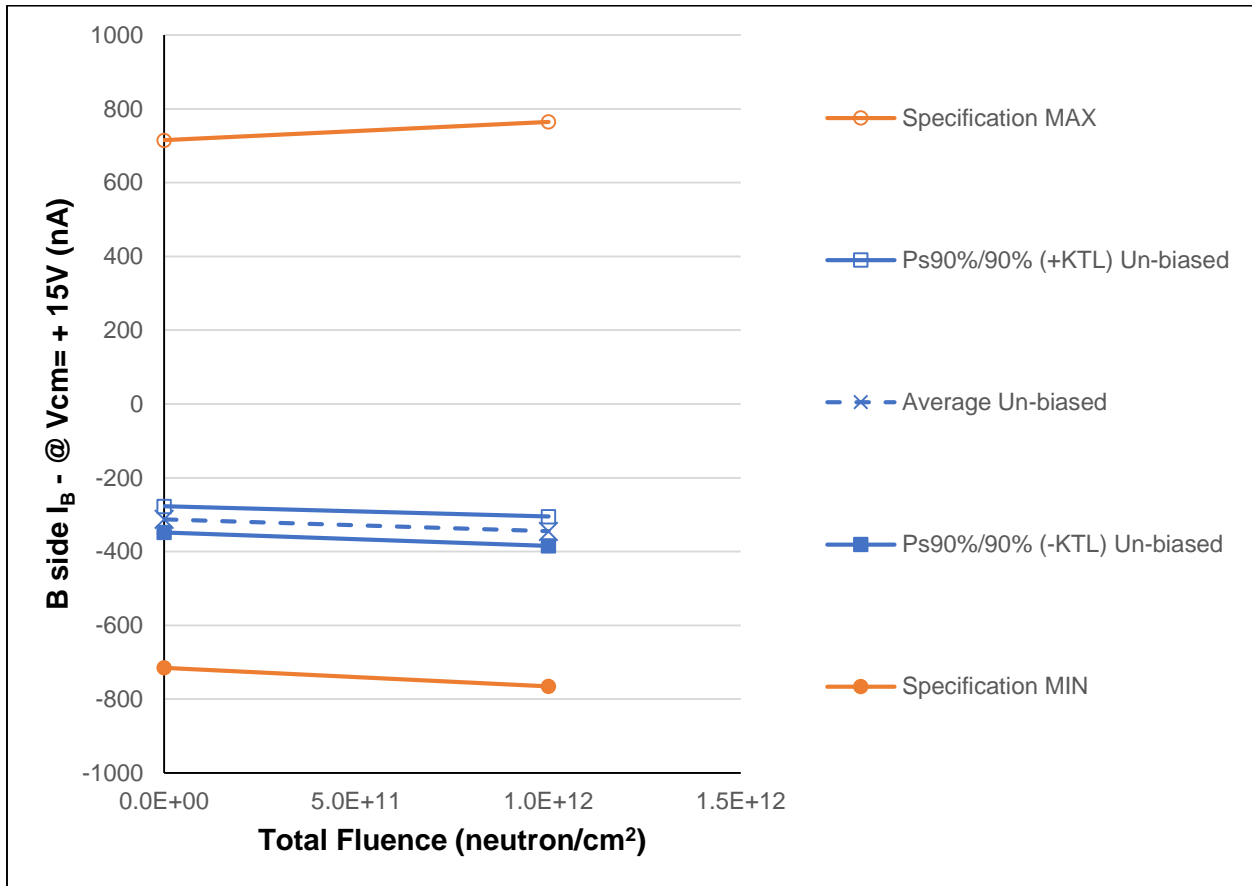


Figure 5.8: Plot of B-side I_B - @ $V_{cm} = + 15V$ versus Total Fluence

Table 5.8: Raw data table for B-side I_B - @ V_{cm} = +15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B I _B - @ V _s =±15V, V _{cm} = +15V	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-303.665	-329.176
17	Un-biased Irradiation	-303.287	-338.579
18	Un-biased Irradiation	-303.532	-340.109
19	Un-biased Irradiation	-321.601	-348.127
20	Un-biased Irradiation	-330.755	-367.692
13	Control Unit	-290.494	-290.496
14	Control Unit	-301.147	-300.559
Un-biased Irradiation Statistics			
	Average Un-biased	-312.568	-344.737
	Std Dev Un-biased	12.840	14.491
	Ps90%/90% (+KTL) Un-biased	-277.362	-305.004
	Ps90%/90% (-KTL) Un-biased	-347.774	-384.470
	Specification MIN	-715	-765
	Status (Measurements)	PASS	PASS
	Specification MAX	715	765
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

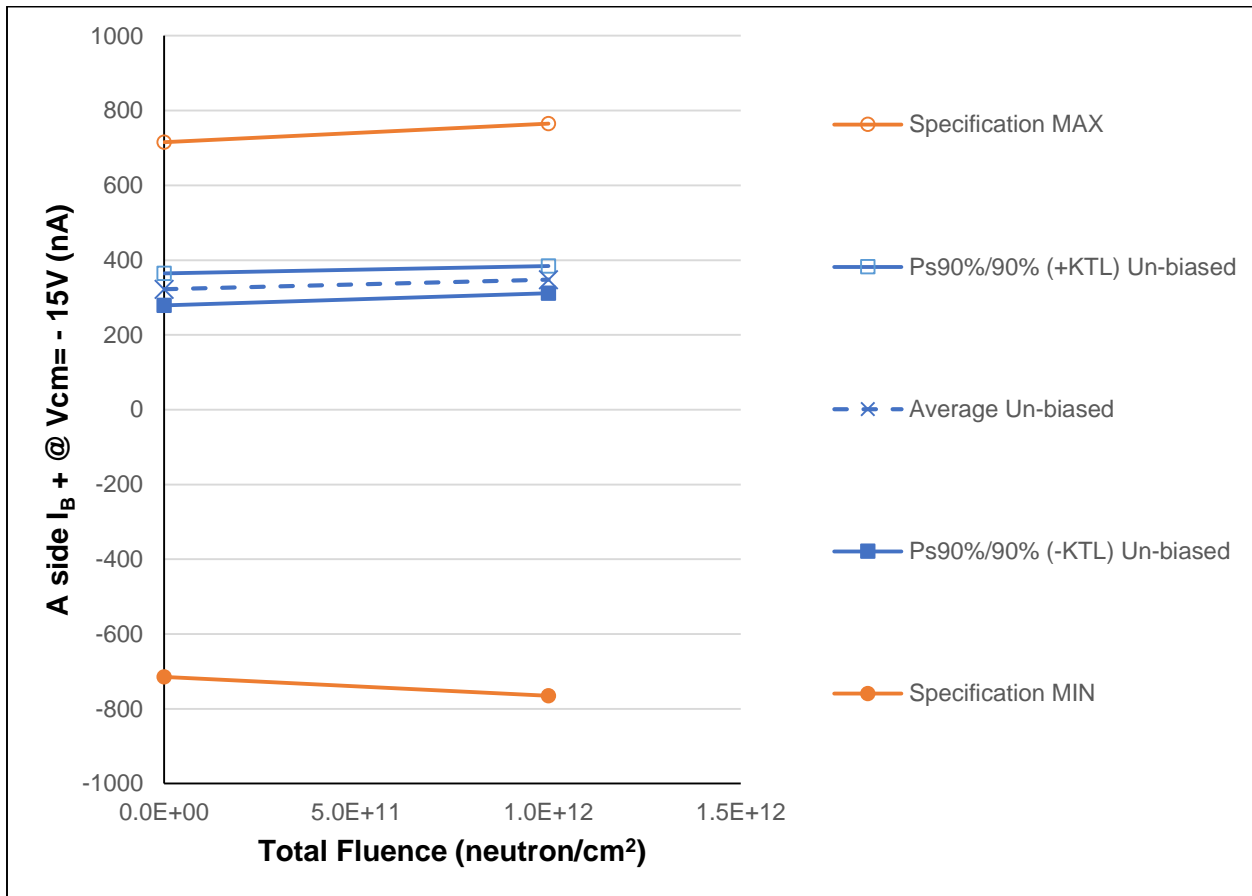


Figure 5.9: Plot of Positive Bias Current (A-side) @ Vcm = -15V versus Total Fluence

Table 5.9: Raw data table for I_{B+} @ $V_{cm} = -15V$ (side A) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	$A_{I_{B+}}$ @ $V_s = \pm 15V, V_{cm} = -15V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	311.197	337.815
17	Un-biased Irradiation	305.680	334.133
18	Un-biased Irradiation	315.680	344.635
19	Un-biased Irradiation	336.490	366.557
20	Un-biased Irradiation	340.206	355.274
13	Control Unit	299.048	299.535
14	Control Unit	308.656	308.575
Un-biased Irradiation Statistics			
	Average Un-biased	321.850	347.683
	Std Dev Un-biased	15.527	13.268
	Ps90%/90% (+KTL) Un-biased	364.424	384.063
	Ps90%/90% (-KTL) Un-biased	279.277	311.303
	Specification MIN	-715	-765
	Status (Measurements)	PASS	PASS
	Specification MAX	715	765
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

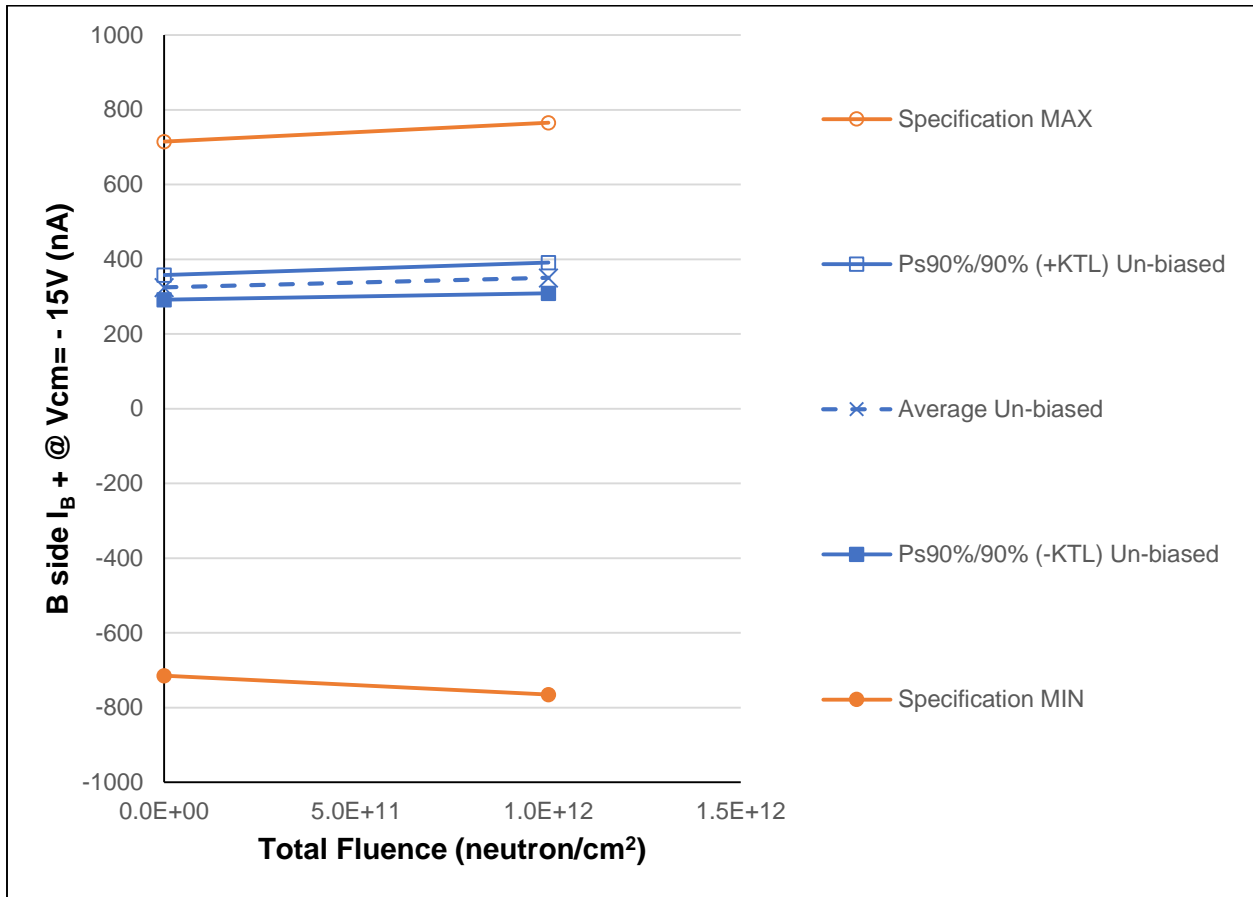


Figure 5.10: Plot of Positive Input Bias Current @ Vcm = -15V (side B) versus Total Fluence

Table 5.10: Raw data table for B-side I_{B+} @ V_s=+-15V, V_{cm}= -15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B I _{B+} @ V _s =+-15V, V _{cm} = -15V	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	312.284	331.531
17	Un-biased Irradiation	320.041	353.988
18	Un-biased Irradiation	316.519	336.918
19	Un-biased Irradiation	339.840	364.158
20	Un-biased Irradiation	334.933	363.502
13	Control Unit	292.261	292.985
14	Control Unit	302.612	302.880
Un-biased Irradiation Statistics			
	Average Un-biased	324.723	350.020
	Std Dev Un-biased	12.007	15.090
	Ps90%/90% (+KTL) Un-biased	357.647	391.398
	Ps90%/90% (-KTL) Un-biased	291.799	308.642
	Specification MIN	-715	-765
	Status (Measurements)	PASS	PASS
	Specification MAX	715	765
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

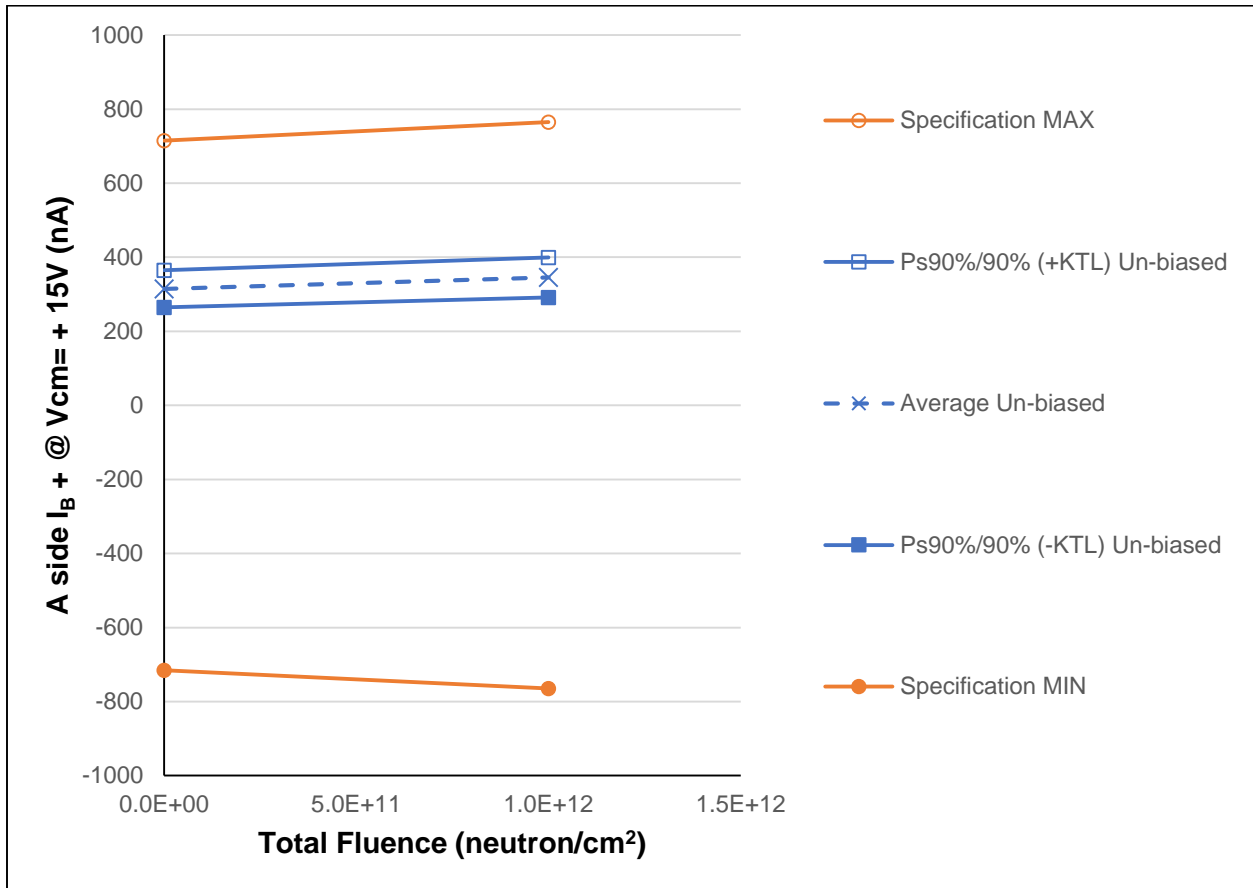


Figure 5.11: Plot of I_{B+} @ $V_{cm} = + 15\text{V}$ (side A) versus Total Fluence

Table 5.11: Raw data table for A-side I_{B+} @ V_{cm} = +15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A I _{B+} @ V _s =+-15V,V _{cm} =+15V	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	305.909	336.628
17	Un-biased Irradiation	297.148	324.402
18	Un-biased Irradiation	309.018	337.059
19	Un-biased Irradiation	314.898	355.534
20	Un-biased Irradiation	344.990	374.812
13	Control Unit	308.015	308.717
14	Control Unit	318.722	319.550
Un-biased Irradiation Statistics			
	Average Un-biased	314.393	345.687
	Std Dev Un-biased	18.266	19.716
	Ps90%/90% (+KTL) Un-biased	364.479	399.747
	Ps90%/90% (-KTL) Un-biased	264.306	291.627
	Specification MIN	-715	-765
	Status (Measurements)	PASS	PASS
	Specification MAX	715	765
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

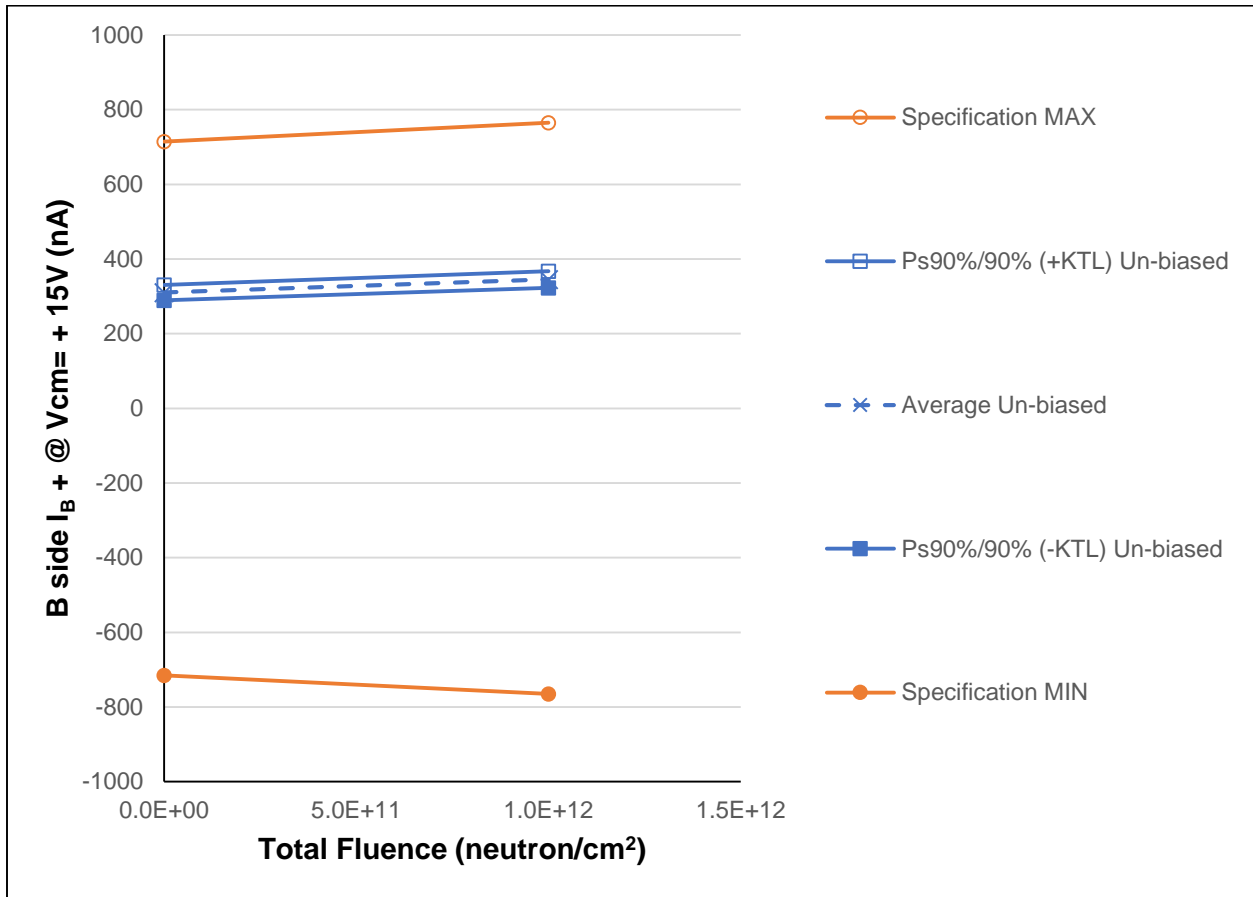


Figure 5.12: Plot of B-side I_{B+} @ $V_{cm} = +15V$ versus Total Fluence

Table 5.12: Raw data table for B-side I_{B+} @ V_{cm} = +15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B I _{B+} @ V _s =±15V, V _{cm} =+15V	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	307.141	335.110
17	Un-biased Irradiation	305.111	347.168
18	Un-biased Irradiation	302.521	338.283
19	Un-biased Irradiation	319.556	353.855
20	Un-biased Irradiation	316.615	351.795
13	Control Unit	291.219	292.253
14	Control Unit	305.687	305.489
Un-biased Irradiation Statistics			
	Average Un-biased	310.189	345.242
	Std Dev Un-biased	7.465	8.245
	Ps90%/90% (+KTL) Un-biased	330.659	367.850
	Ps90%/90% (-KTL) Un-biased	289.719	322.635
	Specification MIN	-715	-765
	Status (Measurements)	PASS	PASS
	Specification MAX	715	765
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

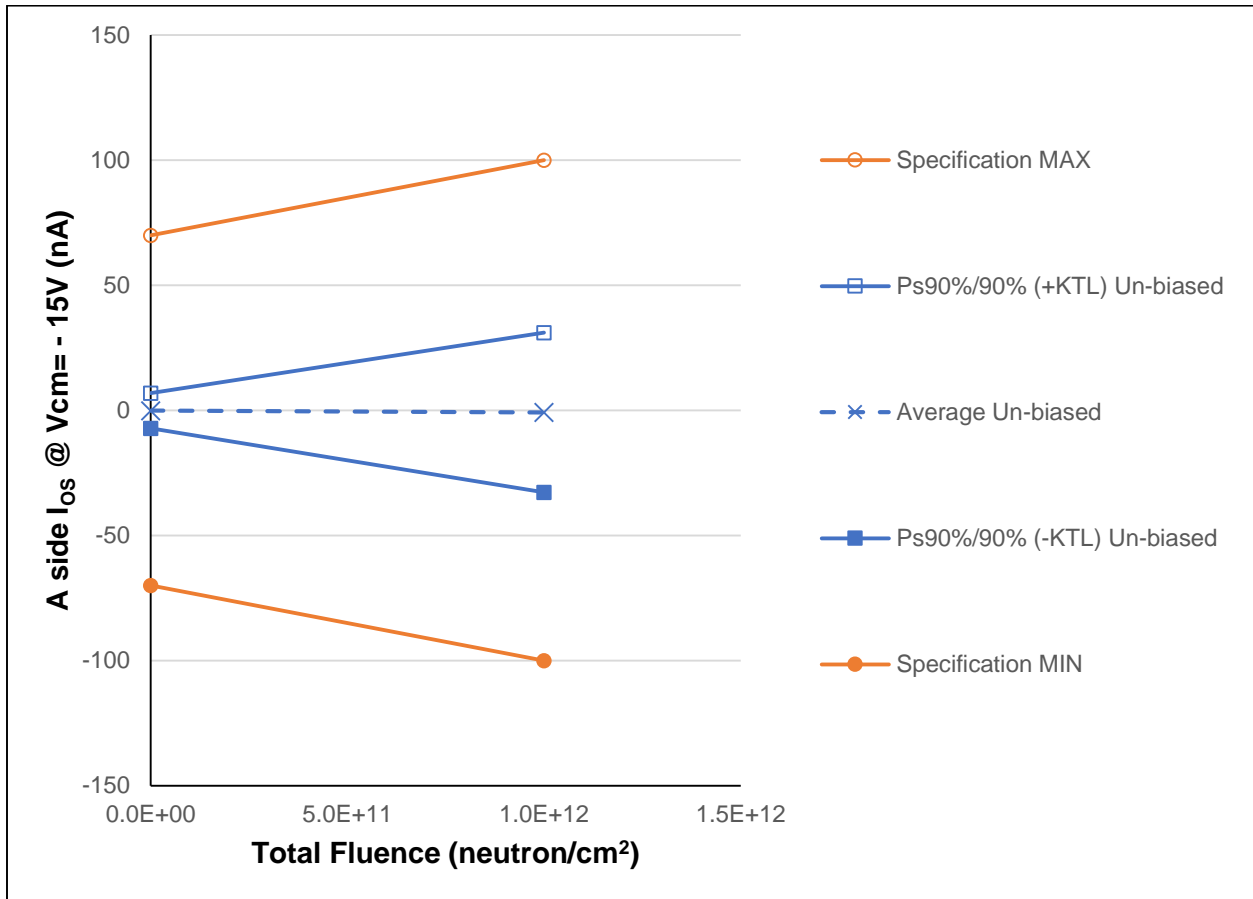


Figure 5.13: Plot of Input Offset Current (side A) @ $V_{cm} = -15V$ versus Total Fluence

Table 5.13: Raw data table for A-side I_{OS} @ $V_{cm} = -15V$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	A I_{OS} @ $V_s=+-15V, V_{cm}= -15V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	1.938	8.009
17	Un-biased Irradiation	-2.224	-3.153
18	Un-biased Irradiation	2.480	10.981
19	Un-biased Irradiation	0.523	-1.329
20	Un-biased Irradiation	-3.369	-18.663
13	Control Unit	0.641	0.521
14	Control Unit	1.957	2.157
Un-biased Irradiation Statistics			
	Average Un-biased	-0.131	-0.831
	Std Dev Un-biased	2.569	11.633
	Ps90%/90% (+KTL) Un-biased	6.913	31.066
	Ps90%/90% (-KTL) Un-biased	-7.174	-32.728
	Specification MIN	-70	-100
	Status (Measurements)	PASS	PASS
	Specification MAX	70	100
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

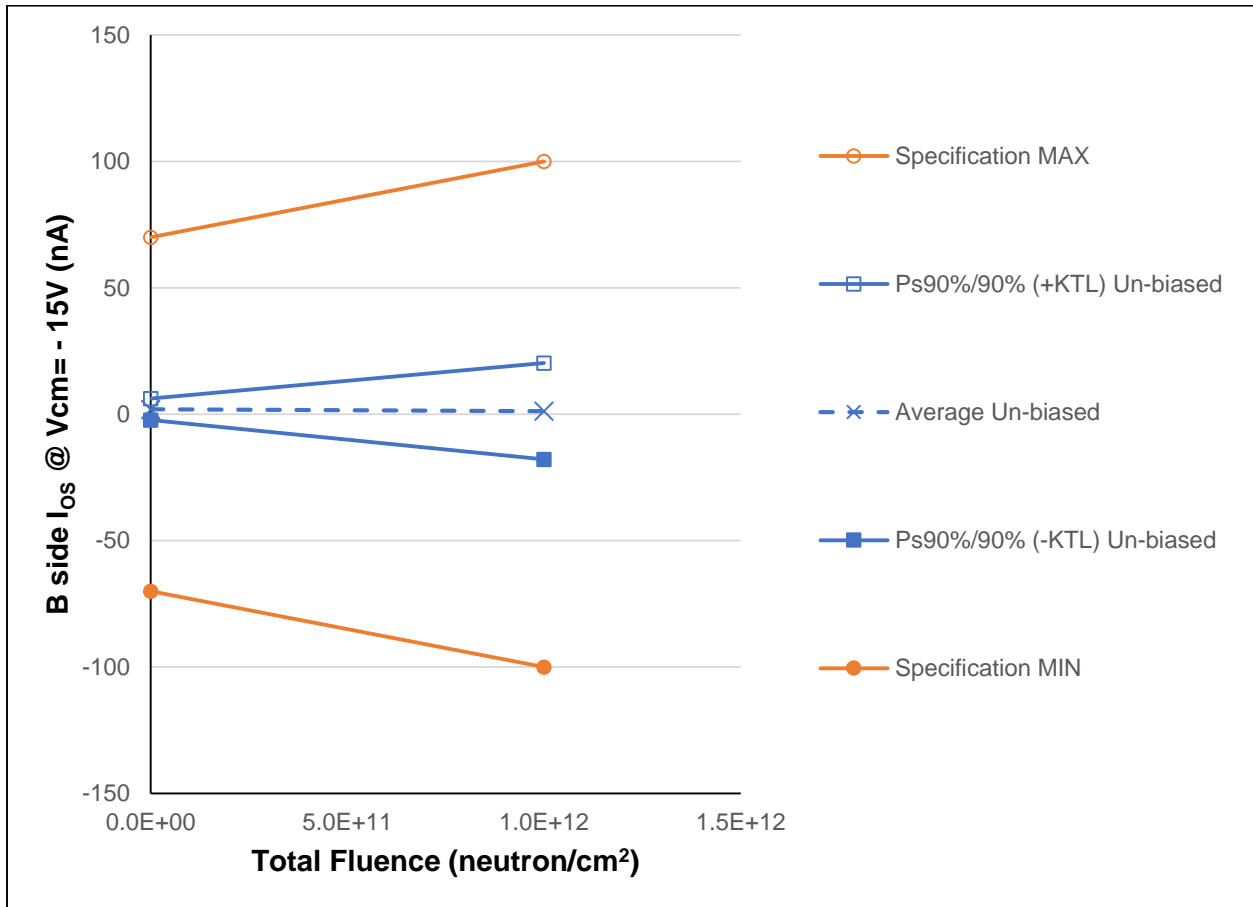


Figure 5.14: Plot of B-side Input Offset Current @ Vcm = - 15V versus Total Fluence

Table 5.14: Raw data table for B-side I_{OS} @ $V_{cm} = -15V$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B I_{OS} @ $V_s = \pm 15V, V_{cm} = -15V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	2.365	-1.574
17	Un-biased Irradiation	2.106	11.900
18	Un-biased Irradiation	1.892	0.823
19	Un-biased Irradiation	3.846	2.279
20	Un-biased Irradiation	-0.454	-7.139
13	Control Unit	1.038	0.956
14	Control Unit	-1.309	-1.173
Un-biased Irradiation Statistics			
	Average Un-biased	1.951	1.258
	Std Dev Un-biased	1.547	6.946
	Ps90%/90% (+KTL) Un-biased	6.193	20.305
	Ps90%/90% (-KTL) Un-biased	-2.291	-17.789
	Specification MIN	-70	-100
	Status (Measurements)	PASS	PASS
	Specification MAX	70	100
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

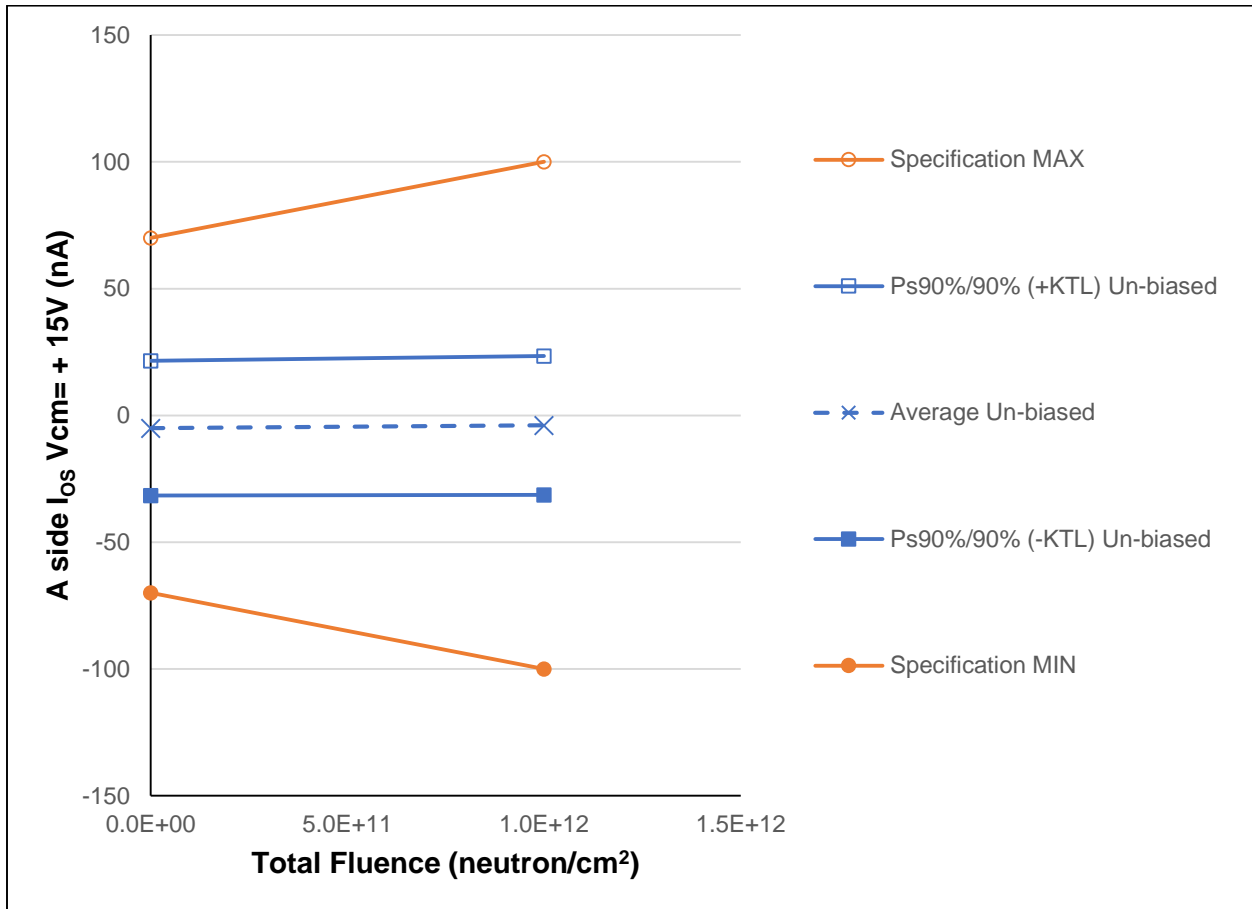


Figure 5.15: Plot of A-side Input Offset Current @ Vcm = + 15 V versus Total Fluence

Table 5.15: Raw data table for A-side I_{OS} @ $V_{cm} = +15V$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	A I_{OS} @ $V_s = \pm 15V, V_{cm} = 15V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-2.988	-4.900
17	Un-biased Irradiation	-1.431	5.156
18	Un-biased Irradiation	0.035	6.708
19	Un-biased Irradiation	1.377	-9.814
20	Un-biased Irradiation	-22.110	-16.828
13	Control Unit	-3.877	-4.167
14	Control Unit	-5.518	-6.243
Un-biased Irradiation Statistics			
	Average Un-biased	-5.024	-3.935
	Std Dev Un-biased	9.690	9.970
	Ps90%/90% (+KTL) Un-biased	21.546	23.404
	Ps90%/90% (-KTL) Un-biased	-31.593	-31.275
	Specification MIN	-70	-100
	Status (Measurements)	PASS	PASS
	Specification MAX	70	100
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

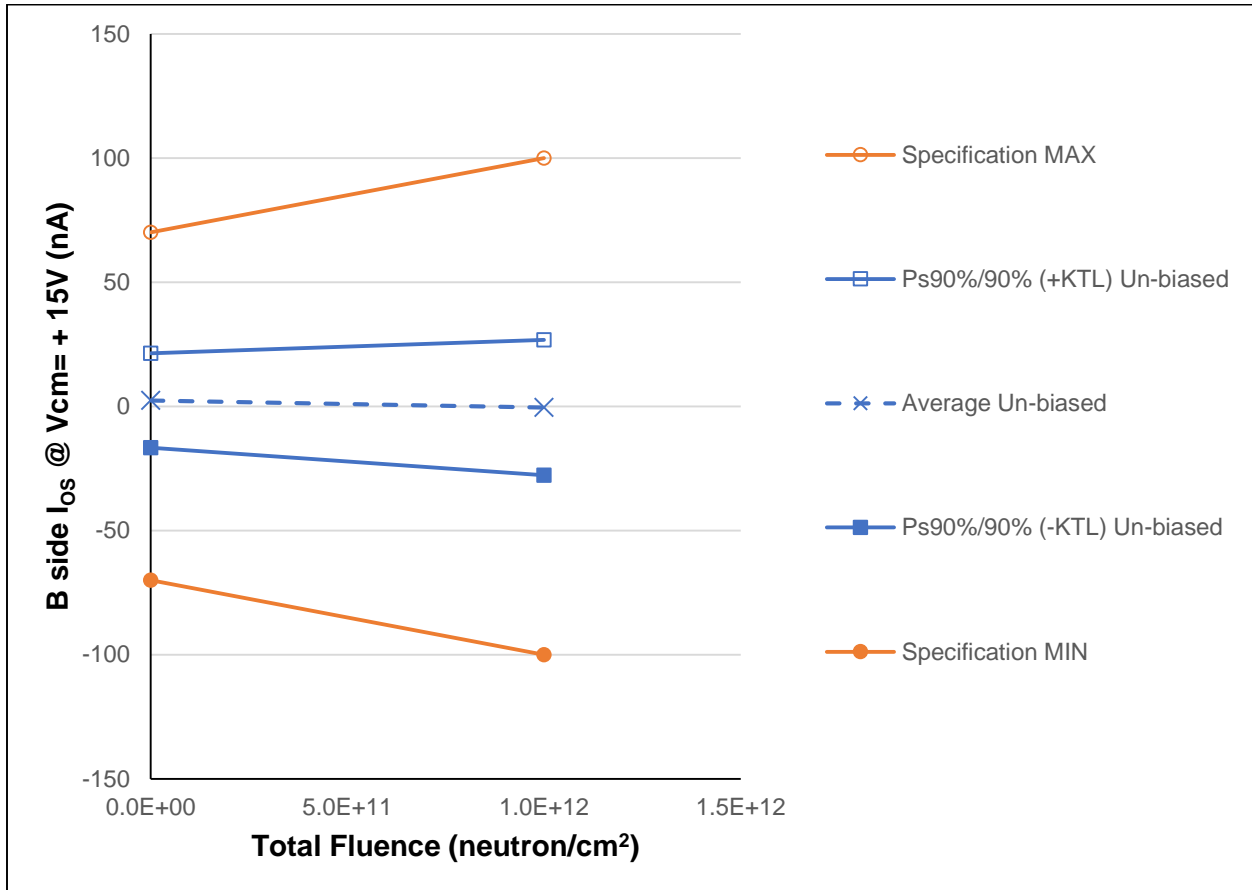


Figure 5.16: Plot of B-side Input Offset Current @ Vcm = + 15 V versus Total Fluence

Table 5.16: Raw data table for B-side I_{OS} @ $V_{cm} = +15V$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B I_{OS} @ $V_s = \pm 15V, V_{cm} = 15V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-3.476	-5.934
17	Un-biased Irradiation	-1.824	-8.588
18	Un-biased Irradiation	1.011	1.826
19	Un-biased Irradiation	2.045	-5.728
20	Un-biased Irradiation	14.140	15.898
13	Control Unit	-0.725	-1.757
14	Control Unit	-4.540	-4.930
Un-biased Irradiation Statistics			
	Average Un-biased	2.379	-0.505
	Std Dev Un-biased	6.933	9.957
	Ps90%/90% (+KTL) Un-biased	21.388	26.797
	Ps90%/90% (-KTL) Un-biased	-16.630	-27.808
	Specification MIN	-70	-100
	Status (Measurements)	PASS	PASS
	Specification MAX	70	100
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

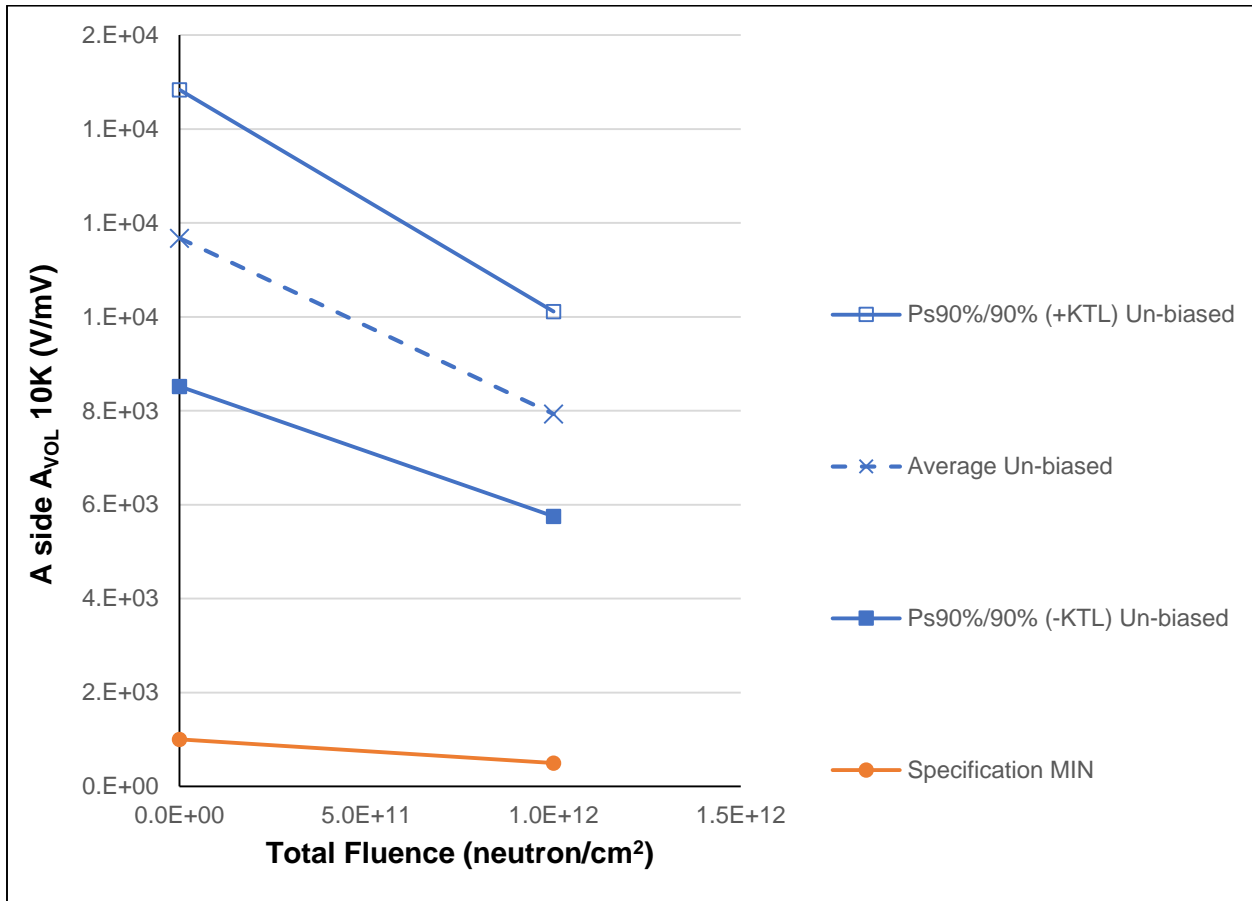


Figure 5.17: Plot of A-side Large Signal Voltage Gain @ $R_L = 10K\Omega$ versus Total Fluence

Table 5.17: Raw data table for A-side A_{VOL} @ $R_L = 10K\Omega$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	A GAIN (R1 = 10K)	Total Fluence (neutron/cm ²)	
Units	(V/mV)	0	1.E+12
16	Un-biased Irradiation	10966.860	9305.933
17	Un-biased Irradiation	11411.680	7927.812
18	Un-biased Irradiation	13174.780	7594.960
19	Un-biased Irradiation	10327.640	7409.709
20	Un-biased Irradiation	12498.440	7424.182
13	Control Unit	10121.050	10150.450
14	Control Unit	13216.580	17928.610
Un-biased Irradiation Statistics			
	Average Un-biased	11675.880	7932.519
	Std Dev Un-biased	1152.559	795.608
	Ps90%/90% (+KTL) Un-biased	14836.197	10114.077
	Ps90%/90% (-KTL) Un-biased	8515.563	5750.961
	Specification MIN	1000	500
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

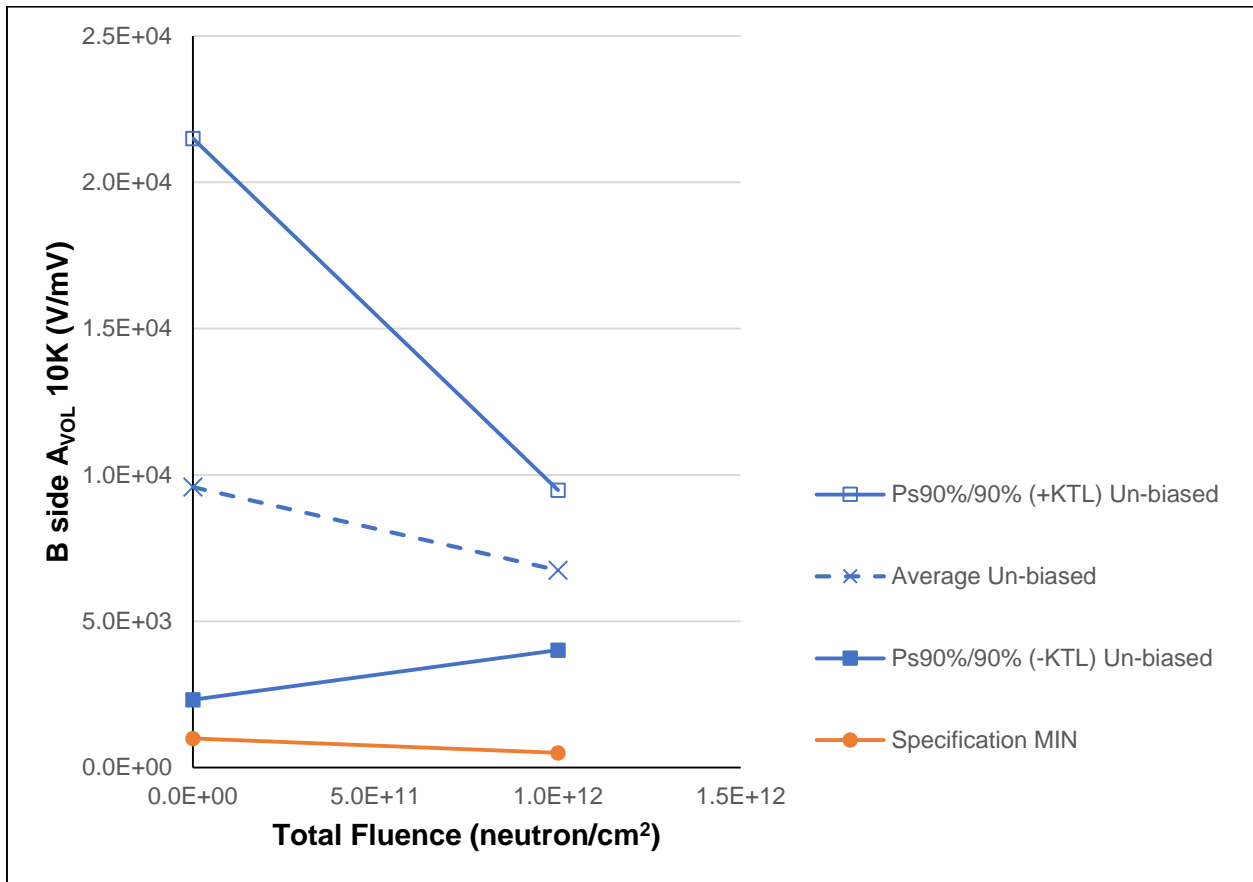


Figure 5.18: Plot of B-side Large Signal Voltage Gain @ $R_L = 10K\Omega$ versus Total Fluence

Table 5.18: Raw data table for B-side A_{VOL} @ $R_L = 10K\Omega$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B 10K GAIN (R1 = 10K)	Total Fluence (neutron/cm ²)	
Units	(V/mV)	0	1.E+12
16	Un-biased Irradiation	17232.640	6231.675
17	Un-biased Irradiation	7755.147	6739.817
18	Un-biased Irradiation	6463.018	5395.961
19	Un-biased Irradiation	7860.593	7453.480
20	Un-biased Irradiation	8637.363	7918.728
13	Control Unit	8974.257	7919.553
14	Control Unit	7183.755	7772.852
Un-biased Irradiation Statistics			
	Average Un-biased	9589.752	6747.932
	Std Dev Un-biased	4343.185	995.361
	Ps90%/90% (+KTL) Un-biased	21498.765	9477.212
	Ps90%/90% (-KTL) Un-biased	2319.260	4018.652
	Specification MIN	1000	500
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

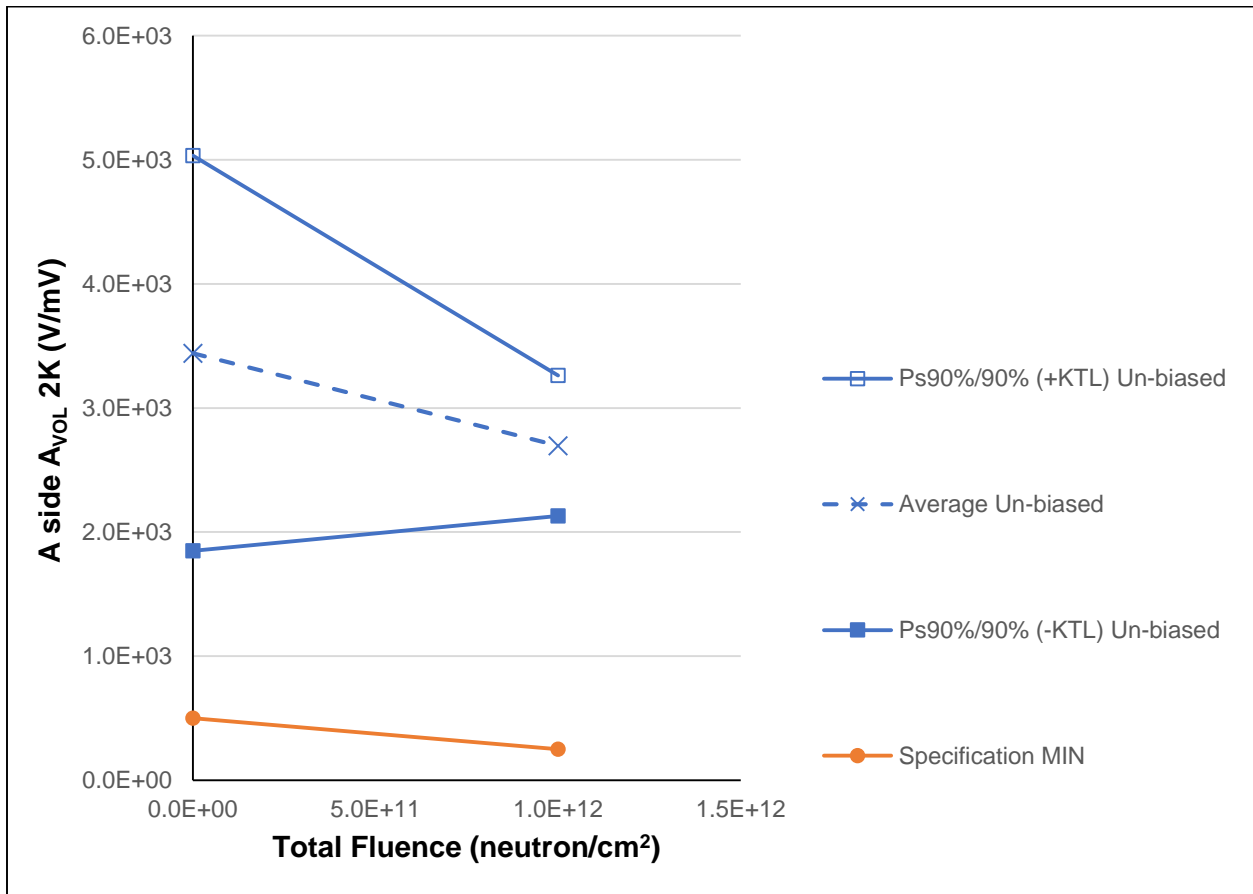


Figure 5.19: Plot of A-side Large Signal Voltage Gain @ $R_L = 2K\Omega$ versus Total Fluence

