

# TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 subpart Z

FOR:

**Airspan Networks Inc.**

**WiMAX base station**

**Model: uMAXe/AirGrid 3.65 GHz TDD Ext**

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

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## 1 Applicant information

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**Contact name:** Mr. Zion Levi

## 2 Equipment under test attributes

**Product name:** WiMAX base station  
**Product type:** Transceiver  
**Model(s):** uMAXe / AirGrid 3.65GHz TDD Ext  
**Serial number:** 5B3AB4136731  
**Hardware version:** A1  
**Software release:** 13.9.60.003  
**Receipt date:** 3/27/2011

## 3 Manufacturer information

**Manufacturer name:** Airspan Networks Inc.  
**Address:** 777 Yamato Rd, Suite 310, Boca Raton 33431, Florida, USA  
**Telephone:** +1 561 893 8686  
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**E-Mail:** zlevi@airspan.com  
**Contact name:** Mr. Zion Levi

## 4 Test details

**Project ID:** 21823  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 3/27/2011  
**Test completed:** 5/16/2011  
**Test specification(s):** 47CFR part 90 subpart Z

## 5 Tests summary

| Test                                                            | Status                                                  |
|-----------------------------------------------------------------|---------------------------------------------------------|
| <b>Transmitter characteristics</b>                              |                                                         |
| FCC Section 90.1321, Maximum conducted output power             | Pass                                                    |
| FCC Section 90.1321, Peak EIRP power density                    | Pass                                                    |
| FCC Section 90.209, Occupied bandwidth                          | Pass                                                    |
| FCC Section 90.210(b), Emission mask                            | Pass                                                    |
| FCC Section 90.1323, Spurious emissions at RF antenna connector | Pass                                                    |
| FCC Section 90.1323, Radiated spurious emissions                | Pass                                                    |
| FCC Section 90.213, Frequency stability                         | Pass                                                    |
| FCC Section 90.203 (o), Contention based protocol               | Pass                                                    |
| FCC Section 90.1335, RF exposure                                | Pass, Exhibit attached to Application for certification |

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

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

|                     | Name and Title                               | Date         | Signature                                                                             |
|---------------------|----------------------------------------------|--------------|---------------------------------------------------------------------------------------|
| <b>Tested by:</b>   | Mr. S. Samokha, test engineer                | May 16, 2011 |  |
| <b>Reviewed by:</b> | Mrs. M. Cherniavsky, certification engineer  | May 24, 2011 |  |
| <b>Approved by:</b> | Mr. M. Nikishin, EMC and Radio group manager | May 31, 2011 |  |

## 6 EUT description

### 6.1 General information

The EUT, base station radio, uMAXe/AirGrid 3.65GHz TDD Ext, is part of a WiMAX 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 uMAX's transceiver/receiver (up to 64 QAM modulation, data rate up to 46) uses OFDMA and operating in TDD duplexing mode, equipped with a 2 dBi external antenna.

The uMAXe / AirGrid 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 ProST 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         | PS             | EUT          | 1    | Unshielded | 3.5             |
| RF (Tx/Rx) | Antenna 1        | EUT            | Antenna      | 1    | Coax       | 10              |
| RF (Tx/Rx) | Antenna 2        | EUT            | Antenna      | 1    | Coax       | 10              |
| Signal     | GPS              | EUT            | GPS Antenna  | 1    | Coax       | 1.5             |
| Control    | Manage           | EUT            | PC           | 1    | Not in use | Not in use      |
| Telecom    | Ethernet         | EUT            | Laptop       | 1    | STP        | 3               |

### 6.3 Support and test equipment

| Description                | Manufacturer        | Model number | Serial number          |
|----------------------------|---------------------|--------------|------------------------|
| DC power supply            | Horizon Electronics | DHR3655D     | S/N 767469             |
| Laptop                     | IBM                 | X31          | 99-TXWYC               |
| GPS Antenna                | Trimble             | P/N 57861-00 | S/N 01880177           |
| Power Splitter             | Mini-Circuits       | ZA4PD-4      | SF118400430            |
| Power Splitter             | Mini-Circuits       | ZAPD-4-S+    | SF273900809            |
| Terminal Station           | Airspan             | WIXS-168 V01 | 00A00A158390           |
| PS (for Terminal Station)  | Power Dsine         | PD-3001/AC   | RO8268050024397001     |
| AC Adapter                 | IBM                 | 92P1014      | 11S92P1014Z1ZD2N74T2LS |
| Attenuator 30 dB (2 units) | Aeroflex            | 33-30-34     | NA                     |

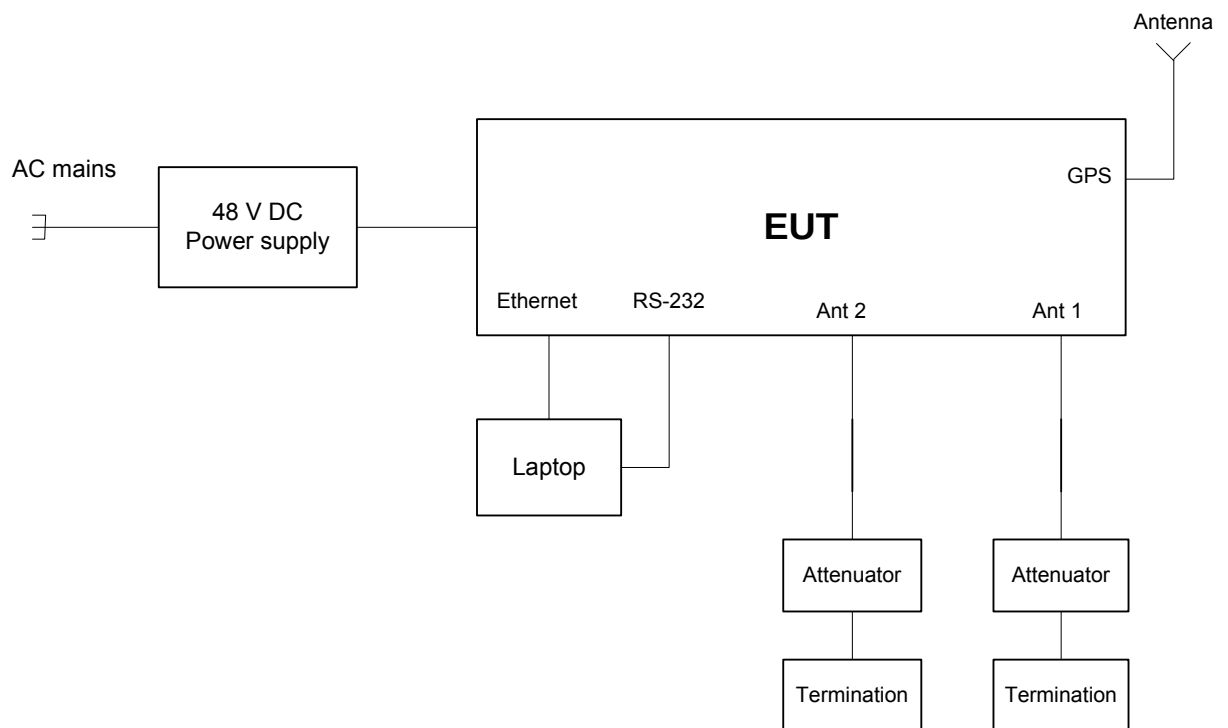
### 6.4 Operating frequencies

| Source | Frequency, MHz |      |         |
|--------|----------------|------|---------|
| Tx     | 3651.75        | 3675 | 3698.25 |
| LO     | 153            |      |         |

### 6.5 Changes made in EUT

No changes were implemented.

## 6.6 Test configuration



## 6.7 Transmitter characteristics

|                                                      |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------|-----------------------|------------------------|
| <b>Type of equipment</b>                             |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| <input checked="" type="checkbox"/> V                | Stand-alone (Equipment with or without its own control provisions)                                       |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| <input type="checkbox"/>                             | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| <input type="checkbox"/>                             | Plug-in card (Equipment intended for a variety of host systems)                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| <b>Intended use</b>                                  |                                                                                                          | <b>Condition of use</b>                                                                                                                                                                                                                                                                   |                                                                                                                              |                                                                      |                       |                       |                        |
| <input checked="" type="checkbox"/> V                | fixed                                                                                                    | Always at a distance more than 2 m from all people                                                                                                                                                                                                                                        |                                                                                                                              |                                                                      |                       |                       |                        |
| <input type="checkbox"/>                             | mobile                                                                                                   | Always at a distance more than 20 cm from all people                                                                                                                                                                                                                                      |                                                                                                                              |                                                                      |                       |                       |                        |
| <input type="checkbox"/>                             | portable                                                                                                 | May operate at a distance closer than 20 cm to human body                                                                                                                                                                                                                                 |                                                                                                                              |                                                                      |                       |                       |                        |
| <b>Assigned frequency range</b>                      |                                                                                                          | 3650.0 – 3700.0 MHz                                                                                                                                                                                                                                                                       |                                                                                                                              |                                                                      |                       |                       |                        |
| <b>Operating frequency range</b>                     |                                                                                                          | 3651.75 – 3698.25 MHz for 3.5 MHz EBW<br>3652.50 – 3697.50 MHz for 5 MHz EBW<br>3653.50 – 3696.50 MHz for 7 MHz EBW<br>3655.00 – 3695.00 MHz for 10 MHz EBW                                                                                                                               |                                                                                                                              |                                                                      |                       |                       |                        |
| <b>RF channel spacing</b>                            |                                                                                                          | 3.5 MHz, 5 MHz, 7 MHz, 10 MHz                                                                                                                                                                                                                                                             |                                                                                                                              |                                                                      |                       |                       |                        |
| <b>Maximum rated output power</b>                    |                                                                                                          | At transmitter 50 $\Omega$ RF output connector (aggregate power of both RF chains) <table border="1"> <tr> <td>33.08 dBm – 3.5 MHz OBW</td> </tr> <tr> <td>34.55 dBm – 5 MHz OBW</td> </tr> <tr> <td>36.07 dBm – 7 MHz OBW</td> </tr> <tr> <td>36.08 dBm – 10 MHz OBW</td> </tr> </table> |                                                                                                                              | 33.08 dBm – 3.5 MHz OBW                                              | 34.55 dBm – 5 MHz OBW | 36.07 dBm – 7 MHz OBW | 36.08 dBm – 10 MHz OBW |
| 33.08 dBm – 3.5 MHz OBW                              |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| 34.55 dBm – 5 MHz OBW                                |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| 36.07 dBm – 7 MHz OBW                                |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| 36.08 dBm – 10 MHz OBW                               |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| <b>Is transmitter output power variable?</b>         |                                                                                                          | <input type="checkbox"/> No                                                                                                                                                                                                                                                               |                                                                                                                              |                                                                      |                       |                       |                        |
|                                                      |                                                                                                          | <input checked="" type="checkbox"/> V                                                                                                                                                                                                                                                     | <input checked="" type="checkbox"/> Yes                                                                                      | <input type="checkbox"/> continuous variable                         |                       |                       |                        |
|                                                      |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              | <input checked="" type="checkbox"/> V stepped variable with stepsize | 0.1 dB                |                       |                        |
|                                                      |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              | minimum RF power                                                     | 0 dBm                 |                       |                        |
|                                                      |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              | maximum RF power                                                     | dBm                   |                       |                        |
| <b>Antenna connection</b>                            |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| <input type="checkbox"/> unique coupling             | <input checked="" type="checkbox"/> V standard connector                                                 | <input type="checkbox"/> Integral                                                                                                                                                                                                                                                         | <input checked="" type="checkbox"/> V with temporary RF connector<br><input type="checkbox"/> without temporary RF connector |                                                                      |                       |                       |                        |
| <b>Antenna/s technical characteristics</b>           |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| Type                                                 | Manufacturer                                                                                             | Model number                                                                                                                                                                                                                                                                              | Gain                                                                                                                         |                                                                      |                       |                       |                        |
| Blade antenna                                        | European Antennas Ltd.                                                                                   | SBA-3800-D1/1040                                                                                                                                                                                                                                                                          | 2.0 dBi                                                                                                                      |                                                                      |                       |                       |                        |
| Omni Directional Antenna                             | MTI Wireless Edge Ltd.                                                                                   | MT-403017/N                                                                                                                                                                                                                                                                               | 10.5 dBi                                                                                                                     |                                                                      |                       |                       |                        |
| Manual Tilt Panel Antenna, Dual Slant $\pm 45^\circ$ | Argus Technologies Pty Ltd.                                                                              | SSPX310M                                                                                                                                                                                                                                                                                  | 18.0 dBi                                                                                                                     |                                                                      |                       |                       |                        |
| <b>Transmitter aggregate data rate/s, Mbps</b>       |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| Transmitter 99% power bandwidth                      | Type of modulation                                                                                       |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
|                                                      | 64QAM                                                                                                    | 16QAM                                                                                                                                                                                                                                                                                     | QPSK                                                                                                                         |                                                                      |                       |                       |                        |
|                                                      | 10 MHz                                                                                                   | 43                                                                                                                                                                                                                                                                                        | 26                                                                                                                           |                                                                      |                       |                       |                        |
|                                                      | 7 MHz                                                                                                    | 26                                                                                                                                                                                                                                                                                        | 16                                                                                                                           |                                                                      |                       |                       |                        |
|                                                      | 5 MHz                                                                                                    | 22                                                                                                                                                                                                                                                                                        | 13                                                                                                                           |                                                                      |                       |                       |                        |
| 3.5 MHz                                              | 11                                                                                                       | 7                                                                                                                                                                                                                                                                                         | 3                                                                                                                            |                                                                      |                       |                       |                        |
| Type of multiplexing                                 |                                                                                                          | OFDMA/TDD                                                                                                                                                                                                                                                                                 |                                                                                                                              |                                                                      |                       |                       |                        |
| Modulating test signal (baseband)                    |                                                                                                          | PRBS                                                                                                                                                                                                                                                                                      |                                                                                                                              |                                                                      |                       |                       |                        |
| Maximum transmitter duty cycle in normal use         |                                                                                                          | 75 %                                                                                                                                                                                                                                                                                      |                                                                                                                              |                                                                      |                       |                       |                        |
| <b>Transmitter power source</b>                      |                                                                                                          |                                                                                                                                                                                                                                                                                           |                                                                                                                              |                                                                      |                       |                       |                        |
| <input checked="" type="checkbox"/> V                | <input checked="" type="checkbox"/> DC                                                                   | Nominal rated voltage                                                                                                                                                                                                                                                                     | 48 VDC                                                                                                                       |                                                                      |                       |                       |                        |
| Common power source for transmitter and receiver     |                                                                                                          | <input checked="" type="checkbox"/> V                                                                                                                                                                                                                                                     | yes no                                                                                                                       |                                                                      |                       |                       |                        |

|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

## 7 Transmitter tests according to 47CFR part 90 requirements

### 7.1 Peak output power and EIRP power density test

#### 7.1.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Peak output power limits

| Assigned frequency range, MHz | Occupied Bandwidth, MHz | Maximum peak output power, EIRP           |         |
|-------------------------------|-------------------------|-------------------------------------------|---------|
|                               |                         | W                                         | dBm     |
| 3650.0 – 3700.0               | 3.5                     | 3.5                                       | 35.44   |
|                               | 5                       | 5                                         | 36.99   |
|                               | 7                       | 7                                         | 38.45   |
|                               | 10                      | 10                                        | 40.00   |
| Assigned frequency range, MHz | Occupied Bandwidth, MHz | Maximum peak power spectral density, EIRP |         |
|                               |                         | W/MHz                                     | dBm/MHz |
| 3650.0 – 3700.0               | 5                       | 1                                         | 30      |
|                               | 7                       |                                           |         |
|                               | 10                      |                                           |         |

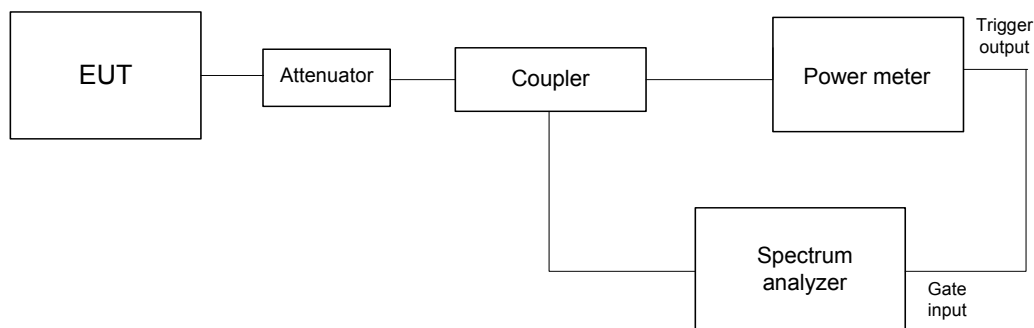
#### 7.1.2 Test procedure

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 adjusted to produce maximum available to the end user RF output power.

7.1.2.3 The peak output power was measured with spectrum analyzer as provided in Table 7.1.2 and associated plots.

Figure 7.1.1 Peak output power test setup



|                      |                                                      |                         |                      |
|----------------------|------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1321, Maximum conducted output power      |                         |                      |
| Test procedure:      | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 |                         |                      |
| Test mode:           | Compliance                                           | Verdict: PASS           |                      |
| Date:                | 3/27/2011                                            |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1022 hPa                               | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks:             |                                                      |                         |                      |

Table 7.1.2 Peak EIRP output power test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3700.0 MHz  
DETECTOR USED: Average (Power Meter)  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum (see NOTE 1)  
EBW: 3.5 MHz

| Channel, MHz | Modulation | P <sub>meas</sub> (RF#1), dBm | P <sub>meas</sub> (RF#2), dBm | P <sub>meas</sub> *, dBm | Antenna gain, dBi | EIRP total**, dBm | Limit, dBm | Margin, dB | Verdict |
|--------------|------------|-------------------------------|-------------------------------|--------------------------|-------------------|-------------------|------------|------------|---------|
| 3651.75      | QPSK       | 30.10                         | 30.01                         | 33.07                    | 2.0               | 35.07             | 35.44      | -0.37      | Pass    |
| 3675.00      | QPSK       | 30.07                         | 30.04                         | 33.07                    | 2.0               | 35.07             | 35.44      | -0.37      | Pass    |
| 3698.25      | QPSK       | 30.06                         | 30.01                         | 33.05                    | 2.0               | 35.05             | 35.44      | -0.39      | Pass    |
| 3651.75      | 64QAM      | 30.11                         | 30.03                         | 33.08                    | 2.0               | 35.08             | 35.44      | -0.36      | Pass    |
| 3675.00      | 64QAM      | 30.08                         | 30.04                         | 33.07                    | 2.0               | 35.07             | 35.44      | -0.37      | Pass    |
| 3698.25      | 64QAM      | 30.08                         | 30.05                         | 33.08                    | 2.0               | 35.08             | 35.44      | -0.36      | Pass    |

EBW: 5 MHz

| Channel, MHz | Modulation | P <sub>meas</sub> (RF#1), dBm | P <sub>meas</sub> (RF#2), dBm | P <sub>meas</sub> *, dBm | Antenna gain, dBi | EIRP total**, dBm | Limit, dBm | Margin, dB | Verdict |
|--------------|------------|-------------------------------|-------------------------------|--------------------------|-------------------|-------------------|------------|------------|---------|
| 3652.50      | QPSK       | 31.32                         | 31.54                         | 34.44                    | 2.0               | 36.44             | 36.70      | -0.26      | Pass    |
| 3675.00      | QPSK       | 31.45                         | 31.52                         | 34.50                    | 2.0               | 36.50             | 36.70      | -0.20      | Pass    |
| 3697.50      | QPSK       | 31.56                         | 31.46                         | 34.52                    | 2.0               | 36.52             | 36.70      | -0.18      | Pass    |
| 3652.50      | 64QAM      | 31.46                         | 31.62                         | 34.55                    | 2.0               | 36.55             | 36.70      | -0.15      | Pass    |
| 3675.00      | 64QAM      | 31.47                         | 31.54                         | 34.52                    | 2.0               | 36.52             | 36.70      | -0.18      | Pass    |
| 3697.50      | 64QAM      | 31.57                         | 31.41                         | 34.50                    | 2.0               | 36.50             | 36.70      | -0.20      | Pass    |

EBW: 7 MHz

| Channel, MHz | Modulation | P <sub>meas</sub> (RF#1), dBm | P <sub>meas</sub> (RF#2), dBm | P <sub>meas</sub> *, dBm | Antenna gain, dBi | EIRP total**, dBm | Limit, dBm | Margin, dB | Verdict |
|--------------|------------|-------------------------------|-------------------------------|--------------------------|-------------------|-------------------|------------|------------|---------|
| 3653.50      | QPSK       | 32.96                         | 33.04                         | 36.01                    | 2.0               | 38.01             | 38.45      | -0.44      | Pass    |
| 3675.00      | QPSK       | 33.02                         | 32.90                         | 35.97                    | 2.0               | 37.97             | 38.45      | -0.48      | Pass    |
| 3696.50      | QPSK       | 33.06                         | 32.41                         | 35.76                    | 2.0               | 37.76             | 38.45      | -0.69      | Pass    |
| 3653.50      | 64QAM      | 33.04                         | 33.07                         | 36.07                    | 2.0               | 38.07             | 38.45      | -0.38      | Pass    |
| 3675.00      | 64QAM      | 33.11                         | 32.96                         | 36.05                    | 2.0               | 38.05             | 38.45      | -0.40      | Pass    |
| 3696.50      | 64QAM      | 33.09                         | 32.49                         | 35.81                    | 2.0               | 37.81             | 38.45      | -0.64      | Pass    |

|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b>                                        | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                     |                                                        |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Table 7.1.2 Peak EIRP output power test results (continued)

ASSIGNED FREQUENCY RANGE: 3650.0 – 3700.0 MHz  
DETECTOR USED: Average (Power Meter)  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum (see NOTE 1)

EBW:

10 MHz

| Channel, MHz | Modulation | Pmeas (RF#1), dBm | Pmeas (RF#2), dBm | P <sub>meas</sub> *, dBm | Antenna gain, dBi | EIRP total**, dBm | Limit, dBm | Margin, dB | Verdict |
|--------------|------------|-------------------|-------------------|--------------------------|-------------------|-------------------|------------|------------|---------|
| 3655.00      | QPSK       | 32.91             | 33.24             | 36.08                    | 2.0               | 38.08             | 40.00      | -1.92      | Pass    |
| 3675.00      | QPSK       | 32.81             | 32.95             | 35.89                    | 2.0               | 37.89             | 40.00      | -2.11      | Pass    |
| 3695.00      | QPSK       | 33.31             | 32.65             | 36.00                    | 2.0               | 38.00             | 40.00      | -2.00      | Pass    |
| 3655.00      | 64QAM      | 32.89             | 33.23             | 36.07                    | 2.0               | 38.07             | 40.00      | -1.93      | Pass    |
| 3675.00      | 64QAM      | 32.75             | 32.96             | 35.87                    | 2.0               | 37.87             | 40.00      | -2.13      | Pass    |
| 3695.00      | 64QAM      | 33.29             | 32.64             | 35.99                    | 2.0               | 37.99             | 40.00      | -2.01      | Pass    |

\* -  $P_{meas}, dBm = 10 \log\{10^{[P(dBm, RF\#1)/10]} + 10^{[P(dBm, RF\#2)/10]}\}$

\*\* -  $EIRP\ total, dBm = P_{meas}^*, dBm + Antenna\ Gain, dBi$

NOTE 1: EUT was configured to produce maximum conducted RF power for minimum declared Antenna gain of 2 dBi. RF output power will vary depending on the antenna assembly gain to ensure that the total EIRP power and power limits withstand with EIRP limits. For actual settings of power levels with respect to actual antenna assembly used, please refer to the User's Manual.

|                             |                                                        |                                |                             |
|-----------------------------|--------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.1321, Maximum conducted output power</b> |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                                |                             |
| <b>Test mode:</b>           | Compliance                                             | <b>Verdict:</b> PASS           |                             |
| <b>Date:</b>                | 3/27/2011                                              |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa                          | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                        |                                |                             |

Table 7.1.3 Peak EIRP power density test results

OPERATING FREQUENCY RANGE: 3650.0 – 3700.0 MHz  
DETECTOR USED: Average (RMS)  
RESOLUTION BANDWIDTH: 1000 kHz  
VIDEO BANDWIDTH: 3000 kHz  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum (see NOTE 1)  
EBW: 3.5 MHz

| Channel, MHz | Modulation | Pmeas (RF#1), dBm/MHz | Pmeas (RF#2), dBm/MHz | Power density *, dBm/MHz | Antenna gain, dBi | EIRP power density**, dBm/MHz | Limit, dBm/MHz | Margin, dB | Verdict |
|--------------|------------|-----------------------|-----------------------|--------------------------|-------------------|-------------------------------|----------------|------------|---------|
| 3651.75      | QPSK       | 24.12                 | 24.56                 | 27.36                    | 2.0               | 29.36                         | 30.0           | -0.64      | Pass    |
| 3675.00      | QPSK       | 24.40                 | 24.68                 | 27.55                    | 2.0               | 29.55                         | 30.0           | -0.45      | Pass    |
| 3698.25      | QPSK       | 24.25                 | 24.19                 | 27.23                    | 2.0               | 29.23                         | 30.0           | -0.77      | Pass    |
| 3651.75      | 64QAM      | 24.05                 | 24.49                 | 27.29                    | 2.0               | 29.30                         | 30.0           | -0.70      | Pass    |
| 3675.00      | 64QAM      | 24.31                 | 24.56                 | 27.45                    | 2.0               | 29.45                         | 30.0           | -0.55      | Pass    |
| 3698.25      | 64QAM      | 24.22                 | 24.42                 | 27.33                    | 2.0               | 29.35                         | 30.0           | -0.65      | Pass    |

EBW: 5 MHz

| Channel, MHz | Modulation | Pmeas (RF#1), dBm/MHz | Pmeas (RF#2), dBm/MHz | Power density *, dBm/MHz | Antenna gain, dBi | EIRP power density**, dBm/MHz | Limit, dBm/MHz | Margin, dB | Verdict |
|--------------|------------|-----------------------|-----------------------|--------------------------|-------------------|-------------------------------|----------------|------------|---------|
| 3652.50      | QPSK       | 24.48                 | 24.46                 | 27.48                    | 2.0               | 29.48                         | 30.0           | -0.52      | Pass    |
| 3675.00      | QPSK       | 24.38                 | 24.37                 | 27.39                    | 2.0               | 29.40                         | 30.0           | -0.60      | Pass    |
| 3697.50      | QPSK       | 24.45                 | 24.06                 | 27.27                    | 2.0               | 29.27                         | 30.0           | -0.73      | Pass    |
| 3652.50      | 64QAM      | 24.62                 | 24.52                 | 27.58                    | 2.0               | 29.60                         | 30.0           | -0.40      | Pass    |
| 3675.00      | 64QAM      | 24.55                 | 24.58                 | 27.58                    | 2.0               | 29.58                         | 30.0           | -0.42      | Pass    |
| 3697.50      | 64QAM      | 24.67                 | 24.30                 | 27.50                    | 2.0               | 29.51                         | 30.0           | -0.49      | Pass    |

EBW: 7 MHz

| Channel, MHz | Modulation | Pmeas (RF#1), dBm/MHz | Pmeas (RF#2), dBm/MHz | Power density *, dBm/MHz | Antenna gain, dBi | EIRP power density **, dBm/MHz | Limit, dBm/MHz | Margin, dB | Verdict |
|--------------|------------|-----------------------|-----------------------|--------------------------|-------------------|--------------------------------|----------------|------------|---------|
| 3653.50      | QPSK       | 24.22                 | 24.77                 | 27.51                    | 2.0               | 29.51                          | 30.0           | -0.49      | Pass    |
| 3675.00      | QPSK       | 24.59                 | 24.66                 | 27.64                    | 2.0               | 29.65                          | 30.0           | -0.35      | Pass    |
| 3696.50      | QPSK       | 24.51                 | 24.83                 | 27.68                    | 2.0               | 29.68                          | 30.0           | -0.32      | Pass    |
| 3653.50      | 64QAM      | 24.37                 | 24.95                 | 27.68                    | 2.0               | 29.70                          | 30.0           | -0.30      | Pass    |
| 3675.00      | 64QAM      | 24.69                 | 24.80                 | 27.76                    | 2.0               | 29.76                          | 30.0           | -0.24      | Pass    |
| 3696.50      | 64QAM      | 24.59                 | 24.87                 | 27.74                    | 2.0               | 29.76                          | 30.0           | -0.24      | Pass    |

|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b>                                        | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                     |                                                        |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

**Table 7.1.3 Peak EIRP power density test results (continued)**

OPERATING FREQUENCY RANGE: 3650.0 – 3700.0 MHz  
DETECTOR USED: Average (RMS)  
RESOLUTION BANDWIDTH: 1000 kHz  
VIDEO BANDWIDTH: 3000 kHz  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum (see NOTE 1)

**EBW:**

**10 MHz**

| Channel, MHz | Modulation | Pmeas (RF#1), dBm/MHz | Pmeas (RF#2), dBm/MHz | Power density *, dBm/MHz | Antenna gain, dBi | EIRP power density **, dBm/MHz | Limit, dBm/MHz | Margin, dB | Verdict |
|--------------|------------|-----------------------|-----------------------|--------------------------|-------------------|--------------------------------|----------------|------------|---------|
| 3655.00      | QPSK       | 23.86                 | 24.20                 | 27.04                    | 2.0               | 29.04                          | 30.0           | -0.96      | Pass    |
| 3675.00      | QPSK       | 23.81                 | 24.05                 | 26.94                    | 2.0               | 28.96                          | 30.0           | -1.04      | Pass    |
| 3695.00      | QPSK       | 23.41                 | 23.44                 | 26.44                    | 2.0               | 28.44                          | 30.0           | -1.56      | Pass    |
| 3655.00      | 64QAM      | 23.72                 | 24.40                 | 27.08                    | 2.0               | 29.10                          | 30.0           | -0.90      | Pass    |
| 3675.00      | 64QAM      | 23.78                 | 24.04                 | 26.92                    | 2.0               | 28.92                          | 30.0           | -1.08      | Pass    |
| 3695.00      | 64QAM      | 23.44                 | 23.60                 | 26.53                    | 2.0               | 28.55                          | 30.0           | -1.45      | Pass    |

\* - Power density, dBm/MHz =  $10 \log\{10^{[P(\text{dBm/MHz}, \text{RF}\#1)/10]} + 10^{[P(\text{dBm/MHz}, \text{RF}\#2)/10]}\}$

\*\* - EIRP power density, dBm/MHz = Power density\*, dBm/MHz + Antenna Gain, dBi

NOTE1: EUT was configured to produce maximum conducted RF power for minimum declared Antenna gain of 2 dBi. RF output power will vary depending on the antenna assembly gain to ensure that the total EIRP power and power limits withstand with EIRP limits. For actual settings of power levels with respect to actual antenna assembly used, please refer to the User's Manual.

