

**Total Dose Radiation Test Report**

**MSK 5977RH**  
**(MSK5953RH, MSK5976RH, MSK5979RH)**

**RAD Hard Positive Adjustable Voltage Regulators**

Sept 24, 2010  
Updated October 16, 2014

C. Salce  
F. Freytag

M.S. Kennedy Corporation

## **I. Introduction:**

The total dose radiation test plan for the MSK 5977RH was developed to qualify the devices as RAD Hard to 300 KRADS(Si). The testing was performed beyond 300 KRADS(Si) to show trends in device performance as a function of total dose. The test does not classify maximum radiation tolerance of the device, but simply offers designers insight to the critical parameter-shifts up to the specified total dose level. The MSK5977RH, MSK5976RH, MSK5953RH, and MSK5979RH all use the same active components. The data in this report is from direct measurement of the MSK5977RH response to irradiation but it is indicative of the response of all three devices and is applicable to all three devices.

MIL-STD-883 Method 1019.7 and ASTM F1892-06 were used as guidelines in the development and implementation of the total dose test plan for the MSK 5977RH.

## **II. Radiation Source:**

Total dose was performed at the University of Massachusetts, Lowell, using a cobalt 60 radiation source. The dose rate was determined to be 132 RADS(Si)/sec. The total dose schedule can be found in Table I.

## **III. Test Setup:**

All test samples were subjected to Group A Electrical Test in accordance with the device data sheet. In addition, all devices received 320 hours of burn-in per MIL-STD-883 Method 1015 and were fully screened IAW MIL-PRF-38534 Class K. For test platform verification, one control device was tested at 25°C. Ten devices were then tested at 25°C, prior to irradiation, and were found to be within acceptable test limits.

The devices were vertically aligned with the radiation source and enclosed in a lead/aluminum container during irradiation. Five devices were kept under bias during irradiation. An operating voltage of +26 Volts was used for the bias condition. Five devices had all leads grounded during irradiation for the unbiased condition.

After each irradiation, the device leads were shorted together and the devices were transported to the MSK automatic electrical test platform. Testing was performed in accordance with the MSK device data sheet. Testing was performed on irradiated devices, as well as the control device, at each total dose level. Electrical tests were completed within one hour of irradiation. Devices were subjected to subsequent radiation doses within two hours of removal from the radiation field.

## **IV. Data:**

All performance curves are averaged from the test results of the biased and unbiased devices, respectively. If required, full test data can be obtained by contacting M.S. Kennedy Corporation.

## **V. Summary:**

Based on the test data recorded during radiation testing and statistical analysis, the MSK5977RH, MSK5976RH, MSK5953RH, and MSK5979RH qualify as 300 KRADS(Si) radiation hardened. Set Pin Current and Line Regulation exhibited the most significant shift due to irradiation, however all performance curves stayed within specification up to 450 KRADS(Si) TID.

MSK 5977 RH Biased/Unbiased Dose Rate Schedule
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Dosimetry Equipment
Bruker Biospin # 0162

Irradiation Date
9/24/10

Exposure Length (min:sec)	Incremental Dose rads(Si)	Cumulative Dose rads(Si)
6:30	51,480	51,480
6:30	51,480	102,960
6:30	51,480	154,440
6:30	51,480	205,920
13:00	102,960	308,880
19:31	154,572	463,452