Table 5.19: Raw data table for A-side A_{VOL} @ $R_L = 2K\Omega$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	A GAIN (R1 = 2K)	Total Fluence (neutron/cm ²)	
Units	(V/mV)	0	1.E+12
16	Un-biased Irradiation	3504.024	2814.353
17	Un-biased Irradiation	3375.263	2852.686
18	Un-biased Irradiation	2647.485	2622.883
19	Un-biased Irradiation	3394.274	2826.503
20	Un-biased Irradiation	4282.786	2363.934
13	Control Unit	4082.445	3852.085
14	Control Unit	4085.626	4504.289
Un-biased Irradiation Statistics			
	Average Un-biased	3440.766	2696.072
	Std Dev Un-biased	580.678	206.883
	Ps90%/90% (+KTL) Un-biased	5032.985	3263.346
	Ps90%/90% (-KTL) Un-biased	1848.548	2128.798
	Specification MIN	500	250
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

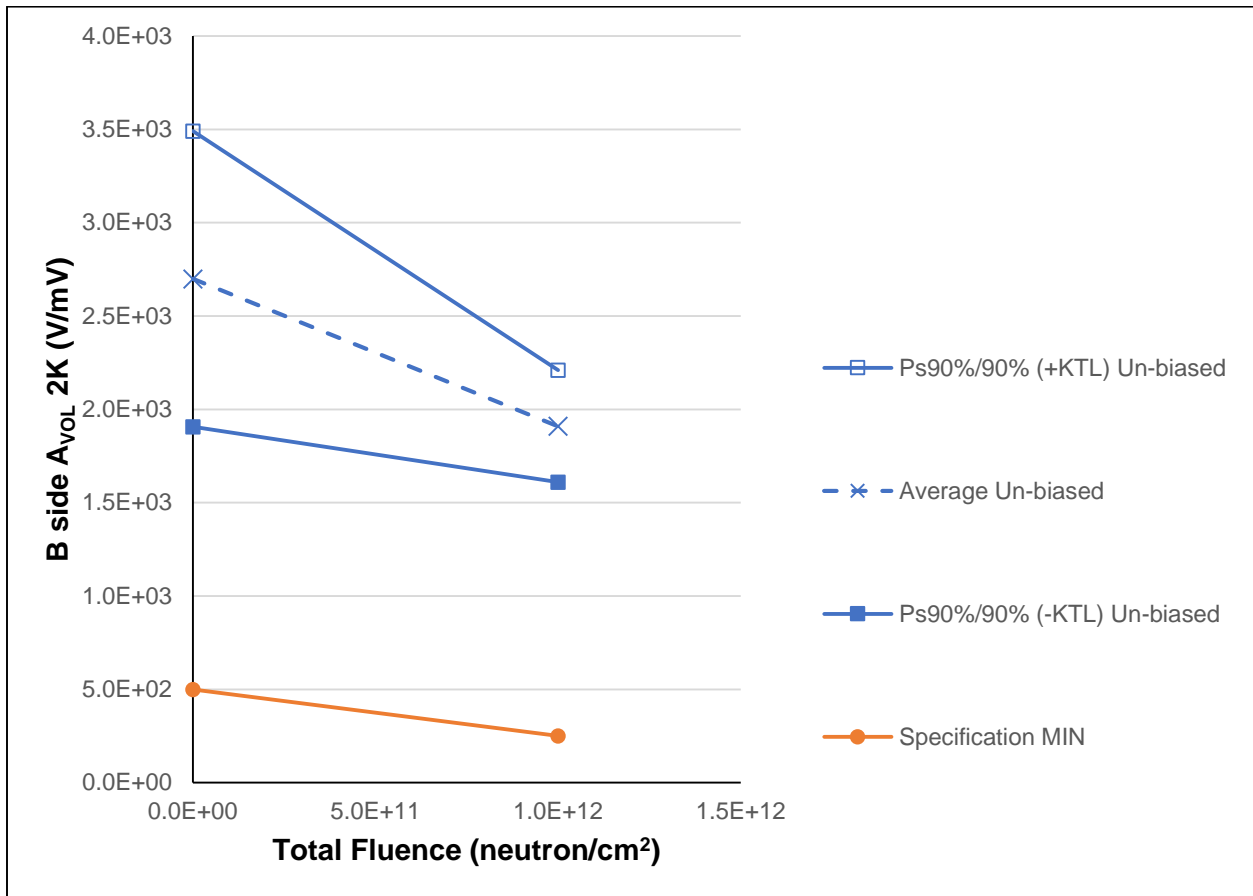


Figure 5.20: Plot of B-side Large Signal Voltage Gain @ $R_L = 2K\Omega$ versus Total Fluence

Table 5.20: Raw data table for B-side A_{VOL} @ $R_L = 2K\Omega$ of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B GAIN (R1 = 2K)	Total Fluence (neutron/cm ²)	
Units	(V/mV)	0	1.E+12
16	Un-biased Irradiation	3061.759	1750.559
17	Un-biased Irradiation	2522.526	2011.097
18	Un-biased Irradiation	2336.904	1848.790
19	Un-biased Irradiation	2897.819	1997.288
20	Un-biased Irradiation	2675.929	1940.406
13	Control Unit	2559.500	2365.944
14	Control Unit	2303.133	2519.433
Un-biased Irradiation Statistics			
	Average Un-biased	2698.987	1909.628
	Std Dev Un-biased	288.926	109.467
	Ps90%/90% (+KTL) Un-biased	3491.221	2209.785
	Ps90%/90% (-KTL) Un-biased	1906.753	1609.471
	Specification MIN	500	250
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

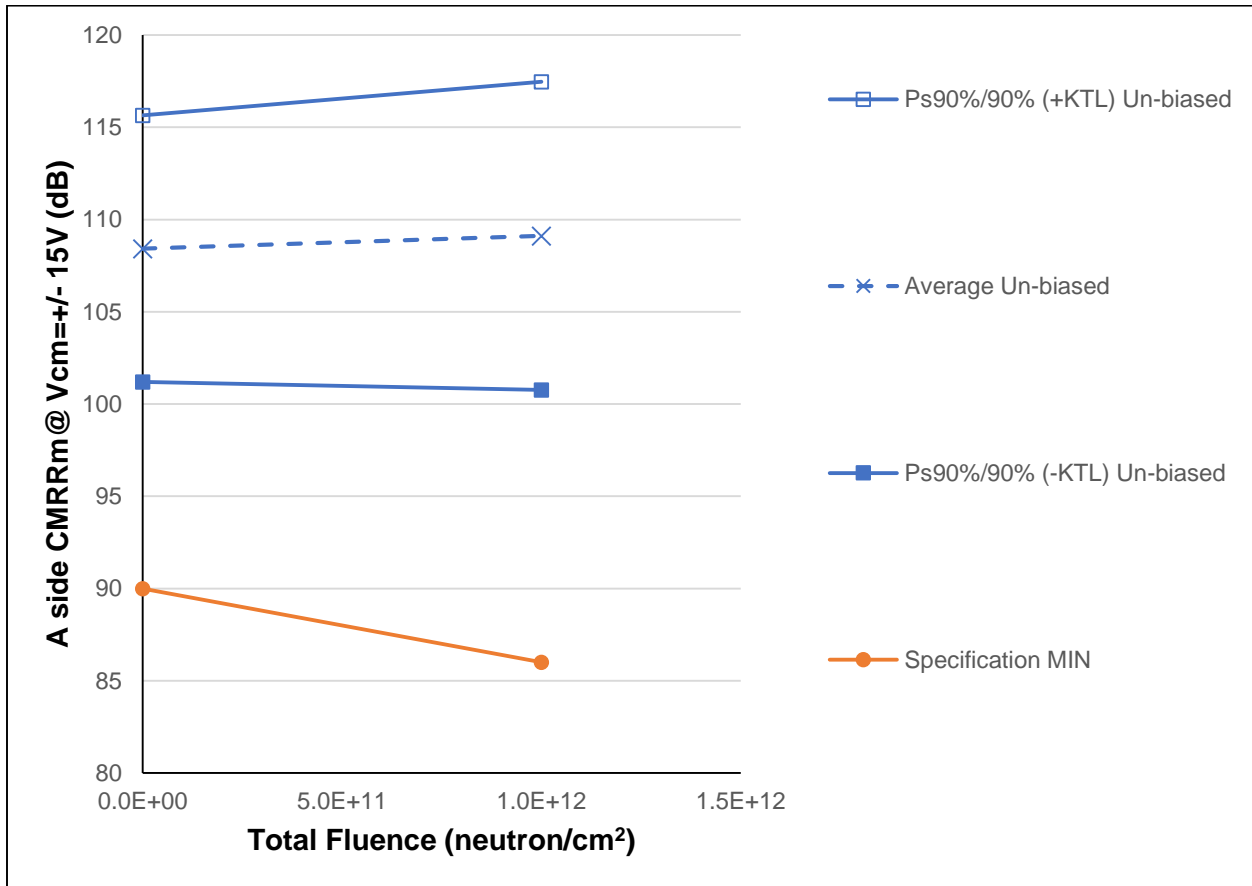


Figure 5.21: Plot of A-side Common Mode Rejection Ratio (CMRR) @ Vcm = +/-15V versus Total Fluence

Table 5.21: Raw data table for A-side CMRR @ Vcm = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A CMRR, Vcm=+-15V	Total Fluence (neutron/cm ²)	
Units	(dB)	0	1.E+12
16	Un-biased Irradiation	107.692	107.894
17	Un-biased Irradiation	111.713	113.143
18	Un-biased Irradiation	104.662	104.842
19	Un-biased Irradiation	109.903	109.657
20	Un-biased Irradiation	108.125	110.036
13	Control Unit	109.108	108.994
14	Control Unit	104.442	104.359
Un-biased Irradiation Statistics			
	Average Un-biased	108.419	109.114
	Std Dev Un-biased	2.635	3.046
	Ps90%/90% (+KTL) Un-biased	115.646	117.467
	Ps90%/90% (-KTL) Un-biased	101.193	100.761
	Specification MIN	90	86
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

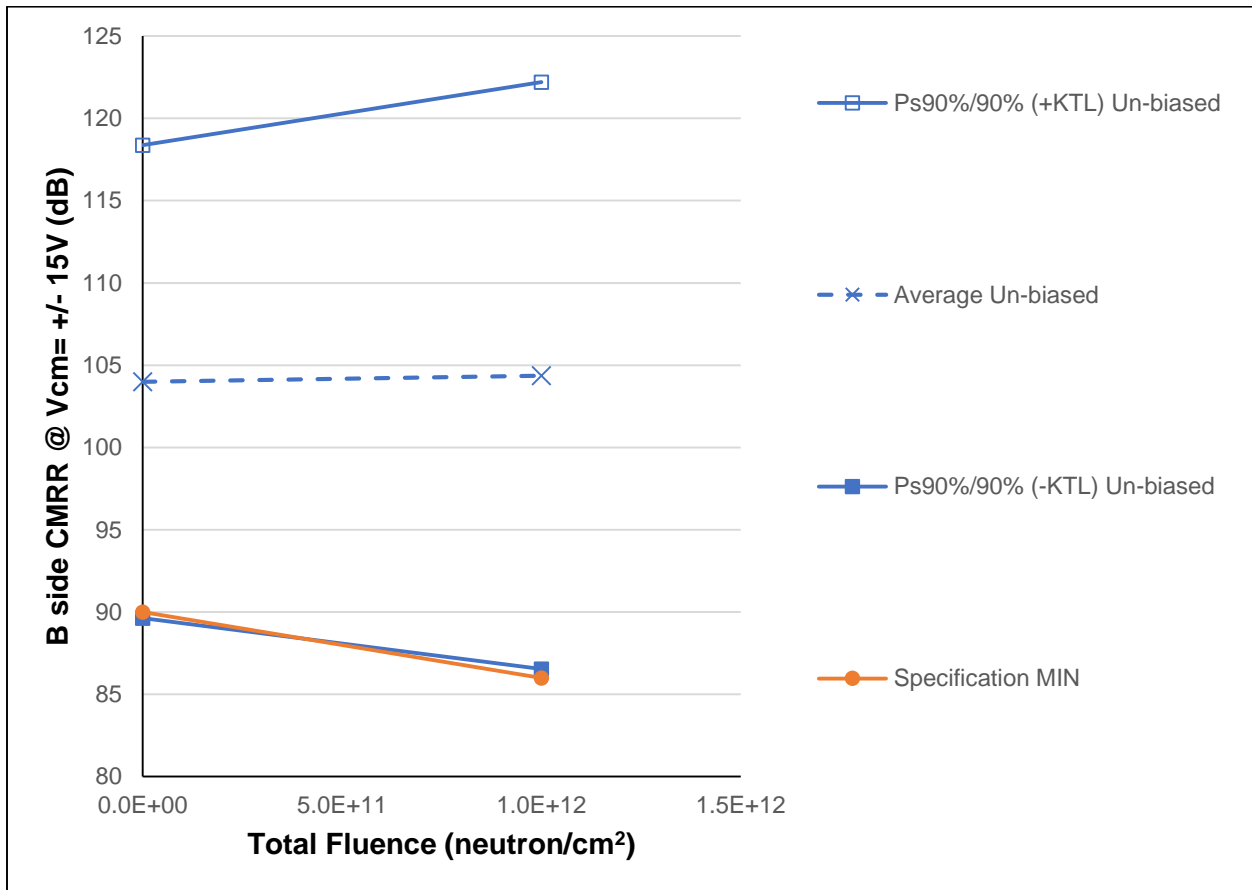


Figure 5.22: Plot of B-side Common Mode Rejection Ratio (CMRR) @ $V_{cm} = \pm 15V$ versus Total Fluence

Note: the pre-irradiation – KTL point is slightly lower than the minimum specification datasheet due to the small 5-piece sample size.

Table 5.22: Raw data table for B-side CMRR @ Vcm = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B CMRR, Vcm = +/-15V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(dB)		
16	Un-biased Irradiation	99.282	98.887
17	Un-biased Irradiation	99.293	98.851
18	Un-biased Irradiation	105.086	104.853
19	Un-biased Irradiation	104.335	104.475
20	Un-biased Irradiation	112.002	114.782
13	Control Unit	112.437	112.477
14	Control Unit	117.258	117.330
Un-biased Irradiation Statistics			
	Average Un-biased	104.000	104.370
	Std Dev Un-biased	5.238	6.504
	Ps90%/90% (+KTL) Un-biased	118.362	122.203
	Ps90%/90% (-KTL) Un-biased	89.637	86.537
	Specification MIN	90	86
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	FAIL	PASS
	Status (+KTL) Un-biased		

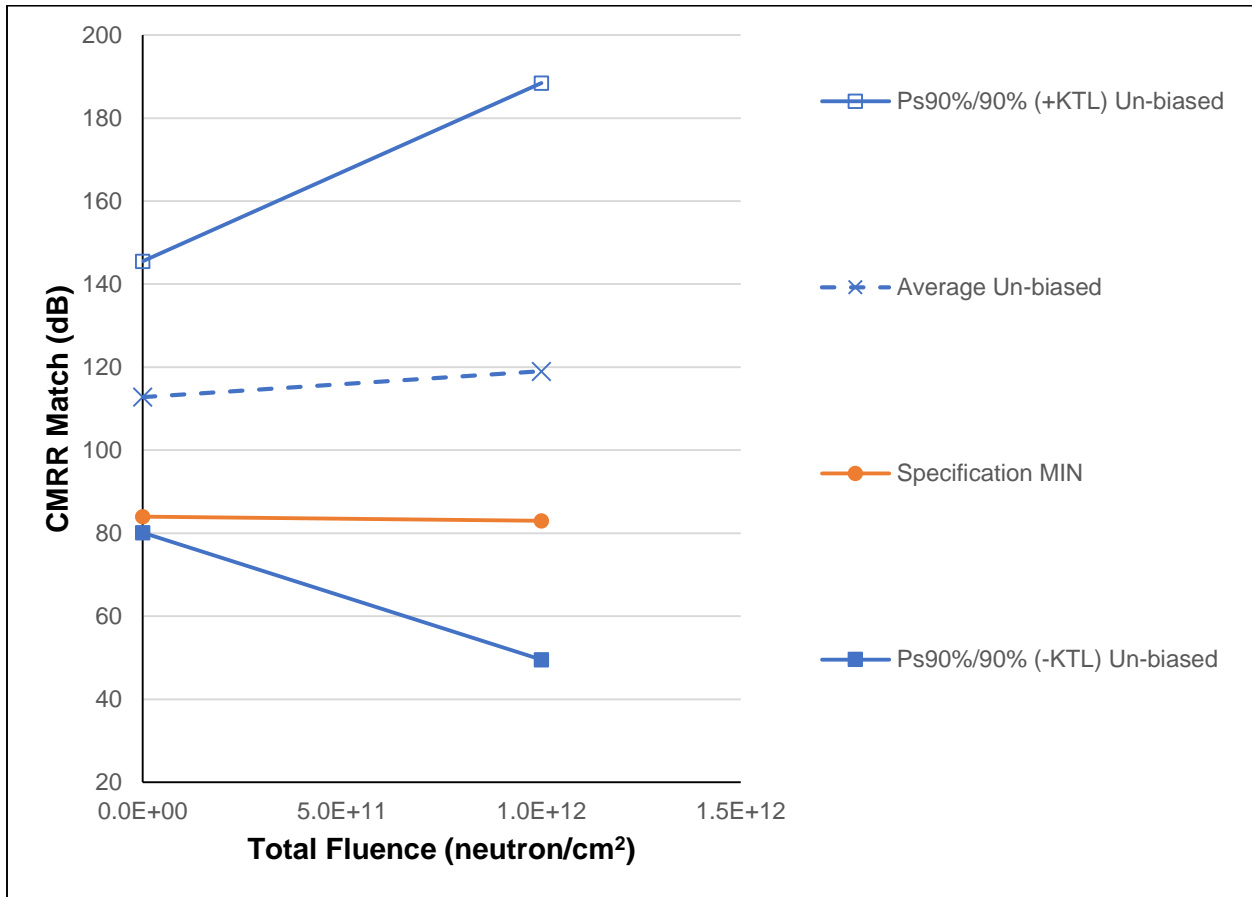


Figure 5.23: Plot of CMRR Match @ $V_{cm} = \pm 15V$ versus Total Fluence

Note: The - KTL line is lower than the minimum specification datasheet limits due to the small 5-piece sample size.

Table 5.23: Raw data table for CMRR Match @ Vcm = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	CMRR MATCH	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(dB)		
16	Un-biased Irradiation	103.431	102.690
17	Un-biased Irradiation	101.669	100.712
18	Un-biased Irradiation	131.103	162.672
19	Un-biased Irradiation	110.834	111.425
20	Un-biased Irradiation	116.997	117.551
13	Control Unit	119.050	118.613
14	Control Unit	106.697	106.568
Un-biased Irradiation Statistics			
	Average Un-biased	112.807	119.010
	Std Dev Un-biased	11.918	25.334
	Ps90%/90% (+KTL) Un-biased	145.486	188.475
	Ps90%/90% (-KTL) Un-biased	80.128	49.545
	Specification MIN	84	83
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	FAIL	FAIL
	Status (+KTL) Un-biased		

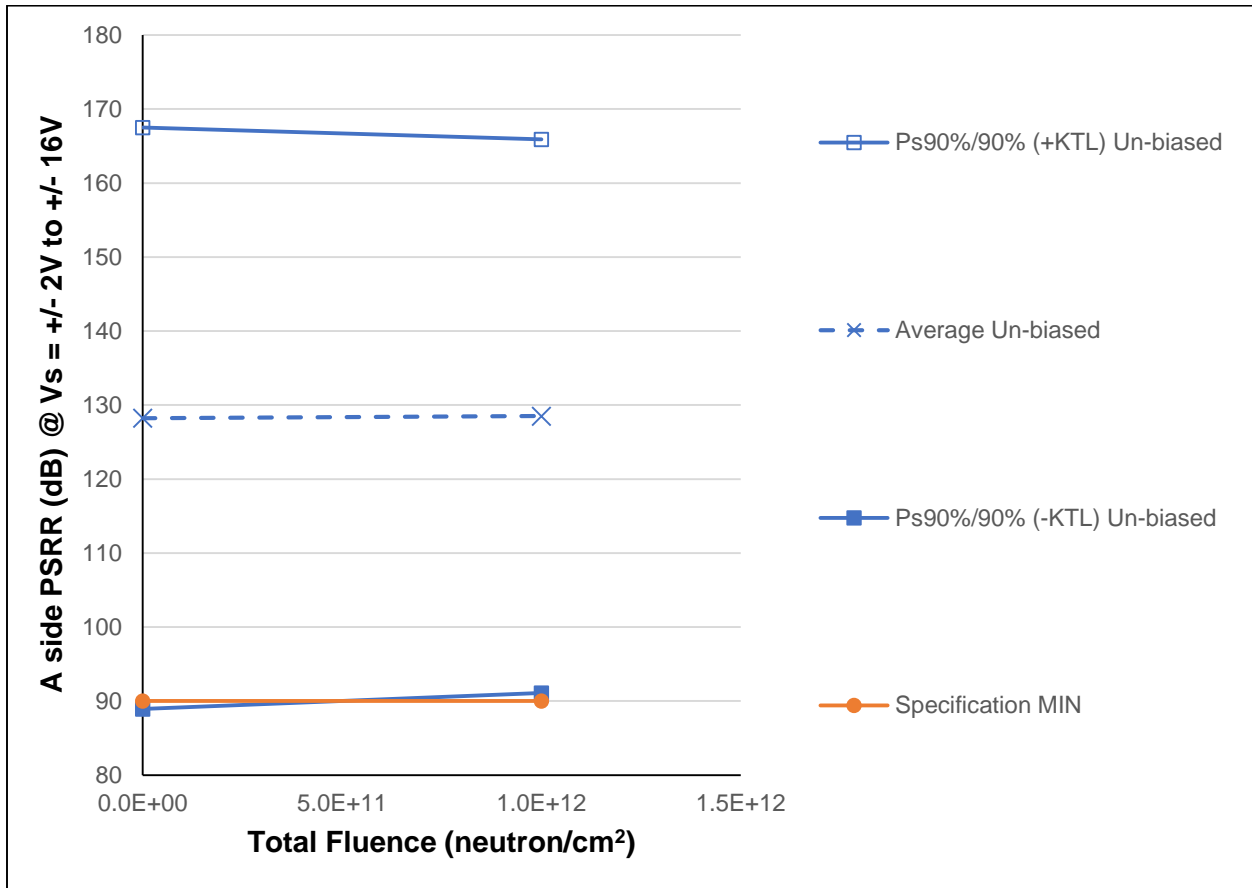


Figure 5.24: Plot of Power Supply Rejection Ratio (PSRR) @ Vs = +/- 2V to +/- 16V versus Total Fluence (side A)

Note: The pre-irradiation – KTL point is slightly lower than the minimum specification limit due to the small 5-piece sample size.

Table 5.24: Raw data table for A-side PSRR @ Vs = +- 2V to +- 16V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A PSRR, +-2 TO +-16V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(dB)		
16	Un-biased Irradiation	133.534	134.244
17	Un-biased Irradiation	128.724	130.986
18	Un-biased Irradiation	112.500	112.850
19	Un-biased Irradiation	117.448	117.529
20	Un-biased Irradiation	148.943	146.916
13	Control Unit	119.146	119.220
14	Control Unit	105.735	105.691
Un-biased Irradiation Statistics			
	Average Un-biased	128.230	128.505
	Std Dev Un-biased	14.328	13.635
	Ps90%/90% (+KTL) Un-biased	167.516	165.891
	Ps90%/90% (-KTL) Un-biased	88.944	91.119
	Specification MIN	90	90
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	FAIL	PASS
	Status (+KTL) Un-biased		

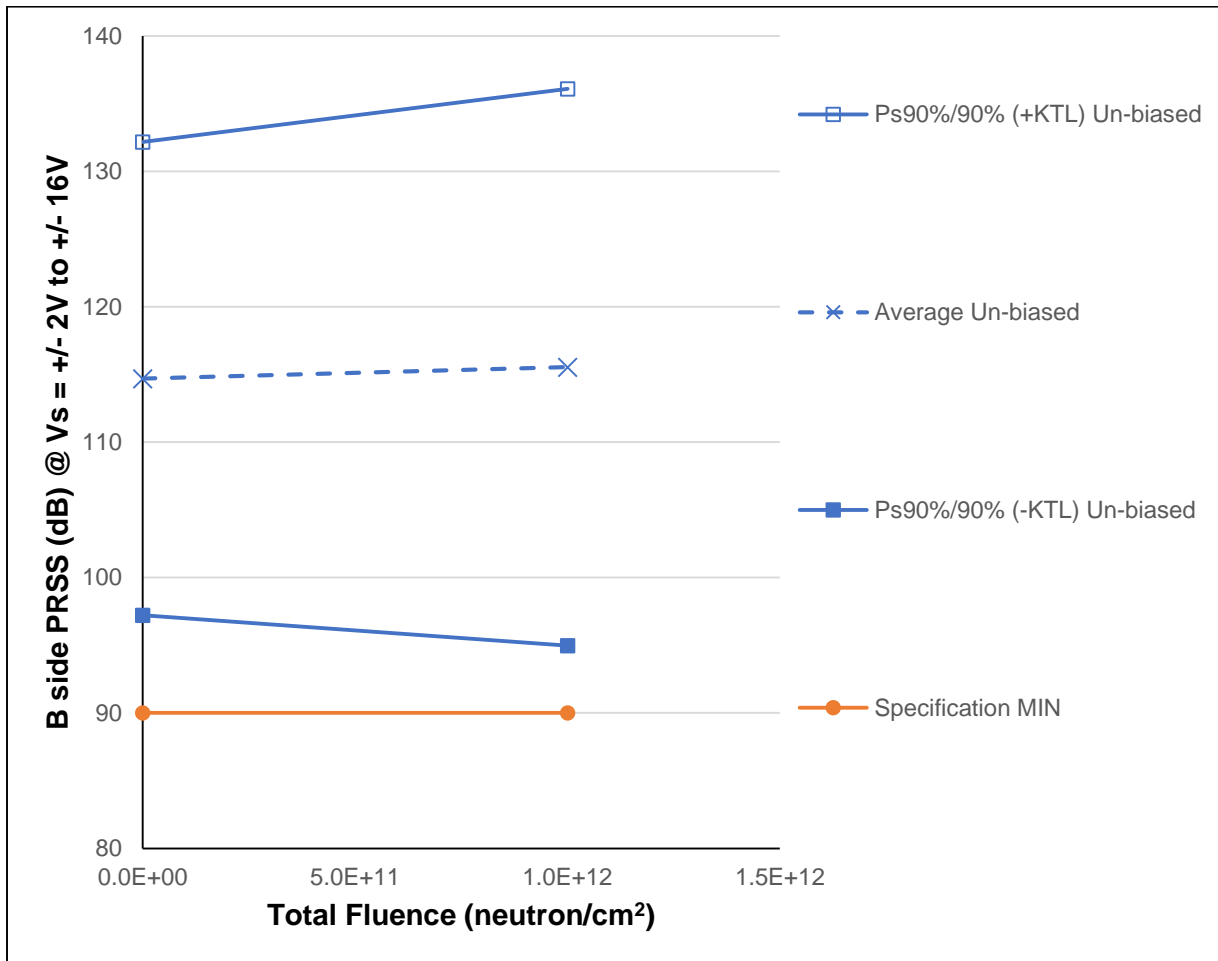


Figure 5.25: Plot of Power Supply Rejection Ratio (PSRR) @ Vs = +/- 2V to +/- 16V versus Total Fluence (side B)

Table 5.25: Raw data table for B-side PSRR @ Vs = +- 2V to +- 16V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B PSRR, +-2 TO +-16V	Total Fluence (neutron/cm ²)	
Units	(dB)	0	1.E+12
16	Un-biased Irradiation	108.959	109.353
17	Un-biased Irradiation	111.047	111.896
18	Un-biased Irradiation	120.539	119.535
19	Un-biased Irradiation	110.308	110.097
20	Un-biased Irradiation	122.626	126.850
13	Control Unit	148.943	148.943
14	Control Unit	105.421	105.427
Un-biased Irradiation Statistics			
	Average Un-biased	114.696	115.546
	Std Dev Un-biased	6.374	7.501
	Ps90%/90% (+KTL) Un-biased	132.173	136.113
	Ps90%/90% (-KTL) Un-biased	97.219	94.979
	Specification MIN	90	90
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

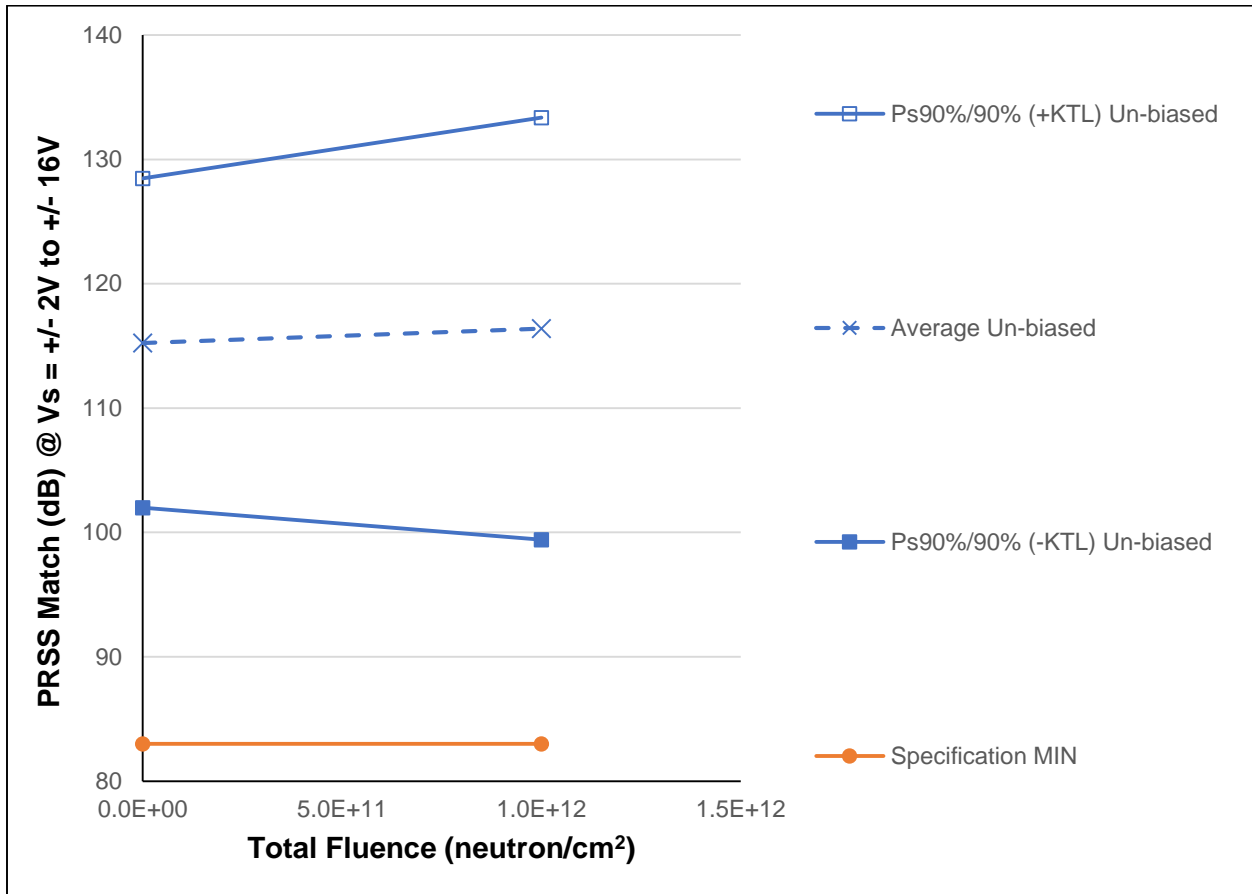


Figure 5.26: Plot of PSRR Match @ Vs = +/- 2V to +/- 16V versus Total Fluence

Table 5.26: Raw data table for PSRR Match @ Vs = +- 2V to +- 16V of pre- and post-irradiation (1E12 N/cm²)

Parameter	PSRR MATCH @ Vs = +- 2V to +-16V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(dB)		
16	Un-biased Irradiation	109.488	109.863
17	Un-biased Irradiation	112.263	112.918
18	Un-biased Irradiation	116.884	118.254
19	Un-biased Irradiation	115.338	114.905
20	Un-biased Irradiation	122.216	126.028
13	Control Unit	118.869	118.941
14	Control Unit	134.432	135.913
Un-biased Irradiation Statistics			
	Average Un-biased	115.238	116.394
	Std Dev Un-biased	4.830	6.189
	Ps90%/90% (+KTL) Un-biased	128.482	133.365
	Ps90%/90% (-KTL) Un-biased	101.993	99.422
	Specification MIN	83	83
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

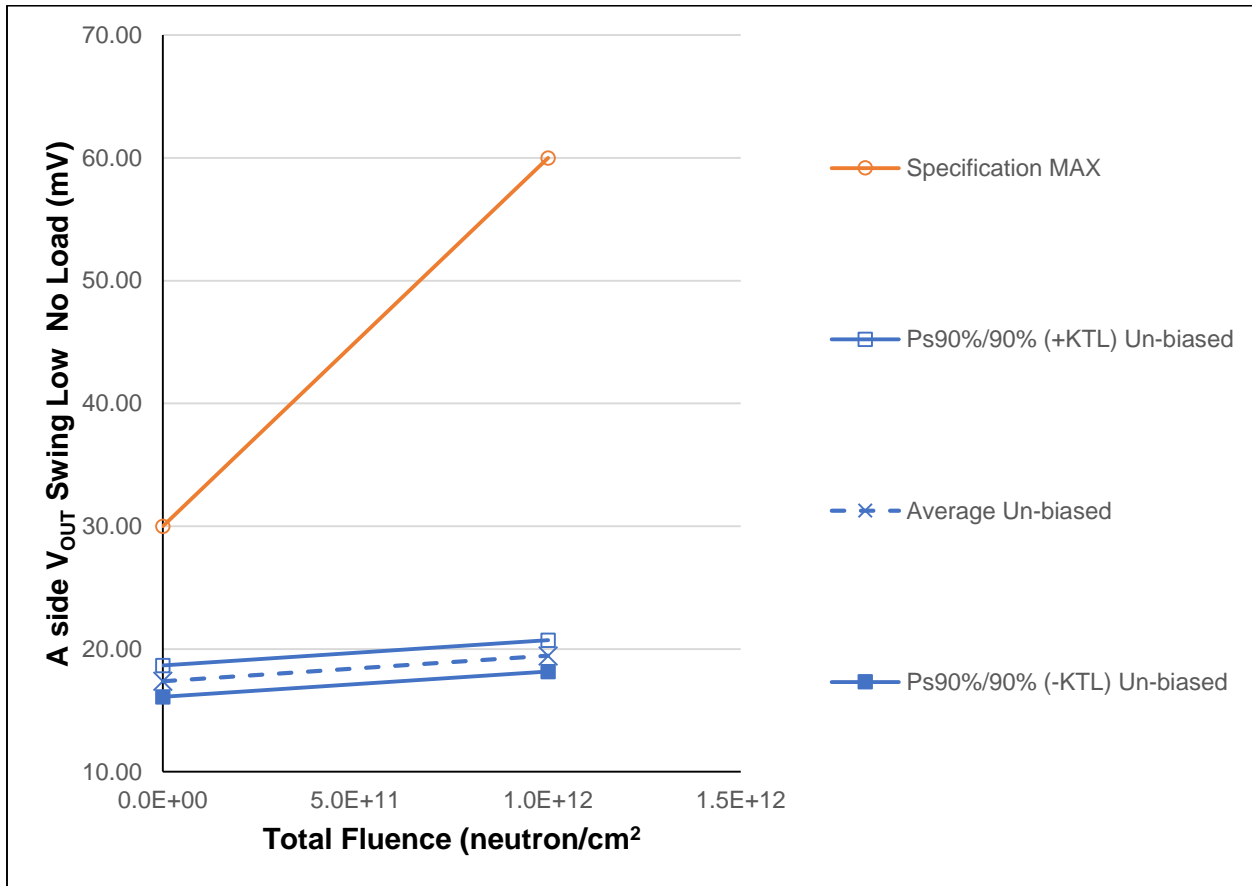


Figure 5.27: Plot of Output Voltage Swing Low @ No Load versus Total Fluence (Side A)

Table 5.27: Raw data table for output voltage swing low (side A) @ no load of pre- and post-irradiation (1E12 N/cm²)

Parameter	A NO LOAD SW- @ Vs=+-15V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	17.692	20.006
17	Un-biased Irradiation	18.009	19.865
18	Un-biased Irradiation	17.146	19.081
19	Un-biased Irradiation	16.852	19.005
20	Un-biased Irradiation	17.200	19.260
13	Control Unit	17.754	17.875
14	Control Unit	17.811	17.937
Un-biased Irradiation Statistics			
	Average Un-biased	17.380	19.443
	Std Dev Un-biased	0.463	0.461
	Ps90%/90% (+KTL) Un-biased	18.651	20.708
	Ps90%/90% (-KTL) Un-biased	16.109	18.178
	Specification MIN		
	Status (Measurements)		
	Specification MAX	30	60
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

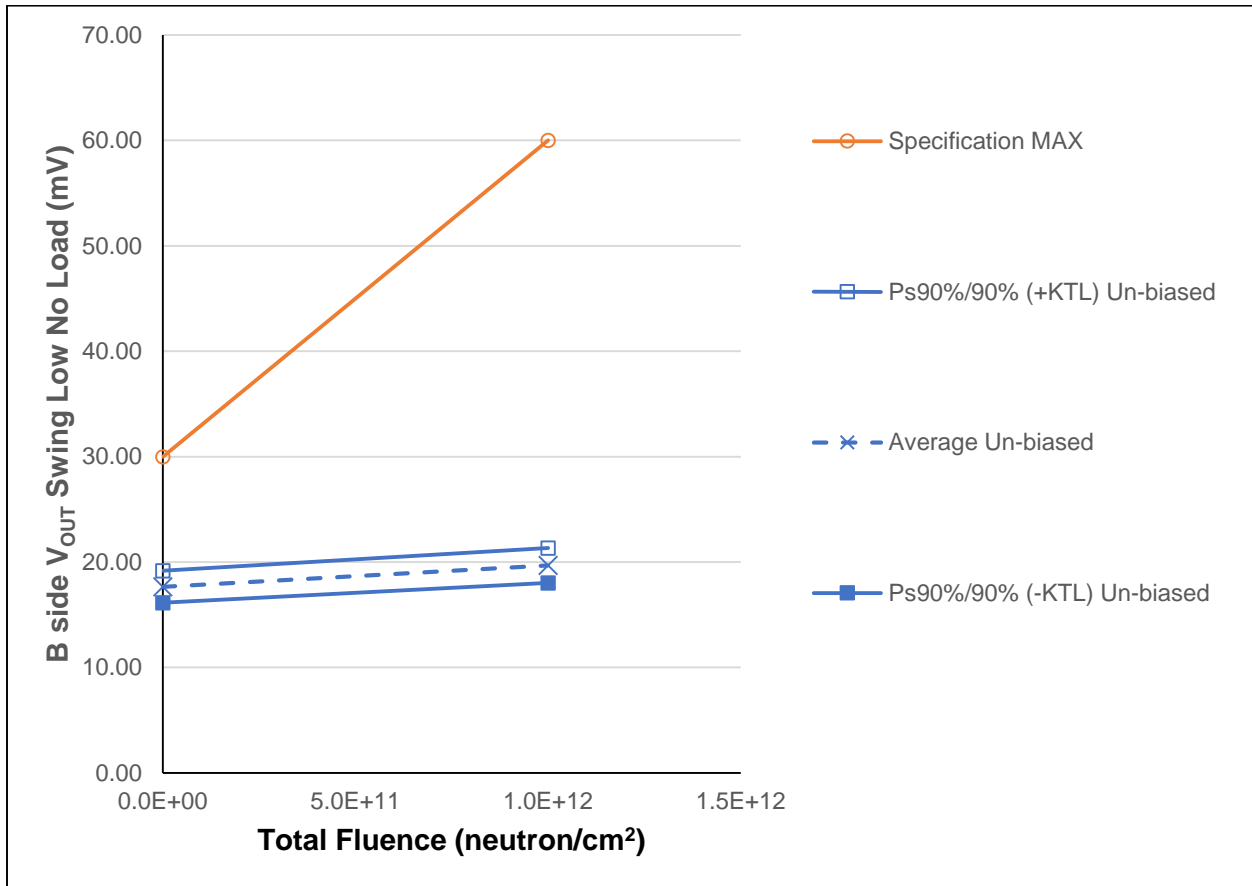


Figure 5.28: Plot of Output Voltage Swing Low @ No Load versus Total Fluence (Side B)

Table 5.28: Raw data table for output voltage swing low (side B) @ no load of pre- and post-irradiation (1E12 N/cm²)

Parameter	B NO LOAD SW- @ Vs=+-15V	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	18.277	20.518
17	Un-biased Irradiation	17.971	19.908
18	Un-biased Irradiation	17.179	19.081
19	Un-biased Irradiation	16.969	19.117
20	Un-biased Irradiation	17.866	19.822
13	Control Unit	18.038	18.125
14	Control Unit	17.966	18.116
Un-biased Irradiation Statistics			
	Average Un-biased	17.652	19.689
	Std Dev Un-biased	0.554	0.602
	Ps90%/90% (+KTL) Un-biased	19.172	21.341
	Ps90%/90% (-KTL) Un-biased	16.133	18.038
	Specification MIN		
	Status (Measurements)		
	Specification MAX	30	60
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

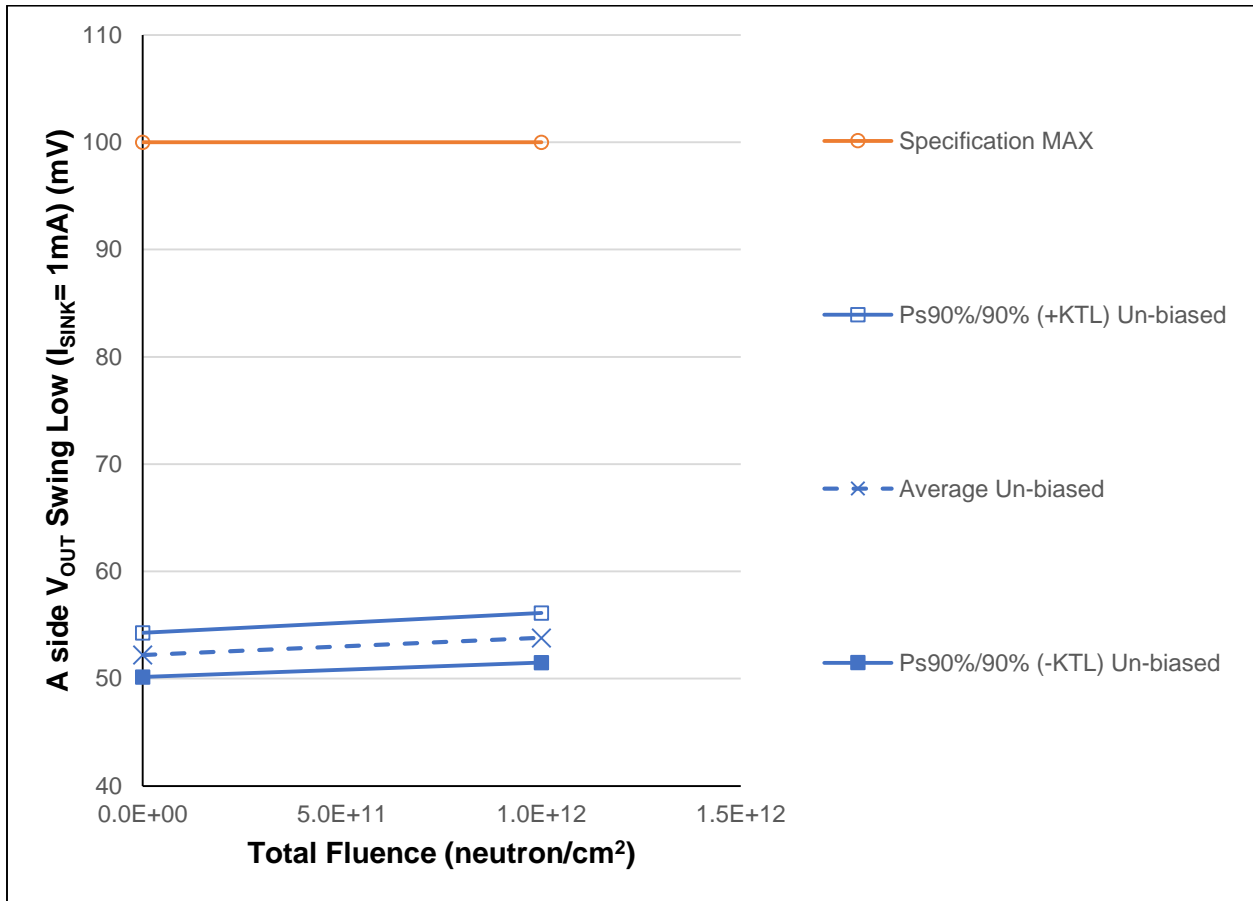


Figure 5.29: Plot of Output Voltage Swing Low @ $I_{SINK} = 1\text{ mA}$ versus Total Fluence (Side A)

Table 5.29: Raw data table for output voltage swing low (side A) @ $I_{SINK} = 1 \text{ mA}$ of pre- and post-irradiation ($1E12 \text{ N/cm}^2$)

Parameter	A 1mA V_{OL} @ $V_s = \pm 15V$	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	52.754	54.886
17	Un-biased Irradiation	53.109	54.411
18	Un-biased Irradiation	51.778	53.265
19	Un-biased Irradiation	51.217	52.817
20	Un-biased Irradiation	52.210	53.648
13	Control Unit	52.849	52.826
14	Control Unit	53.100	53.131
Un-biased Irradiation Statistics			
	Average Un-biased	52.214	53.805
	Std Dev Un-biased	0.754	0.841
	Ps90%/90% (+KTL) Un-biased	54.282	56.111
	Ps90%/90% (-KTL) Un-biased	50.145	51.500
	Specification MIN		
	Status (Measurements)		
	Specification MAX	100	100
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

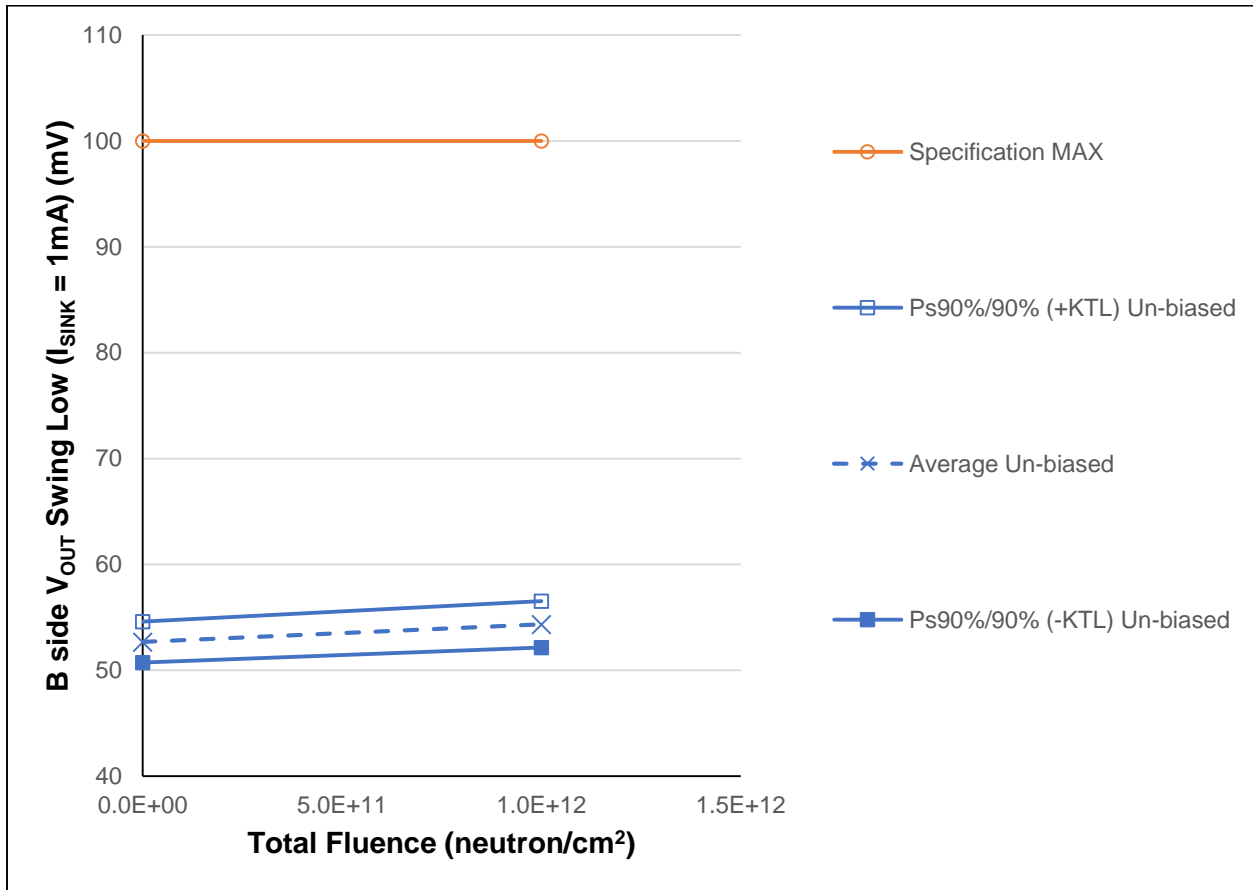


Figure 5.30: Plot of Output Voltage Swing Low @ $I_{SINK} = 1\text{ mA}$ versus Total Fluence (Side B)

