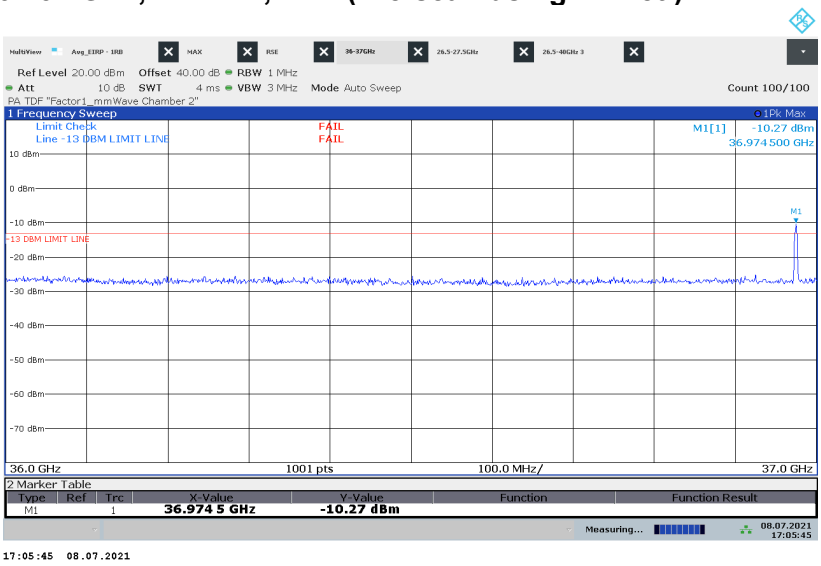
## 36 - 37 GHz n260, 2CC

**36 - 37 GHz, ANT M1, 2CC (Pre-scan using Pk Det.)**




Worst case configuration:
SISO-DUAL_QPSK_(50 MHz + 50 MHz)_Low CH_RB Offset 1/15 (1RB-M)

Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.

Highest emission in this band was investigated.

| Antenna | Freq. | Meas. Distance | Rx Ant. Polarity | Corrected Avg EIRP | TRP Limit | Margin |
|---|---|---|---|---|---|---|
| | (GHz) | (m) | H/V | (dBm) | (dBm) | (dB) |
| M1 | 36.974 | 3 | H | -20.07 | -13 | -7.07 |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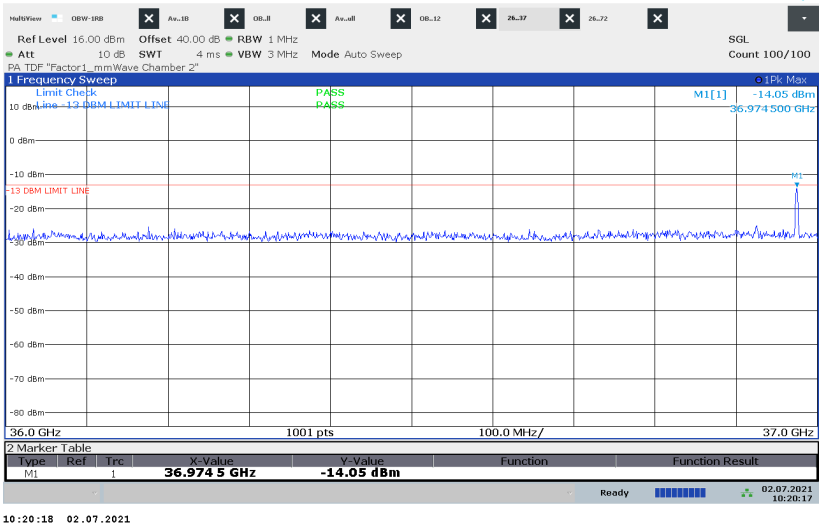
**36 - 37 GHz, ANT M2, 2CC (Pre-scan using Pk Det.)**




Worst case configuration:
SISO-DUAL_QPSK_(100 MHz + 100 MHz)_Low CH_RB Offset 1/32 (1RB-M)

Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.

Highest emission in this band was investigated.

| Antenna | Freq. | Meas. Distance | Rx Ant. Polarity | Corrected Avg EIRP | TRP Limit | Margin |
|---|---|---|---|---|---|---|
| | (GHz) | (m) | H/V | (dBm) | (dBm) | (dB) |
| M2 | 36.974 | 3 | V | -22.26 | -13 | -9.26 |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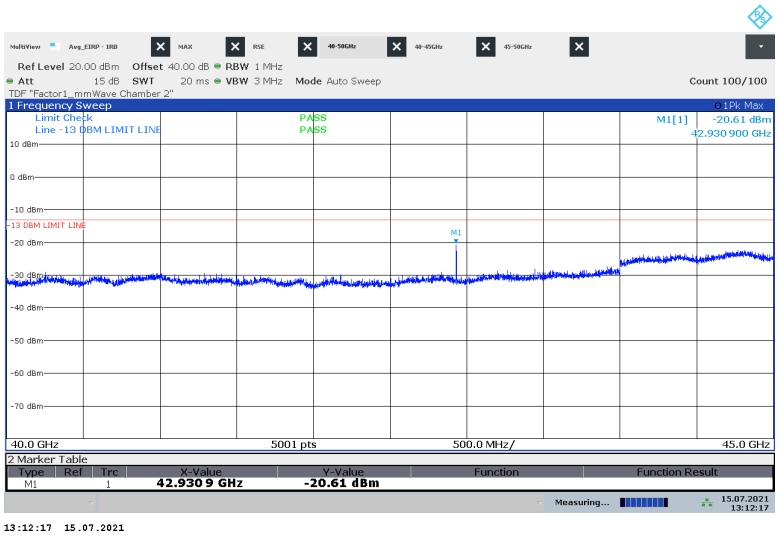
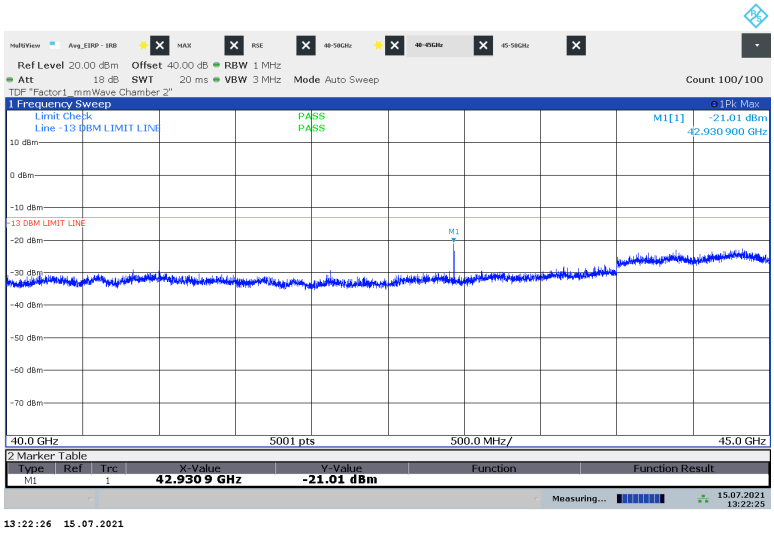
### 8.4.30. RSE n260 40 - 50 GHz

Note: 37 - 40 GHz covered by Fundamental and BE measurements.