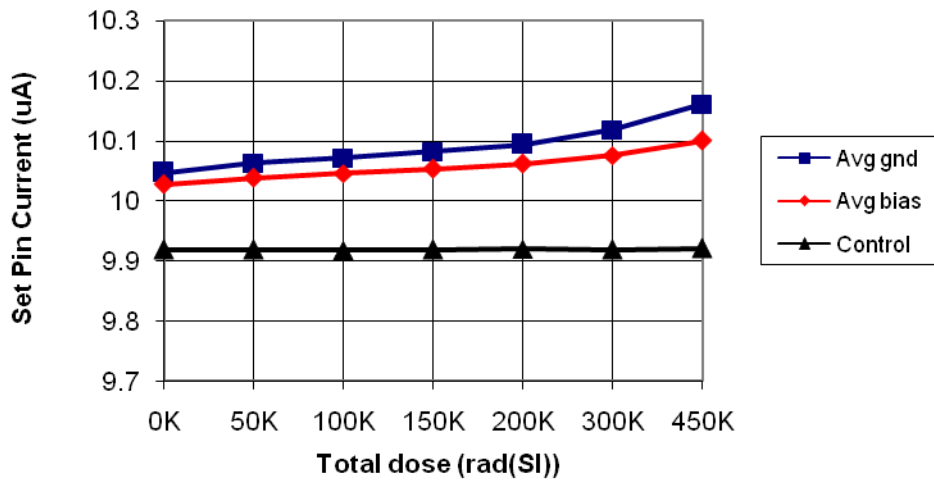
Biased S/N – 0011, 0012, 0014, 0015, 0021
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Unbiased S/N – 0022, 0023, 0024, 0025, 0033
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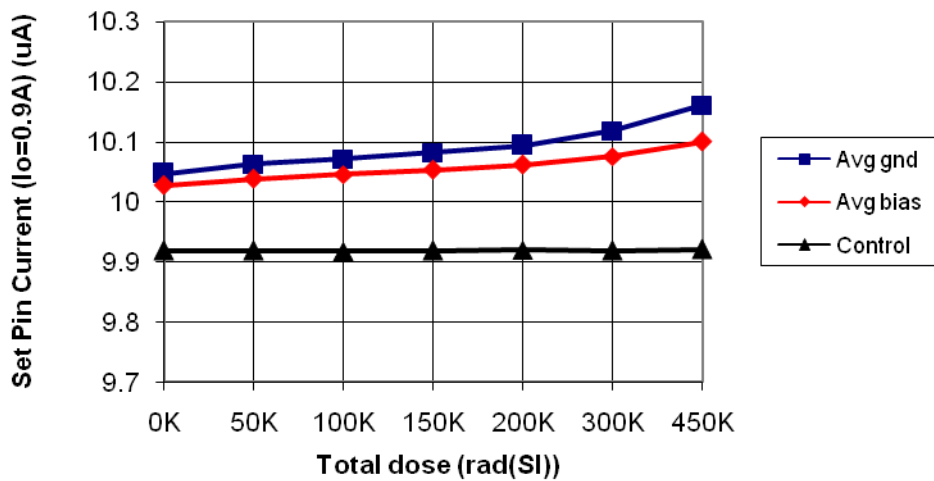
Table 1

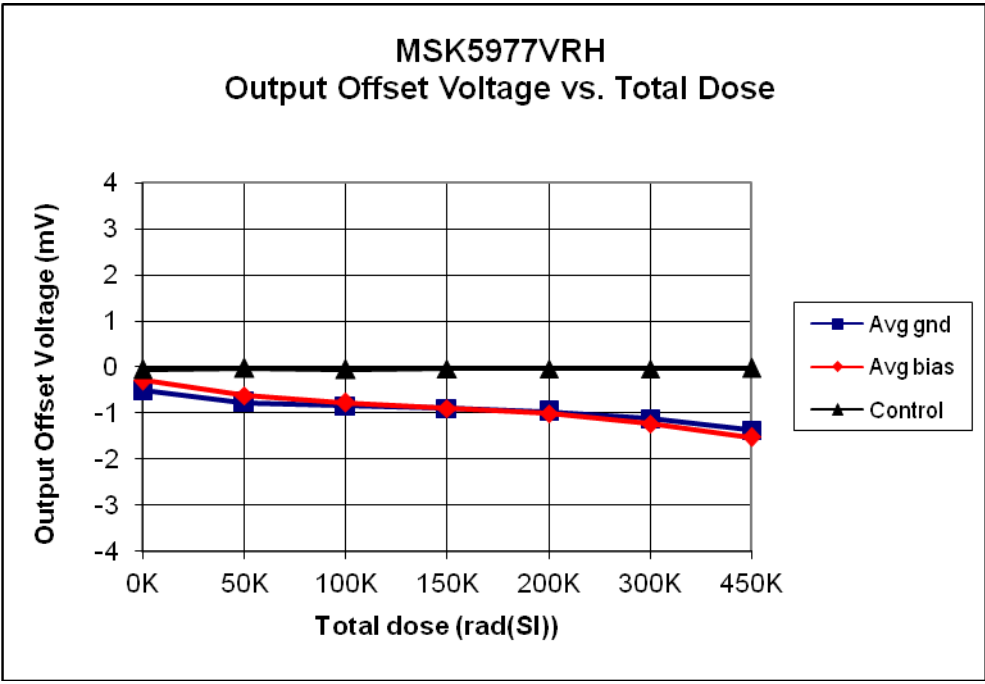
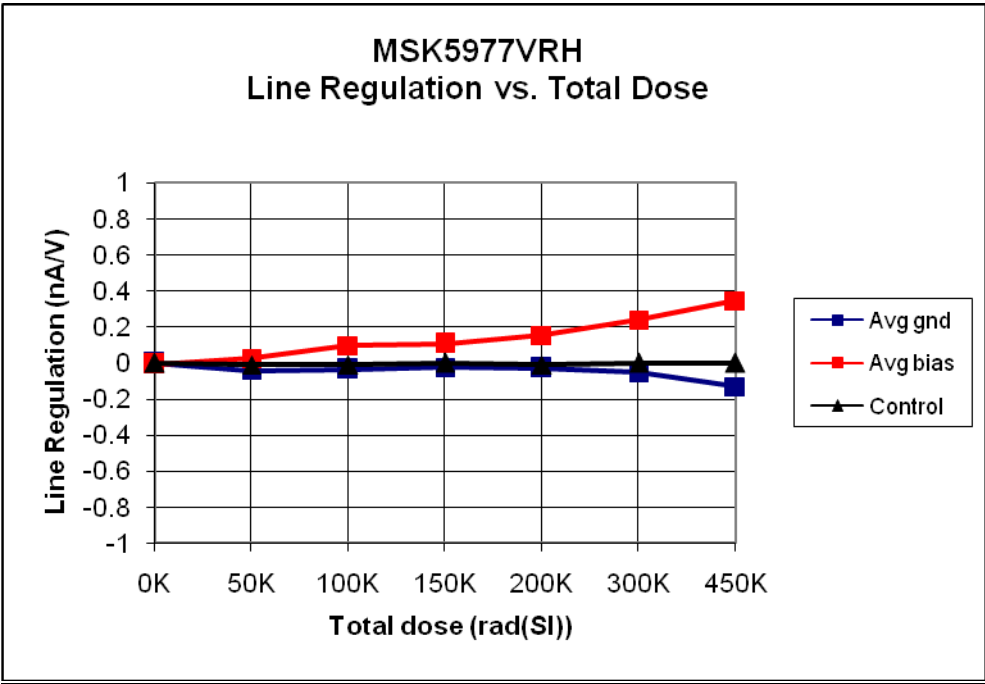
**Dose Time, Incremental Dose and Total Cumulative Dose**

