

IAR-TIA REPORT

Date: 17/07/2023

TIA Characterization:

The Transimpedance amplifier OPA4991IDR was tested and characterized for all 4 channels.

This Part was recommended as a better Opamp 4 Channel by TI-USA compared to TLC2274-Which was Original Designed Part by CeNSE-IISc. Parts 2# were Purchased through Mouser Electronics and Date Code is 31C4TQK-G4.

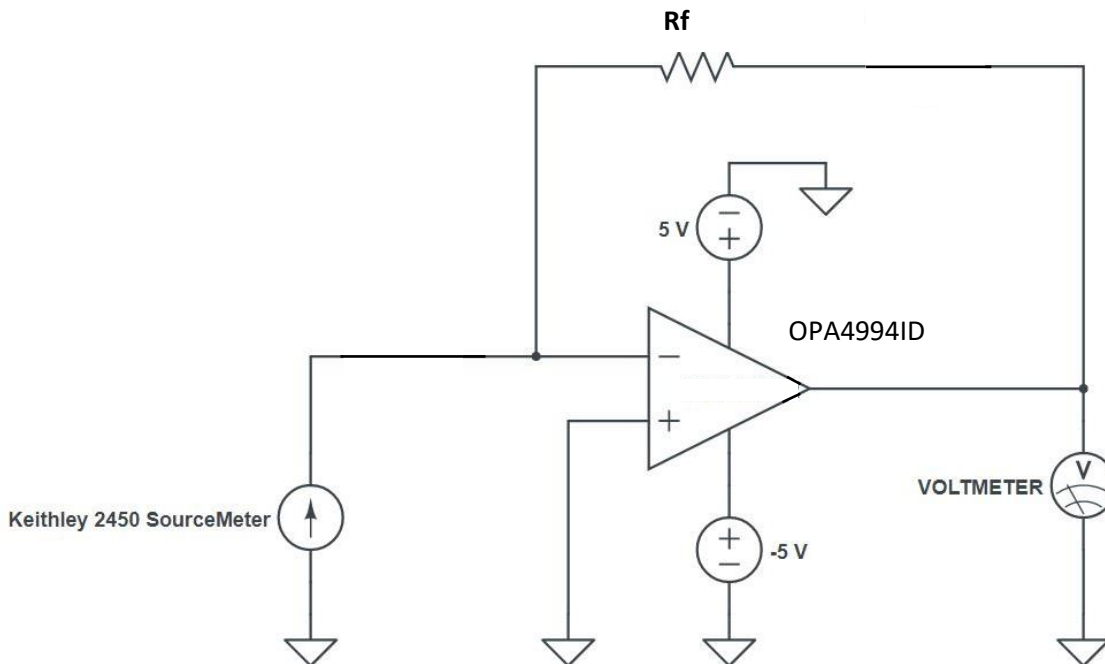
Setup:

A voltage regulator of $-5V$ and $+5V$ was connected to the supply pins of op amp.

The input current was provided through SMU to the inverting terminal.

Non-inverting terminal is connected to ground.

The output voltage was measured through the multimeter.



