

Total Ionization Dose (TID) Test Results of the RH6200MW Low Noise, High Speed Rail-to-Rail Op Amp @ Low Dose Rate (LDR)

Dose Rate = 10 mrad(Si)/s

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Acknowledgements

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TID LDR Test Results of the RH6200MW Low Noise, High Speed Rail-to-Rail Op Amp

Part Type Tested: RH6200MW Low Noise, High Speed Rail-to-Rail Op Amp.

Traceability Information: Manufacturer: Analog Devices Inc., Lot Number: 687654.1, Date Code: 1241A. Wafer Number 2. Fab Lot Number WD004929.1. See photograph of unit under test in Appendix A.

Quantity of Units: 22 Units, SNs: 213-234 See Appendix B for the radiation bias conditions.

Radiation and Electrical Test Increments: 22 samples were divided into 4 groups of 5 each. Serial numbers 213-217 irradiated to 50 krad(Si) and biased. Serial numbers 218-222 were irradiated to 50 krad(Si) and unbiased. Serial numbers 223-227 were irradiated to 100 krad(Si) and biased. Serial numbers 228-232 were irradiated to 100 krad(Si) and unbiased. Serial numbers 233 and 234 were used as controls. Units were shipped to Analog Devices Inc. after each irradiation dose level via dry ice for electrical testing.

Radiation dose: 10 mrad(Si)/s ionizing radiation to 50 krad(Si) and 100 krad(Si)

Radiation Test Standard: MIL-STD-883 TM1019.9 Condition D [1].

Test Hardware and Software: Cobham RAD Solutions provided Radiation Bias Boards. See photographs in Appendix B for Radiation Bias Conditions and Radiation Bias Board.

Facility and Radiation Source: Cobham RAD Solutions' Longmire Laboratories, Colorado Springs, CO. Gamma rays provided by a ⁶⁰Co (GB-150) low dose rate source. Dosimetry performed by Air Ionization Chamber (AIC) traceable to NIST. Cobham RAD Solutions dosimetry has been audited by DLA and Cobham RAD Solutions has been awarded Laboratory Suitability for MIL-STD-750 and MIL-STD-883 TM 1019.

Irradiation and Test Temperature: Room temperature controlled to 24 °C ± 6 °C per MIL-STD-883 and MIL-STD-750 [2].

SUMMARY

ALL 22 PARTS PASSED THE ELECTRICAL TEST LIMITS AS SPECIFIED IN THE DATASHEET AFTER EACH IRRADIATION INCREMENT.

1.0 Overview and Background

Total-ionizing dose (TID) can result in charge trapping in the transistors' dielectrics and interface regions, affecting the devices' electrical performance. For some mixed signal and linear devices based on bipolar minority carrier elements, enhanced low dose rate sensitivity (ELDRS) may result in more significant parametric degradation and/or earlier functional failures for irradiation at low dose rate relative to high dose rate. Such effects warrant testing the circuits at low dose rate and monitoring the circuits to the effects of TID, accounting for any annealing and/or time dependent effects (TDE) that may take place, depending on the circuit's design and process technology. Hence the requirement per Condition D (for low-dose rates $\leq 10\text{mrad/s}$) in TM1019, MIL-STD-883 "shall be tested either at the intended application dose rate, at a prescribed low dose rate to an overtest radiation level, or with an accelerated test such as an elevated temperature irradiation test that includes a parameter delta design margin".

2.0 Radiation Facility and Test Equipment

The samples were irradiated at Cobham RAD Solutions Longmire Laboratories in Colorado Springs, Colorado. Cobham utilizes a GB-150 ^{60}Co low dose source to provide a dose rate of 10 mrad(Si)/s. To maintain this dose rate the devices were placed about 2 meters from the source. Dosimetry was performed by Air Ionization Chamber (AIC) traceable to National Institute of Standards and Technology (NIST). Cobham RAD's dosimetry has been audited by DSCC and Cobham RAD has been awarded Laboratory Suitability for MIL-STD-750 and MIL-STD-883 TM 1019. Appendix C has a figure of the source used for this test.

3.0 Test Conditions

Twenty test samples and two control units of the RH6200MW Low Noise, High Speed Rail-to-Rail Op Amp were electrically tested at 25°C prior to irradiation. The parts were then shipped to Cobham RAD Solutions Longmire Laboratories in Colorado Springs, Colorado for irradiation. During irradiation, the test samples were divided into 4 groups of 5 each. 5 were irradiated to 50 krad(Si) while being biased and five were irradiated to 50 krad(Si) while unbiased. The next ten pieces were irradiated to 100 krad(Si) with 5 of them biased and 5 of them unbiased. Units were shipped back to Analog Devices Inc. after each irradiation dose level via dry ice for electrical testing. The bias and unbiased conditions are shown in Appendix B. Testing was performed on the two control units to confirm the operation of the test system prior to the electrical testing of the 22 units (20 irradiated and 2 control).

The criteria to pass the test requires that five samples in each corresponding dose group irradiated under electrical bias must pass the datasheet limits for all measured electrical parameters. 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 and if valid the lot will be scrapped.

4.0 Tested Parameters

The following parameters were measured pre- and post-irradiation:

- IS @ Vs=5V
- IS @ Vs = +/-5V
- +IS, S/D PIN @V=-2.2V,VS=+/-2.5V: IS Vs =5V, Vshdn=0.3V
- +IS, S/D PIN @V=0.3V,VS=+/-5V: IS Vshdn=0.3V
- CURRENT OF S/D PIN @V=0.3V,VS=+/-5V: ISHDN Vshdn=0.3V
- CURRENT OF S/D PIN @V=-2.2V,VS=+/-2.5V: ISHDN Vshdn=0.3V
- VOS @ +/-5V, VCM=0V: VOS Vs = +/-5V VCM=Half Supply
- VOS @ +/-5V, VCM=V+: vos VCM=V+
- IOS @+/-5V, VCM=V+: IOs VCM=V+
- +IB @+/-5V, VCM=V+:IB VCM=V+
- -IB @+/-5V, VCM=V+:IB VCM=V+
- VOS @ +/-5V, VCM=V-: VOS VCM=V-
- IOS @+/-5V, VCM=V-: IOS VCM=V-
- +IB @+/-5V, VCM=V-: IB VCM=V-
- -IB @+/-5V, VCM=V-: IB VCM=V-
- VOS +/-2.5v, VCM=0V: VOS Vs=5V, VCM=Half Supply
- IOS +/-2.5V, VCM=0V: IOS VCM=Half Supply
- +IB +/-2.5V, VCM=0V: IB VCM=Half Supply
- -IB +/-2.5V, VCM=0V: IB VCM=Half Supply
- VOS +/-2.5V, VCM=V+: VOS Vs=5V, VCM=V- to V+
- IOS +/-2.5V. VCM=V+: IOS VCM=V+
- +IB +/-2.5V, VCM=V+: IB VCM=V+
- -IB +/-2.5V, VCM=V+: IB VCM=V+
- VOS +/-2.5V, VCM=V-: VOS Vs=5V, VCM=V- to V+
- IOS +/-2.5V, VCM=V-: IOS VCM=V-
- +IB +/-2.5V, VCM=V-: IB VCM=V-
- -IB +/-2.5V, VCM=V-: IB VCM=V-
- +/-CMRR @ +/-2.5V, VCM=+/-1V: CMRR VS=5V, VCM=1.5V to 3.5V
- +/-CMRR +/-2.5V, VCM=+/-2.5V: CMRR VS=5V, VCM=V- to V+
- +/-CMRR AMP @ +/-5V, VCM=+/-5V: CMRR VCM=V- to V+
- +/-CMRR @ +/-5V, VCM=+/-2V: CMRR VCM=-2V to 2V
- PSRR @ +/-2.25V TO +/-5V: PSRR Vs= 2.5V to 10V
- +/-AVOL @+/-2.5V, RL=1K, VOUT=+/-2V:AVOL Vs=5V, Vo=0.5V to 4.5V, RL=1K to Vs/2
- +/-AVOL @+/-2.5V, RL=100, VOUT=+/-1.5V: AVOL Vs=5V, Vo=1V to 4V, RL=100W to Vs/2
- +/-AVOL @+/-5V, RL=1K, VOUT=+/-4.5V: AVOL Vo=+/-4.5V, RL=1K
- +/-AVOL @+/-5V, RL=100, VOUT=+/-2V: AVOL Vo=+/-2V, RL=100W
- VOH @ +/-5V, IL=0MA: VOH No Load
- VOH @ +/-5V, IL=-5MA: VOH Isource=5MA
- VOH @ +/-5V, IL=-20MA: VOH Isource=20MA
- VOL @ +/-5V, IL=0MA: VOL No Load
- VOL @ +/-5V, IL=5MA: VOL Isink=5MA
- VOL @ +/-5V, IL=20MA: VOL Isink=20mA
- VOH @ +5V, IL=0MA: VOH No Load
- VOH @ +5V, IL=-5MA: VOH Isource=5MA
- VOH @ +5V, IL=-20MA: VOH Vs=5V, Isource=20MA

- VOL AMP1 @ +5V, IL=0MA: VOL No Load
- VOL @ +5V, IL=5MA: VOL Isink=5MA
- VOL @ +5V, IL=20MA: VOL Vs=5V, Isink=20MA
- ISRC @ +5V: ISC VS=5V
- ISNK @ +5V: ISC VS=5V
- ISRC @ +/-5V: ISC
- ISNK @ +/-5V: ISC

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

5.0 Test Results

All 20 samples passed the post-irradiation electrical tests. All measurements of the 52 listed parameters in section 4.0 were within the specification limits.

The statistical analysis used in this report is 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 by adding to and subtracting from mean the product of standard deviation and the tolerance limit factor K_{TL} where K_{TL} is tabulated from a table of the inverse normal probability distribution. The upper tolerance limit $+K_{TL}$ and the lower tolerance limit $-K_{TL}$ are

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

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

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 black dual dotted lines with black diamond markers are the average of the measured data points of ten samples irradiated under electrical bias while the blue dual dotted rounded lines with X-markers are the average of measured data points of ten units irradiated with all pins tied to ground (un-biased). The black solid lines are the average of the data points after the calculation of the $+K_{TL}$ statistics on the sample irradiated in the biased setup. The black dotted lines are the average of the data points after the calculation of the $-K_{TL}$ statistics on the sample irradiated in the biased setup. The blue solid lines are the average of the data points after the calculation of the $+K_{TL}$ statistics on the sample irradiated in the un-biased setup. The blue dotted lines are the average of the data points after the calculation of the $-K_{TL}$ statistics on the sample irradiated in the un-biased setup. The red dotted lines are the specification limits.

IS @ Vs=5V (mA) vs Total Ionizing Dose (kRad(Si))

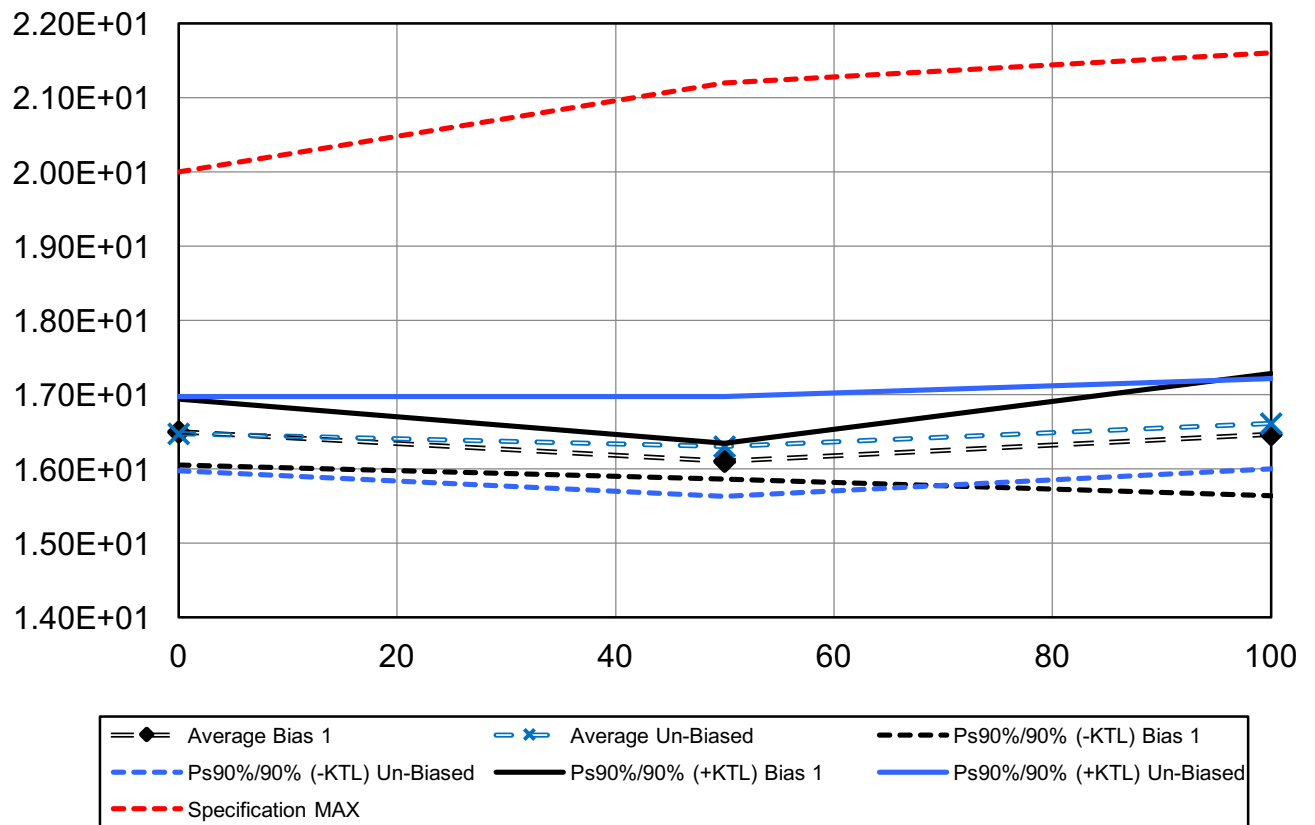


Figure 5.1 Plot of Supply Current with Vs=5V (mA) vs Total Ionizing Dose (kRad(Si))

Table 5.1: Raw data for Supply Current @ Vs=5V (mA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

IS @ Vs=5V (mA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.63E+01	1.60E+01	
214	1.65E+01	1.62E+01	
215	1.64E+01	1.60E+01	
216	1.64E+01	1.61E+01	
217	1.65E+01	1.62E+01	
223	1.65E+01		16.30589
224	1.66E+01		16.51151
225	1.62E+01		16.04634
226	1.67E+01		16.62594
227	1.69E+01		16.82829
218	1.62E+01	1.61E+01	
219	1.62E+01	1.61E+01	
220	1.66E+01	1.65E+01	
221	1.67E+01	1.66E+01	
222	1.63E+01	1.62E+01	
228	1.67E+01		1.69E+01
229	1.66E+01		1.66E+01
230	1.62E+01		1.63E+01
231	1.65E+01		1.66E+01
232	1.68E+01		1.67E+01
Bias 1 Statistics			
Average Bias 1	1.65E+01	1.61E+01	1.65E+01
Std Dev Bias 1	2.15E-01	8.78E-02	3.00E-01
Ps90%/90% (+KTL) Bias 1	1.69E+01	1.63E+01	1.73E+01
Ps90%/90% (-KTL) Bias 1	1.61E+01	1.59E+01	1.56E+01
Un-Biased Statistics			
Average Un-Biased	1.65E+01	1.63E+01	1.66E+01
Std Dev Un-Biased	2.42E-01	2.46E-01	2.22E-01
Ps90%/90% (+KTL) Un-Biased	1.70E+01	1.70E+01	1.72E+01
Ps90%/90% (-KTL) Un-Biased	1.60E+01	1.56E+01	1.60E+01
Specification MAX	2.00E+01	2.12E+01	2.16E+01
Status	PASS	PASS	PASS

IS @ Vs=+/-5V (mA) vs Total Ionizing Dose (kRad(Si))

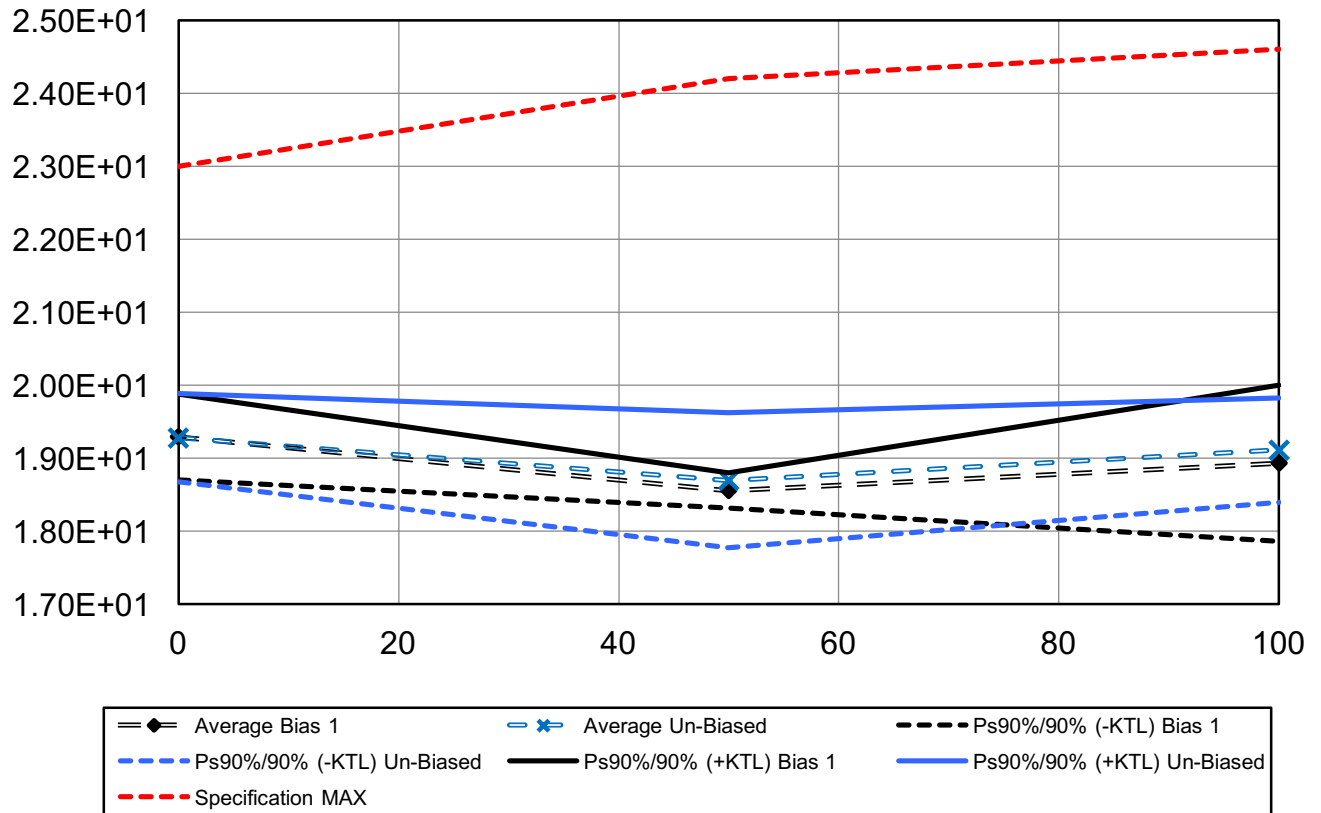


Figure 5.2: Plot of Supply Current with Vs=+/-5V (mA) vs Total Ionizing Dose (kRad(Si))

Table 5.2: Raw data for Supply Current @ Vs=+/- 5V (mA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

IS @ Vs = +/-5V (mA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.91E+01	1.85E+01	
214	1.93E+01	1.87E+01	
215	1.91E+01	1.85E+01	
216	1.92E+01	1.86E+01	
217	1.92E+01	1.86E+01	
223	1.94E+01		18.73343
224	1.94E+01		19.01207
225	1.88E+01		18.38983
226	1.96E+01		19.11368
227	1.98E+01		19.41615
218	1.90E+01	1.85E+01	
219	1.89E+01	1.85E+01	
220	1.95E+01	1.89E+01	
221	1.96E+01	1.92E+01	
222	1.89E+01	1.84E+01	
228	1.95E+01		1.94E+01
229	1.95E+01		1.92E+01
230	1.90E+01		1.87E+01
231	1.93E+01		1.91E+01
232	1.96E+01		1.92E+01
Bias 1 Statistics			
Average Bias 1	1.93E+01	1.86E+01	1.89E+01
Std Dev Bias 1	2.86E-01	8.65E-02	3.90E-01
Ps90%/90% (+KTL) Bias 1	1.99E+01	1.88E+01	2.00E+01
Ps90%/90% (-KTL) Bias 1	1.87E+01	1.83E+01	1.79E+01
Un-Biased Statistics			
Average Un-Biased	1.93E+01	1.87E+01	1.91E+01
Std Dev Un-Biased	2.93E-01	3.38E-01	2.62E-01
Ps90%/90% (+KTL) Un-Biased	1.99E+01	1.96E+01	1.98E+01
Ps90%/90% (-KTL) Un-Biased	1.87E+01	1.78E+01	1.84E+01
Specification MAX	2.30E+01	2.42E+01	2.46E+01
Status	PASS	PASS	PASS

I_s(SHDN) V_s=5V, 0V (mA) vs Total Ionizing Dose (kRad(Si))

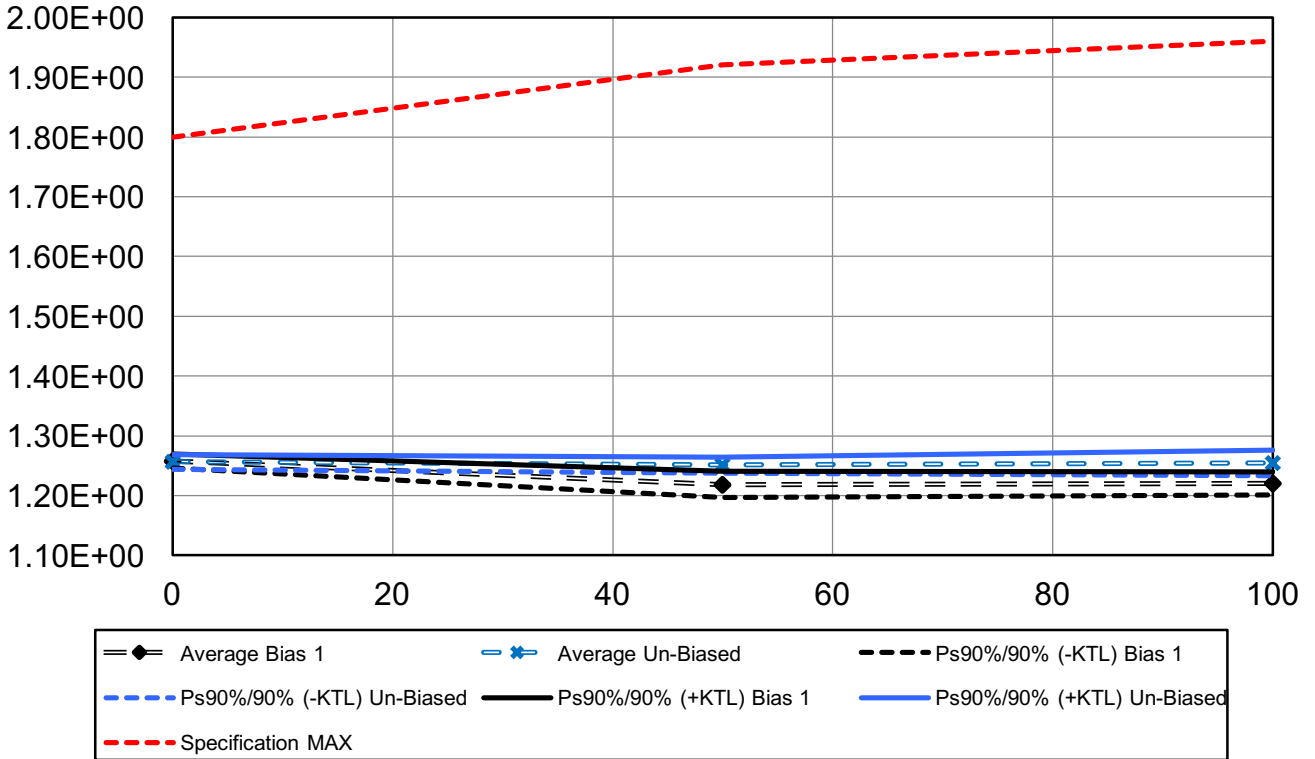


Figure 5.3: Plot of Shutdown Supply Current @ V_s= 5V, 0V versus Total Dose

Table 5.3: Raw data for Shutdown Supply Current @ Vs=5V, 0V (mA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

IS(SHDN) Vs=5V, 0V (mA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.25E+00	1.21E+00	
214	1.25E+00	1.21E+00	
215	1.26E+00	1.22E+00	
216	1.26E+00	1.22E+00	
217	1.27E+00	1.23E+00	
223	1.26E+00		1.22E+00
224	1.26E+00		1.22E+00
225	1.25E+00		1.21E+00
226	1.25E+00		1.22E+00
227	1.26E+00		1.23E+00
218	1.25E+00	1.24E+00	
219	1.25E+00	1.25E+00	
220	1.26E+00	1.25E+00	
221	1.26E+00	1.26E+00	
222	1.26E+00	1.25E+00	
228	1.26E+00		1.25E+00
229	1.26E+00		1.26E+00
230	1.25E+00		1.25E+00
231	1.27E+00		1.27E+00
232	1.26E+00		1.25E+00
Bias 1 Statistics			
Average Bias 1	1.26E+00	1.22E+00	1.22E+00
Std Dev Bias 1	5.54E-03	7.98E-03	7.07E-03
Ps90%/90% (+KTL) Bias 1	1.27E+00	1.24E+00	1.24E+00
Ps90%/90% (-KTL) Bias 1	1.25E+00	1.20E+00	1.20E+00
Un-Biased Statistics			
Average Un-Biased	1.26E+00	1.25E+00	1.25E+00
Std Dev Un-Biased	5.77E-03	4.79E-03	7.86E-03
Ps90%/90% (+KTL) Un-Biased	1.27E+00	1.26E+00	1.28E+00
Ps90%/90% (-KTL) Un-Biased	1.24E+00	1.24E+00	1.23E+00
Specification MAX	1.80E+00	1.92E+00	1.96E+00
Status	PASS	PASS	PASS

I_{S(SHDN)} V_s=+/-5V (mA) vs Total Ionizing Dose (kRad(Si))

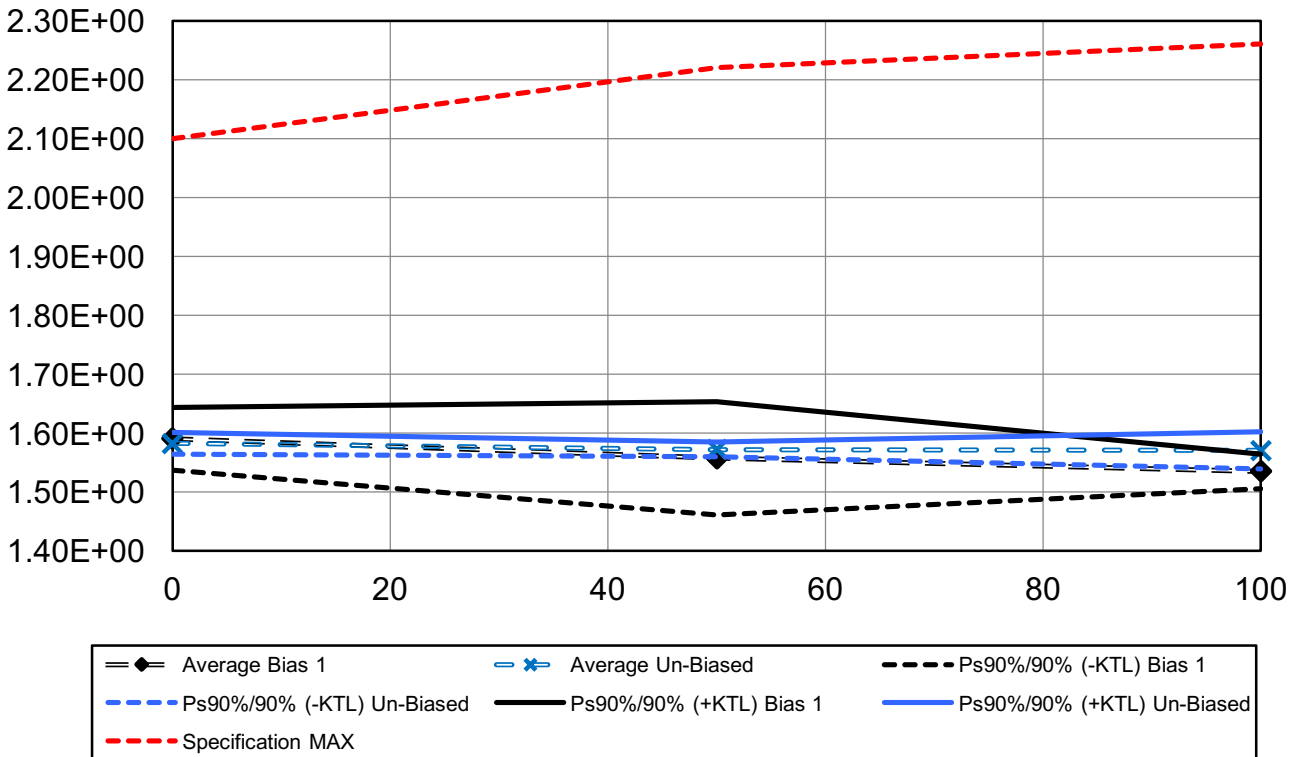


Figure 5.4: Plot of Shutdown Supply Current @ V_s=+/- 5V versus Total Dose

Table 5.4: Raw data for Shutdown Supply Current @ $V_s = \pm 5V$ (mA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

Is(SHDN) $V_s = \pm 5V$ (mA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.58E+00	1.53E+00	
214	1.57E+00	1.53E+00	
215	1.66E+00	1.62E+00	
216	1.59E+00	1.54E+00	
217	1.60E+00	1.56E+00	
223	1.58E+00		1.529949
224	1.59E+00		1.545811
225	1.57E+00		1.52442
226	1.58E+00		1.526707
227	1.59E+00		1.546572
218	1.57E+00	1.57E+00	
219	1.58E+00	1.57E+00	
220	1.58E+00	1.57E+00	
221	1.59E+00	1.58E+00	
222	1.59E+00	1.57E+00	
228	1.58E+00		1.56E+00
229	1.58E+00		1.57E+00
230	1.57E+00		1.56E+00
231	1.60E+00		1.59E+00
232	1.58E+00		1.56E+00
Bias 1 Statistics			
Average Bias 1	1.59E+00	1.56E+00	1.53E+00
Std Dev Bias 1	2.58E-02	3.50E-02	1.07E-02
Ps90%/90% (+KTL) Bias 1	1.64E+00	1.65E+00	1.56E+00
Ps90%/90% (-KTL) Bias 1	1.54E+00	1.46E+00	1.51E+00
Un-Biased Statistics			
Average Un-Biased	1.58E+00	1.57E+00	1.57E+00
Std Dev Un-Biased	8.75E-03	4.61E-03	1.16E-02
Ps90%/90% (+KTL) Un-Biased	1.60E+00	1.58E+00	1.60E+00
Ps90%/90% (-KTL) Un-Biased	1.56E+00	1.56E+00	1.54E+00
Specification MAX	2.10E+00	2.22E+00	2.26E+00
Status	PASS	PASS	PASS

CURRENT OF S/D PIN @V=0.3V, VS=+/-5V (uA) vs Total Ionizing Dose (kRad(Si))

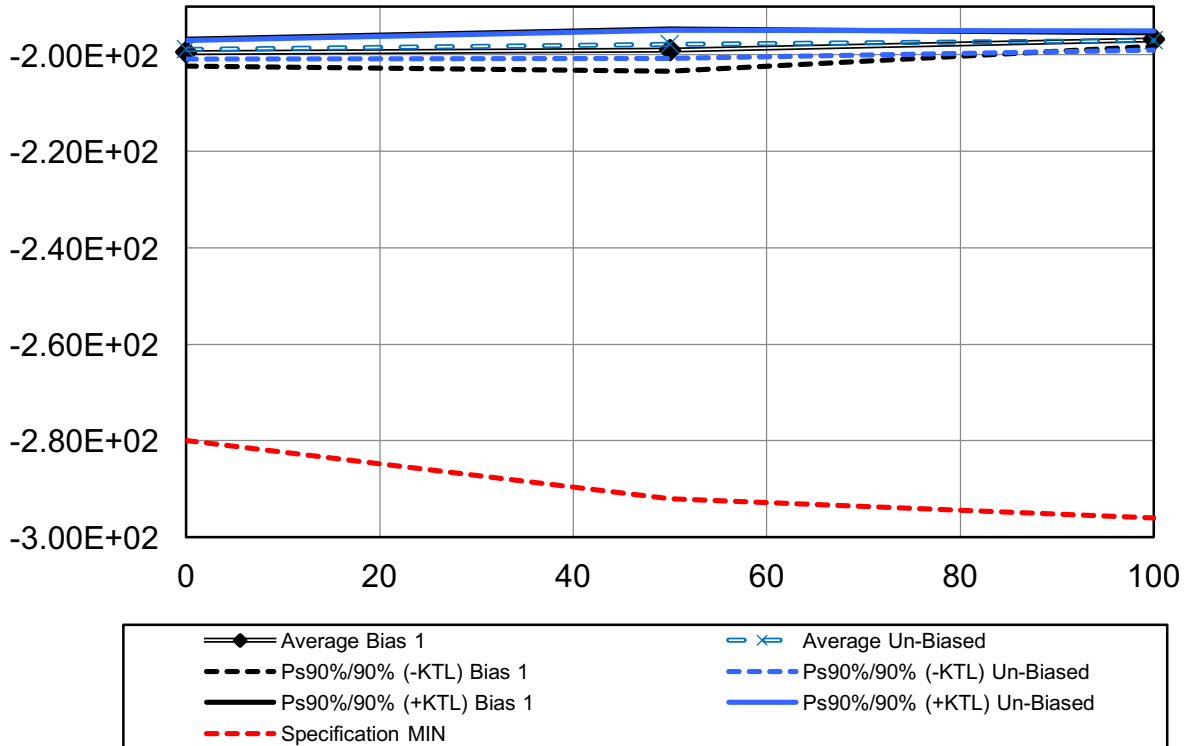


Figure 5.5: Plot of Shutdown Pin Current @V=0.3V, VS=+/-5V (uA) versus Total Dose

Table 5.5: Raw data for Shutdown Pin Current @V=0.3V, VS=+/-5V (uA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

CURRENT OF S/D PIN @V=0.3V,VS=+/-5V (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-1.99E+02	-1.97E+02	
214	-2.00E+02	-1.99E+02	
215	-2.01E+02	-2.00E+02	
216	-1.99E+02	-1.98E+02	
217	-2.03E+02	-2.01E+02	
223	-2.00E+02		-1.98E+02
224	-1.98E+02		-1.97E+02
225	-1.98E+02		-1.96E+02
226	-1.99E+02		-1.97E+02
227	-1.98E+02		-1.97E+02
218	-1.98E+02	-1.97E+02	
219	-2.01E+02	-1.99E+02	
220	-1.99E+02	-1.97E+02	
221	-2.00E+02	-1.99E+02	
222	-1.98E+02	-1.97E+02	
228	-1.99E+02		-1.98E+02
229	-1.98E+02		-1.96E+02
230	-1.98E+02		-1.97E+02
231	-2.00E+02		-1.98E+02
232	-1.99E+02		-1.97E+02
Bias 1 Statistics			
Average Bias 1	-2.00E+02	-1.99E+02	-1.97E+02
Std Dev Bias 1	1.35E+00	1.61E+00	5.04E-01
Ps90%/90% (+KTL) Bias 1	-1.97E+02	-1.95E+02	-1.95E+02
Ps90%/90% (-KTL) Bias 1	-2.02E+02	-2.03E+02	-1.98E+02
Un-Biased Statistics			
Average Un-Biased	-1.99E+02	-1.98E+02	-1.97E+02
Std Dev Un-Biased	9.42E-01	1.06E+00	7.24E-01
Ps90%/90% (+KTL) Un-Biased	-1.97E+02	-1.95E+02	-1.95E+02
Ps90%/90% (-KTL) Un-Biased	-2.01E+02	-2.01E+02	-1.99E+02
Specification MIN	-2.80E+02	-2.92E+02	-2.96E+02
Status	PASS	PASS	PASS

CURRENT OF S/D PIN @V=0.3V, VS=5V, 0V (uA) vs Total Ionizing Dose (kRad(Si))