MSK5977VRH  
Set Pin Current ( $I_o=1mA$ ) vs. Total Dose

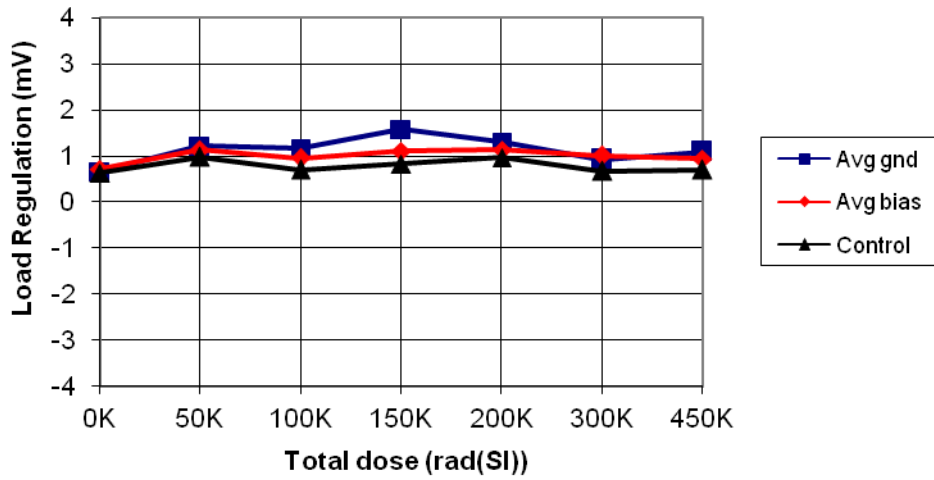


MSK5977VRH  
Set Pin Current ( $I_o=0.9A$ ) vs. Total Dose

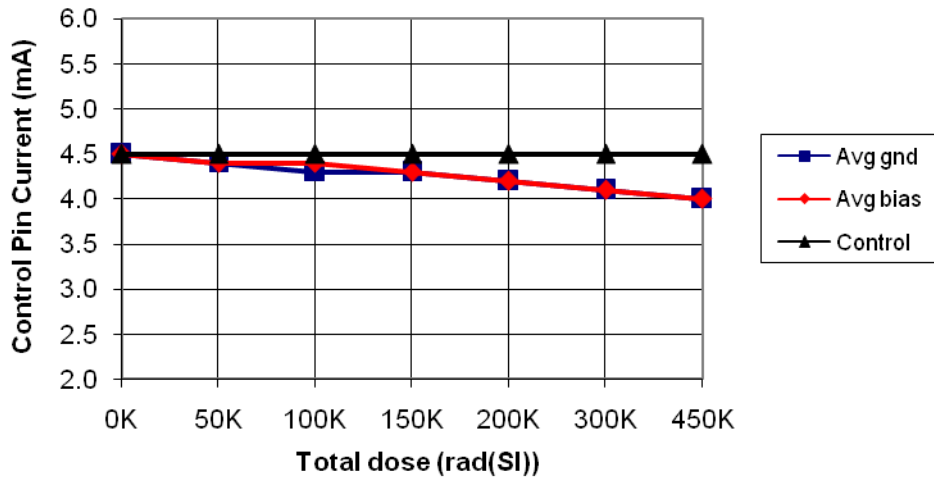




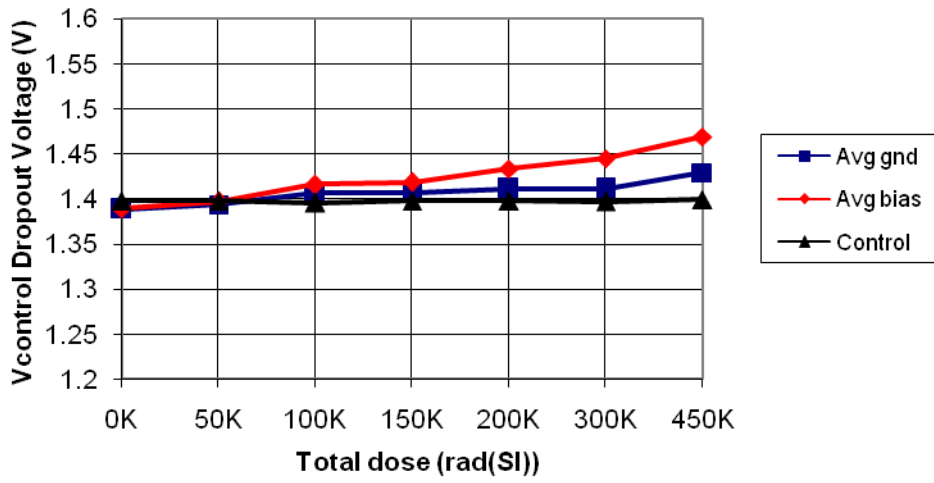