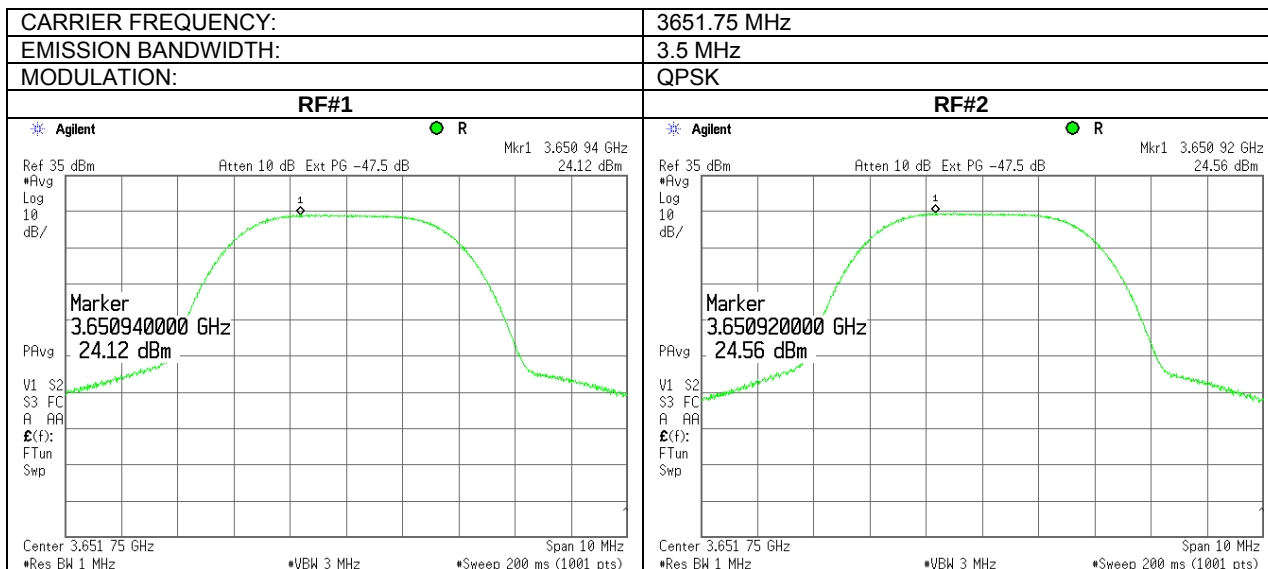
**Reference numbers of test equipment used**

|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 1906 | HL 2013 | HL 2952 | HL 3301 | HL 3302 | HL 3472 | HL 3474 | HL 3782 |
| HL 3818 |         |         |         |         |         |         |         |

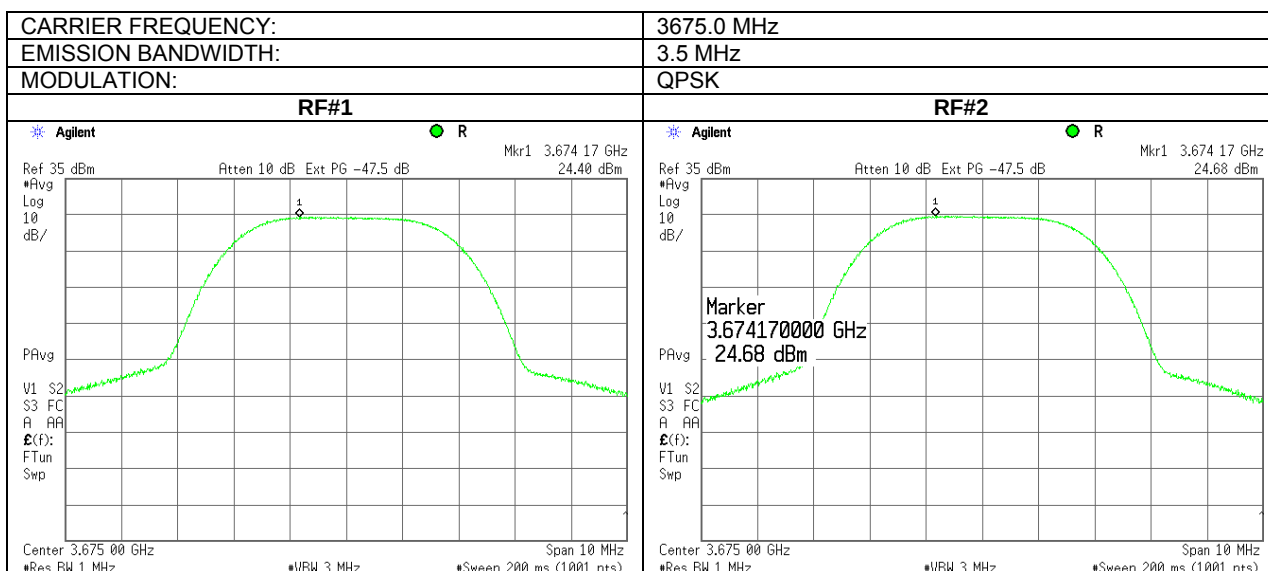
Full description is given in Appendix A.

|                      |                                                      |                         |                      |
|----------------------|------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1321, Maximum conducted output power      |                         |                      |
| Test procedure:      | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1 |                         |                      |
| Test mode:           | Compliance                                           | Verdict: PASS           |                      |
| Date:                | 3/27/2011                                            |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1022 hPa                               | Relative Humidity: 46 % | Power Supply: 48 VDC |
| Remarks:             |                                                      |                         |                      |

Plot 7.1.1 Peak output power density test results at low frequency

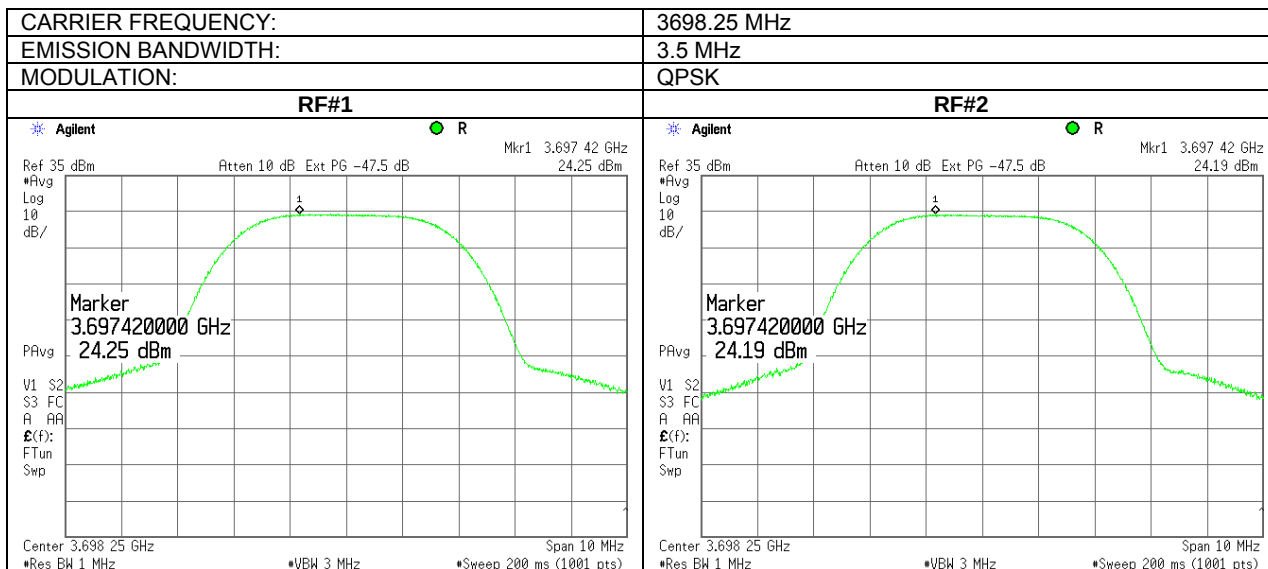


Plot 7.1.2 Peak output power density test results at mid frequency

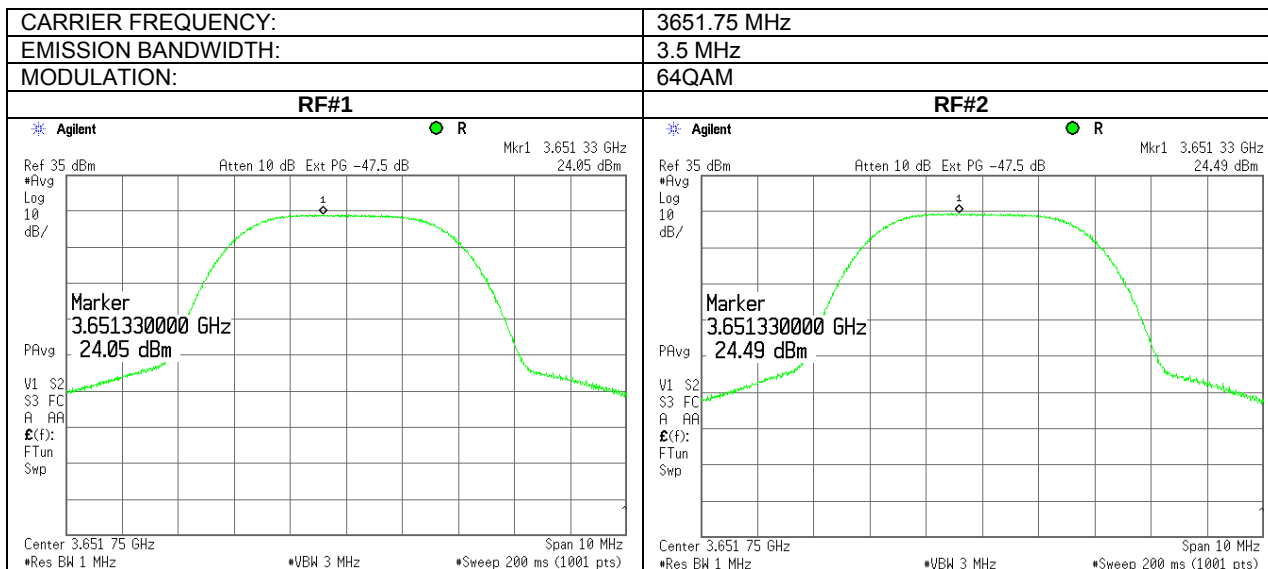


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.3 Peak output power test results at high frequency

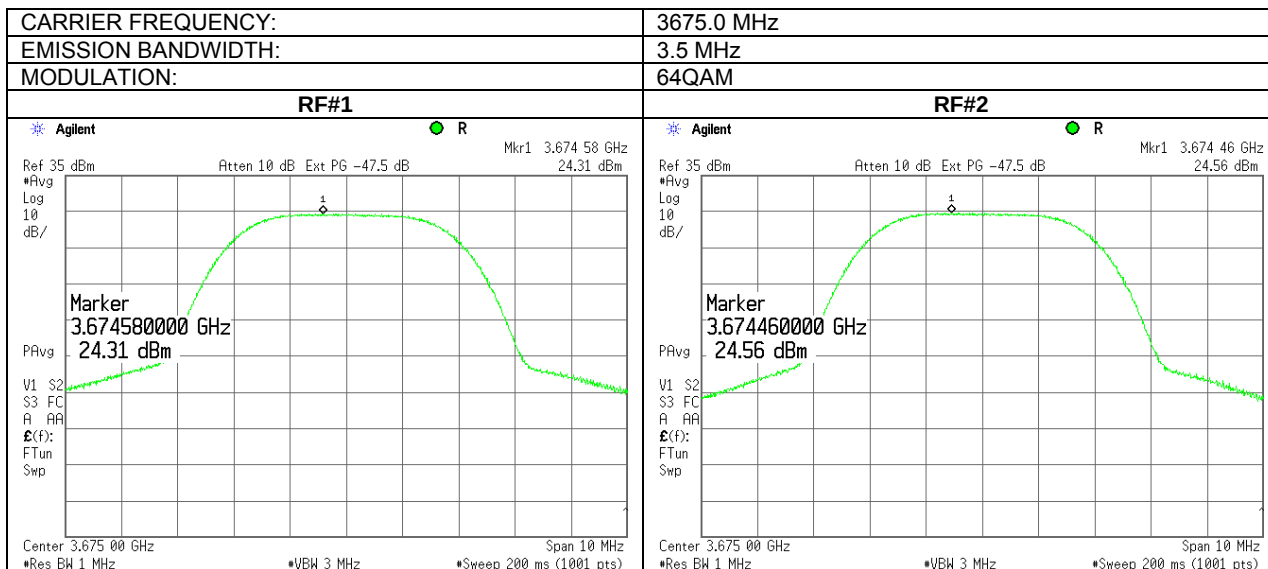


Plot 7.1.4 Peak output power density test results at low frequency

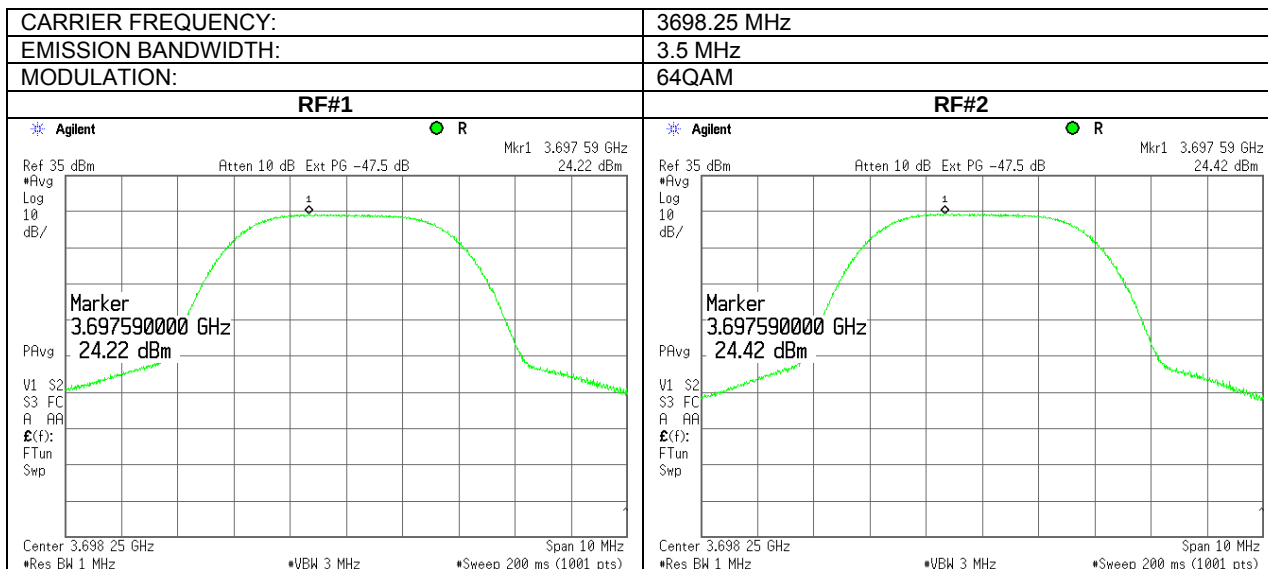


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.5 Peak output power density test results at mid frequency

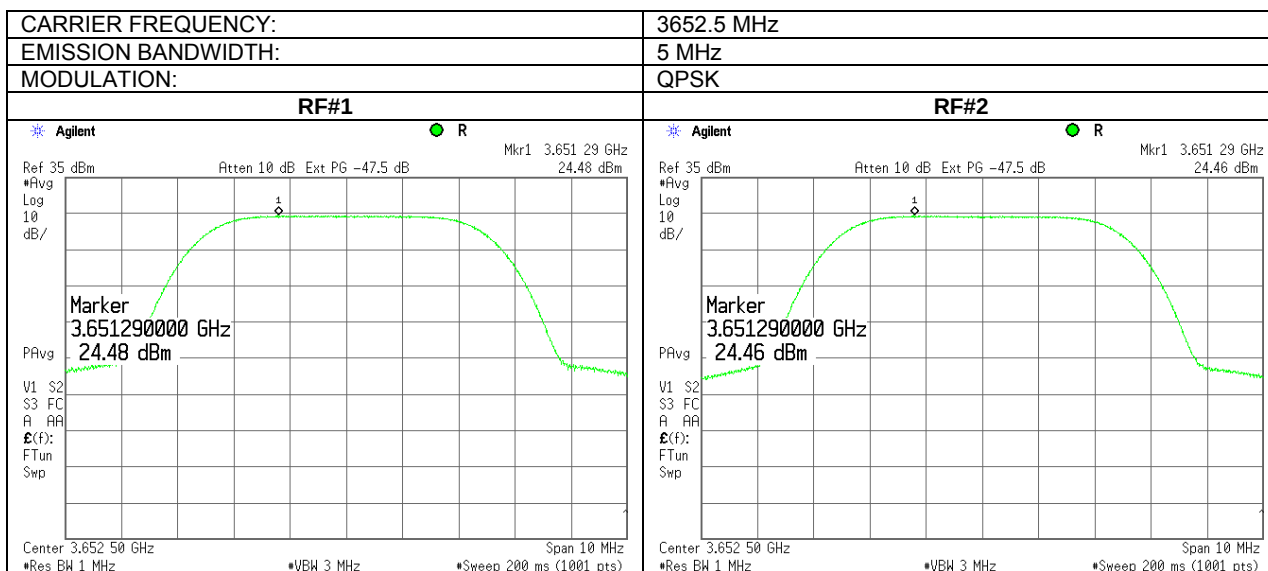


Plot 7.1.6 Peak output power test results at high frequency

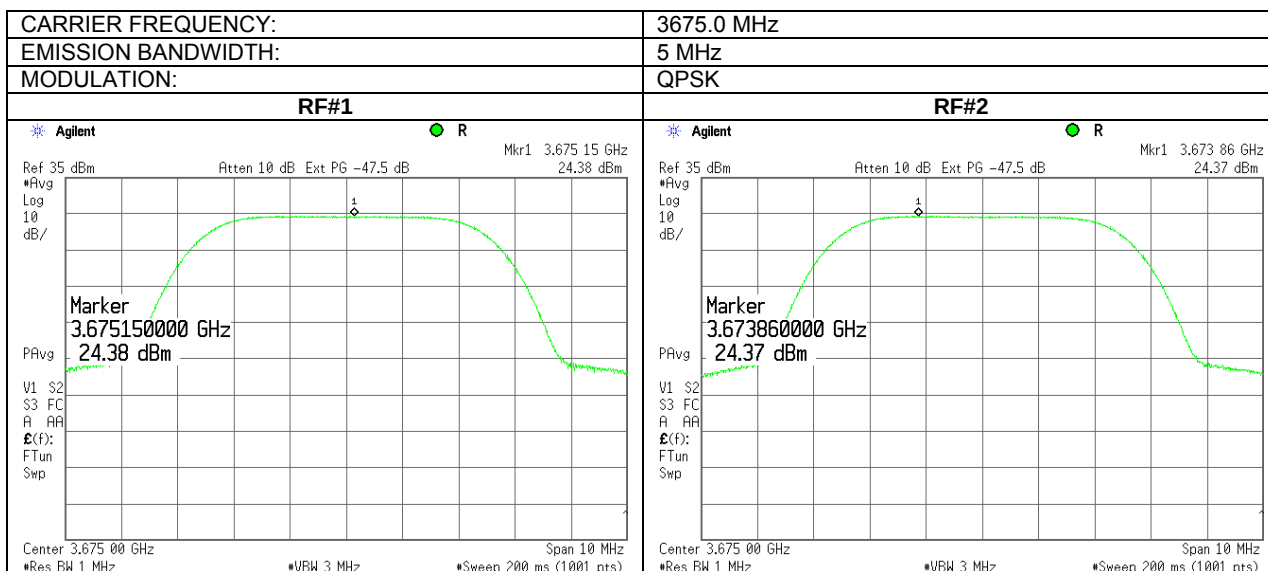


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.7 Peak output power density test results at low frequency

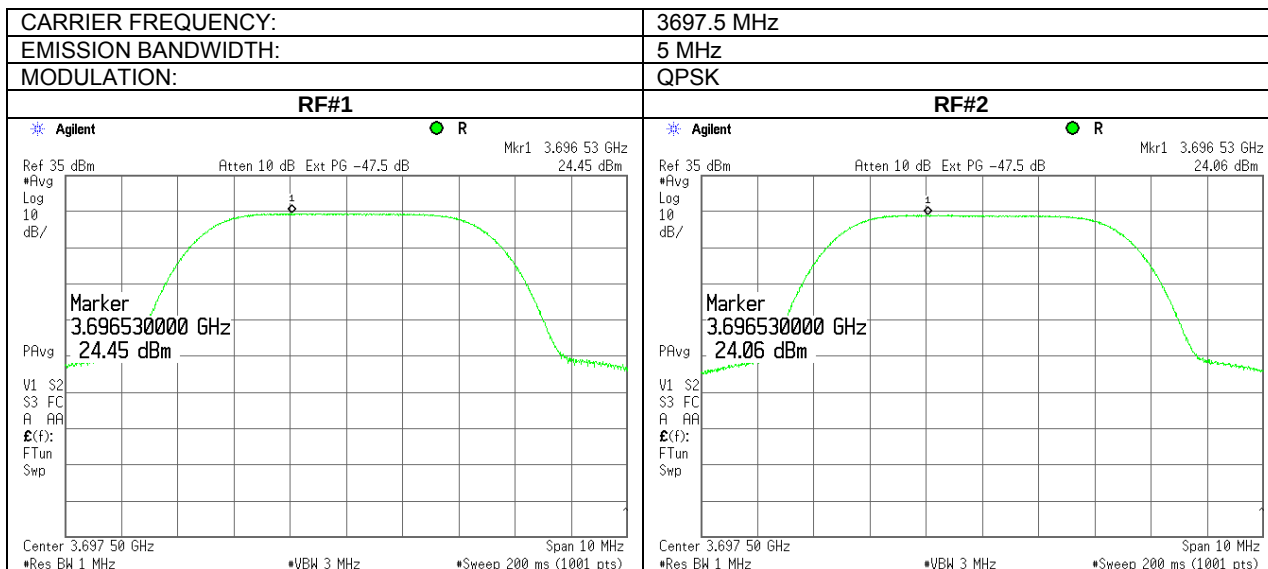


Plot 7.1.8 Peak output power density test results at mid frequency

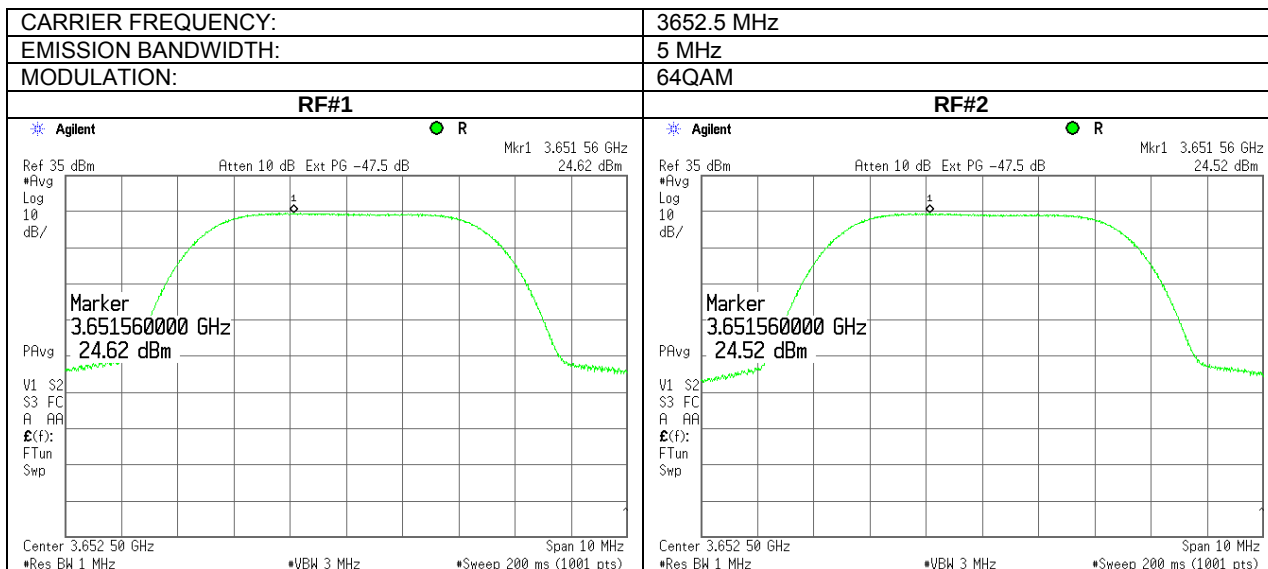


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.9 Peak output power test results at high frequency