Table 5.30: Raw data table for output voltage swing low (side B) @ $I_{SINK} = 1 \text{ mA}$ of pre- and post-irradiation ($1E12 \text{ N/cm}^2$)

Parameter	B 1mA V_{OL} @ $V_s = \pm 15V$	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	53.365	55.546
17	Un-biased Irradiation	53.148	54.504
18	Un-biased Irradiation	52.203	53.732
19	Un-biased Irradiation	51.685	53.503
20	Un-biased Irradiation	52.935	54.411
13	Control Unit	53.713	53.665
14	Control Unit	53.503	53.563
Un-biased Irradiation Statistics			
	Average Un-biased	52.667	54.339
	Std Dev Un-biased	0.702	0.799
	Ps90%/90% (+KTL) Un-biased	54.591	56.531
	Ps90%/90% (-KTL) Un-biased	50.743	52.147
	Specification MIN		
	Status (Measurements)		
	Specification MAX	100	100
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

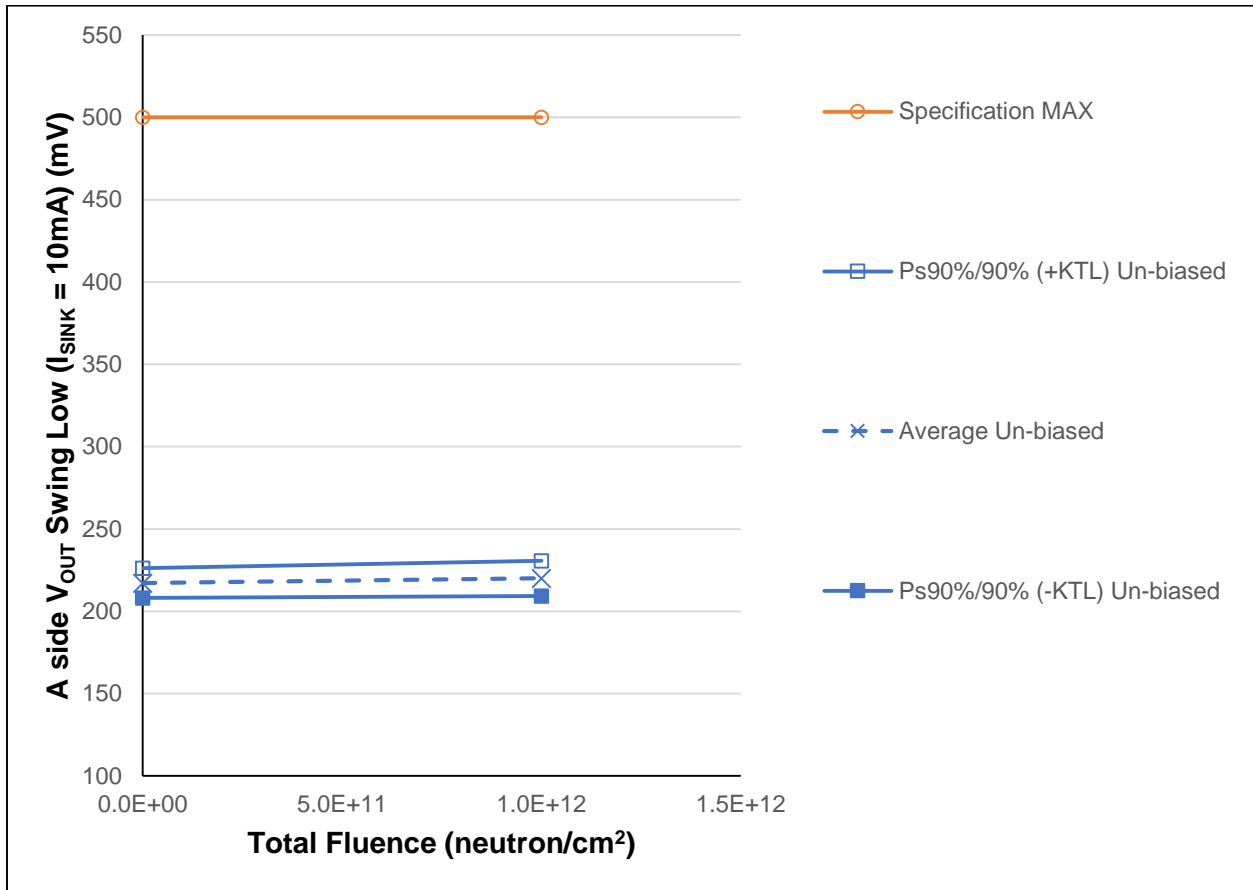


Figure 5.31: Plot of Output Voltage Swing Low @ $I_{SINK} = 10\text{ mA}$ versus Total Fluence (Side A)

Table 5.31: Raw data table for output voltage swing low (side A) @ $I_{SINK} = 10 \text{ mA}$ of pre- and post-irradiation ($1E12 \text{ N/cm}^2$)

Parameter	A 10mA V_{OL} @ $V_s = \pm 15V$	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	220.787	225.922
17	Un-biased Irradiation	219.484	221.246
18	Un-biased Irradiation	215.447	217.957
19	Un-biased Irradiation	212.460	215.583
20	Un-biased Irradiation	217.542	219.516
13	Control Unit	219.446	219.172
14	Control Unit	221.679	221.685
Un-biased Irradiation Statistics			
	Average Un-biased	217.144	220.045
	Std Dev Un-biased	3.306	3.890
	Ps90%/90% (+KTL) Un-biased	226.209	230.711
	Ps90%/90% (-KTL) Un-biased	208.079	209.378
	Specification MIN		
	Status (Measurements)		
	Specification MAX	500	500
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

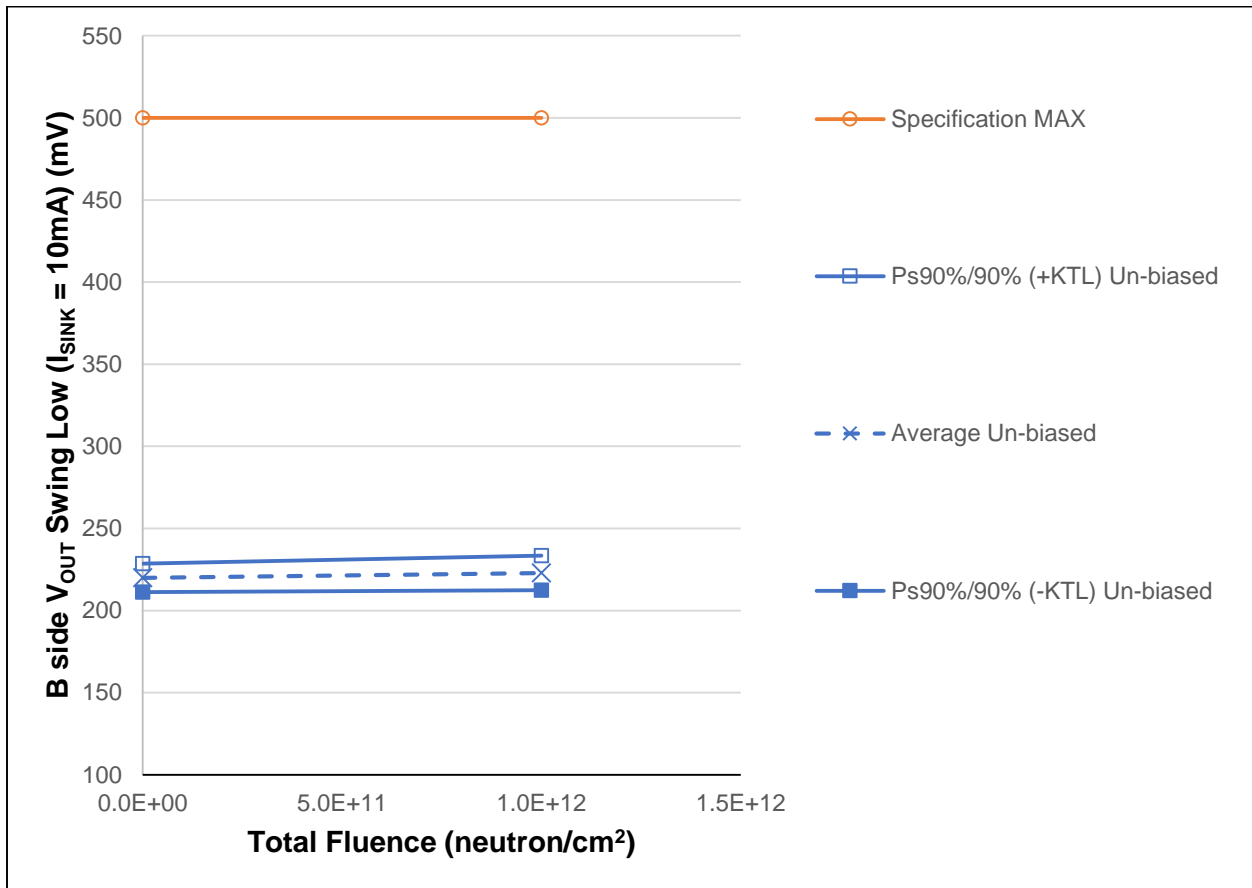


Figure 5.32: Plot of Output Voltage Swing Low @ $I_{SINK} = 10\text{ mA}$ versus Total Fluence (Side B)

Table 5.32: Raw data table for output voltage swing low (side B) @ $I_{SINK} = 10 \text{ mA}$ of pre- and post-irradiation ($1E12 \text{ N/cm}^2$)

Parameter	B 10mA V_{OL} @ $V_s = \pm 15V$	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	223.706	228.934
17	Un-biased Irradiation	221.493	223.348
18	Un-biased Irradiation	218.539	221.150
19	Un-biased Irradiation	215.361	218.519
20	Un-biased Irradiation	220.481	222.333
13	Control Unit	222.976	222.676
14	Control Unit	224.370	224.549
Un-biased Irradiation Statistics			
	Average Un-biased	219.916	222.857
	Std Dev Un-biased	3.155	3.846
	Ps90%/90% (+KTL) Un-biased	228.567	233.404
	Ps90%/90% (-KTL) Un-biased	211.265	212.310
	Specification MIN		
	Status (Measurements)		
	Specification MAX	500	500
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

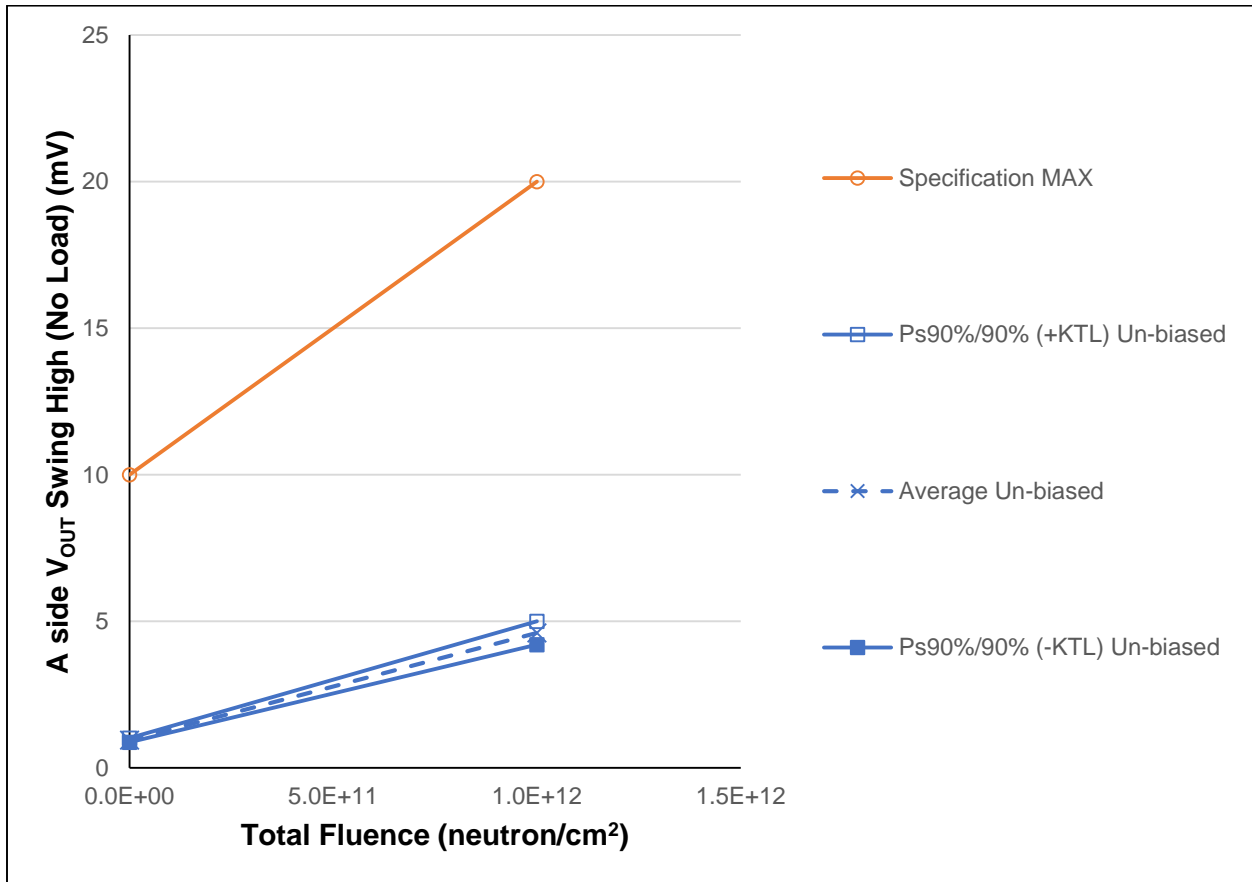


Figure 5.33: Plot of Output Voltage Swing High @ No Load versus Total Fluence (Side A)

Table 5.33: Raw data table for output voltage swing high (side A) @ no load of pre- and post-irradiation (1E12 N/cm²)

Parameter	A NO LOAD SW+ @ Vs=+-15V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	0.933	4.359
17	Un-biased Irradiation	0.933	4.628
18	Un-biased Irradiation	0.933	4.609
19	Un-biased Irradiation	0.961	4.705
20	Un-biased Irradiation	0.990	4.721
13	Control Unit	0.966	0.949
14	Control Unit	0.914	0.958
Un-biased Irradiation Statistics			
	Average Un-biased	0.950	4.605
	Std Dev Un-biased	0.025	0.145
	Ps90%/90% (+KTL) Un-biased	1.020	5.003
	Ps90%/90% (-KTL) Un-biased	0.880	4.206
	Specification MIN		
	Status (Measurements)		
	Specification MAX	10	20
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

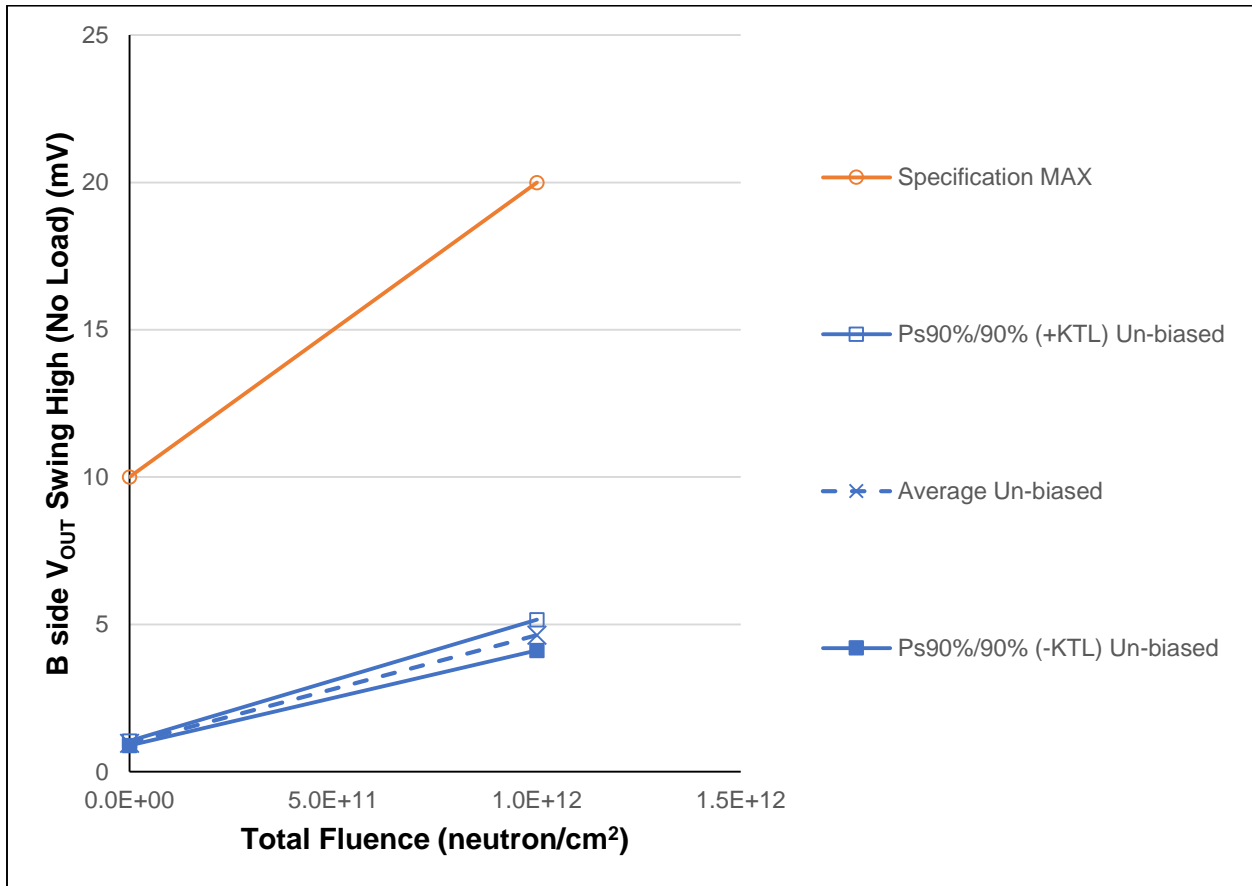


Figure 5.34: Plot of Output Voltage Swing High @ No Load versus Total Fluence (Side B)

Table 5.34: Raw data table for output voltage swing high (side B) @ no load of pre- and post-irradiation (1E12 N/cm²)

Parameter	B NO LOAD SW+ @ Vs=+-15V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	0.990	4.323
17	Un-biased Irradiation	0.935	4.645
18	Un-biased Irradiation	0.949	4.645
19	Un-biased Irradiation	0.990	4.762
20	Un-biased Irradiation	0.990	4.814
13	Control Unit	1.579	1.635
14	Control Unit	0.949	0.949
Un-biased Irradiation Statistics			
	Average Un-biased	0.971	4.638
	Std Dev Un-biased	0.027	0.191
	Ps90%/90% (+KTL) Un-biased	1.044	5.161
	Ps90%/90% (-KTL) Un-biased	0.898	4.115
	Specification MIN		
	Status (Measurements)		
	Specification MAX	10	20
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

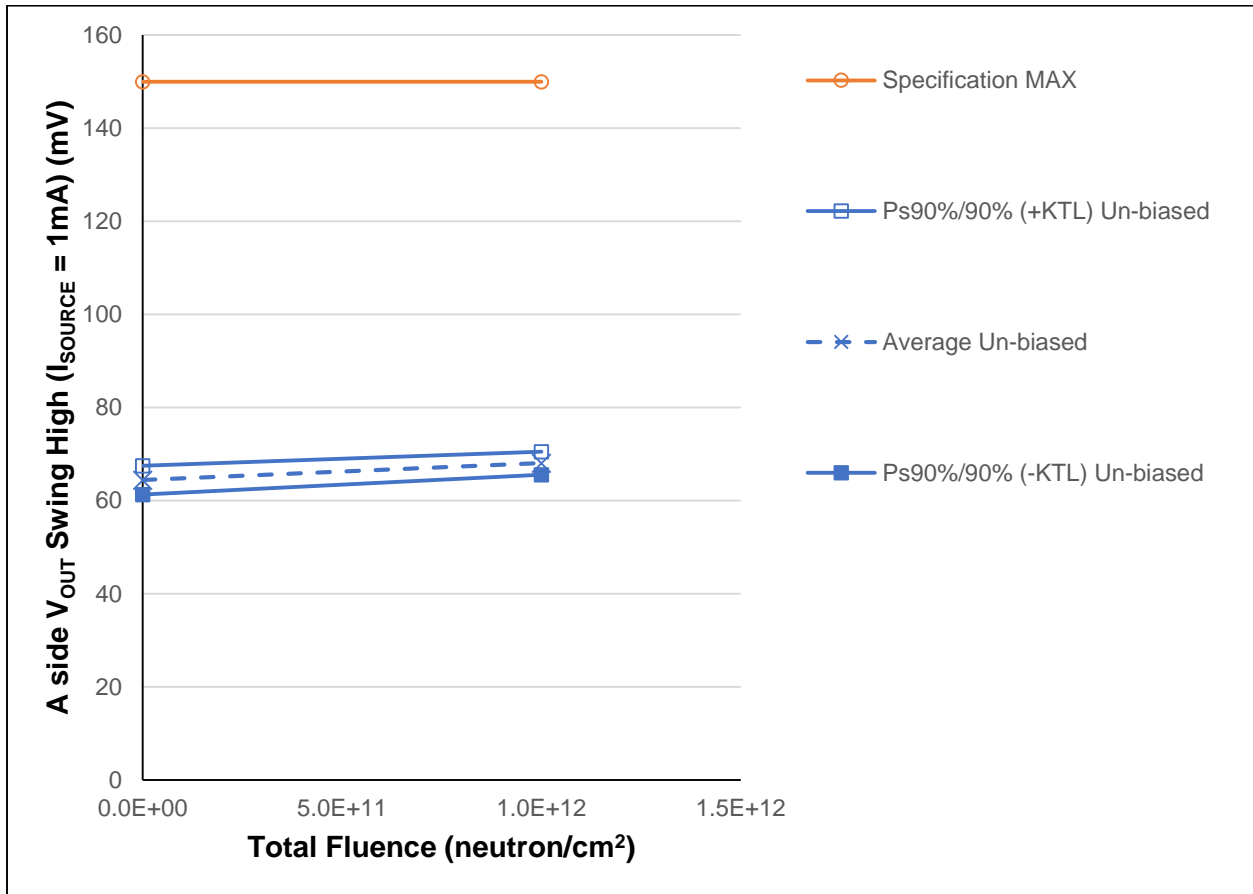


Figure 5.35: Plot of Output Voltage Swing High @ $I_{SOURCE} = 1 \text{ mA}$ versus Total Fluence (Side A)

Table 5.35: Raw data table for output voltage swing high (side A) @ I_{SOURCE} = 1 mA of pre- and post-irradiation (1E12 N/cm²)

Parameter	A 1mA V _{OH} @ Vs=+-15V	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	62.577	66.592
17	Un-biased Irradiation	64.997	68.423
18	Un-biased Irradiation	65.226	68.768
19	Un-biased Irradiation	64.061	67.810
20	Un-biased Irradiation	65.190	68.692
13	Control Unit	66.870	66.649
14	Control Unit	64.808	64.688
Un-biased Irradiation Statistics			
	Average Un-biased	64.410	68.057
	Std Dev Un-biased	1.129	0.901
	Ps90%/90% (+KTL) Un-biased	67.506	70.528
	Ps90%/90% (-KTL) Un-biased	61.315	65.586
	Specification MIN		
	Status (Measurements)		
	Specification MAX	150	150
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

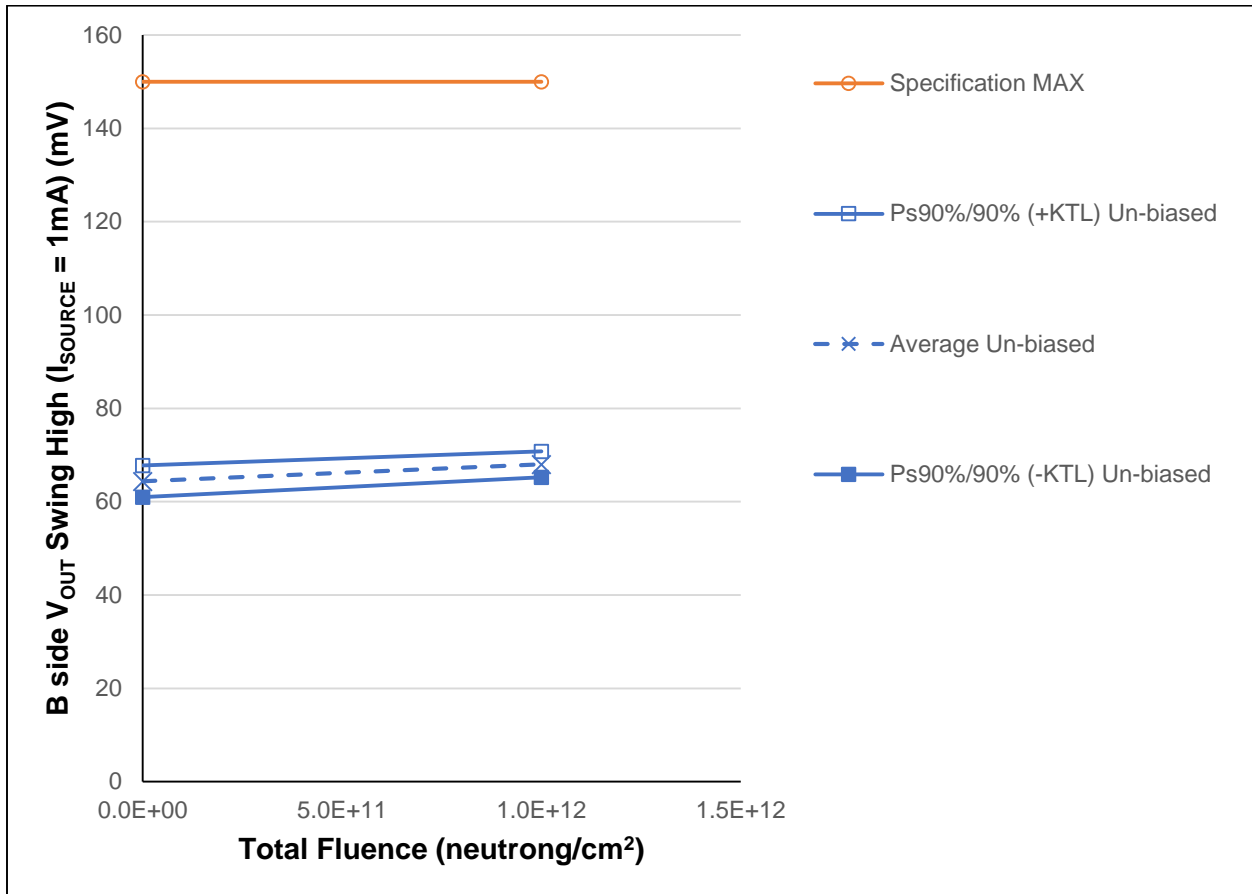


Figure 5.36: Plot of Output Voltage Swing High @ $I_{SOURCE} = 1 \text{ mA}$ versus Total Fluence (Side B)

Table 5.36: Raw data table for output voltage swing high (side B) @ I_{SOURCE} = 1 mA of pre- and post-irradiation (1E12 N/cm²)

Parameter	B 1mA V _{OH} @ Vs=+-15V	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	62.265	66.327
17	Un-biased Irradiation	64.522	67.860
18	Un-biased Irradiation	65.445	68.959
19	Un-biased Irradiation	64.436	68.270
20	Un-biased Irradiation	65.073	68.572
13	Control Unit	66.354	66.099
14	Control Unit	64.131	64.020
Un-biased Irradiation Statistics			
	Average Un-biased	64.348	67.998
	Std Dev Un-biased	1.236	1.017
	Ps90%/90% (+KTL) Un-biased	67.736	70.786
	Ps90%/90% (-KTL) Un-biased	60.960	65.209
	Specification MIN		
	Status (Measurements)	PASS	PASS
	Specification MAX	150	150
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

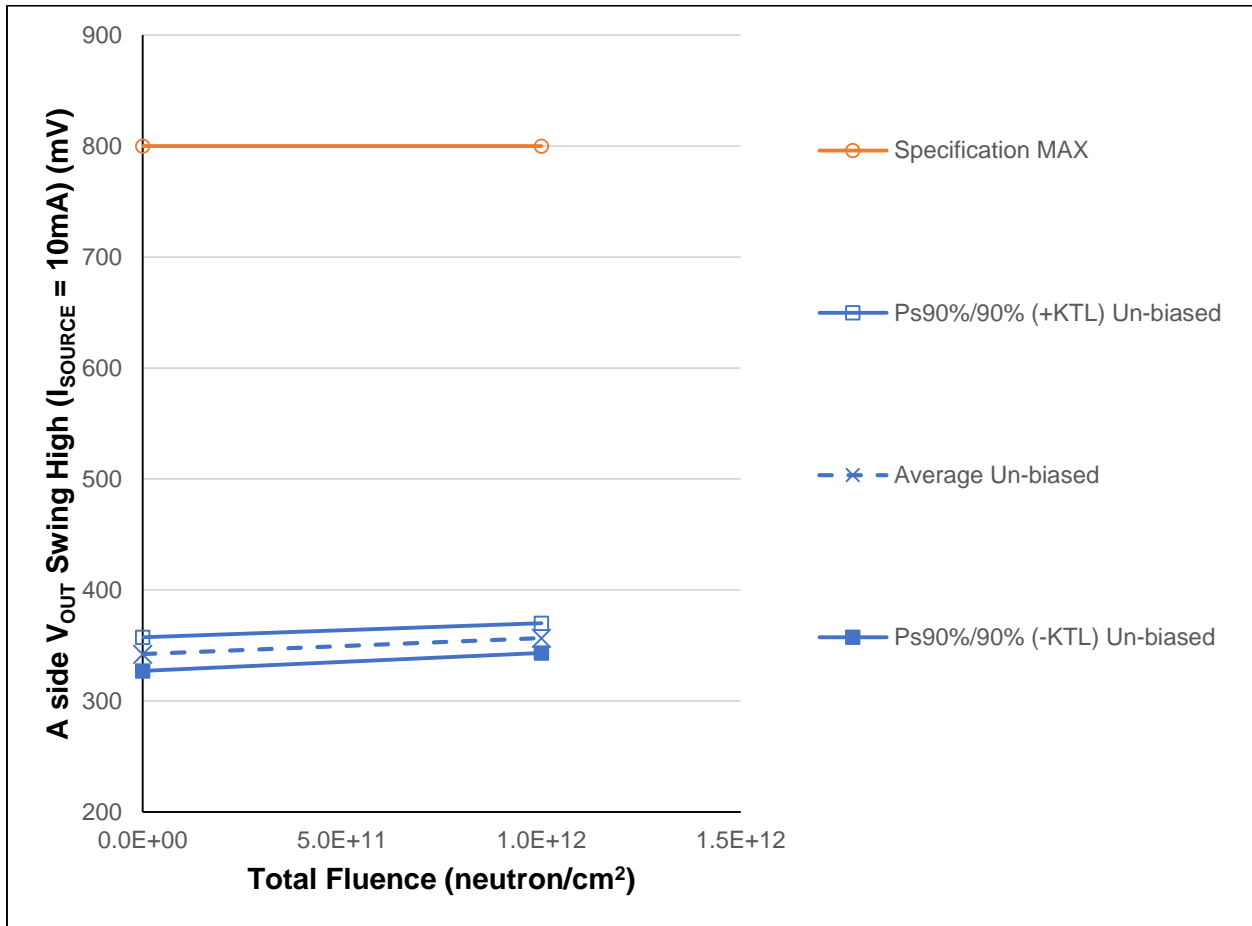


Figure 5.37: Plot of A-side Output Voltage Swing High @ $I_{SOURCE} = 10\text{ mA}$ versus Total Fluence

Table 5.37: Raw data table for output voltage swing high (side A) @ I_{SOURCE} = 10 mA of pre- and post-irradiation (1E12 N/cm²)

Parameter	A 10mA V _{OH} @ Vs=+-15V	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	334.022	349.726
17	Un-biased Irradiation	345.130	358.539
18	Un-biased Irradiation	347.382	361.642
19	Un-biased Irradiation	339.156	353.658
20	Un-biased Irradiation	345.435	359.621
13	Control Unit	357.393	356.590
14	Control Unit	345.163	344.639
Un-biased Irradiation Statistics			
	Average Un-biased	342.225	356.637
	Std Dev Un-biased	5.524	4.853
	Ps90%/90% (+KTL) Un-biased	357.371	369.944
	Ps90%/90% (-KTL) Un-biased	327.079	343.330
	Specification MIN		
	Status (Measurements)		
	Specification MAX	800	800
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

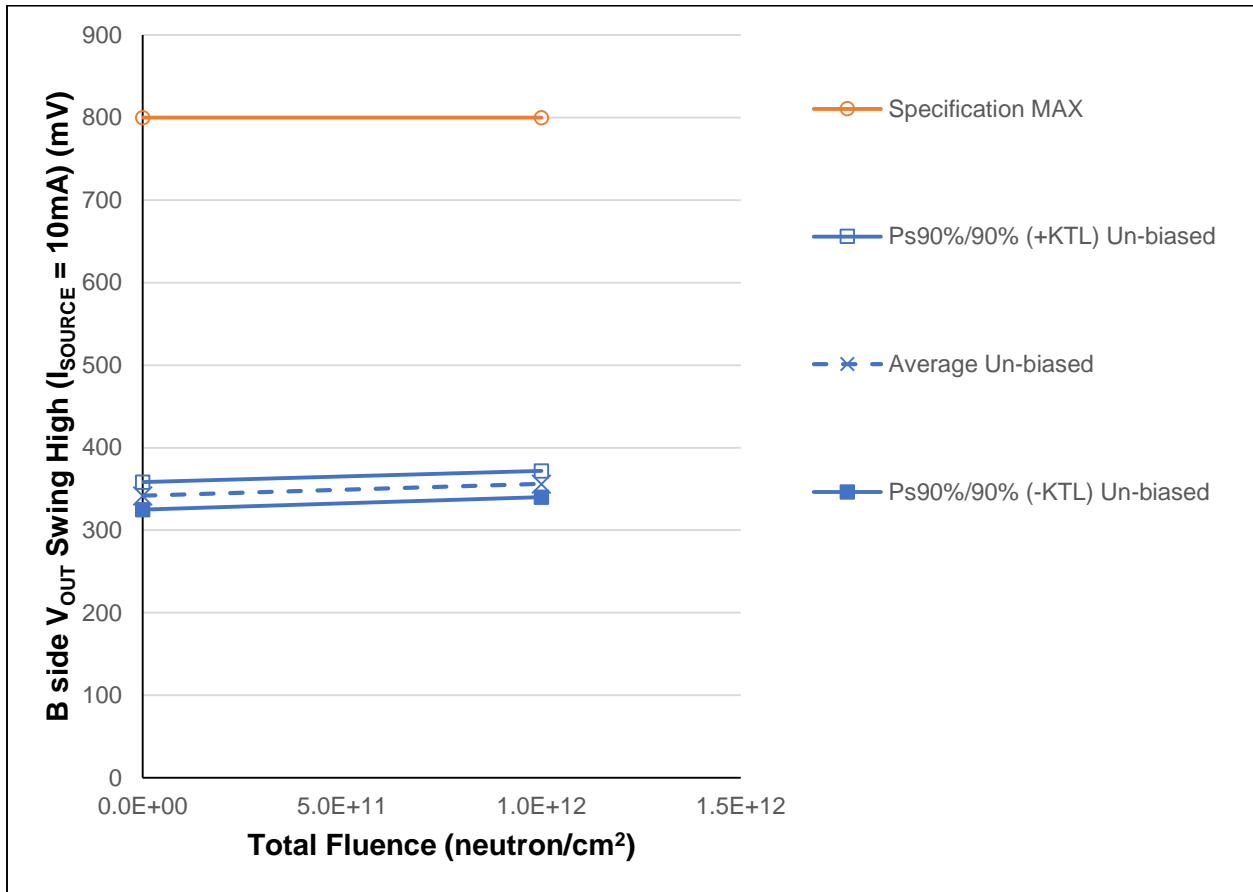


Figure 5.37: Plot of B-side Output Voltage Swing High @ $I_{SOURCE} = 10\text{ mA}$ versus Total Fluence

Table 5.38: Raw data table for output voltage swing high (side B) @ I_{SOURCE} = 10 mA of pre- and post-irradiation (1E12 N/cm²)

Parameter	B 10mA V _{OH} @ Vs=+-15V	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	331.894	347.261
17	Un-biased Irradiation	342.176	355.317
18	Un-biased Irradiation	348.264	362.896
19	Un-biased Irradiation	341.160	355.846
20	Un-biased Irradiation	344.882	359.096
13	Control Unit	353.761	352.991
14	Control Unit	342.033	341.627
Un-biased Irradiation Statistics			
	Average Un-biased	341.675	356.083
	Std Dev Un-biased	6.121	5.787
	Ps90%/90% (+KTL) Un-biased	358.460	371.952
	Ps90%/90% (-KTL) Un-biased	324.891	340.214
	Specification MIN		
	Status (Measurements)		
	Specification MAX	800	800
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

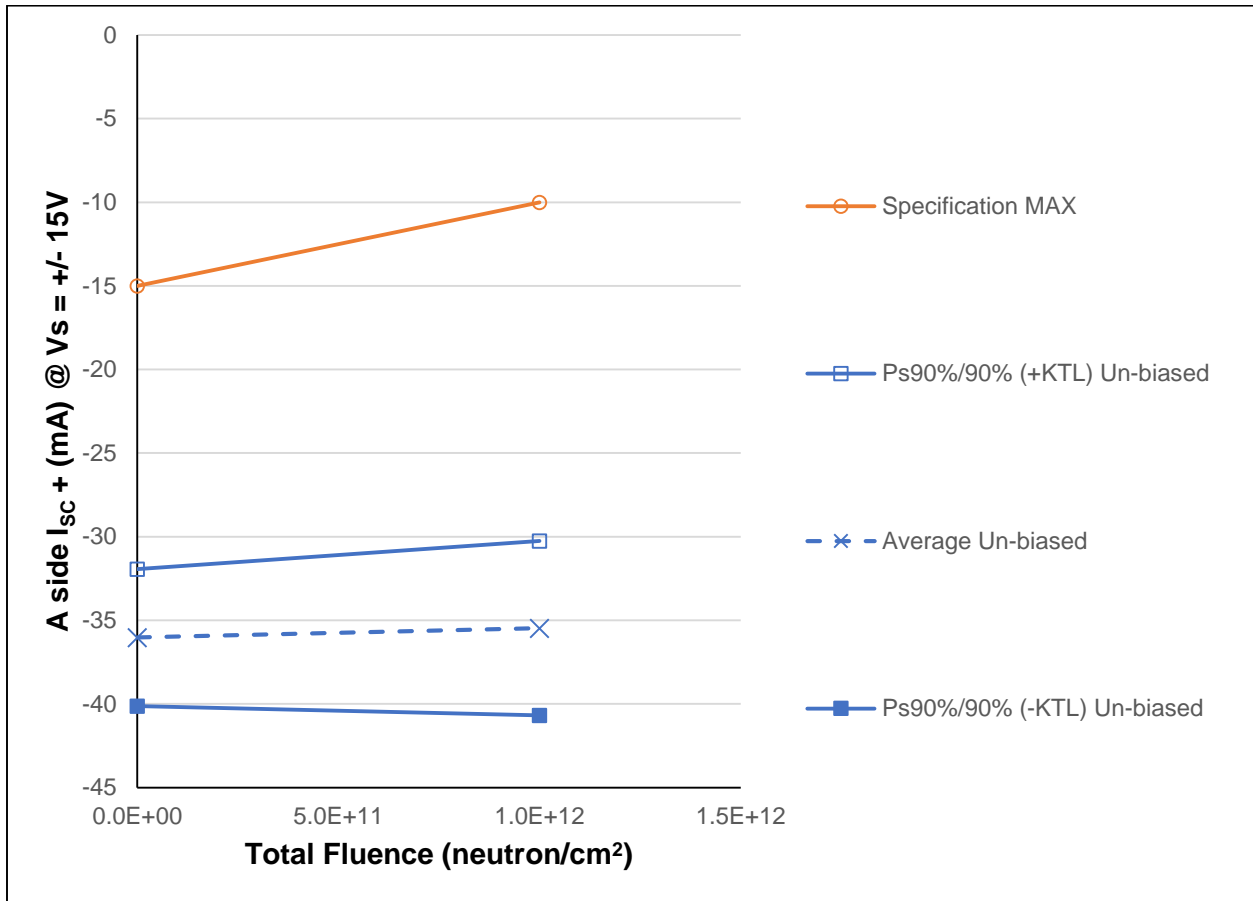


Figure 5.39: Plot of A-side Short Circuit Current @ Vs = +/- 15V versus Total Fluence

Table 5.39: Raw data table for A-side short circuit current @ Vs = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A _{ISC} + @ Vs = +/- 15V (mA)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	-38.427	-38.646
17	Un-biased Irradiation	-35.273	-34.357
18	Un-biased Irradiation	-36.504	-35.880
19	Un-biased Irradiation	-34.702	-34.221
20	Un-biased Irradiation	-35.235	-34.279
13	Control Unit	-35.198	-35.109
14	Control Unit	-37.236	-37.245
Un-biased Irradiation Statistics			
	Average Un-biased	-36.028	-35.477
	Std Dev Un-biased	1.495	1.902
	Ps90%/90% (+KTL) Un-biased	-31.929	-30.261
	Ps90%/90% (-KTL) Un-biased	-40.128	-40.692
	Specification MIN		
	Status (Measurements)		
	Specification MAX	-15	-10
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

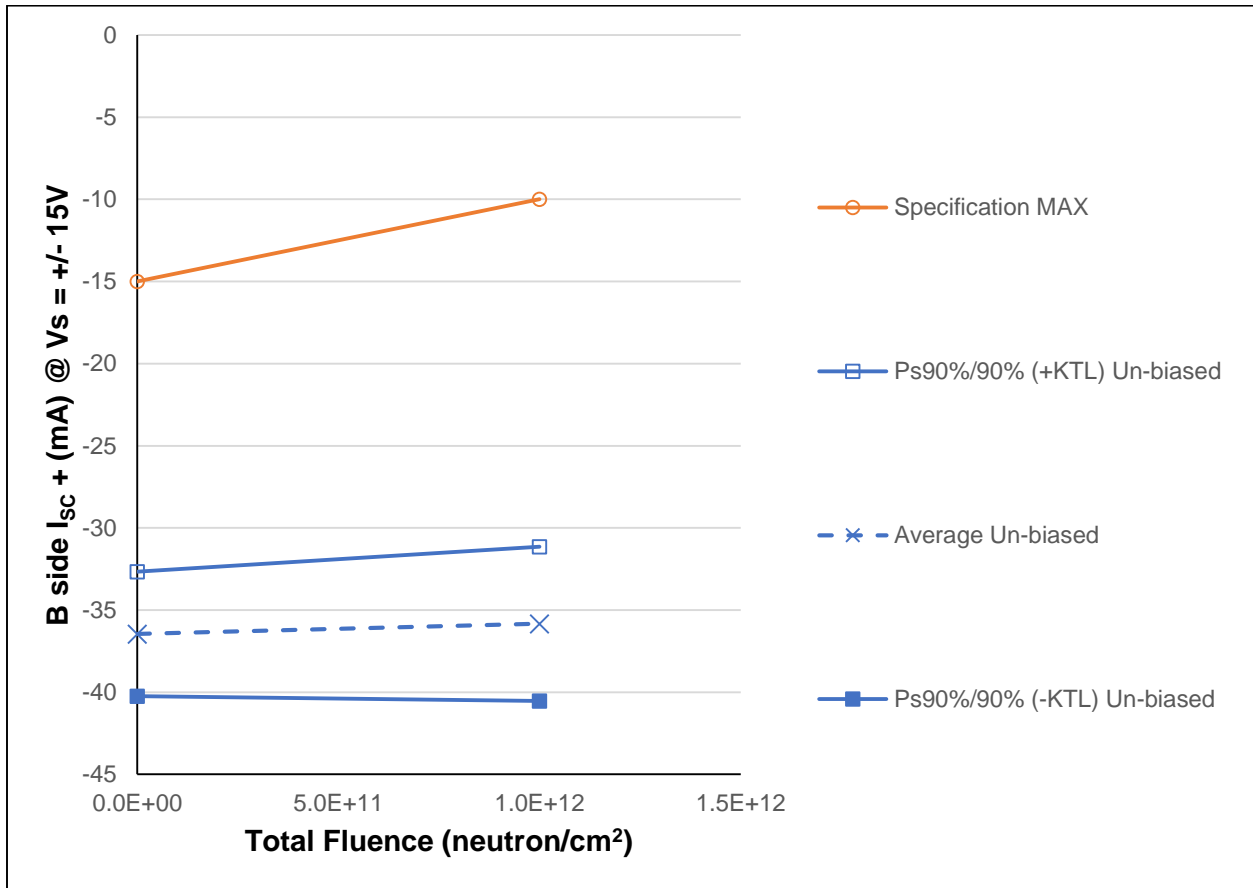


Figure 5.40: Plot of B-side Short Circuit Current @ Vs = +/- 15V versus Total Fluence

Table 5.40: Raw data table for B-side short circuit current @ Vs = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B I _{SC} + @ Vs = +/- 15V (mA)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	-38.463	-38.610
17	Un-biased Irradiation	-36.399	-35.406
18	Un-biased Irradiation	-36.862	-36.157
19	Un-biased Irradiation	-34.710	-34.211
20	Un-biased Irradiation	-35.838	-34.794
13	Control Unit	-36.800	-36.678
14	Control Unit	-38.122	-38.123
Un-biased Irradiation Statistics			
	Average Un-biased	-36.455	-35.836
	Std Dev Un-biased	1.381	1.711
	Ps90%/90% (+KTL) Un-biased	-32.668	-31.144
	Ps90%/90% (-KTL) Un-biased	-40.241	-40.527
	Specification MIN		
	Status (Measurements)		
	Specification MAX	-15	-10
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

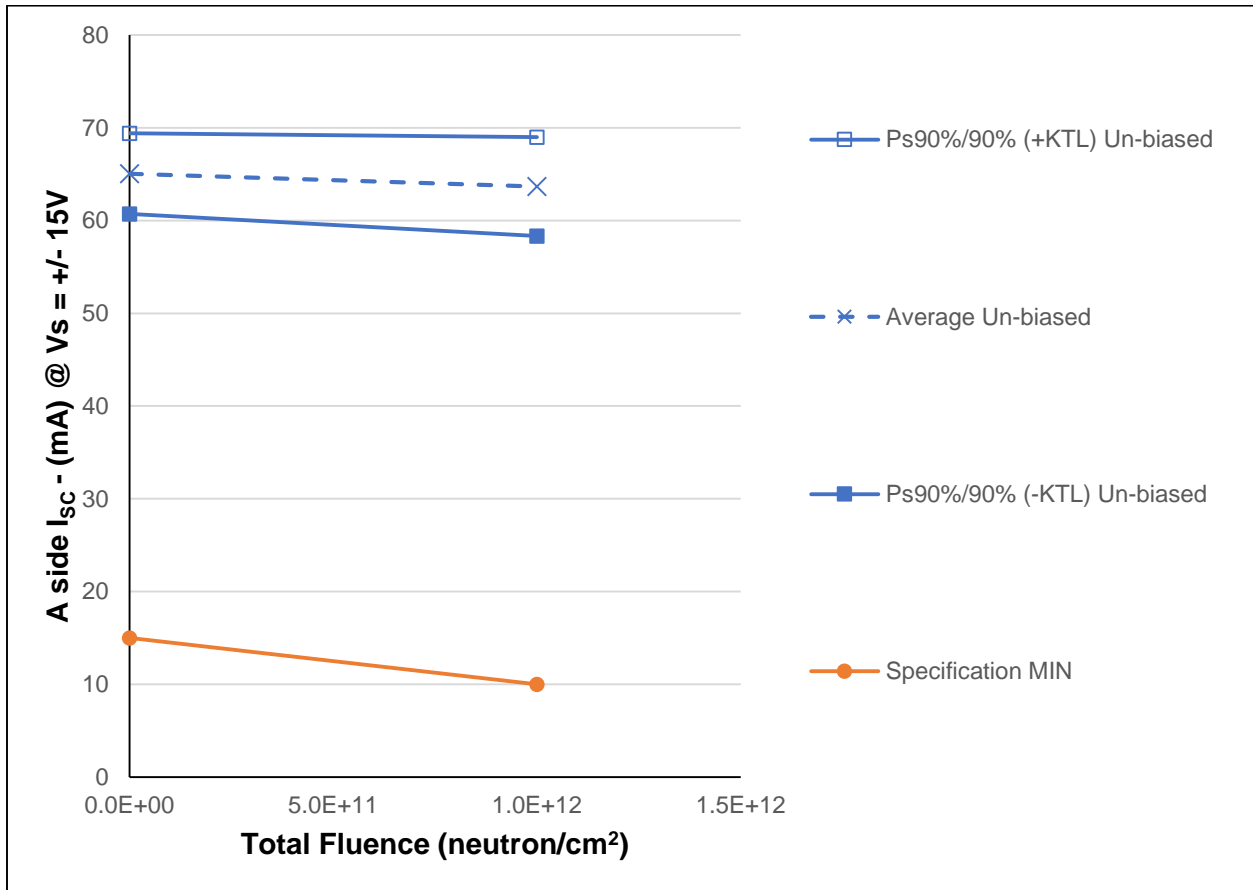


Figure 5.41: Plot of A-side I_{sc} - @ $V_s = +/- 15V$ versus Total Fluence

Table 5.41: Raw data table for A-side I_{SC} - @ $V_s = \pm 15V$ of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	A I_{SC} - @ $V_s = \pm 15V$ (mA)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	63.036	60.493
17	Un-biased Irradiation	64.075	63.366
18	Un-biased Irradiation	66.461	65.232
19	Un-biased Irradiation	66.795	65.216
20	Un-biased Irradiation	64.882	64.051
13	Control Unit	65.201	65.426
14	Control Unit	63.036	63.087
Un-biased Irradiation Statistics			
	Average Un-biased	65.050	63.671
	Std Dev Un-biased	1.587	1.947
	Ps90%/90% (+KTL) Un-biased	69.400	69.010
	Ps90%/90% (-KTL) Un-biased	60.700	58.333
	Specification MIN	15	10
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