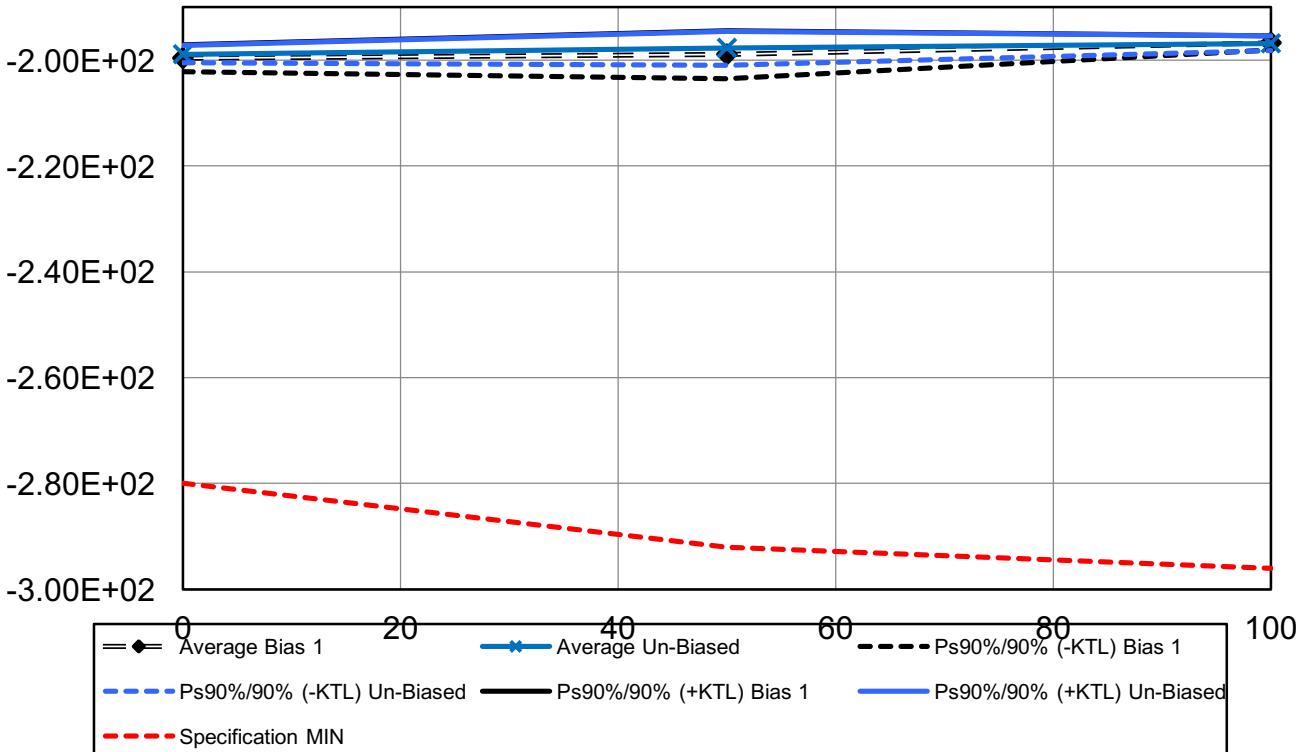


Figure 5.6: Plot of Shutdown Pin Current @V=0.3V, VS=5V, 0V (uA) versus Total Dose

Table 5.6: Raw data for Shutdown Pin Current V=0.3V, VS=5V, 0V (uA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

CURRENT OF S/D PIN @V=0.3V, VS=5V, 0V (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-1.99E+02	-1.98E+02	
214	-2.00E+02	-1.98E+02	
215	-2.01E+02	-2.00E+02	
216	-1.99E+02	-1.98E+02	
217	-2.02E+02	-2.01E+02	
223	-2.00E+02		-1.98E+02
224	-1.99E+02		-1.96E+02
225	-1.99E+02		-1.96E+02
226	-1.99E+02		-1.97E+02
227	-1.99E+02		-1.97E+02
218	-1.98E+02	-1.97E+02	
219	-2.00E+02	-1.99E+02	
220	-1.98E+02	-1.97E+02	
221	-2.00E+02	-1.98E+02	
222	-1.98E+02	-1.97E+02	
228	-1.99E+02		-1.97E+02
229	-1.98E+02		-1.96E+02
230	-1.98E+02		-1.96E+02
231	-2.00E+02		-1.98E+02
232	-1.98E+02		-1.97E+02
Bias 1 Statistics			
Average Bias 1	-2.00E+02	-1.99E+02	-1.97E+02
Std Dev Bias 1	1.23E+00	1.67E+00	4.69E-01
Ps90%/90% (+KTL) Bias 1	-1.97E+02	-1.94E+02	-1.95E+02
Ps90%/90% (-KTL) Bias 1	-2.02E+02	-2.04E+02	-1.98E+02
Un-Biased Statistics			
Average Un-Biased	-1.99E+02	-1.98E+02	-1.97E+02
Std Dev Un-Biased	8.09E-01	1.16E+00	5.17E-01
Ps90%/90% (+KTL) Un-Biased	-1.97E+02	-1.95E+02	-1.95E+02
Ps90%/90% (-KTL) Un-Biased	-2.01E+02	-2.01E+02	-1.98E+02
Specification MIN	-2.80E+02	-2.92E+02	-2.96E+02
Status	PASS	PASS	PASS

VOS @ $V_s = \pm 5V$ $V_{CM}=0V(mV)$ vs Total Ionizing Dose (kRad(Si))

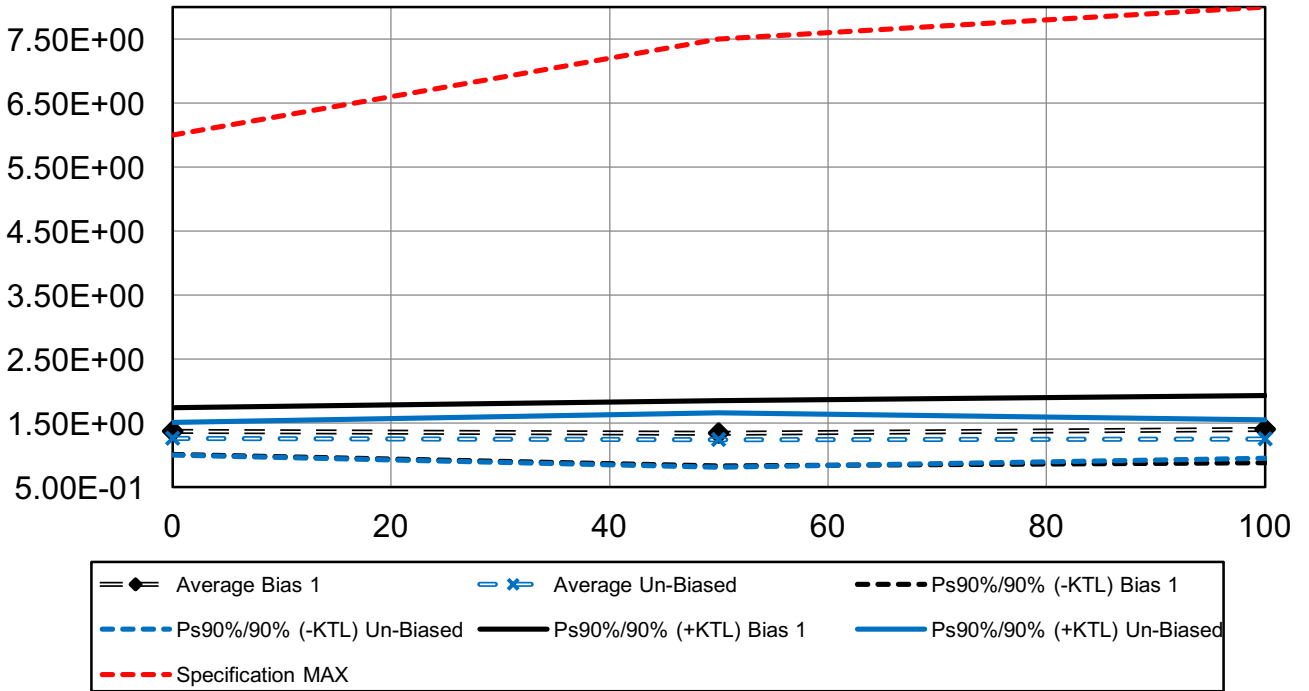


Figure 5.7: Plot of Input Offset Voltage @ $V_s = \pm 5V$ $V_{CM}=0V(mV)$ versus Total Dose

Table 5.7: Raw data for Input Offset Voltage @ $V_s = \pm 5V$ $V_{CM}=0V(mV)$ versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

Device	0	50	100
213	1.28E+00	1.27E+00	
214	1.38E+00	1.38E+00	
215	1.10E+00	1.07E+00	
216	1.44E+00	1.42E+00	
217	1.61E+00	1.58E+00	
223	1.38E+00		1.40E+00
224	1.20E+00		1.21E+00
225	1.64E+00		1.66E+00
226	1.22E+00		1.23E+00
227	1.50E+00		1.52E+00
218	1.23E+00	1.19E+00	
219	1.21E+00	1.19E+00	
220	1.32E+00	1.30E+00	
221	1.07E+00	1.04E+00	
222	1.46E+00	1.46E+00	
228	1.46E+00		1.43E+00
229	1.18E+00		1.18E+00
230	1.29E+00		1.29E+00
231	1.18E+00		1.16E+00
232	1.23E+00		1.21E+00
Bias 1 Statistics			
Average Bias 1	1.37E+00	1.34E+00	1.40E+00
Std Dev Bias 1	1.77E-01	1.87E-01	1.91E-01
Ps90%/90% (+KTL) Bias 1	1.74E+00	1.85E+00	1.93E+00
Ps90%/90% (-KTL) Bias 1	1.01E+00	8.31E-01	8.79E-01
Un-Biased Statistics			
Average Un-Biased	1.26E+00	1.24E+00	1.25E+00
Std Dev Un-Biased	1.23E-01	1.54E-01	1.09E-01
Ps90%/90% (+KTL) Un-Biased	1.52E+00	1.66E+00	1.55E+00
Ps90%/90% (-KTL) Un-Biased	1.01E+00	8.15E-01	9.53E-01
Specification MAX	6.00E+00	7.50E+00	8.00E+00
Status	PASS	PASS	PASS

VOS @ Vs=+/-5V, VCM=V+ (mV) vs Total Ionizing Dose (kRad(Si))

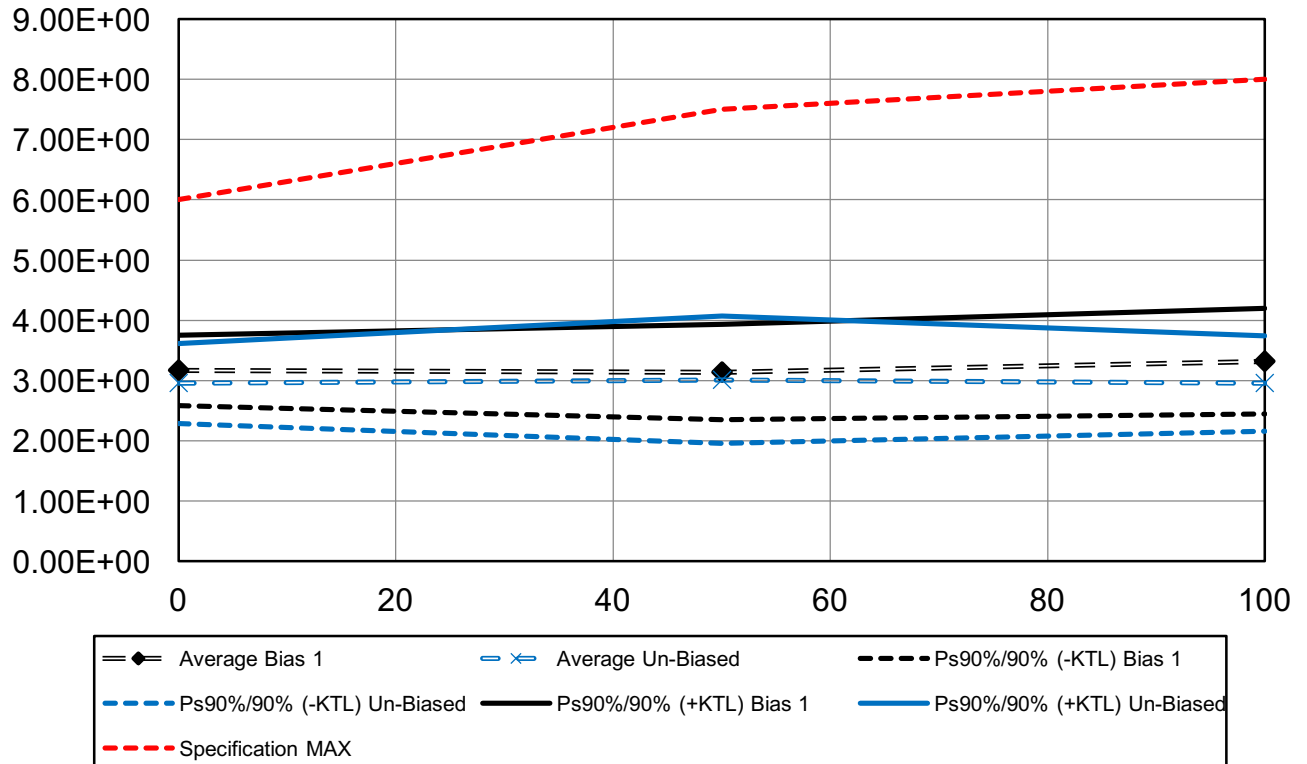


Figure 5.8: Plot of Input Offset Voltage @ Vs=+/-5V, VCM=V+ (mV) versus Total Dose

Table 5.8: Raw data for Input Offset Voltage @ $V_s = \pm 5V$, $V_{CM} = V+$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOS @ $V_s = \pm 5V$, $V_{CM} = V+$ (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	2.85E+00	2.89E+00	
214	3.14E+00	3.19E+00	
215	2.82E+00	2.80E+00	
216	3.34E+00	3.36E+00	
217	3.45E+00	3.46E+00	
223	2.94E+00		3.02E+00
224	2.98E+00		3.10E+00
225	3.66E+00		3.77E+00
226	3.09E+00		3.18E+00
227	3.40E+00		3.53E+00
218	3.13E+00	3.12E+00	
219	2.72E+00	2.74E+00	
220	2.86E+00	2.88E+00	
221	2.66E+00	2.68E+00	
222	3.58E+00	3.63E+00	
228	3.40E+00		3.44E+00
229	2.69E+00		2.77E+00
230	2.96E+00		3.01E+00
231	2.73E+00		2.77E+00
232	2.77E+00		2.79E+00
Bias 1 Statistics			
Average Bias 1	3.17E+00	3.14E+00	3.32E+00
Std Dev Bias 1	2.82E-01	2.89E-01	3.19E-01
Ps90%/90% (+KTL) Bias 1	3.75E+00	3.93E+00	4.20E+00
Ps90%/90% (-KTL) Bias 1	2.58E+00	2.35E+00	2.44E+00
Un-Biased Statistics			
Average Un-Biased	2.95E+00	3.01E+00	2.95E+00
Std Dev Un-Biased	3.22E-01	3.87E-01	2.89E-01
Ps90%/90% (+KTL) Un-Biased	3.62E+00	4.07E+00	3.75E+00
Ps90%/90% (-KTL) Un-Biased	2.28E+00	1.95E+00	2.16E+00
Specification MAX	6.00E+00	7.50E+00	8.00E+00
Status	PASS	PASS	PASS

IOS @ $V_s = \pm 5V$, $V_{CM} = V+$ (μA) vs Total Ionizing Dose (kRad(Si))

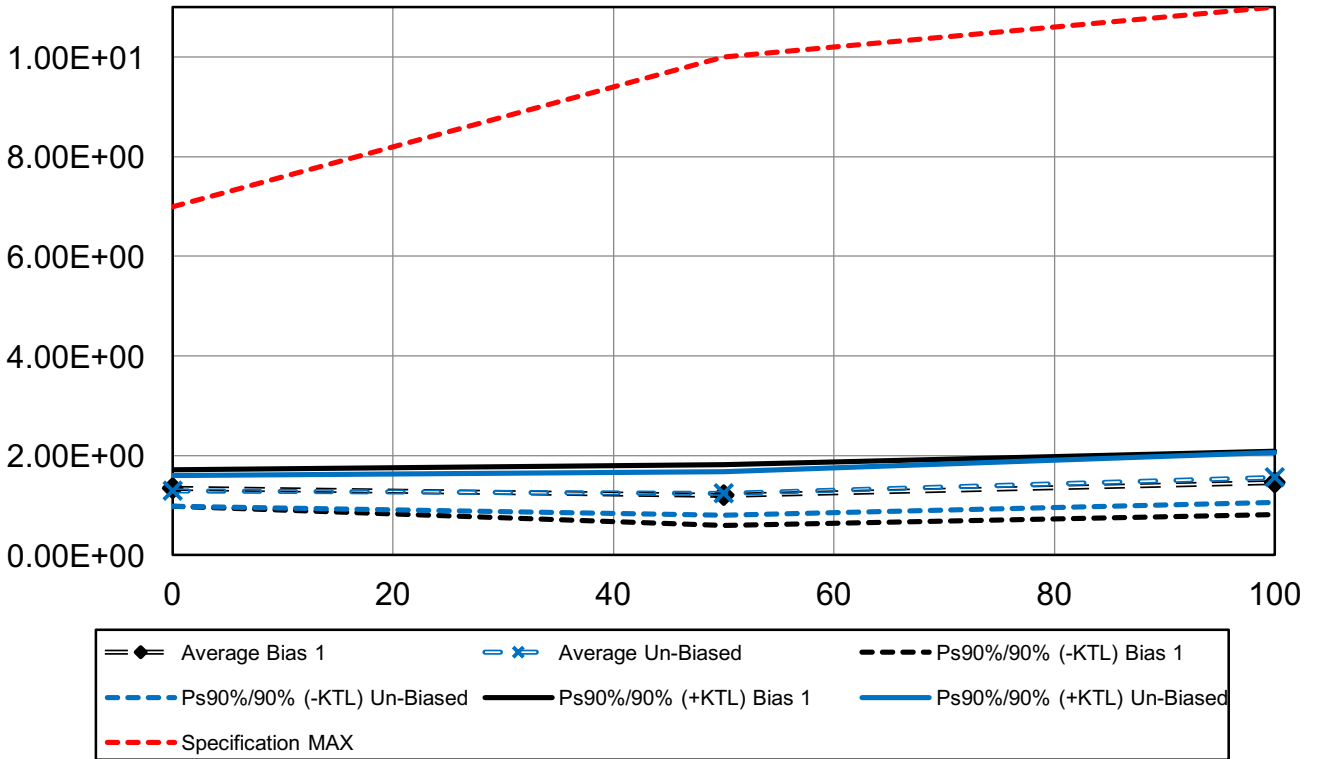


Figure 5.9: Plot of Input Offset Current @ $V_s = \pm 5V$, $V_{CM} = V+$ (μA) versus Total Dose

Table 5.9: Raw data for Input Offset Current @ $V_s = \pm 5V$, $V_{CM} = V+$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

IOS @ $V_s = \pm 5V$, $V_{CM} = V+$ (μA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.14E+00	9.83E-01	
214	1.23E+00	1.04E+00	
215	1.24E+00	1.16E+00	
216	1.45E+00	1.29E+00	
217	1.63E+00	1.54E+00	
223	1.12E+00		1.13E+00
224	1.32E+00		1.50E+00
225	1.57E+00		1.69E+00
226	1.29E+00		1.32E+00
227	1.50E+00		1.63E+00
218	1.39E+00	1.28E+00	
219	1.21E+00	1.28E+00	
220	1.20E+00	1.10E+00	
221	1.24E+00	1.08E+00	
222	1.57E+00	1.47E+00	
228	1.52E+00		1.87E+00
229	1.17E+00		1.53E+00
230	1.27E+00		1.54E+00
231	1.18E+00		1.41E+00
232	1.15E+00		1.44E+00
Bias 1 Statistics			
Average Bias 1	1.35E+00	1.20E+00	1.45E+00
Std Dev Bias 1	1.78E-01	2.22E-01	2.31E-01
Ps90%/90% (+KTL) Bias 1	1.72E+00	1.81E+00	2.09E+00
Ps90%/90% (-KTL) Bias 1	9.79E-01	5.93E-01	8.21E-01
Un-Biased Statistics			
Average Un-Biased	1.29E+00	1.24E+00	1.56E+00
Std Dev Un-Biased	1.50E-01	1.60E-01	1.83E-01
Ps90%/90% (+KTL) Un-Biased	1.60E+00	1.68E+00	2.06E+00
Ps90%/90% (-KTL) Un-Biased	9.81E-01	8.01E-01	1.06E+00
Specification MAX	7.00E+00	1.00E+01	1.10E+01
Status	PASS	PASS	PASS

+IB @ Vs=+/-5V, VCM=V+ (uA) vs Total Ionizing Dose (kRad(Si))

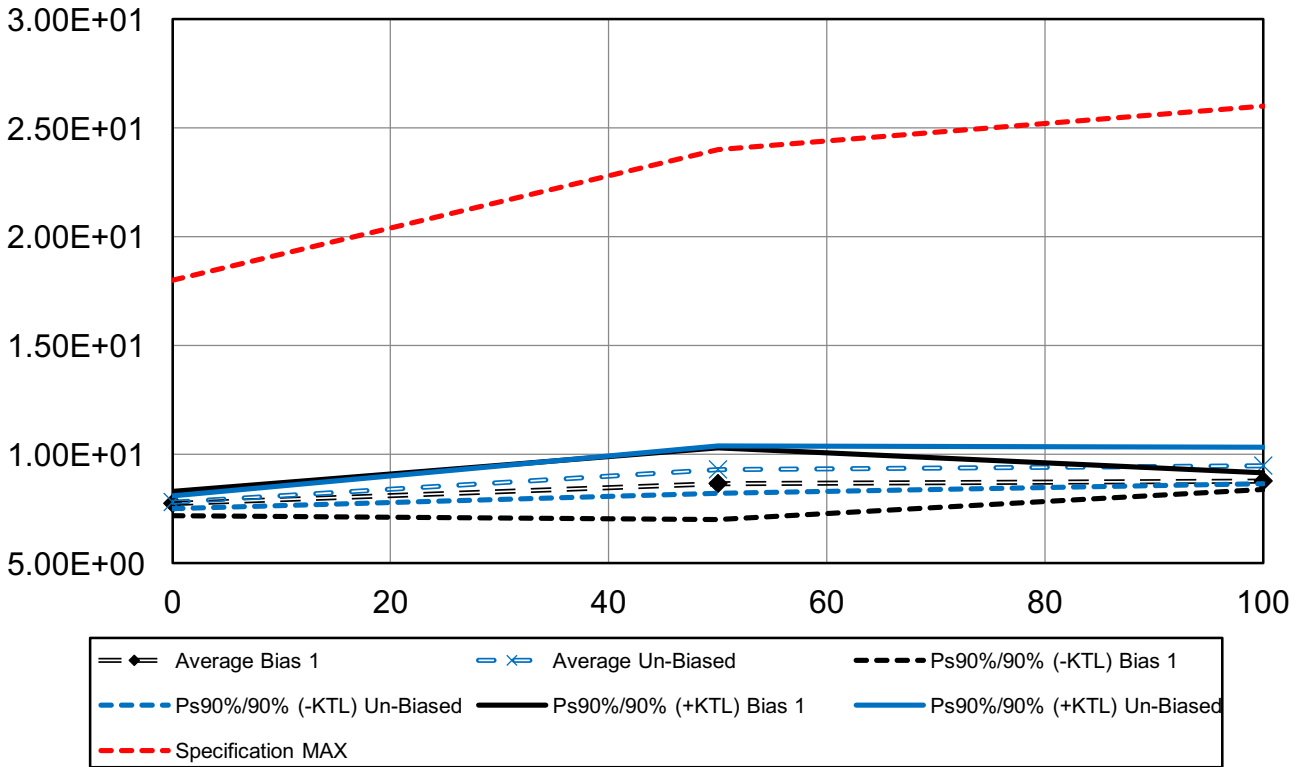


Figure 5.10: Plot of +Input Bias Current @ Vs=+/-5V, VCM=V+ (mV) versus Total Dose

Table 5.10: Raw data for +Input Bias Current @ $V_s=+/-5V$, $V_{CM}=V+$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+IB @ $V_s=+/-5V$, $V_{CM}=V+$ (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	7.50E+00	8.19E+00	
214	7.44E+00	8.28E+00	
215	7.78E+00	8.92E+00	
216	7.44E+00	8.26E+00	
217	8.30E+00	9.59E+00	
223	7.83E+00		8.76E+00
224	7.83E+00		8.59E+00
225	7.57E+00		8.70E+00
226	7.85E+00		8.96E+00
227	7.98E+00		8.81E+00
218	7.78E+00	9.38E+00	
219	7.83E+00	9.20E+00	
220	7.64E+00	8.76E+00	
221	8.11E+00	9.30E+00	
222	7.82E+00	9.87E+00	
228	7.66E+00		9.83E+00
229	7.85E+00		9.58E+00
230	7.68E+00		9.60E+00
231	7.92E+00		9.43E+00
232	7.72E+00		9.01E+00
Bias 1 Statistics			
Average Bias 1	7.75E+00	8.65E+00	8.77E+00
Std Dev Bias 1	2.71E-01	6.04E-01	1.38E-01
Ps90%/90% (+KTL) Bias 1	8.31E+00	1.03E+01	9.14E+00
Ps90%/90% (-KTL) Bias 1	7.19E+00	6.99E+00	8.39E+00
Un-Biased Statistics			
Average Un-Biased	7.80E+00	9.30E+00	9.49E+00
Std Dev Un-Biased	1.42E-01	3.99E-01	3.06E-01
Ps90%/90% (+KTL) Un-Biased	8.10E+00	1.04E+01	1.03E+01
Ps90%/90% (-KTL) Un-Biased	7.51E+00	8.21E+00	8.65E+00
Specification MAX	1.80E+01	2.40E+01	2.60E+01
Status	PASS	PASS	PASS

-IB @Vs=+/-5V, VCM=V+ (uA) vs Total Ionizing Dose (kRad(Si))

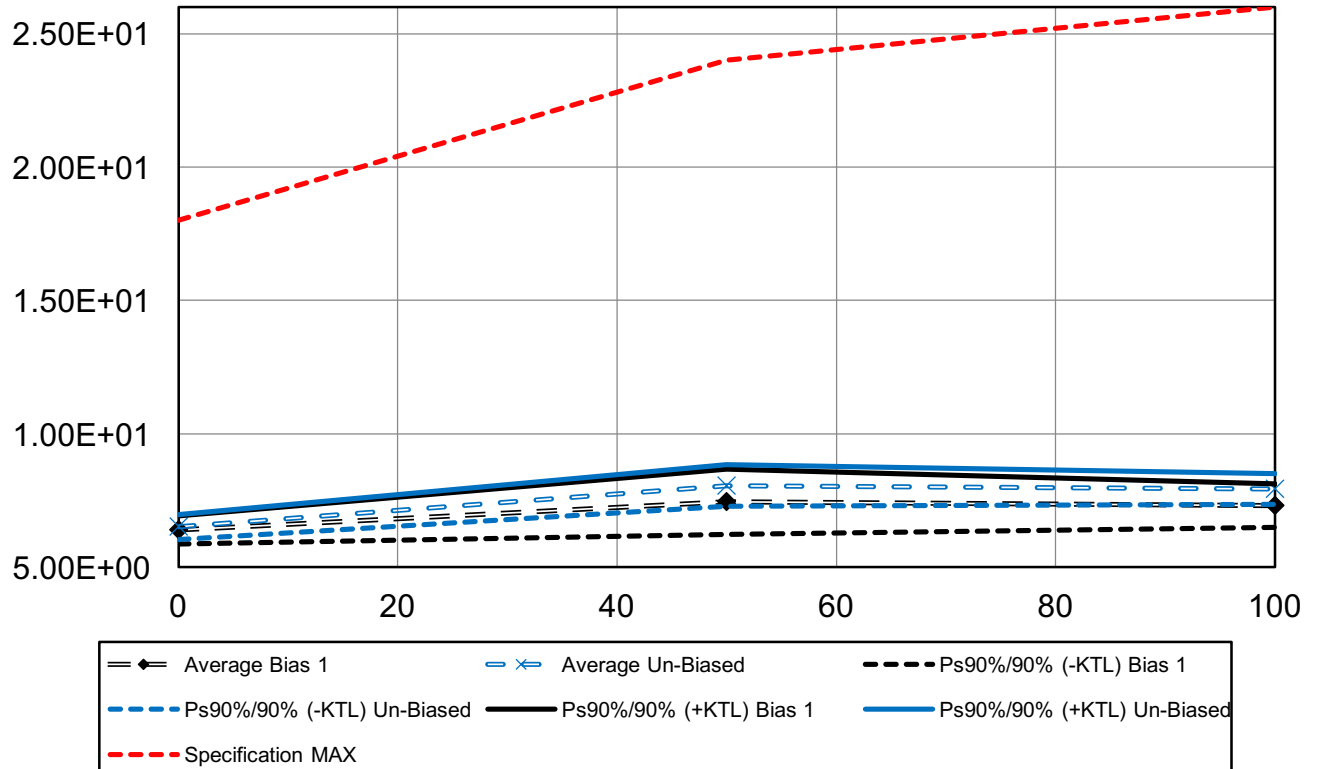


Figure 5.11: Plot of -Input Bias Current @ Vs=+/-5V, VCM=V+ (mV) versus Total Dose

Table 5.11: Raw data for -Input Bias Current @ $V_s = \pm 5V$, $V_{CM} = V+$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

-IB @ $V_s = \pm 5V$, $V_{CM} = V+$ (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	6.37E+00	7.21E+00	
214	6.20E+00	7.24E+00	
215	6.54E+00	7.76E+00	
216	6.00E+00	6.97E+00	
217	6.67E+00	8.05E+00	
223	6.72E+00		7.63E+00
224	6.51E+00		7.10E+00
225	6.01E+00		7.01E+00
226	6.57E+00		7.64E+00
227	6.47E+00		7.18E+00
218	6.38E+00	8.10E+00	
219	6.62E+00	7.91E+00	
220	6.44E+00	7.66E+00	
221	6.87E+00	8.22E+00	
222	6.25E+00	8.40E+00	
228	6.14E+00		7.96E+00
229	6.68E+00		8.05E+00
230	6.41E+00		8.06E+00
231	6.74E+00		8.03E+00
232	6.57E+00		7.56E+00
Bias 1 Statistics			
Average Bias 1	6.40E+00	7.45E+00	7.31E+00
Std Dev Bias 1	2.57E-01	4.45E-01	3.00E-01
Ps90%/90% (+KTL) Bias 1	6.93E+00	8.67E+00	8.14E+00
Ps90%/90% (-KTL) Bias 1	5.87E+00	6.23E+00	6.49E+00
Un-Biased Statistics			
Average Un-Biased	6.51E+00	8.06E+00	7.93E+00
Std Dev Un-Biased	2.27E-01	2.85E-01	2.11E-01
Ps90%/90% (+KTL) Un-Biased	6.98E+00	8.84E+00	8.51E+00
Ps90%/90% (-KTL) Un-Biased	6.04E+00	7.28E+00	7.35E+00
Specification MAX	1.80E+01	2.40E+01	2.60E+01
Status	PASS	PASS	PASS

VOS @ Vs=+/-5V, VCM=V- (mV) vs Total Ionizing Dose (kRad(Si))

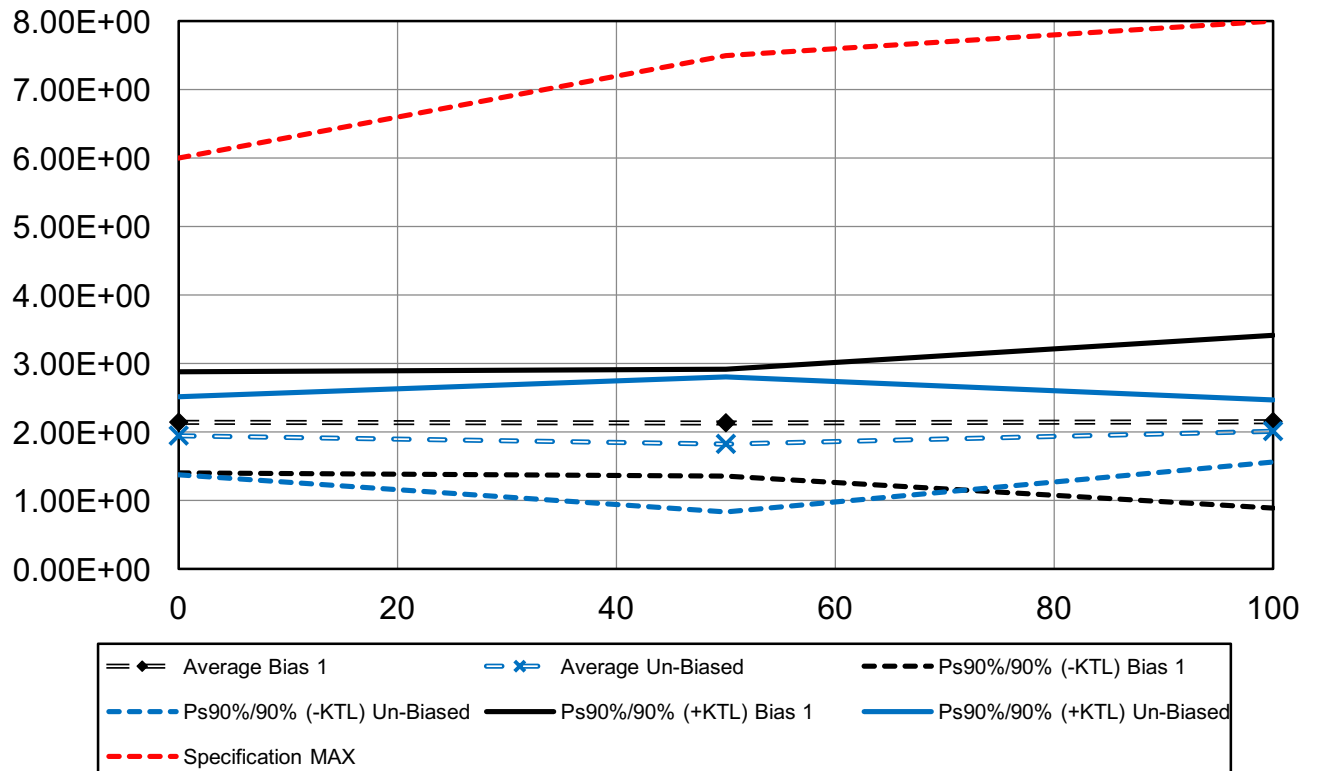


Figure 5.12: Plot of Input Offset Voltage @ Vs=+/-5V, VCM=V- (mV) versus Total Dose

Table 5.12: Raw data for Input Offset Voltage @ $V_s=+/-5V$, $V_{CM}=V-$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOS @ $V_s=+/-5V$, $V_{CM}=V-$ (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	2.00E+00	1.99E+00	
214	2.06E+00	2.06E+00	
215	1.89E+00	1.83E+00	
216	2.28E+00	2.25E+00	
217	2.63E+00	2.57E+00	
223	2.20E+00		2.25E+00
224	1.69E+00		1.73E+00
225	2.71E+00		2.77E+00
226	1.67E+00		1.67E+00
227	2.33E+00		2.36E+00
218	1.63E+00	1.57E+00	
219	2.07E+00	2.03E+00	
220	2.22E+00	2.20E+00	
221	1.38E+00	1.33E+00	
222	2.00E+00	1.99E+00	
228	2.33E+00		2.29E+00
229	1.95E+00		1.96E+00
230	2.02E+00		2.03E+00
231	1.88E+00		1.85E+00
232	1.99E+00		1.95E+00
Bias 1 Statistics			
Average Bias 1	2.14E+00	2.14E+00	2.15E+00
Std Dev Bias 1	3.56E-01	2.83E-01	4.61E-01
Ps90%/90% (+KTL) Bias 1	2.88E+00	2.91E+00	3.42E+00
Ps90%/90% (-KTL) Bias 1	1.41E+00	1.36E+00	8.91E-01
Un-Biased Statistics			
Average Un-Biased	1.95E+00	1.82E+00	2.02E+00
Std Dev Un-Biased	2.74E-01	3.60E-01	1.66E-01
Ps90%/90% (+KTL) Un-Biased	2.51E+00	2.81E+00	2.47E+00
Ps90%/90% (-KTL) Un-Biased	1.38E+00	8.34E-01	1.56E+00
Specification MAX	6.00E+00	7.50E+00	8.00E+00
Status	PASS	PASS	PASS

IOS @ $V_s = \pm 5V$, $V_{CM} = V_-$ (μA) vs Total Ionizing Dose (kRad(Si))