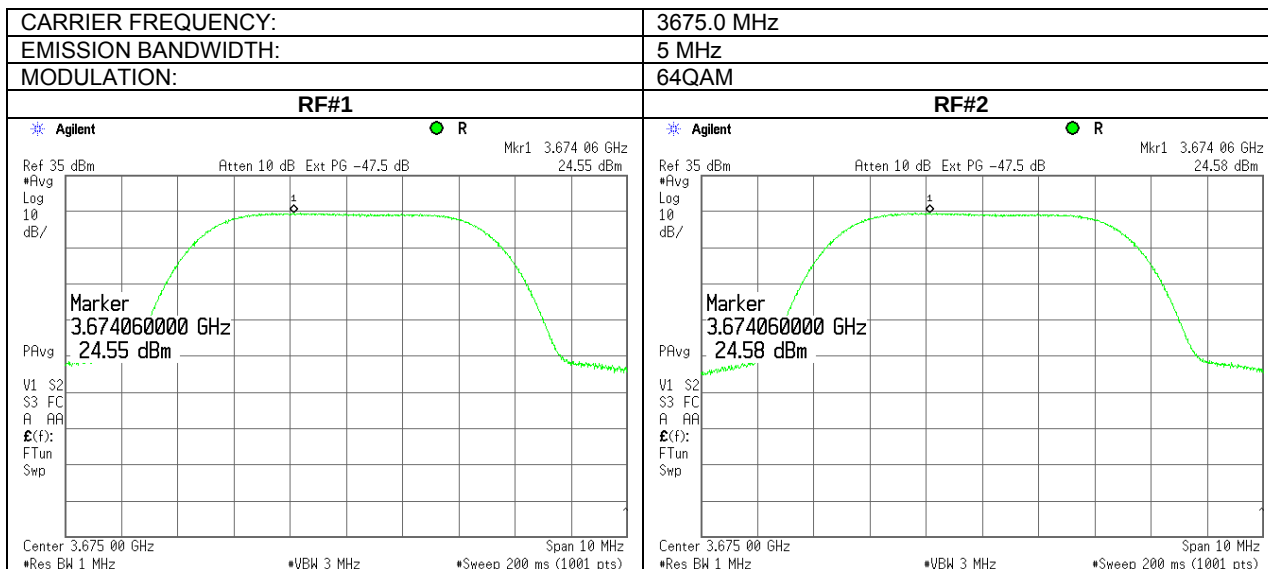


Plot 7.1.10 Peak output power test results at low frequency

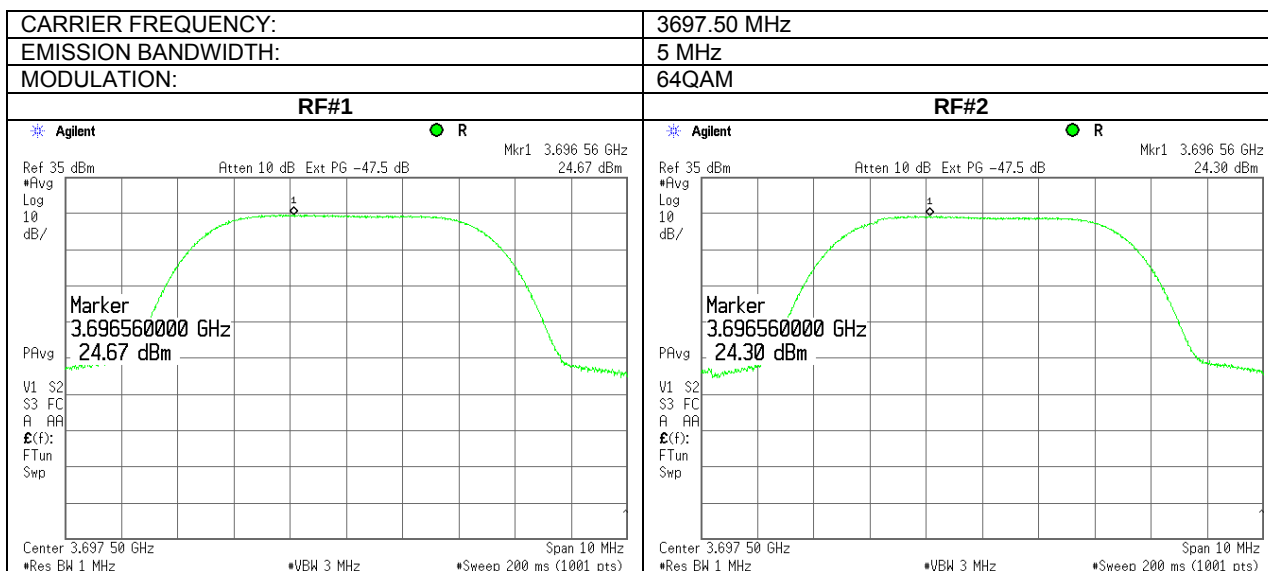


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.11 Peak output power test results at mid frequency

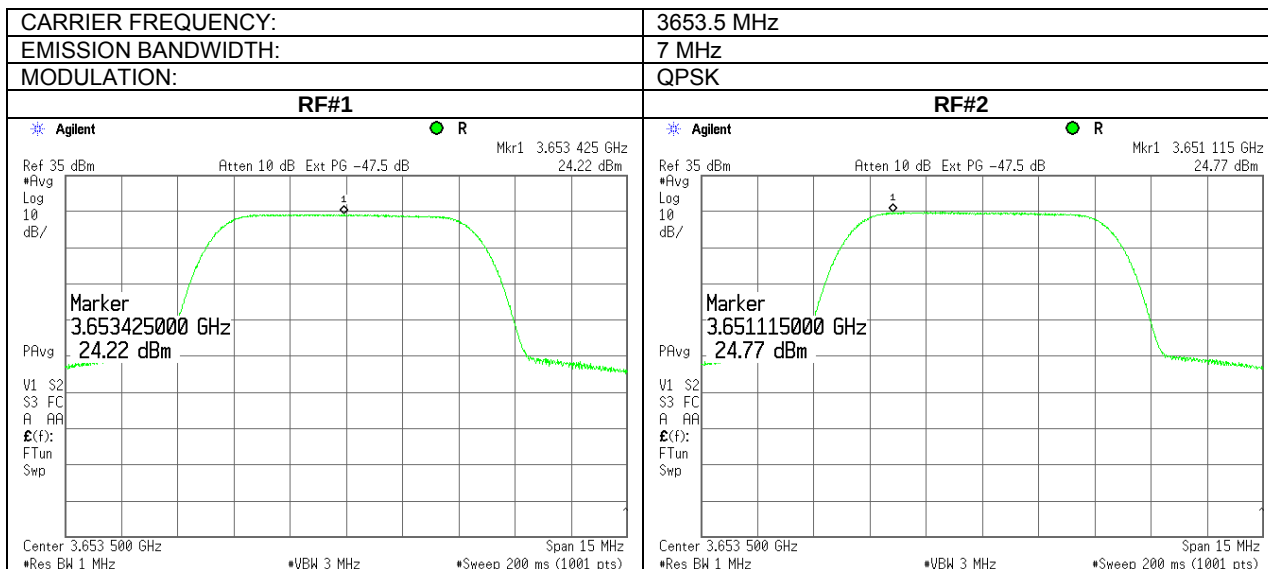


Plot 7.1.12 Peak output power test results at high frequency

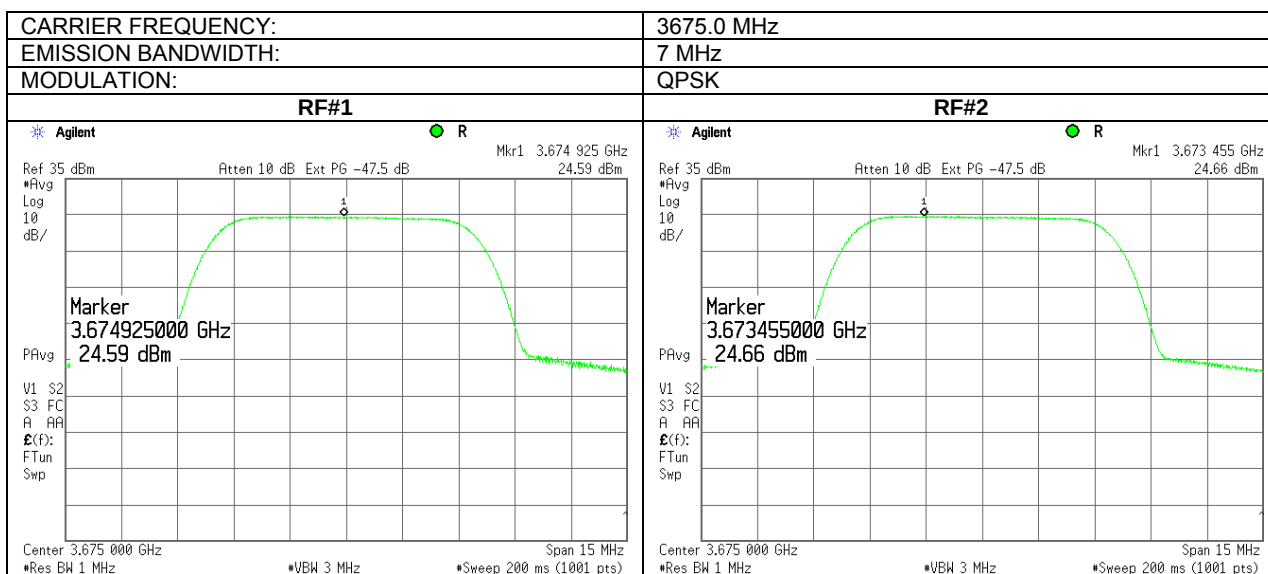


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.13 Peak output power test results at low frequency

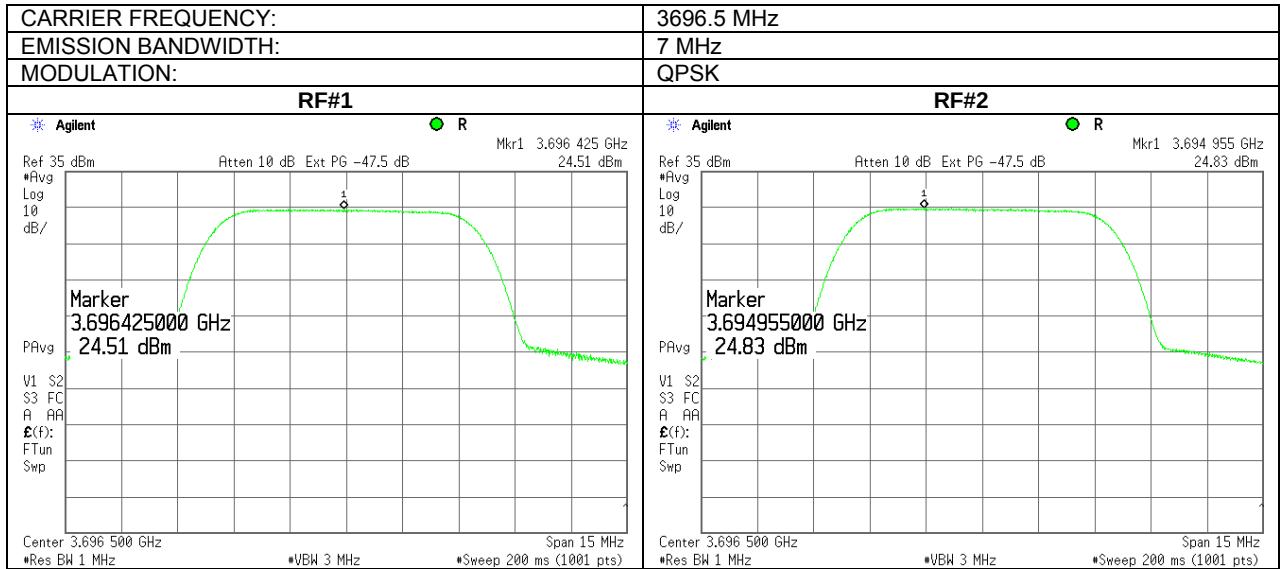


Plot 7.1.14 Peak output power test results at mid frequency

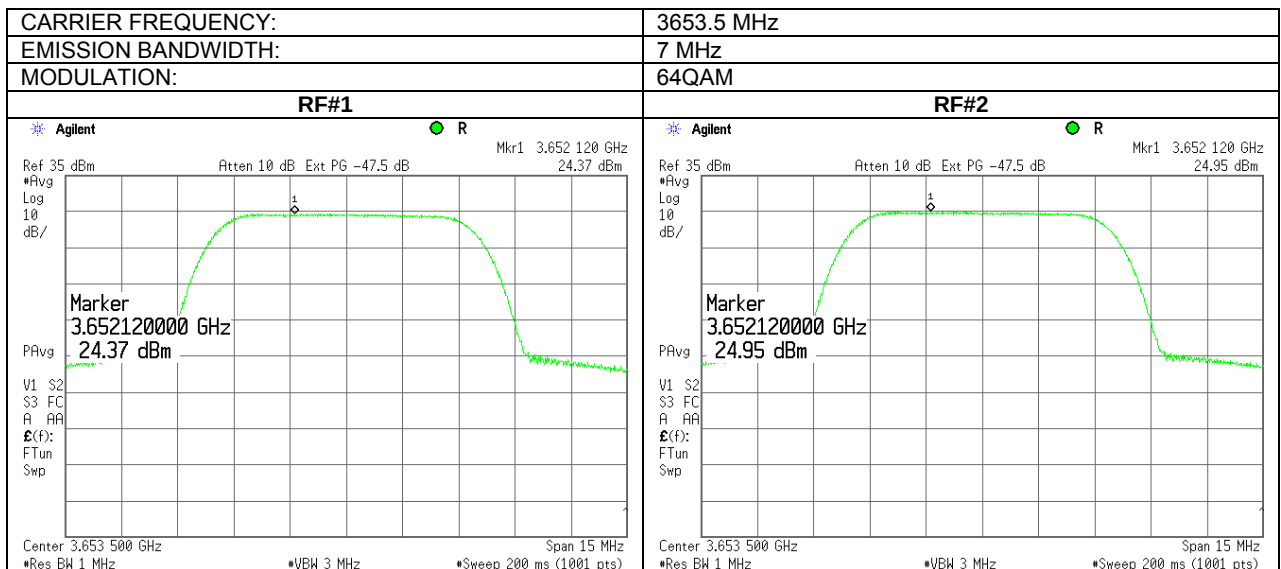


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.15 Peak output power test results at high frequency

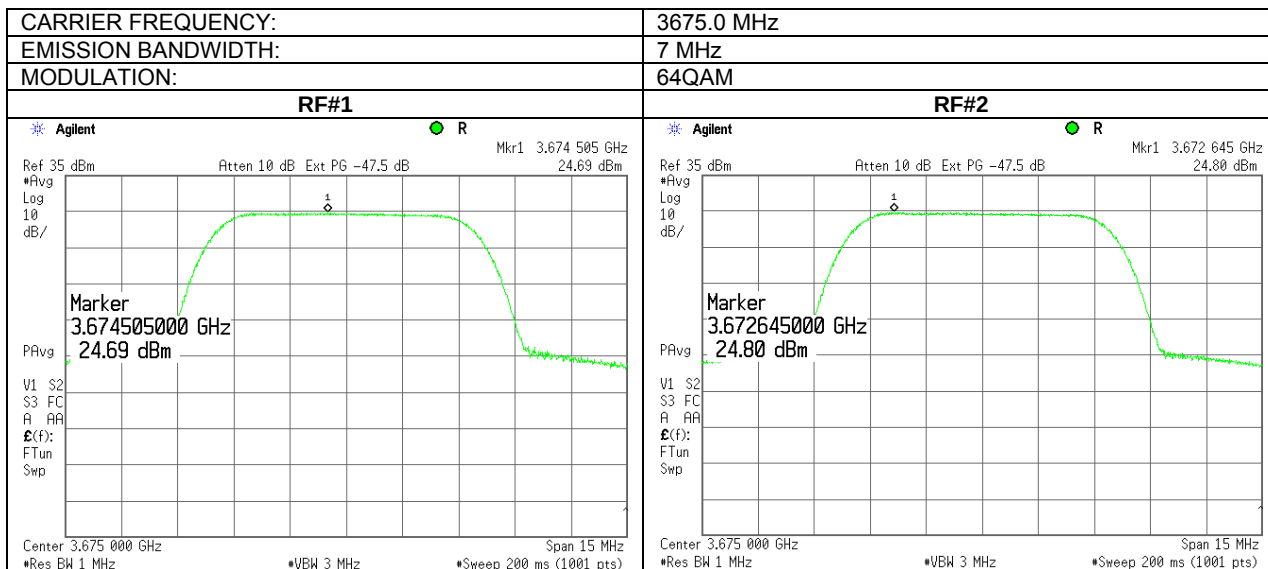


Plot 7.1.16 Peak output power test results at low frequency

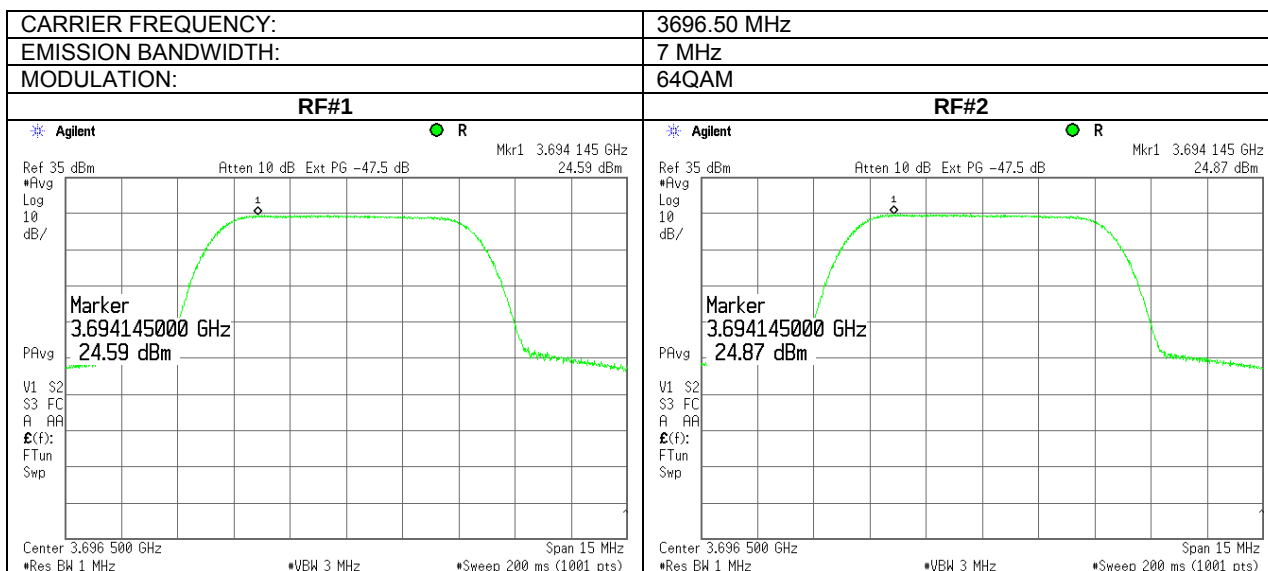


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.17 Peak output power test results at mid frequency

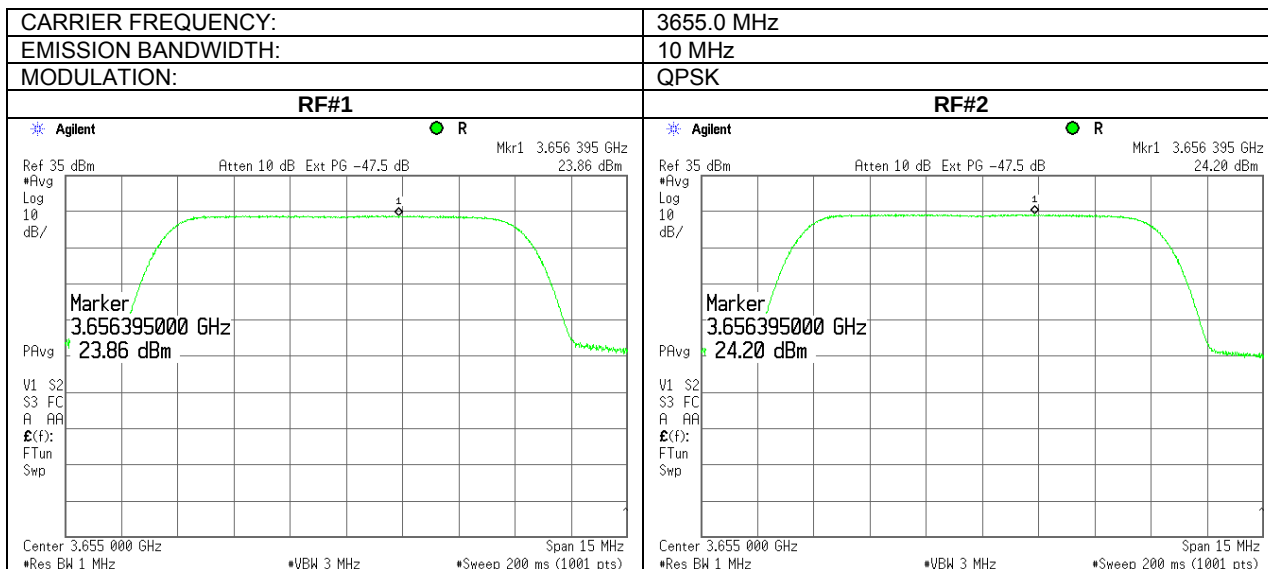


Plot 7.1.18 Peak output power test results at high frequency

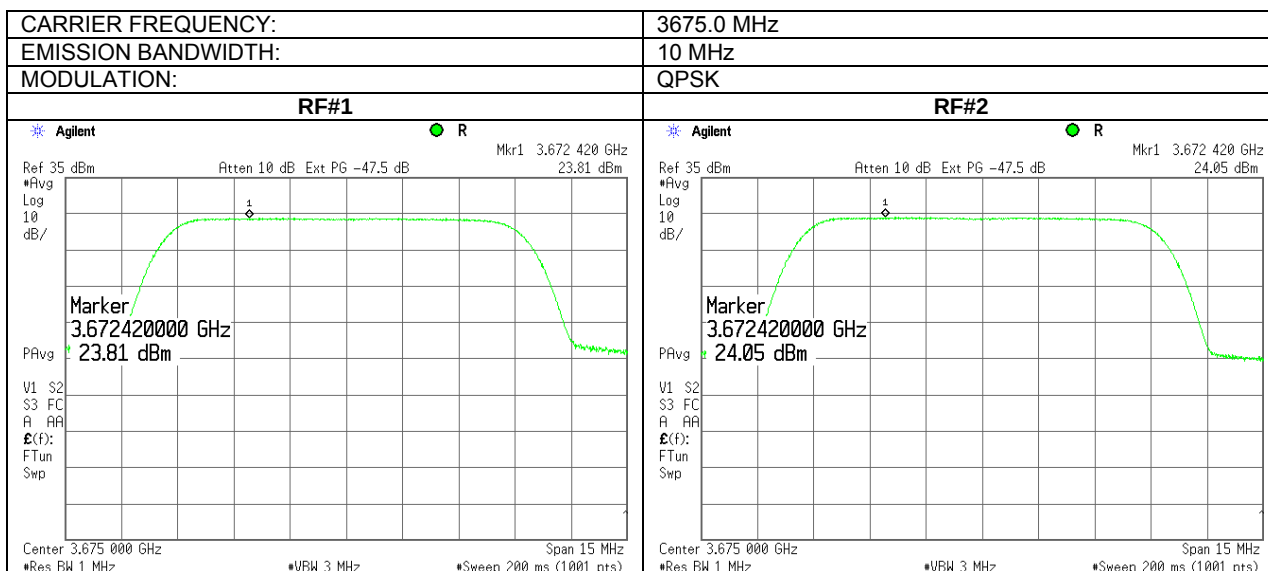


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.19 Peak output power test results at low frequency

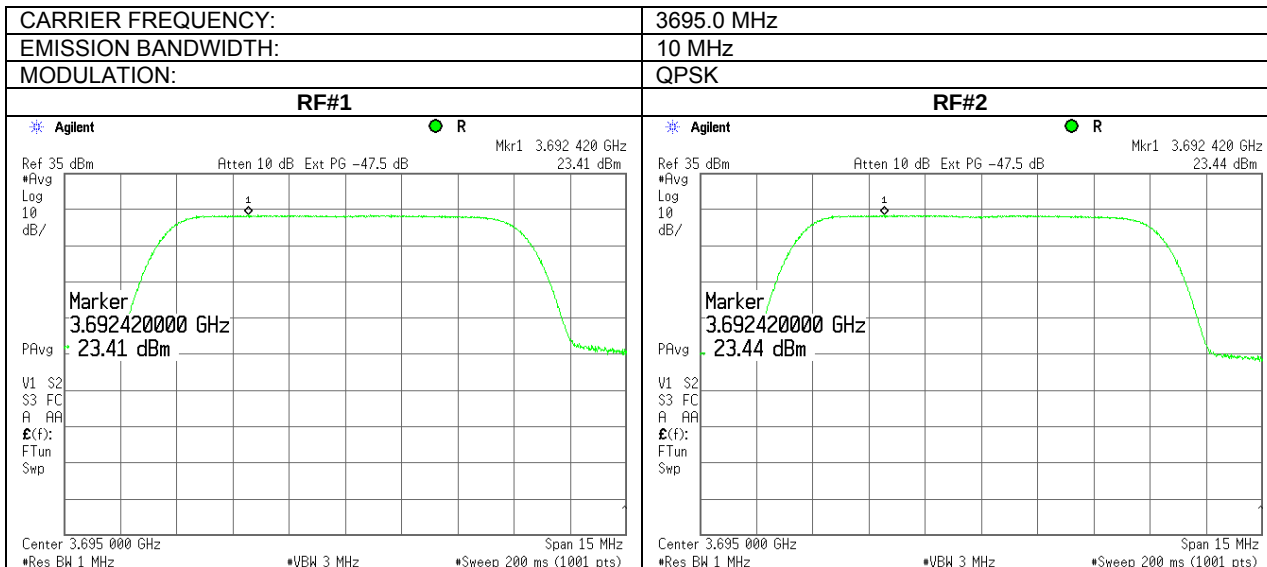


Plot 7.1.20 Peak output power test results at mid frequency

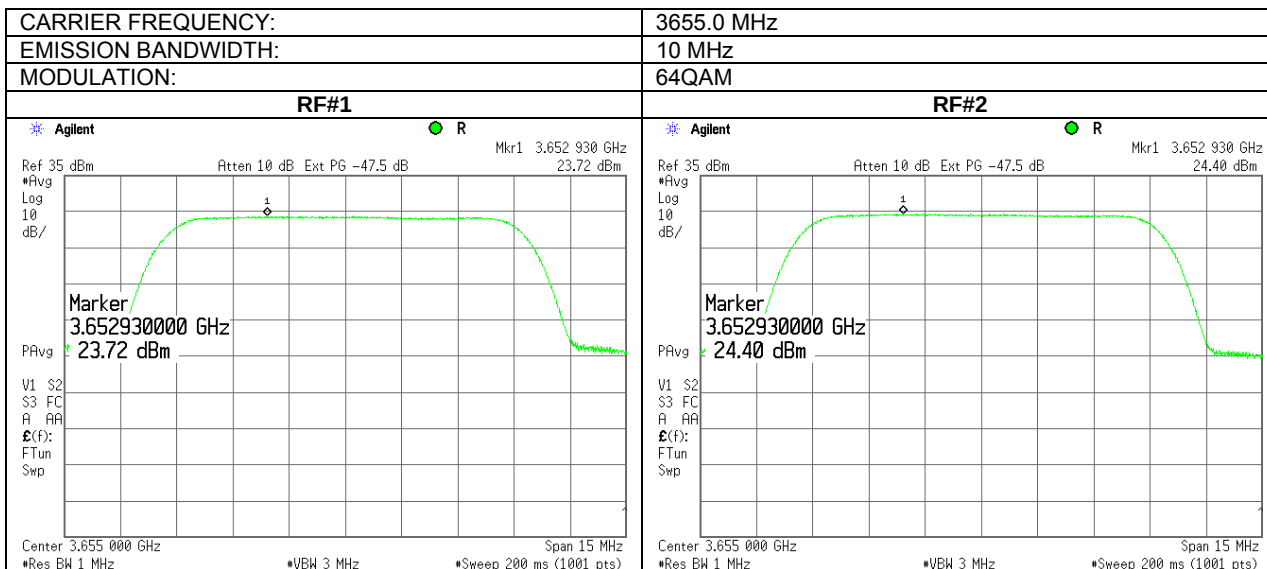


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.21 Peak output power test results at high frequency