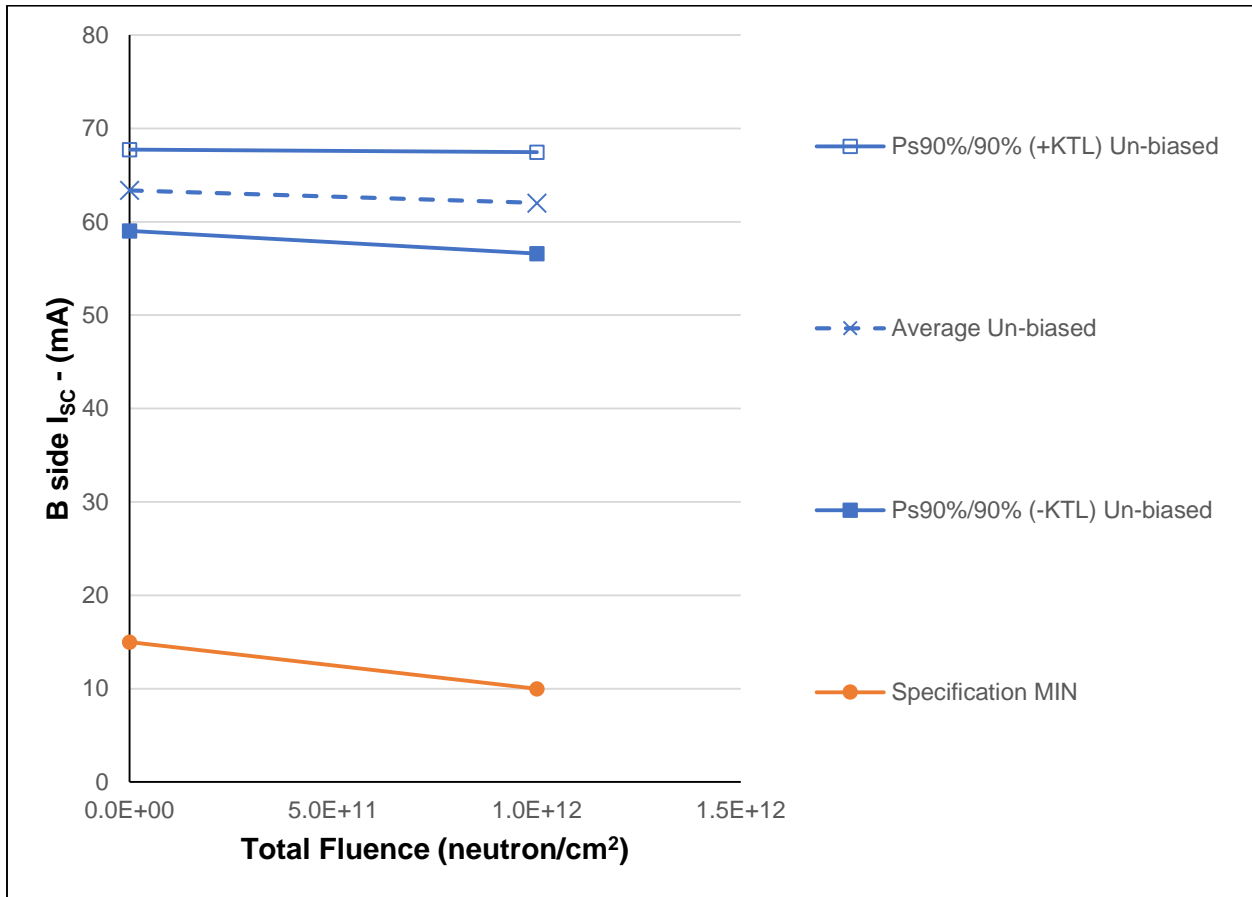


Figure 5.42: Plot of B-side I_{sc} - @ $V_s = \pm 15V$ versus Total Fluence

Table 5.42: Raw data table for B-side I_{SC} - @ V_s = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B I _{SC} - @ V _s = +/- 15V	Total Fluence (neutron/cm ²)	
Units	(mA)	0	1.E+12
16	Un-biased Irradiation	61.174	58.725
17	Un-biased Irradiation	62.664	61.866
18	Un-biased Irradiation	64.794	63.641
19	Un-biased Irradiation	65.015	63.455
20	Un-biased Irradiation	63.245	62.433
13	Control Unit	63.007	63.226
14	Control Unit	61.329	61.362
Un-biased Irradiation Statistics			
	Average Un-biased	63.379	62.024
	Std Dev Un-biased	1.586	1.984
	Ps90%/90% (+KTL) Un-biased	67.729	67.463
	Ps90%/90% (-KTL) Un-biased	59.028	56.585
	Specification MIN	15	10
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

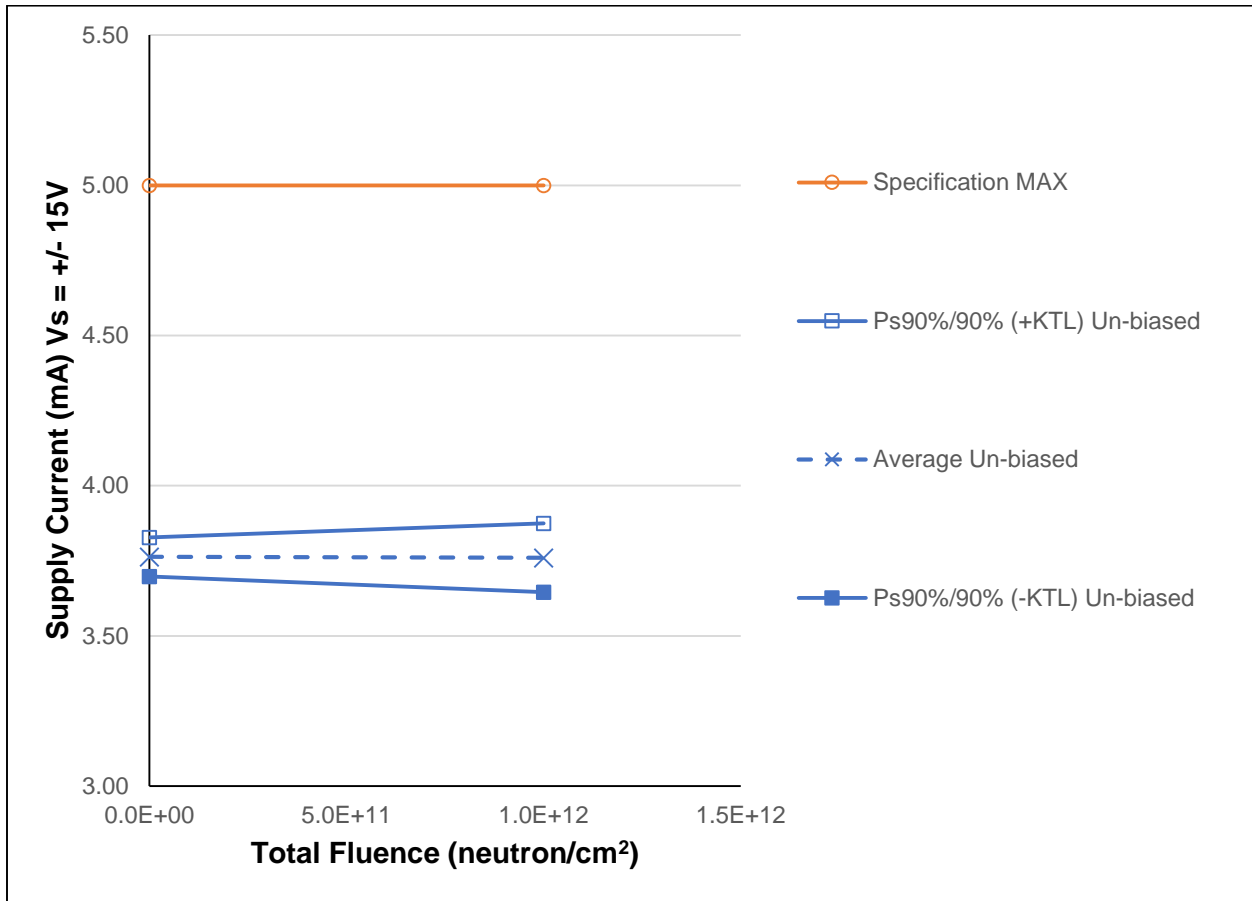


Figure 5.43: Plot of Device Supply Current @ Vs = +/- 15V versus Total Fluence

Table 5.43: Raw data table for device supply current @ Vs = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	Supply Current @ +/-15V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mA)		
16	Un-biased Irradiation	3.797	3.831
17	Un-biased Irradiation	3.739	3.720
18	Un-biased Irradiation	3.766	3.756
19	Un-biased Irradiation	3.743	3.746
20	Un-biased Irradiation	3.770	3.748
13	Control Unit	3.723	3.716
14	Control Unit	3.749	3.748
Un-biased Irradiation Statistics			
	Average Un-biased	3.763	3.760
	Std Dev Un-biased	0.024	0.042
	Ps90%/90% (+KTL) Un-biased	3.828	3.875
	Ps90%/90% (-KTL) Un-biased	3.698	3.646
	Specification MIN		
	Status (Measurements)		
	Specification MAX	5	5
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

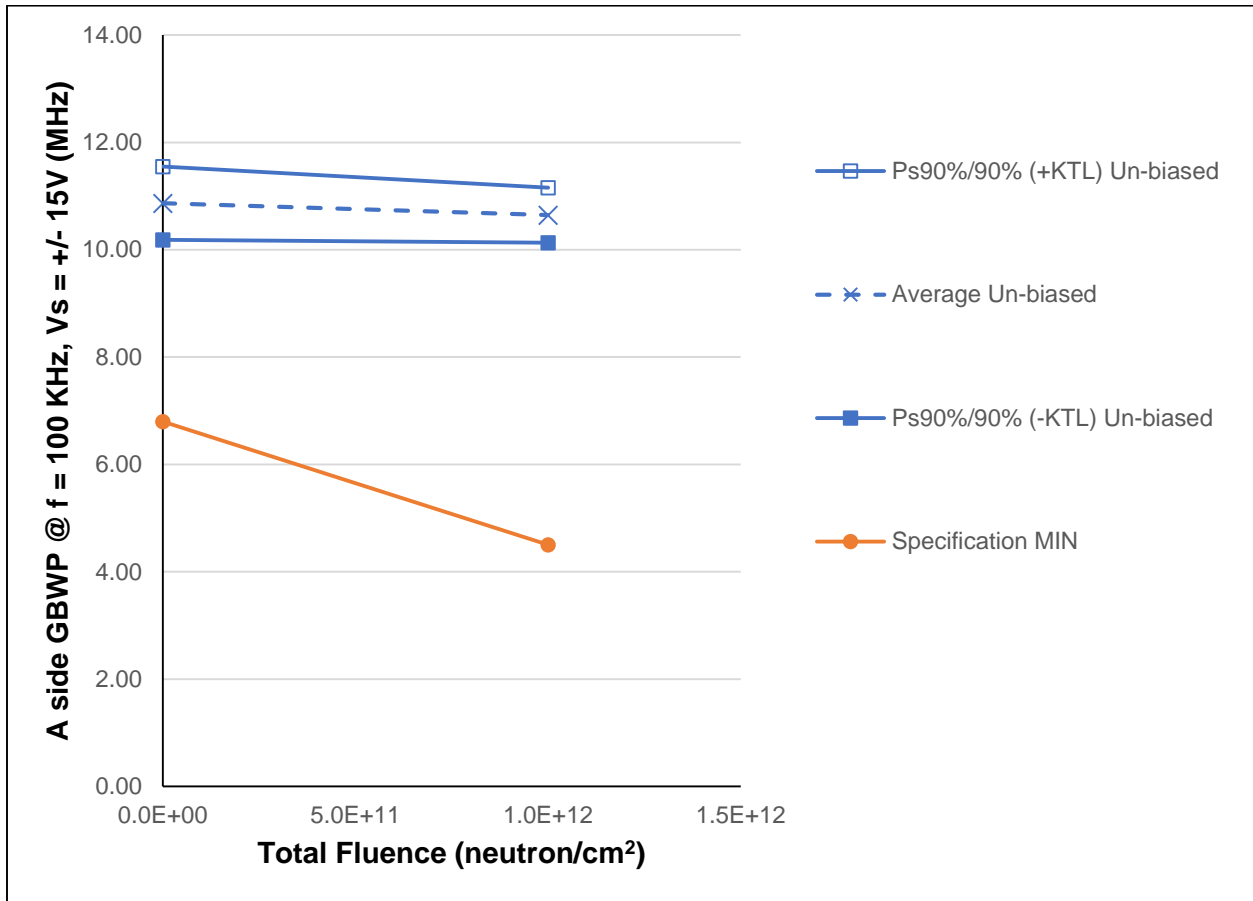


Figure 5.44: Plot of Gain Bandwidth Product @ Vs = +/- 15V versus Total Fluence (side A)

Table 5.44: Raw data table for A-side Gain-bandwidth Product @ $V_s = \pm 15V$ of pre- and post-irradiation ($1E12 \text{ N/cm}^2$)

Parameter	A GBWP @ $f = 100\text{KHz}$, $V_s = \pm 15V$	Total Fluence (neutron/cm ²)	
Units	(MHz)	0	1.E+12
16	Un-biased Irradiation	10.760	10.518
17	Un-biased Irradiation	10.506	10.383
18	Un-biased Irradiation	10.873	10.732
19	Un-biased Irradiation	11.138	10.803
20	Un-biased Irradiation	11.050	10.795
13	Control Unit	10.706	10.663
14	Control Unit	10.502	10.513
Un-biased Irradiation Statistics			
	Average Un-biased	10.866	10.646
	Std Dev Un-biased	0.249	0.187
	Ps90%/90% (+KTL) Un-biased	11.549	11.159
	Ps90%/90% (-KTL) Un-biased	10.182	10.134
	Specification MIN	6.8	4.5
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

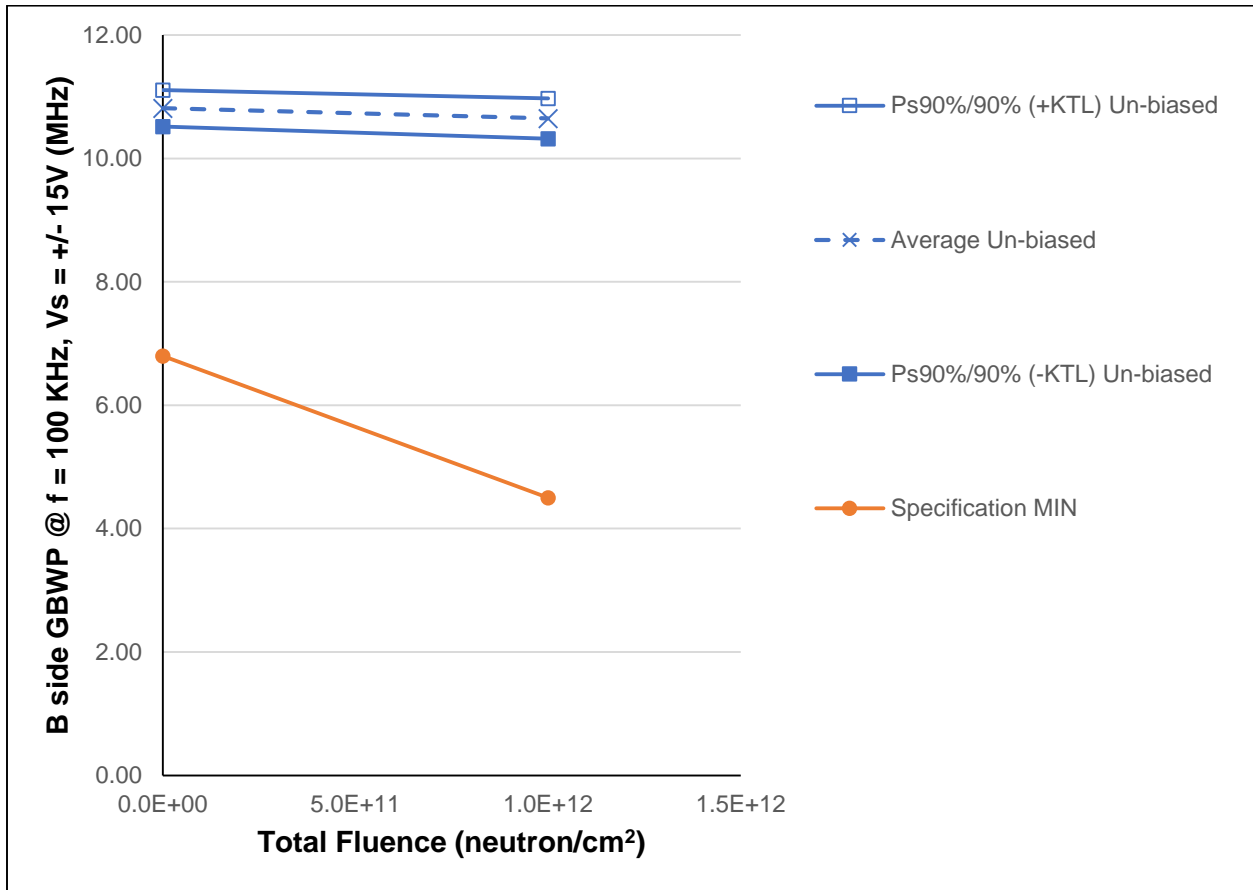


Figure 5.45: Plot of Gain Bandwidth Product @ Vs = +/- 15V versus Total Fluence (side B)

Table 5.45: Raw data table for B-side Gain-bandwidth Product @ $V_s = \pm 15V$ of pre- and post-irradiation ($1E12 \text{ N/cm}^2$)

Parameter	B GBWP @ $f = 100 \text{ KHz}$, $V_s = \pm 15V$	Total Fluence (neutron/cm ²)	
Units	(MHz)	0	1.E+12
16	Un-biased Irradiation	10.672	10.465
17	Un-biased Irradiation	10.763	10.629
18	Un-biased Irradiation	10.811	10.653
19	Un-biased Irradiation	10.962	10.788
20	Un-biased Irradiation	10.856	10.703
13	Control Unit	10.586	10.559
14	Control Unit	10.505	10.471
Un-biased Irradiation Statistics			
	Average Un-biased	10.813	10.648
	Std Dev Un-biased	0.108	0.119
	Ps90%/90% (+KTL) Un-biased	11.109	10.974
	Ps90%/90% (-KTL) Un-biased	10.517	10.322
	Specification MIN	6.8	4.5
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

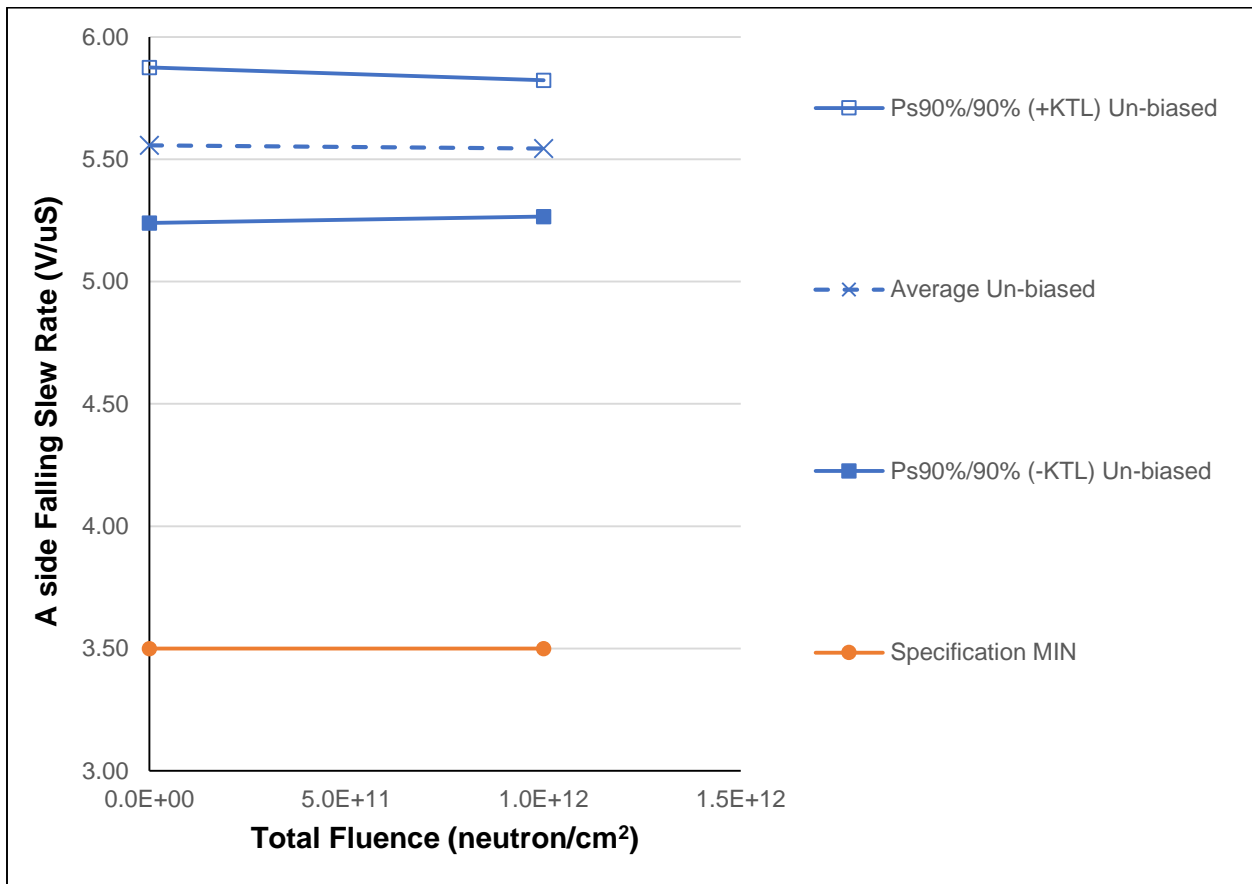


Figure 5.46: Plot of Slew Rate (Falling) @ Vs = +/- 15V versus Total Fluence (side A)

Table 5.46: Raw data table for A-side Slew Rate (Falling) @ Vs = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A SLEW RATE (F) @ Vs = +/- 15V Units (V/uS)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	5.525	5.556
17	Un-biased Irradiation	5.376	5.376
18	Un-biased Irradiation	5.587	5.556
19	Un-biased Irradiation	5.682	5.650
20	Un-biased Irradiation	5.618	5.587
13	Control Unit	5.405	5.435
14	Control Unit	5.405	5.405
Un-biased Irradiation Statistics			
	Average Un-biased	5.558	5.545
	Std Dev Un-biased	0.116	0.102
	Ps90%/90% (+KTL) Un-biased	5.876	5.824
	Ps90%/90% (-KTL) Un-biased	5.239	5.266
	Specification MIN	3.5	3.5
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

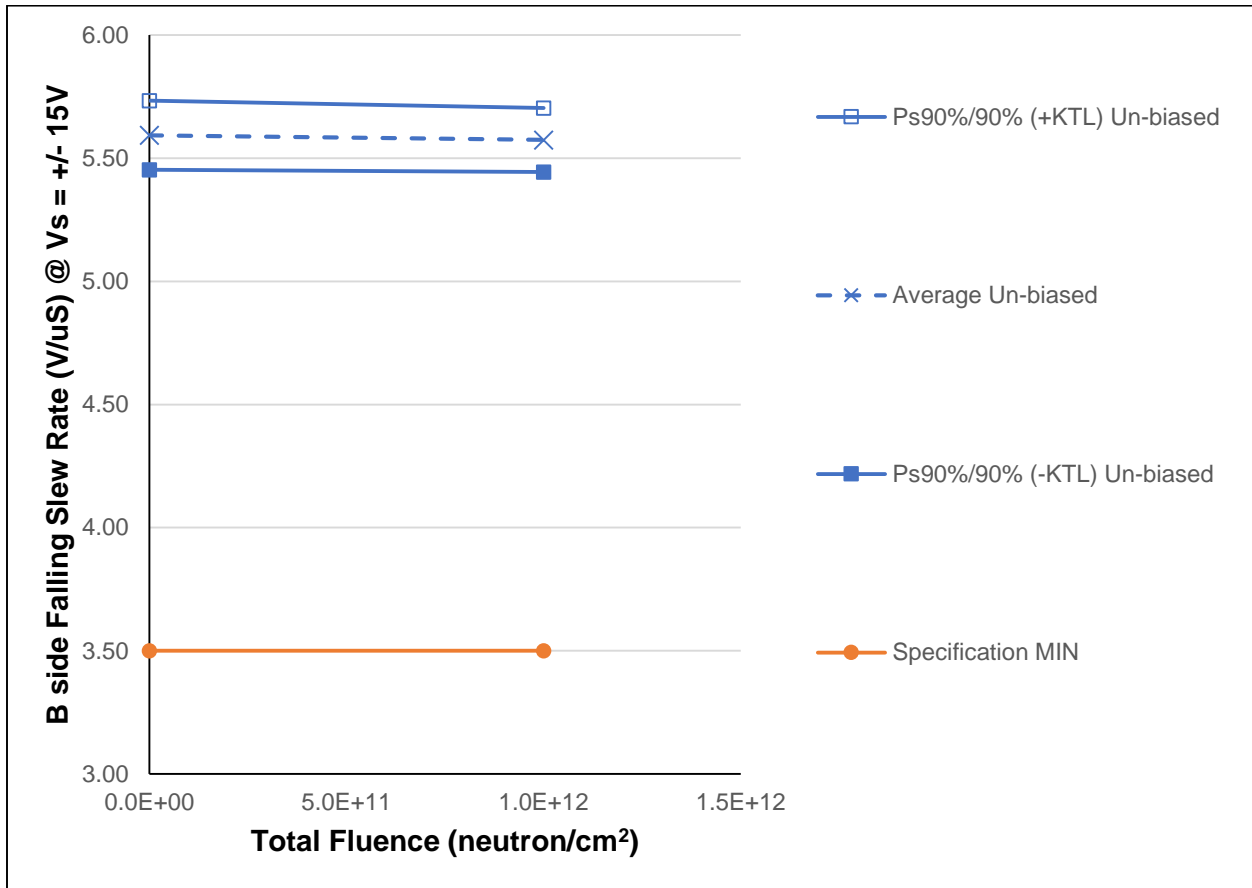


Figure 5.47: Plot of Slew Rate (Falling) @ Vs = +/- 15V versus Total Fluence (side B)

Table 5.47: Raw data table for B-side Slew Rate (Falling) @ Vs = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B SLEW RATE (F) @ Vs = +/- 15V (V/uS)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	5.525	5.556
17	Un-biased Irradiation	5.556	5.525
18	Un-biased Irradiation	5.618	5.587
19	Un-biased Irradiation	5.650	5.650
20	Un-biased Irradiation	5.618	5.556
13	Control Unit	5.405	5.435
14	Control Unit	5.435	5.464
Un-biased Irradiation Statistics			
	Average Un-biased	5.593	5.574
	Std Dev Un-biased	0.051	0.047
	Ps90%/90% (+KTL) Un-biased	5.734	5.704
	Ps90%/90% (-KTL) Un-biased	5.453	5.444
	Specification MIN	3.5	3.5
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

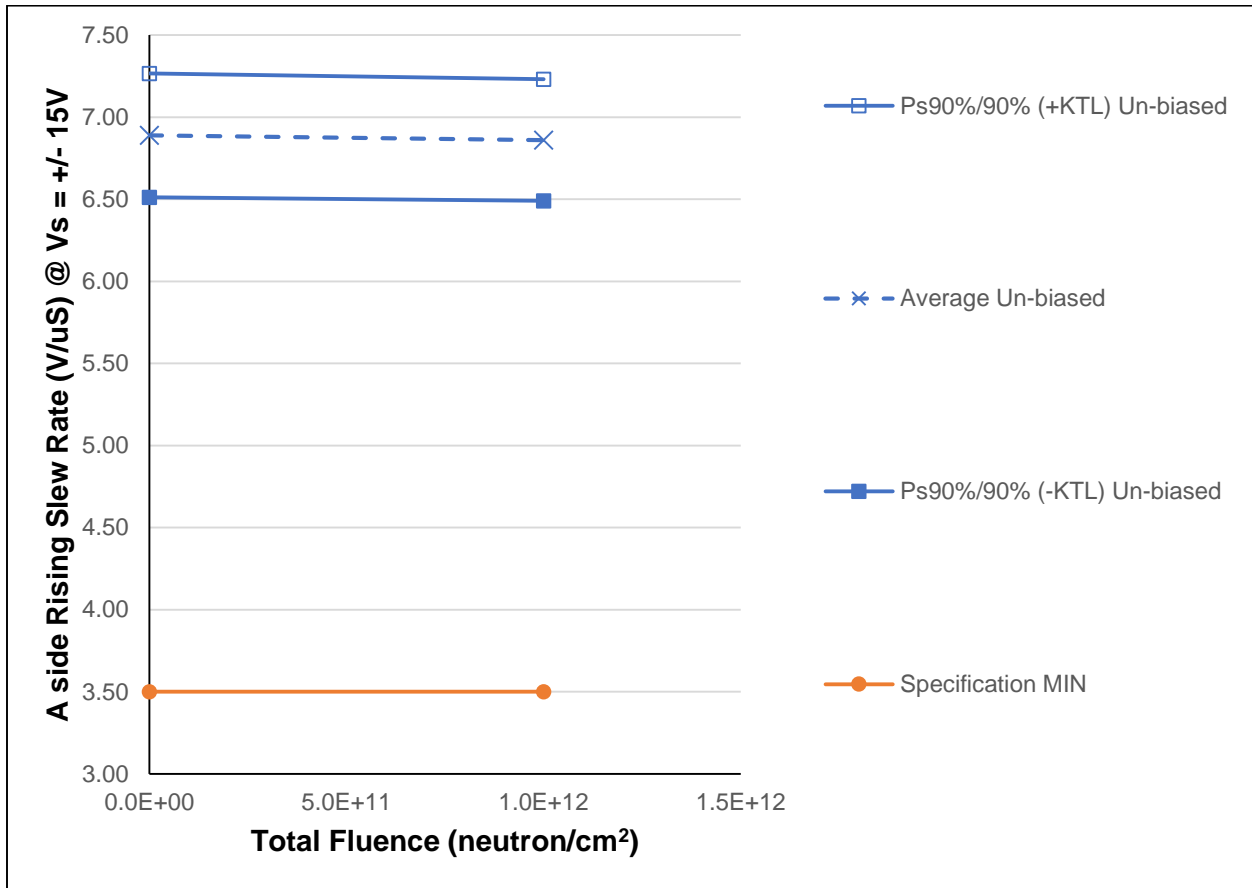


Figure 5.48: Plot of Slew Rate (Rising) @ Vs = +/- 15V versus Total Fluence (side A)

Table 5.48: Raw data table for A-side slew rate (rising) @ Vs = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A SLEW RATE (R) @ Vs = +/- 15V Units (V/uS)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	6.849	6.897
17	Un-biased Irradiation	6.667	6.623
18	Un-biased Irradiation	6.993	6.944
19	Un-biased Irradiation	6.993	6.944
20	Un-biased Irradiation	6.944	6.897
13	Control Unit	6.757	6.711
14	Control Unit	6.667	6.711
Un-biased Irradiation Statistics			
	Average Un-biased	6.889	6.861
	Std Dev Un-biased	0.138	0.135
	Ps90%/90% (+KTL) Un-biased	7.267	7.232
	Ps90%/90% (-KTL) Un-biased	6.512	6.490
	Specification MIN	3.5	3.5
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

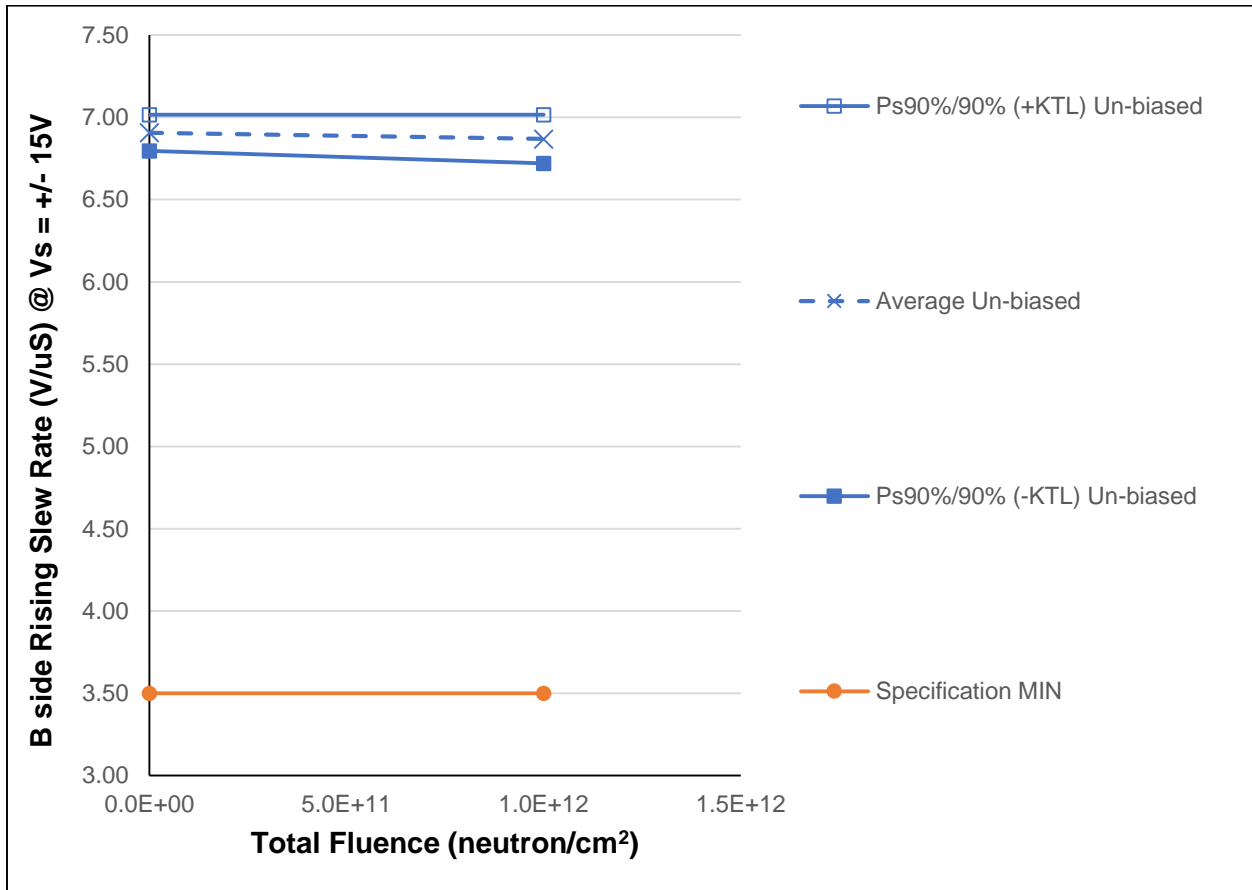


Figure 5.49: Plot of Slew Rate (Rising) @ Vs = +/- 15V versus Total Fluence (side B)

Table 5.49: Raw data table for B-side slew rate (rising) @ Vs = +/- 15V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B SLEW RATE (R) @ Vs = +/- 15V (V/uS)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	6.849	6.849
17	Un-biased Irradiation	6.897	6.803
18	Un-biased Irradiation	6.897	6.897
19	Un-biased Irradiation	6.944	6.944
20	Un-biased Irradiation	6.944	6.849
13	Control Unit	6.667	6.711
14	Control Unit	6.667	6.667
Un-biased Irradiation Statistics			
	Average Un-biased	6.906	6.868
	Std Dev Un-biased	0.040	0.054
	Ps90%/90% (+KTL) Un-biased	7.015	7.016
	Ps90%/90% (-KTL) Un-biased	6.797	6.721
	Specification MIN	3.5	3.5
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

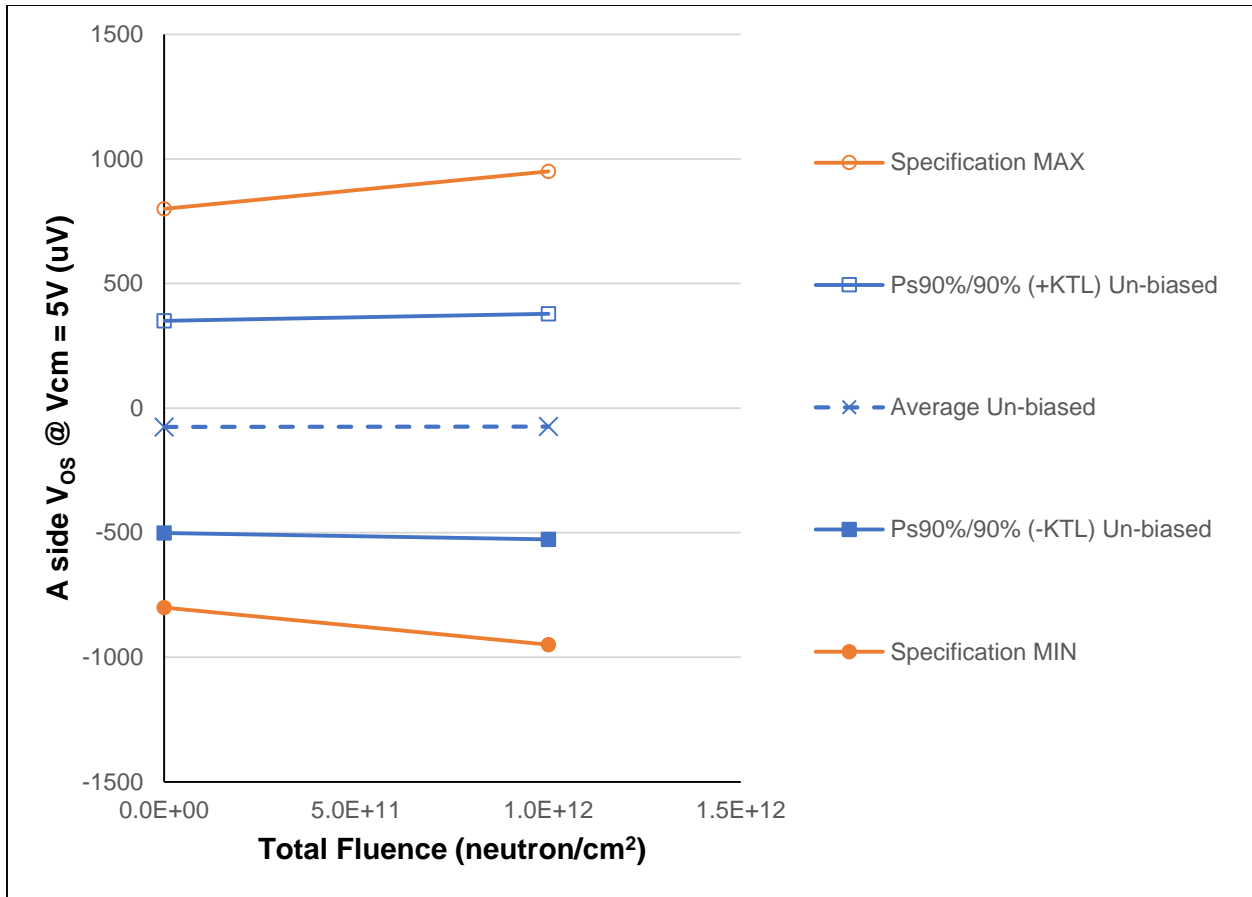


Figure 5.50 Plot of Input Offset Voltage V_{os} (A side) @ $V_{cm} = 5V$ versus Total Fluence

Table 5.50: Raw data table for V_{OS} (A side with $V_{cm} = 5V$) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	A V_{OS} @ $V_s=5V$, $V_{cm}=5V$	Total Fluence (neutron/ cm^2)	
		0	1.E+12
Units	(uS)		
16	Un-biased Irradiation	-26.716	-50.888
17	Un-biased Irradiation	17.383	37.012
18	Un-biased Irradiation	105.936	122.615
19	Un-biased Irradiation	-249.433	-275.489
20	Un-biased Irradiation	-225.391	-203.580
13	Control Unit	32.847	32.991
14	Control Unit	-135.221	-135.466
Un-biased Irradiation Statistics			
	Average Un-biased	-75.644	-74.066
	Std Dev Un-biased	155.440	165.003
	Ps90%/90% (+KTL) Un-biased	350.571	378.372
	Ps90%/90% (-KTL) Un-biased	-501.859	-526.504
	Specification MIN	-800	-950
	Status (Measurements)	PASS	PASS
	Specification MAX	800	950
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

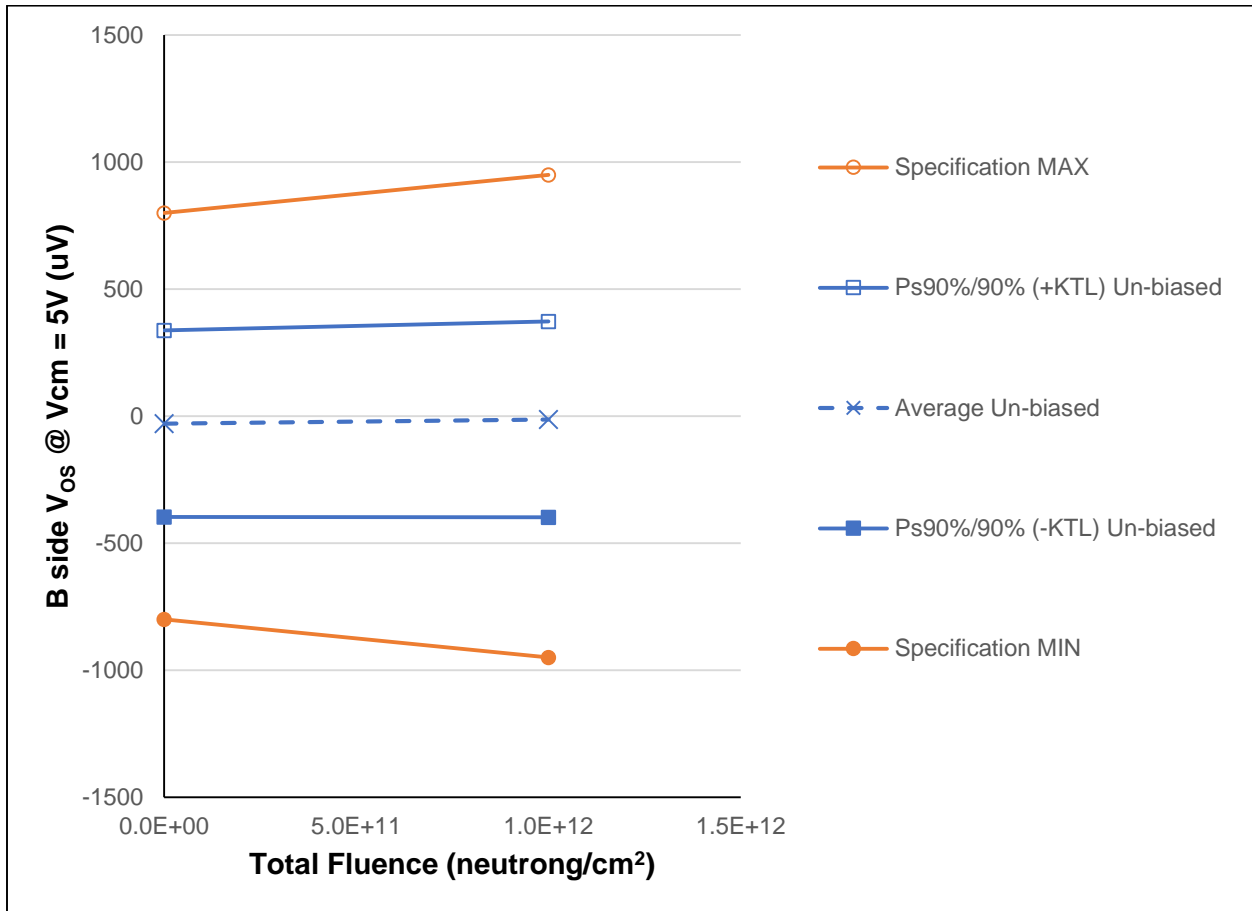


Figure 5.51 Plot of Input Offset Voltage V_{os} (B side) @ $V_{cm} = 5V$ versus Total Fluence

Table 5.51: Raw data table for V_{OS} (B side with $V_{cm} = 5V$) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	B V_{OS} @ $V_s=5V$, $V_{cm}=5V$	Total Fluence (neutron/cm ²)	
Units	(uV)	0	1.E+12
16	Un-biased Irradiation	42.336	106.315
17	Un-biased Irradiation	-181.994	-175.077
18	Un-biased Irradiation	-108.397	-74.989
19	Un-biased Irradiation	-58.296	-80.917
20	Un-biased Irradiation	160.986	160.334
13	Control Unit	13.339	14.399
14	Control Unit	-240.585	-240.582
Un-biased Irradiation Statistics			
	Average Un-biased	-29.073	-12.867
	Std Dev Un-biased	133.934	140.539
	Ps90%/90% (+KTL) Un-biased	338.173	372.491
	Ps90%/90% (-KTL) Un-biased	-396.319	-398.225
	Specification MIN	-800	-950
	Status (Measurements)	PASS	PASS
	Specification MAX	800	950
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

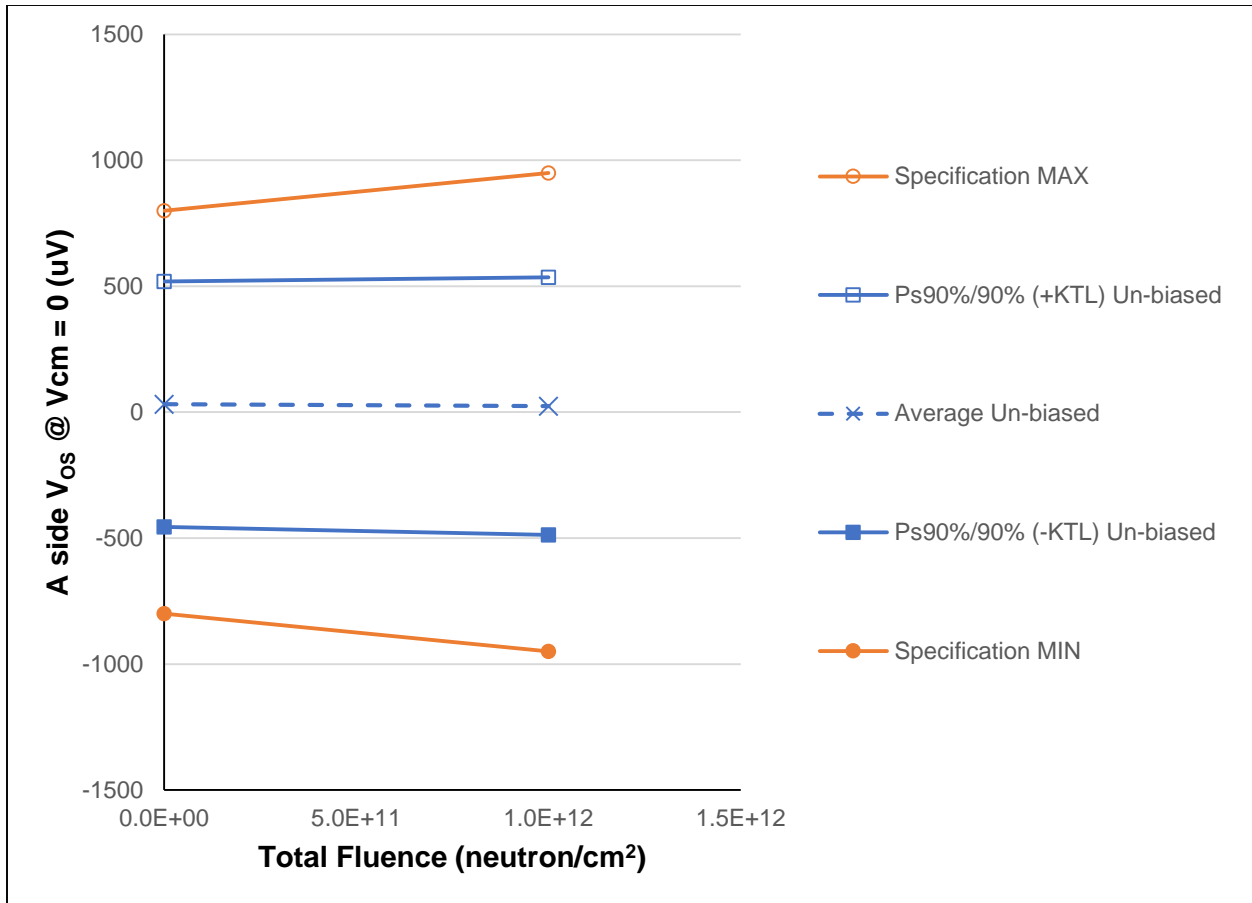


Figure 5.52 Plot of Input Offset Voltage V_{os} (A side) @ $V_{cm} = 0V$ versus Total Fluence

Table 5.52: Raw data table for V_{OS} (A side with $V_{cm} = 0V$) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	A V_{OS} @ $V_s=5V, V_{cm}=0V$	Total Fluence (neutron/ cm^2)	
Units	(μV)	0	1.E+12
16	Un-biased Irradiation	87.267	56.043
17	Un-biased Irradiation	80.384	87.258
18	Un-biased Irradiation	274.744	284.622
19	Un-biased Irradiation	-162.051	-186.014
20	Un-biased Irradiation	-124.040	-124.373
13	Control Unit	123.769	125.629
14	Control Unit	33.778	34.116
Un-biased Irradiation Statistics			
	Average Un-biased	31.261	23.507
	Std Dev Un-biased	177.709	186.461
	Ps90%/90% (+KTL) Un-biased	518.538	534.783
	Ps90%/90% (-KTL) Un-biased	-456.017	-487.769
	Specification MIN	-800	-950
	Status (Measurements)	PASS	PASS
	Specification MAX	800	950
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

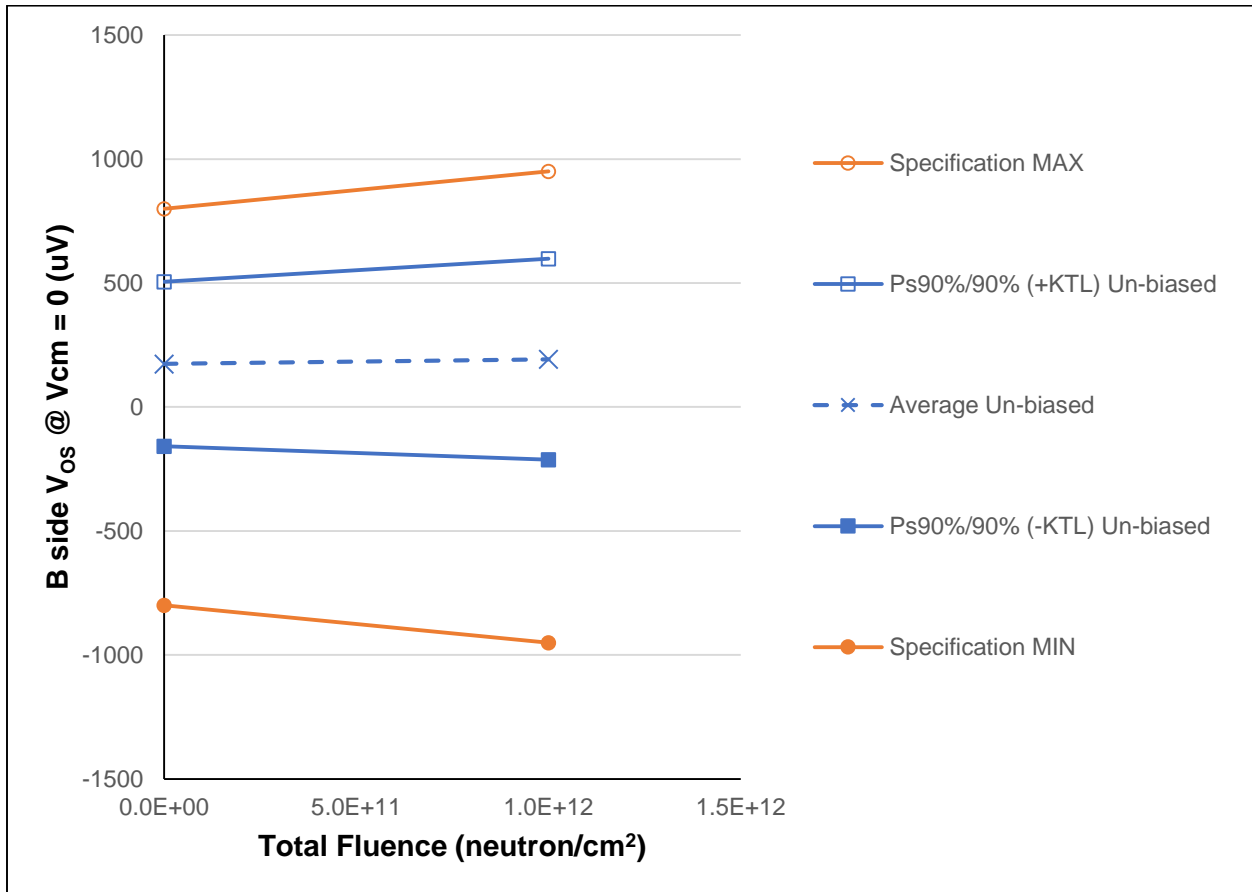


Figure 5.53 Plot of Input Offset Voltage V_{os} (B side) @ $V_{cm} = 0V$ versus Total Fluence