**40 – 45 GHz, ANT M1, 1CC (Pre-scan using Pk Det.)**
**Horizontal**




**40 – 45 GHz, ANT M1, 1CC (Pre-scan using Pk Det.)**
**Vertical**




Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.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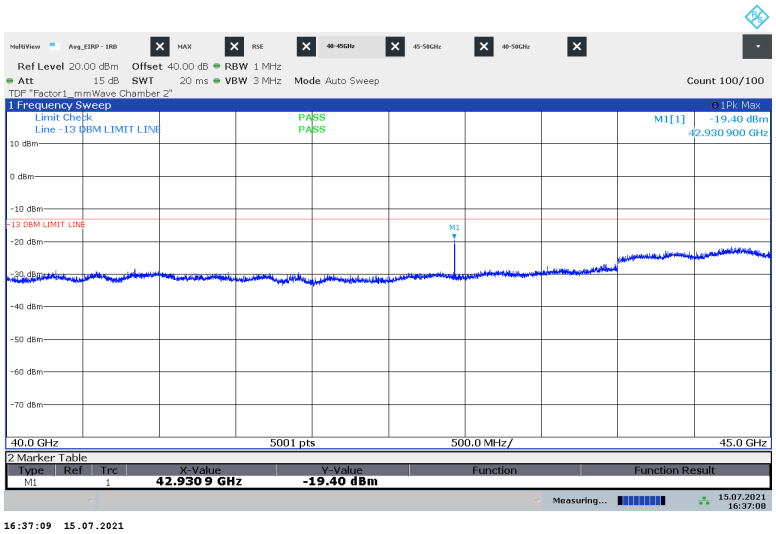
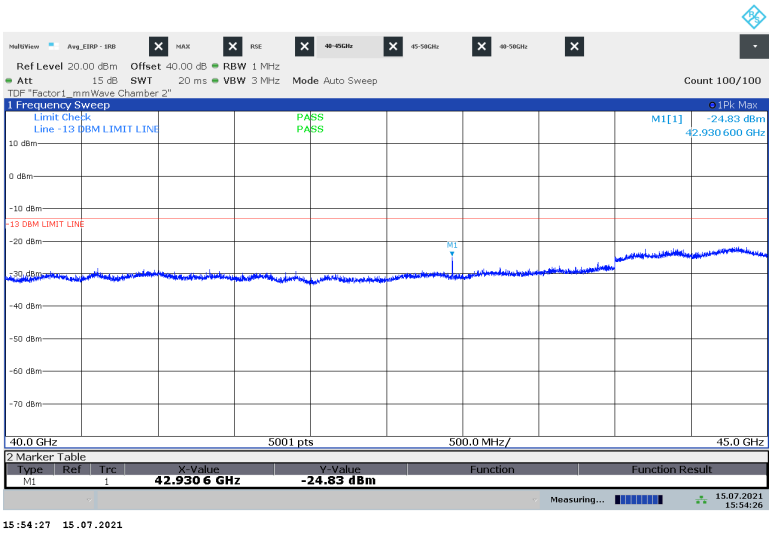
**40 – 45 GHz, ANT M2, 1CC (Pre-scan using Pk Det.)**
**Horizontal**




**40 – 45 GHz, ANT M2, 1CC (Pre-scan using Pk Det.)**
**Vertical**




Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.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**40 - 45 GHz n260, 1CC**

| Antenna | Freq. | Meas. Distance | Rx Ant. Polarity | Corrected Avg EIRP | TRP Limit | Margin |
|---|---|---|---|---|---|---|
| | (GHz) | (m) | H/V | (dBm) | (dBm) | (dB) |
| M1 | 42.931 | 3 | H | -22.35 | -13 | -9.35 |
| M1 | 42.931 | 3 | V | -23.28 | -13 | -10.28 |
| M2 | 42.931 | 3 | H | -22.52 | -13 | -9.52 |
| M2 | 42.931 | 3 | V | -32.01 | -13 | -19.01 |


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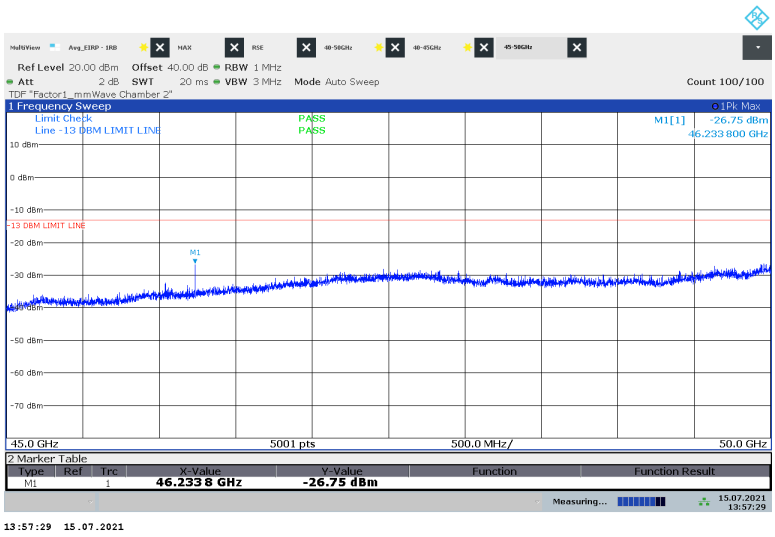
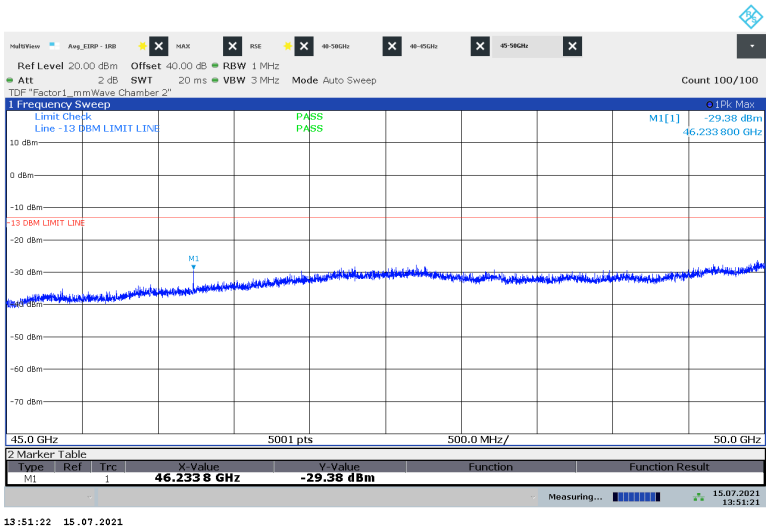
**45 – 50 GHz, ANT M1, 1CC (Pre-scan using Pk Det.)**
**Horizontal**