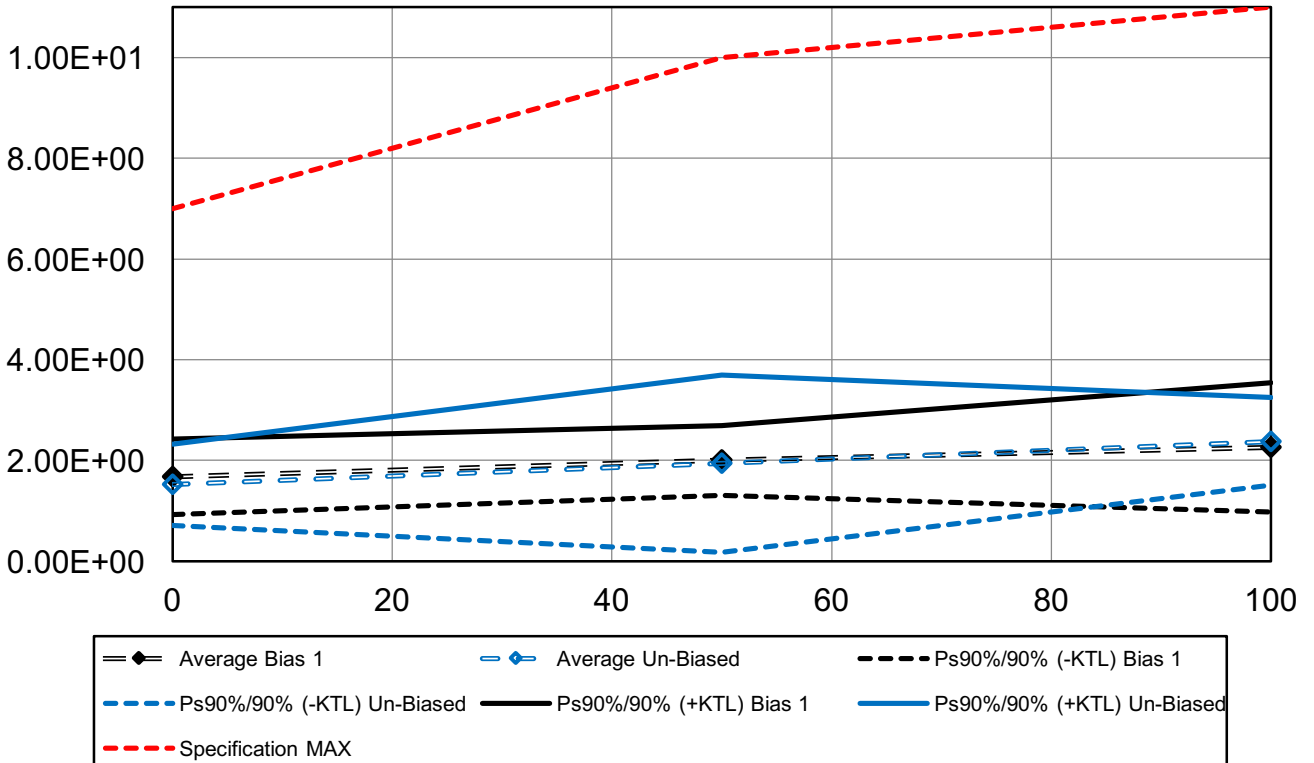


Figure 5.13: Plot of Input Offset Current @ $V_s = \pm 5V$, $V_{CM} = V_-$ (mV) versus Total Dose

Table 5.13: Raw data for Input Offset Current @ $V_s=+/-5V$, $V_{CM}=V_-$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

IOS @ $V_s=+/-5V$, $V_{CM}=V_-$ (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.40E+00	1.72E+00	
214	1.53E+00	1.88E+00	
215	1.66E+00	1.98E+00	
216	1.67E+00	2.02E+00	
217	2.11E+00	2.41E+00	
223	2.00E+00		2.56E+00
224	1.20E+00		1.78E+00
225	2.22E+00		2.82E+00
226	1.17E+00		1.78E+00
227	1.81E+00		2.38E+00
218	9.79E-01	1.41E+00	
219	1.82E+00	2.20E+00	
220	1.92E+00	2.34E+00	
221	7.60E-01	1.12E+00	
222	1.80E+00	2.63E+00	
228	1.89E+00		2.88E+00
229	1.66E+00		2.38E+00
230	1.53E+00		2.38E+00
231	1.38E+00		2.02E+00
232	1.45E+00		2.21E+00
Bias 1 Statistics			
Average Bias 1	1.68E+00	2.00E+00	2.26E+00
Std Dev Bias 1	3.62E-01	2.52E-01	4.68E-01
Ps90%/90% (+KTL) Bias 1	2.42E+00	2.69E+00	3.54E+00
Ps90%/90% (-KTL) Bias 1	9.31E-01	1.31E+00	9.80E-01
Un-Biased Statistics			
Average Un-Biased	1.52E+00	1.94E+00	2.38E+00
Std Dev Un-Biased	3.92E-01	6.42E-01	3.18E-01
Ps90%/90% (+KTL) Un-Biased	2.33E+00	3.70E+00	3.25E+00
Ps90%/90% (-KTL) Un-Biased	7.10E-01	1.79E-01	1.50E+00
Specification MAX	7.00E+00	1.00E+01	1.10E+01
Status	PASS	PASS	PASS

+IB @ Vs=+/-5V, VCM=V- (uA) vs Total Ionizing Dose (kRad(Si))

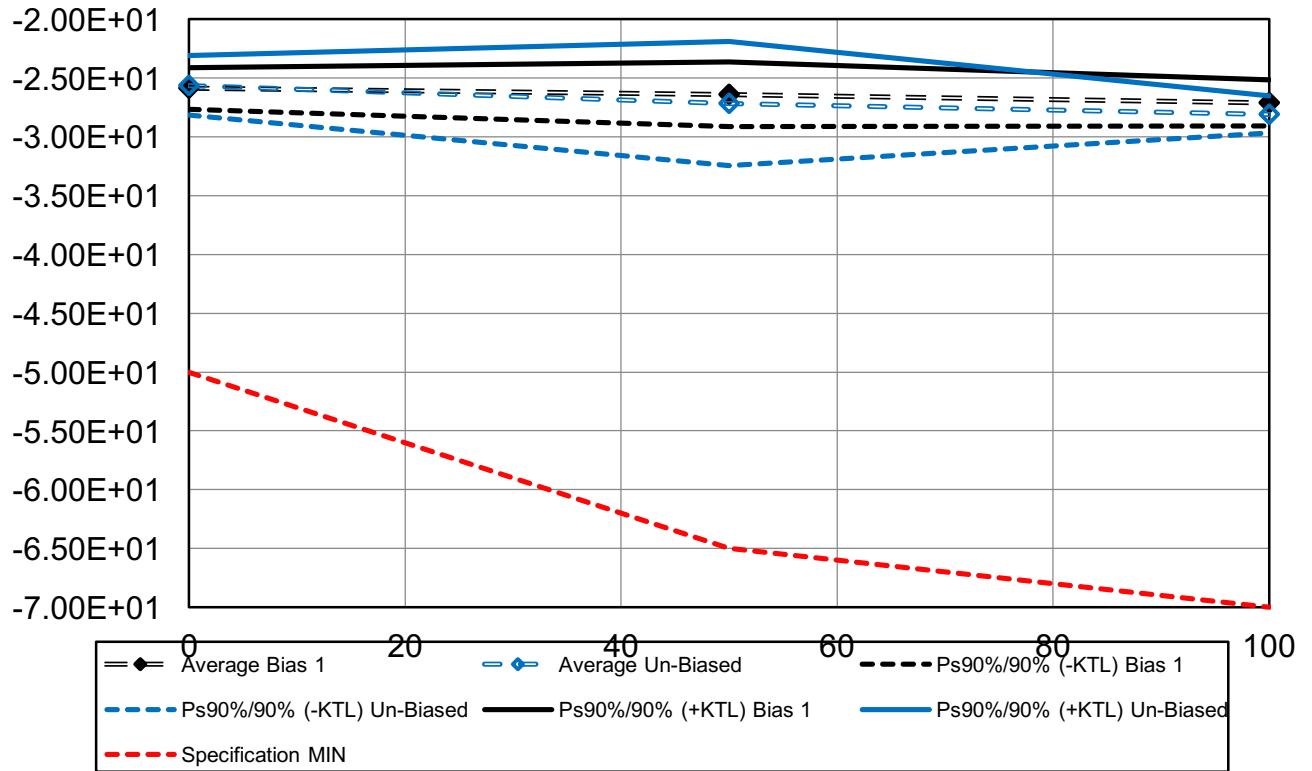


Figure 5.14: Plot of +Input Bias Current @ Vs=+/-5V, VCM=V- (mV) versus Total Dose

Table 5.14: Raw data for +Input Bias Current @ $V_s=+/-5V$, $V_{CM}=V_-$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+IB @ $V_s=+/-5V$, $V_{CM}=V_-$ (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-2.49E+01	-2.56E+01	
214	-2.65E+01	-2.72E+01	
215	-2.68E+01	-2.77E+01	
216	-2.48E+01	-2.55E+01	
217	-2.52E+01	-2.60E+01	
223	-2.71E+01		-2.79E+01
224	-2.51E+01		-2.62E+01
225	-2.67E+01		-2.77E+01
226	-2.61E+01		-2.72E+01
227	-2.56E+01		-2.66E+01
218	-2.42E+01	-2.55E+01	
219	-2.66E+01	-2.80E+01	
220	-2.56E+01	-2.67E+01	
221	-2.43E+01	-2.55E+01	
222	-2.84E+01	-3.01E+01	
228	-2.61E+01		-2.90E+01
229	-2.58E+01		-2.81E+01
230	-2.50E+01		-2.81E+01
231	-2.48E+01		-2.74E+01
232	-2.55E+01		-2.79E+01
Bias 1 Statistics			
Average Bias 1	-2.59E+01	-2.64E+01	-2.71E+01
Std Dev Bias 1	8.59E-01	1.00E+00	7.18E-01
Ps90%/90% (+KTL) Bias 1	-2.41E+01	-2.37E+01	-2.51E+01
Ps90%/90% (-KTL) Bias 1	-2.77E+01	-2.92E+01	-2.91E+01
Un-Biased Statistics			
Average Un-Biased	-2.56E+01	-2.72E+01	-2.81E+01
Std Dev Un-Biased	1.23E+00	1.92E+00	5.77E-01
Ps90%/90% (+KTL) Un-Biased	-2.31E+01	-2.19E+01	-2.65E+01
Ps90%/90% (-KTL) Un-Biased	-2.82E+01	-3.24E+01	-2.97E+01
Specification MIN	-5.00E+01	-6.50E+01	-7.00E+01
Status	PASS	PASS	PASS

-IB @ Vs=+/-5V, VCM=V- (uA) vs Total Ionizing Dose (kRad(Si))

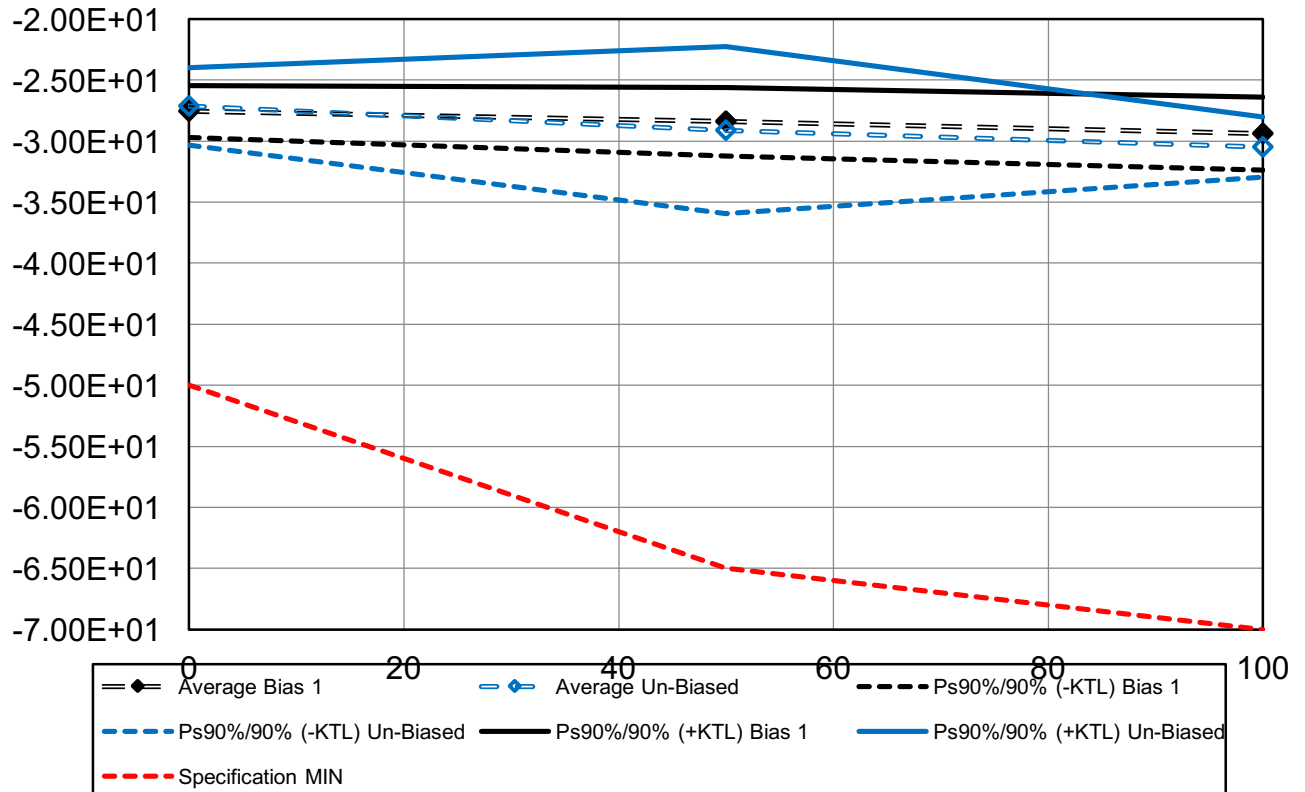


Figure 5.15: Plot of -Input Bias Current @ Vs=+/-5V, VCM=V- (mV) versus Total Dose

Table 5.15: Raw data for -Input Bias Current @ $V_s=+/-5V$, $V_{CM}=V-$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

-IB @ $V_s=+/-5V$, $V_{CM}=V-$ (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-2.63E+01	-2.73E+01	
214	-2.81E+01	-2.91E+01	
215	-2.85E+01	-2.97E+01	
216	-2.65E+01	-2.75E+01	
217	-2.74E+01	-2.84E+01	
223	-2.91E+01		-3.04E+01
224	-2.63E+01		-2.80E+01
225	-2.89E+01		-3.05E+01
226	-2.73E+01		-2.90E+01
227	-2.74E+01		-2.90E+01
218	-2.52E+01	-2.69E+01	
219	-2.84E+01	-3.02E+01	
220	-2.76E+01	-2.91E+01	
221	-2.51E+01	-2.67E+01	
222	-3.02E+01	-3.27E+01	
228	-2.80E+01		-3.19E+01
229	-2.74E+01		-3.04E+01
230	-2.65E+01		-3.05E+01
231	-2.62E+01		-2.94E+01
232	-2.69E+01		-3.01E+01
Bias 1 Statistics			
Average Bias 1	-2.76E+01	-2.84E+01	-2.94E+01
Std Dev Bias 1	1.04E+00	1.02E+00	1.09E+00
Ps90%/90% (+KTL) Bias 1	-2.54E+01	-2.56E+01	-2.64E+01
Ps90%/90% (-KTL) Bias 1	-2.97E+01	-3.12E+01	-3.24E+01
Un-Biased Statistics			
Average Un-Biased	-2.71E+01	-2.91E+01	-3.05E+01
Std Dev Un-Biased	1.54E+00	2.50E+00	8.94E-01
Ps90%/90% (+KTL) Un-Biased	-2.40E+01	-2.22E+01	-2.80E+01
Ps90%/90% (-KTL) Un-Biased	-3.03E+01	-3.59E+01	-3.29E+01
Specification MIN	-5.00E+01	-6.50E+01	-7.00E+01
Status	PASS	PASS	PASS

VOS @ Vs=5V, 0V, VCM=0 (mV) vs Total Ionizing Dose (kRad(Si))

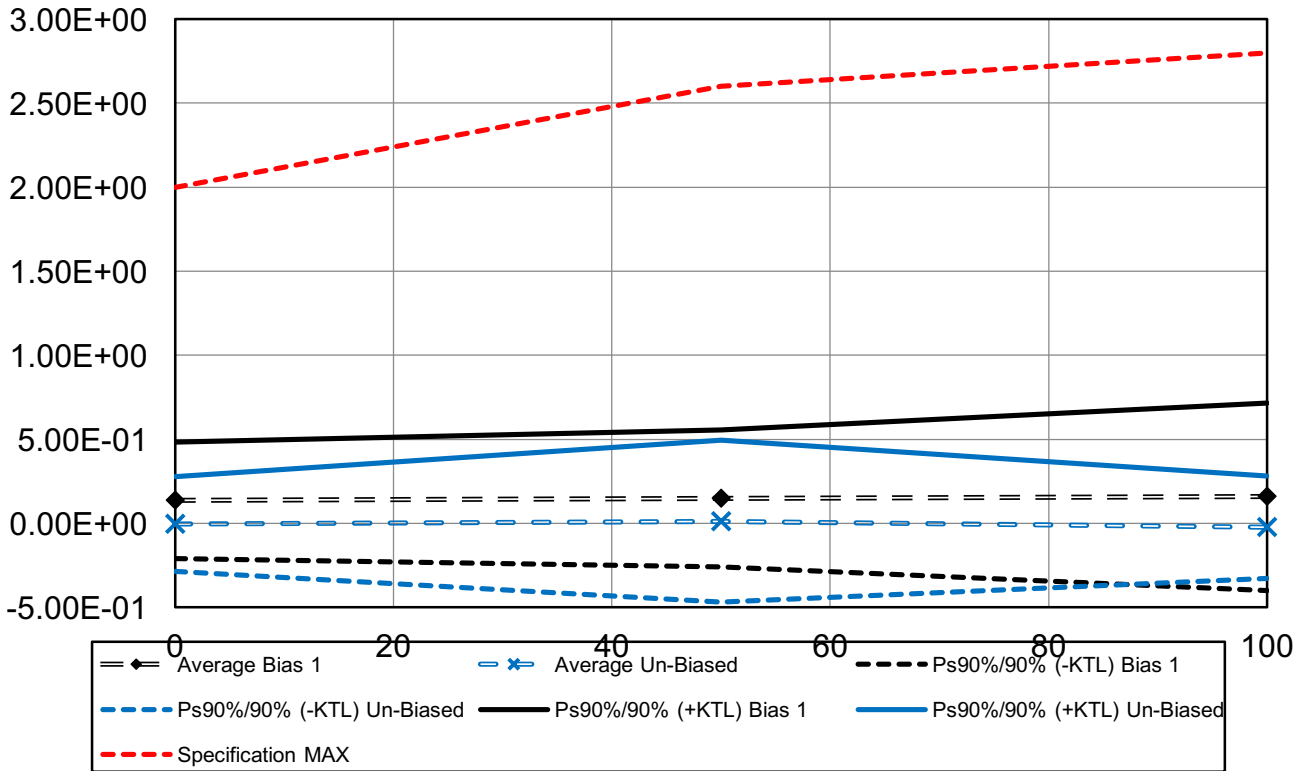


Figure 5.16: Plot of Input Offset Voltage @ Vs = 5V, 0V VCM=0V (mV) versus Total Dose

Table 5.16: Raw data for Input Offset Voltage @ $V_s = 5V, 0V$ $V_{CM}=0V$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOS @ $V_s=5V, 0V, V_{CM}=0$ (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-3.86E-02	-1.48E-02	
214	7.22E-02	1.05E-01	
215	1.04E-01	1.04E-01	
216	1.50E-01	1.59E-01	
217	3.88E-01	3.90E-01	
223	1.30E-01		1.53E-01
224	-6.21E-02		-4.11E-02
225	4.00E-01		4.29E-01
226	-4.04E-02		-3.49E-02
227	2.62E-01		2.82E-01
218	-4.22E-02	-4.97E-02	
219	-3.45E-02	-1.79E-02	
220	3.12E-02	4.25E-02	
221	-2.09E-01	-1.98E-01	
222	2.49E-01	2.83E-01	
228	1.97E-01		1.63E-01
229	-9.50E-02		-8.96E-02
230	8.42E-05		1.13E-03
231	-7.67E-02		-1.01E-01
232	-6.52E-02		-8.36E-02
Bias 1 Statistics			
Average Bias 1	1.36E-01	1.49E-01	1.58E-01
Std Dev Bias 1	1.68E-01	1.49E-01	2.03E-01
Ps90%/90% (+KTL) Bias 1	4.84E-01	5.57E-01	7.15E-01
Ps90%/90% (-KTL) Bias 1	-2.11E-01	-2.60E-01	-4.00E-01
Un-Biased Statistics			
Average Un-Biased	-4.45E-03	1.19E-02	-2.19E-02
Std Dev Un-Biased	1.36E-01	1.75E-01	1.11E-01
Ps90%/90% (+KTL) Un-Biased	2.77E-01	4.93E-01	2.83E-01
Ps90%/90% (-KTL) Un-Biased	-2.86E-01	-4.69E-01	-3.27E-01
Specification MAX	2.00E+00	2.60E+00	2.80E+00
Status	PASS	PASS	PASS

IOS @ Vs=5V, 0V VCM=0V (uA) vs Total Ionizing Dose (kRad(Si))

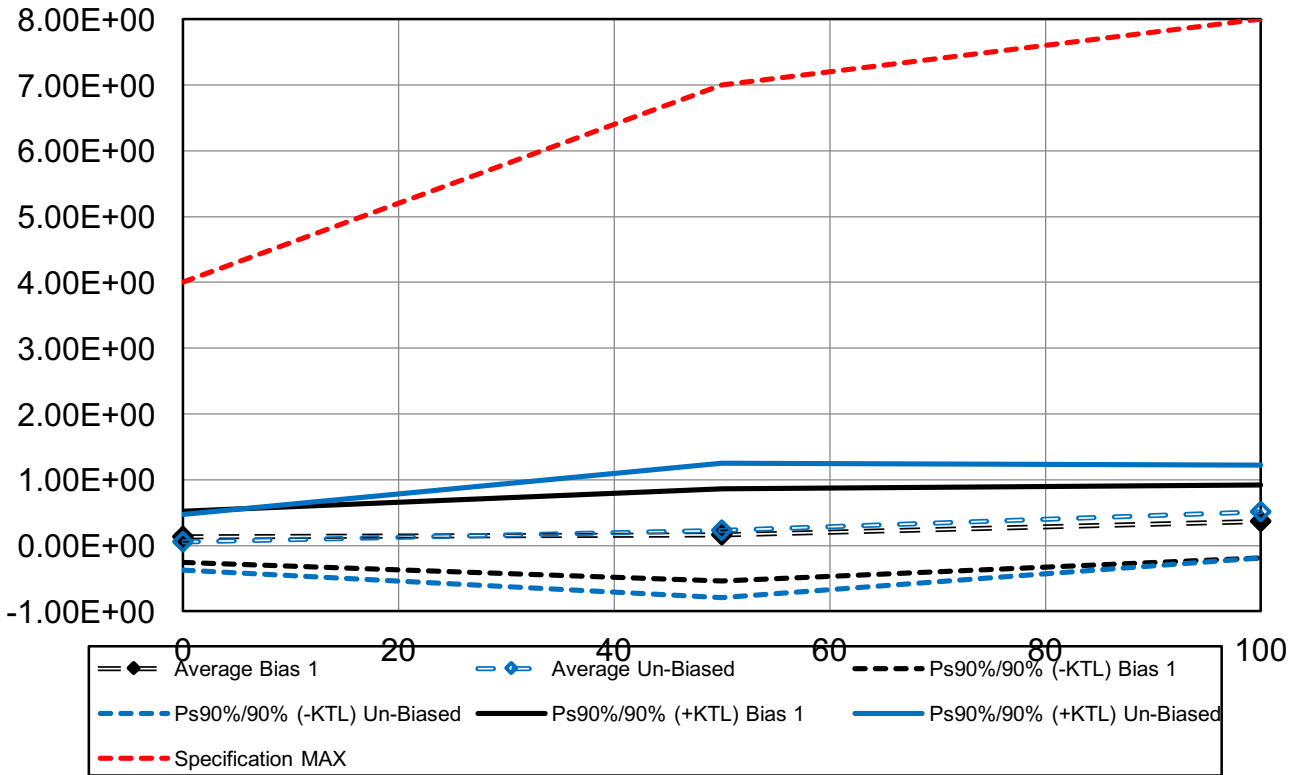


Figure 5.17: Plot of Input Offset Current @ Vs=5V, 0V VCM=0V (mV) versus Total Dose

Table 5.17: Raw data for Input Offset Current @ $V_s=5V$, $0V$ $V_{CM}=0V$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

IOS @ $V_s=5V$, $0V$ $V_{CM}=0V$ (μA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-1.16E-01	-8.79E-02	
214	-3.67E-02	-8.10E-02	
215	2.60E-01	2.92E-01	
216	1.35E-01	1.71E-01	
217	4.44E-01	5.14E-01	
223	1.27E-01		3.09E-01
224	-6.49E-03		2.60E-01
225	3.44E-01		6.25E-01
226	-6.84E-02		1.19E-01
227	2.48E-01		5.08E-01
218	-5.50E-02	-1.38E-02	
219	1.30E-01	3.67E-01	
220	1.19E-01	2.55E-01	
221	-2.33E-01	-2.16E-01	
222	4.68E-01	7.55E-01	
228	2.76E-01		9.42E-01
229	2.33E-02		5.19E-01
230	5.73E-03		4.84E-01
231	-8.60E-02		2.68E-01
232	-1.27E-01		3.64E-01
Bias 1 Statistics			
Average Bias 1	1.33E-01	1.62E-01	3.64E-01
Std Dev Bias 1	1.89E-01	2.56E-01	2.02E-01
Ps90%/90% (+KTL) Bias 1	5.23E-01	8.64E-01	9.17E-01
Ps90%/90% (-KTL) Bias 1	-2.57E-01	-5.40E-01	-1.89E-01
Un-Biased Statistics			
Average Un-Biased	5.22E-02	2.29E-01	5.15E-01
Std Dev Un-Biased	2.06E-01	3.72E-01	2.58E-01
Ps90%/90% (+KTL) Un-Biased	4.77E-01	1.25E+00	1.22E+00
Ps90%/90% (-KTL) Un-Biased	-3.72E-01	-7.91E-01	-1.93E-01
Specification MAX	4.00E+00	7.00E+00	8.00E+00
Status	PASS	PASS	PASS

+IB @ Vs=5V, 0V VCM=0V (uA) vs Total Ionizing Dose (kRad(Si))

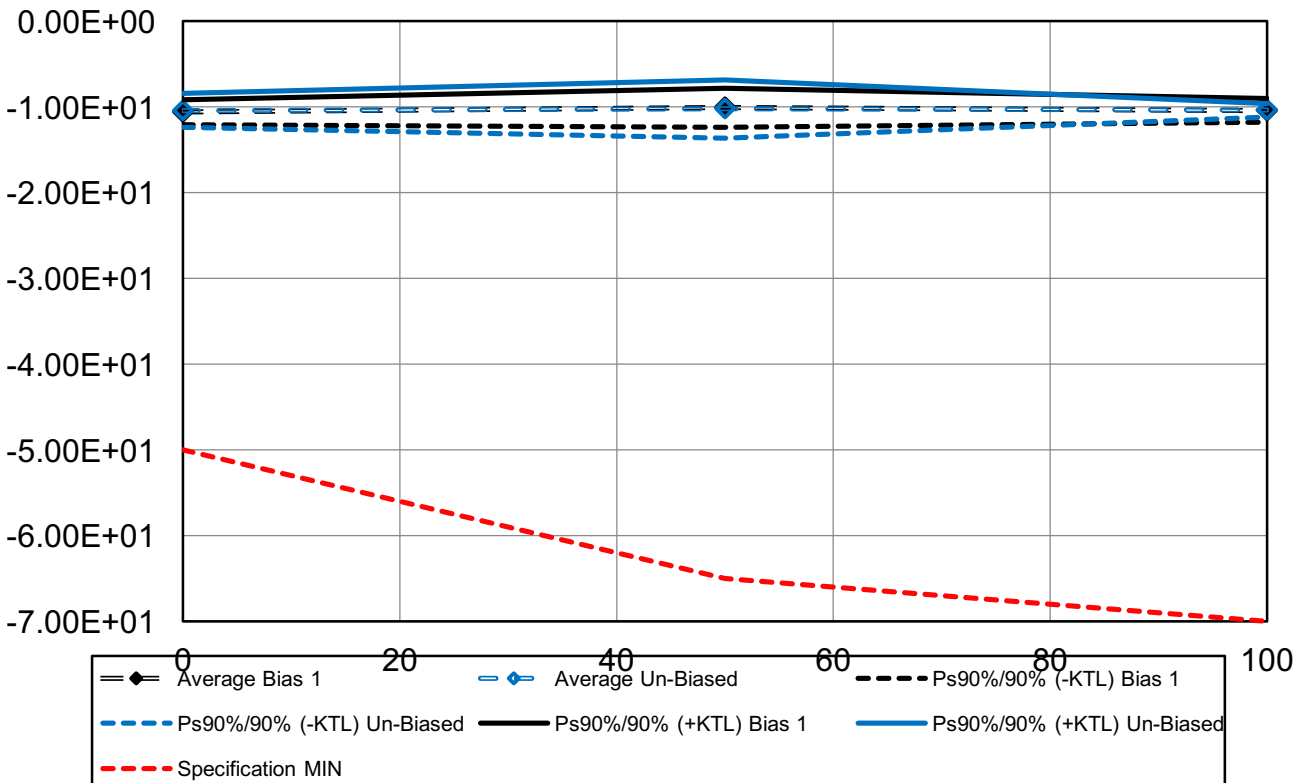


Figure 5.19: Plot of +Input Bias Current @ Vs=5V, 0V VCM=0V (mV) versus Total Dose

Table 5.19: Raw data for +Input Bias Current @ $V_s=5V$, $0V$ $V_{CM}=0V$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+IB @ V=5V, 0V VCM=0 (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-1.01E+01	-9.89E+00	
214	-1.14E+01	-1.10E+01	
215	-1.14E+01	-1.09E+01	
216	-9.94E+00	-9.66E+00	
217	-9.64E+00	-9.04E+00	
223	-1.14E+01		-1.10E+01
224	-1.01E+01		-9.94E+00
225	-1.12E+01		-1.08E+01
226	-1.08E+01		-1.05E+01
227	-1.01E+01		-9.88E+00
218	-9.47E+00	-8.90E+00	
219	-1.13E+01	-1.10E+01	
220	-1.04E+01	-1.03E+01	
221	-9.37E+00	-9.19E+00	
222	-1.26E+01	-1.19E+01	
228	-1.07E+01		-1.06E+01
229	-1.04E+01		-1.03E+01
230	-9.94E+00		-1.03E+01
231	-9.74E+00		-1.01E+01
232	-1.03E+01		-1.08E+01
Bias 1 Statistics			
Average Bias 1	-1.06E+01	-1.01E+01	-1.04E+01
Std Dev Bias 1	7.04E-01	8.28E-01	5.07E-01
Ps90%/90% (+KTL) Bias 1	-9.14E+00	-7.82E+00	-9.03E+00
Ps90%/90% (-KTL) Bias 1	-1.21E+01	-1.24E+01	-1.18E+01
Un-Biased Statistics			
Average Un-Biased	-1.04E+01	-1.03E+01	-1.04E+01
Std Dev Un-Biased	9.45E-01	1.24E+00	2.79E-01
Ps90%/90% (+KTL) Un-Biased	-8.46E+00	-6.84E+00	-9.63E+00
Ps90%/90% (-KTL) Un-Biased	-1.24E+01	-1.37E+01	-1.12E+01
Specification MIN	-5.00E+01	-6.50E+01	-7.00E+01
Status	PASS	PASS	PASS

-IB @ Vs=5V, 0V VCM=0V (uA) vs Total Ionizing Dose (kRad(Si))

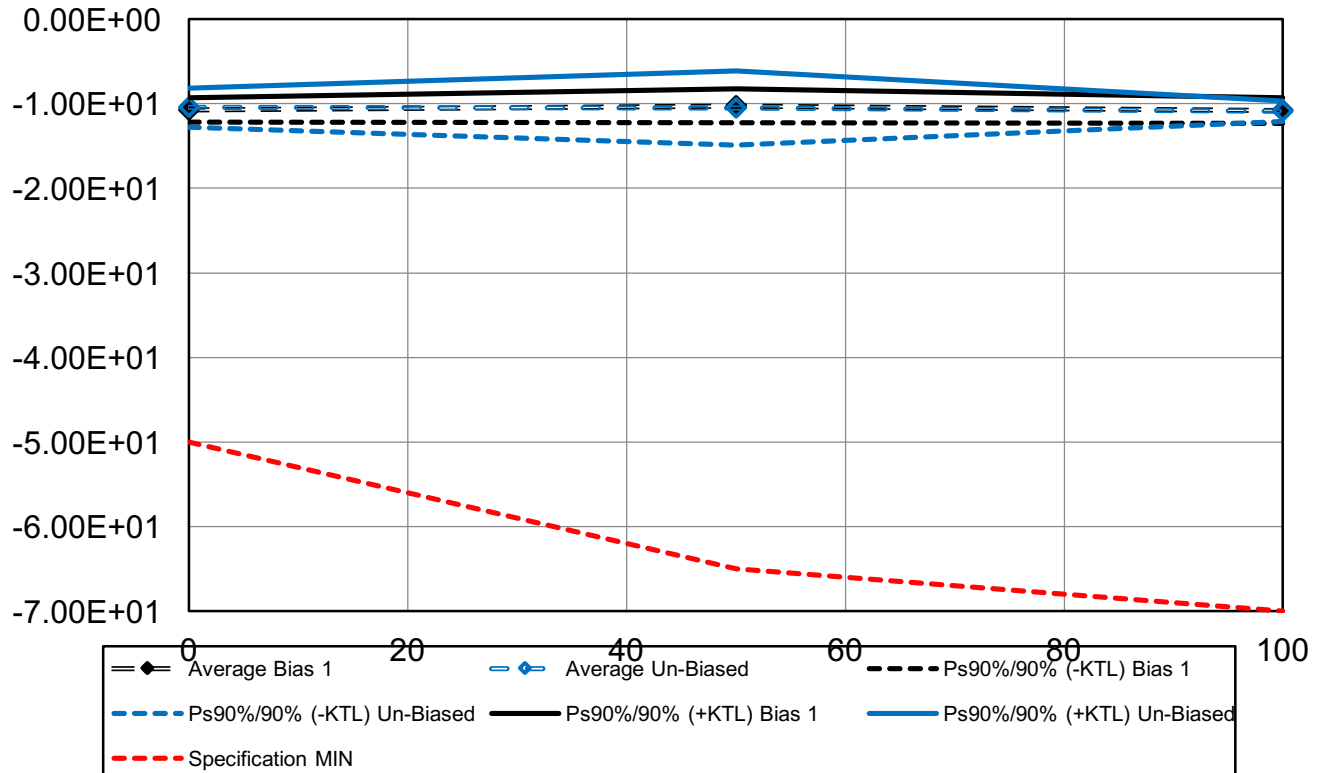


Figure 5.20: Plot of -Input Bias Current @ Vs=5V, 0V VCM=0V (mV) versus Total Dose

Table 5.20: Raw data for -Input Bias Current @ $V_s=5V$, $0V$ $V_{CM}=0V$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

-IB @ $V_s=5V$, $0V$ $V_{CM}=0V$ (uA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-9.97E+00	-9.80E+00	
214	-1.13E+01	-1.09E+01	
215	-1.17E+01	-1.12E+01	
216	-1.01E+01	-9.83E+00	
217	-1.01E+01	-9.56E+00	
223	-1.15E+01		-1.13E+01
224	-1.01E+01		-1.02E+01
225	-1.15E+01		-1.14E+01
226	-1.08E+01		-1.06E+01
227	-1.03E+01		-1.04E+01
218	-9.42E+00	-8.89E+00	
219	-1.14E+01	-1.14E+01	
220	-1.05E+01	-1.05E+01	
221	-9.14E+00	-8.97E+00	
222	-1.30E+01	-1.26E+01	
228	-1.09E+01		-1.15E+01
229	-1.04E+01		-1.08E+01
230	-9.95E+00		-1.08E+01
231	-9.66E+00		-1.03E+01
232	-1.02E+01		-1.11E+01
Bias 1 Statistics			
Average Bias 1	-1.07E+01	-1.03E+01	-1.08E+01
Std Dev Bias 1	7.12E-01	7.31E-01	5.53E-01
Ps90%/90% (+KTL) Bias 1	-9.26E+00	-8.25E+00	-9.27E+00
Ps90%/90% (-KTL) Bias 1	-1.22E+01	-1.23E+01	-1.23E+01
Un-Biased Statistics			
Average Un-Biased	-1.05E+01	-1.05E+01	-1.09E+01
Std Dev Un-Biased	1.13E+00	1.60E+00	4.43E-01
Ps90%/90% (+KTL) Un-Biased	-8.13E+00	-6.09E+00	-9.69E+00
Ps90%/90% (-KTL) Un-Biased	-1.28E+01	-1.49E+01	-1.21E+01
Specification MIN	-5.00E+01	-6.50E+01	-7.00E+01
Status	PASS	PASS	PASS

VOS @ Vs=5V, 0V VCM=V+ (mV) vs Total Ionizing Dose (kRad(Si))

