HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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# TEST REPORT

**ACCORDING TO: FCC 47CFR part 27**

**FOR:**

## Airspan Networks Inc.
## LTE Base Station
## Model: Synergy 2000 2.5 GHz (B41)
## FCC ID:PIDSYN2500

# Table of contents

# 1 Applicant information

| | |
|---|---|
| **Client name:** | Airspan Networks Inc. |
| **Address:** | 777 Yamato, Road Suite 310 Boca Raton, FL 33431, USA |
| **Telephone:** | +1 561 893 8670 |
| **Fax:** | +1 561 893 8671 |
| **E-mail:** | zlevi@airspan.com |
| **Contact name:** | Mr. Zion Levi |

# 2 Equipment under test attributes

| | |
|---|---|
| **Product name:** | LTE Base Station |
| **Product type:** | Transceiver |
| **Model(s):** | Synergy 2000 2.5 GHz (B41) |
| **Serial number:** | 70F1E1173BD0 |
| **Hardware version:** | C8 |
| **Software release:** | 14.12.50.57 |
| **Receipt date** | 23-Feb-14 |

# 3 Manufacturer information

| | |
|---|---|
| **Manufacturer name:** | Airspan Networks Inc. |
| **Address:** | 777 Yamato, Road Suite 310 Boca Raton, FL 33431, USA |
| **Telephone:** | +1 561 893 8670 |
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| **E-Mail:** | zlevi@airspan.com |
| **Contact name:** | Mr. Zion Levi |

# 4 Test details

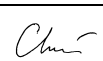
| | |
|---|---|
| **Project ID:** | 25543 |
| **Location:** | Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel |
| **Test started:** | 25-Feb-14 |
| **Test completed:** | 4-Mar-14 |
| **Test specification(s):** | FCC 47CFR part 27 |

# 5 Tests summary

| Test | Status |
|---|---|
| **Transmitter characteristics** | |
| 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 |
| Section 2.1049, Occupied bandwidth | 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.

This test report supersedes the previously issued test report identified by Doc ID:AIRRAD_FCC.25543.

| | Name and Title | Date | Signature |
|---|---|---|---|
| **Tested by:** | Mr. V. Einem, test engineer | March 4, 2014 |  |
| **Reviewed by:** | Mrs. M. Cherniavsky, certification engineer | March 20, 2014 |  |
| **Approved by:** | Mr. M. Nikishin, EMC and Radio group manager | March 20, 2014 |  |

# 6 EUT description

## 6.1 General information

A base station radio, Synergy 2000-Band 41 TDD LTE, is a part of the 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 Synergy's' transceiver/receiver (Up to 64 QAM modulation, data rate up to 150 Mbps) uses OFDM and operating in TDD mode, equipped with a 18 dBi external antenna.

The Synergy is installed outdoors and typically is mounted on a pole. 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 | DC power | DC power supply | EUT | 1 | Unshielded | 10 |
| Signal | Ethernet | ETH1 port | Laptop | 1 | Shielded | 10 |
| Signal | Antenna | EUT | GPS external antenna | 1 | Coax | 5 |
| RF | Antenna | EUT | Termination 50 Ohm | 2 | Coax | NA |
| Signal* | RS-232 | EUT | Laptop | 1 | Unshielded | 2 |

* For maintance only

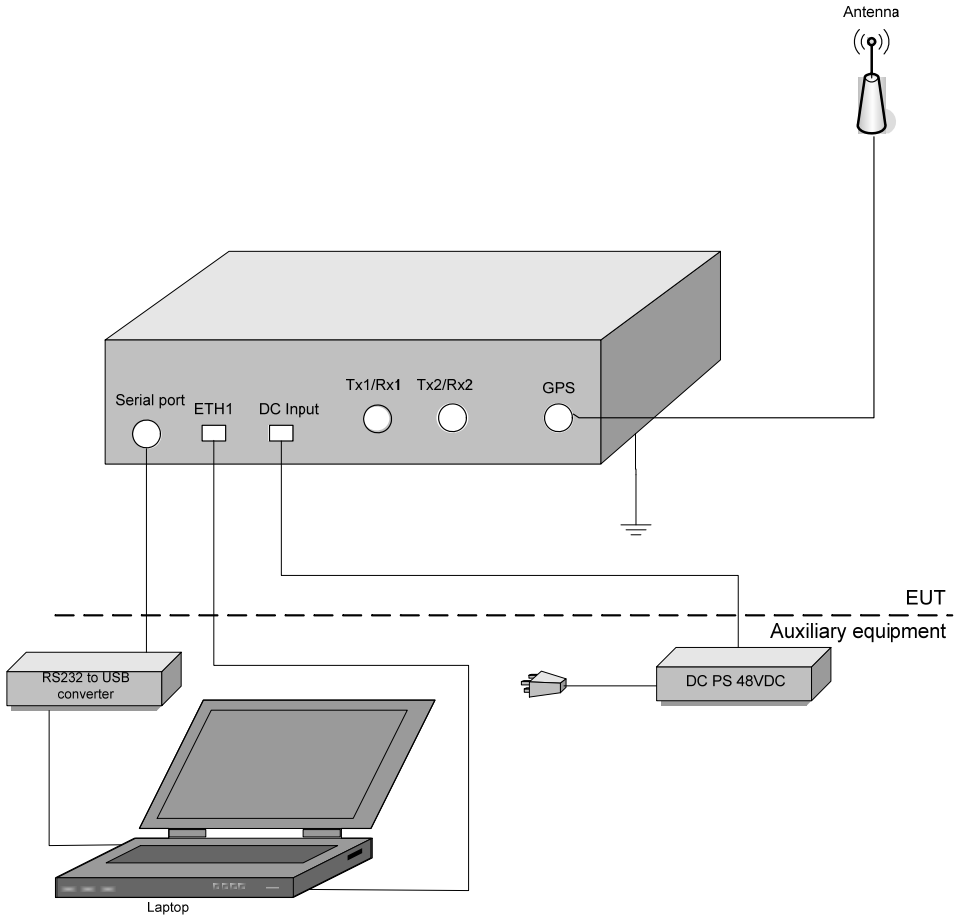
## 6.3 Support and test equipment

| Description | Manufacturer | Model number | Serial number |
|---|---|---|---|
| DC power supply | Mean Well | PSP-600-48 | RB29063683 |
| GPS antenna | Tallysman Wireless | 32-3030-0 | 20110606 |
| Laptop | DELL | E6410 | PO1038624 |
| 4 Port USB to RS-232 hub | ATEN INTERNATIONAL | UC2324 | Z3CA2180AB40199 |

## 6.4 Changes made in the EUT

No changes were implemented in the EUT during testing.

## 6.5 Test configuration



## 6.6 Transmitter characteristics

| **Type of equipment** | |
|---|---|
| **V** | Stand-alone (Equipment with or without its own control provisions) |
| | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) |
| | Plug-in card (Equipment intended for a variety of host systems) |

| **Intended use** | | **Condition of use** |
|---|---|---|
| **V** | fixed | Always at a distance more than 2 m from all people |
| | mobile | Always at a distance more than 20 cm from all people |
| | portable | May operate at a distance closer than 20 cm to human body |

| | |
|---|---|
| **Assigned frequency range** | 2496.0 – 2690.0 MHz |
| **Operating frequency** | 2501.0 – 2685.0 MHz for 10 MHz OBW<br>2506.0 – 2680.0 MHz for 20 MHz OBW |
| **RF channel spacing** | 10 MHz, 20MHz |
| **Maximum rated output power** | At transmitter 50 Ω RF output connector (aggregate power of both RF chains) — 33.65 dBm |

| **Is transmitter output power variable?** | | | | |
|---|---|---|---|---|
| | No | | | |
| **V** | Yes | | continuous variable | |
| | | V | stepped variable with stepsize | 0.25 dB |
| | | minimum RF power | | -30 dBm |
| | | maximum RF power at antenna connector | | 33. 65 dBm |

| **Antenna connection** | | | | | |
|---|---|---|---|---|---|
| unique coupling | **V** | standard connector | Integral | **V** | with temporary RF connector |
| | | | | | without temporary RF connector |

**Antenna/s technical characteristics**

| Type | Manufacturer | Model number | Gain |
|---|---|---|---|
| External | ALPHA Wireless Ltd | AW3007 | 18 dBi |
| External | ALPHA Wireless Ltd | AW3008 | 17 dBi |
| External sector | Cobham Antenna Systems | SA12-2.5-DS/1915 | 11 dBi |

**Transmitter aggregate data rate/s, MBps**

| Transmitter 99% power bandwidth | Type of modulation | | |
|---|---|---|---|
| | QPSK | 16QAM | 64QAM |
| 10 MHz | 15.5 | 30.5 | 75.0 |
| 20 MHz | 31.0 | 61.0 | 150.0 |

| | |
|---|---|
| **Type of multiplexing** | TDD |
| **Modulating test signal (baseband)** | PRBS |
| **Maximum transmitter duty cycle in normal use** | 75% |

| **Transmitter power source** | | | | | |
|---|---|---|---|---|---|
| | | **Nominal rated voltage** | | Battery type | |
| **V** | DC | **Nominal rated voltage** | 48 VDC via AC/DC adaptor | | |
| | AC mains | **Nominal rated voltage** | 120 V | Frequency | 60 Hz |

| | | | |
|---|---|---|---|
| **Common power source for transmitter and receiver** | **V** | yes | no |

| Test specification: | Section 2.1049, Occupied bandwidth | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 44 % | Power Supply: 48 VDC |
| Remarks: | | | |

# 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*, dBc | Maximum allowed bandwidth, kHz |
|---|---|---|
| 2496.0 – 2690.0 MHz | 26 | NA |

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

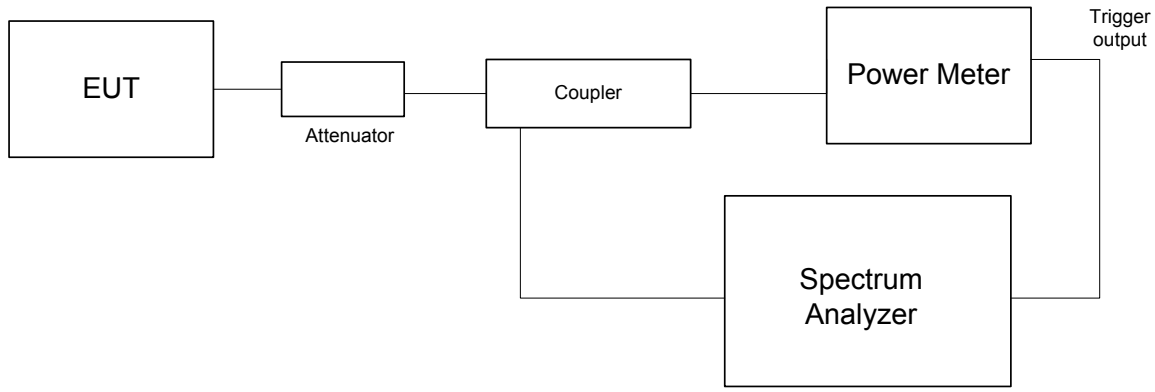
### 7.1.2 Test procedure

**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**



| **Test specification:** | **Section 2.1049, Occupied bandwidth** | | |
|---|---|---|---|
| **Test procedure:** | 47 CFR, Section 2.1049 | | |
| **Test mode:** | Compliance | **Verdict:** | PASS |
| **Date(s):** | 25-Feb-14 | | |
| **Temperature:** 23 ºC | **Air Pressure:** 1015 hPa | **Relative Humidity:** 44 % | **Power Supply:** 48 VDC |
| **Remarks:** | | | |

**Table 7.1.2 Occupied bandwidth test results**

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
MODULATING SIGNAL: PRBS
EBW: 10 MHz

| Carrier frequency, MHz | Occupied bandwidth, kHz | Limit, kHz | Margin, kHz | Verdict |
|---|---|---|---|---|
| **QPSK 15.1 Mbps** | | | | |
| 2501 | 9711 | NA | NA | Pass |
| 2595 | 9728 | NA | NA | Pass |
| 2685 | 9696 | NA | NA | Pass |
| **64QAM 75.0 Mbps** | | | | |
| 2501 | 9648 | NA | NA | Pass |
| 2595 | 9558 | NA | NA | Pass |
| 2685 | 9641 | NA | NA | Pass |

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 200 kHz
VIDEO BANDWIDTH: 620 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
MODULATING SIGNAL: PRBS
EBW: 20 MHz

| Carrier frequency, MHz | Occupied bandwidth, kHz | Limit, kHz | Margin, kHz | Verdict |
|---|---|---|---|---|
| **QPSK 31.0 Mbps** | | | | |
| 2506 | 19484 | NA | NA | Pass |
| 2595 | 19463 | NA | NA | Pass |
| 2680 | 19467 | NA | NA | Pass |
| **64QAM 150.0 Mbps** | | | | |
| 2506 | 19534 | NA | NA | Pass |
| 2595 | 19488 | NA | NA | Pass |
| 2680 | 19324 | NA | NA | Pass |

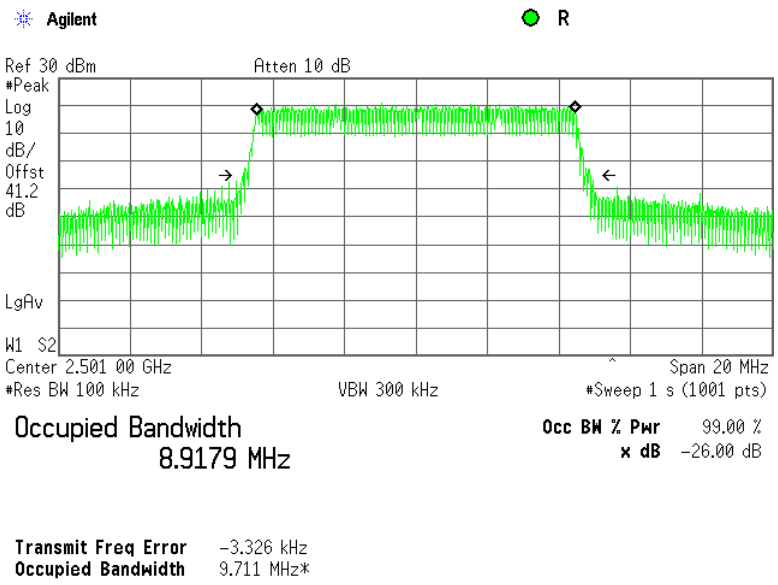
**Reference numbers of test equipment used**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HL 3301 | HL 3302 | HL 3818 | HL 4229 | HL 4234 | HL 4273 | HL 4366 | |

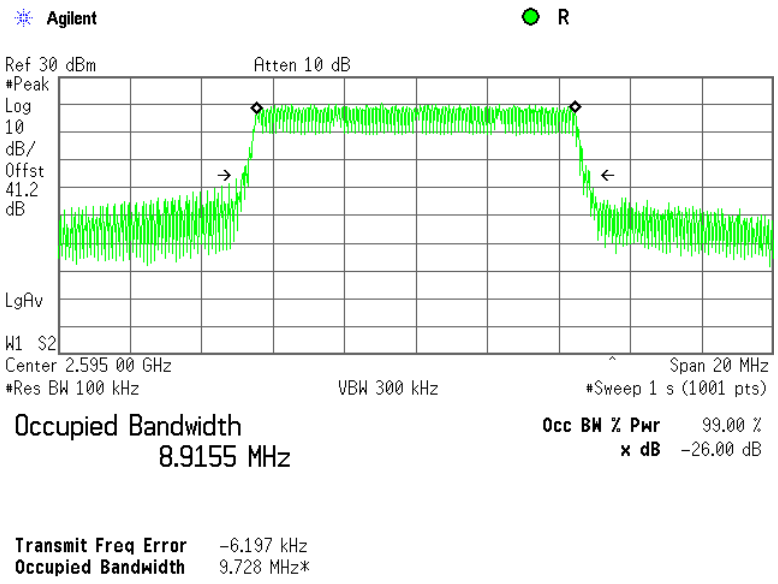
Full description is given in Appendix A.

| Test specification: | Section 2.1049, Occupied bandwidth | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 44 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.1.1 Occupied bandwidth test results at low frequency, 10 MHz EBW, QPSK, RF#2**

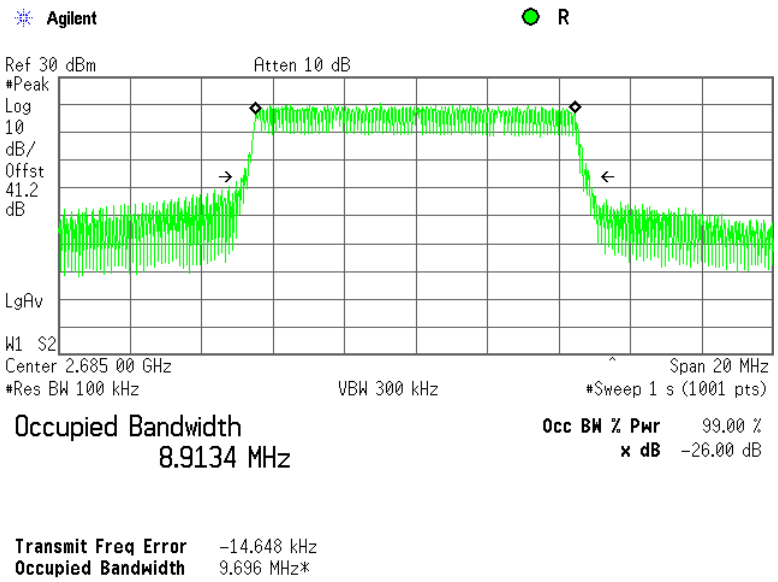



**Plot 7.1.2 Occupied bandwidth test results at mid frequency, 10 MHz EBW, QPSK, RF#2**

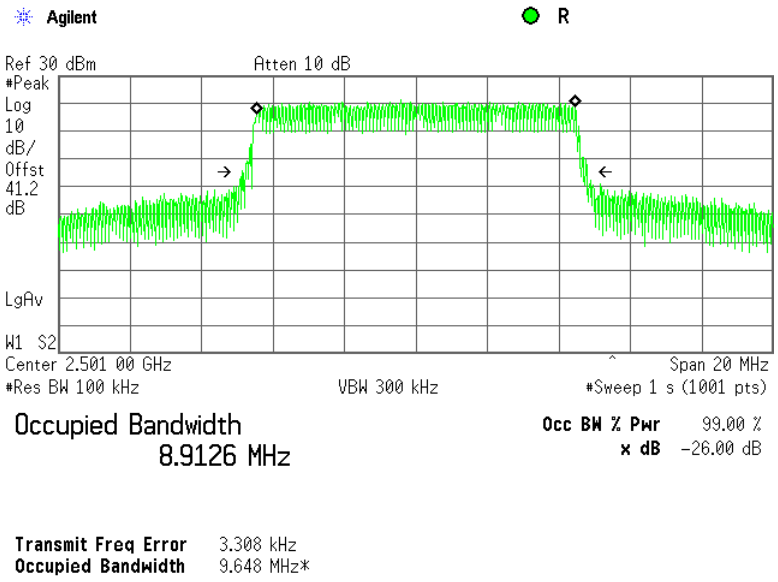


| Test specification: | Section 2.1049, Occupied bandwidth | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 44 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.1.3 Occupied bandwidth test results at high frequency, 10 MHz EBW, QPSK, RF#2**

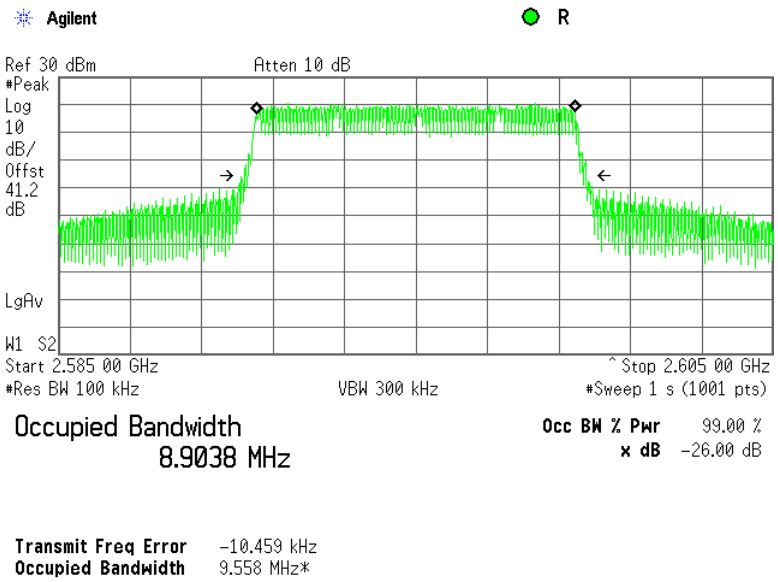



**Plot 7.1.4 Occupied bandwidth test results at low frequency, 10 MHz EBW, 64QAM, RF#2**

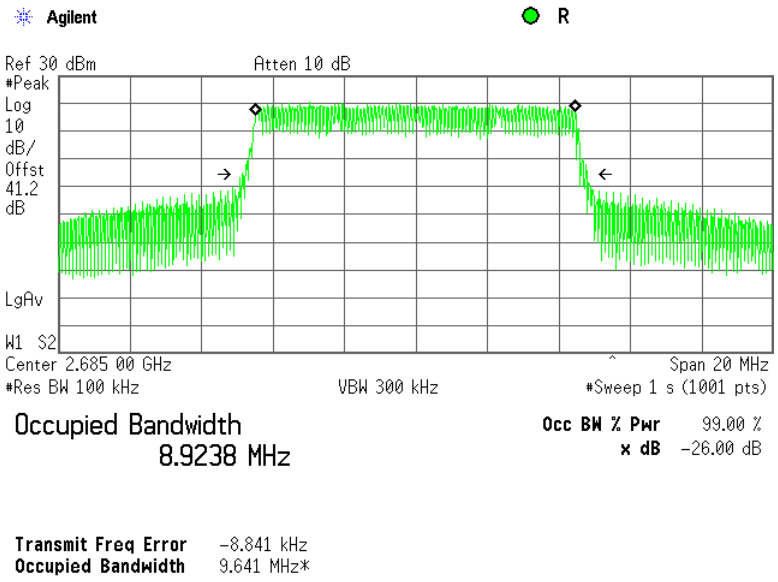


| Test specification: | Section 2.1049, Occupied bandwidth | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 44 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.1.5 Occupied bandwidth test results at mid frequency, 10 MHz EBW, 64QAM, RF#2**

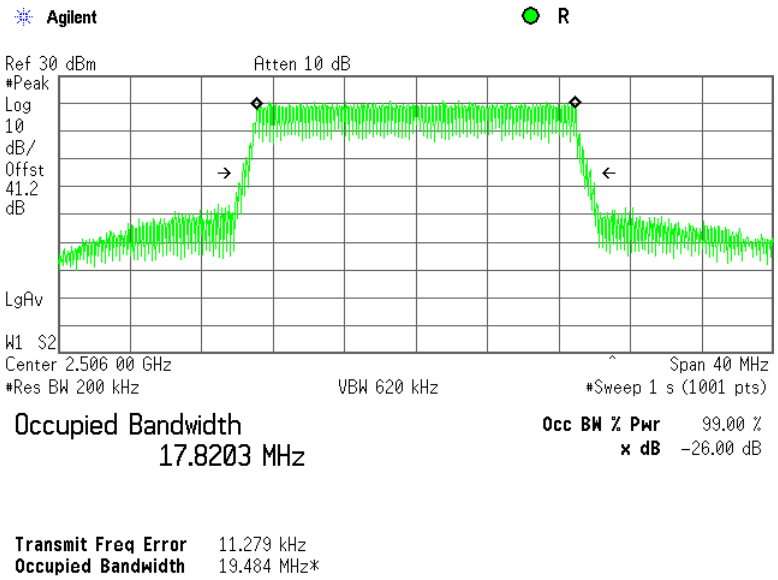



**Plot 7.1.6 Occupied bandwidth test results at high frequency, 10 MHz EBW, 64QAM, RF#2**

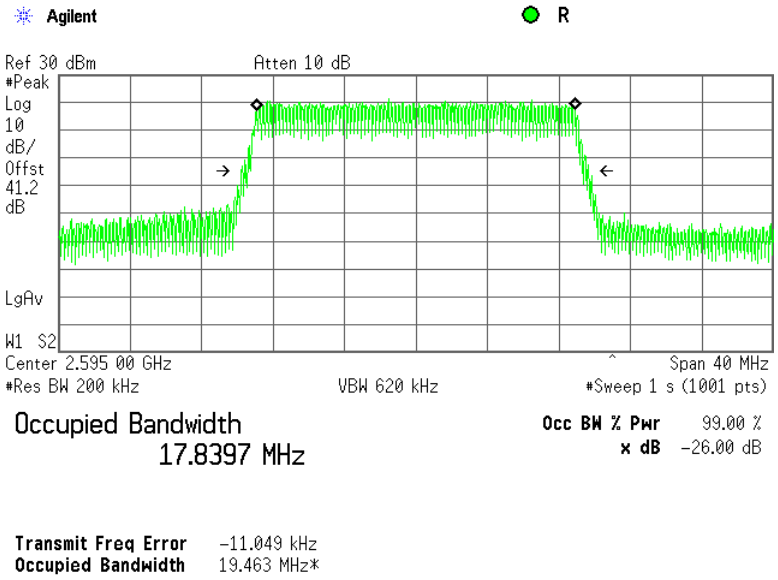


| Test specification: | Section 2.1049, Occupied bandwidth | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 44 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.1.7 Occupied bandwidth test results at low frequency, 20 MHz EBW, QPSK, RF#2**

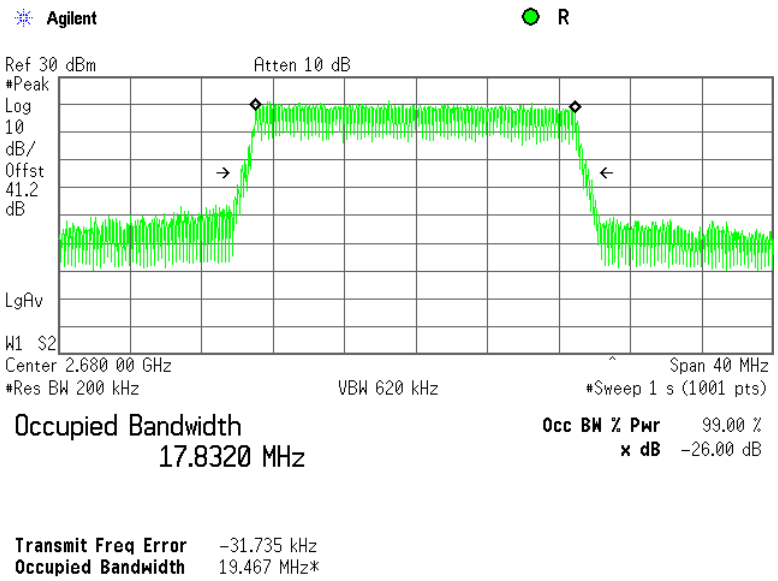



**Plot 7.1.8 Occupied bandwidth test results at mid frequency, 20 MHz EBW, QPSK, RF#2**

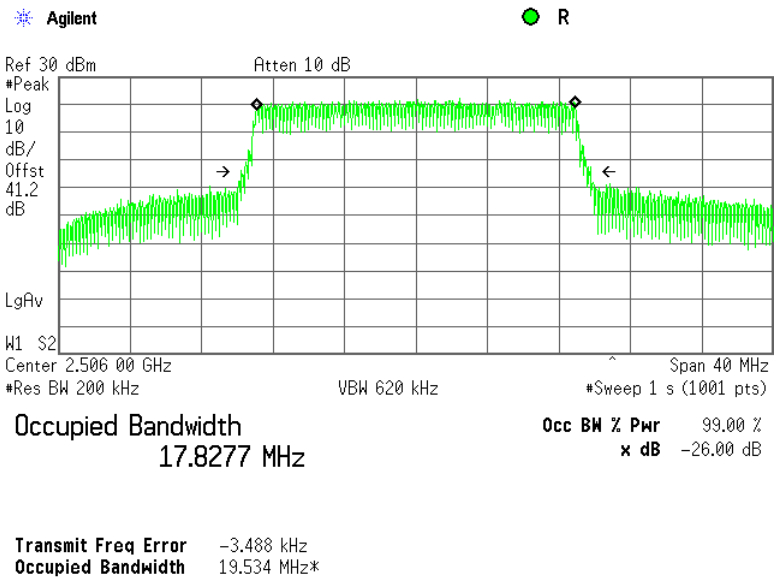


| Test specification: | Section 2.1049, Occupied bandwidth | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 44 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.1.9 Occupied bandwidth test results at high frequency, 20 MHz EBW, QPSK, RF#2**

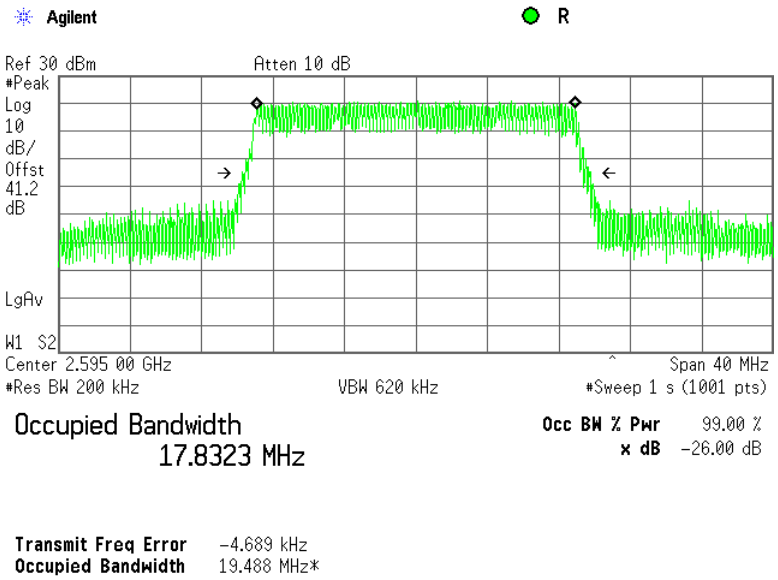



**Plot 7.1.10 Occupied bandwidth test results at low frequency, 20 MHz EBW, 64QAM, RF#2**

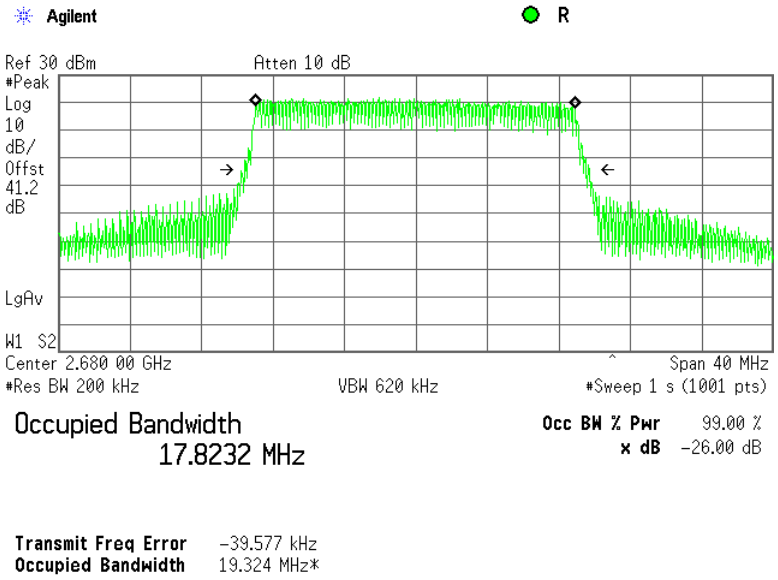


| Test specification: | Section 2.1049, Occupied bandwidth | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1049 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 44 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.1.11 Occupied bandwidth test results at mid frequency, 20 MHz EBW, 64QAM, RF#2**




**Plot 7.1.12 Occupied bandwidth test results at high frequency, 20 MHz EBW, 64QAM, RF#2**



| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

## 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 – 2690 | 63+10log(X/Y)+10log(360/beamwidth) |
| | | **Maximum peak power density dBm/100 kHz** |
| | | EIRP+10log(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

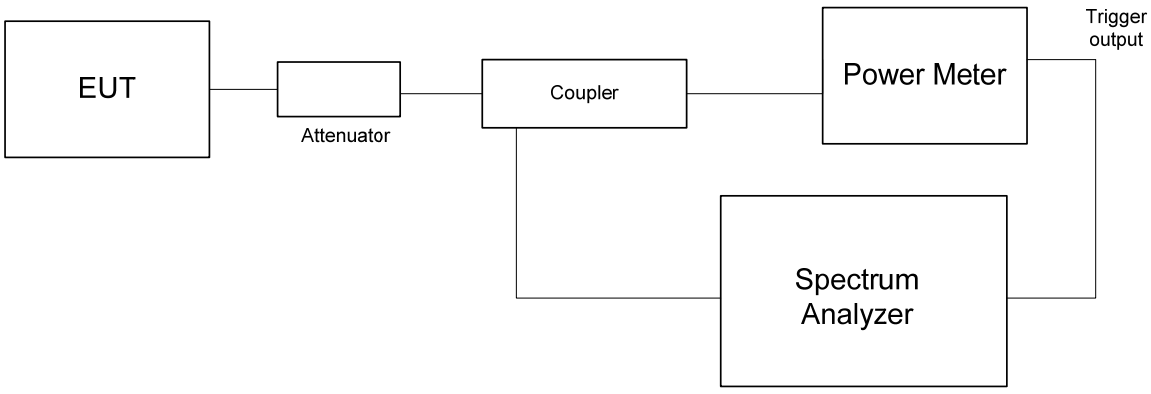
**7.2.2.1** The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

**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 and Table 7.2.3.

**7.2.2.4** The power spectral density was measured with spectrum analyzer as provided in Table 7.2.4 to Table 7.2.5 and the associated plots.