Table 5.53: Raw data table for V_{OS} (B side with $V_{cm} = 0V$) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	B V_{OS} @ $V_s=5V$, $V_{cm}=0V$	Total Fluence (neutron/cm ²)	
Units	(uV)	0	1.E+12
16	Un-biased Irradiation	353.148	436.855
17	Un-biased Irradiation	135.438	158.476
18	Un-biased Irradiation	44.366	81.722
19	Un-biased Irradiation	103.871	75.432
20	Un-biased Irradiation	230.946	211.450
13	Control Unit	62.428	63.271
14	Control Unit	-215.528	-215.798
Un-biased Irradiation Statistics			
	Average Un-biased	173.554	192.787
	Std Dev Un-biased	120.981	147.650
	Ps90%/90% (+KTL) Un-biased	505.285	597.644
	Ps90%/90% (-KTL) Un-biased	-158.177	-212.070
	Specification MIN	-800	-950
	Status (Measurements)	PASS	PASS
	Specification MAX	800	950
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

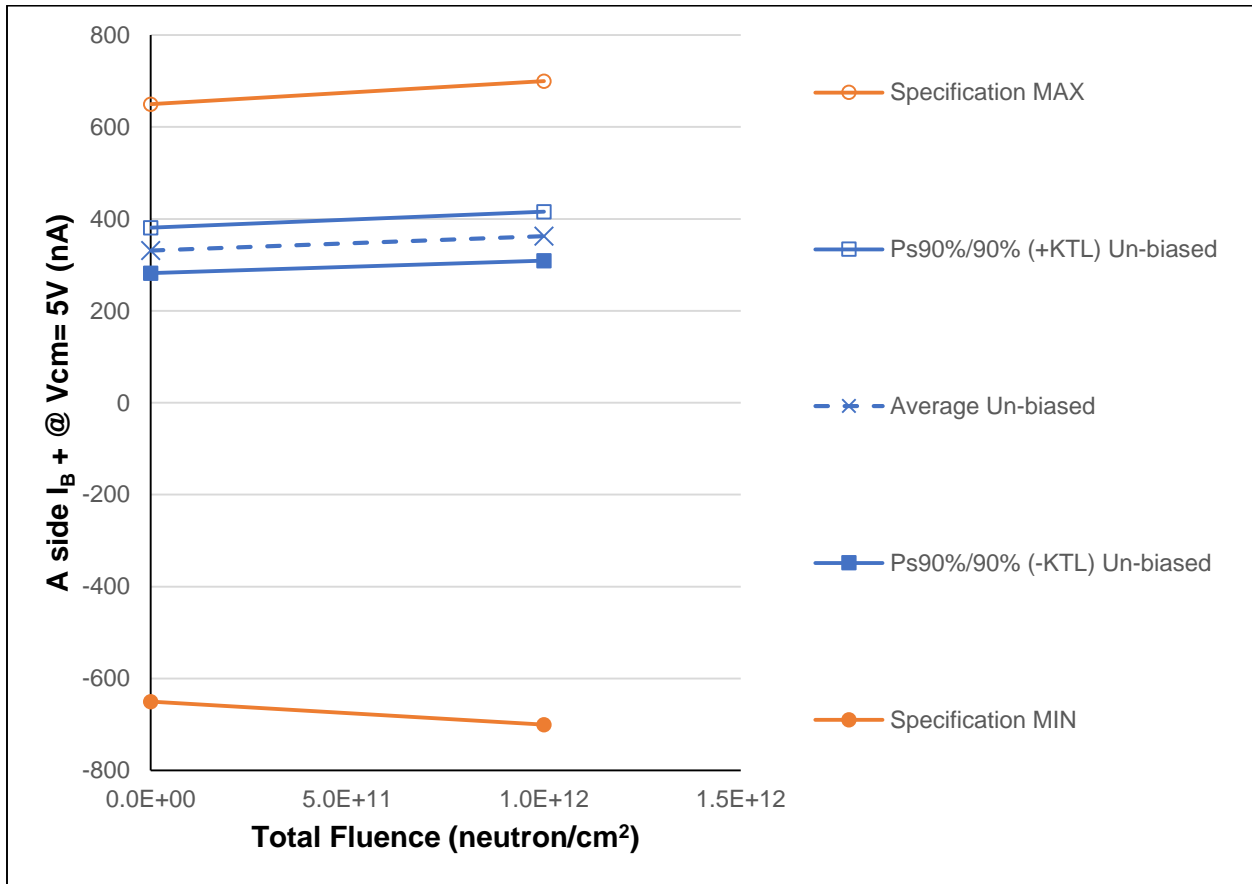


Figure 5.54: Plot of Positive Bias Current (A-side) @ Vcm = 5V versus Total Fluence

Table 5.54: Raw data table for I_{B+} @ V_{cm}=5V (side A) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A I _{B+} @ Vs=5V, Vcm=5V	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	326.081	357.544
17	Un-biased Irradiation	314.829	342.254
18	Un-biased Irradiation	321.510	349.704
19	Un-biased Irradiation	332.494	373.199
20	Un-biased Irradiation	361.370	390.822
13	Control Unit	326.749	327.271
14	Control Unit	339.698	337.937
	Un-biased Irradiation Statistics		
	Average Un-biased	331.257	362.705
	Std Dev Un-biased	18.028	19.459
	Ps90%/90% (+KTL) Un-biased	380.689	416.060
	Ps90%/90% (-KTL) Un-biased	281.825	309.349
	Specification MIN	-650	-700
	Status (Measurements)	PASS	PASS
	Specification MAX	650	700
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

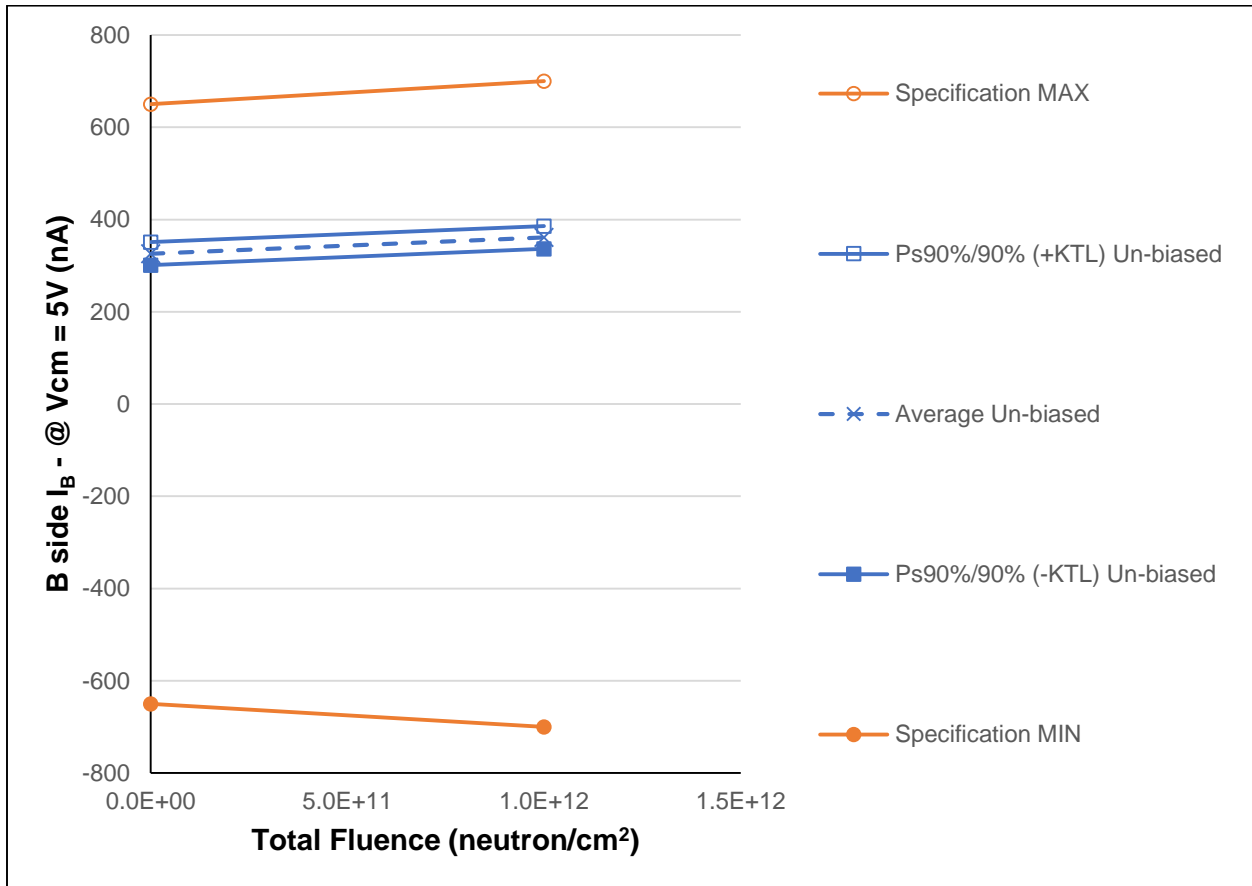


Figure 5.55: Plot of Positive Bias Current (B-side) @ Vcm = 5V versus Total Fluence

Table 5.55: Raw data table for I_{B+} @ $V_{cm}=5V$ (side B) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B I_{B+} @ $V_s=5V, V_{cm}=5V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	326.634	354.801
17	Un-biased Irradiation	318.770	361.663
18	Un-biased Irradiation	315.341	350.421
19	Un-biased Irradiation	337.005	372.165
20	Un-biased Irradiation	332.979	367.965
13	Control Unit	309.777	308.660
14	Control Unit	323.891	324.784
	Un-biased Irradiation Statistics		
	Average Un-biased	326.146	361.403
	Std Dev Un-biased	9.165	8.988
	Ps90%/90% (+KTL) Un-biased	351.277	386.048
	Ps90%/90% (-KTL) Un-biased	301.014	336.758
	Specification MIN	-650	-700
	Status (Measurements)	PASS	PASS
	Specification MAX	650	700
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

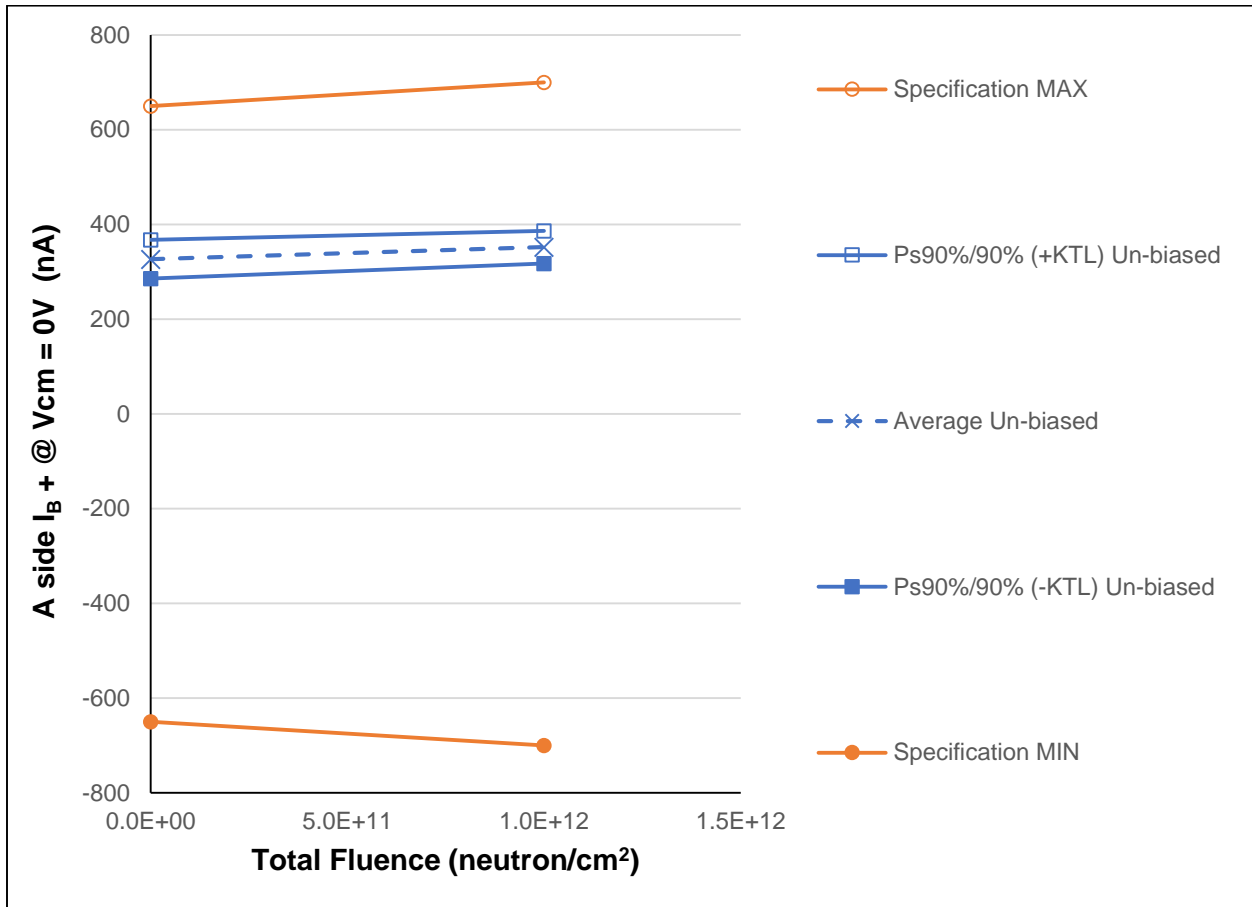


Figure 5.56: Plot of Positive Bias Current (A-side) @ Vcm = 0V versus Total Fluence

Table 5.56: Raw data table for I_{B+} @ $V_{cm}=0V$ (side B) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	$A_{I_{B+}}$ @ $V_s=5V, V_{cm}=0V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	318.710	344.906
17	Un-biased Irradiation	311.976	340.683
18	Un-biased Irradiation	316.626	345.631
19	Un-biased Irradiation	341.307	371.066
20	Un-biased Irradiation	343.854	358.718
13	Control Unit	305.058	305.470
14	Control Unit	314.212	313.935
Un-biased Irradiation Statistics			
	Average Un-biased	326.494	352.201
	Std Dev Un-biased	14.913	12.524
	Ps90%/90% (+KTL) Un-biased	367.385	386.542
	Ps90%/90% (-KTL) Un-biased	285.604	317.860
	Specification MIN	-650	-700
	Status (Measurements)	PASS	PASS
	Specification MAX	650	700
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

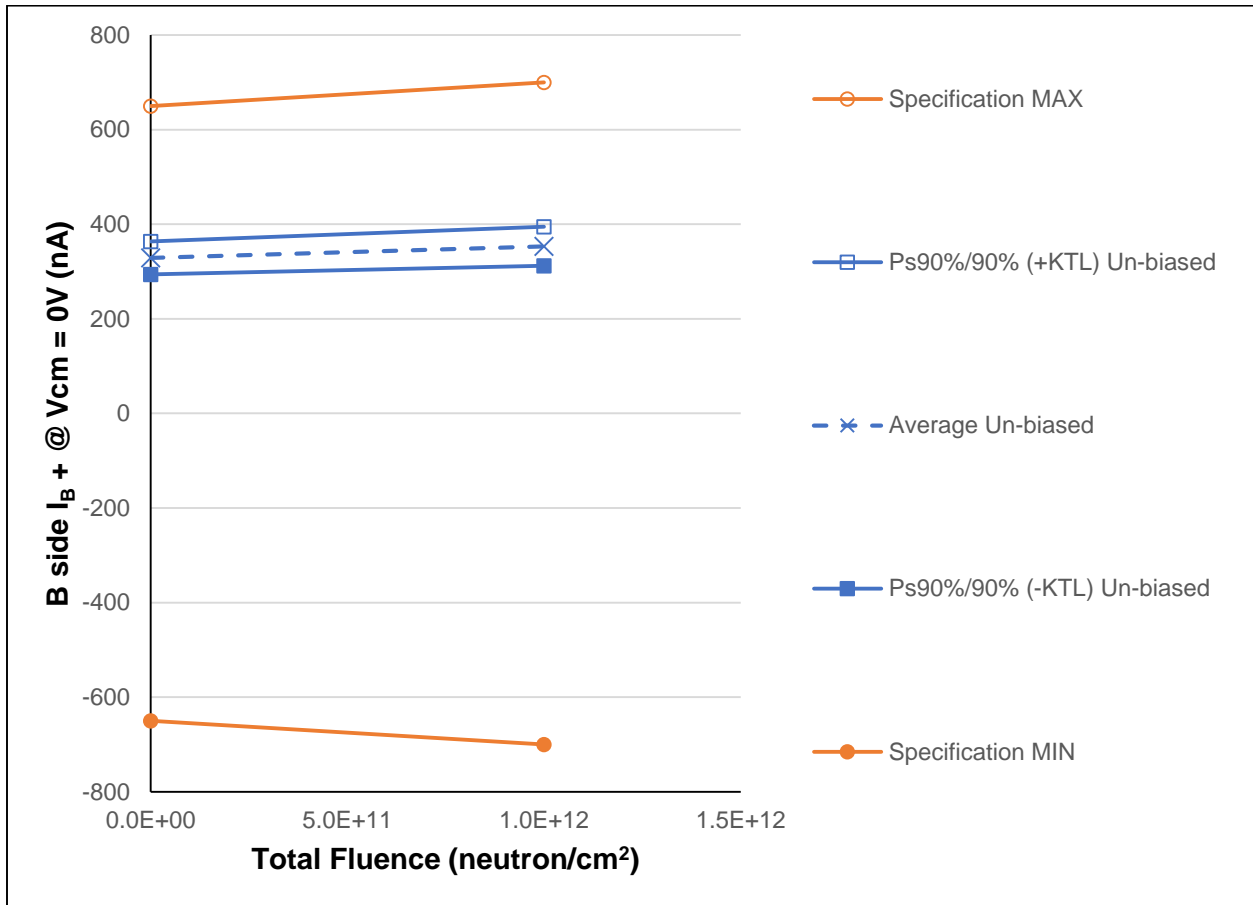


Figure 5.57: Plot of Positive Bias Current (B-side) @ Vcm = 0V versus Total Fluence

Table 5.57: Raw data table for I_{B+} @ $V_{cm}=0V$ (side B) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B I_{B+} @ $V_s=5V, V_{cm}=0V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	320.285	339.241
17	Un-biased Irradiation	321.136	353.363
18	Un-biased Irradiation	317.779	337.307
19	Un-biased Irradiation	345.685	369.113
20	Un-biased Irradiation	339.512	367.423
13	Control Unit	298.610	299.199
14	Control Unit	308.229	308.400
Un-biased Irradiation Statistics			
	Average Un-biased	328.879	353.289
	Std Dev Un-biased	12.772	15.025
	Ps90%/90% (+KTL) Un-biased	363.901	394.487
	Ps90%/90% (-KTL) Un-biased	293.858	312.092
	Specification MIN	-650	-700
	Status (Measurements)	PASS	PASS
	Specification MAX	650	700
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

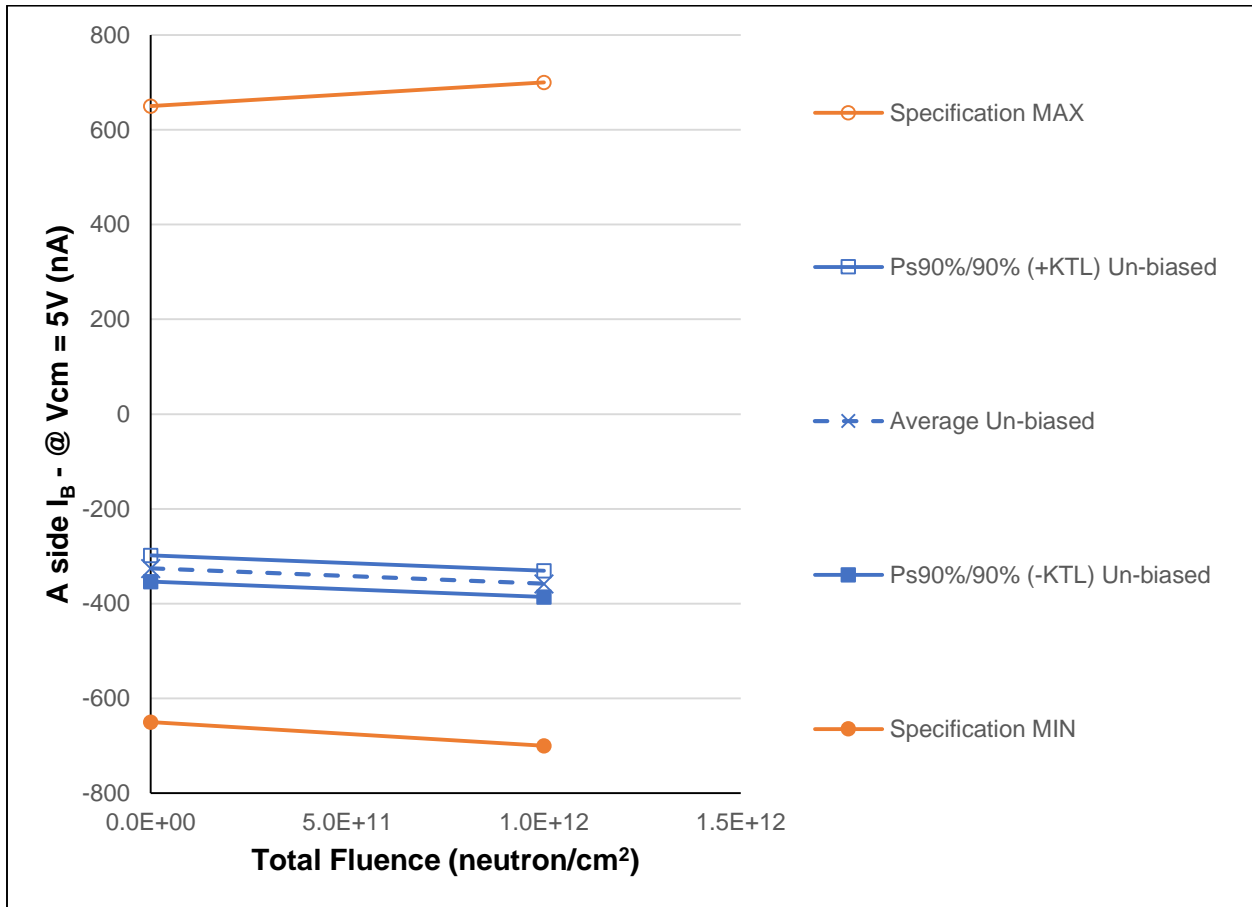


Figure 5.58: Plot of Negative Bias Current (A-side) @ V_{cm} = 5V versus Total Fluence

Table 5.58: Raw data table for I_B^- @ $V_{cm}=5V$ (side A) of pre- and post-irradiation ($1E12 N/cm^2$)

Parameter	$A I_B^-$ @ $V_s=5V, V_{cm}=5V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-322.468	-351.278
17	Un-biased Irradiation	-313.109	-347.441
18	Un-biased Irradiation	-321.659	-356.264
19	Un-biased Irradiation	-333.624	-362.474
20	Un-biased Irradiation	-338.146	-373.170
13	Control Unit	-322.483	-322.829
14	Control Unit	-331.338	-330.980
Un-biased Irradiation Statistics			
	Average Un-biased	-325.801	-358.125
	Std Dev Un-biased	10.037	10.121
	Ps90%/90% (+KTL) Un-biased	-298.280	-330.373
	Ps90%/90% (-KTL) Un-biased	-353.322	-385.878
	Specification MIN	-650	-700
	Status (Measurements)	PASS	PASS
	Specification MAX	650	700
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

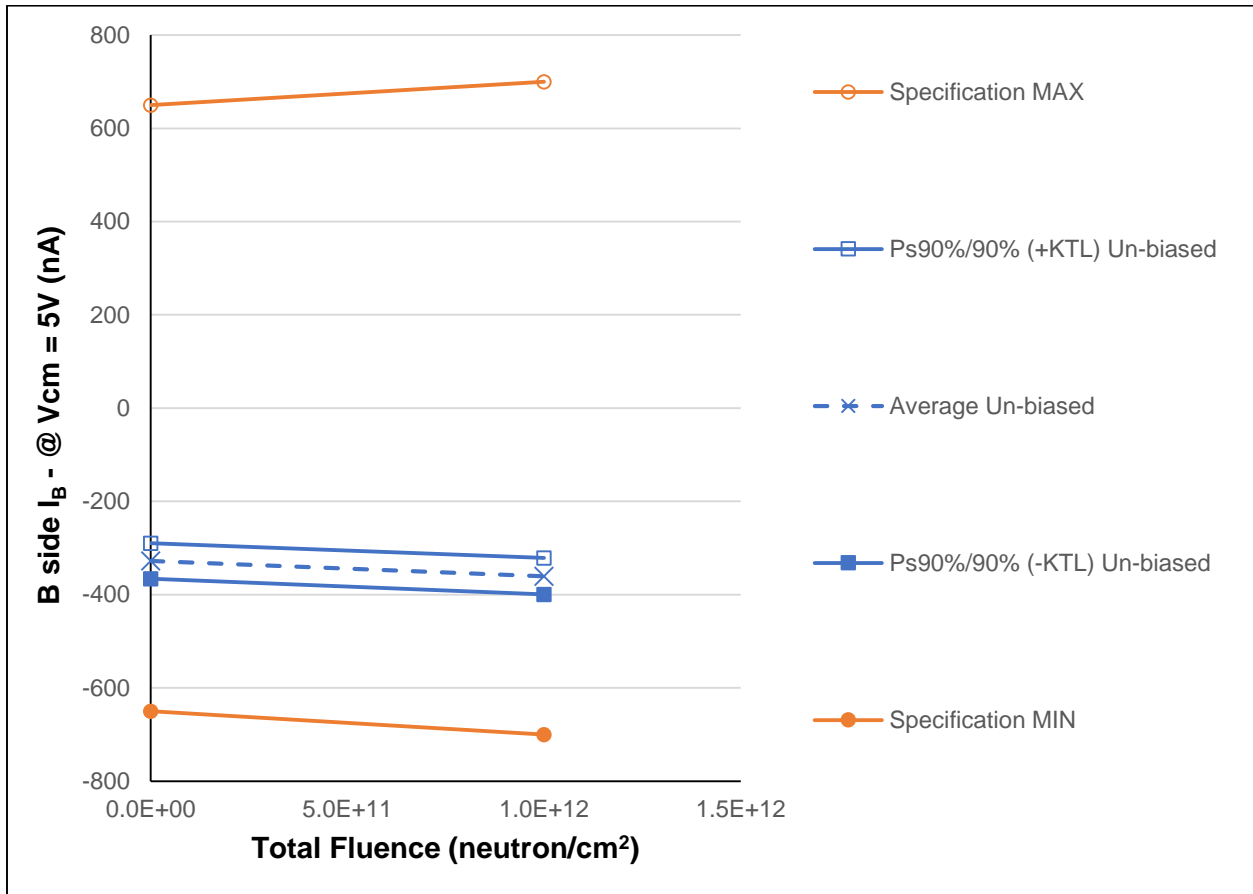


Figure 5.59: Plot of Negative Bias Current (B-side) @ Vcm = 5V versus Total Fluence

Table 5.59: Raw data table for I_B^- @ $V_{cm}=5V$ (side B) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B I_B^- @ $V_s=5V$, $V_{cm}=5V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-322.521	-349.535
17	Un-biased Irradiation	-315.508	-351.732
18	Un-biased Irradiation	-315.768	-353.196
19	Un-biased Irradiation	-338.252	-365.159
20	Un-biased Irradiation	-346.257	-383.805
13	Control Unit	-308.530	-307.330
14	Control Unit	-317.878	-317.889
	Un-biased Irradiation Statistics		
	Average Un-biased	-327.661	-360.686
	Std Dev Un-biased	13.906	14.275
	Ps90%/90% (+KTL) Un-biased	-289.530	-321.543
	Ps90%/90% (-KTL) Un-biased	-365.793	-399.828
	Specification MIN	-650	-700
	Status (Measurements)	PASS	PASS
	Specification MAX	650	700
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

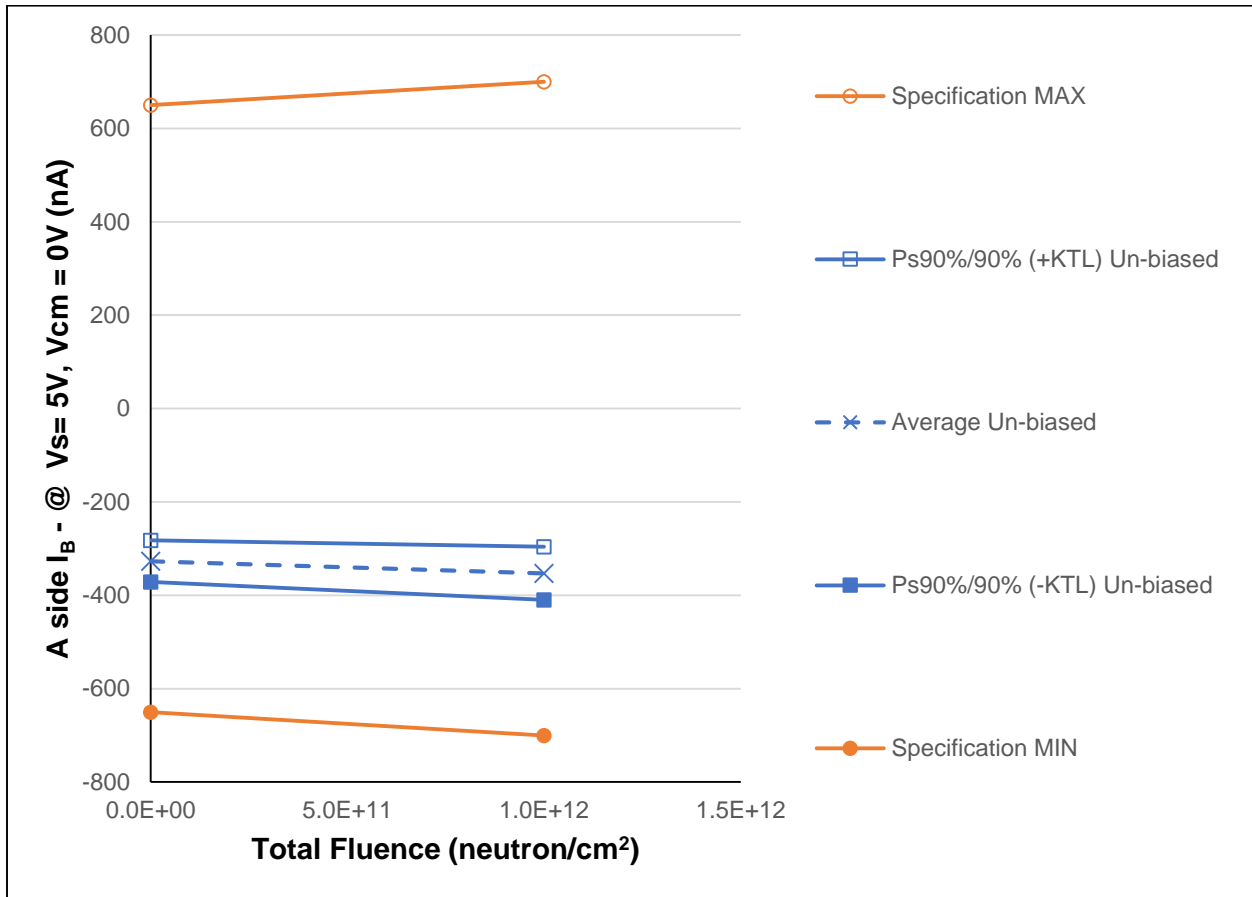


Figure 5.60: Plot of Negative Bias Current (A-side) @ $V_{cm} = 0V$ versus Total Fluence

Table 5.60: Raw data table for I_{B-} @ $V_{cm}=0V$ (side A) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	A I_{B-} @ $V_s=5V, V_{cm}=0V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-316.817	-336.703
17	Un-biased Irradiation	-314.387	-343.233
18	Un-biased Irradiation	-314.272	-333.884
19	Un-biased Irradiation	-341.339	-372.850
20	Un-biased Irradiation	-347.509	-377.656
13	Control Unit	-304.409	-304.953
14	Control Unit	-312.441	-312.410
Un-biased Irradiation Statistics			
	Average Un-biased	-326.865	-352.865
	Std Dev Un-biased	16.209	20.786
	Ps90%/90% (+KTL) Un-biased	-282.421	-295.869
	Ps90%/90% (-KTL) Un-biased	-371.309	-409.861
	Specification MIN	-650	-700
	Status (Measurements)	PASS	PASS
	Specification MAX	650	700
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

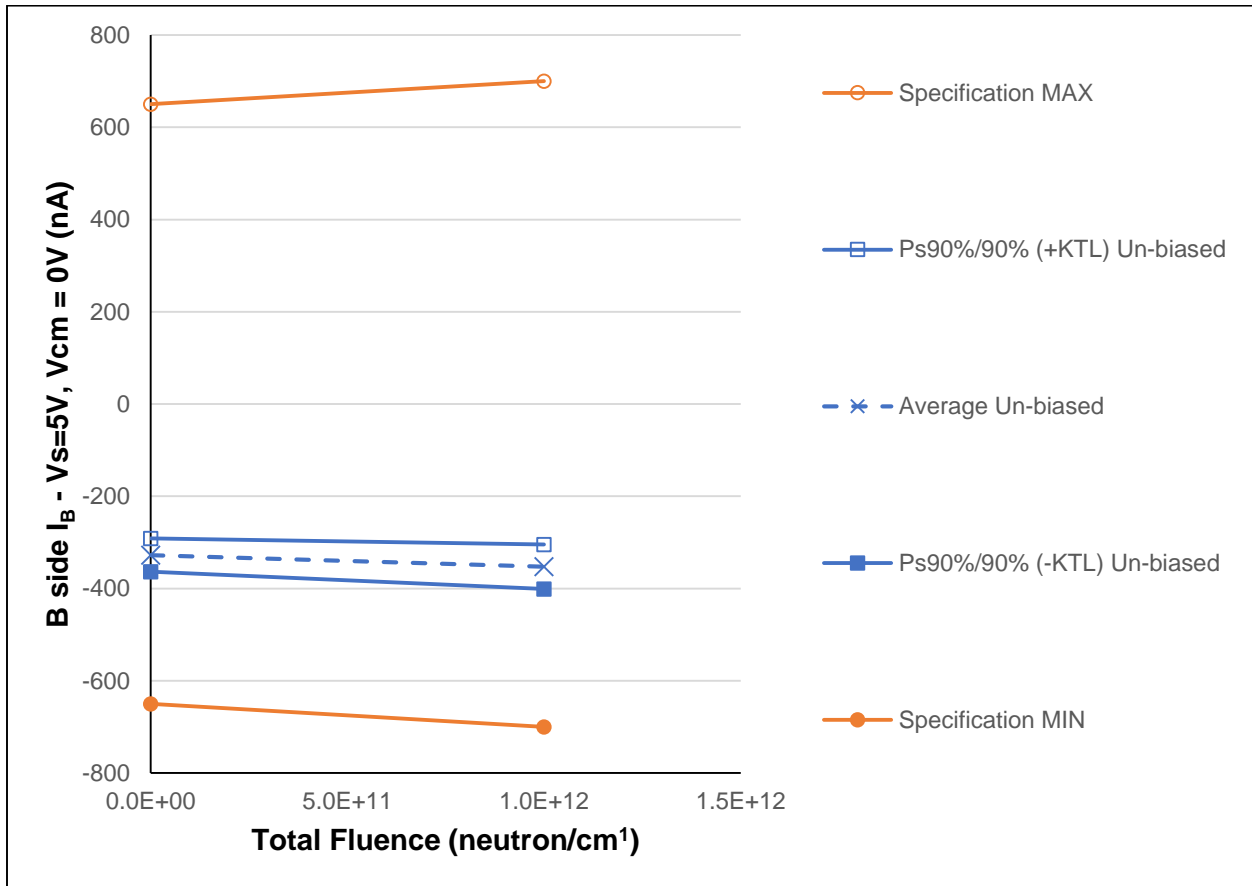


Figure 5.61: Plot of Negative Bias Current (B-side) @ Vcm = 0V versus Total Fluence

Table 5.61: Raw data table for I_B^- @ $V_{cm}=0V$ (side B) of pre- and post-irradiation ($1E12 N/cm^2$)

Parameter	B I_B^- @ $V_s=5V, V_{cm}=0V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-317.596	-340.536
17	Un-biased Irradiation	-319.942	-343.145
18	Un-biased Irradiation	-316.188	-336.733
19	Un-biased Irradiation	-342.503	-367.436
20	Un-biased Irradiation	-341.248	-375.890
13	Control Unit	-297.694	-298.438
14	Control Unit	-310.785	-310.824
Un-biased Irradiation Statistics			
	Average Un-biased	-327.495	-352.748
	Std Dev Un-biased	13.203	17.671
	Ps90%/90% (+KTL) Un-biased	-291.293	-304.293
	Ps90%/90% (-KTL) Un-biased	-363.698	-401.203
	Specification MIN	-650	-700
	Status (Measurements)	PASS	PASS
	Specification MAX	650	700
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

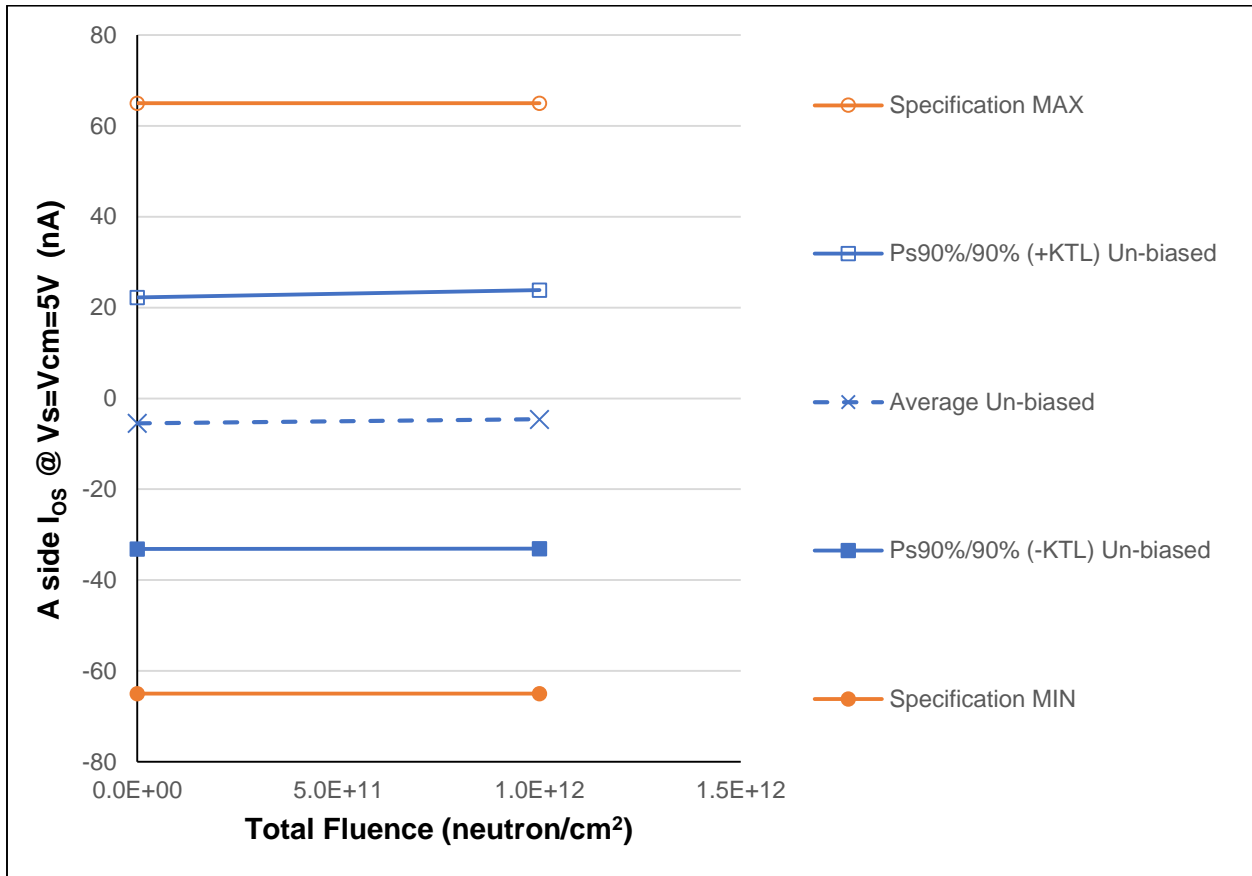


Figure 5.62: Plot of Input Offset Current (A-side) @ $V_s = V_{cm} = 5V$ versus Total Fluence

Table 5.62: Raw data table for I_{os} @ $V_s=V_{cm}=5V$ (side A) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	A I_{os} @ $V_s=5V, V_{cm}=5V$	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(nA)		
16	Un-biased Irradiation	-3.613	-6.266
17	Un-biased Irradiation	-1.721	5.186
18	Un-biased Irradiation	0.148	6.560
19	Un-biased Irradiation	1.129	-10.725
20	Un-biased Irradiation	-23.225	-17.652
13	Control Unit	-4.266	-4.442
14	Control Unit	-8.359	-6.956
Un-biased Irradiation Statistics			
	Average Un-biased	-5.456	-4.579
	Std Dev Un-biased	10.098	10.380
	Ps90%/90% (+KTL) Un-biased	22.231	23.882
	Ps90%/90% (-KTL) Un-biased	-33.144	-33.041
	Specification MIN	-65	-65
	Status (Measurements)	PASS	PASS
	Specification MAX	65	65
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

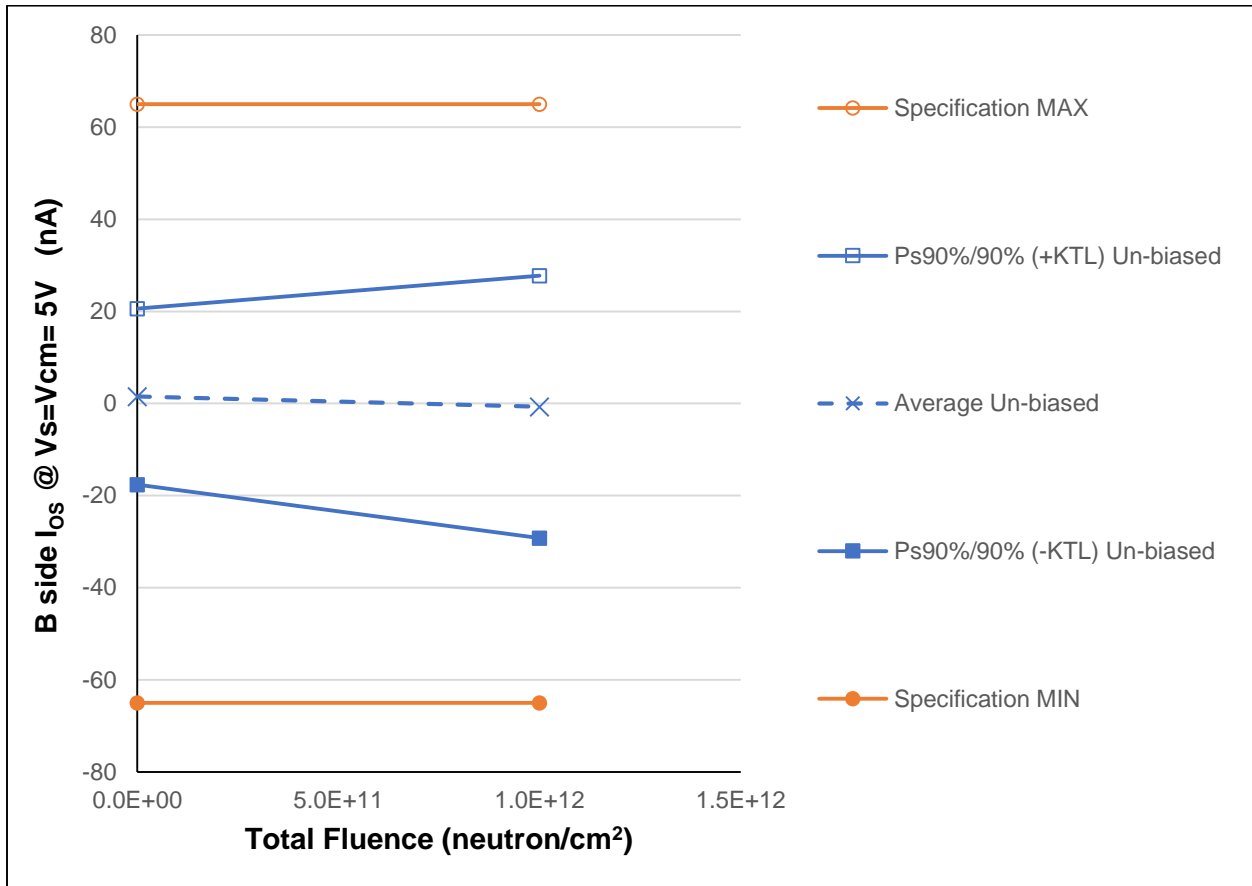


Figure 5.63: Plot of Input Offset Current (B-side) @ $V_s = V_{cm} = 5V$ versus Total Fluence

Table 5.63: Raw data table for I_{OS} @ $V_s=V_{cm}=5V$ (side B) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B I_{OS} @ $V_s=5V, V_{cm}=5V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	-4.113	-5.266
17	Un-biased Irradiation	-3.262	-9.931
18	Un-biased Irradiation	0.427	2.776
19	Un-biased Irradiation	1.247	-7.006
20	Un-biased Irradiation	13.278	15.841
13	Control Unit	-1.248	-1.329
14	Control Unit	-6.014	-6.895
Un-biased Irradiation Statistics			
	Average Un-biased	1.515	-0.717
	Std Dev Un-biased	6.966	10.386
	Ps90%/90% (+KTL) Un-biased	20.617	27.762
	Ps90%/90% (-KTL) Un-biased	-17.586	-29.196
	Specification MIN	-65	-65
	Status (Measurements)	PASS	PASS
	Specification MAX	65	65
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

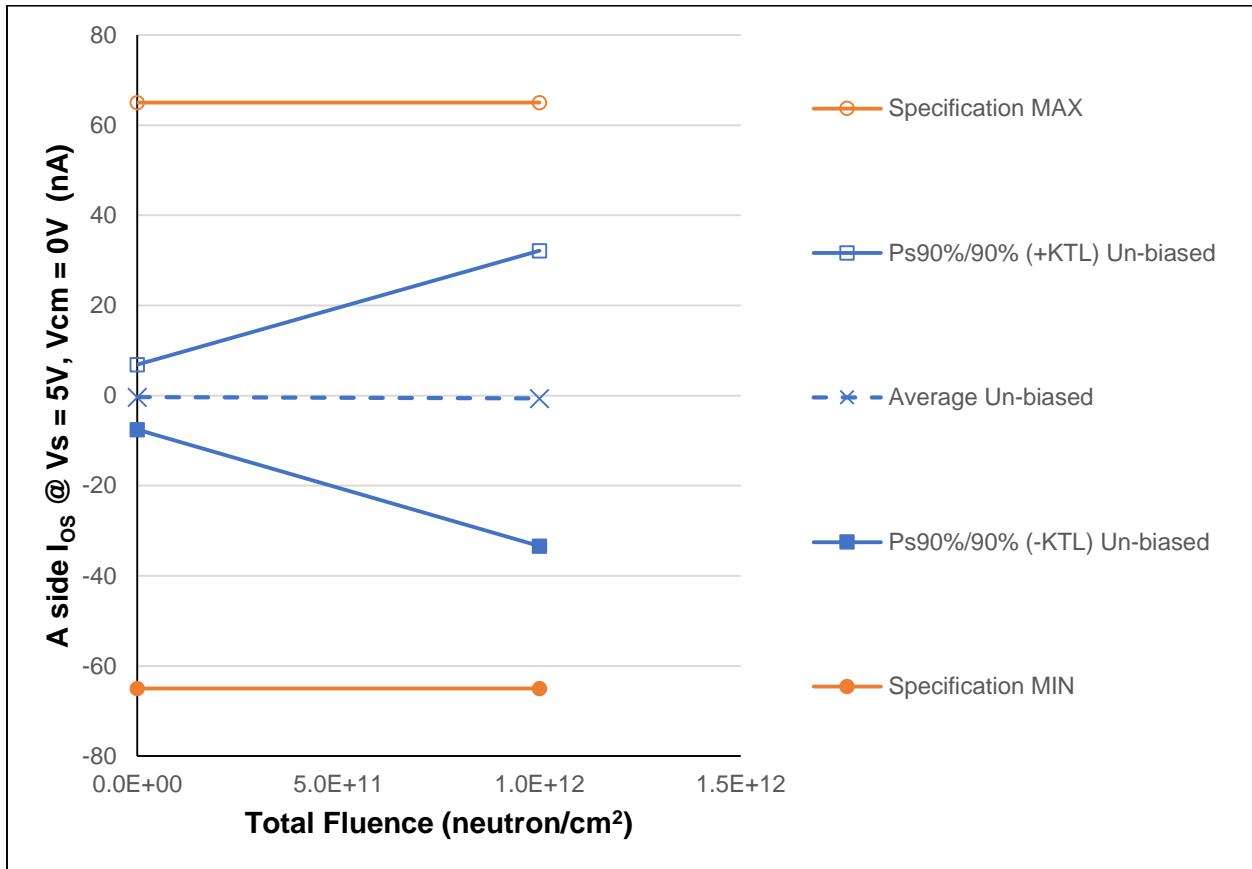


Figure 5.64: Plot of Input Offset Current (A-side) @ $V_s = 5V$, $V_{cm} = 0V$ versus Total Fluence

Table 5.64: Raw data table for I_{OS} @ $V_s=5V$, $V_{cm}=0V$ (side A) of pre- and post-irradiation ($1E12$ N/cm^2)

Parameter	A I_{OS} @ $V_s=5V$, $V_{cm}=0V$	Total Fluence (neutron/cm ²)	
Units	(nA)	0	1.E+12
16	Un-biased Irradiation	1.892	8.203
17	Un-biased Irradiation	-2.411	-2.550
18	Un-biased Irradiation	2.354	11.747
19	Un-biased Irradiation	-0.031	-1.784
20	Un-biased Irradiation	-3.655	-18.938
13	Control Unit	0.649	0.517
14	Control Unit	1.770	1.524
Un-biased Irradiation Statistics			
	Average Un-biased	-0.370	-0.664
	Std Dev Un-biased	2.627	11.952
	Ps90%/90% (+KTL) Un-biased	6.834	32.109
	Ps90%/90% (-KTL) Un-biased	-7.574	-33.437
	Specification MIN	-65	-65
	Status (Measurements)	PASS	PASS
	Specification MAX	65	65
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased	PASS	PASS