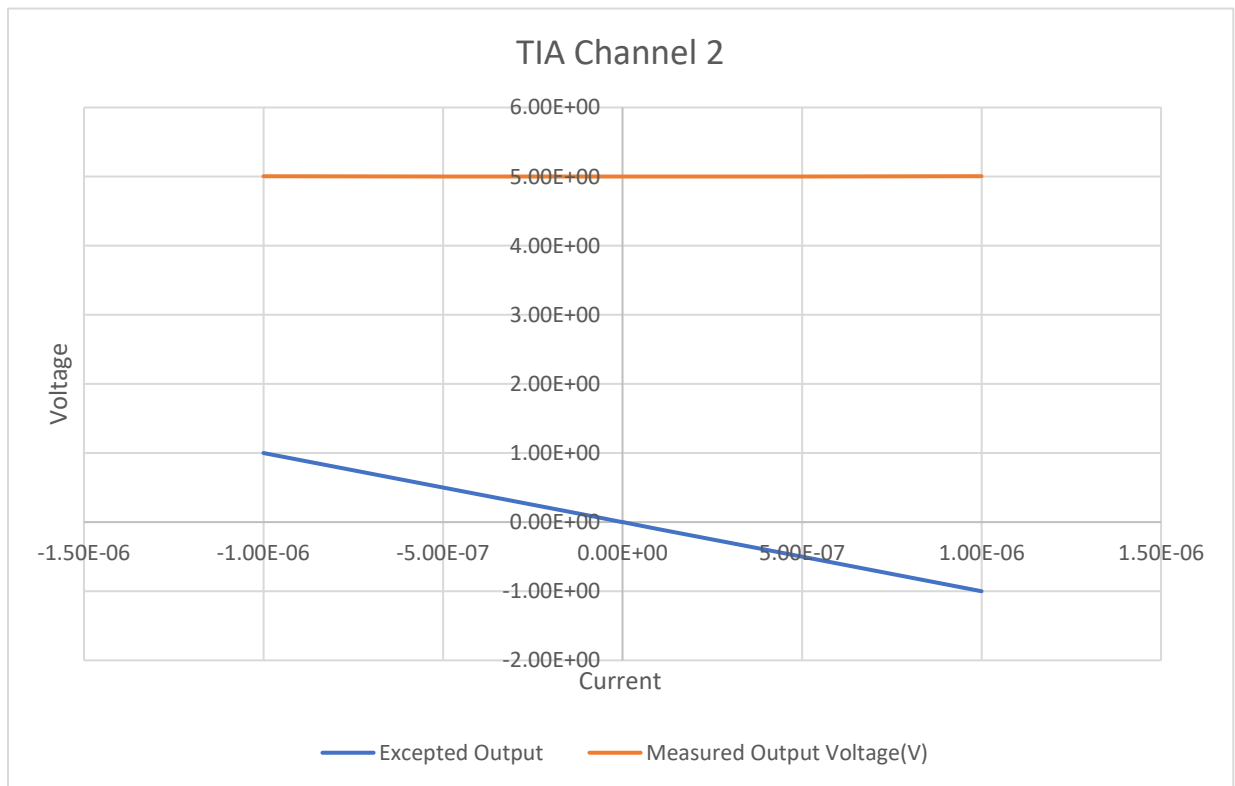
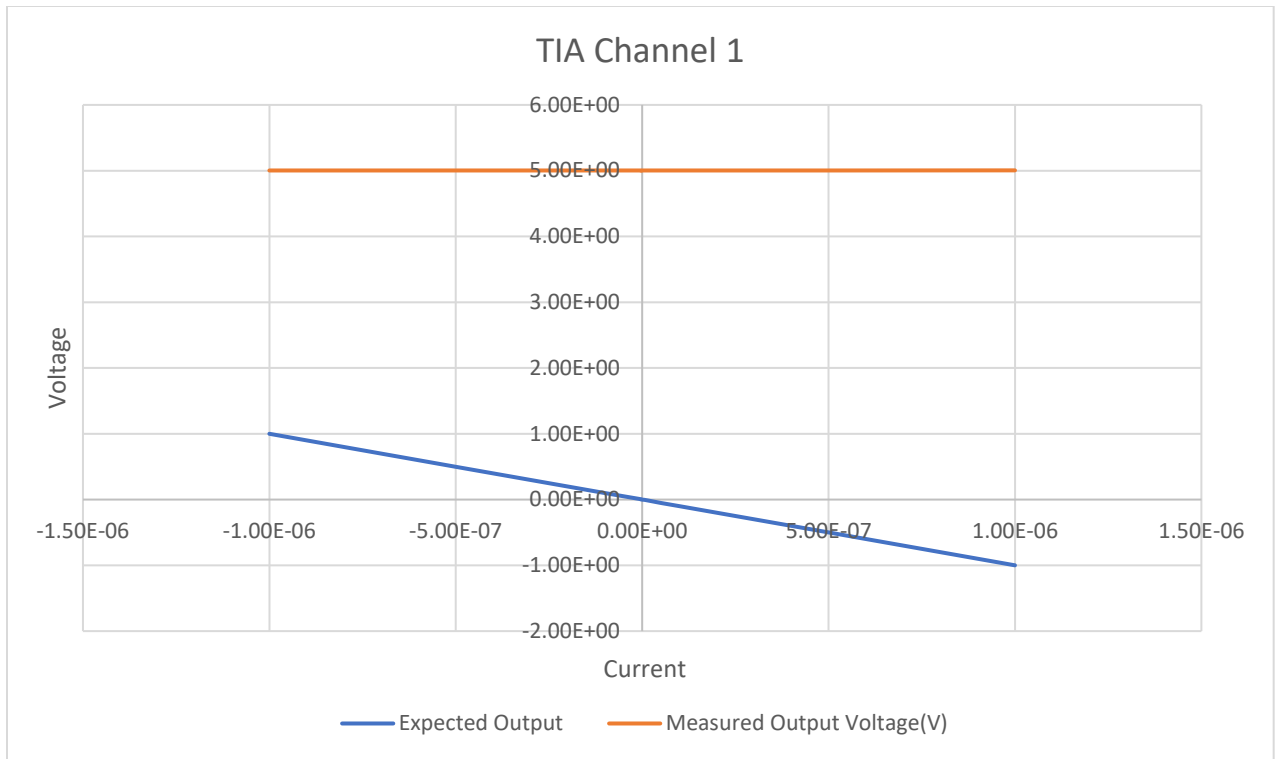
Procedure:

- Make the necessary connections.
- Supply the input current to the inverting terminal of opamp.
- Measure the voltage through multimeter.
- Change the input current and measure output voltage again.