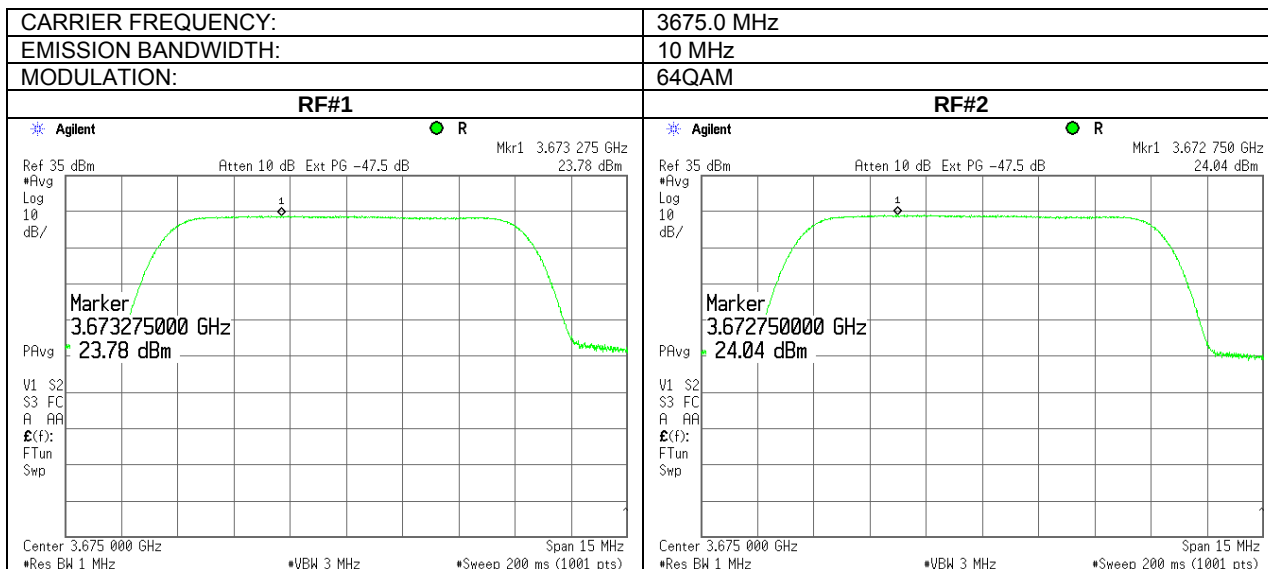


Plot 7.1.22 Peak output power test results at low frequency

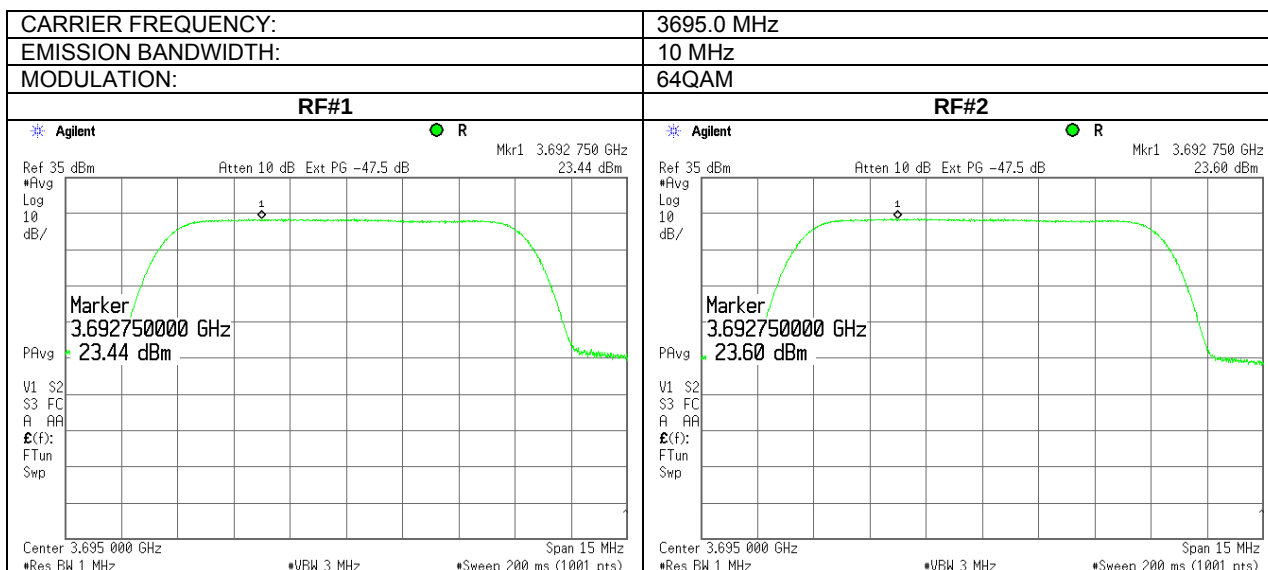


|                             |                               |                                                        |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1321, Maximum conducted output power</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1   |                             |
| <b>Test mode:</b>           |                               | Compliance                                             | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                         | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                        |                             |

Plot 7.1.23 Peak output power test results at mid frequency



Plot 7.1.24 Peak output power test results at high frequency



|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

## 7.2 Occupied bandwidth test

### 7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

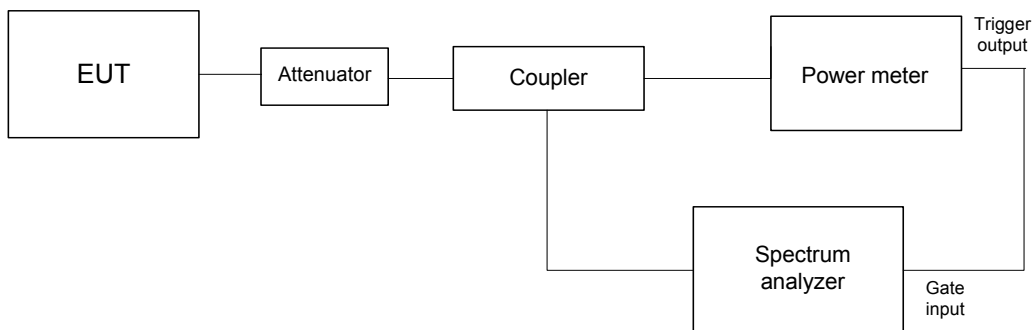
| Assigned frequency, MHz | Modulation envelope reference points*, dBc | Maximum allowed bandwidth, kHz |
|-------------------------|--------------------------------------------|--------------------------------|
| 3650.0 – 3700.0         | 26                                         | NA                             |

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

### 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 set to transmit the unmodulated carrier and the reference peak power level was measured.
- 7.2.2.3 The EUT was set to transmit the normally modulated carrier.
- 7.2.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup



|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b>                           | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                     |                                           |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Average  
RESOLUTION BANDWIDTH: 0.5-2% of the Emission bandwidth  
VIDEO BANDWIDTH: 10 times RBW  
MODULATION ENVELOPE REFERENCE POINTS: 26 dB below total average power  
MODULATING SIGNAL: PRBS

| Carrier frequency, MHz | Modulation | Occupied bandwidth, MHz | Emission bandwidth, MHz | Verdict |
|------------------------|------------|-------------------------|-------------------------|---------|
| 3651.75                | QPSK       | 3.335                   | 3.5                     | Pass    |
| 3675.00                | QPSK       | 3.330                   | 3.5                     | Pass    |
| 3698.25                | QPSK       | 3.335                   | 3.5                     | Pass    |
| 3651.75                | 64QAM      | 3.330                   | 3.5                     | Pass    |
| 3675.00                | 64QAM      | 3.320                   | 3.5                     | Pass    |
| 3698.25                | 64QAM      | 3.310                   | 3.5                     | Pass    |
|                        |            |                         |                         |         |
| 3652.50                | QPSK       | 4.662                   | 5.0                     | Pass    |
| 3675.00                | QPSK       | 4.634                   | 5.0                     | Pass    |
| 3697.50                | QPSK       | 4.641                   | 5.0                     | Pass    |
| 3652.50                | 64QAM      | 4.648                   | 5.0                     | Pass    |
| 3675.00                | 64QAM      | 4.655                   | 5.0                     | Pass    |
| 3697.50                | 64QAM      | 4.655                   | 5.0                     | Pass    |
|                        |            |                         |                         |         |
| 3653.50                | QPSK       | 6.620                   | 7.0                     | Pass    |
| 3675.00                | QPSK       | 6.610                   | 7.0                     | Pass    |
| 3696.50                | QPSK       | 6.610                   | 7.0                     | Pass    |
| 3653.50                | 64QAM      | 6.610                   | 7.0                     | Pass    |
| 3675.00                | 64QAM      | 6.610                   | 7.0                     | Pass    |
| 3696.50                | 64QAM      | 6.610                   | 7.0                     | Pass    |
|                        |            |                         |                         |         |
| 3655.00                | QPSK       | 9.264                   | 10.0                    | Pass    |
| 3675.00                | QPSK       | 9.240                   | 10.0                    | Pass    |
| 3695.00                | QPSK       | 9.240                   | 10.0                    | Pass    |
| 3655.00                | 64QAM      | 9.276                   | 10.0                    | Pass    |
| 3675.00                | 64QAM      | 9.276                   | 10.0                    | Pass    |
| 3695.00                | 64QAM      | 9.300                   | 10.0                    | Pass    |

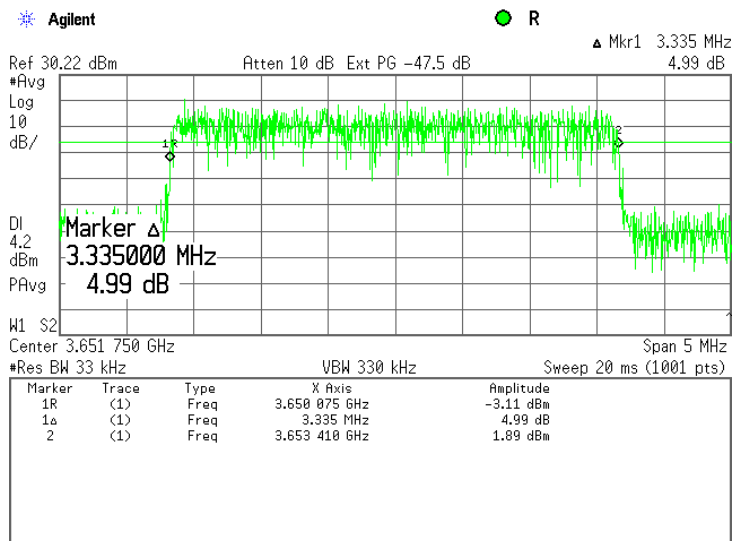
Reference numbers of test equipment used

|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 1906 | HL 2013 | HL 2952 | HL 3301 | HL 3302 | HL 3472 | HL 3474 | HL 3782 |
| HL 3818 |         |         |         |         |         |         |         |

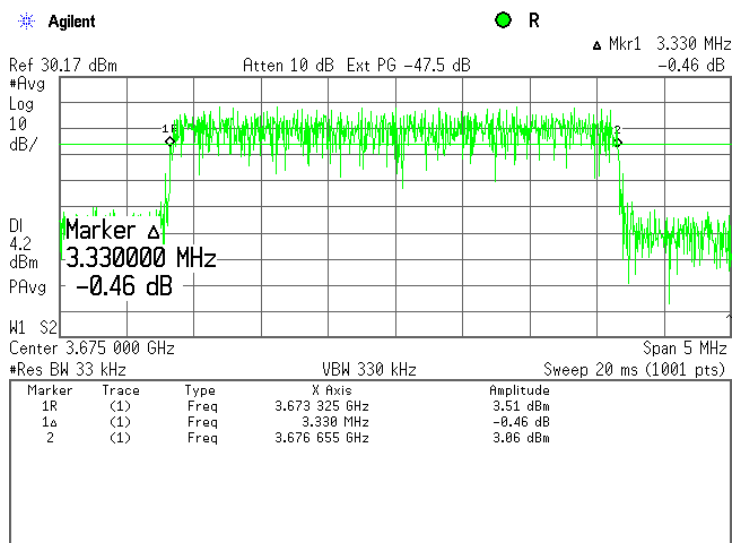
Full description is given in Appendix A.

|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.1 Occupied bandwidth test result at low frequency, 3.5 MHz EBW, QPSK

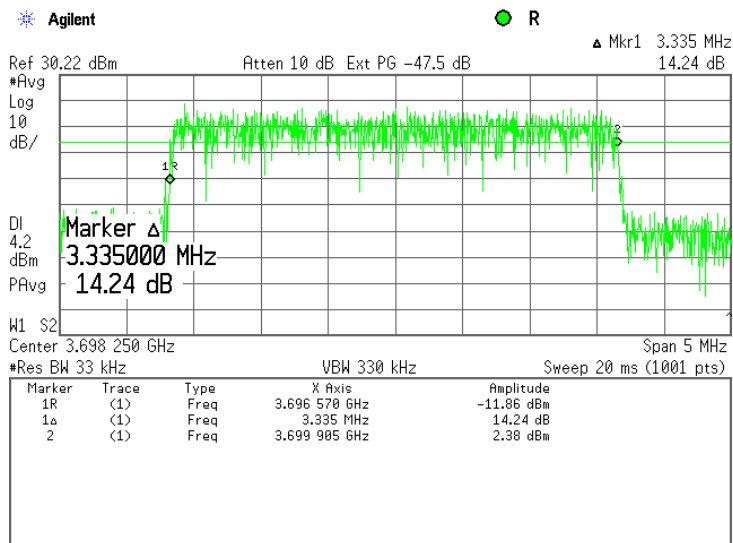


Plot 7.2.2 Occupied bandwidth test result at mid frequency, 3.5 MHz EBW, QPSK

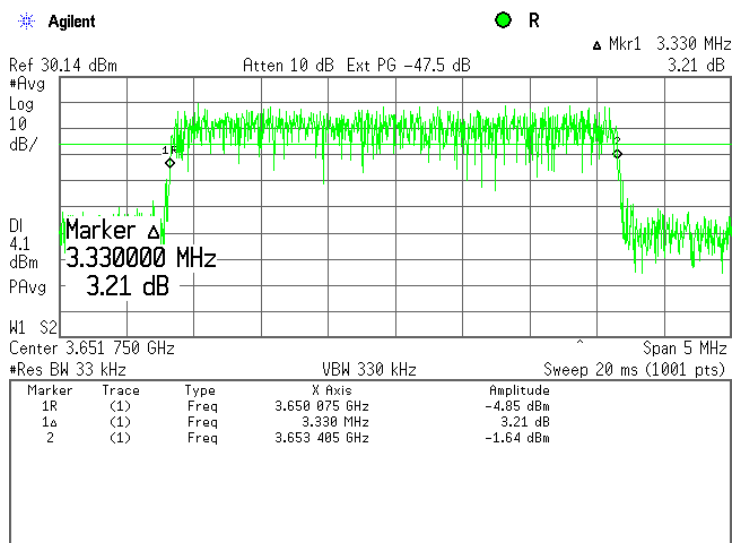


|                      |                        |                                    |                      |
|----------------------|------------------------|------------------------------------|----------------------|
| Test specification:  |                        | Section 90.209, Occupied bandwidth |                      |
| Test procedure:      |                        | 47 CFR, Section 2.1049             |                      |
| Test mode:           | Compliance             | Verdict: PASS                      |                      |
| Date:                | 3/27/2011              |                                    |                      |
| Temperature: 22.4 °C | Air Pressure: 1022 hPa | Relative Humidity: 46 %            | Power Supply: 48 VDC |
| Remarks:             |                        |                                    |                      |

Plot 7.2.3 Occupied bandwidth test result at high frequency, 3.5 MHz EBW, QPSK

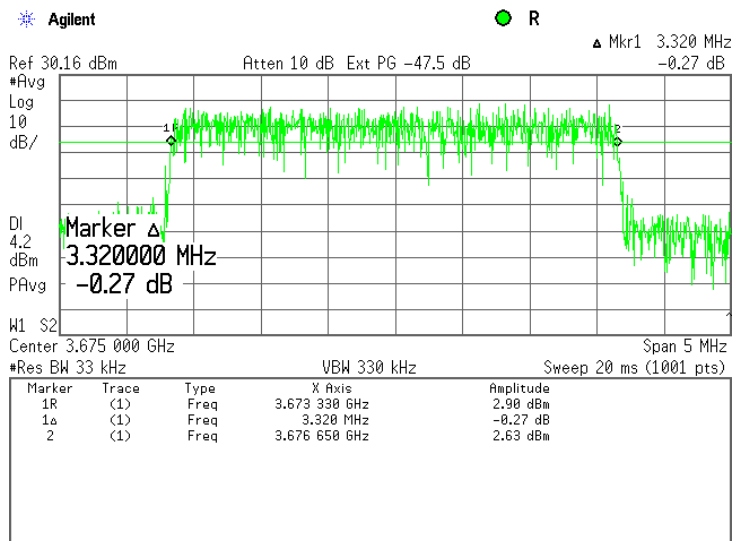


Plot 7.2.4 Occupied bandwidth test result at low frequency, 3.5 MHz EBW, 64QAM

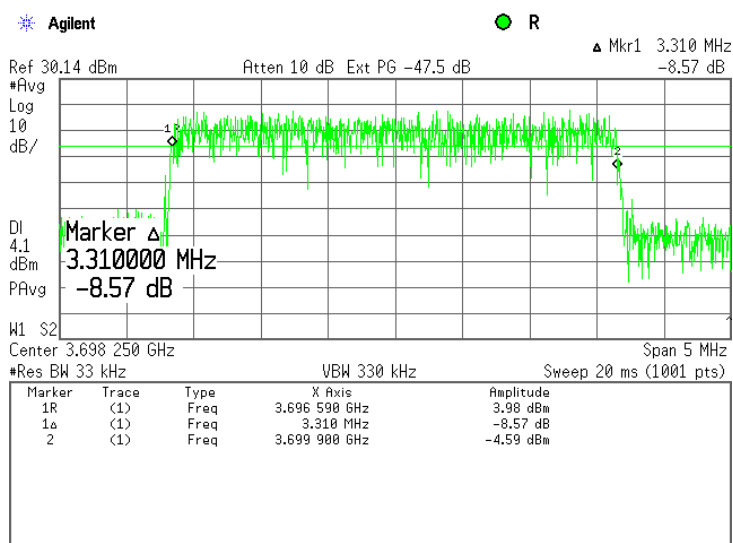


|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.5 Occupied bandwidth test result at mid frequency, 3.5 MHz EBW, 64QAM

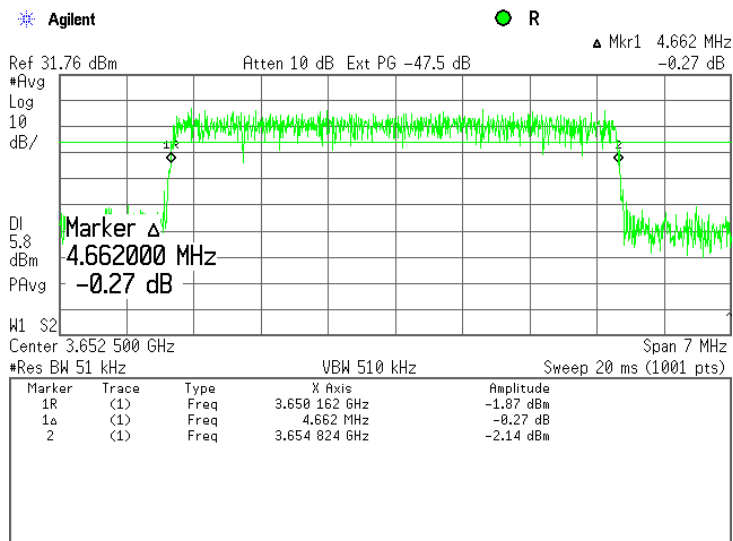


Plot 7.2.6 Occupied bandwidth test result at high frequency, 3.5 MHz EBW, 64QAM

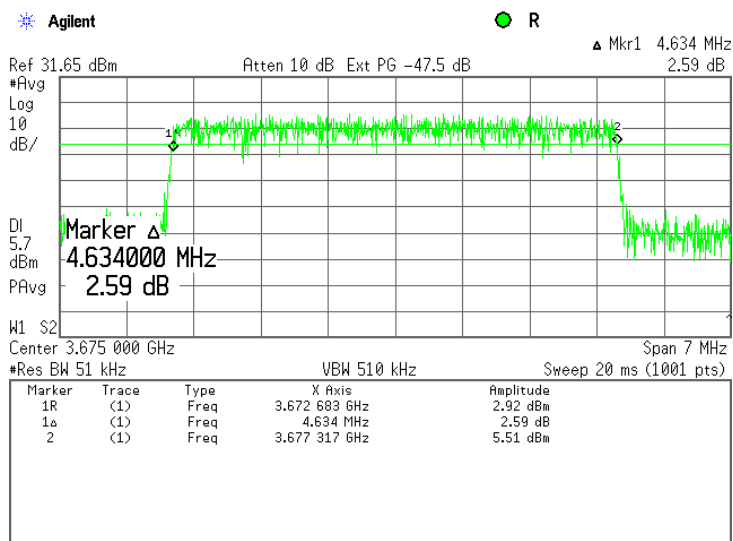


|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.7 Occupied bandwidth test result at low frequency, 5 MHz EBW, QPSK

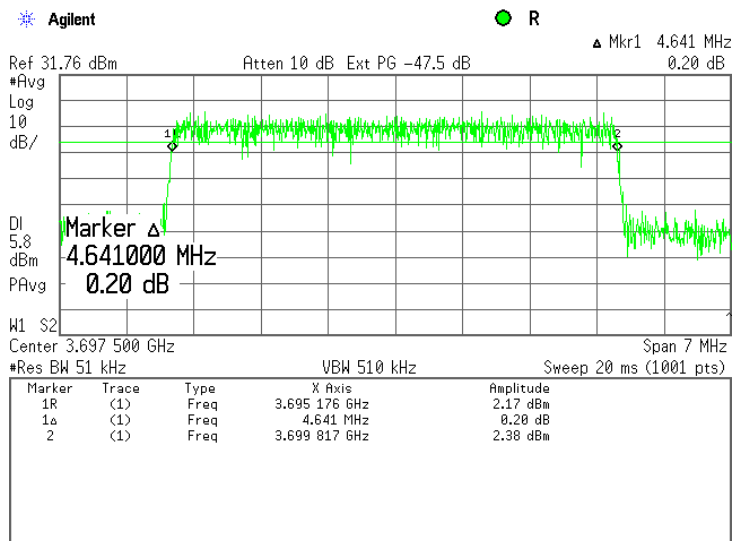


Plot 7.2.8 Occupied bandwidth test result at mid frequency, 5 MHz EBW, QPSK

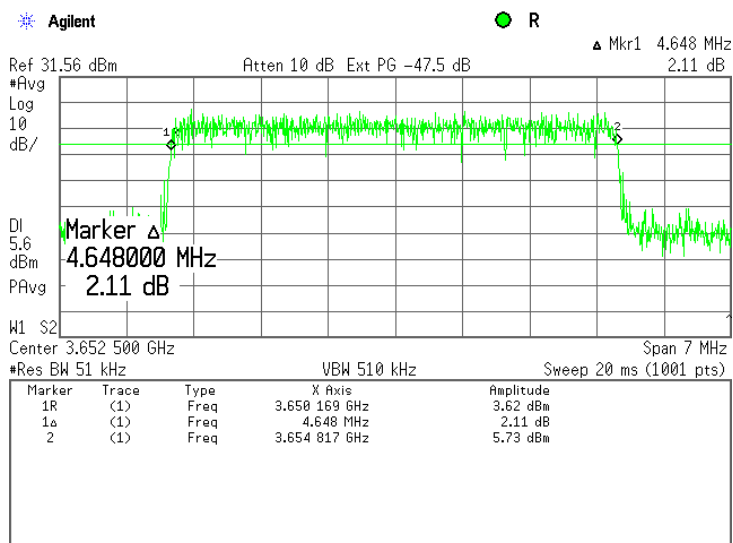


|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.9 Occupied bandwidth test result at high frequency, 5 MHz EBW, QPSK

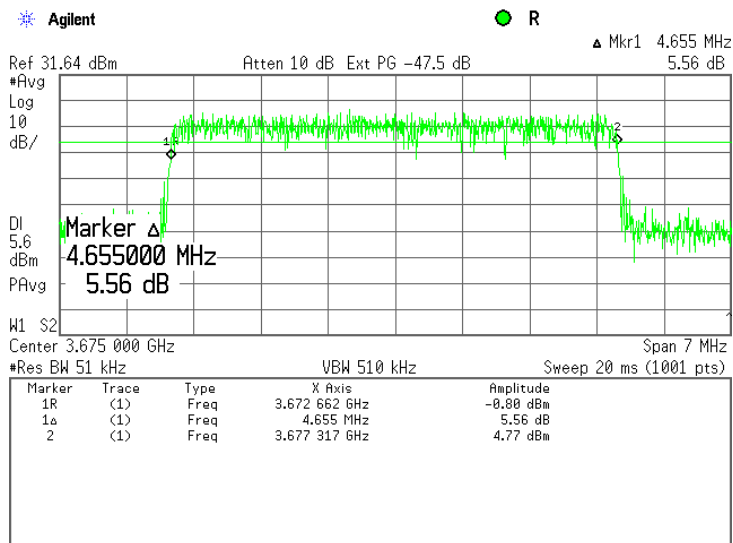


Plot 7.2.10 Occupied bandwidth test result at low frequency, 5 MHz EBW, 64QAM

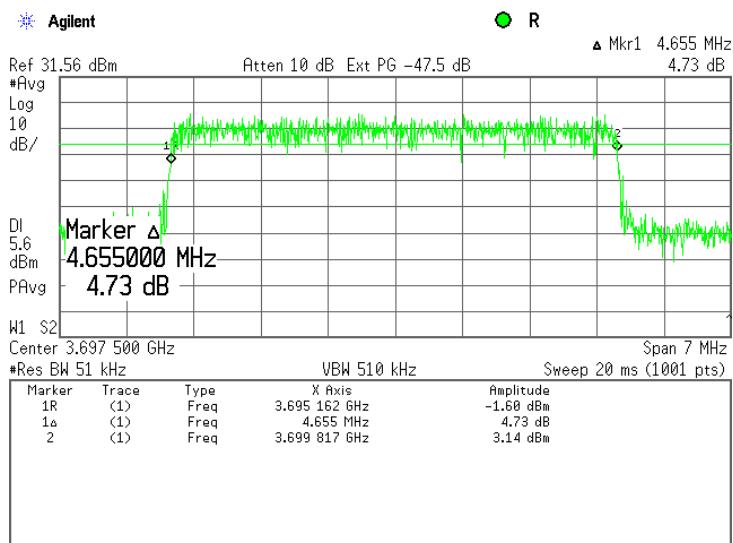


|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.11 Occupied bandwidth test result at mid frequency, 5 MHz EBW, 64QAM

