



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

| | |
|--------------------------------|--|
| Customer: _____ | Tested By: <u>Anton L.</u> |
| SO No: _____ | Temperature: <u>+25°C -40°C +85°C</u> |
| Model No: <u>HADA-D2002</u> | Date: <u>7/23/24</u> |
| Serial No: <u>PL47006/2431</u> | Drawing No: <u>27620222</u> Rev: <u>A1</u> |

| TEST ITEM NO | PARAMETERS | SPECIFIED VALUE | TEST RESULTS | QA QC |
|--------------|---|--|---|------------|
| 1 | Frequency Range: | 2.0 GHz – 18.0 GHz | 2.0 GHz – 18.0 GHz See Plot | PMI QA3 |
| 2 | TSS: | -40 dBm Min @ -40°C to +85° | -41.0 dBm See Plot | |
| 3 | Frequency Flatness: | ±1.65 dB Max | ±1.101 dB See Plot | |
| 4 | Input / Output Characteristics: (93 Ω) | Y = 2150 + 50X [X: Input (dBm), Y: Output (mv)] | Pass | |
| 5 | Logging Accuracy | ±1.5 dB Max (@ +25°C, 10 GHz)* [-36 dBm ≤ INPUT ≤ +4 dBm] ±3.1 dB Max (Note) | -0.68 / -1.28 dB +1.70 / -1.50 dB See Plot | |
| 6 | Log Linearity: | ±0.5 dB Max @ +25°C ±0.75 dB Max @ -40°C to +85°C | +0.33 / -0.29 dB +0.59 / -0.42 dB See Plot | |
| 7 | Maximum Input Power (CW): | +23 dBm | Pass | |
| 8 | Duty Cycle: | 100% | Pass | |
| 9 | Rise Time: | 30 ns Max (10% to 90%) | 23.8 ns See Plot | |
| 10 | Fall Time: | 500 ns Max (@ Pulse width 100usec input) (90% to 10%) | 119.3 ns See Plot | |
| 11 | DC Offset: (Input 50 Ω terminated): | +95 mV +55/-100 mV (@ -40°C to +85°C) | 108 mV @ +25°C 104 mV @ -40°C 97 mV @ +85°C | |
| 12 | Input VSWR: | 3.0:1 Max @ +23 dBm | 1.66:1 See Plot | |

4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

| | | | | |
|----|--------------------|---|----------------|------------|
| 13 | Propagation Delay: | 60 ns Max | 45 ns | PMI QA3 |
| 14 | Power Supply: | +12 ± 1VDC @ 125 mA Max -12 ± 1VDC @ 75 mA Max | 90 mA 40 mA | |
| 15 | Warm Up Time: | 2 Minutes Max | 2 Minutes | |

*Notes: Includes Frequency Flatness. Input Power, Temperature Deviation and Deviation for DC Offset. The test shall be performed using RG-62 (or equivalent), 5 meter, 93±0.5 Ohms terminated.

QA/QC Approval: *H. Luter*

Date: 7-25-24



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

Log Linearity and Log Accuracy @ +25°C

Output Voltage Offset= 0.108 Volts

| Frequency | INTERCEPT (mV) | SLOPE (mV/dB) |
|-----------|----------------|---------------|
| 2 GHz | 2174 | 49.4 |

| Frequency | INTERCEPT (mV) | SLOPE (mV/dB) |
|-----------|----------------|---------------|
| 6 GHz | 2152 | 49 |

| Frequency | INTERCEPT (mV) | SLOPE (mV/dB) |
|-----------|----------------|---------------|
| 10 GHz | 2098 | 49.7 |

| Frequency | INTERCEPT (mV) | SLOPE (mV/dB) |
|-----------|----------------|---------------|
| 14 GHz | 2113 | 49.4 |

| Frequency | INTERCEPT (mV) | SLOPE (mV/dB) |
|-----------|----------------|---------------|
| 18 GHz | 2108 | 50 |

| | |
|--------------------|--|
| Flatness +/- dB | |
| Max Video Output V | |
| Min Video Output V | |