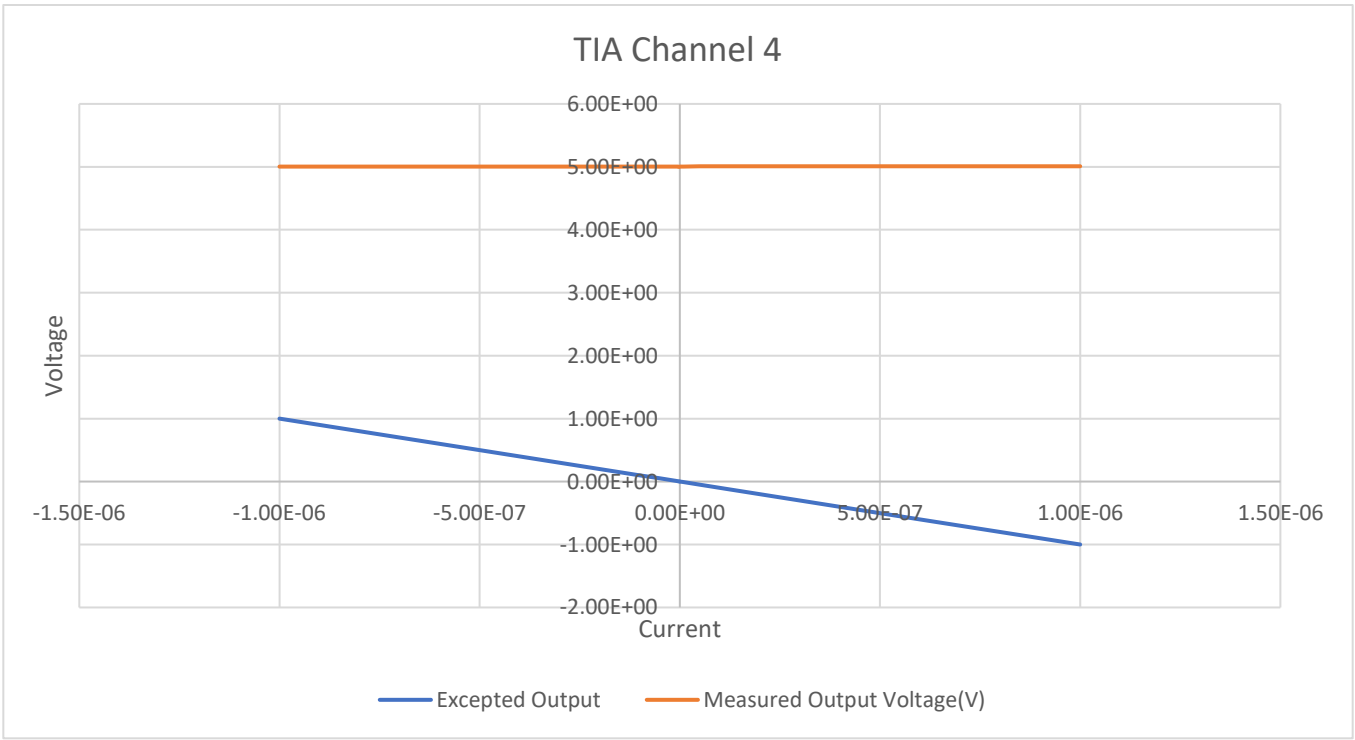
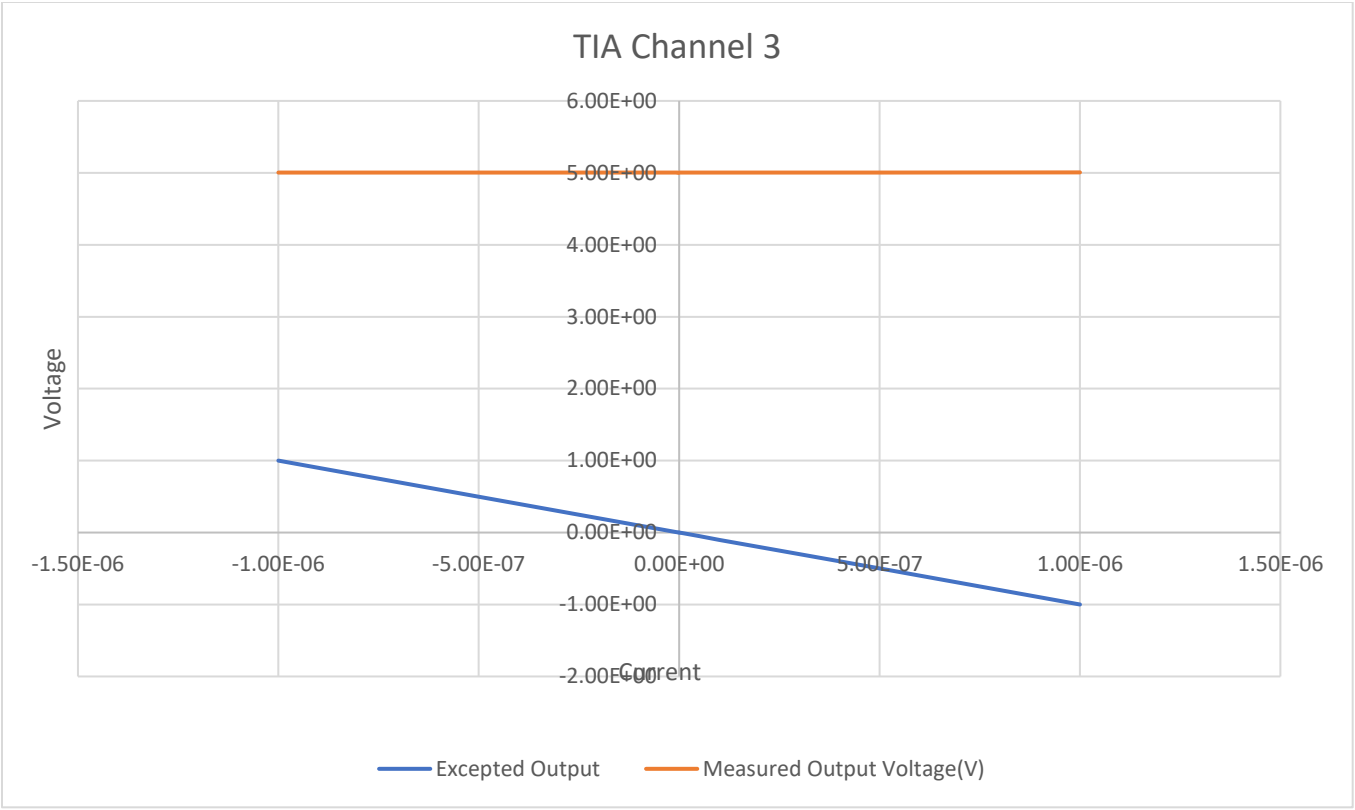
Output:

