

# TEST REPORT

ACCORDING TO: FCC 47CFR part 27

FOR:

**Airspan Networks Inc.**  
**LTE Base Station**  
**Model: AirSpeed1200, 2.6 GHz (B41LH)**  
**FCC ID:PIDAS1200**

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## 1 Applicant information

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**Contact name:** Mr. Zion Levi

## 2 Equipment under test attributes

**Product name:** LTE Base Station  
**Product type:** Transceiver  
**Model(s):** AirSpeed1200 2.6 GHz (B41LH)  
**Serial number:** DA4B13417C14  
**Hardware version:** A0  
**Software release:** 6\_4\_1\_119  
**Receipt date** 15-Aug-17

## 3 Manufacturer information

**Manufacturer name:** Airspan Networks Inc.  
**Address:** 777 Yamato, Road Suite 310 Boca Raton, FL 33431, USA  
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**Contact name:** Mr. Zion Levi

## 4 Test details

**Project ID:** 29984  
**Location:** Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel  
**Test started:** 15-Aug-17  
**Test completed:** 03-Sep-17  
**Test specification(s):** FCC 47CFR part 27

## 5 Tests summary

| Test                                                             | Status                                                  |
|------------------------------------------------------------------|---------------------------------------------------------|
| <b>Transmitter characteristics</b>                               |                                                         |
| Section 2.1049, Occupied bandwidth                               | Pass                                                    |
| Section 27.50(h), Peak output power at RF antenna connector      | Pass                                                    |
| Section 27.50(h)(4), Spectral power density                      | Pass                                                    |
| Section 2.1091, 27.52, RF safety                                 | Pass, exhibit provided in Application for certification |
| Section 27.53(m)(2), Spurious emissions at RF antenna connector  | Pass                                                    |
| Section 27.53(m)(2), Band edge emissions at RF antenna connector | Pass                                                    |
| Section 27.53(m)(2), Radiated spurious emissions                 | Pass                                                    |
| Section 27.54, Frequency stability                               | Pass                                                    |

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.

The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

|                     | Name and Title                                                 | Date               | Signature                                                                                                                                                                      |
|---------------------|----------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mr. S. Samokha, test engineer<br>Mr. A. Morozov, test engineer | September 3, 2017  | <br> |
| <b>Reviewed by:</b> | Mrs. M. Cherniavsky, certification engineer                    | September 11, 2017 |                                                                                           |
| <b>Approved by:</b> | Mr. M. Nikishin, EMC and Radio group manager                   | September 28, 2017 |                                                                                           |

## 6 EUT description

### 6.1 General information

The EUT, digital station, model AirSpeed1200 2.6GHz (B41LH), is part of a LTE broadband fixed cellular wireless access system. The system provides a radio link between an end-user (a subscriber) and a network to give high-speed data access. The AirSpeed's transceiver/receiver (Up to 64 QAM modulation, data rate up to 95 Mbps) equipped with a 10.5 dBi external antenna. Advanced Antenna Techniques 2x8 MIMO are supported. The maximum total RF output power (not including antenna gain) is 28.33 dBm for 10.5 dBi and it can be reduced by software.

The AirSpeed is installed outdoors. The Subscriber transmits and receives traffic to and from the base station respectively. The transceiver provides subscribers with "always-on" Internet, high speed data only, or data and voice (VoIP) services and is configured with a unique base station reference number, preventing the LTE UE from relocating to another subscriber premises without authorization.

### 6.2 Ports and lines

| Port Type | Port description | Connected from | Connected to         | Qty. | Cable type | Cable length, m |
|-----------|------------------|----------------|----------------------|------|------------|-----------------|
| Power     | AC power         | EUT            | AC mains             | 1    | Unshielded | 3               |
| Signal    | GPS              | EUT            | GPS external antenna | 1    | Coax       | 3               |
| Signal    | Eth. POE         | EUT            | Laptop               | 1    | FTP        | 3               |
| Signal    | Serial*          | Not connected  | Not connected        | 1    | NA         | NA              |

\*for maintenance only

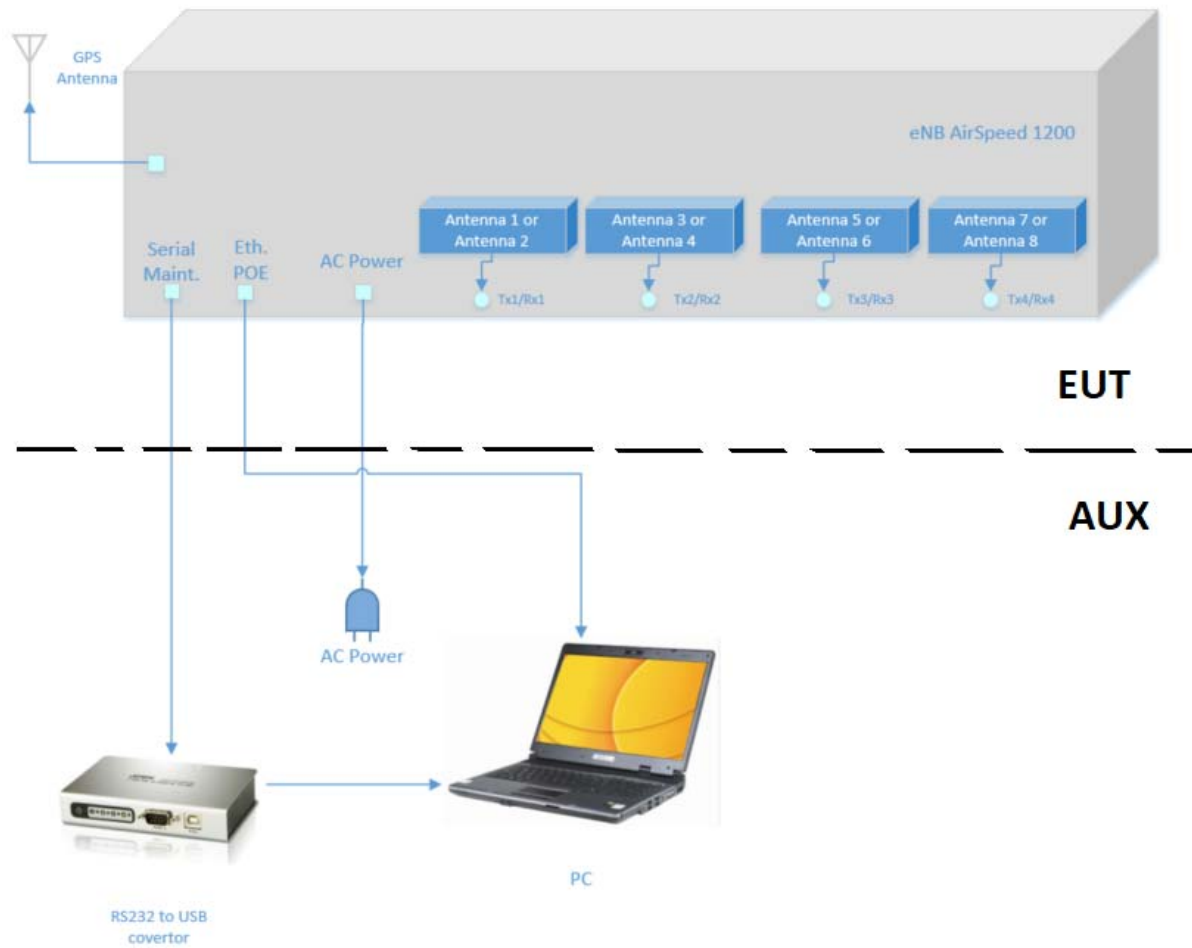
### 6.3 Support and test equipment

| Description | Manufacturer | Model number | Serial number |
|-------------|--------------|--------------|---------------|
| Laptop      | Dell         | E7450        | 8TYRP32       |

### 6.4 Changes made in the EUT

No changes were implemented in the EUT during testing.

## 6.5 Test configuration



## 6.6 Transmitter characteristics

|                                                         |                                                                                                          |                                                                                    |                                                                     |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Type of equipment</b>                                |                                                                                                          |                                                                                    |                                                                     |
| <input checked="" type="checkbox"/>                     | Stand-alone (Equipment with or without its own control provisions)                                       |                                                                                    |                                                                     |
| <input type="checkbox"/>                                | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) |                                                                                    |                                                                     |
| <input type="checkbox"/>                                | Plug-in card (Equipment intended for a variety of host systems)                                          |                                                                                    |                                                                     |
| <b>Intended use</b>                                     |                                                                                                          | <b>Condition of use</b>                                                            |                                                                     |
| <input checked="" type="checkbox"/>                     | fixed                                                                                                    | Always at a distance more than 2 m from all people                                 |                                                                     |
| <input type="checkbox"/>                                | mobile                                                                                                   | Always at a distance more than 20 cm from all people                               |                                                                     |
| <input type="checkbox"/>                                | portable                                                                                                 | May operate at a distance closer than 20 cm to human body                          |                                                                     |
| <b>Assigned frequency range</b>                         |                                                                                                          | 2496.0 – 2690.0 MHz                                                                |                                                                     |
| <b>Operating frequency (full bands)</b>                 |                                                                                                          | 2506.0 – 2680.0 MHz                                                                |                                                                     |
| <b>RF channel spacing</b>                               |                                                                                                          | 20 MHz                                                                             |                                                                     |
| <b>Maximum rated output power</b>                       |                                                                                                          | At transmitter 50 $\Omega$ RF output connector (aggregate power of both RF chains) |                                                                     |
|                                                         |                                                                                                          | 28.33 dBm                                                                          |                                                                     |
| <b>Is transmitter output power variable?</b>            |                                                                                                          | <input type="checkbox"/> No                                                        |                                                                     |
|                                                         |                                                                                                          | <input checked="" type="checkbox"/> Yes                                            | <input type="checkbox"/> continuous variable                        |
|                                                         |                                                                                                          |                                                                                    | <input checked="" type="checkbox"/> stepped variable with step size |
|                                                         |                                                                                                          |                                                                                    | 0.25 dB                                                             |
|                                                         |                                                                                                          | minimum RF power                                                                   |                                                                     |
|                                                         |                                                                                                          | -30 dBm                                                                            |                                                                     |
|                                                         |                                                                                                          | maximum RF power at antenna connector                                              |                                                                     |
|                                                         |                                                                                                          | 28.33 dBm                                                                          |                                                                     |
| <b>Antenna connection</b>                               |                                                                                                          |                                                                                    |                                                                     |
| unique coupling                                         | <input checked="" type="checkbox"/> standard connector                                                   | Integral                                                                           | <input checked="" type="checkbox"/> with temporary RF connector     |
|                                                         |                                                                                                          |                                                                                    | without temporary RF connector                                      |
| <b>Antenna/s technical characteristics</b>              |                                                                                                          |                                                                                    |                                                                     |
| Type                                                    | Manufacturer                                                                                             | Model number                                                                       | Gain                                                                |
| External                                                | ALPHA Wireless Ltd                                                                                       | AW3627                                                                             | 10.5 dBi                                                            |
| <b>Transmitter aggregate data rate/s, MBps</b>          |                                                                                                          |                                                                                    |                                                                     |
| Transmitter 26dBc power bandwidth                       |                                                                                                          | Type of modulation                                                                 |                                                                     |
|                                                         |                                                                                                          | QPSK                                                                               | 16QAM                                                               |
| 20 MHz                                                  |                                                                                                          | 23.4                                                                               | 45.4                                                                |
|                                                         |                                                                                                          | 64QAM                                                                              | 95.0                                                                |
| <b>Type of multiplexing</b>                             |                                                                                                          | TDD                                                                                |                                                                     |
| <b>Modulating test signal (baseband)</b>                |                                                                                                          | PRBS                                                                               |                                                                     |
| <b>Maximum transmitter duty cycle in normal use</b>     |                                                                                                          | 55%                                                                                |                                                                     |
| <b>Transmitter power source</b>                         |                                                                                                          |                                                                                    |                                                                     |
|                                                         | Nominal rated voltage                                                                                    | Battery type                                                                       |                                                                     |
| <input type="checkbox"/>                                | DC                                                                                                       | Nominal rated voltage                                                              |                                                                     |
| <input checked="" type="checkbox"/>                     | AC mains                                                                                                 | Nominal rated voltage                                                              | 120 VAC                                                             |
|                                                         |                                                                                                          | Frequency                                                                          |                                                                     |
| <b>Common power source for transmitter and receiver</b> |                                                                                                          | <input checked="" type="checkbox"/> yes                                            | <input type="checkbox"/> no                                         |

|                                                                      |                                |                               |                       |
|----------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 2.1049, Occupied bandwidth</b> |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1049                        |                                |                               |                       |
| <b>Test mode:</b> Compliance                                         |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 15-Aug-17                                            |                                |                               |                       |
| <b>Temperature:</b> 24.2 °C                                          | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                      |                                |                               |                       |

## 7 Transmitter tests according to 47CFR part 27

### 7.1 Occupied bandwidth test

#### 7.1.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Occupied bandwidth limits

| Assigned frequency, MHz | Modulation envelope reference points*, % | Maximum allowed bandwidth, kHz |
|-------------------------|------------------------------------------|--------------------------------|
| 2496.0 – 2690.0 MHz     | 99%                                      | NA                             |

\* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

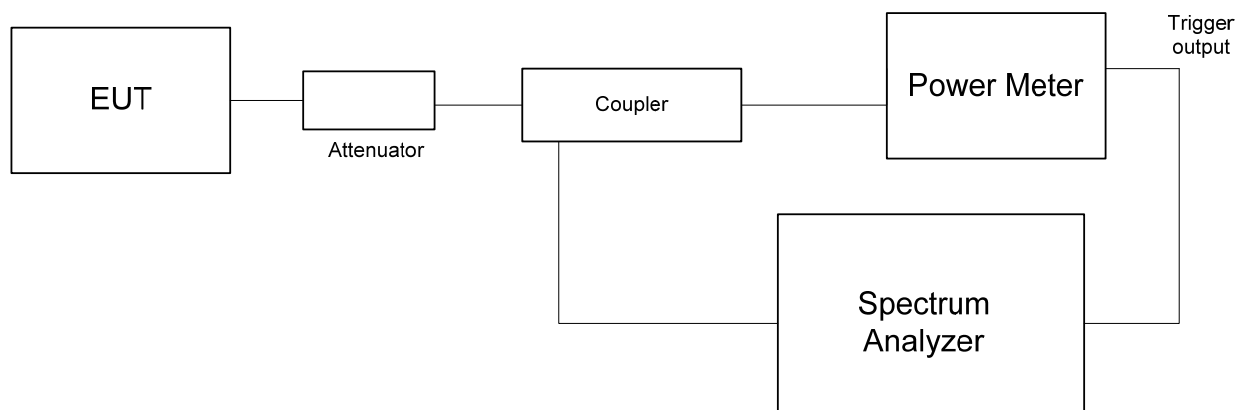
#### 7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was set to transmit the normal modulated signal and actual channel width was measured at the 26 dBc modulation envelope reference points.

7.1.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.1.2 and the associated plots.

Figure 7.1.1 Occupied bandwidth test setup







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|                                                                      |                                |                               |                       |
|----------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 2.1049, Occupied bandwidth</b> |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1049                        |                                |                               |                       |
| <b>Test mode:</b> Compliance                                         |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 15-Aug-17                                            |                                |                               |                       |
| <b>Temperature:</b> 24.2 °C                                          | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                      |                                |                               |                       |

Table 7.1.2 Occupied bandwidth test results

DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 390 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 26 dBc; 99%  
 EBW: 20 MHz

| Carrier frequency, MHz | OBW 26 dBc, MHz | OBW 99%, MHz | Limit, kHz | Verdict |
|------------------------|-----------------|--------------|------------|---------|
| <b>QPSK</b>            |                 |              |            |         |
| 2506.0                 | 19.020          | 17.9699      | NA         | Pass    |
| 2624.0                 | 19.125          | 17.9729      | NA         | Pass    |
| 2680.0                 | 19.154          | 17.9548      | NA         | Pass    |
| <b>64QAM</b>           |                 |              |            |         |
| 2506.0                 | 19.270          | 17.9778      | NA         | Pass    |
| 2624.0                 | 18.996          | 17.8498      | NA         | Pass    |
| 2680.0                 | 19.270          | 17.9580      | NA         | Pass    |

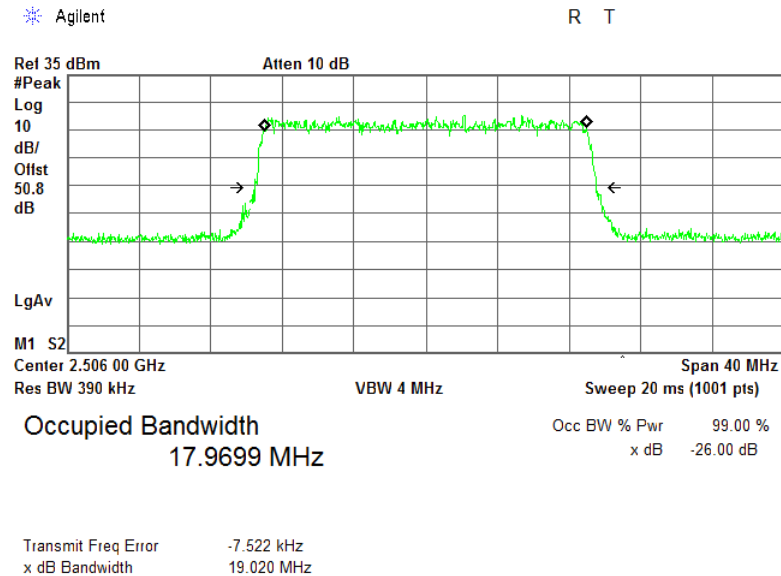
## Reference numbers of test equipment used

|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 3301 | HL 3302 | HL 3667 | HL 3901 | HL 5112 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

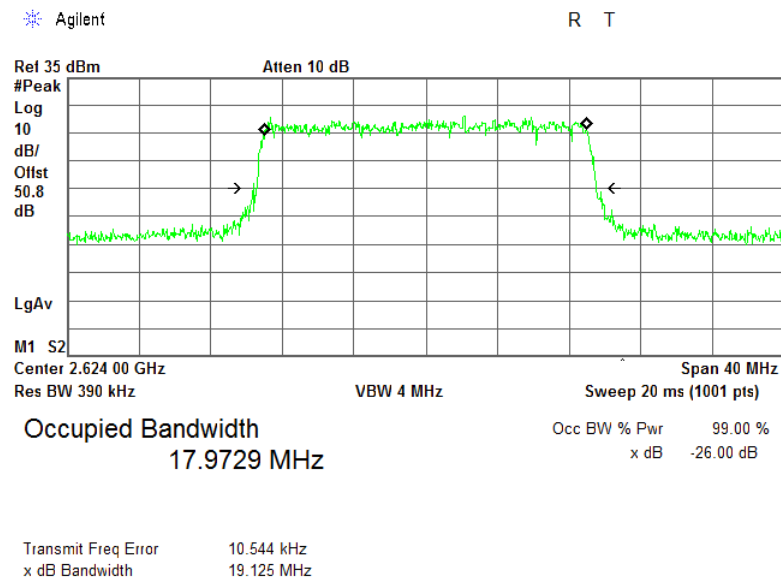
Full description is given in Appendix A.

|                      |                         |                                    |                |
|----------------------|-------------------------|------------------------------------|----------------|
| Test specification:  |                         | Section 2.1049, Occupied bandwidth |                |
| Test procedure:      |                         | 47 CFR, Section 2.1049             |                |
| Test mode:           |                         | Verdict: PASS                      |                |
| Date(s):             |                         |                                    |                |
| 15-Aug-17            |                         |                                    |                |
| Temperature: 24.2 °C | Relative Humidity: 43 % | Air Pressure: 1008 hPa             | Power: 120 VAC |
| Remarks:             |                         |                                    |                |

Plot 7.1.1 Occupied bandwidth test results at low frequency, 20 MHz EBW, QPSK

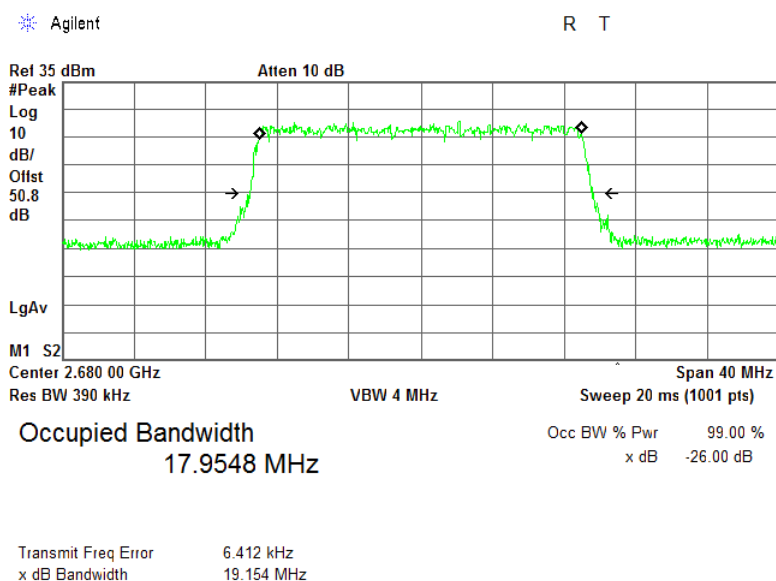


Plot 7.1.2 Occupied bandwidth test results at mid frequency, 20 MHz EBW, QPSK

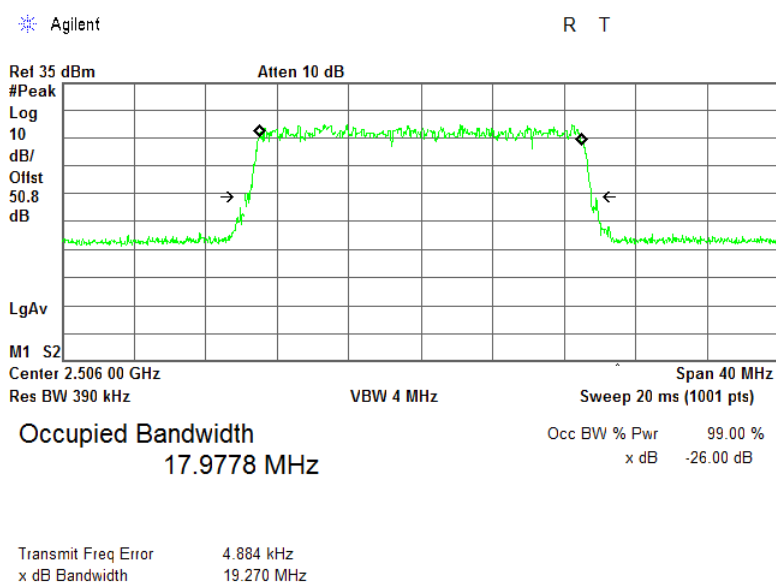


|                                                                      |                                |                               |                       |
|----------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 2.1049, Occupied bandwidth</b> |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1049                        |                                |                               |                       |
| <b>Test mode:</b> Compliance                                         |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 15-Aug-17                                            |                                |                               |                       |
| <b>Temperature:</b> 24.2 °C                                          | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                      |                                |                               |                       |

Plot 7.1.3 Occupied bandwidth test results at high frequency, 20 MHz EBW, QPSK

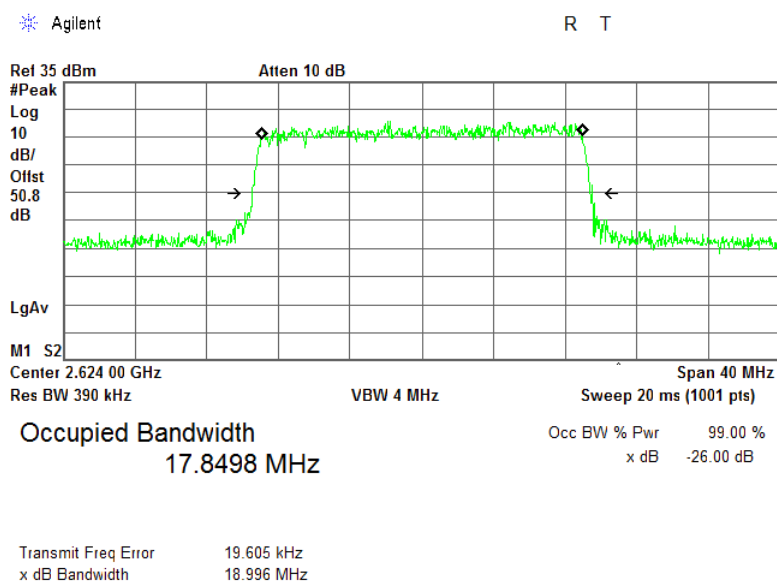


Plot 7.1.4 Occupied bandwidth test results at low frequency, 20 MHz EBW, 64QAM

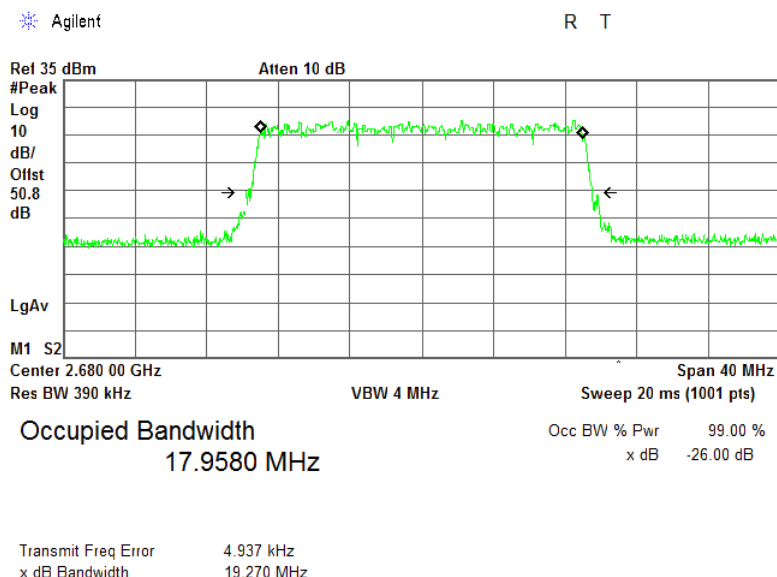


|                                                                      |                                |                               |                       |
|----------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 2.1049, Occupied bandwidth</b> |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1049                        |                                |                               |                       |
| <b>Test mode:</b> Compliance                                         |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 15-Aug-17                                            |                                |                               |                       |
| <b>Temperature:</b> 24.2 °C                                          | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1008 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                      |                                |                               |                       |

Plot 7.1.5 Occupied bandwidth test results at mid frequency, 20 MHz EBW, 64QAM



Plot 7.1.6 Occupied bandwidth test results at high frequency, 20 MHz EBW, 64QAM



|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.50, Peak output power</b>                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

## 7.2 Peak output power test

### 7.2.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

| Transmitter type                | Assigned frequency range, MHz | Maximum peak output power, dBm                    |
|---------------------------------|-------------------------------|---------------------------------------------------|
| Main, booster and base stations | 2496.0 – 2690.0               | $63 + 10\log(X/Y) + 10\log(360/\text{beamwidth})$ |
|                                 |                               | Maximum peak power density, dBm/100 kHz           |
|                                 |                               | $\text{EIRP} + 10\log(0.1/Y)$                     |

\*- X is the actual channel width in MHz (occupied bandwidth), Y is either

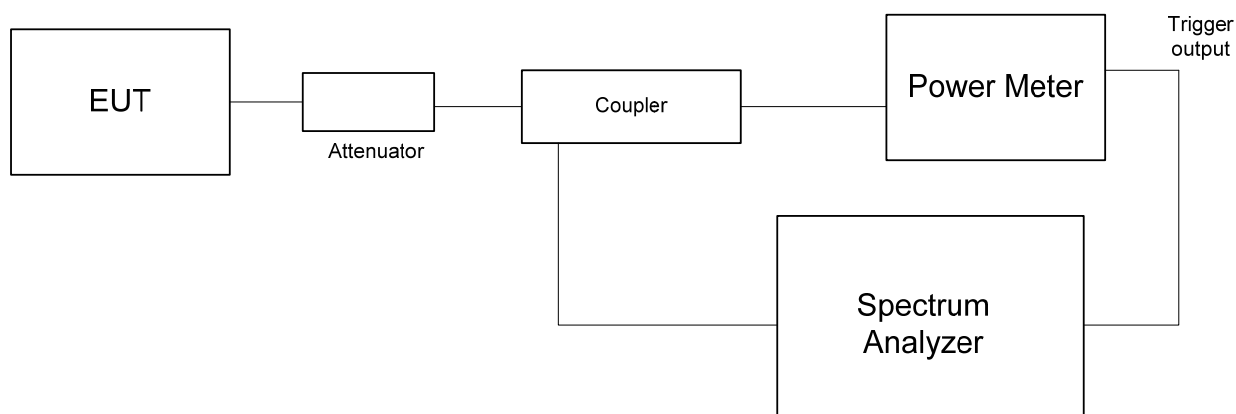
- 1) 6 MHz if prior to transition or the station is in the MBS following transition or
- 2) 5.5 MHz if the station is in the LBS and UBS following transition, and
- 3) beamwidth is the total horizontal plane beam width of the individual transmitting antenna for the station or any sector measured at the half-power points.