| | -36 | -31 | -26 | -21 | -16 | -11 | -6 | -1 | 4 | RF Input Power (dBm) | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|-----------|-------|
| | 395 | 641 | 888 | 1127 | 1397 | 1646 | 1865 | 2116 | 2375 | Measured Value (mV) | Error(dB) | |
| | 0 | -1 | -1 | -9 | 14 | 16 | -12 | -8 | 4 | Error (mV) | MAX | MIN |
| | -0.01 | -0.03 | -0.03 | -0.19 | 0.28 | 0.32 | -0.25 | -0.17 | 0.08 | LINEARITY ERROR (dB) | 0.32 | -0.25 |
| | 0.90 | 0.82 | 0.76 | 0.54 | 0.94 | 0.92 | 0.30 | 0.32 | 0.50 | LOGGING ACCURACY (dB) | 0.94 | 0.30 |
| | 383 | 634 | 879 | 1117 | 1376 | 1625 | 1845 | 2096 | 2352 | Measured Value (mV) | Error(dB) | |
| | -4 | 2 | 2 | -5 | 9 | 13 | -13 | -7 | 4 | Error (mV) | MAX | MIN |
| | -0.09 | 0.03 | 0.03 | -0.11 | 0.17 | 0.26 | -0.26 | -0.13 | 0.09 | LINEARITY ERROR (dB) | 0.26 | -0.26 |
| | 0.66 | 0.68 | 0.58 | 0.34 | 0.52 | 0.50 | -0.10 | -0.08 | 0.04 | LOGGING ACCURACY (dB) | 0.68 | -0.10 |
| | 312 | 566 | 805 | 1045 | 1297 | 1553 | 1786 | 2046 | 2313 | Measured Value (mV) | Error(dB) | |
| | 4 | 9 | 0 | -9 | -6 | 2 | -14 | -2 | 16 | Error (mV) | MAX | MIN |
| | 0.07 | 0.18 | -0.01 | -0.18 | -0.11 | 0.04 | -0.28 | -0.05 | 0.33 | LINEARITY ERROR (dB) | 0.33 | -0.28 |
| | -0.76 | -0.68 | -0.90 | -1.10 | -1.06 | -0.94 | -1.28 | -1.08 | -0.74 | LOGGING ACCURACY (dB) | -0.68 | -1.28 |
| | 332 | 587 | 827 | 1064 | 1333 | 1583 | 1806 | 2059 | 2313 | Measured Value (mV) | Error(dB) | |
| | -3 | 5 | -2 | -12 | 10 | 13 | -11 | -5 | 3 | Error (mV) | MAX | MIN |
| | -0.06 | 0.10 | -0.04 | -0.24 | 0.21 | 0.27 | -0.21 | -0.09 | 0.05 | LINEARITY ERROR (dB) | 0.27 | -0.24 |
| | -0.36 | -0.26 | -0.46 | -0.72 | -0.34 | -0.34 | -0.88 | -0.82 | -0.74 | LOGGING ACCURACY (dB) | -0.26 | -0.88 |
| | 311 | 566 | 803 | 1043 | 1312 | 1567 | 1795 | 2056 | 2316 | Measured Value (mV) | Error(dB) | |
| | 3 | 8 | -5 | -15 | 4 | 9 | -13 | -2 | 8 | Error (mV) | MAX | MIN |
| | 0.06 | 0.16 | -0.09 | -0.29 | 0.09 | 0.19 | -0.25 | -0.03 | 0.17 | LINEARITY ERROR (dB) | 0.19 | -0.29 |
| | -0.78 | -0.68 | -0.94 | -1.14 | -0.76 | -0.66 | -1.10 | -0.88 | -0.68 | LOGGING ACCURACY (dB) | -0.66 | -1.14 |
| | 0.848 | 0.758 | 0.859 | 0.848 | 1.010 | 0.939 | 0.798 | 0.707 | 0.626 | | | |
| | 0.395 | 0.641 | 0.888 | 1.127 | 1.397 | 1.646 | 1.865 | 2.116 | 2.375 | | | |
| | 0.311 | 0.566 | 0.803 | 1.043 | 1.297 | 1.553 | 1.786 | 2.046 | 2.313 | | | |

| Logging Linearity vs Frequency | Error(dB) | |
|--------------------------------|-----------|-------|
| | MAX | MIN |
| LOGGING LINEARITY ERROR (dB) | 0.33 | -0.29 |

| Logging Accuracy vs Frequency | Error(dB) | |
|-------------------------------|-----------|-------|
| | MAX | MIN |
| LOGGING ACCURACY ERROR (dB) | 0.94 | -1.28 |

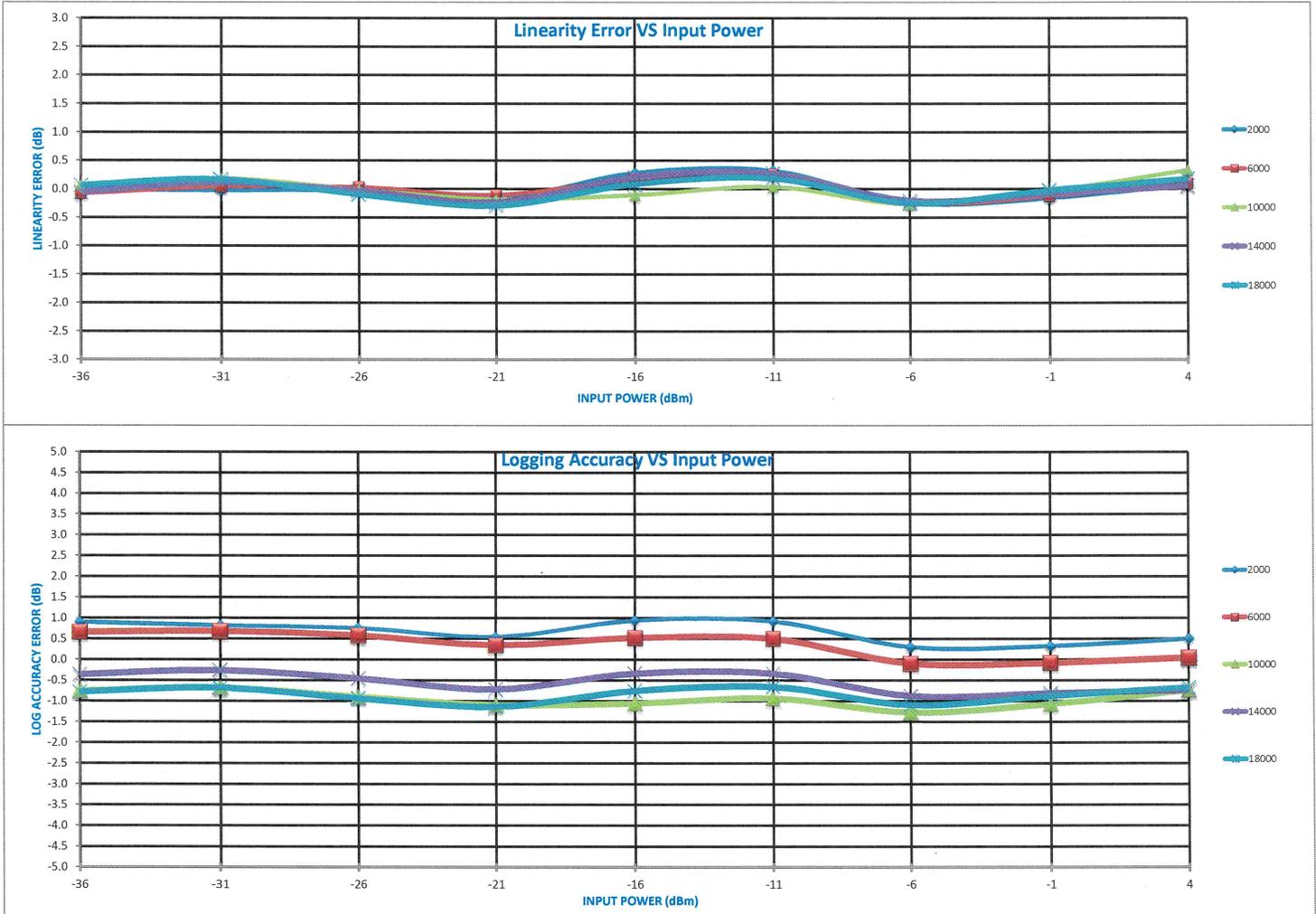
4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