Gain Resistor, $R_f = 1M\Omega$; Bias Voltage, $V_{bias} = 0V$;

TIA Channel 1				TIA Channel 2		
Current(A)	Expected Output Voltage(V)	Measured Output Voltage(V)		Current(mA)	Expected Output Voltage(V)	Measured Output Voltage(V)
-1.00E-06	1.00E+00	5.00386		-1.00E-06	1.00E+00	5.00475
-5.00E-07	5.00E-01	5.00356		-5.00E-07	5.00E-01	5.00321
-1.00E-07	1.00E-01	5.00343		-1.00E-07	1.00E-01	5.00302
-5.00E-08	5.00E-02	5.00321		-5.00E-08	5.00E-02	5.00258
-1.00E-08	1.00E-02	5.00286		-1.00E-08	1.00E-02	5.00242
-5.00E-09	5.00E-03	5.00247		-5.00E-09	5.00E-03	5.00231
-4.00E-09	4.00E-03	5.0018		-4.00E-09	4.00E-03	5.00229
-3.00E-09	3.00E-03	5.0009		-3.00E-09	3.00E-03	5.00012
-2.00E-09	2.00E-03	5.00013		-2.00E-09	2.00E-03	5.00112
-1.00E-09	1.00E-03	4.99911		-1.00E-09	1.00E-03	5.00062
1.00E-09	-1.00E-03	5.00402		1.00E-09	-1.00E-03	5.00271
2.00E-09	-2.00E-03	5.00419		2.00E-09	-2.00E-03	5.00291
3.00E-09	-3.00E-03	5.00422		3.00E-09	-3.00E-03	5.00296
4.00E-09	-4.00E-03	5.00432		4.00E-09	-4.00E-03	5.00301
5.00E-09	-5.00E-03	5.00432		5.00E-09	-5.00E-03	5.00312
1.00E-08	-1.00E-02	5.00436		1.00E-08	-1.00E-02	5.00312
5.00E-08	-5.00E-02	5.00439		5.00E-08	-5.00E-02	5.00313
1.00E-07	-1.00E-01	5.00448		1.00E-07	-1.00E-01	5.00315
5.00E-07	-5.00E-01	5.00453		5.00E-07	-5.00E-01	5.00321
1.00E-06	-1.00E+00	5.00459		1.00E-06	-1.00E+00	5.00325