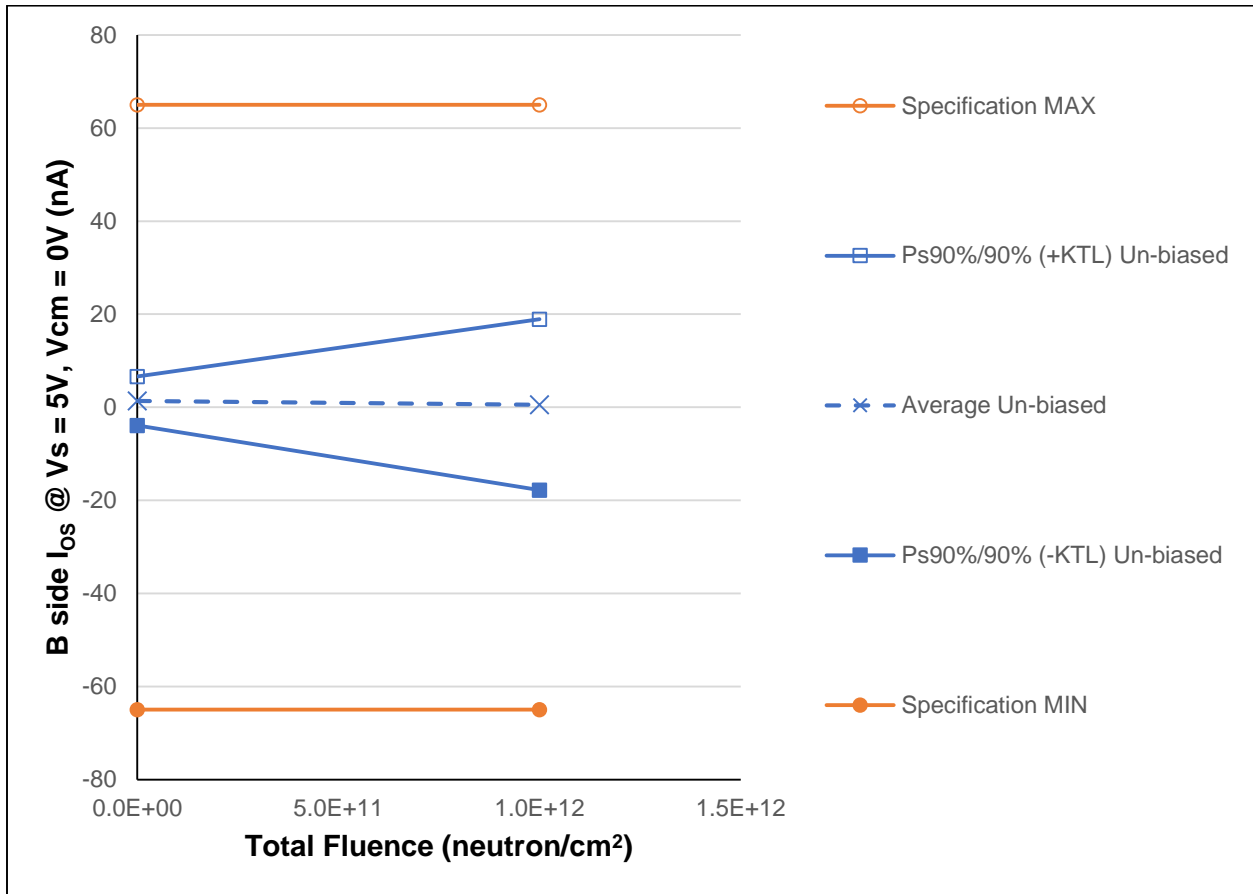


Figure 5.65: Plot of Input Offset Current (B-side) @ $V_s = 5V$, $V_{cm} = 0V$ versus Total Fluence

Table 5.65: Raw data table for I_{OS} @ $V_s=5V$, $V_{cm}=0V$ (side B) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B	I_{OS} @ $V_s=5V$, $V_{cm}=0V$	Total Fluence (neutron/cm ²)	
Units		(nA)	0	1.E+12
16	Un-biased Irradiation		2.689	-1.295
17	Un-biased Irradiation		1.194	10.218
18	Un-biased Irradiation		1.591	0.574
19	Un-biased Irradiation		3.182	1.677
20	Un-biased Irradiation		-1.736	-8.466
13	Control Unit		0.915	0.761
14	Control Unit		-2.556	-2.424
	Un-biased Irradiation Statistics			
	Average Un-biased		1.384	0.542
	Std Dev Un-biased		1.920	6.698
	Ps90%/90% (+KTL) Un-biased		6.650	18.906
	Ps90%/90% (-KTL) Un-biased		-3.882	-17.823
	Specification MIN		-65	-65
	Status (Measurements)		PASS	PASS
	Specification MAX		65	65
	Status (Measurements)		PASS	PASS
	Status (-KTL) Un-biased		PASS	PASS
	Status (+KTL) Un-biased		PASS	PASS

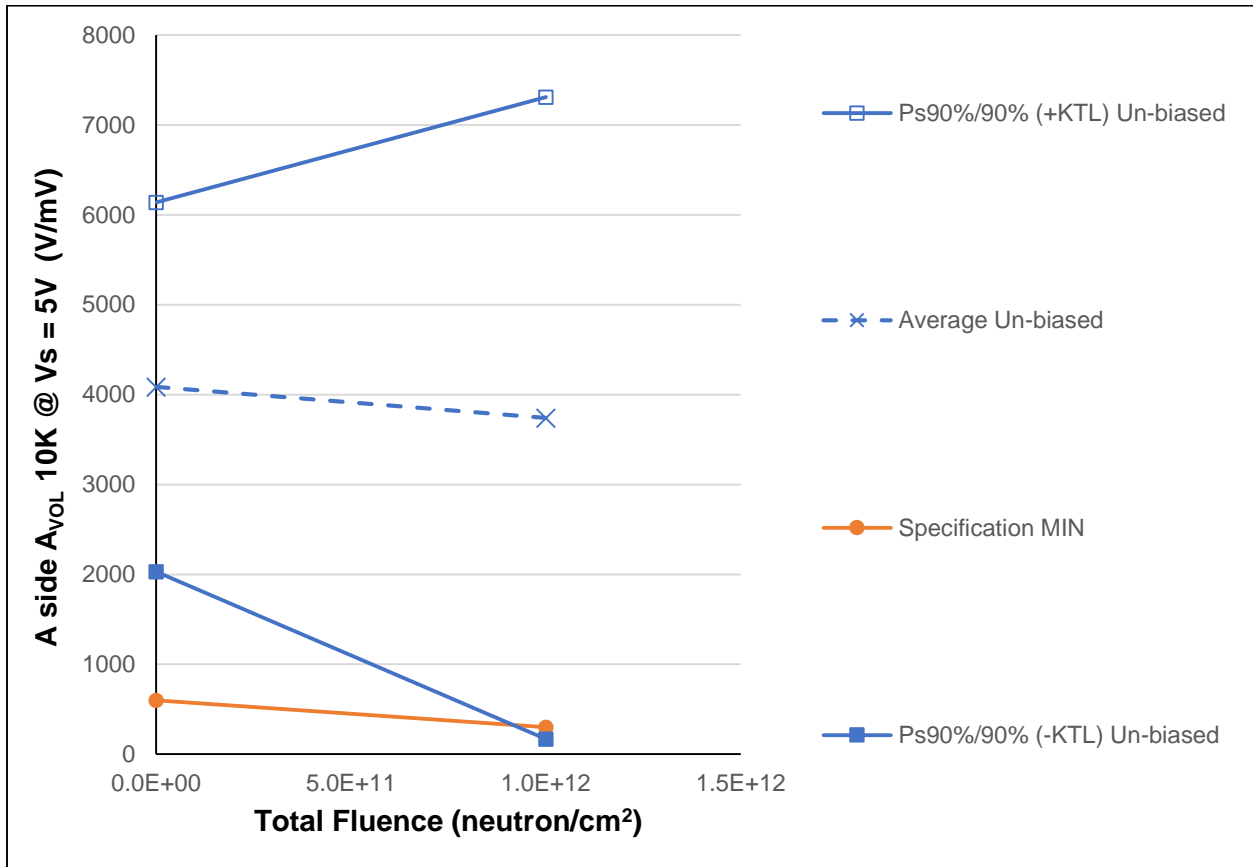


Figure 5.66: Plot of Large Signal Voltage Gain (A-side) @ Vs = 5V versus Total Fluence

Table 5.66: Raw data table for A_{VOL} @ $V_s=5V$ (side A) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	A GAIN @ $V_s = 5V$	Total Fluence (neutron/cm ²)	
Units	(V/mV)	0	1.E+12
16	Un-biased Irradiation	4362.288	2521.755
17	Un-biased Irradiation	3559.019	4604.496
18	Un-biased Irradiation	3051.132	4724.999
19	Un-biased Irradiation	4724.999	4724.999
20	Un-biased Irradiation	4724.999	2124.802
13	Control Unit	4502.884	3519.180
14	Control Unit	4724.999	4724.999
Un-biased Irradiation Statistics			
	Average Un-biased	4084.487	3740.210
	Std Dev Un-biased	748.603	1301.997
	Ps90%/90% (+KTL) Un-biased	6137.156	7310.286
	Ps90%/90% (-KTL) Un-biased	2031.819	170.134
	Specification MIN	600	300
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	FAIL
	Status (+KTL) Un-biased		

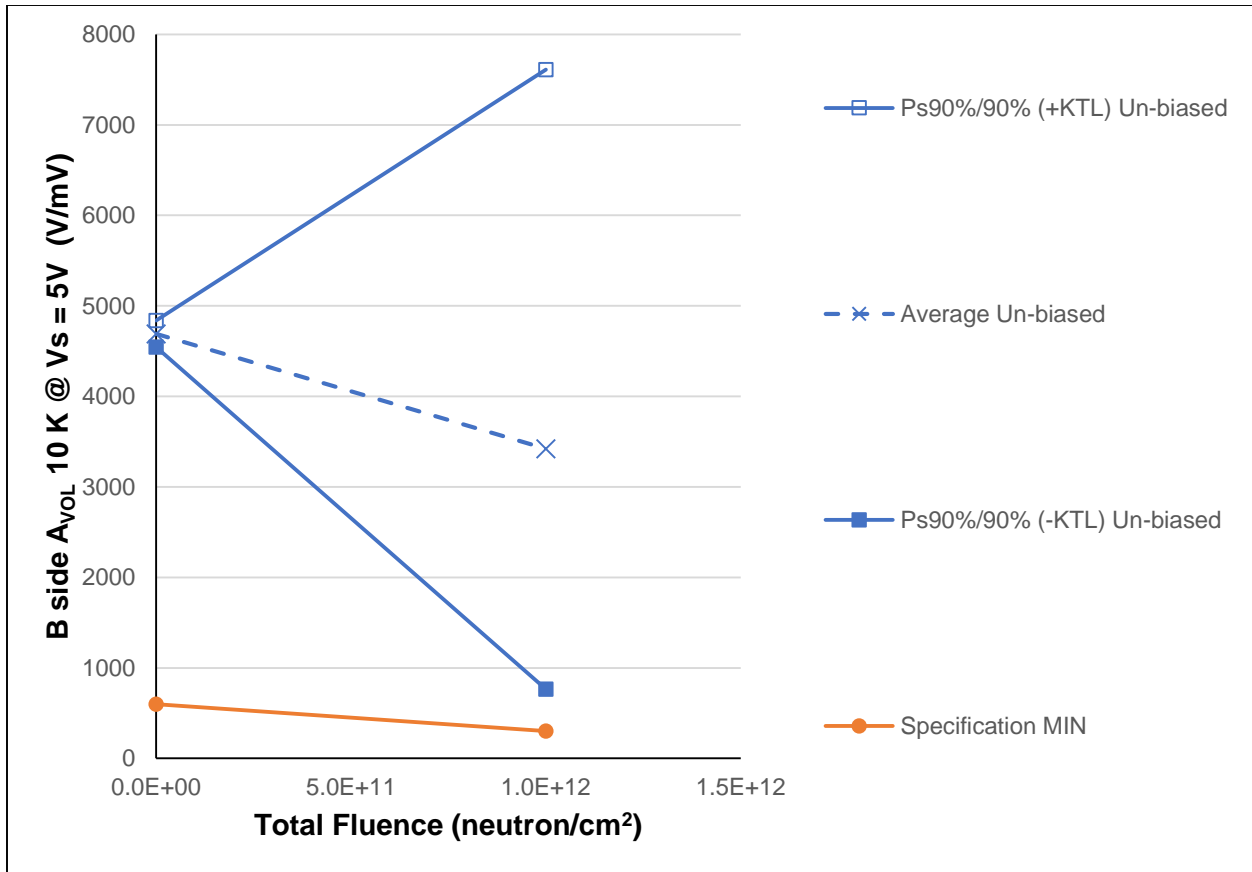


Figure 5.67: Plot of Large Signal Voltage Gain (B-side) @ Vs = 5V versus Total Fluence

Table 5.67: Raw data table for A_{VOL} @ $V_s=5V$ (side B) of pre- and post-irradiation ($1E12$ N/cm²)

Parameter	B GAIN @ $V_s = 5V$	Total Fluence (neutron/cm ²)	
Units	(V/mV)	0	1.E+12
16	Un-biased Irradiation	4673.008	1214.254
17	Un-biased Irradiation	4603.423	2522.821
18	Un-biased Irradiation	4724.999	4724.999
19	Un-biased Irradiation	4724.999	3920.492
20	Un-biased Irradiation	4724.999	4724.999
13	Control Unit	2715.271	4060.648
14	Control Unit	4724.999	3356.922
Un-biased Irradiation Statistics			
	Average Un-biased	4690.286	3421.513
	Std Dev Un-biased	53.523	1526.988
	Ps90%/90% (+KTL) Un-biased	4837.045	7608.514
	Ps90%/90% (-KTL) Un-biased	4543.527	765.488
	Specification MIN	600	300
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

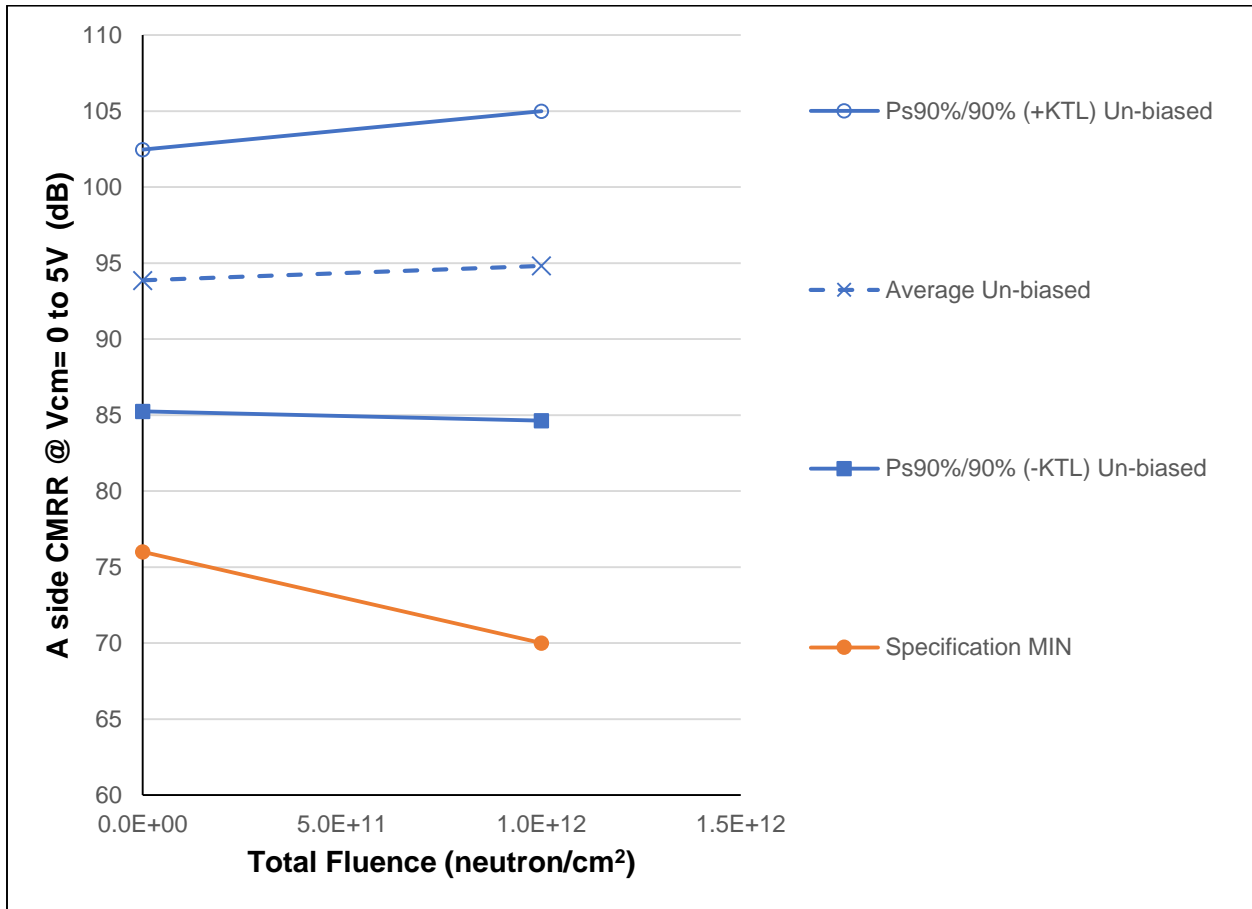


Figure 5.68: Plot of Common Mode Rejection Ratio (A-side) @ Vs = 5V versus Total Fluence

Table 5.68: Raw data table for CMRR @ Vs=5V (side A) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A	CMRR, Vcm = 0 TO 5V	Total Fluence (neutron/cm ²)	
Units		(dB)	0	1.E+12
16		Un-biased Irradiation	92.843	93.397
17		Un-biased Irradiation	97.993	99.957
18		Un-biased Irradiation	89.432	89.789
19		Un-biased Irradiation	95.151	94.945
20		Un-biased Irradiation	93.863	96.004
13		Control Unit	94.806	94.644
14		Control Unit	89.422	89.392
		Un-biased Irradiation Statistics		
		Average Un-biased	93.856	94.819
		Std Dev Un-biased	3.138	3.713
		Ps90%/90% (+KTL) Un-biased	102.461	105.000
		Ps90%/90% (-KTL) Un-biased	85.251	84.637
		Specification MIN	76	70
		Status (Measurements)	PASS	PASS
		Specification MAX		
		Status (Measurements)		
		Status (-KTL) Un-biased	PASS	PASS
		Status (+KTL) Un-biased		

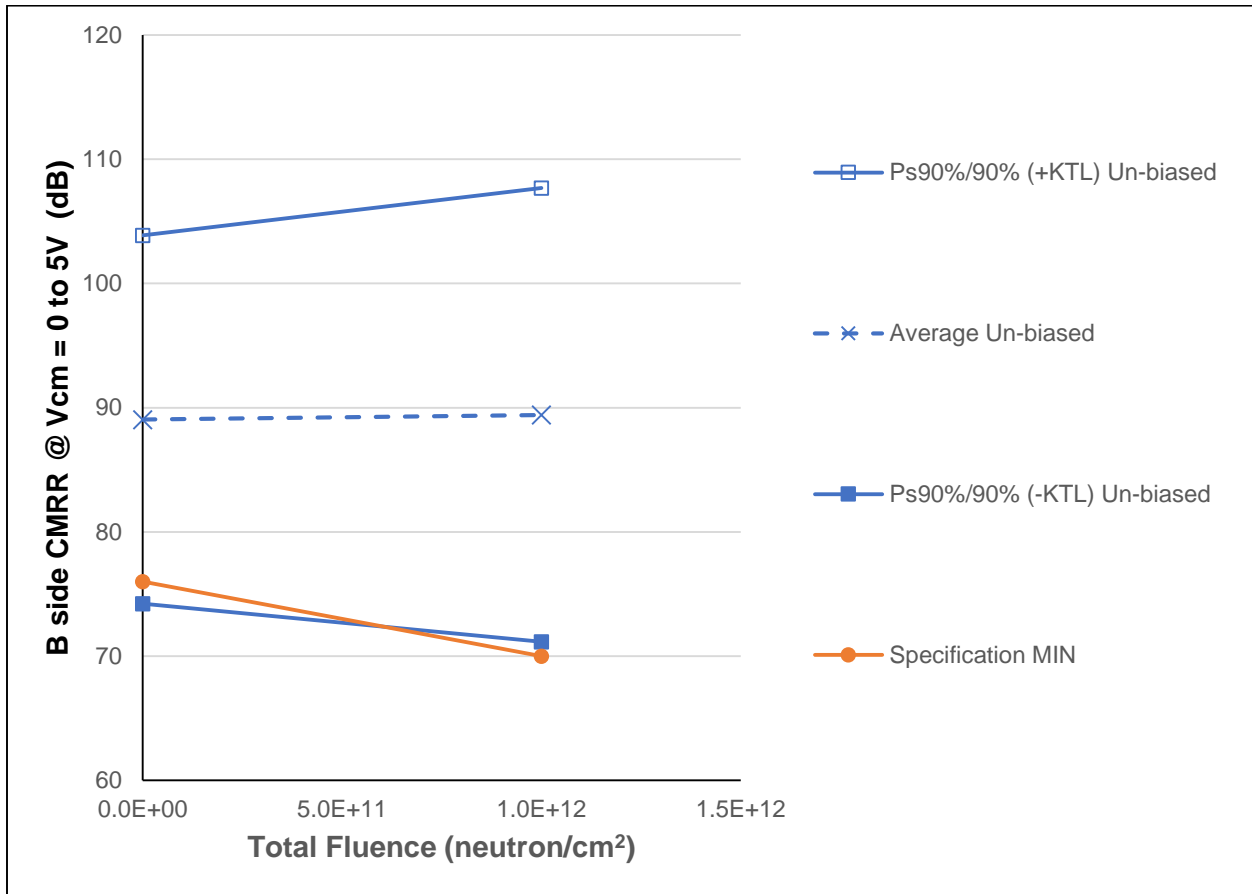


Figure 5.69: Plot of Common Mode Rejection Ratio (B-side) @ $V_s = 5V$ versus Total Fluence

Table 5.69: Raw data table for CMRR @ Vs=5V (side B) of pre- and post-irradiation (1E12 N/cm²)

Parameter	B CMRR, Vcm = 0 TO 5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(dB)		
16	Un-biased Irradiation	84.129	83.595
17	Un-biased Irradiation	83.946	83.516
18	Un-biased Irradiation	90.299	90.077
19	Un-biased Irradiation	89.780	90.097
20	Un-biased Irradiation	97.082	99.808
13	Control Unit	100.160	100.198
14	Control Unit	106.001	106.096
Un-biased Irradiation Statistics			
	Average Un-biased	89.047	89.419
	Std Dev Un-biased	5.405	6.663
	Ps90%/90% (+KTL) Un-biased	103.869	107.690
	Ps90%/90% (-KTL) Un-biased	74.226	71.148
	Specification MIN	76	70
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	FAIL	PASS
	Status (+KTL) Un-biased		

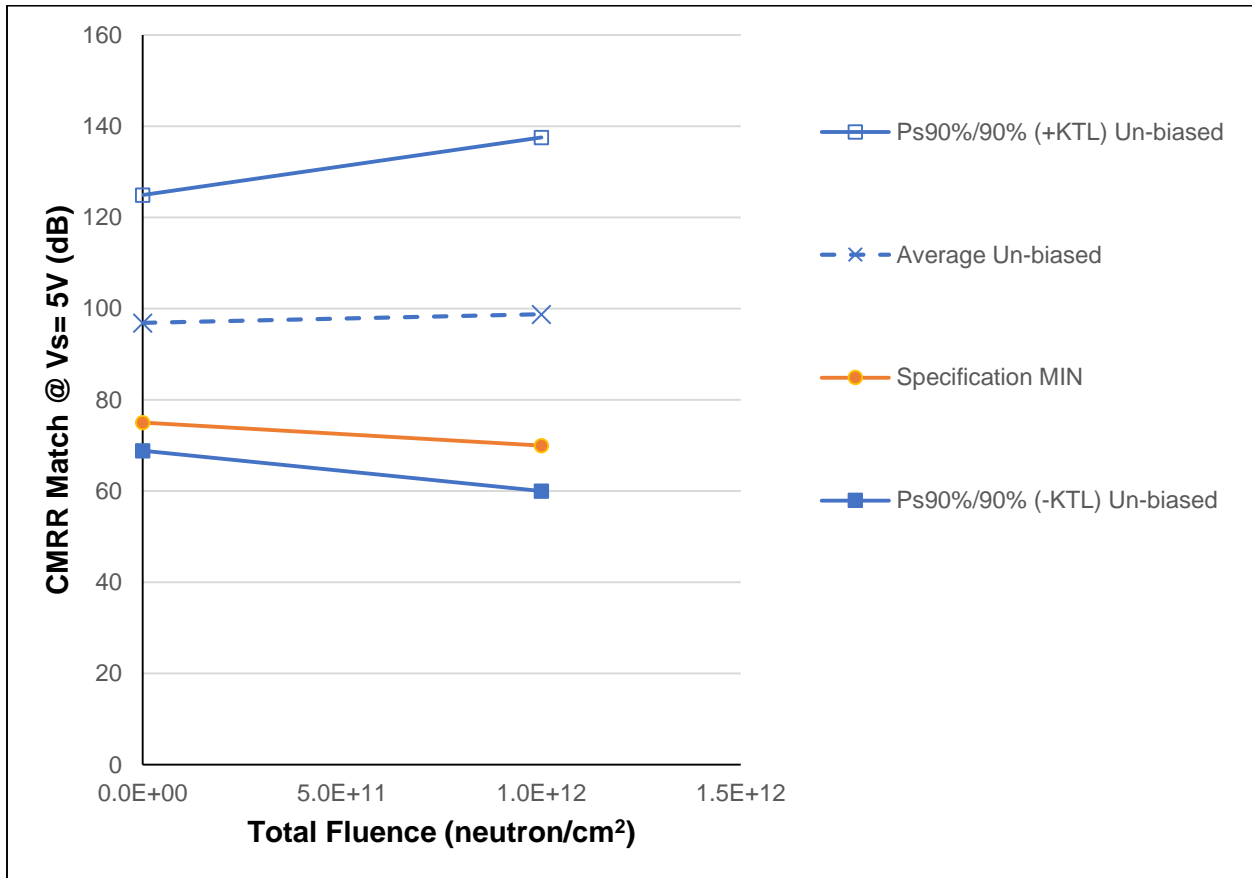


Figure 5.70: Plot of CMRR Match @ Vs = 5V versus Total Fluence

All five samples pass the CMRR Match test. The calculated -KTL line is lower than the specification MIN limit due to the small 5-piece sample size.

Table 5.70: Raw data table for CMRR match @ Vs=5V (side B) of pre- and post-irradiation (1E12 N/cm²)

Parameter	CMRR MATCH @ Vs = 5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(dB)		
16	Un-biased Irradiation	88.098	86.990
17	Un-biased Irradiation	85.868	84.934
18	Un-biased Irradiation	109.873	119.502
19	Un-biased Irradiation	96.503	97.474
20	Un-biased Irradiation	104.044	105.008
13	Control Unit	101.549	101.157
14	Control Unit	90.816	90.764
	Un-biased Irradiation Statistics		
	Average Un-biased	96.877	98.782
	Std Dev Un-biased	10.231	14.147
	Ps90%/90% (+KTL) Un-biased	124.929	137.574
	Ps90%/90% (-KTL) Un-biased	68.825	59.989
	Specification MIN	75	70
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	FAIL	FAIL
	Status (+KTL) Un-biased		

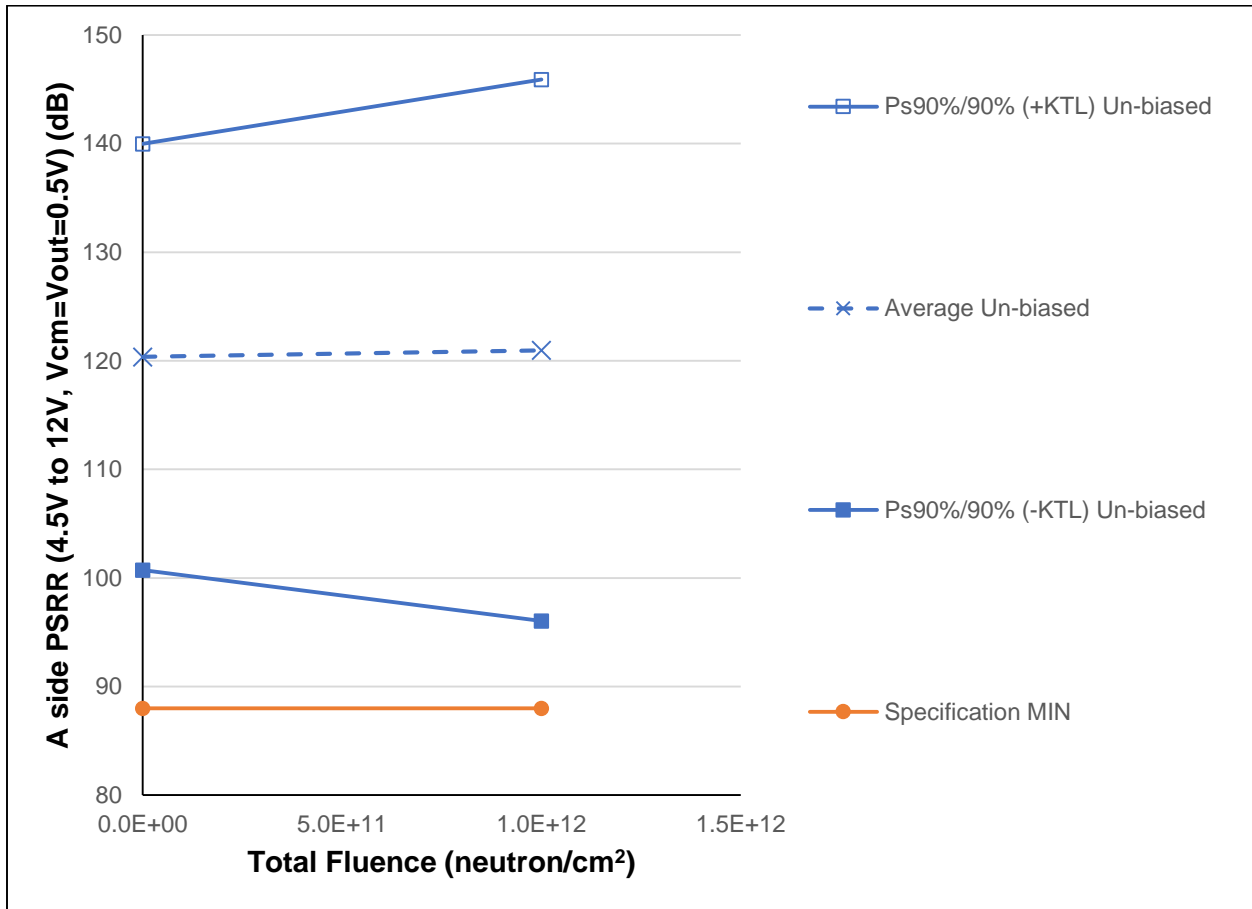


Figure 5.71: Plot of Power Supply Rejection Ratio @ Vs = 4.5V to 12V versus Total Fluence (A-side)

Table 5.71: Raw data table for PSRR @ Vs=4.5V to 12V (side A) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A PSRR,4.5V to 12V Vcm=Vout=0.5V Units (dB)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	118.522	116.443
17	Un-biased Irradiation	130.113	133.920
18	Un-biased Irradiation	119.266	120.005
19	Un-biased Irradiation	110.553	109.694
20	Un-biased Irradiation	123.364	124.758
13	Control Unit	131.616	132.883
14	Control Unit	107.883	107.875
Un-biased Irradiation Statistics			
	Average Un-biased	120.364	120.964
	Std Dev Un-biased	7.157	9.092
	Ps90%/90% (+KTL) Un-biased	139.988	145.893
	Ps90%/90% (-KTL) Un-biased	100.739	96.035
	Specification MIN	88	88
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

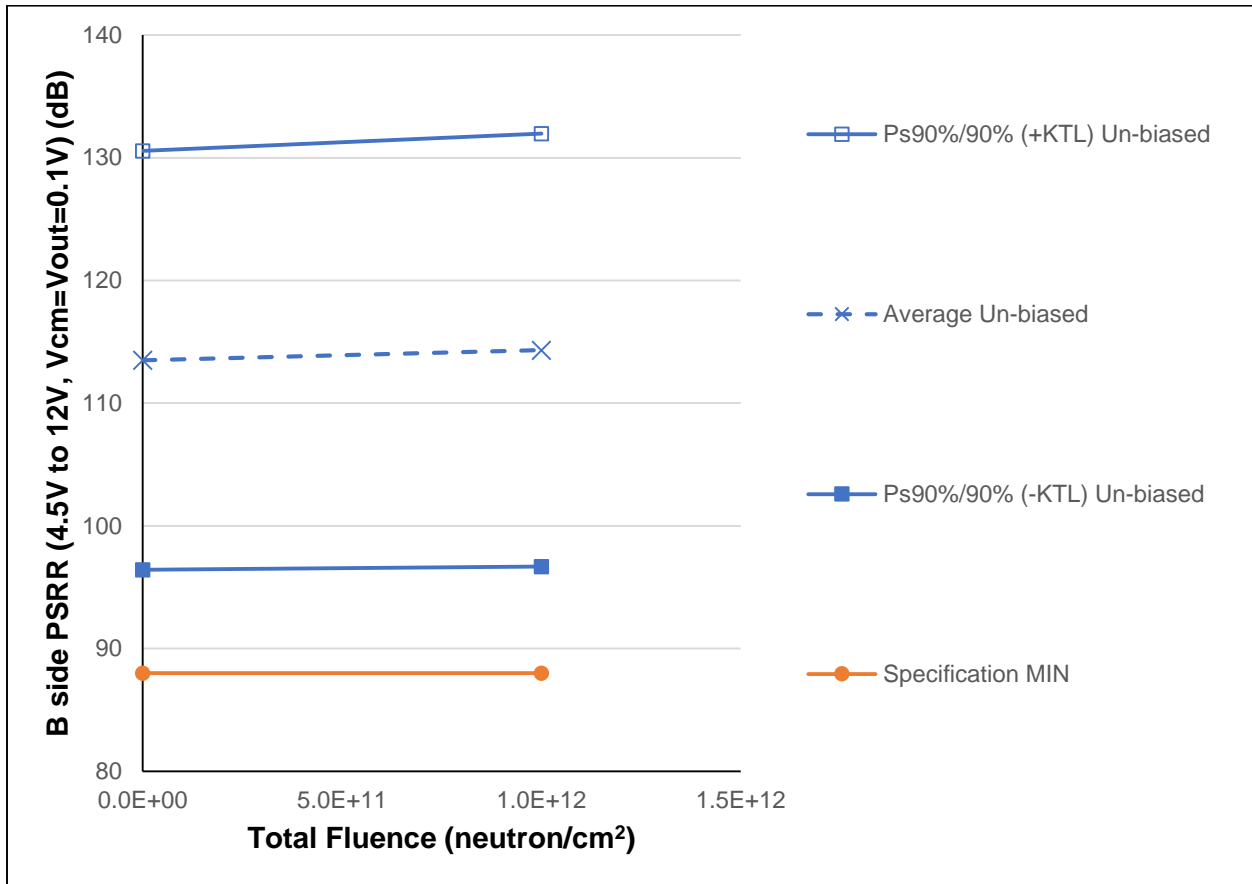


Figure 5.72: Plot of Power Supply Rejection Ratio @ Vs = 4.5V to 12V versus Total Fluence (B-side)

Table 5.72: Raw data table for PSRR @ Vs=4.5V to 12V (side B) of pre- and post-irradiation (1E12 N/cm²)

Parameter	B PSRR,4.5V to 12V,Vcm=Vout=0.5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(dB)		
16	Un-biased Irradiation	113.582	116.631
17	Un-biased Irradiation	110.318	110.959
18	Un-biased Irradiation	123.472	123.972
19	Un-biased Irradiation	113.330	113.126
20	Un-biased Irradiation	106.766	106.943
13	Control Unit	123.045	123.057
14	Control Unit	105.526	105.413
Un-biased Irradiation Statistics			
	Average Un-biased	113.494	114.326
	Std Dev Un-biased	6.224	6.435
	Ps90%/90% (+KTL) Un-biased	130.560	131.971
	Ps90%/90% (-KTL) Un-biased	96.427	96.681
	Specification MIN	88	88
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

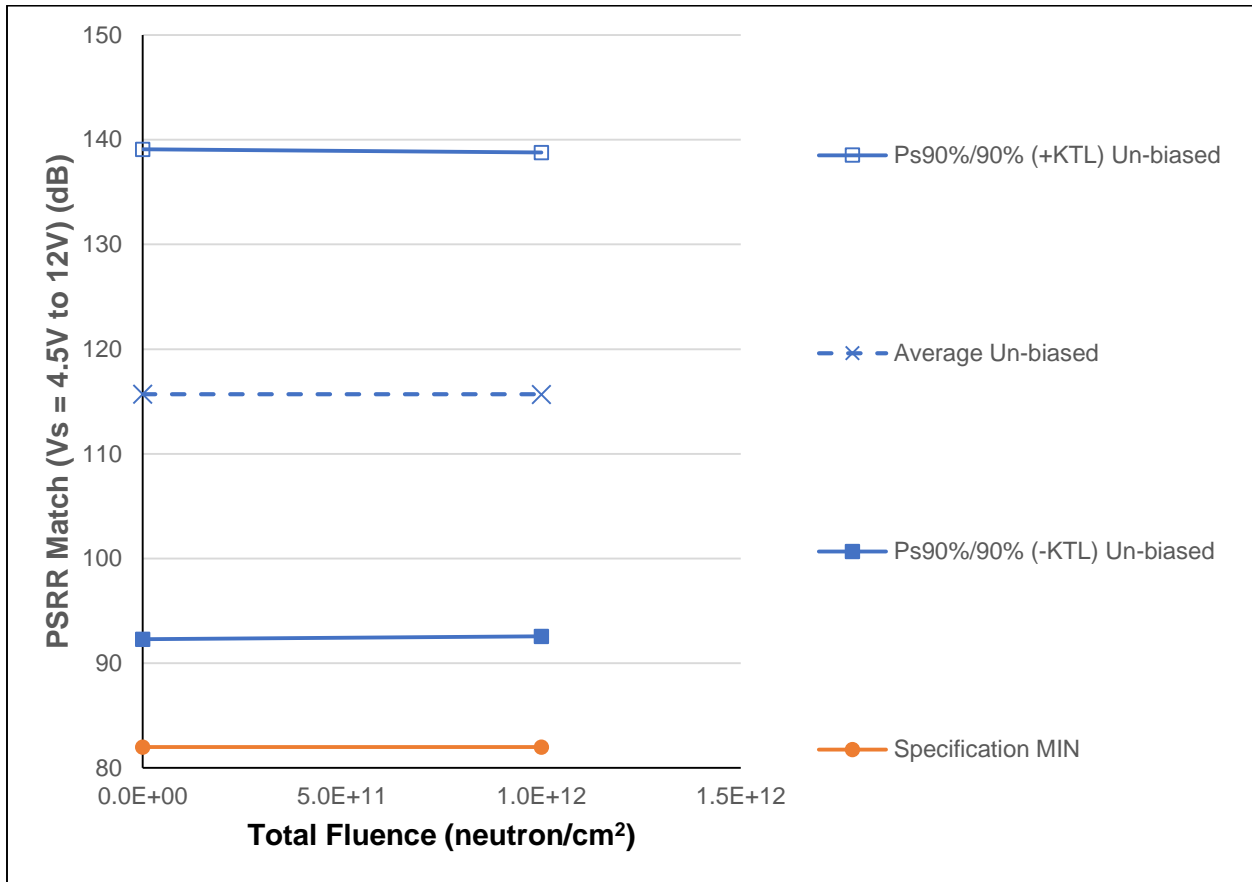


Figure 5.73: Plot of PSRR Match @ Vs = 4.5V to 12V versus Total Fluence

Table 5.73: Raw data table for PSRR Match @ Vs=4.5V to 12V of pre- and post-irradiation (1E12 N/cm²)

Parameter	PSRR MATCH @ Vs = 4.2V to 12V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(dB)		
16	Un-biased Irradiation	109.685	110.516
17	Un-biased Irradiation	111.256	111.599
18	Un-biased Irradiation	127.582	128.721
19	Un-biased Irradiation	121.811	119.419
20	Un-biased Irradiation	108.157	108.139
13	Control Unit	120.293	120.628
14	Control Unit	118.007	117.564
	Un-biased Irradiation Statistics		
	Average Un-biased	115.698	115.679
	Std Dev Un-biased	8.535	8.430
	Ps90%/90% (+KTL) Un-biased	139.100	138.793
	Ps90%/90% (-KTL) Un-biased	92.296	92.564
	Specification MIN	82	82
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

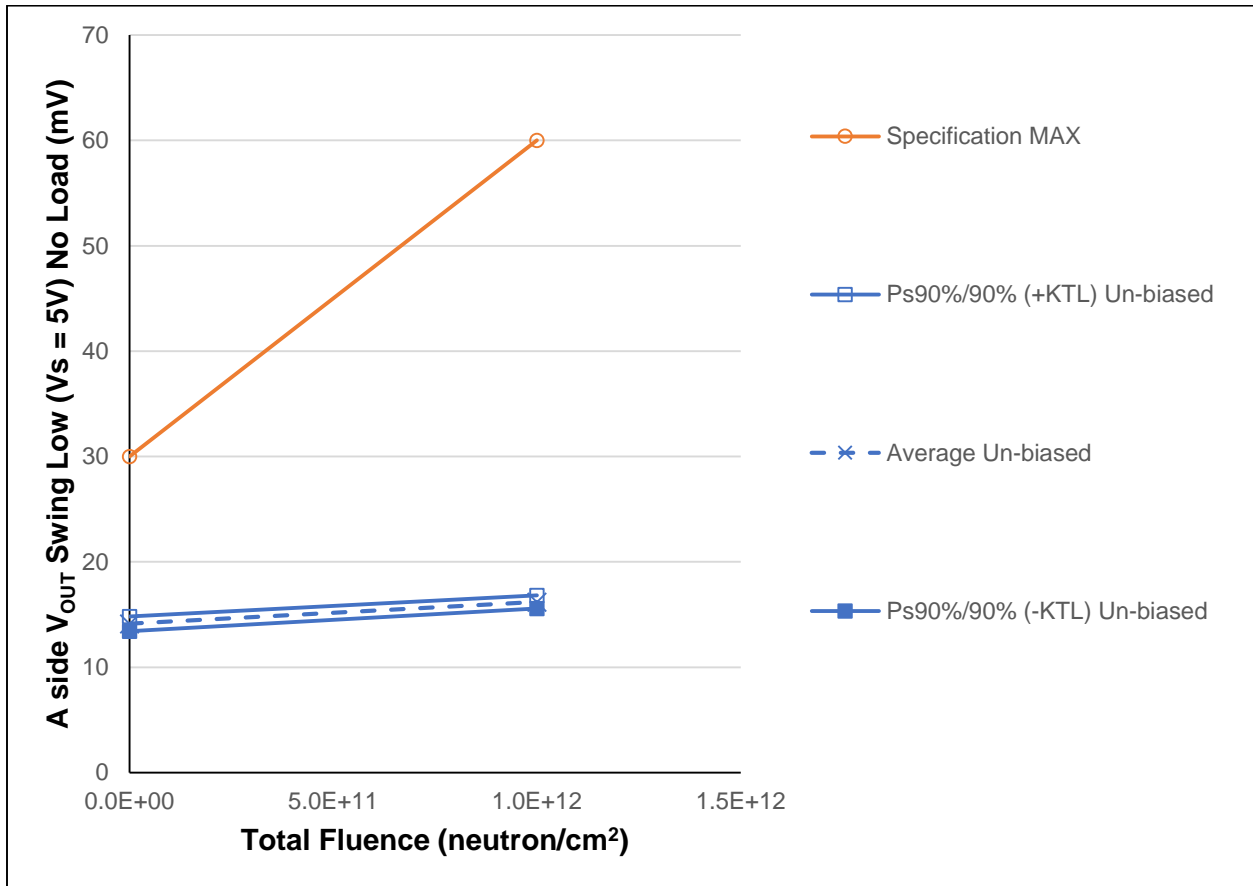


Figure 5.74: Plot of Output Voltage Swing Low @ $V_s = 5V$ and No Load versus Total Fluence (side A)

Table 5.74: Raw data table for A-side output voltage swing low @ Vs=5V and no load of pre- and post-irradiation (1E12 N/cm²)

Parameter	A NO LOAD SW- @ Vs=+5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	14.176	16.467
17	Un-biased Irradiation	14.459	16.352
18	Un-biased Irradiation	13.954	15.963
19	Un-biased Irradiation	13.806	15.956
20	Un-biased Irradiation	14.202	16.247
13	Control Unit	14.295	14.200
14	Control Unit	14.371	14.417
	Un-biased Irradiation Statistics		
	Average Un-biased	14.119	16.197
	Std Dev Un-biased	0.251	0.230
	Ps90%/90% (+KTL) Un-biased	14.807	16.828
	Ps90%/90% (-KTL) Un-biased	13.432	15.566
	Specification MIN		
	Status (Measurements)		
	Specification MAX	30	60
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

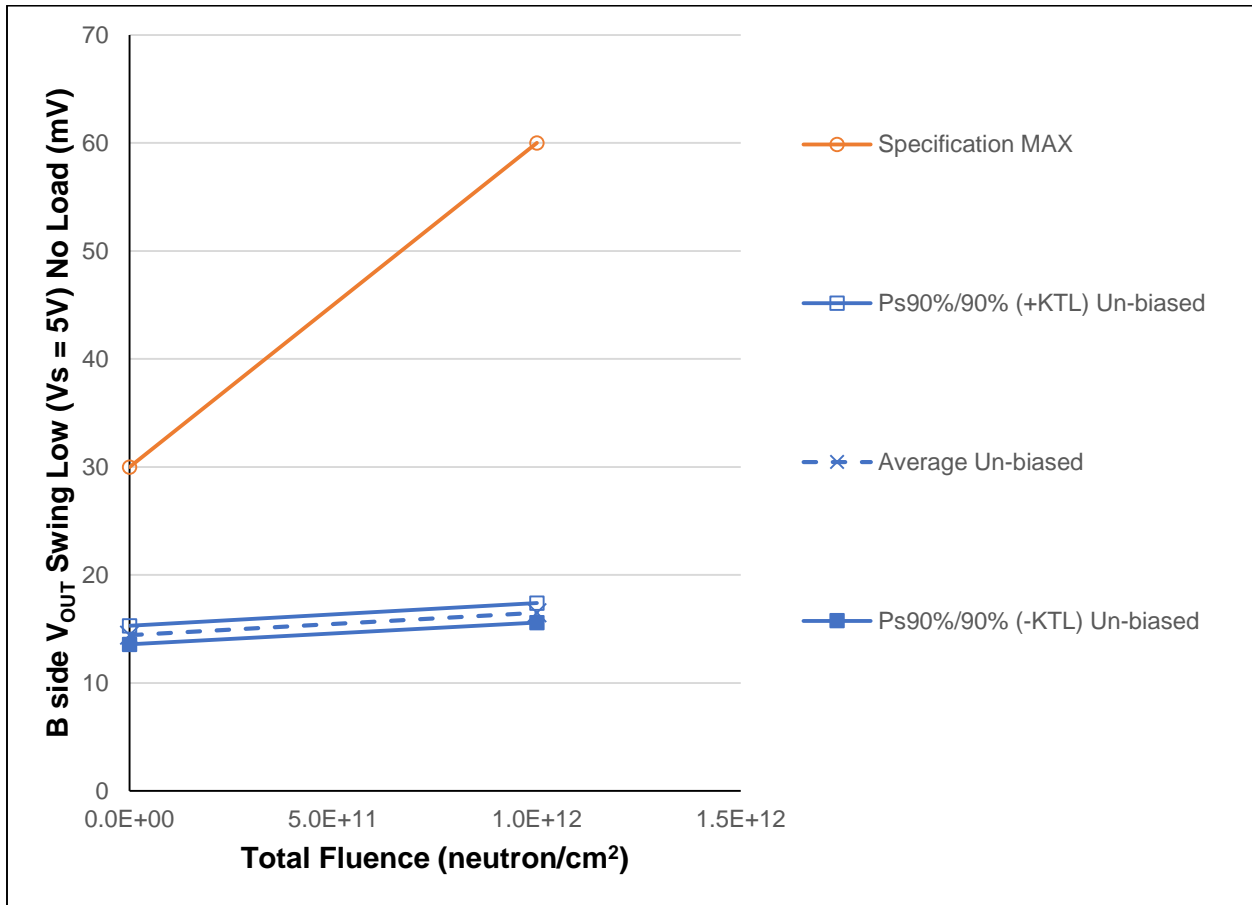


Figure 5.75: Plot of Output Voltage Swing Low @ Vs = 5V and No Load versus Total Fluence (side B)

Table 5.75: Raw data table for B-side output voltage swing low @ Vs=5V and no load of pre- and post-irradiation (1E12 N/cm²)

Parameter	B NO LOAD SW- @ Vs=5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	14.641	16.886
17	Un-biased Irradiation	14.605	16.564
18	Un-biased Irradiation	14.144	16.123
19	Un-biased Irradiation	14.033	16.192
20	Un-biased Irradiation	14.727	16.716
13	Control Unit	14.526	14.477
14	Control Unit	14.633	14.600
	Un-biased Irradiation Statistics		
	Average Un-biased	14.430	16.496
	Std Dev Un-biased	0.317	0.330
	Ps90%/90% (+KTL) Un-biased	15.299	17.402
	Ps90%/90% (-KTL) Un-biased	13.560	15.591
	Specification MIN		
	Status (Measurements)		
	Specification MAX	30	60
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