**45 – 50 GHz, ANT M1, 1CC (Pre-scan using Pk Det.)**
**Vertical**




Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.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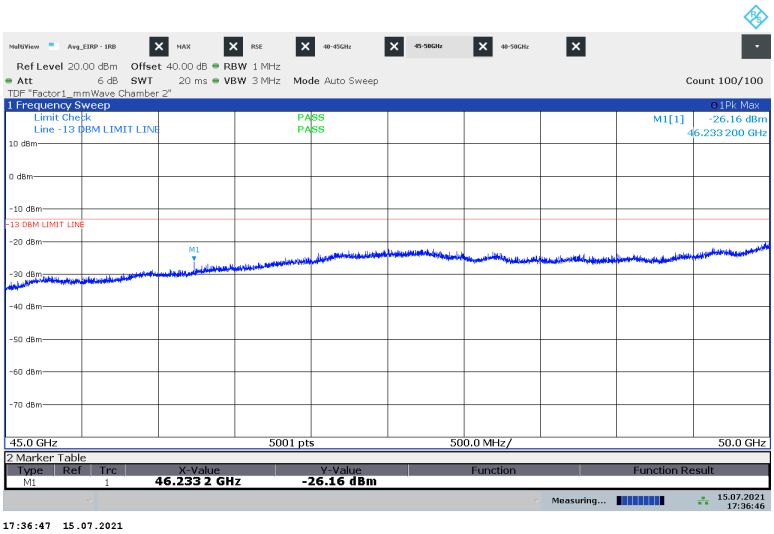
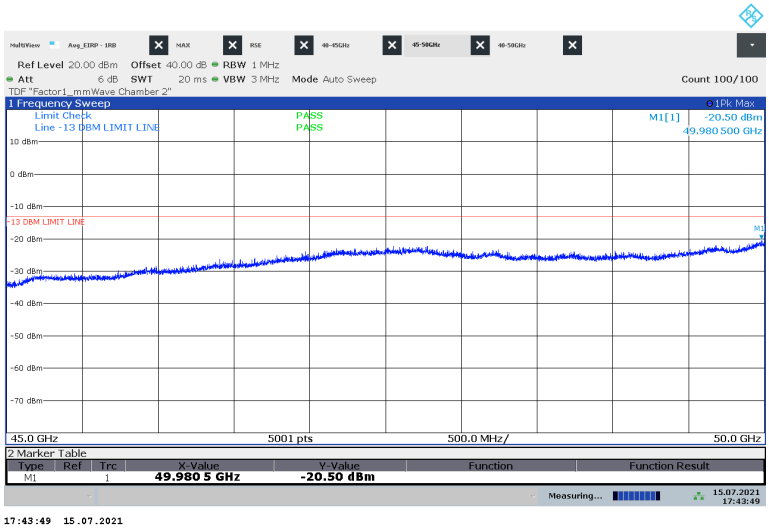
**45 – 50 GHz, ANT M2, 1CC (Pre-scan using Pk Det.)**
**Horizontal**




**45 – 50 GHz, ANT M2, 1CC (Pre-scan using Pk Det.)**
**Vertical**




Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.



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**45 - 50 GHz n260, 1CC**

| Antenna | Freq. | Meas. Distance | Rx Ant. Polarity | Corrected Avg EIRP | TRP Limit | Margin |
|---|---|---|---|---|---|---|
| | (GHz) | (m) | H/V | (dBm) | (dBm) | (dB) |
| M1 | 46.233 | 3 | H | -30.16 | -13 | -17.16 |
| M1 | 46.233 | 3 | V | -32.17 | -13 | -19.17 |
| M2 | 46.233 | 3 | H | -30.56 | -13 | -17.56 |
| M2 | 46.233 | 3 | V | -40.29 | -13 | -27.29 |


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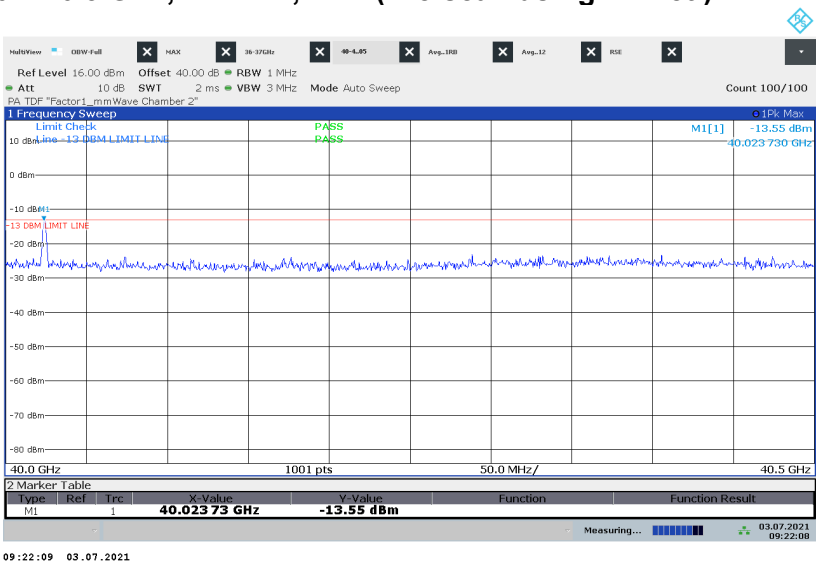
## 40 – 40.5 GHz n260, 2CC

**40 – 40.5 GHz, ANT M1, 2CC (Pre-scan using Pk Det.)**




Worst case configuration:
SISO-DUAL_QPSK_(50 MHz + 50 MHz)_High CH_RB Offset 1/15 (1RB-M)

Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.

Highest emission in this band was investigated.

| Antenna | Freq. | Meas. Distance | Rx Ant. Polarity | Corrected Avg EIRP | TRP Limit | Margin |
|---|---|---|---|---|---|---|
| | (GHz) | (m) | H/V | (dBm) | (dBm) | (dB) |
| M1 | 40.024 | 3 | H | -21.17 | -13 | -8.17 |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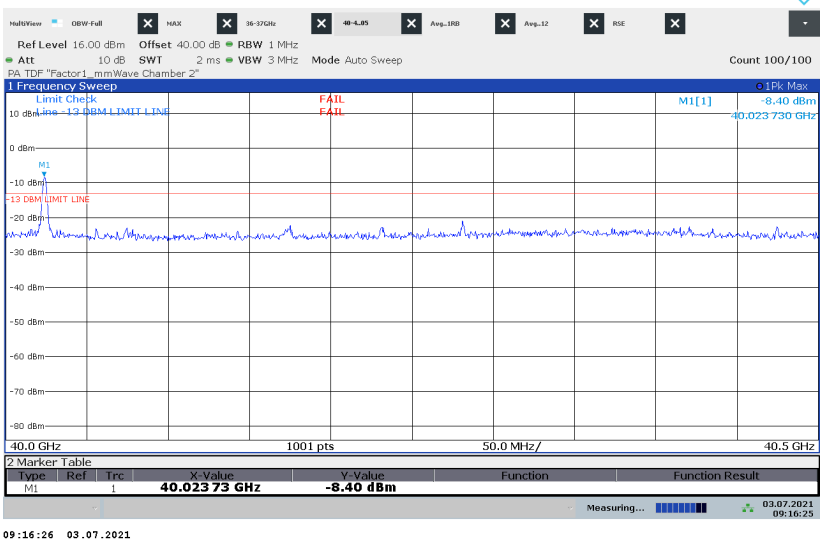
**40 – 40.5 GHz, ANT M2, 2CC (Pre-scan using Pk Det.)**




Worst case configuration:
SISO-DUAL_QPSK_(100 MHz + 100 MHz)_High CH_RB Offset 1/32 (1RB-M)

Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.