MSK5977VRH  
Load Regulation vs. Total Dose



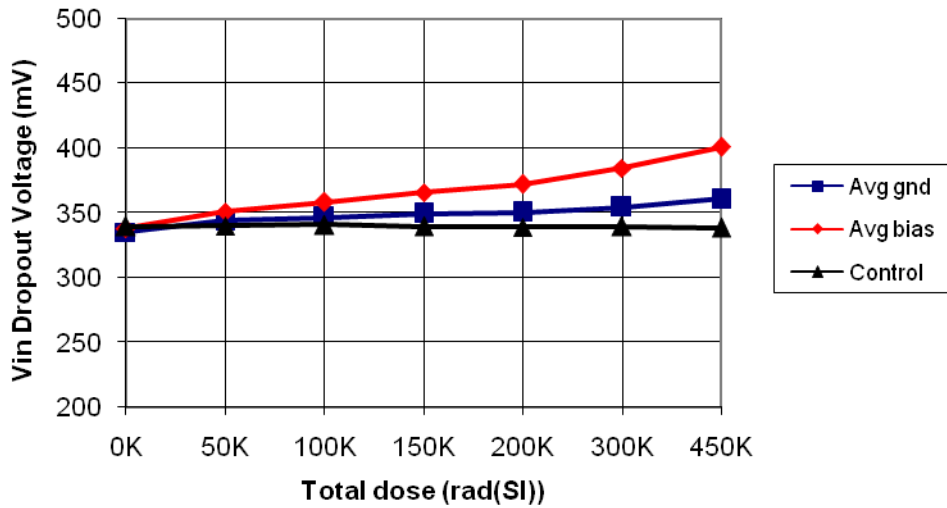
MSK5977VRH  
Control Pin Current vs. Total Dose



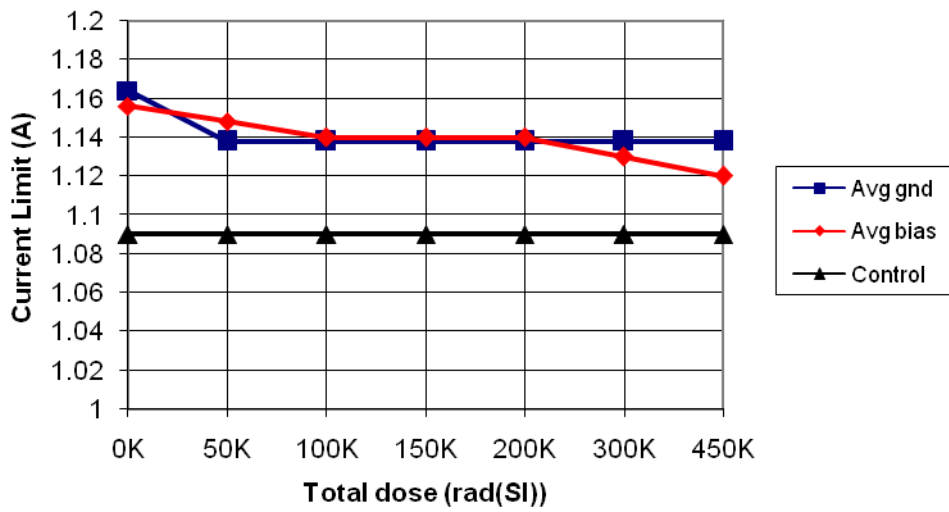
MSK5977VRH  
Vcontrol Dropout Voltage vs. Total Dose