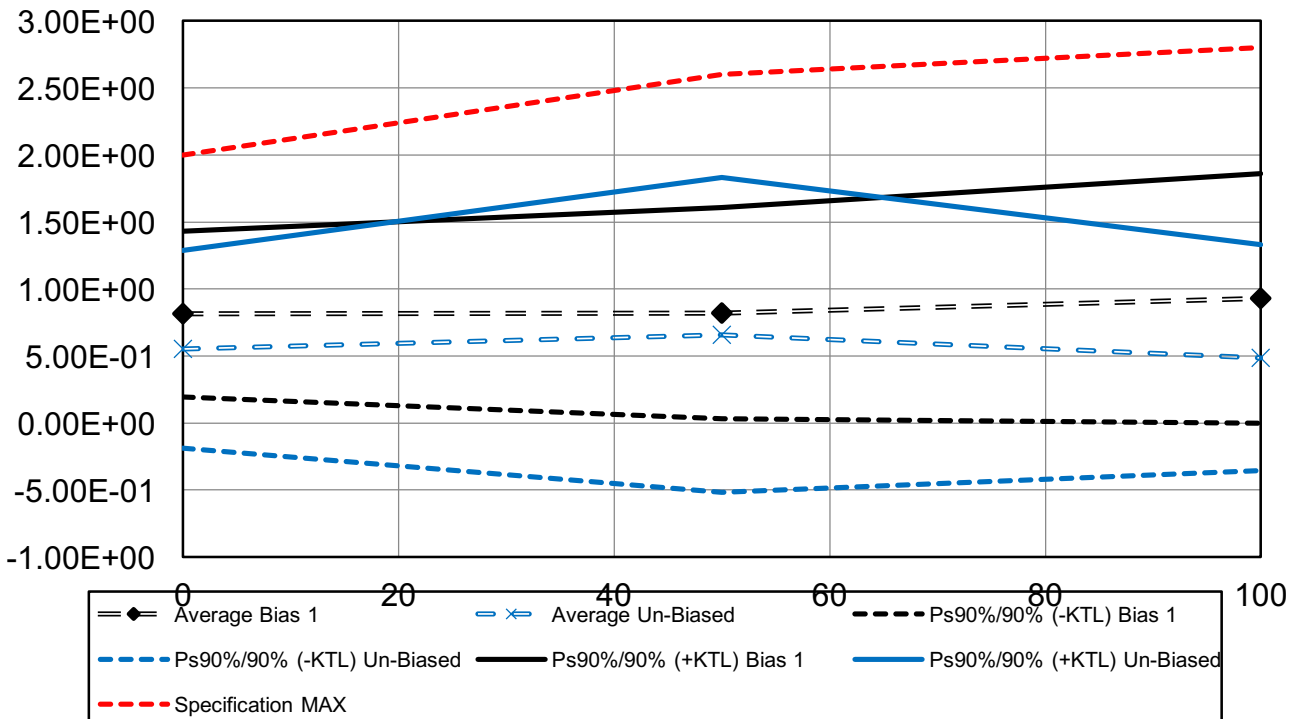


Figure 5.21: Plot of Input Offset Voltage @ Vs=5V, 0V VCM=V+ (mV) versus Total Dose

Table 5.21: Raw data for Input Offset Voltage @ $V_s=5V$, $0V$ $V_{CM}=V+$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOS @ $V_s=5V$, $0V$ $V_{CM}=V+$ (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	3.39E-01	3.97E-01	
214	6.51E-01	7.21E-01	
215	8.58E-01	8.76E-01	
216	8.75E-01	9.24E-01	
217	1.15E+00	1.18E+00	
223	5.94E-01		6.51E-01
224	5.84E-01		6.74E-01
225	1.33E+00		1.42E+00
226	7.03E-01		7.59E-01
227	1.06E+00		1.15E+00
218	7.09E-01	7.19E-01	
219	3.80E-01	4.22E-01	
220	4.18E-01	4.57E-01	
221	2.69E-01	3.12E-01	
222	1.31E+00	1.37E+00	
228	1.03E+00		1.01E+00
229	2.67E-01		3.03E-01
230	4.95E-01		5.08E-01
231	3.30E-01		3.21E-01
232	2.98E-01		2.87E-01
Bias 1 Statistics			
Average Bias 1	8.14E-01	8.20E-01	9.30E-01
Std Dev Bias 1	3.00E-01	2.88E-01	3.39E-01
Ps90%/90% (+KTL) Bias 1	1.43E+00	1.61E+00	1.86E+00
Ps90%/90% (-KTL) Bias 1	1.95E-01	2.96E-02	2.78E-06
Un-Biased Statistics			
Average Un-Biased	5.50E-01	6.57E-01	4.86E-01
Std Dev Un-Biased	3.57E-01	4.28E-01	3.07E-01
Ps90%/90% (+KTL) Un-Biased	1.29E+00	1.83E+00	1.33E+00
Ps90%/90% (-KTL) Un-Biased	-1.87E-01	-5.17E-01	-3.57E-01
Specification MAX	2.00E+00	2.60E+00	2.80E+00
Status	PASS	PASS	PASS

IOS @ Vs=5V, 0V VCM=V+ (uA) vs Total Ionizing Dose (kRad(Si))

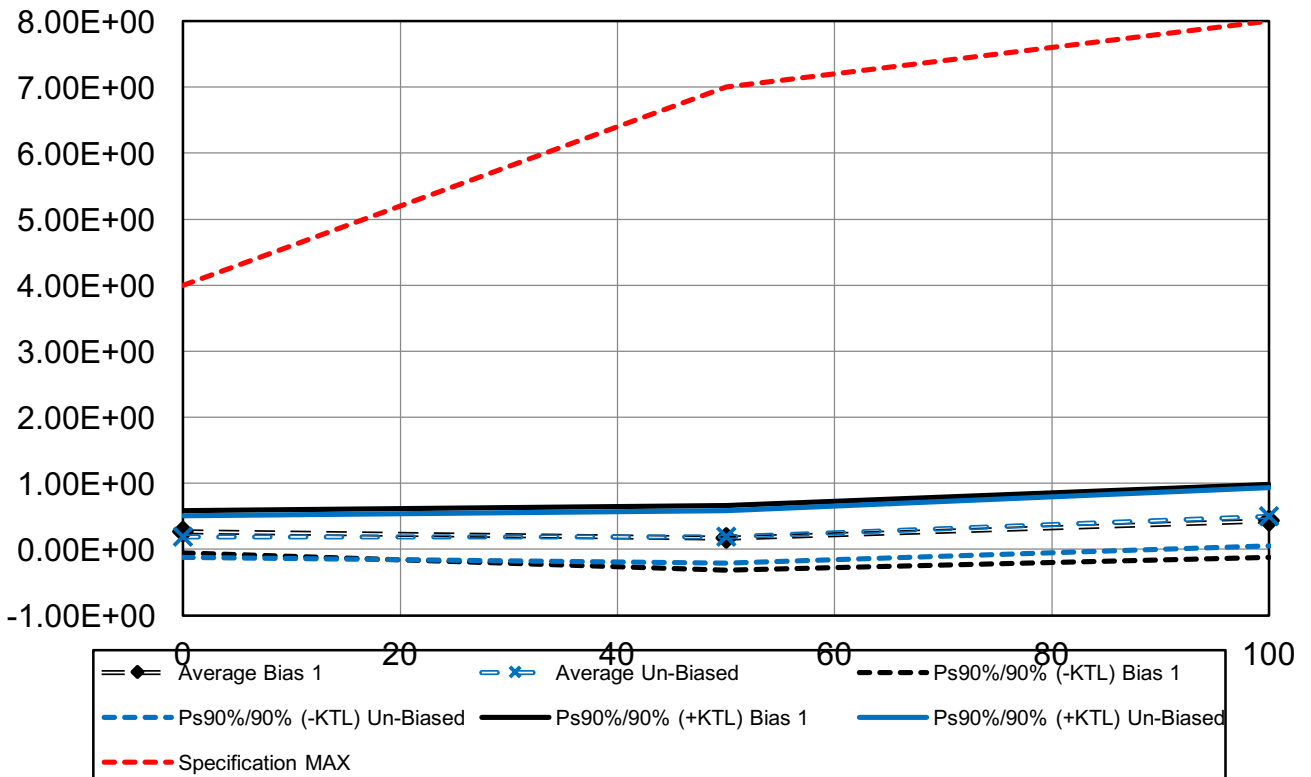


Figure 5.22: Plot of Input Offset Current @ Vs=5V, 0V VCM=V+ (mV) versus Total Dose

Table 5.22: Raw data for Input Offset Current @ $V_s=5V$, $0V$ $V_{CM}=V+$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

IOS @ $V_s=5V$, $0V$ $V_{CM}=V+$ (μA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	3.74E-02	-6.88E-03	
214	1.43E-01	0.00E+00	
215	3.13E-01	2.15E-01	
216	3.27E-01	2.36E-01	
217	4.72E-01	4.16E-01	
223	5.89E-02		1.60E-01
224	2.38E-01		4.56E-01
225	4.73E-01		6.62E-01
226	2.01E-01		3.11E-01
227	3.86E-01		5.68E-01
218	2.81E-01	1.82E-01	
219	1.74E-01	2.63E-01	
220	1.02E-01	7.34E-02	
221	1.22E-01	2.45E-02	
222	4.79E-01	3.85E-01	
228	4.17E-01		7.78E-01
229	7.27E-02		4.63E-01
230	1.51E-01		4.37E-01
231	8.49E-02		3.78E-01
232	4.06E-02		4.10E-01
Bias 1 Statistics			
Average Bias 1	2.65E-01	1.72E-01	4.32E-01
Std Dev Bias 1	1.57E-01	1.78E-01	2.00E-01
Ps90%/90% (+KTL) Bias 1	5.88E-01	6.60E-01	9.81E-01
Ps90%/90% (-KTL) Bias 1	-5.85E-02	-3.17E-01	-1.18E-01
Un-Biased Statistics			
Average Un-Biased	1.92E-01	1.86E-01	4.93E-01
Std Dev Un-Biased	1.51E-01	1.45E-01	1.62E-01
Ps90%/90% (+KTL) Un-Biased	5.04E-01	5.84E-01	9.38E-01
Ps90%/90% (-KTL) Un-Biased	-1.19E-01	-2.13E-01	4.88E-02
Specification MAX	4.00E+00	7.00E+00	8.00E+00
Status	PASS	PASS	PASS

+IB @ Vs=5V, 0V VCM=V+ (uA) vs Total Ionizing Dose (kRad(Si))

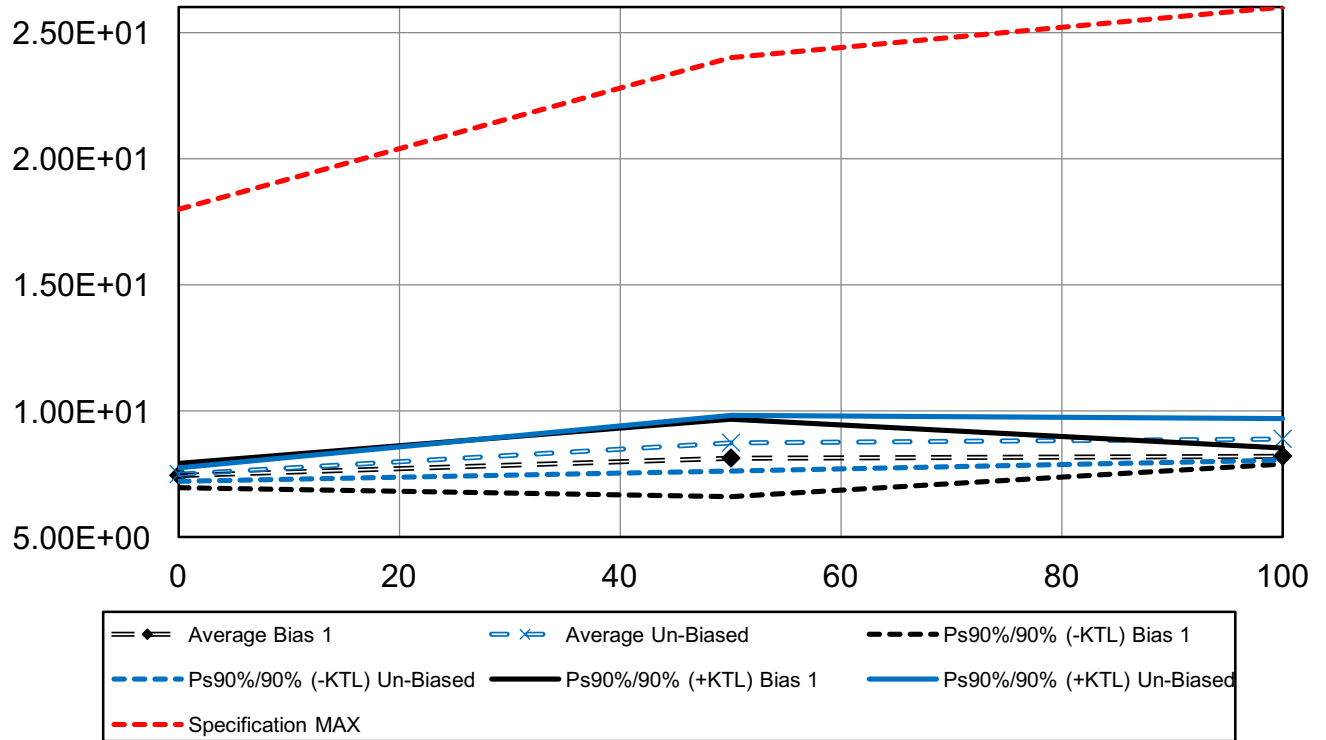


Figure 5.23: Plot of +Input Bias Current @ Vs=5V, 0V VCM=V+ (mV) versus Total Dose

Table 5.23: Raw data for +Input Bias Current @ $V_s=5V$, $0V$ $V_{CM}=V+$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+IB @ $V_s=5V$, $0V$ $V_{CM}=V+$ (μA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	7.26E+00	7.68E+00	
214	7.21E+00	7.84E+00	
215	7.38E+00	8.36E+00	
216	7.18E+00	7.79E+00	
217	7.94E+00	9.03E+00	
223	7.51E+00		8.21E+00
224	7.52E+00		8.10E+00
225	7.26E+00		8.13E+00
226	7.53E+00		8.39E+00
227	7.61E+00		8.24E+00
218	7.45E+00	8.82E+00	
219	7.45E+00	8.61E+00	
220	7.36E+00	8.21E+00	
221	7.76E+00	8.70E+00	
222	7.48E+00	9.32E+00	
228	7.33E+00		9.20E+00
229	7.56E+00		8.99E+00
230	7.41E+00		9.01E+00
231	7.58E+00		8.78E+00
232	7.46E+00		8.42E+00
Bias 1 Statistics			
Average Bias 1	7.44E+00	8.14E+00	8.21E+00
Std Dev Bias 1	2.33E-01	5.60E-01	1.12E-01
Ps90%/90% (+KTL) Bias 1	7.92E+00	9.68E+00	8.52E+00
Ps90%/90% (-KTL) Bias 1	6.96E+00	6.60E+00	7.91E+00
Un-Biased Statistics			
Average Un-Biased	7.48E+00	8.73E+00	8.88E+00
Std Dev Un-Biased	1.26E-01	4.03E-01	2.98E-01
Ps90%/90% (+KTL) Un-Biased	7.74E+00	9.84E+00	9.70E+00
Ps90%/90% (-KTL) Un-Biased	7.22E+00	7.63E+00	8.06E+00
Specification MAX	1.80E+01	2.40E+01	2.60E+01
Status	PASS	PASS	PASS

-IB @Vs=5V, 0V VCM=V+ (uA) vs Total Ionizing Dose (kRad(Si))

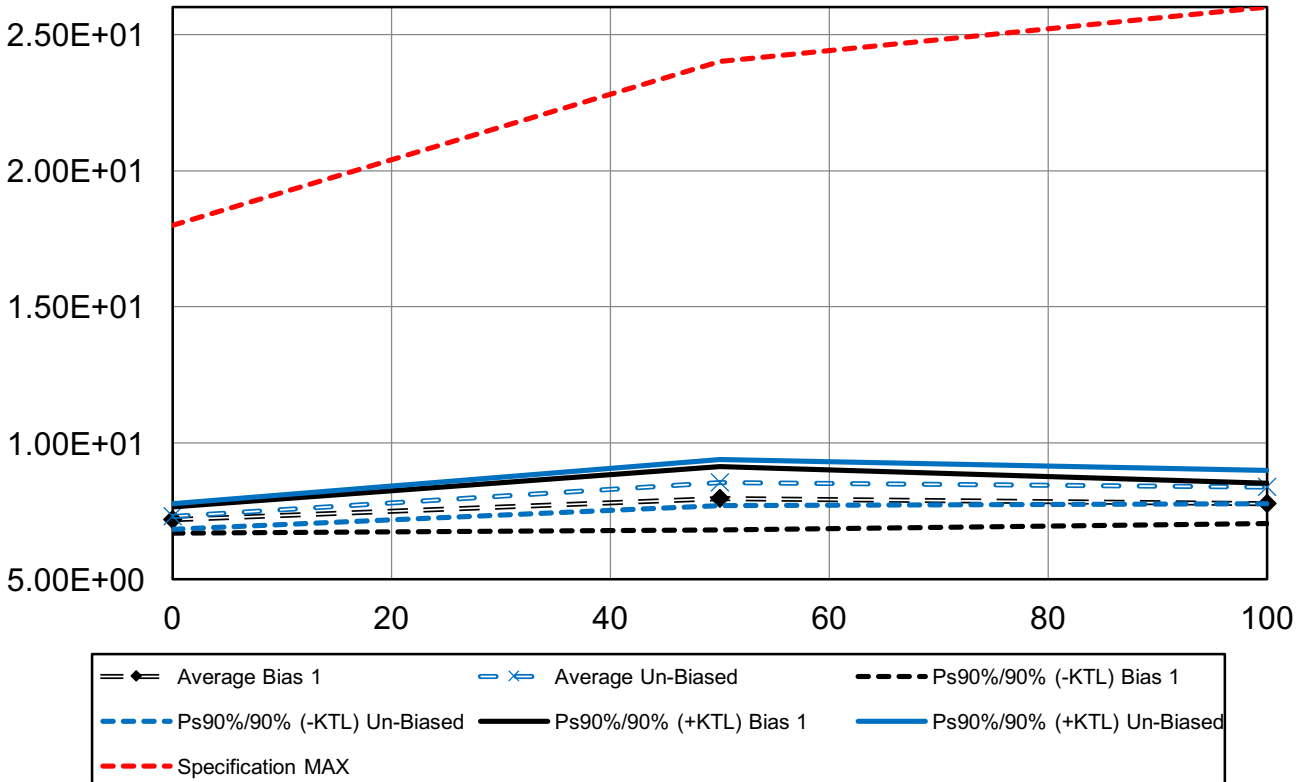


Figure 5.24: Plot of -Input Bias Current @ Vs=5V, 0V VCM=V+ (mV) versus Total Dose

Table 5.24: Raw data for -Input Bias Current @ $V_s=5V$, $0V$ $V_{CM}=V+$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

-IB @ $V_s=5V$, $0V$ $V_{CM}=V+$ (μA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	7.22E+00	7.68E+00	
214	7.06E+00	7.84E+00	
215	7.07E+00	8.14E+00	
216	6.86E+00	7.56E+00	
217	7.47E+00	8.61E+00	
223	7.45E+00		8.05E+00
224	7.28E+00		7.64E+00
225	6.78E+00		7.47E+00
226	7.33E+00		8.08E+00
227	7.22E+00		7.67E+00
218	7.17E+00	8.63E+00	
219	7.28E+00	8.34E+00	
220	7.25E+00	8.14E+00	
221	7.64E+00	8.68E+00	
222	7.00E+00	8.94E+00	
228	6.91E+00		8.42E+00
229	7.49E+00		8.52E+00
230	7.26E+00		8.58E+00
231	7.50E+00		8.40E+00
232	7.42E+00		8.01E+00
Bias 1 Statistics			
Average Bias 1	7.17E+00	7.97E+00	7.78E+00
Std Dev Bias 1	2.32E-01	4.21E-01	2.69E-01
Ps90%/90% (+KTL) Bias 1	7.65E+00	9.12E+00	8.52E+00
Ps90%/90% (-KTL) Bias 1	6.70E+00	6.81E+00	7.05E+00
Un-Biased Statistics			
Average Un-Biased	7.29E+00	8.55E+00	8.39E+00
Std Dev Un-Biased	2.27E-01	3.12E-01	2.23E-01
Ps90%/90% (+KTL) Un-Biased	7.76E+00	9.40E+00	9.00E+00
Ps90%/90% (-KTL) Un-Biased	6.82E+00	7.69E+00	7.78E+00
Specification MAX	1.80E+01	2.40E+01	2.60E+01
Status	PASS	PASS	PASS

VOS @ Vs=5V, 0V VCM=V- (mV) vs Total Ionizing Dose (kRad(Si))

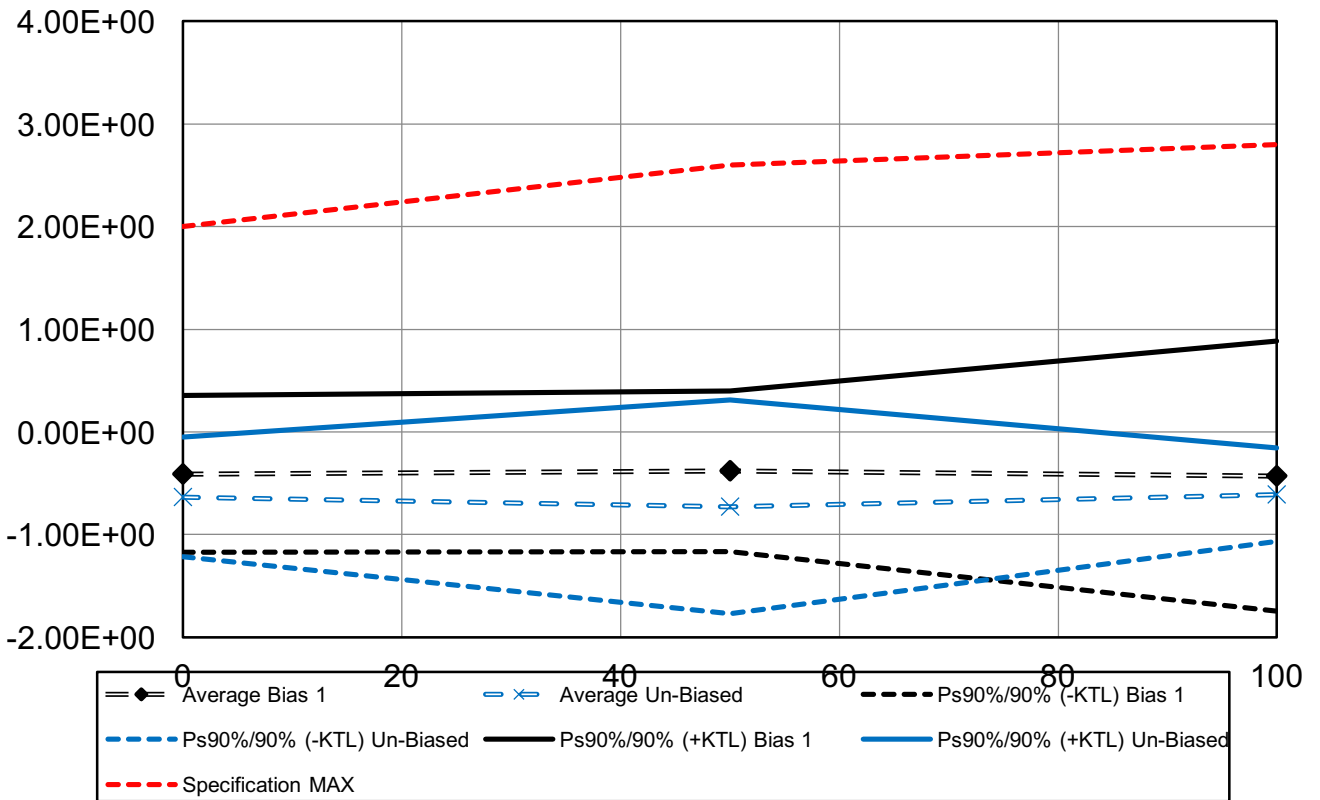


Figure 5.25: Plot of Input Offset Voltage @ Vs=5V, 0V VCM=V- (mV) versus Total Dose

Table 5.25: Raw data for Input Offset Voltage @ $V_s=5V$, $0V$ $V_{CM}=V_-$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOS @ $V_s=5V$, $0V$ $V_{CM}=V_-$ (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-6.86E-01	-6.66E-01	
214	-5.91E-01	-5.58E-01	
215	-4.04E-01	-4.28E-01	
216	-3.27E-01	-3.37E-01	
217	1.13E-01	7.55E-02	
223	-3.72E-01		-3.43E-01
224	-8.58E-01		-8.55E-01
225	1.69E-01		2.07E-01
226	-9.26E-01		-9.53E-01
227	-2.05E-01		-2.10E-01
218	-9.49E-01	-9.94E-01	
219	-5.10E-01	-5.33E-01	
220	-3.81E-01	-3.91E-01	
221	-1.23E+00	-1.26E+00	
222	-4.75E-01	-4.70E-01	
228	-2.51E-01		-3.34E-01
229	-6.33E-01		-6.56E-01
230	-5.81E-01		-6.02E-01
231	-6.65E-01		-7.46E-01
232	-6.62E-01		-7.27E-01
Bias 1 Statistics			
Average Bias 1	-4.09E-01	-3.83E-01	-4.31E-01
Std Dev Bias 1	3.71E-01	2.85E-01	4.79E-01
Ps90%/90% (+KTL) Bias 1	3.57E-01	3.99E-01	8.82E-01
Ps90%/90% (-KTL) Bias 1	-1.17E+00	-1.16E+00	-1.74E+00
Un-Biased Statistics			
Average Un-Biased	-6.34E-01	-7.30E-01	-6.13E-01
Std Dev Un-Biased	2.82E-01	3.79E-01	1.66E-01
Ps90%/90% (+KTL) Un-Biased	-5.25E-02	3.08E-01	-1.58E-01
Ps90%/90% (-KTL) Un-Biased	-1.22E+00	-1.77E+00	-1.07E+00
Specification MAX	2.00E+00	2.60E+00	2.80E+00
Status	PASS	PASS	PASS

IOS @ Vs=5V, 0V VCM=V- (uA) vs Total Ionizing Dose (kRad(Si))

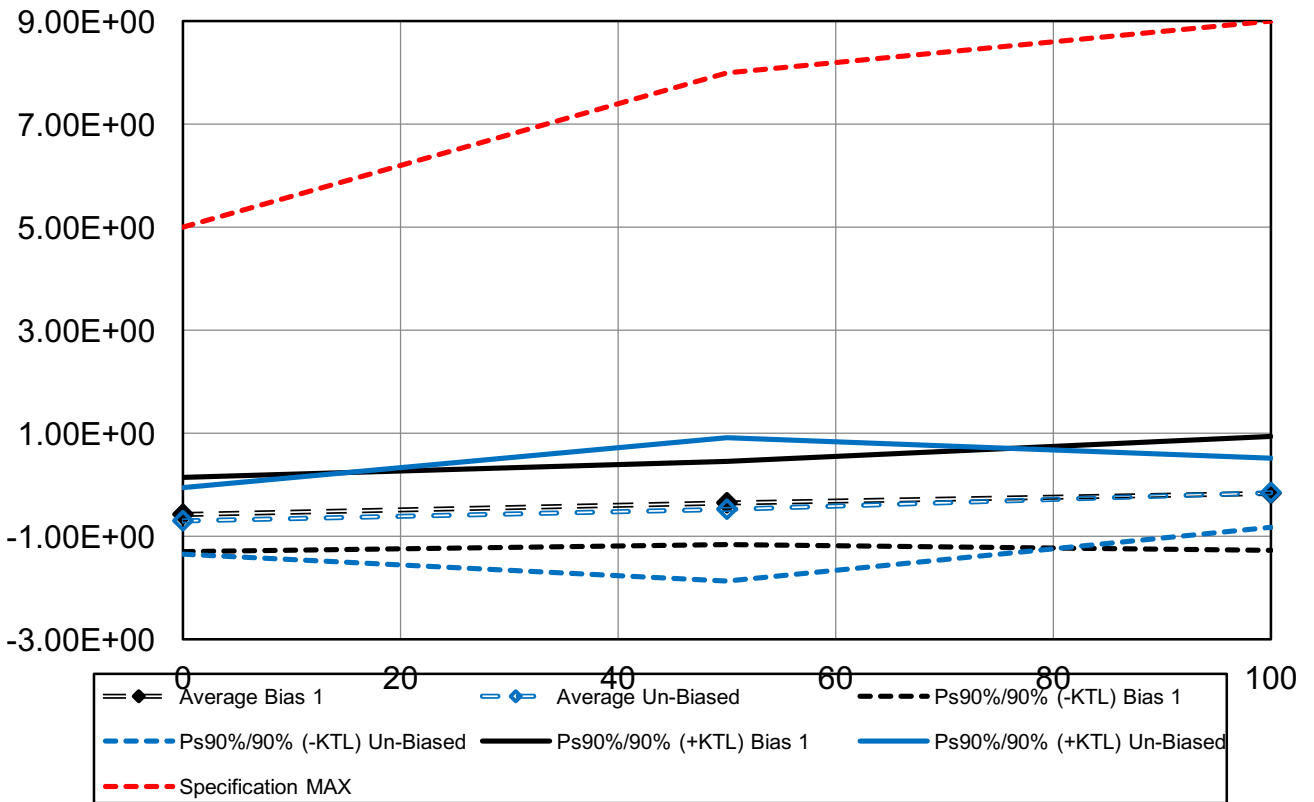


Figure 5.26: Plot of Input Offset Current @ Vs=5V, 0V VCM=V- (mV) versus Total Dose

Table 5.26: Raw data for Input Offset Current @ $V_s=5V$, $0V$ $V_{CM}=V^-$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

IOS @ $V_s=5V$, $0V$ $V_{CM}=V^+$ (μA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-8.51E-01	-6.38E-01	
214	-8.56E-01	-6.24E-01	
215	-4.52E-01	-2.41E-01	
216	-5.35E-01	-3.24E-01	
217	-8.35E-02	7.34E-02	
223	-3.91E-01		3.37E-02
224	-9.38E-01		-5.42E-01
225	-1.31E-01		3.05E-01
226	-1.10E+00		-6.38E-01
227	-4.03E-01		-9.18E-03
218	-1.09E+00	-8.67E-01	
219	-4.83E-01	-2.75E-01	
220	-3.46E-01	-1.03E-01	
221	-1.35E+00	-1.16E+00	
222	-5.54E-01	6.12E-03	
228	-4.16E-01		2.45E-01
229	-5.68E-01		-1.41E-01
230	-6.74E-01		-1.74E-01
231	-7.52E-01		-3.78E-01
232	-8.01E-01		-3.29E-01
Bias 1 Statistics			
Average Bias 1	-5.74E-01	-3.51E-01	-1.70E-01
Std Dev Bias 1	3.47E-01	2.96E-01	4.03E-01
Ps90%/90% (+KTL) Bias 1	1.43E-01	4.60E-01	9.36E-01
Ps90%/90% (-KTL) Bias 1	-1.29E+00	-1.16E+00	-1.28E+00
Un-Biased Statistics			
Average Un-Biased	-7.03E-01	-4.79E-01	-1.56E-01
Std Dev Un-Biased	3.12E-01	5.07E-01	2.45E-01
Ps90%/90% (+KTL) Un-Biased	-5.83E-02	9.10E-01	5.17E-01
Ps90%/90% (-KTL) Un-Biased	-1.35E+00	-1.87E+00	-8.28E-01
Specification MAX	5.00E+00	8.00E+00	9.00E+00
Status	PASS	PASS	PASS

+IB @ Vs=5V, 0V VCM=V- (uA) vs Total Ionizing Dose (kRad(Si))

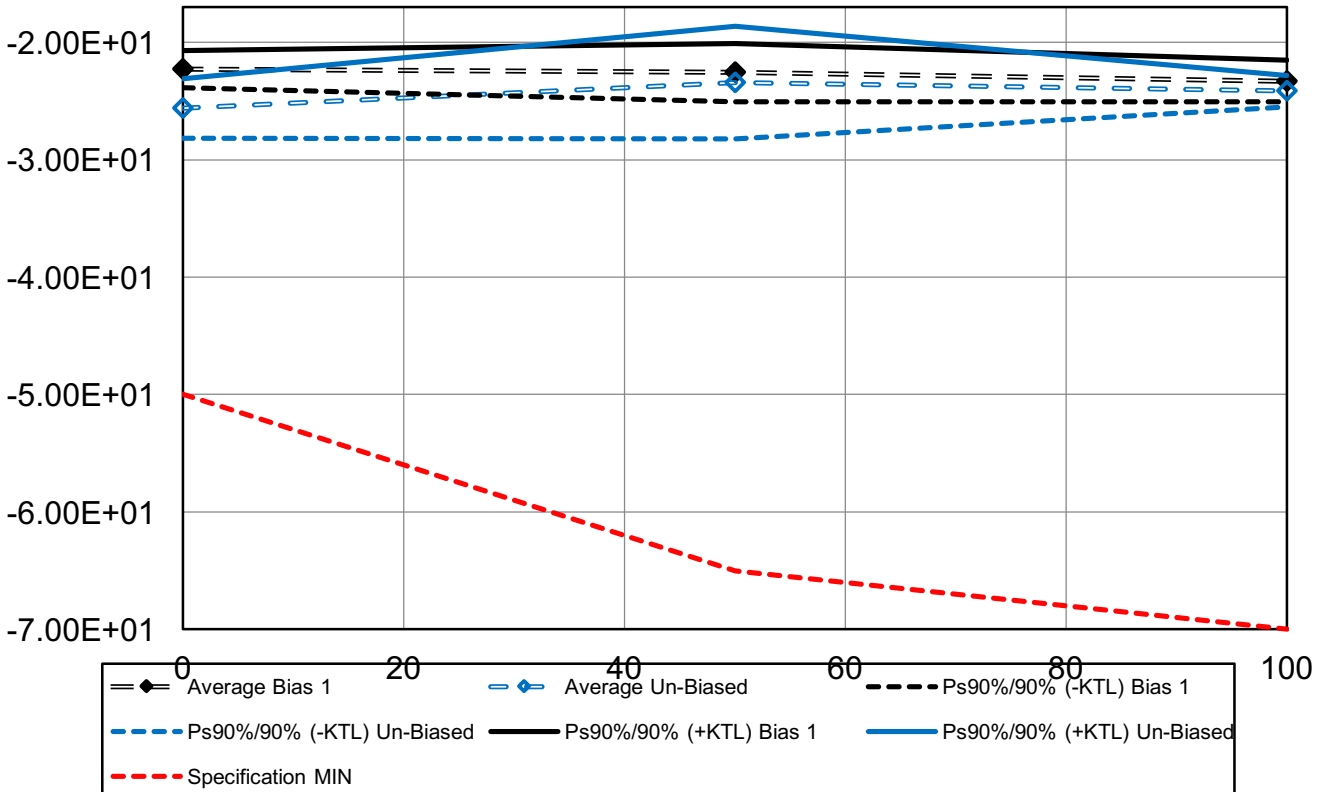


Figure 5.27: Plot of +Input Bias Current @ Vs=5V, 0V VCM=V- (mV) versus Total Dose

Table 5.27: Raw data for +Input Bias Current @ $V_s=5V$, $0V$ $V_{CM}=V^-$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+IB @ $V_s=5V$, $0V$ $V_{CM}=V^-$ (μA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-2.13E+01	-2.18E+01	
214	-2.28E+01	-2.32E+01	
215	-2.31E+01	-2.38E+01	
216	-2.13E+01	-2.17E+01	
217	-2.19E+01	-2.24E+01	
223	-2.33E+01		-2.40E+01
224	-2.16E+01		-2.25E+01
225	-2.31E+01		-2.39E+01
226	-2.25E+01		-2.34E+01
227	-2.20E+01		-2.28E+01
218	-2.42E+01	-2.18E+01	
219	-2.66E+01	-2.42E+01	
220	-2.56E+01	-2.30E+01	
221	-2.43E+01	-2.19E+01	
222	-2.84E+01	-2.60E+01	
228	-2.61E+01		-2.49E+01
229	-2.58E+01		-2.41E+01
230	-2.50E+01		-2.42E+01
231	-2.48E+01		-2.36E+01
232	-2.55E+01		-2.40E+01
Bias 1 Statistics			
Average Bias 1	-2.23E+01	-2.26E+01	-2.33E+01
Std Dev Bias 1	7.71E-01	9.01E-01	6.51E-01
Ps90%/90% (+KTL) Bias 1	-2.07E+01	-2.01E+01	-2.15E+01
Ps90%/90% (-KTL) Bias 1	-2.39E+01	-2.50E+01	-2.51E+01
Un-Biased Statistics			
Average Un-Biased	-2.56E+01	-2.34E+01	-2.42E+01
Std Dev Un-Biased	1.23E+00	1.75E+00	4.86E-01
Ps90%/90% (+KTL) Un-Biased	-2.31E+01	-1.86E+01	-2.28E+01
Ps90%/90% (-KTL) Un-Biased	-2.82E+01	-2.82E+01	-2.55E+01
Specification MIN	-5.00E+01	-6.50E+01	-7.00E+01
Status	PASS	PASS	PASS

-IB @ Vs=5V, 0V VCM=V- (uA) vs Total Ionizing Dose (kRad(Si))