Highest emission in this band was investigated.

| Antenna | Freq. | Meas. Distance | Rx Ant. Polarity | Corrected Avg EIRP | TRP Limit | Margin |
|---|---|---|---|---|---|---|
| | (GHz) | (m) | H/V | (dBm) | (dBm) | (dB) |
| M2 | 40.024 | 3 | V | -21.61 | -13 | -8.61 |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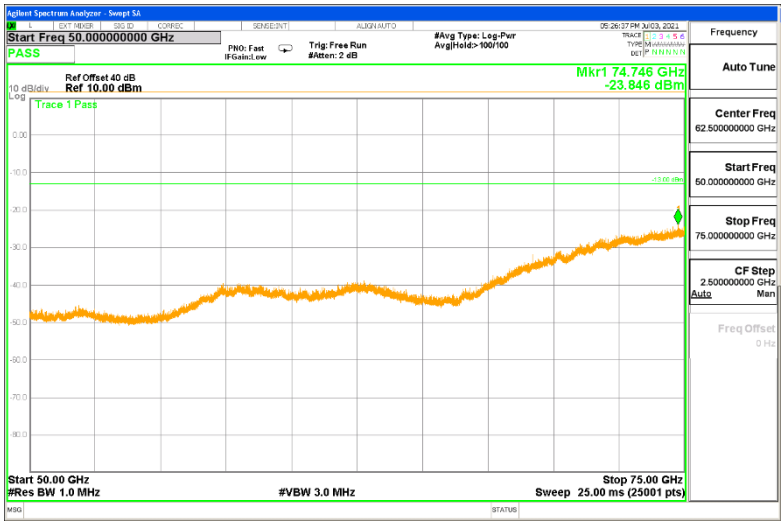
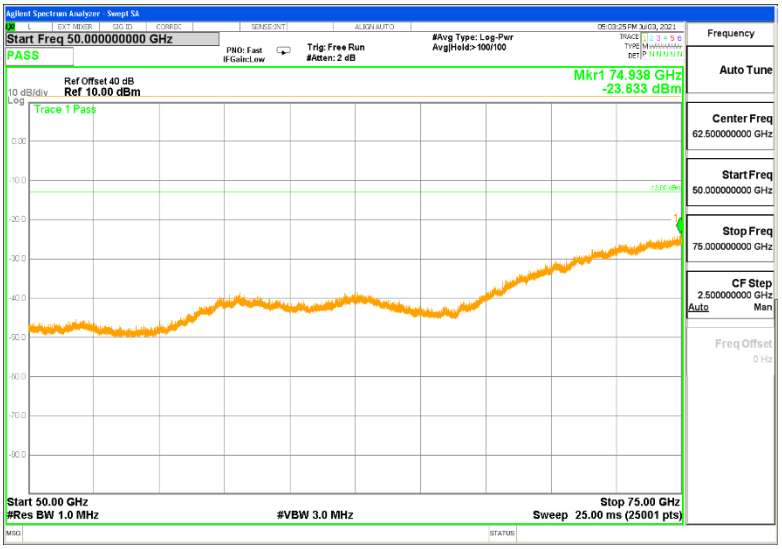
### 8.4.31. RSE n260 50 - 75 GHz

**50 - 75 GHz, ANT M1 (Pre-scan using Pk Det.)**
**Horizontal**




**50 - 75 GHz, ANT M1 (Pre-scan using Pk Det.)**
**Vertical**




No emission detected using Peak Detection.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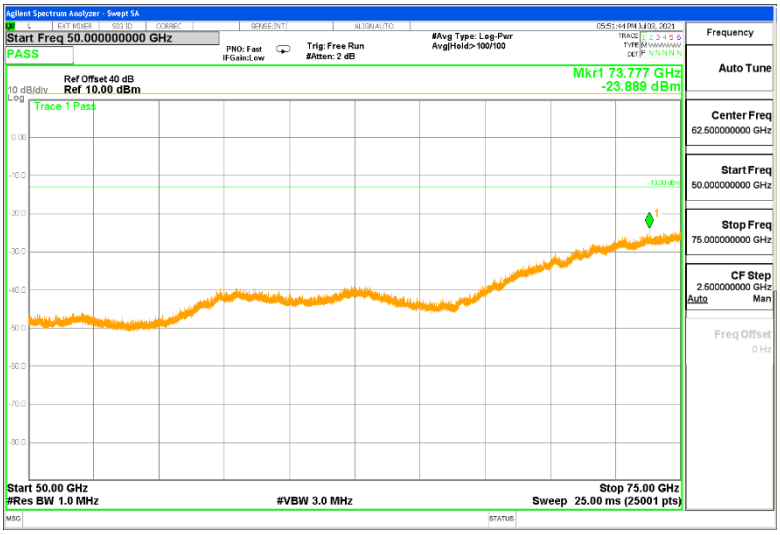
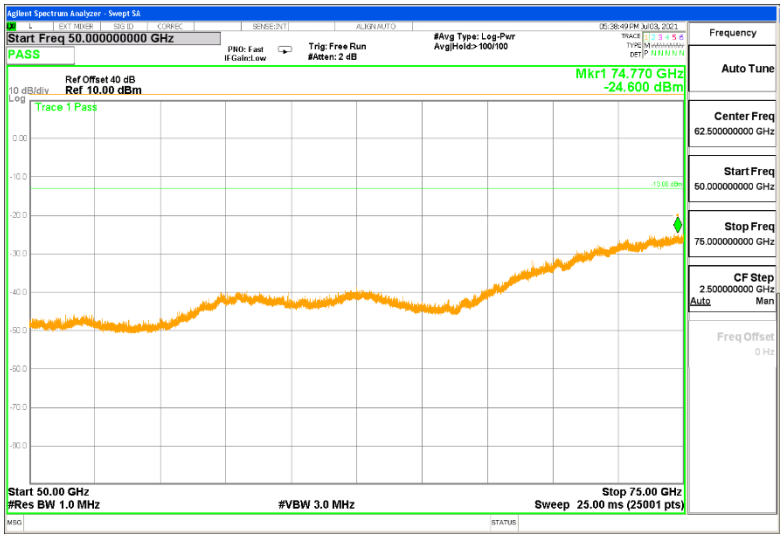
**50 - 75 GHz, ANT M2 (Pre-scan using Pk Det.)**
**Horizontal**




**50 - 75 GHz, ANT M2 (Pre-scan using Pk Det.)**
**Vertical**




No emission detected using Peak Detection.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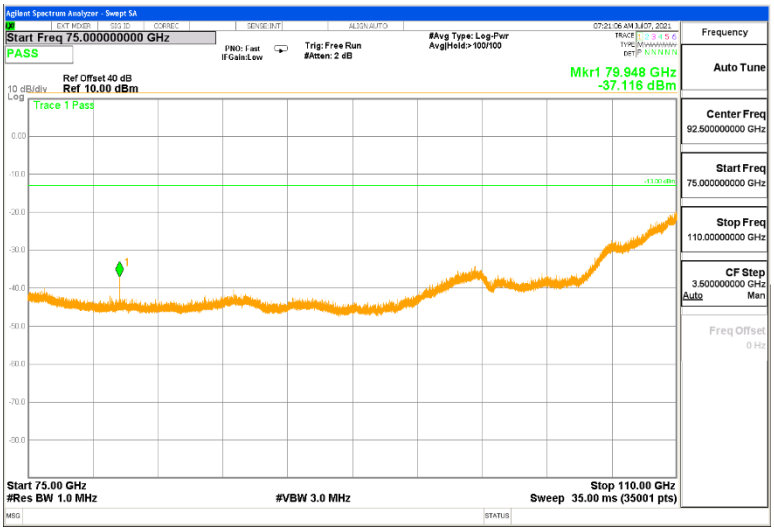
### 8.4.32. RSE n260 75 - 110 GHz

**75 - 110 GHz, ANT M1 (Pre-scan using Pk Det.)**
**Horizontal**

**75 - 110 GHz, ANT M1 (Pre-scan using Pk Det.)**
**Vertical**




Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.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**75 - 110 GHz, ANT M2 (Pre-scan using Pk Det.)**
**Horizontal**

**75 - 110 GHz, ANT M2 (Pre-scan using Pk Det.)**
**Vertical**

Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.