Log Linearity and Log Accuracy @ +25°C



4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

Log Linearity and Log Accuracy @ -40°C

Output Voltage Offset= 0.104 Volts

Frequency

| | | |
|--------------|-----------------------|-------------|
| 2 GHz | INTERCEPT (mV) | 2199 |
| | SLOPE (mV/dB) | 49 |

| | | |
|--------------|-----------------------|-------------|
| 6 GHz | INTERCEPT (mV) | 2172 |
| | SLOPE (mV/dB) | 48.5 |

| | | |
|---------------|-----------------------|-------------|
| 10 GHz | INTERCEPT (mV) | 2118 |
| | SLOPE (mV/dB) | 49.2 |

| | | |
|---------------|-----------------------|-------------|
| 14 GHz | INTERCEPT (mV) | 2140 |
| | SLOPE (mV/dB) | 49 |

| | | |
|---------------|-----------------------|-------------|
| 18 GHz | INTERCEPT (mV) | 2116 |
| | SLOPE (mV/dB) | 49.5 |

| |
|---------------------------|
| Flatness +/- dB |
| Max Video Output V |
| Min Video Output V |

| | -36 | -31 | -26 | -21 | -16 | -11 | -6 | -1 | 4 | RF Input Power (dBm) | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|-----------|-------|
| | 435 | 670 | 920 | 1168 | 1435 | 1677 | 1903 | 2136 | 2390 | Measured Value (mV) | Error(dB) | |
| | 0 | -10 | -5 | -2 | 20 | 17 | -2 | -14 | -4 | Error (mV) | MAX | MIN |
| | -0.01 | -0.21 | -0.10 | -0.04 | 0.41 | 0.35 | -0.03 | -0.28 | -0.09 | LINEARITY ERROR (dB) | 0.41 | -0.28 |
| | 1.70 | 1.40 | 1.40 | 1.36 | 1.70 | 1.54 | 1.06 | 0.72 | 0.80 | LOGGING ACCURACY (dB) | 1.70 | 0.72 |
| | 419 | 660 | 910 | 1155 | 1410 | 1654 | 1878 | 2114 | 2360 | Measured Value (mV) | Error(dB) | |
| | -6 | -8 | 0 | 2 | 14 | 16 | -3 | -10 | -6 | Error (mV) | MAX | MIN |
| | -0.12 | -0.15 | 0.00 | 0.04 | 0.30 | 0.32 | -0.06 | -0.20 | -0.13 | LINEARITY ERROR (dB) | 0.32 | -0.20 |
| | 1.38 | 1.20 | 1.20 | 1.10 | 1.20 | 1.08 | 0.56 | 0.28 | 0.20 | LOGGING ACCURACY (dB) | 1.38 | 0.20 |
| | 347 | 595 | 840 | 1077 | 1333 | 1587 | 1816 | 2069 | 2316 | Measured Value (mV) | Error(dB) | |
| | 0 | 2 | 1 | -8 | 2 | 10 | -7 | 0 | 1 | Error (mV) | MAX | MIN |
| | 0.00 | 0.04 | 0.02 | -0.16 | 0.04 | 0.20 | -0.14 | 0.00 | 0.02 | LINEARITY ERROR (dB) | 0.20 | -0.16 |
| | -0.06 | -0.10 | -0.20 | -0.46 | -0.34 | -0.26 | -0.68 | -0.62 | -0.68 | LOGGING ACCURACY (dB) | -0.06 | -0.68 |
| | 373 | 617 | 864 | 1102 | 1371 | 1619 | 1843 | 2087 | 2328 | Measured Value (mV) | Error(dB) | |
| | -3 | -4 | -2 | -9 | 15 | 18 | -3 | -4 | -8 | Error (mV) | MAX | MIN |
| | -0.05 | -0.08 | -0.04 | -0.18 | 0.31 | 0.37 | -0.06 | -0.09 | -0.17 | LINEARITY ERROR (dB) | 0.37 | -0.18 |
| | 0.46 | 0.34 | 0.28 | 0.04 | 0.42 | 0.38 | -0.14 | -0.26 | -0.44 | LOGGING ACCURACY (dB) | 0.46 | -0.44 |
| | 336 | 582 | 823 | 1060 | 1333 | 1587 | 1814 | 2068 | 2310 | Measured Value (mV) | Error(dB) | |
| | 3 | 1 | -5 | -16 | 9 | 16 | -5 | 1 | -5 | Error (mV) | MAX | MIN |
| | 0.06 | 0.03 | -0.11 | -0.32 | 0.19 | 0.32 | -0.10 | 0.02 | -0.09 | LINEARITY ERROR (dB) | 0.32 | -0.32 |
| | -0.28 | -0.36 | -0.54 | -0.80 | -0.34 | -0.26 | -0.72 | -0.64 | -0.80 | LOGGING ACCURACY (dB) | -0.26 | -0.80 |
| | 1.009 | 0.897 | 0.989 | 1.101 | 1.040 | 0.917 | 0.907 | 0.693 | 0.815 | | | |
| | 0.435 | 0.670 | 0.920 | 1.168 | 1.435 | 1.677 | 1.903 | 2.136 | 2.390 | | | |
| | 0.336 | 0.582 | 0.823 | 1.060 | 1.333 | 1.587 | 1.814 | 2.068 | 2.310 | | | |