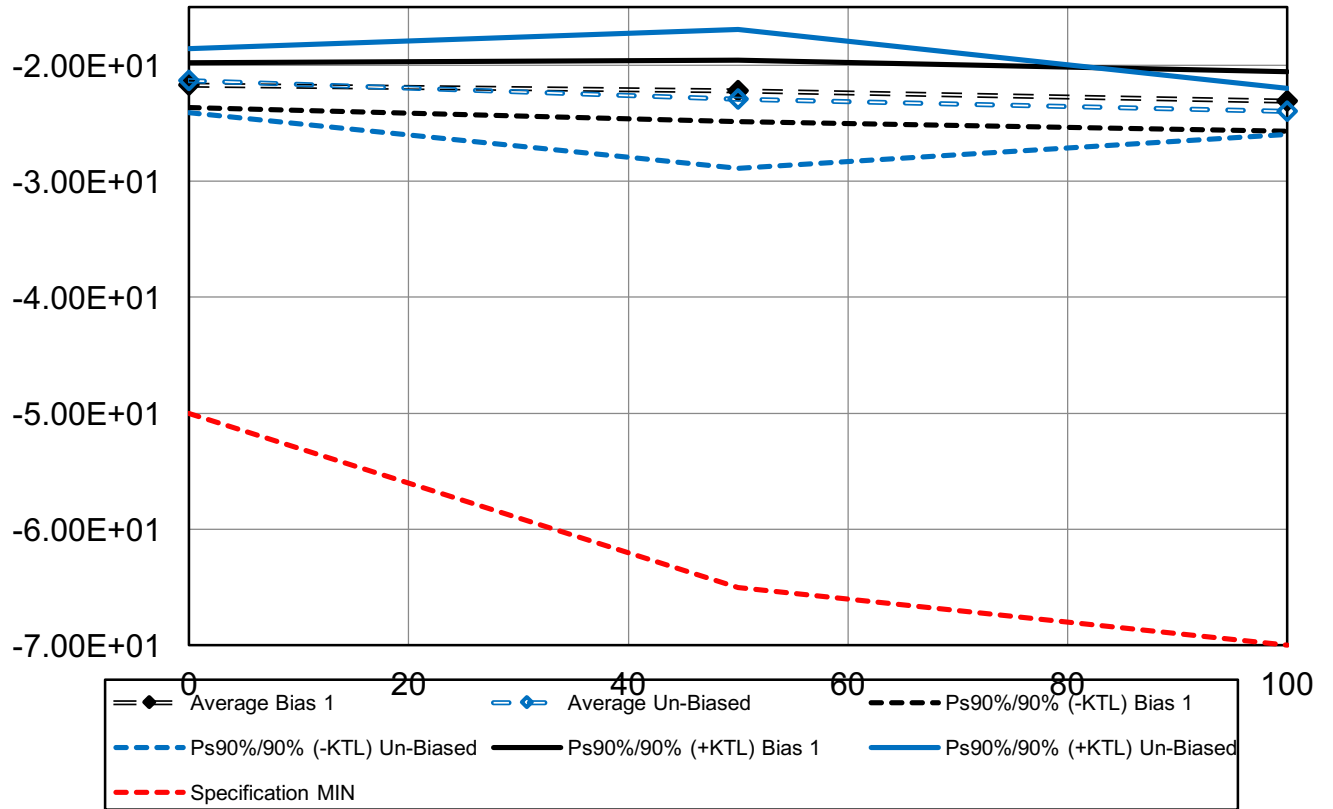


Figure 5.28: Plot of -Input Bias Current @ Vs=5V, 0V VCM=V- (mV) versus Total Dose

Table 5.28: Raw data for -Input Bias Current @ $V_s=5V$, $0V V_{CM}=V_-$ (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

-IB @ $V_s=5V$, $0V V_{CM}=V_+$ (μA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-2.05E+01	-2.11E+01	
214	-2.19E+01	-2.26E+01	
215	-2.27E+01	-2.35E+01	
216	-2.08E+01	-2.14E+01	
217	-2.18E+01	-2.25E+01	
223	-2.29E+01		-2.40E+01
224	-2.06E+01		-2.19E+01
225	-2.30E+01		-2.42E+01
226	-2.14E+01		-2.27E+01
227	-2.16E+01		-2.28E+01
218	-1.96E+01	-2.10E+01	
219	-2.25E+01	-2.39E+01	
220	-2.17E+01	-2.29E+01	
221	-1.95E+01	-2.08E+01	
222	-2.39E+01	-2.60E+01	
228	-2.20E+01		-2.52E+01
229	-2.16E+01		-2.39E+01
230	-2.08E+01		-2.40E+01
231	-2.06E+01		-2.32E+01
232	-2.11E+01		-2.37E+01
Bias 1 Statistics			
Average Bias 1	-2.17E+01	-2.22E+01	-2.31E+01
Std Dev Bias 1	9.26E-01	9.73E-01	9.40E-01
Ps90%/90% (+KTL) Bias 1	-1.98E+01	-1.96E+01	-2.05E+01
Ps90%/90% (-KTL) Bias 1	-2.36E+01	-2.49E+01	-2.57E+01
Un-Biased Statistics			
Average Un-Biased	-2.13E+01	-2.29E+01	-2.40E+01
Std Dev Un-Biased	1.32E+00	2.18E+00	7.25E-01
Ps90%/90% (+KTL) Un-Biased	-1.86E+01	-1.69E+01	-2.20E+01
Ps90%/90% (-KTL) Un-Biased	-2.41E+01	-2.89E+01	-2.60E+01
Specification MIN	-5.00E+01	-6.50E+01	-7.00E+01
Status	PASS	PASS	PASS

CMRR @ VS=5V, VCM=1.5V to 3.5V (dB) vs Total Ionizing Dose (kRad(Si))

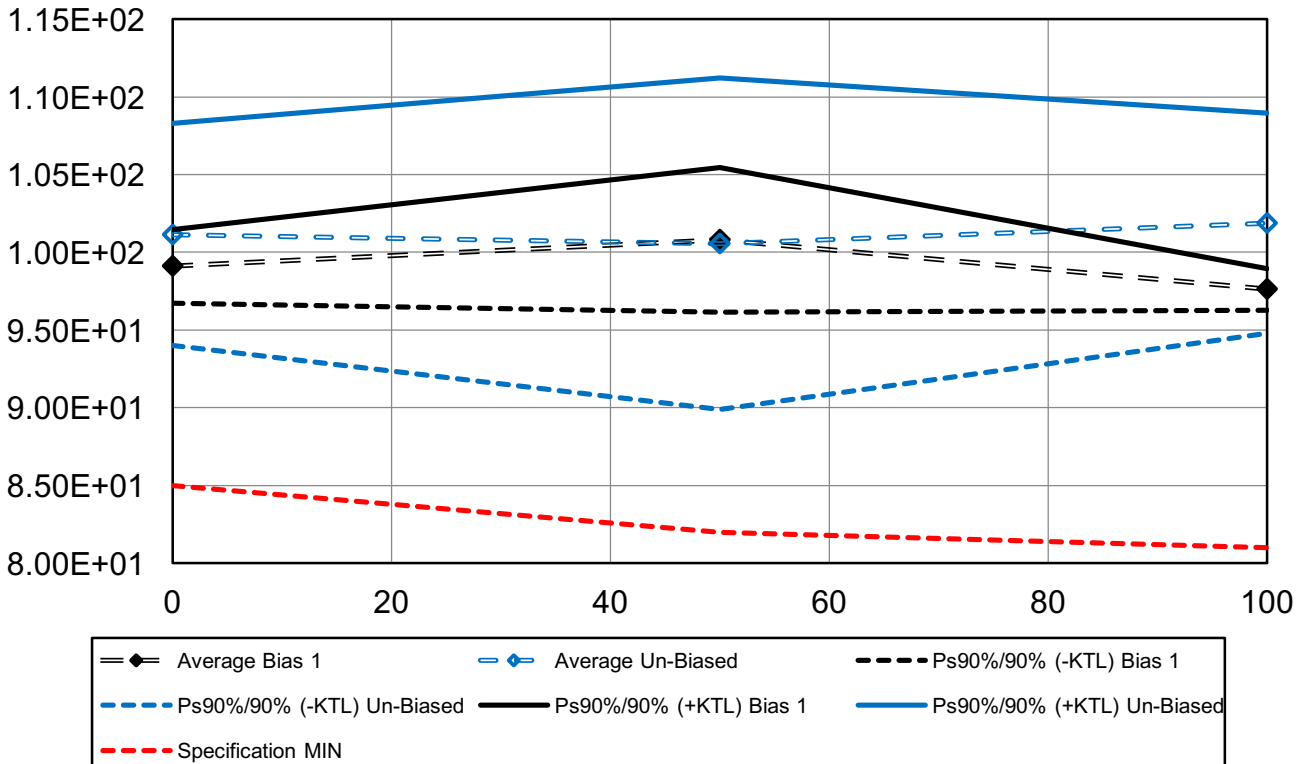


Figure 5.29: Plot of Common Mode Rejection Ratio @ VS=5V, VCM=1.5V to 3.5V (dB) versus Total Dose

Table 5.29: Raw data for Common Mode Rejection Ratio @ VS=5V, VCM=1.5V to 3.5V (dB) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

CMRR @ VS=5V, VCM=1.5V to 3.5V (dB)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.02E+02	1.04E+02	
214	9.84E+01	9.93E+01	
215	9.99E+01	1.01E+02	
216	9.88E+01	9.95E+01	
217	9.96E+01	1.01E+02	
223	9.92E+01		9.84E+01
224	9.87E+01		9.76E+01
225	9.82E+01		9.75E+01
226	9.79E+01		9.72E+01
227	9.85E+01		9.74E+01
218	9.74E+01	9.82E+01	
219	1.02E+02	1.03E+02	
220	1.03E+02	1.05E+02	
221	9.92E+01	1.00E+02	
222	9.50E+01	9.56E+01	
228	9.84E+01		9.79E+01
229	1.03E+02		1.02E+02
230	1.02E+02		1.01E+02
231	1.05E+02		1.04E+02
232	1.05E+02		1.04E+02
Bias 1 Statistics			
Average Bias 1	9.91E+01	1.01E+02	9.76E+01
Std Dev Bias 1	1.15E+00	1.70E+00	4.89E-01
Ps90%/90% (+KTL) Bias 1	1.01E+02	1.05E+02	9.90E+01
Ps90%/90% (-KTL) Bias 1	9.67E+01	9.62E+01	9.63E+01
Un-Biased Statistics			
Average Un-Biased	1.01E+02	1.01E+02	1.02E+02
Std Dev Un-Biased	3.46E+00	3.89E+00	2.59E+00
Ps90%/90% (+KTL) Un-Biased	1.08E+02	1.11E+02	1.09E+02
Ps90%/90% (-KTL) Un-Biased	9.40E+01	8.99E+01	9.48E+01
Specification MIN	8.50E+01	8.20E+01	8.10E+01
Status	PASS	PASS	PASS

+/-CMRR @ VS=+/-5V, VCM= +/-5V (dB) vs Total Ionizing Dose (kRad(Si))

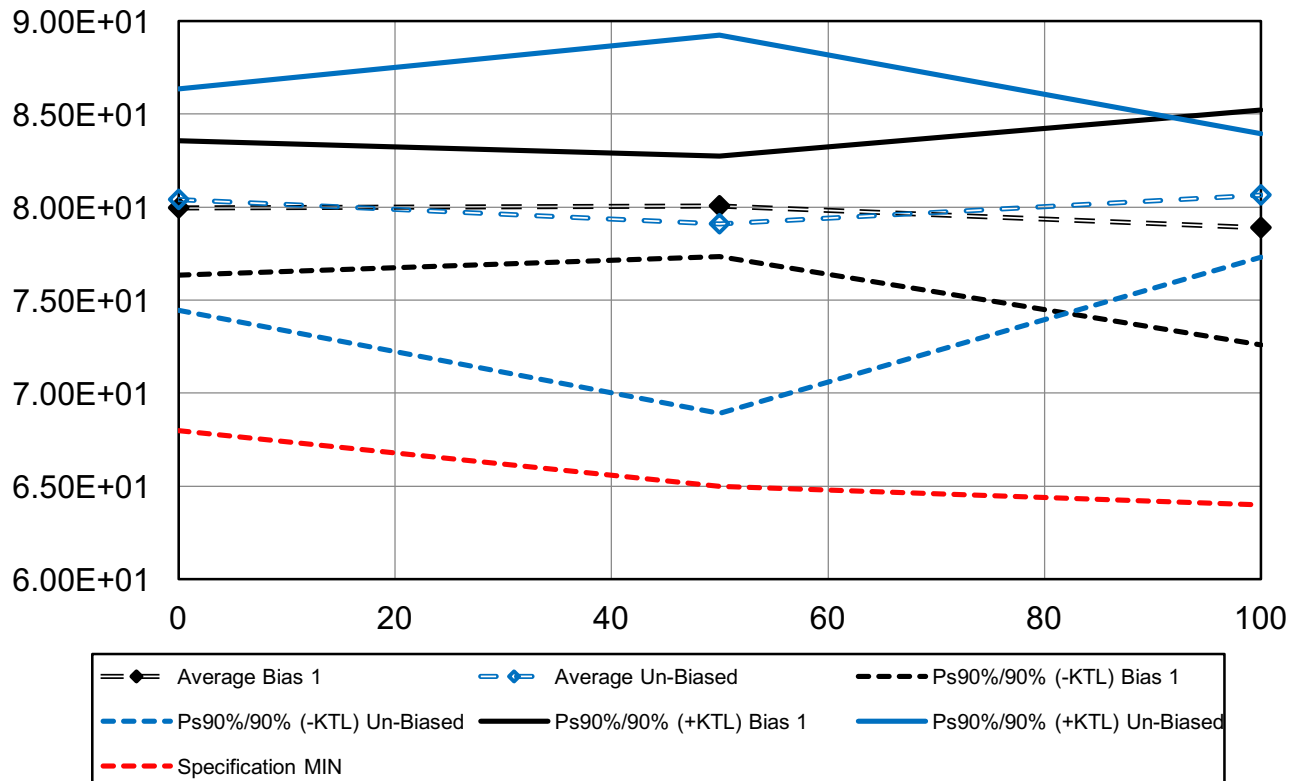


Figure 5.30: Plot of Common Mode Rejection Ratio @ VS=+/-5V, VCM= +/-5V (dB) versus Total Dose

Table 5.30: Raw data for Common Mode Rejection Ratio @ $V_S=+/-5V$, $V_{CM}= +/-5V$ (dB) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+/-CMRR @ $V_S=+/-5V$, $V_{CM}= +/-5V$ (dB)	Total Dose (krad(Si))		
	Device	0	50
213	8.13E+01	8.09E+01	
214	7.93E+01	7.90E+01	
215	8.06E+01	8.03E+01	
216	7.95E+01	7.90E+01	
217	8.17E+01	8.10E+01	
223	8.26E+01		8.22E+01
224	7.78E+01		7.72E+01
225	8.04E+01		8.00E+01
226	7.69E+01		7.64E+01
227	7.94E+01		7.87E+01
218	7.65E+01	7.62E+01	
219	8.37E+01	8.29E+01	
220	8.40E+01	8.33E+01	
221	7.78E+01	7.74E+01	
222	7.60E+01	7.57E+01	
228	7.93E+01		7.88E+01
229	8.25E+01		8.19E+01
230	8.05E+01		8.02E+01
231	8.15E+01		8.07E+01
232	8.22E+01		8.15E+01
Bias 1 Statistics			
Average Bias 1	8.00E+01	8.00E+01	7.89E+01
Std Dev Bias 1	1.74E+00	9.84E-01	2.30E+00
Ps90%/90% (+KTL) Bias 1	8.36E+01	8.27E+01	8.52E+01
Ps90%/90% (-KTL) Bias 1	7.64E+01	7.73E+01	7.26E+01
Un-Biased Statistics			
Average Un-Biased	8.04E+01	7.91E+01	8.06E+01
Std Dev Un-Biased	2.89E+00	3.71E+00	1.21E+00
Ps90%/90% (+KTL) Un-Biased	8.64E+01	8.93E+01	8.40E+01
Ps90%/90% (-KTL) Un-Biased	7.45E+01	6.89E+01	7.73E+01
Specification MIN	6.80E+01	6.50E+01	6.40E+01
Status	PASS	PASS	PASS

+/-CMRR @ VS=+/-5V, VCM= +/-2V (dB) vs Total Ionizing Dose (kRad(Si))

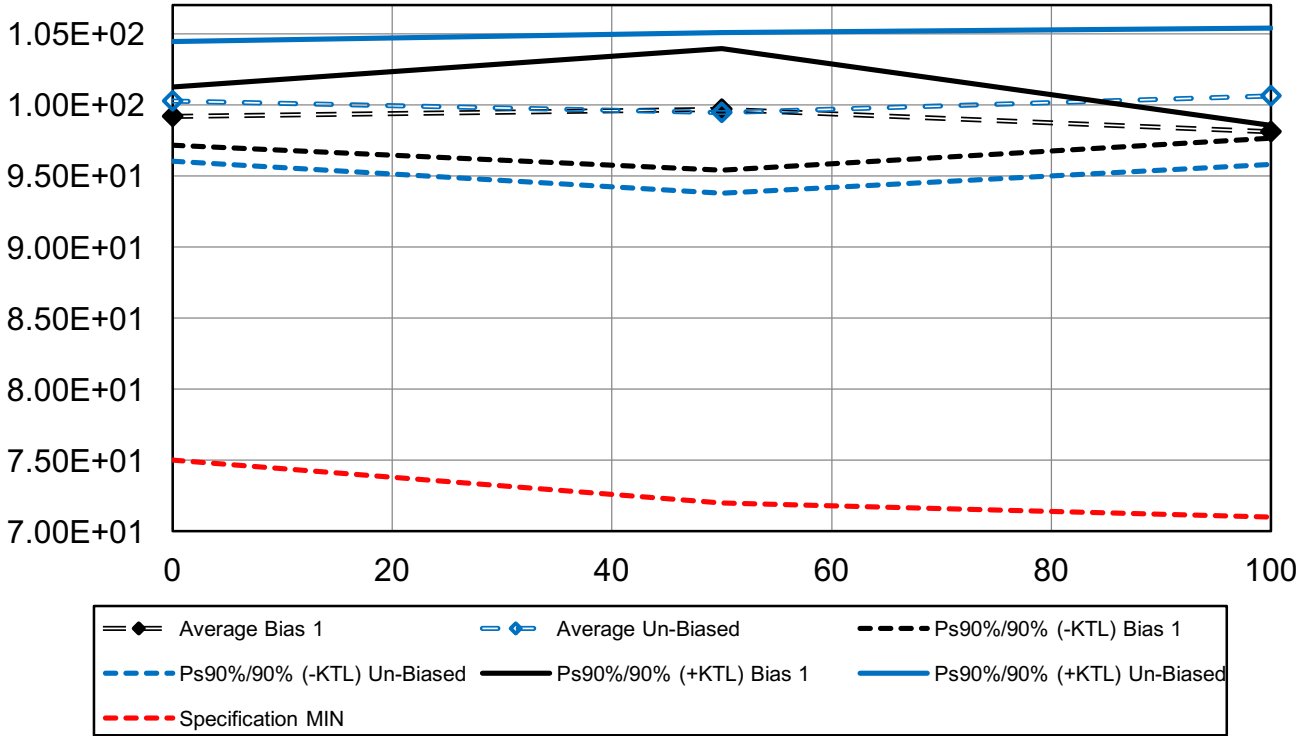


Figure 5.31: Plot of Common Mode Rejection Ratio @ VS=+/-5V, VCM= +/-2V (dB) versus Total Dose

Table 5.31: Raw data for Common Mode Rejection Ratio @ $V_S=+/-5V$, $V_{CM}= +/-2V$ (dB) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+/-CMRR @ $V_S=+/-5V$, $V_{CM}=+/-2V$ (dB)	Total Dose (krad(Si))		
	Device	0	50
213	9.99E+01	1.00E+02	
214	9.84E+01	9.83E+01	
215	1.02E+02	1.02E+02	
216	9.83E+01	9.82E+01	
217	9.98E+01	9.98E+01	
223	9.87E+01		9.81E+01
224	9.87E+01		9.79E+01
225	9.88E+01		9.82E+01
226	9.91E+01		9.83E+01
227	9.86E+01		9.79E+01
218	9.81E+01	9.82E+01	
219	1.02E+02	1.02E+02	
220	1.01E+02	1.01E+02	
221	9.92E+01	9.91E+01	
222	9.68E+01	9.69E+01	
228	9.87E+01		9.82E+01
229	1.01E+02		1.00E+02
230	1.00E+02		1.00E+02
231	1.03E+02		1.02E+02
232	1.03E+02		1.02E+02
Bias 1 Statistics			
Average Bias 1	9.92E+01	9.97E+01	9.81E+01
Std Dev Bias 1	9.91E-01	1.56E+00	1.65E-01
Ps90%/90% (+KTL) Bias 1	1.01E+02	1.04E+02	9.85E+01
Ps90%/90% (-KTL) Bias 1	9.71E+01	9.54E+01	9.76E+01
Un-Biased Statistics			
Average Un-Biased	1.00E+02	9.94E+01	1.01E+02
Std Dev Un-Biased	2.03E+00	2.06E+00	1.75E+00
Ps90%/90% (+KTL) Un-Biased	1.04E+02	1.05E+02	1.05E+02
Ps90%/90% (-KTL) Un-Biased	9.60E+01	9.38E+01	9.58E+01
Specification MIN	7.50E+01	7.20E+01	7.10E+01
Status	PASS	PASS	PASS

PSRR @ VS= +/-2.25V TO +/-5V (dB) vs Total Ionizing Dose (kRad(Si))

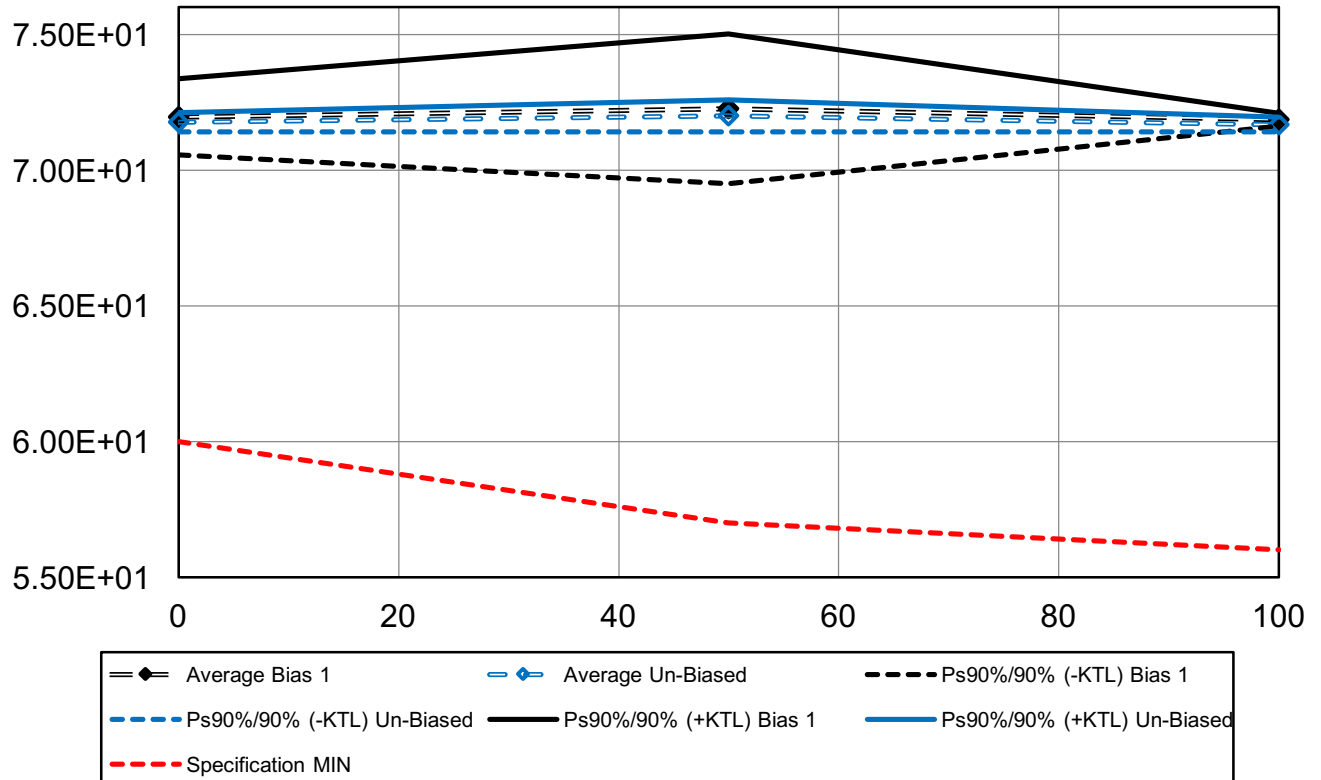


Figure 5.32: Plot of Power Supply Rejection Ratio @ VS= +/-2.25V TO +/-5V (dB) versus Total Dose

Table 5.32: Raw data for Common Mode Rejection Ratio @ $V_S = \pm 5V$, $V_{CM} = \pm 2V$ (dB) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

PSRR @ $V_S = \pm 2.25V$ TO $\pm 5V$ (dB)	Total Dose (krad(Si))		
	0	50	100
Device			
213	7.14E+01	7.16E+01	
214	7.15E+01	7.17E+01	
215	7.38E+01	7.40E+01	
216	7.16E+01	7.18E+01	
217	7.21E+01	7.23E+01	
223	7.18E+01		7.19E+01
224	7.18E+01		7.18E+01
225	7.19E+01		7.20E+01
226	7.18E+01		7.18E+01
227	7.19E+01		7.19E+01
218	7.17E+01	7.19E+01	
219	7.19E+01	7.21E+01	
220	7.16E+01	7.18E+01	
221	7.17E+01	7.19E+01	
222	7.21E+01	7.23E+01	
228	7.18E+01		7.17E+01
229	7.17E+01		7.17E+01
230	7.16E+01		7.16E+01
231	7.18E+01		7.18E+01
232	7.15E+01		7.15E+01
Bias 1 Statistics			
Average Bias 1	7.20E+01	7.22E+01	7.19E+01
Std Dev Bias 1	6.80E-01	1.01E+00	8.49E-02
Ps90%/90% (+KTL) Bias 1	7.34E+01	7.50E+01	7.21E+01
Ps90%/90% (-KTL) Bias 1	7.06E+01	6.95E+01	7.16E+01
Un-Biased Statistics			
Average Un-Biased	7.18E+01	7.20E+01	7.17E+01
Std Dev Un-Biased	1.75E-01	2.12E-01	1.00E-01
Ps90%/90% (+KTL) Un-Biased	7.21E+01	7.26E+01	7.20E+01
Ps90%/90% (-KTL) Un-Biased	7.14E+01	7.14E+01	7.14E+01
Specification MIN	6.00E+01	5.70E+01	5.60E+01
Status	PASS	PASS	PASS

+/-AVOL @ Vs=5V, Vo=0.5V to 4.5V, RL=1K (V/mV) vs Total Ionizing Dose (kRad(Si))

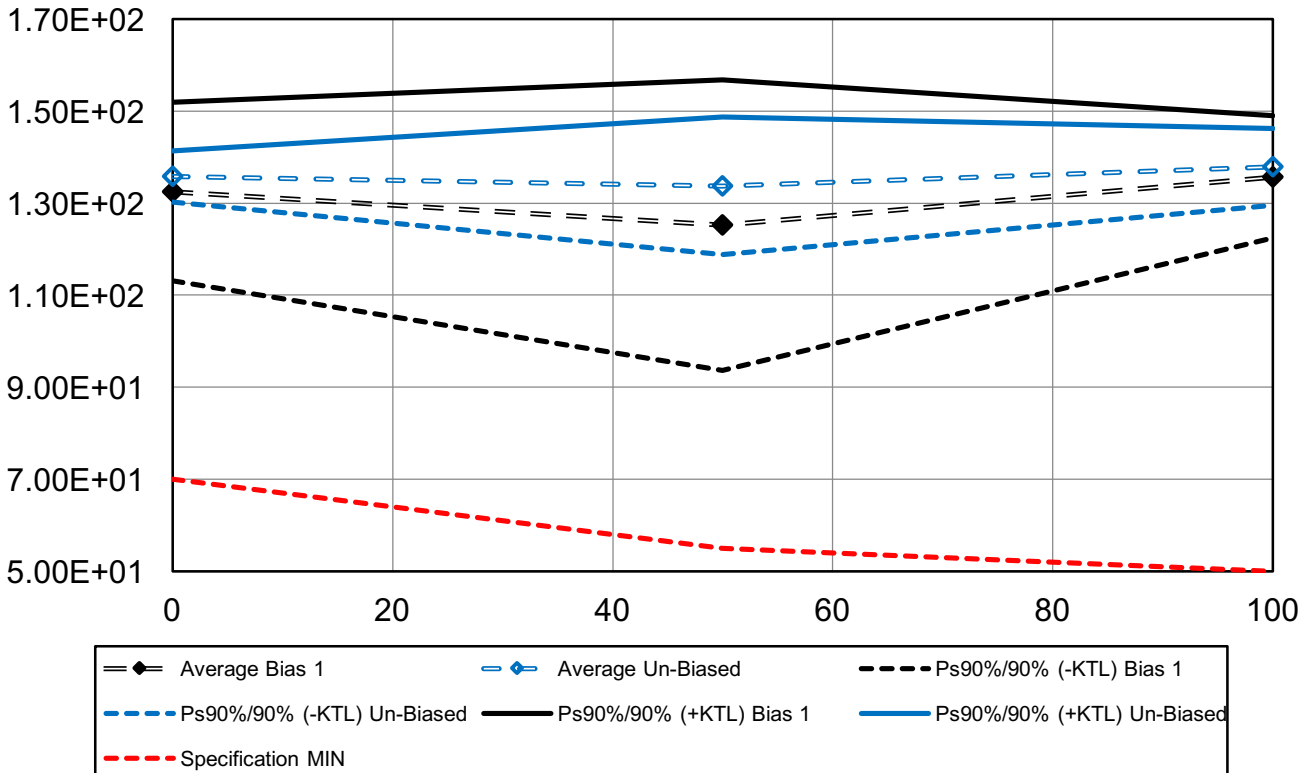


Figure 5.33: Plot of Large Signal Open-Loop Voltage Gain @ Vs=5V, Vo=0.5V to 4.5V, RL=1K (V/mV) versus Total Dose

Table 5.33: Raw data for Large Signal Open-Loop Voltage Gain @ Vs=5V, Vo=0.5V to 4.5V, RL=1K (V/mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+/-AVOL @ Vs=5V, Vo=0.5V to 4.5V, RL=1K (V/mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.27E+02	1.25E+02	
214	1.28E+02	1.26E+02	
215	1.10E+02	1.07E+02	
216	1.34E+02	1.31E+02	
217	1.40E+02	1.38E+02	
223	1.36E+02		1.33E+02
224	1.39E+02		1.37E+02
225	1.32E+02		1.30E+02
226	1.37E+02		1.36E+02
227	1.43E+02		1.43E+02
218	1.36E+02	1.33E+02	
219	1.31E+02	1.27E+02	
220	1.38E+02	1.36E+02	
221	1.40E+02	1.42E+02	
222	1.35E+02	1.31E+02	
228	1.38E+02		1.41E+02
229	1.34E+02		1.39E+02
230	1.34E+02		1.34E+02
231	1.37E+02		1.41E+02
232	1.34E+02		1.36E+02
Bias 1 Statistics			
Average Bias 1	1.33E+02	1.25E+02	1.36E+02
Std Dev Bias 1	9.40E+00	1.15E+01	4.83E+00
Ps90%/90% (+KTL) Bias 1	1.52E+02	1.57E+02	1.49E+02
Ps90%/90% (-KTL) Bias 1	1.13E+02	9.36E+01	1.22E+02
Un-Biased Statistics			
Average Un-Biased	1.36E+02	1.34E+02	1.38E+02
Std Dev Un-Biased	2.69E+00	5.45E+00	3.05E+00
Ps90%/90% (+KTL) Un-Biased	1.41E+02	1.49E+02	1.46E+02
Ps90%/90% (-KTL) Un-Biased	1.30E+02	1.19E+02	1.30E+02
Specification MIN	7.00E+01	5.50E+01	5.00E+01
Status	PASS	PASS	PASS

+/-AVOL @ Vs=5V, Vo=1V to 4V, RL=100 (V/mV) vs Total Ionizing Dose (kRad(Si))

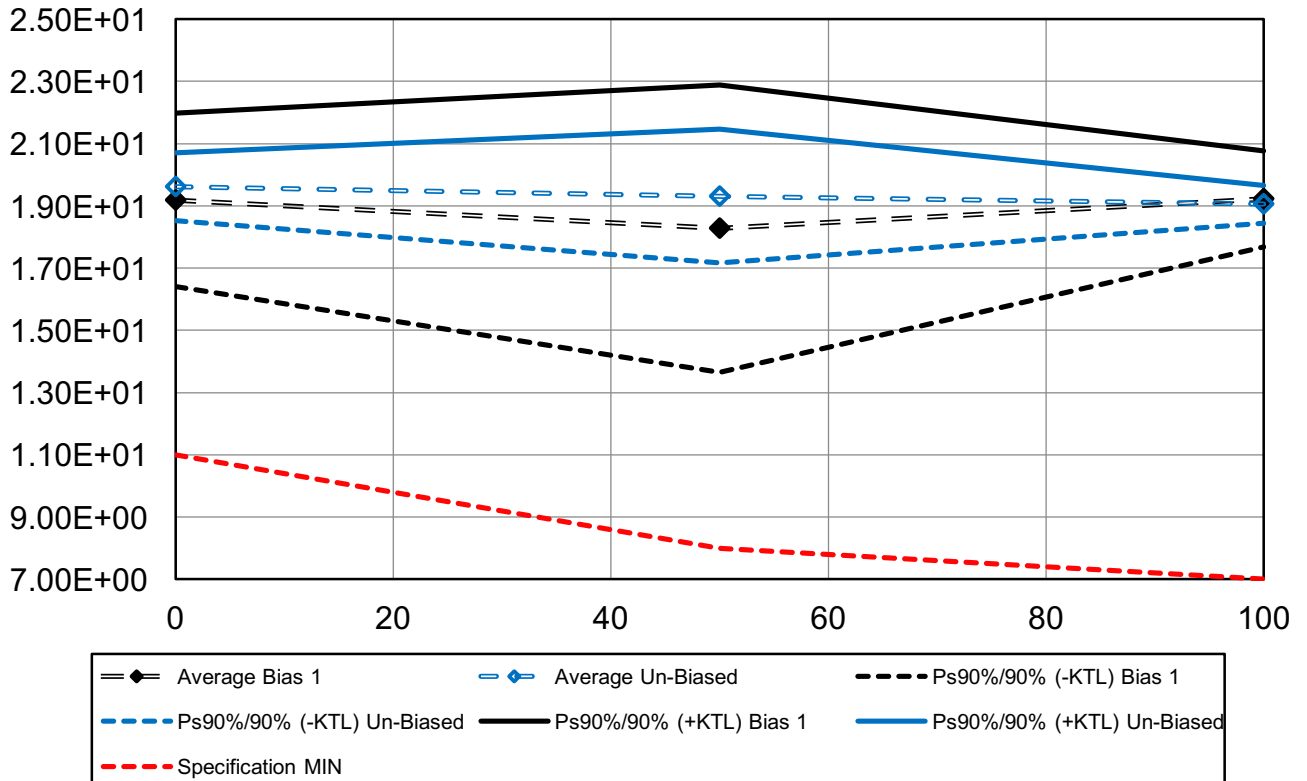


Figure 5.34: Plot of Large Signal Open-Loop Voltage Gain @ Vs=5V, Vo=1V to 4V, RL=100 (V/mV) versus Total Dose

Table 5.34: Raw data for Large Signal Open-Loop Voltage Gain @ Vs=5V, Vo=1V to 4V, RL=100 (V/mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+/-AVOL @ Vs=5V, Vo=1V to 4V, RL=100 (V/mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.89E+01	1.86E+01	
214	1.87E+01	1.84E+01	
215	1.57E+01	1.55E+01	
216	1.94E+01	1.91E+01	
217	2.03E+01	1.99E+01	
223	1.96E+01		1.91E+01
224	2.01E+01		1.97E+01
225	1.90E+01		1.84E+01
226	1.96E+01		1.91E+01
227	2.05E+01		1.98E+01
218	1.97E+01	1.94E+01	
219	1.86E+01	1.83E+01	
220	2.00E+01	1.97E+01	
221	2.05E+01	2.03E+01	
222	1.91E+01	1.88E+01	
228	1.98E+01		1.91E+01
229	1.98E+01		1.91E+01
230	1.94E+01		1.88E+01
231	2.00E+01		1.94E+01
232	1.94E+01		1.89E+01
Bias 1 Statistics			
Average Bias 1	1.92E+01	1.83E+01	1.92E+01
Std Dev Bias 1	1.35E+00	1.68E+00	5.62E-01
Ps90%/90% (+KTL) Bias 1	2.20E+01	2.29E+01	2.08E+01
Ps90%/90% (-KTL) Bias 1	1.64E+01	1.37E+01	1.77E+01
Un-Biased Statistics			
Average Un-Biased	1.96E+01	1.93E+01	1.91E+01
Std Dev Un-Biased	5.28E-01	7.85E-01	2.23E-01
Ps90%/90% (+KTL) Un-Biased	2.07E+01	2.15E+01	1.97E+01
Ps90%/90% (-KTL) Un-Biased	1.85E+01	1.72E+01	1.84E+01
Specification MIN	1.10E+01	8.00E+00	7.00E+00
Status	PASS	PASS	PASS