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**75 - 110 GHz n260, 1CC**

| Antenna | Freq. | Meas. Distance | Rx Ant. Polarity | Corrected Avg EIRP | TRP Limit | Margin |
|---|---|---|---|---|---|---|
| | (GHz) | (m) | H/V | (dBm) | (dBm) | (dB) |
| M1 | 79.948 | 1 | H | -41.36 | -13 | -28.36 |
| M1 | 79.948 | 1 | V | -39.86 | -13 | -26.86 |
| M2 | 79.898 | 1 | H | -30.44 | -13 | -17.44 |
| M2 | 79.898 | 1 | V | -34.17 | -13 | -21.17 |


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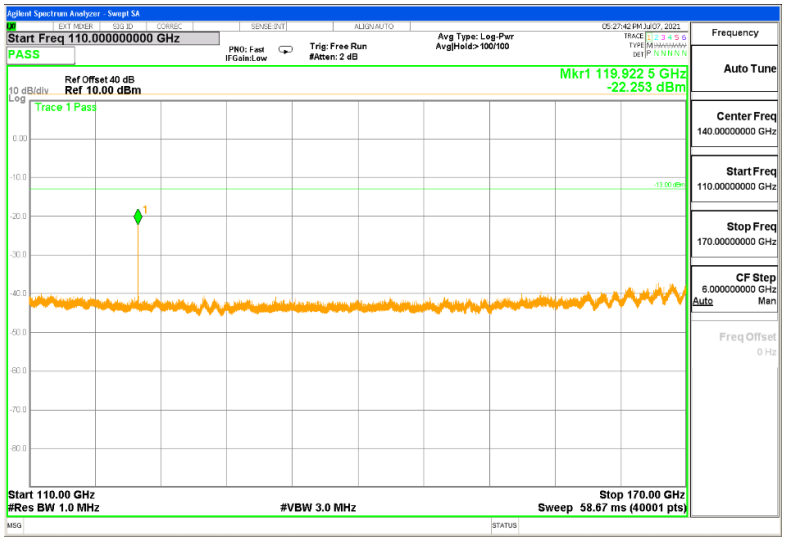
### 8.4.33. RSE n260 110 - 170 GHz

**110 - 170 GHz, ANT M1 (Pre-scan using Pk Det.)**
**Horizontal**

**110 - 170 GHz, ANT M1 (Pre-scan using Pk Det.)**
**Vertical**




Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.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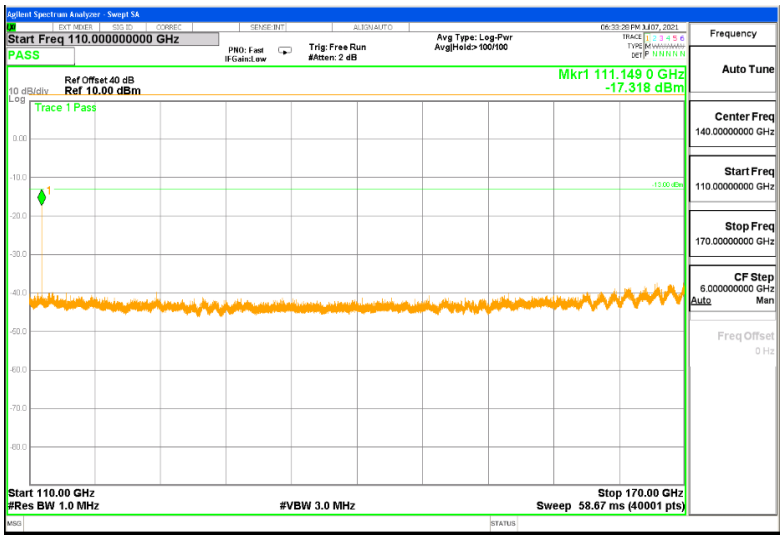
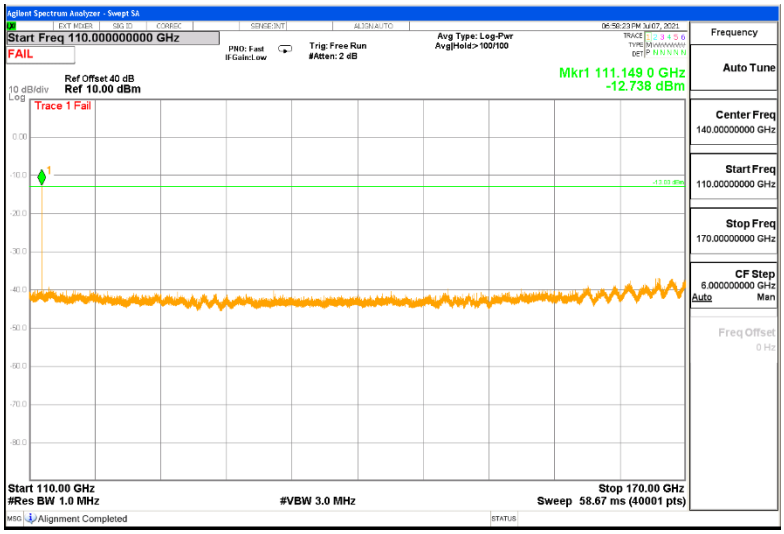
**110 - 170 GHz, ANT M2 (Pre-scan using Pk Det.)**
**Horizontal**




**110 - 170 GHz, ANT M2 (Pre-scan using Pk Det.)**
**Vertical**




Emissions detected using Peak Detection at pre-scan. Avg EIRP was measured.



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**110 - 170 GHz n260, 1CC**

| Antenna | Freq. | Meas. Distance | Rx Ant. Polarity | Corrected Avg EIRP | TRP Limit | Margin |
|---|---|---|---|---|---|---|
| | (GHz) | (m) | H/V | (dBm) | (dBm) | (dB) |
| M1 | 119.923 | 1 | H | -24.93 | -13 | -11.93 |
| M1 | 119.923 | 1 | V | -29.23 | -13 | -16.23 |
| M2 | 111.149 | 1 | H | -31.50 | -13 | -18.50 |
| M2 | 111.149 | 1 | V | -19.77 | -13 | -6.77 |


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### 8.4.34. RSE n260 170 - 200 GHz

**170 - 200 GHz, ANT M1 (Pre-scan using Pk Det.)**
**Horizontal**

**170 - 200 GHz, ANT M1 (Pre-scan using Pk Det.)**
**Vertical**

No emission detected using Peak Detection.


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**170 - 200 GHz, ANT M2 (Pre-scan using Pk Det.)**
**Horizontal**

**170 - 200 GHz, ANT M2 (Pre-scan using Pk Det.)**
**Vertical**

No emission detected using Peak Detection.


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## 8.5. FREQUENCY STABILITY

**RULE PART(S)**

FCC: §2.1055

**LIMIT**

For reporting purposes only

**TEST PROCEDURES**

KDB 842590 D01 Upper Microwave Flexible Use Service v01 Section 4.5
ANSI C63.26-2015 Section 5.6

**Test procedures for temperature variation:**

a. Position the EUT in temperature/humidity chamber with power off.
b. Set chamber temperature to -30°C and stabilize the EUT for at least 30 minutes.
c. Record maximum change in frequency within one minute after powering the EUT.
d. Increase chamber temperature at 10°C intervals from -30°C to 50°C. Record maximum change in frequency at each temperature.
e. A period of at least 30 minutes is provided to allow stabilization of the equipment at each temperature level.

- Temp. = −30°C to +50°C

**Test procedures for voltage variation:**

a. Position the EUT in temperature/humidity chamber with power off.
b. Set chamber temperature to 20°C.
c. Record maximum frequency change within one minute after powering the EUT.
d. The primary supply voltage is varied from 85% to 115% of the nominal value for hand-carried, battery-powered equipment. primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

- Voltage = (85% - 115%)
- Nominal: 3.8 VDC; Low: 3.32VDC; High: 4.37 VDC

The measurements were performed with the CW signal of center frequency of each frequency band. Testing of n258 SB2 and n260 bands on Ant M1 represent the performance of Chipset 1. Likewise, testing of n258 SB1 and n261 bands on Ant M2 represent the performance of Chipset 2.