**Figure 7.2.1 Peak output power test setup**



| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.2.2 Peak output power test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
DETECTOR USED: Average
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DUTY CYCLE: 100%
EBW: 10 MHz
NUMBER OF RF OUTPUTS: N = 2
MAXIMUM ANTENNA GAIN: 18 dBi

| - 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 |
|---|---|---|---|---|---|---|---|---|
| **QPSK 15.5 Mbps** | | | | | | | | |
| 2501 | 30.06 | 30.14 | 33.11 | 18.0 | 51.11 | 70.31 | -19.20 | Pass |
| 2595 | 29.79 | 30.09 | 32.95 | 18.0 | 50.95 | 69.52 | -18.57 | Pass |
| 2685 | 29.81 | 29.67 | 32.75 | 18.0 | 50.75 | 70.30 | -19.55 | Pass |
| **64QAM 75.0 Mbps** | | | | | | | | |
| 2501 | 30.53 | 30.52 | 33.54 | 18.0 | 51.54 | 70.28 | -18.74 | Pass |
| 2595 | 29.77 | 30.10 | 32.95 | 18.0 | 50.95 | 69.45 | -17.81 | Pass |
| 2685 | 29.78 | 29.75 | 32.78 | 18.0 | 50.78 | 70.28 | -19.50 | Pass |

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi;
** - Total RF power, dBm = 10 log{10^[P(dBm,RF#1)/10]+ 10^([P(dBm, RF#2)/10]}
*** - See Table 7.2.6, Table 7.2.7
**Note:** the calculation of total EIRP was done for the worst case, 18 dBi gain antenna; the limit is the same for 11 dBi and 18 dBi antenna

MAXIMUM ANTENNA GAIN: 17 dBi

| 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 |
|---|---|---|---|---|---|---|---|---|
| **QPSK 15.5 Mbps** | | | | | | | | |
| 2501 | 30.06 | 30.14 | 33.11 | 17.0 | 50.11 | 68.89 | -18.78 | Pass |
| 2595 | 29.79 | 30.09 | 32.95 | 17.0 | 49.95 | 68.11 | -18.16 | Pass |
| 2685 | 29.81 | 29.67 | 32.75 | 17.0 | 49.75 | 68.89 | -19.14 | Pass |
| **64QAM 75.0 Mbps** | | | | | | | | |
| 2501 | 30.53 | 30.52 | 33.54 | 17.0 | 50.54 | 68.86 | -18.32 | Pass |
| 2595 | 29.77 | 30.10 | 32.95 | 17.0 | 50.64 | 68.03 | -17.39 | Pass |
| 2685 | 29.78 | 29.75 | 32.78 | 17.0 | 49.78 | 68.86 | -19.08 | Pass |

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi
** - Total RF power , dBm = 10 log{10^[P(dBm,RF#1)/10]+ 10^([P(dBm, RF#2)/10]}
*** - See Table 7.2.6, Table 7.2.7

| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.2.3 Peak output power test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
DETECTOR USED: Average
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DUTY CYCLE: 100%
EBW: 20 MHz
NUMBER OF RF OUTPUTS: N = 2
MAXIMUM ANTENNA GAIN: 18 dBi

| - 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 |
|---|---|---|---|---|---|---|---|---|
| **QPSK 31.0 Mbps** | | | | | | | | |
| 2506 | 29.79 | 30.23 | 33.03 | 18.0 | 51.03 | 69.91 | -18.88 | Pass |
| 2595 | 30.83 | 30.09 | 33.49 | 18.0 | 51.49 | 69.52 | -18.03 | Pass |
| 2680 | 30.04 | 29.98 | 33.02 | 18.0 | 51.02 | 69.90 | -18.88 | Pass |
| **64QAM 150.0 Mbps** | | | | | | | | |
| 2506 | 30.54 | 30.74 | 33.65 | 18.0 | 51.65 | 69.92 | -18.27 | Pass |
| 2595 | 30.12 | 30.15 | 33.15 | 18.0 | 51.15 | 69.53 | -18.38 | Pass |
| 2680 | 30.03 | 30.51 | 33.29 | 18.0 | 51.29 | 69.87 | -18.58 | Pass |

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi
** - Total RF power , dBm = 10 log{10^[P(dBm,RF#1)/10]+ 10^([P(dBm, RF#2)/10]}
*** - See Table 7.2.6, Table 7.2.7
**Note:** the calculation of total EIRP was done for the worst case, 18 dBi gain antenna; the limit is the same for 11 dBi and 18 dBi antenna

MAXIMUM ANTENNA GAIN: 17 dBi

| - 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 |
|---|---|---|---|---|---|---|---|---|
| **QPSK 31.0 Mbps** | | | | | | | | |
| 2506 | 29.79 | 30.23 | 33.03 | 17.0 | 50.03 | 68.49 | -18.46 | Pass |
| 2595 | 30.83 | 30.09 | 33.49 | 17.0 | 50.49 | 68.11 | -17.62 | Pass |
| 2680 | 30.04 | 29.98 | 33.02 | 17.0 | 50.02 | 68.49 | -18.47 | Pass |
| **64QAM 150.0 Mbps** | | | | | | | | |
| 2506 | 30.54 | 30.74 | 33.65 | 17.0 | 50.65 | 68.50 | -17.85 | Pass |
| 2595 | 30.12 | 30.15 | 33.15 | 17.0 | 50.15 | 68.12 | -17.97 | Pass |
| 2680 | 30.03 | 30.51 | 33.29 | 17.0 | 50.29 | 68.46 | -18.17 | Pass |

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi
** - Total RF power , dBm = 10 log{10^[P(dBm,RF#1)/10]+ 10^([P(dBm, RF#2)/10]}
*** - See Table 7.2.6, Table 7.2.7

| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.2.4 Power spectral density test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
DETECTOR USED: Average
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATING SIGNAL: PRBS
CHANNEL BANDWIDTH: 10 MHz
TRANSMITTER OUTPUT POWER SETTINGS: 30 dBm
DUTY CYCLE: 100%
NUMBER OF RF OUTPUTS: N = 2
MAXIMUM ANTENNA GAIN: 18 dBi

| Carrier frequency, MHz | SA reading, RF #2 dBm/100kHz | PSD result**, dBm/100kHz | Antenna gain, dBi | Total PSD*, dBm/100kHz | Limit***, dBm | Margin, dB | Verdict |
|---|---|---|---|---|---|---|---|
| **QPSK 15.5 Mbps** | | | | | | | |
| 2501 | 11.76 | 14.76 | 18.0 | 32.76 | 50.31 | -17.55 | Pass |
| 2595 | 11.44 | 14.44 | 18.0 | 32.44 | 48.73 | -16.29 | Pass |
| 2685 | 11.18 | 14.18 | 18.0 | 32.18 | 50.30 | -18.12 | Pass |
| **64QAM 75.0 Mbps** | | | | | | | |
| 2501 | 12.10 | 15.10 | 18.0 | 33.10 | 50.28 | -17.18 | Pass |
| 2595 | 11.60 | 14.60 | 18.0 | 32.60 | 48.65 | -16.05 | Pass |
| 2685 | 11.52 | 14.52 | 18.0 | 32.52 | 50.28 | -17.76 | Pass |

* - Total PSD, dBm/100kHz = PSD result**,dBm/100kHz + Antenna Gain, dBi
** - PSD result, dBm/100kHz = SA reading + 10*log(N)
*** - See Table 7.2.6, Table 7.2.8
**Note:** the calculation of Total PSD was done for the worst case of 18 dBi gain antenna

MAXIMUM ANTENNA GAIN: 17 dBi

| Carrier frequency, MHz | SA reading, RF #2 dBm/100kHz | PSD result**, dBm/100kHz | Antenna gain, dBi | Total PSD*, dBm/100kHz | Limit***, dBm | Margin, dB | Verdict |
|---|---|---|---|---|---|---|---|
| **QPSK 15.5 Mbps** | | | | | | | |
| 2501 | 11.76 | 14.76 | 17.0 | 31.76 | 48.89 | -17.13 | Pass |
| 2595 | 11.44 | 14.44 | 17.0 | 31.44 | 47.32 | -15.88 | Pass |
| 2685 | 11.18 | 14.18 | 17.0 | 31.18 | 48.89 | -17.71 | Pass |
| **64QAM 75.0 Mbps** | | | | | | | |
| 2501 | 12.10 | 15.10 | 17.0 | 32.10 | 48.86 | -16.76 | Pass |
| 2595 | 11.60 | 14.60 | 17.0 | 31.60 | 47.24 | -15.64 | Pass |
| 2685 | 11.52 | 14.52 | 17.0 | 31.52 | 48.86 | -17.34 | Pass |

* - Total PSD, dBm/100kHz = PSD result**,dBm/100kHz + Antenna Gain, dBi
** - PSD result, dBm/100kHz = SA reading + 10*log(N)
*** - See Table 7.2.6, Table 7.2.8

| **Test specification:** | **Section 27.50(h), Peak output power** | | |
|---|---|---|---|
| **Test procedure:** | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| **Test mode:** | Compliance | **Verdict:** | PASS |
| **Date(s):** | 25-Feb-14 | | |
| **Temperature:** 23 ºC | **Air Pressure:** 1015 hPa | **Relative Humidity:** 42 % | **Power Supply:** 48 VDC |
| **Remarks:** | | | |

**Table 7.2.5 Power spectral density test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
DETECTOR USED: Average
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATING SIGNAL: PRBS
CHANNEL BANDWIDTH: 20 MHz
TRANSMITTER OUTPUT POWER SETTINGS: 30 dBm
DUTY CYCLE: 100%
NUMBER OF RF OUTPUTS: N = 2
MAXIMUM ANTENNA GAIN: 18 dBi

| Carrier frequency, MHz | SA reading, RF #2 dBm/100kHz | PSD result**, dBm/100kHz | Antenna gain, dBi | Total PSD*, dBm/100kHz | Limit***, dBm | Margin, dB | Verdict |
|---|---|---|---|---|---|---|---|
| **QPSK 31.0 Mbps** | | | | | | | |
| 2506 | 8.61 | 11.61 | 18.0 | 29.61 | 46.48 | -16.87 | Pass |
| 2595 | 8.40 | 11.40 | 18.0 | 29.40 | 45.72 | -16.32 | Pass |
| 2680 | 8.73 | 11.73 | 18.0 | 29.73 | 46.48 | -16.75 | Pass |
| **64QAM 150.0 Mbps** | | | | | | | |
| 2506 | 9.69 | 12.69 | 18.0 | 30.69 | 46.49 | -15.80 | Pass |
| 2595 | 8.99 | 11.99 | 18.0 | 29.99 | 45.73 | -15.74 | Pass |
| 2680 | 9.46 | 12.46 | 18.0 | 30.46 | 46.45 | -15.99 | Pass |

* - Total PSD, dBm/100kHz = PSD result**,dBm/100kHz + Antenna Gain, dBi
** - PSD result, dBm/100kHz = SA reading + 10*log(N)
*** - See Table 7.2.6, Table 7.2.8
**Note:** the calculation of Total PSD was done for the worst case of 18 dBi gain antenna

MAXIMUM ANTENNA GAIN: 17 dBi

| Carrier frequency, MHz | SA reading, RF #2 dBm/100kHz | PSD result**, dBm/100kHz | Antenna gain, dBi | Total PSD*, dBm/100kHz | Limit***, dBm | Margin, dB | Verdict |
|---|---|---|---|---|---|---|---|
| **QPSK 31.0 Mbps** | | | | | | | |
| 2506 | 8.61 | 11.61 | 17.0 | 28.61 | 45.07 | -16.46 | Pass |
| 2595 | 8.40 | 11.40 | 17.0 | 28.40 | 44.31 | -15.91 | Pass |
| 2680 | 8.73 | 11.73 | 17.0 | 28.73 | 45.07 | -16.34 | Pass |
| **64QAM 150.0 Mbps** | | | | | | | |
| 2506 | 9.69 | 12.69 | 17.0 | 29.69 | 45.08 | -15.39 | Pass |
| 2595 | 8.99 | 11.99 | 17.0 | 28.99 | 44.31 | -15.32 | Pass |
| 2680 | 9.46 | 12.46 | 17.0 | 29.46 | 45.03 | -15.57 | Pass |

* - Total PSD, dBm/100kHz = PSD result**,dBm/100kHz + Antenna Gain, dBi
** - PSD result, dBm/100kHz = SA reading + 10*log(N)
*** - See Table 7.2.6, Table 7.2.8

**Reference numbers of test equipment used**

| HL 3301 | HL 3302 | HL 3818 | HL 4229 | HL 4234 | HL 4273 | HL 4366 | |
|---|---|---|---|---|---|---|---|

Full description is given in Appendix A.

| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.2.6 Pre - transition frequency channels assignment**

| Channel | Channel BW, MHz | Peak power limit, dBm | Power density limit, dBm/100kHz |
|---|---|---|---|
| **10 MHz Dual Channel QPSK 15.1 Mbps** | | | |
| **2501.0 MHz** BRS Ch.1 ERS Ch. A1 | 9.711 | 63+10log(OBW/10.0)+10log(360/beamwidth) | EIRP+10log(0.1/10.0) |
| **2595.0 MHz** EBS Ch.D4+ BRS Ch. E1 | 9.728 | 63+10log(OBW/12.0)+10log(360/beamwidth) | EIRP+10log(0.1/12.0) |
| **2685.0 MHz** EBS Ch.I+ EBS Ch.G4 | 9.696 | 63+10log(OBW/10.0)+10log(360/beamwidth) | EIRP+10log(0.1/10.0) |
| **10 MHz Dual Channel 64QAM 75.0 Mbps** | | | |
| **2501.0 MHz** BRS Ch.1 ERS Ch. A1 | 9.648 | 63+10log(OBW/10.0)+10log(360/beamwidth) | EIRP+10log(0.1/10.0) |
| **2595.0 MHz** EBS Ch.D4+ BRS Ch. E1 | 9.558 | 63+10log(OBW/12.0)+10log(360/beamwidth) | EIRP+10log(0.1/12.0) |
| **2685.0 MHz** EBS Ch.I+ EBS Ch.G4 | 9.641 | 63+10log(OBW/10.0)+10log(360/beamwidth) | EIRP+10log(0.1/10.0) |
| **20 MHz 4 Channels QPSK 31.0 Mbps** | | | |
| **2506.0 MHz** BRS Ch.1+ EBS Ch. A1+A2+B1 | 19.484 | 63+10log(OBW/22.0)+10log(360/beamwidth) | EIRP+10log(0.1/22.0) |
| **2595.0 MHz** EBS Ch.C4+D4+ BRS Ch.E1+F1 | 19.463 | 63+10log(OBW/24.0)+10log(360/beamwidth) | EIRP+10log(0.1/24.0) |
| **2680.0 MHz** EBS CH.I+G3+G4 BRS Ch.H**3** | 19.467 | 63+10log(OBW/22.0)+10log(360/beamwidth) | EIRP+10log(0.1/22.0) |
| **20 MHz 4 Channels 64QAM 150.0 Mbps** | | | |
| **2506.0 MHz** BRS Ch.1+ EBS Ch. A1+A2+B1 | 19.534 | 63+10log(OBW/22.0)+10log(360/beamwidth) | EIRP+10log(0.1/22.0) |
| **2595.0 MHz** EBS Ch.C4+D4+ BRS Ch.E1+F1 | 19.488 | 63+10log(OBW/24.0)+10log(360/beamwidth) | EIRP+10log(0.1/24.0) |
| **2680.0 MHz** EBS CH.I+G3+G4 BRS Ch.H**3** | 19.324 | 63+10log(OBW/22.0)+10log(360/beamwidth) | EIRP+10log(0.1/22.0) |

| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.2.7 EIRP limits**

| Channel | Channel BW, MHz | Peak power limit, dBm | |
|---|---|---|---|
| | | 17 dBi, 90º beamwidth | 11 dBi/18 dBi, 65ºbeamwidth |
| **10 MHz Dual Channel QPSK 15.1 Mbps** | | | |
| **2501.0 MHz**<br>BRS Ch.1<br>ERS Ch. A1 | 10.0 | 68.89 | 70.31 |
| **2595.0 MHz**<br>EBS Ch.D4+<br>BRS Ch. E1 | 12.0 | 68.11 | 69.52 |
| **2685.0 MHz**<br>EBS Ch.I+<br>EBS Ch.G4 | 10.0 | 68.89 | 70.30 |
| **10 MHz Dual Channel 64QAM 75.0 Mbps** | | | |
| **2501.0 MHz**<br>BRS Ch.1<br>ERS Ch. A1 | 10.0 | 68.86 | 70.28 |
| **2595.0 MHz**<br>EBS Ch.D4+<br>BRS Ch. E1 | 12.0 | 68.03 | 69.45 |
| **2685.0 MHz**<br>EBS Ch.I+<br>EBS Ch.G4 | 10.0 | 68.86 | 70.28 |
| **20 MHz 4 Channels QPSK 31.0 Mbps** | | | |
| **2506.0 MHz**<br>BRS Ch.1+<br>EBS Ch. A1+A2+B1 | 22.0 | 68.49 | 69.91 |
| **2595.0 MHz**<br>EBS Ch.C4+D4+<br>BRS Ch.E1+F1 | 24.0 | 68.11 | 69.52 |
| **2680.0 MHz**<br>EBS CH.I+G3+G4<br>BRS Ch.H**3** | 22.0 | 68.49 | 69.90 |
| **20 MHz 4 Channels 64QAM 150.0 Mbps** | | | |
| **2506.0 MHz**<br>BRS Ch.1+<br>EBS Ch. A1+A2+B1 | 22.0 | 68.50 | 69.92 |
| **2595.0 MHz**<br>EBS Ch.C4+D4+<br>BRS Ch.E1+F1 | 24.0 | 68.12 | 69.53 |
| **2680.0 MHz**<br>EBS CH.I+G3+G4<br>BRS Ch.H**3** | 22.0 | 68.46 | 69.87 |

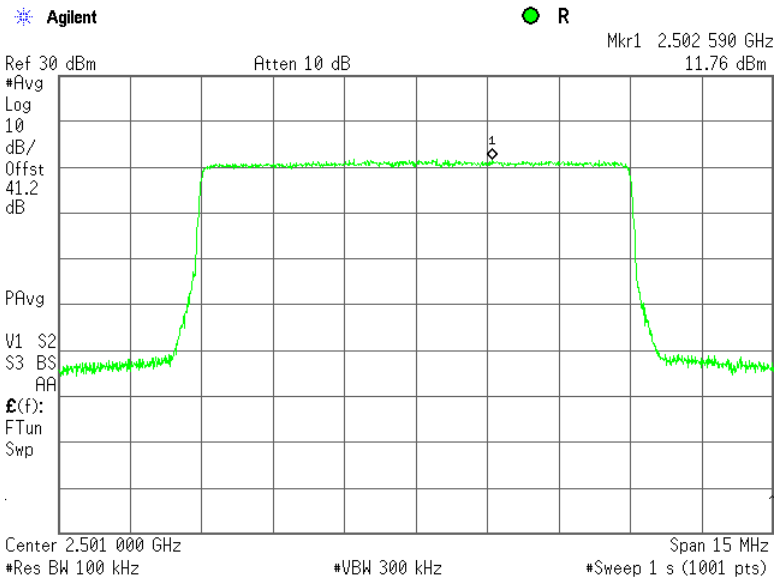
| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.2.8 Peak power density limits**

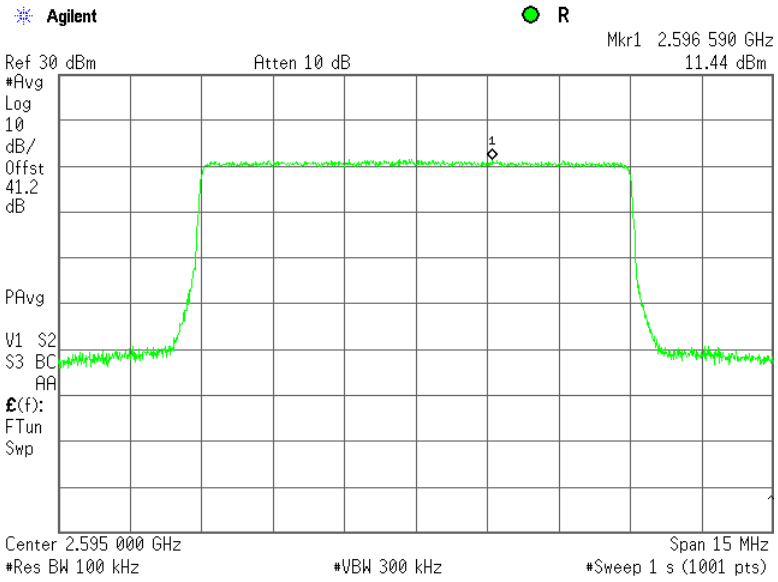
| Channel | Channel BW, MHz | Peak power density, dBm/100kHz | |
|---|---|---|---|
| | | 17 dBi, 90º beamwidth | 18 dBi, 65ºbeamwidth |
| **10 MHz Dual Channel QPSK 15.1 Mbps** | | | |
| **2501.0 MHz** BRS Ch.1 ERS Ch. A1 | 10.0 | 48.89 | 50.31 |
| **2595.0 MHz** EBS Ch.D4+ BRS Ch. E1 | 12.0 | 47.32 | 48.73 |
| **2685.0 MHz** EBS Ch.I+ EBS Ch.G4 | 10.0 | 48.89 | 50.30 |
| **10 MHz Dual Channel 64QAM 75.0 Mbps** | | | |
| **2501.0 MHz** BRS Ch.1 ERS Ch. A1 | 10.0 | 48.86 | 50.28 |
| **2595.0 MHz** EBS Ch.D4+ BRS Ch. E1 | 12.0 | 47.24 | 48.65 |
| **2685.0 MHz** EBS Ch.I+ EBS Ch.G4 | 10.0 | 48.86 | 50.28 |
| **20 MHz 4 Channels QPSK 31.0 Mbps** | | | |
| **2506.0 MHz** BRS Ch.1+ ERS Ch. A1+A2+A3 | 22.0 | 45.07 | 46.48 |
| **2595.0 MHz** EBS Ch.C4+D4+ EBS Ch.G4+F4 | 24.0 | 44.31 | 45.72 |
| **2680.0 MHz** EBS CH.G1+G2+G3 BRS Ch.H**3** | 22.0 | 45.07 | 46.48 |
| **20 MHz 4 Channels 64QAM 150.0 Mbps** | | | |
| **2506.0 MHz** BRS Ch.1+ ERS Ch. A1+A2+A3 | 22.0 | 45.08 | 46.49 |
| **2595.0 MHz** EBS Ch.C4+D4+ EBS Ch.G4+F4 | 24.0 | 44.31 | 45.73 |
| **2680.0 MHz** EBS CH.G1+G2+G3 BRS Ch.H**3** | 22.0 | 45.03 | 46.45 |

| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.2.1 Power spectral density test results at low frequency, QPSK, 10 MHz EBW, RF # 2**

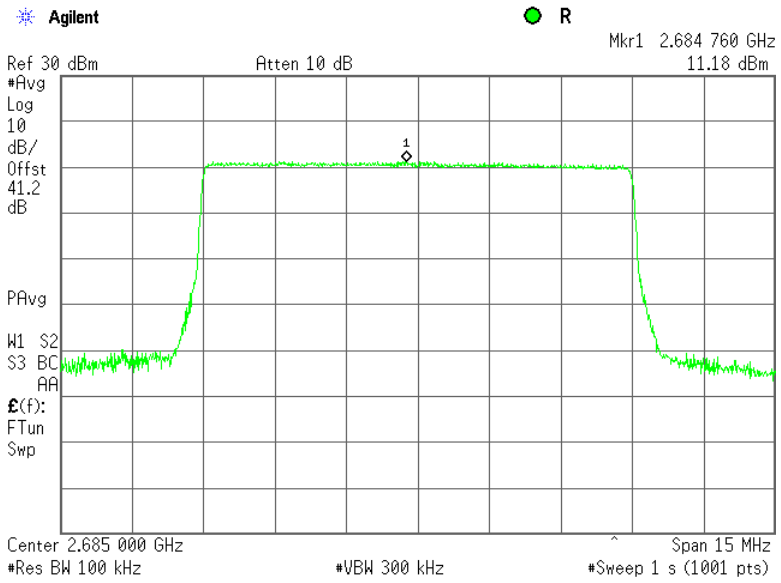



**Plot 7.2.2 Power spectral density test results at mid frequency, QPSK, 10 MHz EBW, RF # 2**

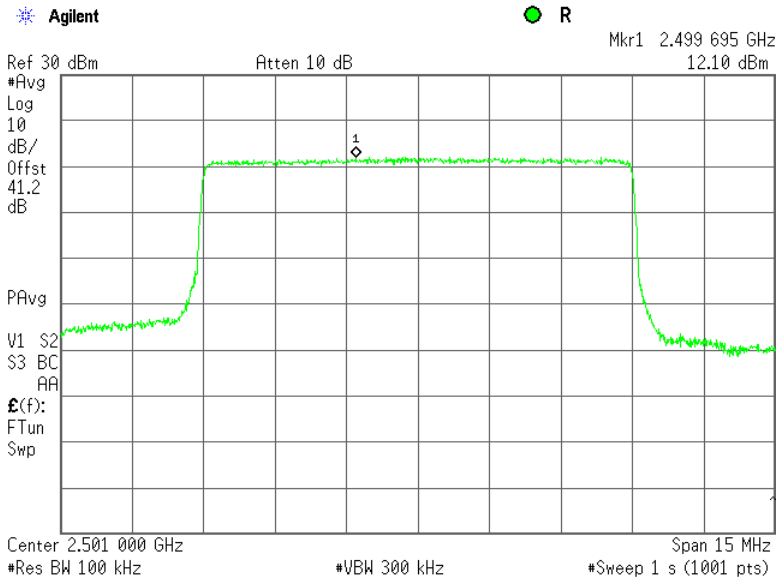


| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.2.3 Power spectral density test results at high frequency, QPSK, 10 MHz EBW, RF # 2**

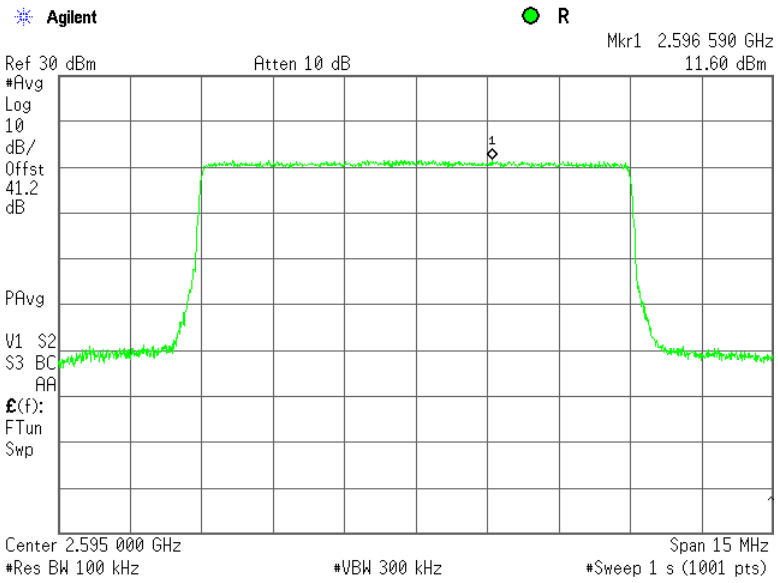



**Plot 7.2.4 Power spectral density test results at low frequency, 64QAM, 10 MHz EBW, RF # 2**

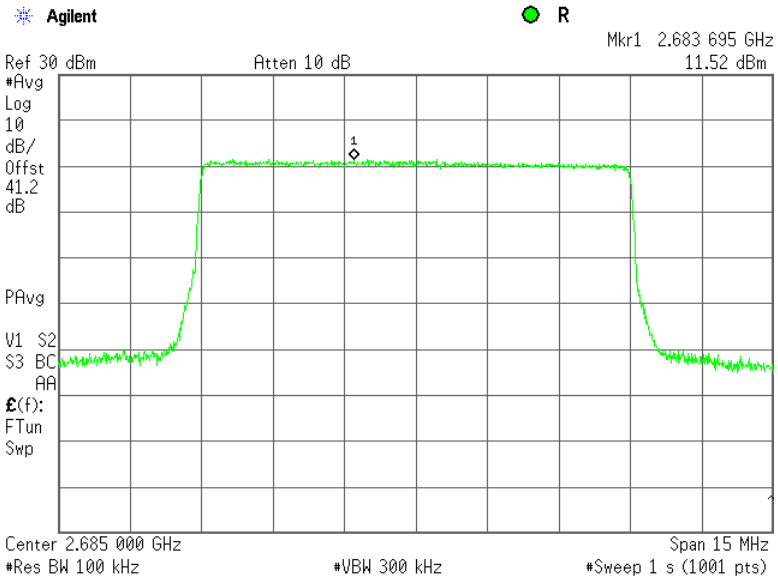


| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.2.5 Power spectral density test results at mid frequency, 64QAM, 10 MHz EBW, RF # 2**

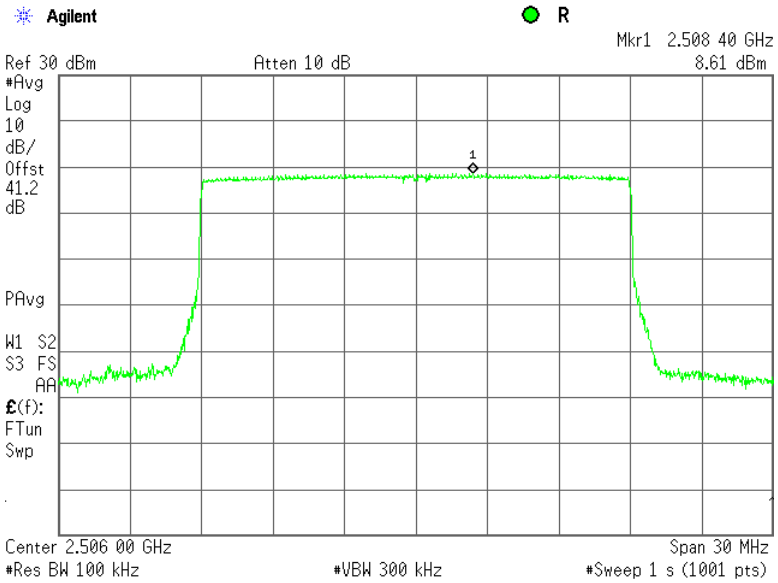



**Plot 7.2.6 Power spectral density test results at high frequency, 64QAM, 10 MHz EBW, RF # 2**

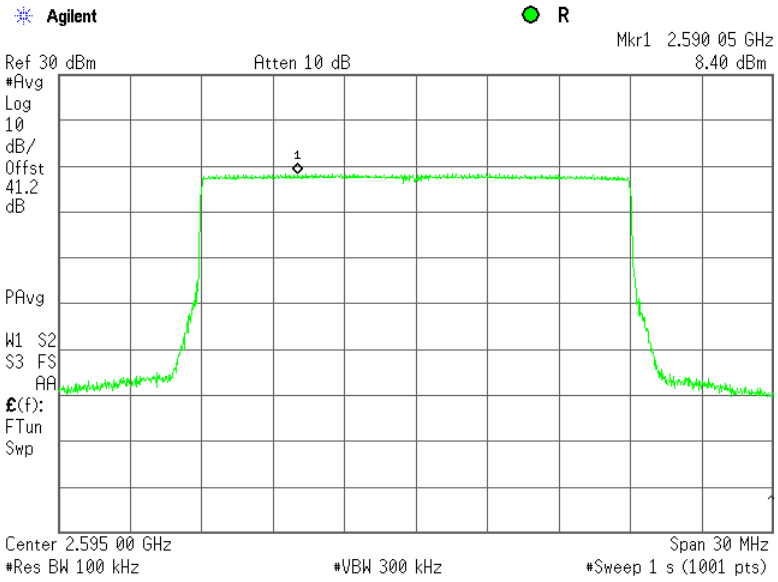


| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.2.7 Power spectral density test results at low frequency, QPSK, 20 MHz EBW, RF # 2**

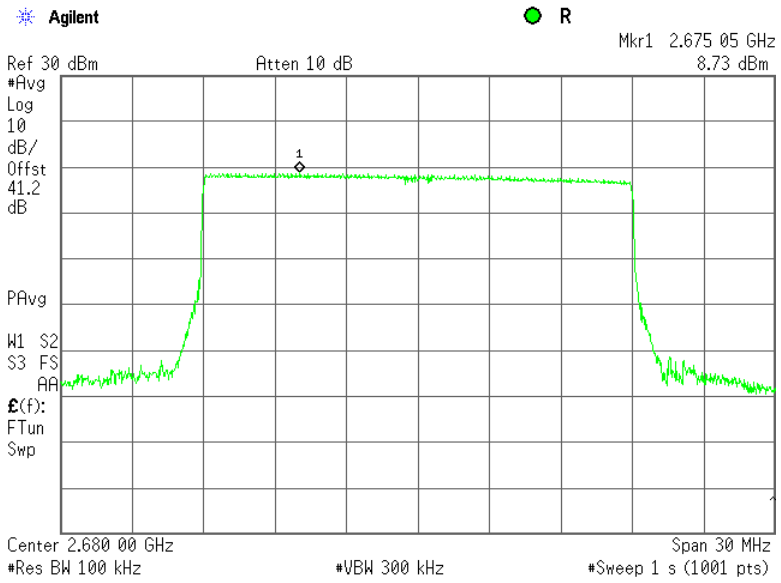



**Plot 7.2.8 Power spectral density test results at mid frequency, QPSK, 20 MHz EBW, RF # 2**

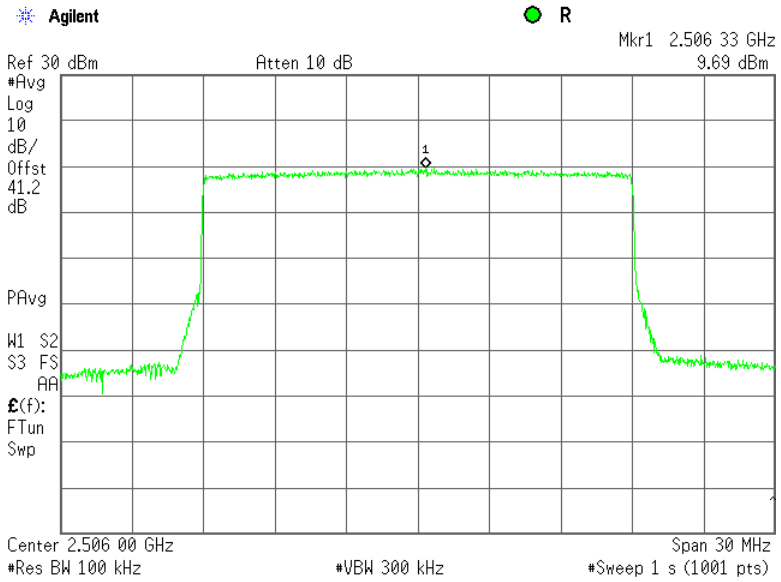


| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.2.9 Power spectral density test results at high frequency, QPSK, 20 MHz EBW, RF # 2**

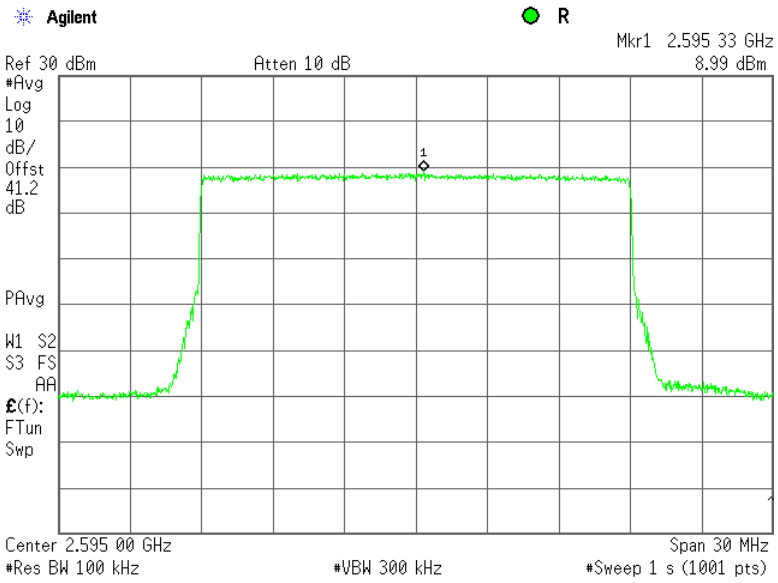



**Plot 7.2.10 Power spectral density test results at low frequency, 64QAM, 20 MHz EBW, RF # 2**

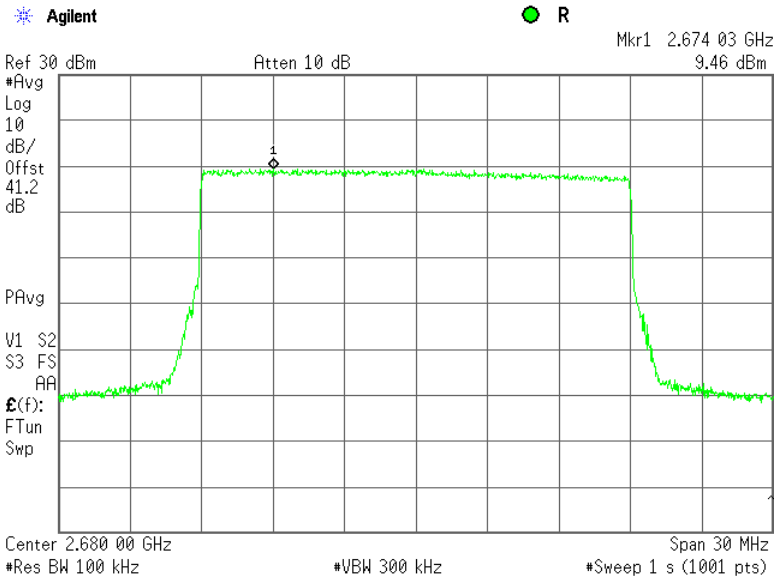


| Test specification: | Section 27.50(h), Peak output power | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 25-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1015 hPa | Relative Humidity: 42 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.2.11 Power spectral density test results at mid frequency, 64QAM, 20 MHz EBW, RF # 2**