| | | |
|---------------------------------------|------------------|-------|
| Logging Linearity vs Frequency | Error(dB) | |
| | MAX | MIN |
| LOGGING LINEARITY ERROR (dB) | 0.41 | -0.32 |

| | | |
|--------------------------------------|------------------|-------|
| Logging Accuracy vs Frequency | Error(dB) | |
| | MAX | MIN |
| LOGGING ACCURACY ERROR (dB) | 1.70 | -0.80 |

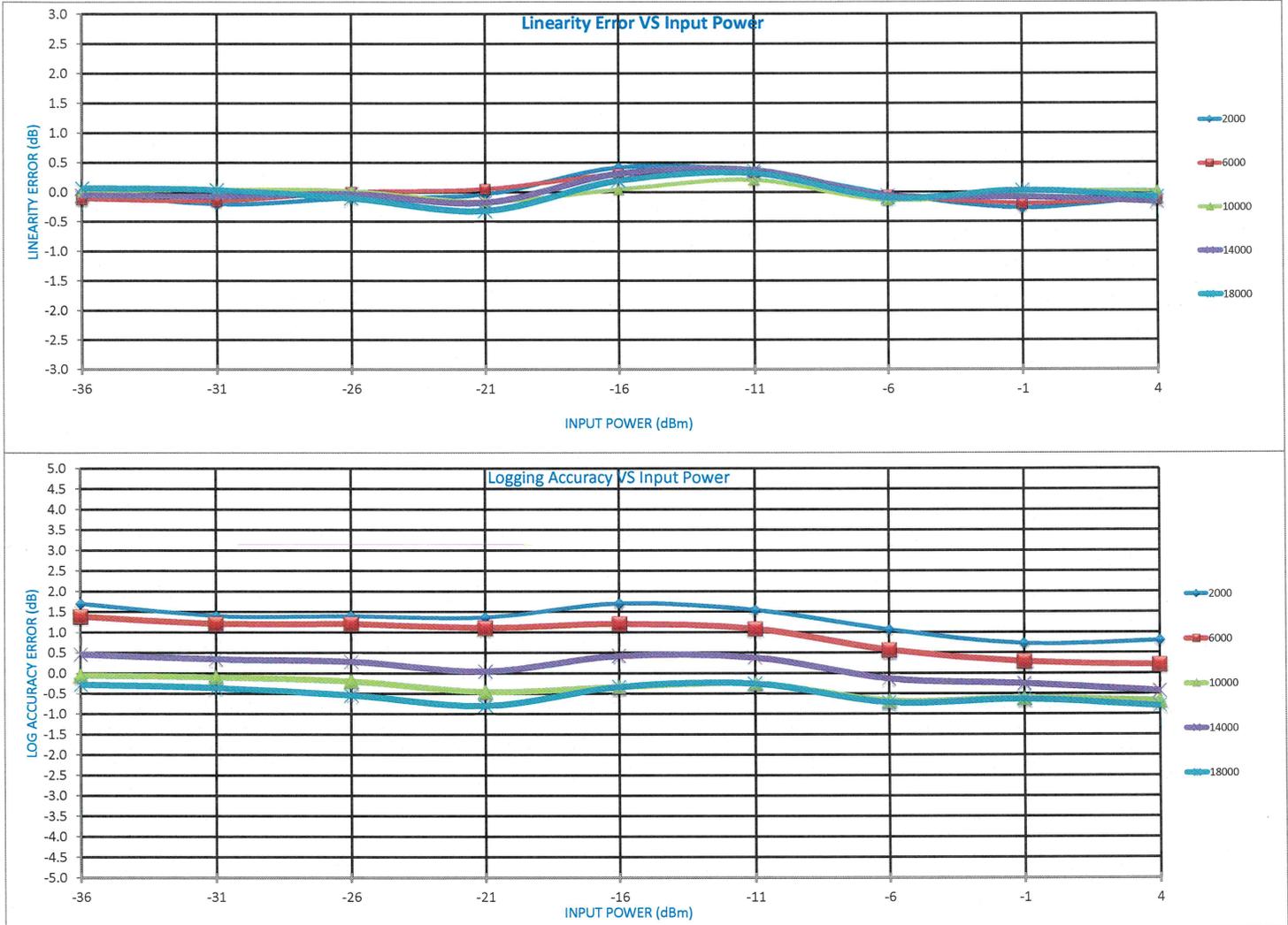
4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