**\pm -AVOL @ VS= \pm -5V, RL=1K, VOUT= \pm -4.5V
(V/mV)vs Total Ionizing Dose (kRad(Si))**

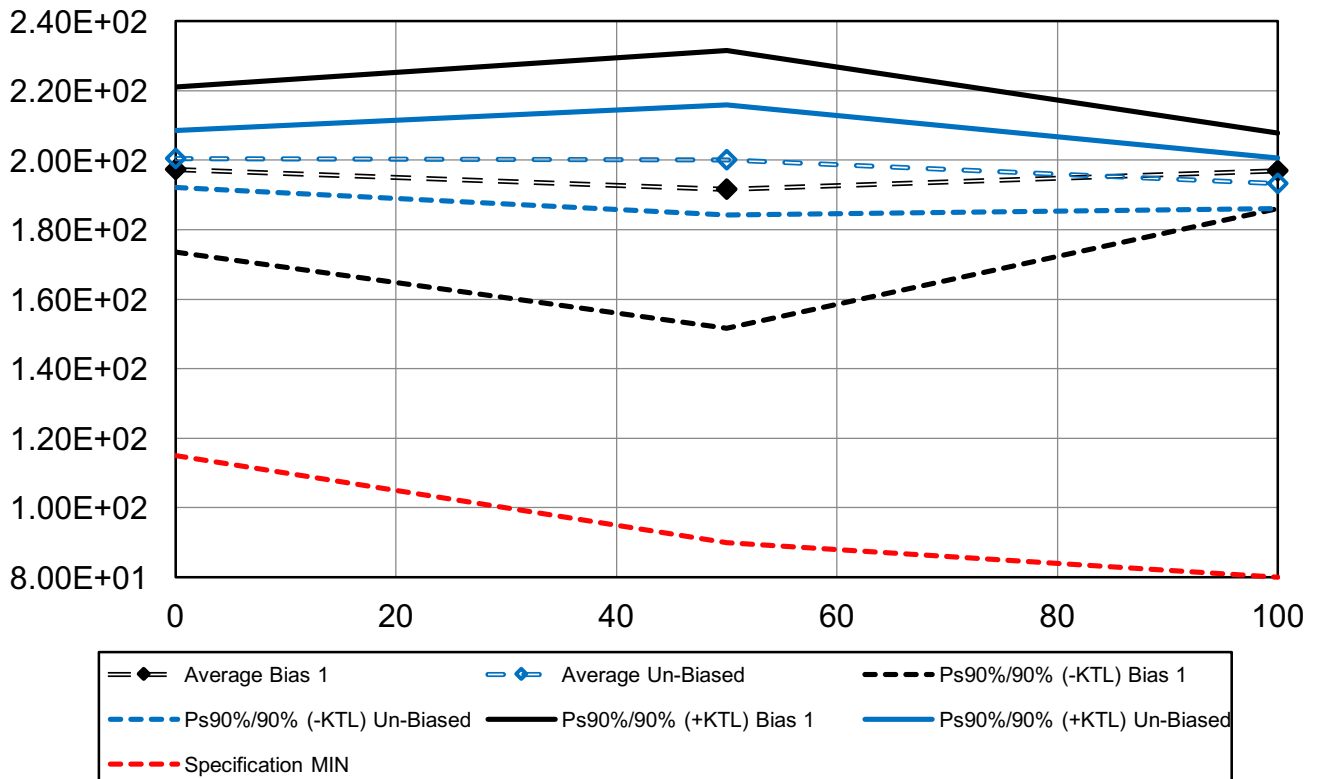


Figure 5.35: Plot of Large Signal Open-Loop Voltage Gain @ Vs= \pm 5V; RL= 1k; Vo= \pm 4.5V (V/mV) versus Total Dose

Table 5.35: Raw data for Large Signal Open-Loop Voltage Gain @ $V_s = \pm 5V$; $R_L = 1k$; $V_o = \pm 4.5V$ (V/mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+/-AVOL @ VS= +/-5V, RL=1K, VOUT=+/-4.5V (V/mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.90E+02	1.91E+02	
214	1.92E+02	1.92E+02	
215	1.70E+02	1.68E+02	
216	1.99E+02	1.98E+02	
217	2.08E+02	2.08E+02	
223	2.02E+02		1.97E+02
224	2.07E+02		2.01E+02
225	1.97E+02		1.92E+02
226	1.99E+02		1.94E+02
227	2.09E+02		2.00E+02
218	2.02E+02	2.00E+02	
219	1.93E+02	1.92E+02	
220	2.00E+02	2.01E+02	
221	2.08E+02	2.08E+02	
222	2.01E+02	1.99E+02	
228	2.03E+02		1.94E+02
229	2.02E+02		1.95E+02
230	1.97E+02		1.93E+02
231	2.01E+02		1.95E+02
232	1.96E+02		1.89E+02
Bias 1 Statistics			
Average Bias 1	1.97E+02	1.92E+02	1.97E+02
Std Dev Bias 1	1.15E+01	1.46E+01	3.94E+00
Ps90%/90% (+KTL) Bias 1	2.21E+02	2.32E+02	2.08E+02
Ps90%/90% (-KTL) Bias 1	1.74E+02	1.52E+02	1.86E+02
Un-Biased Statistics			
Average Un-Biased	2.00E+02	2.00E+02	1.93E+02
Std Dev Un-Biased	3.97E+00	5.77E+00	2.64E+00
Ps90%/90% (+KTL) Un-Biased	2.09E+02	2.16E+02	2.01E+02
Ps90%/90% (-KTL) Un-Biased	1.92E+02	1.84E+02	1.86E+02
Specification MIN	1.15E+02	9.00E+01	8.00E+01
Status	PASS	PASS	PASS

**\pm -AVOL @ VS= \pm -5V, RL=100, VOUT= \pm -2V
(V/mV)vs Total Ionizing Dose (kRad(Si))**

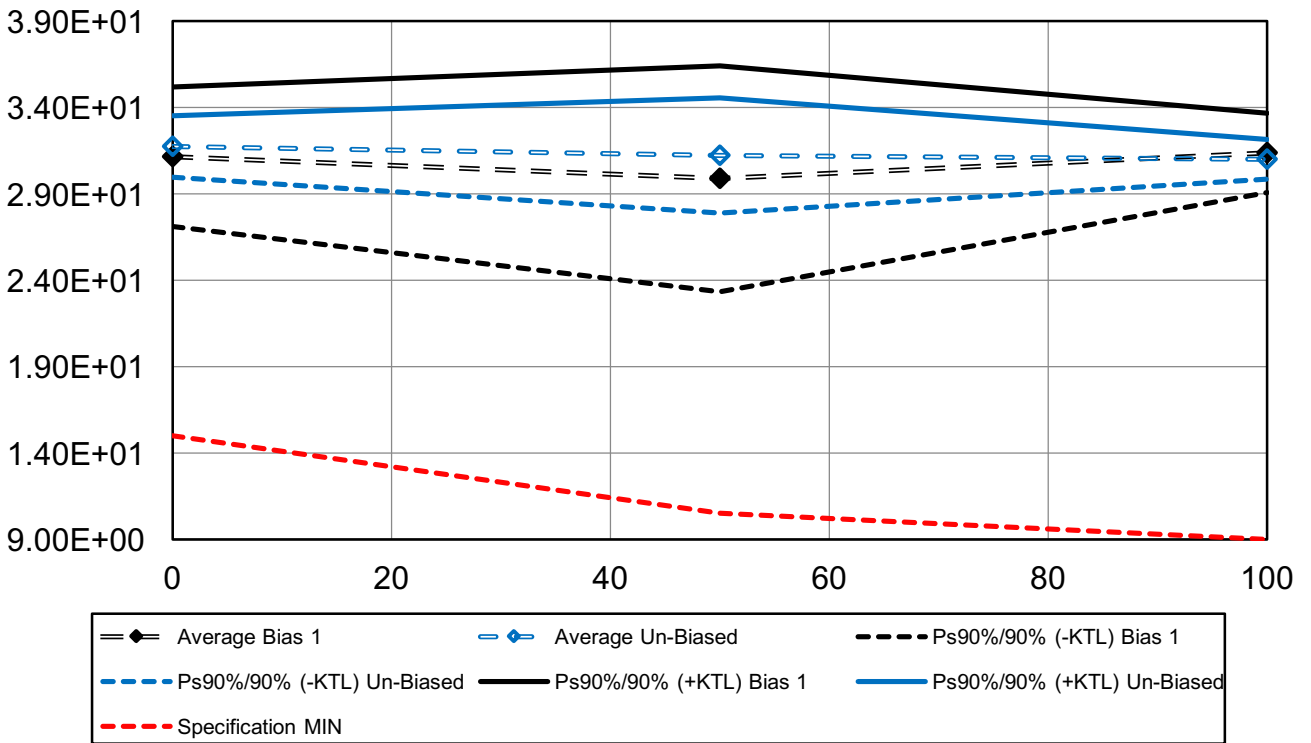


Figure 5.36: Plot of Large Signal Open-Loop Voltage Gain @ VS= \pm -5V, RL=100, Vo= \pm -2V (V/mV) versus Total Dose

Table 5.36: Raw data for Large Signal Open-Loop Voltage Gain @ $V_S = \pm 5V$, $R_L = 100$, $V_O = \pm 2V$ (V/mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

+/-AVOL @ $V_S = \pm 5V$, $R_L = 100$, $V_{OUT} = \pm 2V$ (V/mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	3.04E+01	3.01E+01	
214	3.03E+01	2.99E+01	
215	2.63E+01	2.60E+01	
216	3.14E+01	3.09E+01	
217	3.29E+01	3.24E+01	
223	3.19E+01		3.12E+01
224	3.27E+01		3.20E+01
225	3.08E+01		3.02E+01
226	3.16E+01		3.10E+01
227	3.30E+01		3.23E+01
218	3.18E+01	3.14E+01	
219	3.00E+01	2.96E+01	
220	3.22E+01	3.18E+01	
221	3.32E+01	3.27E+01	
222	3.12E+01	3.06E+01	
228	3.21E+01		3.13E+01
229	3.21E+01		3.11E+01
230	3.14E+01		3.06E+01
231	3.22E+01		3.15E+01
232	3.12E+01		3.06E+01
Bias 1 Statistics			
Average Bias 1	3.11E+01	2.99E+01	3.14E+01
Std Dev Bias 1	1.96E+00	2.39E+00	8.40E-01
Ps90%/90% (+KTL) Bias 1	3.52E+01	3.64E+01	3.37E+01
Ps90%/90% (-KTL) Bias 1	2.71E+01	2.33E+01	2.91E+01
Un-Biased Statistics			
Average Un-Biased	3.17E+01	3.12E+01	3.10E+01
Std Dev Un-Biased	8.58E-01	1.21E+00	4.24E-01
Ps90%/90% (+KTL) Un-Biased	3.35E+01	3.45E+01	3.22E+01
Ps90%/90% (-KTL) Un-Biased	3.00E+01	2.79E+01	2.98E+01
Specification MIN	1.50E+01	1.05E+01	9.00E+00
Status	PASS	PASS	PASS

VOH @ VS= +/-5V, IL=0MA (mV) vs Total Ionizing Dose (kRad(Si))

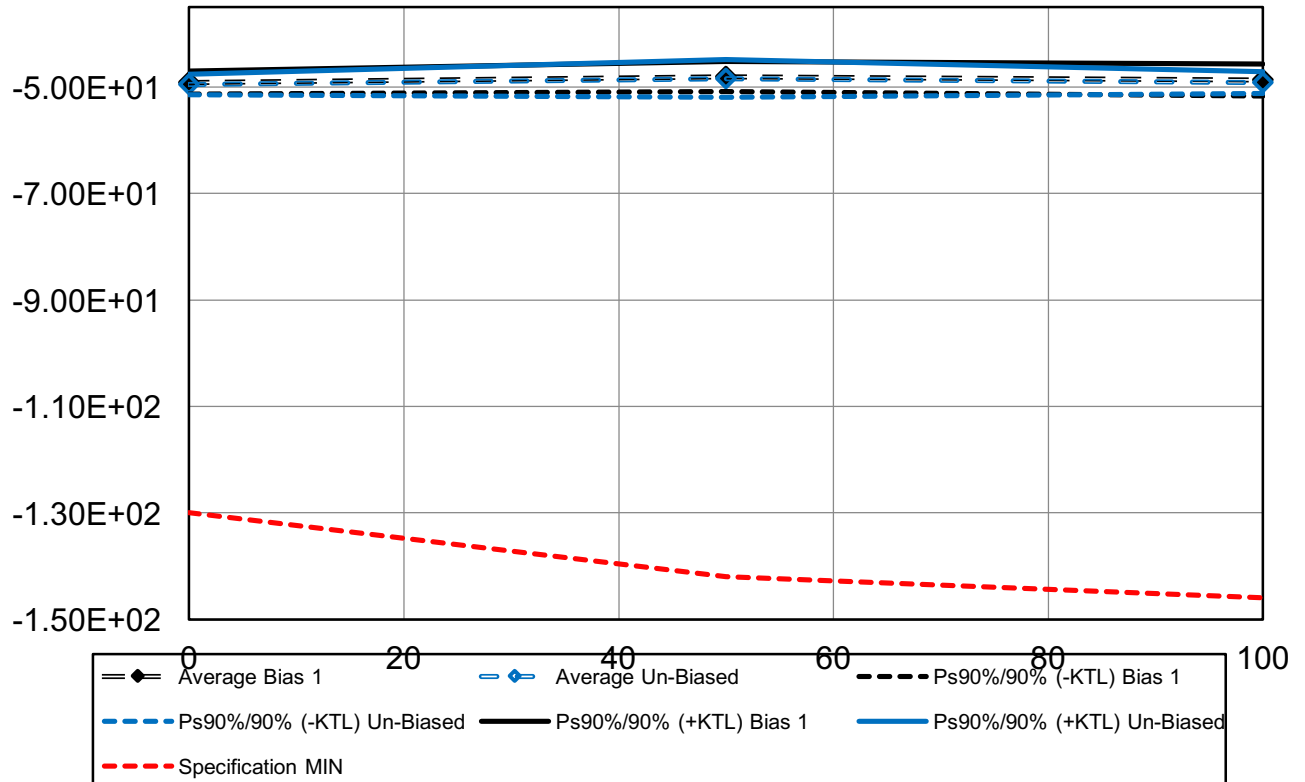


Figure 5.37: Plot of Output Voltage Swing High @ VS= +/-5V, IL=0 mA (mV) versus Total Dose

Table 5.37: Raw data for Output Voltage Swing High @ VS= +/-5V, IL=0 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOH @ VS= +/-5V, IL=0MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-4.97E+01	-4.82E+01	
214	-4.81E+01	-4.72E+01	
215	-5.08E+01	-4.92E+01	
216	-5.05E+01	-4.89E+01	
217	-4.82E+01	-4.67E+01	
223	-4.79E+01		-4.72E+01
224	-4.89E+01		-4.88E+01
225	-4.91E+01		-4.91E+01
226	-4.85E+01		-4.82E+01
227	-4.99E+01		-5.02E+01
218	-4.91E+01	-4.78E+01	
219	-5.11E+01	-4.98E+01	
220	-5.02E+01	-4.90E+01	
221	-5.00E+01	-4.89E+01	
222	-4.82E+01	-4.65E+01	
228	-4.92E+01		-4.94E+01
229	-4.91E+01		-4.88E+01
230	-4.87E+01		-4.85E+01
231	-5.05E+01		-5.03E+01
232	-4.92E+01		-4.87E+01
Bias 1 Statistics			
Average Bias 1	-4.92E+01	-4.80E+01	-4.87E+01
Std Dev Bias 1	1.03E+00	1.05E+00	1.10E+00
Ps90%/90% (+KTL) Bias 1	-4.71E+01	-4.52E+01	-4.57E+01
Ps90%/90% (-KTL) Bias 1	-5.13E+01	-5.09E+01	-5.17E+01
Un-Biased Statistics			
Average Un-Biased	-4.95E+01	-4.84E+01	-4.92E+01
Std Dev Un-Biased	9.10E-01	1.28E+00	7.47E-01
Ps90%/90% (+KTL) Un-Biased	-4.76E+01	-4.49E+01	-4.71E+01
Ps90%/90% (-KTL) Un-Biased	-5.14E+01	-5.19E+01	-5.12E+01
Specification MIN	-1.30E+02	-1.42E+02	-1.46E+02
Status	PASS	PASS	PASS

VOH @ VS= +/-5V, IL=-5MA (mV) vs Total Ionizing Dose (kRad(Si))

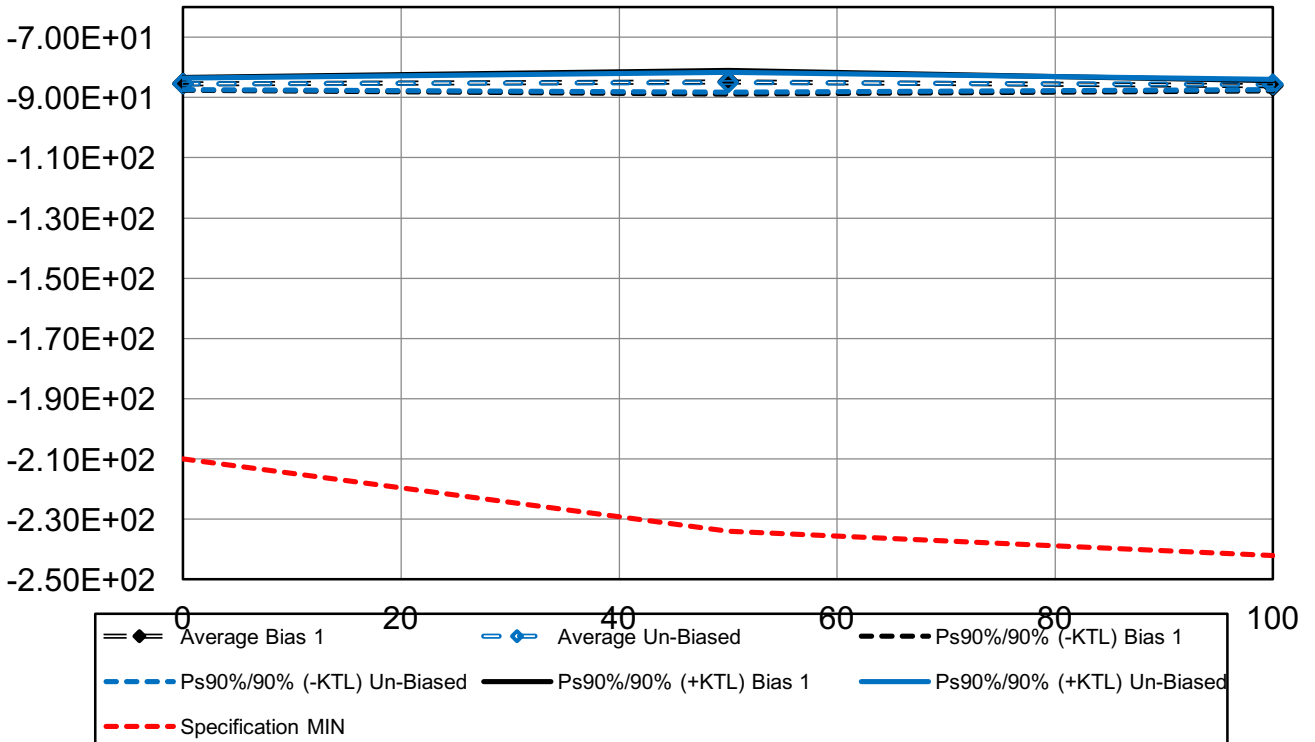


Figure 5.38: Plot of Output Voltage Swing High @ VS= +/-5V, IL=-5 mA (mV) versus Total Dose

Table 5.38: Raw data for Output Voltage Swing High @ VS= +/-5V, IL=-5 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOH @ +/-5V, IL=-5MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-8.56E+01	-8.47E+01	
214	-8.51E+01	-8.51E+01	
215	-8.80E+01	-8.71E+01	
216	-8.58E+01	-8.48E+01	
217	-8.40E+01	-8.31E+01	
223	-8.49E+01		-8.55E+01
224	-8.48E+01		-8.57E+01
225	-8.59E+01		-8.71E+01
226	-8.53E+01		-8.60E+01
227	-8.52E+01		-8.65E+01
218	-8.46E+01	-8.38E+01	
219	-8.78E+01	-8.70E+01	
220	-8.58E+01	-8.50E+01	
221	-8.53E+01	-8.44E+01	
222	-8.57E+01	-8.47E+01	
228	-8.52E+01		-8.62E+01
229	-8.51E+01		-8.57E+01
230	-8.44E+01		-8.49E+01
231	-8.58E+01		-8.65E+01
232	-8.53E+01		-8.55E+01
Bias 1 Statistics			
Average Bias 1	-8.55E+01	-8.49E+01	-8.62E+01
Std Dev Bias 1	1.03E+00	1.43E+00	6.29E-01
Ps90%/90% (+KTL) Bias 1	-8.33E+01	-8.10E+01	-8.44E+01
Ps90%/90% (-KTL) Bias 1	-8.76E+01	-8.89E+01	-8.79E+01
Un-Biased Statistics			
Average Un-Biased	-8.55E+01	-8.50E+01	-8.57E+01
Std Dev Un-Biased	9.53E-01	1.24E+00	6.33E-01
Ps90%/90% (+KTL) Un-Biased	-8.35E+01	-8.16E+01	-8.40E+01
Ps90%/90% (-KTL) Un-Biased	-8.75E+01	-8.83E+01	-8.75E+01
Specification MIN	-2.10E+02	-2.34E+02	-2.42E+02
Status	PASS	PASS	PASS

VOH @ VS= +/-5V, IL=-20MA (mV) vs Total Ionizing Dose (kRad(Si))

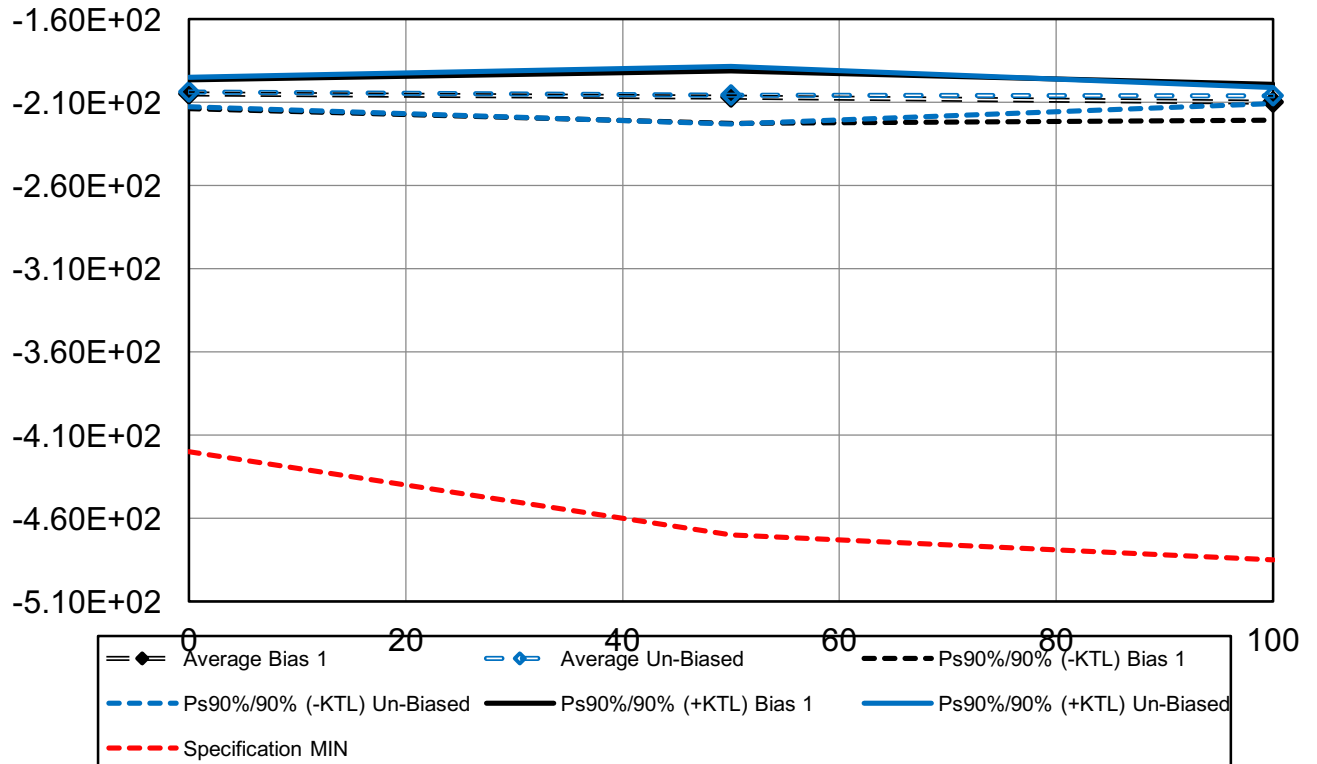


Figure 5.39: Plot of Output Voltage Swing High @ VS= +/-5V, IL=-20 mA (mV) versus Total Dose

Table 5.39: Raw data for Output Voltage Swing High @ VS= +/-5V, IL=-20 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOH @ +/-5V, IL=-20 MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-2.04E+02	-2.04E+02	
214	-2.09E+02	-2.11E+02	
215	-2.13E+02	-2.14E+02	
216	-2.01E+02	-2.02E+02	
217	-2.00E+02	-2.02E+02	
223	-2.08E+02		-2.13E+02
224	-2.02E+02		-2.07E+02
225	-2.08E+02		-2.14E+02
226	-2.07E+02		-2.12E+02
227	-2.00E+02		-2.05E+02
218	-2.01E+02	-2.01E+02	
219	-2.10E+02	-2.11E+02	
220	-2.03E+02	-2.03E+02	
221	-1.99E+02	-2.00E+02	
222	-2.13E+02	-2.14E+02	
228	-2.04E+02		-2.08E+02
229	-2.03E+02		-2.07E+02
230	-2.01E+02		-2.04E+02
231	-2.01E+02		-2.04E+02
232	-2.04E+02		-2.07E+02
Bias 1 Statistics			
Average Bias 1	-2.05E+02	-2.07E+02	-2.10E+02
Std Dev Bias 1	4.24E+00	5.70E+00	3.95E+00
Ps90%/90% (+KTL) Bias 1	-1.96E+02	-1.91E+02	-1.99E+02
Ps90%/90% (-KTL) Bias 1	-2.14E+02	-2.22E+02	-2.21E+02
Un-Biased Statistics			
Average Un-Biased	-2.04E+02	-2.06E+02	-2.06E+02
Std Dev Un-Biased	4.29E+00	6.29E+00	1.72E+00
Ps90%/90% (+KTL) Un-Biased	-1.95E+02	-1.89E+02	-2.01E+02
Ps90%/90% (-KTL) Un-Biased	-2.13E+02	-2.23E+02	-2.11E+02
Specification MIN	-4.20E+02	-4.70E+02	-4.85E+02
Status	PASS	PASS	PASS

VOL @ VS= +/-5V, IL=0MA (mV) vs Total Ionizing Dose (kRad(Si))

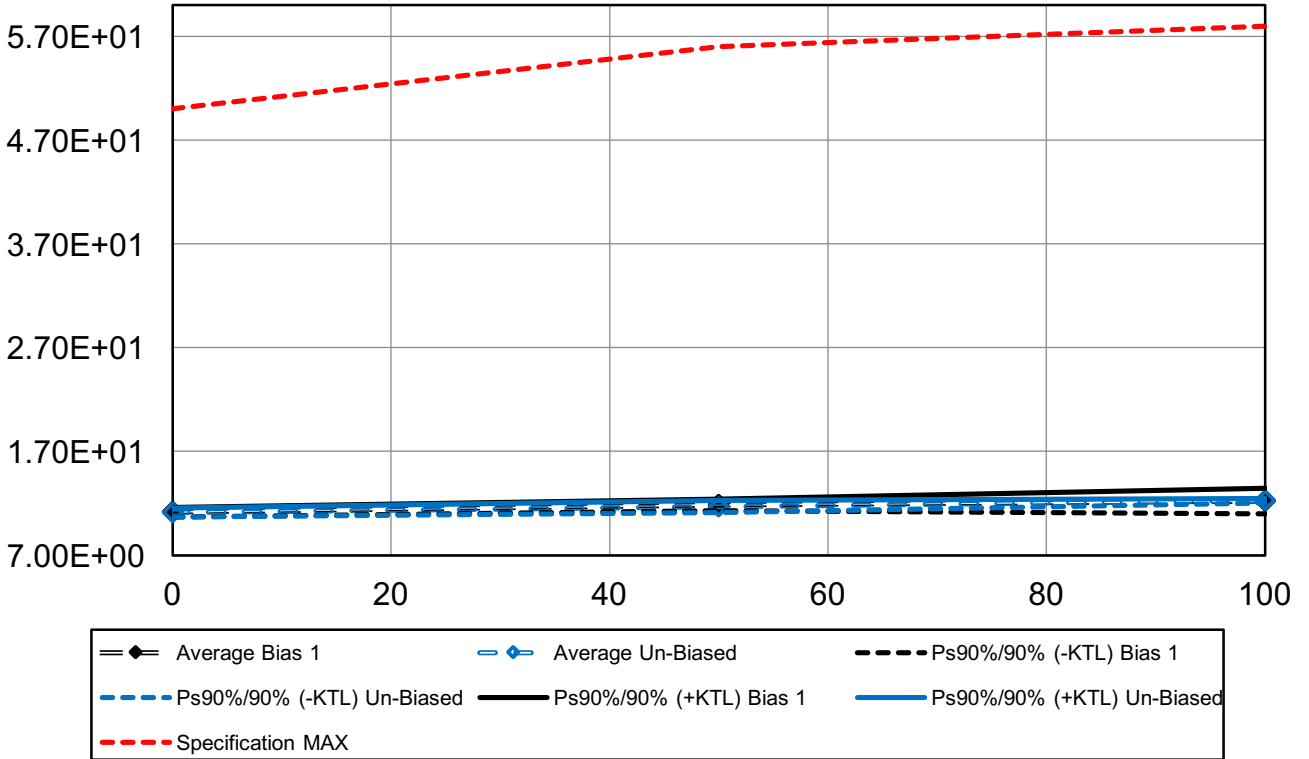


Figure 5.40: Plot of Output Voltage Swing Low @ VS= +/-5V, IL=0 mA (mV) versus Total Dose

Table 5.40: Raw data for Output Voltage Swing Low @ VS= +/-5V, IL=0 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOL @ VS= +/-5V, IL=0MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.10E+01	1.17E+01	
214	1.10E+01	1.18E+01	
215	1.12E+01	1.22E+01	
216	1.11E+01	1.18E+01	
217	1.11E+01	1.18E+01	
223	1.09E+01		1.17E+01
224	1.13E+01		1.24E+01
225	1.10E+01		1.20E+01
226	1.12E+01		1.20E+01
227	1.17E+01		1.29E+01
218	1.09E+01	1.15E+01	
219	1.10E+01	1.17E+01	
220	1.12E+01	1.17E+01	
221	1.14E+01	1.20E+01	
222	1.08E+01	1.14E+01	
228	1.13E+01		1.23E+01
229	1.12E+01		1.23E+01
230	1.11E+01		1.22E+01
231	1.12E+01		1.22E+01
232	1.12E+01		1.22E+01
Bias 1 Statistics			
Average Bias 1	1.11E+01	1.18E+01	1.22E+01
Std Dev Bias 1	2.25E-01	1.95E-01	4.40E-01
Ps90%/90% (+KTL) Bias 1	1.16E+01	1.24E+01	1.34E+01
Ps90%/90% (-KTL) Bias 1	1.07E+01	1.13E+01	1.10E+01
Un-Biased Statistics			
Average Un-Biased	1.11E+01	1.17E+01	1.23E+01
Std Dev Un-Biased	2.11E-01	2.22E-01	8.54E-02
Ps90%/90% (+KTL) Un-Biased	1.16E+01	1.23E+01	1.25E+01
Ps90%/90% (-KTL) Un-Biased	1.07E+01	1.11E+01	1.20E+01
Specification MAX	5.00E+01	5.60E+01	5.80E+01
Status	PASS	PASS	PASS

VOL @ VS= +/-5V, IL=5MA (mV) vs Total Ionizing Dose (kRad(Si))

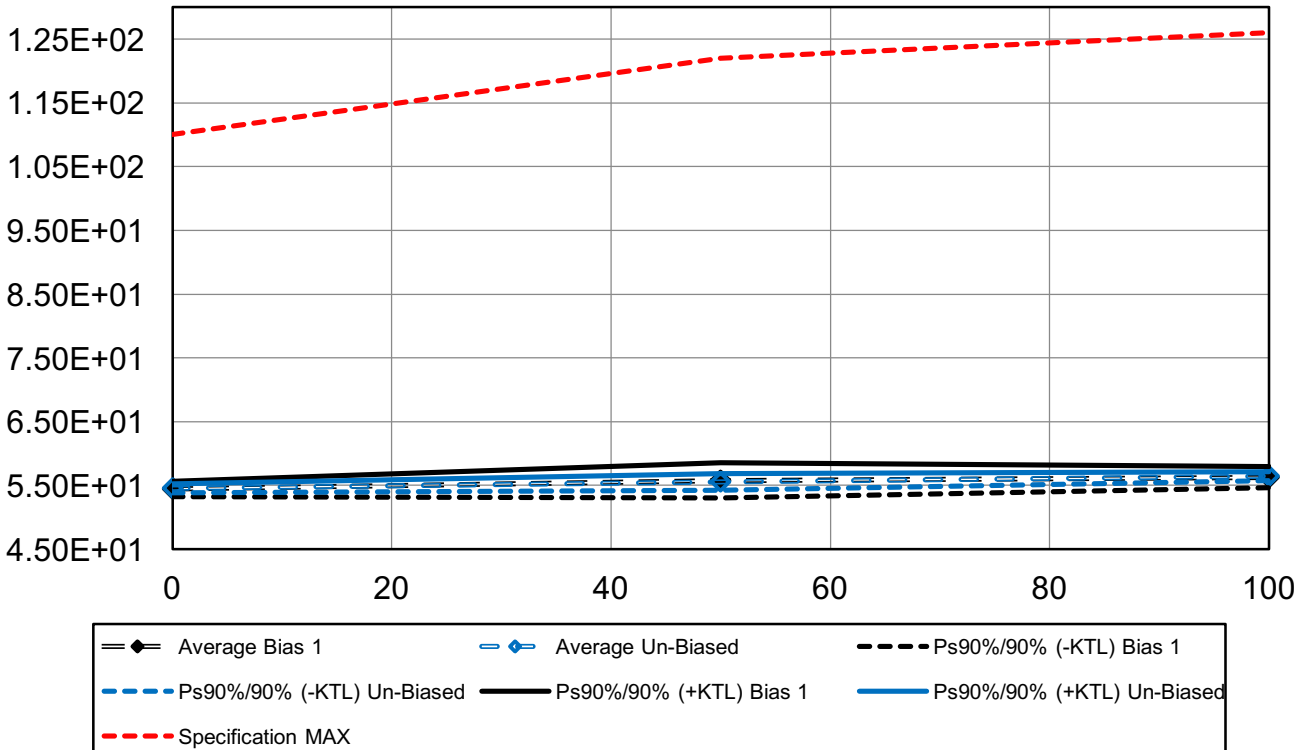


Figure 5.41: Plot of Output Voltage Swing Low @ VS= +/-5V, IL=5 mA (mV) versus Total Dose

Table 5.41: Raw data for Output Voltage Swing Low @ VS= +/-5V, IL=5 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOL @ VS= +/-5V, IL=5MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	5.43E+01	5.56E+01	
214	5.43E+01	5.55E+01	
215	5.56E+01	5.74E+01	
216	5.46E+01	5.58E+01	
217	5.35E+01	5.46E+01	
223	5.37E+01		5.54E+01
224	5.44E+01		5.64E+01
225	5.48E+01		5.66E+01
226	5.43E+01		5.59E+01
227	5.50E+01		5.70E+01
218	5.42E+01	5.53E+01	
219	5.53E+01	5.64E+01	
220	5.43E+01	5.52E+01	
221	5.44E+01	5.53E+01	
222	5.45E+01	5.55E+01	
228	5.48E+01		5.67E+01
229	5.45E+01		5.66E+01
230	5.44E+01		5.63E+01
231	5.48E+01		5.66E+01
232	5.43E+01		5.60E+01
Bias 1 Statistics			
Average Bias 1	5.45E+01	5.58E+01	5.63E+01
Std Dev Bias 1	6.02E-01	1.00E+00	6.03E-01
Ps90%/90% (+KTL) Bias 1	5.57E+01	5.85E+01	5.79E+01
Ps90%/90% (-KTL) Bias 1	5.32E+01	5.30E+01	5.46E+01
Un-Biased Statistics			
Average Un-Biased	5.46E+01	5.56E+01	5.64E+01
Std Dev Un-Biased	3.27E-01	4.68E-01	2.60E-01
Ps90%/90% (+KTL) Un-Biased	5.52E+01	5.68E+01	5.71E+01
Ps90%/90% (-KTL) Un-Biased	5.39E+01	5.43E+01	5.57E+01
Specification MAX	1.10E+02	1.22E+02	1.26E+02
Status	PASS	PASS	PASS

VOL @ VS= +/-5V, IL=20 MA (mV) vs Total Ionizing Dose (kRad(Si))