### 7.2.2 Test procedure

- 7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.
- 7.2.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.
- 7.2.2.3 The average output power was measured with power meter as provided in Table 7.2.2.
- 7.2.2.4 The power spectral density was measured with spectrum analyzer as provided in Table 7.2.3 and the associated plots.
- 7.2.2.5 The test results are provided in the tables below and associated plots.

|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

Figure 7.2.1 Peak output power test setup





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|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

Table 7.2.2 Peak output power test results

DETECTOR USED:

Average within Tx burst

DUTY CYCLE:

55%

EBW:

20 MHz

| Carrier frequency, MHz          | Power Meter reading RF#1, dBm | Power Meter reading RF#2, dBm | Total RF power**, dBm | Antenna gain, dBi | Total EIRP*, dBm | Limit***, dBm | Margin, dB | Verdict |
|---------------------------------|-------------------------------|-------------------------------|-----------------------|-------------------|------------------|---------------|------------|---------|
| <b>Antenna Chain RF #1 / #3</b> |                               |                               |                       |                   |                  |               |            |         |
| <b>QPSK</b>                     |                               |                               |                       |                   |                  |               |            |         |
| 2506.0                          | 24.70                         | 25.06                         | 27.88                 | 10.5              | 38.38            | 69.01         | -30.63     | Pass    |
| 2624.0                          | 25.12                         | 25.35                         | 28.24                 | 10.5              | 38.75            | 69.31         | -30.56     | Pass    |
| 2680.0                          | 25.17                         | 25.14                         | 28.16                 | 10.5              | 38.66            | 69.11         | -30.45     | Pass    |
| <b>64QAM</b>                    |                               |                               |                       |                   |                  |               |            |         |
| 2506.0                          | 25.19                         | 25.26                         | 28.23                 | 10.5              | 38.74            | 69.02         | -30.27     | Pass    |
| 2624.0                          | 25.17                         | 25.24                         | 28.21                 | 10.5              | 38.71            | 69.28         | -30.58     | Pass    |
| 2680.0                          | 25.21                         | 25.24                         | 28.23                 | 10.5              | 38.74            | 69.11         | -30.37     | Pass    |
| <b>Antenna Chain RF #2 / #4</b> |                               |                               |                       |                   |                  |               |            |         |
| <b>QPSK</b>                     |                               |                               |                       |                   |                  |               |            |         |
| 2506.0                          | 24.92                         | 25.34                         | 28.14                 | 10.5              | 38.64            | 69.01         | -30.38     | Pass    |
| 2624.0                          | 25.19                         | 25.14                         | 28.17                 | 10.5              | 38.68            | 69.31         | -30.63     | Pass    |
| 2680.0                          | 25.09                         | 25.20                         | 28.15                 | 10.5              | 38.65            | 69.11         | -30.46     | Pass    |
| <b>64QAM</b>                    |                               |                               |                       |                   |                  |               |            |         |
| 2506.0                          | 24.59                         | 25.06                         | 27.83                 | 10.5              | 38.35            | 69.02         | -30.67     | Pass    |
| 2624.0                          | 25.29                         | 25.23                         | 28.26                 | 10.5              | 38.76            | 69.28         | -30.52     | Pass    |
| 2680.0                          | 25.22                         | 25.34                         | 28.28                 | 10.5              | 38.80            | 69.11         | -30.31     | Pass    |
| <b>Antenna Chain RF #5 / #7</b> |                               |                               |                       |                   |                  |               |            |         |
| <b>QPSK</b>                     |                               |                               |                       |                   |                  |               |            |         |
| 2506.0                          | 24.33                         | 25.23                         | 27.80                 | 10.5              | 38.30            | 69.01         | -30.71     | Pass    |
| 2624.0                          | 25.15                         | 25.36                         | 28.26                 | 10.5              | 38.77            | 69.31         | -30.54     | Pass    |
| 2680.0                          | 25.23                         | 25.37                         | 28.30                 | 10.5              | 38.80            | 69.11         | -30.31     | Pass    |
| <b>64QAM</b>                    |                               |                               |                       |                   |                  |               |            |         |
| 2506.0                          | 24.92                         | 25.20                         | 28.06                 | 10.5              | 38.58            | 69.02         | -30.44     | Pass    |
| 2624.0                          | 25.39                         | 25.26                         | 28.33                 | 10.5              | 38.83            | 69.28         | -30.46     | Pass    |
| 2680.0                          | 25.28                         | 25.21                         | 28.25                 | 10.5              | 38.76            | 69.11         | -30.35     | Pass    |
| <b>Antenna Chain RF #6 / #8</b> |                               |                               |                       |                   |                  |               |            |         |
| <b>QPSK</b>                     |                               |                               |                       |                   |                  |               |            |         |
| 2506.0                          | 24.63                         | 25.22                         | 27.94                 | 10.5              | 38.44            | 69.01         | -30.58     | Pass    |
| 2624.0                          | 25.23                         | 25.16                         | 28.20                 | 10.5              | 38.71            | 69.31         | -30.60     | Pass    |
| 2680.0                          | 25.25                         | 25.22                         | 28.24                 | 10.5              | 38.74            | 69.11         | -30.37     | Pass    |
| <b>64QAM</b>                    |                               |                               |                       |                   |                  |               |            |         |
| 2506.0                          | 24.21                         | 24.98                         | 27.61                 | 10.5              | 38.13            | 69.02         | -30.89     | Pass    |
| 2624.0                          | 25.43                         | 25.21                         | 28.32                 | 10.5              | 38.82            | 69.28         | -30.46     | Pass    |
| 2680.0                          | 25.37                         | 25.27                         | 28.32                 | 10.5              | 38.84            | 69.11         | -30.27     | Pass    |

\* - EIRP total, dBm = Total RF power\*\*, dBm + Antenna Gain, dBi

\*\* - Total RF power, dBm = 10\*log[10^(Power RF#1 / 10) + 10^(Power RF#2 / 10)]

\*\*\* - See Table 7.2.5

## Reference numbers of test equipment used

|         |         |         |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|
| HL 2214 | HL 3301 | HL 3302 |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|

Full description is given in Appendix A.

|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.50, Peak output power</b>                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

Table 7.2.3 Power spectral density test results

DETECTOR USED: Average gated  
RESOLUTION BANDWIDTH: 100 kHz  
VIDEO BANDWIDTH: 300 kHz  
CHANNEL BANDWIDTH: 20 MHz  
DUTY CYCLE: 55%

| Carrier frequency, MHz          | SA reading*, RF #1 dBm/100kHz | SA reading*, RF #2 dBm/100kHz | Total PSD dBm/100kHz | Antenna gain, dBi | Total EIRP**, dBm/100kHz | Limit***, dBm/100kHz | Margin, dB | Verdict |
|---------------------------------|-------------------------------|-------------------------------|----------------------|-------------------|--------------------------|----------------------|------------|---------|
| <b>Antenna Chain RF #1 / #3</b> |                               |                               |                      |                   |                          |                      |            |         |
| <b>QPSK</b>                     |                               |                               |                      |                   |                          |                      |            |         |
| 2506.0                          | 4.19                          | 4.58                          | 7.39                 | 10.5              | 17.89                    | 45.49                | -27.60     | Pass    |
| 2624.0                          | 5.00                          | 4.88                          | 7.94                 | 10.5              | 18.44                    | 46.09                | -27.65     | Pass    |
| 2680.0                          | 4.40                          | 4.78                          | 7.59                 | 10.5              | 18.09                    | 45.68                | -27.59     | Pass    |
| <b>64QAM</b>                    |                               |                               |                      |                   |                          |                      |            |         |
| 2506.0                          | 4.54                          | 4.94                          | 7.74                 | 10.5              | 18.24                    | 45.49                | -27.25     | Pass    |
| 2624.0                          | 4.98                          | 5.41                          | 8.20                 | 10.5              | 18.70                    | 46.06                | -27.36     | Pass    |
| 2680.0                          | 4.99                          | 4.97                          | 7.98                 | 10.5              | 18.48                    | 45.68                | -27.20     | Pass    |
| <b>Antenna Chain RF #2 / #4</b> |                               |                               |                      |                   |                          |                      |            |         |
| <b>QPSK</b>                     |                               |                               |                      |                   |                          |                      |            |         |
| 2506.0                          | 4.70                          | 4.48                          | 7.59                 | 10.5              | 18.09                    | 45.49                | -27.40     | Pass    |
| 2624.0                          | 5.33                          | 5.41                          | 8.37                 | 10.5              | 18.87                    | 46.09                | -27.22     | Pass    |
| 2680.0                          | 4.71                          | 4.64                          | 7.68                 | 10.5              | 18.18                    | 45.68                | -27.51     | Pass    |
| <b>64QAM</b>                    |                               |                               |                      |                   |                          |                      |            |         |
| 2506.0                          | 4.41                          | 4.93                          | 7.68                 | 10.5              | 18.18                    | 45.49                | -27.32     | Pass    |
| 2624.0                          | 5.51                          | 5.44                          | 8.48                 | 10.5              | 18.98                    | 46.06                | -27.09     | Pass    |
| 2680.0                          | 4.79                          | 4.84                          | 7.82                 | 10.5              | 18.32                    | 45.68                | -27.37     | Pass    |
| <b>Antenna Chain RF #5 / #7</b> |                               |                               |                      |                   |                          |                      |            |         |
| <b>QPSK</b>                     |                               |                               |                      |                   |                          |                      |            |         |
| 2506.0                          | 3.82                          | 4.79                          | 7.33                 | 10.5              | 17.83                    | 45.49                | -27.66     | Pass    |
| 2624.0                          | 5.44                          | 5.05                          | 8.25                 | 10.5              | 18.75                    | 46.09                | -27.34     | Pass    |
| 2680.0                          | 4.78                          | 5.36                          | 8.08                 | 10.5              | 18.58                    | 45.68                | -27.10     | Pass    |
| <b>64QAM</b>                    |                               |                               |                      |                   |                          |                      |            |         |
| 2506.0                          | 4.36                          | 4.96                          | 7.67                 | 10.5              | 18.17                    | 45.49                | -27.32     | Pass    |
| 2624.0                          | 5.66                          | 5.36                          | 8.51                 | 10.5              | 19.01                    | 46.06                | -27.05     | Pass    |
| 2680.0                          | 5.02                          | 5.24                          | 8.13                 | 10.5              | 18.63                    | 45.68                | -27.05     | Pass    |
| <b>Antenna Chain RF #6 / #8</b> |                               |                               |                      |                   |                          |                      |            |         |
| <b>QPSK</b>                     |                               |                               |                      |                   |                          |                      |            |         |
| 2506.0                          | 4.11                          | 4.75                          | 7.44                 | 10.5              | 17.94                    | 45.49                | -27.55     | Pass    |
| 2624.0                          | 5.49                          | 5.04                          | 8.27                 | 10.5              | 18.79                    | 46.09                | -27.30     | Pass    |
| 2680.0                          | 4.94                          | 5.03                          | 7.99                 | 10.5              | 18.49                    | 45.68                | -27.20     | Pass    |
| <b>64QAM</b>                    |                               |                               |                      |                   |                          |                      |            |         |
| 2506.0                          | 3.66                          | 4.43                          | 7.06                 | 10.5              | 17.58                    | 45.49                | -27.92     | Pass    |
| 2624.0                          | 5.76                          | 5.18                          | 8.48                 | 10.5              | 18.98                    | 46.06                | -27.08     | Pass    |
| 2680.0                          | 4.88                          | 5.39                          | 8.14                 | 10.5              | 18.66                    | 45.68                | -27.03     | Pass    |

\* SA reading including attenuation, cable loss and Duty Cycle correction factor

\*\* - Total EIRP PSD, dBm =  $10 \cdot \log[10^{\wedge}(\text{SA reading Max (dBm/100kHz, RF\#1/10)} + 10^{\wedge}(\text{SA reading Max (dBm/100kHz, RF\#2/10)})] + \text{Antenna Gain, dBi}$

\*\*\* See Table 7.2.6

Reference numbers of test equipment used

|         |         |         |         |         |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|
| HL 2214 | HL 3301 | HL 3302 | HL 3818 | HL 3901 |  |  |  |
|---------|---------|---------|---------|---------|--|--|--|

Full description is given in Appendix A.





|                      |                         |                                                      |                |
|----------------------|-------------------------|------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.50, Peak output power                     |                |
| Test procedure:      |                         | 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                |
| Test mode:           |                         | Verdict: PASS                                        |                |
| Date(s):             |                         |                                                      |                |
| 15-Aug-17            |                         |                                                      |                |
| Temperature: 24.3 °C | Relative Humidity: 43 % | Air Pressure: 1009 hPa                               | Power: 120 VAC |
| Remarks:             |                         |                                                      |                |

Table 7.2.4 Post - transition frequency channels assignment

| Channel                                                                                         | OBW, MHz | Peak power limit, dBm                                     | Power density limit, dBm/100kHz |
|-------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------|---------------------------------|
| <b>20 MHz QPSK</b>                                                                              |          |                                                           |                                 |
| 2506.0 MHz<br>BRS1+EBS A1+A2+A3                                                                 | 17.9699  | $63+10\log(\text{OBW}/22.5)+10\log(360/\text{beamwidth})$ | $\text{EIRP}+10\log(0.1/22.5)$  |
| 2624.0 MHz<br>BRS KH1+KH2+KH3+KG1KG2+KG3+<br>KF1+KF2+KF3+KE1+KE2+KE3 +<br>BRS 2A+ BRS/EBS E1+E2 | 17.9729  | $63+10\log(\text{OBW}/24.0)+10\log(360/\text{beamwidth})$ | $\text{EIRP}+10\log(0.1/24.0)$  |
| 2680.0 MHz<br>EBS H3+G1+G2+G3                                                                   | 17.9548  | $63+10\log(\text{OBW}/22.0)+10\log(360/\text{beamwidth})$ | $\text{EIRP}+10\log(0.1/22.0)$  |
| <b>20 MHz 64QAM</b>                                                                             |          |                                                           |                                 |
| 2506.0 MHz<br>BRS1+EBS A1+A2+A3                                                                 | 17.9778  | $63+10\log(\text{OBW}/22.5)+10\log(360/\text{beamwidth})$ | $\text{EIRP}+10\log(0.1/22.5)$  |
| 2624.0 MHz<br>BRS KH1+KH2+KH3+KG1KG2+KG3+<br>KF1+KF2+KF3+KE1+KE2+KE3 +<br>BRS 2A+ BRS/EBS E1+E2 | 17.8498  | $63+10\log(\text{OBW}/24.0)+10\log(360/\text{beamwidth})$ | $\text{EIRP}+10\log(0.1/24.0)$  |
| 2680.0 MHz<br>EBS H3+G1+G2+G3                                                                   | 17.958   | $63+10\log(\text{OBW}/22.0)+10\log(360/\text{beamwidth})$ | $\text{EIRP}+10\log(0.1/22.0)$  |

Table 7.2.5 EIRP limits

| Channel                                                                                         | Channel BW,<br>MHz | Peak power limit, dBm   |
|-------------------------------------------------------------------------------------------------|--------------------|-------------------------|
|                                                                                                 |                    | 10.5 dBi, 72° beamwidth |
| 20 MHz QPSK                                                                                     |                    |                         |
| 2506.0 MHz<br>BRS1+EBS A1+A2+A3                                                                 | 22.5               | 69.01                   |
| 2624.0 MHz<br>BRS KH1+KH2+KH3+KG1KG2+KG3+<br>KF1+KF2+KF3+KE1+KE2+KE3 +<br>BRS 2A+ BRS/EBS E1+E2 | 21.0               | 69.31                   |
| 2680.0 MHz<br>EBS H3+G1+G2+G3                                                                   | 22.0               | 69.11                   |
| 20 MHz 64 QAM                                                                                   |                    |                         |
| 2506.0 MHz<br>BRS1+EBS A1+A2+A3                                                                 | 22.5               | 69.02                   |
| 2624.0 MHz<br>BRS KH1+KH2+KH3+KG1KG2+KG3+<br>KF1+KF2+KF3+KE1+KE2+KE3 +<br>BRS 2A+ BRS/EBS E1+E2 | 21.0               | 69.28                   |
| 2680.0 MHz<br>EBS H3+G1+G2+G3                                                                   | 22.0               | 69.11                   |



|                      |                         |                                                      |                |
|----------------------|-------------------------|------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.50, Peak output power                     |                |
| Test procedure:      |                         | 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                |
| Test mode:           |                         | Verdict: PASS                                        |                |
| Date(s):             |                         |                                                      |                |
| 15-Aug-17            |                         |                                                      |                |
| Temperature: 24.3 °C | Relative Humidity: 43 % | Air Pressure: 1009 hPa                               | Power: 120 VAC |
| Remarks:             |                         |                                                      |                |

Table 7.2.6 Peak power density limits

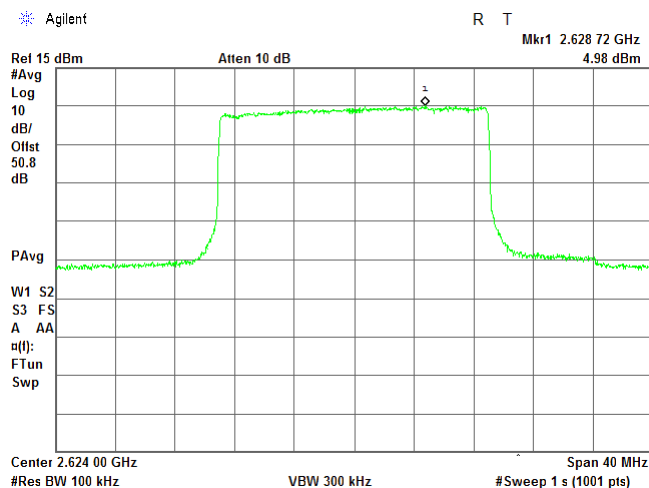
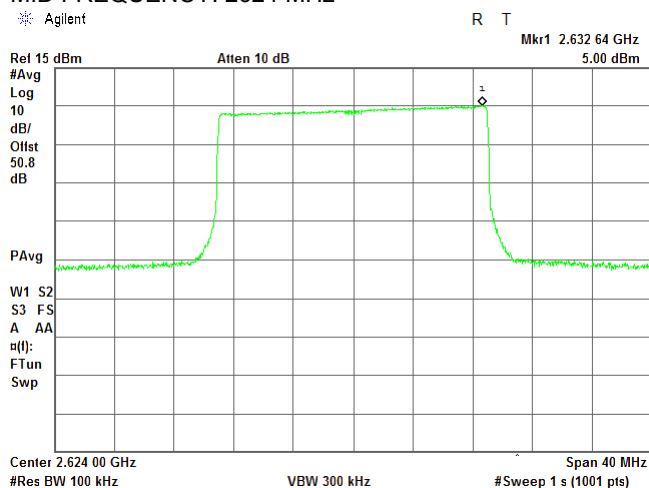
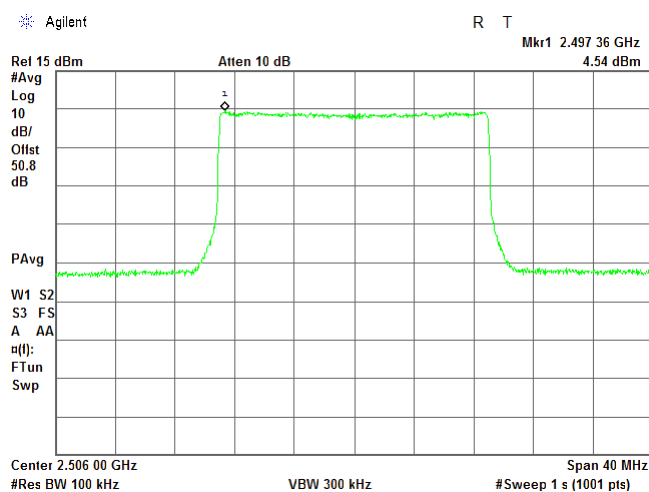
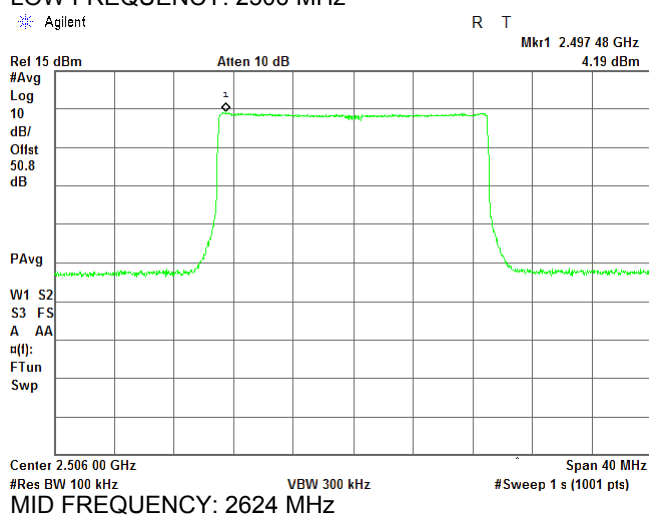
| Channel                                                                                         | Channel BW,<br>MHz | Peak power density,<br>dBm/100kHz |
|-------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
|                                                                                                 |                    | 10.5 dBi, 72° beamwidth           |
| 20 MHz QPSK                                                                                     |                    |                                   |
| 2506.0 MHz<br>BRS1+EBS A1+A2+A3                                                                 | 22.5               | 45.49                             |
| 2624.0 MHz<br>BRS KH1+KH2+KH3+KG1KG2+KG3+<br>KF1+KF2+KF3+KE1+KE2+KE3 +<br>BRS 2A+ BRS/EBS E1+E2 | 21.0               | 46.09                             |
| 2680.0 MHz<br>EBS H3+G1+G2+G3                                                                   | 22.0               | 45.68                             |
| 20 MHz 64 QAM                                                                                   |                    |                                   |
| 2506.0 MHz<br>BRS1+EBS A1+A2+A3                                                                 | 22.5               | 45.49                             |
| 2624.0 MHz<br>BRS KH1+KH2+KH3+KG1KG2+KG3+<br>KF1+KF2+KF3+KE1+KE2+KE3 +<br>BRS 2A+ BRS/EBS E1+E2 | 21.0               | 46.06                             |
| 2680.0 MHz<br>EBS H3+G1+G2+G3                                                                   | 22.0               | 45.68                             |

|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

### Plot 7.2.1 Peak output power test results at antenna chain RF # 1

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK  
LOW FREQUENCY: 2506 MHz

20 MHz  
1  
Modulation: 64 QAM



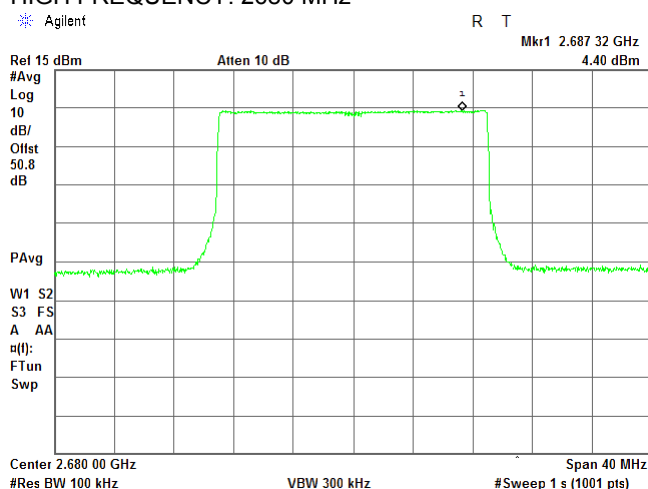
|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

Plot 7.2.2 Peak output power test results at antenna chain RF # 1

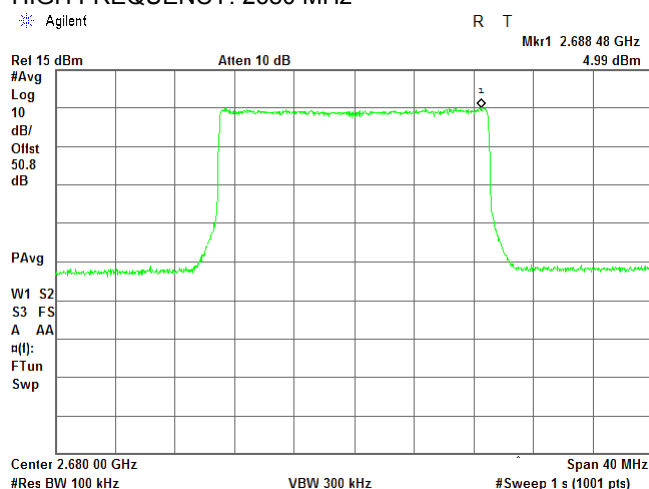
CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK

20 MHz  
1  
Modulation: 64 QAM

HIGH FREQUENCY: 2680 MHz



HIGH FREQUENCY: 2680 MHz

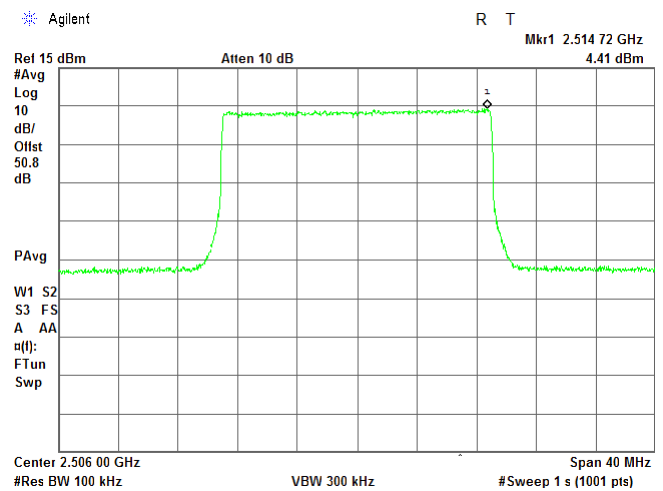
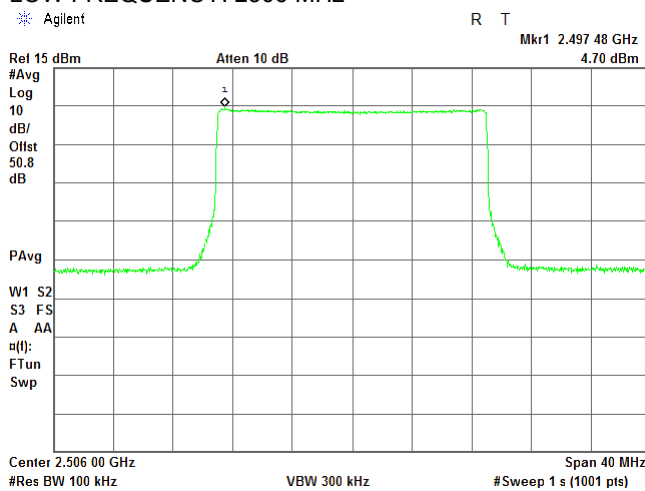


|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

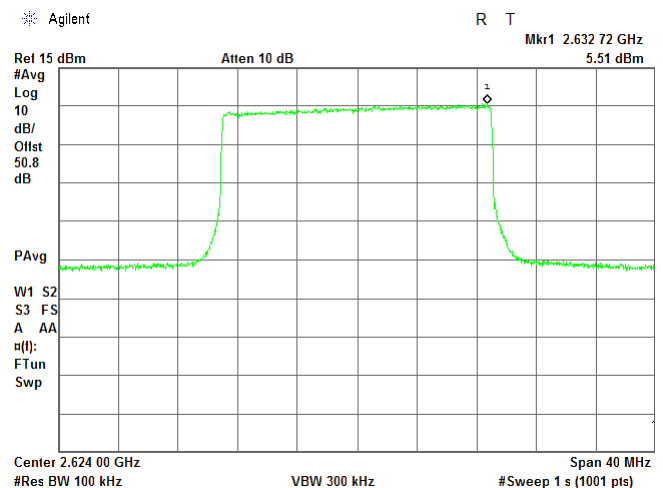
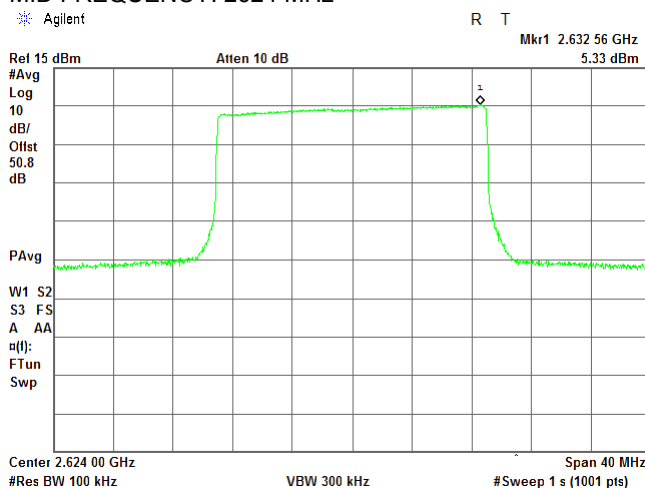
### Plot 7.2.3 Peak output power test results at antenna chain RF # 2

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK  
LOW FREQUENCY: 2506 MHz

20 MHz  
2  
Modulation: 64 QAM



### MID FREQUENCY: 2624 MHz



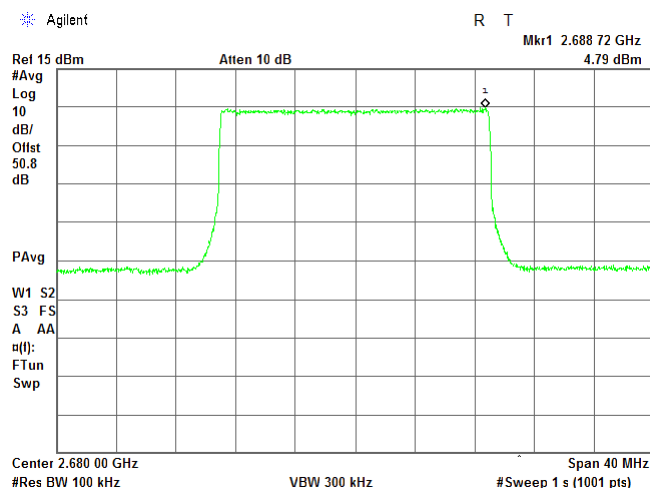
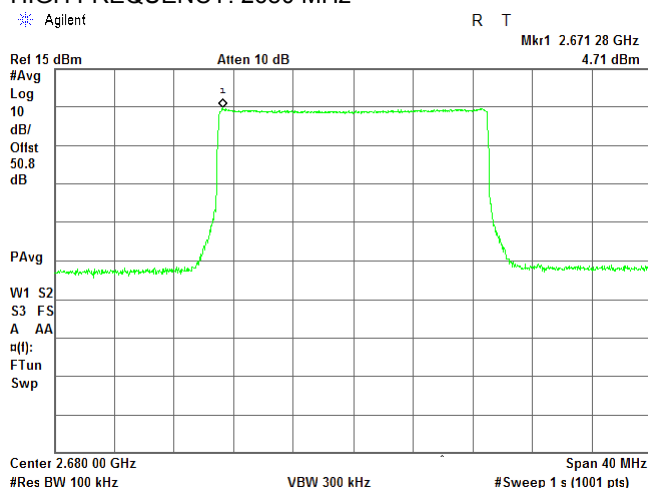
|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

#### Plot 7.2.4 Peak output power test results at antenna chain RF # 2

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK

20 MHz  
2  
Modulation: 64 QAM

HIGH FREQUENCY: 2680 MHz

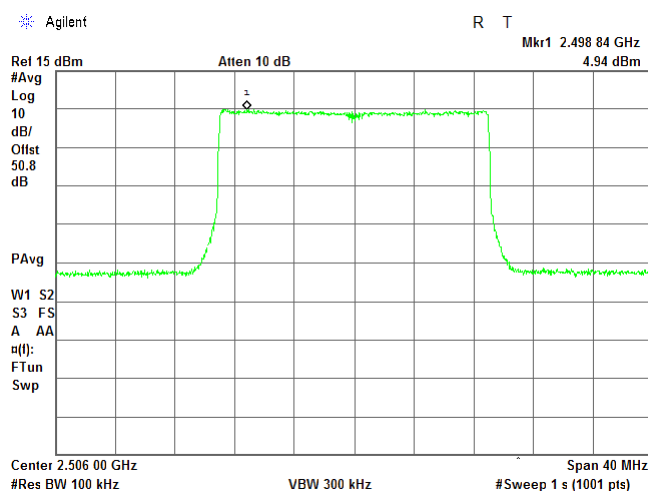
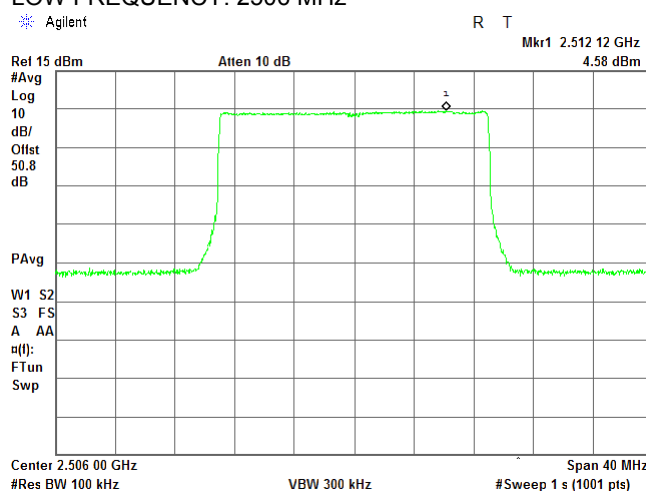


|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.50, Peak output power</b>                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

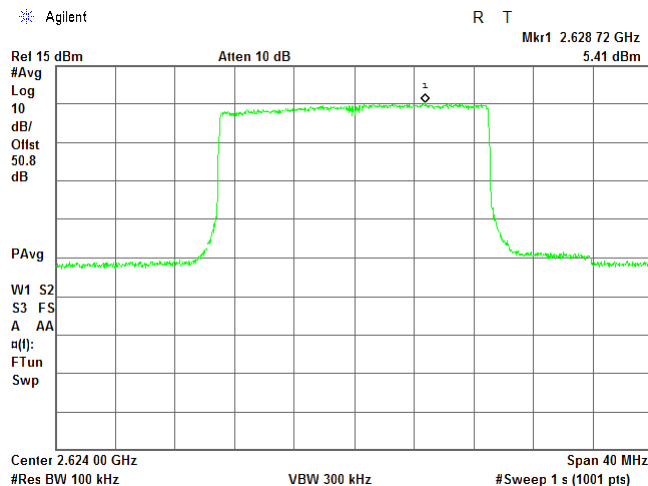
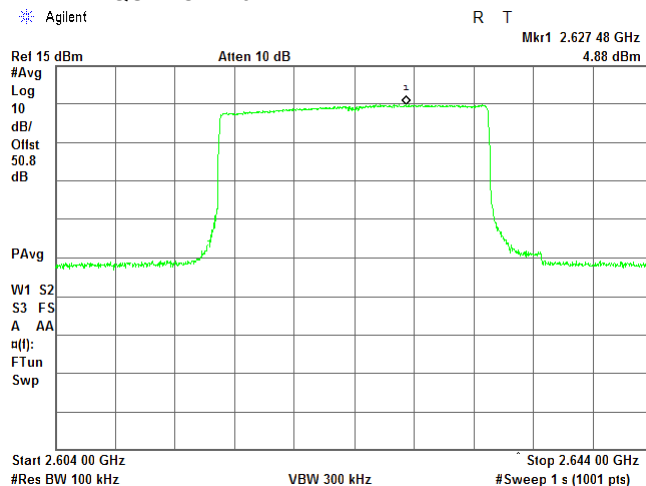
### Plot 7.2.5 Peak output power test results at antenna chain RF # 3

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK  
LOW FREQUENCY: 2506 MHz

20 MHz  
3  
Modulation: 64 QAM



MID FREQUENCY: 2624 MHz



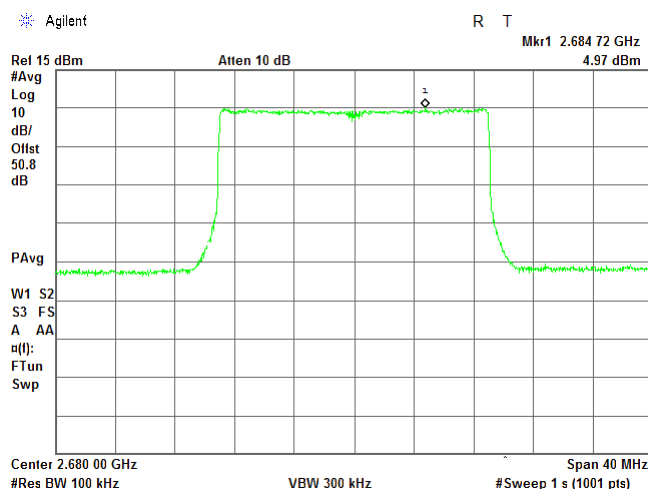
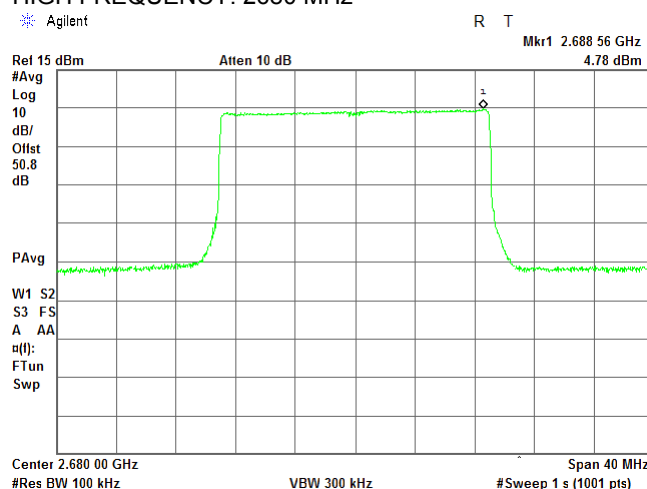
|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