**Plot 7.2.12 Power spectral density test results at high frequency, 64QAM, 20 MHz EBW, RF # 2**



| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

## 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 | Frequency range | Attenuation below carrier, dBc | Limit, dBm |
|---|---|---|---|
| **Channel bandwidth 10 MHz** | | | |
| 2501 | 2490.0 - 2496.0<br>2506.0 - 2512.0 | 43+ 10*Log (P*) | -13.0 |
| 2595 | 2584.0 - 2590.0<br>2602.0 - 2608.0 | 43+ 10*Log (P*) | -13.0 |
| 2685 | 2674.0 - 2680.0<br>2690.0 - 2696.0 | 43+ 10*Log (P*) | -13.0 |
| **Channel bandwidth 20 MHz** | | | |
| 2506 | 2490.0 - 2496.0<br>2518.0 - 2524.0 | 43+ 10*Log (P*) | -13.0 |
| 2595 | 2578.0 - 2584.0<br>2608.0 - 2614.0 | 43+ 10*Log (P*) | -13.0 |
| 2680 | 2662.0 - 2668.0<br>2690.0 - 2696.0 | 43+ 10*Log (P*) | -13.0 |

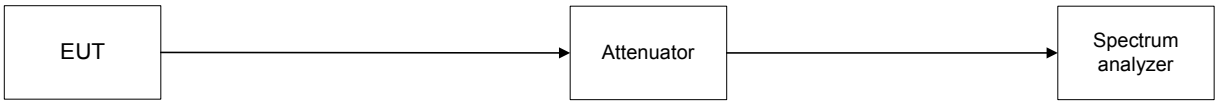
* - P is transmitter output power in Watts

### 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**



| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.3.2 Spurious emission at the low band edge test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
INVESTIGATED FREQUENCY RANGE: See below
RBW: 100 kHz
DETECTOR USED: Average
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
MODULATION: QPSK, 64QAM
EBW: 10 MHz
NUMBER OF RF OUTPUTS: N = 2

| Frequency offset, ± MHz | Low band edge SA reading, dBm | Low band edge result, dBm | RBW, kHz | Integration BW, kHz | Limit, dBm | Verdict |
|---|---|---|---|---|---|---|
| **Low carrier frequency 2501.0 MHz QPSK** | | | | | | |
| 5.5 | -22.17 | -19.17 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -23.00 | -20.00 | 100 | 1000 | -13.0 | |
| 7.5 | -23.44 | -20.44 | 100 | 1000 | -13.0 | |
| 9.5 | -25.16 | -22.16 | 100 | 1000 | -13.0 | |
| **Low carrier frequency 2501.0 MHz 64QAM** | | | | | | |
| 5.5 | -21.98 | -18.98 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -23.93 | -20.93 | 100 | 1000 | -13.0 | |
| 7.5 | -24.16 | -21.16 | 100 | 1000 | -13.0 | |
| 8.5 | -25.91 | -22.91 | 100 | 1000 | -13.0 | |
| **Mid carrier frequency 2595.0 MHz QPSK** | | | | | | |
| 5.5 | -19.40 | -16.40 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -20.97 | -17.97 | 100 | 1000 | -13.0 | |
| 7.5 | -22.13 | -19.13 | 100 | 1000 | -13.0 | |
| 9.5 | -24.37 | -21.37 | 100 | 1000 | -13.0 | |
| **Mid carrier frequency 2595.0 MHz 64QAM** | | | | | | |
| 5.5 | -20.75 | -17.75 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -21.88 | -18.88 | 100 | 1000 | -13.0 | |
| 7.5 | -22.50 | -19.50 | 100 | 1000 | -13.0 | |
| 9.5 | -26.51 | -23.51 | 100 | 1000 | -13.0 | |
| **High carrier frequency 2685.0 MHz QPSK** | | | | | | |
| 5.5 | -21.86 | -18.86 | 300 | 1000 | -13.0 | Pass |
| 6.5 | -23.71 | -20.71 | 300 | 1000 | -13.0 | |
| 7.5 | -24.70 | -21.70 | 300 | 1000 | -13.0 | |
| 9.5 | -27.27 | -24.27 | 300 | 1000 | -13.0 | |
| **High carrier frequency 2685.0 MHz 64QAM** | | | | | | |
| 5.5 | -21.01 | -18.01 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -22.62 | -19.62 | 100 | 1000 | -13.0 | |
| 7.5 | -23.71 | -20.71 | 100 | 1000 | -13.0 | |
| 9.5 | -26.91 | -23.91 | 100 | 1000 | -13.0 | |

* - Low band edge result = Low band edge SA Reading + 10log(N)

| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.3.3 Spurious emission at the high band edge test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
INVESTIGATED FREQUENCY RANGE: See below
RBW: 100 kHz
DETECTOR USED: Average
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
MODULATION: QPSK, 64QAM
EBW: 10 MHz
NUMBER OF RF OUTPUTS: N = 2

| Frequency offset, ± MHz | High band edge SA reading, dBm | High band edge result, dBm* | RBW, kHz | Integration BW, kHz | Limit, dBm | Verdict |
|---|---|---|---|---|---|---|
| **Low carrier frequency 2501.0 MHz QPSK** | | | | | | |
| 5.5 | -20.60 | -17.60 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -21.94 | -18.94 | 100 | 1000 | -13.0 | |
| 7.5 | -23.70 | -20.70 | 100 | 1000 | -13.0 | |
| 9.5 | -25.68 | -22.68 | 100 | 1000 | -13.0 | |
| **Low carrier frequency 2501.0 MHz 64QAM** | | | | | | |
| 5.5 | -21.14 | -18.14 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -22.23 | -19.23 | 100 | 1000 | -13.0 | |
| 7.5 | -23.87 | -20.87 | 100 | 1000 | -13.0 | |
| 8.5 | -24.68 | -21.68 | 100 | 1000 | -13.0 | |
| **Mid carrier frequency 2595.0 MHz QPSK** | | | | | | |
| 5.5 | -17.67 | -14.67 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -19.58 | -16.58 | 100 | 1000 | -13.0 | |
| 7.5 | -19.79 | -16.79 | 100 | 1000 | -13.0 | |
| 9.5 | -23.73 | -20.73 | 100 | 1000 | -13.0 | |
| **Mid carrier frequency 2595.0 MHz 64QAM** | | | | | | |
| 5.5 | -19.78 | -16.78 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -21.57 | -18.57 | 100 | 1000 | -13.0 | |
| 7.5 | -23.15 | -20.15 | 100 | 1000 | -13.0 | |
| 9.5 | -26.04 | -23.04 | 100 | 1000 | -13.0 | |
| **High carrier frequency 2685.0 MHz QPSK** | | | | | | |
| 5.5 | -22.74 | -19.74 | 300 | 1000 | -13.0 | Pass |
| 6.5 | -23.90 | -20.90 | 300 | 1000 | -13.0 | |
| 7.5 | -25.14 | -22.14 | 300 | 1000 | -13.0 | |
| 9.5 | -28.96 | -25.96 | 300 | 1000 | -13.0 | |
| **High carrier frequency 2685.0 MHz 64QAM** | | | | | | |
| 5.5 | -22.39 | -19.39 | 100 | 1000 | -13.0 | Pass |
| 6.5 | -22.78 | -19.78 | 100 | 1000 | -13.0 | |
| 7.5 | -24.46 | -21.46 | 100 | 1000 | -13.0 | |
| 9.5 | -28.22 | -25.22 | 100 | 1000 | -13.0 | |

* - High band edge result = High band edge SA Reading + 10log(N)

| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.3.4 Spurious emission at the low band edge test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
INVESTIGATED FREQUENCY RANGE: See below
RBW: 200 kHz
DETECTOR USED: Average
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
MODULATION: QPSK, 64QAM
EBW: 20 MHz
NUMBER OF RF OUTPUTS: N = 2

| Frequency offset, ± MHz | Low band edge SA reading, dBm | Low band edge result, dBm | RBW, kHz | Integration BW, kHz | Limit, dBm | Verdict |
|---|---|---|---|---|---|---|
| **Low carrier frequency 2506.0 MHz QPSK** | | | | | | |
| 10.5 | -25.11 | -22.11 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -27.17 | -24.17 | 200 | 1000 | -13.0 | |
| 12.5 | -28.05 | -25.05 | 200 | 1000 | -13.0 | |
| 13.5 | -28.66 | -25.66 | 200 | 1000 | -13.0 | |
| **Low carrier frequency 2506.0 MHz 64QAM** | | | | | | |
| 10.5 | -22.18 | -19.18 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -21.93 | -18.93 | 200 | 1000 | -13.0 | |
| 12.5 | -23.44 | -20.44 | 200 | 1000 | -13.0 | |
| 13.5 | -23.15 | -20.15 | 200 | 1000 | -13.0 | |
| **Mid carrier frequency 2595.0 MHz QPSK** | | | | | | |
| 10.5 | -25.17 | -22.17 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -27.13 | -24.13 | 200 | 1000 | -13.0 | |
| 12.5 | -27.23 | -24.23 | 200 | 1000 | -13.0 | |
| 13.5 | -27.79 | -24.79 | 200 | 1000 | -13.0 | |
| **Mid carrier frequency 2595.0 MHz 64QAM** | | | | | | |
| 10.5 | -27.74 | -24.74 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -29.93 | -26.93 | 200 | 1000 | -13.0 | |
| 12.5 | -30.76 | -27.76 | 200 | 1000 | -13.0 | |
| 13.5 | -31.20 | -28.20 | 200 | 1000 | -13.0 | |
| **High carrier frequency 2680.0 MHz QPSK** | | | | | | |
| 10.5 | -24.63 | -21.63 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -26.25 | -23.25 | 200 | 1000 | -13.0 | |
| 12.5 | -26.63 | -23.63 | 200 | 1000 | -13.0 | |
| 13.5 | -27.31 | -24.31 | 200 | 1000 | -13.0 | |
| **High carrier frequency 2680.0 MHz 64QAM** | | | | | | |
| 10.5 | -25.42 | -22.42 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -27.83 | -24.83 | 200 | 1000 | -13.0 | |
| 12.5 | -27.30 | -24.30 | 200 | 1000 | -13.0 | |
| 13.5 | -27.83 | -24.83 | 200 | 1000 | -13.0 | |

* - Low band edge result = Low band edge SA Reading + 10log(N)

| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.3.5 Spurious emission at the high band edge test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
INVESTIGATED FREQUENCY RANGE: See below
RBW: 200 kHz
DETECTOR USED: Average
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
MODULATION: QPSK, 64QAM
EBW: 20 MHz
NUMBER OF RF OUTPUTS: N = 2

| Frequency offset, ± MHz | High band edge SA reading, dBm | High band edge result, dBm* | RBW, kHz | Integration BW, kHz | Limit, dBm | Verdict |
|---|---|---|---|---|---|---|
| **Low carrier frequency 2506.0 MHz QPSK** | | | | | | |
| 10.5 | -25.90 | -22.90 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -27.53 | -24.53 | 200 | 1000 | -13.0 | |
| 12.5 | -27.59 | -24.59 | 200 | 1000 | -13.0 | |
| 13.5 | -28.48 | -25.48 | 200 | 1000 | -13.0 | |
| **Low carrier frequency 2506.0 MHz 64QAM** | | | | | | |
| 10.5 | -21.50 | -18.50 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -21.98 | -18.98 | 200 | 1000 | -13.0 | |
| 12.5 | -21.25 | -18.25 | 200 | 1000 | -13.0 | |
| 13.5 | -22.45 | -19.45 | 200 | 1000 | -13.0 | |
| **Mid carrier frequency 2595.0 MHz QPSK** | | | | | | |
| 10.5 | -27.04 | -24.04 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -28.29 | -25.29 | 200 | 1000 | -13.0 | |
| 12.5 | -28.40 | -25.40 | 200 | 1000 | -13.0 | |
| 13.5 | -29.93 | -25.93 | 200 | 1000 | -13.0 | |
| **Mid carrier frequency 2595.0 MHz 64QAM** | | | | | | |
| 10.5 | -27.46 | -24.46 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -29.14 | -26.14 | 200 | 1000 | -13.0 | |
| 12.5 | -29.89 | -26.89 | 200 | 1000 | -13.0 | |
| 13.5 | -30.66 | -27.66 | 200 | 1000 | -13.0 | |
| **High carrier frequency 2680.0 MHz QPSK** | | | | | | |
| 10.5 | -27.35 | -24.35 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -28.20 | -25.20 | 200 | 1000 | -13.0 | |
| 12.5 | -29.10 | -26.10 | 200 | 1000 | -13.0 | |
| 13.5 | -30.09 | -27.09 | 200 | 1000 | -13.0 | |
| **High carrier frequency 2680.0 MHz 64QAM** | | | | | | |
| 10.5 | -24.69 | -21.69 | 200 | 1000 | -13.0 | Pass |
| 11.5 | -25.32 | -22.32 | 200 | 1000 | -13.0 | |
| 12.5 | -26.62 | -23.62 | 200 | 1000 | -13.0 | |
| 13.5 | -28.05 | -25.05 | 200 | 1000 | -13.0 | |

* - High band edge result = High band edge SA Reading + 10log(N)

**Reference numbers of test equipment used**

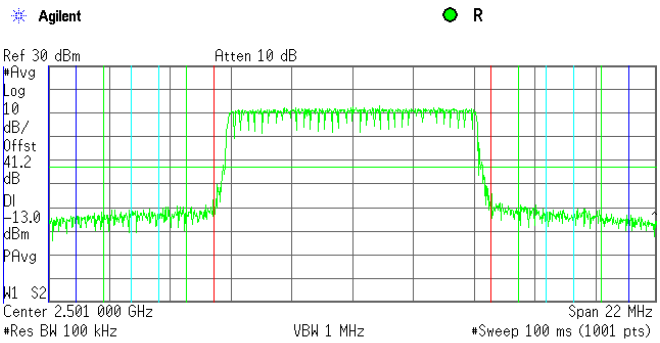
| HL 3301 | HL 3302 | HL 3818 | HL 4229 | HL 4234 | HL 4273 | HL 4366 | |
|---|---|---|---|---|---|---|---|

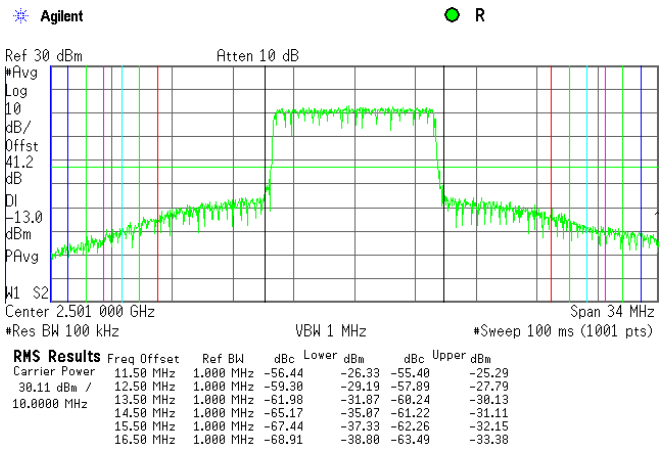
Full description is given in Appendix A.

| **Test specification:** | **Section 27.53(m)(2), Band edge emissions** | | |
|---|---|---|---|
| **Test procedure:** | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| **Test mode:** | Compliance | **Verdict:** | PASS |
| **Date(s):** | 04-Mar-14 | | |
| **Temperature:** 22 ºC | **Air Pressure:** 1009 hPa | **Relative Humidity:** 47 % | **Power Supply:** 48 VDC |
| **Remarks:** | | | |

**Plot 7.3.1 Spurious emission at band edges test results at low carrier frequency, 10 MHz EBW**

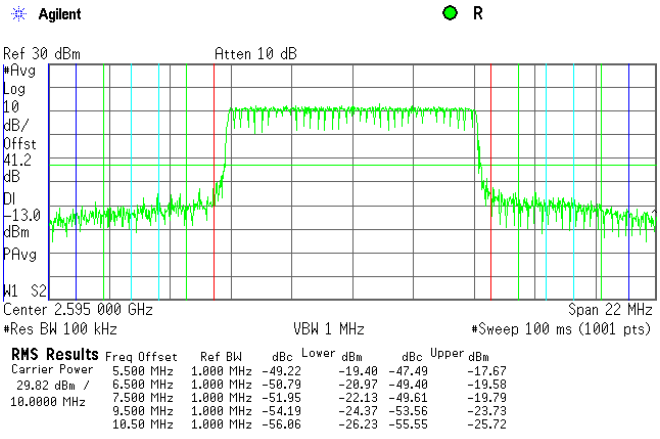
| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 15.5 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

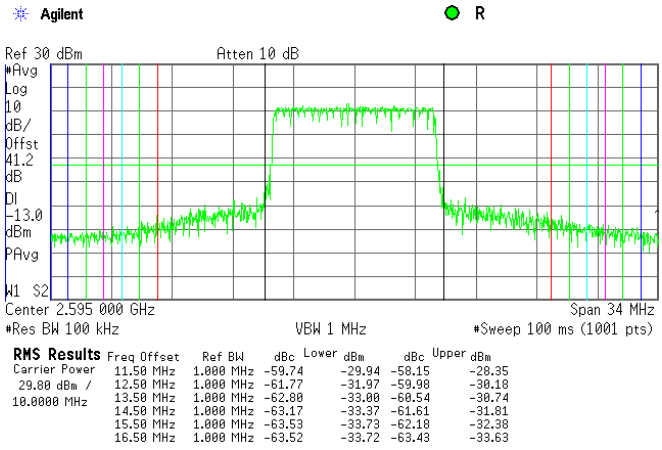



**Plot 7.3.2 Spurious emission at band edges test results at mid carrier frequency, 10 MHz EBW**

| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 15.5 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

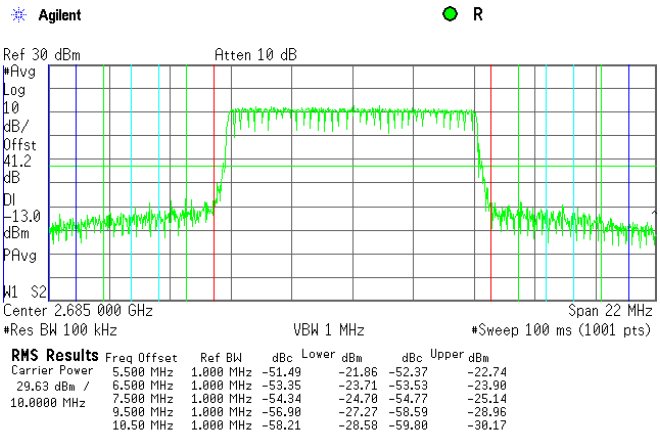


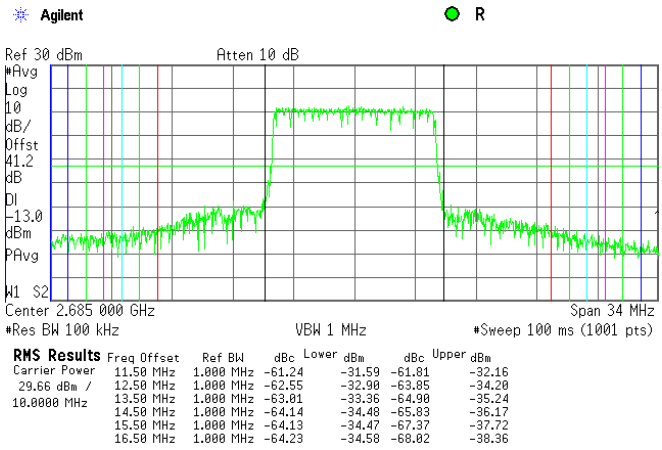



| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.3.3 Spurious emission at band edges test results at high carrier frequency, 10 MHz EBW**

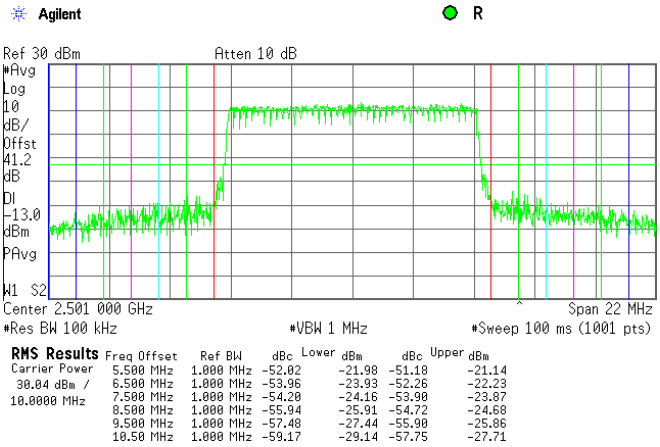
| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 15.5 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

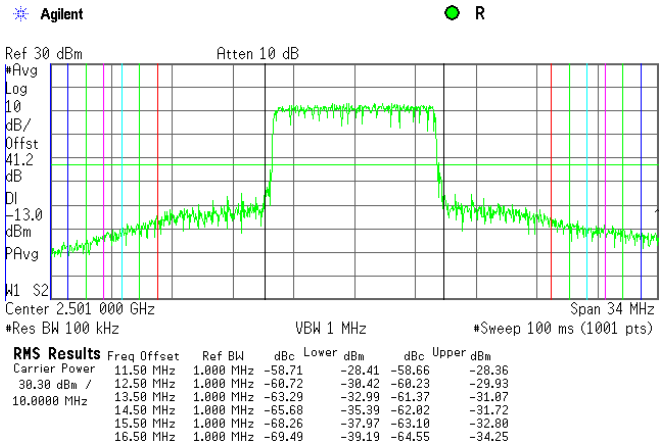



**Plot 7.3.4 Spurious emission at band edges test results at low carrier frequency, 10 MHz EBW**

| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 75.0 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

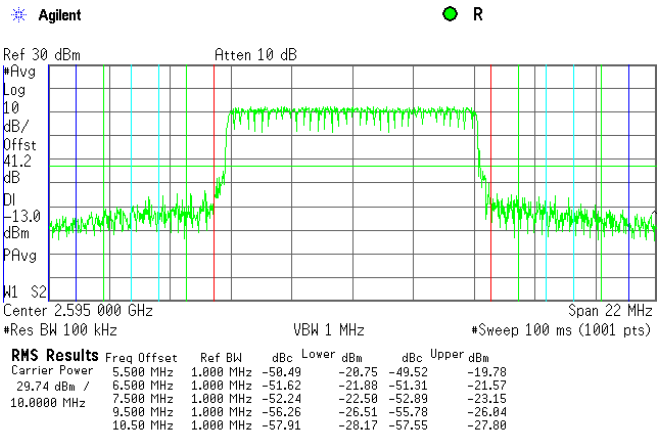


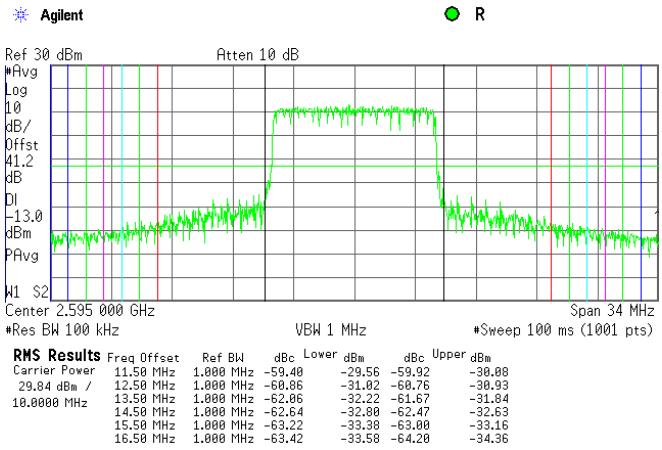



| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.3.5 Spurious emission at band edges test results at mid carrier frequency, 10 MHz EBW**

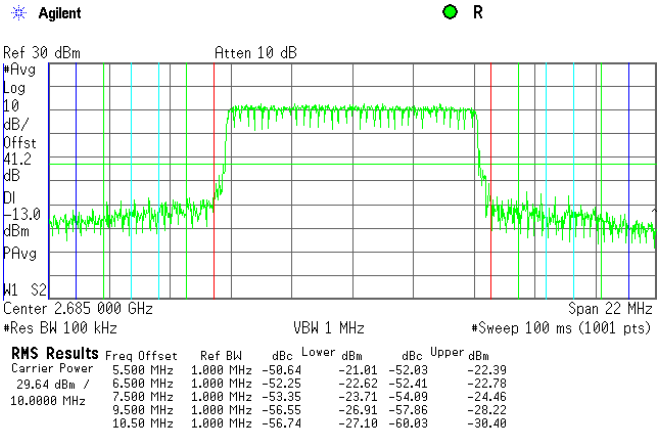
| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 75.0 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

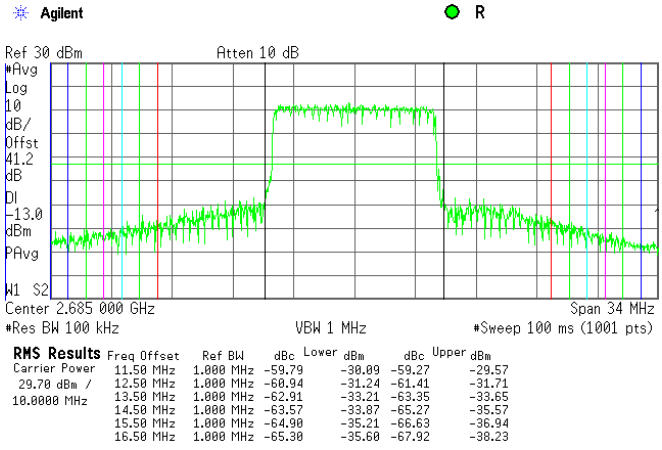



**Plot 7.3.6 Spurious emission at band edges test results at high carrier frequency, 10 MHz EBW**

| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 75.0 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

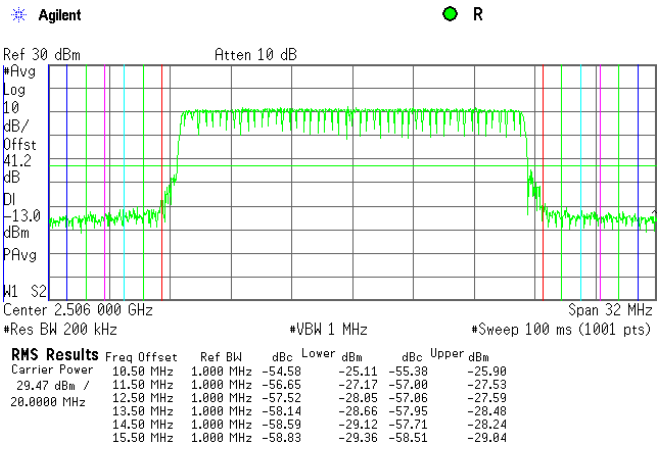


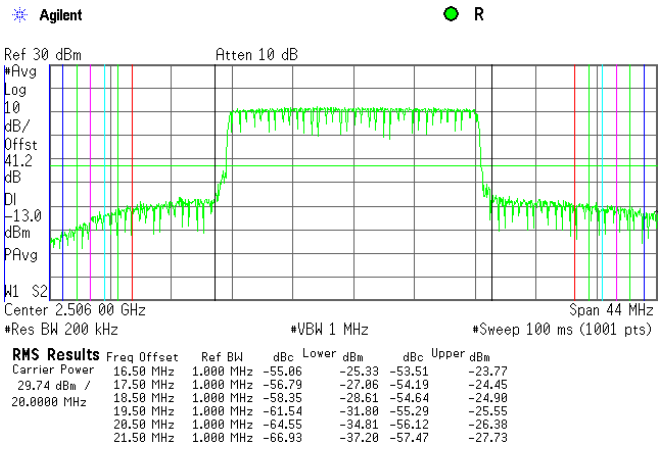



| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.3.7 Spurious emission at band edges test results at low carrier frequency, 20 MHz EBW**

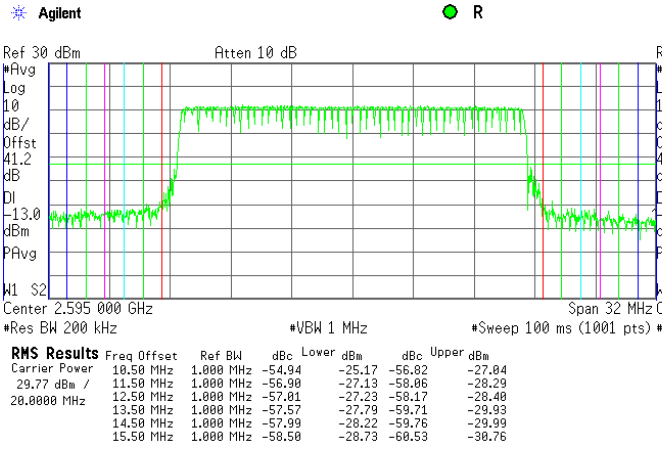
| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 31 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

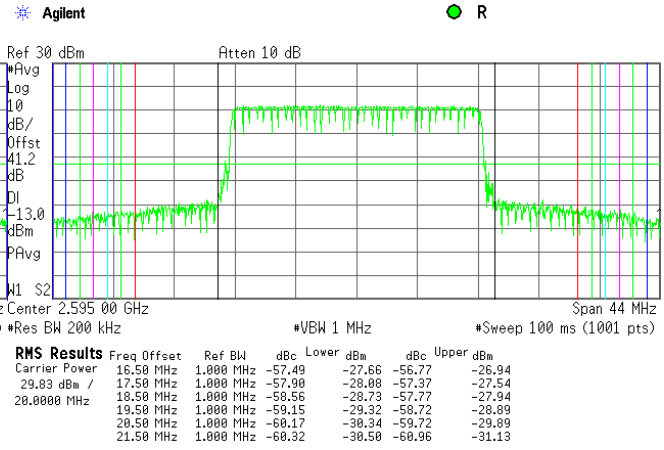



**Plot 7.3.8 Spurious emission at band edges test results at mid carrier frequency, 20 MHz EBW**

| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 31 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

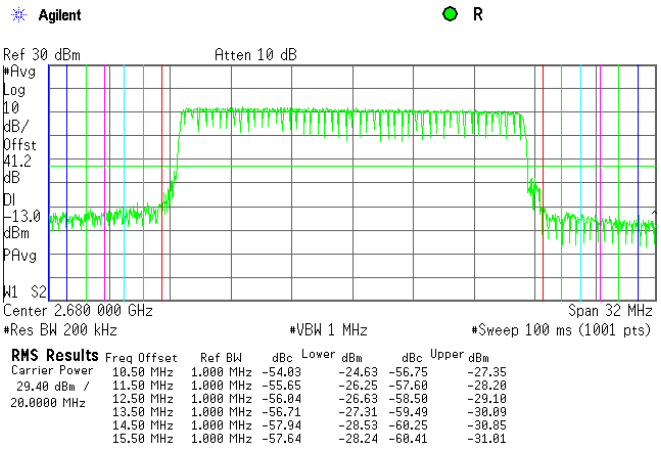


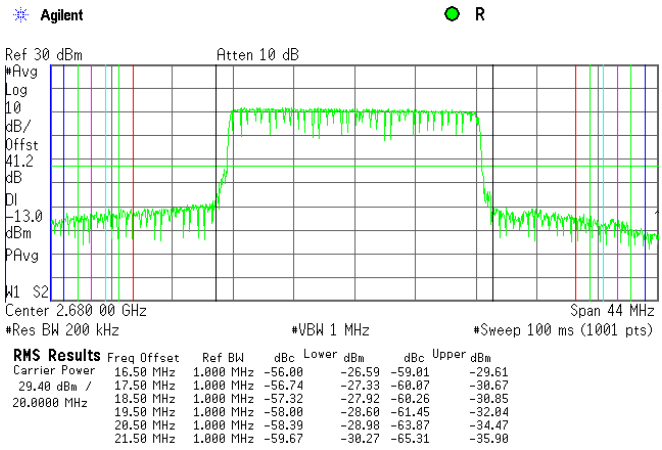



| Test specification: | Section 27.53(m)(2), Band edge emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.3.9 Spurious emission at band edges test results at high carrier frequency, 20 MHz EBW**

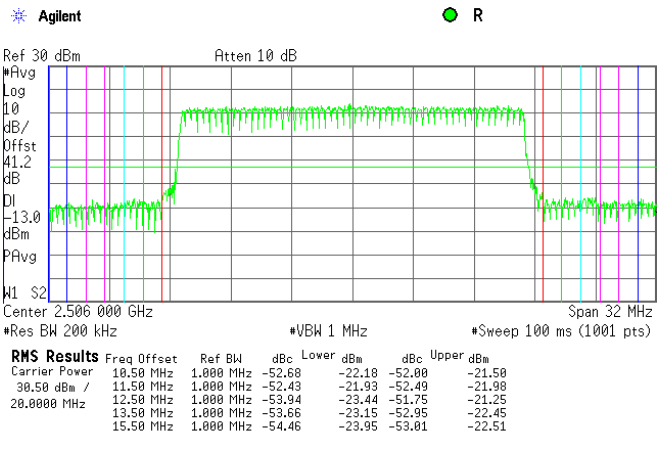
| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 31 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

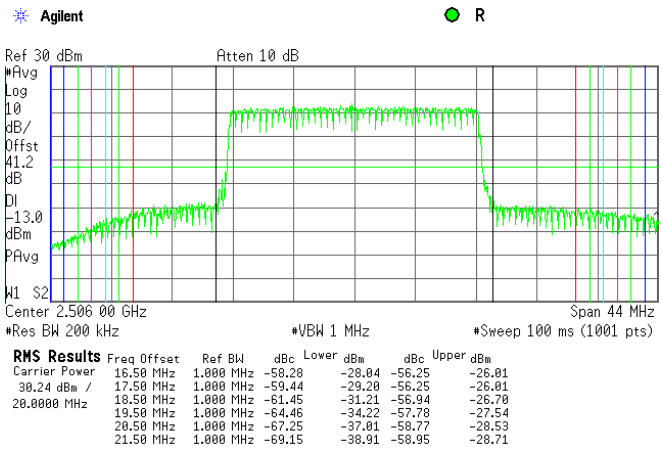



**Plot 7.3.10 Spurious emission at band edges test results at low carrier frequency, 20 MHz EBW**

| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 150 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

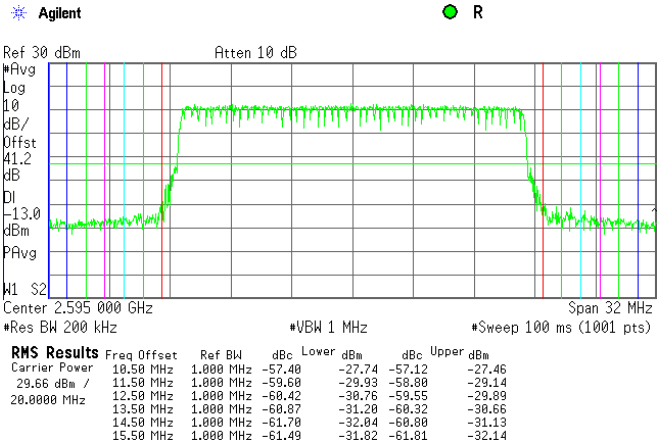


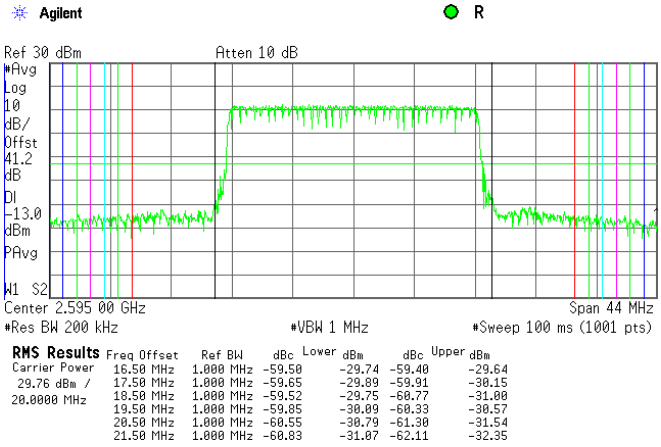



| **Test specification:** | **Section 27.53(m)(2), Band edge emissions** | | |
|---|---|---|---|
| **Test procedure:** | 47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13 | | |
| **Test mode:** | Compliance | **Verdict:** | PASS |
| **Date(s):** | 04-Mar-14 | | |
| **Temperature:** 22 ºC | **Air Pressure:** 1009 hPa | **Relative Humidity:** 47 % | **Power Supply:** 48 VDC |
| **Remarks:** | | | |