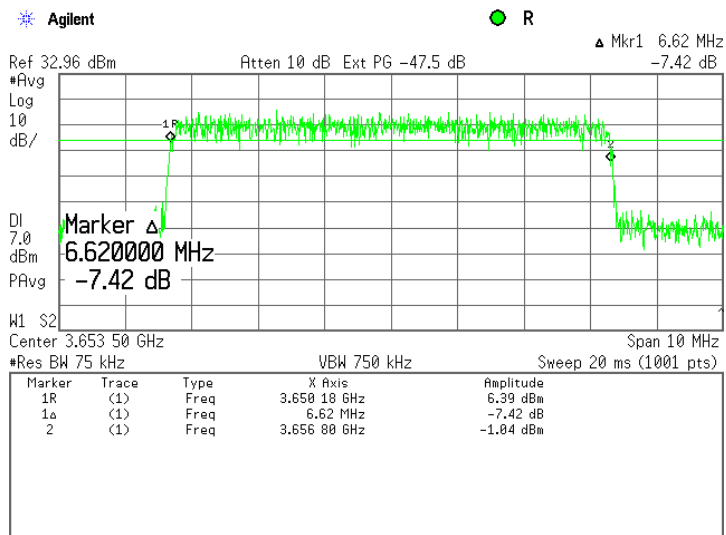


Plot 7.2.12 Occupied bandwidth test result at high frequency, 5 MHz EBW, 64QAM

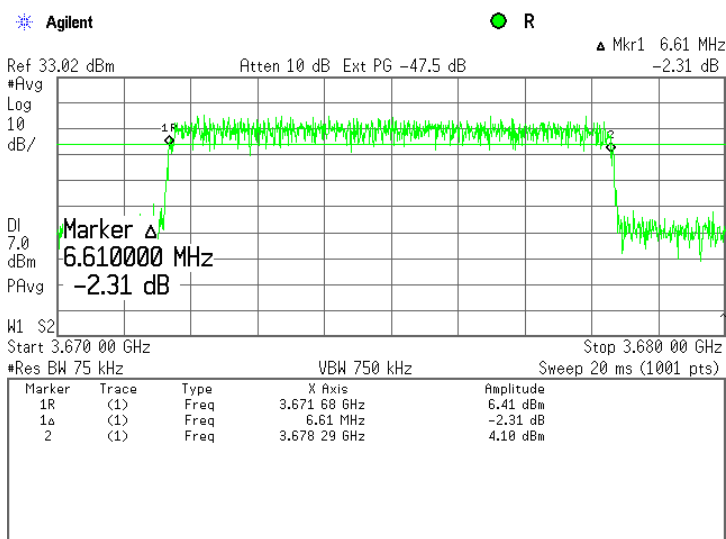


|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.13 Occupied bandwidth test result at low frequency, 7 MHz EBW, QPSK

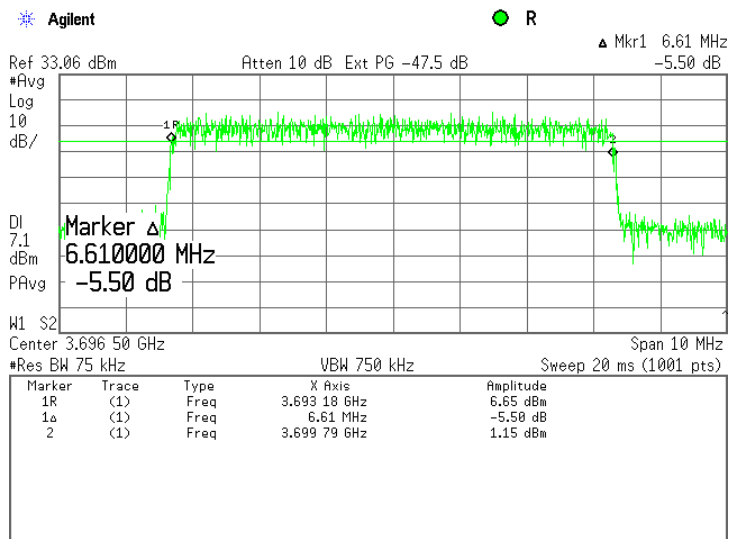


Plot 7.2.14 Occupied bandwidth test result at mid frequency, 7 MHz EBW, QPSK

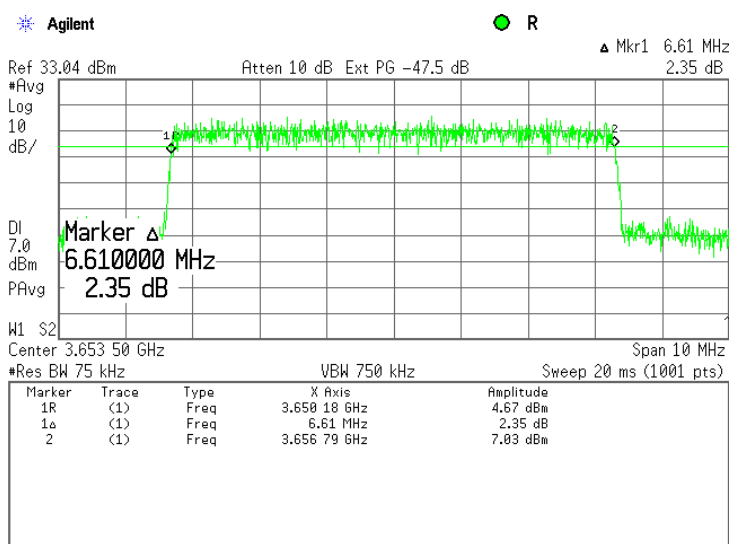


|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.15 Occupied bandwidth test result at high frequency, 7 MHz EBW, QPSK

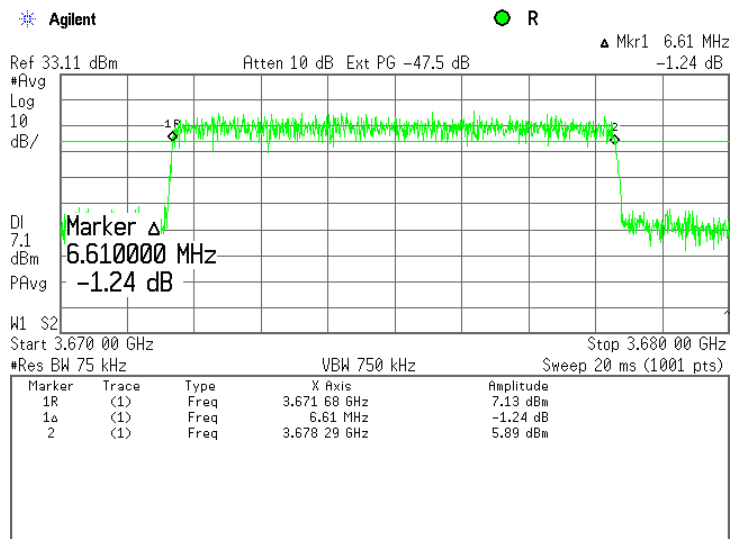


Plot 7.2.16 Occupied bandwidth test result at low frequency, 7 MHz EBW, 64QAM

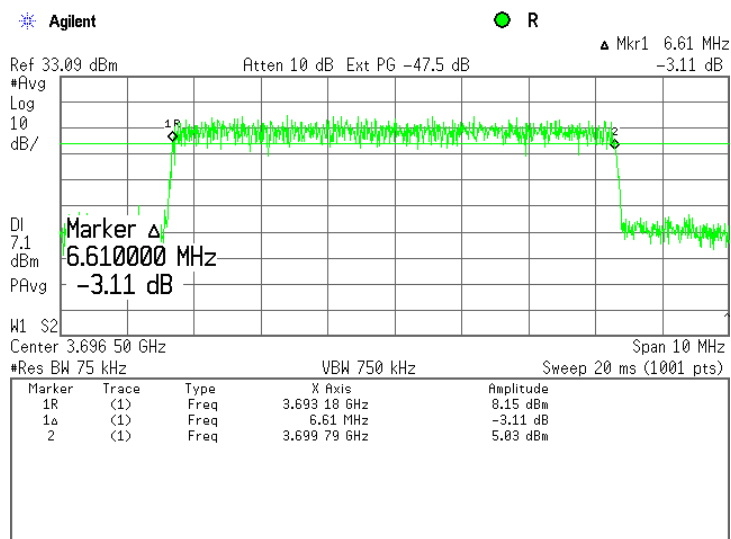


|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.17 Occupied bandwidth test result at mid frequency, 7 MHz EBW, 64QAM

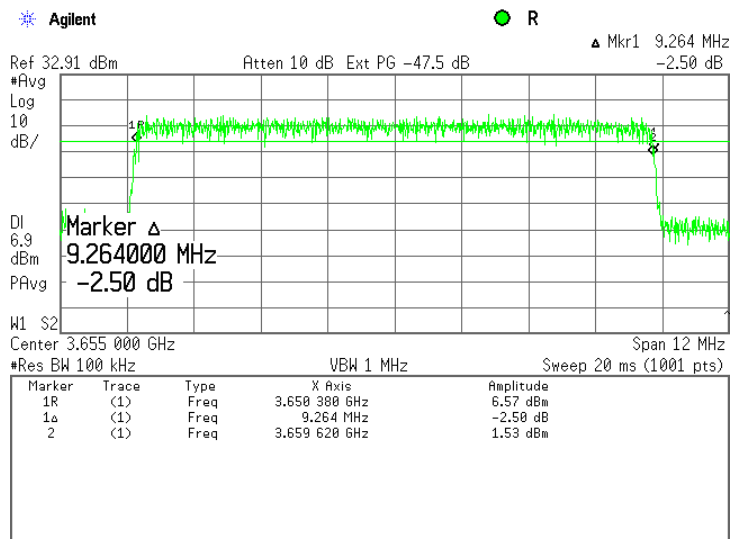


Plot 7.2.18 Occupied bandwidth test result at high frequency, 7 MHz EBW, 64QAM

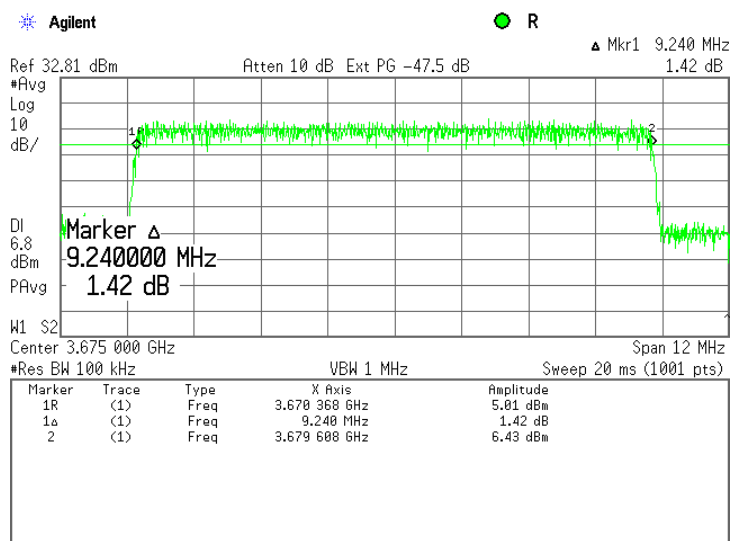


|                             |                               |                                           |                             |
|-----------------------------|-------------------------------|-------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.209, Occupied bandwidth</b> |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Section 2.1049                    |                             |
| <b>Test mode:</b>           |                               | Compliance                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                           |                             |

Plot 7.2.19 Occupied bandwidth test result at low frequency, 10 MHz EBW, QPSK

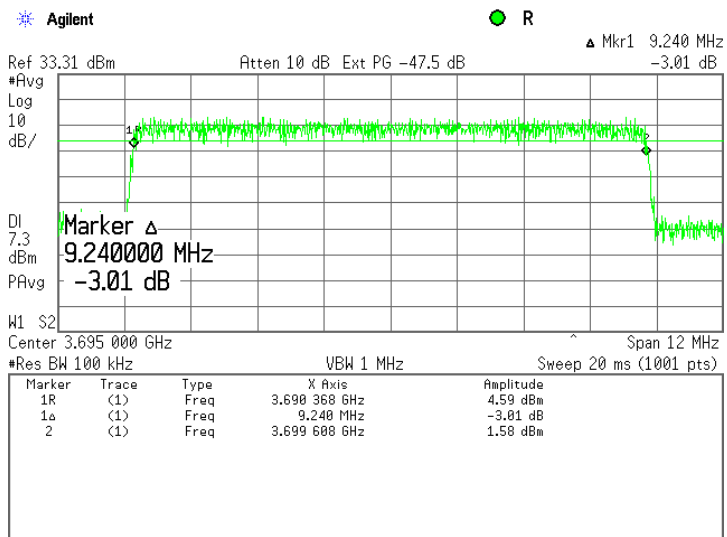


Plot 7.2.20 Occupied bandwidth test result at mid frequency, 10 MHz EBW, QPSK

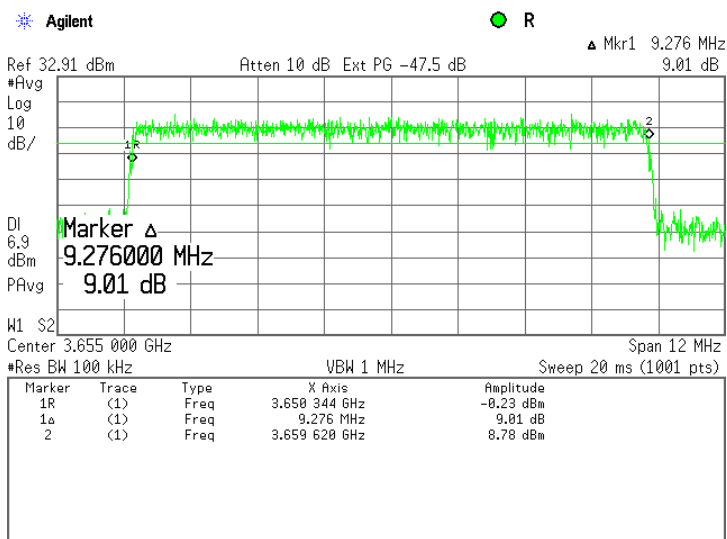


|                                                               |                               |                                |                             |
|---------------------------------------------------------------|-------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b> Section 90.209, Occupied bandwidth |                               |                                |                             |
| <b>Test procedure:</b> 47 CFR, Section 2.1049                 |                               |                                |                             |
| <b>Test mode:</b> Compliance                                  | <b>Verdict:</b> PASS          |                                |                             |
| <b>Date:</b> 3/27/2011                                        |                               |                                |                             |
| <b>Temperature:</b> 22.4 °C                                   | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>                                               |                               |                                |                             |

Plot 7.2.21 Occupied bandwidth test result at high frequency, 10 MHz EBW, QPSK

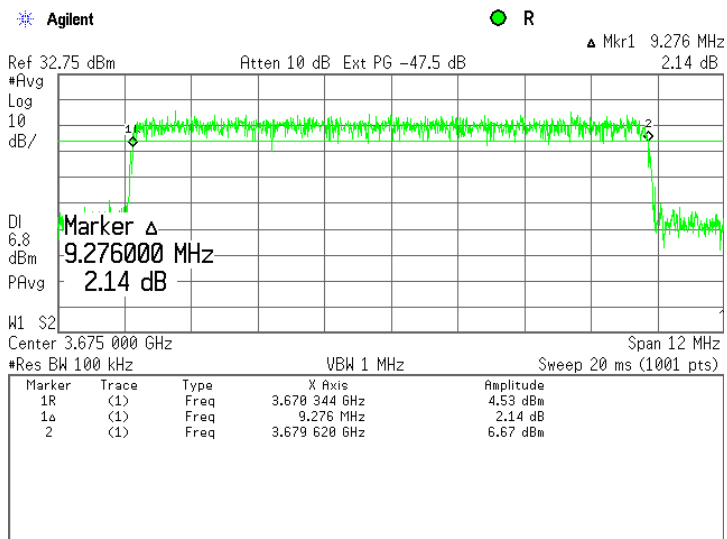


Plot 7.2.22 Occupied bandwidth test result at low frequency, 10 MHz EBW, 64QAM

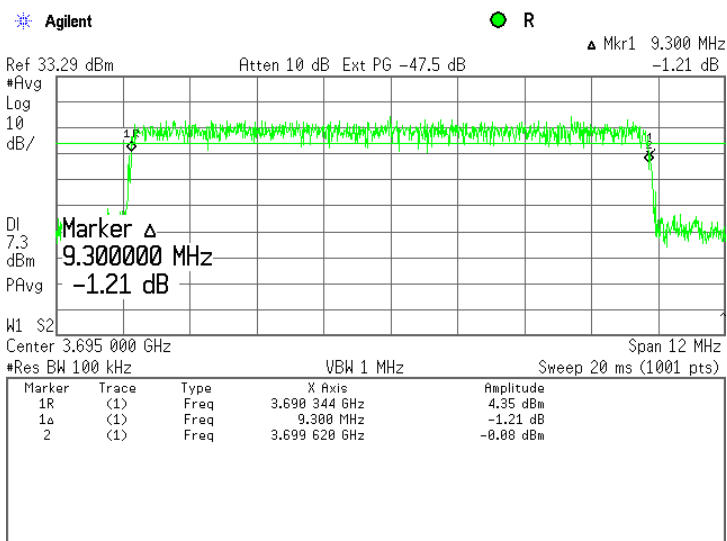


|                      |                        |                                    |                      |
|----------------------|------------------------|------------------------------------|----------------------|
| Test specification:  |                        | Section 90.209, Occupied bandwidth |                      |
| Test procedure:      |                        | 47 CFR, Section 2.1049             |                      |
| Test mode:           | Compliance             | Verdict: PASS                      |                      |
| Date:                | 3/27/2011              |                                    |                      |
| Temperature: 22.4 °C | Air Pressure: 1022 hPa | Relative Humidity: 46 %            | Power Supply: 48 VDC |
| Remarks:             |                        |                                    |                      |

Plot 7.2.23 Occupied bandwidth test result at mid frequency, 10 MHz EBW, 64QAM



Plot 7.2.24 Occupied bandwidth test result at high frequency, 10 MHz EBW, 64QAM



|                             |                                                                           |                                |                             |
|-----------------------------|---------------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.210(b), Emission mask</b>                                   |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                                | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                                                                 |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa                                             | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                                           |                                |                             |

## 7.3 Emission mask test

### 7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Emission mask limits

| Frequency displacement from carrier          | Attenuation below carrier, dBc |
|----------------------------------------------|--------------------------------|
| Emission mask B (Emission bandwidth 3.5 MHz) |                                |
| 0 – 1.75 MHz                                 | 0                              |
| 1.75 – 3.5 MHz                               | 25                             |
| 3.5 – 7.0 MHz                                | 35                             |
| More than** 8.75 MHz                         | 43 + 10 log(P)                 |
| Emission mask B (Emission bandwidth 5 MHz)   |                                |
| 0 – 2.5 MHz                                  | 0                              |
| 2.5 – 5.0 MHz                                | 25                             |
| 5.0 – 12.5 MHz                               | 35                             |
| More than** 12.5 MHz                         | 43 + 10 log(P)                 |
| Emission mask B (Emission bandwidth 7 MHz)   |                                |
| 0 – 3.5 MHz                                  | 0                              |
| 3.5 – 7.0 MHz                                | 25                             |
| 7.0 – 17.5 MHz                               | 35                             |
| More than** 17.5 MHz                         | 43 + 10 log(P)                 |
| Emission mask B (Emission bandwidth 10 MHz)  |                                |
| 0 – 5 MHz                                    | 0                              |
| 5 – 10.0 MHz                                 | 25                             |
| 10.0 – 25.0 MHz                              | 35                             |
| More than** 25.0 MHz                         | 43 + 10 log(P)                 |

\* - linearly increase with frequency

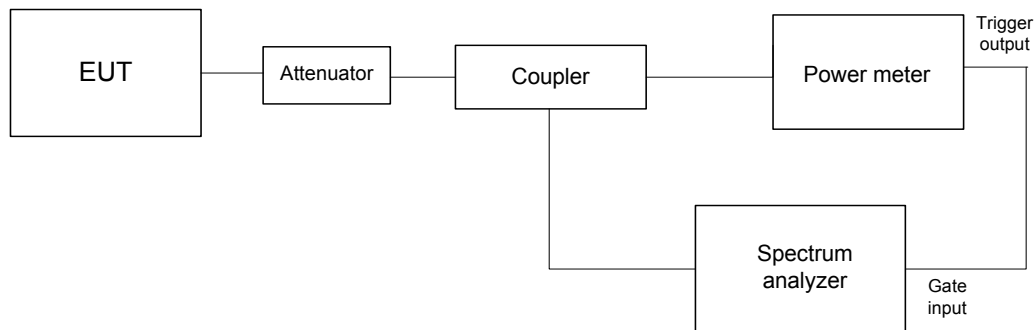
\*\* - emission mask includes carrier modulation envelope within ± 250 % of the authorized bandwidth; the frequency range removed beyond ± 250 % of the authorized bandwidth from carrier was investigated as spurious emission

### 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. The emission mask was measured with spectrum analyzer as provided in the associated plots. The test results are recorded in Table 7.3.2 and shown in the associated plots.

|                             |                               |                                                                           |                             |
|-----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.210(b), Emission mask</b>                                   |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                                            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                           |                             |

Figure 7.3.1 Emission mask test setup



|                             |                               |                                                                           |                             |
|-----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.210(b), Emission mask</b>                                   |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                                | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/27/2011                                                                 |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                                            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                           |                             |

Table 7.3.2 Emission mask test results

| Carrier frequency, MHz | Limit           | Reference to Plot | Verdict |
|------------------------|-----------------|-------------------|---------|
| 3.5 MHz EBW, 64QAM     |                 |                   |         |
| 3651.75                | Emission mask B | Plot 7.3.1        | Pass    |
| 3675.00                |                 | Plot 7.3.2        |         |
| 3698.25                |                 | Plot 7.3.3        |         |
| 5 MHz EBW, 64QAM       |                 |                   |         |
| 3652.50                | Emission mask B | Plot 7.3.4        | Pass    |
| 3675.00                |                 | Plot 7.3.5        |         |
| 3697.50                |                 | Plot 7.3.6        |         |
| 7 MHz EBW, 64QAM       |                 |                   |         |
| 3653.50                | Emission mask B | Plot 7.3.7        | Pass    |
| 3675.00                |                 | Plot 7.3.8        |         |
| 3696.50                |                 | Plot 7.3.9        |         |
| 10 MHz EBW, 64QAM      |                 |                   |         |
| 3655.00                | Emission mask B | Plot 7.3.10       | Pass    |
| 3675.00                |                 | Plot 7.3.11       |         |
| 3695.00                |                 | Plot 7.3.12       |         |

NOTE1: Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW [ $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ ];

NOTE2: Measurement was performed at 64QAM modulation as represent the worst case of power and power density.

**Reference numbers of test equipment used**

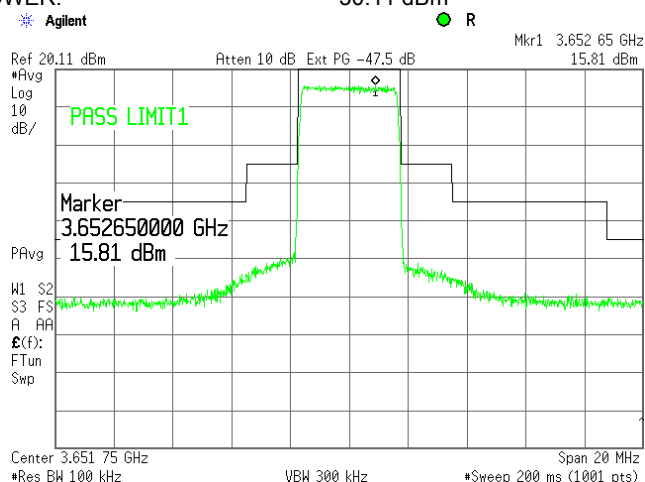
|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 1906 | HL 2013 | HL 2952 | HL 3301 | HL 3302 | HL 3472 | HL 3474 | HL 3782 |
| HL 3818 |         |         |         |         |         |         |         |

Full description is given in Appendix A.

|                             |                                                                           |                                |                             |
|-----------------------------|---------------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.210(b), Emission mask</b>                                   |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                                | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                                                                 |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa                                             | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                                           |                                |                             |

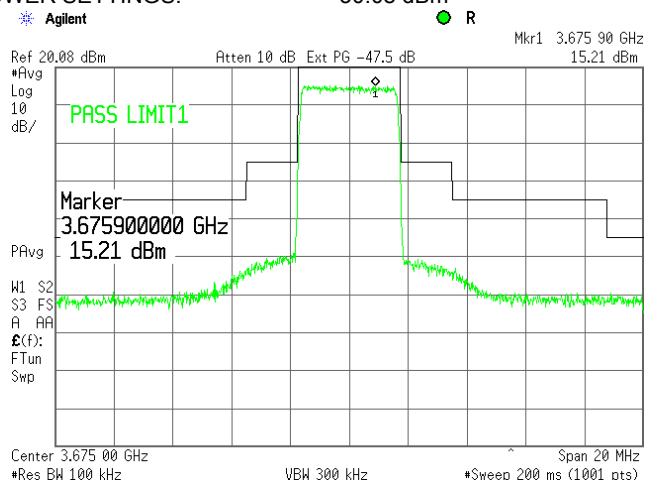
### Plot 7.3.1 Emission mask test results at low carrier frequency

ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
 DETECTOR USED: Average  
 MODULATION: 64QAM  
 MODULATING SIGNAL: PRBS  
 CHANNEL BANDWIDTH: 3.5 MHz  
 TRANSMITTER OUTPUT POWER: 30.11 dBm



### Plot 7.3.2 Emission mask test results at mid carrier frequency

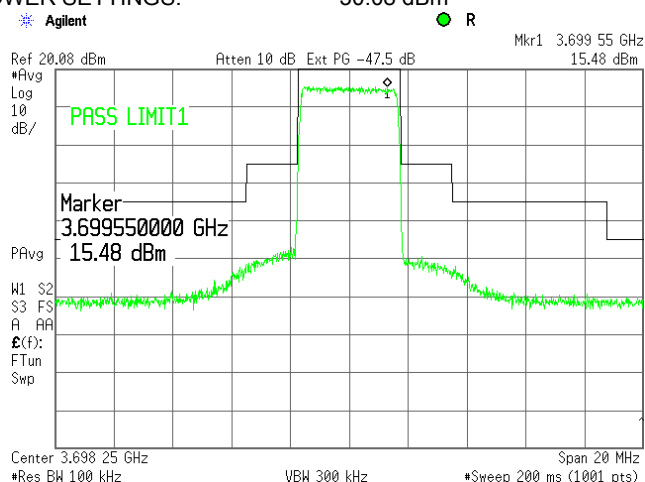
ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
 DETECTOR USED: Average  
 MODULATION: 64QAM  
 MODULATING SIGNAL: PRBS  
 CHANNEL BANDWIDTH: 3.5 MHz  
 TRANSMITTER OUTPUT POWER SETTINGS: 30.08 dBm



|                             |                                                                           |                                |                             |
|-----------------------------|---------------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.210(b), Emission mask</b>                                   |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                                | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                                                                 |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa                                             | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                                           |                                |                             |

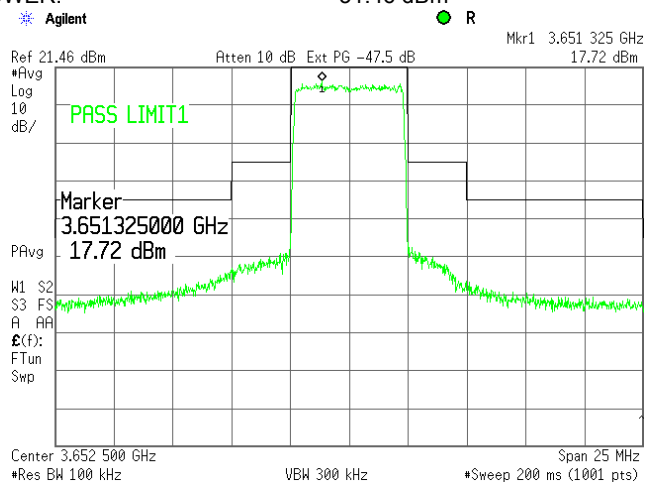
**Plot 7.3.3 Emission mask test results at high carrier frequency**

ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 3.5 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: 30.08 dBm



**Plot 7.3.4 Emission mask test results at low carrier frequency**

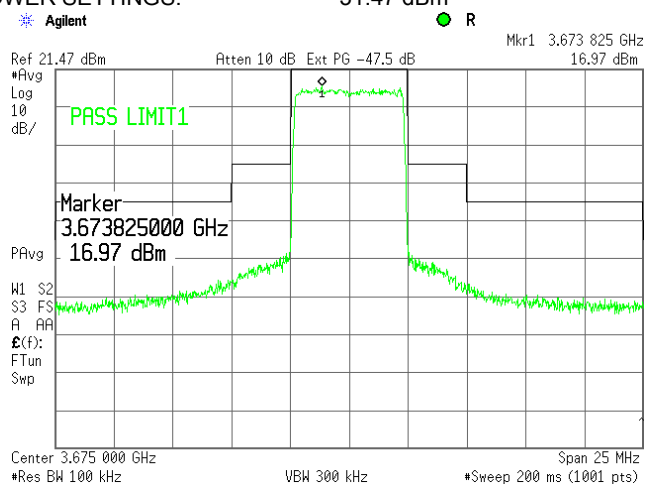
ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 5 MHz  
TRANSMITTER OUTPUT POWER: 31.46 dBm



|                             |                               |                                                                           |                             |
|-----------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.210(b), Emission mask</b>                                   |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b> PASS                                                      |                             |
| <b>Date:</b>                | 3/27/2011                     |                                                                           |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa | <b>Relative Humidity:</b> 46 %                                            | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                           |                             |

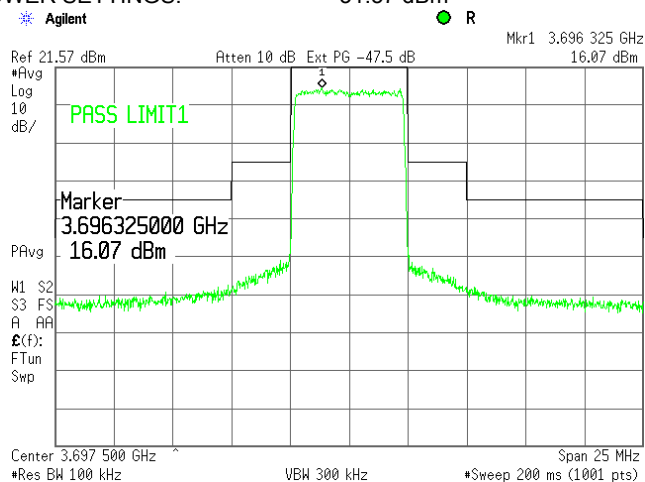
### Plot 7.3.5 Emission mask test results at mid carrier frequency

ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 5 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: 31.47 dBm



### Plot 7.3.6 Emission mask test results at high carrier frequency

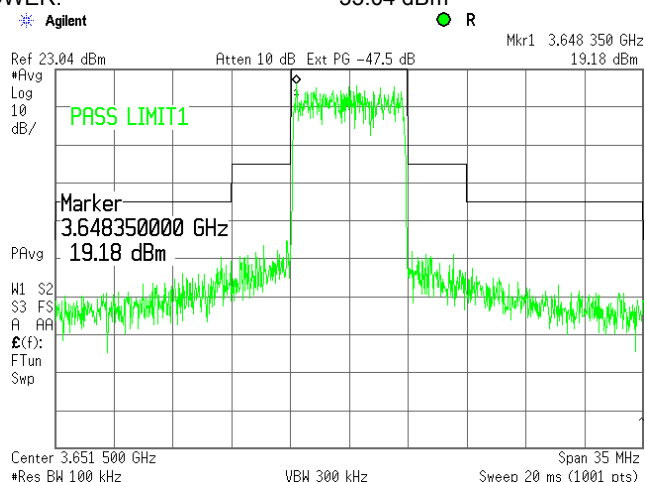
ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 5 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: 31.57 dBm



|                             |                                                                           |                                |                             |
|-----------------------------|---------------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.210(b), Emission mask</b>                                   |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                                | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                                                                 |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa                                             | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                                           |                                |                             |

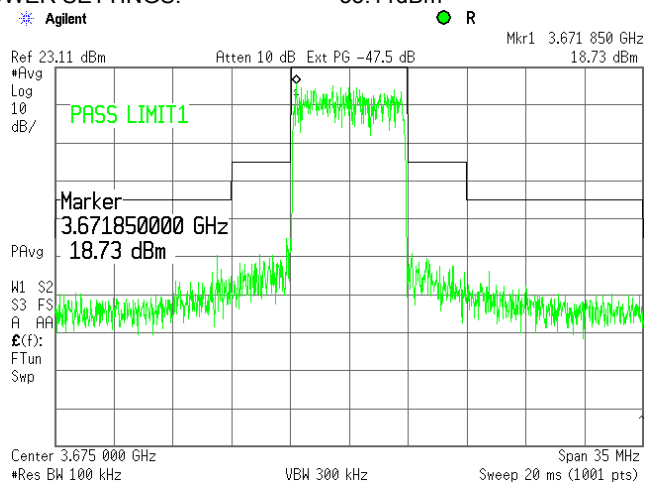
**Plot 7.3.7 Emission mask test results at low carrier frequency**

ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 7 MHz  
TRANSMITTER OUTPUT POWER: 33.04 dBm



**Plot 7.3.8 Emission mask test results at mid carrier frequency**

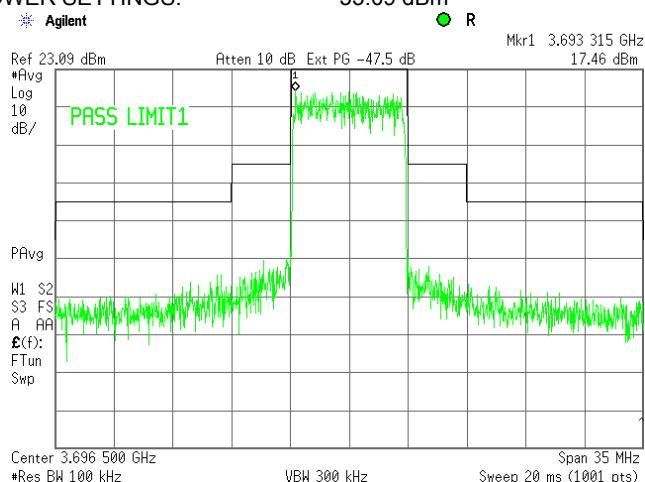
ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 7 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: 33.11dBm



|                             |                                                                           |                                |                             |
|-----------------------------|---------------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.210(b), Emission mask</b>                                   |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                                | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                                                                 |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa                                             | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                                           |                                |                             |

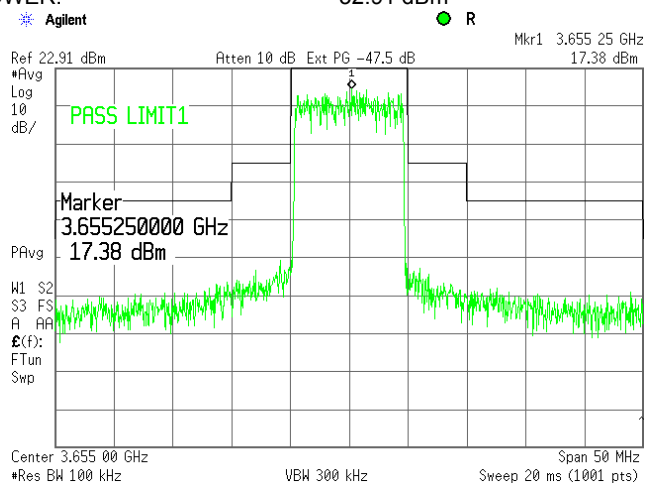
**Plot 7.3.9 Emission mask test results at high carrier frequency**

ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 7 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: 33.09 dBm



**Plot 7.3.10 Emission mask test results at low carrier frequency**

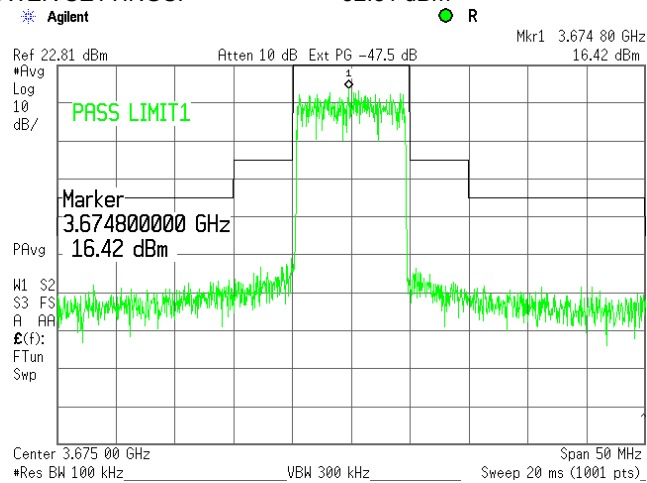
ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER: 32.91 dBm



|                             |                                                                           |                                |                             |
|-----------------------------|---------------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.210(b), Emission mask</b>                                   |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1051, 2.1047 and 90.210; TIA/EIA-603-C, Section 2.2.13 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                                | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/27/2011                                                                 |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1022 hPa                                             | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                                           |                                |                             |

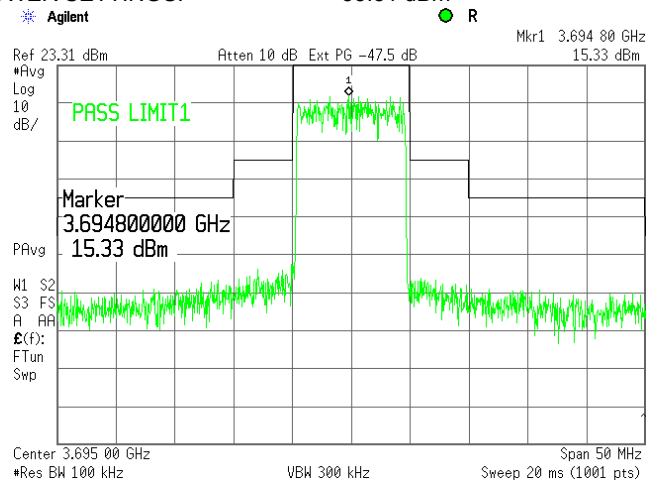
**Plot 7.3.11 Emission mask test results at mid carrier frequency**

ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: 32.81 dBm



**Plot 7.3.12 Emission mask test results at high carrier frequency**

ASSIGNED FREQUENCY RANGE: 3650.0 - 3700.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: 33.31 dBm



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

## 7.4 Radiated spurious emission measurements

### 7.4.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Radiated spurious emission test limits

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

\* - Excluding the in band emission within ± 250 % of the authorized bandwidth from the carrier

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

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

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

**7.4.2.1** The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

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

**7.4.2.3** The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

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

**7.4.3.1** The EUT was set up as shown in Figure 7.4.2, energized and the performance check was conducted.

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

**7.4.3.3** The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

Figure 7.4.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

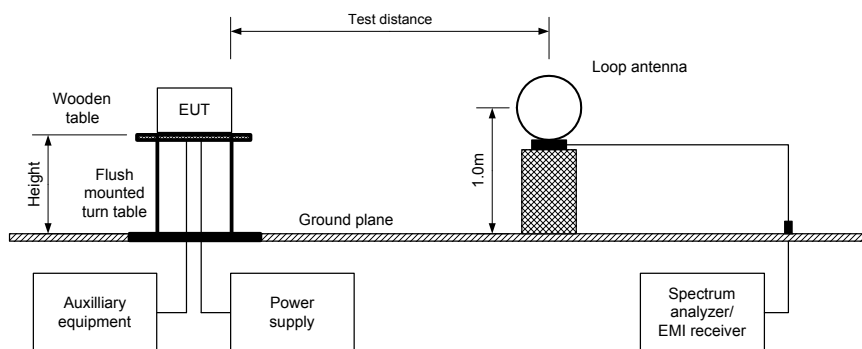
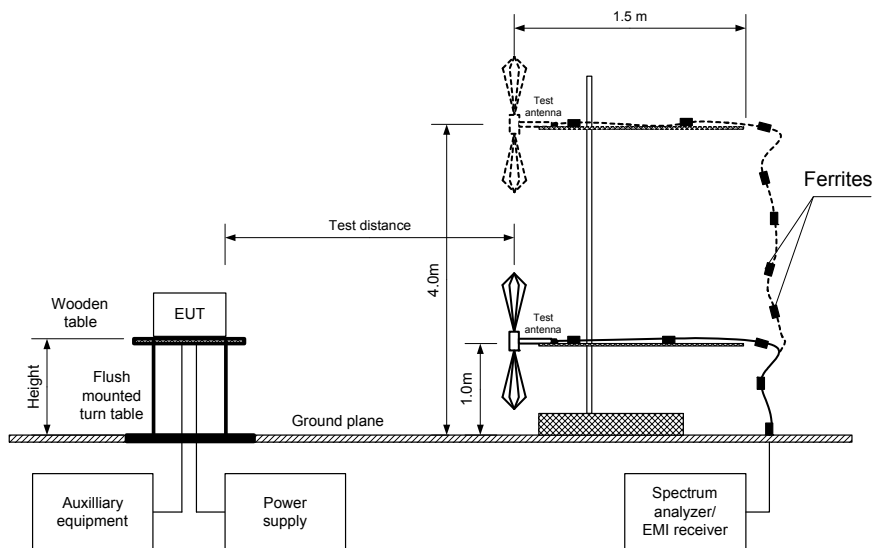


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz



|                             |                                                                    |                                |                             |
|-----------------------------|--------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.1323, Radiated spurious emissions</b>                |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                         | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/29/2011                                                          |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa                                      | <b>Relative Humidity:</b> 47 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                                    |                                |                             |

**Table 7.4.2 Spurious emission field strength test results**

ASSIGNED FREQUENCY RANGE: 3650.0 – 3700.0 MHz  
 TEST DISTANCE: 3 m  
 TEST SITE: Semi anechoic chamber  
 EUT HEIGHT: 0.8 m  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 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)  
 EMISSION BANDWIDTH: 7 MHz (Highest power settings)  
 MODULATION: 64QAM  
 MODULATING SIGNAL: PRBS  
 BIT RATE: 26 Mbps  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

| Frequency<br>MHz                                                 | Field strength,<br>dB(μV/m) | Limit,<br>dB(μV/m) | Margin,<br>dB* | RBW,<br>kHz | Antenna<br>polarization | Antenna<br>height, m | Turn-table position**,<br>degrees | Verdict |
|------------------------------------------------------------------|-----------------------------|--------------------|----------------|-------------|-------------------------|----------------------|-----------------------------------|---------|
| <b>Low carrier frequency</b>                                     |                             |                    |                |             |                         |                      |                                   |         |
| All spurious were found at least 20 dB below the specified limit |                             |                    |                |             |                         |                      |                                   | Pass    |
| <b>Mid carrier frequency</b>                                     |                             |                    |                |             |                         |                      |                                   |         |
| All spurious were found at least 20 dB below the specified limit |                             |                    |                |             |                         |                      |                                   | Pass    |
| <b>High carrier frequency</b>                                    |                             |                    |                |             |                         |                      |                                   |         |
| All spurious were found at least 20 dB below the specified limit |                             |                    |                |             |                         |                      |                                   | Pass    |

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

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

**Reference numbers of test equipment used**

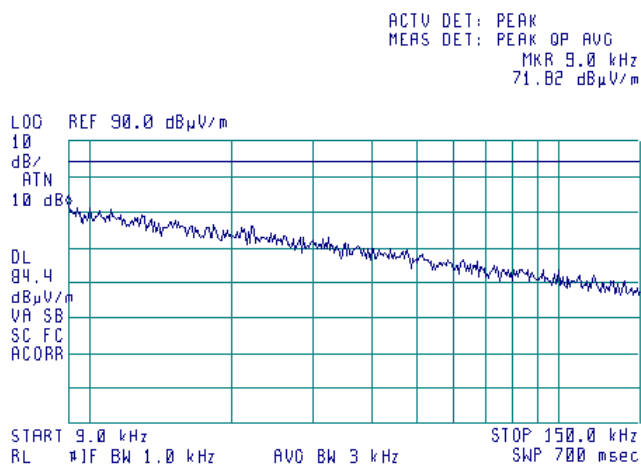
|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 0521 | HL 0604 | HL 0768 | HL 0769 | HL 1424 | HL 1984 | HL 2871 |
| HL 3123 | HL 3534 | HL 3535 | HL 3623 | HL 3818 |         |         |         |

Full description is given in Appendix A.

|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

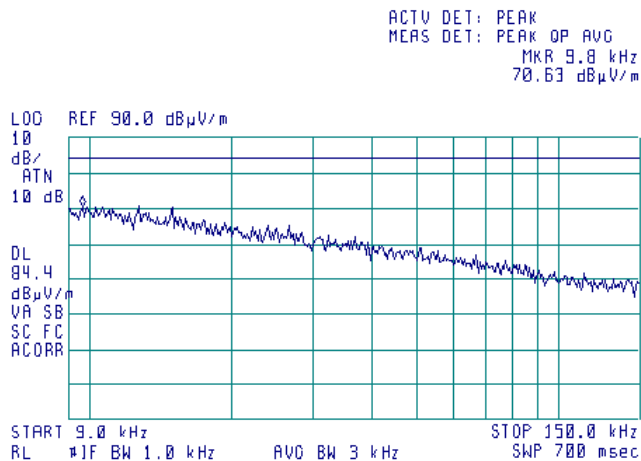
Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.4.2 Radiated emission measurements in 9 - 150 kHz range

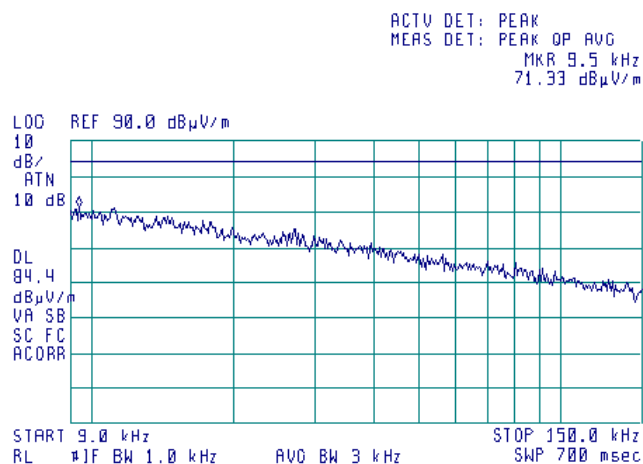
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

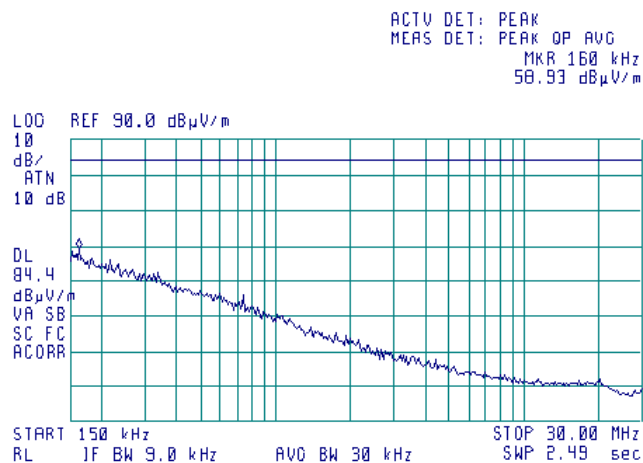
**Plot 7.4.3 Radiated emission measurements in 9 - 150 kHz range**

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



**Plot 7.4.4 Radiated emission measurements in 0.15 - 30 MHz range**

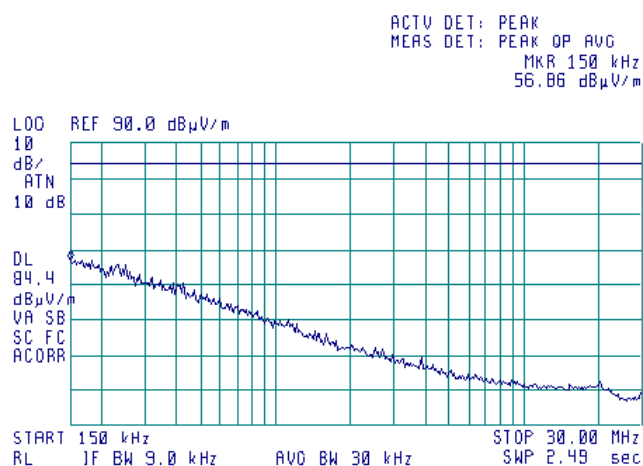
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

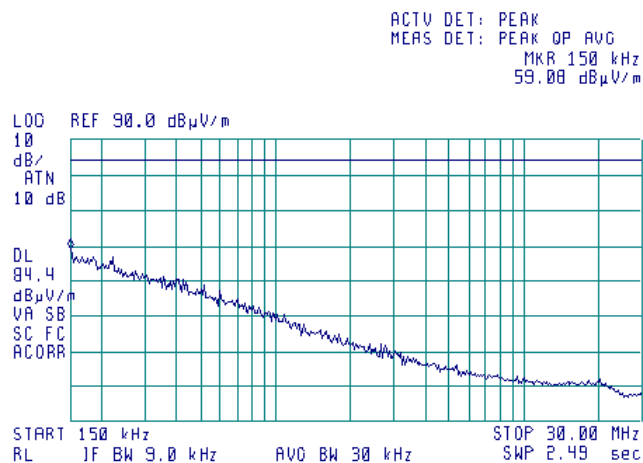
**Plot 7.4.5 Radiated emission measurements in 0.15 - 30 MHz range**

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



**Plot 7.4.6 Radiated emission measurements in 0.15 - 30 MHz range**

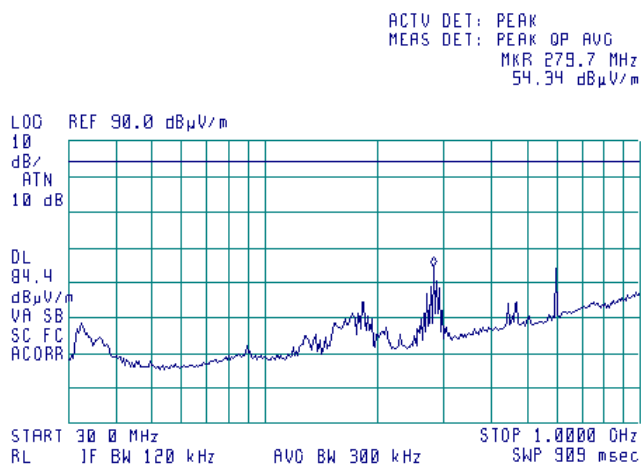
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

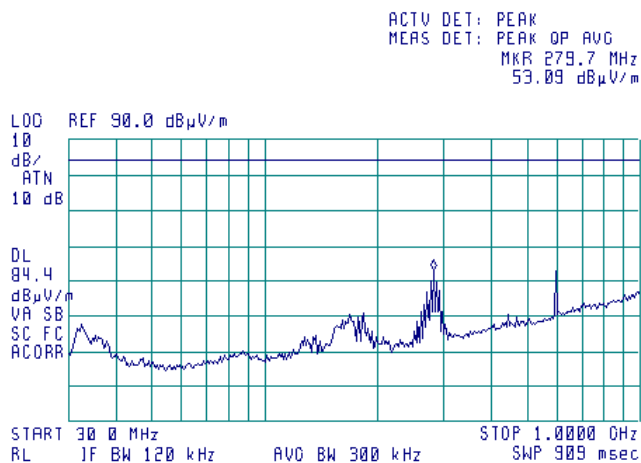
Plot 7.4.7 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.4.8 Radiated emission measurements in 30 - 1000 MHz range

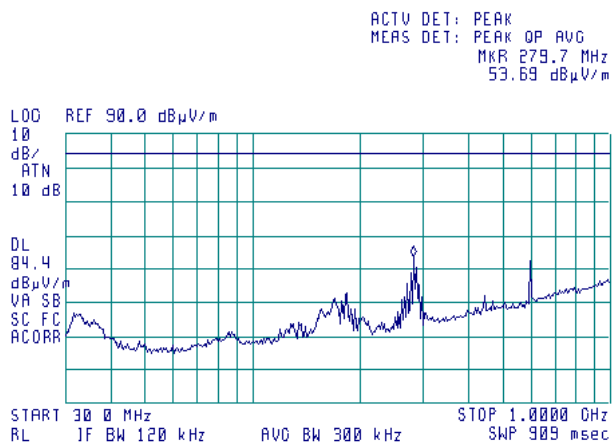
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

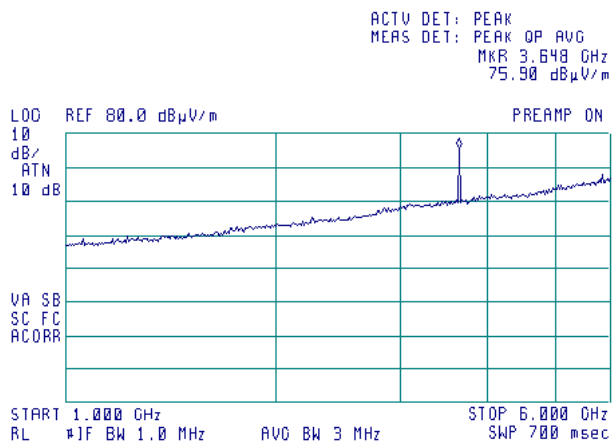
Plot 7.4.9 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.4.10 Radiated emission measurements in 1000 - 6500 MHz range

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

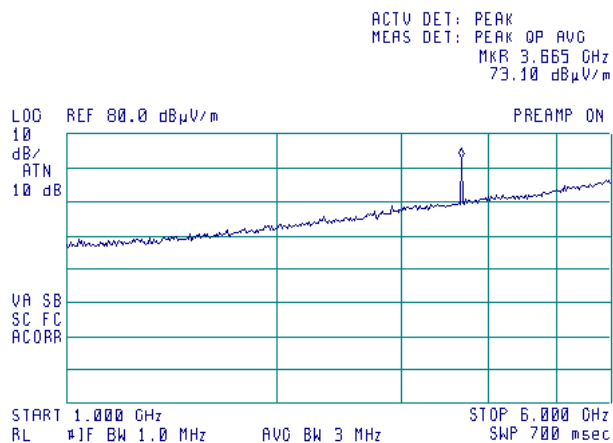


Notes: The 84.4 dBμV limit was applied;  
3648.0 MHz is a low carrier channel

|                             |                                                                    |                                |                             |
|-----------------------------|--------------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.1323, Radiated spurious emissions</b>                |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                         | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/29/2011                                                          |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa                                      | <b>Relative Humidity:</b> 47 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                                    |                                |                             |

**Plot 7.4.11 Radiated emission measurements in 1000 – 6500 MHz range**

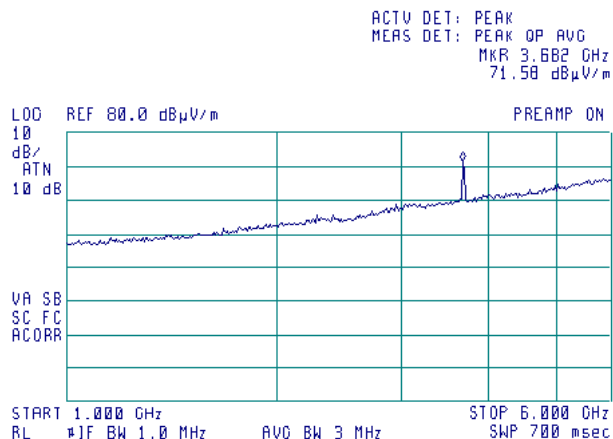
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