**Plot 7.2.6 Peak output power test results at antenna chain RF # 3**

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK

20 MHz  
3  
Modulation: 64 QAM

HIGH FREQUENCY: 2680 MHz



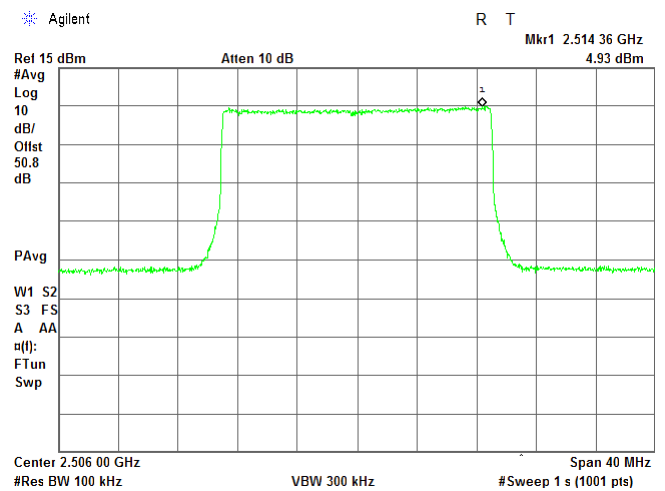
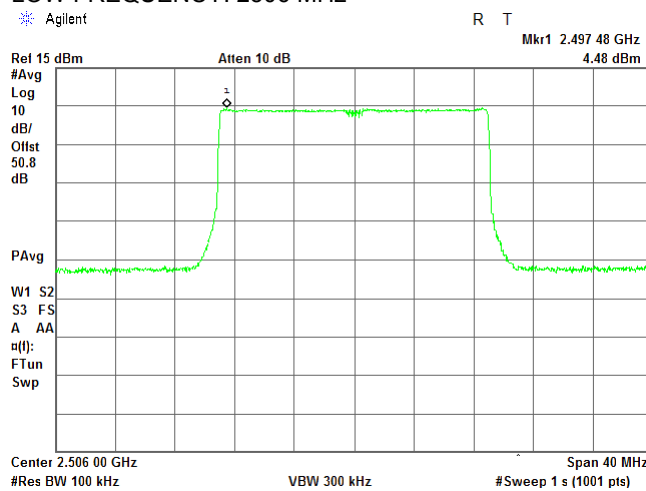


|                      |                         |                                                      |                |
|----------------------|-------------------------|------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.50, Peak output power                     |                |
| Test procedure:      |                         | 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                |
| Test mode:           |                         | Verdict: PASS                                        |                |
| Date(s):             |                         |                                                      |                |
| 15-Aug-17            |                         |                                                      |                |
| Temperature: 24.3 °C | Relative Humidity: 43 % | Air Pressure: 1009 hPa                               | Power: 120 VAC |
| Remarks:             |                         |                                                      |                |

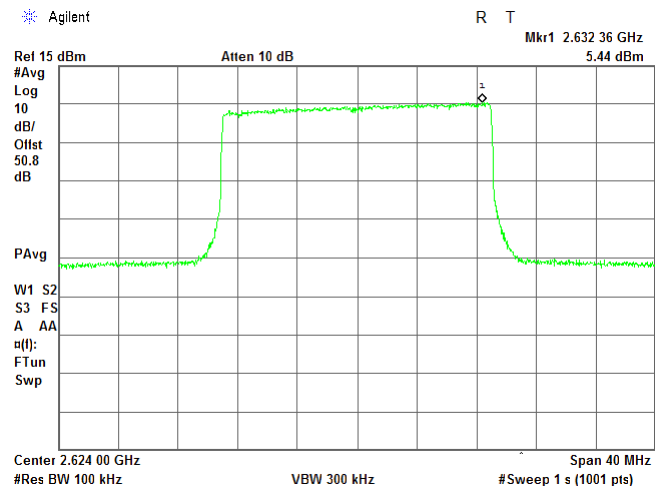
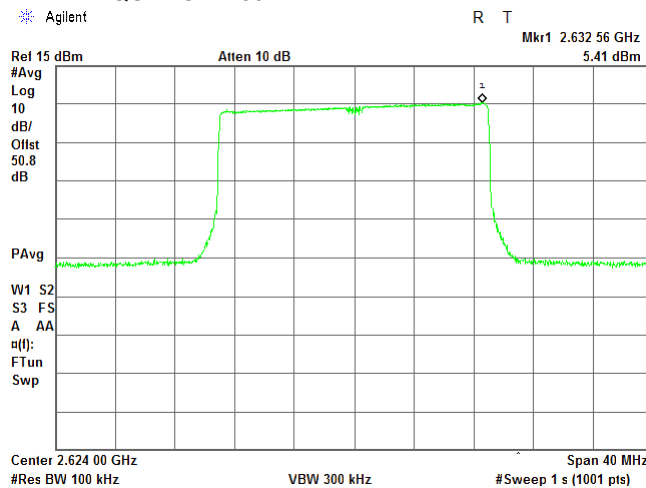
### Plot 7.2.7 Peak output power test results at antenna chain, RF # 4

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK  
LOW FREQUENCY: 2506 MHz

20 MHz  
4  
Modulation: 64 QAM



MID FREQUENCY: 2594 MHz



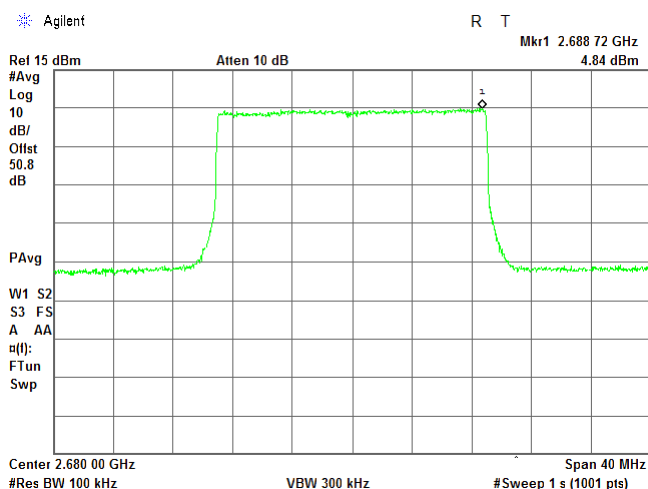
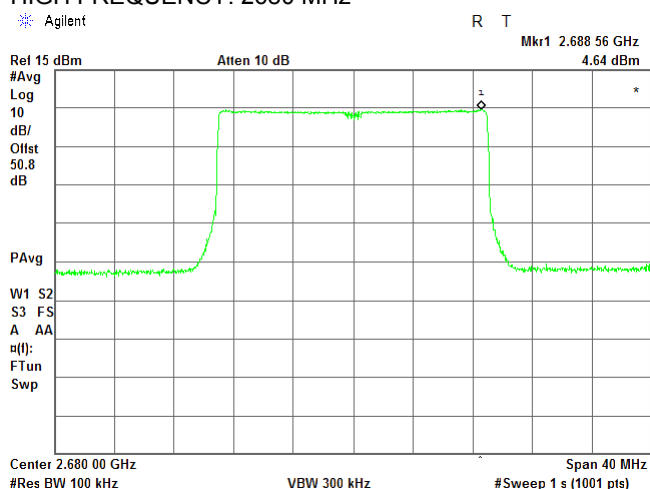
|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.50, Peak output power</b>                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

**Plot 7.2.8 Peak output power test results at antenna chain, RF # 4**

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK

20 MHz  
4  
Modulation: 64 QAM

HIGH FREQUENCY: 2680 MHz



|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

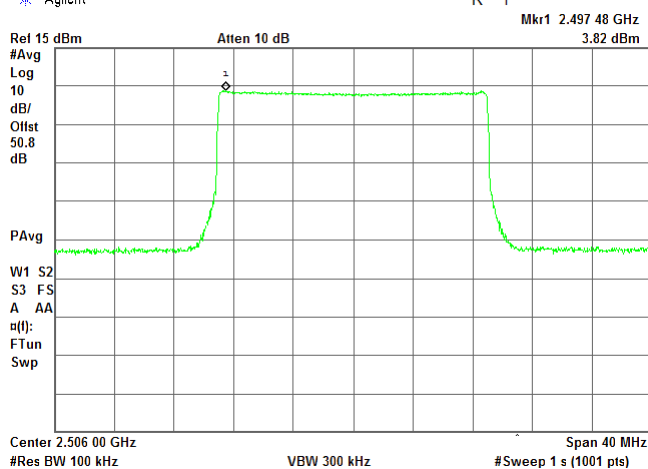
### Plot 7.2.9 Peak output power test results at antenna chain RF # 5

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK  
LOW FREQUENCY: 2506 MHz

20 MHz  
5  
Modulation: 64 QAM

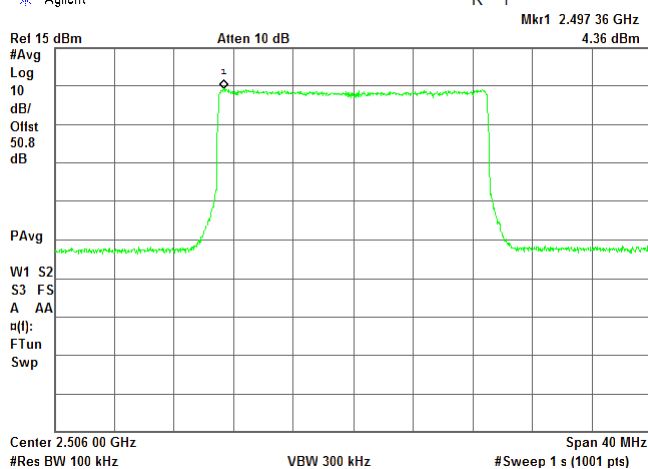
Agilent

R T



Agilent

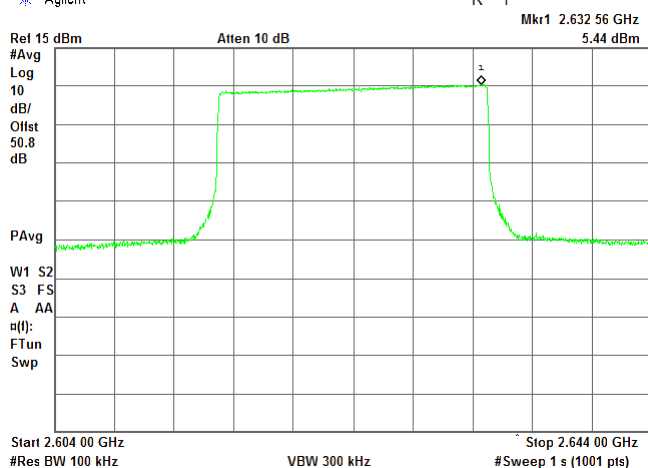
R T



MID FREQUENCY: 2624 MHz

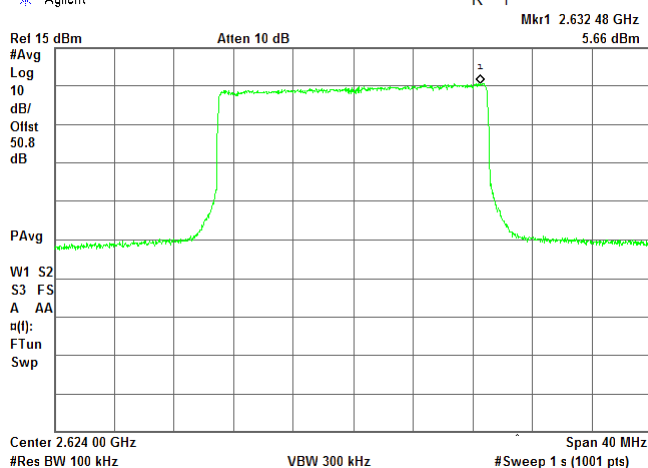
Agilent

R T



Agilent

R T





HERMON LABORATORIES

|                                                                      |                         |                        |                |
|----------------------------------------------------------------------|-------------------------|------------------------|----------------|
| Test specification: Section 27.50, Peak output power                 |                         |                        |                |
| Test procedure: 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                         |                        |                |
| Test mode: Compliance                                                |                         | Verdict: PASS          |                |
| Date(s): 15-Aug-17                                                   |                         |                        |                |
| Temperature: 24.3 °C                                                 | Relative Humidity: 43 % | Air Pressure: 1009 hPa | Power: 120 VAC |
| Remarks:                                                             |                         |                        |                |

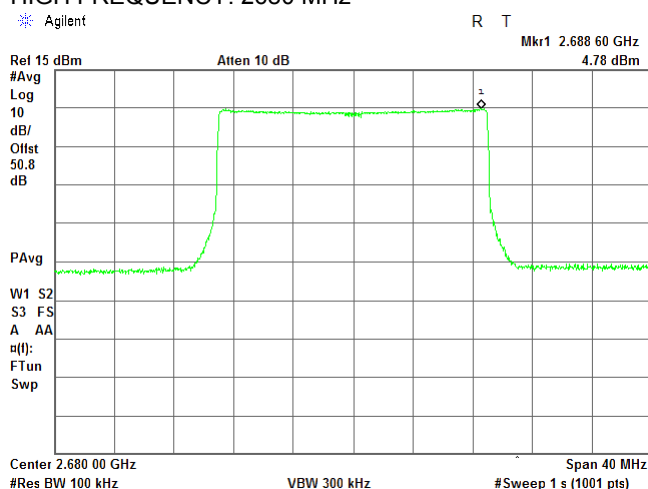
Plot 7.2.10 Peak output power test results at antenna chain RF # 5

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK

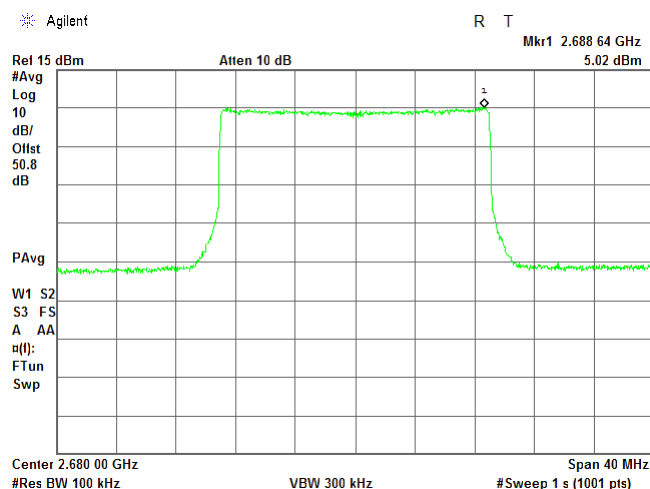
20 MHz  
5  
Modulation: 64 QAM

HIGH FREQUENCY: 2680 MHz

Agilent



Agilent

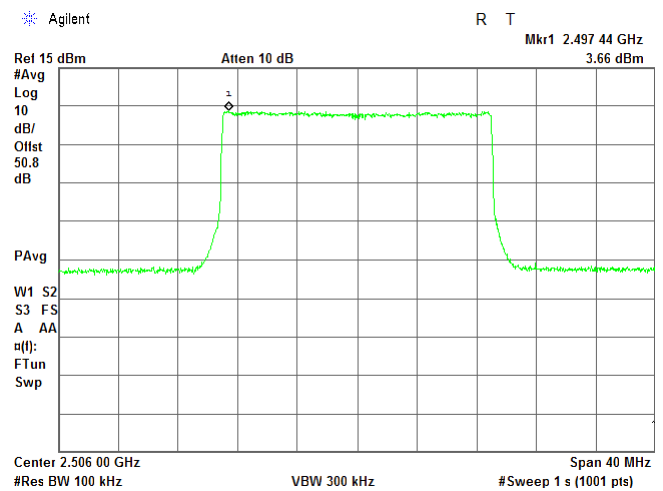
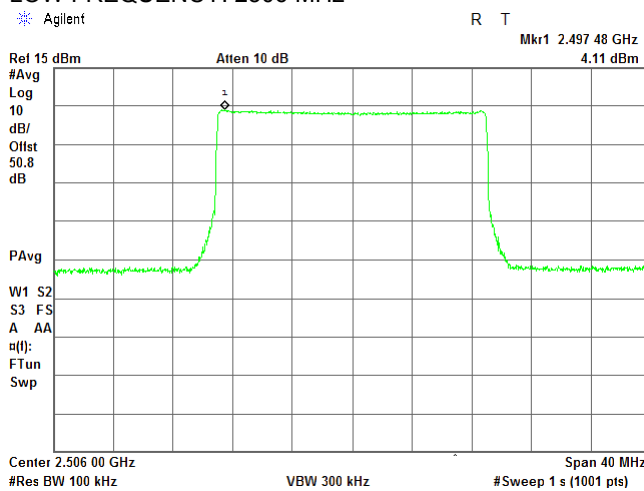


|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

Plot 7.2.11 Peak output power test results at antenna chain RF # 6

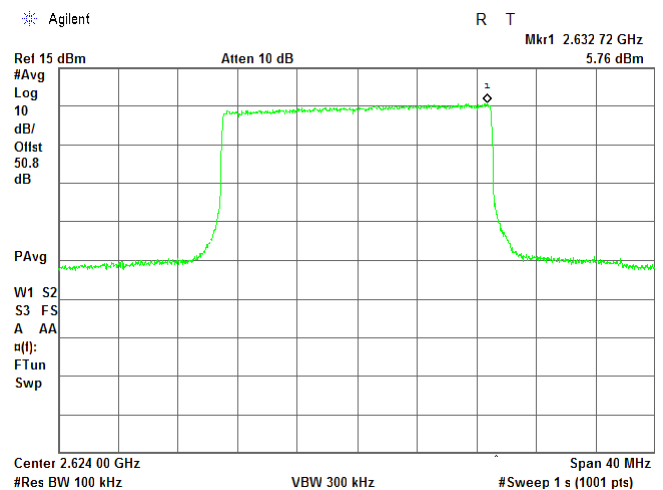
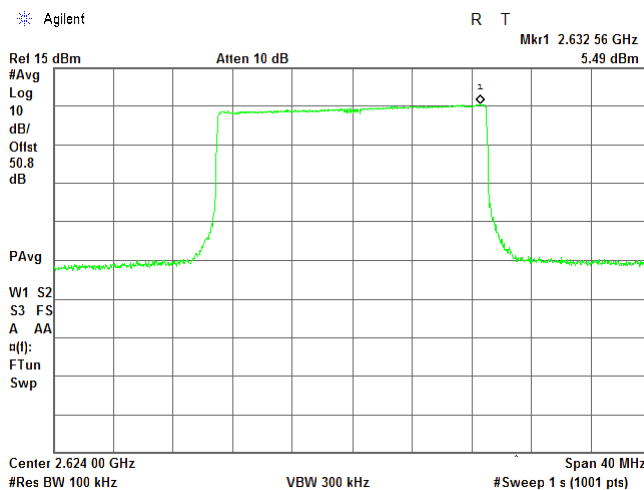
CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK  
LOW FREQUENCY: 2506 MHz

20 MHz  
6  
Modulation: 64 QAM



MID FREQUENCY: 2 MHz

2

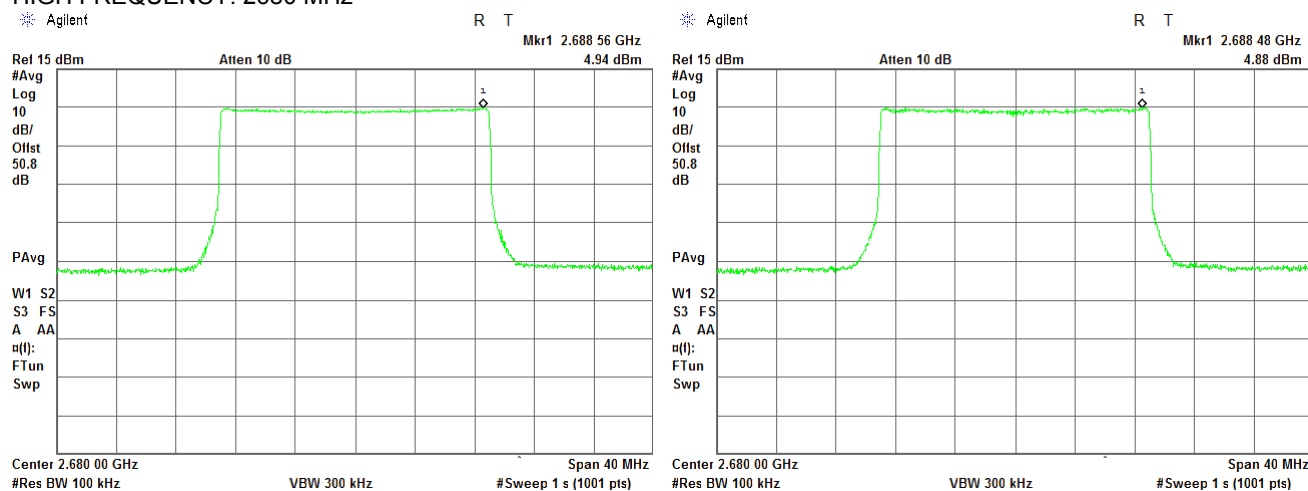


|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

Plot 7.2.12 Peak output power test results at antenna chain RF # 6

CHANNEL BANDWIDTH: 20 MHz  
NUMBER OF ANTENNA: 6

HIGH FREQUENCY: 2680 MHz

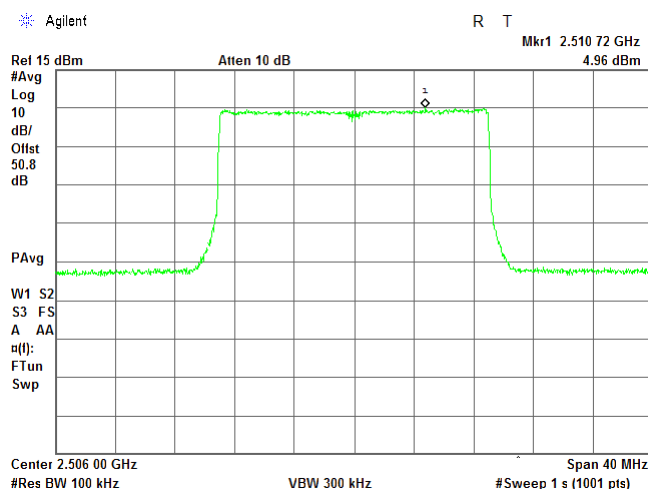
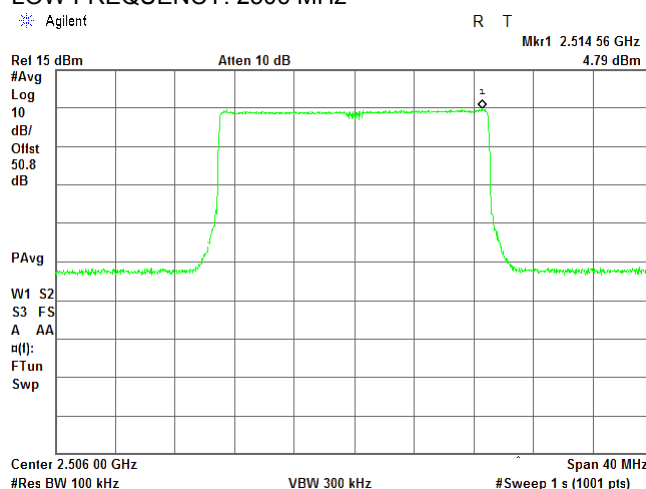


|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.50, Peak output power</b>                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

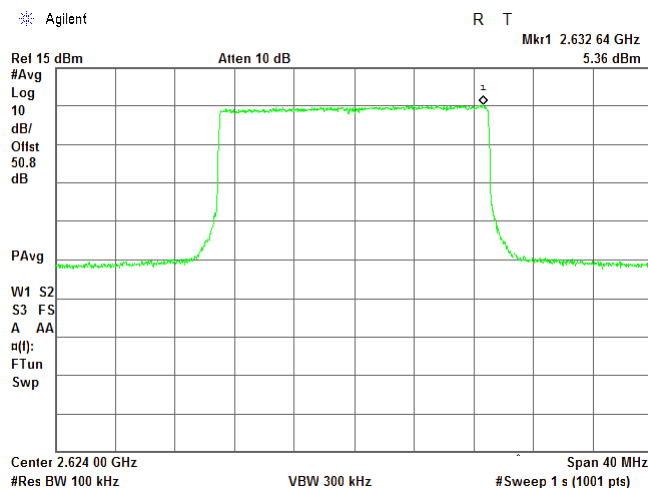
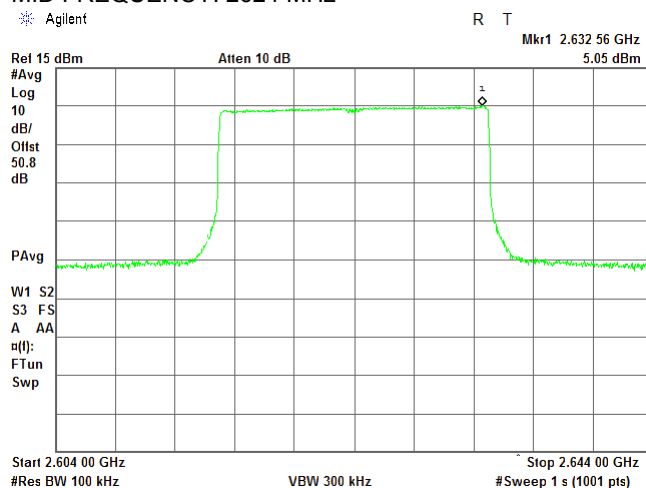
Plot 7.2.13 Peak output power test results at antenna chain RF # 7

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK  
LOW FREQUENCY: 2506 MHz

20 MHz  
7  
Modulation: 64 QAM



MID FREQUENCY: 2624 MHz



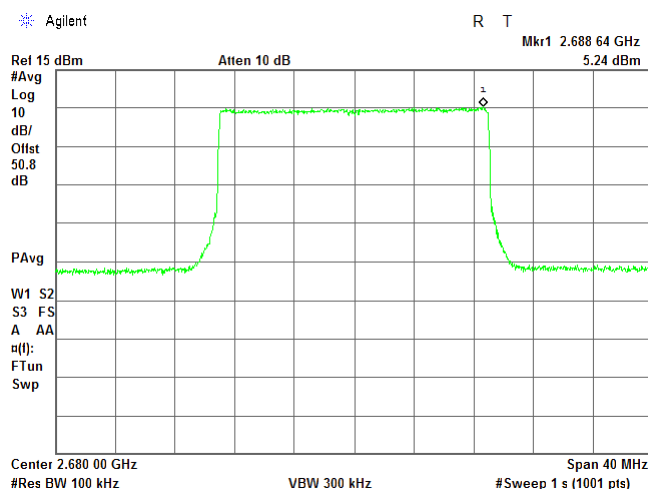
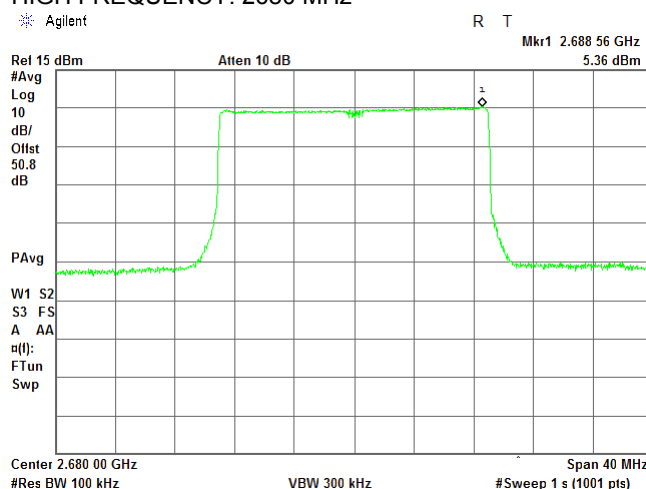
|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.50, Peak output power</b>                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

Plot 7.2.14 Peak output power test results at antenna chain RF # 7

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK

20 MHz  
7  
Modulation: 64 QAM

HIGH FREQUENCY: 2680 MHz



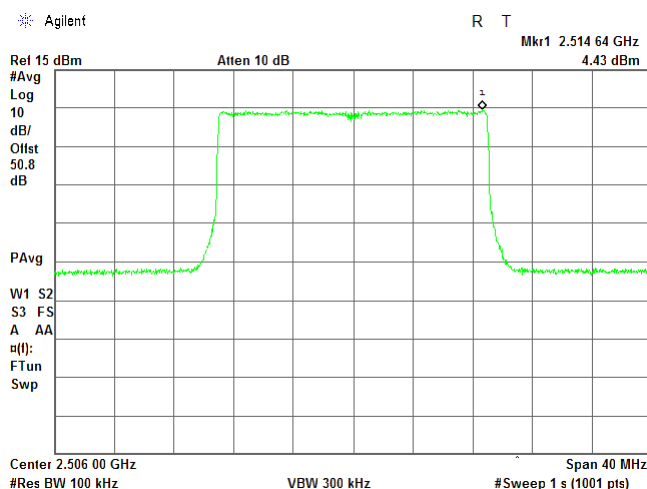
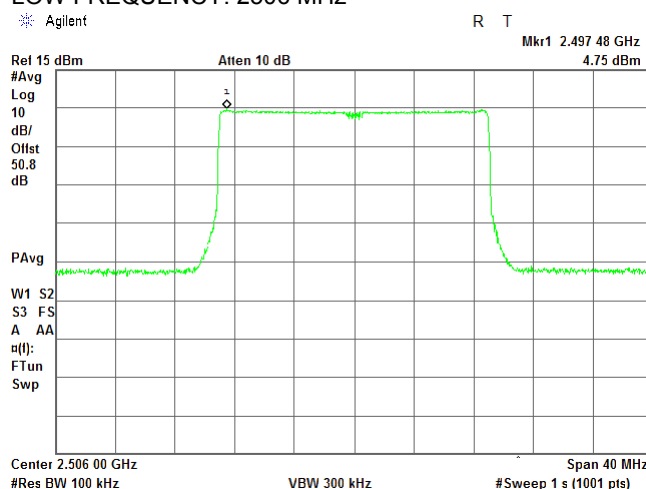


|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 27.50, Peak output power</b>          |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

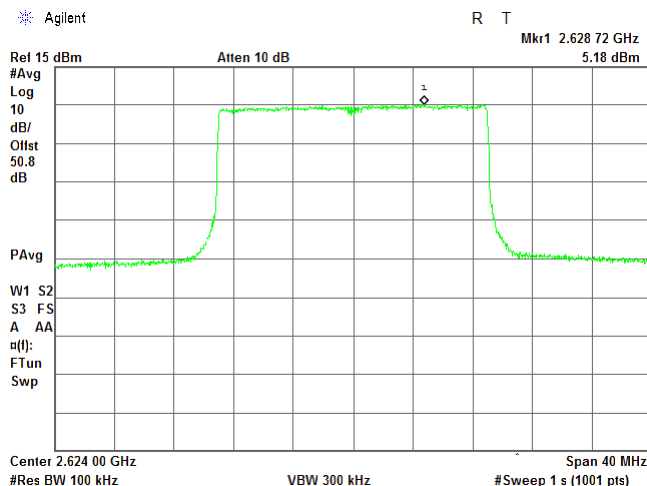
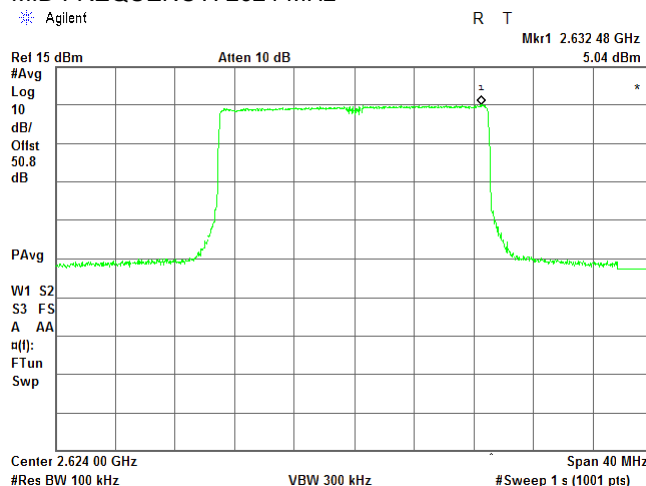
**Plot 7.2.15 Peak output power test results at antenna chain RF # 8**

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK  
LOW FREQUENCY: 2506 MHz

20 MHz  
8  
Modulation: 64 QAM



MID FREQUENCY: 2624 MHz



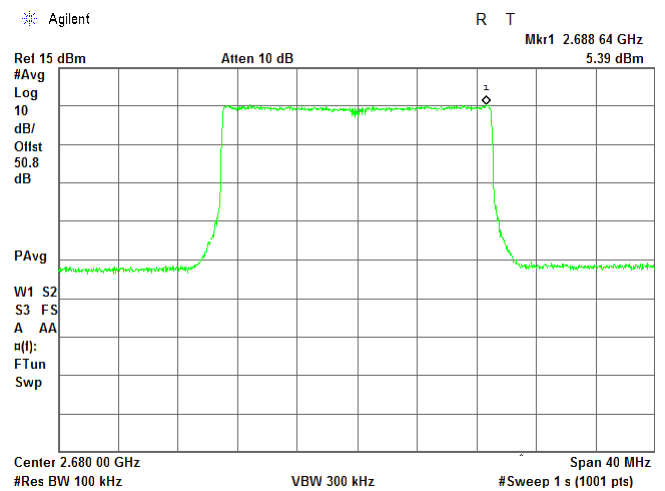
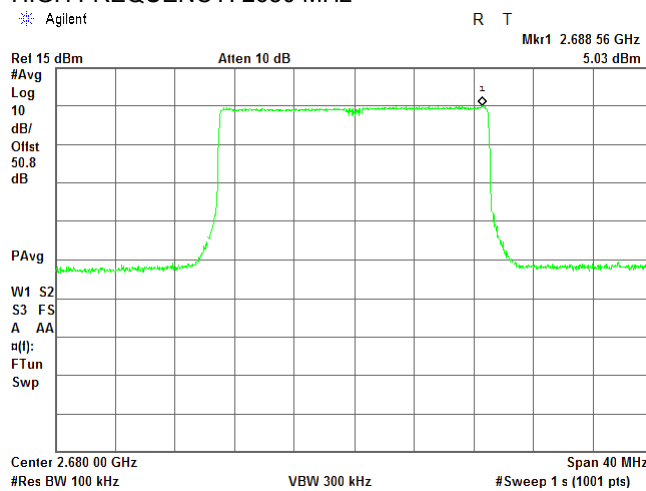
|                                                                             |                                |                               |                       |
|-----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.50, Peak output power                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1046; TIA/EIA-603-D, Section 2.2.1 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 15-Aug-17                                                   |                                |                               |                       |
| <b>Temperature:</b> 24.3 °C                                                 | <b>Relative Humidity:</b> 43 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                             |                                |                               |                       |

**Plot 7.2.16 Peak output power test results at antenna chain RF # 8**

CHANNEL BANDWIDTH:  
NUMBER OF ANTENNA:  
Modulation: QPSK

20 MHz  
8  
Modulation: 64 QAM

HIGH FREQUENCY: 2680 MHz



|                                                                                      |                                |                               |                       |
|--------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> <b>Section 27.53, Band edge emissions</b>                 |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                         |                                | <b>Verdict:</b> <b>PASS</b>   |                       |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |                               |                       |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                                      |                                |                               |                       |

## 7.3 Band edge emissions at RF connector test

### 7.3.1 General

This test was performed to measure spurious emissions at the channel edge at the RF antenna connector. Specification test limits are given in Table 7.3.1.