**RESULTS**

See the following pages.

Employee IDs: 19437 & 19459
Test Date: 6/18/2021
Test Location: Temperature Chamber


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### 8.5.1. FREQUENCY STABILITY n258 SB1

| | | | Antenna M2 n258 SB1 | |
|---|---|---|---|---|
| Input Voltage | Environment | Frequency | Frequency | Delta |
| | Temperature (ºC) | (Hz) | (MHz) | (kHz) |
| Normal | 50 | 2435490000 | 2435.4900000 | -5.990 |
| Normal | 40 | 2435479010 | 2435.4790100 | -16.980 |
| Normal | 30 | 2435489500 | 2435.4895000 | -6.490 |
| **Normal** | **20** | ***2435495990*** | **2435.4959900** | **Reference** |
| Normal | 10 | 2435498990 | 2435.4989900 | 3.000 |
| Normal | 0 | 2435496490 | 2435.4964900 | 0.500 |
| Normal | -10 | 2435504490 | 2435.5044900 | 8.500 |
| Normal | -20 | 2435507480 | 2435.5074800 | 11.490 |
| Normal | -30 | 2435510980 | 2435.5109800 | 14.990 |
| 115% | 20 | 2435486500 | 2435.4865000 | -9.490 |
| 85% | 20 | 2435480510 | 2435.4805100 | -15.480 |

### 8.5.2. FREQUENCY STABILITY n258 SB2

| | | | Antenna M1 n258 SB2 | |
|---|---|---|---|---|
| Input Voltage | Environment | Frequency | Frequency | Delta |
| | Temperature (ºC) | (Hz) | (MHz) | (kHz) |
| Normal | 50 | 2500491510 | 2500.4915100 | 12.990 |
| Normal | 40 | 2500482520 | 2500.4825200 | 4.000 |
| Normal | 30 | 2500484020 | 2500.4840200 | 5.500 |
| **Normal** | ***20*** | ***2500478520*** | **2500.4785200** | ***Reference*** |
| Normal | 10 | 2500491510 | 2500.4915100 | 12.990 |
| Normal | 0 | 2500500000 | 2500.5000000 | 21.480 |
| Normal | -10 | 2500503500 | 2500.5035000 | 24.980 |
| Normal | -20 | 2500505000 | 2500.5050000 | 26.480 |
| Normal | -30 | 2500511490 | 2500.5114900 | 32.970 |
| 115% | 20 | 2500482020 | 2500.4820200 | 3.500 |
| 85% | 20 | 2500482020 | 2500.4820200 | 3.500 |


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### 8.5.3. FREQUENCY STABILITY n261

| | | | Antenna M2 n261 | |
|---|---|---|---|---|
| Input Voltage | Environment | Frequency | Frequency | Delta |
| | Temperature (ºC) | (Hz) | (MHz) | (kHz) |
| Normal | 50 | 2792990000 | 2792.9900000 | 8.490 |
| Normal | 40 | 2792980510 | 2792.9805100 | -1.000 |
| Normal | 30 | 2792978510 | 2792.9785100 | -3.000 |
| **Normal** | **20** | ***2792981510*** | **2792.9815100** | **Reference** |
| Normal | 10 | 2793002990 | 2793.0029900 | 21.480 |
| Normal | 0 | 2793000490 | 2793.0004900 | 18.980 |
| Normal | -10 | 2793011980 | 2793.0119800 | 30.470 |
| Normal | -20 | 2793005980 | 2793.0059800 | 24.470 |
| Normal | -30 | 2793001990 | 2793.0019900 | 20.480 |
| 115% | 20 | 2792981010 | 2792.9810100 | -0.500 |
| 85% | 20 | 2792985000 | 2792.9850000 | 3.490 |

### 8.5.4. FREQUENCY STABILITY n260

| | | | Antenna M1 n260 | |
|---|---|---|---|---|
| Input Voltage | Environment | Frequency | Frequency | Delta |
| | Temperature (ºC) | (Hz) | (MHz) | (kHz) |
| Normal | 50 | 3850488010 | 3850.4880100 | 14.010 |
| Normal | 40 | 3850474030 | 3850.4740300 | 0.030 |
| Normal | 30 | 3850471030 | 3850.4710300 | -2.970 |
| **Normal** | **20** | ***3850474000*** | **3850.4740000** | **Reference** |
| Normal | 10 | 3850497480 | 3850.4974800 | 23.480 |
| Normal | 0 | 3850499000 | 3850.4990000 | 25.000 |
| Normal | -10 | 3850517480 | 3850.5174800 | 43.480 |
| Normal | -20 | 3850505990 | 3850.5059900 | 31.990 |
| Normal | -30 | 3850505490 | 3850.5054900 | 31.490 |
| 115% | 20 | 3850477500 | 3850.4775000 | 3.500 |
| 85% | 20 | 3850476500 | 3850.4765000 | 2.500 |


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# 9. SETUP PHOTOS

Please refer to 13573777-EP20V1 for setup photos.

# END OF REPORT


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# APPENDIX A

## 1. 50 - 80 GHz Keysight M1970V

KEYSIGHT TECHNOLOGIES

Keysight Technologies Malaysia Sdn Bhd (463532-M)
Bayan Lepas Free Industrial Zone
11900 Penang, Malaysia
Keysight Approved Calibration provider #71456

5962-0476

### Certificate Of Calibration

**Certificate No:** M1970VMY5139083020200903

**Manufacturer:** Keysight Technologies
**Model No:** M1970V
**Options Installed With Specifications:** 002

**Description:** Waveguide Harmonic Mixer
**Serial No:** MY51390830

**Customer Asset:**
**Customer:**
UL Verification Services Inc
47173 Benicia St
FREMONT CA 94538-7366
UNITED STATES

**Location of Calibration:**
Plot 44, Bayan Lepas Industrial Park IV
11900 Penang
Malaysia

**Date of Calibration:** 03-SEP-2020
**Temperature:** (23 ± 3)°C
**Procedure:** MTA-T0264

**Received Date:** 03-SEP-2020
**Humidity:** (20 to 70) % RH

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures in compliance with a quality management system registered to ISO 9001:2015.

**As Received Conditions:** Initial testing found the equipment to be IN SPECIFICATION at the points tested.

**Action Taken:** No corrective actions were necessary.

**As Shipped Conditions:** At the completion of calibration, measured values were IN SPECIFICATION at the parameters tested.

**Remarks or special requirements:**

**Notes:**
1. This calibration report may refer to equipment manufactured by HP, Agilent and Keysight as being manufactured by Keysight Technologies, Inc.
2. The test limits stated in the calibration report correspond to the published specifications of the equipment, at the points tested.
3. The documented test results relate to the equipment tested only.
4. This calibration report shall not be reproduced, except in full.