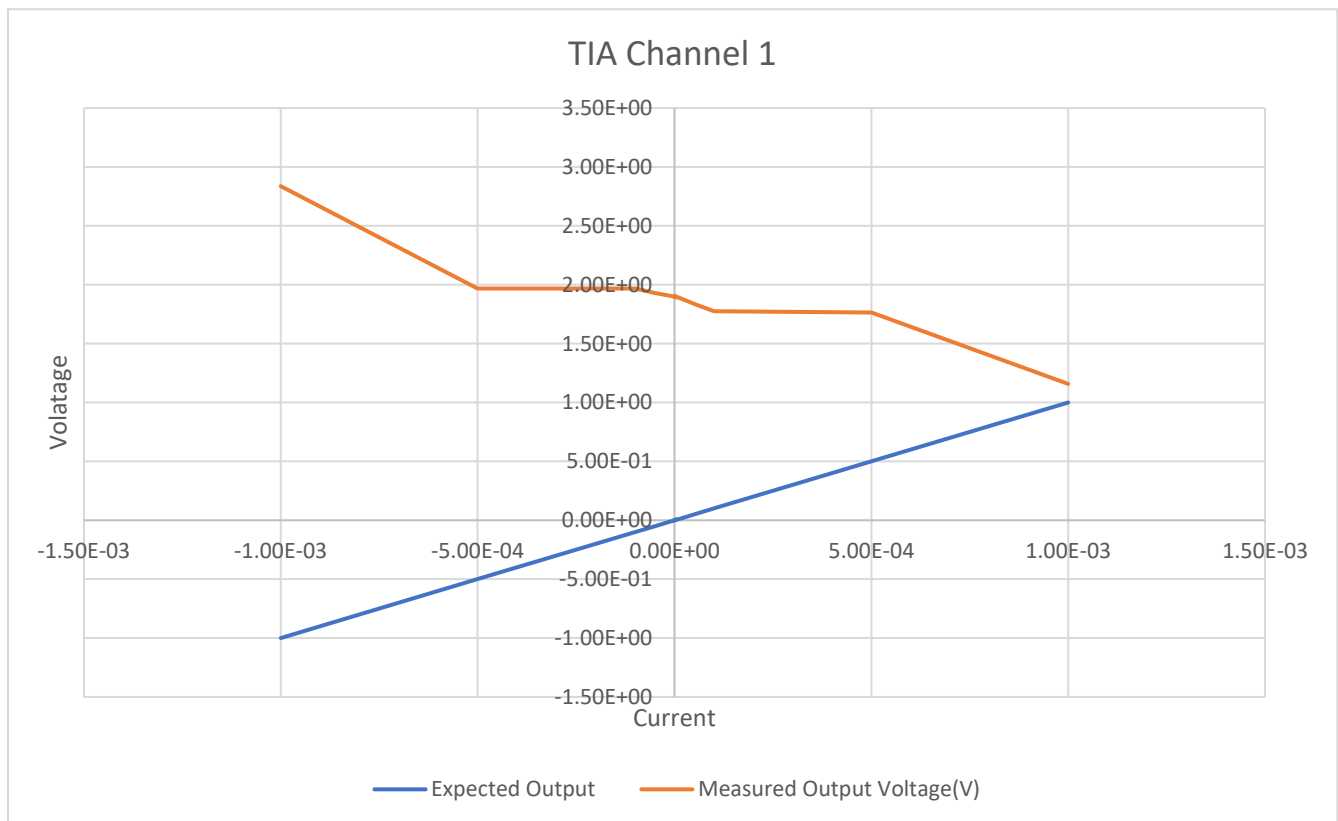


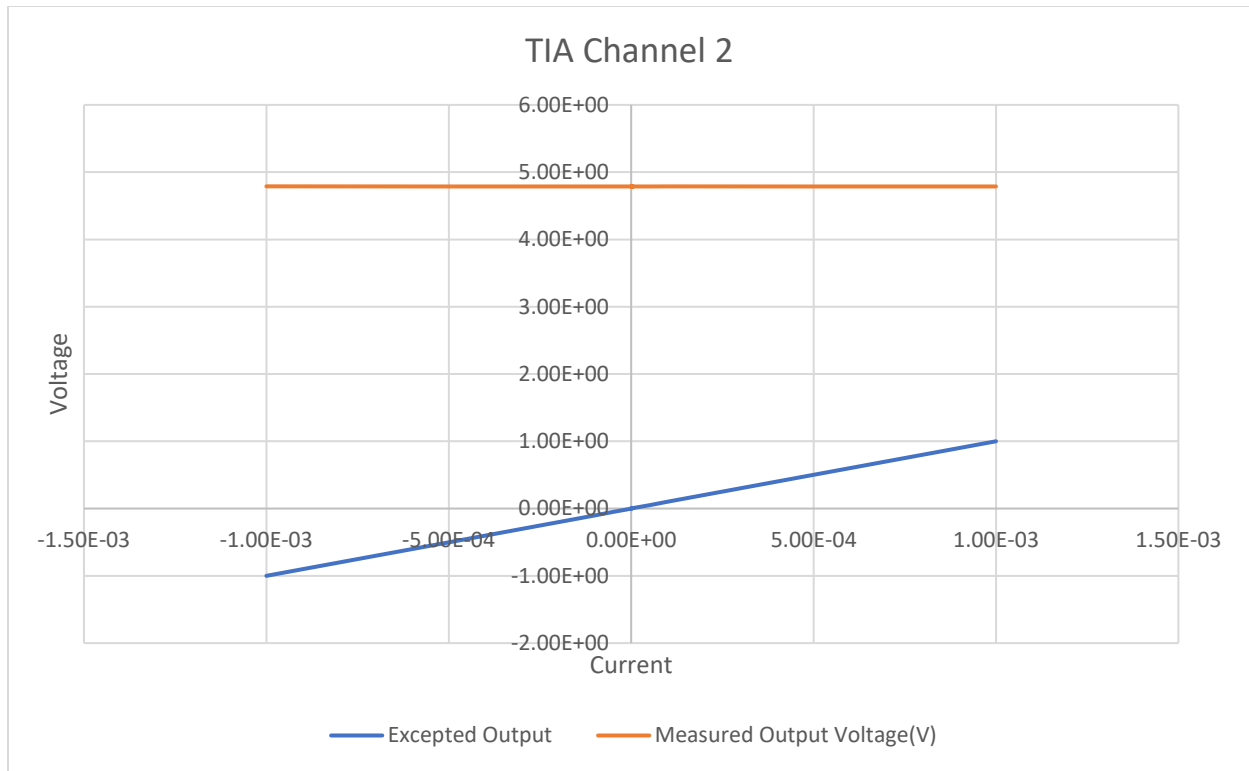
TIA Channel 3				TIA Channel 4		
Current(A)	Expected Output Voltage(V)	Measured Output Voltage(V)		Current(mA)	Expected Output Voltage(V)	Measured Output Voltage(V)
-1.00E-06	1.00E+00	5.00475		-1.00E-06	1.00E+00	5.00475
-5.00E-07	5.00E-01	5.00321		-5.00E-07	5.00E-01	5.00321
-1.00E-07	1.00E-01	5.00302		-1.00E-07	1.00E-01	5.00302
-5.00E-08	5.00E-02	5.00258		-5.00E-08	5.00E-02	5.00258
-1.00E-08	1.00E-02	5.00242		-1.00E-08	1.00E-02	5.00242
-5.00E-09	5.00E-03	5.00231		-5.00E-09	5.00E-03	5.00231
-4.00E-09	4.00E-03	5.00229		-4.00E-09	4.00E-03	5.00229
-3.00E-09	3.00E-03	5.00012		-3.00E-09	3.00E-03	5.00012
-2.00E-09	2.00E-03	5.00112		-2.00E-09	2.00E-03	5.00112
-1.00E-09	1.00E-03	5.00062		-1.00E-09	1.00E-03	5.00062
1.00E-09	-1.00E-03	5.00271		1.00E-09	-1.00E-03	5.00271
2.00E-09	-2.00E-03	5.00291		2.00E-09	-2.00E-03	5.00291
3.00E-09	-3.00E-03	5.00296		3.00E-09	-3.00E-03	5.00296
4.00E-09	-4.00E-03	5.00301		4.00E-09	-4.00E-03	5.00502
5.00E-09	-5.00E-03	5.0042		5.00E-09	-5.00E-03	5.0055
1.00E-08	-1.00E-02	5.00423		1.00E-08	-1.00E-02	5.00613
5.00E-08	-5.00E-02	5.00522		5.00E-08	-5.00E-02	5.00725
1.00E-07	-1.00E-01	5.00529		1.00E-07	-1.00E-01	5.00732
5.00E-07	-5.00E-01	5.00601		5.00E-07	-5.00E-01	5.00833
1.00E-06	-1.00E+00	5.0062		1.00E-06	-1.00E+00	5.00901