**Plot 7.3.11 Spurious emission at band edges test results at mid carrier frequency, 20 MHz EBW**

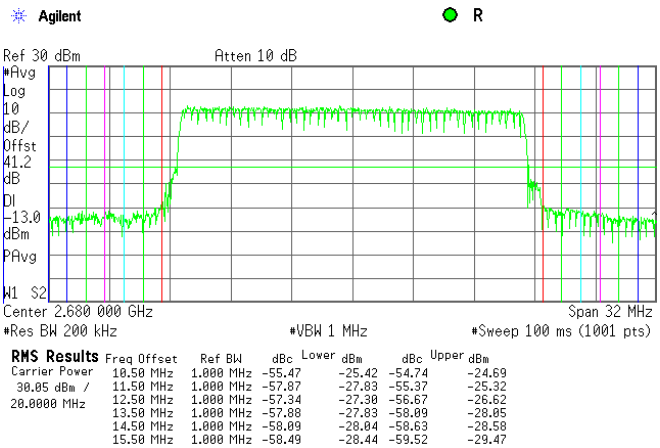
| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 150 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |

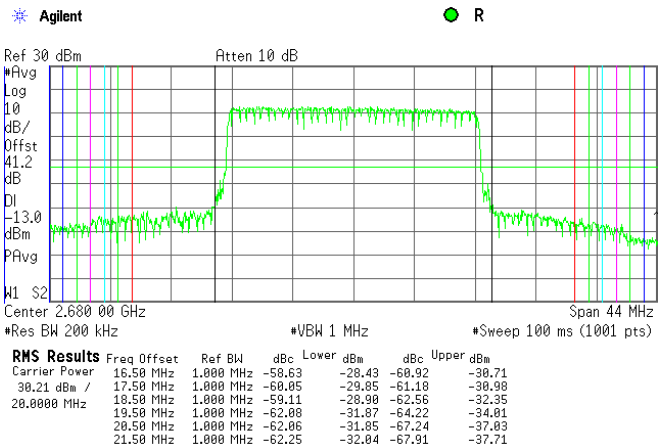



**Plot 7.3.12 Spurious emission at band edges test results at high carrier frequency, 20 MHz EBW**

| | |
|---|---|
| OPERATING FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 150 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |



| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

## 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 |

* - 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

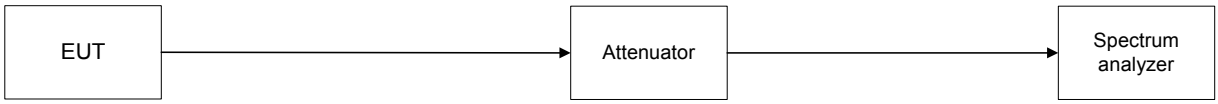
### 7.4.2 Test procedure

**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 associated plots.

**Figure 7.4.1 Spurious emission test setup, single output**



| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.4.2 Spurious emission test results**

ASSIGNED FREQUENCY RANGE: 2496 – 2690 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 27000 MHz
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATION: 64QAM
MODULATING SIGNAL: PRBS
BIT RATE: 75.0Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
TESTED RF CHAIN: RF#1

| Frequency, MHz | SA reading, dBm | Attenuation, dB | Detector used | RBW, kHz | Spurious emission, dBm | Limit, dBm | Margin, dB* | Verdict |
|---|---|---|---|---|---|---|---|---|
| **Low carrier frequency** | | | | | | | | |
| 999.88 | -46.98 | included | Peak | 100 | -46.98 | -13.00 | -33.98 | Pass |
| 1665.00 | -39.39 | included | Peak | 1000 | -39.39 | -13.00 | -26.39 | Pass |
| 2479.04 | -41.10 | included | Average | 1000 | -41.10 | -13.00 | -28.10 | Pass |
| 2522.00 | -22.59 | included | Average | 1000 | -22.59 | -13.00 | -9.59 | Pass |
| 6973.00 | -35.07 | included | Peak | 1000 | -35.07 | -13.00 | -22.07 | Pass |
| 14125.00 | -32.27 | included | Peak | 1000 | -32.27 | -13.00 | -19.27 | Pass |
| 20575.40 | -35.67 | included | Peak | 1000 | -35.67 | -13.00 | -22.67 | Pass |
| 26710.90 | -31.69 | included | Peak | 1000 | -31.69 | -13.00 | -18.69 | Pass |
| **Mid carrier frequency** | | | | | | | | |
| 776.30 | -47.55 | included | Peak | 100 | -47.55 | -13.00 | -34.55 | Pass |
| 1466.00 | -39.23 | included | Peak | 1000 | -39.23 | -13.00 | -26.23 | Pass |
| 2574.00 | -19.07 | included | Average | 1000 | -19.07 | -13.00 | -6.07 | Pass |
| 2616.40 | -24.33 | included | Average | 1000 | -24.33 | -13.00 | -11.33 | Pass |
| 6959.30 | -34.79 | included | Peak | 1000 | -34.79 | -13.00 | -21.79 | Pass |
| 14105.00 | -31.98 | included | Peak | 1000 | -31.98 | -13.00 | -18.98 | Pass |
| 22791.80 | -35.96 | included | Peak | 1000 | -35.96 | -13.00 | -22.96 | Pass |
| 26666.50 | -32.74 | included | Peak | 1000 | -32.74 | -13.00 | -19.74 | Pass |
| **High carrier frequency** | | | | | | | | |
| 271.46 | -47.76 | included | Peak | 100 | -47.76 | -13.00 | -34.76 | Pass |
| 1661.00 | -39.55 | included | Peak | 1000 | -39.55 | -13.00 | -26.55 | Pass |
| 2664.00 | -17.21 | included | Average | 1000 | -17.21 | -13.00 | -4.21 | Pass |
| 2711.00 | -46.46 | included | Average | 1000 | -46.46 | -13.00 | -33.46 | Pass |
| 3027.30 | -34.77 | included | Peak | 1000 | -34.77 | -13.00 | -21.77 | Pass |
| 14139.20 | -32.55 | included | Peak | 1000 | -32.55 | -13.00 | -19.55 | Pass |
| 20776.20 | -35.26 | included | Peak | 1000 | -35.26 | -13.00 | -22.26 | Pass |
| 26775.90 | -31.96 | included | Peak | 1000 | -31.96 | -13.00 | -18.96 | Pass |

| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.4.2 Spurious emission test results (continued)**

TESTED RF CHAIN: RF#2

| Frequency, MHz | SA reading, dBm | Attenuation, dB | Detector used | RBW, kHz | Spurious emission, dBm | Limit, dBm | Margin, dB* | Verdict |
|---|---|---|---|---|---|---|---|---|
| **Low carrier frequency** | | | | | | | | |
| 443.77 | -47.19 | included | Peak | 100 | -47.19 | -13.00 | -34.19 | Pass |
| 1703.00 | -39.23 | included | Peak | 1000 | -39.23 | -13.00 | -26.23 | Pass |
| 2416.85 | -46.19 | included | Average | 1000 | -46.19 | -13.00 | -33.19 | Pass |
| 2524.90 | -31.03 | included | Average | 1000 | -31.03 | -13.00 | -18.03 | Pass |
| 6854.20 | -35.75 | included | Peak | 1000 | -35.75 | -13.00 | -22.75 | Pass |
| 13925.30 | -31.89 | included | Peak | 1000 | -31.89 | -13.00 | -18.89 | Pass |
| 22399.30 | -34.91 | included | Peak | 1000 | -34.91 | -13.00 | -21.91 | Pass |
| 26702.60 | -31.75 | included | Peak | 1000 | -31.75 | -13.00 | -18.75 | Pass |
| **Mid carrier frequency** | | | | | | | | |
| 339.91 | -47.71 | included | Peak | 100 | -47.71 | -13.00 | -34.71 | Pass |
| 1757.00 | -39.42 | included | Peak | 1000 | -39.42 | -13.00 | -26.42 | Pass |
| 2572.85 | -22.67 | included | Average | 1000 | -22.67 | -13.00 | -9.67 | Pass |
| 2617.90 | -27.41 | included | Average | 1000 | -27.41 | -13.00 | -14.41 | Pass |
| 7633.60 | -35.53 | included | Peak | 1000 | -35.53 | -13.00 | -22.53 | Pass |
| 13954.60 | -31.22 | included | Peak | 1000 | -31.22 | -13.00 | -18.22 | Pass |
| 22533.00 | -36.14 | included | Peak | 1000 | -36.14 | -13.00 | -23.14 | Pass |
| 26767.10 | -32.61 | included | Peak | 1000 | -32.61 | -13.00 | -19.61 | Pass |
| **High carrier frequency** | | | | | | | | |
| 331.27 | -47.32 | included | Peak | 100 | -47.32 | -13.00 | -34.32 | Pass |
| 1408.00 | -39.46 | included | Peak | 1000 | -39.46 | -13.00 | -26.46 | Pass |
| 2663.70 | -21.07 | included | Average | 1000 | -21.07 | -13.00 | -8.07 | Pass |
| 2706.00 | -46.89 | included | Average | 1000 | -46.89 | -13.00 | -33.89 | Pass |
| 6822.60 | -35.72 | included | Peak | 1000 | -35.72 | -13.00 | -22.72 | Pass |
| 13894.00 | -31.91 | included | Peak | 1000 | -31.91 | -13.00 | -18.91 | Pass |
| 20740.80 | -35.98 | included | Peak | 1000 | -35.98 | -13.00 | -22.98 | Pass |
| 26753.90 | -32.38 | included | Peak | 1000 | -32.38 | -13.00 | -19.38 | Pass |

*****- Margin = Spurious emission – specification limit.

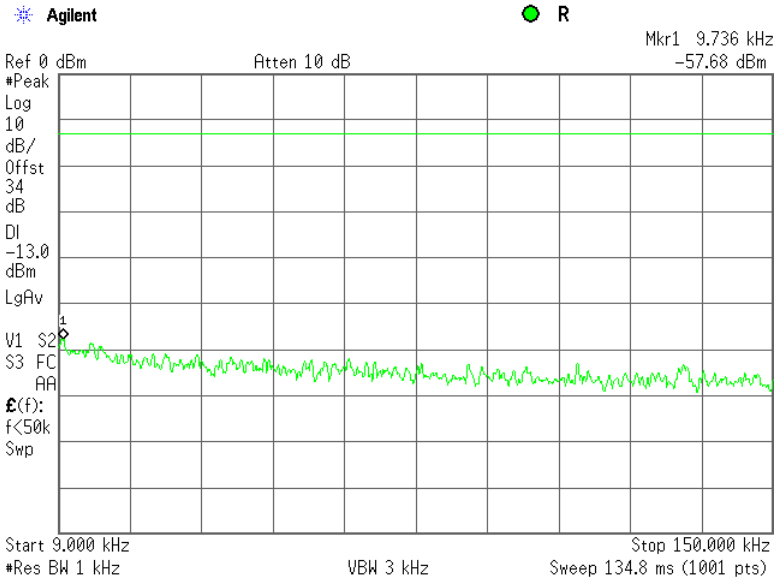
**Reference numbers of test equipment used**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HL 3455 | HL 3818 | HL 3901 | HL 4229 | HL 4234 | HL 4273 | | |

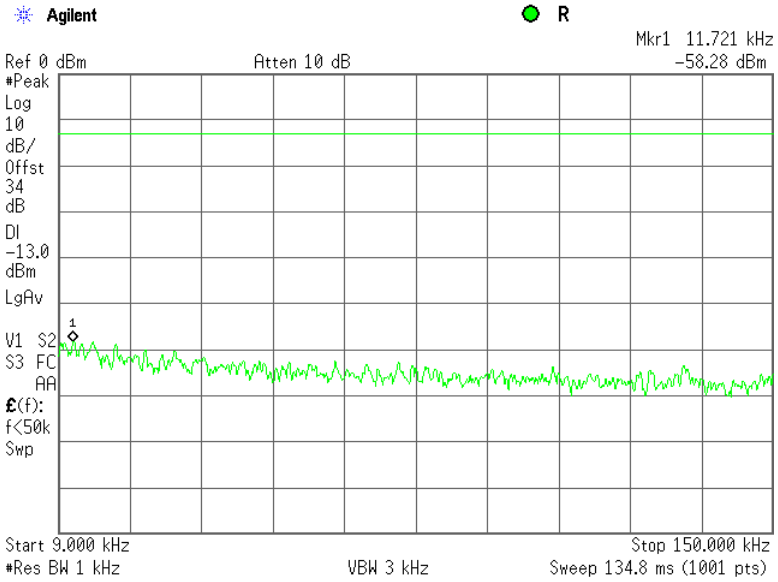
Full description is given in Appendix A.

| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency, RF#1**

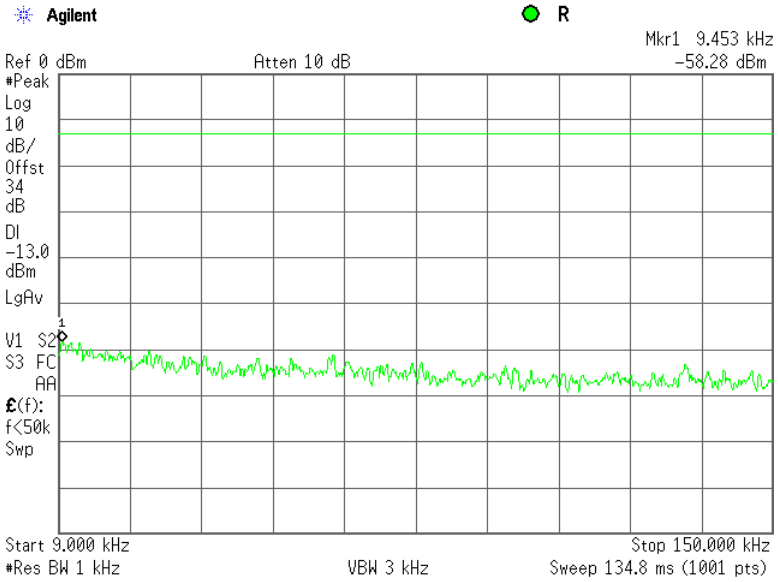



**Plot 7.4.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency, RF#1**

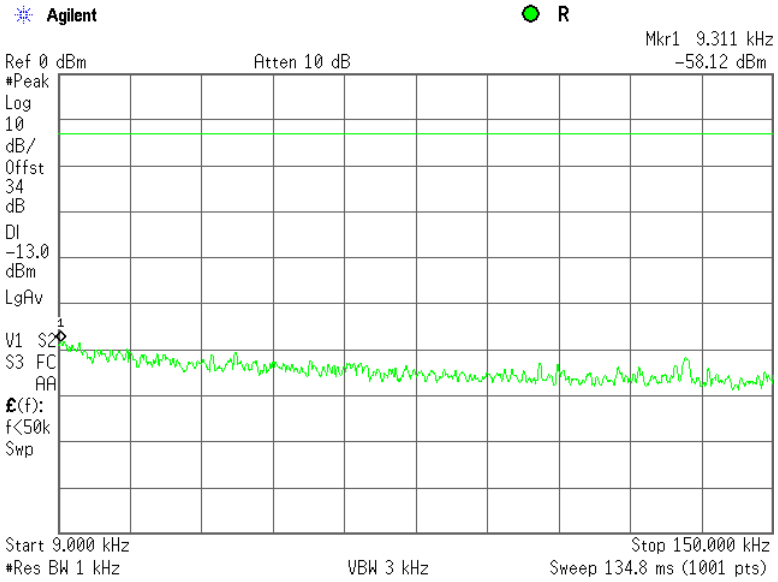


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency, RF#1**

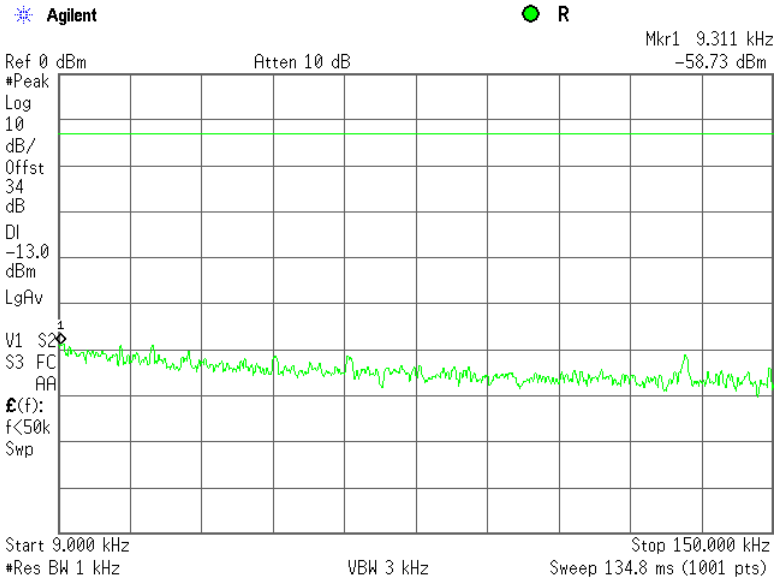



**Plot 7.4.4 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency, RF#2**

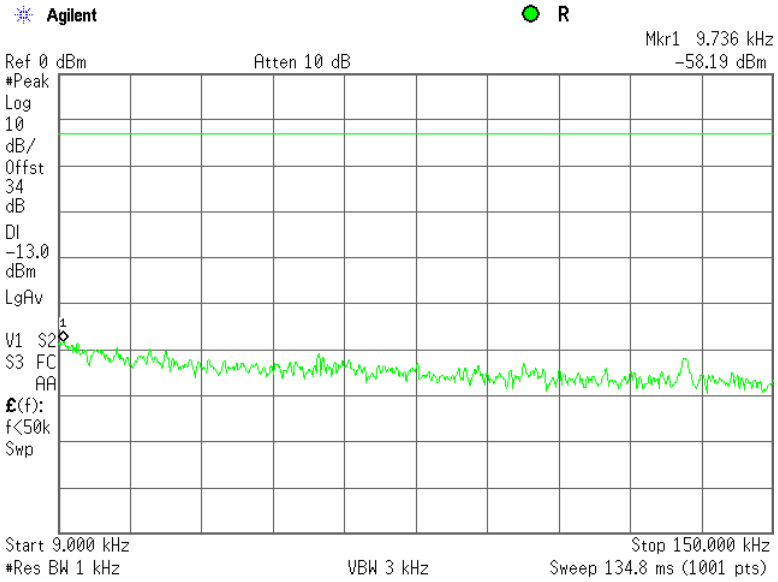


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.5 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency, RF#2**

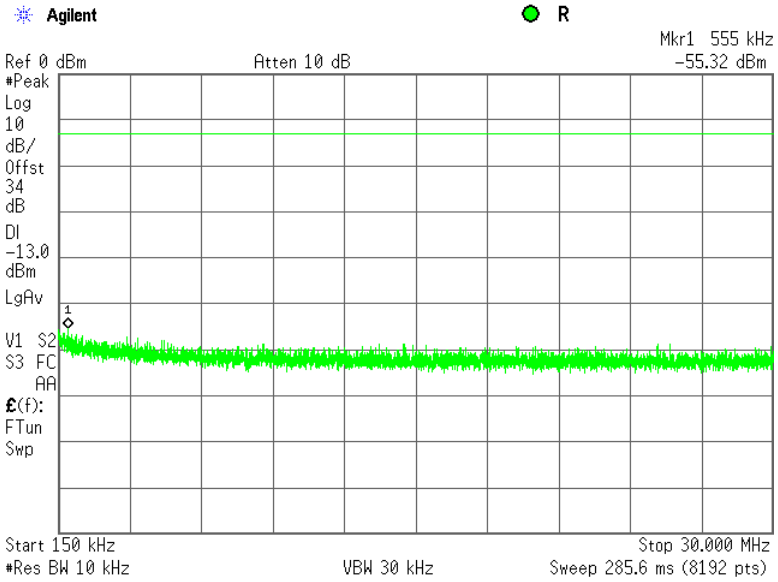



**Plot 7.4.6 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency, RF#2**

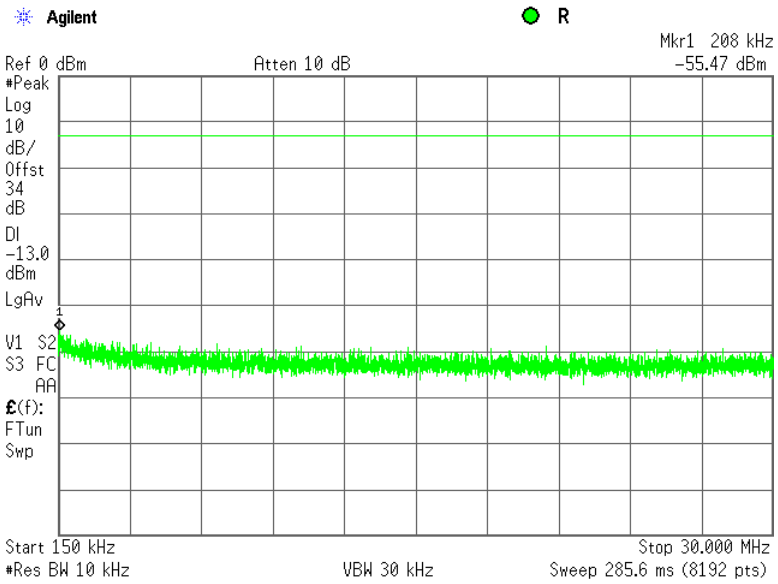


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.7 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency, #RF1**

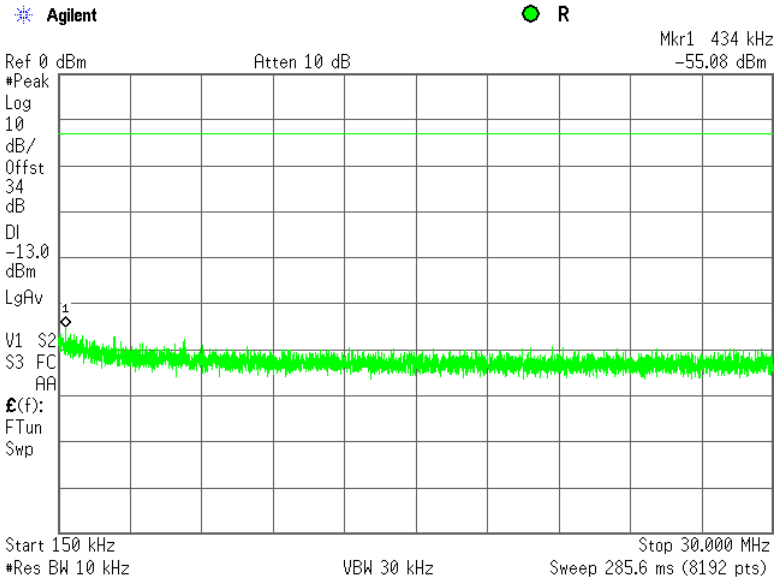



**Plot 7.4.8 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency, #RF1**

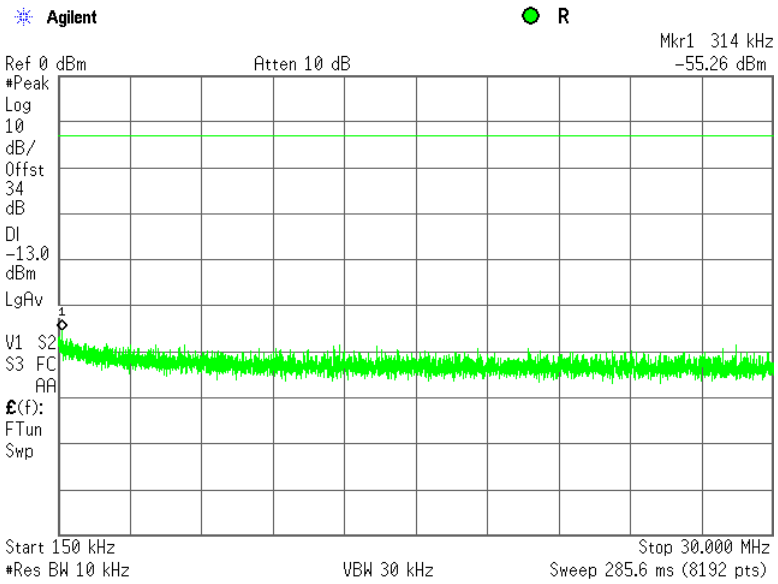


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.9 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency, #RF1**

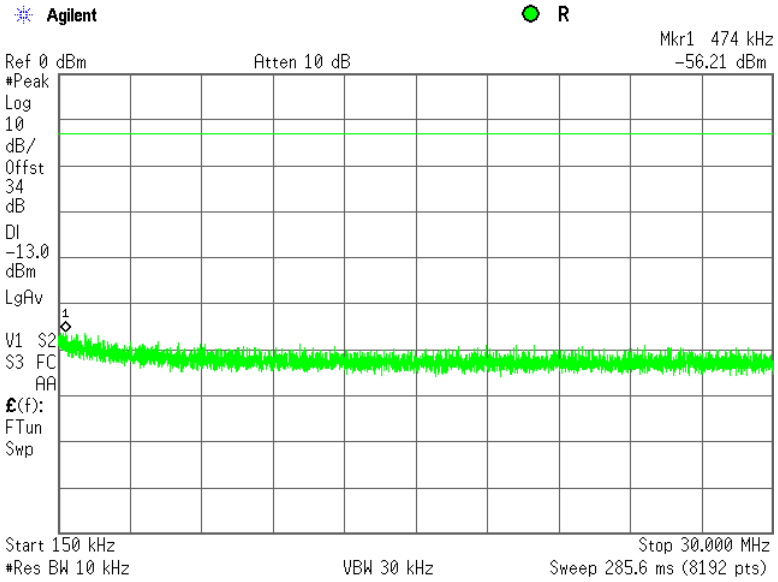



**Plot 7.4.10 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency, #RF2**

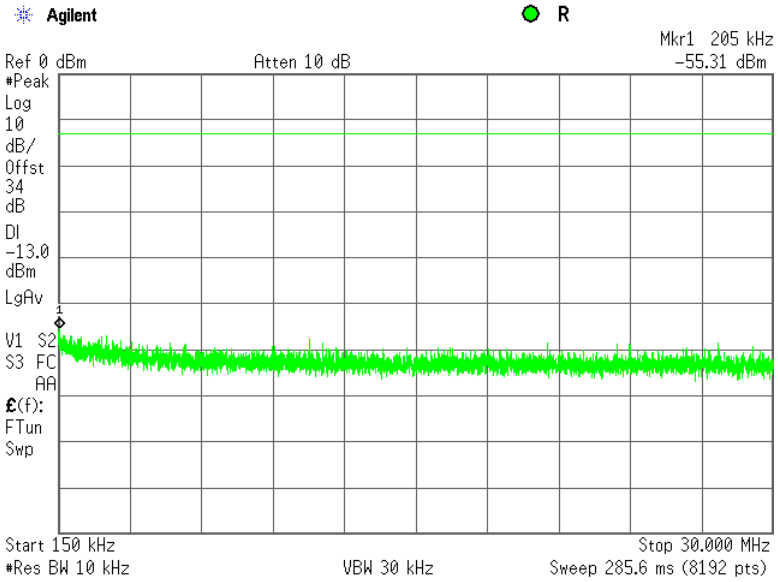


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.11 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency, #RF2**

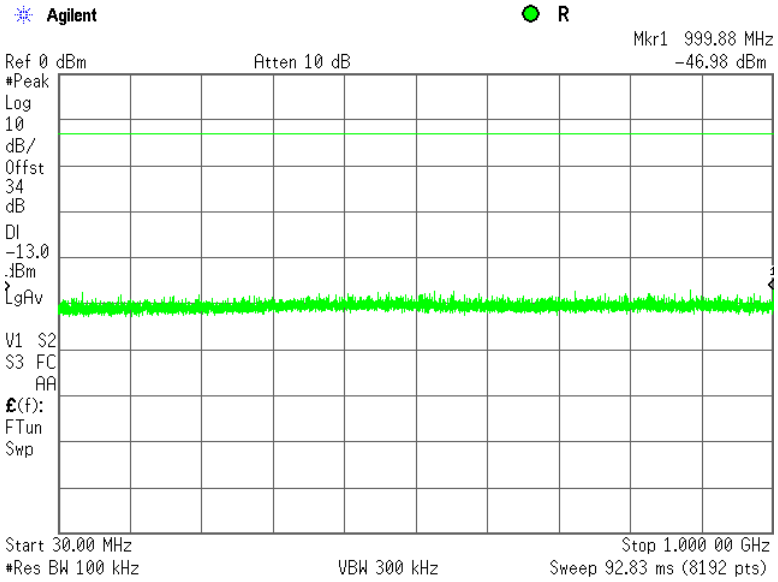



**Plot 7.4.12 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency, #RF2**

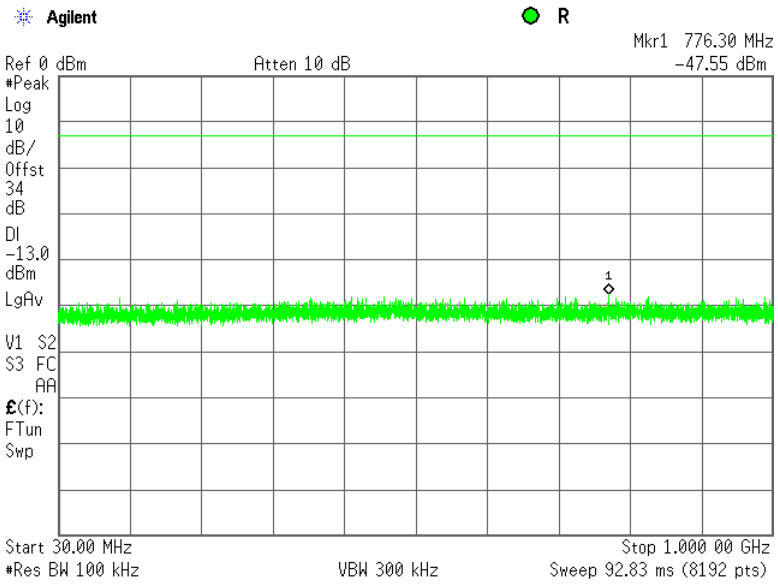


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.13 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency, #RF1**

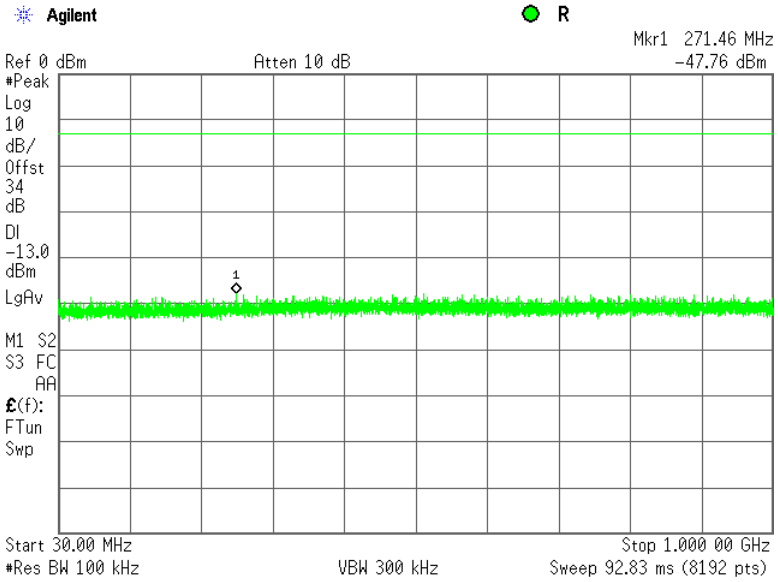



**Plot 7.4.14 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency, #RF1**

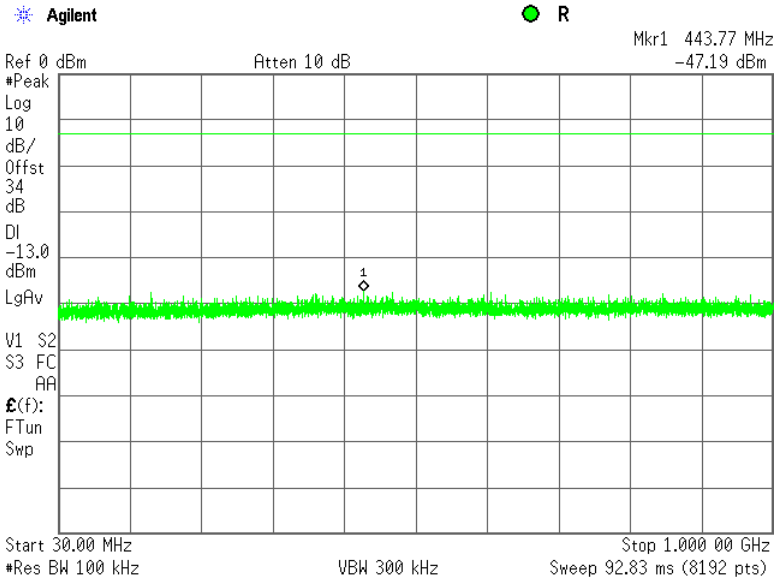


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.15 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency, #RF1**

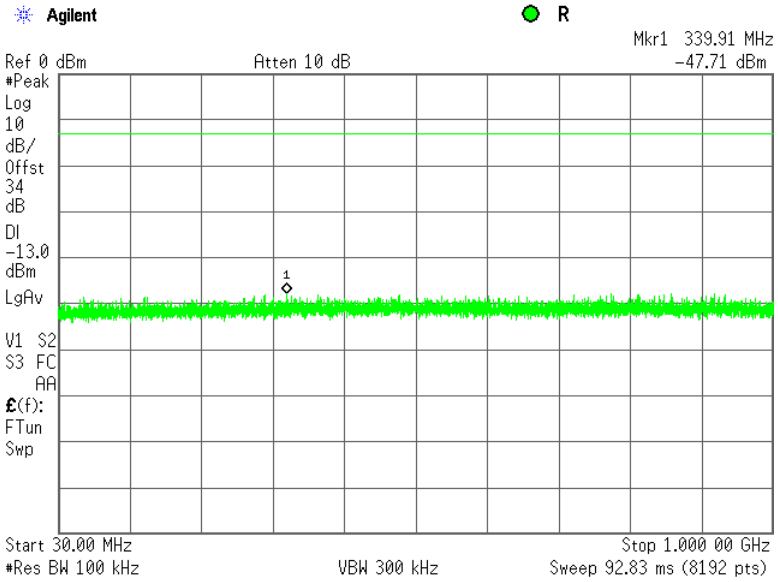



**Plot 7.4.16 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency, #RF2**

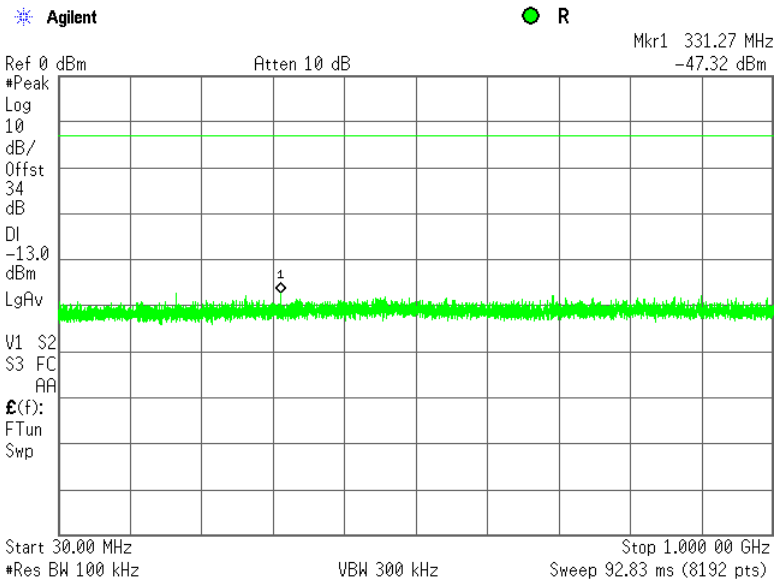


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.17 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency, #RF2**

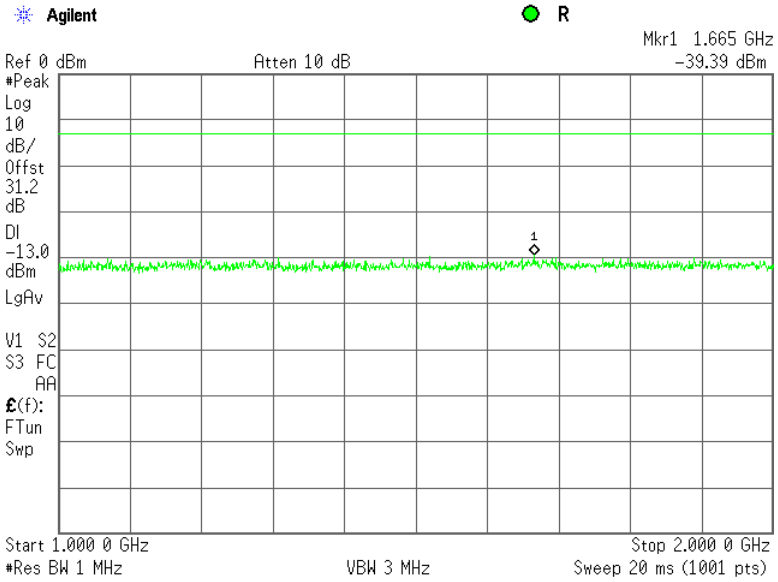



**Plot 7.4.18 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency, #RF2**

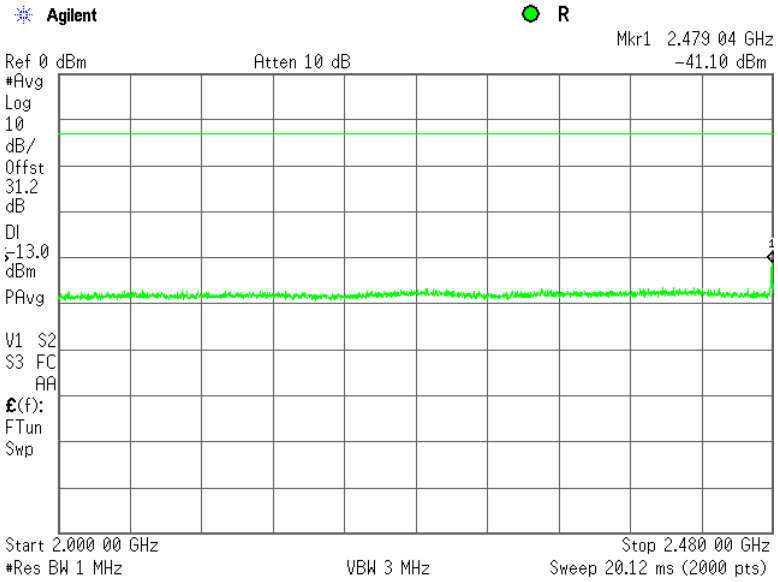


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.19 Spurious emission measurements in 1000 – 2000 MHz range at low carrier frequency, #RF1**



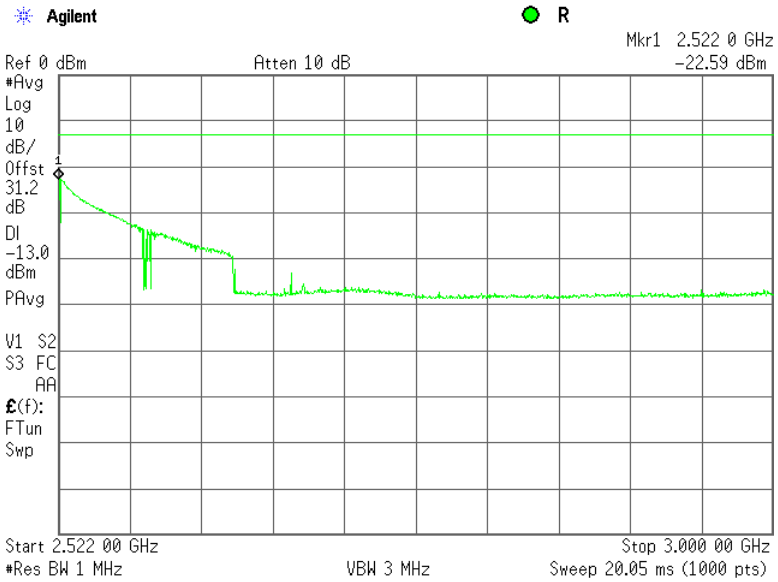

**Plot 7.4.20 Spurious emission measurements in 2000 – 2480 MHz range at low carrier frequency, #RF1**




NOTE: Average Detector and Max Hold were used.