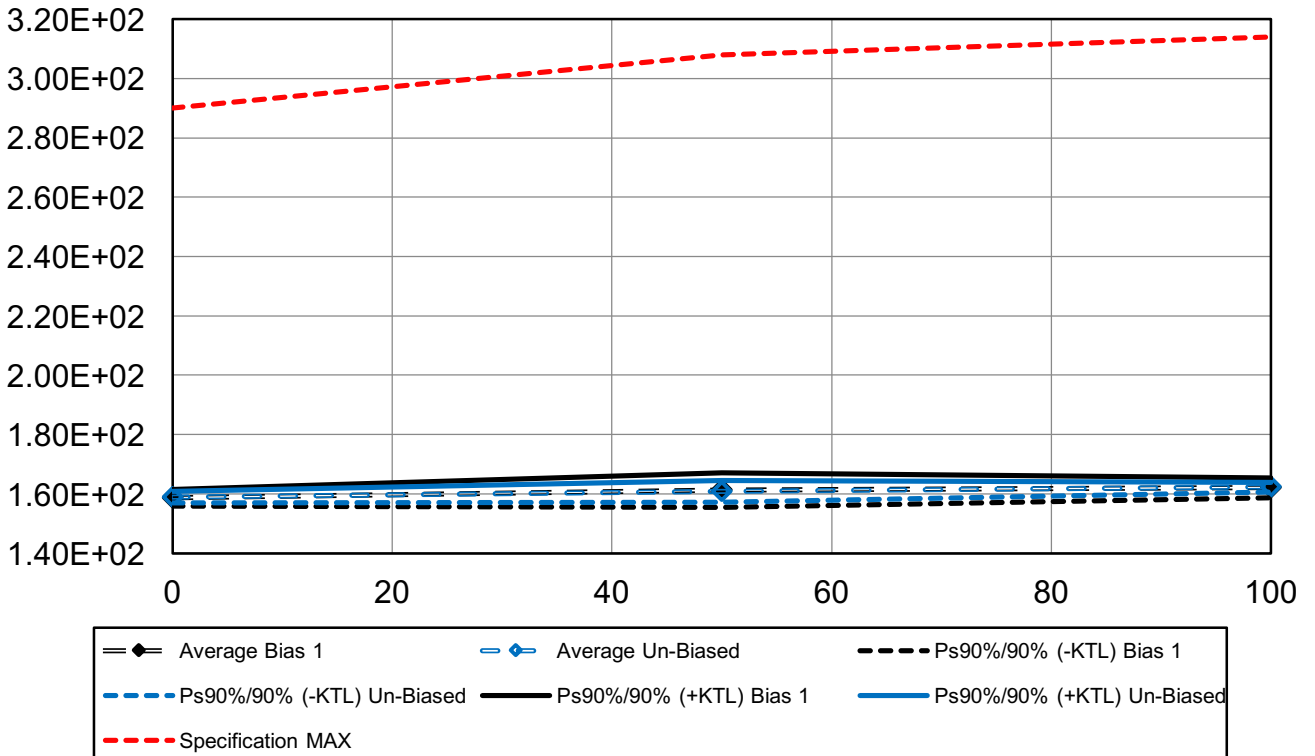


Figure 5.42: Plot of Output Voltage Swing Low @ VS= +/-5V, IL=20 mA (mV) versus Total Dose

Table 5.42: Raw data for Output Voltage Swing Low @ VS= +/-5V, IL=20 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOL @ VS= +/-5V, IL=20MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.59E+02	1.61E+02	
214	1.59E+02	1.61E+02	
215	1.62E+02	1.65E+02	
216	1.59E+02	1.61E+02	
217	1.57E+02	1.59E+02	
223	1.57E+02		1.60E+02
224	1.58E+02		1.62E+02
225	1.60E+02		1.63E+02
226	1.58E+02		1.62E+02
227	1.59E+02		1.63E+02
218	1.58E+02	1.60E+02	
219	1.61E+02	1.63E+02	
220	1.58E+02	1.60E+02	
221	1.58E+02	1.60E+02	
222	1.60E+02	1.62E+02	
228	1.59E+02		1.63E+02
229	1.59E+02		1.62E+02
230	1.58E+02		1.62E+02
231	1.59E+02		1.62E+02
232	1.58E+02		1.62E+02
Bias 1 Statistics			
Average Bias 1	1.59E+02	1.61E+02	1.62E+02
Std Dev Bias 1	1.41E+00	2.14E+00	1.21E+00
Ps90%/90% (+KTL) Bias 1	1.62E+02	1.67E+02	1.65E+02
Ps90%/90% (-KTL) Bias 1	1.56E+02	1.55E+02	1.59E+02
Un-Biased Statistics			
Average Un-Biased	1.59E+02	1.61E+02	1.62E+02
Std Dev Un-Biased	9.10E-01	1.35E+00	5.87E-01
Ps90%/90% (+KTL) Un-Biased	1.61E+02	1.65E+02	1.64E+02
Ps90%/90% (-KTL) Un-Biased	1.57E+02	1.57E+02	1.61E+02
Specification MAX	2.90E+02	3.08E+02	3.14E+02
Status	PASS	PASS	PASS

VOH @ VS= 5V, IL=0MA (mV) vs Total Ionizing Dose (kRad(Si))

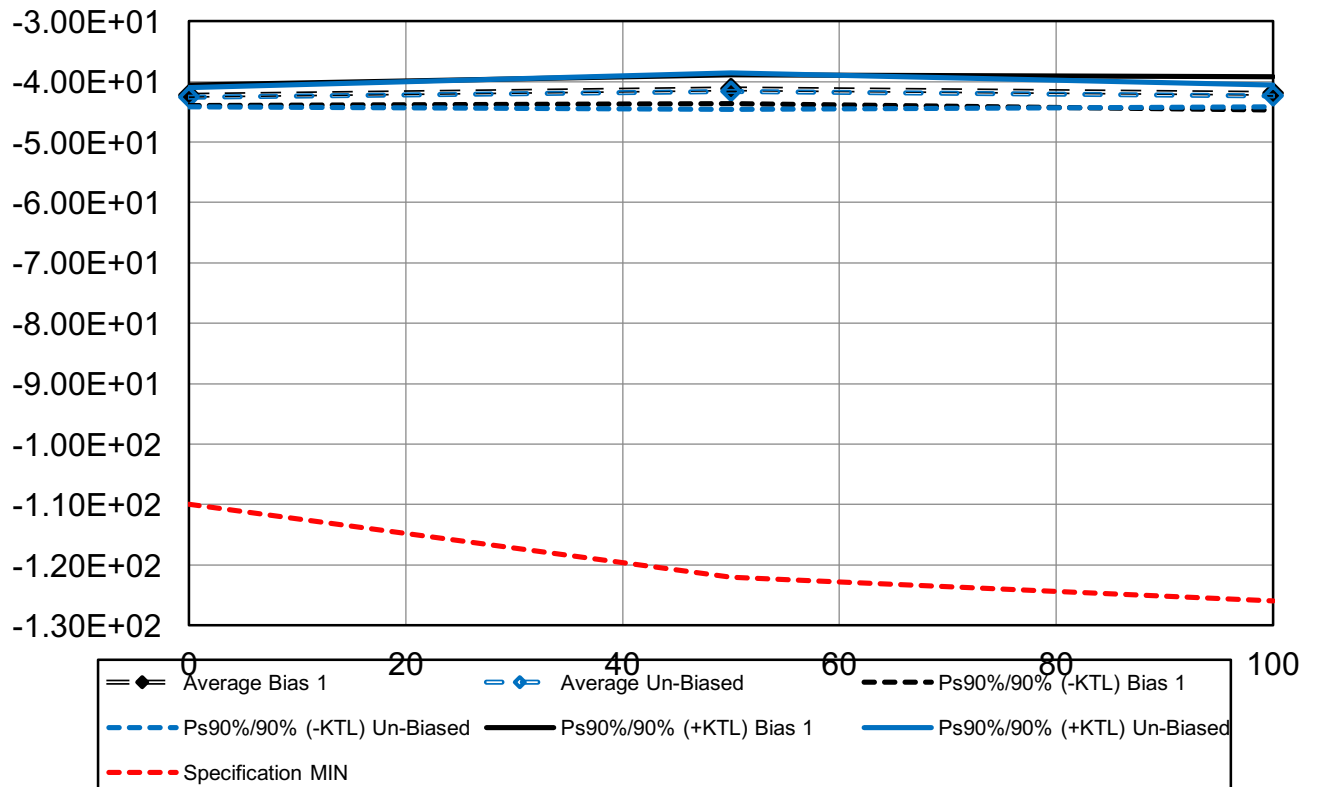


Figure 5.43: Plot of Output Voltage Swing High @ VS= 5V, IL=0 mA (mV) versus Total Dose

Table 5.43: Raw data for Output Voltage Swing High @ VS= 5V, IL=0 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOH @ VS= +5V, IL=0MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-4.29E+01	-4.14E+01	
214	-4.14E+01	-4.05E+01	
215	-4.35E+01	-4.20E+01	
216	-4.34E+01	-4.20E+01	
217	-4.16E+01	-4.02E+01	
223	-4.12E+01		-4.06E+01
224	-4.20E+01		-4.20E+01
225	-4.23E+01		-4.23E+01
226	-4.18E+01		-4.16E+01
227	-4.29E+01		-4.33E+01
218	-4.21E+01	-4.11E+01	
219	-4.39E+01	-4.28E+01	
220	-4.31E+01	-4.21E+01	
221	-4.32E+01	-4.21E+01	
222	-4.15E+01	-4.00E+01	
228	-4.22E+01		-4.26E+01
229	-4.22E+01		-4.20E+01
230	-4.19E+01		-4.18E+01
231	-4.34E+01		-4.35E+01
232	-4.25E+01		-4.21E+01
Bias 1 Statistics			
Average Bias 1	-4.23E+01	-4.12E+01	-4.20E+01
Std Dev Bias 1	8.36E-01	8.68E-01	1.01E+00
Ps90%/90% (+KTL) Bias 1	-4.06E+01	-3.88E+01	-3.92E+01
Ps90%/90% (-KTL) Bias 1	-4.40E+01	-4.36E+01	-4.47E+01
Un-Biased Statistics			
Average Un-Biased	-4.26E+01	-4.16E+01	-4.24E+01
Std Dev Un-Biased	7.58E-01	1.10E+00	6.57E-01
Ps90%/90% (+KTL) Un-Biased	-4.10E+01	-3.86E+01	-4.06E+01
Ps90%/90% (-KTL) Un-Biased	-4.42E+01	-4.46E+01	-4.42E+01
Specification MIN	-1.10E+02	-1.22E+02	-1.26E+02
Status	PASS	PASS	PASS

VOH @ VS= 5V, IL=-5MA (mV) vs Total Ionizing Dose (kRad(Si))

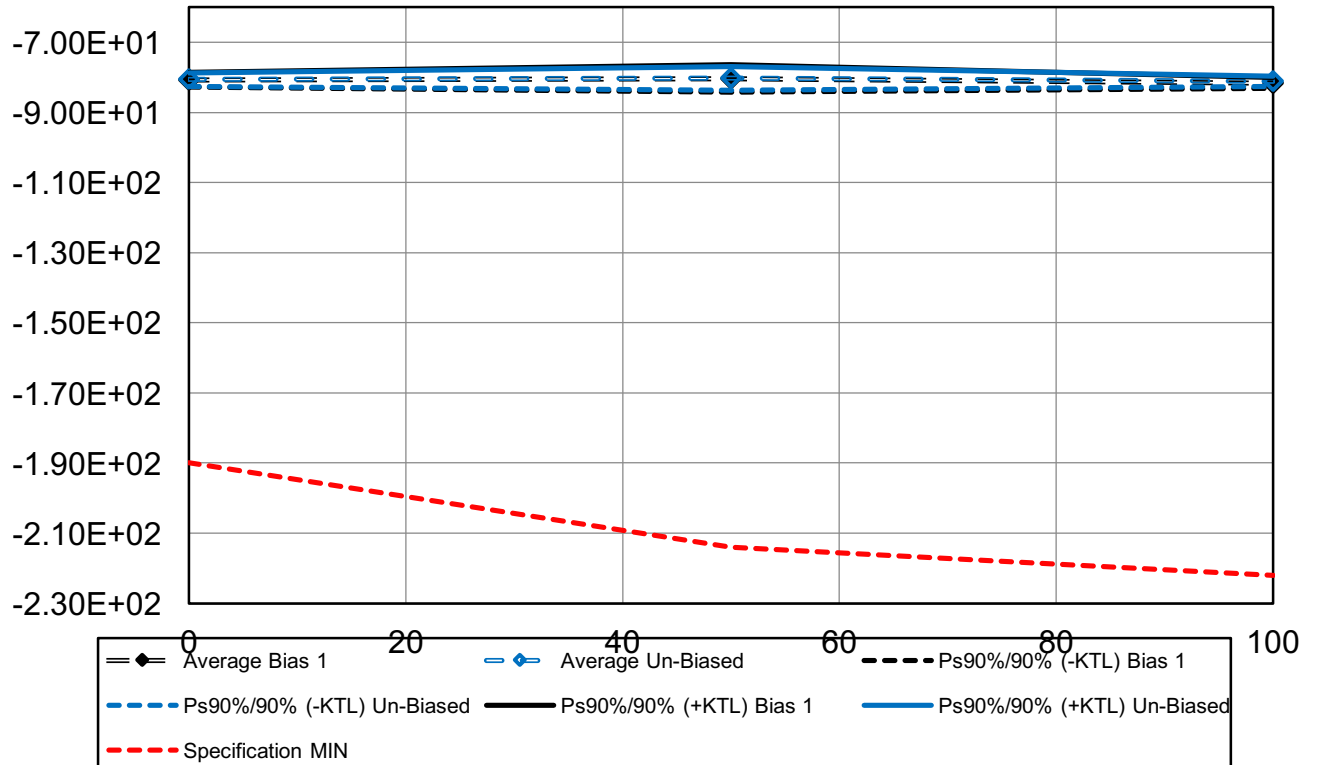


Figure 5.44: Plot of Output Voltage Swing High @ VS= 5V, IL=-5 mA (mV) versus Total Dose

Table 5.44: Raw data for Output Voltage Swing High @ VS= 5V, IL=-5 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOH @ VS= +5V, IL=-5MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-8.08E+01	-7.99E+01	
214	-8.07E+01	-8.07E+01	
215	-8.31E+01	-8.25E+01	
216	-8.08E+01	-8.00E+01	
217	-7.94E+01	-7.86E+01	
223	-8.04E+01		-8.12E+01
224	-8.00E+01		-8.12E+01
225	-8.12E+01		-8.25E+01
226	-8.06E+01		-8.17E+01
227	-8.03E+01		-8.16E+01
218	-7.98E+01	-7.90E+01	
219	-8.29E+01	-8.23E+01	
220	-8.09E+01	-8.02E+01	
221	-8.04E+01	-7.96E+01	
222	-8.12E+01	-8.04E+01	
228	-8.04E+01		-8.15E+01
229	-8.03E+01		-8.11E+01
230	-7.96E+01		-8.03E+01
231	-8.08E+01		-8.16E+01
232	-8.06E+01		-8.10E+01
Bias 1 Statistics			
Average Bias 1	-8.07E+01	-8.03E+01	-8.16E+01
Std Dev Bias 1	9.84E-01	1.41E+00	5.61E-01
Ps90%/90% (+KTL) Bias 1	-7.87E+01	-7.65E+01	-8.01E+01
Ps90%/90% (-KTL) Bias 1	-8.27E+01	-8.42E+01	-8.32E+01
Un-Biased Statistics			
Average Un-Biased	-8.07E+01	-8.03E+01	-8.11E+01
Std Dev Un-Biased	9.13E-01	1.22E+00	5.25E-01
Ps90%/90% (+KTL) Un-Biased	-7.88E+01	-7.70E+01	-7.97E+01
Ps90%/90% (-KTL) Un-Biased	-8.26E+01	-8.37E+01	-8.25E+01
Specification MIN	-1.90E+02	-2.14E+02	-2.22E+02
Status	PASS	PASS	PASS

VOH @ VS= 5V, IL=-20 MA (mV) vs Total Ionizing Dose (kRad(Si))

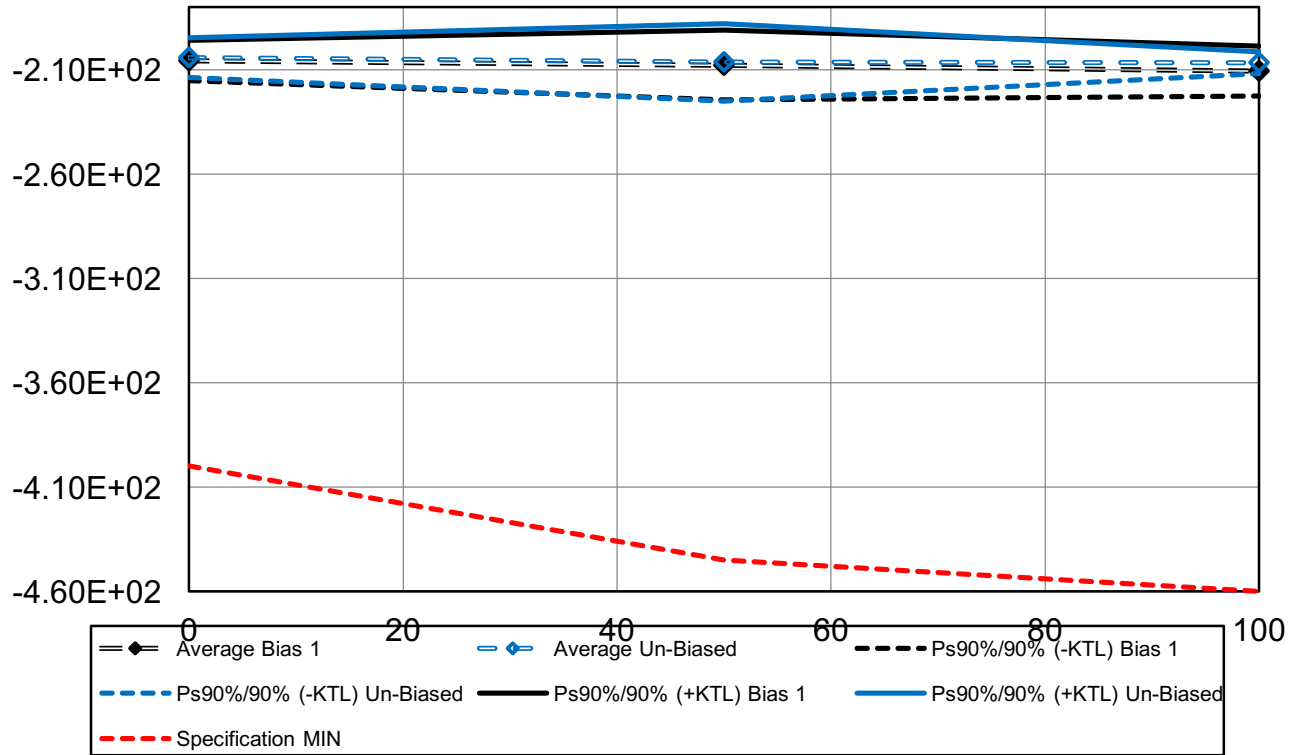


Figure 5.45: Plot of Output Voltage Swing High @ VS= 5V, IL=-20 mA (mV) versus Total Dose

Table 5.45: Raw data for Output Voltage Swing High @ VS= 5V, IL=-20 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOH @ VS=+5V, IL=-20MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-2.04E+02	-2.05E+02	
214	-2.09E+02	-2.12E+02	
215	-2.14E+02	-2.16E+02	
216	-2.01E+02	-2.03E+02	
217	-2.01E+02	-2.02E+02	
223	-2.09E+02		-2.14E+02
224	-2.02E+02		-2.07E+02
225	-2.09E+02		-2.15E+02
226	-2.08E+02		-2.13E+02
227	-2.00E+02		-2.05E+02
218	-2.01E+02	-2.02E+02	
219	-2.11E+02	-2.13E+02	
220	-2.03E+02	-2.04E+02	
221	-1.99E+02	-2.00E+02	
222	-2.13E+02	-2.15E+02	
228	-2.04E+02		-2.09E+02
229	-2.03E+02		-2.08E+02
230	-2.01E+02		-2.05E+02
231	-2.01E+02		-2.05E+02
232	-2.04E+02		-2.07E+02
Bias 1 Statistics			
Average Bias 1	-2.06E+02	-2.08E+02	-2.11E+02
Std Dev Bias 1	4.69E+00	6.11E+00	4.38E+00
Ps90%/90% (+KTL) Bias 1	-1.96E+02	-1.91E+02	-1.99E+02
Ps90%/90% (-KTL) Bias 1	-2.15E+02	-2.24E+02	-2.23E+02
Un-Biased Statistics			
Average Un-Biased	-2.04E+02	-2.06E+02	-2.07E+02
Std Dev Un-Biased	4.64E+00	6.75E+00	1.92E+00
Ps90%/90% (+KTL) Un-Biased	-1.95E+02	-1.88E+02	-2.01E+02
Ps90%/90% (-KTL) Un-Biased	-2.14E+02	-2.25E+02	-2.12E+02
Specification MIN	-4.00E+02	-4.45E+02	-4.60E+02
Status	PASS	PASS	PASS

VOL @ VS= 5V, IL=0MA (mV) vs Total Ionizing Dose (kRad(Si))

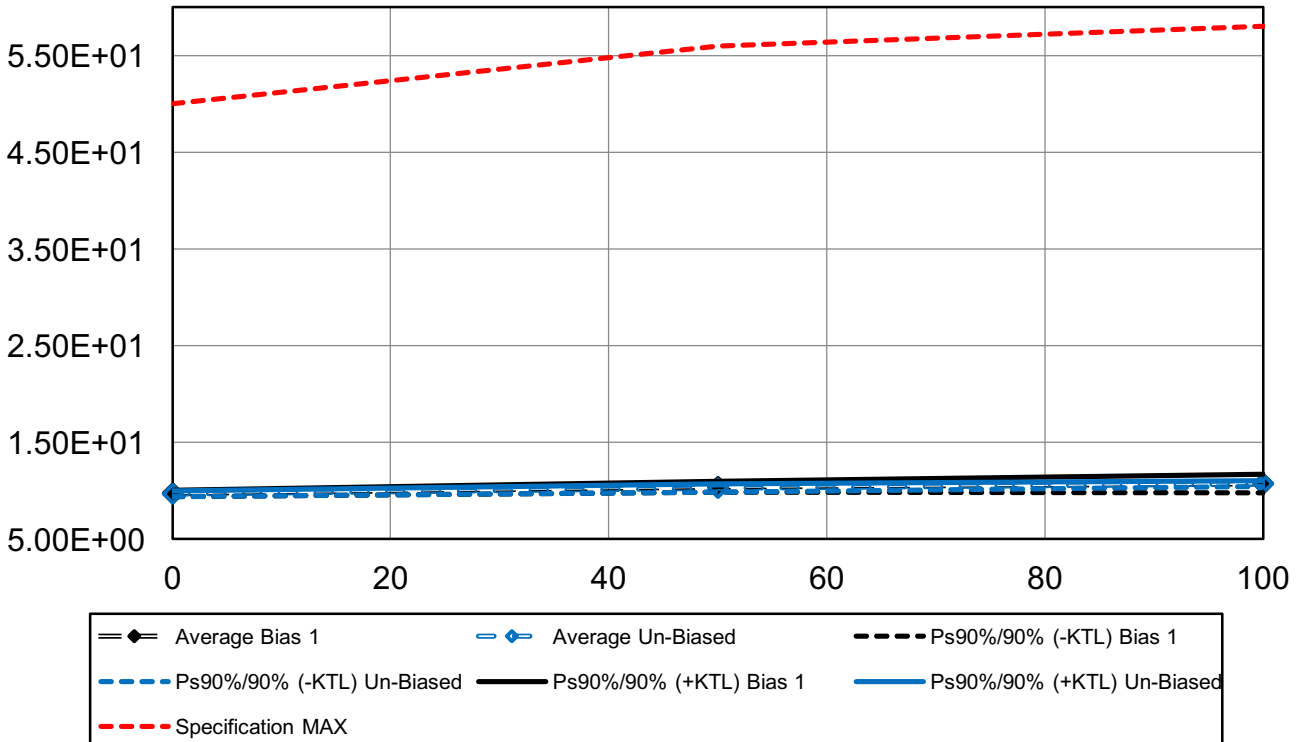


Figure 5.46: Plot of Output Voltage Swing Low @ VS= 5V, IL=0 mA (mV) versus Total Dose

Table 5.46: Raw data for Output Voltage Swing Low @ VS= 5V, IL=0 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOL @ VS= +5V, IL=0MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	9.61E+00	1.03E+01	
214	9.68E+00	1.03E+01	
215	9.70E+00	1.08E+01	
216	9.70E+00	1.03E+01	
217	9.71E+00	1.04E+01	
223	9.50E+00		1.03E+01
224	9.77E+00		1.09E+01
225	9.60E+00		1.06E+01
226	9.75E+00		1.06E+01
227	1.01E+01		1.12E+01
218	9.41E+00	1.01E+01	
219	9.70E+00	1.04E+01	
220	9.70E+00	1.02E+01	
221	9.94E+00	1.05E+01	
222	9.49E+00	1.02E+01	
228	9.83E+00		1.08E+01
229	9.74E+00		1.09E+01
230	9.60E+00		1.07E+01
231	9.71E+00		1.06E+01
232	9.81E+00		1.07E+01
Bias 1 Statistics			
Average Bias 1	9.71E+00	1.04E+01	1.07E+01
Std Dev Bias 1	1.56E-01	1.97E-01	3.43E-01
Ps90%/90% (+KTL) Bias 1	1.00E+01	1.10E+01	1.17E+01
Ps90%/90% (-KTL) Bias 1	9.39E+00	9.88E+00	9.80E+00
Un-Biased Statistics			
Average Un-Biased	9.69E+00	1.03E+01	1.07E+01
Std Dev Un-Biased	1.60E-01	1.58E-01	1.02E-01
Ps90%/90% (+KTL) Un-Biased	1.00E+01	1.07E+01	1.10E+01
Ps90%/90% (-KTL) Un-Biased	9.36E+00	9.85E+00	1.05E+01
Specification MAX	5.00E+01	5.60E+01	5.80E+01
Status	PASS	PASS	PASS

VOL @ VS= 5V, IL=5MA (mV) vs Total Ionizing Dose (kRad(Si))

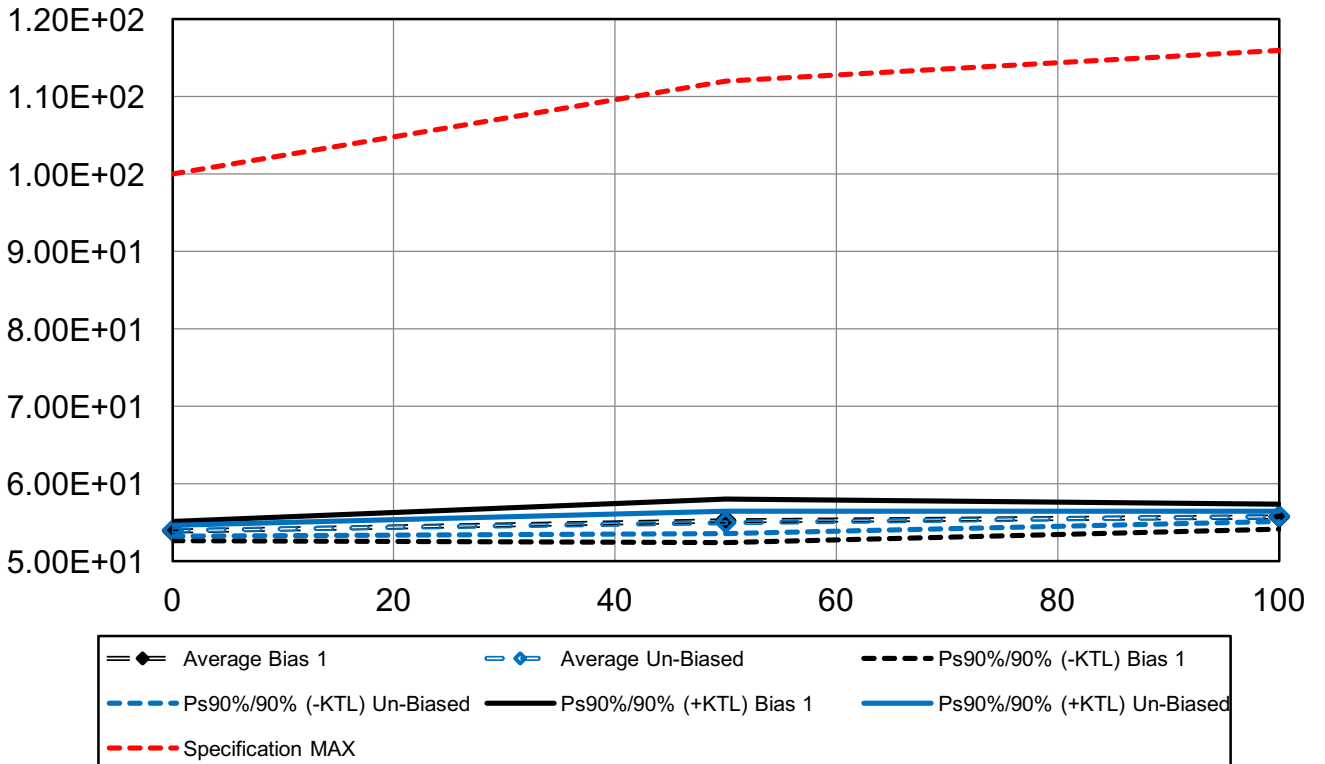


Figure 5.47: Plot of Output Voltage Swing Low @ VS= 5V, IL=5 mA (mV) versus Total Dose

Table 5.47: Raw data for Output Voltage Swing Low @ VS= 5V, IL=5 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOL @ VS= +5V, IL=5MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	5.38E+01	5.50E+01	
214	5.37E+01	5.51E+01	
215	5.51E+01	5.68E+01	
216	5.39E+01	5.52E+01	
217	5.29E+01	5.40E+01	
223	5.32E+01		5.49E+01
224	5.38E+01		5.59E+01
225	5.44E+01		5.62E+01
226	5.37E+01		5.53E+01
227	5.42E+01		5.63E+01
218	5.36E+01	5.47E+01	
219	5.47E+01	5.59E+01	
220	5.36E+01	5.46E+01	
221	5.38E+01	5.47E+01	
222	5.40E+01	5.51E+01	
228	5.42E+01		5.61E+01
229	5.39E+01		5.59E+01
230	5.39E+01		5.57E+01
231	5.42E+01		5.59E+01
232	5.37E+01		5.55E+01
Bias 1 Statistics			
Average Bias 1	5.39E+01	5.52E+01	5.57E+01
Std Dev Bias 1	6.10E-01	1.02E+00	5.86E-01
Ps90%/90% (+KTL) Bias 1	5.51E+01	5.80E+01	5.73E+01
Ps90%/90% (-KTL) Bias 1	5.26E+01	5.24E+01	5.41E+01
Un-Biased Statistics			
Average Un-Biased	5.40E+01	5.50E+01	5.58E+01
Std Dev Un-Biased	3.41E-01	5.23E-01	2.48E-01
Ps90%/90% (+KTL) Un-Biased	5.47E+01	5.64E+01	5.65E+01
Ps90%/90% (-KTL) Un-Biased	5.33E+01	5.36E+01	5.51E+01
Specification MAX	1.00E+02	1.12E+02	1.16E+02
Status	PASS	PASS	PASS

VOL @ VS= 5V, IL=20 MA (mV) vs Total Ionizing Dose (kRad(Si))

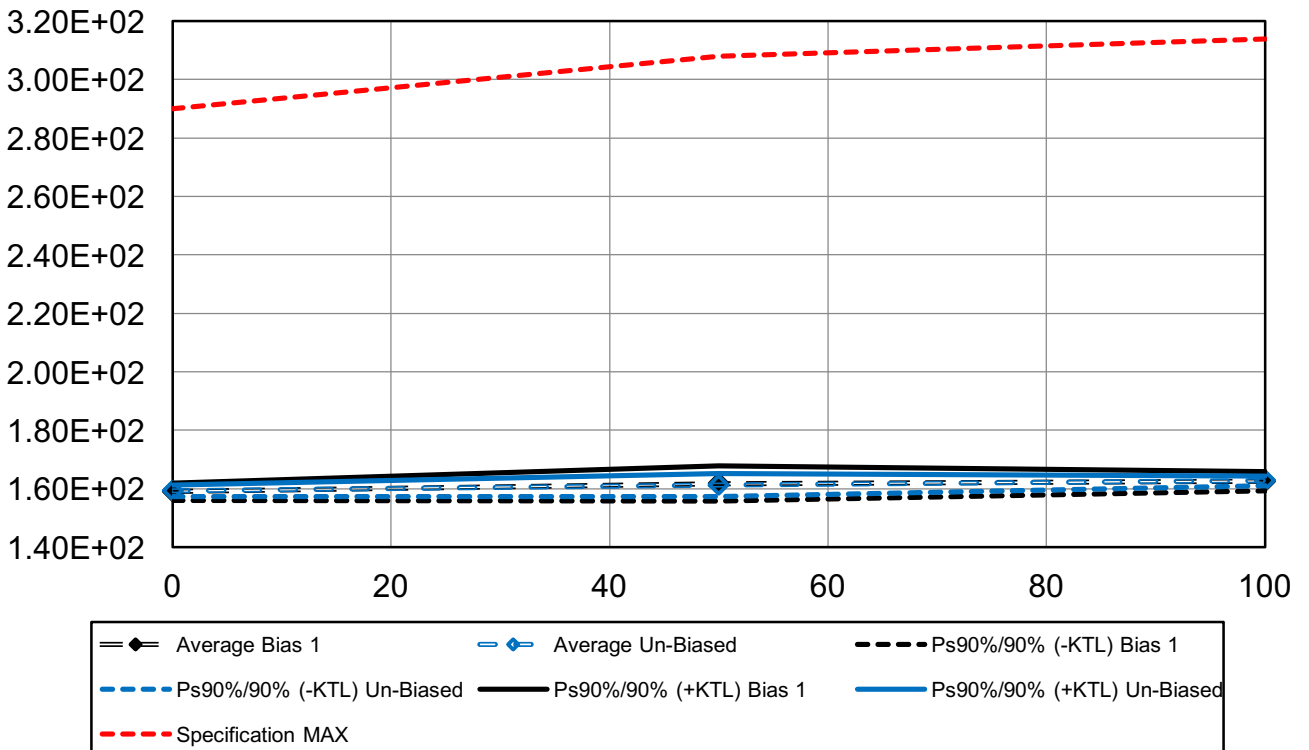


Figure 5.48: Plot of Output Voltage Swing Low @ VS= 5V, IL=20 mA (mV) versus Total Dose

Table 5.48: Raw data for Output Voltage Swing Low @ VS= 5V, IL=20 mA (mV) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

VOL @ VS= +5V, IL=20MA (mV)	Total Dose (krad(Si))		
	0	50	100
Device			
213	1.59E+02	1.61E+02	
214	1.59E+02	1.62E+02	
215	1.62E+02	1.65E+02	
216	1.59E+02	1.62E+02	
217	1.57E+02	1.59E+02	
223	1.57E+02		1.61E+02
224	1.59E+02		1.63E+02
225	1.60E+02		1.64E+02
226	1.58E+02		1.62E+02
227	1.59E+02		1.63E+02
218	1.59E+02	1.60E+02	
219	1.61E+02	1.63E+02	
220	1.58E+02	1.60E+02	
221	1.59E+02	1.60E+02	
222	1.61E+02	1.62E+02	
228	1.60E+02		1.63E+02
229	1.59E+02		1.63E+02
230	1.59E+02		1.62E+02
231	1.60E+02		1.63E+02
232	1.59E+02		1.62E+02
Bias 1 Statistics			
Average Bias 1	1.59E+02	1.62E+02	1.63E+02
Std Dev Bias 1	1.42E+00	2.21E+00	1.23E+00
Ps90%/90% (+KTL) Bias 1	1.62E+02	1.68E+02	1.66E+02
Ps90%/90% (-KTL) Bias 1	1.56E+02	1.56E+02	1.59E+02
Un-Biased Statistics			
Average Un-Biased	1.59E+02	1.61E+02	1.63E+02
Std Dev Un-Biased	9.65E-01	1.45E+00	5.99E-01
Ps90%/90% (+KTL) Un-Biased	1.61E+02	1.65E+02	1.64E+02
Ps90%/90% (-KTL) Un-Biased	1.57E+02	1.57E+02	1.61E+02
Specification MAX	2.90E+02	3.08E+02	3.14E+02
Status	PASS	PASS	PASS

ISRC @ VS= +5V (mA) vs Total Ionizing Dose (kRad(Si))