Log Linearity and Log Accuracy @ -40°C



4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

Log Linearity and Log Accuracy @ +85°C

Output Voltage Offset= 0.097 Volts

Frequency

| | | |
|--------------|-----------------------|-------------|
| 2 GHz | INTERCEPT (mV) | 2180 |
| | SLOPE (mV/dB) | 50.2 |

| | | |
|--------------|-----------------------|-------------|
| 6 GHz | INTERCEPT (mV) | 2160 |
| | SLOPE (mV/dB) | 49.9 |

| | | |
|---------------|-----------------------|-------------|
| 10 GHz | INTERCEPT (mV) | 2105 |
| | SLOPE (mV/dB) | 50.6 |

| | | |
|---------------|-----------------------|-------------|
| 14 GHz | INTERCEPT (mV) | 2107 |
| | SLOPE (mV/dB) | 50.3 |

| | | |
|---------------|-----------------------|-------------|
| 18 GHz | INTERCEPT (mV) | 2100 |
| | SLOPE (mV/dB) | 50.7 |

| |
|---------------------------|
| Flatness +/- dB |
| Max Video Output V |
| Min Video Output V |

| | -36 | -31 | -26 | -21 | -16 | -11 | -6 | -1 | 4 | RF Input Power (dBm) | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------|-----------|-------|
| | 367 | 633 | 877 | 1116 | 1388 | 1638 | 1859 | 2119 | 2394 | Measured Value (mV) | Error(dB) | |
| | -6 | 9 | 2 | -10 | 11 | 10 | -20 | -10 | 14 | Error (mV) | MAX | MIN |
| | -0.13 | 0.18 | 0.04 | -0.20 | 0.22 | 0.21 | -0.39 | -0.21 | 0.27 | LINEARITY ERROR (dB) | 0.27 | -0.39 |
| | 0.34 | 0.66 | 0.54 | 0.32 | 0.76 | 0.76 | 0.18 | 0.38 | 0.88 | LOGGING ACCURACY (dB) | 0.88 | 0.18 |
| | 355 | 625 | 869 | 1107 | 1367 | 1618 | 1840 | 2099 | 2378 | Measured Value (mV) | Error(dB) | |
| | -9 | 11 | 6 | -6 | 5 | 7 | -21 | -11 | 18 | Error (mV) | MAX | MIN |
| | -0.18 | 0.23 | 0.12 | -0.11 | 0.10 | 0.13 | -0.42 | -0.23 | 0.36 | LINEARITY ERROR (dB) | 0.36 | -0.42 |
| | 0.10 | 0.50 | 0.38 | 0.14 | 0.34 | 0.36 | -0.20 | -0.02 | 0.56 | LOGGING ACCURACY (dB) | 0.56 | -0.20 |
| | 283 | 550 | 794 | 1036 | 1285 | 1543 | 1783 | 2044 | 2337 | Measured Value (mV) | Error(dB) | |
| | 0 | 14 | 5 | -6 | -10 | -5 | -18 | -10 | 30 | Error (mV) | MAX | MIN |
| | 0.00 | 0.28 | 0.10 | -0.12 | -0.20 | -0.10 | -0.36 | -0.20 | 0.59 | LINEARITY ERROR (dB) | 0.59 | -0.36 |
| | -1.34 | -1.00 | -1.12 | -1.28 | -1.30 | -1.14 | -1.34 | -1.12 | -0.26 | LOGGING ACCURACY (dB) | -0.26 | -1.34 |
| | 291 | 560 | 802 | 1043 | 1309 | 1561 | 1791 | 2045 | 2322 | Measured Value (mV) | Error(dB) | |
| | -7 | 11 | 2 | -8 | 6 | 7 | -14 | -11 | 14 | Error (mV) | MAX | MIN |
| | -0.13 | 0.22 | 0.04 | -0.17 | 0.13 | 0.14 | -0.28 | -0.23 | 0.29 | LINEARITY ERROR (dB) | 0.29 | -0.28 |
| | -1.18 | -0.80 | -0.96 | -1.14 | -0.82 | -0.78 | -1.18 | -1.10 | -0.56 | LOGGING ACCURACY (dB) | -0.56 | -1.18 |
| | 275 | 539 | 782 | 1025 | 1291 | 1548 | 1782 | 2041 | 2319 | Measured Value (mV) | Error(dB) | |
| | 0 | 10 | 0 | -11 | 2 | 5 | -14 | -8 | 16 | Error (mV) | MAX | MIN |
| | -0.01 | 0.20 | -0.01 | -0.21 | 0.04 | 0.11 | -0.28 | -0.16 | 0.32 | LINEARITY ERROR (dB) | 0.32 | -0.28 |
| | -1.50 | -1.22 | -1.36 | -1.50 | -1.18 | -1.04 | -1.36 | -1.18 | -0.62 | LOGGING ACCURACY (dB) | -0.62 | -1.50 |
| | 0.914 | 0.934 | 0.944 | 0.904 | 1.023 | 0.944 | 0.765 | 0.775 | 0.745 | | | |
| | 0.367 | 0.633 | 0.877 | 1.116 | 1.388 | 1.638 | 1.859 | 2.119 | 2.394 | | | |
| | 0.275 | 0.539 | 0.782 | 1.025 | 1.285 | 1.543 | 1.782 | 2.041 | 2.319 | | | |

| | | |
|---------------------------------------|------------------|-------|
| Logging Linearity vs Frequency | Error(dB) | |
| | MAX | MIN |
| LOGGING LINEARITY ERROR (dB) | 0.59 | -0.42 |

| | | |
|--------------------------------------|------------------|-------|
| Logging Accuracy vs Frequency | Error(dB) | |
| | MAX | MIN |
| LOGGING ACCURACY ERROR (dB) | 0.88 | -1.50 |