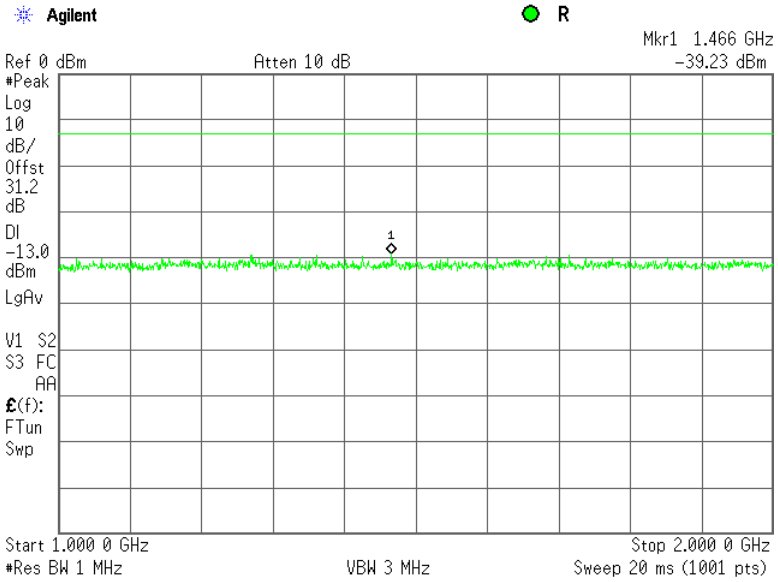
| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.21 Spurious emission measurements in 2522 - 3000 MHz range at low carrier frequency, #RF1**



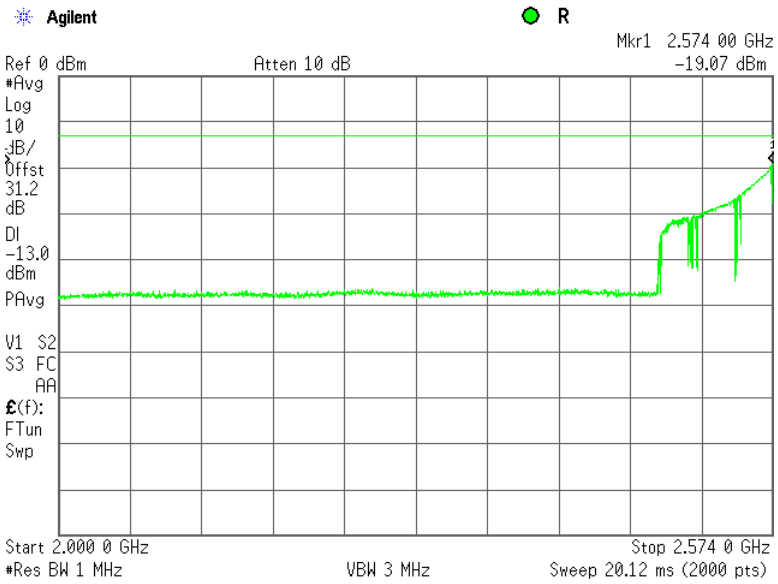

NOTE: Average Detector and Max Hold were used.

**Plot 7.4.22 Spurious emission measurements in 1000 - 2000 MHz range at mid carrier frequency, #RF1**



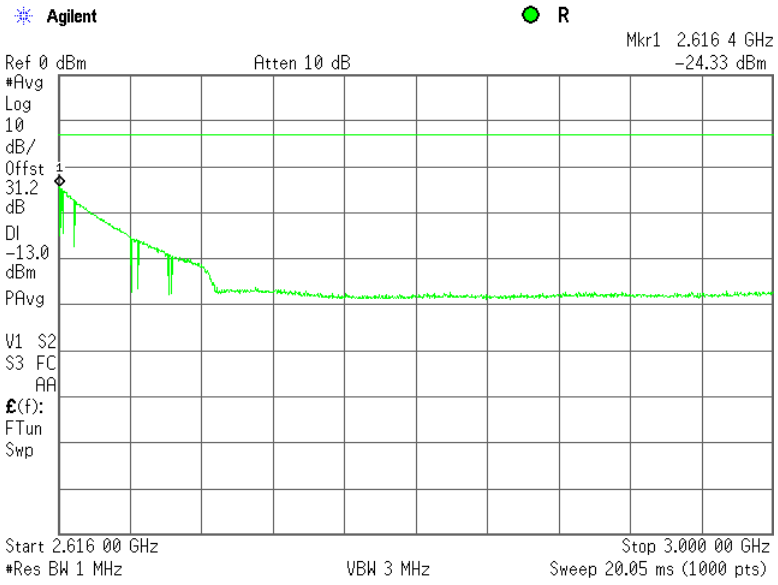
| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.23 Spurious emission measurements in 2000 - 2590 MHz range at mid carrier frequency, #RF1**




NOTE: Average Detector and Max Hold were used.

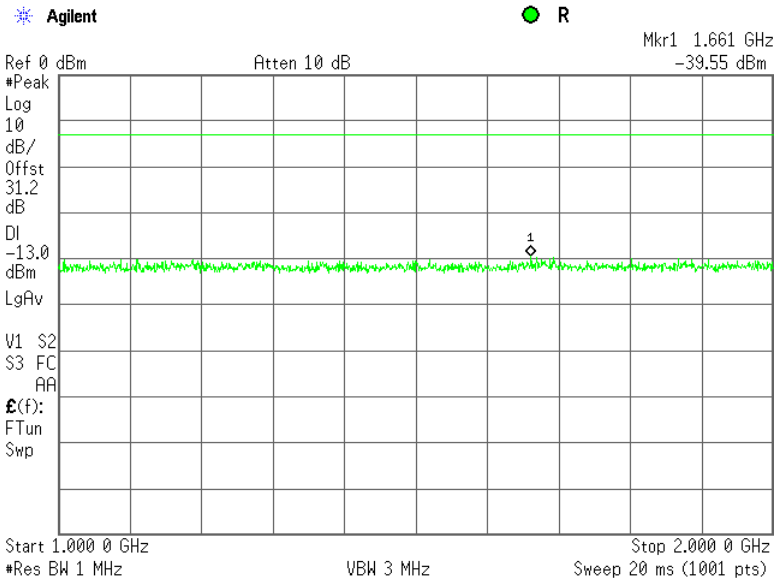
**Plot 7.4.24 Spurious emission measurements in 2616 - 3000 MHz range at mid carrier frequency, #RF1**



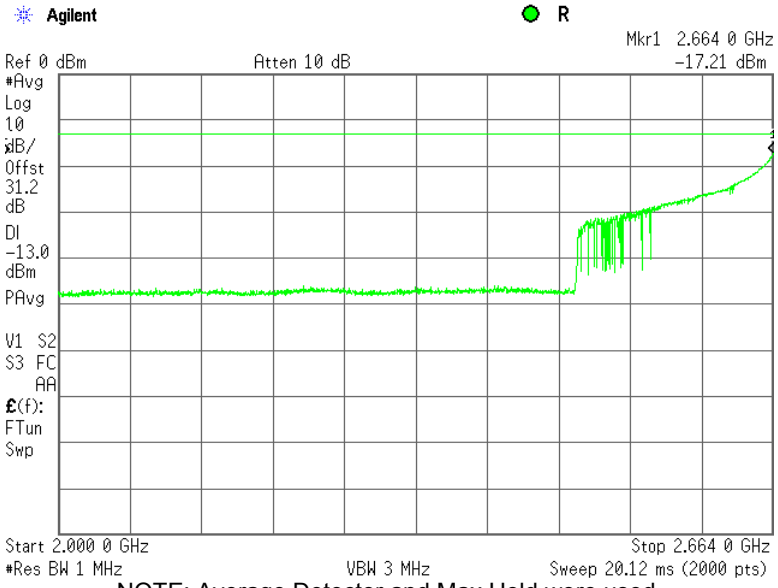

NOTE: Average Detector and Max Hold were used.

| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.25 Spurious emission measurements in 1000 - 2000 MHz at high carrier frequency, #RF1**



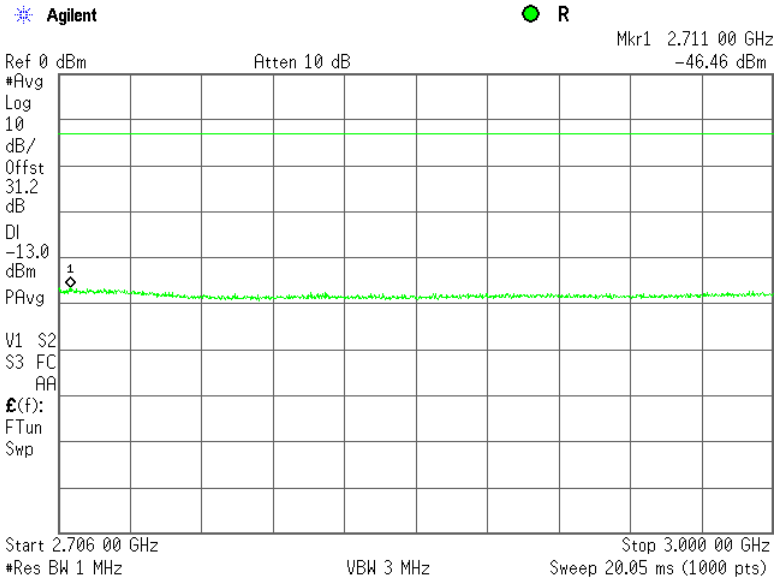

**Plot 7.4.26 Spurious emission measurements in 2000 - 2680 MHz at high carrier frequency, #RF1**




NOTE: Average Detector and Max Hold were used.

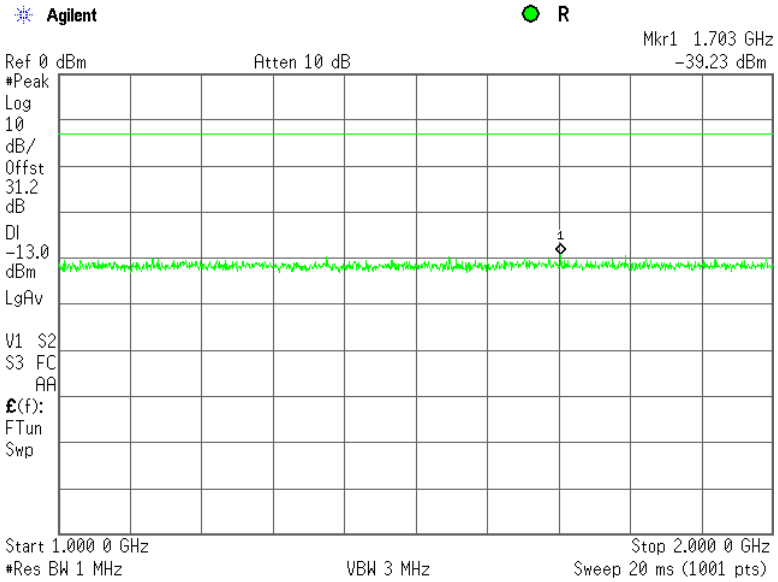
| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.27 Spurious emission measurements in 2706 – 3000 MHz range at high carrier frequency, #RF1**



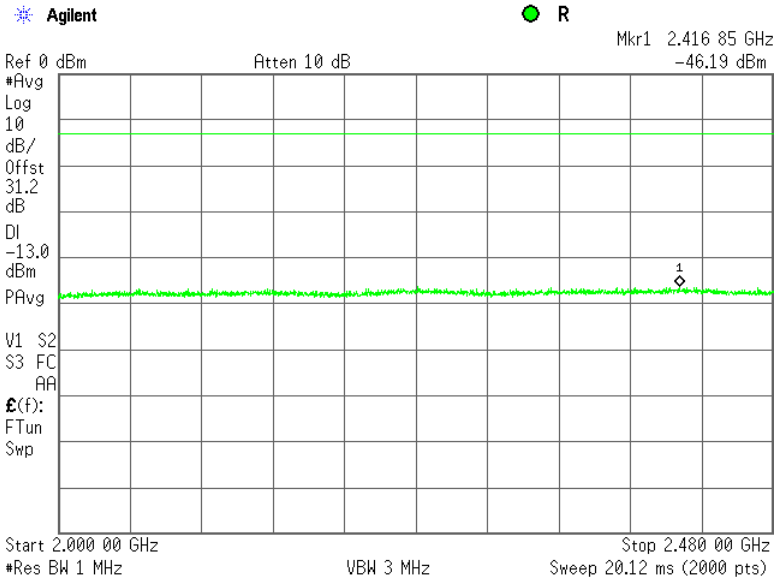

NOTE: Average Detector and Max Hold were used.

**Plot 7.4.28 Spurious emission measurements in 1000 – 2000 MHz range at low carrier frequency, #RF2**



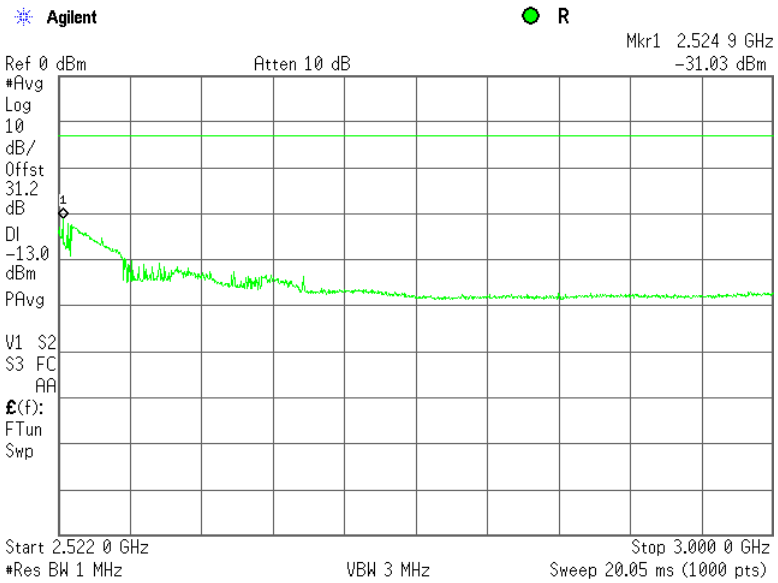
| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.29 Spurious emission measurements in 2000 – 2480 MHz range at low carrier frequency, #RF2**




NOTE: Average Detector and Max Hold were used.

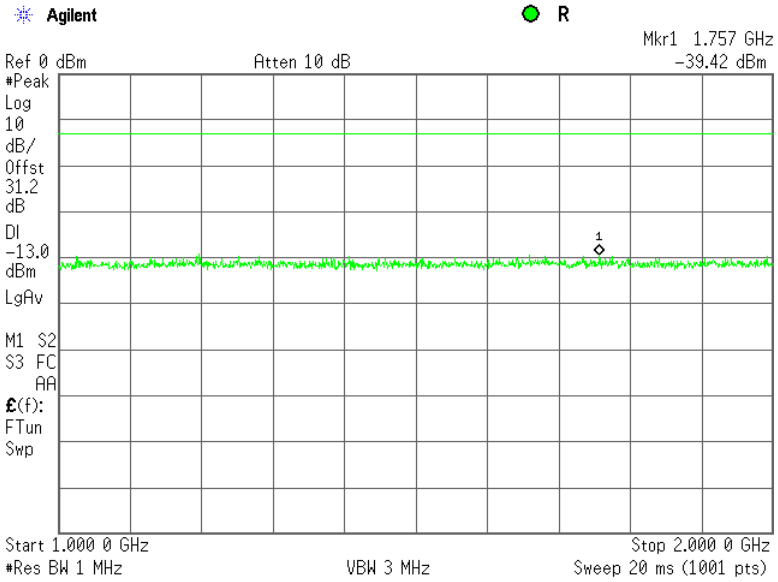
**Plot 7.4.30 Spurious emission measurements in 2522 - 3000 MHz range at low carrier frequency, #RF2**



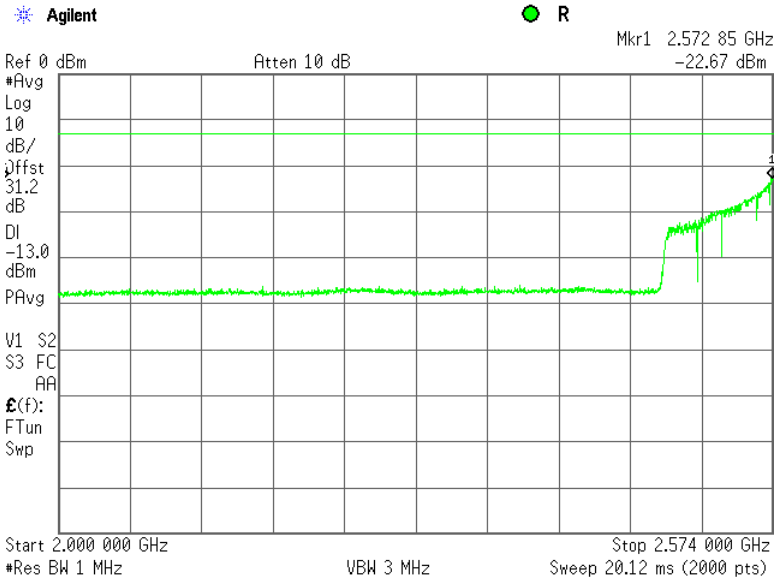

NOTE: Average Detector and Max Hold were used.

| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.31 Spurious emission measurements in 1000 - 2000 MHz range at mid carrier frequency, #RF2**



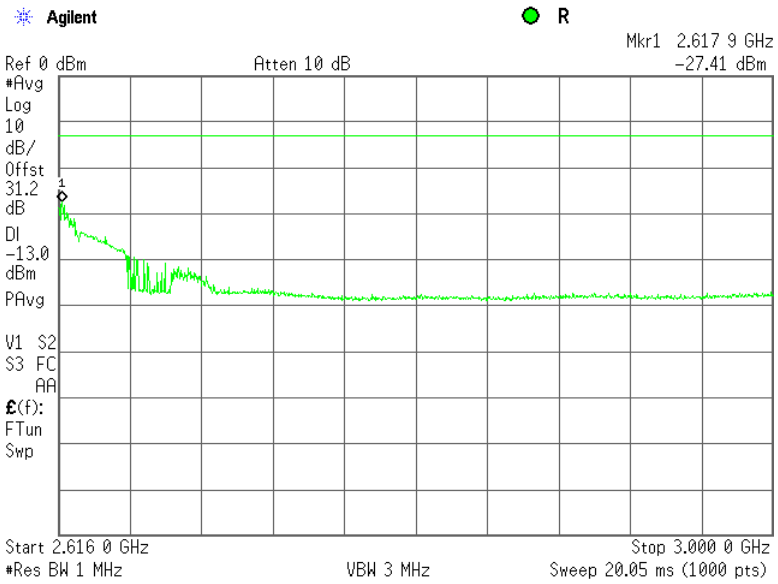

**Plot 7.4.32 Spurious emission measurements in 2000 - 2590 MHz range at mid carrier frequency, #RF2**




NOTE: Average Detector and Max Hold were used.

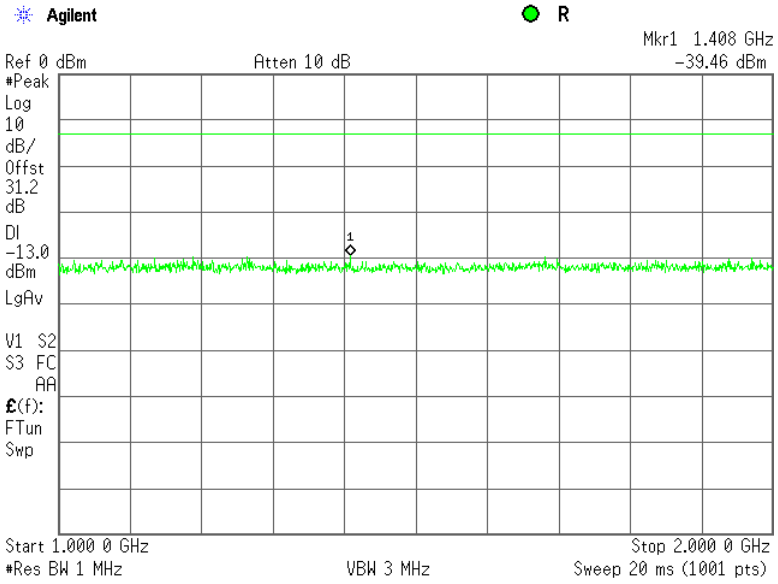
| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.33 Spurious emission measurements in 2616 - 3000 MHz range at mid carrier frequency, #RF2**



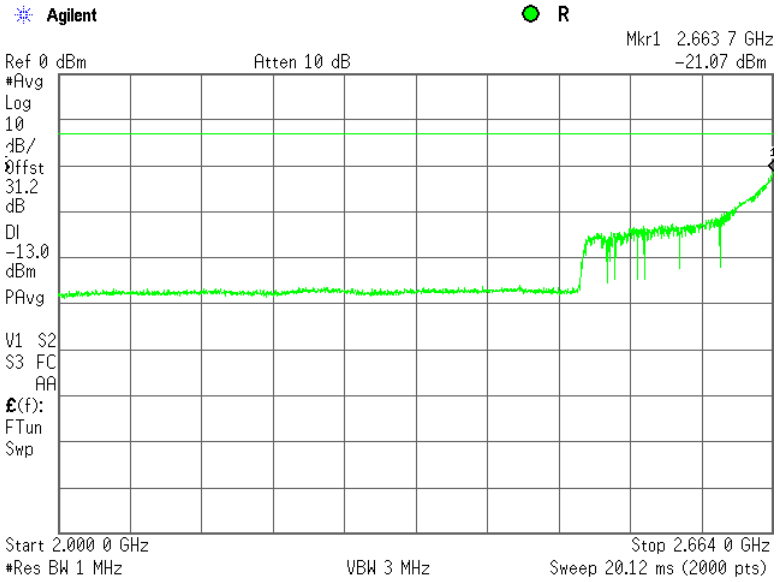

NOTE: Average Detector and Max Hold were used.

**Plot 7.4.34 Spurious emission measurements in 1000 - 2000 MHz at high carrier frequency, #RF2**



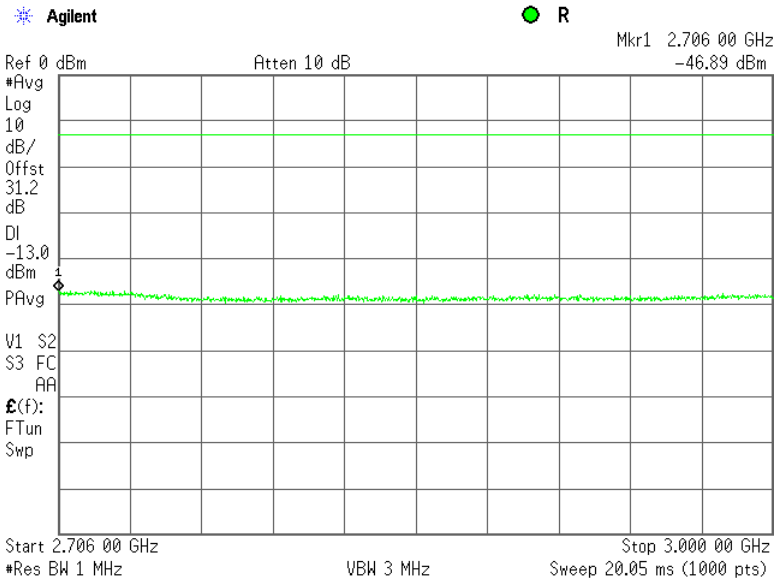
| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.35 Spurious emission measurements in 2000 - 2680 MHz at high carrier frequency, #RF2**




NOTE: Average Detector and Max Hold were used.

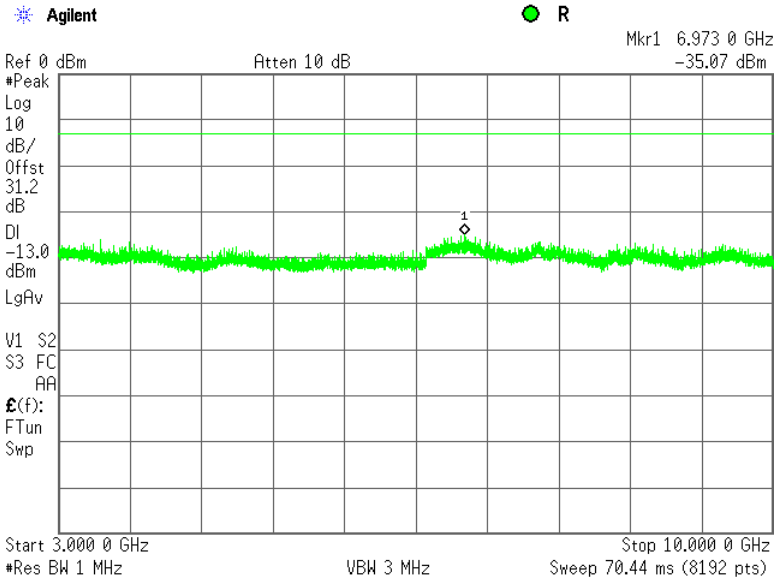
**Plot 7.4.36 Spurious emission measurements in 2706 – 3000 MHz range at high carrier frequency, #RF2**



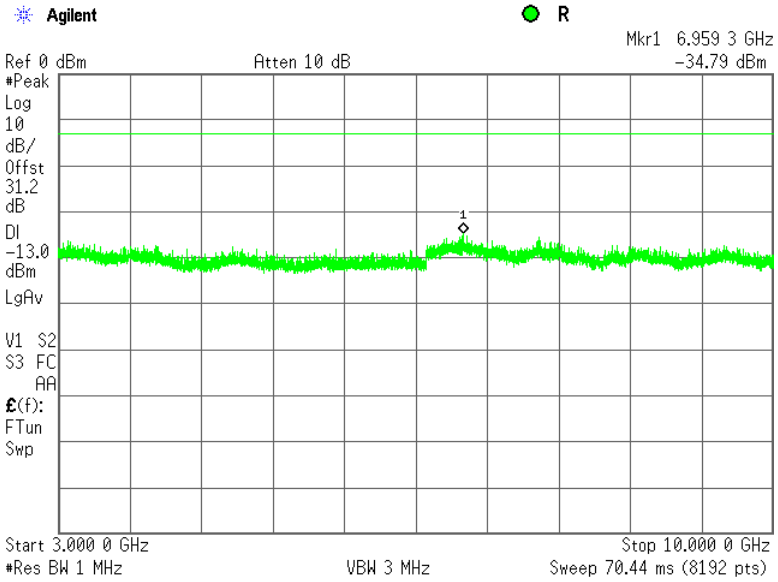

NOTE: Average Detector and Max Hold were used.

| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.37 Spurious emission measurements in 3000 - 10000 MHz range at low carrier frequency, #RF1**

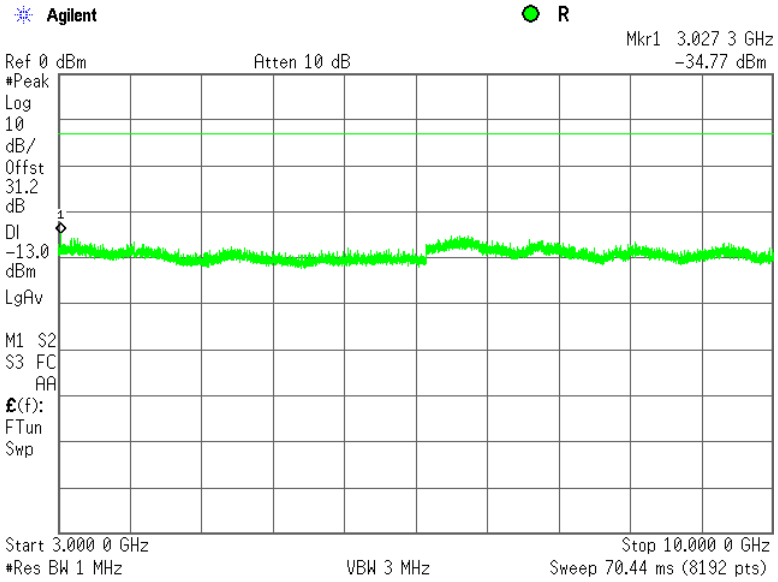



**Plot 7.4.38 Spurious emission measurements in 3000 - 10000 MHz at mid carrier frequency, #RF1**

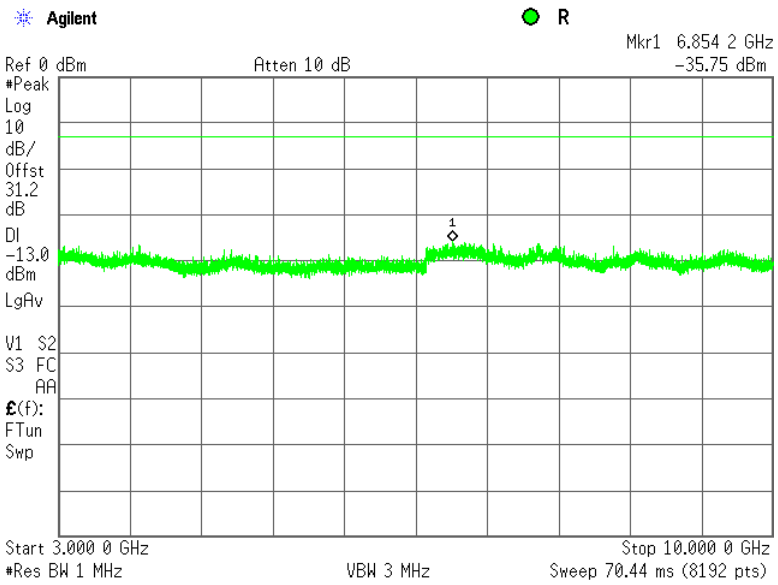


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.39 Spurious emission measurements in 3000 - 10000 MHz at high carrier frequency, #RF1**

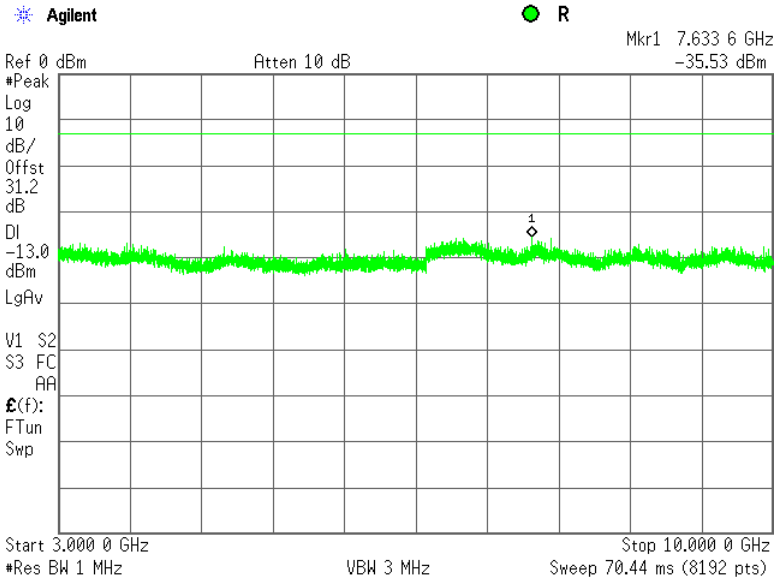



**Plot 7.4.40 Spurious emission measurements in 3000 - 10000 MHz range at low carrier frequency, #RF2**

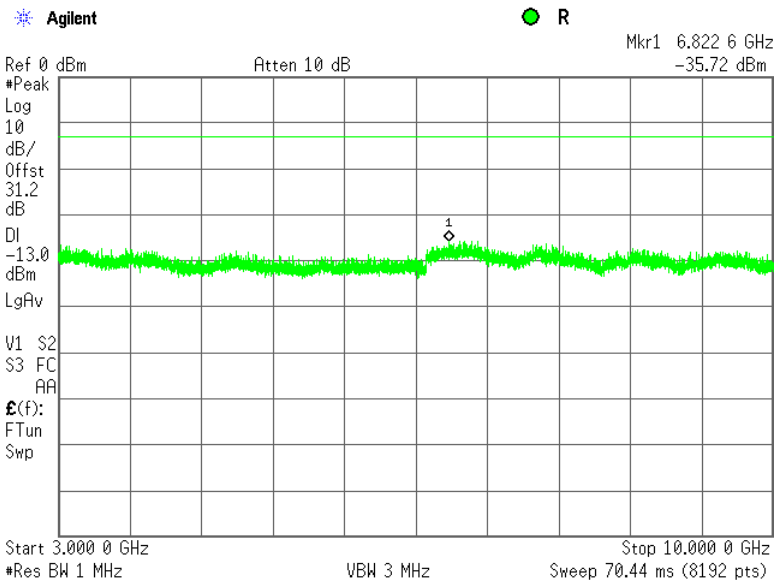


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.41 Spurious emission measurements in 3000 - 10000 MHz at mid carrier frequency, #RF2**