**Traceability Information**: Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Keysight Provider #71456

| | DD | MM | YY | BY |
|---|---|---|---|---|
| CAL | 03 | 09 | 20 | NF |
| DUE | | | | |


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## 2. 75 - 110 GHz Keysight M1970W

KEYSIGHT TECHNOLOGIES

Keysight Technologies Malaysia Sdn Bhd (463532-M)
Bayan Lepas Free Industrial Zone
11900 Penang, Malaysia
Keysight Approved Calibration provider #71456

5962-0476

# Certificate Of Calibration

**Certificate No:** M1970WMY5143078420200902

**Manufacturer:** Keysight Technologies
**Model No:** M1970W
**Options Installed With Specifications:** N/A

**Description:** Waveguide Harmonic Mixer
**Serial No:** MY51430784

**Customer Asset:**
**Customer:**
UL Verification Services Inc
47173 Benicia St
FREMONT CA 94538-7366
UNITED STATES

**Location of Calibration:**
Plot 44, Bayan Lepas Industrial Park IV
11900 Penang
Malaysia

**Date of Calibration:** 02-SEP-2020
**Temperature:** (23 ± 3)°C
**Procedure:** MTA-T0264

**Received Date:** 02-SEP-2020
**Humidity:** (20 to 70) % RH

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures in compliance with a quality management system registered to ISO 9001:2015.

**As Received Conditions:** Initial testing found the equipment to be IN SPECIFICATION at the points tested.

**Action Taken:** No corrective actions were necessary.

**As Shipped Conditions:** At the completion of calibration, measured values were IN SPECIFICATION at the parameters tested.

**Remarks or special requirements:**

**Notes:**
1. This calibration report may refer to equipment manufactured by HP, Agilent and Keysight as being manufactured by Keysight Technologies, Inc.
2. The test limits stated in the calibration report correspond to the published specifications of the equipment, at the points tested.
3. The documented test results relate to the equipment tested only.
4. This calibration report shall not be reproduced, except in full.

**Traceability Information**: Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Keysight Provider #71456

| | DD | MM | YY | BY |
|---|---|---|---|---|
| CAL | 02 | 09 | 20 | NF |
| DUE | | | | |


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## 3. 110 - 170 GHz VDI WR6.5SAX

**Virginia Diodes, Inc**
979 2nd St. SE
Suite 309
Charlottesville, VA 22902
Phone: 434-297-3257
Fax: 434-297-3258

***Certificate of Conformance***

To: UL LLC
47173 Benicia Street
Fremont, CA 94538
United States

From: Virginia Diodes, Inc
979 2nd St. SE
Suite 309
Charlottesville, VA 22902

**Packing List No:** 211178 **Today's Date:** 04/06/21
**Shipping Date:** 04/06/21 **PO Number:** 7862019330

| Quantity Shipped | Unit | Description | Order-Job Number |
|---|---|---|---|
| 1 | EA | UPGRADE-WR6.5SAX TO WR6.5SAX-F<br>WR6.5SAX-F / SN: SAX 624 | 21064B-01 |

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

AJ for GSS
Authorized Signature
Virginia Diodes, Inc

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## 4. 170 - 260 GHz VDI WR4.3SAX

**Virginia Diodes, Inc**
979 2nd St. SE
Suite 309
Charlottesville, VA 22902
Phone: 434-297-3257
Fax: 434-297-3258

***Certificate of Conformance***

To: UL LLC
47173 Benicia Street
Fremont, CA 94538
United States

From: Virginia Diodes, Inc
979 2nd St. SE
Suite 309
Charlottesville, VA 22902

**Packing List No:** 211687 **Today's Date:** 05/18/21
**Shipping Date:** 05/18/21 **PO Number:** 7862019330

| Quantity Shipped | Unit | Description | Order-Job Number |
|---|---|---|---|
| 1 | EA | UPGRADE-WR4.3SAX TO WR4.3SAX-F SAX 651 | 21064C-01 |

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

Authorized Signature
Virginia Diodes, Inc

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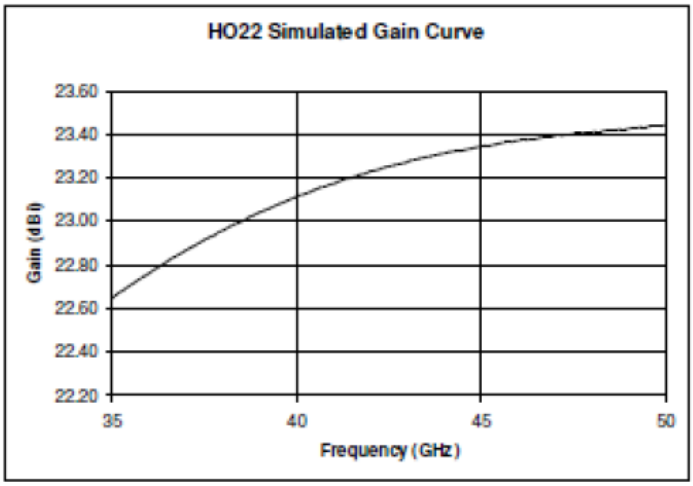
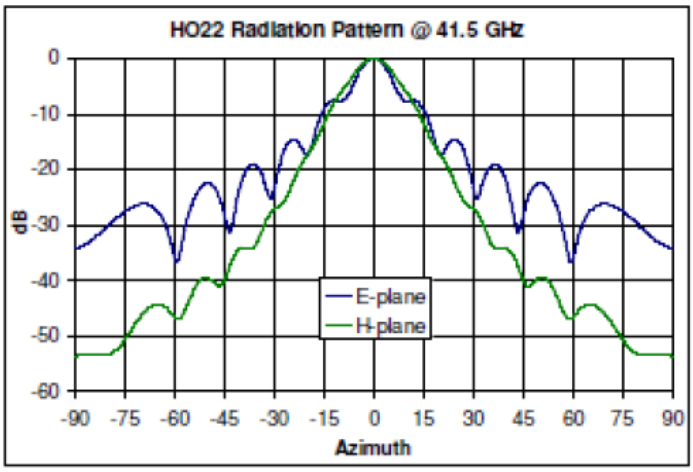
## 5. 35 - 50 GHz CMI HO22R HORN ANTENNA

custom microwave inc.
24 Boston Court
Longmont, CO 80501
303 651-0707(P)
303 651-0706(F)
www.customimicrowave.com





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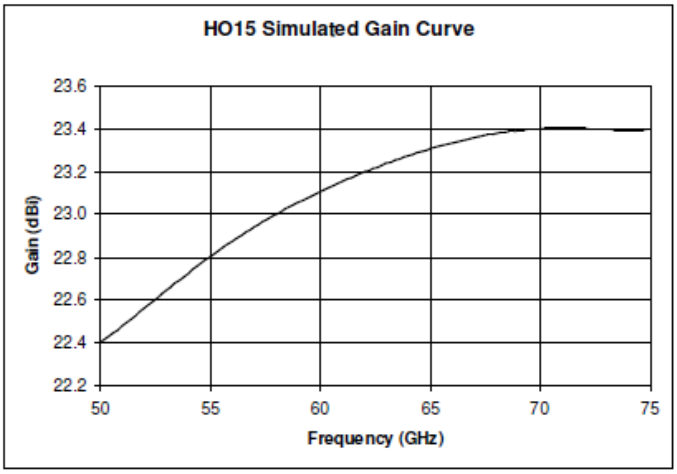
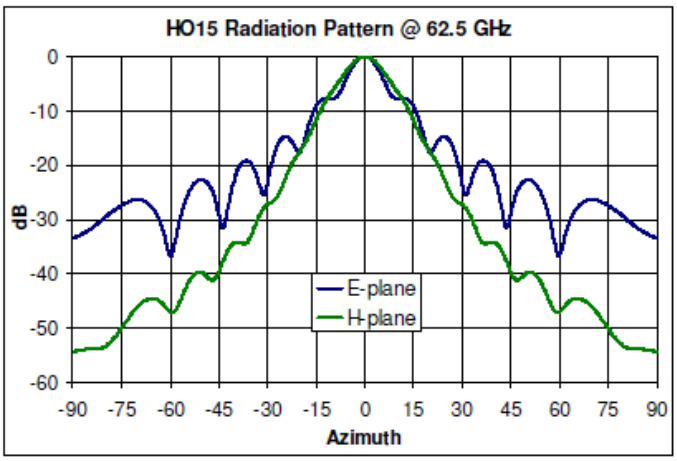
# 6. 50 - 75 GHz CMI HO15R HORN ANTENNA