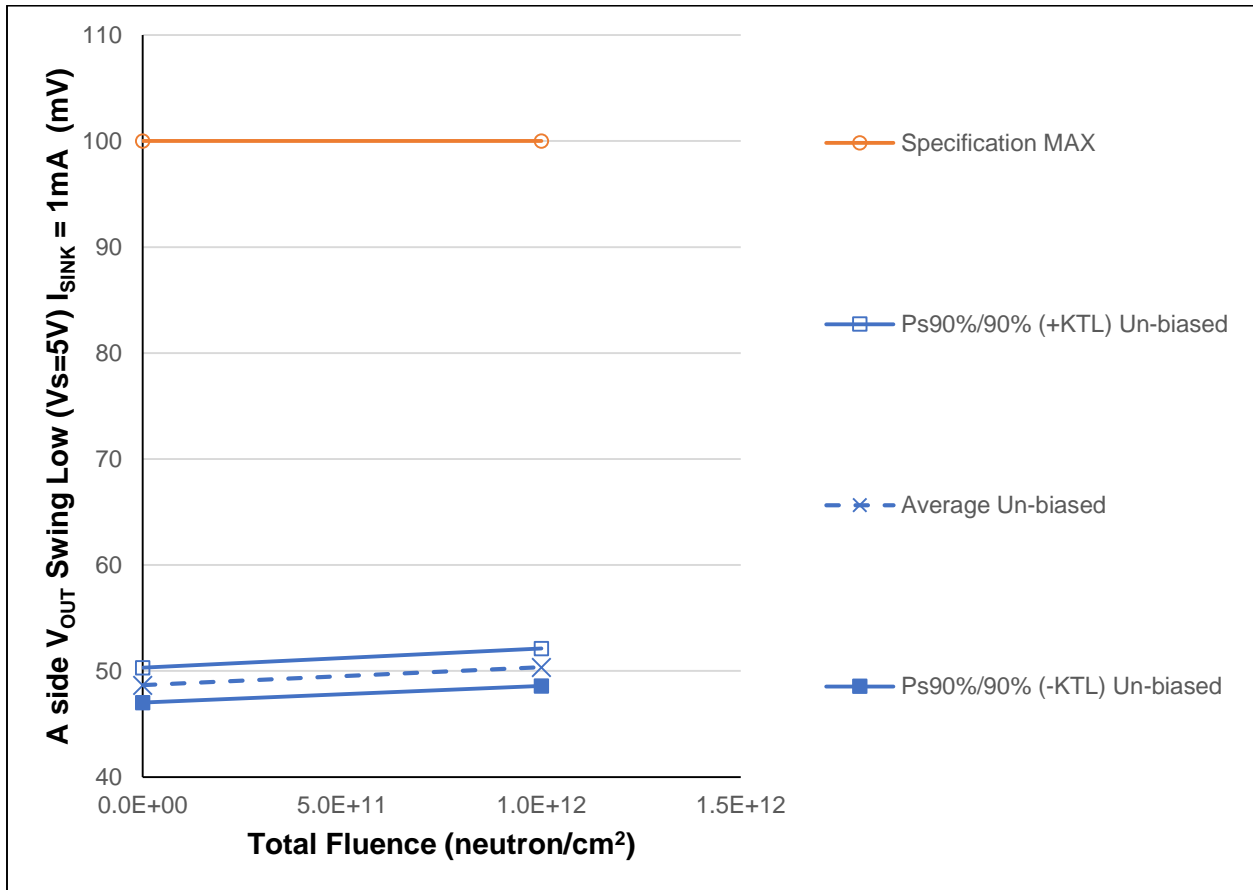


Figure 5.76: Plot of Output Voltage Swing Low (@ $V_s = 5V$ and $I_{SINK} = 1 mA$) versus Total Fluence (side A)

Table 5.76: Raw data table for A-side output voltage swing low (@ Vs=5V and I_{SINK} = 1 mA) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A 1mA Vol @ Vs=5V	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	48.937	51.129
17	Un-biased Irradiation	49.304	50.751
18	Un-biased Irradiation	48.460	50.024
19	Un-biased Irradiation	47.727	49.471
20	Un-biased Irradiation	48.877	50.407
13	Control Unit	49.089	49.037
14	Control Unit	49.416	49.375
Un-biased Irradiation Statistics			
	Average Un-biased	48.661	50.356
	Std Dev Un-biased	0.602	0.642
	Ps90%/90% (+KTL) Un-biased	50.311	52.118
	Ps90%/90% (-KTL) Un-biased	47.011	48.595
	Specification MIN		
	Status (Measurements)		
	Specification MAX	100	100
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

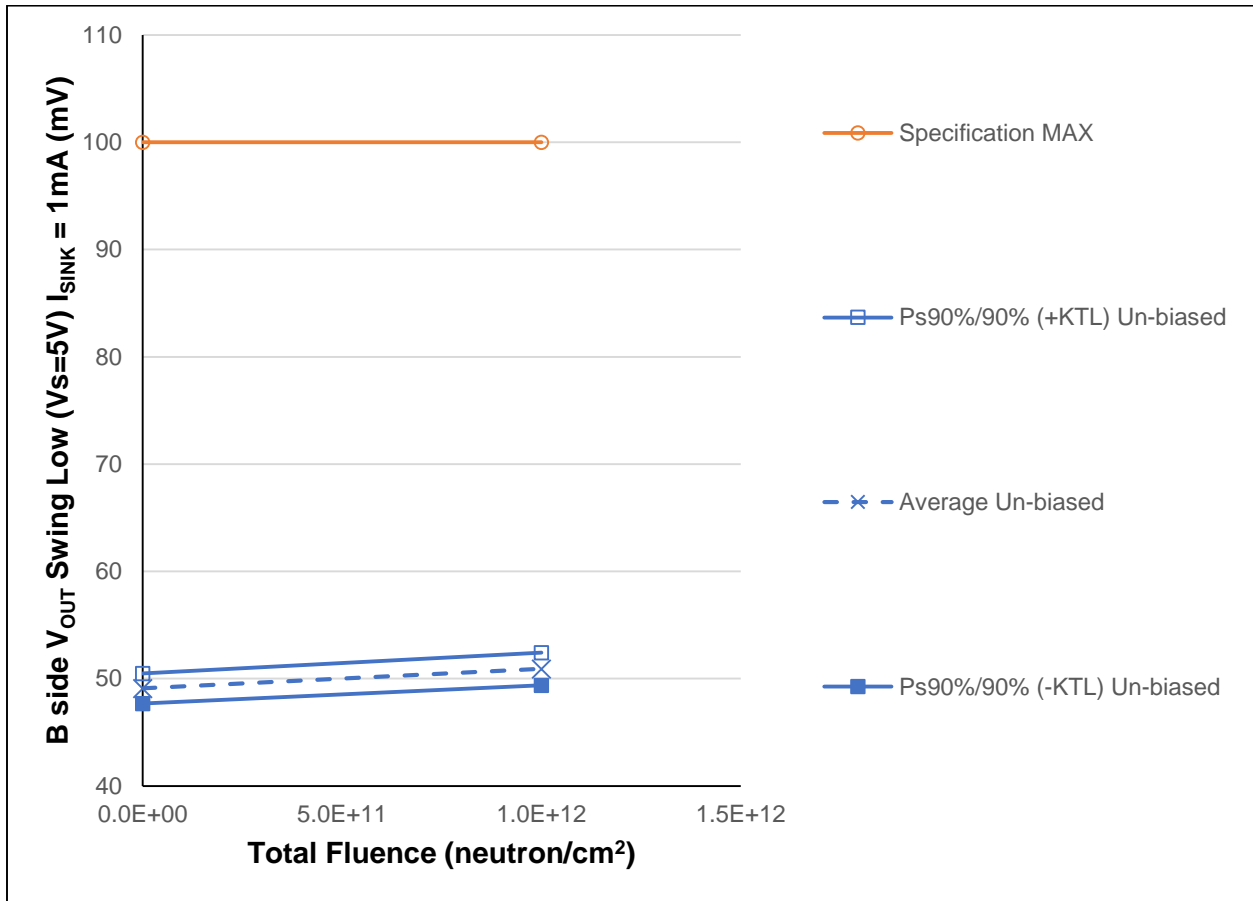


Figure 5.77: Plot of Output Voltage Swing Low (@ $V_s = 5V$ and $I_{SINK} = 1 mA$) versus Total Fluence (side B)

Table 5.77: Raw data table for B-side output voltage swing low (@ Vs=5V and I_{SINK} = 1 mA) of pre- and post-irradiation (1E12 N/cm²)

Parameter	B 1mA Vol @ Vs=5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	49.385	51.666
17	Un-biased Irradiation	49.576	51.089
18	Un-biased Irradiation	48.851	50.596
19	Un-biased Irradiation	48.309	50.197
20	Un-biased Irradiation	49.338	50.979
13	Control Unit	49.912	49.950
14	Control Unit	49.698	49.759
	Un-biased Irradiation Statistics		
	Average Un-biased	49.092	50.905
	Std Dev Un-biased	0.513	0.551
	Ps90%/90% (+KTL) Un-biased	50.498	52.416
	Ps90%/90% (-KTL) Un-biased	47.686	49.394
	Specification MIN		
	Status (Measurements)		
	Specification MAX	100	100
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

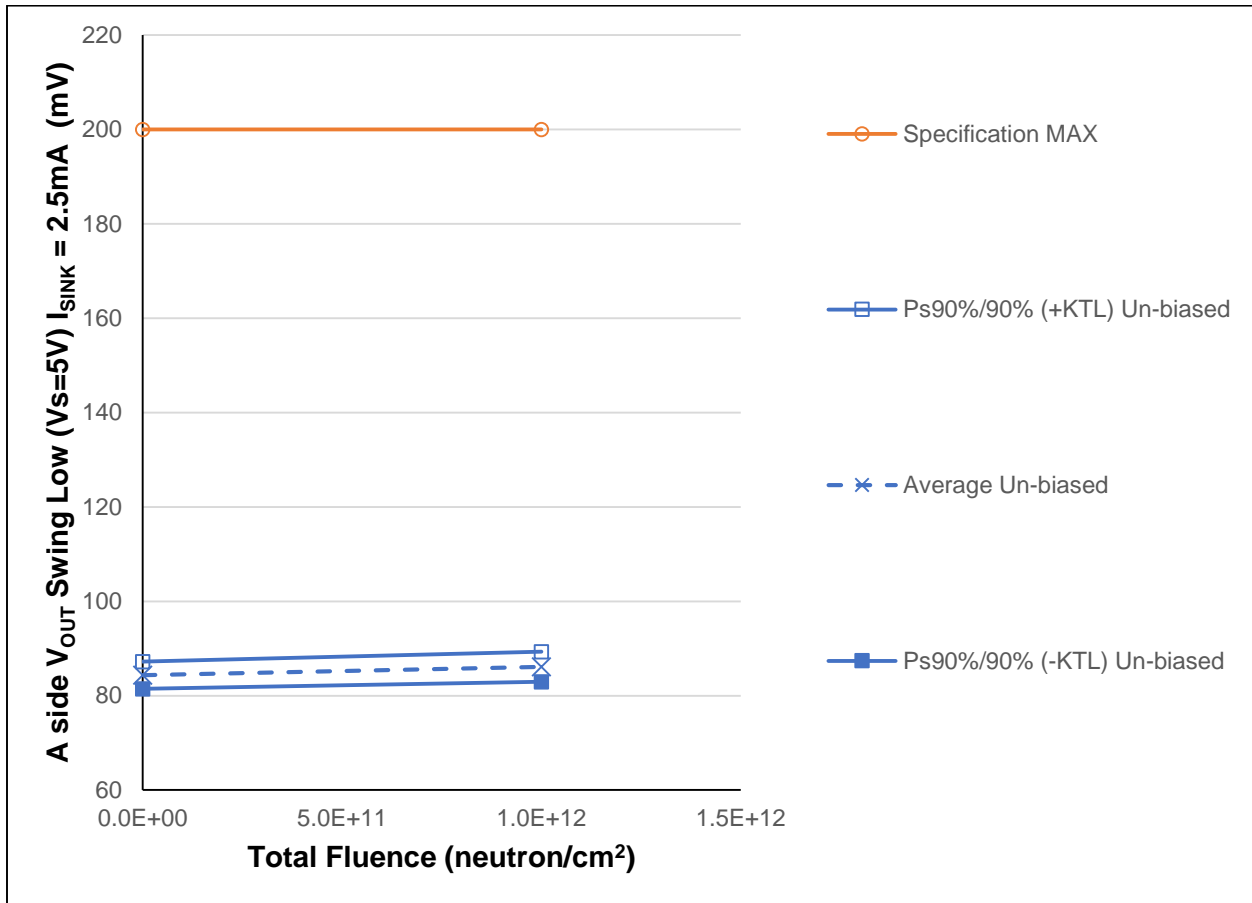


Figure 5.78: Plot of Output Voltage Swing Low (@ $V_s = 5V$ and $I_{SINK} = 2.5 mA$) versus Total Fluence (side A)

Table 5.78: Raw data table for A-side output voltage swing low (@ Vs=5V and I_{SINK} = 2.5 mA) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A 2.5mA Vol @ Vs=5V	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	85.161	87.721
17	Un-biased Irradiation	85.281	86.603
18	Un-biased Irradiation	83.942	85.556
19	Un-biased Irradiation	82.730	84.613
20	Un-biased Irradiation	84.591	86.138
13	Control Unit	85.080	84.920
14	Control Unit	85.717	85.716
	Un-biased Irradiation Statistics		
	Average Un-biased	84.341	86.126
	Std Dev Un-biased	1.045	1.160
	Ps90%/90% (+KTL) Un-biased	87.208	89.308
	Ps90%/90% (-KTL) Un-biased	81.474	82.945
	Specification MIN		
	Status (Measurements)		
	Specification MAX	200	200
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

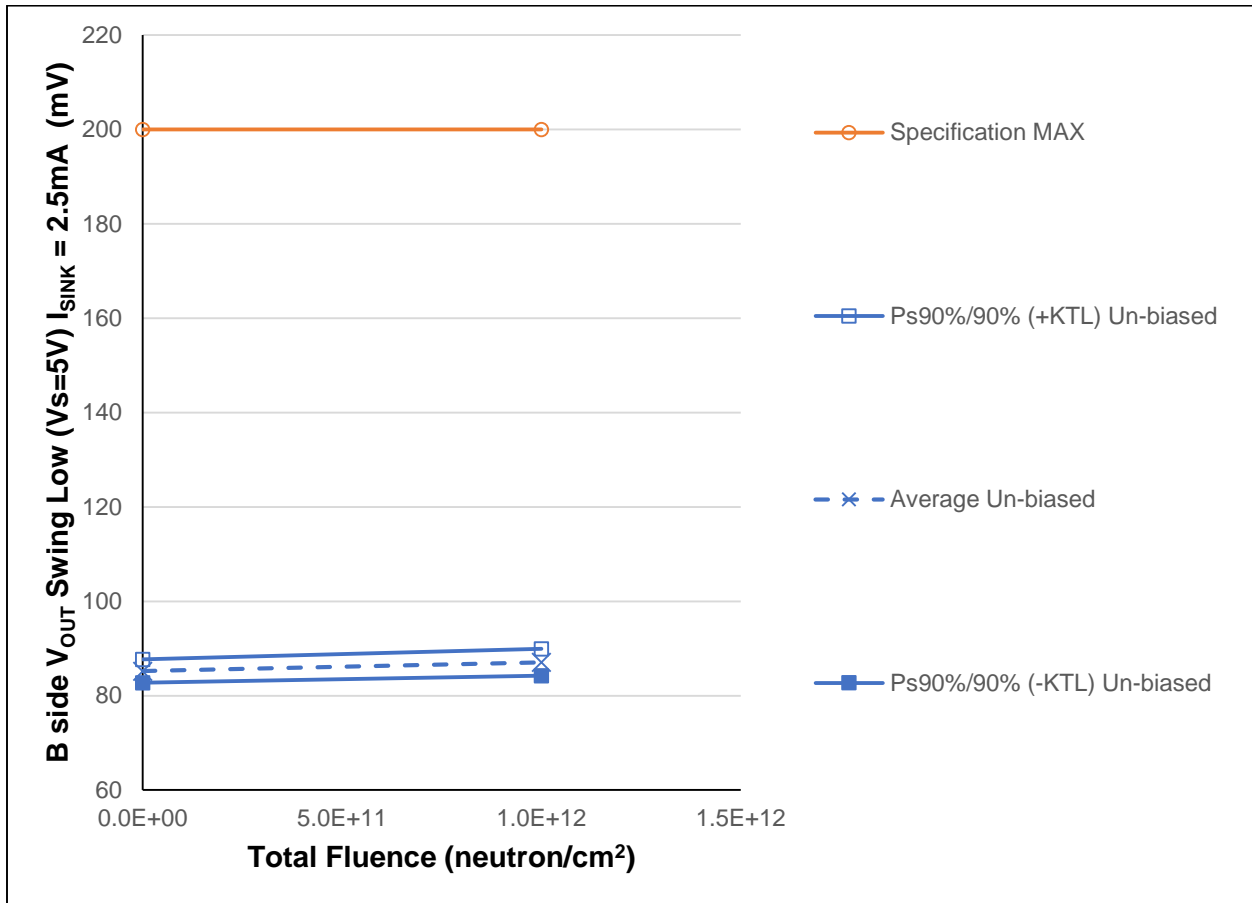


Figure 5.79: Plot of Output Voltage Swing Low (@ Vs = 5V and ISINK = 2.5 mA) versus Total Fluence (side A)

Table 5.79: Raw data table for B-side output voltage swing low (@ Vs=5V and I_{SINK} = 2.5 mA) of pre- and post-irradiation (1E12 N/cm²)

Parameter	B 2.5mA Vol @ Vs=5V	Total Fluence (neutron/cm ²)	
Units	(mV)	0	1.E+12
16	Un-biased Irradiation	85.912	88.636
17	Un-biased Irradiation	85.958	87.320
18	Un-biased Irradiation	84.906	86.593
19	Un-biased Irradiation	83.792	85.814
20	Un-biased Irradiation	85.528	87.022
13	Control Unit	86.480	86.357
14	Control Unit	86.416	86.517
Un-biased Irradiation Statistics			
	Average Un-biased	85.219	87.077
	Std Dev Un-biased	0.902	1.039
	Ps90%/90% (+KTL) Un-biased	87.693	89.927
	Ps90%/90% (-KTL) Un-biased	82.745	84.227
	Specification MIN		
	Status (Measurements)		
	Specification MAX	200	200
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

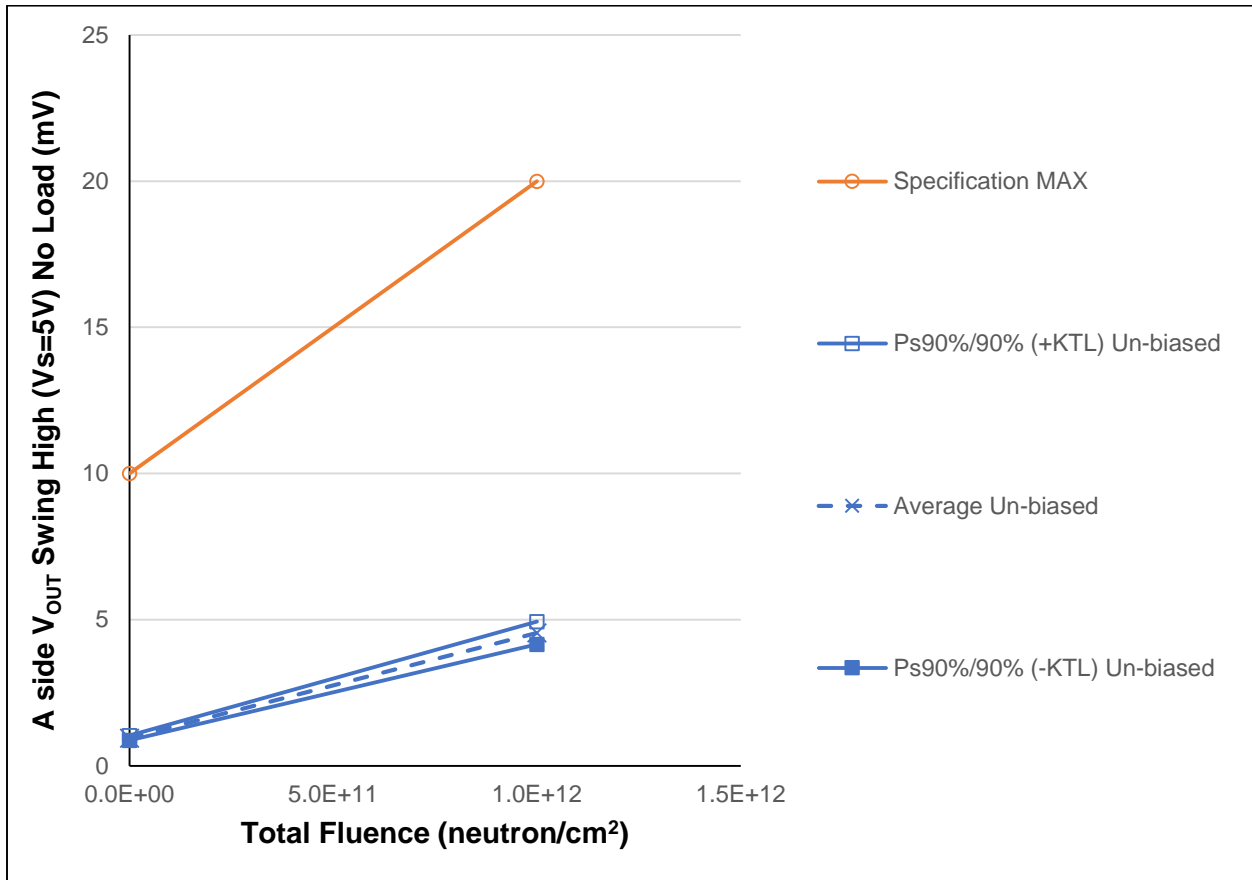


Figure 5.80: Plot of Output Voltage Swing High @ $V_s = 5V$ and No Load versus Total Fluence (side A)

Table 5.80: Raw data table for A-side output voltage swing high @ Vs=5V and no load of pre- and post-irradiation (1E12 N/cm²)

Parameter	A NO LOAD SW+ @ Vs=5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	0.914	4.304
17	Un-biased Irradiation	0.940	4.559
18	Un-biased Irradiation	0.933	4.559
19	Un-biased Irradiation	0.968	4.635
20	Un-biased Irradiation	0.990	4.664
13	Control Unit	0.928	0.937
14	Control Unit	0.895	0.908
	Un-biased Irradiation Statistics		
	Average Un-biased	0.949	4.544
	Std Dev Un-biased	0.030	0.142
	Ps90%/90% (+KTL) Un-biased	1.032	4.934
	Ps90%/90% (-KTL) Un-biased	0.866	4.155
	Specification MIN		
	Status (Measurements)		
	Specification MAX	10	20
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

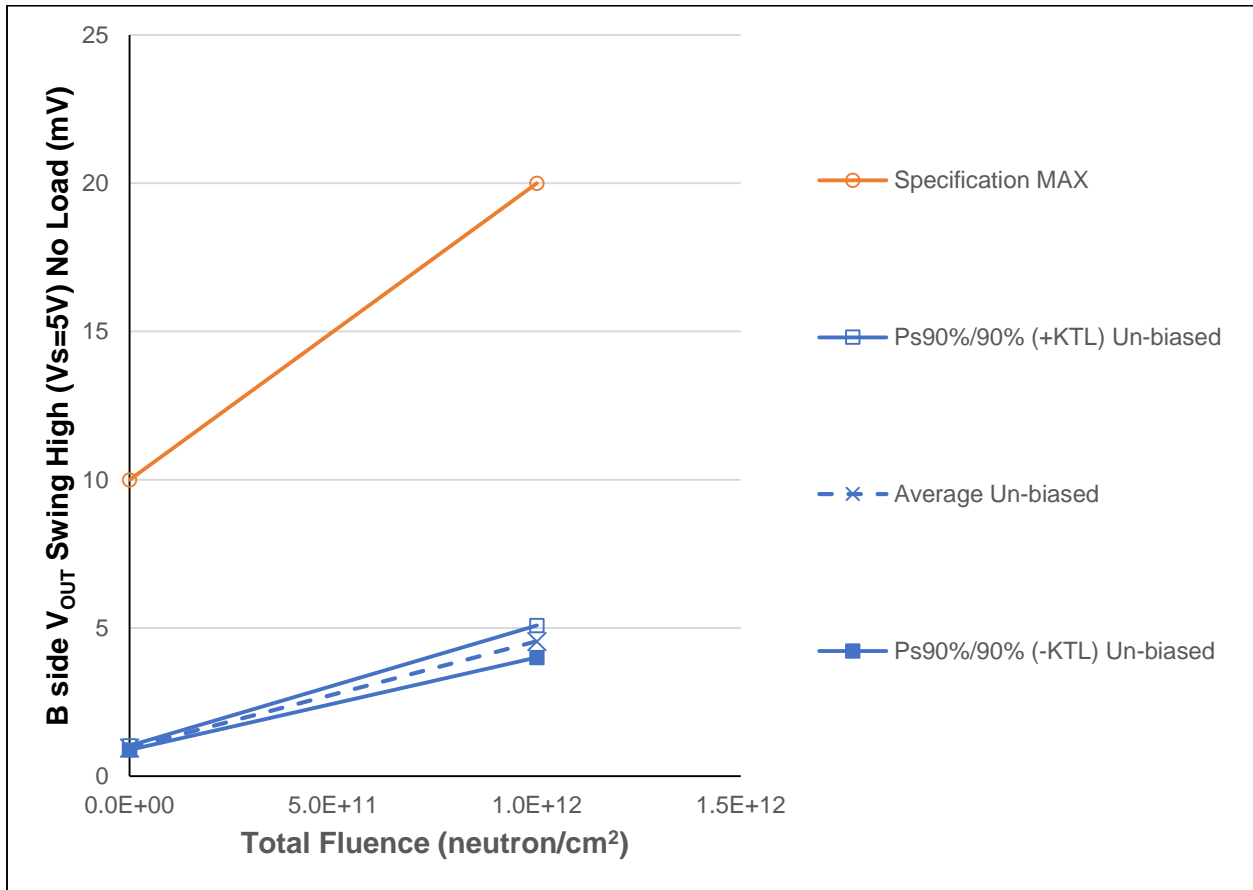


Figure 5.81: Plot of Output Voltage Swing High @ Vs = 5V and No Load versus Total Fluence (side B)

Table 5.81: Raw data table for B-side output voltage swing high @ Vs=5V and no load of pre- and post-irradiation (1E12 N/cm²)

Parameter	B NO LOAD SW+ @ Vs=5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	0.923	4.228
17	Un-biased Irradiation	0.961	4.569
18	Un-biased Irradiation	0.933	4.542
19	Un-biased Irradiation	0.966	4.664
20	Un-biased Irradiation	0.990	4.745
13	Control Unit	0.947	0.932
14	Control Unit	0.902	0.949
	Un-biased Irradiation Statistics		
	Average Un-biased	0.955	4.550
	Std Dev Un-biased	0.027	0.197
	Ps90%/90% (+KTL) Un-biased	1.028	5.090
	Ps90%/90% (-KTL) Un-biased	0.881	4.009
	Specification MIN		
	Status (Measurements)		
	Specification MAX	10	20
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

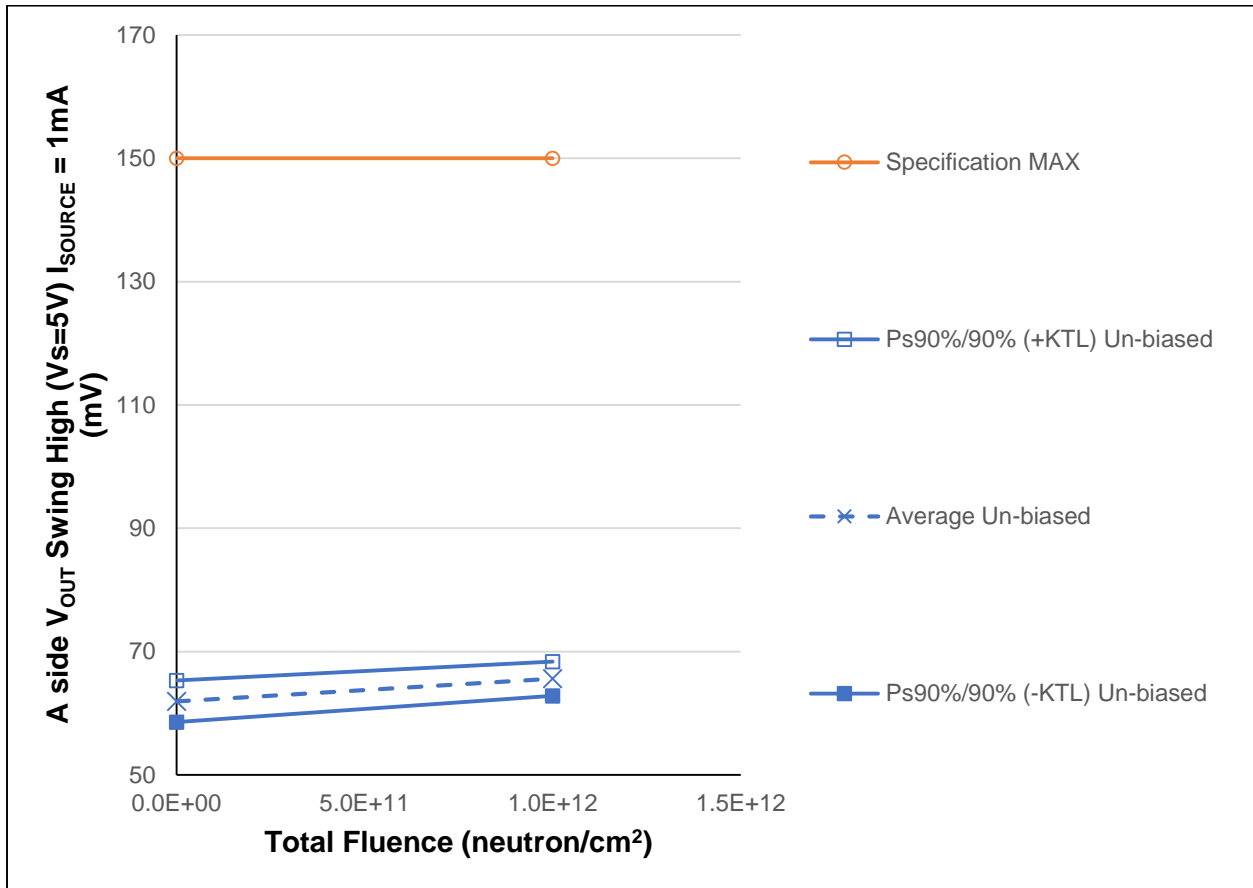


Figure 5.82: Plot of Output Voltage Swing High (@ $V_s = 5V$ and $I_{SOURCE} = 1mA$) versus Total Fluence (side A)

Table 5.82: Raw data table for A-side output voltage swing high (@ Vs=5V and I_{SOURCE} = 1 mA) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A	1mA Voh @ Vs=5V	Total Fluence (neutron/cm ²)	
Units	(mV)		0	1.E+12
16	Un-biased Irradiation		59.970	63.999
17	Un-biased Irradiation		62.461	65.861
18	Un-biased Irradiation		62.986	66.556
19	Un-biased Irradiation		61.468	65.267
20	Un-biased Irradiation		62.726	66.287
13	Control Unit		64.147	64.020
14	Control Unit		62.172	62.038
Un-biased Irradiation Statistics				
	Average Un-biased		61.922	65.594
	Std Dev Un-biased		1.233	1.016
	Ps90%/90% (+KTL) Un-biased		65.303	68.380
	Ps90%/90% (-KTL) Un-biased		58.541	62.808
	Specification MIN			
	Status (Measurements)			
	Specification MAX		150	150
	Status (Measurements)		PASS	PASS
	Status (-KTL) Un-biased			
	Status (+KTL) Un-biased		PASS	PASS

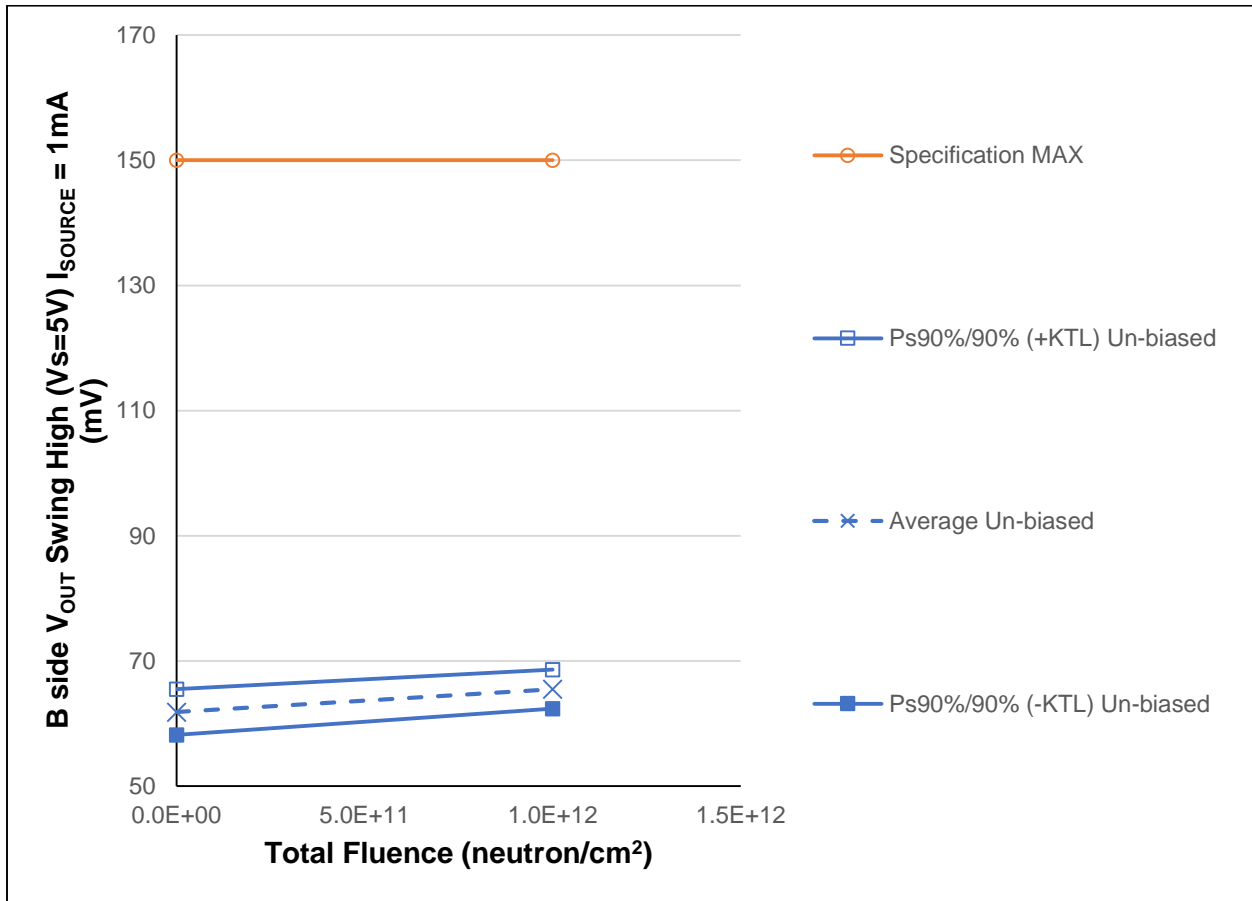


Figure 5.83: Plot of Output Voltage Swing High (@ $V_s = 5V$ and $I_{SOURCE} = 1 mA$) versus Total Fluence (side B)

Table 5.83: Raw data table for B-side output voltage swing high (@ Vs=5V and I_{SOURCE} = 1 mA) of pre- and post-irradiation (1E12 N/cm²)

Parameter	B 1mA Voh @ Vs=5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mV)		
16	Un-biased Irradiation	59.617	63.620
17	Un-biased Irradiation	62.156	65.555
18	Un-biased Irradiation	63.079	66.614
19	Un-biased Irradiation	61.850	65.641
20	Un-biased Irradiation	62.535	66.099
13	Control Unit	63.394	63.115
14	Control Unit	61.476	61.335
	Un-biased Irradiation Statistics		
	Average Un-biased	61.847	65.506
	Std Dev Un-biased	1.328	1.135
	Ps90%/90% (+KTL) Un-biased	65.490	68.619
	Ps90%/90% (-KTL) Un-biased	58.205	62.393
	Specification MIN		
	Status (Measurements)		
	Specification MAX	150	150
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

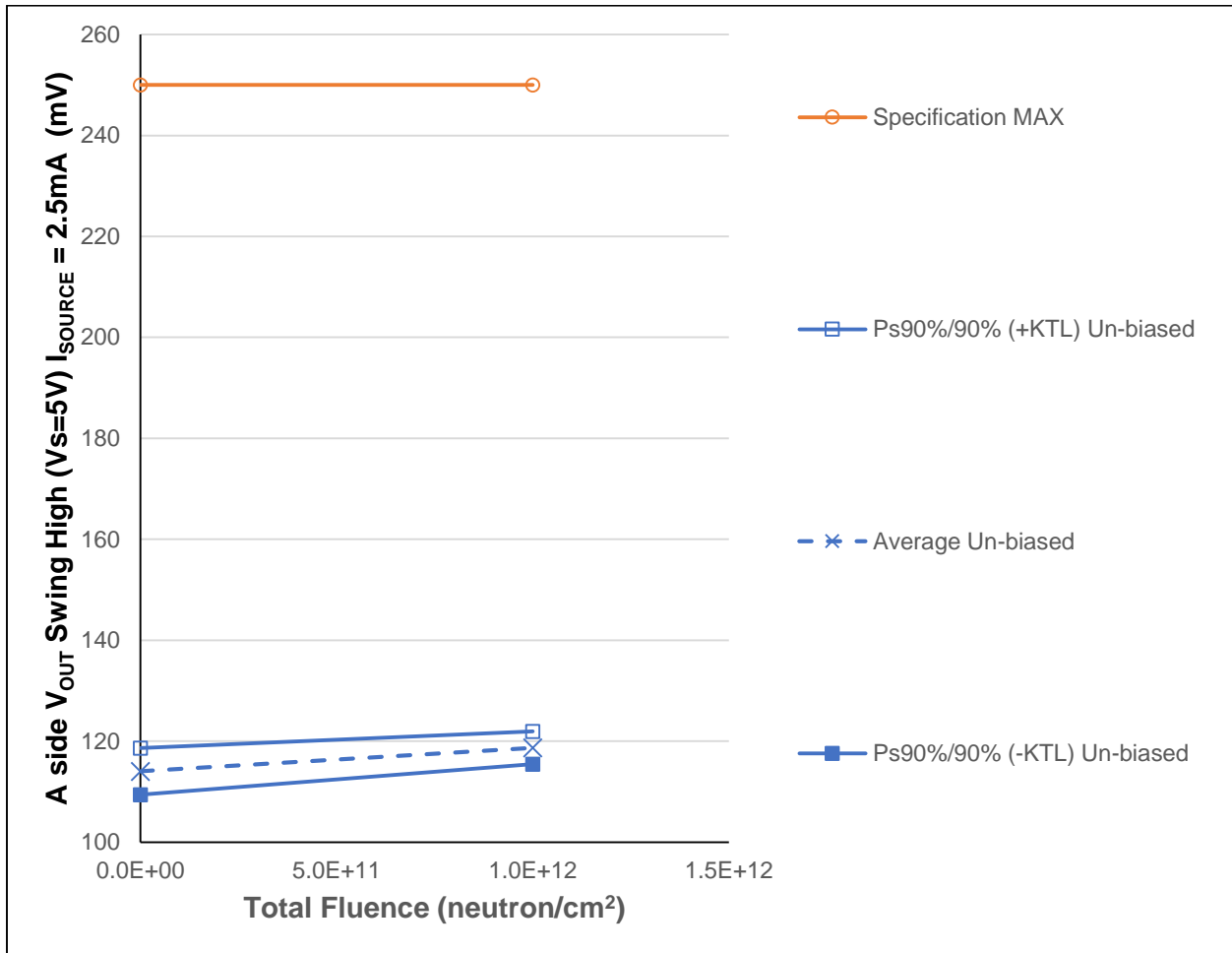


Figure 5.84: Plot of Output Voltage Swing High (@ $V_s = 5V$ and $I_{SOURCE} = 2.5 mA$) versus Total Fluence (side A)

Table 5.84: Raw data table for A-side output voltage swing high (@ Vs=5V and I_{SOURCE} = 2.5 mA) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A	2.5mA Voh @ Vs=5V	Total Fluence (neutron/cm ²)	
Units		(mV)	0	1.E+12
16	Un-biased Irradiation		111.513	117.119
17	Un-biased Irradiation		114.719	118.758
18	Un-biased Irradiation		115.671	120.210
19	Un-biased Irradiation		113.173	118.017
20	Un-biased Irradiation		115.060	119.332
13	Control Unit		117.580	117.331
14	Control Unit		114.679	114.606
	Un-biased Irradiation Statistics			
	Average Un-biased		114.027	118.687
	Std Dev Un-biased		1.681	1.188
	Ps90%/90% (+KTL) Un-biased		118.636	121.946
	Ps90%/90% (-KTL) Un-biased		109.419	115.429
	Specification MIN			
	Status (Measurements)			
	Specification MAX		250	250
	Status (Measurements)		PASS	PASS
	Status (-KTL) Un-biased			
	Status (+KTL) Un-biased		PASS	PASS

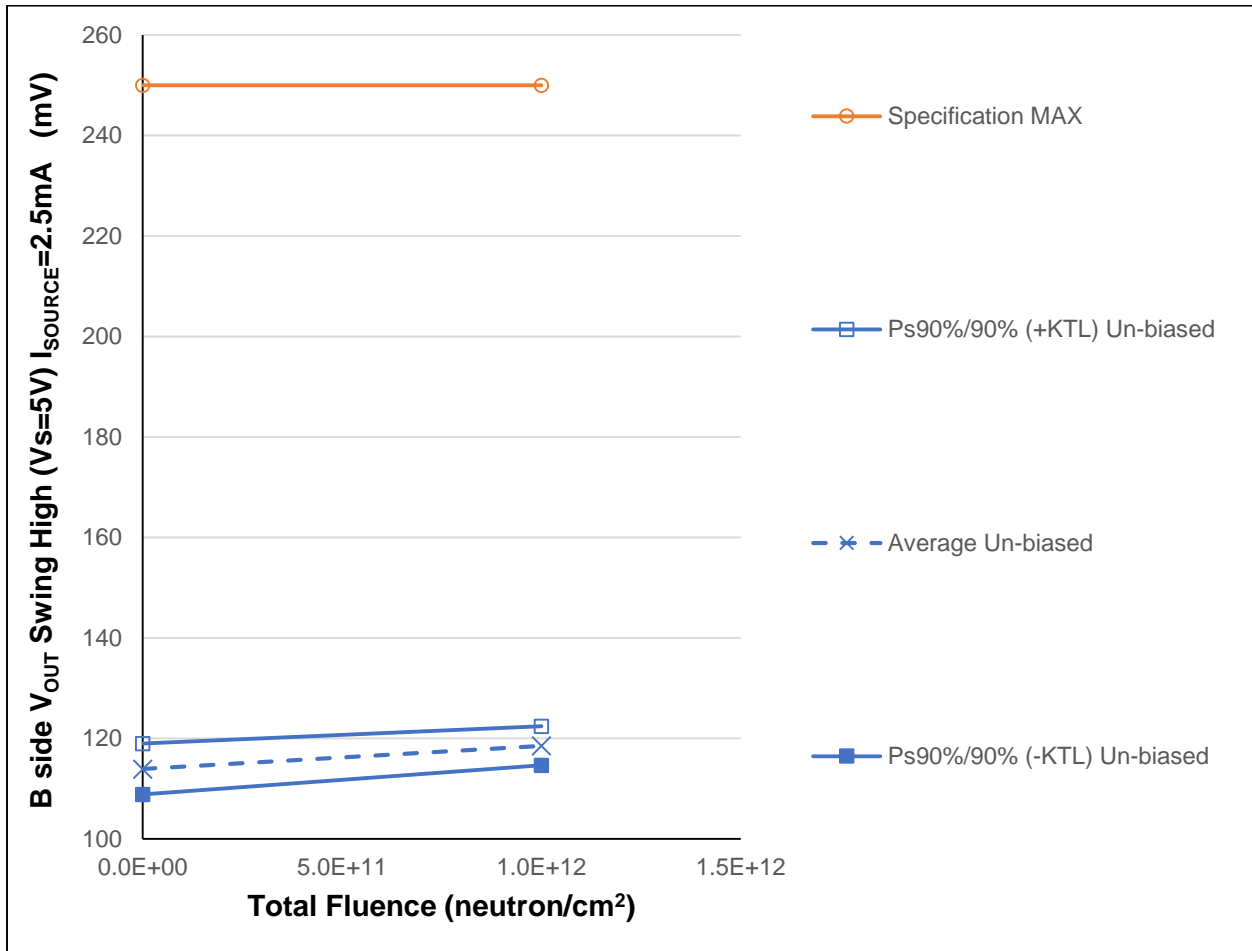


Figure 5.85: Plot of Output Voltage Swing High (@ $V_s = 5V$ and $I_{SOURCE} = 2.5 mA$) versus Total Fluence (side B)

Table 5.85: Raw data table for B-side output voltage swing high (@ Vs=5V and I_{SOURCE} = 2.5 mA) of pre- and post-irradiation (1E12 N/cm²)

Parameter	B	2.5mA Voh @ Vs=5V	Total Fluence (neutron/cm ²)	
			0	1.E+12
Units		(mV)		
16	Un-biased Irradiation		110.938	116.399
17	Un-biased Irradiation		114.352	118.417
18	Un-biased Irradiation		115.865	120.324
19	Un-biased Irradiation		113.686	118.453
20	Un-biased Irradiation		114.812	119.035
13	Control Unit		116.611	116.282
14	Control Unit		113.791	113.629
	Un-biased Irradiation Statistics			
	Average Un-biased		113.930	118.526
	Std Dev Un-biased		1.851	1.417
	Ps90%/90% (+KTL) Un-biased		119.007	122.411
	Ps90%/90% (-KTL) Un-biased		108.854	114.640
	Specification MIN			
	Status (Measurements)			
	Specification MAX		250	250
	Status (Measurements)		PASS	PASS
	Status (-KTL) Un-biased			
	Status (+KTL) Un-biased		PASS	PASS

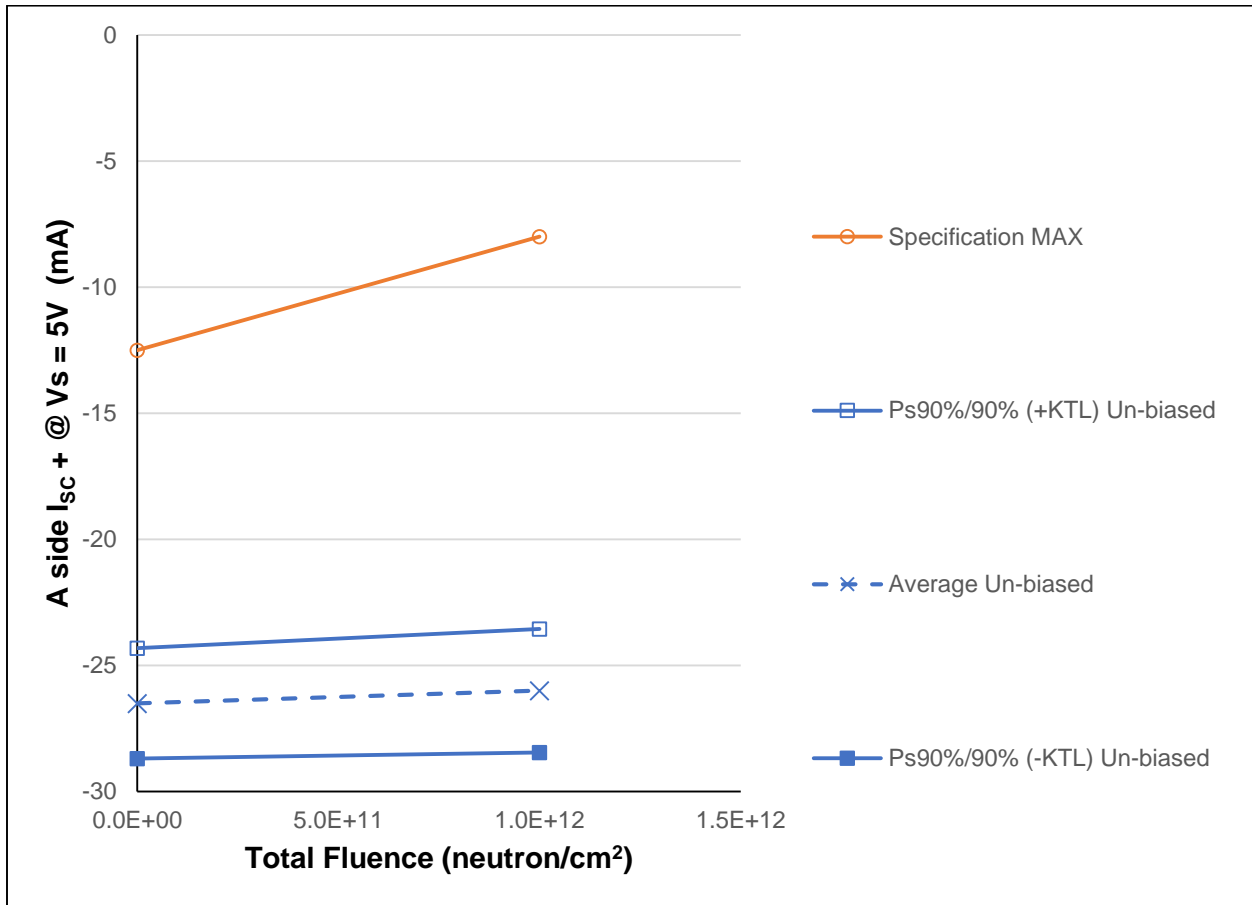


Figure 5.86: Plot of A-side Short Circuit Current (@ $V_s = 5V$) versus Total Fluence (side A)

Table 5.86: Raw data table for A-side short circuit current (@ Vs=5V) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A	I _{sc+} @ Vs = 5V	Total Fluence (neutron/cm ²)	
			0	1.E+12
Units		(mA)		
16	Un-biased Irradiation		-27.886	-27.546
17	Un-biased Irradiation		-26.246	-25.666
18	Un-biased Irradiation		-25.958	-25.476
19	Un-biased Irradiation		-26.457	-25.954
20	Un-biased Irradiation		-25.980	-25.367
13	Control Unit		-25.406	-25.410
14	Control Unit		-26.638	-26.687
	Un-biased Irradiation Statistics			
	Average Un-biased		-26.506	-26.002
	Std Dev Un-biased		0.799	0.892
	Ps90%/90% (+KTL) Un-biased		-24.316	-23.557
	Ps90%/90% (-KTL) Un-biased		-28.695	-28.447
	Specification MIN			
	Status (Measurements)			
	Specification MAX		-12.5	-8.0
	Status (Measurements)		PASS	PASS
	Status (-KTL) Un-biased			
	Status (+KTL) Un-biased		PASS	PASS