MSK5977VRH  
Vin Dropout Voltage vs. Total Dose



MSK5977VRH  
Current Limit vs. Total Dose





**Total Dose Radiation Test Report**

**MSK 5977RH  
(MSK5953RH, MSK5976RH)**

**RAD Hard Positive Adjustable Voltage Regulators**

Sept 24, 2010  
Updated January 15, 2014

C. Salce  
F. Freytag

M.S. Kennedy Corporation  
Liverpool, NY

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MSK 5977 RH Biased/Unbiased Dose Rate Schedule
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Bruker Biospin # 0162

Irradiation Date
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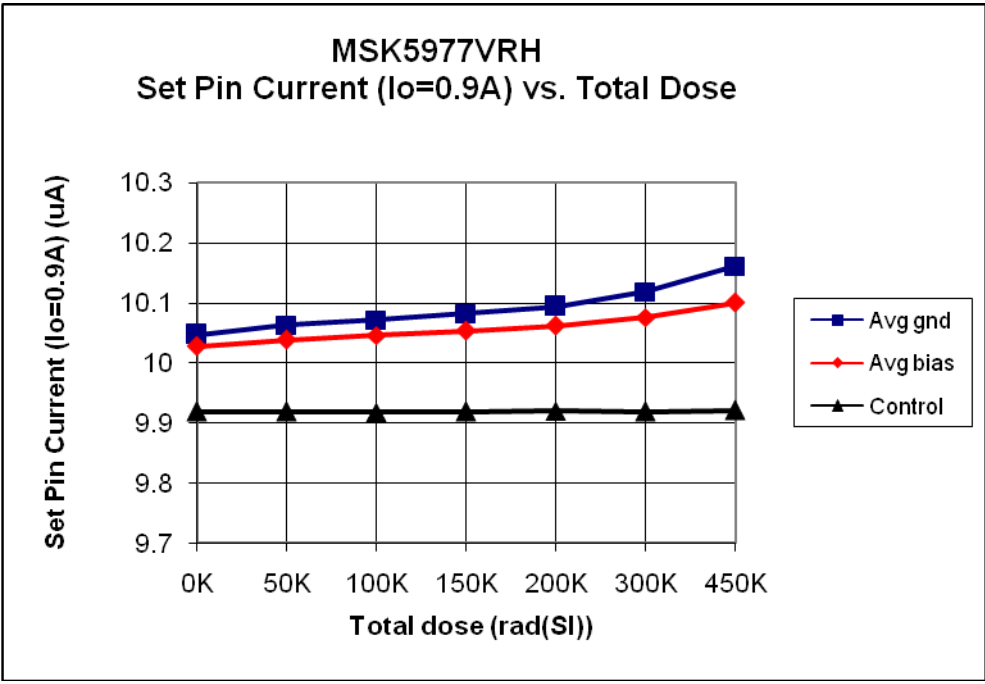