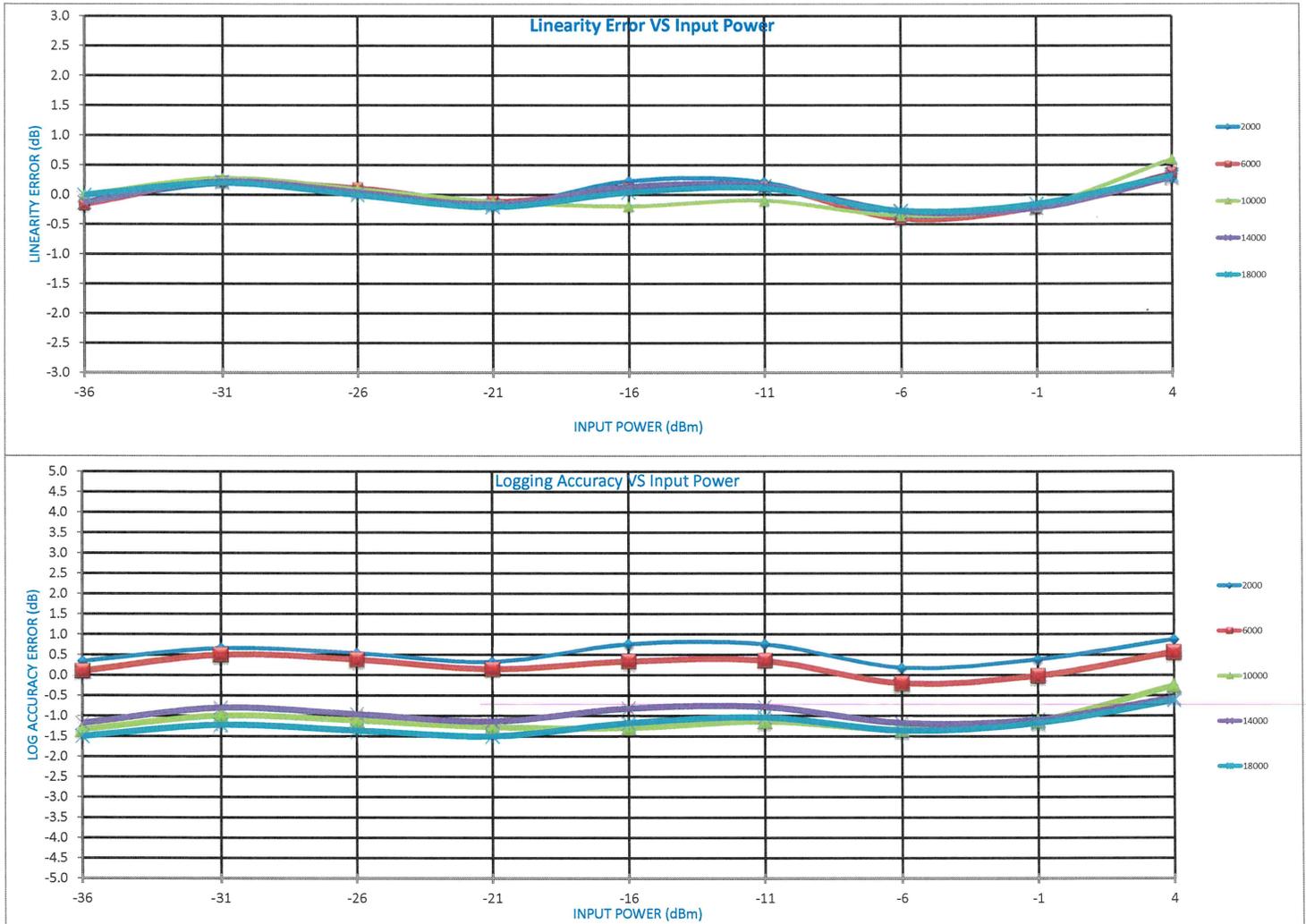
4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