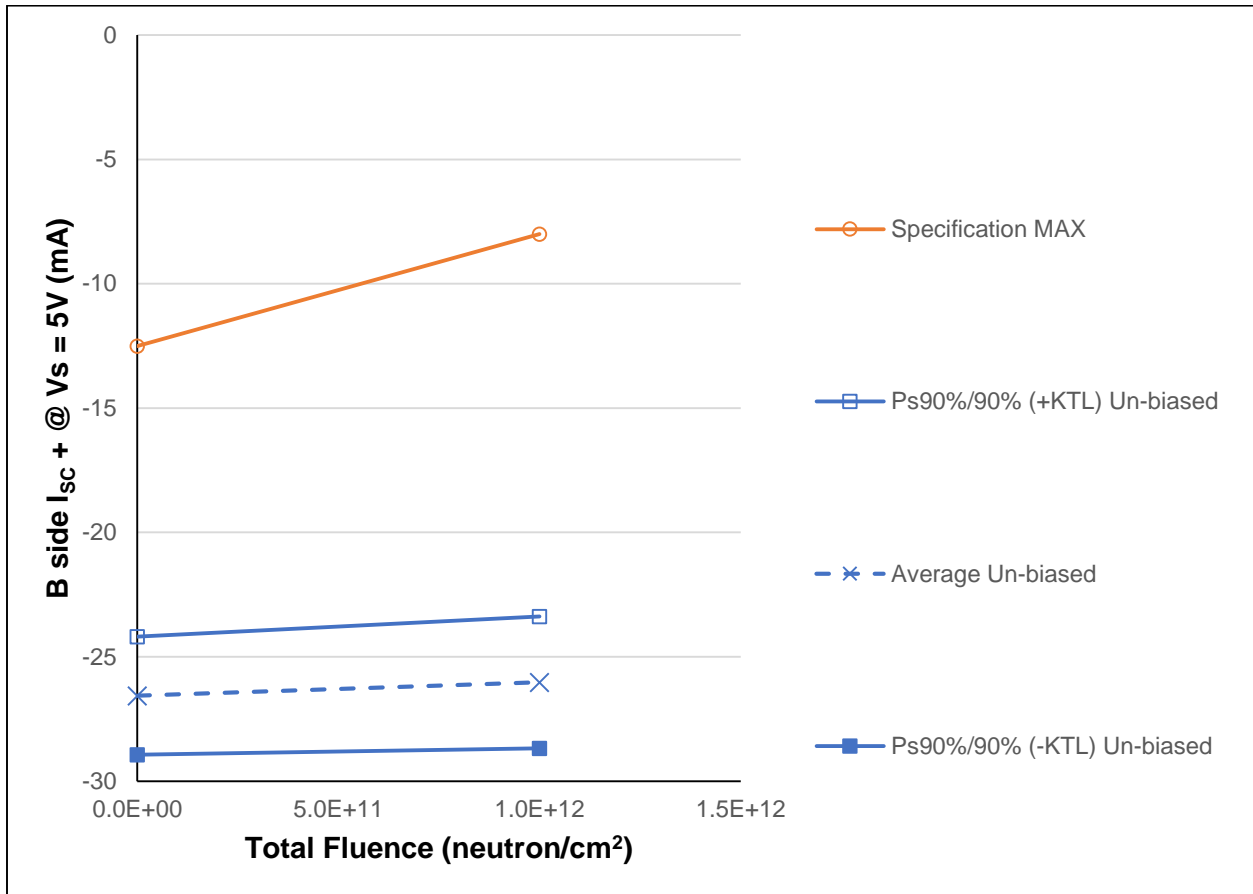


Figure 5.87: Plot of B-side Short Circuit Current (@ Vs = 5V) versus Total Fluence (side B)

Table 5.87: Raw data table for B-side short circuit current (@ Vs=5V) of pre- and post-irradiation (1E12 N/cm²)

Parameter	B	I _{sc+} @ Vs = 5V	Total Fluence (neutron/cm ²)	
Units		(mA)	0	1.E+12
16	Un-biased Irradiation		-28.089	-27.738
17	Un-biased Irradiation		-26.438	-25.806
18	Un-biased Irradiation		-25.980	-25.443
19	Un-biased Irradiation		-26.210	-25.705
20	Un-biased Irradiation		-26.122	-25.458
13	Control Unit		-25.937	-25.924
14	Control Unit		-27.058	-27.069
	Un-biased Irradiation Statistics			
	Average Un-biased		-26.568	-26.030
	Std Dev Un-biased		0.866	0.968
	Ps90%/90% (+KTL) Un-biased		-24.192	-23.377
	Ps90%/90% (-KTL) Un-biased		-28.943	-28.683
	Specification MIN			
	Status (Measurements)			
	Specification MAX		-12.5	-8.0
	Status (Measurements)		PASS	PASS
	Status (-KTL) Un-biased			
	Status (+KTL) Un-biased		PASS	PASS

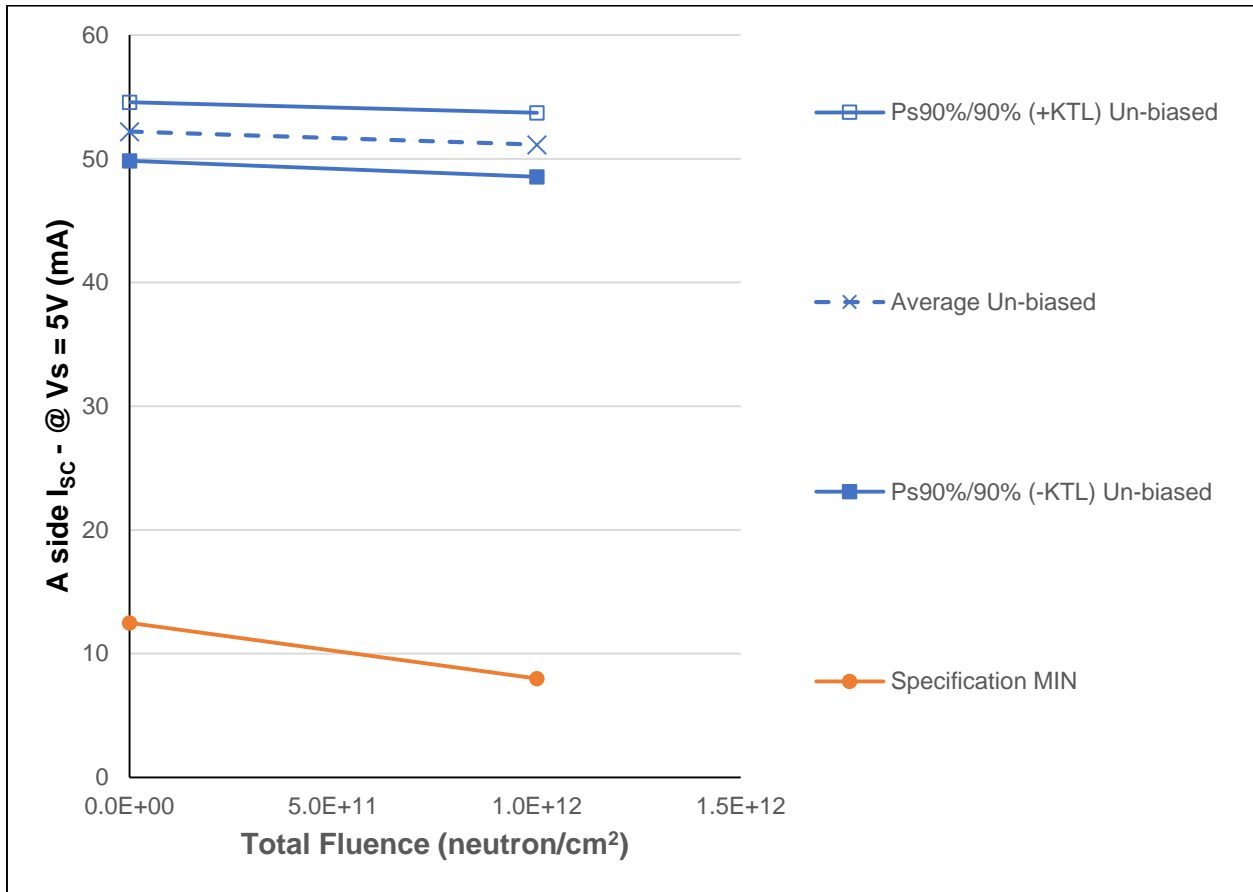


Figure 5.88: Plot of A-side I_{sc} - (@ $V_s = 5V$) versus Total Fluence (side B)

Table 5.88: Raw data table for A-side short circuit current (@ Vs=5V) of pre- and post-irradiation (1E12 N/cm²)

Parameter	A	I _{sc} @ Vs = 5V	Total Fluence (neutron/cm ²)	
Units		(mA)	0	1.E+12
16	Un-biased Irradiation		51.805	49.917
17	Un-biased Irradiation		51.765	51.185
18	Un-biased Irradiation		51.959	50.976
19	Un-biased Irradiation		53.736	52.553
20	Un-biased Irradiation		51.728	51.027
13	Control Unit		51.107	51.337
14	Control Unit		50.620	50.717
	Un-biased Irradiation Statistics			
	Average Un-biased		52.199	51.132
	Std Dev Un-biased		0.864	0.940
	Ps90%/90% (+KTL) Un-biased		54.567	53.709
	Ps90%/90% (-KTL) Un-biased		49.830	48.555
	Specification MIN		12.5	8.0
	Status (Measurements)		PASS	PASS
	Specification MAX			
	Status (Measurements)			
	Status (-KTL) Un-biased		PASS	PASS
	Status (+KTL) Un-biased			

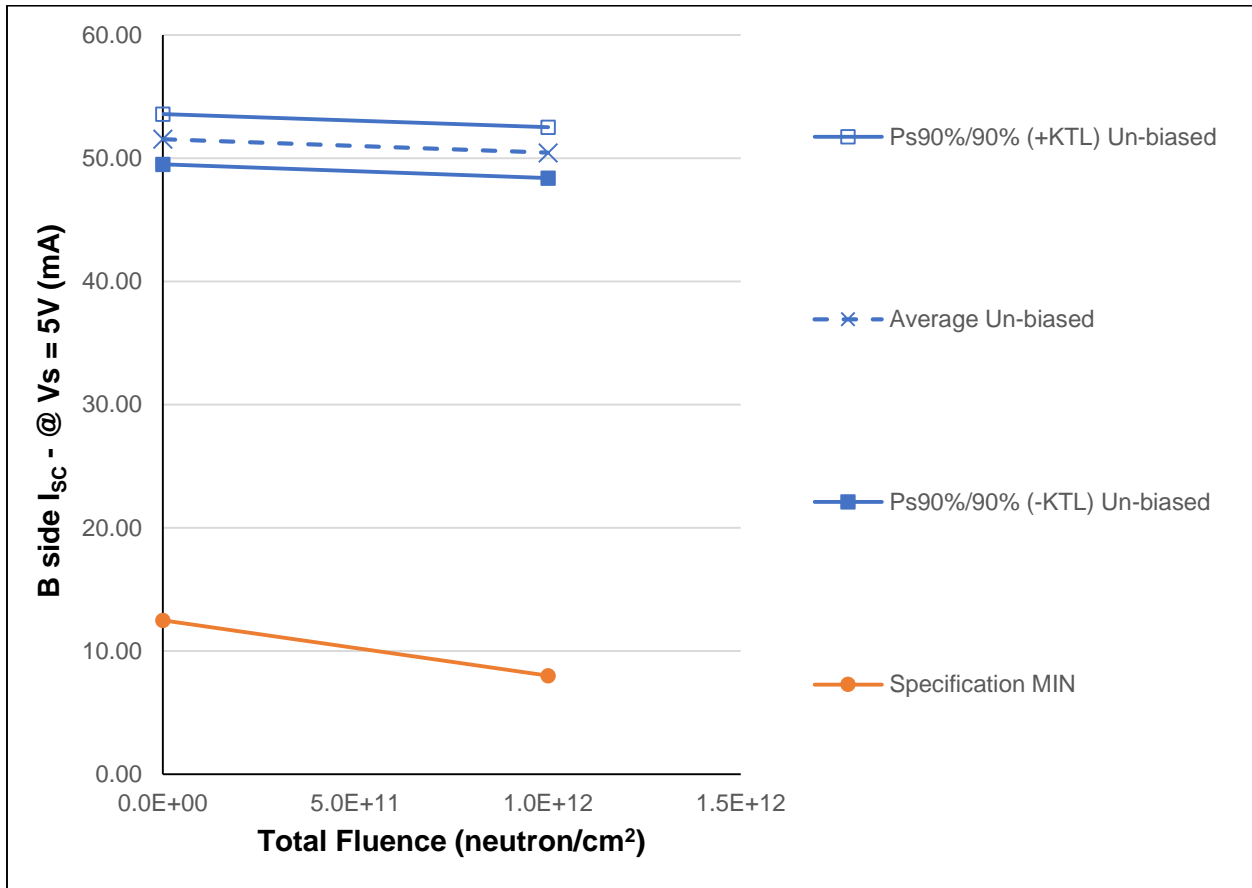


Figure 5.89: Plot of B-side I_{sc} - (@ $V_s = 5V$) versus Total Fluence (side B)

Table 5.89: Raw data table for B-side I_{sc}- (@ Vs=5V) of pre- and post-irradiation (1E12 N/cm²)

Parameter	B I _{sc} - @ 5V (mA)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	51.445	49.535
17	Un-biased Irradiation	51.227	50.536
18	Un-biased Irradiation	51.205	50.226
19	Un-biased Irradiation	52.863	51.614
20	Un-biased Irradiation	51.041	50.318
13	Control Unit	50.049	50.213
14	Control Unit	50.267	50.318
Un-biased Irradiation Statistics			
	Average Un-biased	51.556	50.446
	Std Dev Un-biased	0.744	0.753
	Ps90%/90% (+KTL) Un-biased	53.597	52.510
	Ps90%/90% (-KTL) Un-biased	49.515	48.382
	Specification MIN	12.5	8.0
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

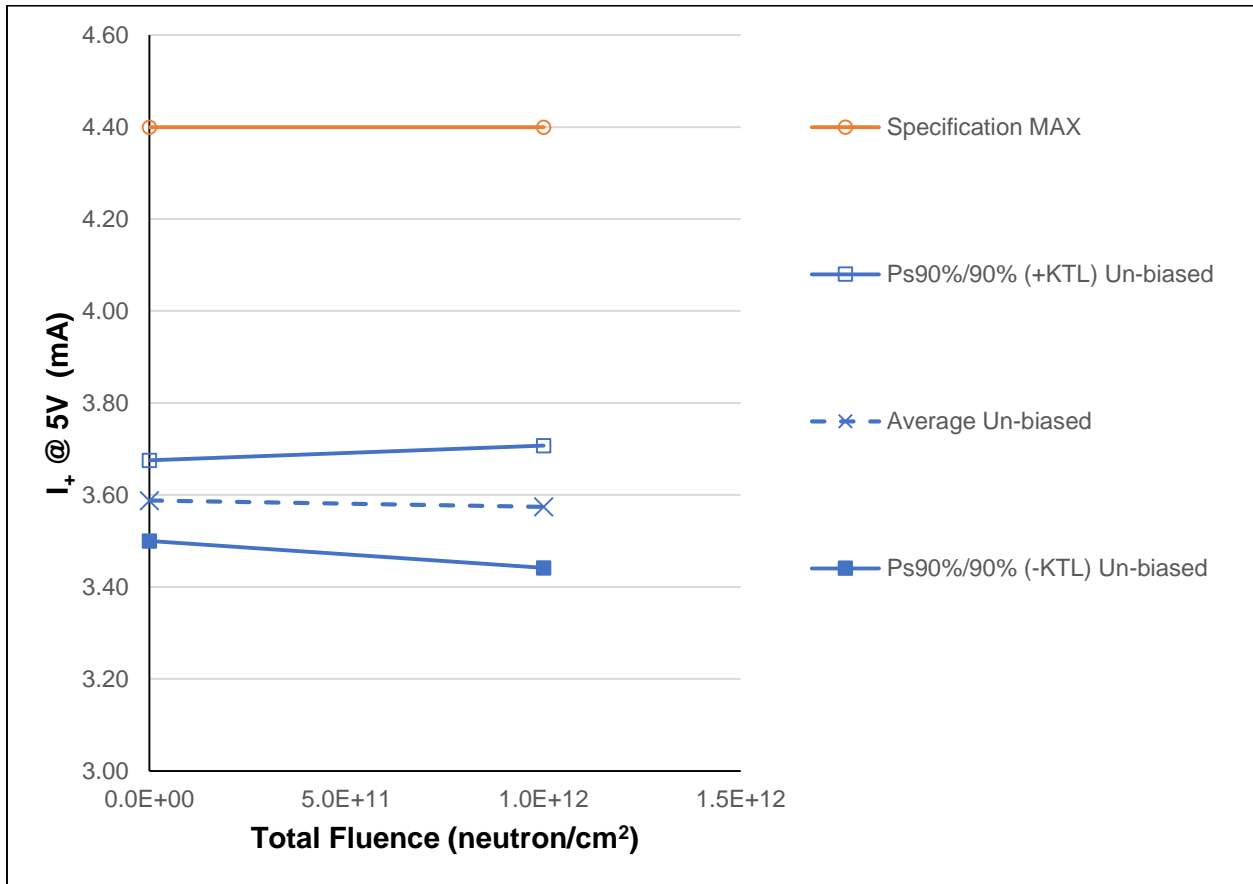


Figure 5.90: Plot of Device Supply Current @ Vs = 5V versus Total Fluence

Table 5.90: Raw data table for device supply current @ Vs=5V of pre- and post-irradiation (1E12 N/cm²)

Parameter	Supply Current @ 5V	Total Fluence (neutron/cm ²)	
		0	1.E+12
Units	(mA)		
16	Un-biased Irradiation	3.633	3.652
17	Un-biased Irradiation	3.550	3.522
18	Un-biased Irradiation	3.568	3.551
19	Un-biased Irradiation	3.586	3.576
20	Un-biased Irradiation	3.603	3.571
13	Control Unit	3.551	3.544
14	Control Unit	3.580	3.579
	Un-biased Irradiation Statistics		
	Average Un-biased	3.588	3.575
	Std Dev Un-biased	0.032	0.048
	Ps90%/90% (+KTL) Un-biased	3.676	3.707
	Ps90%/90% (-KTL) Un-biased	3.500	3.442
	Specification MIN		
	Status (Measurements)		
	Specification MAX	4.4	4.4
	Status (Measurements)	PASS	PASS
	Status (-KTL) Un-biased		
	Status (+KTL) Un-biased	PASS	PASS

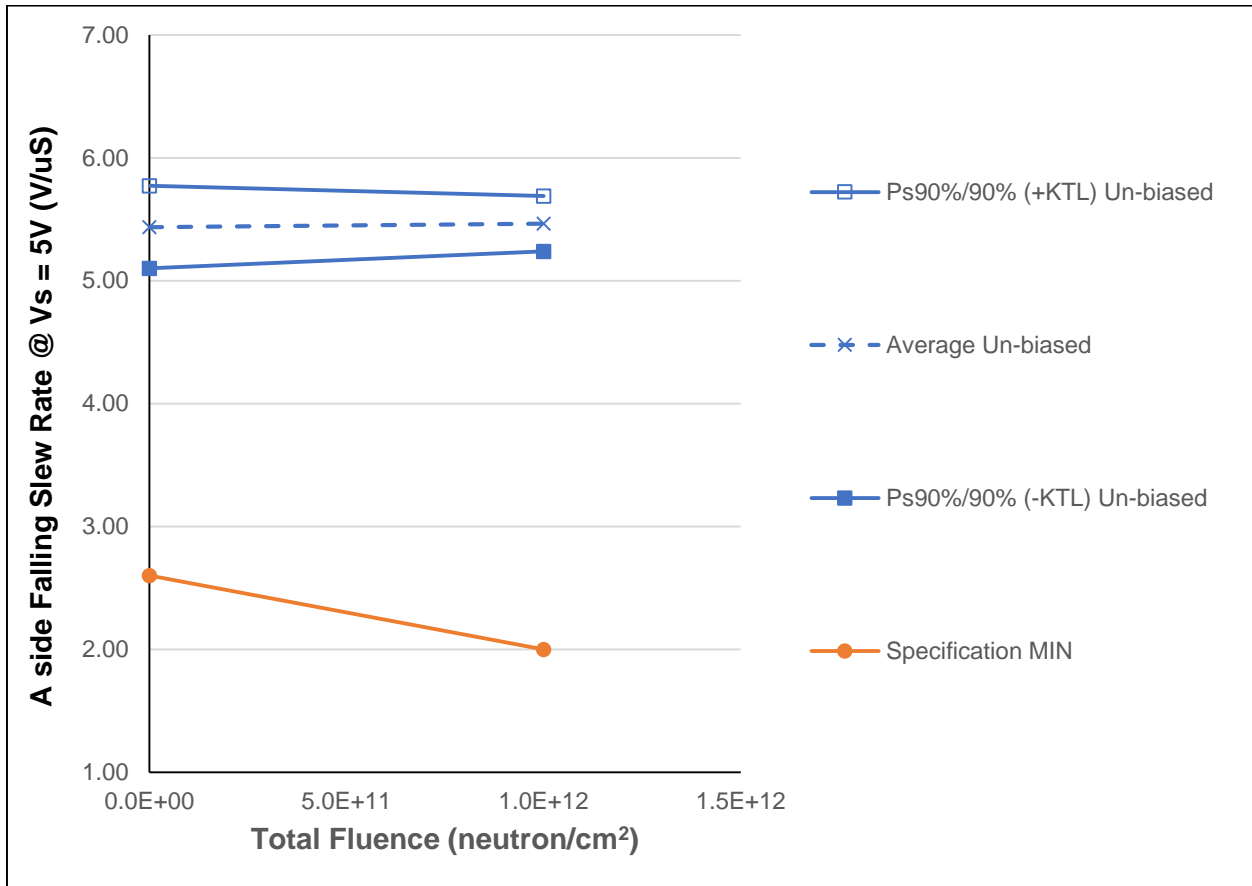


Figure 5.91: Plot of A-side Slew Rate (Falling) @ Vs = 5V versus Total Fluence

Table 5.91: Raw data table for A-side Slew Rate (Falling) @ Vs=5V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A FALLING SLEW RATE @ Vs=5V (V/uS)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	5.556	5.556
17	Un-biased Irradiation	5.263	5.405
18	Un-biased Irradiation	5.405	5.405
19	Un-biased Irradiation	5.556	5.556
20	Un-biased Irradiation	5.405	5.405
13	Control Unit	5.405	5.405
14	Control Unit	5.405	5.263
Un-biased Irradiation Statistics			
	Average Un-biased	5.437	5.465
	Std Dev Un-biased	0.123	0.082
	Ps90%/90% (+KTL) Un-biased	5.774	5.691
	Ps90%/90% (-KTL) Un-biased	5.100	5.240
	Specification MIN	2.6	2.0
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

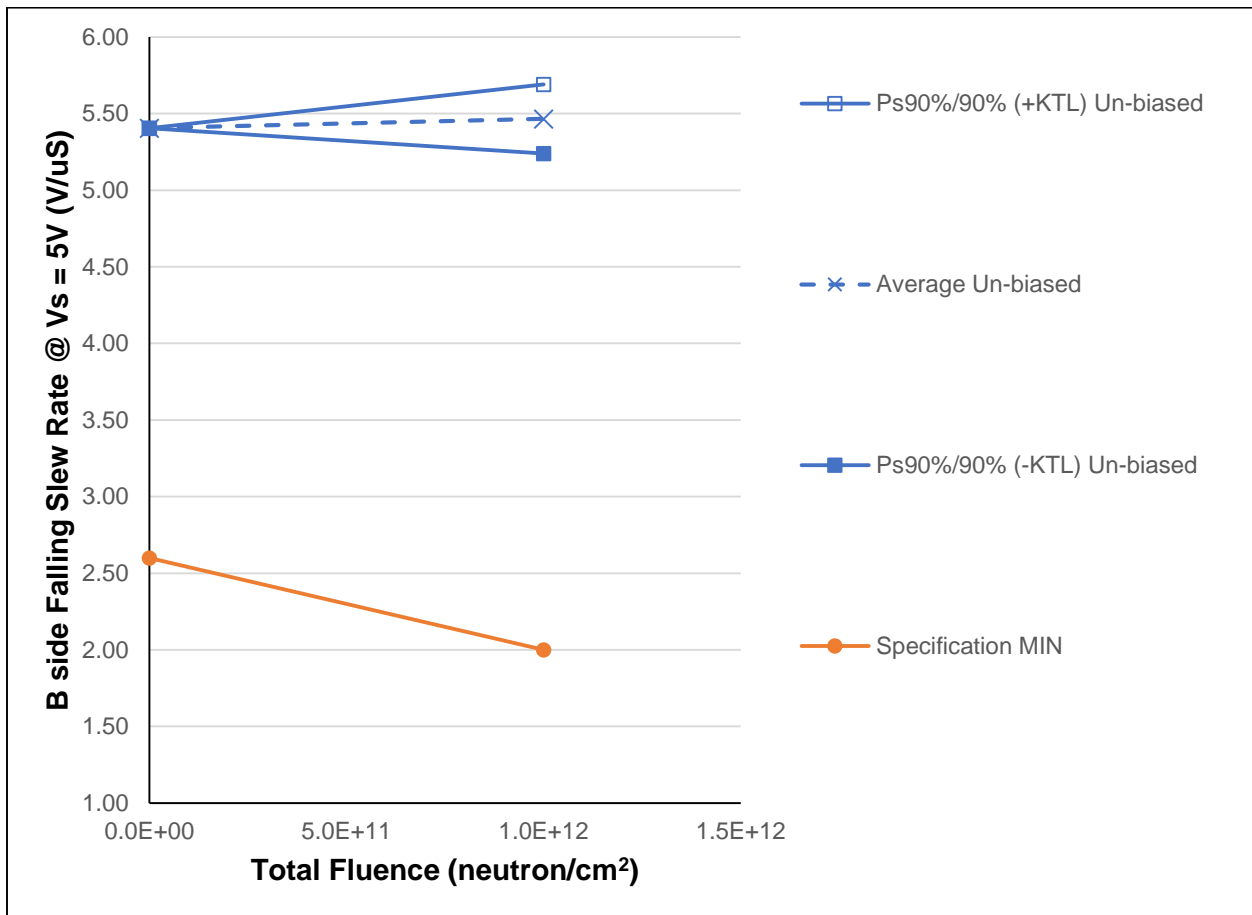


Figure 5.92: Plot of B-side Slew Rate (Falling) @ Vs = 5V versus Total Fluence

Table 5.92: Raw data table for B-side Slew Rate (Falling) @ Vs=5V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B FALLING SLEW RATE @ Vs=5V (V/uS)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	5.405	5.556
17	Un-biased Irradiation	5.405	5.405
18	Un-biased Irradiation	5.405	5.405
19	Un-biased Irradiation	5.405	5.556
20	Un-biased Irradiation	5.405	5.405
13	Control Unit	5.405	5.405
14	Control Unit	5.405	5.405
Un-biased Irradiation Statistics			
	Average Un-biased	5.405	5.465
	Std Dev Un-biased	0.000	0.082
	Ps90%/90% (+KTL) Un-biased	5.405	5.691
	Ps90%/90% (-KTL) Un-biased	5.405	5.240
	Specification MIN	2.6	2.0
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

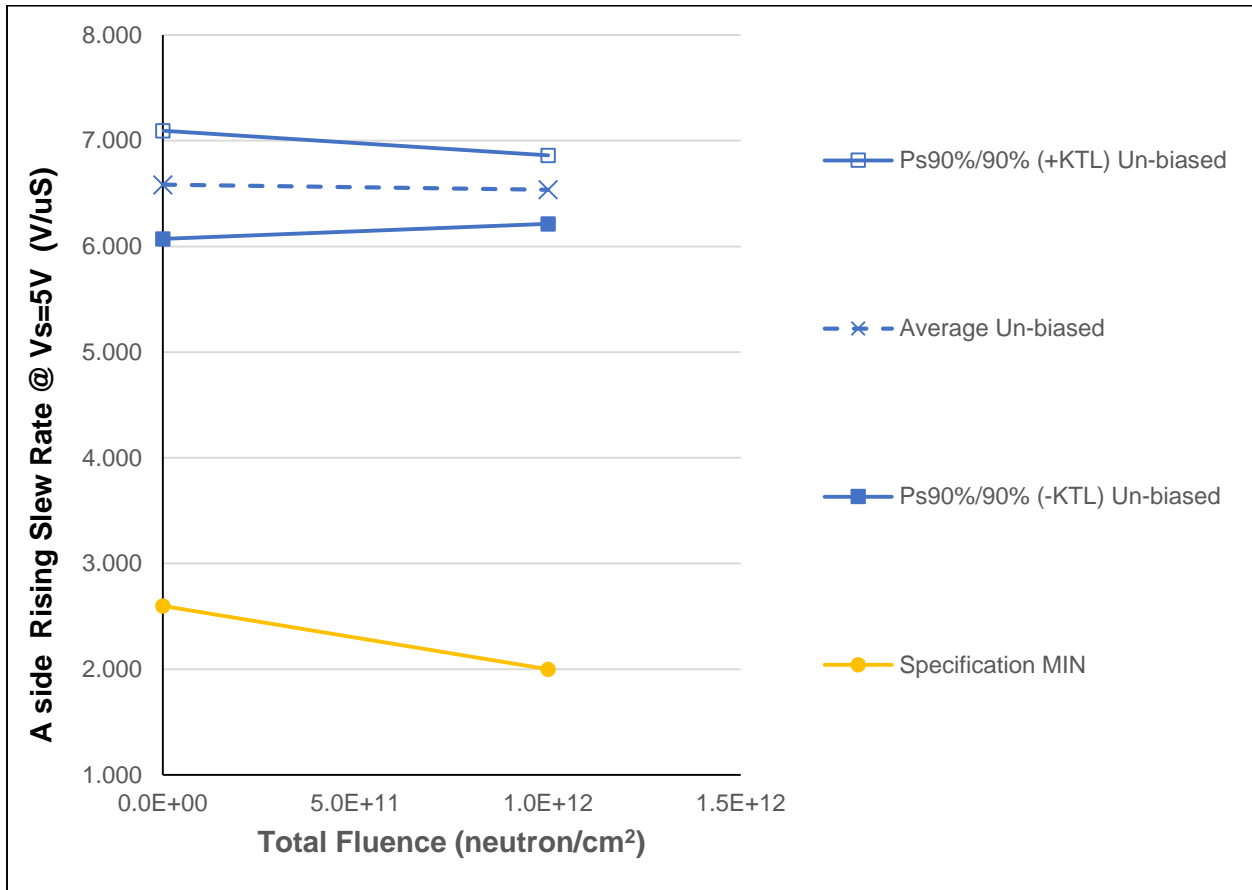


Figure 5.93: Plot of A-side Slew Rate (Rising) @ Vs = 5V versus Total Fluence

Table 5.93: Raw data table for A-side Slew Rate (Rising) @ Vs=5V of pre- and post-irradiation (1E12 N/cm²)

Parameter	A RISING SLEW RATE @ Vs=5V (V/uS)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	6.667	6.667
17	Un-biased Irradiation	6.250	6.452
18	Un-biased Irradiation	6.667	6.452
19	Un-biased Irradiation	6.667	6.667
20	Un-biased Irradiation	6.667	6.452
13	Control Unit	6.452	6.452
14	Control Unit	6.250	6.452
Un-biased Irradiation Statistics			
	Average Un-biased	6.583	6.538
	Std Dev Un-biased	0.186	0.118
	Ps90%/90% (+KTL) Un-biased	7.094	6.861
	Ps90%/90% (-KTL) Un-biased	6.072	6.215
	Specification MIN	2.6	2.0
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

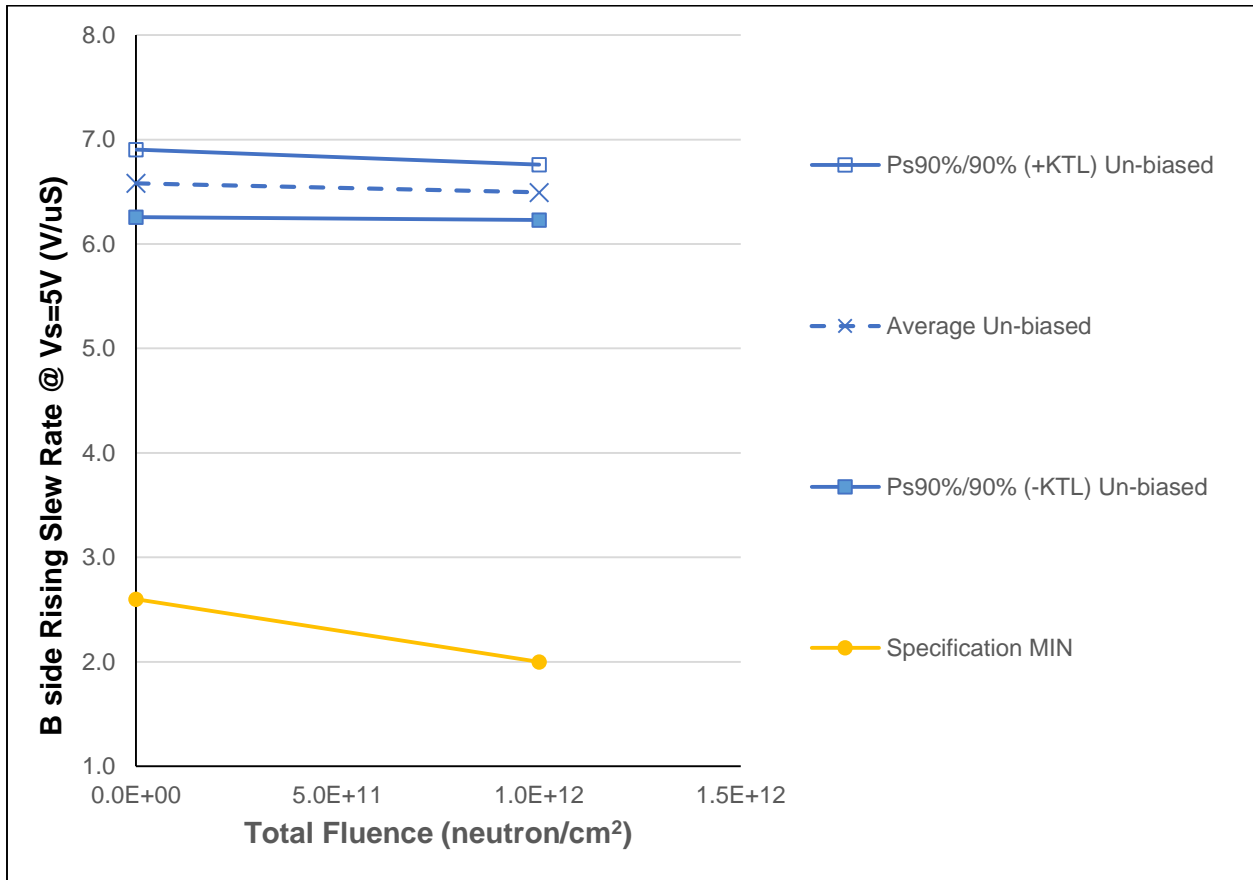


Figure 5.94: Plot of B-side Slew Rate (Rising) @ Vs = 5V versus Total Fluence

Table 5.94: Raw data table for B-side Slew Rate (Rising) @ Vs=5V of pre- and post-irradiation (1E12 N/cm²)

Parameter	B RISING SLEW RATE @ Vs=5V (V/uS)	Total Fluence (neutron/cm ²)	
		0	1.E+12
16	Un-biased Irradiation	6.452	6.452
17	Un-biased Irradiation	6.452	6.452
18	Un-biased Irradiation	6.667	6.452
19	Un-biased Irradiation	6.667	6.667
20	Un-biased Irradiation	6.667	6.452
13	Control Unit	6.452	6.452
14	Control Unit	6.250	6.452
Un-biased Irradiation Statistics			
	Average Un-biased	6.581	6.495
	Std Dev Un-biased	0.118	0.096
	Ps90%/90% (+KTL) Un-biased	6.904	6.758
	Ps90%/90% (-KTL) Un-biased	6.258	6.231
	Specification MIN	2.6	2.0
	Status (Measurements)	PASS	PASS
	Specification MAX		
	Status (Measurements)		
	Status (-KTL) Un-biased	PASS	PASS
	Status (+KTL) Un-biased		

Appendix A



Figure A1: Top View

Appendix B

Radiation Bias Connection Table

Table B1: Unbiased condition

Pin	Function	Connection/Bias
1	OUT A	Float
2	-IN A	Float
3	+IN A	Float
4	NC	Float
5	V ⁻	Float
6	NC	Float
7	+IN B	Float
8	-IN B	Float
9	OUT B	Float
10	V ⁺	Float

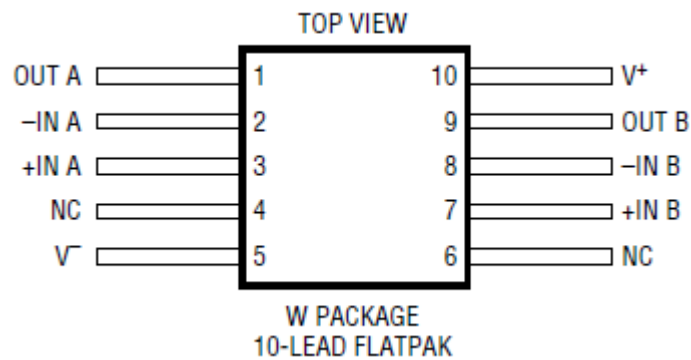


Figure B1: Pin-Out

Appendix C



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 Lowell, Massachusetts 01854
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Thomas Regan
 Reactor Engineering

RADIATION LABORATORY

7/2/2012
 Linear Technology Corporation
 Attention: Sana Rezgui
 1530 Buckeye Drive
 Milpitas, CA 95035

Subject: Certificate of Neutron Exposure
Product: Multiple products see attached table
Irradiation Date: June, 27th, 2012
Irradiation Facility: Reactor Facility- FNI
Dosimetry system: S/P-32, ASTM E-265

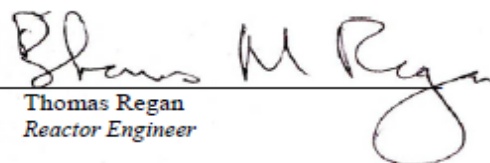
Neutron Dosimetry Results:

Irradiation	Requested Fluence (n/cm ²)	Reactor Power (kW)	Time (s)	Fluence Rate (n/cm ² -s) ^(2,3)	Gamma Dose rad (Si) ⁽¹⁾	Measured Fluence (n/cm ²) ⁽⁴⁾	Total Integral Fluence (n/cm ²)
Group 1	1.00E+12	45.0	228	4.05E+09	117	1.03E+12	1.03E+12
Group 2	1.00E+12	45.0	228	4.05E+09	117	9.41E+11	9.41E+11
Group 3	1.00E+13	475	234	4.28E+10	1266	9.22E+12	9.22E+12
Group 4	1.00E+13	90	1235	8.10E+09	1266	9.03E+12	9.03E+12

- (1) Based on reactor power at 1,000kW, the gamma dose is 41+/- 5.3% krad(Si)/hr as mapped by TLD-based dosimetry
- (2) Dosimetry method: ASTM E-265
- (3) The neutron fluence rate is determined from "Initial Testing of the New Ex-Core Fast Neutron Irradiator at UMass Lowell" (6/18/02)
- (4) Validated by S-32 flux monitors

The neutron fluence for this irradiation was determined using the previously measured neutron radiation field for this facility, measured with ASTM E-265 "Measuring Reaction Rates and Fast Neutron Fluence by Radioactivation of Sulfur-32" and correlated to the measured reactor power level.

Group 1	Average Integrated Neutron Fluence (1 MeV Si Eq.) =1.03E12 n/cm²
Group 2	Average Integrated Neutron Fluence (1 MeV Si Eq.) =9.41E11 n/cm²
Group 3	Average Integrated Neutron Fluence (1 MeV Si Eq.) =9.22E12 n/cm²
Group 4	Average Integrated Neutron Fluence (1 MeV Si Eq.) =9.03E12 n/cm²

Reviewed by 
 Thomas Regan
 Reactor Engineer

Appendix D

Table D1: Electrical Characteristics of Device-Under-Test Pre-Irradiation

 (Preirradiation) $V_S = \pm 15V$, $V_{CM} = V_{OUT} = 0V$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25^\circ C$			SUB-GROUP	$-55^\circ C \leq T_A \leq 125^\circ C$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
V_{OS}	Input Offset Voltage	$V_{CM} = V^+, V^-$ $V_{CM} = 14.5V, -14.5V$			200	800	1		350	1100	2, 3	μV μV
	Input Offset Voltage Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+ \text{ to } V^-$ $V_{CM} = 14.5V \text{ to } -14.5V$	3		250	1400			450	1800		μV μV
I_B	Input Bias Current	$V_{CM} = V^+$ $V_{CM} = 14.5V$ $V_{CM} = V^-$ $V_{CM} = -14.5V$		0	250	715	1		500	1200	2, 3	nA nA nA nA
	Input Bias Current Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+, V^-$ $V_{CM} = 14.5V, -14.5V$	3	0	12	200			50	400		nA nA
I_{OS}	Input Offset Current	$V_{CM} = V^+, V^-$ $V_{CM} = 14.5V, -14.5V$			6	70	1		40	300	2, 3	nA nA
	Input Voltage Range			-15		15		-14.5		14.5		V
	Input Noise Voltage	0.1Hz to 10Hz			400							nV _{p-p}
e_n	Input Noise Voltage Density	$f = 1kHz$			12							nV/ \sqrt{Hz}
i_n	Input Noise Current Density	$f = 1kHz$			0.3							pA/ \sqrt{Hz}
A_{VOL}	Large-Signal Voltage Gain	$V_O = -14.5V \text{ to } 14.5V$, $R_L = 10k$		1000	5200		4	60	400		5, 6	V/mV
		$V_O = -10V \text{ to } 10V$, $R_L = 2k$		500	2300			25	100			V/mV
CMRR	Common Mode Rejection Ratio	$V_{CM} = V^+ \text{ to } V^-$ $V_{CM} = 14.5V \text{ to } -14.5V$		90	102		1	86	102		2, 3	dB dB
	CMRR Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+ \text{ to } V^-$ $V_{CM} = 14.5V \text{ to } -14.5V$	3	84	103			80	100			dB dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 2V \text{ to } \pm 16V$		90	110		1	88			2, 3	dB
	PSRR Match (Channel-to-Channel) (Note 3)	$V_S = \pm 2V \text{ to } \pm 16V$	3	83	110			82	100			dB
V_{OL}	Output Voltage Swing (Low) (Note 4)	No Load			18	30			25	75		mV
		$I_{SINK} = 1mA$	4		50	100	4		70	150	5, 6	mV
		$I_{SINK} = 10mA$			230	500						mV
		$I_{SINK} = 5mA$							180	500		mV
V_{OH}	Output Voltage Swing (High) (Note 4)	No Load			2.5	10			5	25		mV
		$I_{SOURCE} = 1mA$	4		75	150	4		100	250	5, 6	mV
		$I_{SOURCE} = 10mA$			420	800						mV
		$I_{SOURCE} = 5mA$							300	800		mV
I_{SC}	Short-Circuit Current			± 15	± 30		1	± 7.5	± 12	2, 3	mA	
I_S	Supply Current per Amp				1.8	2.5	1		2.2	3	2, 3	mA
GBW	Gain-Bandwidth Product	$f = 100kHz$		6.8	10.5			5.8	8.5			MHz
SR	Slew Rate	$A_V = -1$, $R_L = 10k$, $V_O = \pm 10V$, Measure at $V_O = \pm 5V$		3.5	6		4	2.2	4		5, 6	V/ μs

Table D1 (continued): Electrical Characteristics of Device-Under-Test Pre-Irradiation
(Preirradiation) $V_S = 5V$; $V_{CM} = V_{OUT} = \text{half supply}$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25^\circ\text{C}$			SUB-GROUP	$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
V_{OS}	Input Offset Voltage	$V_{CM} = V^+, V^-$ $V_{CM} = V^+ - 0.5V, V^- + 0.5V$		150	800		1	300	1100		2, 3	μV μV
	Input Offset Voltage Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+ \text{ to } V^-$ $V_{CM} = V^+ - 0.5V, V^- + 0.5V$	3	200	1400			350	1800			μV μV
I_B	Input Bias Current	$V_{CM} = V^+$ $V_{CM} = V^+ - 0.5V$ $V_{CM} = V^-$ $V_{CM} = V^- + 0.5V$		0 -650	250 -250	650 0	1	0 -1100	450 -450	1100 0	2, 3	nA nA nA nA
	Input Bias Current Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+, V^-$ $V_{CM} = V^+ - 0.5V, V^- + 0.5V$	3	0	10	180		0	30	400		nA nA
I_{OS}	Input Offset Current	$V_{CM} = V^+, V^-$ $V_{CM} = V^+ - 0.5V, V^- + 0.5V$		5	65		1	15	300		2, 3	nA nA
	Input Voltage Range			V^-		V^+		$V^- + 0.5V$		$V^+ - 0.5V$		V
	Input Noise Voltage	0.1Hz to 10Hz		400								nV_{p-p}
e_n	Input Noise Voltage Density	$f = 1\text{kHz}$		12								$\text{nV}/\sqrt{\text{Hz}}$
i_n	Input Noise Current Density	$f = 1\text{kHz}$		0.3								$\text{pA}/\sqrt{\text{Hz}}$
C_{IN}	Input Capacitance			5								pF
A_{VOL}	Large-Signal Voltage Gain	$V_S = 5V, V_O = 75\text{mV to } 4.8V,$ $R_L = 10k$		600	3800		4	60	210		5, 6	V/mV
CMRR	Common Mode Rejection Ratio	$V_S = 5V, V_{CM} = V^+ \text{ to } V^-$ $V_S = 5V, V_{CM} = 0.5V \text{ to } 4.5V$		76	90			68	85			dB dB
	CMRR Match (Channel-to-Channel) (Note 3)	$V_S = 5V, V_{CM} = V^+ \text{ to } V^-$ $V_S = 5V, V_{CM} = 0.5V \text{ to } 4.5V$	3	75	91			66				dB dB
PSRR	Power Supply Rejection Ratio	$V_S = 4.5V \text{ to } 12V,$ $V_{CM} = V_O = 0.5V$		88	105		1	86	104		2, 3	dB
	PSRR Match (Channel-to-Channel) (Note 3)	$V_S = 4.5V \text{ to } 12V,$ $V_{CM} = V_O = 0.5V$	3	82	120			80	118			dB
V_{OL}	Output Voltage Swing (Low) (Note 4)	No Load $I_{SINK} = 1\text{mA}$ $I_{SINK} = 2.5\text{mA}$	4	14 50 90	30 100 200		4	25 65 110	75 150 220		5, 6	mV mV mV
V_{OH}	Output Voltage Swing (High) (Note 4)	No Load $I_{SOURCE} = 1\text{mA}$ $I_{SOURCE} = 2.5\text{mA}$	4	2.5 70 140	10 150 250		4	5 100 180	25 250 300		5, 6	mV mV mV
I_{SC}	Short-Circuit Current	$V_S = 5V$		± 12.5	24		1	± 5	± 10		2, 3	mA
I_S	Supply Current per Amp			1.7	2.2		1	2	2.7		2, 3	mA
GBW	Gain-Bandwidth Product	$V_S = 5V, f = 100\text{kHz}$		6.8	10.5			5.8	8.5			MHz
SR	Slew Rate	$V_S = \pm 2.5V, A_V = -1,$ $R_L = 10k, V_O = \pm 2V,$ Measure at $V_O = \pm 1V$		2.6	4.5		4	2	3.6		5, 6	V/ μs

Table D2: Electrical Characteristics of Device-Under-Test Post-Irradiation

 (Postirradiation) $V_S = \pm 15V$, $V_{CM} = 0V$, $T_A = 25^\circ C$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	NOTES	10-Krad(Si)		20Krad(Si)		50Krad(Si)		100Krad(Si)		200Krad(Si)		UNITS
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
V_{OS}	Input Offset Voltage	$V_{CM} = V^+, V^-$			950		950		950		950		950	μV
I_B	Input Bias Current	$V_{CM} = V^+, V^-$			765		815		865		915		965	nA
I_{OS}	Input Offset Current	$V_{CM} = V^+, V^-$			100		100		100		100		100	nA
	Input Voltage Range			V^-	V^+	V^-	V^+	V^-	V^+	V^-	V^+	V^-	V^+	V
A_{VOL}	Large-Signal Voltage Gain	$V_O = -14.5V$ to $14.5V$, $R_L = 10k$		500		500		500		500		500		V/mV
		$V_O = -10V$ to $10V$, $R_L = 2k$		250		250		250		250		250		250
CMRR	Common Mode Rejection Ratio	$V_{CM} = V^+$ to V^-		86		86		86		86		86		dB
	CMRR Match (Channel-to-Channel)	$V_{CM} = V^+$ to V^-	3	83		83		83		83		83		dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 2V$ to $\pm 16V$		90		90		90		90		90		dB
	PSRR Match (Channel-to-Channel)	$V_S = \pm 2V$ to $\pm 16V$	3	83		83		83		83		83		dB
V_{OUT}	Output Voltage Swing Low	No Load		60		60		60		60		60		mV
		$I_{SINK} = 1mA$	4	100		100		100		100		100		mV
		$I_{SINK} = 10mA$		500		500		500		500		500		mV
Output Voltage Swing High	No Load		20		20		20		20		20		mV	
	$I_{SOURCE} = 1mA$	4	150		150		150		150		150		mV	
	$I_{SOURCE} = 10mA$		800		800		800		800		800		mV	
I_{SC}	Short-Circuit Current		± 10		± 10		± 10		± 10		± 10		mA	
I_S	Supply Current		2.5		2.5		2.5		2.5		2.5		mA	
GBW	Gain-Bandwidth Product	$f = 100kHz$		4.5		4.5		4.5		4.5		4.5		MHz
SR	Slew Rate	$A_V = -1$, $R_L = 10k$, $V_O = \pm 10V$, Measure at $V_O = \pm 5V$		3		3		3		3		3		V/ μs

 (Postirradiation) $V_S = 5V$; $V_{CM} = \text{half supply}$, $T_A = 25^\circ C$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	NOTES	10Krad(Si)		20Krad(Si)		50Krad(Si)		100Krad(Si)		200Krad(Si)		UNITS
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX			
V_{OS}	Input Offset Voltage	$V_{CM} = V^+, V^-$			950		950		950		950		950	μV
I_B	Input Bias Current	$V_{CM} = V^+, V^-$			700		750		800		850		900	nA
I_{OS}	Input Offset Current	$V_{CM} = V^+, V^-$			65		65		65		65		65	nA
	Input Voltage Range			V^-	V^+	V^-	V^+	V^-	V^+	V^-	V^+	V^-	V^+	V
A_{VOL}	Large-Signal Voltage Gain	$V_O = 75mV$ to $V^+ - 0.2V$ $R_L = 10k$		300		300		300		300		300		V/mV
CMRR	Common Mode Rejection Ratio	$V_{CM} = V^+$ to V^-		70		70		70		70		70		dB
	CMRR Match (Channel-to-Channel)	$V_{CM} = V^+$ to V^-	3	70		70		70		70		70		dB
PSRR	Power Supply Rejection Ratio	$V_S = 4.5V$ to $12V$, $V_{CM} = V_O = 0.5V$		88		88		88		88		88		dB

Table D2 (continued): Electrical Characteristics of Device-Under-Test Post-Irradiation

 (Postirradiation) $V_S = 5V$; $V_{CM} = \text{half supply}$, $T_A = 25^\circ C$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	NOTES	10Krad(Si)		20Krad(Si)		50Krad(Si)		100Krad(Si)		200Krad(Si)		UNITS	
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
	PSRR Match (Channel-to-Channel)	$V_S = 4.5V$ to $12V$, $V_{CM} = V_O = 0.5V$	3	82		82		82		82		82		dB	
V_{OUT}	Output Voltage Swing Low	No Load	4	60		60		60		60		60		mV	
		$I_{SINK} = 1mA$		100		100		100		100		100		mV	
$I_{SINK} = 2.5mA$		200			200		200		200		200		200		mV
	Output Voltage Swing High	No Load	4	20		20		20		20		20		mV	
$I_{SOURCE} = 1mA$		150			150		150		150		150		150		mV
$I_{SOURCE} = 2.5mA$		250			250		250		250		250		250		mV
I_{SC}	Short-Circuit Current			± 8		± 8		± 8		± 8		± 8		mA	
I_S	Supply Current			2.2		2.2		2.2		2.2		2.2		mA	
SR	Slew Rate	$V_S = \pm 2.5V$, $A_V = -1$, $R_L = 10k$, $V_O = \pm 2V$, Measure at $V_O = \pm 1V$		2		2		2		2		2		V/ μs	

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: A heat sink may be required to keep the junction temperature below this absolute maximum rating when the output is shorted indefinitely.

Note 3: Matching parameters are the difference between amplifiers A and B.

Note 4: Output voltage swings are measured between the output and power supply rails.