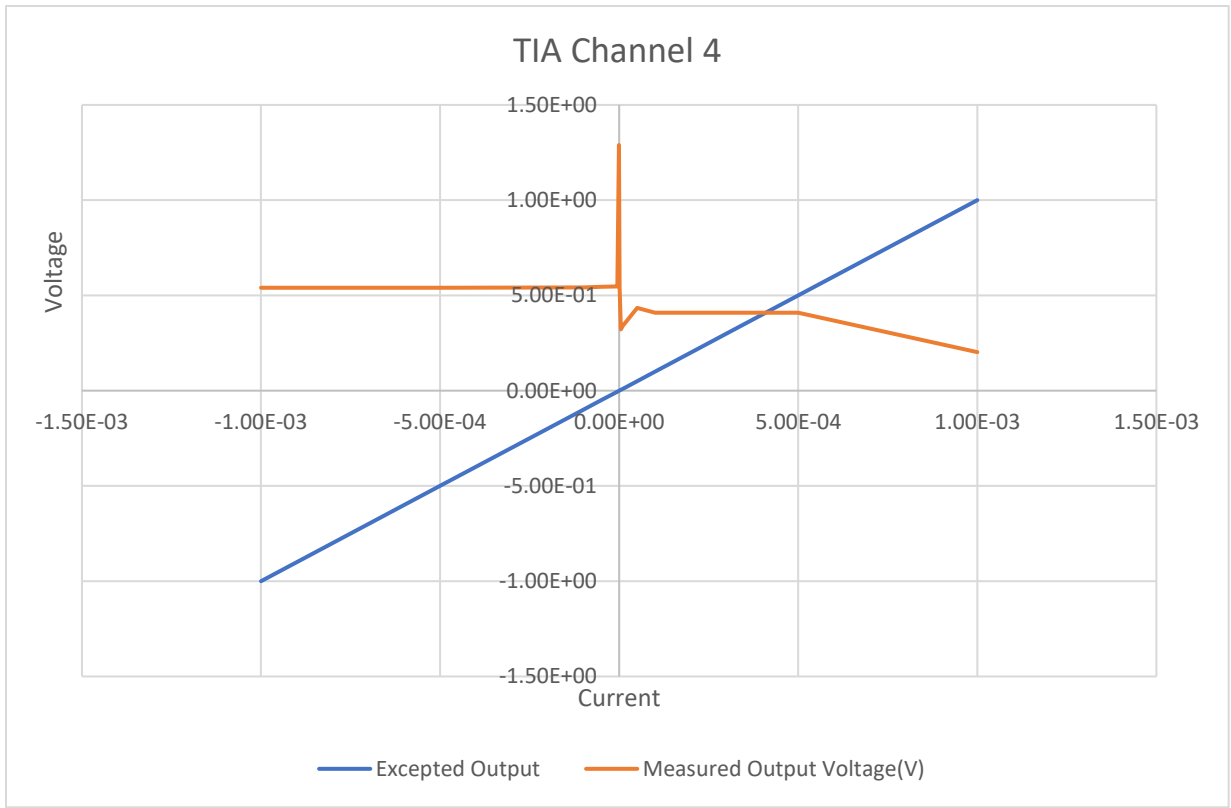
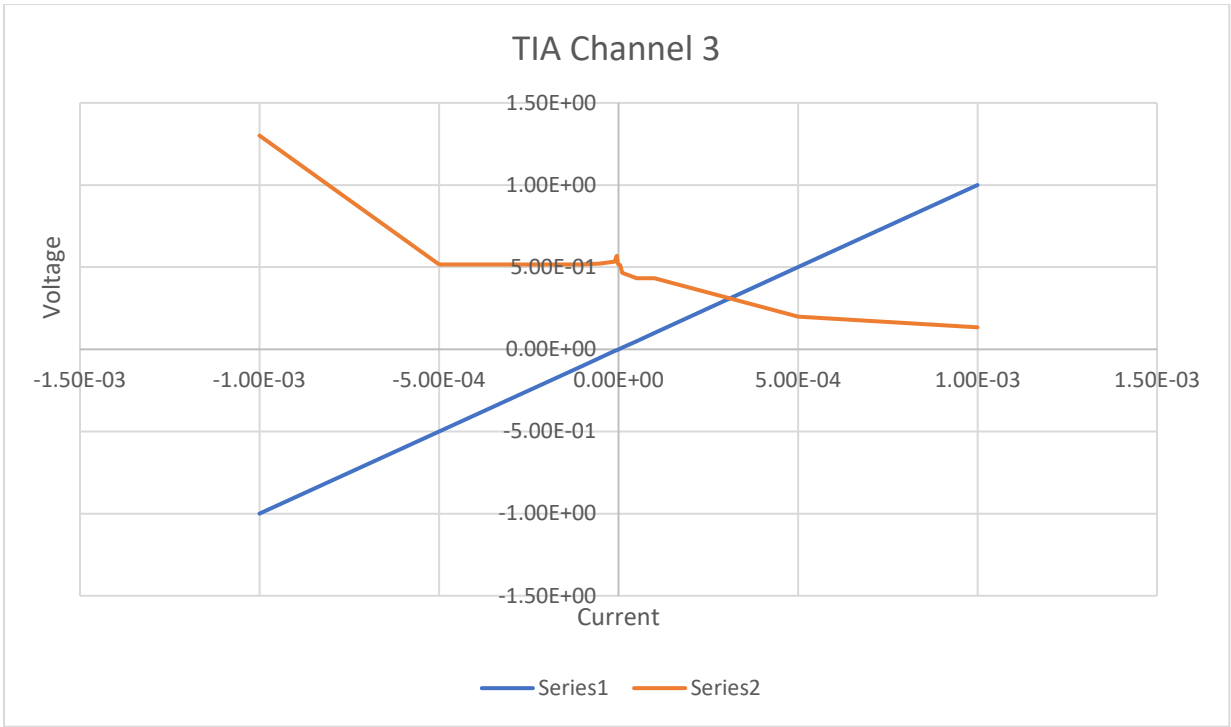
Gain Resistor, $R_f = 1\text{K}\Omega$; Bias Voltage, $V_{\text{bias}} = 0\text{V}$;