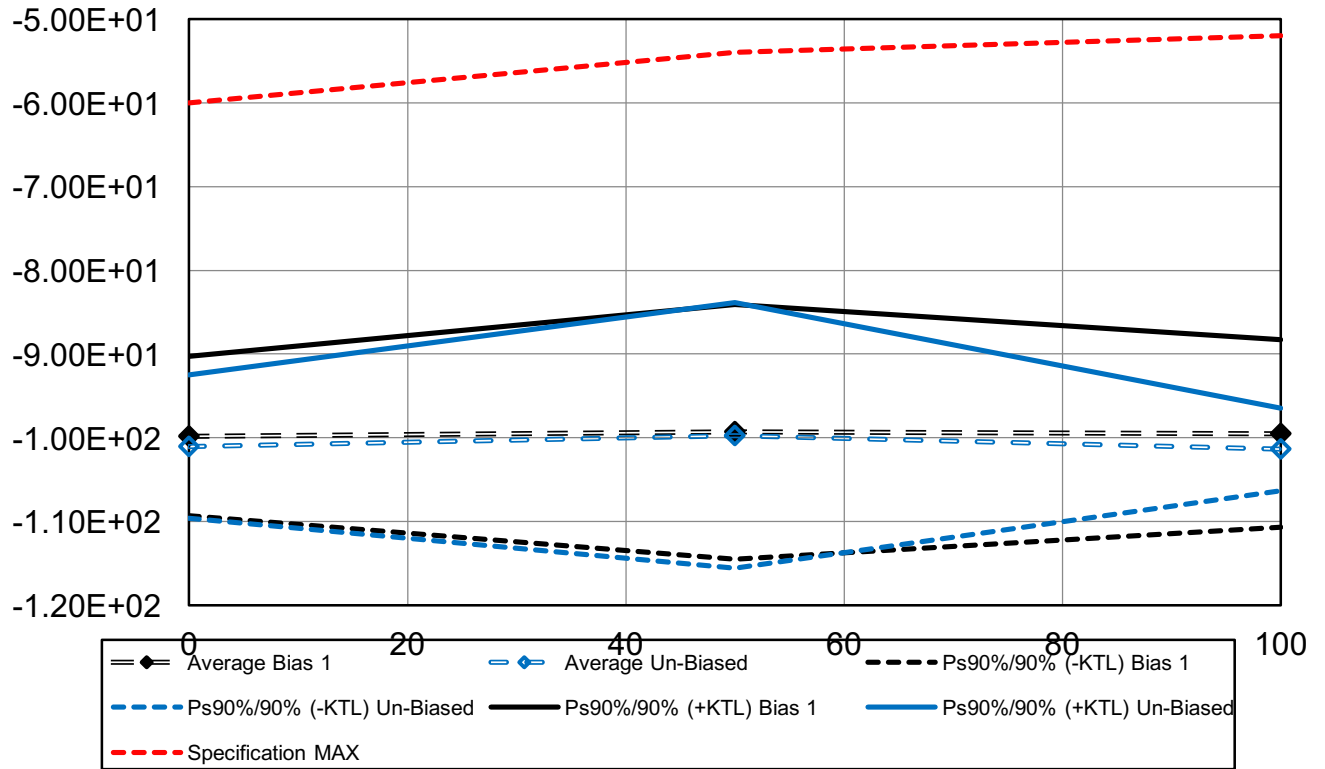


Figure 5.49: Plot of Short-Circuit Source Current @ VS= 5V (mA) versus Total Dose

Table 5.49: Raw data for Short-Circuit Source Current @ VS= 5V (mA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

ISRC @ VS= +5V (mA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-1.01E+02	-1.01E+02	
214	-9.62E+01	-9.60E+01	
215	-9.17E+01	-9.14E+01	
216	-1.04E+02	-1.04E+02	
217	-1.05E+02	-1.05E+02	
223	-9.66E+01		-9.61E+01
224	-1.03E+02		-1.03E+02
225	-9.71E+01		-9.65E+01
226	-9.77E+01		-9.72E+01
227	-1.06E+02		-1.05E+02
218	-1.04E+02	-1.04E+02	
219	-9.32E+01	-9.29E+01	
220	-1.02E+02	-1.02E+02	
221	-1.06E+02	-1.05E+02	
222	-9.45E+01	-9.42E+01	
228	-1.00E+02		-9.94E+01
229	-1.02E+02		-1.01E+02
230	-1.04E+02		-1.03E+02
231	-1.04E+02		-1.04E+02
232	-1.01E+02		-1.00E+02
Bias 1 Statistics			
Average Bias 1	-9.98E+01	-9.93E+01	-9.95E+01
Std Dev Bias 1	4.60E+00	5.55E+00	4.08E+00
Ps90%/90% (+KTL) Bias 1	-9.03E+01	-8.41E+01	-8.83E+01
Ps90%/90% (-KTL) Bias 1	-1.09E+02	-1.15E+02	-1.11E+02
Un-Biased Statistics			
Average Un-Biased	-1.01E+02	-9.97E+01	-1.01E+02
Std Dev Un-Biased	4.14E+00	5.78E+00	1.79E+00
Ps90%/90% (+KTL) Un-Biased	-9.25E+01	-8.39E+01	-9.65E+01
Ps90%/90% (-KTL) Un-Biased	-1.10E+02	-1.16E+02	-1.06E+02
Specification MAX	-6.00E+01	-5.40E+01	-5.20E+01
Status	PASS	PASS	PASS

ISNK @ VS= +5V (mA) vs Total Ionizing Dose (kRad(Si))

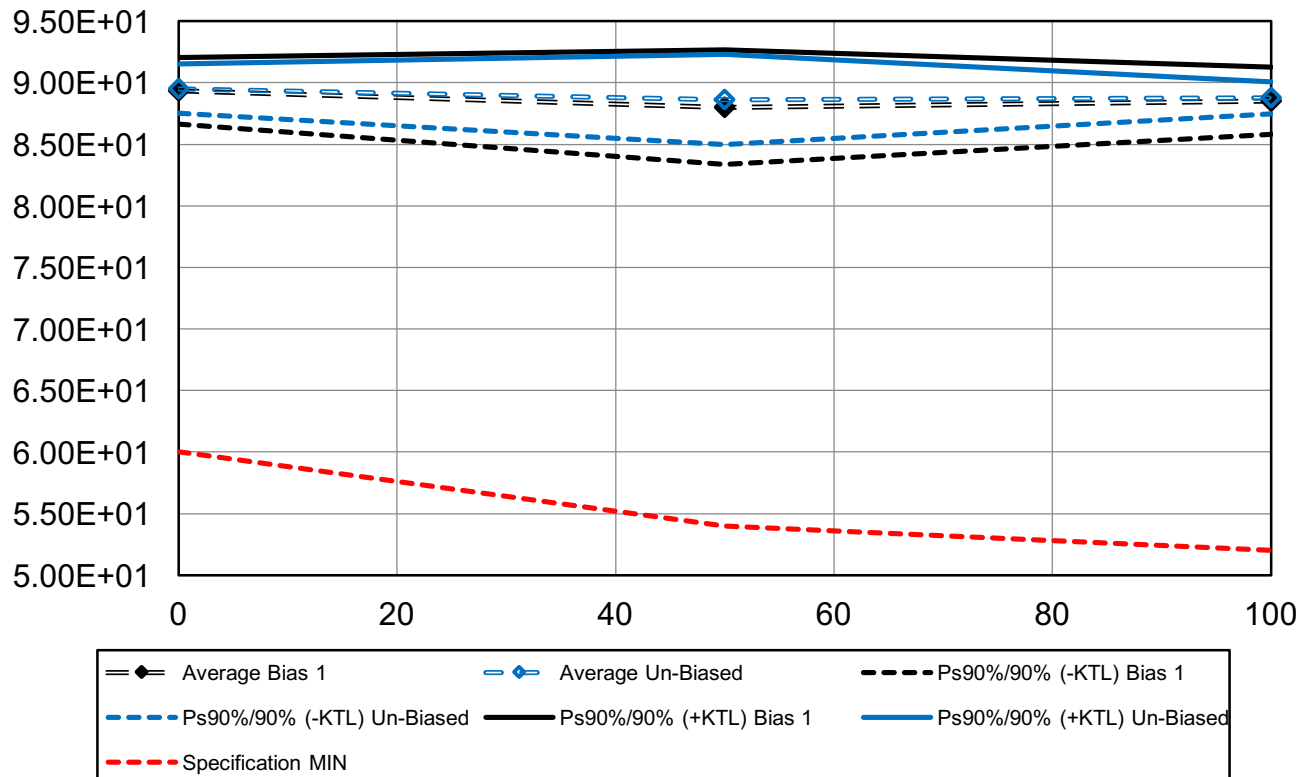


Figure 5.50: Plot of Short-Circuit Sink Current @ VS= 5V (mA) versus Total Dose

Table 5.50: Raw data for Short-Circuit Sink Current @ VS= 5V (mA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

ISNK @ +5V (mA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	8.99E+01	8.87E+01	
214	8.91E+01	8.80E+01	
215	8.64E+01	8.52E+01	
216	8.96E+01	8.84E+01	
217	9.08E+01	8.97E+01	
223	8.93E+01		8.81E+01
224	9.01E+01		8.91E+01
225	8.81E+01		8.72E+01
226	8.94E+01		8.85E+01
227	9.08E+01		8.98E+01
218	8.97E+01	8.89E+01	
219	8.74E+01	8.65E+01	
220	9.04E+01	8.95E+01	
221	9.08E+01	9.00E+01	
222	8.91E+01	8.83E+01	
228	8.91E+01		8.85E+01
229	8.93E+01		8.85E+01
230	8.98E+01		8.88E+01
231	8.92E+01		8.85E+01
232	9.05E+01		8.96E+01
Bias 1 Statistics			
Average Bias 1	8.94E+01	8.80E+01	8.85E+01
Std Dev Bias 1	1.30E+00	1.69E+00	9.98E-01
Ps90%/90% (+KTL) Bias 1	9.20E+01	9.27E+01	9.13E+01
Ps90%/90% (-KTL) Bias 1	8.67E+01	8.34E+01	8.58E+01
Un-Biased Statistics			
Average Un-Biased	8.95E+01	8.86E+01	8.88E+01
Std Dev Un-Biased	9.79E-01	1.33E+00	4.72E-01
Ps90%/90% (+KTL) Un-Biased	9.15E+01	9.23E+01	9.01E+01
Ps90%/90% (-KTL) Un-Biased	8.75E+01	8.50E+01	8.75E+01
Specification MIN	6.00E+01	5.40E+01	5.20E+01
Status	PASS	PASS	PASS

ISRC @ VS= +/-5V (mA) vs Total Ionizing Dose (kRad(Si))

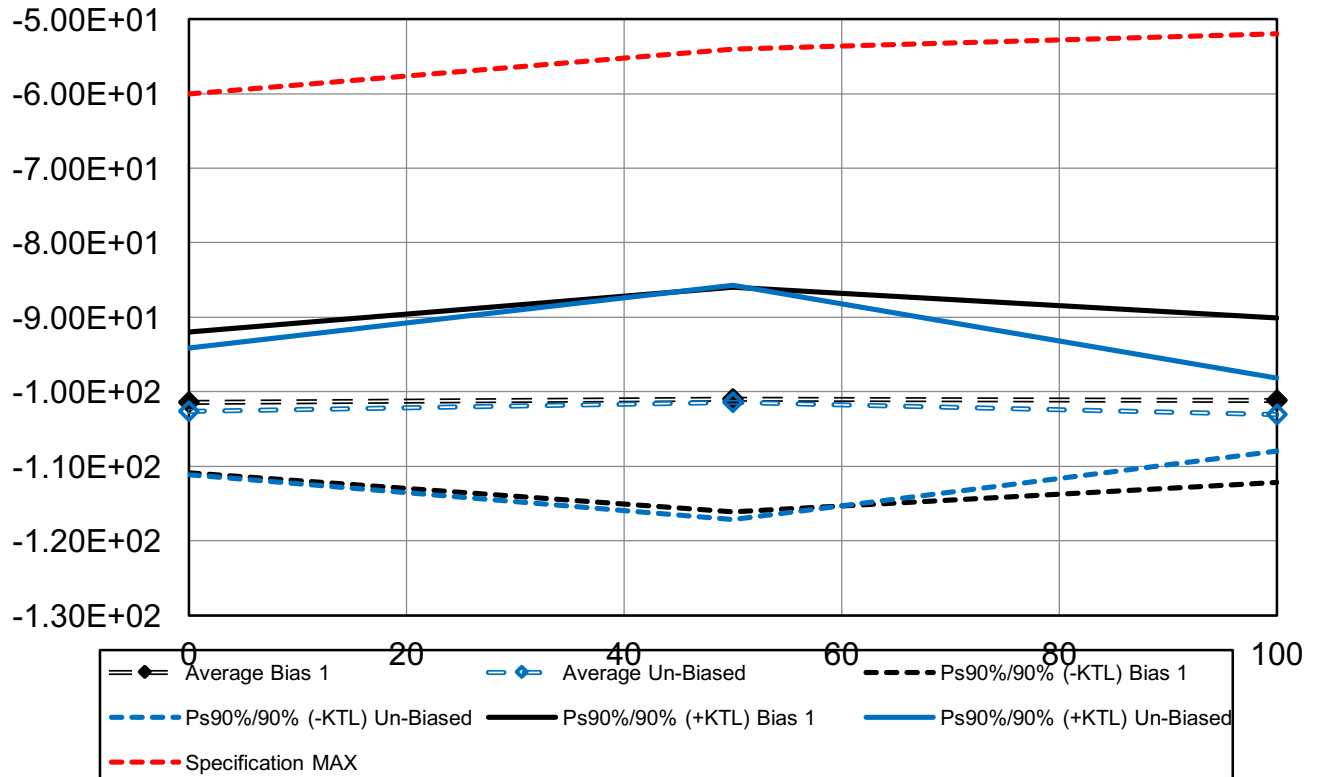


Figure 5.51: Plot of Short-Circuit Source Current @ VS= +/-5V (mA) versus Total Dose

Table 5.51: Raw data for Short-Circuit Source Current @ VS= +/-5V (mA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

ISRC @ VS= +/-5V (mA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	-1.03E+02	-1.03E+02	
214	-9.77E+01	-9.76E+01	
215	-9.34E+01	-9.33E+01	
216	-1.06E+02	-1.05E+02	
217	-1.07E+02	-1.06E+02	
223	-9.83E+01		-9.78E+01
224	-1.05E+02		-1.04E+02
225	-9.87E+01		-9.82E+01
226	-9.92E+01		-9.88E+01
227	-1.07E+02		-1.07E+02
218	-1.06E+02	-1.06E+02	
219	-9.50E+01	-9.47E+01	
220	-1.04E+02	-1.04E+02	
221	-1.07E+02	-1.07E+02	
222	-9.62E+01	-9.59E+01	
228	-1.02E+02		-1.01E+02
229	-1.03E+02		-1.02E+02
230	-1.05E+02		-1.05E+02
231	-1.06E+02		-1.05E+02
232	-1.02E+02		-1.02E+02
Bias 1 Statistics			
Average Bias 1	-1.01E+02	-1.01E+02	-1.01E+02
Std Dev Bias 1	4.58E+00	5.51E+00	4.03E+00
Ps90%/90% (+KTL) Bias 1	-9.20E+01	-8.59E+01	-9.01E+01
Ps90%/90% (-KTL) Bias 1	-1.11E+02	-1.16E+02	-1.12E+02
Un-Biased Statistics			
Average Un-Biased	-1.03E+02	-1.01E+02	-1.03E+02
Std Dev Un-Biased	4.12E+00	5.73E+00	1.79E+00
Ps90%/90% (+KTL) Un-Biased	-9.41E+01	-8.57E+01	-9.81E+01
Ps90%/90% (-KTL) Un-Biased	-1.11E+02	-1.17E+02	-1.08E+02
Specification MAX	-6.00E+01	-5.40E+01	-5.20E+01
Status	PASS	PASS	PASS

ISNK @ VS= +/-5V (mA) vs Total Ionizing Dose (kRad(Si))

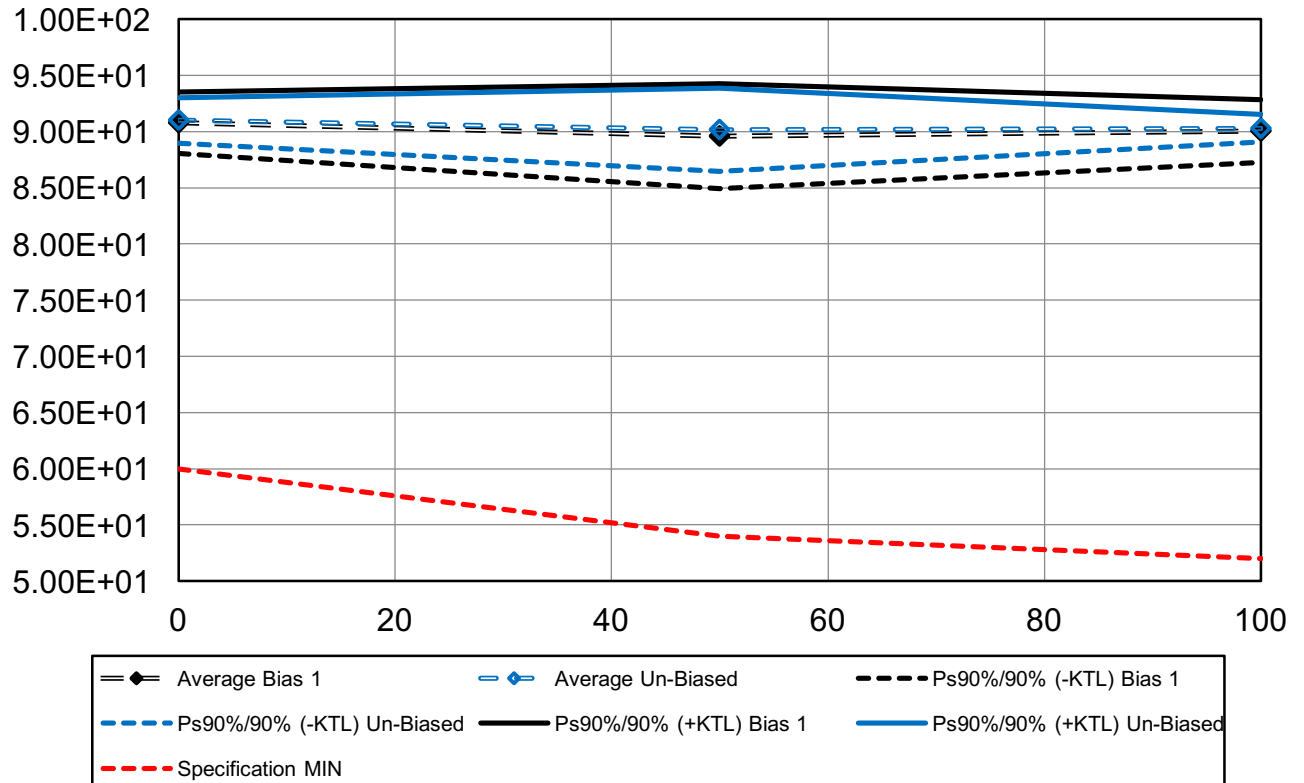


Figure 5.52: Plot of Short-Circuit Sink Current @ VS= +/-5V (mA) versus Total Dose

Table 5.52: Raw data for Short-Circuit Sink Current @ VS= +/-5V (mA) versus total dose including the statistical calculations, maximum specification, and the status of the test (PASS/FAIL) under the orange headers)

ISNK @ VS= +/-5V (mA)	Total Dose (krad(Si))		
	0	50	100
Device			
213	9.14E+01	9.04E+01	
214	9.06E+01	8.96E+01	
215	8.78E+01	8.68E+01	
216	9.11E+01	9.01E+01	
217	9.23E+01	9.12E+01	
223	9.07E+01		8.97E+01
224	9.15E+01		9.06E+01
225	8.95E+01		8.86E+01
226	9.08E+01		8.99E+01
227	9.22E+01		9.13E+01
218	9.12E+01	9.05E+01	
219	8.88E+01	8.80E+01	
220	9.19E+01	9.10E+01	
221	9.22E+01	9.15E+01	
222	9.05E+01	8.98E+01	
228	9.05E+01		8.99E+01
229	9.08E+01		9.01E+01
230	9.13E+01		9.04E+01
231	9.07E+01		9.01E+01
232	9.19E+01		9.10E+01
Bias 1 Statistics			
Average Bias 1	9.08E+01	8.96E+01	9.00E+01
Std Dev Bias 1	1.33E+00	1.70E+00	1.02E+00
Ps90%/90% (+KTL) Bias 1	9.35E+01	9.43E+01	9.28E+01
Ps90%/90% (-KTL) Bias 1	8.81E+01	8.49E+01	8.72E+01
Un-Biased Statistics			
Average Un-Biased	9.10E+01	9.02E+01	9.03E+01
Std Dev Un-Biased	9.82E-01	1.35E+00	4.45E-01
Ps90%/90% (+KTL) Un-Biased	9.30E+01	9.39E+01	9.15E+01
Ps90%/90% (-KTL) Un-Biased	8.90E+01	8.65E+01	8.91E+01
Specification MIN	6.00E+01	5.40E+01	5.20E+01
Status	PASS	PASS	PASS

Reference

1. Ionizing Radiation (Total Dose) Test Procedure, MIL-STD-883K, Test Method 1019.9 2017.
2. Test Methods for Semiconductor Devices, MIL-STD-750F, 2016.

Appendix A

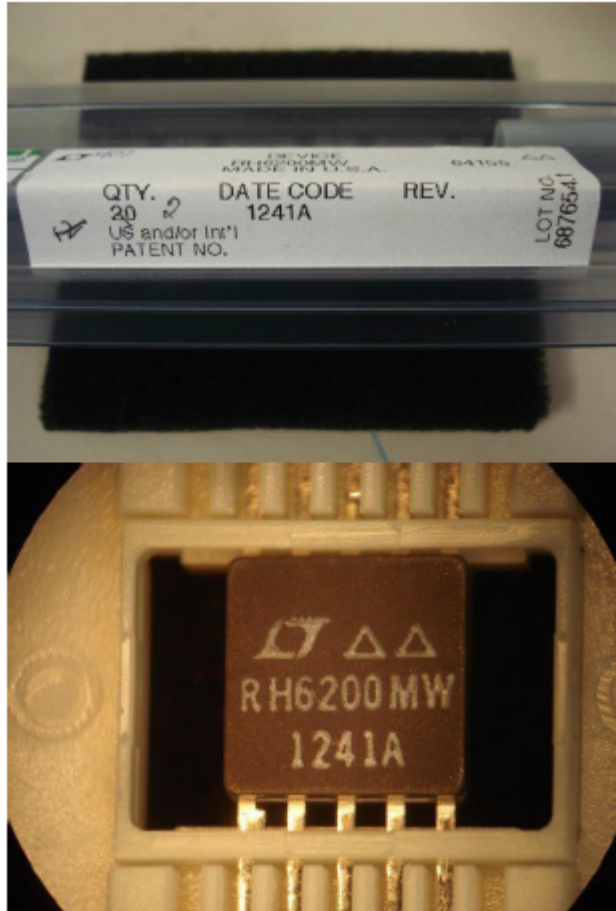


Figure A1: Top View showing date code

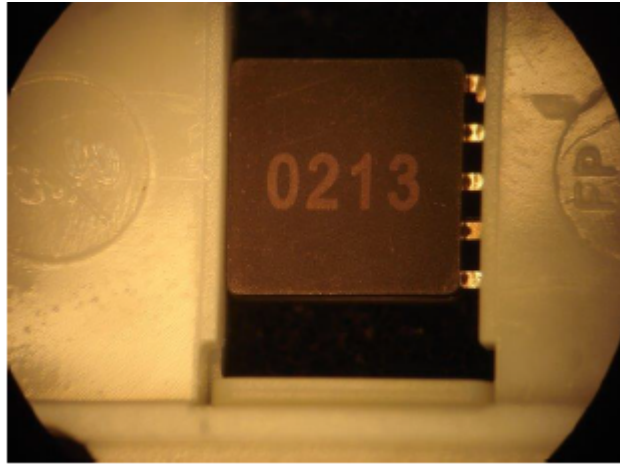


Figure A2: Bottom View showing serial number

Appendix B

Radiation Bias Connection

Pin	Function	Connection / Bias
1	SHDN	NC
2	NC	NC
3	-IN	To Pin 7 via 10kΩ Resistor
4	+IN	To GND via 10kΩ Resistor
5	V-	To -5V Decoupled to GND W/0.1μF
6	NC	NC
7	OUT	To Pin 3 via 10kΩ Resistor
8	V+	To +5V Decoupled to GND W/0.1μF
9	NC	NC
10	NC	NC

Figure B1: Pin-Out

Pin	Function	Connection / Bias
1	SHDN	GND
2	NC	GND
3	-IN	GND
4	+IN	GND
5	V-	GND
6	NC	GND
7	OUT	GND
8	V+	GND
9	NC	GND
10	NC	GND

Table B2: All GND'd

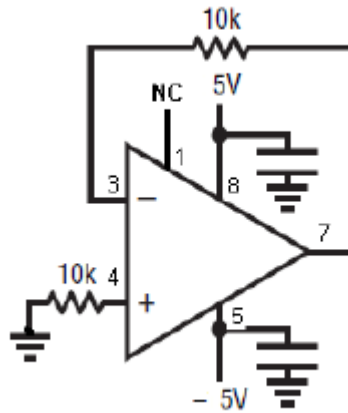


Figure B1: Total Dose Bias Circuit

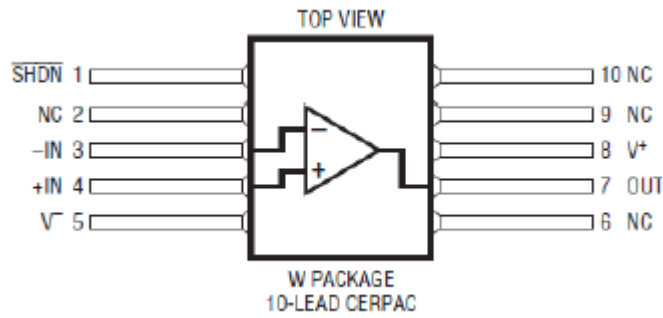


Figure B2: Package Drawing, Top View



Figure B3: Bias Board

Appendix C



Figure C1: Cobham RAD's ^{60}Co irradiator. The desired dose rate is obtained by positioning the device-under-test at a fixed distance from the gamma cell. The dose rate for this irradiator can vary from approximately 50rad(Si)/s, at a position close to the rods, down to <math><1\text{mrad(Si)/s}</math>, at a distance of approximately 4-meters from the rods.

Appendix D

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

TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation)

SYMBOL	PARAMETER	CONDITIONS	NOTES	T _A = 25°C			SUB-GROUP	-55°C ≤ T _A ≤ 125°C			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
V _{OS}	Input Offset Voltage	V _S = 5V, 0V; V _{CM} = V ⁻ to V ⁺			0.6	2	1			4	2,3	mV
		V _S = ±5V; V _{CM} = V ⁻ to V ⁺			2.5	6	1			9	2,3	mV
I _B	Input Bias Current	V _S = 5V, 0V; V _{CM} = V ⁺			8	18	1			20	2,3	μA
		V _S = 5V, 0V; V _{CM} = V ⁻		-50	-23	1		-100		20	2,3	μA
		V _S = ±5V; V _{CM} = V ⁺			8	18	1			20	2,3	μA
		V _S = ±5V; V _{CM} = V ⁻		-50	-23	1		-200		20	2,3	μA
I _{OS}	Input Offset Current	V _S = 5V, 0V; V _{CM} = V ⁺			0.02	4	1			5	2,3	μA
		V _S = 5V, 0V; V _{CM} = V ⁻			0.4	5	1			25	2,3	μA
		V _S = ±5V; V _{CM} = V ⁺			1	7	1			12	2,3	μA
		V _S = ±5V; V _{CM} = V ⁻			3	12	1			50	2,3	μA

TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation)

SYMBOL	PARAMETER	CONDITIONS	NOTES	T _A = 25°C			SUB-GROUP	-55°C ≤ T _A ≤ 125°C			SUB-GROUP	UNITS	
				MIN	TYP	MAX		MIN	TYP	MAX			
	Input Noise Voltage	0.1Hz to 10Hz	6		600							nV _{rms}	
e _n	Input Noise Voltage Density	V _S = 5V, 0V; f = 100kHz	6		1.1							nV/√Hz	
		V _S = 5V, 0V; f = 10kHz			1.5	2.4						nV/√Hz	
		V _S = ±5V; f = 100kHz	6		0.95							nV/√Hz	
		V _S = ±5V; f = 10kHz			1.4	2.3						nV/√Hz	
i _n	Input Noise Current Density	f = 10kHz Balanced Source	6		2.2							pA/√Hz	
		f = 10kHz Unbalanced Source	6		3.5							pA/√Hz	
A _{VOL}	Large Signal Open-Loop Voltage Gain	V _S = 5V, 0V; R _L = 1k; V _{OUT} = 0.5V to 4.5V		70	120		4	35		5,6		V/mV	
		V _S = 5V, 0V; R _L = 100Ω; V _{OUT} = 1V to 4V		11	18		4					V/mV	
		V _S = 5V, 0V; R _L = 100Ω; V _{OUT} = 1.5V to 3.5V						5.5					V/mV
		V _S = ±5V; R _L = 1k; V _{OUT} = ±4.5V		115	200		4	40		5,6			V/mV
CMRR	Common Mode Rejection Ratio	V _S = 5V, 0V; V _{CM} = 0V to 5V		65	90		1	58		2,3		dB	
		V _S = 5V, 0V; V _{CM} = 1.5V to 3.5V		85	112		1	76		2,3		dB	
		V _S = ±5V; V _{CM} = ±5V		68	96		1	63		2,3		dB	
		V _S = ±5V; V _{CM} = ±2V		75	100		1	72		2,3		dB	
PSRR	Power Supply Rejection Ratio	V _S = ±2.25V to ±5V		60	68		1	58		2,3		dB	
V _{OL}	Output Voltage Swing Low	V _S = 5V, 0V; I _L = 0			9	50	4			100	5,6	mV	
		V _S = 5V, 0V; I _L = 5mA			50	100	4			150	5,6	mV	
		V _S = 5V, 0V; I _L = 20mA			150	290	4			350	5,6	mV	
		V _S = ±5V; I _L = 0			12	50	4			100	5,6	mV	
		V _S = ±5V; I _L = 5mA			55	110	4			150	5,6	mV	
		V _S = ±5V; I _L = 20mA			150	290	4			350	5,6	mV	
V _{OH}	Output Voltage Swing High	V _S = 5V, 0V; I _L = 0			55	110	4			150	5,6	mV	
		V _S = 5V, 0V; I _L = 5mA			95	190	4			250	5,6	mV	
		V _S = 5V, 0V; I _L = 20mA			220	400	4			500	5,6	mV	
		V _S = ±5V; I _L = 0			70	130	4			200	5,6	mV	
		V _S = ±5V; I _L = 5mA			110	210	4			275	5,6	mV	
		V _S = ±5V; I _L = 20mA			225	420	4			550	5,6	mV	
I _{SC}	Short-Circuit Current	V _S = 5V, 0V or V _S = ±5V		±60	±90		1	±45		2,3		mA	
I _S	Supply Current	V _S = 5V, 0V			16.5	20	1			30	2,3	mA	
		V _S = ±5V			20	23	1			35	2,3	mA	
I _{S(SHDN)}	Shutdown Supply Current	V _S = 5V, 0V			1.3	1.8	1			2.2	2,3	mA	
		V _S = ±5V			1.6	2.1	1			2.5	2,3	mA	
I _{SHDN}	Shutdown Pin Current	V _S = 5V, 0V or V _S = ±5V; V _{SHDN} = 0.3V		-280	-200		1	-300		2,3		μA	
t _{ON}	Turn-On Time	SHDN from Low to High	6		180							ns	
t _{OFF}	Turn-On Time	SHDN from High to Low	6		180							ns	
GBW	Gain Bandwidth Product	V _S = 5V, 0V; at f = 1MHz			110	145							MHz
		V _S = ±5V; at f = 1MHz			110	165							MHz
SR	Slew Rate	V _S = 5V, 0V; A _V = -1; R _L = 1k; V _O = 4V		31	44		4						V/μs
		V _S = ±5V; A _V = -1; R _L = 1k; V _O = 4V		35	50		4						V/μs

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

TABLE 1A: ELECTRICAL CHARACTERISTICS (Postirradiation) $T_A = 25^\circ\text{C}$

SYMBOL	PARAMETER	CONDITIONS	10KRAD(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	$V_S = 5V, 0V; V_{CM} = V^- \text{ to } V^+$ $V_S = \pm 5V; V_{CM} = V^- \text{ to } V^+$	2.2 6.5	2.4 7	2.6 7.5	2.8 8	3 8.5						mV mV
I_B	Input Bias Current	$V_S = 5V, 0V; V_{CM} = V^+$ $V_S = 5V, 0V; V_{CM} = V^-$ $V_S = \pm 5V; V_{CM} = V^+$ $V_S = \pm 5V; V_{CM} = V^-$	20 -55 20 -55	22 -60 22 -60	24 -65 24 -65	26 -70 26 -70	28 -75 28 -75						μA μA μA μA
I_{OS}	Input Offset Current	$V_S = 5V, 0V; V_{CM} = V^+$ $V_S = 5V, 0V; V_{CM} = V^-$ $V_S = \pm 5V; V_{CM} = V^+$ $V_S = \pm 5V; V_{CM} = V^-$	5 6 8 13	6 7 9 14	7 8 10 15	8 9 11 16	9 10 12 17						μA μA μA μA
A_{VOL}	Large Signal Open Loop Voltage Gain	$V_S = 5V, 0V; R_L = 1k; V_{OUT} = 0.5V \text{ to } 4.5V$ $V_S = 5V, 0V; R_L = 100\Omega; V_{OUT} = 1V \text{ to } 4V$ $V_S = \pm 5V; R_L = 1k; V_{OUT} = \pm 4.5V$ $V_S = \pm 5V; R_L = 100\Omega; V_{OUT} = \pm 2V$	65 10 110 13.5	60 9 100 12	55 8 90 10.5	50 7 80 9	45 6 70 7.5						V/mV V/mV V/mV V/mV
CMRR	Common Mode Rejection Ratio	$V_S = 5V, 0V; V_{CM} = 0V \text{ to } 5V$ $V_S = 5V, 0V; V_{CM} = 1.5V \text{ to } 3.5V$ $V_S = \pm 5V; V_{CM} = \pm 5V$ $V_S = \pm 5V; V_{CM} = \pm 2V$	64 84 67 74	63 83 66 73	62 82 65 72	61 81 64 71	60 80 63 70						dB dB dB dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 2.25V \text{ to } \pm 5V$	59	58	57	56	55						dB
V_{OIL}	Output Voltage Swing Low	$V_S = 5V, 0V; I_L = 0$ $V_S = 5V, 0V; I_L = 5mA$ $V_S = 5V, 0V; I_L = 20mA$ $V_S = \pm 5V; I_L = 0$ $V_S = \pm 5V; I_L = 5mA$ $V_S = \pm 5V; I_L = 20mA$	52 104 296 52 114 296	54 108 302 54 118 302	56 112 308 56 122 308	58 116 314 58 126 314	60 120 320 60 130 320						mV mV mV mV mV mV
V_{OH}	Output Voltage Swing High	$V_S = 5V, 0V; I_L = 0$ $V_S = 5V, 0V; I_L = 5mA$ $V_S = 5V, 0V; I_L = 20mA$ $V_S = \pm 5V; I_L = 0$ $V_S = \pm 5V; I_L = 5mA$ $V_S = \pm 5V; I_L = 20mA$	114 198 415 134 218 430	118 206 430 138 226 455	122 214 445 142 234 470	126 222 460 146 242 485	130 230 475 150 250 500						mV mV mV mV mV mV
I_{SC}	Short-Circuit Current	$V_S = 5V, 0V \text{ or } V_S = \pm 5V$	58	56	54	52	50						mA
I_S	Supply Current	$V_S = 5V, 0V$ $V_S = \pm 5V$	20.4 23.4	20.8 23.8	21.2 24.2	21.6 24.6	22 25						mA mA
$I_{S(SHDN)}$	Shutdown Supply Current	$V_S = 5V, 0V$ $V_S = \pm 5V$	1.84 2.14	1.88 2.18	1.92 2.22	1.96 2.26	2 2.3						mA mA
I_{SHDN}	Shutdown Pin Current	$V_S = 5V, 0V \text{ or } V_S = \pm 5V; V_{SHDN} = 0.3V$	-284	-288	-292	-296	-300						μA

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: Inputs are protected by back-to-back diodes. If the differential input voltage exceeds 0.7V, the input current must be limited to less than 40mA.

Note 3: A heat sink may be required to keep the junction temperature below the absolute maximum rating when the output is shorted indefinitely.

Note 4: There are reverse-biased ESD diodes from all inputs and outputs to the respective supply pins. If these pins are forced beyond either supply, unlimited current will flow through these diodes. If the current is transient in nature and limited to less than 30mA, no damage to the device will occur.

Note 5: The RH6200 is tested under pulse load conditions such that $T_J = T_A$. The thermal resistance of the W 10-lead CERPAC package (without heat sink) is estimated at 170°C/W . For a given application, multiply the RMS power dissipation of the RH6200 times the package thermal resistance (including any heat sinking if present) to calculate the temperature difference between the ambient temperature and the junction temperature. The RH6200 has a thermal shutdown feature that protects the part from excessive junction temperature. The amplifier will shut down to an inactive, low current condition when the junction temperature exceeds approximately 160°C . The amplifier will remain shut down until the die cools off to below approximately 150°C , at which point the amplifier will return to normal operation.

Note 6: This parameter is not production tested. Typical bench evaluation performance listed for information only.