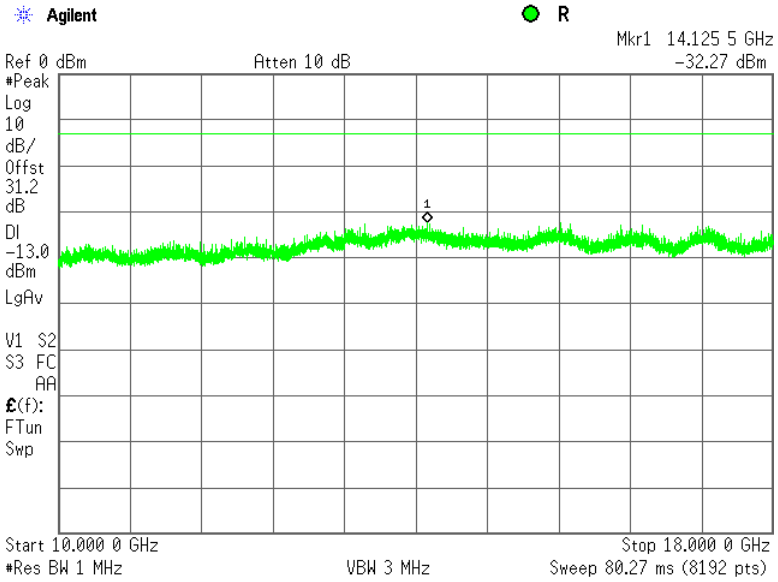



**Plot 7.4.42 Spurious emission measurements in 3000 - 10000 MHz at high carrier frequency, #RF2**

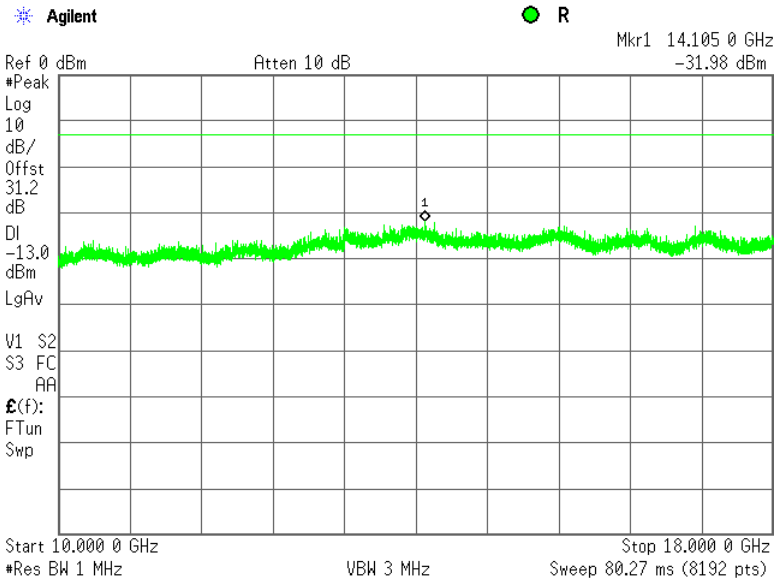


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.43 Spurious emission measurements in 10000 - 18000 MHz range at low carrier frequency, #RF1**

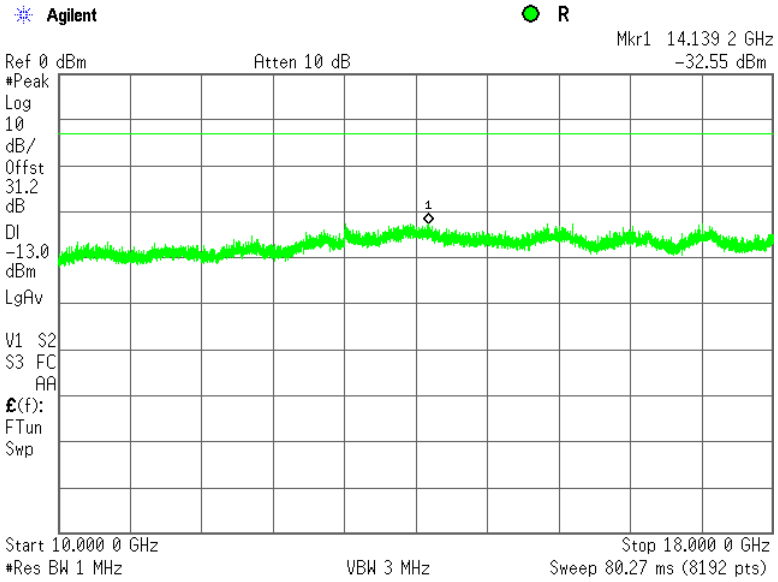



**Plot 7.4.44 Spurious emission measurements in 10000 - 18000 MHz at mid carrier frequency, #RF1**

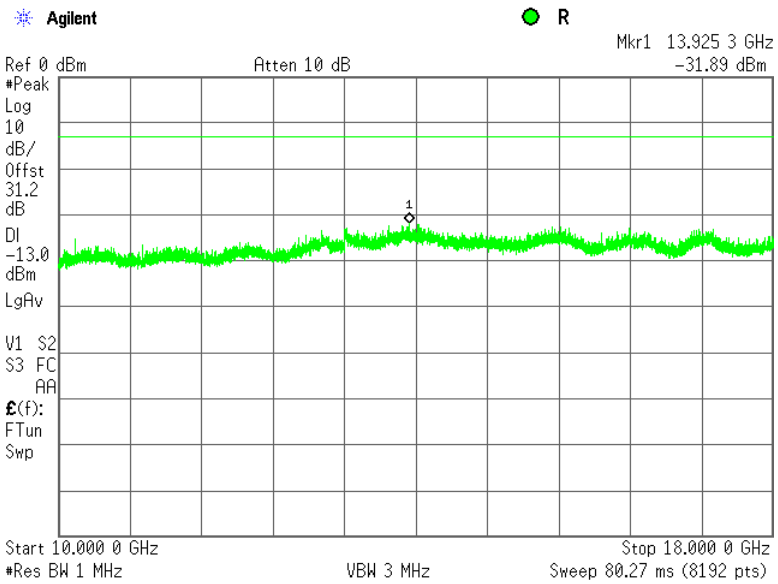


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.45 Spurious emission measurements in 10000 - 18000 MHz at high carrier frequency, #RF1**

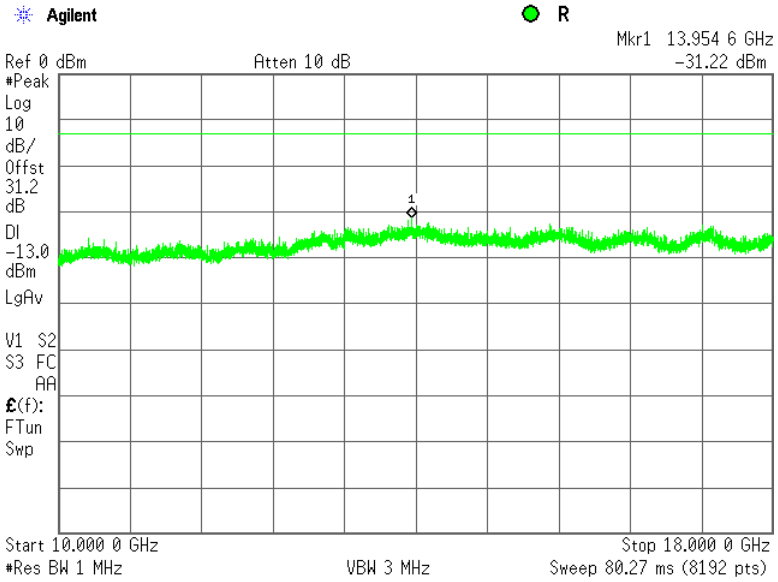



**Plot 7.4.46 Spurious emission measurements in 10000 - 18000 MHz range at low carrier frequency, #RF2**

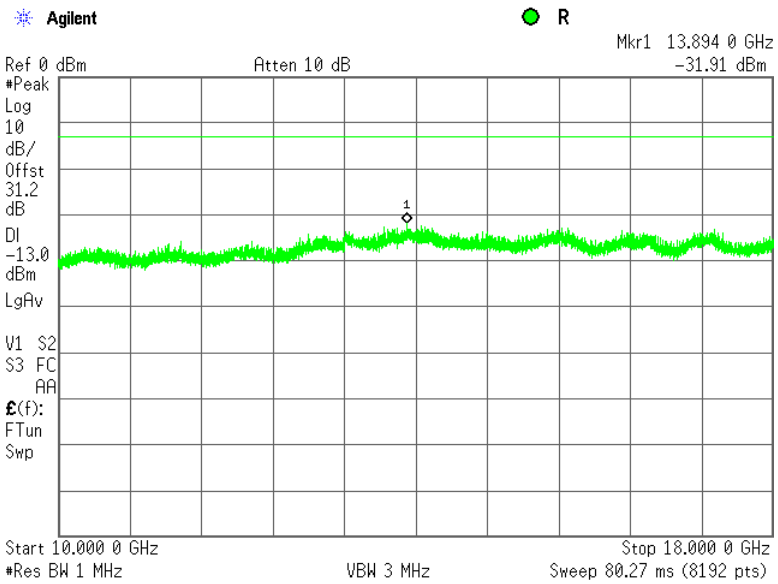


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.47 Spurious emission measurements in 10000 - 18000 MHz at mid carrier frequency, #RF2**

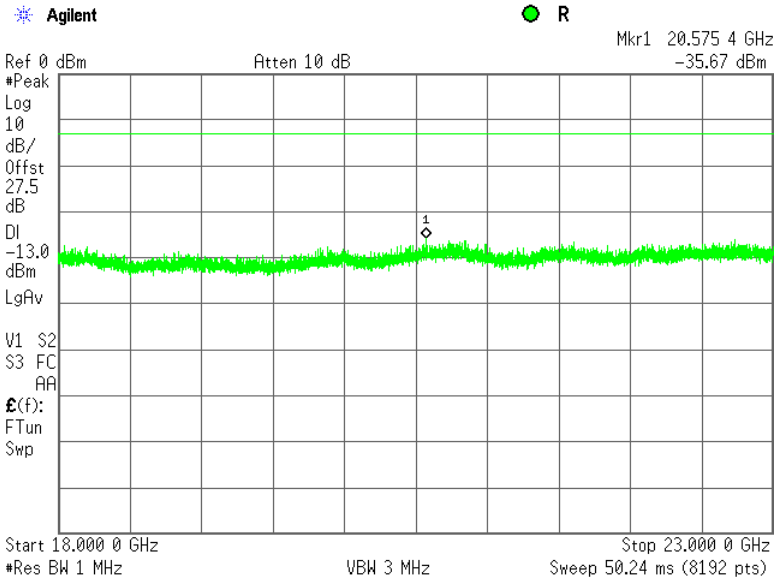



**Plot 7.4.48 Spurious emission measurements in 10000 - 18000 MHz at high carrier frequency, #RF2**

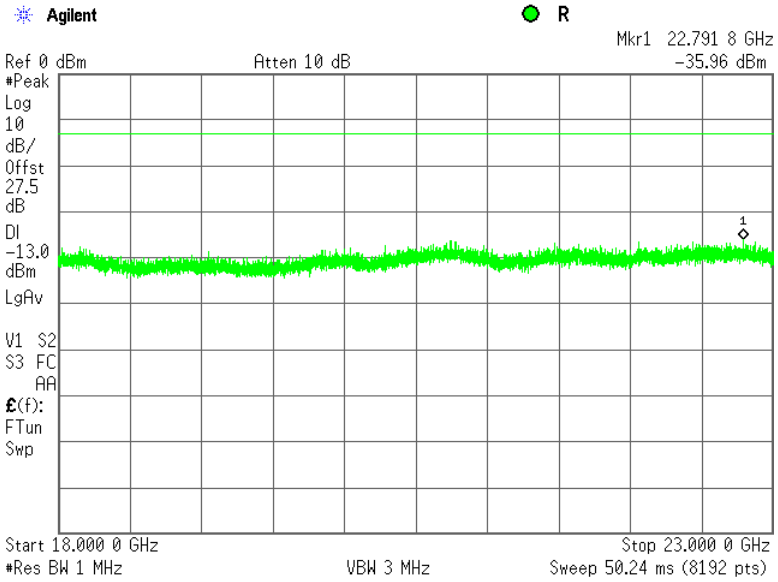


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.49 Spurious emission measurements in 18000 - 23000 MHz range at low carrier frequency, #RF1**

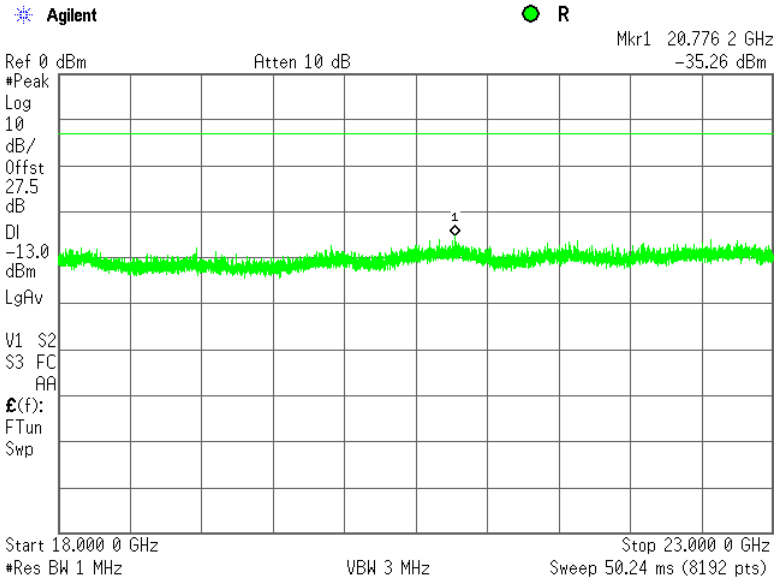



**Plot 7.4.50 Spurious emission measurements in 18000 - 23000 MHz at mid carrier frequency, #RF1**

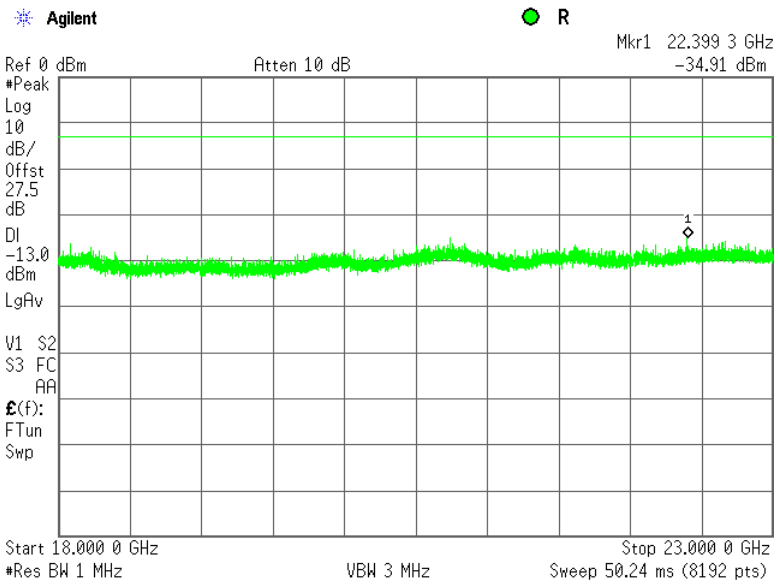


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.51 Spurious emission measurements in 18000 - 23000 MHz at high carrier frequency, #RF1**

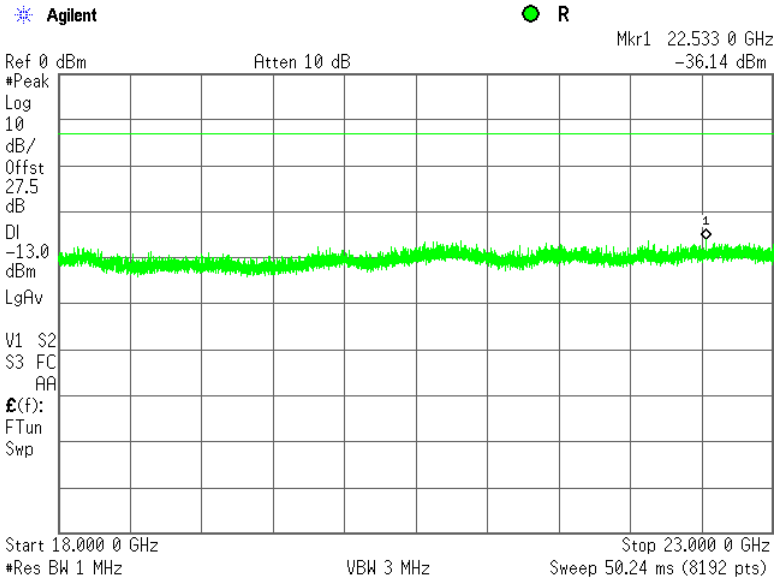



**Plot 7.4.52 Spurious emission measurements in 18000 - 23000 MHz range at low carrier frequency, #RF2**

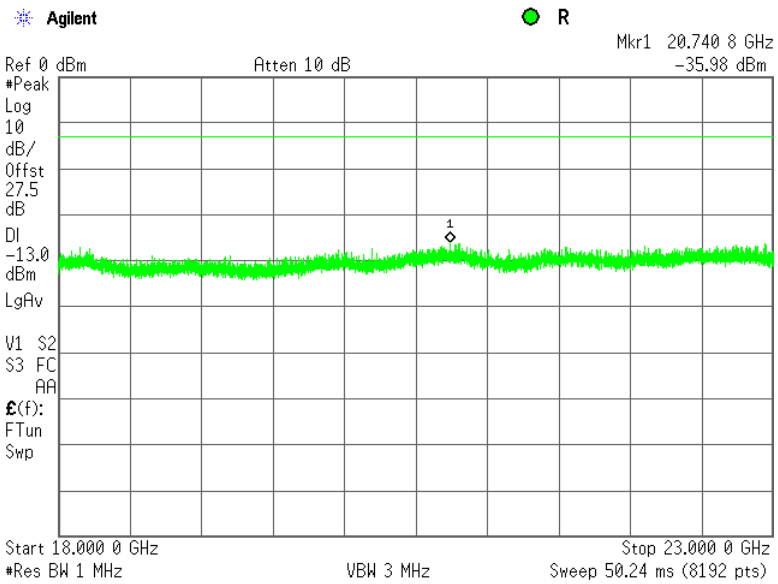


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.53 Spurious emission measurements in 18000 - 23000 MHz at mid carrier frequency, #RF2**

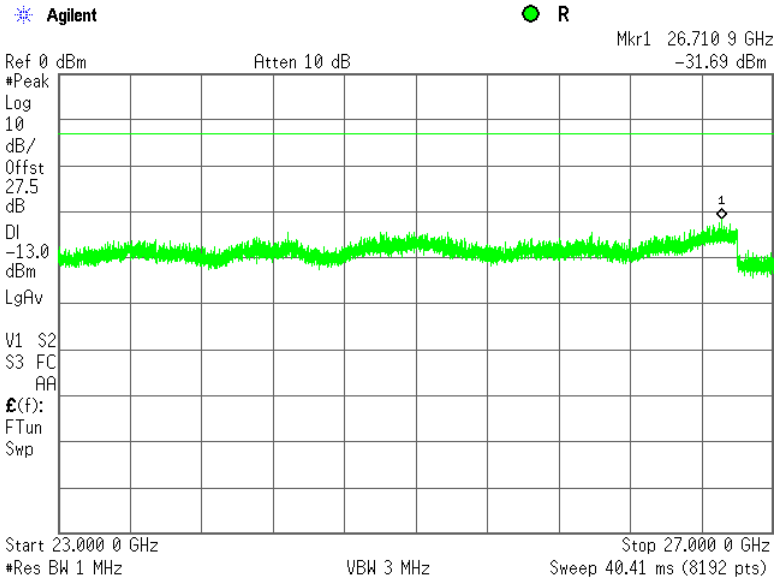



**Plot 7.4.54 Spurious emission measurements in 18000 - 23000 MHz at high carrier frequency, #RF2**

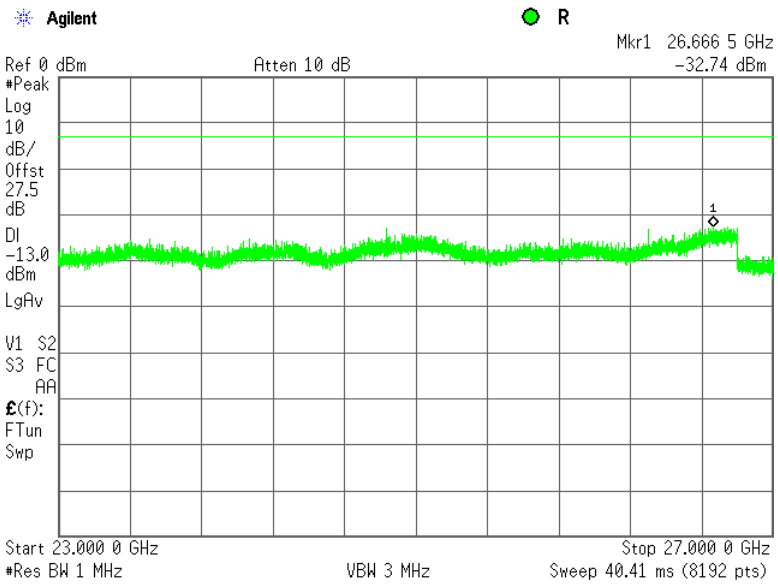


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.55 Spurious emission measurements in 23000 – 27000 MHz range at low carrier frequency, #RF1**

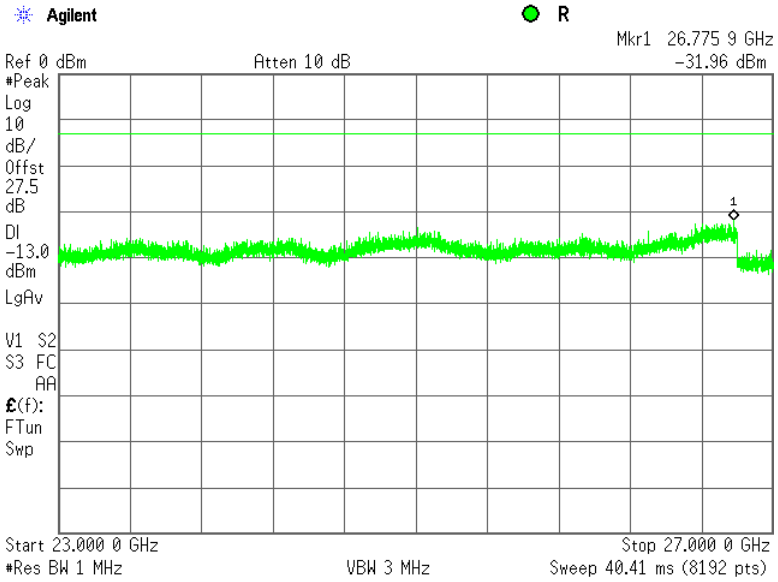



**Plot 7.4.56 Spurious emission measurements in 23000 – 27000 MHz at mid carrier frequency, #RF1**

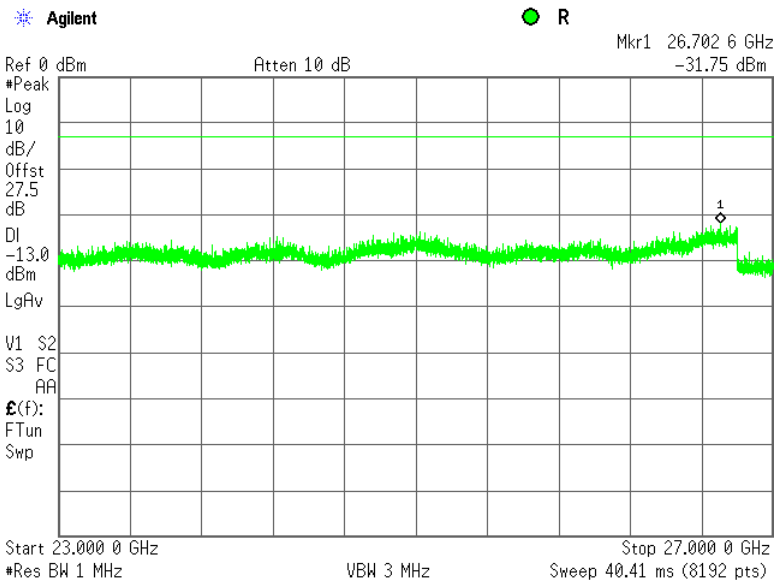


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.57 Spurious emission measurements in 23000 – 27000 MHz at high carrier frequency, #RF1**

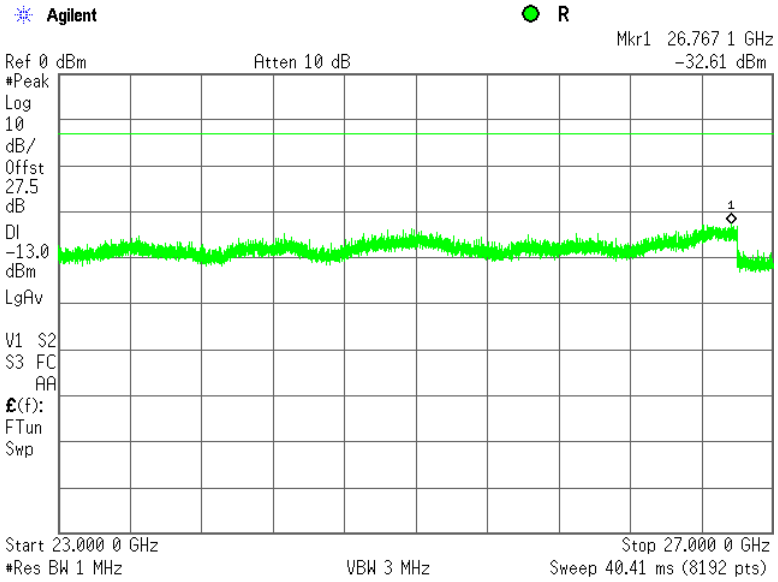



**Plot 7.4.58 Spurious emission measurements in 23000 – 27000 MHz range at low carrier frequency, #RF2**

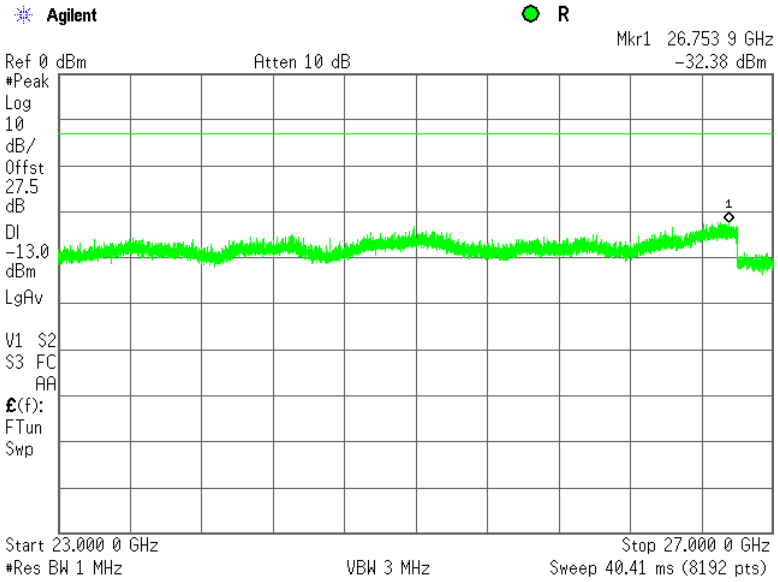


| Test specification: | Section 27.53(m)(2), Spurious emissions at RF antenna connector | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1051, 27.53 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 22 ºC | Air Pressure: 1009 hPa | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.4.59 Spurious emission measurements in 23000 – 27000 MHz at mid carrier frequency, #RF2**




**Plot 7.4.60 Spurious emission measurements in 23000 – 27000 MHz at high carrier frequency, #RF2**



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

## 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 – 10th harmonic* | 43+10logP** fixed | -13 | 84.4 |

* - 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×P×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 $360^0$ and the measuring antenna was rotated around its vertical axis.

**The worst test results (the lowest margins) were recorded in Table 7.5.2**

**7.5.2.3** 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 $360^0$ 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.

| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

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

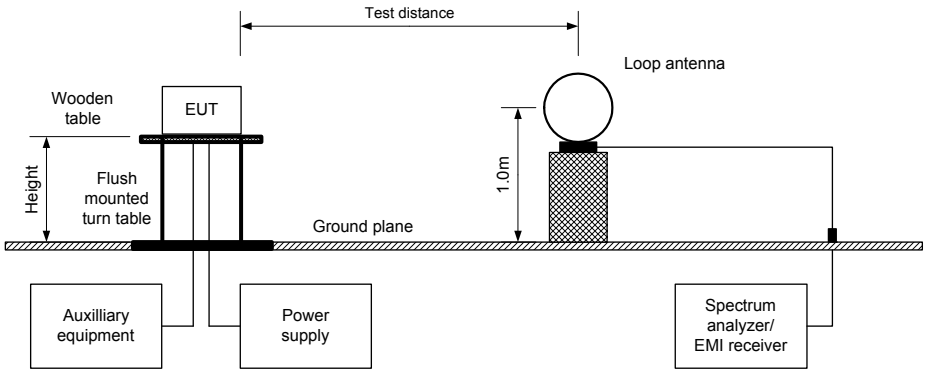
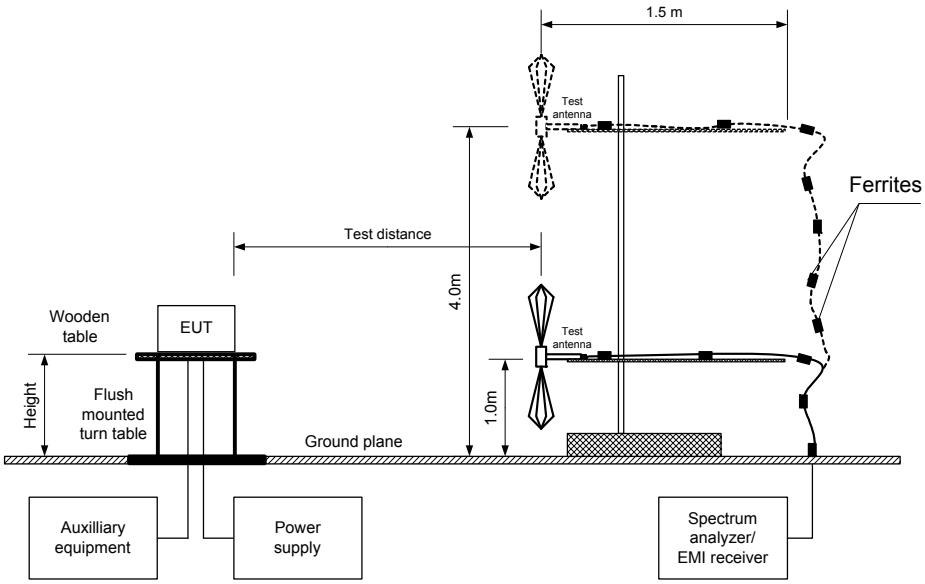



**Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz**



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.5.2 Spurious emission field strength test results**

ASSIGNED FREQUENCY RANGE: 2496-2690 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 27500 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: 64QAM***
MODULATING SIGNAL: PRBS
BANDWIDTH: 10MHz***
BIT RATE: 75.0Mbps***
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 |
|---|---|---|---|---|---|---|---|
| **Low carrier frequency 2501MHz** | | | | | | | |
| No emissions were found | | | | | | | |
| **Mid carrier frequency 2595MHz** | | | | | | | |
| No emissions were found | | | | | | | |
| **High carrier frequency 2690MHz** | | | | | | | |
| No emissions were found | | | | | | | |

*****- Margin = Field strength of spurious – calculated field strength limit.
******- EUT front panel refers to 0 degrees position of turntable.
***- Maximum = Highest Output Power and Power Density EUT settings.