TIA Channel 1			TIA Channel 2		
Current(A)	Expected Output Voltage(V)	Measured Output Voltage(V)	Current(A)	Expected Output Voltage(V)	Measured Output Voltage(V)
-1.00E-03	1.00E+00	2.83686	-1.00E-03	1.00E+00	4.7894
-5.00E-04	5.00E-01	1.96681	-5.00E-04	5.00E-01	4.7892
-1.00E-04	1.00E-01	1.96681	-1.00E-04	1.00E-01	4.7893
-5.00E-05	5.00E-02	1.93033	-5.00E-05	5.00E-02	4.7891
-1.00E-05	1.00E-02	1.90423	-1.00E-05	1.00E-02	4.7892
-5.00E-06	5.00E-03	1.89117	-5.00E-06	5.00E-03	4.7892
-1.00E-06	1.00E-03	1.89985	-1.00E-06	1.00E-03	4.7888
1.00E-06	-1.00E-03	1.90442	1.00E-06	-1.00E-03	4.7888
5.00E-06	-5.00E-03	1.89743	5.00E-06	-5.00E-03	4.7888
1.00E-05	-1.00E-02	1.89059	1.00E-05	-1.00E-02	4.7887
5.00E-05	-5.00E-02	1.83688	5.00E-05	-5.00E-02	4.7887
1.00E-04	-1.00E-01	1.77572	1.00E-04	-1.00E-01	4.7885
5.00E-04	-5.00E-01	1.76532	5.00E-04	-5.00E-01	4.7887
1.00E-03	-1.00E+00	1.15799	1.00E-03	-1.00E+00	4.7887





TIA Channel 3				TIA Channel 4		
Current(A)	Expected Output Voltage(V)	Measured Output Voltage(V)		Current(A)	Expected Output Voltage(V)	Measured Output Voltage(V)
-1.00E-03	1.00E+00	1.30126		-1.00E-03	1.00E+00	0.54022
-5.00E-04	5.00E-01	0.51633		-5.00E-04	5.00E-01	0.54025
-1.00E-04	1.00E-01	0.51633		-1.00E-04	1.00E-01	0.54225
-5.00E-05	5.00E-02	0.52177		-5.00E-05	5.00E-02	0.54607
-1.00E-05	1.00E-02	0.53467		-1.00E-05	1.00E-02	0.51695
5.00E-06	5.00E-03	0.57001		5.00E-06	5.00E-03	0.54707
-1.00E-06	1.00E-03	0.51972		-1.00E-06	1.00E-03	1.28917
1.00E-06	-1.00E-03	0.51291		1.00E-06	-1.00E-03	0.54329
5.00E-06	-5.00E-03	0.51273		5.00E-06	-5.00E-03	0.32253
1.00E-05	-1.00E-02	0.46553		1.00E-05	-1.00E-02	0.34044
5.00E-05	-5.00E-02	0.43185		5.00E-05	-5.00E-02	0.43516
1.00E-04	-1.00E-01	0.43185		1.00E-04	-1.00E-01	0.40951
5.00E-04	-5.00E-01	1.98E+05		5.00E-04	-5.00E-01	0.40965
1.00E-03	-1.00E+00	1.34E-01		1.00E-03	-1.00E+00	2.02E-01



Summary: All the 4 Channels of TIA are not showing Linear Behaviour of Input Current Versus Output Voltage with Different Gain Resistors 1 Mega ohms and 1 Kilo ohms and also Saturating at Certain Current inputs

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