Log Linearity and Log Accuracy @ +85°C



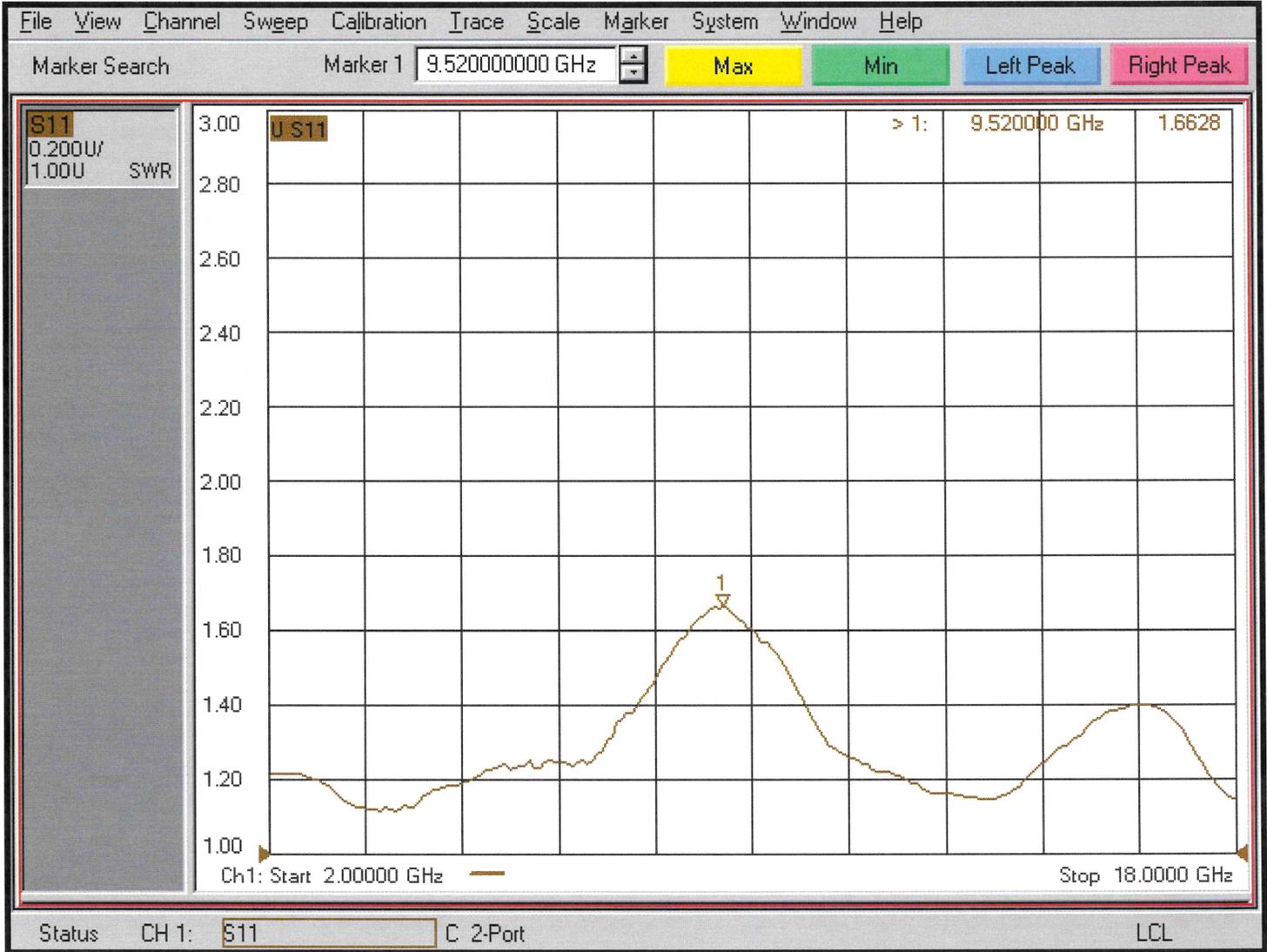
4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

VSWR 1.66:1



4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax:
(916)265-2597
Email: sales@pmi-rf.com



**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

TSS @ -41.0 dBm

M50-X 3054A, MY53400180: Tue Jul 23 08:21:10 2024



4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax:
(916)265-2597
Email: sales@pmi-rf.com