**Reference numbers of test equipment used**

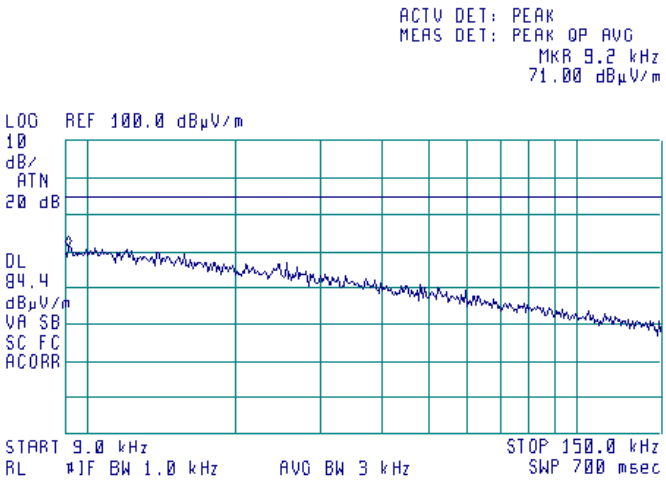
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HL 0446 | HL 0521 | HL 0604 | HL 0768 | HL 0769 | HL 1984 | HL 2780 | HL 2871 |
| HL 3535 | HL 3818 | HL 3901 | HL 4114 | HL 4150 | HL 4353 | | |

Full description is given in Appendix A.

| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

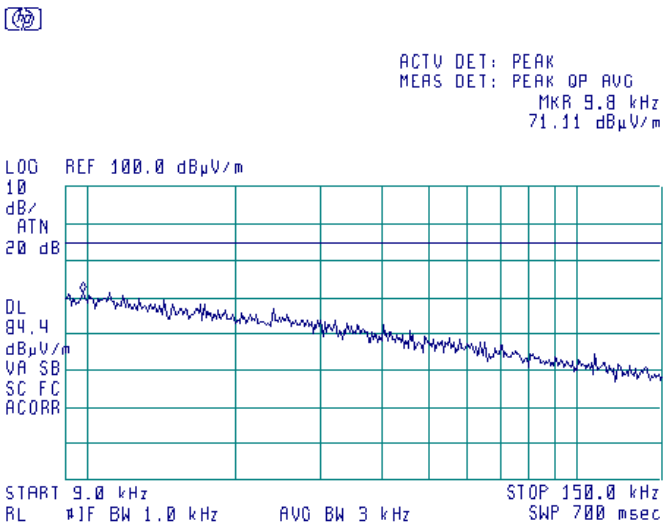
**Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range**

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m




**Plot 7.5.2 Radiated emission measurements in 9 - 150 kHz range**

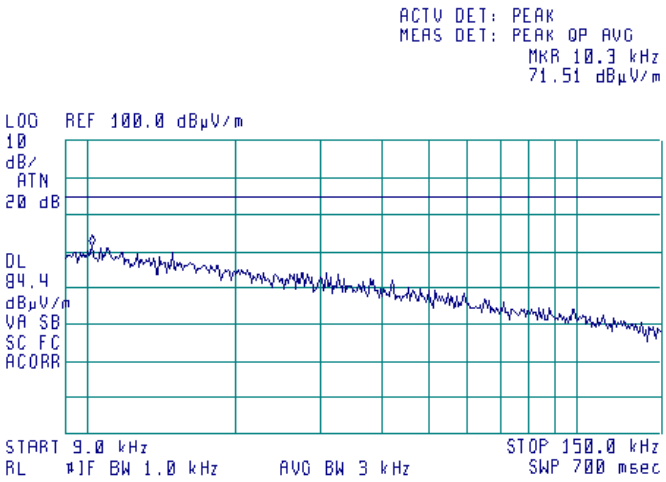
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

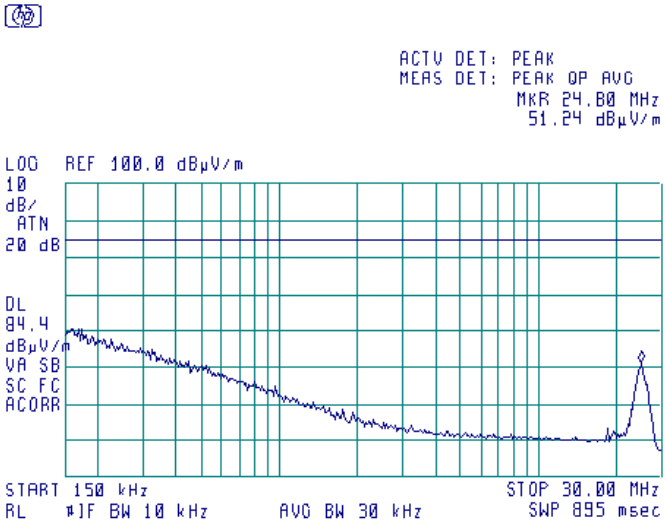
**Plot 7.5.3 Radiated emission measurements in 9 - 150 kHz range**

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m




**Plot 7.5.4 Radiated emission measurements in 0.15 - 30 MHz range**

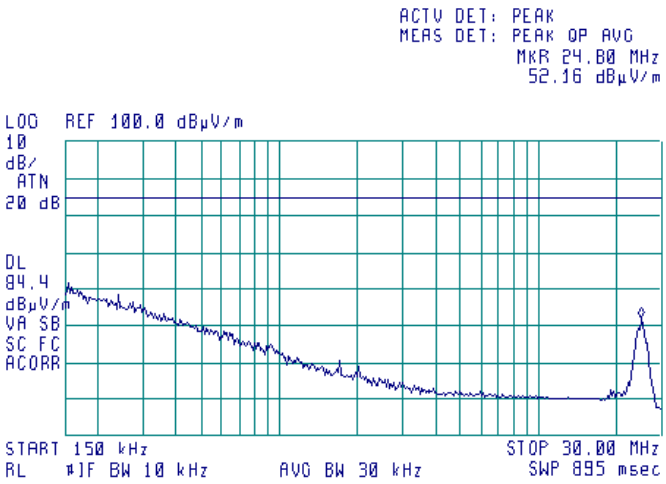
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

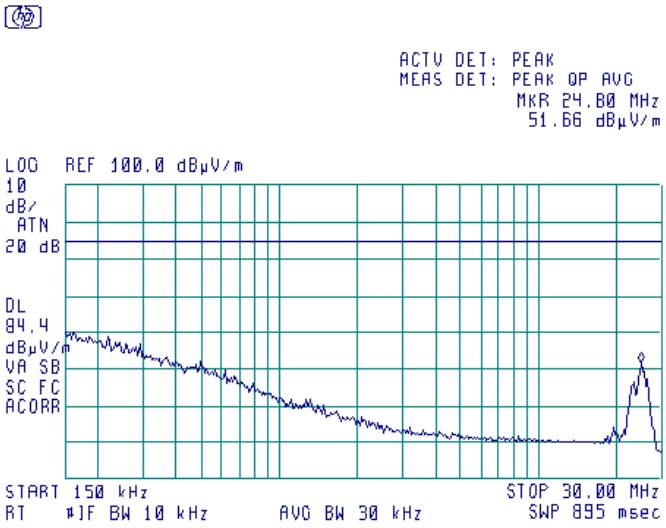
**Plot 7.5.5 Radiated emission measurements in 0.15 - 30 MHz range**

| | |
|---|---|
| TEST SITE: | Semi anechoic chamber |
| CARRIER FREQUENCY: | Mid |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |




**Plot 7.5.6 Radiated emission measurements in 0.15 - 30 MHz range**

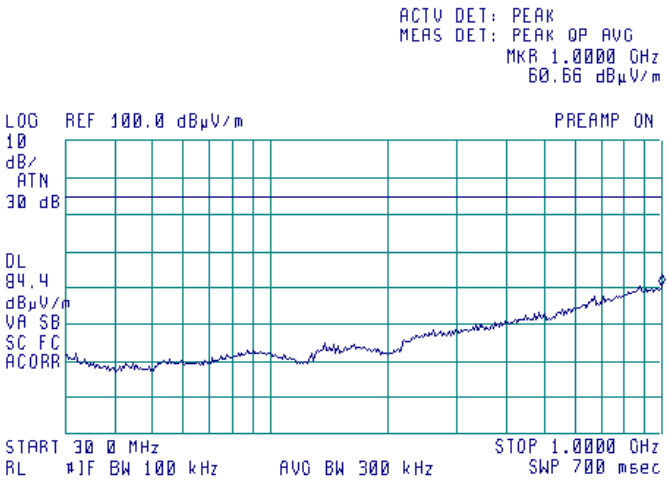
| | |
|---|---|
| TEST SITE: | Semi anechoic chamber |
| CARRIER FREQUENCY: | High |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

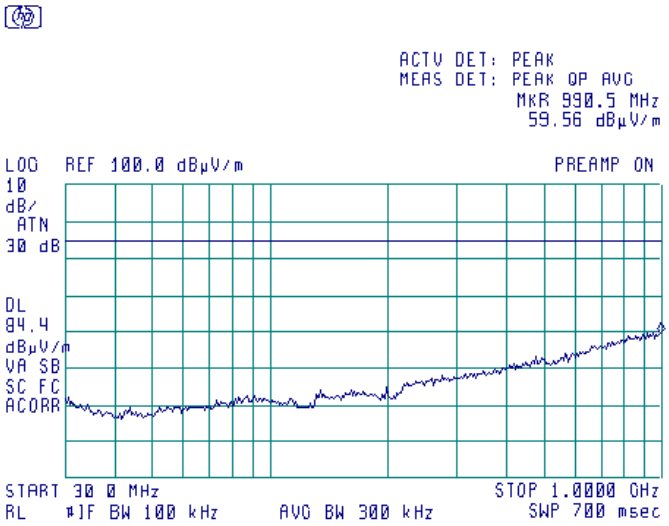
**Plot 7.5.7 Radiated emission measurements in 30 - 1000 MHz range**

| | |
|---|---|
| TEST SITE: | Semi anechoic chamber |
| CARRIER FREQUENCY: | Low |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |




**Plot 7.5.8 Radiated emission measurements in 30 - 1000 MHz range**

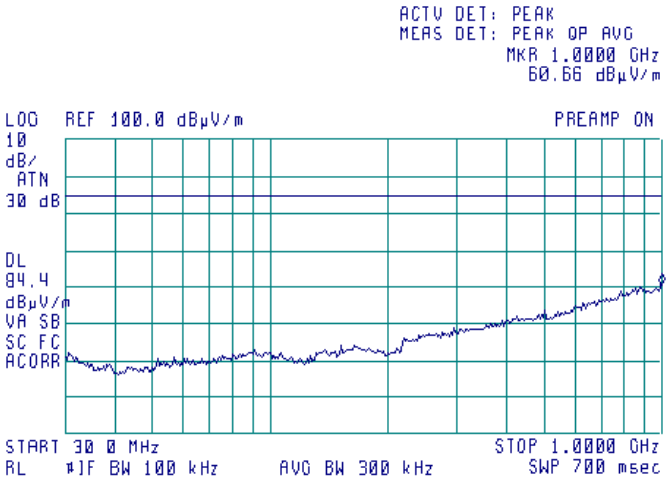
| | |
|---|---|
| TEST SITE: | Semi anechoic chamber |
| CARRIER FREQUENCY: | Mid |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.5.9 Radiated emission measurements in 30 - 1000 MHz range**

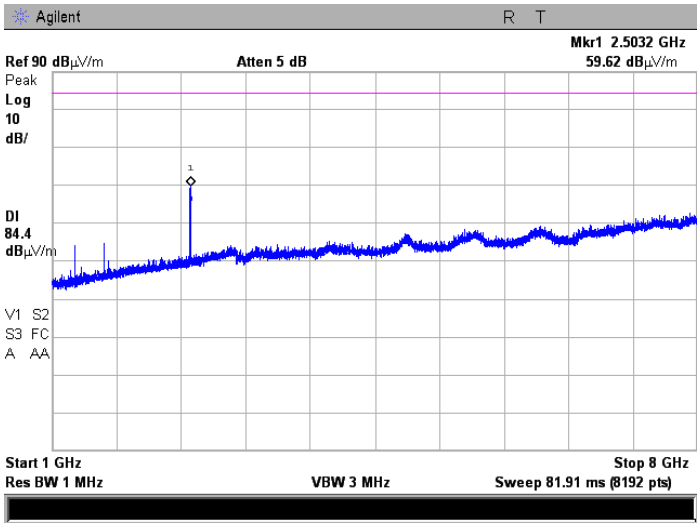
| | |
|---|---|
| TEST SITE: | Semi anechoic chamber |
| CARRIER FREQUENCY: | High |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.5.10 Radiated emission measurements in 1000 – 8000 MHz range**

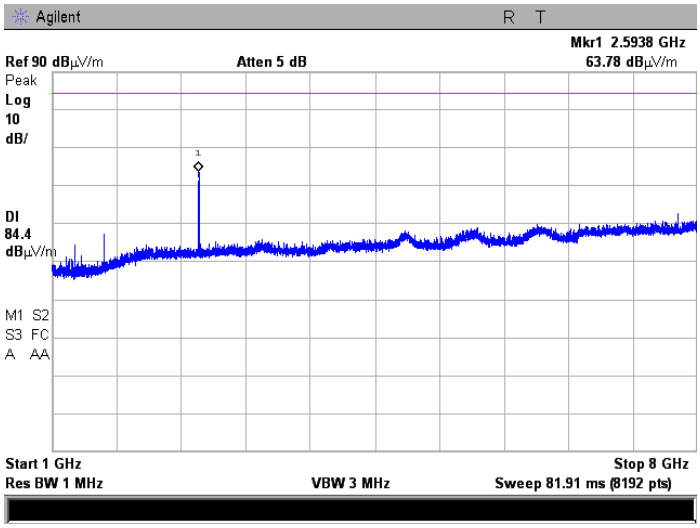
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m




NOTE: 2501 MHz - carrier frequency

**Plot 7.5.11 Radiated emission measurements in 1000 – 8000 MHz range**

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m

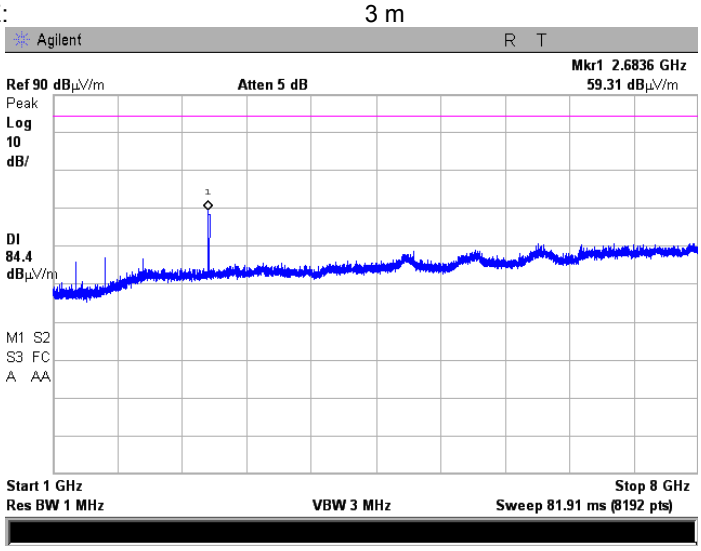



NOTE: 2595 MHz - carrier frequency

| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Plot 7.5.12 Radiated emission measurements in 1000 – 8000 MHz range**

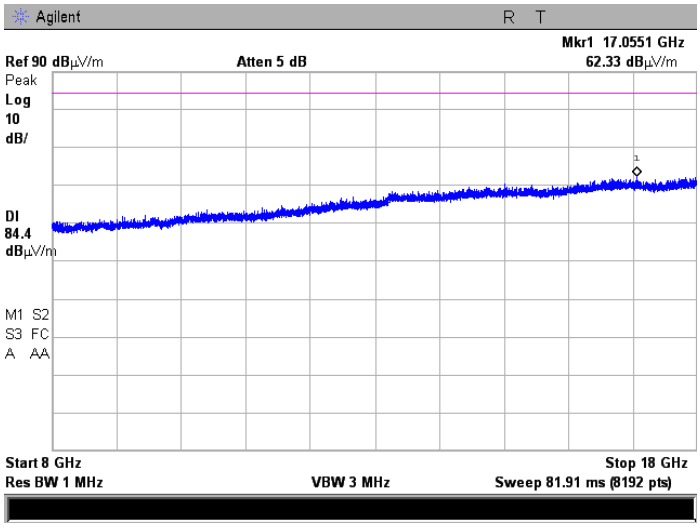
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m




NOTE: 2685 MHz - carrier frequency

**Plot 7.5.13 Radiated emission measurements in 8000 – 18000 MHz range**

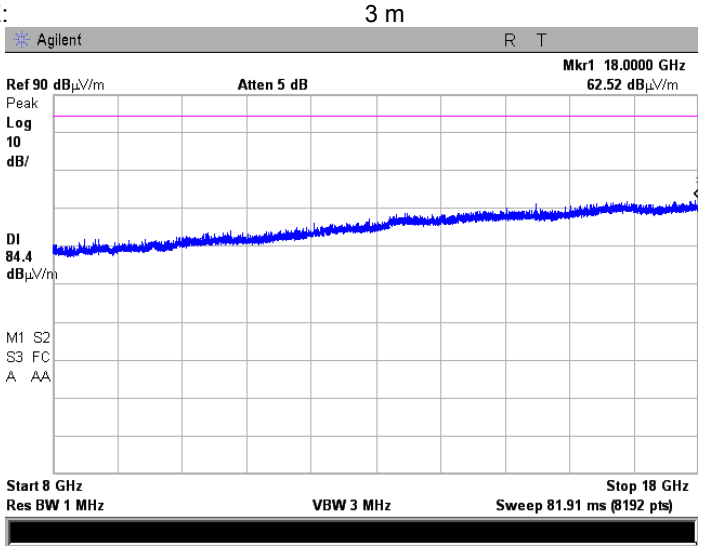
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

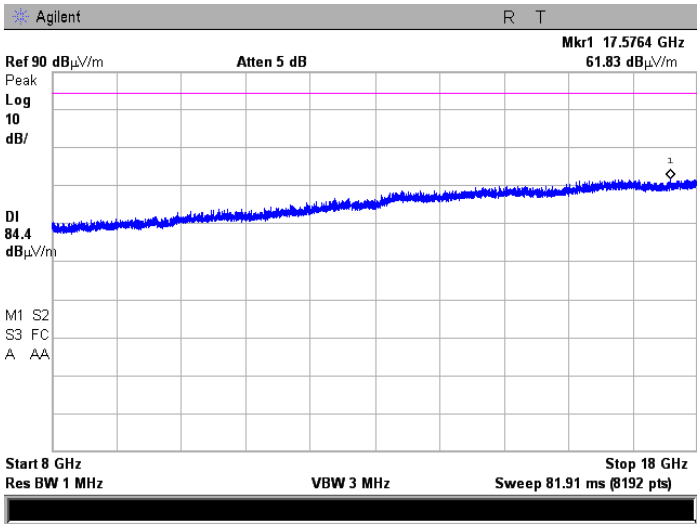
**Plot 7.5.14 Radiated emission measurements in 8000 – 18000 MHz range**

TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m




**Plot 7.5.15 Radiated emission measurements in 8000 – 18000 MHz range**

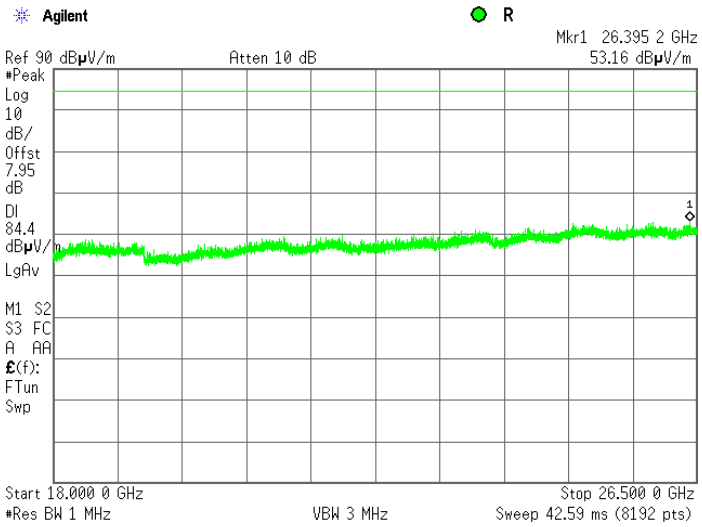
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

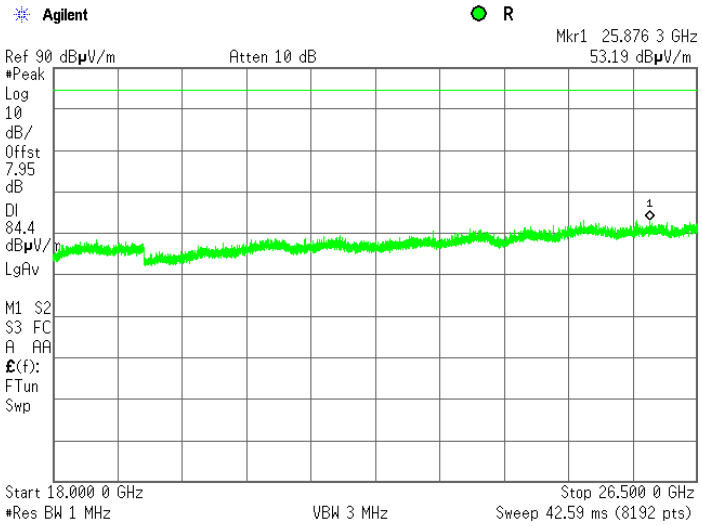
**Plot 7.5.16 Radiated emission measurements in 18000 – 26500 MHz range**

| | |
|---|---|
| TEST SITE: | OATS |
| CARRIER FREQUENCY: | Low |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |




**Plot 7.5.17 Radiated emission measurements in 18000 – 26500 MHz range**

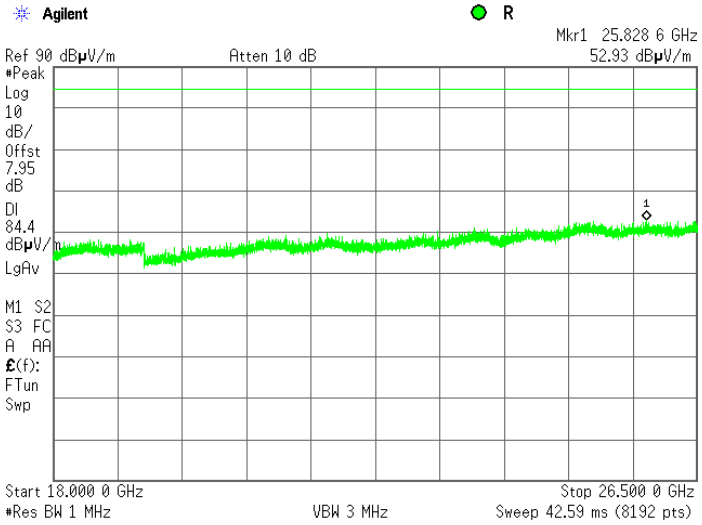
| | |
|---|---|
| TEST SITE: | OATS |
| CARRIER FREQUENCY: | Mid |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

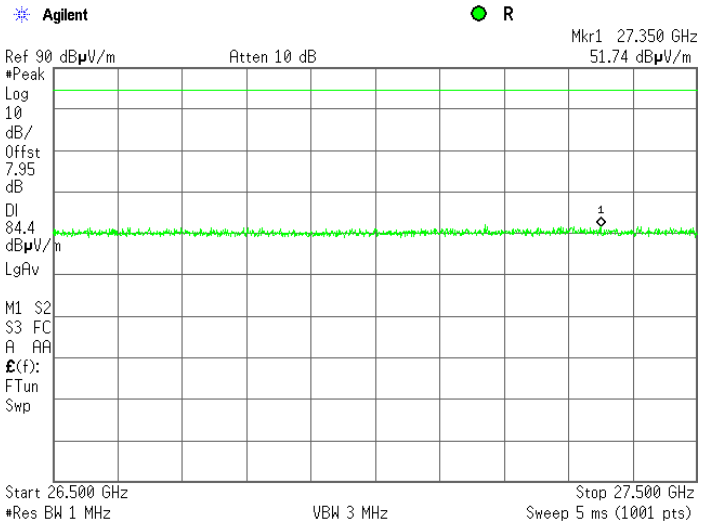
**Plot 7.5.18 Radiated emission measurements in 18000 – 26500 MHz range**

| | |
|---|---|
| TEST SITE: | OATS |
| CARRIER FREQUENCY: | High |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |




**Plot 7.5.19 Radiated emission measurements in 26500 - 27500 MHz range**

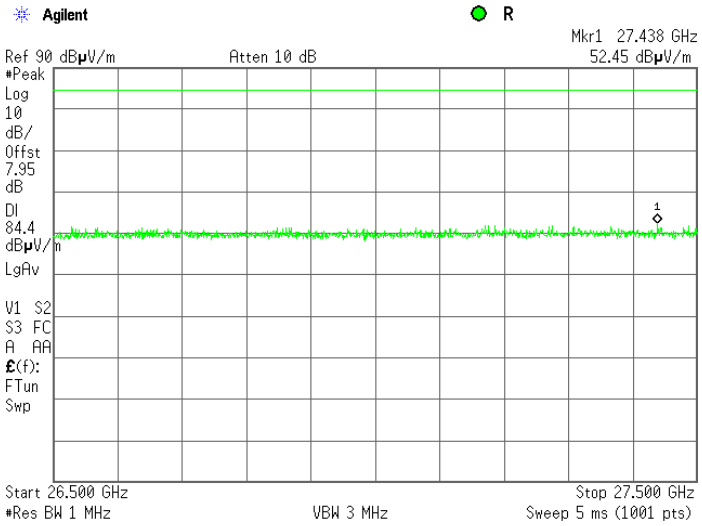
| | |
|---|---|
| TEST SITE: | OATS |
| CARRIER FREQUENCY: | Low |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |



| Test specification: | Section 27.53(m)(2), Radiated spurious emissions | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 26-Feb-14 - 27-Feb-14 | | |
| Temperature: 23 ºC | Air Pressure: 1020 hPa | Relative Humidity: 45 % | Power Supply: 48 VDC |
| Remarks: | | | |

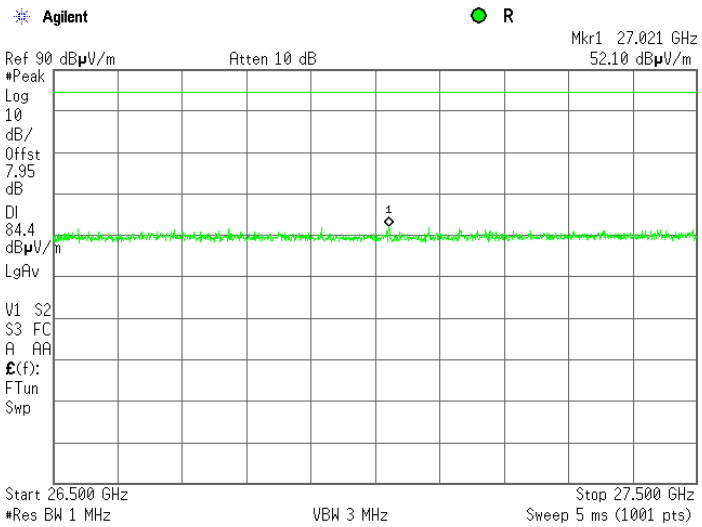
**Plot 7.5.20 Radiated emission measurements in 26500 - 27500 MHz range**

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




**Plot 7.5.21 Radiated emission measurements in 26500 - 27500 MHz range**

| | |
|---|---|
| TEST SITE: | OATS |
| CARRIER FREQUENCY: | High |
| ANTENNA POLARIZATION: | Vertical and Horizontal |
| TEST DISTANCE: | 3 m |



| Test specification: | Section 27.54, Frequency stability | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 23 ºC | Air Pressure: 1007 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

## 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 range, 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.

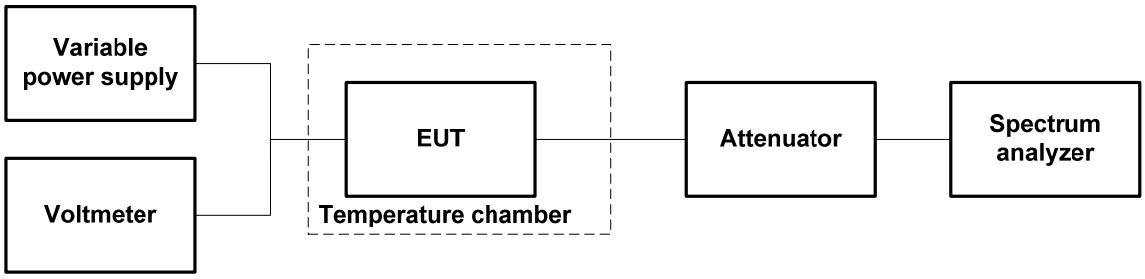
**7.6.2.3** The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.

**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 compared with the limit as provided in Table 7.6.2.

**Figure 7.6.1 Frequency stability test setup**



| **Test specification:** | **Section 27.54, Frequency stability** | | |
|---|---|---|---|
| **Test procedure:** | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| **Test mode:** | Compliance | **Verdict:** | PASS |
| **Date(s):** | 04-Mar-14 | | |
| **Temperature:** 23 ºC | **Air Pressure:** 1007 hPa | **Relative Humidity:** 47 % | **Power Supply:** 48 VDC |
| **Remarks:** | | | |

**Table 7.6.2 Frequency stability test results**

ASSIGNED FREQUENCY RANGE: 2496.0 – 2690.0 MHz
NOMINAL POWER VOLTAGE: 48 VDC
TEMPERATURE STABILIZATION PERIOD: 20 min
POWER DURING TEMPERATURE TRANSITION: Off
SPECTRUM ANALYZER MODE: Max Hold
RESOLUTION BANDWIDTH: 1 kHz
VIDEO BANDWIDTH: 3 kHz
MODULATION: Unmodulated

| T, ºC | Voltage, V | Frequency, MHz | | | | | | | Max frequency drift, Hz | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Start up | 1st min | 2nd min | 3rd min | 4th min | 5th min | 10th min | Positive | Negative |
| **Low carrier frequency 2501.0 MHz** | | | | | | | | | | |
| -30 | nominal | 2501.95977 | 2501.95976 | 2501.95973 | 2501.95960 | 2501.95977 | 2501.95977 | 2501.95977 | 0.00 | 170.00 |
| -20 | nominal | 2501.95975 | NA | NA | NA | NA | NA | 2501.95983 | 80.00 | 0.00 |
| -10 | nominal | 2501.95983 | NA | NA | NA | NA | NA | 2501.96000 | 170.00 | 0.00 |
| 0 | nominal | 2501.95975 | 2501.95965 | 2501.95975 | 2501.95961 | 2501.95975 | 2501.95976 | 2501.95988 | 130.00 | 140.00 |
| 10 | nominal | 2501.95987 | NA | NA | NA | NA | NA | 2501.95990 | 30.00 | 0.00 |
| 20 | 15% | 2501.95975 | NA | NA | NA | NA | NA | 2501.96000 | 250.00 | 0.00 |
| 20 | nominal | 2501.95967 | NA | NA | NA | NA | NA | 2501.96002* | 350.00 | 0.00 |
| 20 | -15% | 2501.95975 | NA | NA | NA | NA | NA | 2501.96000 | 250.00 | 0.00 |
| 30 | nominal | 2501.95977 | 2501.95957 | 2501.95957 | 2501.95987 | 2501.95990 | 2501.95967 | 2501.95963 | 130.00 | 200.00 |
| 40 | nominal | 2501.95967 | NA | NA | NA | NA | NA | 2501.95973 | 60.00 | 0.00 |
| 50 | nominal | 2501.95967 | NA | NA | NA | NA | NA | 2501.95980 | 130.00 | 0.00 |
| **Mid carrier frequency 2595.0 MHz** | | | | | | | | | | |
| -30 | nominal | 2595.95975 | 2595.95975 | 2595.95975 | 2595.95992 | 2595.95983 | 2595.95992 | 2595.95983 | 170.00 | 0.00 |
| -20 | nominal | 2595.95992 | NA | NA | NA | NA | NA | 2595.95992 | 0.00 | 0.00 |
| -10 | nominal | 2595.59975 | NA | NA | NA | NA | NA | 2595.59975 | 0.00 | 0.00 |
| 0 | nominal | 2595.95967 | 2595.95970 | 2595.95967 | 2595.95962 | 2595.95962 | 2595.95960 | 2595.95983 | 160.00 | 70.00 |
| 10 | nominal | 2595.95983 | NA | NA | NA | NA | NA | 2595.95977 | 0.00 | 60.00 |
| 20 | 15% | 2595.96017 | NA | NA | NA | NA | NA | 2595.95997 | 0.00 | 200.00 |
| 20 | nominal | 2595.95992 | NA | NA | NA | NA | NA | 2595.95963* | 0.00 | 290.00 |
| 20 | -15% | 2595.95992 | NA | NA | NA | NA | NA | 2595.95967 | 0.00 | 250.00 |
| 30 | nominal | 2595.95973 | 2595.95963 | 2595.95970 | 2595.95973 | 2595.95973 | 2595.95973 | 2595.95967 | 0.00 | 100.00 |
| 40 | nominal | 2595.95980 | NA | NA | NA | NA | NA | 2595.95983 | 30.00 | 0.00 |
| 50 | nominal | 2595.95963 | NA | NA | NA | NA | NA | 2595.95967 | 40.00 | 0.00 |
| **High carrier frequency 2685.0 MHz** | | | | | | | | | | |
| -30 | nominal | 2685.95992 | 2685.95967 | 2685.95992 | 2685.95992 | 2685.95975 | 2685.96000 | 2685.95983 | 80.00 | 250.00 |
| -20 | nominal | 2685.95983 | NA | NA | NA | NA | NA | 2685.95975 | 0.00 | 80.00 |
| -10 | nominal | 2685.95975 | NA | NA | NA | NA | NA | 2685.95975 | 0.00 | 0.00 |
| 0 | nominal | 2685.95980 | 2685.95980 | 2685.95973 | 2685.95977 | 2685.95983 | 2685.95977 | 2685.95983 | 30.00 | 70.00 |
| 10 | nominal | 2685.95967 | NA | NA | NA | NA | NA | 2685.95970 | 30.00 | 0.00 |
| 20 | 15% | 2685.95980 | NA | NA | NA | NA | NA | 2685.95987 | 70.00 | 0.00 |
| 20 | nominal | 2685.95977 | NA | NA | NA | NA | NA | 2685.95973* | 0.00 | 40.00 |
| 20 | -15% | 2685.95977 | NA | NA | NA | NA | NA | 2685.95977 | 0.00 | 0.00 |
| 30 | nominal | 2685.95963 | 2685.95967 | 2685.95963 | 2685.95963 | 2685.95970 | 2685.95967 | 2685.95980 | 170.00 | 0.00 |
| 40 | nominal | 2685.95983 | NA | NA | NA | NA | NA | 2685.95973 | 0.00 | 100.00 |
| 50 | nominal | 2685.95980 | NA | NA | NA | NA | NA | 2685.95980 | 0.00 | 0.00 |

* - Reference frequency

| Test specification: | Section 27.54, Frequency stability | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 23 ºC | Air Pressure: 1007 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

**Table 7.6.3 Maximum frequency displacement**

| Channel | Maximum frequency displacement | | | |
|---|---|---|---|---|
| | ppm | | Hz | |
| | Negative | Positive | Negative | Positive |
| Low | 0.00 | 1.13 | 0.00 | 350.00 |
| Mid | 0.88 | 0.08 | 290.00 | 170.00 |
| High | 0.72 | 0.27 | 250.00 | 170.00 |

**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 |
|---|---|---|---|---|---|---|---|---|
| **10 MHz BW** | | | | | | | | |
| **QPSK** | | | | | | | | |
| 2496.30 | 2505.68 | 2496.30 | 2505.68 | 2496.00 | 2506.00 | -0.30 | -0.32 | Pass |
| 2590.28 | 2599.64 | 2590.28 | 2599.64 | 2590.00 | 2600.00 | -0.28 | -0.36 | Pass |
| 2680.30 | 2689.66 | 2680.30 | 2689.66 | 2680.00 | 2690.00 | -0.30 | -0.34 | Pass |
| **64QAM** | | | | | | | | |
| 2496.30 | 2505.76 | 2496.30 | 2505.76 | 2496.00 | 2506.00 | -0.30 | -0.24 | Pass |
| 2590.36 | 2599.66 | 2590.36 | 2599.66 | 2590.00 | 2600.00 | -0.36 | -0.34 | Pass |
| 2680.28 | 2689.66 | 2680.28 | 2689.66 | 2680.00 | 2690.00 | -0.28 | -0.34 | Pass |
| **20 MHz BW** | | | | | | | | |
| **QPSK** | | | | | | | | |
| 2496.64 | 2515.32 | 2496.64 | 2515.32 | 2496.00 | 2516.00 | -0.64 | -0.68 | Pass |
| 2585.64 | 2604.28 | 2585.64 | 2604.28 | 2585.00 | 2605.00 | -0.64 | -0.72 | Pass |
| 2670.64 | 2689.28 | 2670.64 | 2689.28 | 2670.00 | 2690.00 | -0.64 | -0.72 | Pass |
| **64QAM** | | | | | | | | |
| 2496.68 | 2515.24 | 2496.68 | 2515.24 | 2496.00 | 2516.00 | -0.68 | -0.76 | Pass |
| 2585.68 | 2604.32 | 2585.68 | 2604.32 | 2585.00 | 2605.00 | -0.68 | -0.68 | Pass |
| 2670.72 | 2689.28 | 2670.72 | 2689.28 | 2670.00 | 2690.00 | -0.72 | -0.72 | 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**

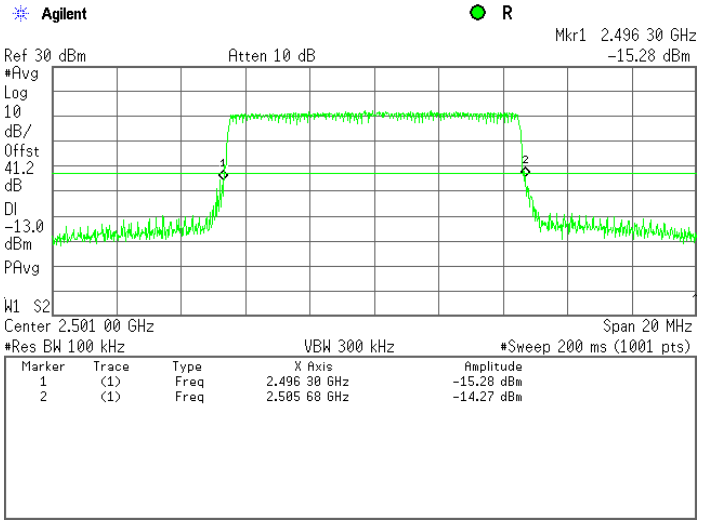
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HL 1424 | HL 3435 | HL 4164 | HL 2979 | HL 3286 | HL 4293 | HL 4366 | HL 4232 |
| HL 4366 | HL 4273 | HL 3302 | HL 3301 | HL 4229 | | | |

Full description is given in Appendix A.

| Test specification: | Section 27.54, Frequency stability | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 23 ºC | Air Pressure: 1007 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

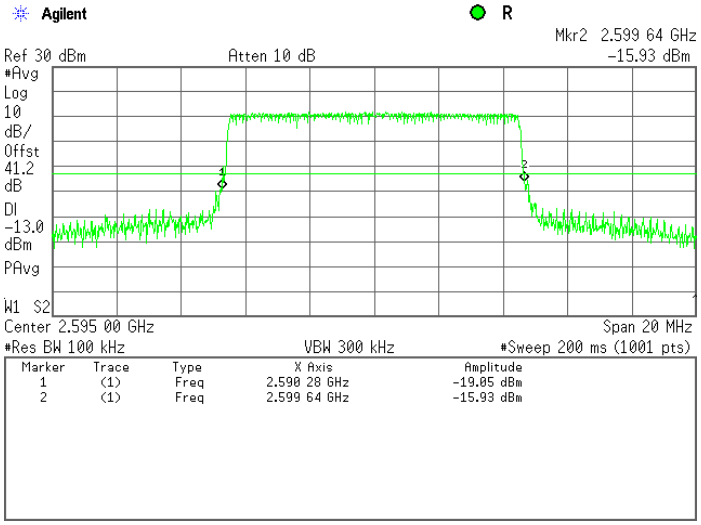
**Plot 7.6.1 Emission mask test results at low carrier frequency, 10 MHz EBW**

| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 15.5 MHz |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |