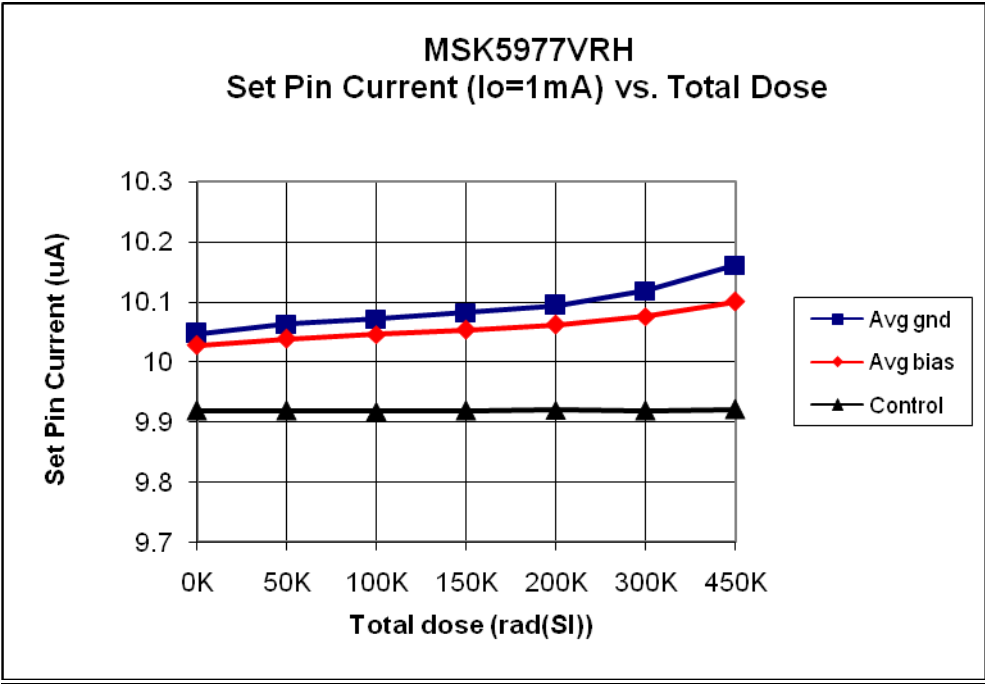
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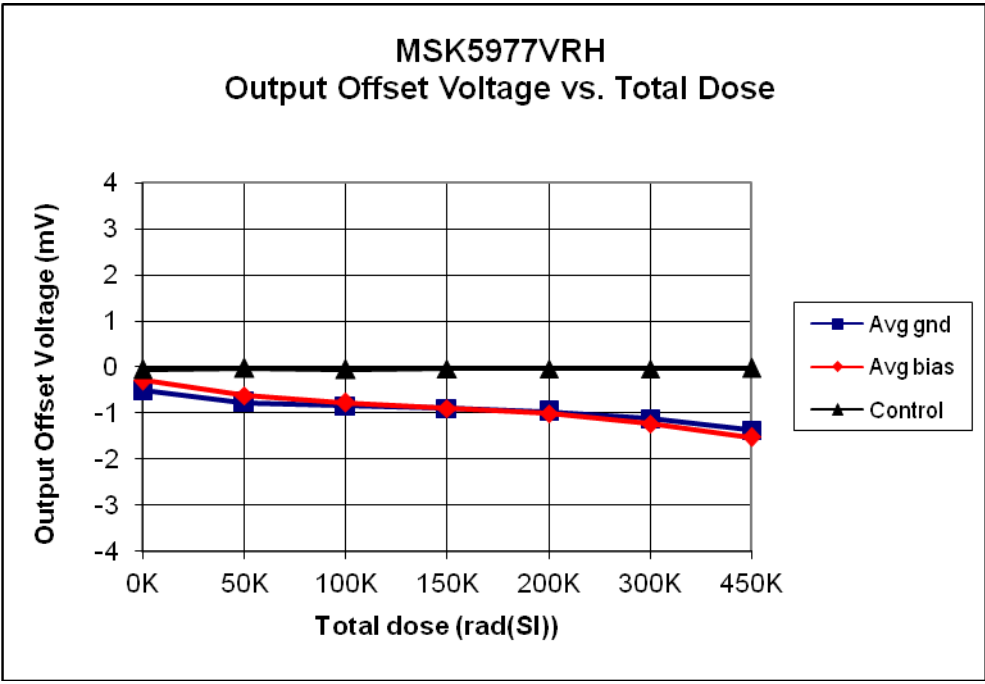
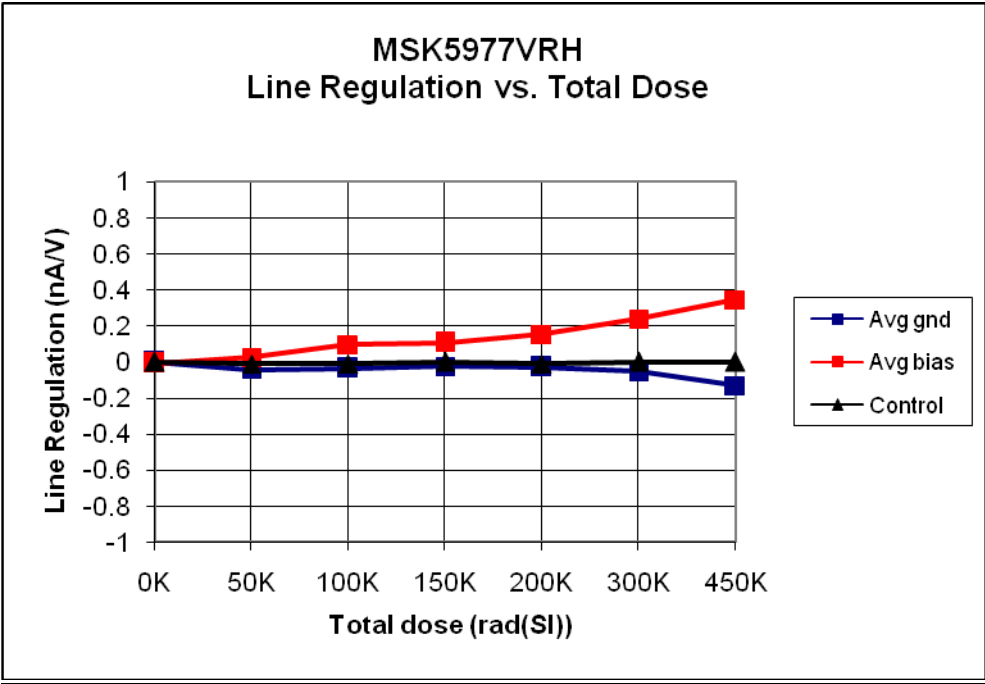
Biased S/N – 0011, 0012, 0014, 0015, 0021
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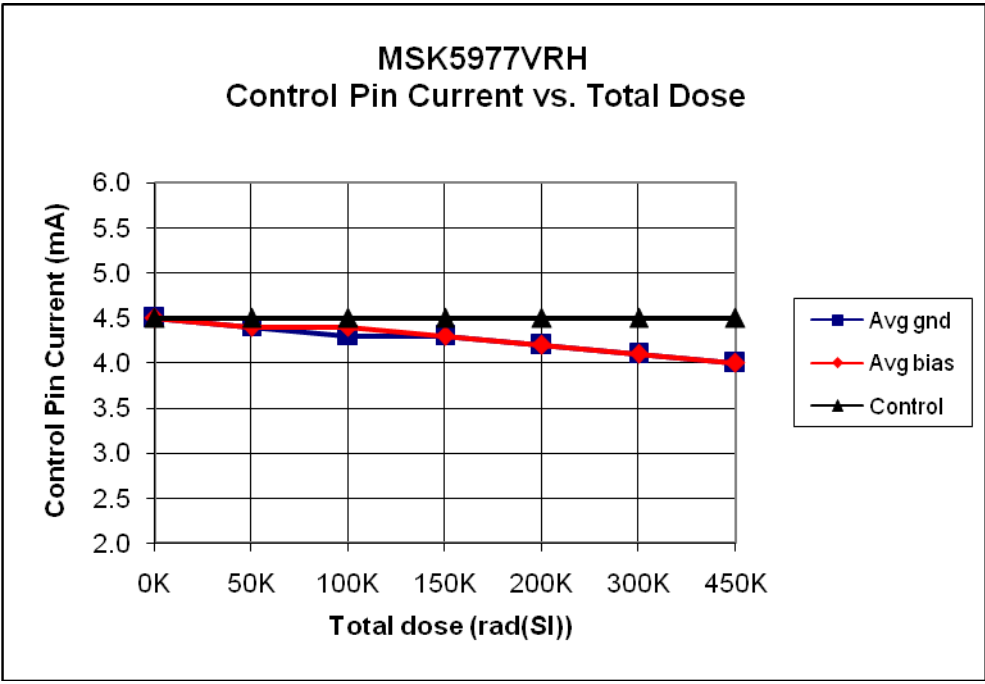