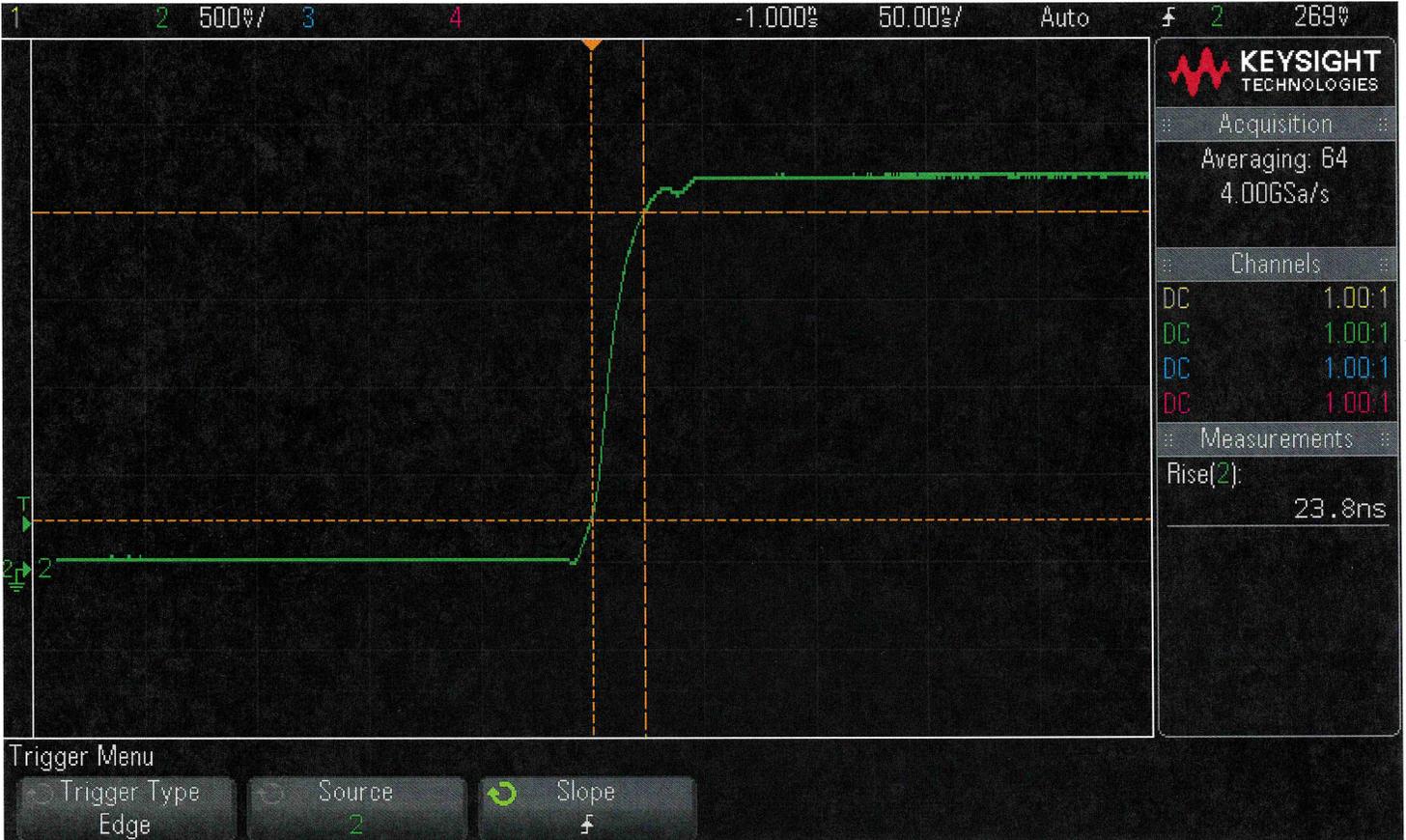


**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

Rise Time 23.8 ns

MSO-X 3054A, MY53400180: Tue Jul 23 08:04:55 2024



4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com

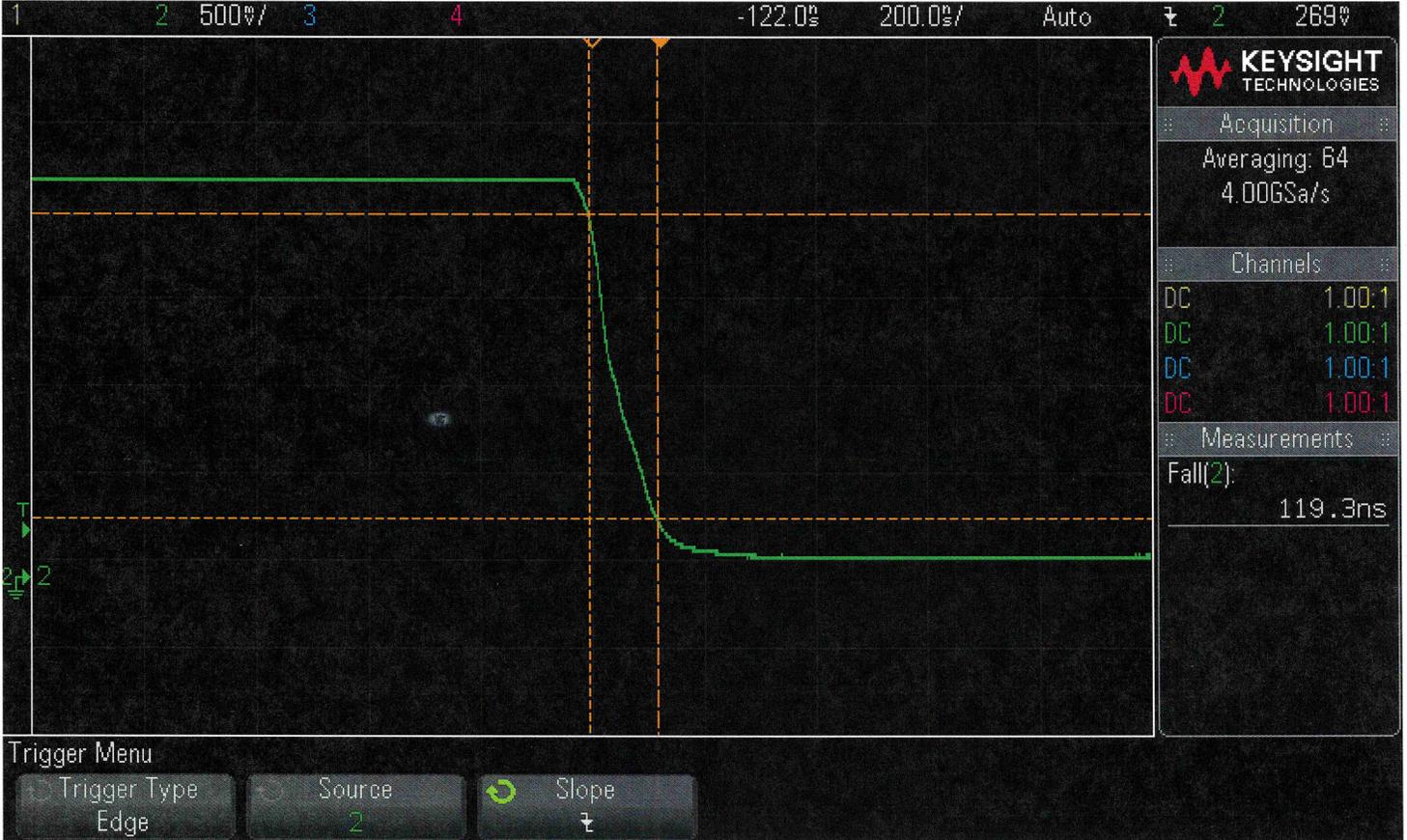


**SUMMARY TEST DATA
ON
HADA-D2002**

PL47006/2431

Fall Time 119.3 ns

MSO-X 3054A, MY53400180: Tue Jul 23 08:08:20 2024



4921 Robert J. Mathews Pkwy Suite 1, El Dorado Hills, CA 95762 USA Phone: (916)542-1401 Fax: (916)265-2597
Email: sales@pmi-rf.com