**Table 7.3.1 Spurious emission limits at band edges**

| Channel, MHz    | Frequency range  | RBW, kHz | Attenuation below carrier, dBc | Limit, dBm |
|-----------------|------------------|----------|--------------------------------|------------|
| 2496.0 – 2518.5 | 2495.0-2496.0    | 300      | 43+ 10*Log (P*)                | -13.0      |
|                 | Below 2495 MHz   | 1000     | 43+ 10*Log (P*)                | -13.0      |
|                 | Above 2518.5 MHz | 1000     | 43+ 10*Log (P*)                | -13.0      |
| 2614.0 – 2635.0 | 2613.0 – 2614.0  | 300      | 43+ 10*Log (P*)                | -13.0      |
|                 | Below 2495 MHz   | 1000     | 43+ 10*Log (P*)                | -13.0      |
|                 | Above 2518.5 MHz | 1000     | 43+ 10*Log (P*)                | -13.0      |
| 2668.0 – 2690.0 | Below 2668.0 MHz | 1000     | 43+ 10*Log (P*)                | -13.0      |
|                 | 2690.0 – 2691.0  | 300      | 43+ 10*Log (P*)                | -13.0      |
|                 | Above 2691.0     | 1000     | 43+ 10*Log (P*)                | -13.0      |

\* - P is transmitter output power in Watts

### 7.3.2 Test procedure

**7.3.2.1** The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

**7.3.2.2** The spurious emission was measured with spectrum analyzer as provided in Table 7.3.2 and the associated plots.

**Figure 7.3.1 Spurious emission test setup for single output**



|                                                                                      |                                |                               |                       |
|--------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Band edge emissions                        |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                         |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |                               |                       |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                                      |                                |                               |                       |

Table 7.3.2 Spurious emission at the band edge test results

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz  
DETECTOR USED: Average (gated)  
RESOLUTION BANDWIDTH: 100 kHz  
VIDEO BANDWIDTH: ≥ Resolution bandwidth  
EBW: 20 MHz  
NUMBER OF CHAINS: 2  
ANTENNA PORT: #5

| Frequency<br>MHz          | Band edge | SA reading over 1chain,<br>dBm | Total band edge*,<br>dBm | RBW,<br>kHz | Integration<br>BW, kHz | Limit,<br>dBm | Verdict |
|---------------------------|-----------|--------------------------------|--------------------------|-------------|------------------------|---------------|---------|
| QPSK                      |           |                                |                          |             |                        |               |         |
| Low frequency 2506.0 MHz  |           |                                |                          |             |                        |               |         |
| 2496.64                   | Low       | -27.33                         | -24.33                   | 300         | NA                     | -13.0         | Pass    |
| 2495.00                   | Low       | -26.83                         | -23.83                   | 100         | 1000                   | -13.0         |         |
| 2515.36                   | High      | -27.84                         | -24.84                   | 300         | NA                     | -13.0         |         |
| 2517.00                   | High      | -26.56                         | -23.56                   | 100         | 1000                   | -13.0         |         |
| Mid frequency 2624.0 MHz  |           |                                |                          |             |                        |               |         |
| 2614.00                   | Low       | -25.96                         | -22.96                   | 300         | NA                     | -13.0         | Pass    |
| 2613.00                   | Low       | -24.23                         | -21.23                   | 100         | 1000                   | -13.0         |         |
| 2634.00                   | High      | -23.52                         | -20.52                   | 300         | NA                     | -13.0         |         |
| 2635.00                   | High      | -23.76                         | -20.76                   | 100         | 1000                   | -13.0         |         |
| High frequency 2680.0 MHz |           |                                |                          |             |                        |               |         |
| 2670.00                   | Low       | -25.98                         | -22.98                   | 300         | NA                     | -13.0         | Pass    |
| 2669.00                   | Low       | -25.70                         | -22.70                   | 100         | 1000                   | -13.0         |         |
| 2690.00                   | High      | -26.00                         | -23.00                   | 300         | NA                     | -13.0         |         |
| 2691.00                   | High      | -25.07                         | -22.07                   | 100         | 1000                   | -13.0         |         |
| 64QAM                     |           |                                |                          |             |                        |               |         |
| Low frequency 2506.0 MHz  |           |                                |                          |             |                        |               |         |
| 2496.00                   | Low       | -28.11                         | -25.11                   | 300         | NA                     | -13.0         | Pass    |
| 2495.00                   | Low       | -26.34                         | -23.34                   | 100         | 1000                   | -13.0         |         |
| 2515.00                   | High      | -27.28                         | -24.28                   | 300         | NA                     | -13.0         |         |
| 2517.00                   | High      | -26.32                         | -23.32                   | 100         | 1000                   | -13.0         |         |
| Mid frequency 2624.0 MHz  |           |                                |                          |             |                        |               |         |
| 2614.00                   | Low       | -24.12                         | -21.12                   | 300         | NA                     | -13.0         | Pass    |
| 2613.00                   | Low       | -24.46                         | -21.46                   | 100         | 1000                   | -13.0         |         |
| 2634.00                   | High      | -24.12                         | -21.12                   | 300         | NA                     | -13.0         |         |
| 2635.00                   | High      | -23.56                         | -20.56                   | 100         | 1000                   | -13.0         |         |
| High frequency 2680.0 MHz |           |                                |                          |             |                        |               |         |
| 2670.00                   | Low       | -27.30                         | -24.30                   | 300         | NA                     | -13.0         | Pass    |
| 2669.00                   | Low       | -25.66                         | -22.66                   | 100         | 1000                   | -13.0         |         |
| 2690.00                   | High      | -25.58                         | -22.58                   | 300         | NA                     | -13.0         |         |
| 2691.00                   | High      | -24.77                         | -21.77                   | 100         | 1000                   | -13.0         |         |

\*- Total band edge, dBm = SA Reading band edge, dBm + 10\*log(N) = SA Reading band edge, dBm + 3 dB

**Reference numbers of test equipment used**

|         |         |         |         |         |         |  |  |
|---------|---------|---------|---------|---------|---------|--|--|
| HL 2214 | HL 3301 | HL 3302 | HL 3433 | HL 3434 | HL 3818 |  |  |
|---------|---------|---------|---------|---------|---------|--|--|

Full description is given in Appendix A.

|                                                                                      |                                |                               |                       |
|--------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Band edge emissions                        |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                         |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |                               |                       |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                                      |                                |                               |                       |

**Plot 7.3.1 Spurious emission at band edges test results at low carrier frequency**

ASSIGNED FREQUENCY RANGE:

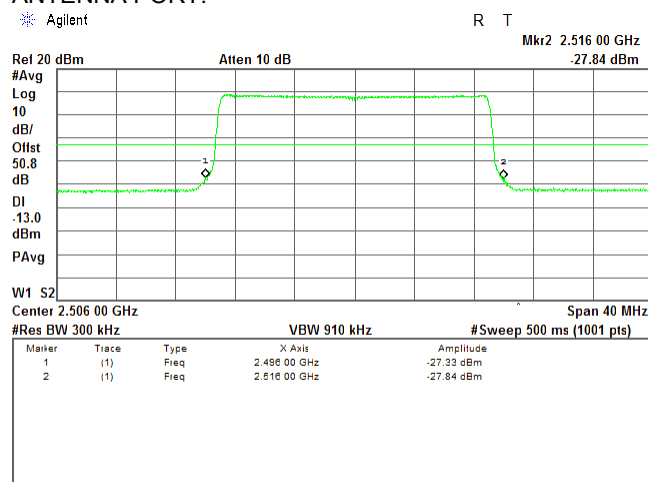
DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

TRANSMITTER OUTPUT POWER SETTINGS:

ANTENNA PORT:



2496 – 2690 MHz

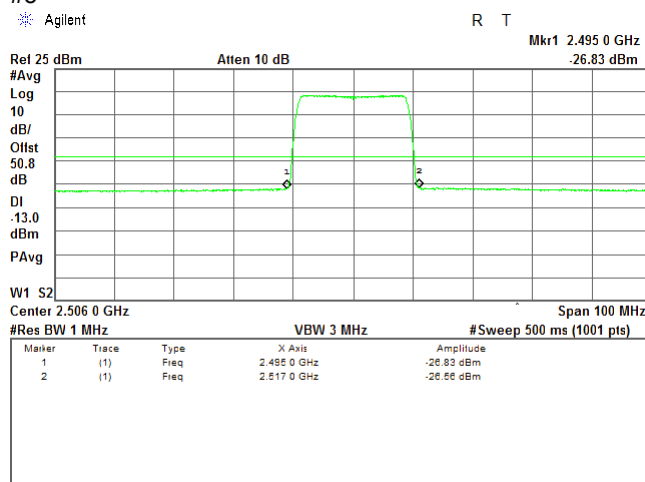
Average

QPSK

PRBS

Maximum

#5



**Plot 7.3.2 Spurious emission at band edges test results at mid carrier frequency**

ASSIGNED FREQUENCY RANGE:

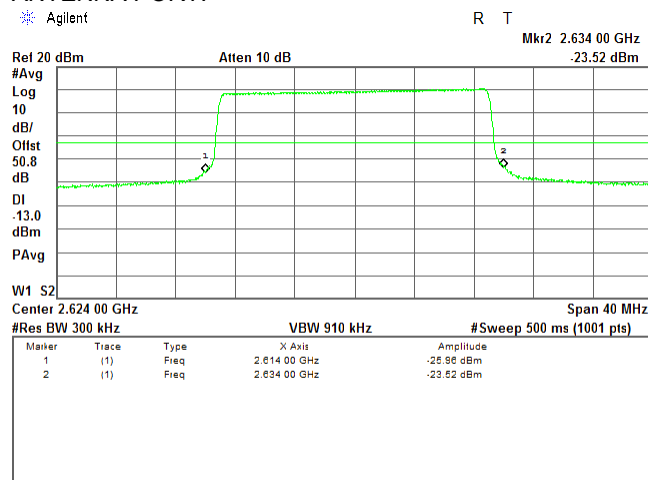
DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

TRANSMITTER OUTPUT POWER SETTINGS:

ANTENNA PORT:



2496 – 2690 MHz

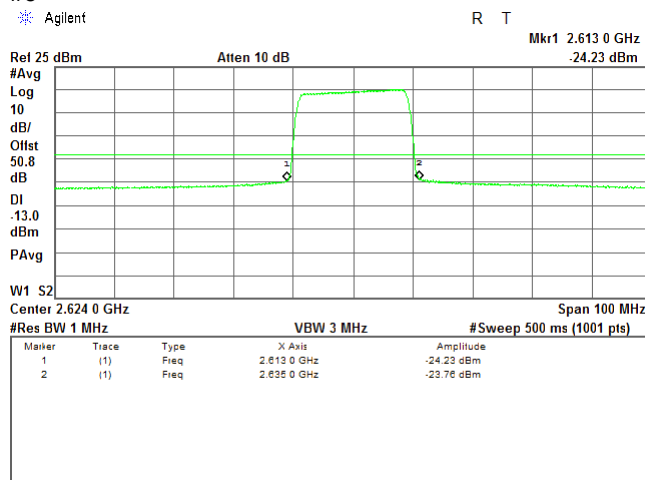
Average

QPSK

PRBS

Maximum

#5



|                             |                                |                                                               |                       |
|-----------------------------|--------------------------------|---------------------------------------------------------------|-----------------------|
| <b>Test specification:</b>  |                                | <b>Section 27.53, Band edge emissions</b>                     |                       |
| <b>Test procedure:</b>      |                                | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13 |                       |
| <b>Test mode:</b>           |                                | Compliance                                                    | <b>Verdict:</b> PASS  |
| <b>Date(s):</b>             |                                | 16-Aug-17                                                     |                       |
| <b>Temperature:</b> 24.4 °C | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa                                 | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>             |                                |                                                               |                       |

**Plot 7.3.3 Spurious emission at band edges test results at high carrier frequency**

ASSIGNED FREQUENCY RANGE:

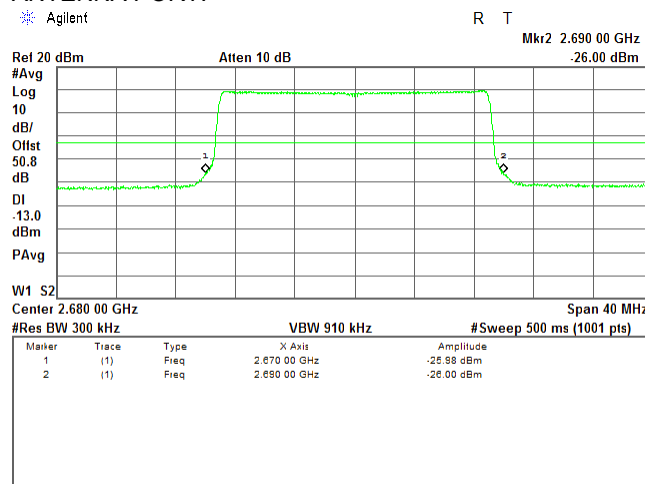
DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

TRANSMITTER OUTPUT POWER SETTINGS:

ANTENNA PORT:



2496 – 2690 MHz

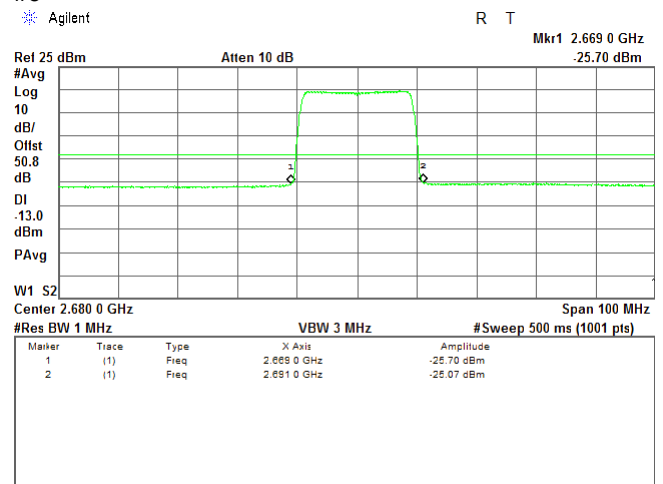
Average

QPSK

PRBS

Maximum

#5



**Plot 7.3.4 Spurious emission at band edges test results at low carrier frequency**

ASSIGNED FREQUENCY RANGE:

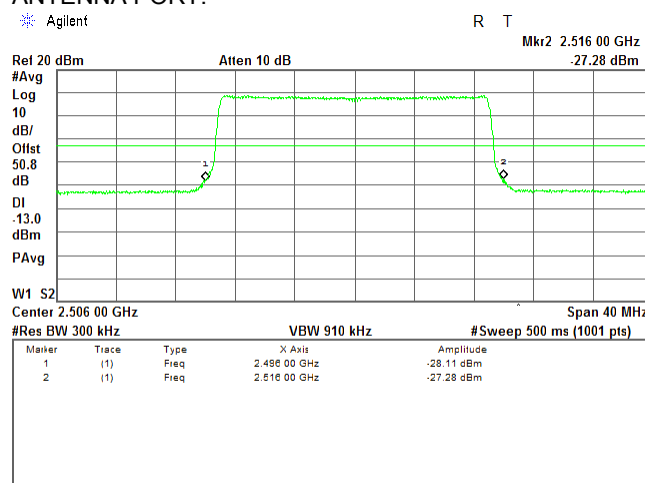
DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

TRANSMITTER OUTPUT POWER SETTINGS:

ANTENNA PORT:



2496 – 2690 MHz

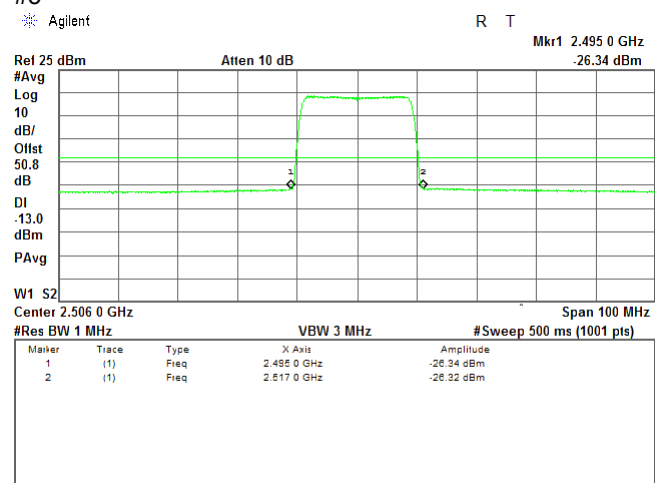
Average

64QAM

PRBS

Maximum

#5



|                                                                                      |                                |
|--------------------------------------------------------------------------------------|--------------------------------|
| <b>Test specification:</b> Section 27.53, Band edge emissions                        |                                |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-D, Section 2.2.13 |                                |
| <b>Test mode:</b> Compliance                                                         | <b>Verdict:</b> PASS           |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % |
| <b>Air Pressure:</b> 1009 hPa                                                        | <b>Power:</b> 120 VAC          |
| <b>Remarks:</b>                                                                      |                                |

Plot 7.3.5 Spurious emission at band edges test results at mid carrier frequency

ASSIGNED FREQUENCY RANGE:

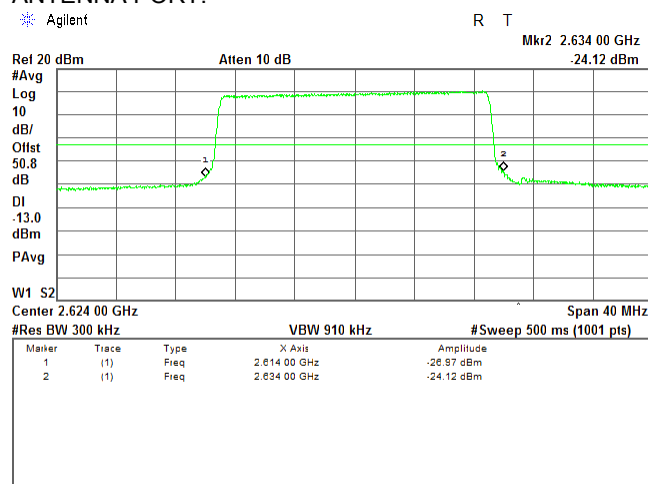
DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

TRANSMITTER OUTPUT POWER SETTINGS:

ANTENNA PORT:



2496 – 2690 MHz

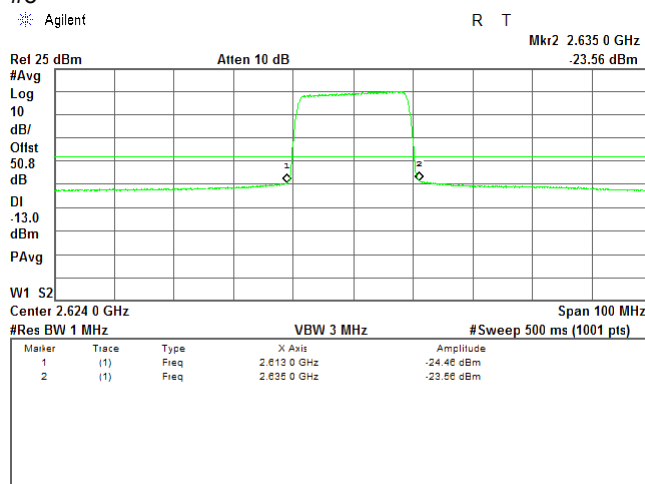
Average

64QAM

PRBS

Maximum

#5



Plot 7.3.6 Spurious emission at band edges test results at high carrier frequency

ASSIGNED FREQUENCY RANGE:

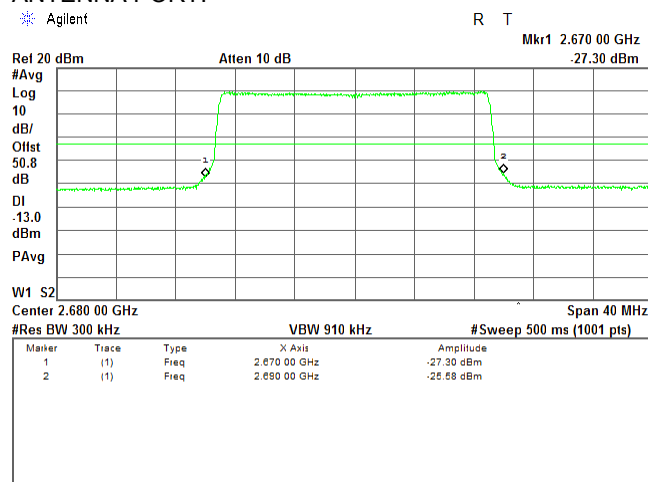
DETECTOR USED:

MODULATION:

MODULATING SIGNAL:

TRANSMITTER OUTPUT POWER SETTINGS:

ANTENNA PORT:



2496 – 2690 MHz

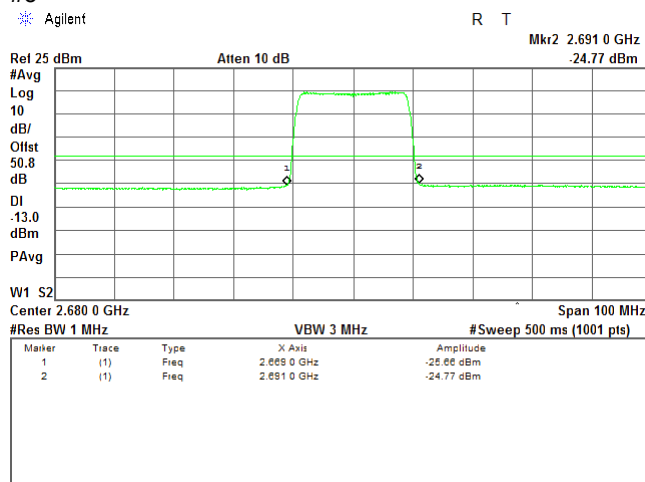
Average

64QAM

PRBS

Maximum

#5



|                                                                                      |                                |                               |                       |
|--------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions at RF antenna connector |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53                                |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                         |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |                               |                       |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                                      |                                |                               |                       |

## 7.4 Spurious emissions at RF antenna connector test

### 7.4.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Spurious emission limits

| Frequency, MHz               | Attenuation below carrier, dBc | Spurious emissions, dBm |
|------------------------------|--------------------------------|-------------------------|
| Base and fixed user stations |                                |                         |
| 0.009 – 10th harmonic        | 43+10logP(W)**                 | -13.0                   |
| Mobile stations              |                                |                         |
| 0.009 – 10th harmonic*       | 55+10logP(W)**                 | -25.0                   |

\* - spurious emission limits do not apply to the channel edge emission investigated in course of band edge emission testing

\*\* - P is transmitter output power in watts

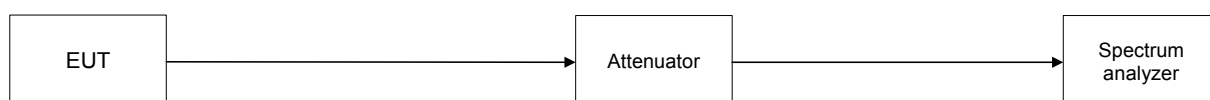
### 7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.

7.4.2.2 The EUT was adjusted to produce maximum available for end user RF output power.

7.4.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.4.2 and the associated plots.

Figure 7.4.1 Spurious emission test setup, single output







|                                                                                      |                                |                               |                       |
|--------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions at RF antenna connector |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53                                |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                         |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |                               |                       |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                                      |                                |                               |                       |

Table 7.4.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 2496-2690 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 26900 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: 64QAM  
 MODULATING SIGNAL: PRBS  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 ANTENNA PORT: #1

| Frequency, MHz                | SA reading, dBm | Attenuation, dB | Cable loss, dB | RBW, kHz | Spurious emission, dBm | Limit, dBm | Margin, dB* | Verdict |
|-------------------------------|-----------------|-----------------|----------------|----------|------------------------|------------|-------------|---------|
| <b>Low carrier frequency</b>  |                 |                 |                |          |                        |            |             |         |
| No emissions were found       |                 |                 |                |          |                        |            |             |         |
| <b>Mid carrier frequency</b>  |                 |                 |                |          |                        |            |             |         |
| No emissions were found       |                 |                 |                |          |                        |            |             |         |
| <b>High carrier frequency</b> |                 |                 |                |          |                        |            |             |         |
| No emissions were found       |                 |                 |                |          |                        |            |             |         |

ANTENNA PORT: #2

| Frequency, MHz                | SA reading, dBm | Attenuation, dB | Cable loss, dB | RBW, kHz | Spurious emission, dBm | Limit, dBm | Margin, dB* | Verdict |
|-------------------------------|-----------------|-----------------|----------------|----------|------------------------|------------|-------------|---------|
| <b>Low carrier frequency</b>  |                 |                 |                |          |                        |            |             |         |
| No emissions were found       |                 |                 |                |          |                        |            |             |         |
| <b>Mid carrier frequency</b>  |                 |                 |                |          |                        |            |             |         |
| No emissions were found       |                 |                 |                |          |                        |            |             |         |
| <b>High carrier frequency</b> |                 |                 |                |          |                        |            |             |         |
| No emissions were found       |                 |                 |                |          |                        |            |             |         |

\*- Margin = Spurious emission – specification limit.

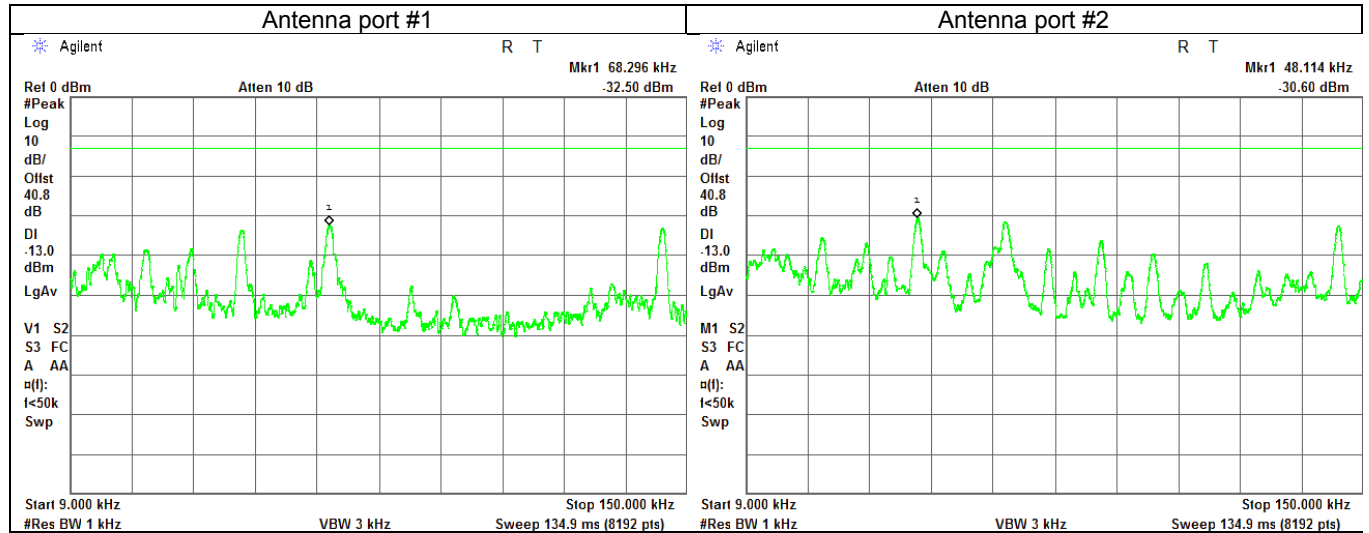
#### Reference numbers of test equipment used

|         |         |         |         |         |         |         |  |
|---------|---------|---------|---------|---------|---------|---------|--|
| HL 3301 | HL 3302 | HL 3433 | HL 3787 | HL 3818 | HL 4068 | HL 4366 |  |
|---------|---------|---------|---------|---------|---------|---------|--|

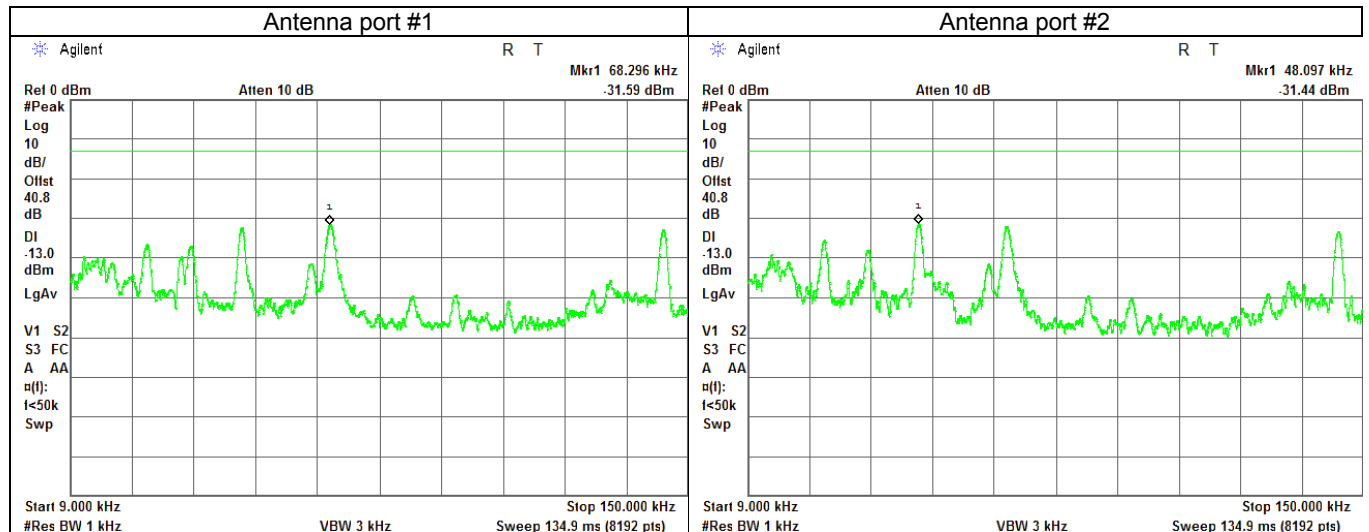
Full description is given in Appendix A.

|                      |                         |                                                           |                |
|----------------------|-------------------------|-----------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.53, Spurious emissions at RF antenna connector |                |
| Test procedure:      |                         | 47 CFR, Sections 2.1051, 27.53                            |                |
| Test mode:           |                         | Verdict: PASS                                             |                |
| Date(s):             |                         |                                                           |                |
| 16-Aug-17            |                         |                                                           |                |
| Temperature: 24.4 °C | Relative Humidity: 44 % | Air Pressure: 1009 hPa                                    | Power: 120 VAC |
| Remarks:             |                         |                                                           |                |