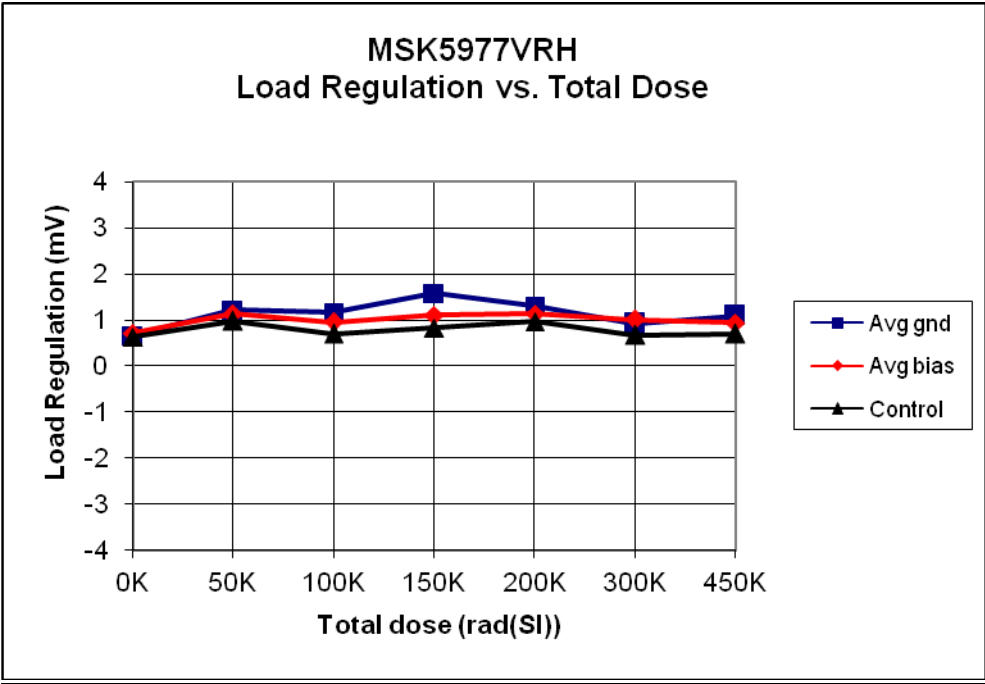
Unbiased S/N – 0022, 0023, 0024, 0025, 0033
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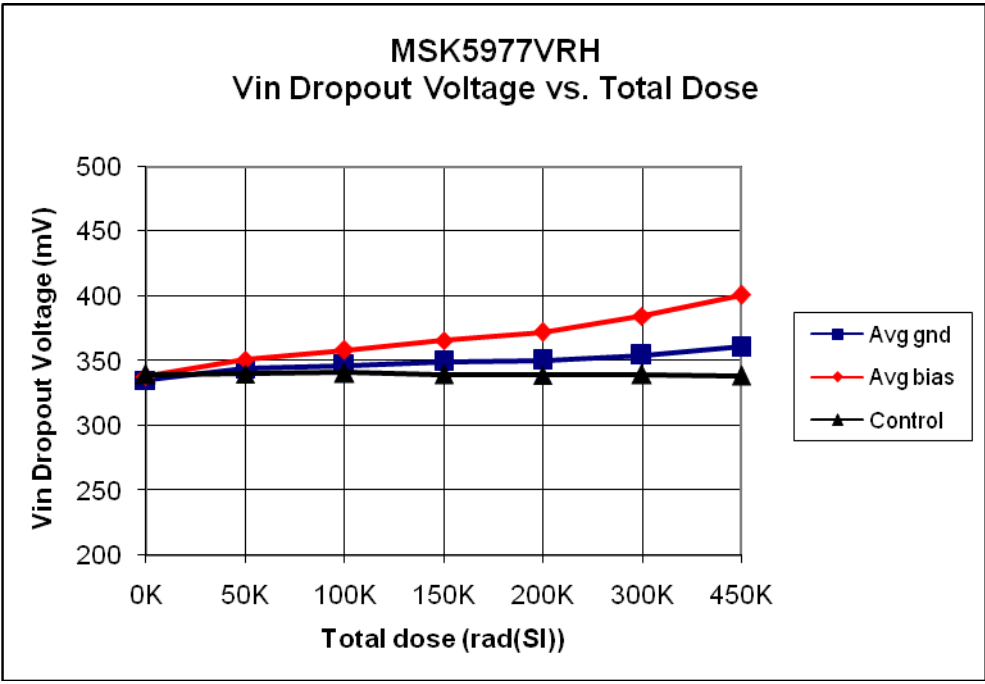
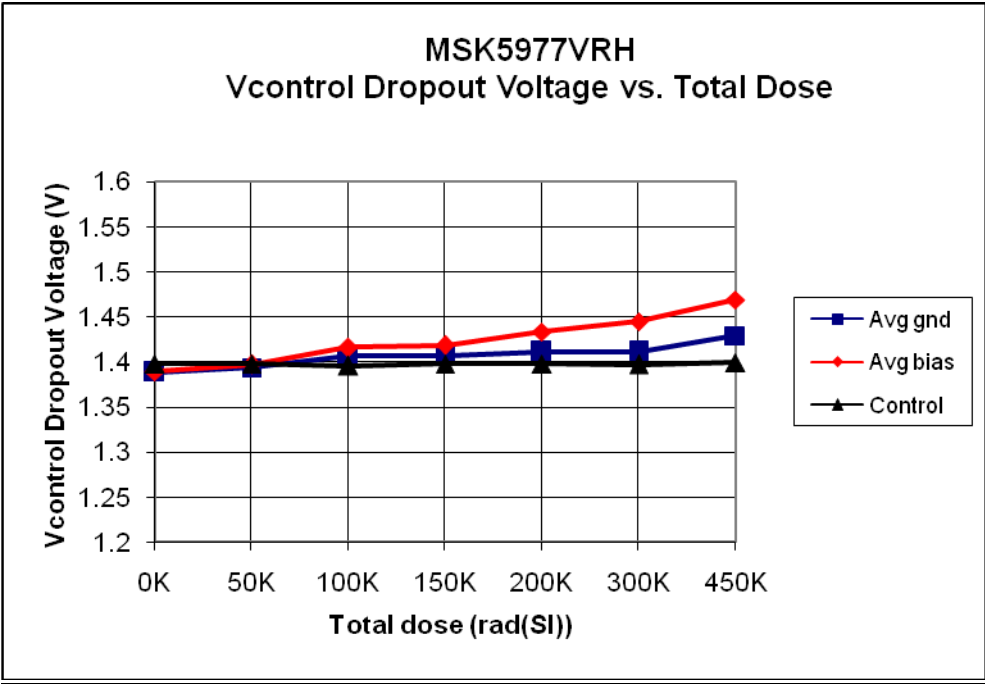
Table 1

**Dose Time, Incremental Dose and Total Cumulative Dose**









MSK5977VRH  
Current Limit vs. Total Dose