Notes: The 84.4 dBuV limit was applied; 3665.0 MHz is a mid carrier channel

**Plot 7.4.12 Radiated emission measurements in 1000 – 6500 MHz range**

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

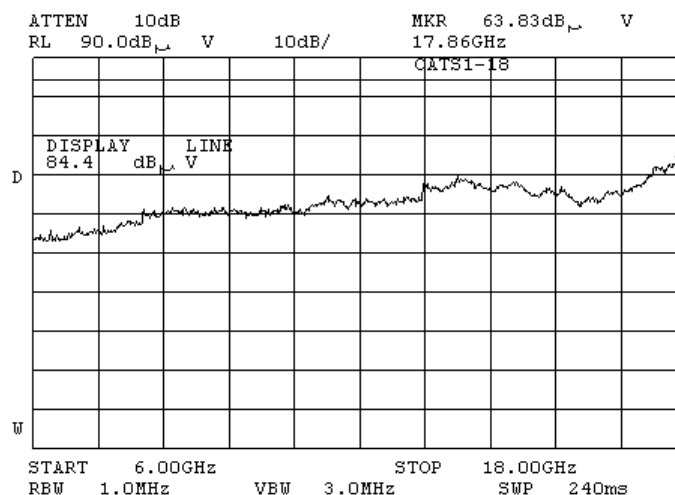


Notes: The 84.4 dBuV limit was applied; 3682.0 MHz is a high carrier channel

|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

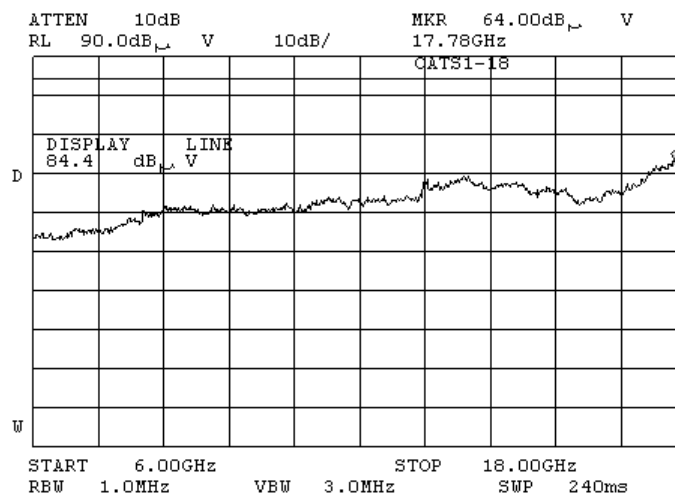
**Plot 7.4.13 Radiated emission measurements in 6000 – 18000 MHz range**

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



**Plot 7.4.14 Radiated emission measurements in 6000 – 18000 MHz range**

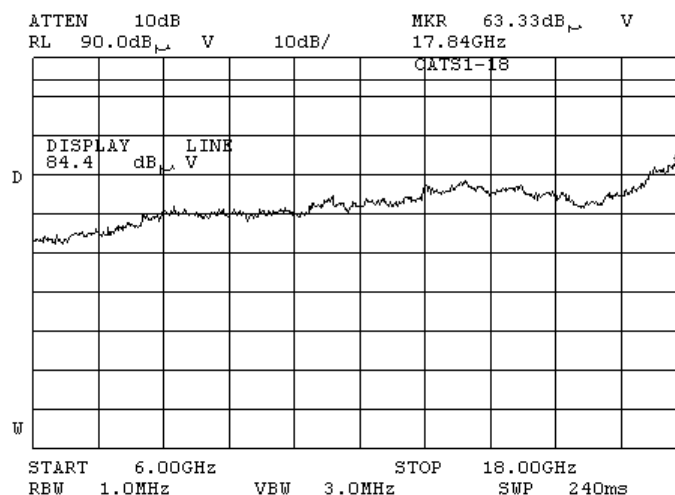
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

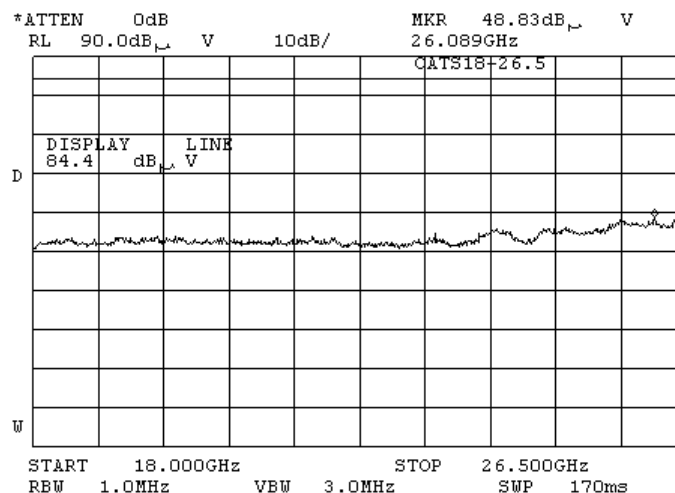
**Plot 7.4.15 Radiated emission measurements in 6000 – 18000 MHz range**

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



**Plot 7.4.16 Radiated emission measurements in 18000 – 26500 MHz range**

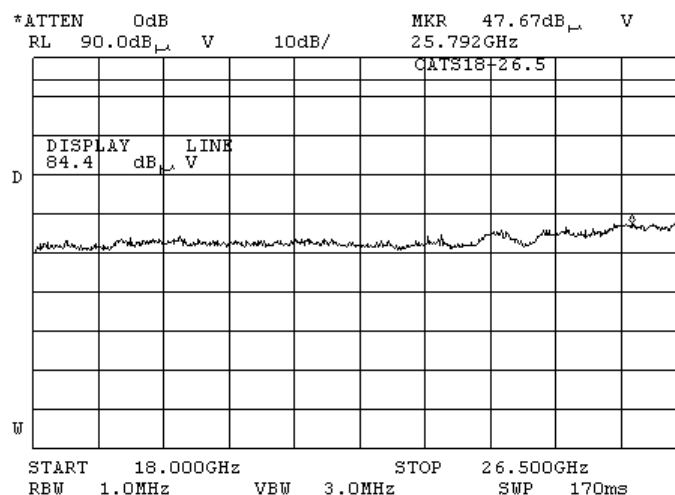
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

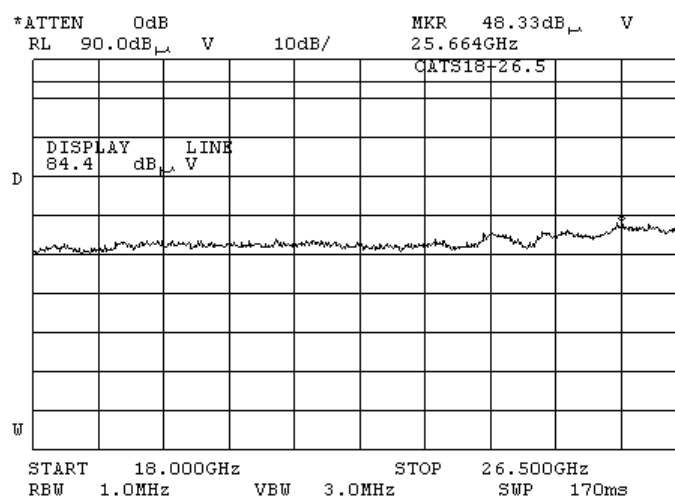
**Plot 7.4.17 Radiated emission measurements in 18000 – 26500 MHz range**

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



**Plot 7.4.18 Radiated emission measurements in 18000 – 26500 MHz range**

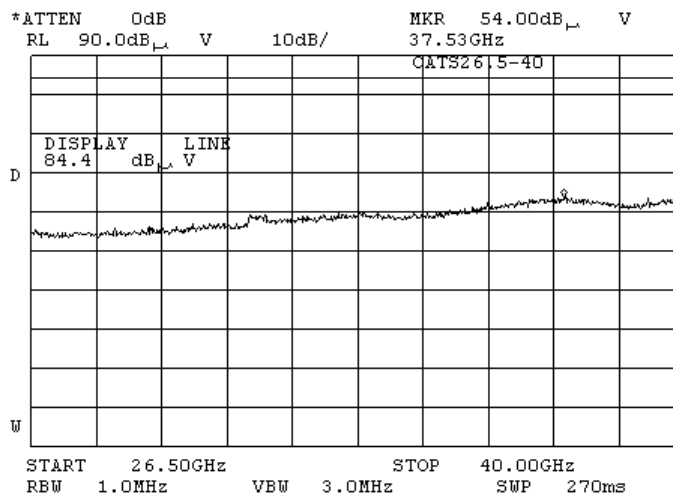
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

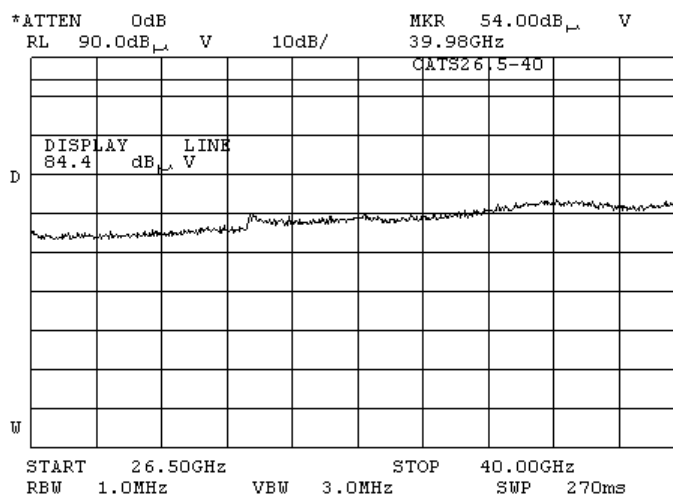
**Plot 7.4.19 Radiated emission measurements in 26500 – 40000 MHz range**

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



**Plot 7.4.20 Radiated emission measurements in 26500 – 40000 MHz range**

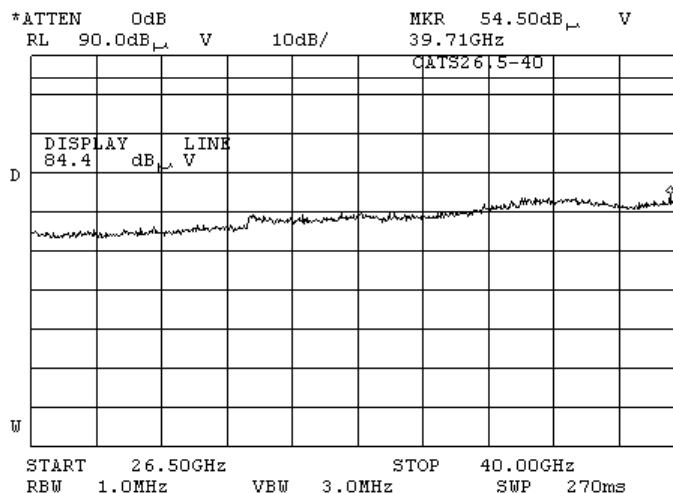
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

**Plot 7.4.21 Radiated emission measurements in 26500 – 40000 MHz range**

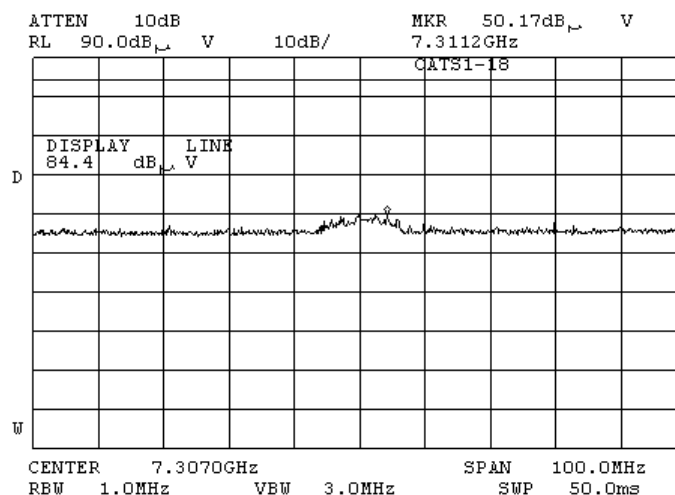
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: High  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

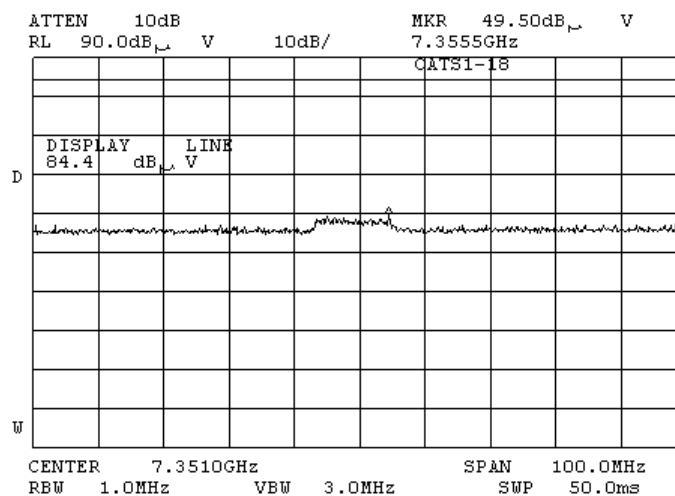
Plot 7.4.22 Radiated emission measurements at the 2<sup>nd</sup> harmonic

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



Plot 7.4.23 Radiated emission measurements at the 2<sup>nd</sup> harmonic

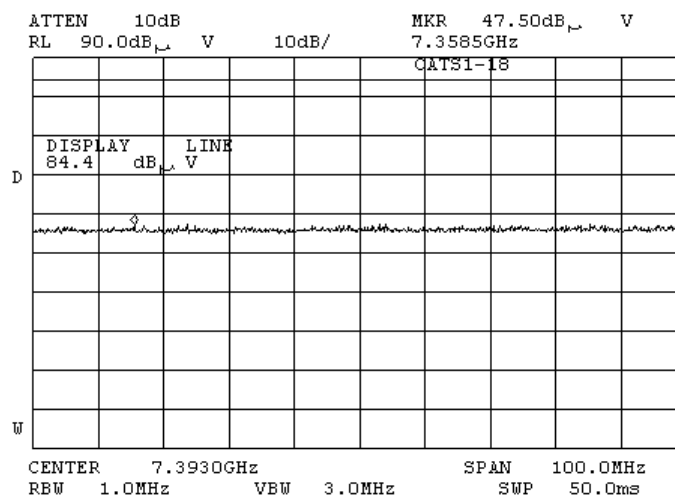
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Mid  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                         | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/29/2011                                                          |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

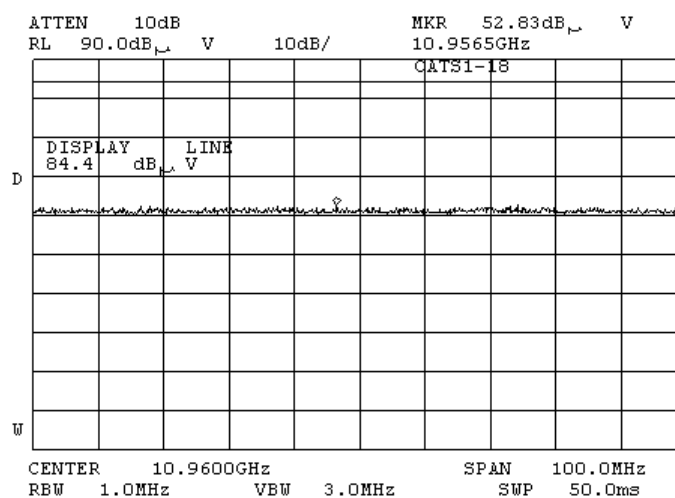
Plot 7.4.24 Radiated emission measurements at the 2<sup>nd</sup> harmonic

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



Plot 7.4.25 Radiated emission measurements at the 3<sup>rd</sup> harmonic

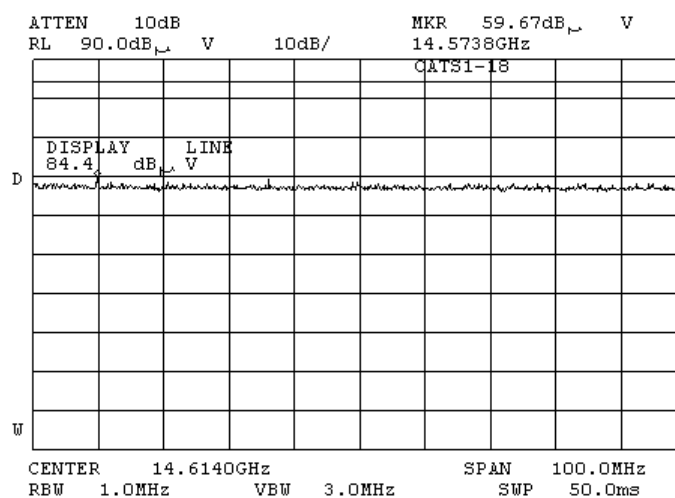
TEST SITE: Semi anechoic chamber  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



|                             |                               |                                                                    |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Radiated spurious emissions</b>                |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1053 and 90.1323; TIA/EIA-603-C, Section 2.2.12 |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b>                                                    | <b>PASS</b>                 |
| <b>Date:</b>                | 3/29/2011                     |                                                                    |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 47 %                                     | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                                    |                             |

**Plot 7.4.26 Radiated emission measurements at the 4<sup>th</sup> harmonic**

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



|                             |                               |                                                              |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Conducted spurious emissions</b>         |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b>                                              | <b>PASS</b>                 |
| <b>Date:</b>                | 3/28/2011                     |                                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 43 %                               | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                              |                             |

## 7.5 Spurious emissions at RF antenna connector test

### 7.5.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.5.1. The test results are provided in Table 7.5.2 and associated plots.

**Table 7.5.1 Spurious emission limits**

| Frequency, MHz         | Attenuation below carrier, dBc | ERP of spurious, dBm |
|------------------------|--------------------------------|----------------------|
| 0.009 – 10th harmonic* | 43+10logP** (mask B)           | -13.0                |

\* - spurious emission limits do not apply to the in band emission within  $\pm 250$  % of the authorized bandwidth from the carrier; investigated in course of emission mask testing

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

### 7.5.2 Test procedure

**7.5.2.1** The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

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

**7.5.2.3** The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and associated plots.

**Figure 7.5.1 Spurious emission test setup for single output mode**



|                             |                                                              |                                |                             |
|-----------------------------|--------------------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.1323, Conducted spurious emissions</b>         |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                                |                             |
| <b>Test mode:</b>           | Compliance                                                   | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/28/2011                                                    |                                |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa                                | <b>Relative Humidity:</b> 43 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                              |                                |                             |

Table 7.5.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: 64QAM  
 MODULATING SIGNAL: PRBS  
 BIT RATE: Mbps  
 EMISSION BANDWIDTH: 7 MHz (worst case output power and density)  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 TRANSMITTER OUTPUT POWER: Maximum

| Frequency, MHz                                                   | SA reading, dBm | Attenuator, dB | Cable loss, dB | RBW, kHz | Spurious emission, dBm | Attenuation below carrier, dBc | Limit, dBc | Margin, dB* | Verdict |
|------------------------------------------------------------------|-----------------|----------------|----------------|----------|------------------------|--------------------------------|------------|-------------|---------|
| <b>Low carrier frequency</b>                                     |                 |                |                |          |                        |                                |            |             |         |
| All spurious were found at least 20 db below the specified limit |                 |                |                |          |                        |                                |            |             | Pass    |
| <b>Mid carrier frequency</b>                                     |                 |                |                |          |                        |                                |            |             |         |
| All spurious were found at least 20 db below the specified limit |                 |                |                |          |                        |                                |            |             | Pass    |
| <b>High carrier frequency</b>                                    |                 |                |                |          |                        |                                |            |             |         |
| All spurious were found at least 20 db below the specified limit |                 |                |                |          |                        |                                |            |             | Pass    |

\*- Margin = Spurious emission – specification limit.

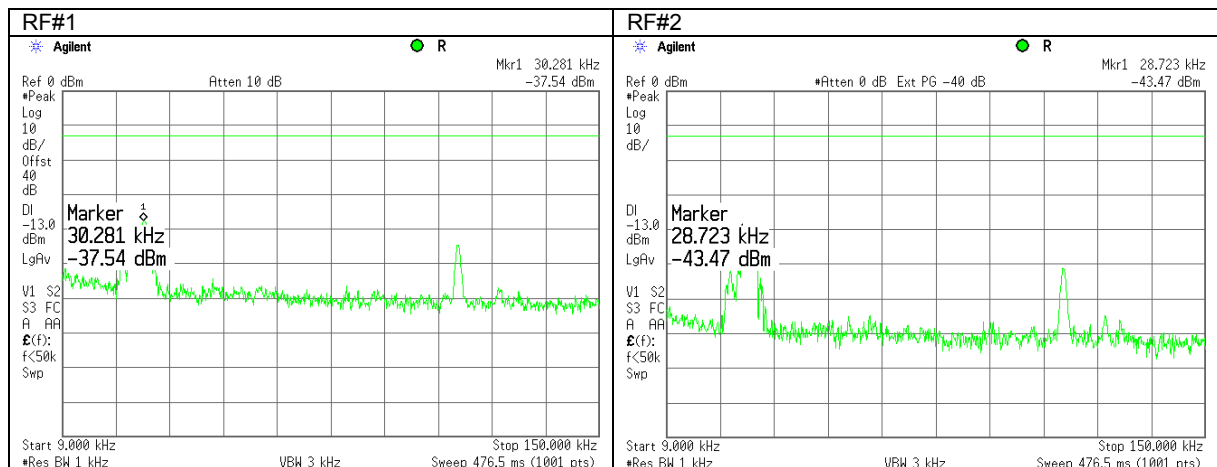
**Reference numbers of test equipment used**

|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 1906 | HL 2951 | HL 3455 | HL 3473 | HL 3474 | HL 3768 | HL 3776 | HL 3787 |
| HL 3818 | HL 3901 |         |         |         |         |         |         |

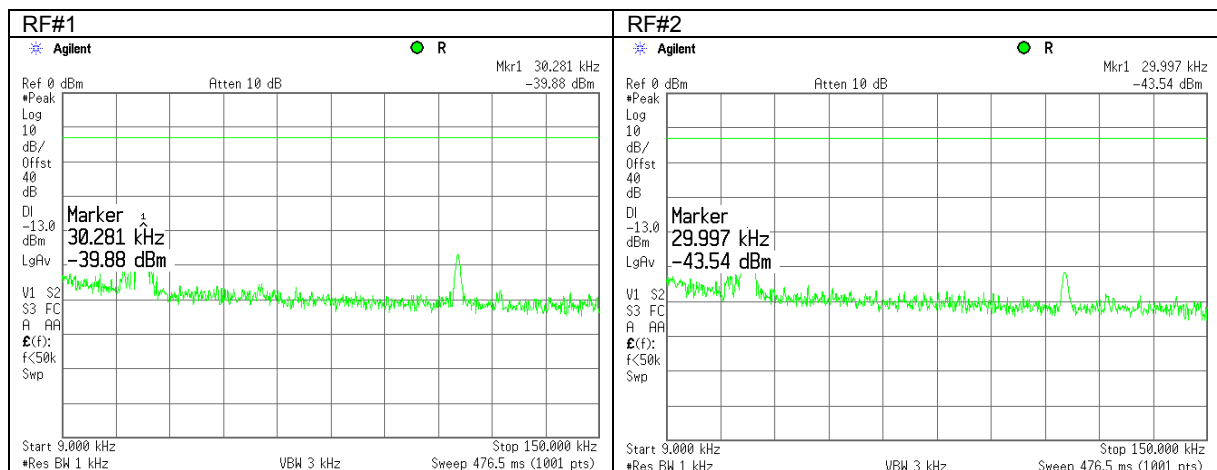
Full description is given in Appendix A.

|                      |                                                              |                         |                      |
|----------------------|--------------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1323, Conducted spurious emissions                |                         |                      |
| Test procedure:      | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                         |                      |
| Test mode:           | Compliance                                                   | Verdict: PASS           |                      |
| Date:                | 3/28/2011                                                    |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1021 hPa                                       | Relative Humidity: 43 % | Power Supply: 48 VDC |
| Remarks:             |                                                              |                         |                      |

Plot 7.5.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

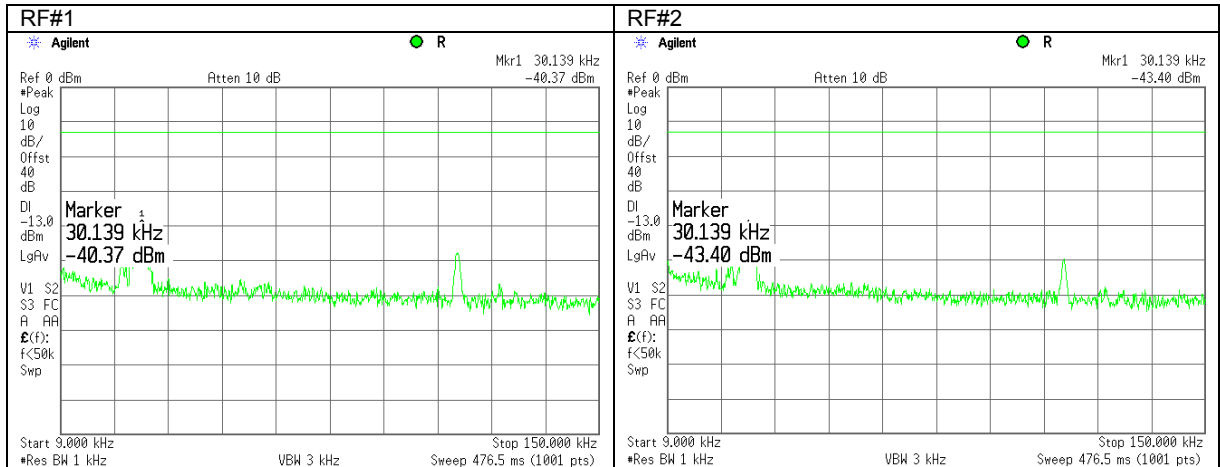


Plot 7.5.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

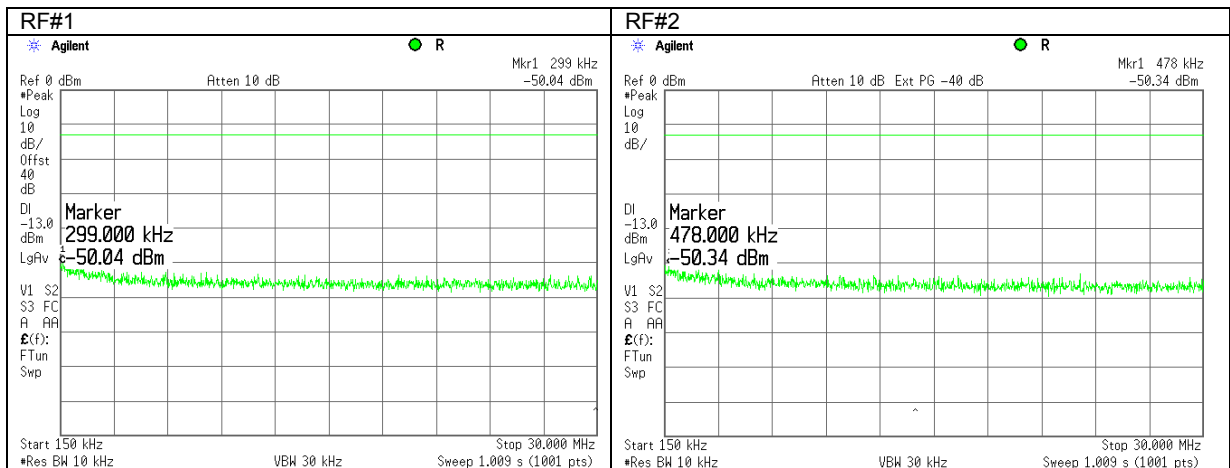


|                             |                               |                                                              |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Conducted spurious emissions</b>         |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b> PASS                                         |                             |
| <b>Date:</b>                | 3/28/2011                     |                                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 43 %                               | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                              |                             |