Plot 7.4.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

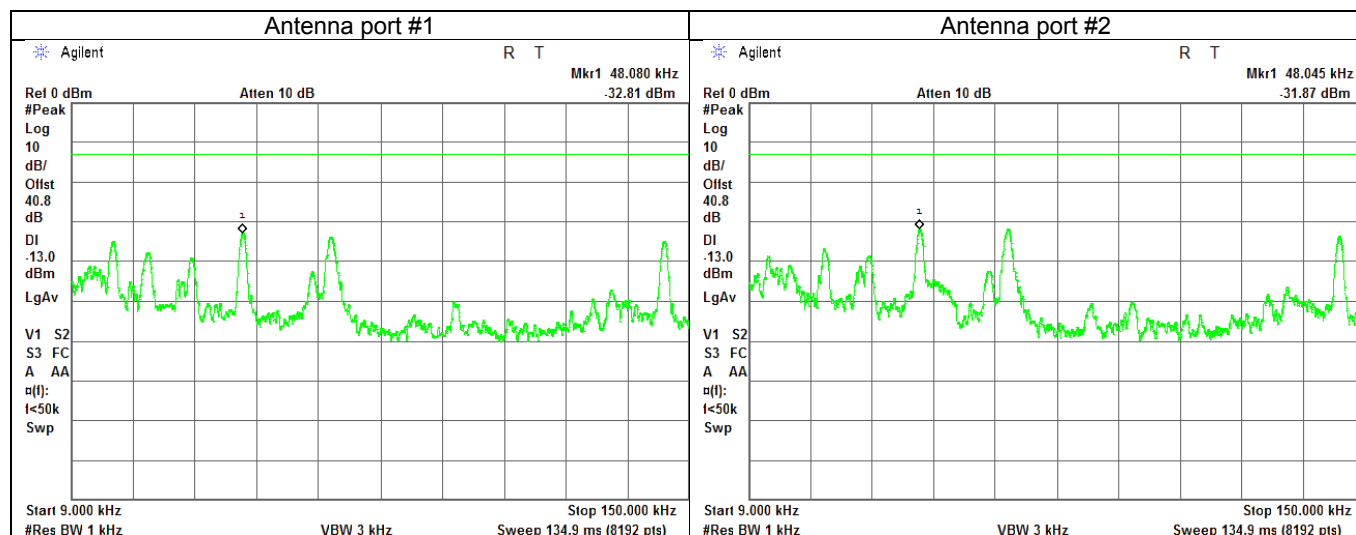


Plot 7.4.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

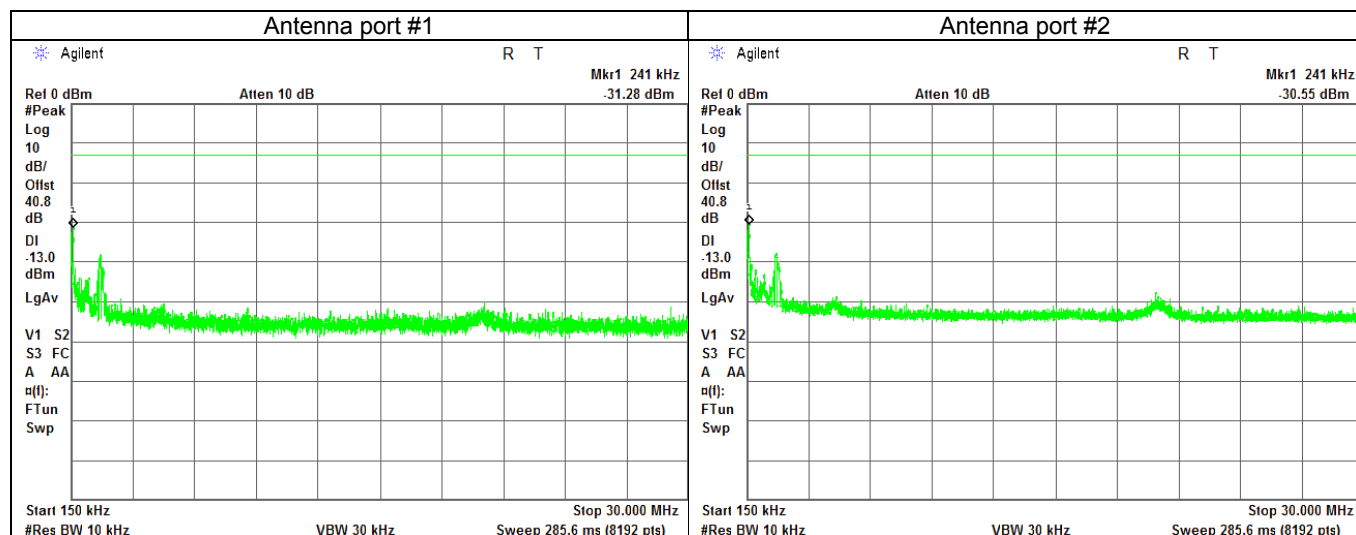


|                                                                                      |                                |                               |                       |
|--------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions at RF antenna connector |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53                                |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                         |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |                               |                       |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                                      |                                |                               |                       |

Plot 7.4.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

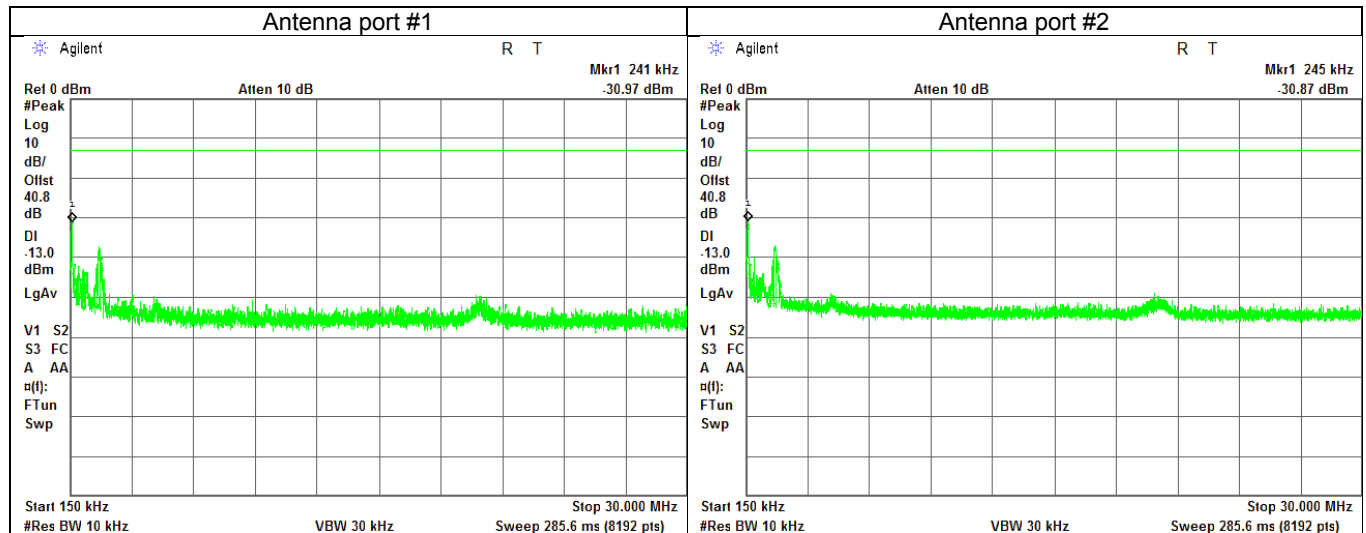


Plot 7.4.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

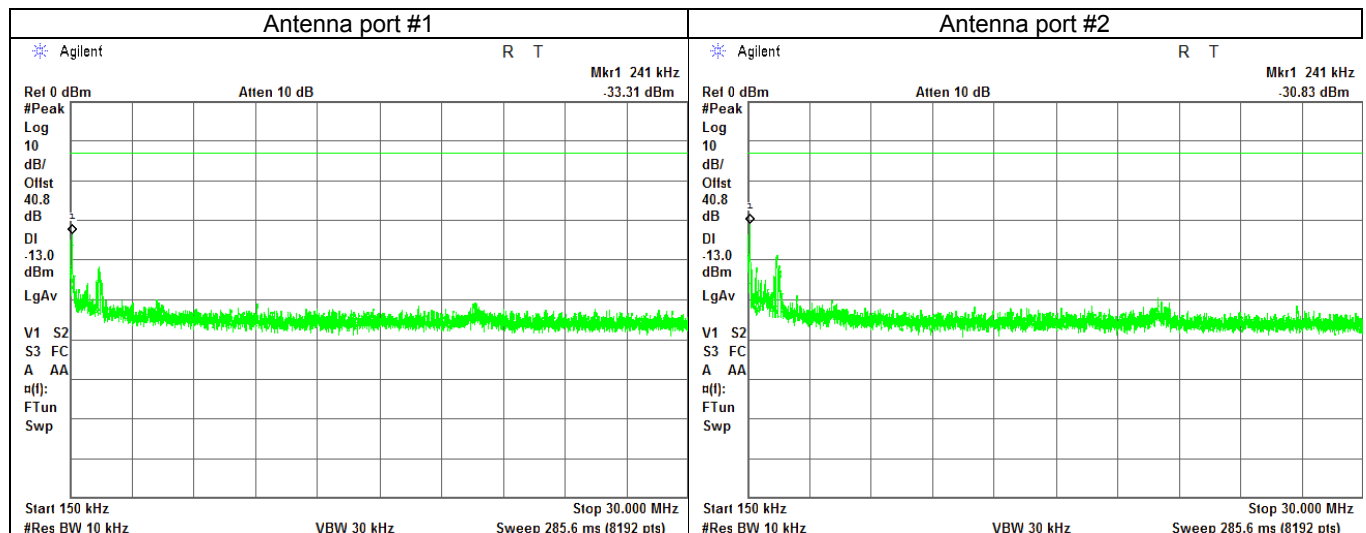


|                      |                         |                                                           |                |
|----------------------|-------------------------|-----------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.53, Spurious emissions at RF antenna connector |                |
| Test procedure:      |                         | 47 CFR, Sections 2.1051, 27.53                            |                |
| Test mode:           |                         | Verdict: PASS                                             |                |
| Date(s):             |                         |                                                           |                |
| 16-Aug-17            |                         |                                                           |                |
| Temperature: 24.4 °C | Relative Humidity: 44 % | Air Pressure: 1009 hPa                                    | Power: 120 VAC |
| Remarks:             |                         |                                                           |                |

Plot 7.4.5 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency

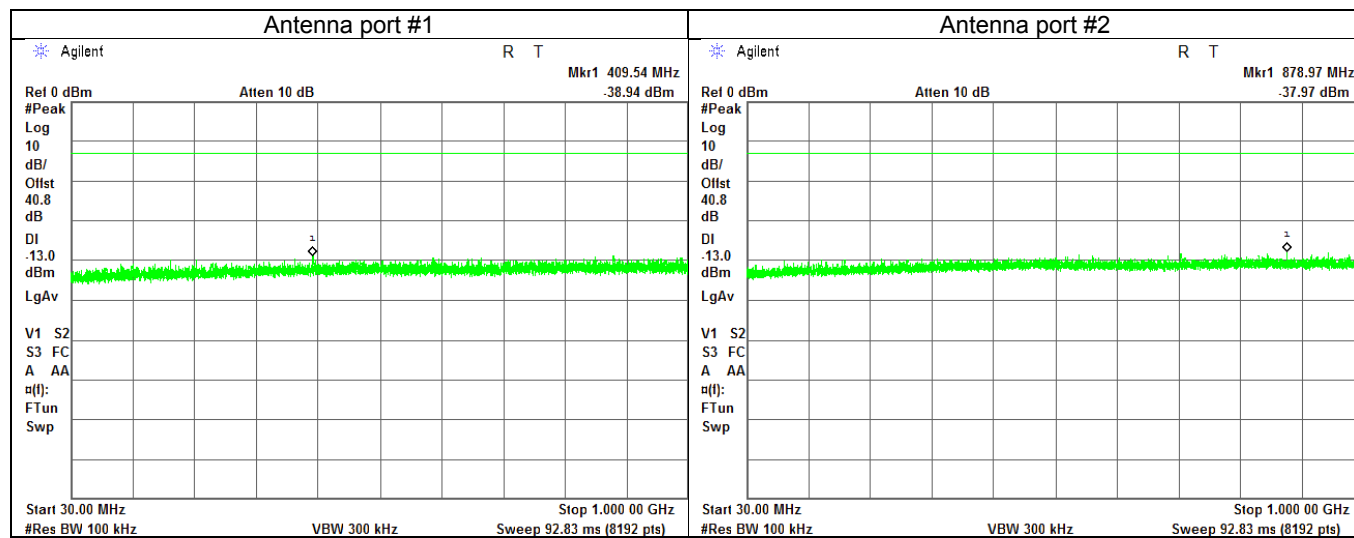


Plot 7.4.6 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency

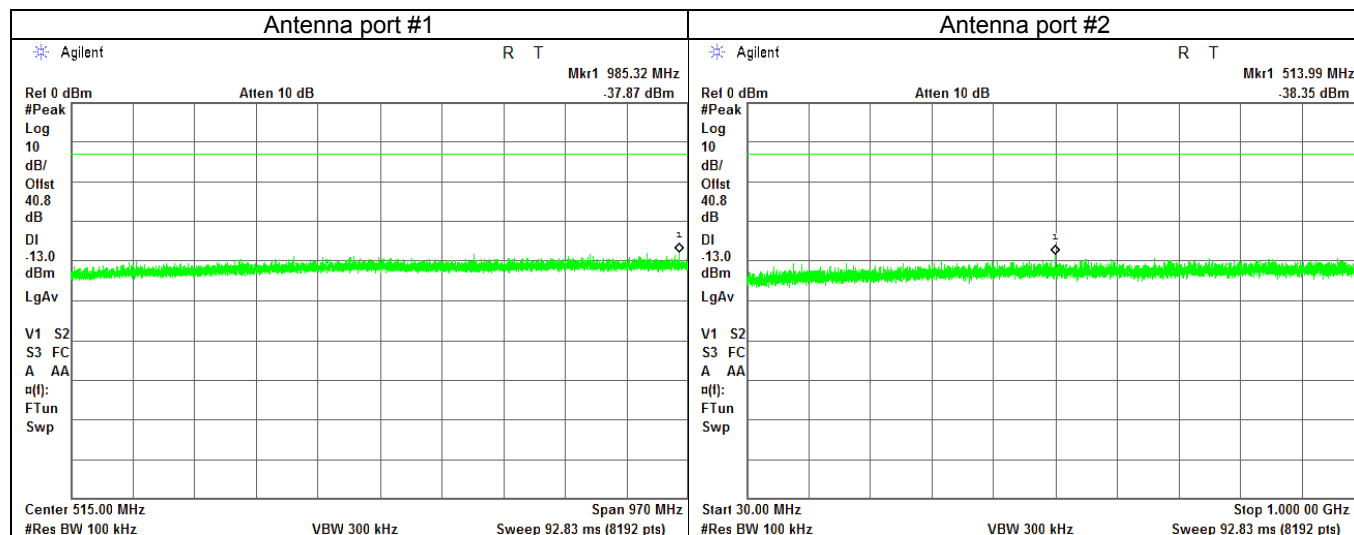


|                                                                                      |                                |                               |                       |
|--------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions at RF antenna connector |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53                                |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                         |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |                               |                       |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                                      |                                |                               |                       |

Plot 7.4.7 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency

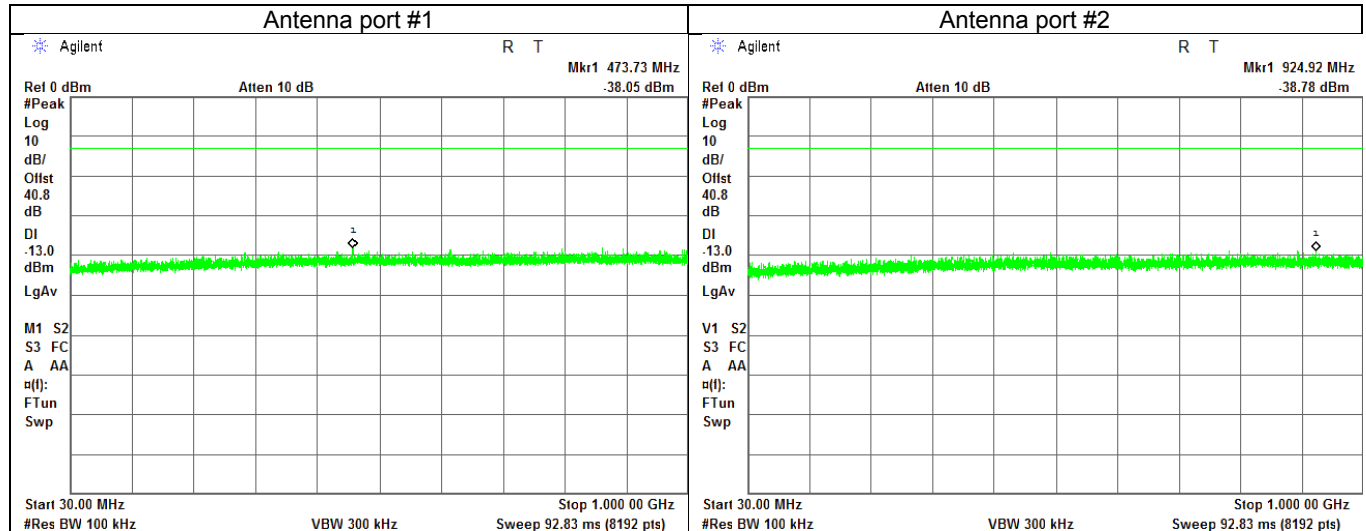


Plot 7.4.8 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency

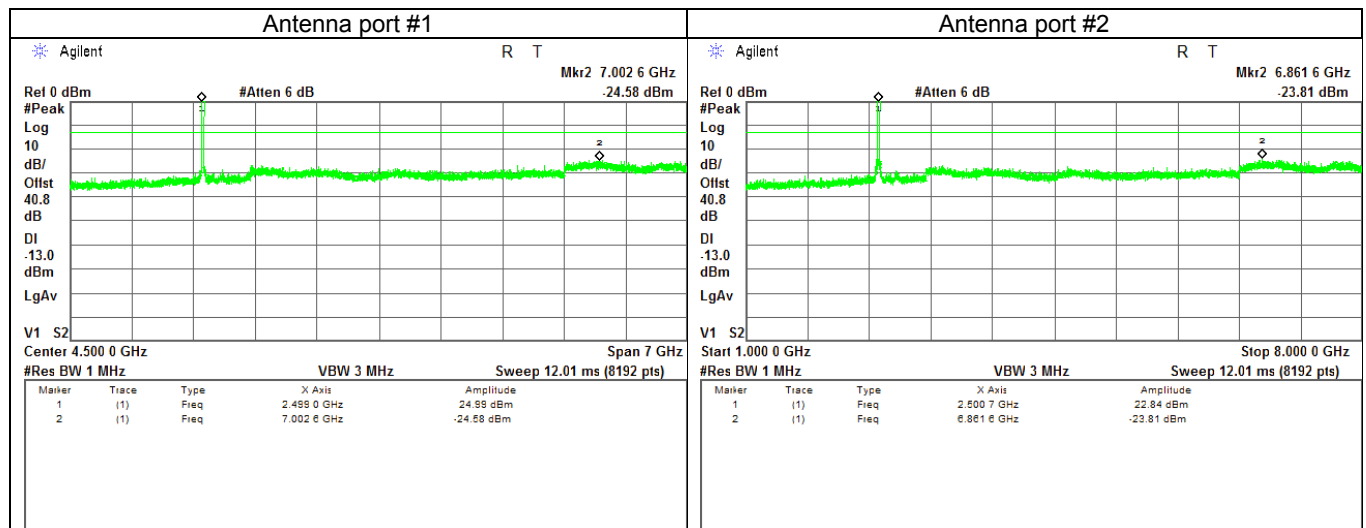


|                      |                         |                                                           |                |
|----------------------|-------------------------|-----------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.53, Spurious emissions at RF antenna connector |                |
| Test procedure:      |                         | 47 CFR, Sections 2.1051, 27.53                            |                |
| Test mode:           |                         | Verdict: PASS                                             |                |
| Date(s):             |                         |                                                           |                |
| 16-Aug-17            |                         |                                                           |                |
| Temperature: 24.4 °C | Relative Humidity: 44 % | Air Pressure: 1009 hPa                                    | Power: 120 VAC |
| Remarks:             |                         |                                                           |                |

Plot 7.4.9 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency

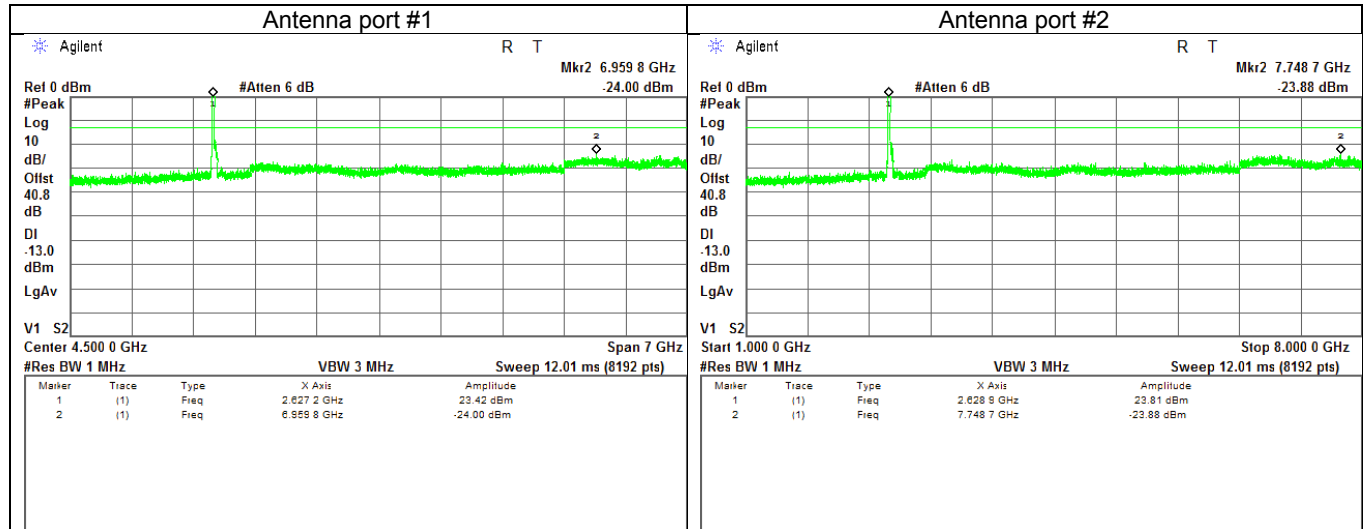


Plot 7.4.10 Spurious emission measurements in 1000 - 8000 MHz range at low carrier frequency

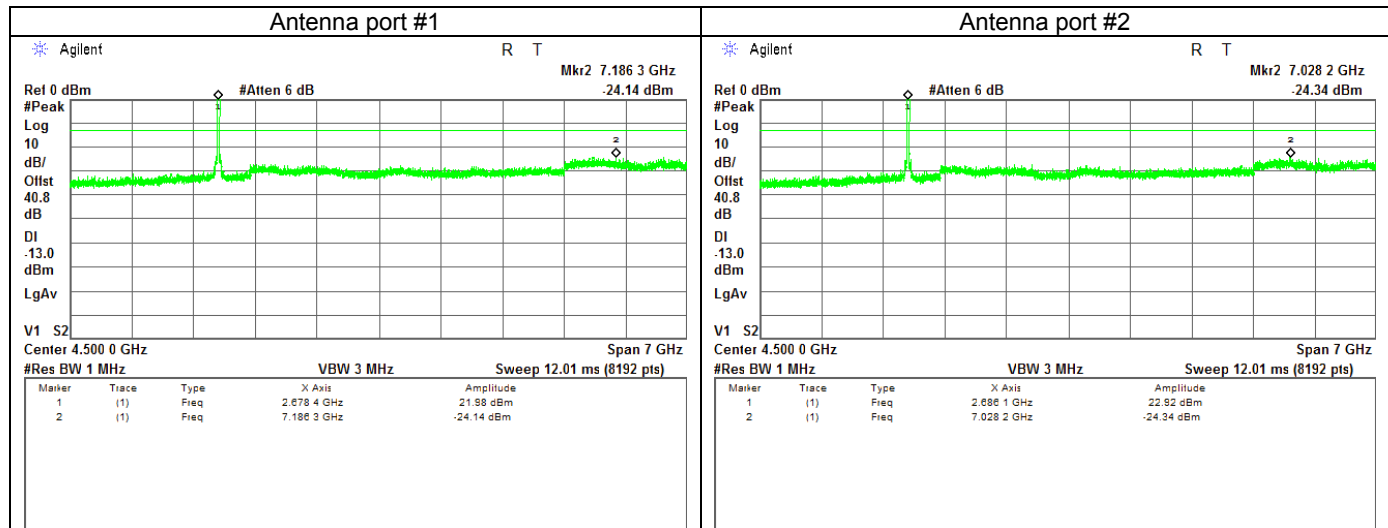


|                      |                         |                                                           |                |
|----------------------|-------------------------|-----------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.53, Spurious emissions at RF antenna connector |                |
| Test procedure:      |                         | 47 CFR, Sections 2.1051, 27.53                            |                |
| Test mode:           |                         | Verdict: PASS                                             |                |
| Date(s):             |                         |                                                           |                |
| 16-Aug-17            |                         |                                                           |                |
| Temperature: 24.4 °C | Relative Humidity: 44 % | Air Pressure: 1009 hPa                                    | Power: 120 VAC |
| Remarks:             |                         |                                                           |                |

Plot 7.4.11 Spurious emission measurements in 1000 - 8000 MHz range at mid carrier frequency

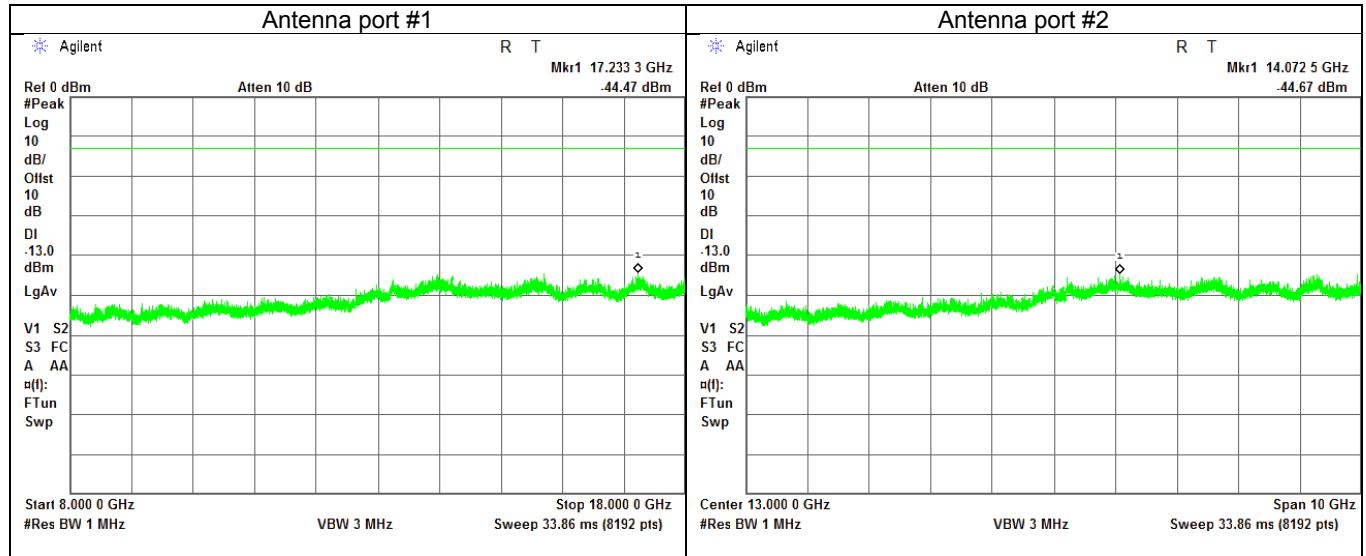


Plot 7.4.12 Spurious emission measurements in 1000 - 8000 MHz range at high carrier frequency

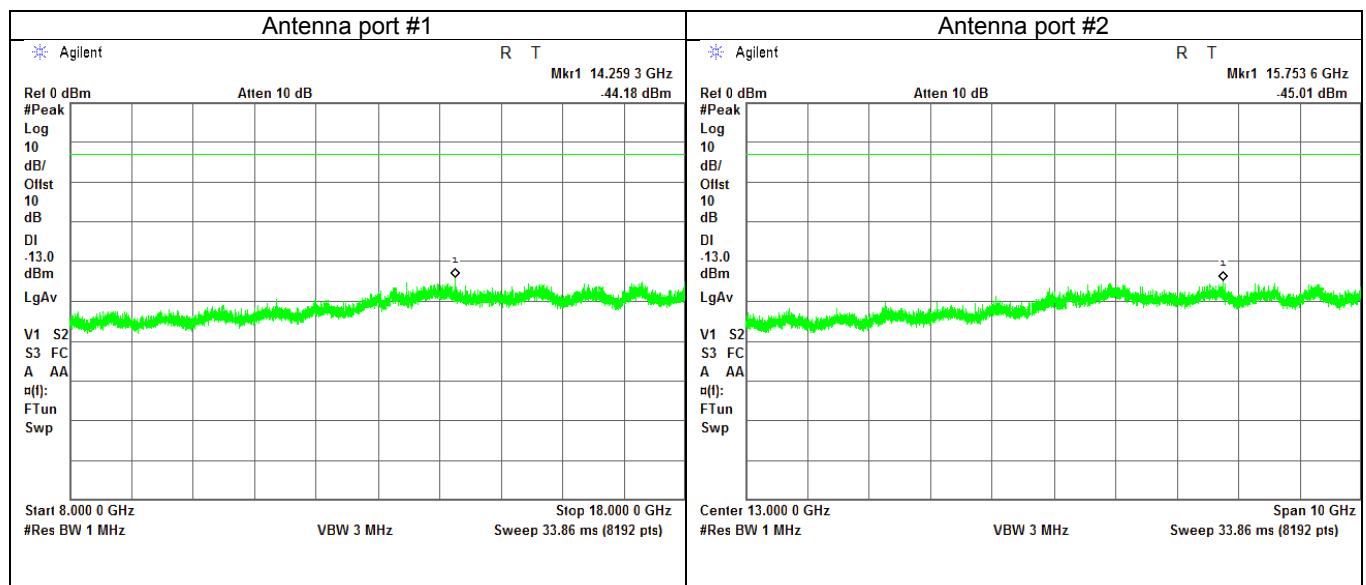


|                      |                         |                                                           |                |
|----------------------|-------------------------|-----------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.53, Spurious emissions at RF antenna connector |                |
| Test procedure:      |                         | 47 CFR, Sections 2.1051, 27.53                            |                |
| Test mode:           |                         | Verdict: PASS                                             |                |
| Date(s):             |                         |                                                           |                |
| 16-Aug-17            |                         |                                                           |                |
| Temperature: 24.4 °C | Relative Humidity: 44 % | Air Pressure: 1009 hPa                                    | Power: 120 VAC |
| Remarks:             |                         |                                                           |                |

Plot 7.4.13 Spurious emission measurements in 8000 - 18000 MHz range at low carrier frequency



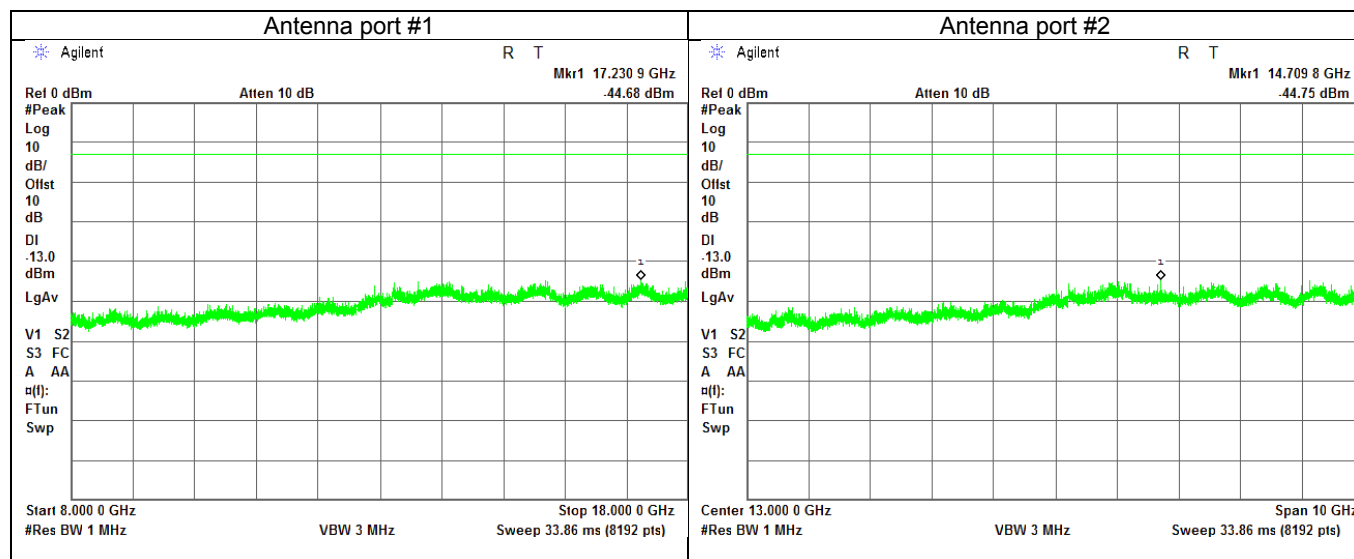
Plot 7.4.14 Spurious emission measurements in 8000 - 18000 MHz at mid carrier frequency