**Plot 7.6.2 Emission mask test results at mid carrier frequency, 10 MHz EBW**

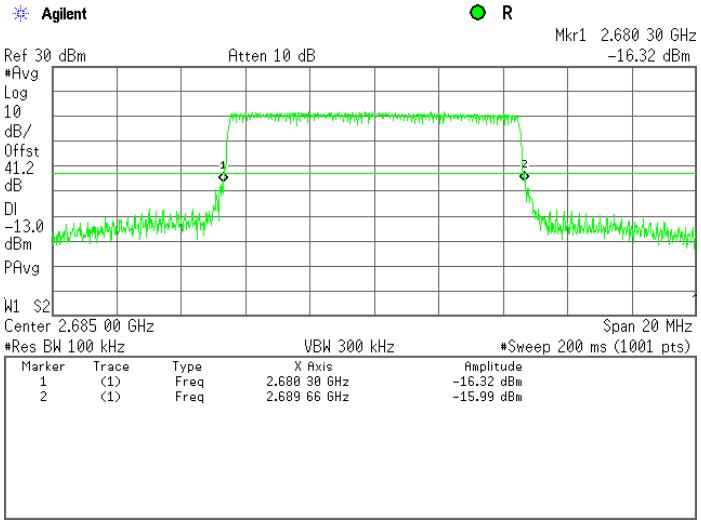
| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 15.5 MHz |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |



| Test specification: | Section 27.54, Frequency stability | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 23 ºC | Air Pressure: 1007 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

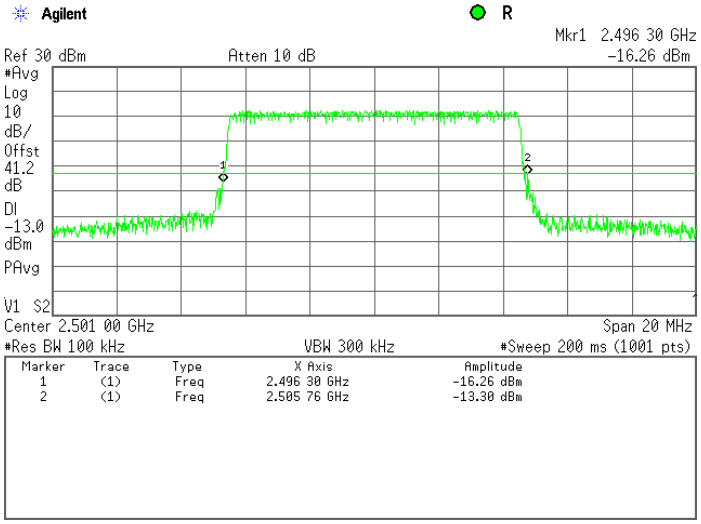
**Plot 7.6.3 Emission mask test results at high carrier frequency, 10 MHz EBW**

| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 15.5 MHz |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |




**Plot 7.6.4 Emission mask test results at low carrier frequency, 10 MHz EBW**

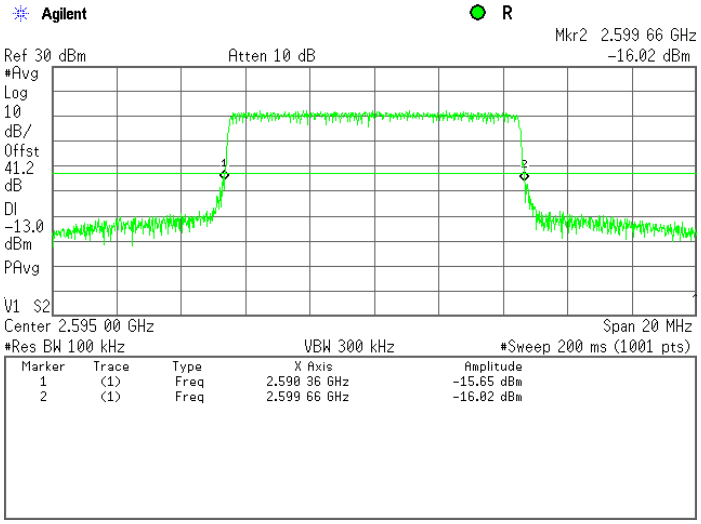
| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 75.0Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |



| Test specification: | Section 27.54, Frequency stability | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 23 ºC | Air Pressure: 1007 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

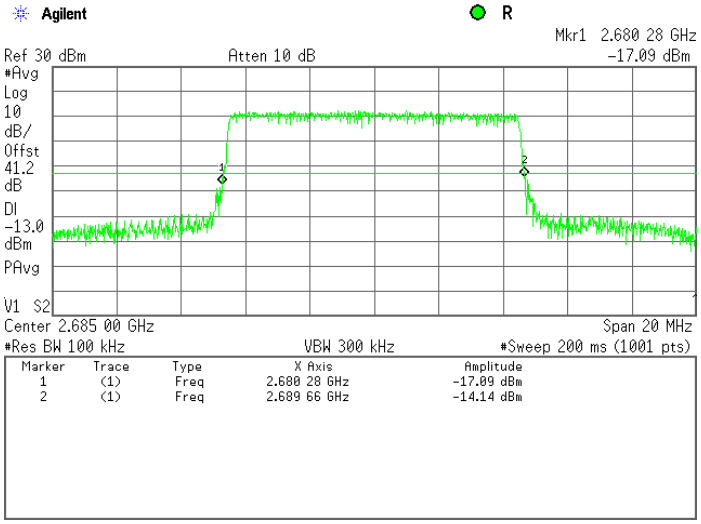
**Plot 7.6.5 Emission mask test results at mid carrier frequency, 10 MHz EBW**

| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 75.0Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |




**Plot 7.6.6 Emission mask test results at high carrier frequency, 10 MHz EBW**

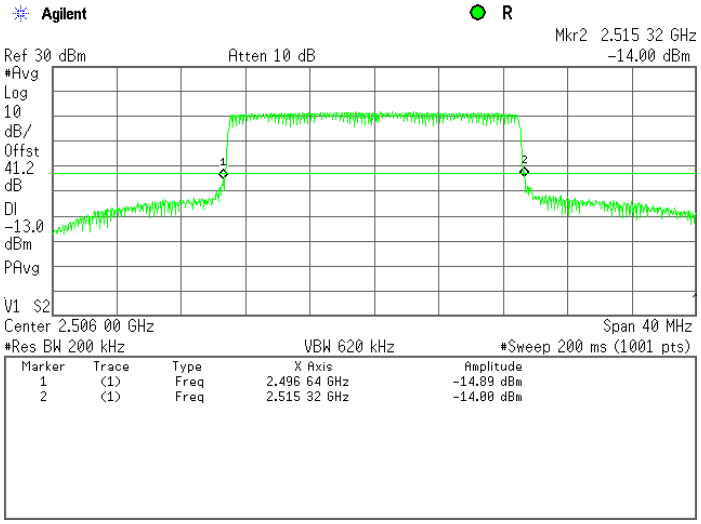
| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 75.0Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |



| Test specification: | Section 27.54, Frequency stability | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 23 ºC | Air Pressure: 1007 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

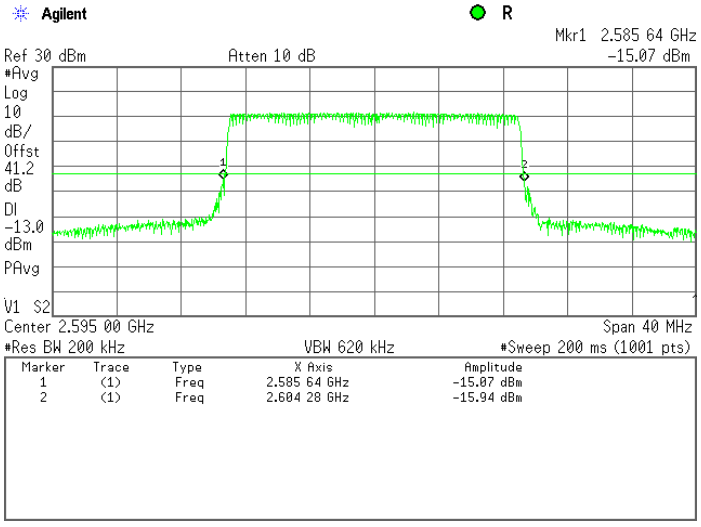
**Plot 7.6.7 Emission mask test results at low carrier frequency, 20 MHz EBW**

| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 31.0 MHz |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |




**Plot 7.6.8 Emission mask test results at mid carrier frequency, 20 MHz EBW**

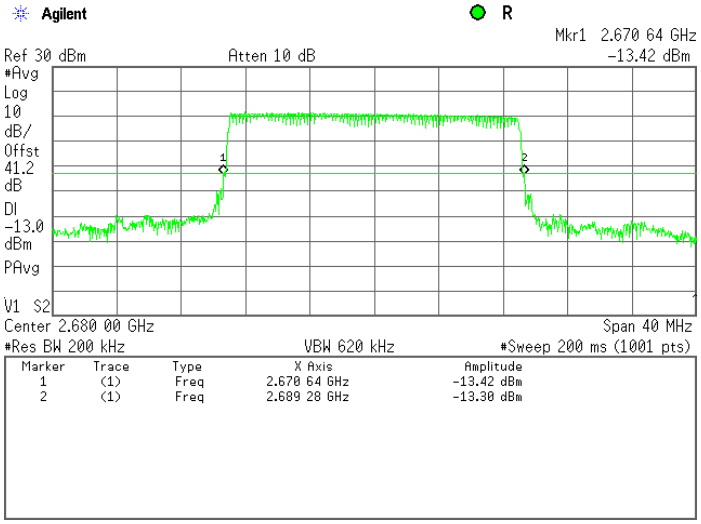
| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 31.0 MHz |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |



| Test specification: | Section 27.54, Frequency stability | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 23 ºC | Air Pressure: 1007 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

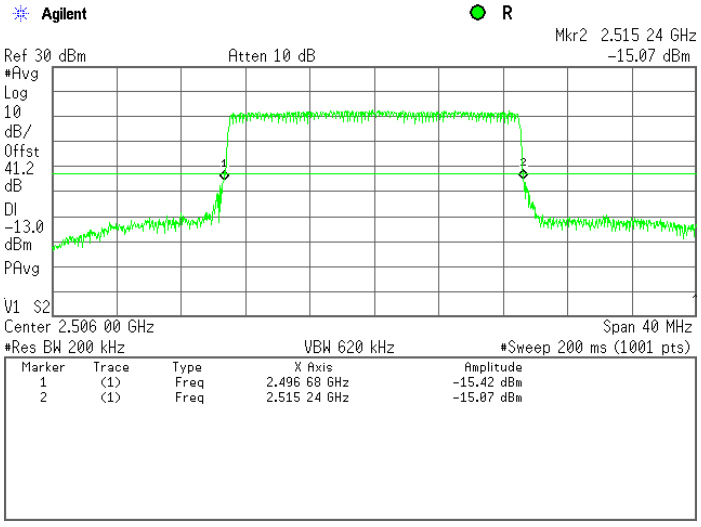
**Plot 7.6.9 Emission mask test results at high carrier frequency, 20 MHz EBW**

| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | QPSK |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 31.0 MHz |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |




**Plot 7.6.10 Emission mask test results at low carrier frequency, 20 MHz EBW**

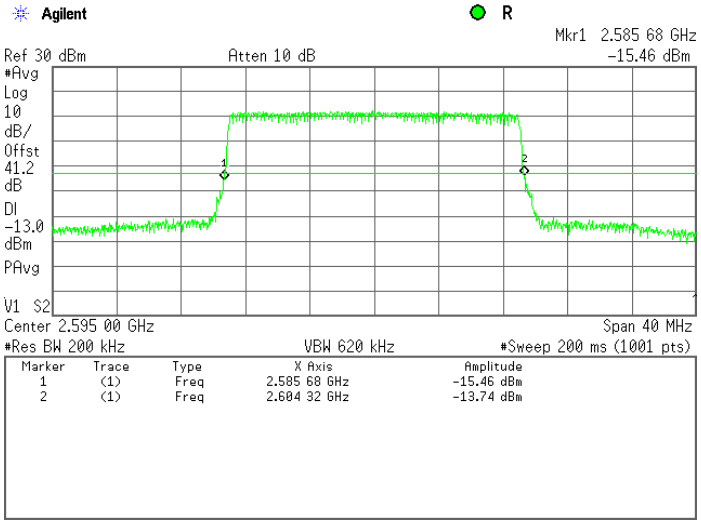
| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 150.0 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |



| Test specification: | Section 27.54, Frequency stability | | |
|---|---|---|---|
| Test procedure: | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 | | |
| Test mode: | Compliance | Verdict: | PASS |
| Date(s): | 04-Mar-14 | | |
| Temperature: 23 ºC | Air Pressure: 1007 hPa | Relative Humidity: 47 % | Power Supply: 48 VDC |
| Remarks: | | | |

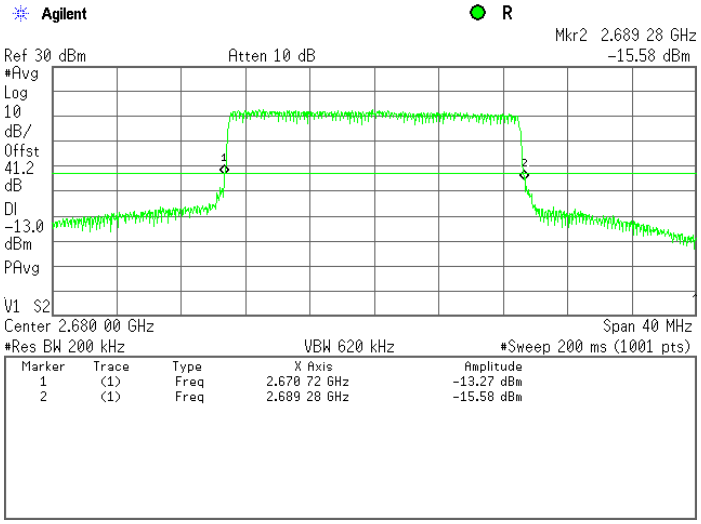
**Plot 7.6.11 Emission mask test results at mid carrier frequency, 20 MHz EBW**

| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 150.0 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |




**Plot 7.6.12 Emission mask test results at high carrier frequency, 20 MHz EBW**

| | |
|---|---|
| ASSIGNED FREQUENCY RANGE: | 2496.0 – 2690.0 MHz |
| DETECTOR USED: | Average |
| MODULATION: | 64QAM |
| MODULATING SIGNAL: | PRBS |
| BIT RATE: | 150.0 Mbps |
| TRANSMITTER OUTPUT POWER SETTINGS: | Maximum |



# 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 | 21-Jan-14 | 21-Jan-15 |
| 0521 | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz | Hewlett Packard | 8546A | 3617A 00319, 3448A002 53 | 28-Oct-13 | 28-Oct-14 |
| 0604 | Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz | EMCO | 3141 | 9611-1011 | 04-Jun-13 | 04-Jun-14 |
| 0768 | Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain | Quinstar Technology | QWH-4200-BA | 110 | 12-Dec-12 | 12-Dec-15 |
| 0769 | Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain | Quinstar Technology | QWH-2800-BA | 112 | 12-Dec-12 | 12-Dec-15 |
| 1424 | Spectrum Analyzer, 30 Hz- 40 GHz | Agilent Technologies | 8564EC | 3946A002 19 | 10-Oct-13 | 10-Oct-14 |
| 1984 | Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W | EMC Test Systems | 3115 | 9911-5964 | 03-Jan-14 | 03-Jan-15 |
| 2780 | EMC analyzer, 100 Hz to 26.5 GHz | Agilent Technologies | E7405A | MY451024 62 | 10-Jul-13 | 10-Jul-14 |
| 2871 | Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA | Huber-Suhner | 198-8155-00 | 2871 | 04-Dec-13 | 04-Dec-14 |
| 2979 | Cable 1 m, N/N-type | Harbour Industries | 7/60-RG142 | 2979 | 02-Sep-13 | 02-Sep-14 |
| 3286 | Temperature Chamber, (-50 to +170) °C | Thermotron | EL-8-CH-1-1-CO2 | 21-9048 | 30-Sep-13 | 30-Sep-14 |
| 3301 | Power Meter, P-series, 50 MHz to 40 GHz | Agilent Technologies | N1911A | MY451010 57 | 12-Feb-14 | 12-Feb-15 |
| 3302 | Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm | Agilent Technologies | N1922A | MY452405 86 | 12-Feb-14 | 12-Feb-15 |
| 3435 | Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz | Mini-Circuits | BW-S10W5+ | NA | 07-Mar-14 | 07-Mar-15 |
| 3455 | Medium Power Fixed Coaxial Attenuator DC to 40 GHz, 20 dB, 5 W | Aeroflex / Weinschel | 75A-20-12 | 1182 | 18-Mar-13 | 18-Mar-14 |
| 3535 | Amplifier, low noise, 18 to 40 GHz | Quinstar Technology | QLJ-18404537-J0 | 111590030 01 | 30-Dec-13 | 30-Dec-14 |
| 3818 | PSA Series Spectrum Analyzer, 3 Hz- 44 GHz | Agilent Technologies | E4446A | MY482502 88 | 24-Apr-13 | 24-Apr-14 |
| 3901 | Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA | Huber-Suhner | SUCOFLEX 102A | 1225/2A | 06-Feb-14 | 06-Feb-15 |
| 4114 | Antenna, Double-Ridged Waveguide Horn, 1-18 GHz | ETS Lindgren | 3117 | 00123515 | 27-Dec-13 | 27-Dec-14 |
| 4150 | Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out. | Agilent Technologies | 87405C | MY470105 91 | 01-Jul-13 | 01-Jul-14 |
| 4164 | DC Power Supply, 60V, 5A | Standig | 605D | NA | 15-Jan-14 | 15-Jan-15 |
| 4229 | Precision Fixed Attenuator, 50 Ohm, 5W, 10dB, DC to 18000 MHz | Mini-Circuits | BW-N10W5+ | NA | 07-Mar-14 | 07-Mar-15 |

| HL No | Description | Manufacturer | Model | Ser. No. | Last Cal./ Check | Due Cal./ Check |
|---|---|---|---|---|---|---|
| 4232 | Precision Fixed Attenuator, 50 Ohm, 5W, 20dB, DC to 18000 MHz | Mini-Circuits | BW-N20W5+ | NA | 07-Mar-14 | 07-Mar-15 |
| 4234 | Precision Fixed Attenuator, 50 Ohm, 5W, 20dB, DC to 18000 MHz | Mini-Circuits | BW-N20W5+ | NA | 06-Mar-14 | 06-Mar-15 |
| 4273 | Test Cable , DC-18 GHz, 1.8 m, SMA/M - N/M | Mini-Circuits | CBL-6FT-SMNM+ | 70045 | 27-Nov-13 | 27-Nov-14 |
| 4293 | Microwave Cable Assembly, 18.0 GHz, 3.4 m, SMA/SMA | Huber-Suhner | Sucoflex P103 | NA | 18-Nov-13 | 18-Nov-14 |
| 4353 | Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M | MegaPhase | NC29-N1N1-244 | 12025101 003 | 06-Mar-14 | 06-Mar-15 |
| 4366 | Directional coupler, 1 GHz to 18 GHz, 10 dB, SMA Female | Tiger Micro-Electronics Institute | TGD-A1101-10 | 01e-JSDE805-007 | 17-Apr-12 | 17-Apr-14 |

# 9 APPENDIX B Measurement uncertainties

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

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

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.
Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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# 11 APPENDIX D Specification references

| | |
|---|---|
| 47CFR part 27: 2013 | Private land mobile radio services |
| 47CFR part 1: 2013 | Practice and procedure |
| 47CFR part 2: 2013 | 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: 2003 | 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-C:2004 | 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, MHz | Magnetic antenna factor, dB | Electric antenna factor, 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(μV) to convert it into field strength in dB(μV/m).

**Antenna factor**
**Standard gain horn antenna**
**Quinstar Technology**
**Model QWH**
**Ser.No.112, HL 0768, 0769, 0770, 0771, 0772**

| Frequency min, GHz | Frequency max, GHz | Antenna factor, dB(1/m) |
|---|---|---|
| 18.000 | 26.500 | 32.01 |
| 26.500 | 40.000 | 35.48 |
| 40.000 | 60.000 | 39.03 |
| 60.000 | 90.000 | 42.55 |
| 90.000 | 140.000 | 46.23 |
| 140.000 | 220.000 | 50.11 |

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

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

| Frequency, MHz | Antenna factor, dB(1/m) | Frequency, MHz | Antenna factor, dB(1/m) | Frequency, MHz | Antenna factor, 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(μV) to convert it into field strength in dB(μV/m).

**Antenna factor**
**Double-ridged wave guide horn antenna**
**Model 3115, S/N 9911-5964, HL1984**

| Frequency, MHz | Antenna factor, dB(1/m) |
|---|---|
| 1000.0 | 24.7 |
| 1500.0 | 25.7 |
| 2000.0 | 27.6 |
| 2500.0 | 28.9 |
| 3000.0 | 31.2 |
| 3500.0 | 32.0 |
| 4000.0 | 32.5 |
| 4500.0 | 32.7 |
| 5000.0 | 33.6 |
| 5500.0 | 35.1 |
| 6000.0 | 35.4 |
| 6500.0 | 34.9 |
| 7000.0 | 36.1 |
| 7500.0 | 37.8 |
| 8000.0 | 38.0 |
| 8500.0 | 38.1 |
| 9000.0 | 39.1 |
| 9500.0 | 38.3 |
| 10000.0 | 38.6 |
| 10500.0 | 38.2 |
| 11000.0 | 38.7 |
| 11500.0 | 39.5 |
| 12000.0 | 40.0 |
| 12500.0 | 40.4 |
| 13000.0 | 40.5 |
| 13500.0 | 41.1 |
| 14000.0 | 41.6 |
| 14500.0 | 41.7 |
| 15000.0 | 38.7 |
| 15500.0 | 38.2 |
| 16000.0 | 38.8 |
| 16500.0 | 40.5 |
| 17000.0 | 42.5 |
| 17500.0 | 45.9 |
| 18000.0 | 49.4 |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field strength in dB(μV/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(μV) to convert to field strength in dB(μV/meter)

**Cable loss**
**Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00, HL 2871**

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB |
|---|---|---|---|---|---|
| 10 | 0.12 | 5750 | 2.34 | 12000 | 3.55 |
| 30 | 0.14 | 6000 | 2.39 | 12250 | 3.61 |
| 100 | 0.27 | 6250 | 2.46 | 12500 | 3.67 |
| 250 | 0.45 | 6500 | 2.52 | 12750 | 3.74 |
| 500 | 0.63 | 6750 | 2.58 | 13000 | 3.79 |
| 750 | 0.76 | 7000 | 2.64 | 13250 | 3.82 |
| 1000 | 0.89 | 7250 | 2.68 | 13500 | 3.83 |
| 1250 | 1.01 | 7500 | 2.73 | 13750 | 3.83 |
| 1500 | 1.12 | 7750 | 2.78 | 14000 | 3.88 |
| 1750 | 1.23 | 8000 | 2.83 | 14250 | 3.93 |
| 2000 | 1.32 | 8250 | 2.88 | 14500 | 3.96 |
| 2250 | 1.41 | 8500 | 2.94 | 14750 | 4.01 |
| 2500 | 1.49 | 8750 | 2.97 | 15000 | 4.00 |
| 2750 | 1.58 | 9000 | 3.02 | 15250 | 4.01 |
| 3000 | 1.66 | 9250 | 3.07 | 15500 | 4.00 |
| 3250 | 1.73 | 9500 | 3.13 | 15750 | 4.13 |
| 3500 | 1.80 | 9750 | 3.18 | 16000 | 4.22 |
| 3750 | 1.87 | 10000 | 3.21 | 16250 | 4.29 |
| 4000 | 1.93 | 10250 | 3.26 | 16500 | 4.29 |
| 4250 | 2.01 | 10500 | 3.30 | 16750 | 4.32 |
| 4500 | 2.06 | 10750 | 3.36 | 17000 | 4.37 |
| 4750 | 2.12 | 11000 | 3.39 | 17250 | 4.45 |
| 5000 | 2.17 | 11250 | 3.44 | 17500 | 4.49 |
| 5250 | 2.24 | 11500 | 3.48 | 17750 | 4.53 |
| 5500 | 2.29 | 11750 | 3.52 | 18000 | 4.55 |

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

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, 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**
**Test cable, Mini-Circuits, S/N 70045, 18 GHz, 1.8 m, SMA/M - N/M**
**CBL-6FT-SMNM+, HL 4273**

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB |
|---|---|---|---|---|---|---|---|
| 10 | 0.09 | 4800 | 1.76 | 9800 | 2.70 | 14800 | 3.59 |
| 30 | 0.11 | 4900 | 1.78 | 9900 | 2.71 | 14900 | 3.59 |
| 50 | 0.14 | 5000 | 1.81 | 10000 | 2.73 | 15000 | 3.60 |
| 100 | 0.20 | 5100 | 1.82 | 10100 | 2.75 | 15100 | 3.63 |
| 200 | 0.30 | 5200 | 1.86 | 10200 | 2.76 | 15200 | 3.67 |
| 300 | 0.38 | 5300 | 1.89 | 10300 | 2.79 | 15300 | 3.70 |
| 400 | 0.45 | 5400 | 1.92 | 10400 | 2.81 | 15400 | 3.68 |
| 500 | 0.50 | 5500 | 1.96 | 10500 | 2.82 | 15500 | 3.70 |
| 600 | 0.55 | 5600 | 2.00 | 10600 | 2.83 | 15600 | 3.71 |
| 700 | 0.60 | 5700 | 2.03 | 10700 | 2.87 | 15700 | 3.77 |
| 800 | 0.65 | 5800 | 2.04 | 10800 | 2.87 | 15800 | 3.75 |
| 900 | 0.69 | 5900 | 2.07 | 10900 | 2.88 | 15900 | 3.77 |
| 1000 | 0.73 | 6000 | 2.10 | 11000 | 2.89 | 16000 | 3.79 |
| 1100 | 0.77 | 6100 | 2.10 | 11100 | 2.91 | 16100 | 3.85 |
| 1200 | 0.80 | 6200 | 2.11 | 11200 | 2.92 | 16200 | 3.82 |
| 1300 | 0.84 | 6300 | 2.11 | 11300 | 2.94 | 16300 | 3.83 |
| 1400 | 0.88 | 6400 | 2.14 | 11400 | 2.95 | 16400 | 3.88 |
| 1500 | 0.92 | 6500 | 2.15 | 11500 | 2.98 | 16500 | 3.89 |
| 1600 | 0.95 | 6600 | 2.15 | 11600 | 3.00 | 16600 | 3.92 |
| 1700 | 0.98 | 6700 | 2.16 | 11700 | 3.02 | 16700 | 3.88 |
| 1800 | 1.01 | 6800 | 2.19 | 11800 | 3.04 | 16800 | 3.95 |
| 1900 | 1.04 | 6900 | 2.22 | 11900 | 3.08 | 16900 | 3.91 |
| 2000 | 1.07 | 7000 | 2.24 | 12000 | 3.09 | 17000 | 3.97 |
| 2100 | 1.09 | 7100 | 2.26 | 12100 | 3.12 | 17100 | 3.92 |
| 2200 | 1.13 | 7200 | 2.29 | 12200 | 3.13 | 17200 | 3.94 |
| 2300 | 1.15 | 7300 | 2.32 | 12300 | 3.16 | 17300 | 3.94 |
| 2400 | 1.18 | 7400 | 2.36 | 12400 | 3.17 | 17400 | 3.98 |
| 2500 | 1.21 | 7500 | 2.39 | 12500 | 3.19 | 17500 | 3.93 |
| 2600 | 1.24 | 7600 | 2.41 | 12600 | 3.20 | 17600 | 3.95 |
| 2700 | 1.27 | 7700 | 2.43 | 12700 | 3.21 | 17700 | 3.96 |
| 2800 | 1.30 | 7800 | 2.46 | 12800 | 3.21 | 17800 | 3.97 |
| 2900 | 1.34 | 7900 | 2.49 | 12900 | 3.22 | 17900 | 3.96 |
| 3000 | 1.36 | 8000 | 2.52 | 13000 | 3.22 | 18000 | 3.97 |
| 3100 | 1.38 | 8100 | 2.52 | 13100 | 3.24 | | |
| 3200 | 1.41 | 8200 | 2.54 | 13200 | 3.24 | | |
| 3300 | 1.45 | 8300 | 2.59 | 13300 | 3.27 | | |
| 3400 | 1.46 | 8400 | 2.61 | 13400 | 3.28 | | |
| 3500 | 1.49 | 8500 | 2.60 | 13500 | 3.31 | | |
| 3600 | 1.51 | 8600 | 2.63 | 13600 | 3.31 | | |
| 3700 | 1.55 | 8700 | 2.65 | 13700 | 3.35 | | |
| 3800 | 1.34 | 8800 | 2.65 | 13800 | 3.37 | | |
| 3900 | 1.36 | 8900 | 2.65 | 13900 | 3.40 | | |
| 4000 | 1.38 | 9000 | 2.66 | 14000 | 3.43 | | |
| 4100 | 1.41 | 9100 | 2.66 | 14100 | 3.45 | | |
| 4200 | 1.45 | 9200 | 2.67 | 14200 | 3.46 | | |
| 4300 | 1.46 | 9300 | 2.67 | 14300 | 3.46 | | |
| 4400 | 1.49 | 9400 | 2.67 | 14400 | 3.49 | | |
| 4500 | 1.51 | 9500 | 2.68 | 14500 | 3.50 | | |
| 4600 | 1.55 | 9600 | 2.69 | 14600 | 3.50 | | |
| 4700 | 1.34 | 9700 | 2.69 | 14700 | 3.52 | | |

**Cable loss**
**Microwave Cable Assembly, 18.0 GHz, 3.4 m, SMA/SMA, Huber-Suhner, Sucoflex P103, HL 4293**

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB |
|---|---|---|---|---|---|---|---|
| 50 | 0.20 | 4900 | 2.01 | 9800 | 2.94 | 14700 | 3.85 |
| 100 | 0.28 | 5000 | 2.03 | 9900 | 2.95 | 14800 | 3.87 |
| 200 | 0.39 | 5100 | 2.06 | 10000 | 2.98 | 14900 | 3.89 |
| 300 | 0.48 | 5200 | 2.08 | 10100 | 3.01 | 15000 | 3.94 |
| 400 | 0.55 | 5300 | 2.07 | 10200 | 3.04 | 15100 | 3.94 |
| 500 | 0.61 | 5400 | 2.12 | 10300 | 3.04 | 15200 | 3.91 |
| 600 | 0.68 | 5500 | 2.12 | 10400 | 3.04 | 15300 | 3.93 |
| 700 | 0.73 | 5600 | 2.16 | 10500 | 3.07 | 15400 | 3.94 |
| 800 | 0.78 | 5700 | 2.16 | 10600 | 3.10 | 15500 | 3.96 |
| 900 | 0.83 | 5800 | 2.22 | 10700 | 3.11 | 15600 | 3.96 |
| 1000 | 0.88 | 5900 | 2.24 | 10800 | 3.12 | 15700 | 3.97 |
| 1100 | 0.92 | 6000 | 2.28 | 10900 | 3.15 | 15800 | 4.00 |
| 1200 | 0.96 | 6100 | 2.31 | 11000 | 3.22 | 15900 | 4.01 |
| 1300 | 1.00 | 6200 | 2.32 | 11100 | 3.20 | 16000 | 4.03 |
| 1400 | 1.04 | 6300 | 2.34 | 11200 | 3.19 | 16100 | 4.02 |
| 1500 | 1.07 | 6400 | 2.37 | 11300 | 3.21 | 16200 | 4.05 |
| 1600 | 1.11 | 6500 | 2.38 | 11400 | 3.26 | 16300 | 4.06 |
| 1700 | 1.15 | 6600 | 2.38 | 11500 | 3.27 | 16400 | 4.08 |
| 1800 | 1.19 | 6700 | 2.40 | 11600 | 3.27 | 16500 | 4.07 |
| 1900 | 1.22 | 6800 | 2.42 | 11700 | 3.28 | 16600 | 4.10 |
| 2000 | 1.25 | 6900 | 2.43 | 11800 | 3.32 | 16700 | 4.14 |
| 2100 | 1.28 | 7000 | 2.44 | 11900 | 3.34 | 16800 | 4.12 |
| 2200 | 1.34 | 7100 | 2.48 | 12000 | 3.34 | 16900 | 4.13 |
| 2300 | 1.35 | 7200 | 2.46 | 12100 | 3.35 | 17000 | 4.13 |
| 2400 | 1.39 | 7300 | 2.51 | 12200 | 3.39 | 17100 | 4.19 |
| 2500 | 1.40 | 7400 | 2.53 | 12300 | 3.44 | 17200 | 4.22 |
| 2600 | 1.44 | 7500 | 2.50 | 12400 | 3.44 | 17300 | 4.20 |
| 2700 | 1.47 | 7600 | 2.53 | 12500 | 3.43 | 17400 | 4.21 |
| 2800 | 1.50 | 7700 | 2.63 | 12600 | 3.45 | 17500 | 4.19 |
| 2900 | 1.54 | 7800 | 2.62 | 12700 | 3.47 | 17600 | 4.22 |
| 3000 | 1.56 | 7900 | 2.58 | 12800 | 3.51 | 17700 | 4.24 |
| 3100 | 1.59 | 8000 | 2.64 | 12900 | 3.51 | 17800 | 4.23 |
| 3200 | 1.62 | 8100 | 2.66 | 13000 | 3.52 | 17900 | 4.26 |
| 3300 | 1.64 | 8200 | 2.67 | 13100 | 3.56 | 18000 | 4.27 |
| 3400 | 1.67 | 8300 | 2.63 | 13200 | 3.57 | | |
| 3500 | 1.69 | 8400 | 2.64 | 13300 | 3.58 | | |
| 3600 | 1.72 | 8500 | 2.65 | 13400 | 3.60 | | |
| 3700 | 1.74 | 8600 | 2.68 | 13500 | 3.61 | | |
| 3800 | 1.78 | 8700 | 2.72 | 13600 | 3.66 | | |
| 3900 | 1.80 | 8800 | 2.73 | 13700 | 3.68 | | |
| 4000 | 1.83 | 8900 | 2.74 | 13800 | 3.67 | | |
| 4100 | 1.84 | 9000 | 2.77 | 13900 | 3.68 | | |
| 4200 | 1.86 | 9100 | 2.79 | 14000 | 3.73 | | |
| 4300 | 1.89 | 9200 | 2.82 | 14100 | 3.74 | | |
| 4400 | 1.92 | 9300 | 2.81 | 14200 | 3.74 | | |
| 4500 | 1.94 | 9400 | 2.85 | 14300 | 3.76 | | |
| 4600 | 1.97 | 9500 | 2.89 | 14400 | 3.78 | | |
| 4700 | 1.97 | 9600 | 2.90 | 14500 | 3.81 | | |
| 4800 | 2.01 | 9700 | 2.92 | 14600 | 3.83 | | |

**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, MHz | Cable loss, dB | Frequency, MHz | Cable loss, 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 | | |

# 13 APPENDIX F Abbreviations and acronyms

| | |
|---|---|
| A | ampere |
| AC | alternating current |
| AM | amplitude modulation |
| AVRG | average (detector) |
| BB | broad band |
| cm | centimeter |
| dB | decibel |
| dBm | decibel referred to one milliwatt |
| dB(μV) | decibel referred to one microvolt |
| dB(μV/m) | decibel referred to one microvolt per meter |
| dB(μA) | decibel referred to one microampere |
| 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 |
| k | kilo |
| kHz | kilohertz |
| LO | local oscillator |
| m | meter |
| MHz | megahertz |
| min | minute |
| mm | millimeter |
| ms | millisecond |
| μs | microsecond |
| NA | not applicable |
| NB | narrow band |
| OATS | open area test site |
| Ω | Ohm |
| QP | quasi-peak |
| RE | radiated emission |
| RF | radio frequency |
| rms | root mean square |
| Rx | receive |
| s | second |
| T | temperature |
| Tx | transmit |
| V | volt |

END OF DOCUMENT