24 Boston Court
Longmont, CO 80501
303 651-0707(P)
303 651-0706(F)
www.custommicrowave.com





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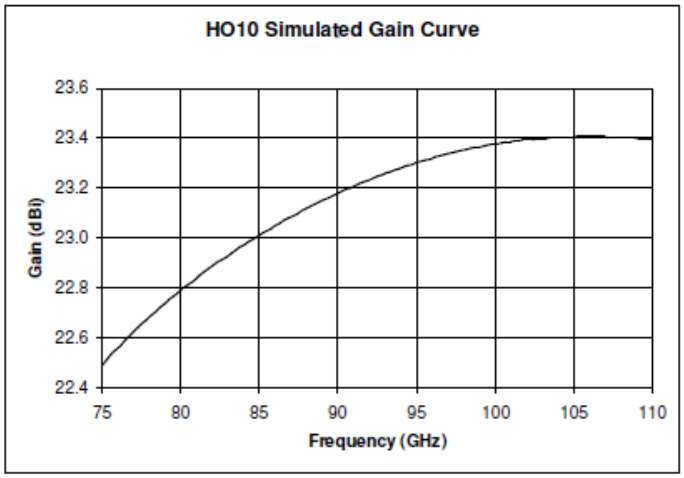
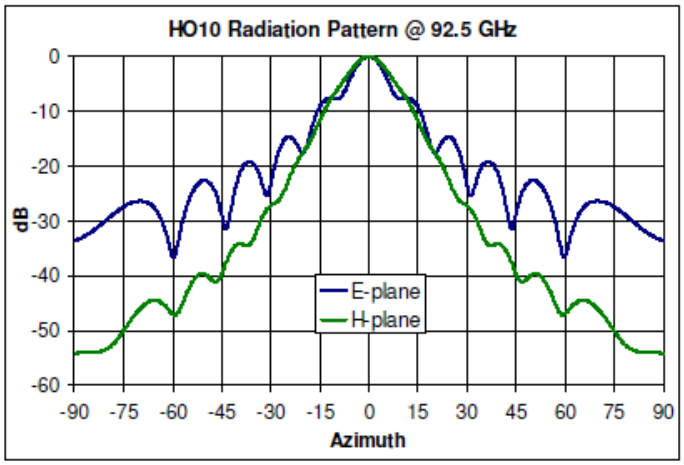
# 7. 75 - 110 GHz CMI HO10R HORN ANTENNA

custom microwave inc.
24 Boston Court
Longmont, CO 80501
303 651-0707(P)
303 651-0706(F)
www.custommicrowave.com





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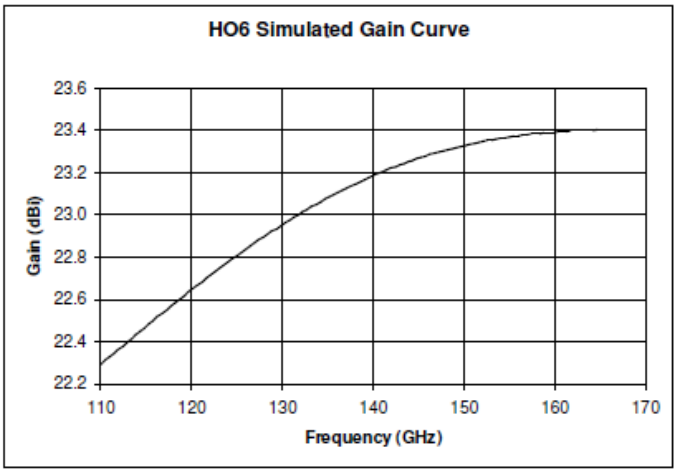
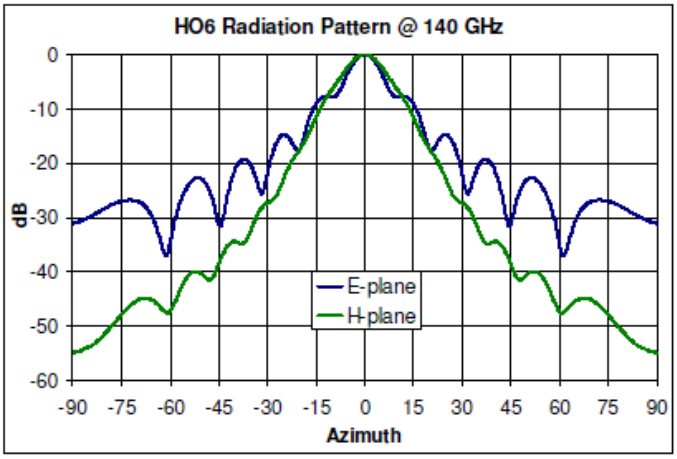
# 8. 110 - 170 GHz CMI HO6R HORN ANTENNA

custom microwave inc.
24 Boston Court
Longmont, CO 80501
303 651-0707(P)
303 651-0706(F)
www.custommicrowave.com





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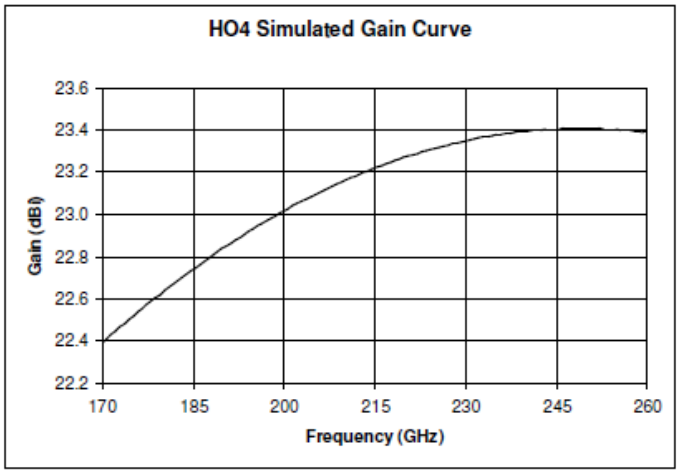
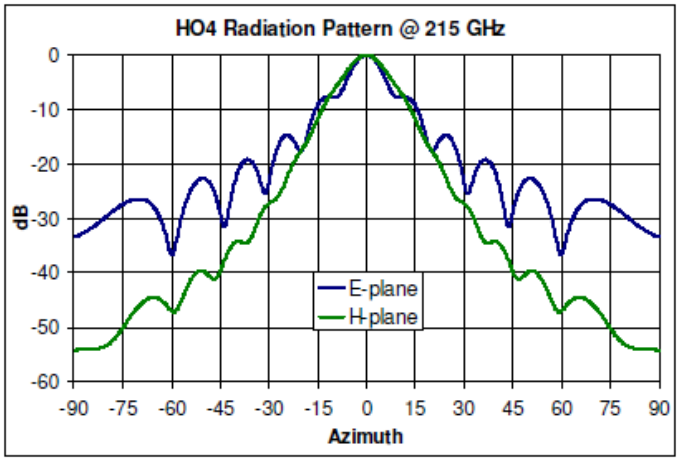
# 9. 170 - 260 GHz CMI HO4R HORN ANTENNA

24 Boston Court
Longmont, CO 80501
303 651-0707(P)
303 651-0706(F)
www.custommicrowave.com





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