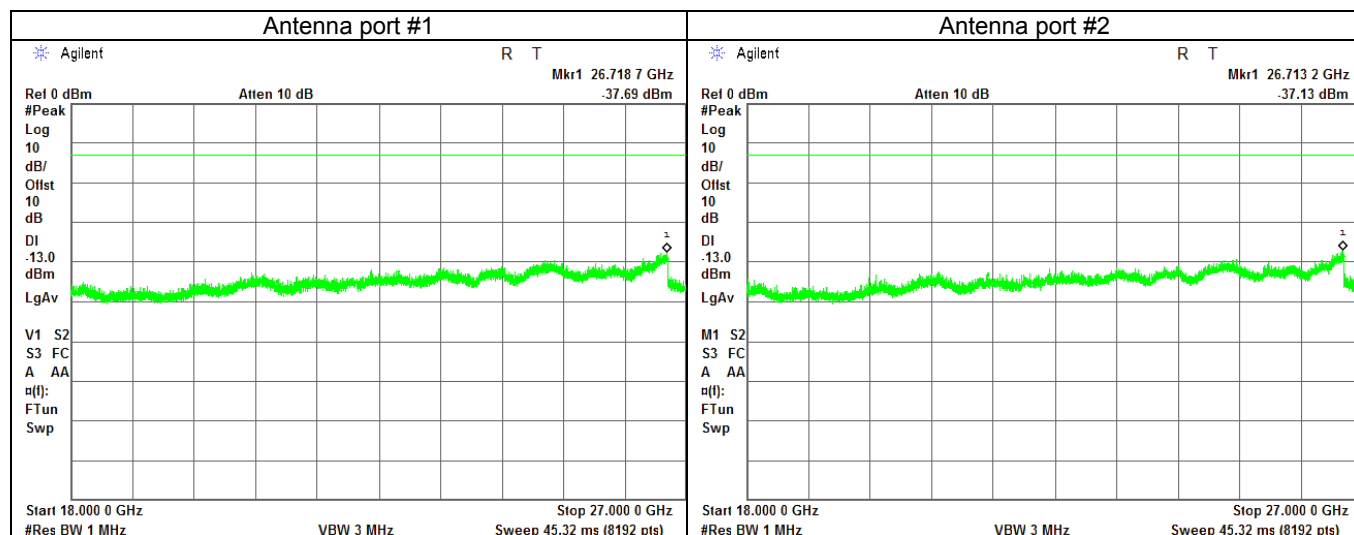


|                                                                                      |                                |                               |                       |
|--------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Spurious emissions at RF antenna connector |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1051, 27.53                                |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                         |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 16-Aug-17                                                            |                                |                               |                       |
| <b>Temperature:</b> 24.4 °C                                                          | <b>Relative Humidity:</b> 44 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                                      |                                |                               |                       |

Plot 7.4.15 Spurious emission measurements in 8000 - 18000 MHz at high carrier frequency

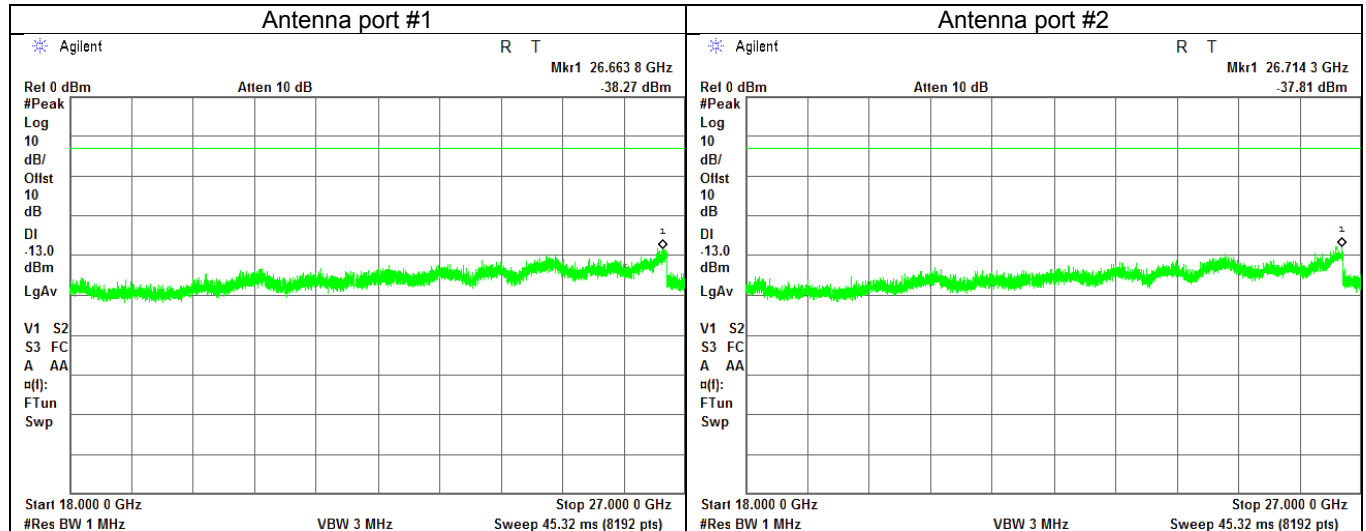


Plot 7.4.16 Spurious emission measurements in 18000 - 27000 MHz range at low carrier frequency

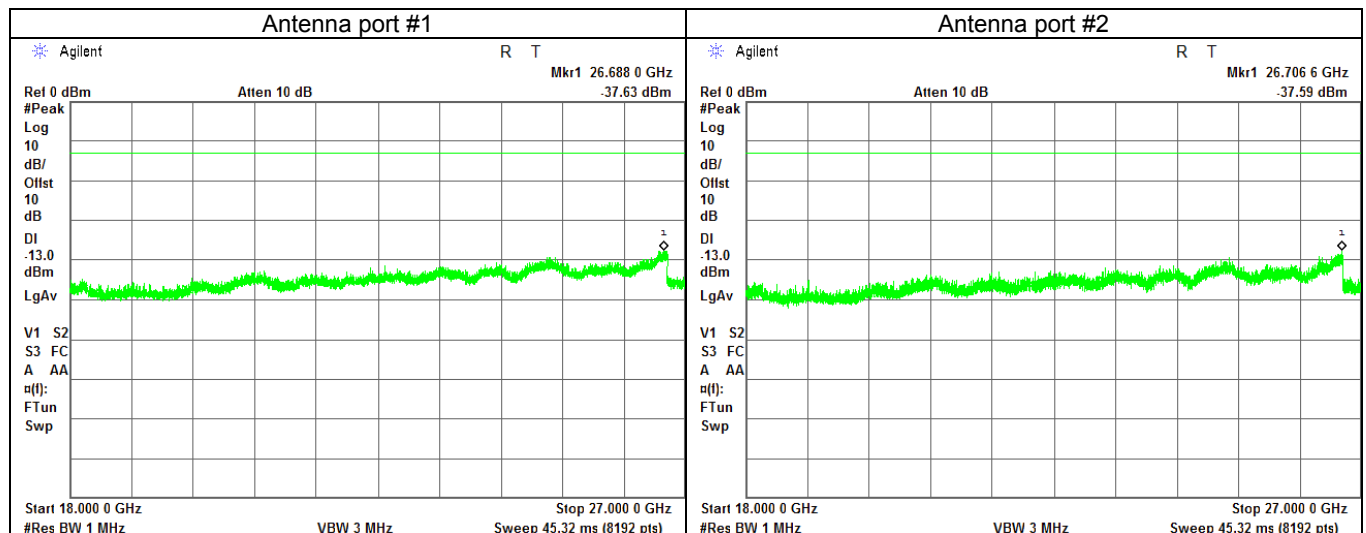


|                      |                         |                                                           |                |
|----------------------|-------------------------|-----------------------------------------------------------|----------------|
| Test specification:  |                         | Section 27.53, Spurious emissions at RF antenna connector |                |
| Test procedure:      |                         | 47 CFR, Sections 2.1051, 27.53                            |                |
| Test mode:           |                         | Verdict: PASS                                             |                |
| Date(s):             |                         |                                                           |                |
| 16-Aug-17            |                         |                                                           |                |
| Temperature: 24.4 °C | Relative Humidity: 44 % | Air Pressure: 1009 hPa                                    | Power: 120 VAC |
| Remarks:             |                         |                                                           |                |

Plot 7.4.17 Spurious emission measurements in 18000 - 27000 MHz at mid carrier frequency



Plot 7.4.18 Spurious emission measurements in 18000 - 27000 MHz at high carrier frequency





|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

## 7.5 Radiated spurious emission measurements

### 7.5.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Radiated spurious emission test limits

| Frequency, MHz                     | Attenuation below carrier, dBc | ERP of spurious, dBm | Equivalent field strength limit @ 3m, dB(μV/m)*** |
|------------------------------------|--------------------------------|----------------------|---------------------------------------------------|
| 0.009 – 10 <sup>th</sup> harmonic* | 43+10logP** fixed              | -13                  | 84.4                                              |
| 0.009 – 10th harmonic*             | 55+10logP** mobile             | -25                  | 72.4                                              |

\* - Excluding the band emission

\*\* - P is transmitter output power in Watts

\*\*\* - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows:  
 $E = \sqrt{30 \times P \times 1.64} / r$ , where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

### 7.5.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and the performance check was conducted.

7.5.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.5.2.3 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

### 7.5.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.5.3.1 The EUT was set up as shown in Figure 7.5.2, energized and the performance check was conducted.

7.5.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

7.5.3.3 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

### 7.5.4 Test procedure for substitution ERP measurements of spurious

7.5.4.1 The test equipment was set up as shown in Figure 7.5.3 and energized.

7.5.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.

7.5.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.

7.5.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.

7.5.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm and antenna gain in dBd reduced by cable loss in dB.

7.5.4.6 The above procedure was repeated at the rest of investigated frequencies.

7.5.4.7 The worst test results (the lowest margins) were recorded in Table 7.5.3 and shown in the associated plots.

|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

Figure 7.5.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

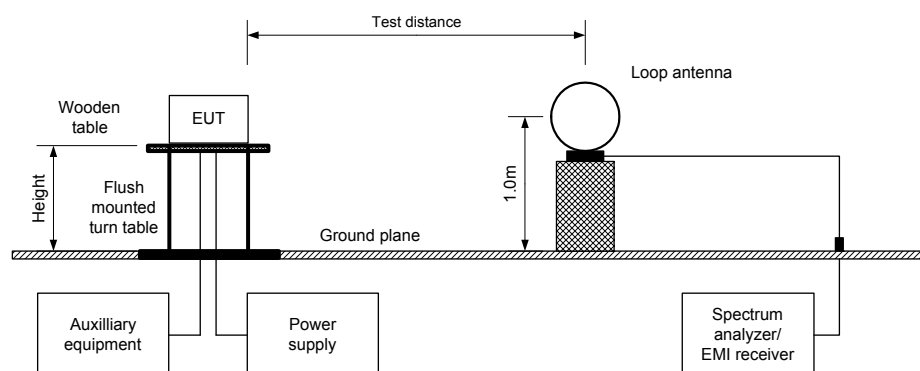
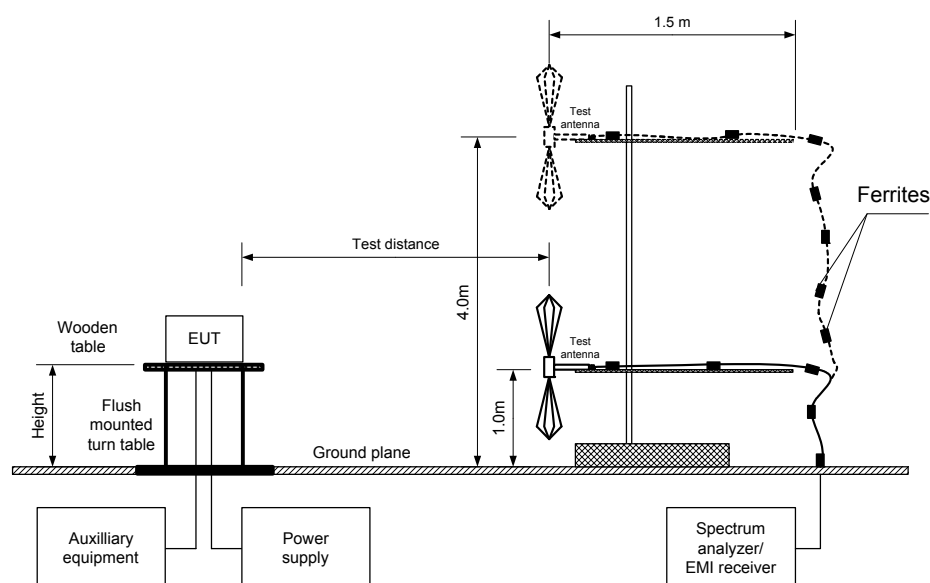
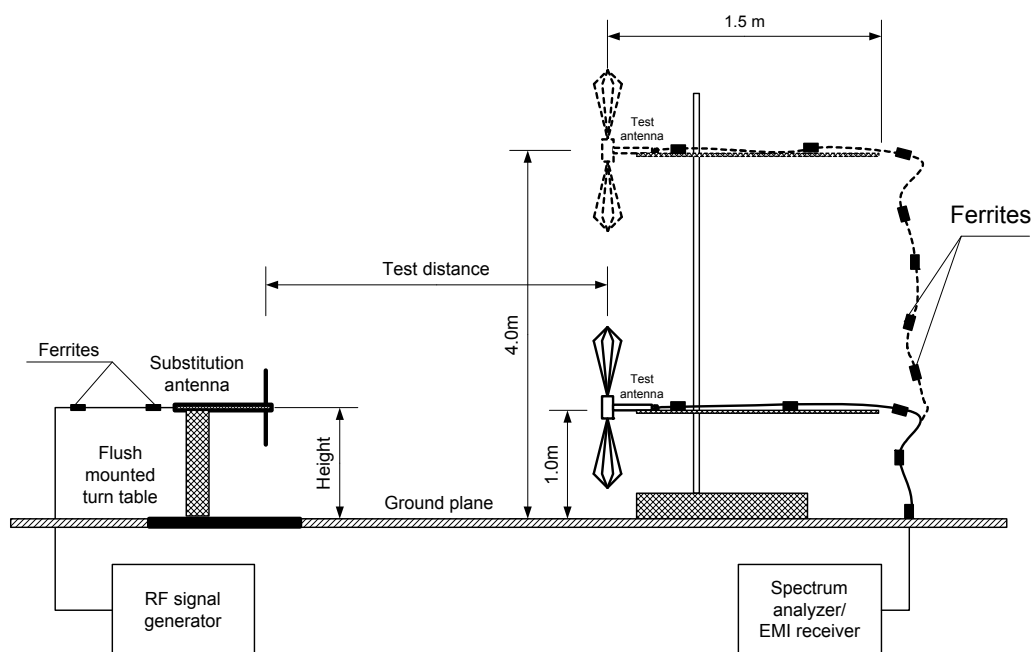


Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz



|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

Figure 7.5.3 Setup for substitution ERP measurements of spurious





|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

Table 7.5.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: OATS  
 EUT HEIGHT: 0.8 m  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 27000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: > Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)  
 MODULATION: QPSK  
 MODULATING SIGNAL: PRBS  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Frequency, MHz                    | Field strength, dB(μV/m) | Limit, dB(μV/m) | Margin, dB* | RBW, kHz | Antenna polarization | Antenna height, m | Turn-table position**, degrees |
|-----------------------------------|--------------------------|-----------------|-------------|----------|----------------------|-------------------|--------------------------------|
| <b>Low carrier frequency MHz</b>  |                          |                 |             |          |                      |                   |                                |
| 15035.79                          | 58.25                    | 84.4            | -26.15      | 1000     | Hor                  | 1.0               | 75                             |
| <b>Mid carrier frequency MHz</b>  |                          |                 |             |          |                      |                   |                                |
| 15743.86                          | 58.05                    | 84.4            | -26.35      | 1000     | Vert                 | 1.15              | 114                            |
| <b>High carrier frequency MHz</b> |                          |                 |             |          |                      |                   |                                |
| 16079.82                          | 59.29                    | 84.4            | -25.11      | 1000     | Vert                 | 1.1               | 121                            |

\*- Margin = Field strength of spurious – calculated field strength limit.

\*\* - EUT front panel refers to 0 degrees position of turntable.



|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

Table 7.5.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz  
 TEST SITE: OATS  
 TEST DISTANCE: 3 m  
 SUBSTITUTION ANTENNA HEIGHT: 0.8 m  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: > Resolution bandwidth  
 SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)

| Frequency, MHz                | Field strength, dB(μV/m) | RBW, kHz | Antenna polarization | RF generator output, dBm | Ant gain, dBd | Cable loss, dB | ERP, dBm | Limit, dBm | Margin, dB* | Verdict |
|-------------------------------|--------------------------|----------|----------------------|--------------------------|---------------|----------------|----------|------------|-------------|---------|
| <b>Low carrier frequency</b>  |                          |          |                      |                          |               |                |          |            |             |         |
| 15035.79                      | 58.25                    | 1000     | Hor                  | -44.63                   | 11.02         | 8.49           | -42.10   | -13.00     | -29.10      | Pass    |
| <b>Mid carrier frequency</b>  |                          |          |                      |                          |               |                |          |            |             |         |
| 15743.86                      | 58.05                    | 1000     | Vert                 | -45.08                   | 11.45         | 8.70           | -42.33   | -13.00     | -29.33      | Pass    |
| <b>High carrier frequency</b> |                          |          |                      |                          |               |                |          |            |             |         |
| 16079.82                      | 59.29                    | 1000     | Vert                 | -44.15                   | 11.07         | 8.79           | -41.88   | -13.00     | -28.88      | Pass    |

\*- Margin = Spurious emission – specification limit.

## Reference numbers of test equipment used

|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 0604 | HL 0661 | HL 2909 | HL 3818 | HL 4114 | HL 4353 | HL 4933 |
| HL 4956 | HL 5110 | HL 5111 | HL 5112 |         |         |         |         |

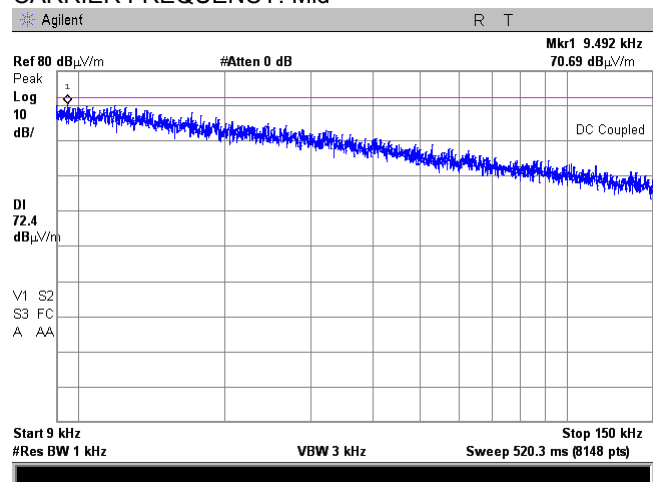
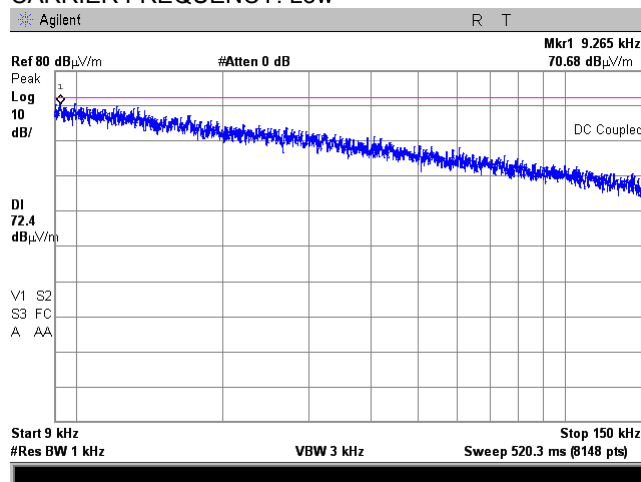
Full description is given in Appendix A.

|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.53, Radiated spurious emissions</b>         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

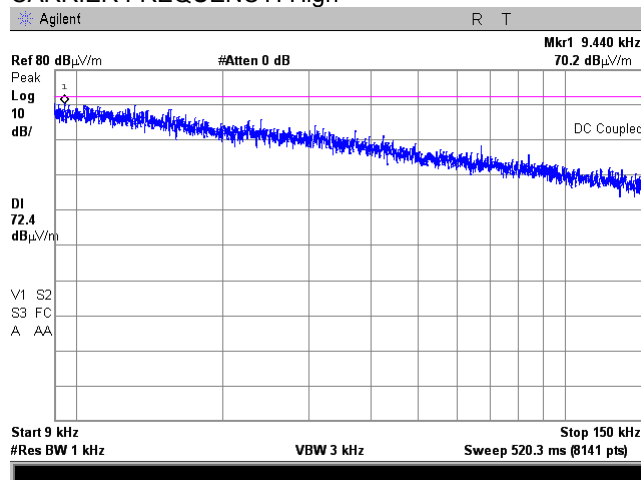
Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range

TEST SITE:  
TEST DISTANCE:  
ANTENNA POLARIZATION:  
EUT POSITION:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
3 m  
Vertical  
Typical (Vertical)  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



NOTE: limit 84.4 dB $\mu$ V/m was applied

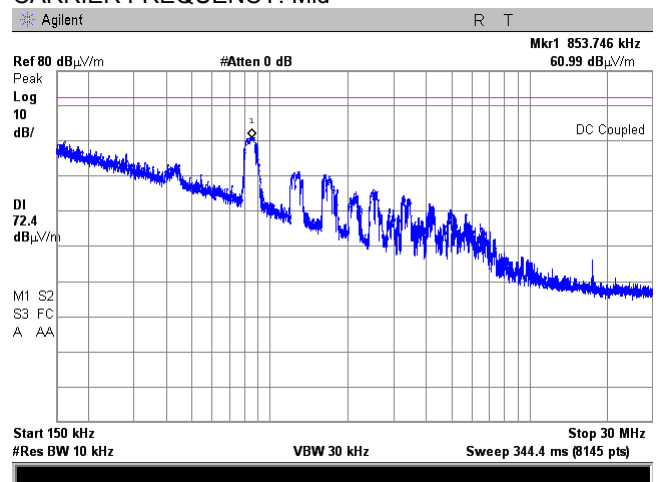
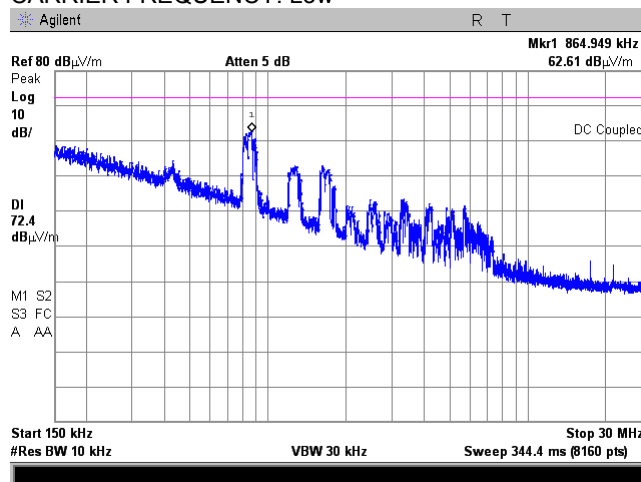


|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

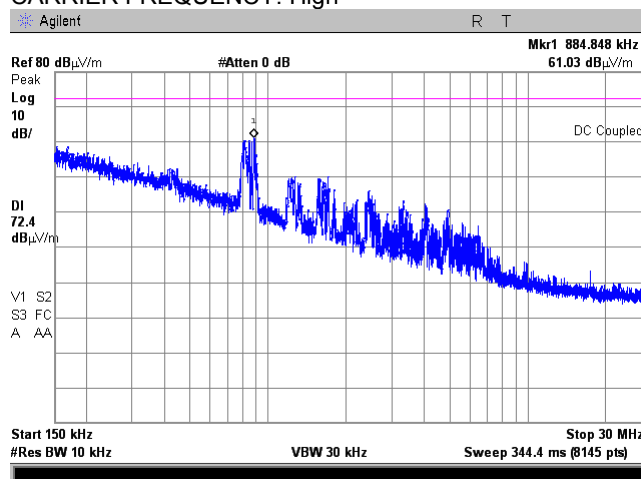
### Plot 7.5.2 Radiated emission measurements in 0.15 - 30 MHz range

TEST SITE:  
TEST DISTANCE:  
ANTENNA POLARIZATION:  
EUT POSITION:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
3 m  
Vertical  
Typical (Vertical)  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



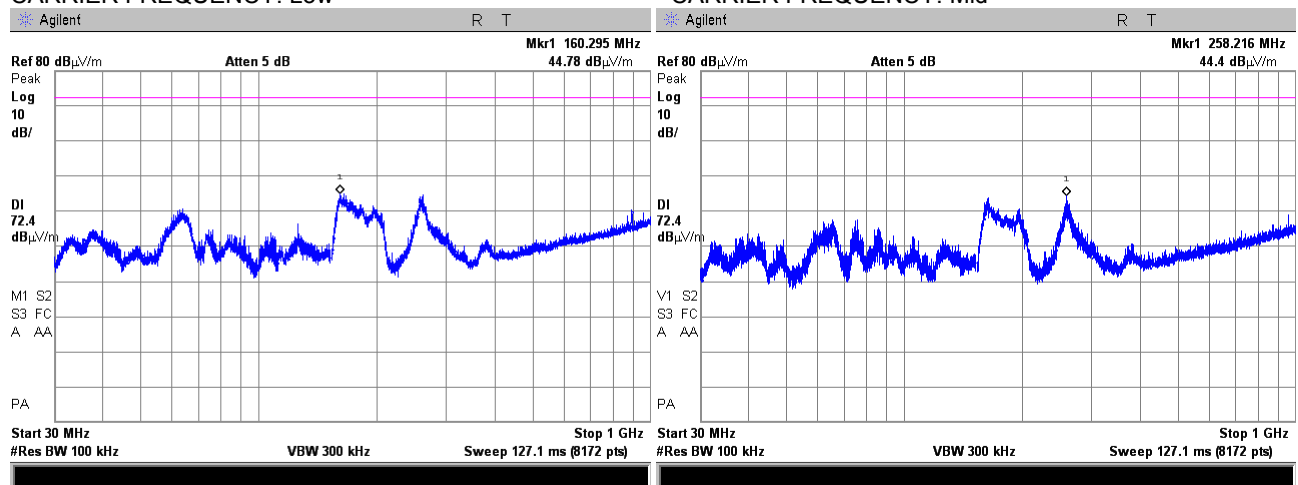
NOTE: limit 84.4 dB $\mu$ V/m was applied

|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.53, Radiated spurious emissions</b>         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

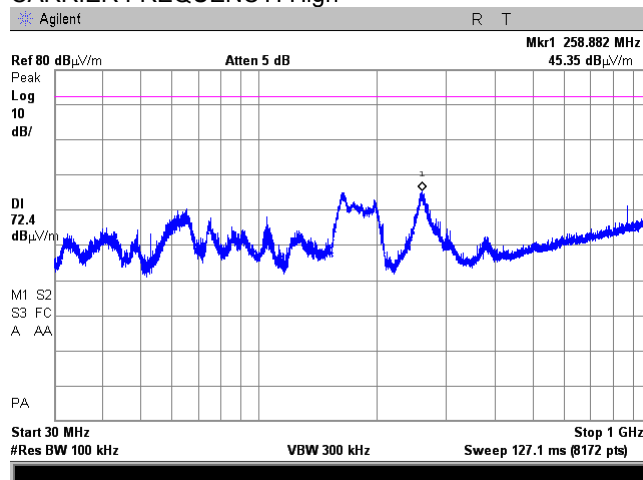
### Plot 7.5.3 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE:  
TEST DISTANCE:  
ANTENNA POLARIZATION:  
EUT POSITION:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
3 m  
Vertical and Horizontal  
Typical (Vertical)  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



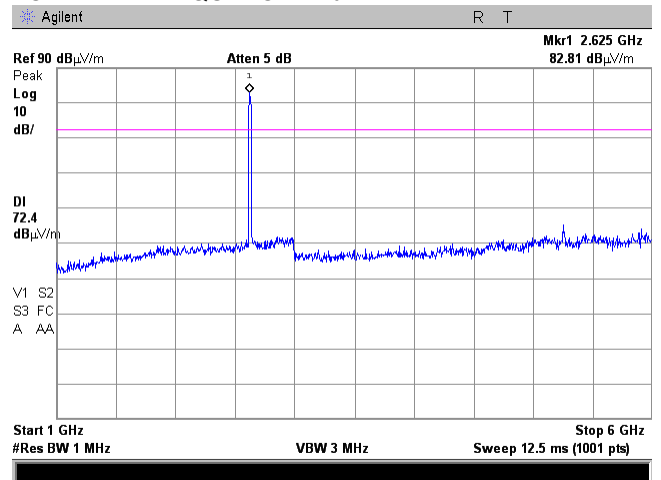
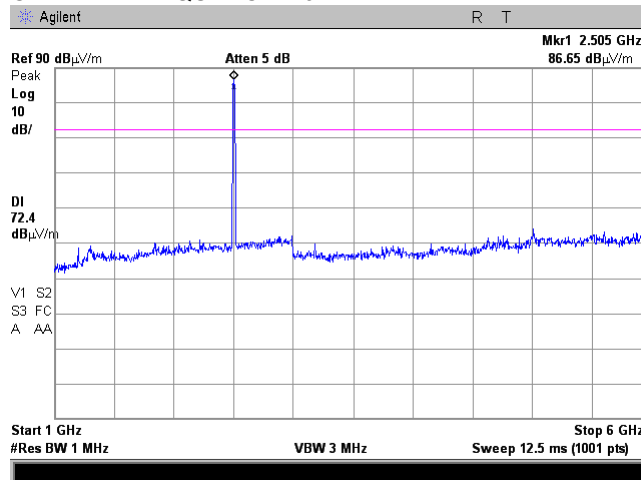
NOTE: limit 84.4 dBuV/m was applied

|                       |                         |                                                        |                |
|-----------------------|-------------------------|--------------------------------------------------------|----------------|
| Test specification:   |                         | Section 27.53, Radiated spurious emissions             |                |
| Test procedure:       |                         | 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                |
| Test mode:            |                         | Verdict: PASS                                          |                |
| Date(s):              |                         |                                                        |                |
| 20-Aug-17 - 21-Aug-17 |                         |                                                        |                |
| Temperature: 24.6 °C  | Relative Humidity: 38 % | Air Pressure: 1011 hPa                                 | Power: 120 VAC |
| Remarks:              |                         |                                                        |                |

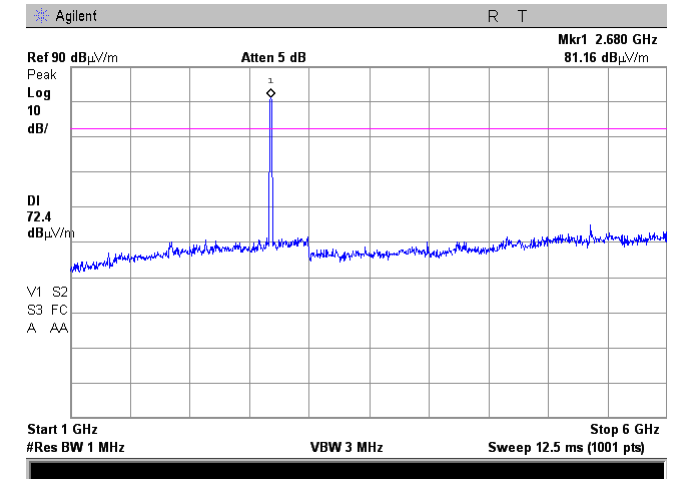
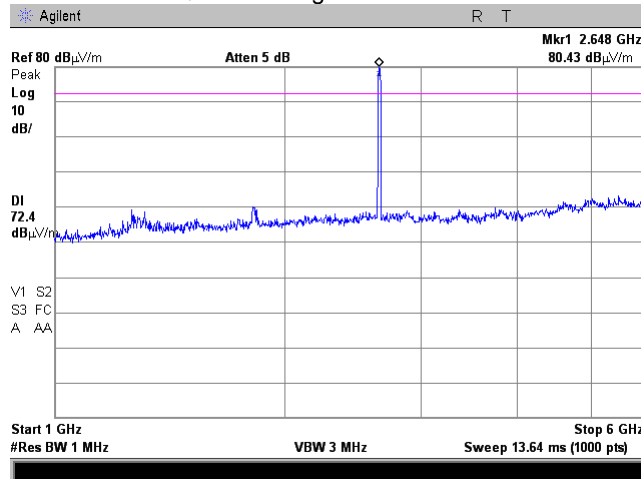
Plot 7.5.4 Radiated emission measurements in 1000 – 6000 MHz range

TEST SITE:  
TEST DISTANCE:  
ANTENNA POLARIZATION:  
EUT POSITION:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
3 m  
Vertical and Horizontal  
Typical (Vertical)  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



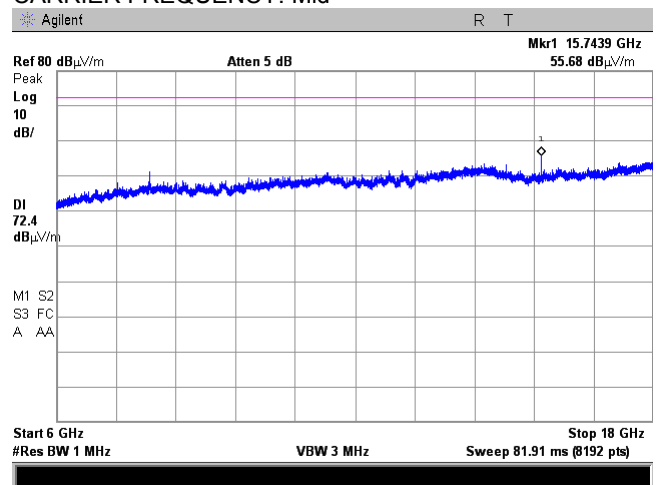
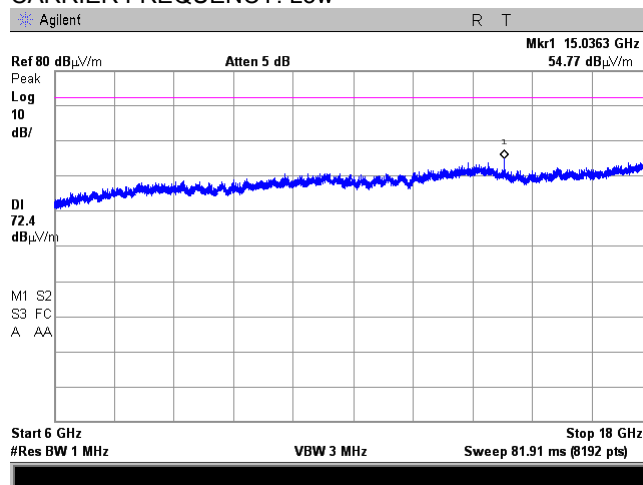
NOTE: limit 84.4 dB $\mu$ V/m was applied

|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.53, Radiated spurious emissions</b>         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

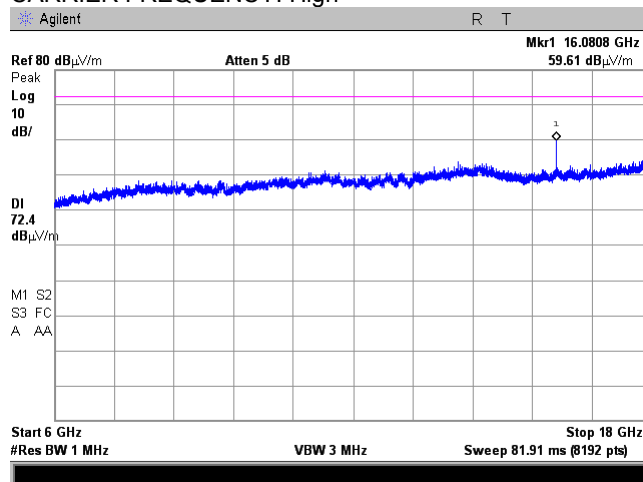
### Plot 7.5.5 Radiated emission measurements in 6000 – 18000 MHz range

TEST SITE:  
TEST DISTANCE:  
ANTENNA POLARIZATION:  
EUT POSITION:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
3 m  
Vertical and Horizontal  
Typical (Vertical)  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



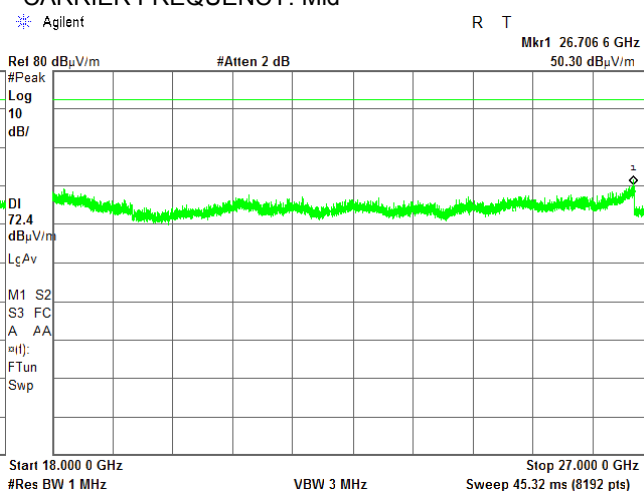
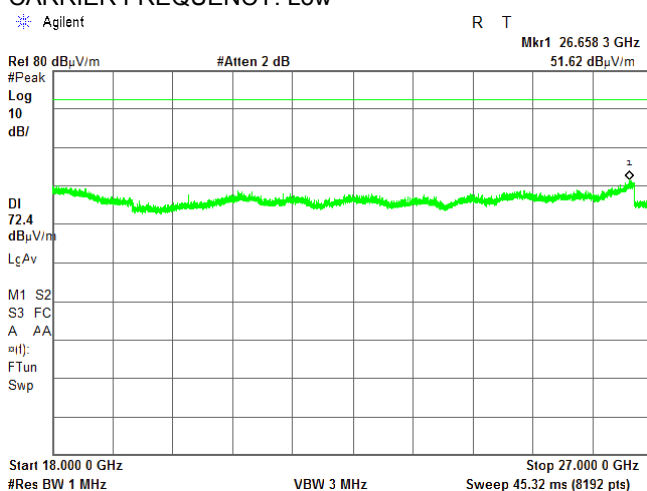
NOTE: limit 84.4 dBuV/m was applied

|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

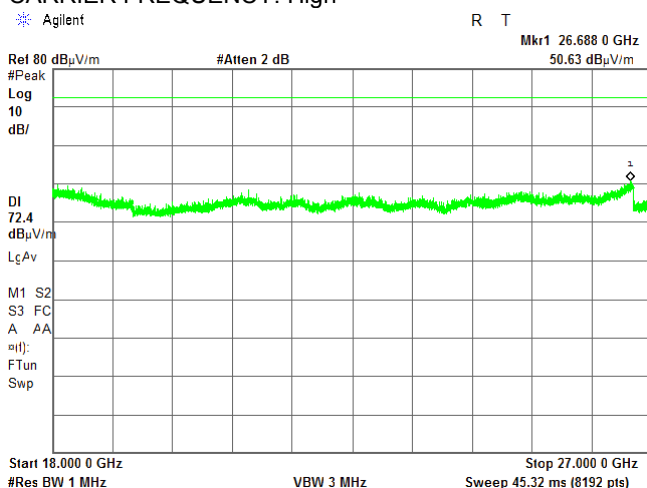
Plot 7.5.6 Radiated emission measurements in 18000 – 27000 MHz range

TEST SITE:  
TEST DISTANCE:  
ANTENNA POLARIZATION:  
EUT POSITION:  
CARRIER FREQUENCY: Low

Semi anechoic chamber  
3 m  
Vertical and Horizontal  
Typical (Vertical)  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High

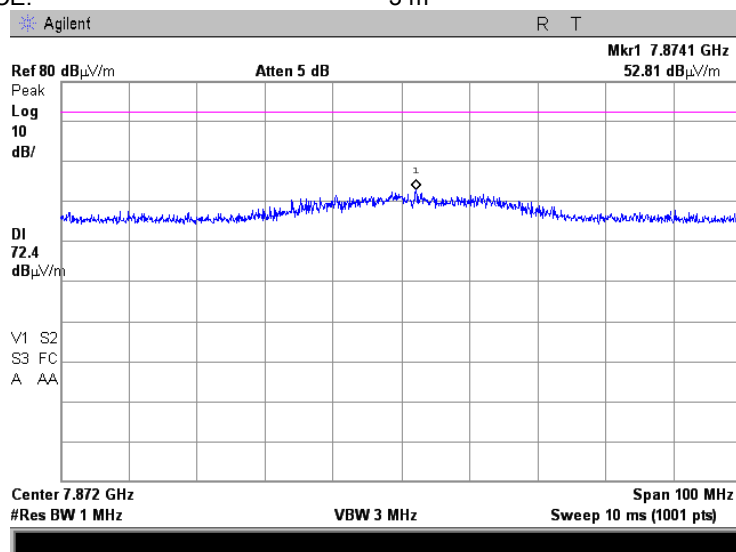


NOTE: limit 84.4 dBuV/m was applied

|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.53, Radiated spurious emissions         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

**Plot 7.5.7 Radiated emission measurements at the 3<sup>rd</sup> harmonic**

TEST SITE: OATS  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



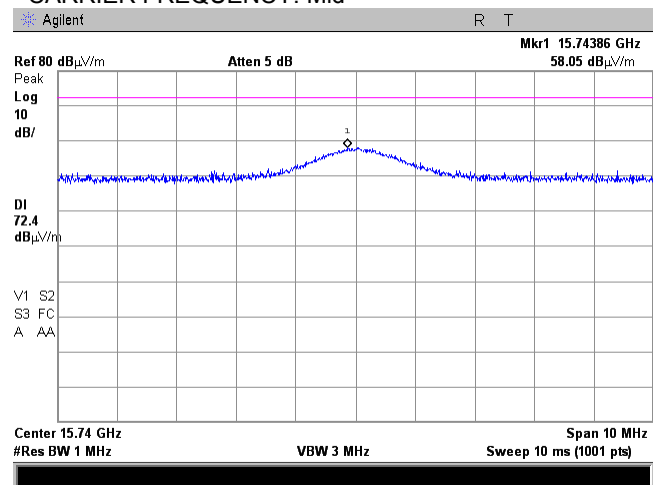
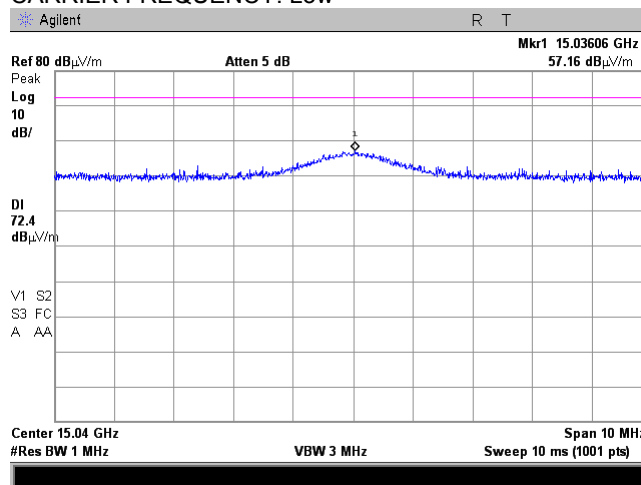
NOTE: limit 84.4 dBuV/m was applied

|                                                                               |                                |                               |                       |
|-------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification: Section 27.53, Radiated spurious emissions</b>         |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                                  |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 20-Aug-17 - 21-Aug-17                                         |                                |                               |                       |
| <b>Temperature:</b> 24.6 °C                                                   | <b>Relative Humidity:</b> 38 % | <b>Air Pressure:</b> 1011 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                               |                                |                               |                       |

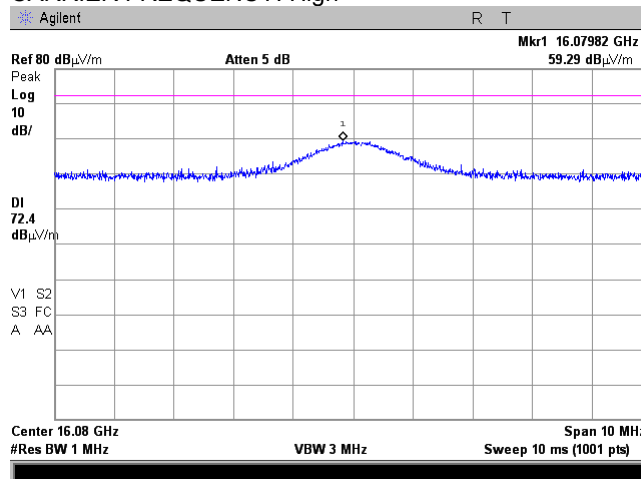
### Plot 7.5.8 Radiated emission measurements at the 7<sup>th</sup> harmonic

TEST SITE:  
TEST DISTANCE:  
ANTENNA POLARIZATION:  
EUT POSITION:  
CARRIER FREQUENCY: Low

OATS  
3 m  
Vertical  
Typical (Vertical)  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



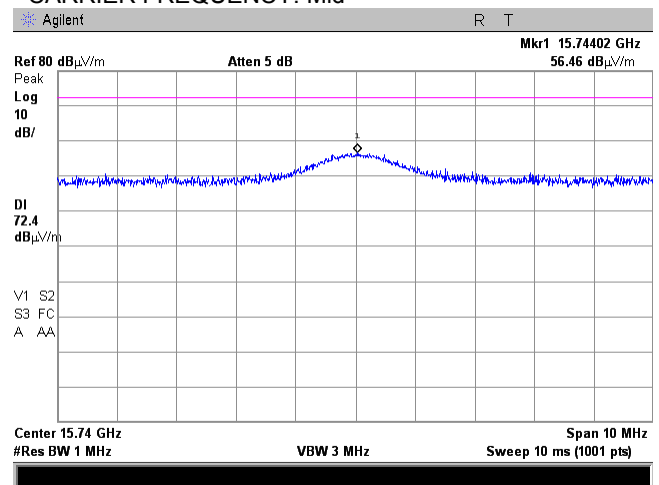
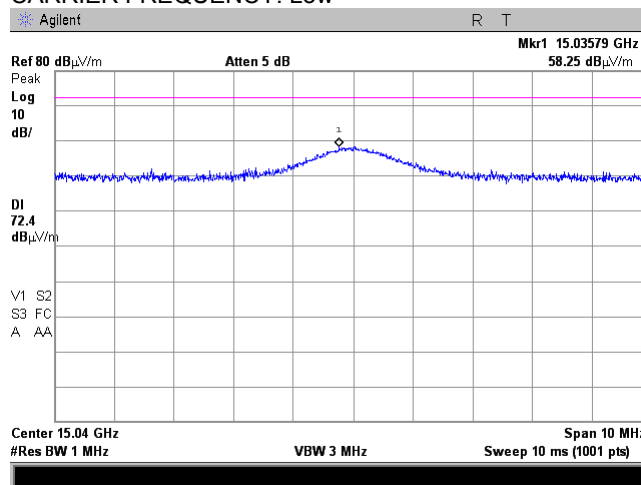
NOTE: limit 84.4 dB $\mu$ V/m was applied

|                       |                         |                                                        |                |
|-----------------------|-------------------------|--------------------------------------------------------|----------------|
| Test specification:   |                         | Section 27.53, Radiated spurious emissions             |                |
| Test procedure:       |                         | 47 CFR, Sections 2.1053; TIA/EIA-603-D, Section 2.2.12 |                |
| Test mode:            |                         | Verdict: PASS                                          |                |
| Date(s):              |                         |                                                        |                |
| 20-Aug-17 - 21-Aug-17 |                         |                                                        |                |
| Temperature: 24.6 °C  | Relative Humidity: 38 % | Air Pressure: 1011 hPa                                 | Power: 120 VAC |
| Remarks:              |                         |                                                        |                |

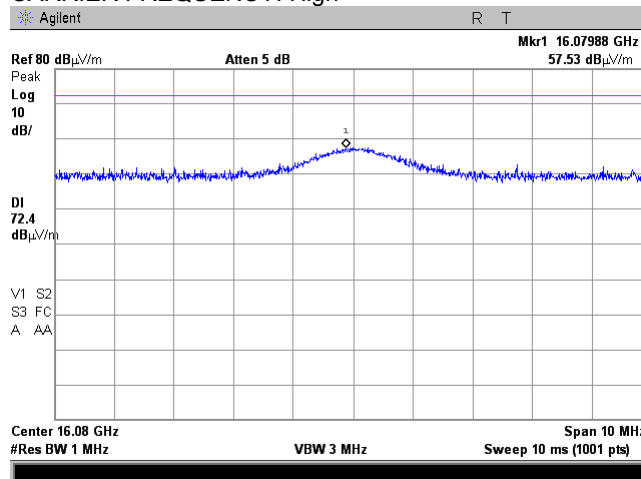
Plot 7.5.9 Radiated emission measurements at the 7<sup>th</sup> harmonic

TEST SITE:  
TEST DISTANCE:  
ANTENNA POLARIZATION:  
EUT POSITION:  
CARRIER FREQUENCY: Low

OATS  
3 m  
Horizontal  
Typical (Vertical)  
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



NOTE: limit 84.4 dBuV/m was applied



|                                                                            |                                |                               |                       |
|----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.54, Frequency stability              |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1055; TIA/EIA-603-D Section 2.2.2 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                               |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 17-Aug-17                                                  |                                |                               |                       |
| <b>Temperature:</b> 24.5 °C                                                | <b>Relative Humidity:</b> 39 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                            |                                |                               |                       |

## 7.6 Frequency stability test

### 7.6.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.6.1.

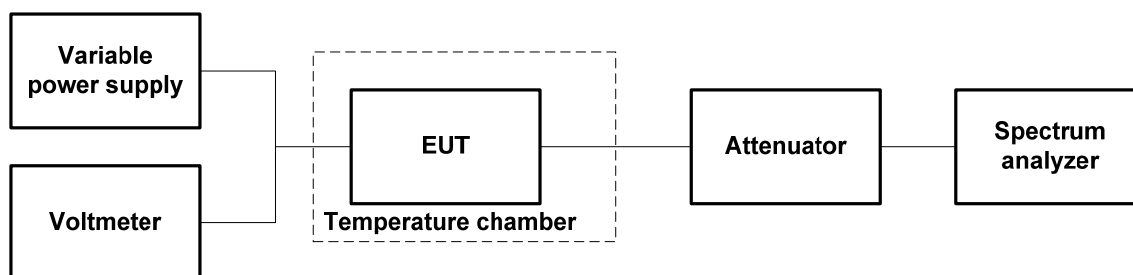
Table 7.6.1 Frequency stability limits

| Assigned frequency, MHz | Maximum allowed frequency displacement                                                                                              |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 2496.0 - 2690.0         | The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation. |

### 7.6.2 Test procedure

- 7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and its proper operation was checked.
- 7.6.2.2 The EUT power was turned off. Temperature within test chamber was set to +30°C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.
- 7.6.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.
- 7.6.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.6.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.
- 7.6.2.6 Frequency displacement was calculated and provided in Table 7.6.2, Table 7.6.3.
- 7.6.2.7 The test results provided in Table 7.6.4.

Figure 7.6.1 Frequency stability test setup



|                                                                            |                                |                               |                       |
|----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.54, Frequency stability              |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1055; TIA/EIA-603-D Section 2.2.2 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                               |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 17-Aug-17                                                  |                                |                               |                       |
| <b>Temperature:</b> 24.5 °C                                                | <b>Relative Humidity:</b> 39 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                            |                                |                               |                       |

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY: 2496.0 – 2690.0 MHz  
 NOMINAL POWER VOLTAGE: 120 VAC  
 TEMPERATURE STABILIZATION PERIOD: 20 min  
 POWER DURING TEMPERATURE TRANSITION: Off  
 SPECTRUM ANALYZER MODE: Counter  
 RESOLUTION BANDWIDTH: 10 Hz  
 VIDEO BANDWIDTH: 30 Hz  
 MODULATION: Unmodulated

| T, °C                  | Voltage, V | Frequency, MHz |                     |                     |                     |                     |                     |                      | Max frequency drift, Hz |          |
|------------------------|------------|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|-------------------------|----------|
|                        |            | Start up       | 1 <sup>st</sup> min | 2 <sup>nd</sup> min | 3 <sup>rd</sup> min | 4 <sup>th</sup> min | 5 <sup>th</sup> min | 10 <sup>th</sup> min | Positive                | Negative |
| Low carrier frequency  |            |                |                     |                     |                     |                     |                     |                      |                         |          |
| -30                    | nominal    | 2506000.000    | 2506000.001         | 2506000.002         | 2506000.000         | 2506000.000         | 2506000.000         | 2506000.004          | 2                       | -2       |
| -20                    | nominal    | 2505999.999    | NA                  | NA                  | NA                  | NA                  | NA                  | 2506000.009          | 7                       | -3       |
| -10                    | nominal    | 2506000.004    | NA                  | NA                  | NA                  | NA                  | NA                  | 2506000.000          | 2                       | -3       |
| 0                      | nominal    | 2506000.004    | 2506000.003         | 2506000.005         | 2505999.996         | 2506000.003         | 2506000.003         | 2506000.001          | 3                       | -6       |
| 10                     | nominal    | 2505999.998    | NA                  | NA                  | NA                  | NA                  | NA                  | 2506000.004          | 2                       | -6       |
| 20                     | 15%        | 2506000.009    | NA                  | NA                  | NA                  | NA                  | NA                  | 2506000.006          | 7                       | -4       |
| 20                     | nominal    | 2506000.009    | NA                  | NA                  | NA                  | NA                  | NA                  | 2506000.002          | 7                       | 0        |
| 20                     | -15%       | 2506000.009    | NA                  | NA                  | NA                  | NA                  | NA                  | 2506000.003          | 7                       | 0        |
| 30                     | nominal    | 2506000.000    | 2506000.005         | 2506000.006         | 2505999.998         | 2506000.002         | 2506000.001         | 2506000.003          | 4                       | -4       |
| 40                     | nominal    | 2505999.997    | NA                  | NA                  | NA                  | NA                  | NA                  | 2506000.002          | 0                       | -5       |
| 50                     | nominal    | 2505999.998    | NA                  | NA                  | NA                  | NA                  | NA                  | 2506000.005          | 3                       | -5       |
| Mid carrier frequency  |            |                |                     |                     |                     |                     |                     |                      |                         |          |
| -30                    | nominal    | 2624000.000    | 2623999.997         | 2624000.000         | 2623999.998         | 2623999.999         | 2623999.998         | 2623999.998          | 2                       | -1       |
| -20                    | nominal    | 2624000.000    | NA                  | NA                  | NA                  | NA                  | NA                  | 2624000.001          | 3                       | 2        |
| -10                    | nominal    | 2624000.002    | NA                  | NA                  | NA                  | NA                  | NA                  | 2624000.000          | 4                       | 2        |
| 0                      | nominal    | 2623999.994    | 2624000.002         | 2623999.998         | 2623999.998         | 2623999.998         | 2623999.998         | 2624000.001          | 4                       | -4       |
| 10                     | nominal    | 2624000.004    | NA                  | NA                  | NA                  | NA                  | NA                  | 2624000.003          | 6                       | 5        |
| 20                     | 15%        | 2624000.001    | NA                  | NA                  | NA                  | NA                  | NA                  | 2623999.999          | 3                       | 1        |
| 20                     | nominal    | 2624000.001    | NA                  | NA                  | NA                  | NA                  | NA                  | 2623999.998          | 3                       | 0        |
| 20                     | -15%       | 2624000.002    | NA                  | NA                  | NA                  | NA                  | NA                  | 2623999.997          | 4                       | -1       |
| 30                     | nominal    | 2623999.998    | 2623999.995         | 2623999.996         | 2623999.997         | 2623999.998         | 2623999.998         | 2624000.004          | 6                       | -3       |
| 40                     | nominal    | 2624000.002    | NA                  | NA                  | NA                  | NA                  | NA                  | 2624000.002          | 4                       | 4        |
| 50                     | nominal    | 2624000.002    | NA                  | NA                  | NA                  | NA                  | NA                  | 2624000.008          | 10                      | 4        |
| High carrier frequency |            |                |                     |                     |                     |                     |                     |                      |                         |          |
| -30                    | nominal    | 2679999.999    | 2680000.001         | 2680000.004         | 2679999.996         | 2679999.997         | 2680000.001         | 2680000.004          | 4                       | -4       |
| -20                    | nominal    | 2680000.002    | NA                  | NA                  | NA                  | NA                  | NA                  | 2680000.005          | 5                       | 2        |
| -10                    | nominal    | 2680000.000    | NA                  | NA                  | NA                  | NA                  | NA                  | 2680000.000          | 0                       | 0        |
| 0                      | nominal    | 2680000.005    | 2680000.001         | 2680000.005         | 2680000.003         | 2680000.003         | 2680000.002         | 2680000.006          | 6                       | 1        |
| 10                     | nominal    | 2679999.998    | NA                  | NA                  | NA                  | NA                  | NA                  | 2679999.997          | -2                      | -3       |
| 20                     | 15%        | 2680000.000    | NA                  | NA                  | NA                  | NA                  | NA                  | 2679999.999          | 0                       | -1       |
| 20                     | nominal    | 2680000.001    | NA                  | NA                  | NA                  | NA                  | NA                  | 2680000.000          | 1                       | 0        |
| 20                     | -15%       | 2680000.002    | NA                  | NA                  | NA                  | NA                  | NA                  | 2680000.001          | 2                       | 1        |
| 30                     | nominal    | 2680000.003    | 2680000.004         | 2680000.002         | 2680000.005         | 2680000.006         | 2680000.012         | 2680000.003          | 12                      | 2        |
| 40                     | nominal    | 2680000.005    | NA                  | NA                  | NA                  | NA                  | NA                  | 2680000.005          | 5                       | 5        |
| 50                     | nominal    | 2680000.006    | NA                  | NA                  | NA                  | NA                  | NA                  | 2679999.998          | 6                       | -2       |

\* - Reference frequency



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|                                                                            |                                |                               |                       |
|----------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------|
| <b>Test specification:</b> Section 27.54, Frequency stability              |                                |                               |                       |
| <b>Test procedure:</b> 47 CFR, Section 2.1055; TIA/EIA-603-D Section 2.2.2 |                                |                               |                       |
| <b>Test mode:</b> Compliance                                               |                                | <b>Verdict:</b> PASS          |                       |
| <b>Date(s):</b> 17-Aug-17                                                  |                                |                               |                       |
| <b>Temperature:</b> 24.5 °C                                                | <b>Relative Humidity:</b> 39 % | <b>Air Pressure:</b> 1009 hPa | <b>Power:</b> 120 VAC |
| <b>Remarks:</b>                                                            |                                |                               |                       |

Table 7.6.3 Maximum frequency displacement

| Channel | Maximum frequency displacement |          |          |          |
|---------|--------------------------------|----------|----------|----------|
|         | ppm                            |          | Hz       |          |
|         | Negative                       | Positive | Negative | Positive |
| Low     | 0.24                           | 0.28     | -6       | 7        |
| High    | 0.15                           | 0.44     | -4       | 12       |

Table 7.6.4 Transmission occupied bandwidth with frequency drift test results

| Lower measured* band edge, MHz | Upper measured* band edge, MHz | Lower calculated** band edge, MHz | Upper calculated** band edge, MHz | Lower specified band edge, MHz | Upper specified band edge, MHz | Lower margin***, MHz | Upper margin***, MHz | Verdict |
|--------------------------------|--------------------------------|-----------------------------------|-----------------------------------|--------------------------------|--------------------------------|----------------------|----------------------|---------|
| <b>Low frequency 2506 MHz</b>  |                                |                                   |                                   |                                |                                |                      |                      |         |
| 2496.64                        | 2515.36                        | 2496.639994                       | 2515.360007                       | 2496.000000                    | 2516.000000                    | -0.639994            | -0.639993            | Pass    |
| 2496.64                        | 2515.36                        | 2496.639994                       | 2515.360007                       | 2496.000000                    | 2516.000000                    | -0.639993            | -0.639993            | Pass    |
| <b>Mid frequency 2624 MHz</b>  |                                |                                   |                                   |                                |                                |                      |                      |         |
| 2614.68                        | 2633.36                        | 2614.679990                       | 2633.360004                       | 2614.000000                    | 2634.000000                    | -0.679990            | -0.639996            | Pass    |
| 2614.64                        | 2633.36                        | 2614.639990                       | 2633.360004                       | 2614.000000                    | 2634.000000                    | -0.639996            | -0.639996            | Pass    |
| <b>High frequency 2680 MHz</b> |                                |                                   |                                   |                                |                                |                      |                      |         |
| 2670.64                        | 2689.36                        | 2670.639996                       | 2689.360012                       | 2670.000000                    | 2690.000000                    | -0.639996            | -0.639988            | Pass    |
| 2670.64                        | 2689.36                        | 2670.639996                       | 2689.360012                       | 2670.000000                    | 2690.000000                    | -0.639988            | -0.639988            | Pass    |

\* - Measured under normal test conditions at 26 dBc points

\*\* - Measured band edge with proper drift addition

\*\*\* - Margin = Calculated band edge – specified band edge

#### Reference numbers of test equipment used

|         |         |         |         |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|
| HL 3818 | HL 3901 | HL 5174 | HL 5175 |  |  |  |  |
|---------|---------|---------|---------|--|--|--|--|

Full description is given in Appendix A.

## 8 APPENDIX A Test equipment and ancillaries used for tests

| HL No | Description                                                        | Manufacturer                      | Model                       | Ser. No.        | Last Cal./ Check | Due Cal./ Check |
|-------|--------------------------------------------------------------------|-----------------------------------|-----------------------------|-----------------|------------------|-----------------|
| 0446  | Antenna, Loop, Active, 10 kHz - 30 MHz                             | EMCO                              | 6502                        | 2857            | 19-Jan-17        | 19-Jan-18       |
| 0604  | Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz            | EMCO                              | 3141                        | 9611-1011       | 12-May-17        | 12-May-18       |
| 0661  | Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm                 | Hewlett Packard                   | 83640B                      | 3614A002 66     | 10-May-17        | 10-May-18       |
| 2214  | Directional Coupler 1.7-26.5 GHz                                   | Krytar                            | 2616                        | 31354           | 16-Sep-15        | 16-Sep-17       |
| 2909  | Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz                       | Agilent Technologies              | E4407B                      | MY414447 62     | 09-Mar-17        | 09-Mar-18       |
| 3301  | Power Meter, P-series, 50 MHz to 40 GHz                            | Agilent Technologies              | N1911A                      | MY451010 57     | 09-Apr-17        | 09-Apr-18       |
| 3302  | Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm         | Agilent Technologies              | N1922A                      | MY452405 86     | 09-Apr-17        | 09-Apr-18       |
| 3433  | Test Cable , DC-18 GHz, 1.5 m, SMA - SMA                           | Mini-Circuits                     | CBL-5FT-SMSM+               | 25679           | 27-Mar-17        | 27-Mar-18       |
| 3434  | Test Cable , DC-18 GHz, 1.5 m, SMA - SMA                           | Mini-Circuits                     | CBL-5FT-SMSM+               | 25683           | 27-Mar-17        | 27-Mar-18       |
| 3667  | Directional coupler, 2 GHz to 8 GHz, 10 dB                         | ELISRA                            | MW10162                     | 1011            | 15-Jun-17        | 15-Jun-18       |
| 3787  | Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz       | Mini-Circuits                     | BW-S10W5+                   | NA              | 07-Dec-16        | 07-Dec-17       |
| 3818  | PSA Series Spectrum Analyzer, 3 Hz- 44 GHz                         | Agilent Technologies              | E4446A                      | MY482502 88     | 07-May-17        | 07-May-18       |
| 3901  | Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA                 | Huber-Suhner                      | SUCOFLE X 102A              | 1225/2A         | 20-Feb-17        | 20-Feb-18       |
| 4068  | Attenuator, SMA, 30 dB, DC to 12.4 GHz                             | Midwest Microwave                 | ATT-0527-30-SMA-07          | NA              | 16-Aug-17        | 16-Aug-18       |
| 4114  | Antenna, Double-Ridged Waveguide Horn, 1 to 18 GHz                 | ETS Lindgren                      | 3117                        | 00123515        | 17-Jan-17        | 17-Jan-18       |
| 4353  | Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M | MegaPhase                         | NC29-N1N1-244               | 12025101 003    | 15-Mar-17        | 15-Mar-18       |
| 4366  | Directional coupler, 1 GHz to 18 GHz, 10 dB, SMA Female            | Tiger Micro-Electronics Institute | TGD-A1101-10                | 01e-JSDE805-007 | 26-May-16        | 26-May-18       |
| 4933  | Active Horn Antenna, 1 GHz to 18 GHz                               | Com-Power Corporation             | AHA-118                     | 701046          | 14-Oct-16        | 14-Oct-17       |
| 4956  | Active horn antenna, 18 to 40 GHz                                  | Com-Power Corporation             | AHA-840                     | 105004          | 17-Jan-17        | 17-Jan-18       |
| 5110  | RF cable, 18 GHz, 3 m, N-type                                      | Huber-Suhner                      | ST18A/N m/Nm/300 0          | 600818/18 A     | 27-Jul-17        | 27-Jul-18       |
| 5111  | RF cable, 40 GHz, 5.5 m, K-type                                    | Huber-Suhner                      | SF102EA/ 11SK/11S K/5500M M | 502493/2E A     | 27-Jul-17        | 27-Jul-18       |



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| HL No | Description                                                       | Manufacturer          | Model                                | Ser. No.       | Last Cal./ Check | Due Cal./ Check |
|-------|-------------------------------------------------------------------|-----------------------|--------------------------------------|----------------|------------------|-----------------|
| 5112  | RF cable, 40 GHz, 5.5 m, K-type                                   | Huber-Suhner          | SF102EA/<br>11SK/11S<br>K/5500M<br>M | 502494/2E<br>A | 27-Jul-17        | 27-Jul-18       |
| 5174  | Medium Power Fixed Coaxial Attenuator<br>DC to 40 GHz, 10 dB, 5 W | API Weinschel,<br>Inc | 75A-10-12                            | TD854          | 20-Feb-17        | 20-Feb-18       |
| 5175  | Medium Power Fixed Coaxial Attenuator<br>DC to 40 GHz, 20 dB, 5 W | API Weinschel,<br>Inc | 75A-20-12                            | TE289          | 20-Feb-17        | 20-Feb-18       |

## 9 APPENDIX B Measurement uncertainties

### Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

| Test description                                                  | Expanded uncertainty                                                                                                                                                                                                        |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transmitter tests</b>                                          |                                                                                                                                                                                                                             |
| Carrier power conducted at antenna connector                      | $\pm 1.7$ dB                                                                                                                                                                                                                |
| Carrier power radiated (substitution method)                      | $\pm 4.5$ dB                                                                                                                                                                                                                |
| Occupied bandwidth                                                | $\pm 8\%$                                                                                                                                                                                                                   |
| Conducted emissions at RF antenna connector                       | 9 kHz to 2.9 GHz: $\pm 2.6$ dB<br>2.9 GHz to 6.46 GHz: $\pm 3.5$ dB<br>6.46 GHz to 13.2 GHz: $\pm 4.3$ dB<br>13.2 GHz to 22.0 GHz: $\pm 5.0$ dB<br>22.0 GHz to 26.8 GHz: $\pm 5.5$ dB<br>26.8 GHz to 40.0 GHz: $\pm 4.8$ dB |
| Spurious emissions radiated 30 MHz – 40 GHz (substitution method) | $\pm 4.5$ dB                                                                                                                                                                                                                |
| Frequency error                                                   | 30 – 300 MHz: $\pm 50.5$ Hz (1.68 ppm)<br>300 – 1000 MHz: $\pm 168$ Hz (0.56 ppm)                                                                                                                                           |
| Transient frequency behaviour                                     | 187 Hz<br>$\pm 13.9\%$                                                                                                                                                                                                      |
| Duty cycle, timing (Tx ON / OFF) and average factor measurements  | $\pm 1.0\%$                                                                                                                                                                                                                 |

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

## 10 APPENDIX C Test facility description

T Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.

Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-869 for RE measurements above 1 GHz, C-845 for conducted emissions site and T-1606 for conducted emissions at telecommunication ports).

The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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website: www.hermonlabs.com

Person for contact: Mr. Michael Nikishin, EMC&Radio group manager

## 11 APPENDIX D Specification references

|                         |                                                                                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47CFR part 27: 2016     | Private land mobile radio services                                                                                                                                   |
| 47CFR part 1: 2016      | Practice and procedure                                                                                                                                               |
| 47CFR part 2: 2016      | Frequency allocations and radio treaty matters; general rules and regulations                                                                                        |
| ANSI C63.2: 1996        | American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.                                            |
| ANSI C63.4: 2014        | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| ANSI/TIA/EIA-603-D:2010 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards                                                                                  |

## 12 APPENDIX E Test equipment correction factors

Antenna factor  
Active loop antenna  
Model 6502, S/N 2857, HL 0446

| Frequency,<br>MHz | Magnetic antenna factor,<br>dB | Electric antenna factor,<br>dB |
|-------------------|--------------------------------|--------------------------------|
| 0.009             | -32.8                          | 18.7                           |
| 0.010             | -33.8                          | 17.7                           |
| 0.020             | -38.3                          | 13.2                           |
| 0.050             | -41.1                          | 10.4                           |
| 0.075             | -41.3                          | 10.2                           |
| 0.100             | -41.6                          | 9.9                            |
| 0.150             | -41.7                          | 9.8                            |
| 0.250             | -41.6                          | 9.9                            |
| 0.500             | -41.8                          | 9.8                            |
| 0.750             | -41.9                          | 9.7                            |
| 1.000             | -41.4                          | 10.1                           |
| 2.000             | -41.5                          | 10.0                           |
| 3.000             | -41.4                          | 10.2                           |
| 4.000             | -41.4                          | 10.1                           |
| 5.000             | -41.5                          | 10.1                           |
| 10.000            | -41.9                          | 9.6                            |
| 15.000            | -41.9                          | 9.6                            |
| 20.000            | -42.2                          | 9.3                            |
| 25.000            | -42.8                          | 8.7                            |
| 30.000            | -44.0                          | 7.5                            |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field strength in dB( $\mu$ V/m).



**Antenna factor**  
**Biconilog antenna EMCO Model 3141**  
**Ser.No.1011, HL 0604**

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) | Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|-------------------|----------------------------|-------------------|----------------------------|
| 26                | 7.8                        | 580               | 20.6                       | 1320              | 27.8                       |
| 28                | 7.8                        | 600               | 21.3                       | 1340              | 28.3                       |
| 30                | 7.8                        | 620               | 21.5                       | 1360              | 28.2                       |
| 40                | 7.2                        | 640               | 21.2                       | 1380              | 27.9                       |
| 60                | 7.1                        | 660               | 21.4                       | 1400              | 27.9                       |
| 70                | 8.5                        | 680               | 21.9                       | 1420              | 27.9                       |
| 80                | 9.4                        | 700               | 22.2                       | 1440              | 27.8                       |
| 90                | 9.8                        | 720               | 22.2                       | 1460              | 27.8                       |
| 100               | 9.7                        | 740               | 22.1                       | 1480              | 28.0                       |
| 110               | 9.3                        | 760               | 22.3                       | 1500              | 28.5                       |
| 120               | 8.8                        | 780               | 22.6                       | 1520              | 28.9                       |
| 130               | 8.7                        | 800               | 22.7                       | 1540              | 29.6                       |
| 140               | 9.2                        | 820               | 22.9                       | 1560              | 29.8                       |
| 150               | 9.8                        | 840               | 23.1                       | 1580              | 29.6                       |
| 160               | 10.2                       | 860               | 23.4                       | 1600              | 29.5                       |
| 170               | 10.4                       | 880               | 23.8                       | 1620              | 29.3                       |
| 180               | 10.4                       | 900               | 24.1                       | 1640              | 29.2                       |
| 190               | 10.3                       | 920               | 24.1                       | 1660              | 29.4                       |
| 200               | 10.6                       | 940               | 24.0                       | 1680              | 29.6                       |
| 220               | 11.6                       | 960               | 24.1                       | 1700              | 29.8                       |
| 240               | 12.4                       | 980               | 24.5                       | 1720              | 30.3                       |
| 260               | 12.8                       | 1000              | 24.9                       | 1740              | 30.8                       |
| 280               | 13.7                       | 1020              | 25.0                       | 1760              | 31.1                       |
| 300               | 14.7                       | 1040              | 25.2                       | 1780              | 31.0                       |
| 320               | 15.2                       | 1060              | 25.4                       | 1800              | 30.9                       |
| 340               | 15.4                       | 1080              | 25.6                       | 1820              | 30.7                       |
| 360               | 16.1                       | 1100              | 25.7                       | 1840              | 30.6                       |
| 380               | 16.4                       | 1120              | 26.0                       | 1860              | 30.6                       |
| 400               | 16.6                       | 1140              | 26.4                       | 1880              | 30.6                       |
| 420               | 16.7                       | 1160              | 27.0                       | 1900              | 30.6                       |
| 440               | 17.0                       | 1180              | 27.0                       | 1920              | 30.7                       |
| 460               | 17.7                       | 1200              | 26.7                       | 1940              | 30.9                       |
| 480               | 18.1                       | 1220              | 26.5                       | 1960              | 31.2                       |
| 500               | 18.5                       | 1240              | 26.5                       | 1980              | 31.6                       |
| 520               | 19.1                       | 1260              | 26.5                       | 2000              | 32.0                       |
| 540               | 19.5                       | 1280              | 26.6                       |                   |                            |
| 560               | 19.8                       | 1300              | 27.0                       |                   |                            |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field strength in dB( $\mu$ V/m).

**Antenna factor**  
**Double-ridged waveguide horn antenna**  
**ETS Lindgren, Model 3117, serial number: 00123515, HL 4114**

| Frequency, MHz | Antenna factor, dB/m |              |           |
|----------------|----------------------|--------------|-----------|
|                | Measured             | Manufacturer | Deviation |
| 1000           | 28.0                 | 28.4         | -0.4      |
| 1500           | 28.0                 | 27.4         | 0.6       |
| 2000           | 31.2                 | 30.9         | 0.3       |
| 2500           | 32.5                 | 33.4         | -0.9      |
| 3000           | 32.9                 | 32.6         | 0.3       |
| 3500           | 32.7                 | 32.8         | -0.1      |
| 4000           | 33.1                 | 33.4         | -0.3      |
| 4500           | 33.8                 | 33.9         | -0.1      |
| 5000           | 33.8                 | 34.1         | -0.3      |
| 5500           | 34.4                 | 34.5         | -0.1      |
| 6000           | 35.0                 | 35.2         | -0.2      |
| 6500           | 35.4                 | 35.5         | -0.1      |
| 7000           | 35.7                 | 35.7         | 0.0       |
| 7500           | 35.9                 | 35.7         | 0.2       |
| 8000           | 35.8                 | 35.8         | 0.0       |
| 8500           | 35.9                 | 35.8         | 0.1       |
| 9000           | 36.3                 | 36.2         | 0.1       |
| 9500           | 36.6                 | 36.6         | 0.0       |
| 10000          | 37.1                 | 37.1         | 0.0       |
| 10500          | 37.6                 | 37.5         | 0.1       |
| 11000          | 37.9                 | 37.7         | 0.2       |
| 11500          | 38.5                 | 38.1         | 0.4       |
| 12000          | 39.2                 | 38.7         | 0.5       |
| 12500          | 39.0                 | 38.9         | 0.1       |
| 13000          | 39.1                 | 39.1         | 0.0       |
| 13500          | 38.9                 | 38.8         | 0.1       |
| 14000          | 39.0                 | 38.8         | 0.2       |
| 14500          | 39.6                 | 39.9         | -0.3      |
| 15000          | 39.9                 | 39.7         | 0.2       |
| 15500          | 39.9                 | 40.1         | -0.2      |
| 16000          | 40.7                 | 40.8         | -0.1      |
| 16500          | 41.3                 | 41.8         | -0.5      |
| 17000          | 42.5                 | 42.1         | 0.4       |
| 17500          | 41.3                 | 41.2         | 0.1       |
| 18000          | 41.4                 | 40.9         | 0.5       |

Antenna factor is to be added to receiver meter reading in dB( $\mu$ V) to convert to field strength in dB( $\mu$ V/meter)



HERMON LABORATORIES

Antenna factor, HL 4933

**Active Horn Antenna Factor Calibration**

1 GHz to 18 GHz

| <b>Equipment:</b>                                                         |                              |                                          | <b>ACTIVE HORN ANTENNA</b> |                              |                                          |
|---------------------------------------------------------------------------|------------------------------|------------------------------------------|----------------------------|------------------------------|------------------------------------------|
| <b>Model:</b>                                                             |                              |                                          | <b>AHA-118</b>             |                              |                                          |
| <b>Serial Number:</b>                                                     |                              |                                          | <b>701046</b>              |                              |                                          |
| <b>Calibration Distance:</b>                                              |                              |                                          | <b>3 Meter</b>             |                              |                                          |
| <b>Polarization:</b>                                                      |                              |                                          | <b>Horizontal</b>          |                              |                                          |
| <b>Calibration Date:</b>                                                  |                              |                                          | <b>11/12/2014</b>          |                              |                                          |
| Frequency<br>(GHz)                                                        | Preamplifier<br>Gain<br>(dB) | Antenna Factor<br>with pre-amp<br>(dB/m) | Frequency<br>(GHz)         | Preamplifier<br>Gain<br>(dB) | Antenna Factor<br>with pre-amp<br>(dB/m) |
| 1                                                                         | 40.96                        | -16.47                                   | 10                         | 40.94                        | -1.97                                    |
| 1.5                                                                       | 41.21                        | -14.53                                   | 10.5                       | 40.63                        | -1.06                                    |
| 2                                                                         | 41.44                        | -13.30                                   | 11                         | 40.74                        | -1.50                                    |
| 2.5                                                                       | 41.71                        | -12.87                                   | 11.5                       | 40.65                        | -0.52                                    |
| 3                                                                         | 41.96                        | -12.26                                   | 12                         | 40.76                        | -0.15                                    |
| 3.5                                                                       | 42.14                        | -11.77                                   | 12.5                       | 41.03                        | -0.85                                    |
| 4                                                                         | 42.13                        | -10.91                                   | 13                         | 41.37                        | -0.81                                    |
| 4.5                                                                       | 41.79                        | -9.41                                    | 13.5                       | 41.18                        | 0.05                                     |
| 5                                                                         | 41.44                        | -7.54                                    | 14                         | 40.98                        | 0.36                                     |
| 5.5                                                                       | 40.91                        | -6.47                                    | 14.5                       | 40.81                        | 1.26                                     |
| 6                                                                         | 40.69                        | -5.48                                    | 15                         | 40.65                        | 0.25                                     |
| 6.5                                                                       | 40.64                        | -5.53                                    | 15.5                       | 40.93                        | -1.05                                    |
| 7                                                                         | 40.76                        | -4.12                                    | 16                         | 41.31                        | -1.44                                    |
| 7.5                                                                       | 40.94                        | -3.12                                    | 16.5                       | 40.96                        | -0.80                                    |
| 8                                                                         | 40.68                        | -1.69                                    | 17                         | 40.64                        | -0.02                                    |
| 8.5                                                                       | 40.08                        | -1.71                                    | 17.5                       | 40.57                        | 1.81                                     |
| 9                                                                         | 40.41                        | -1.86                                    | 18                         | 40.08                        | 3.63                                     |
| 9.5                                                                       | 41.21                        | -2.73                                    |                            |                              |                                          |
| Calibration according to ARP 958                                          |                              |                                          |                            |                              |                                          |
| <b>Antenna Factor to be added to receiver reading:</b>                    |                              |                                          |                            |                              |                                          |
| Meter Reading (dBuV) + Antenna Factor (dB/m) = Corrected Reading (dBuV/m) |                              |                                          |                            |                              |                                          |



HERMON LABORATORIES

Antenna factor, HL 4956

**Active Horn Antenna Factor Calibration**

18 GHz to 40 GHz

| <b>Equipment:</b>                                                                                                                                                        |                              |                                          | <b>ACTIVE HORN ANTENNA</b> |                              |                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------|----------------------------|------------------------------|------------------------------------------|
| <b>Model:</b>                                                                                                                                                            |                              |                                          | <b>AHA-840</b>             |                              |                                          |
| <b>Serial Number:</b>                                                                                                                                                    |                              |                                          | <b>105004</b>              |                              |                                          |
| <b>Calibration Distance:</b>                                                                                                                                             |                              |                                          | <b>3 meter</b>             |                              |                                          |
| <b>Polarization:</b>                                                                                                                                                     |                              |                                          | <b>Horizontal</b>          |                              |                                          |
| <b>Calibration Date:</b>                                                                                                                                                 |                              |                                          | <b>1/26/2015</b>           |                              |                                          |
| Frequency<br>(GHz)                                                                                                                                                       | Preamplifier<br>Gain<br>(dB) | Antenna Factor<br>with pre-amp<br>(dB/m) | Frequency<br>(GHz)         | Preamplifier<br>Gain<br>(dB) | Antenna Factor<br>with pre-amp<br>(dB/m) |
| 18                                                                                                                                                                       | 38.83                        | -1.06                                    | 29.5                       | 42.47                        | -5.33                                    |
| 18.5                                                                                                                                                                     | 39.34                        | -2.65                                    | 30                         | 41.91                        | -4.86                                    |
| 19                                                                                                                                                                       | 39.71                        | -3.88                                    | 30.5                       | 41.60                        | -4.64                                    |
| 19.5                                                                                                                                                                     | 39.87                        | -4.35                                    | 31                         | 41.52                        | -4.60                                    |
| 20                                                                                                                                                                       | 39.98                        | -3.97                                    | 31.5                       | 41.56                        | -4.79                                    |
| 20.5                                                                                                                                                                     | 40.42                        | -3.68                                    | 32                         | 41.80                        | -5.21                                    |
| 21                                                                                                                                                                       | 41.12                        | -4.06                                    | 32.5                       | 42.29                        | -5.54                                    |
| 21.5                                                                                                                                                                     | 41.74                        | -5.46                                    | 33                         | 42.79                        | -5.63                                    |
| 22                                                                                                                                                                       | 42.14                        | -6.22                                    | 33.5                       | 42.88                        | -5.38                                    |
| 22.5                                                                                                                                                                     | 42.35                        | -6.42                                    | 34                         | 42.62                        | -4.76                                    |
| 23                                                                                                                                                                       | 42.50                        | -6.59                                    | 34.5                       | 42.63                        | -4.84                                    |
| 23.5                                                                                                                                                                     | 42.65                        | -6.82                                    | 35                         | 43.15                        | -5.13                                    |
| 24                                                                                                                                                                       | 42.81                        | -7.01                                    | 35.5                       | 43.91                        | -5.83                                    |
| 24.5                                                                                                                                                                     | 42.86                        | -7.37                                    | 36                         | 44.59                        | -6.39                                    |
| 25                                                                                                                                                                       | 42.73                        | -7.53                                    | 36.5                       | 45.04                        | -6.64                                    |
| 25.5                                                                                                                                                                     | 42.77                        | -7.45                                    | 37                         | 45.08                        | -6.40                                    |
| 26                                                                                                                                                                       | 42.85                        | -7.21                                    | 37.5                       | 44.82                        | -5.75                                    |
| 26.5                                                                                                                                                                     | 42.98                        | -7.17                                    | 38                         | 44.16                        | -4.58                                    |
| 27                                                                                                                                                                       | 43.14                        | -7.22                                    | 38.5                       | 42.90                        | -2.66                                    |
| 27.5                                                                                                                                                                     | 43.18                        | -7.32                                    | 39                         | 42.39                        | -1.71                                    |
| 28                                                                                                                                                                       | 43.04                        | -7.10                                    | 39.5                       | 43.76                        | -2.49                                    |
| 28.5                                                                                                                                                                     | 43.01                        | -6.73                                    | 40                         | 45.98                        | -5.21                                    |
| <p>Calibration per ANSI C63.5: 2006<br/> <b>Standard Site Method, Equations 1-6 (3-antenna)</b></p> <p>Corrected Reading (dBμV/m) = Meter Reading (dBμV) + AFE(dB/m)</p> |                              |                                          |                            |                              |                                          |

**Cable loss**  
**Test Cable, Mini-Circuits, CBL-5FT-SMSM+, SMA-SMA, 18 GHz, 1.5 m, S/N 25679**  
**Mini-Circuits, HL 3433**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 10.0              | 0.06              | 9000              | 2.01              |
| 100               | 0.17              | 9500              | 2.06              |
| 500               | 0.41              | 10000             | 2.05              |
| 1000              | 0.58              | 10500             | 2.18              |
| 1500              | 0.72              | 11000             | 2.26              |
| 2000              | 0.86              | 11500             | 2.28              |
| 2500              | 0.96              | 12000             | 2.43              |
| 3000              | 1.04              | 12500             | 2.53              |
| 3500              | 1.13              | 13000             | 2.52              |
| 4000              | 1.23              | 13500             | 2.56              |
| 4500              | 1.31              | 14000             | 2.60              |
| 5000              | 1.41              | 14500             | 2.59              |
| 5500              | 1.49              | 15000             | 2.67              |
| 6000              | 1.55              | 15500             | 2.76              |
| 6500              | 1.63              | 16000             | 2.86              |
| 7000              | 1.71              | 16500             | 2.91              |
| 7500              | 1.78              | 17000             | 2.95              |
| 8000              | 1.86              | 17500             | 3.02              |
| 8500              | 1.92              | 18000             | 3.07              |

**Cable loss**  
**Test Cable, Mini-Circuits, CBL-5FT-SMSM+, SMA-SMA, 18 GHz, 1.5 m, S/N 25683**  
**Mini-Circuits, HL 3434**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 10.0              | 0.06              | 9000              | 1.96              |
| 100               | 0.16              | 9500              | 2.01              |
| 500               | 0.40              | 10000             | 2.01              |
| 1000              | 0.57              | 10500             | 2.14              |
| 1500              | 0.72              | 11000             | 2.21              |
| 2000              | 0.85              | 11500             | 2.24              |
| 2500              | 0.95              | 12000             | 2.36              |
| 3000              | 1.03              | 12500             | 2.47              |
| 3500              | 1.11              | 13000             | 2.46              |
| 4000              | 1.21              | 13500             | 2.50              |
| 4500              | 1.29              | 14000             | 2.53              |
| 5000              | 1.39              | 14500             | 2.53              |
| 5500              | 1.46              | 15000             | 2.62              |
| 6000              | 1.52              | 15500             | 2.70              |
| 6500              | 1.60              | 16000             | 2.80              |
| 7000              | 1.68              | 16500             | 2.86              |
| 7500              | 1.75              | 17000             | 2.88              |
| 8000              | 1.83              | 17500             | 2.94              |
| 8500              | 1.88              | 18000             | 3.00              |

**Cable loss**  
**Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A**  
**HL 3901**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.09              | 9500              | 4.29              | 21000             | 6.67              |
| 100               | 0.41              | 10000             | 4.40              | 22000             | 6.92              |
| 500               | 0.93              | 10500             | 4.52              | 23000             | 7.00              |
| 1000              | 1.33              | 11000             | 4.64              | 24000             | 7.18              |
| 1500              | 1.63              | 11500             | 4.76              | 25000             | 7.29              |
| 2000              | 1.90              | 12000             | 4.87              | 26000             | 7.55              |
| 2500              | 2.12              | 12500             | 4.99              | 27000             | 7.70              |
| 3000              | 2.33              | 13000             | 5.11              | 28000             | 7.88              |
| 3500              | 2.50              | 13500             | 5.20              | 29000             | 8.02              |
| 4000              | 2.67              | 14000             | 5.31              | 30000             | 8.15              |
| 4500              | 2.82              | 14500             | 5.42              | 31000             | 8.35              |
| 5000              | 2.99              | 15000             | 5.51              | 32000             | 8.40              |
| 5500              | 3.16              | 15500             | 5.58              | 33000             | 8.62              |
| 6000              | 3.32              | 16000             | 5.68              | 34000             | 8.73              |
| 6500              | 3.51              | 16500             | 5.78              | 35000             | 8.78              |
| 7000              | 3.65              | 17000             | 5.91              | 36000             | 8.94              |
| 7500              | 3.79              | 17500             | 5.99              | 37000             | 9.21              |
| 8000              | 3.92              | 18000             | 6.07              | 38000             | 9.37              |
| 8500              | 4.04              | 19000             | 6.36              | 39000             | 9.45              |
| 9000              | 4.18              | 20000             | 6.49              | 40000             | 9.52              |



**Cable loss**  
**Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,**  
**NC29-N1N1-244S/N 12025101 003,**  
**HL 4353**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 50                | 0.20              | 9000              | 2.71              |
| 100               | 0.27              | 9500              | 2.81              |
| 300               | 0.47              | 10000             | 2.90              |
| 500               | 0.61              | 10500             | 2.97              |
| 1000              | 0.87              | 11000             | 3.06              |
| 1500              | 1.07              | 11500             | 3.13              |
| 2000              | 1.24              | 12000             | 3.20              |
| 2500              | 1.39              | 12500             | 3.26              |
| 3000              | 1.53              | 13000             | 3.34              |
| 3500              | 1.65              | 13500             | 3.39              |
| 4000              | 1.77              | 14000             | 3.47              |
| 4500              | 1.89              | 14500             | 3.54              |
| 5000              | 1.99              | 15000             | 3.62              |
| 5500              | 2.07              | 15500             | 3.69              |
| 6000              | 2.20              | 16000             | 3.76              |
| 6500              | 2.30              | 16500             | 3.83              |
| 7000              | 2.39              | 17000             | 3.86              |
| 7500              | 2.51              | 17500             | 3.94              |
| 8000              | 2.58              | 18000             | 4.02              |
| 8500              | 2.65              |                   |                   |



**Cable loss**  
**RF Cable, Huber-Suhner, 18 GHz, 3 m, N- type,**  
**ST18A/Nm/Nm/3000, S/N 600818/18A**  
**HL 5110**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 0.1               | 0.01              | 5500              | 1.99              |
| 50                | 0.17              | 6000              | 2.10              |
| 100               | 0.24              | 6500              | 2.20              |
| 200               | 0.34              | 7000              | 2.29              |
| 300               | 0.42              | 7500              | 2.38              |
| 400               | 0.48              | 8000              | 2.47              |
| 500               | 0.54              | 8500              | 2.57              |
| 600               | 0.59              | 9000              | 2.65              |
| 700               | 0.64              | 9500              | 2.74              |
| 800               | 0.69              | 10000             | 2.83              |
| 900               | 0.73              | 10500             | 2.91              |
| 1000              | 0.77              | 11000             | 2.99              |
| 1100              | 0.82              | 11500             | 3.07              |
| 1200              | 0.86              | 12000             | 3.14              |
| 1300              | 0.89              | 12500             | 3.22              |
| 1400              | 0.93              | 13000             | 3.29              |
| 1500              | 0.96              | 13500             | 3.37              |
| 1600              | 1.00              | 14000             | 3.45              |
| 1700              | 1.03              | 14500             | 3.52              |
| 1800              | 1.06              | 15000             | 3.59              |
| 1900              | 1.10              | 15500             | 3.66              |
| 2000              | 1.13              | 16000             | 3.74              |
| 2500              | 1.28              | 16500             | 3.80              |
| 3000              | 1.41              | 17000             | 3.88              |
| 3500              | 1.54              | 17500             | 4.00              |
| 4000              | 1.66              | 18000             | 4.02              |
| 4500              | 1.78              |                   |                   |
| 5000              | 1.89              |                   |                   |

**Cable loss**  
**RF Cable, Huber-Suhner, 40 GHz, 5.5 m, K type,**  
**SF102EA/11SK/11SK/5500MM, S/N 502493/2EA**  
**HL 5111**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 100               | 0.68              | 20500             | 10.17             |
| 200               | 0.97              | 21000             | 10.30             |
| 300               | 1.18              | 21500             | 10.43             |
| 500               | 1.52              | 22000             | 10.58             |
| 1000              | 2.14              | 22500             | 10.73             |
| 1500              | 2.62              | 23000             | 10.85             |
| 2000              | 3.03              | 23500             | 10.98             |
| 2500              | 3.39              | 24000             | 11.11             |
| 3000              | 3.72              | 24500             | 11.20             |
| 3500              | 4.03              | 25000             | 11.32             |
| 4000              | 4.32              | 25500             | 11.47             |
| 4500              | 4.59              | 26000             | 11.59             |
| 5000              | 4.84              | 26500             | 11.72             |
| 5500              | 5.09              | 27000             | 11.83             |
| 6000              | 5.32              | 27500             | 11.94             |
| 6500              | 5.55              | 28000             | 12.04             |
| 7000              | 5.77              | 28500             | 12.16             |
| 7500              | 5.99              | 29000             | 12.28             |
| 8000              | 6.19              | 29500             | 12.40             |
| 8500              | 6.40              | 30000             | 12.50             |
| 9000              | 6.60              | 30500             | 12.59             |
| 9500              | 6.79              | 31000             | 12.68             |
| 10000             | 6.98              | 31500             | 12.80             |
| 10500             | 7.16              | 32000             | 12.94             |
| 11000             | 7.34              | 32500             | 13.09             |
| 11500             | 7.51              | 33000             | 13.23             |
| 12000             | 7.68              | 33500             | 13.32             |
| 12500             | 7.84              | 34000             | 13.44             |
| 13000             | 8.00              | 34500             | 13.54             |
| 13500             | 8.15              | 35000             | 13.68             |
| 14000             | 8.31              | 35500             | 13.81             |
| 14500             | 8.46              | 36000             | 13.90             |
| 15000             | 8.62              | 36500             | 13.99             |
| 15500             | 8.76              | 37000             | 14.12             |
| 16000             | 8.91              | 37500             | 14.22             |
| 16500             | 9.06              | 38000             | 14.33             |
| 17000             | 9.21              | 38500             | 14.47             |
| 17500             | 9.35              | 39000             | 14.54             |
| 18000             | 9.49              | 39500             | 14.62             |
| 18500             | 9.62              | 40000             | 14.75             |
| 19000             | 9.76              |                   |                   |
| 19500             | 9.90              |                   |                   |
| 20000             | 10.05             |                   |                   |

**Cable loss**  
**RF Cable, Huber-Suhner, 40 GHz, 5.5 m, K type,**  
**SF102EA/11SK/11SK/5500MM, S/N 502494/2EA**  
**HL 5112**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|
| 100               | 0.69              | 20500             | 10.18             |
| 200               | 0.97              | 21000             | 10.32             |
| 300               | 1.18              | 21500             | 10.47             |
| 500               | 1.52              | 22000             | 10.60             |
| 1000              | 2.14              | 22500             | 10.75             |
| 1500              | 2.62              | 23000             | 10.87             |
| 2000              | 3.03              | 23500             | 11.00             |
| 2500              | 3.40              | 24000             | 11.12             |
| 3000              | 3.73              | 24500             | 11.23             |
| 3500              | 4.04              | 25000             | 11.35             |
| 4000              | 4.33              | 25500             | 11.52             |
| 4500              | 4.60              | 26000             | 11.64             |
| 5000              | 4.86              | 26500             | 11.73             |
| 5500              | 5.10              | 27000             | 11.84             |
| 6000              | 5.34              | 27500             | 11.93             |
| 6500              | 5.57              | 28000             | 12.05             |
| 7000              | 5.79              | 28500             | 12.19             |
| 7500              | 6.00              | 29000             | 12.33             |
| 8000              | 6.21              | 29500             | 12.44             |
| 8500              | 6.43              | 30000             | 12.53             |
| 9000              | 6.62              | 30500             | 12.58             |
| 9500              | 6.82              | 31000             | 12.71             |
| 10000             | 7.01              | 31500             | 12.86             |
| 10500             | 7.17              | 32000             | 13.00             |
| 11000             | 7.34              | 32500             | 13.11             |
| 11500             | 7.51              | 33000             | 13.24             |
| 12000             | 7.68              | 33500             | 13.33             |
| 12500             | 7.84              | 34000             | 13.44             |
| 13000             | 8.00              | 34500             | 13.58             |
| 13500             | 8.16              | 35000             | 13.69             |
| 14000             | 8.32              | 35500             | 13.81             |
| 14500             | 8.48              | 36000             | 13.93             |
| 15000             | 8.63              | 36500             | 14.05             |
| 15500             | 8.77              | 37000             | 14.24             |
| 16000             | 8.92              | 37500             | 14.28             |
| 16500             | 9.08              | 38000             | 14.38             |
| 17000             | 9.23              | 38500             | 14.50             |
| 17500             | 9.37              | 39000             | 14.61             |
| 18000             | 9.51              | 39500             | 14.70             |
| 18500             | 9.66              | 40000             | 14.83             |
| 19000             | 9.78              |                   |                   |
| 19500             | 9.92              |                   |                   |
| 20000             | 10.07             |                   |                   |

## 13 APPENDIX F Abbreviations and acronyms

|                |                                             |
|----------------|---------------------------------------------|
| A              | ampere                                      |
| AC             | alternating current                         |
| A/m            | ampere per meter                            |
| AM             | amplitude modulation                        |
| AVRG           | average (detector)                          |
| BB             | broad band                                  |
| cm             | centimeter                                  |
| dB             | decibel                                     |
| dBm            | decibel referred to one milliwatt           |
| dB( $\mu$ V)   | decibel referred to one microvolt           |
| dB( $\mu$ V/m) | decibel referred to one microvolt per meter |
| dB( $\mu$ A)   | decibel referred to one microampere         |
| dB $\Omega$    | decibel referred to one Ohm                 |
| DC             | direct current                              |
| EIRP           | equivalent isotropically radiated power     |
| ERP            | effective radiated power                    |
| EUT            | equipment under test                        |
| F              | frequency                                   |
| GHz            | gigahertz                                   |
| GND            | ground                                      |
| H              | height                                      |
| HL             | Hermon laboratories                         |
| Hz             | hertz                                       |
| ITE            | information technology equipment            |
| k              | kilo                                        |
| kHz            | kilohertz                                   |
| LISN           | line impedance stabilization network        |
| LO             | local oscillator                            |
| m              | meter                                       |
| MHz            | megahertz                                   |
| min            | minute                                      |
| mm             | millimeter                                  |
| ms             | millisecond                                 |
| $\mu$ s        | microsecond                                 |
| NA             | not applicable                              |
| NB             | narrow band                                 |
| NT             | not tested                                  |
| OATS           | open area test site                         |
| $\Omega$       | Ohm                                         |
| QP             | quasi-peak                                  |
| PM             | pulse modulation                            |
| PS             | power supply                                |
| RE             | radiated emission                           |
| RF             | radio frequency                             |
| rms            | root mean square                            |
| Rx             | receive                                     |
| s              | second                                      |
| T              | temperature                                 |
| Tx             | transmit                                    |
| V              | volt                                        |
| VA             | volt-ampere                                 |

END OF DOCUMENT