Plot 7.5.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

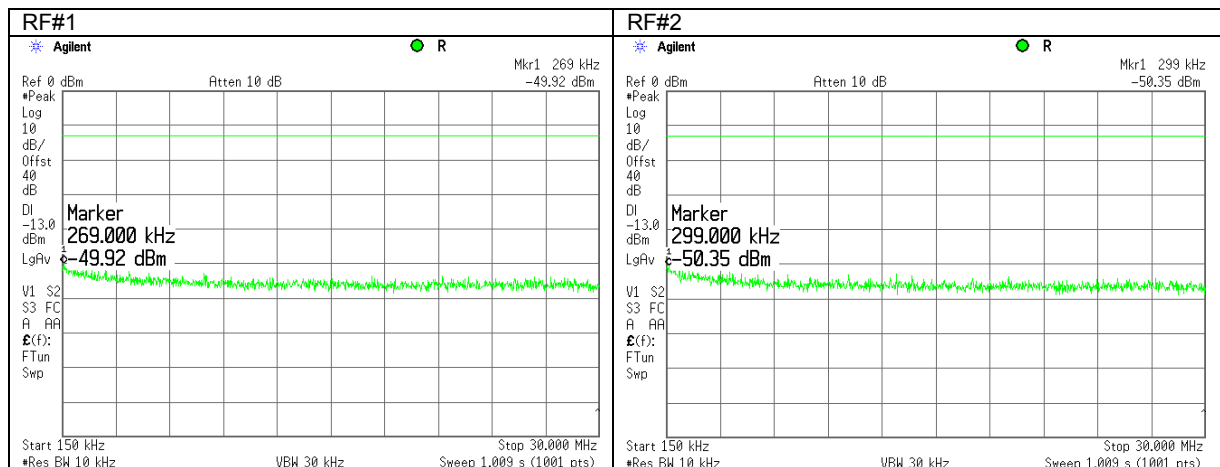


Plot 7.5.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

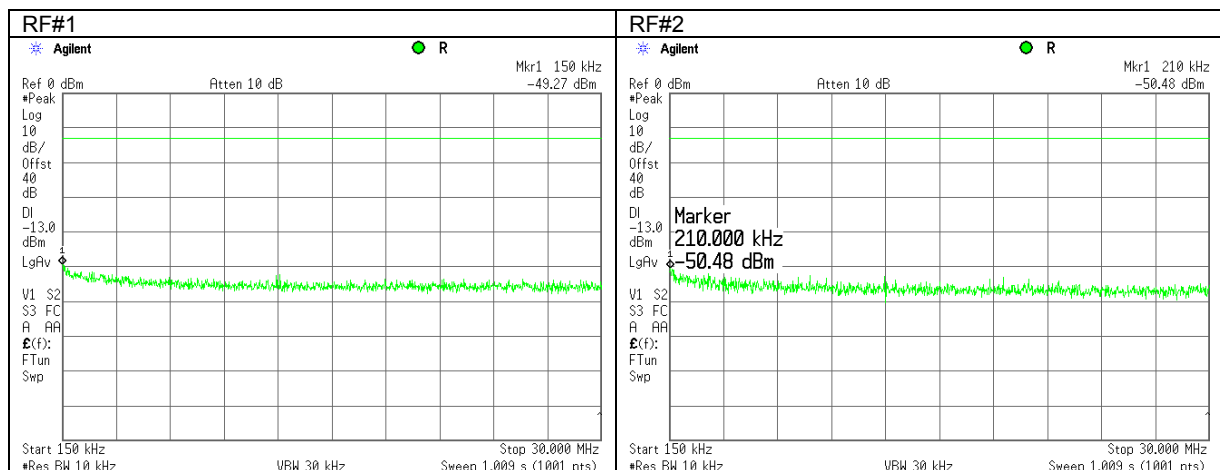


|                             |                               |                                                              |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Conducted spurious emissions</b>         |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                             |
| <b>Test mode:</b>           |                               | Compliance                                                   | <b>Verdict:</b> PASS        |
| <b>Date:</b>                |                               | 3/28/2011                                                    |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 43 %                               | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                              |                             |

Plot 7.5.5 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency

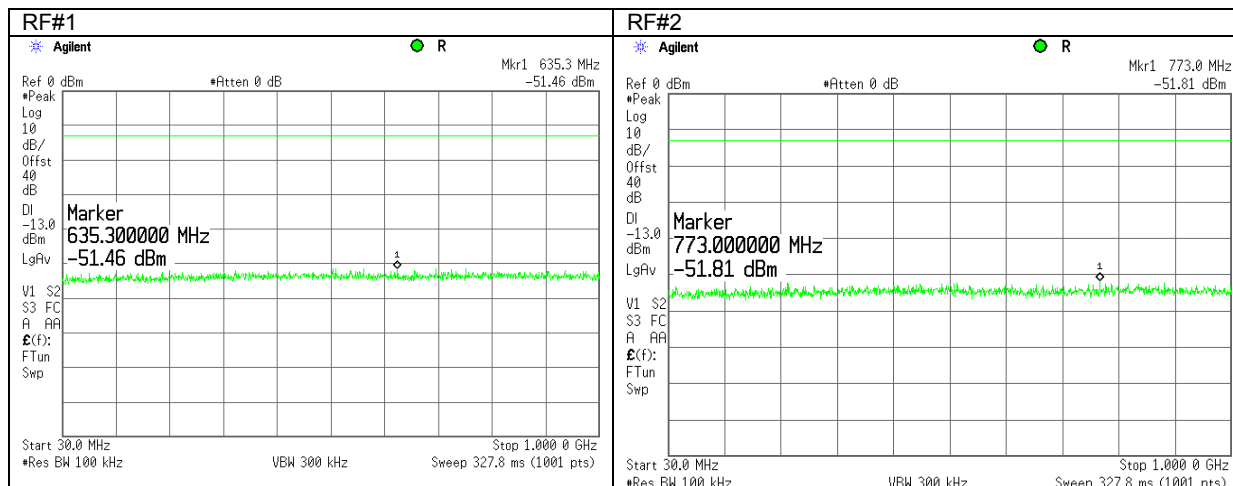


Plot 7.5.6 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency

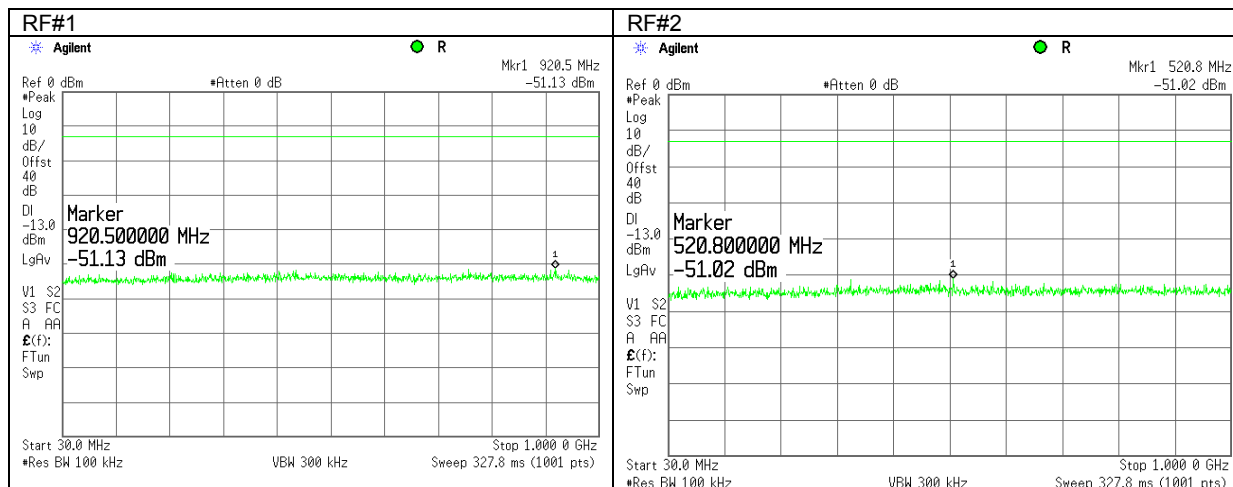


|                      |                                                              |                         |                      |
|----------------------|--------------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1323, Conducted spurious emissions                |                         |                      |
| Test procedure:      | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                         |                      |
| Test mode:           | Compliance                                                   | Verdict: PASS           |                      |
| Date:                | 3/28/2011                                                    |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1021 hPa                                       | Relative Humidity: 43 % | Power Supply: 48 VDC |
| Remarks:             |                                                              |                         |                      |

Plot 7.5.7 Spurious emission measurements in 30.0 - 1000 MHz range at low carrier frequency

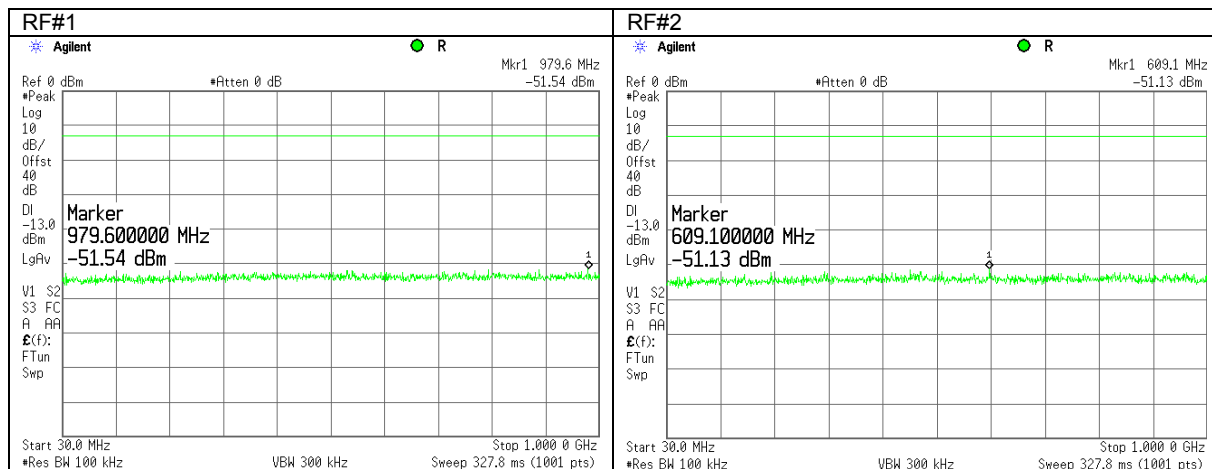


Plot 7.5.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency

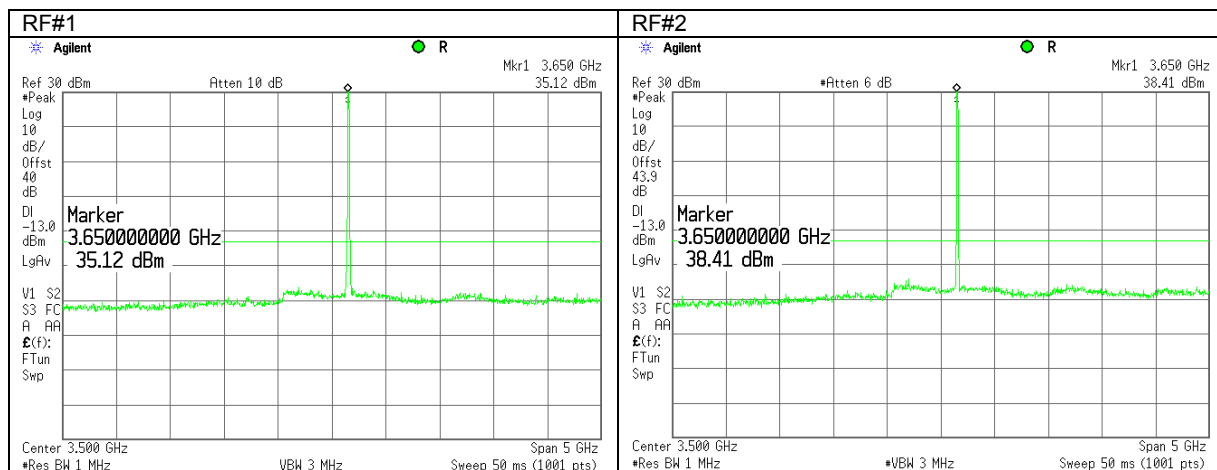


|                      |                                                              |                         |                      |
|----------------------|--------------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1323, Conducted spurious emissions                |                         |                      |
| Test procedure:      | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                         |                      |
| Test mode:           | Compliance                                                   | Verdict: PASS           |                      |
| Date:                | 3/28/2011                                                    |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1021 hPa                                       | Relative Humidity: 43 % | Power Supply: 48 VDC |
| Remarks:             |                                                              |                         |                      |

Plot 7.5.9 Spurious emission measurements in 30.0 - 1000 MHz range at high carrier frequency

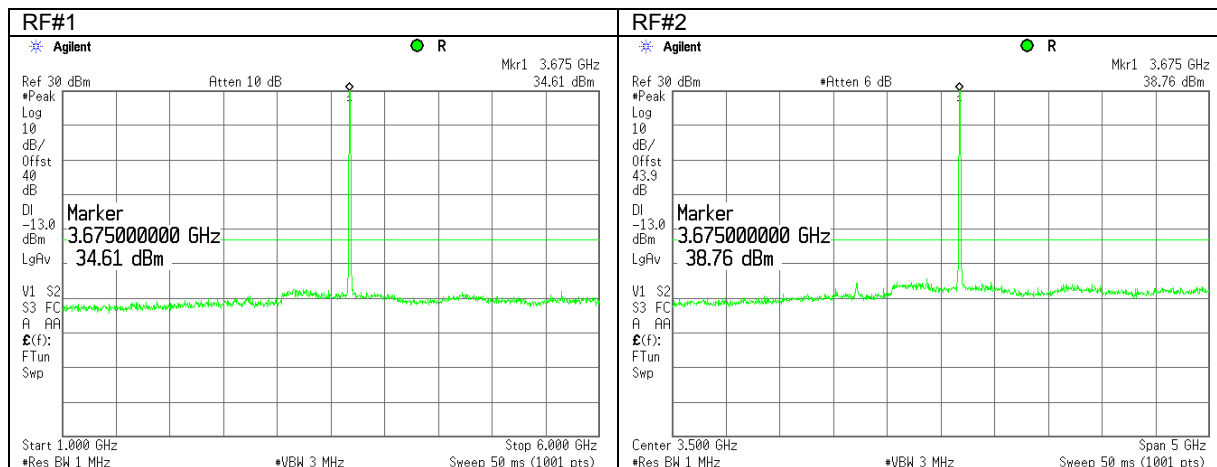


Plot 7.5.10 Spurious emission measurements in 1000 - 6000 MHz range at low carrier frequency

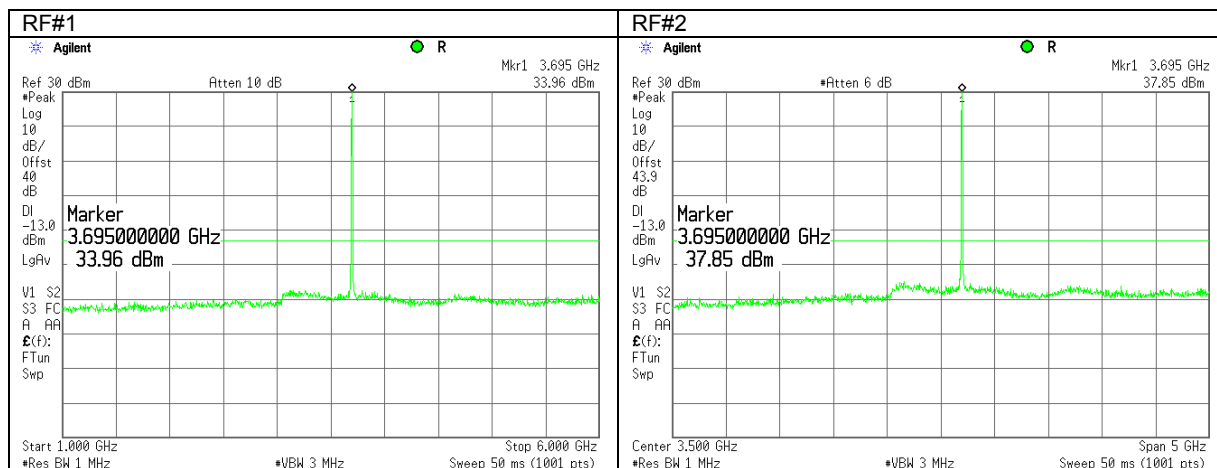


|                      |                                                              |                         |                      |
|----------------------|--------------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1323, Conducted spurious emissions                |                         |                      |
| Test procedure:      | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                         |                      |
| Test mode:           | Compliance                                                   | Verdict: PASS           |                      |
| Date:                | 3/28/2011                                                    |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1021 hPa                                       | Relative Humidity: 43 % | Power Supply: 48 VDC |
| Remarks:             |                                                              |                         |                      |

Plot 7.5.11 Spurious emission measurements in 1000 - 6000 MHz range at mid carrier frequency

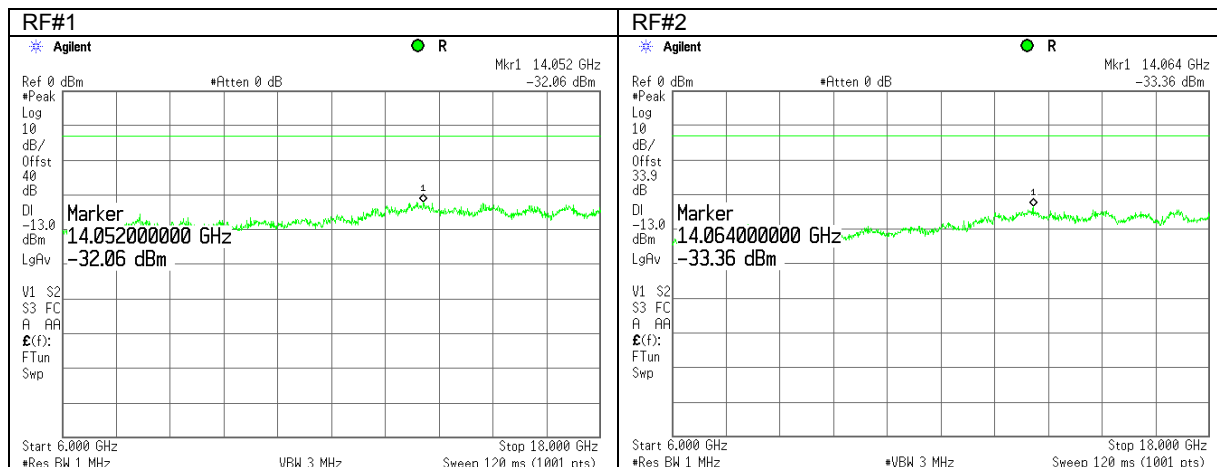


Plot 7.5.12 Spurious emission measurements in 1000 - 6000 MHz range at high carrier frequency

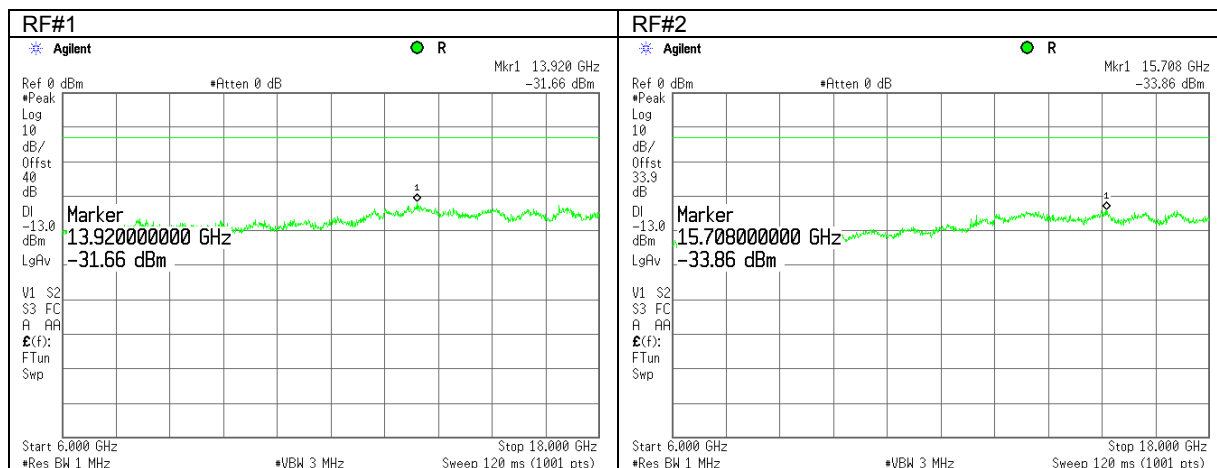


|                             |                               |                                                              |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Conducted spurious emissions</b>         |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b> PASS                                         |                             |
| <b>Date:</b>                | 3/28/2011                     |                                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 43 %                               | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                              |                             |

Plot 7.5.13 Spurious emission measurements in 6000 - 18000 MHz range at low carrier frequency

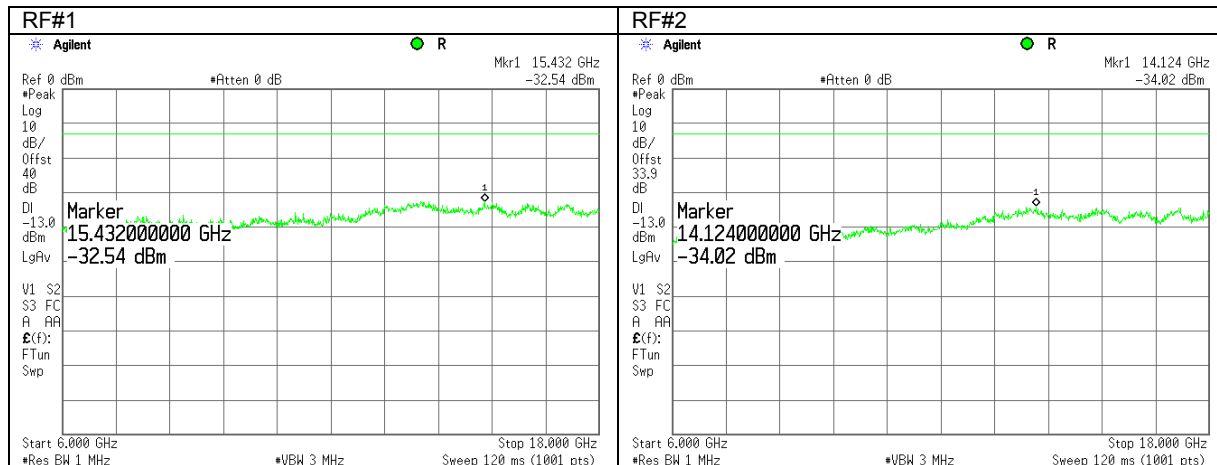


Plot 7.5.14 Spurious emission measurements in 6000 - 18000 MHz at mid carrier frequency

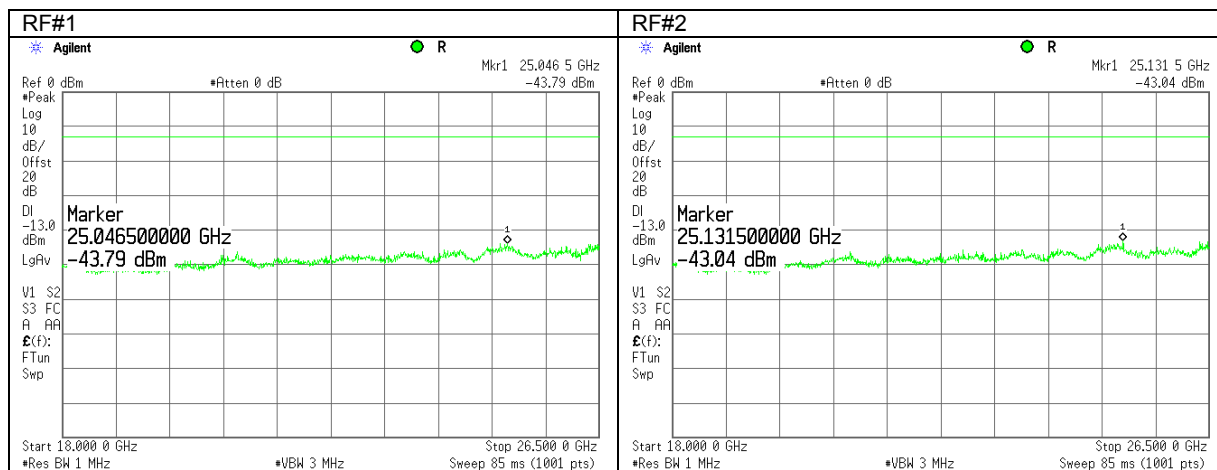


|                      |                                                              |                         |                      |
|----------------------|--------------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1323, Conducted spurious emissions                |                         |                      |
| Test procedure:      | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                         |                      |
| Test mode:           | Compliance                                                   | Verdict: PASS           |                      |
| Date:                | 3/28/2011                                                    |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1021 hPa                                       | Relative Humidity: 43 % | Power Supply: 48 VDC |
| Remarks:             |                                                              |                         |                      |

Plot 7.5.15 Spurious emission measurements in 6000 - 18000 MHz at high carrier frequency

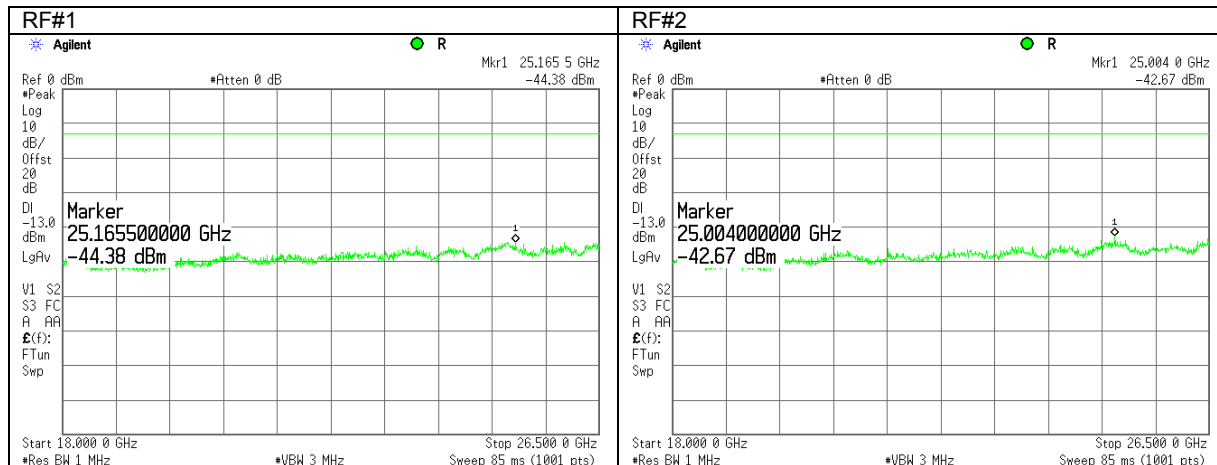


Plot 7.5.16 Spurious emission measurements in 18000 - 26500 MHz range at low carrier frequency

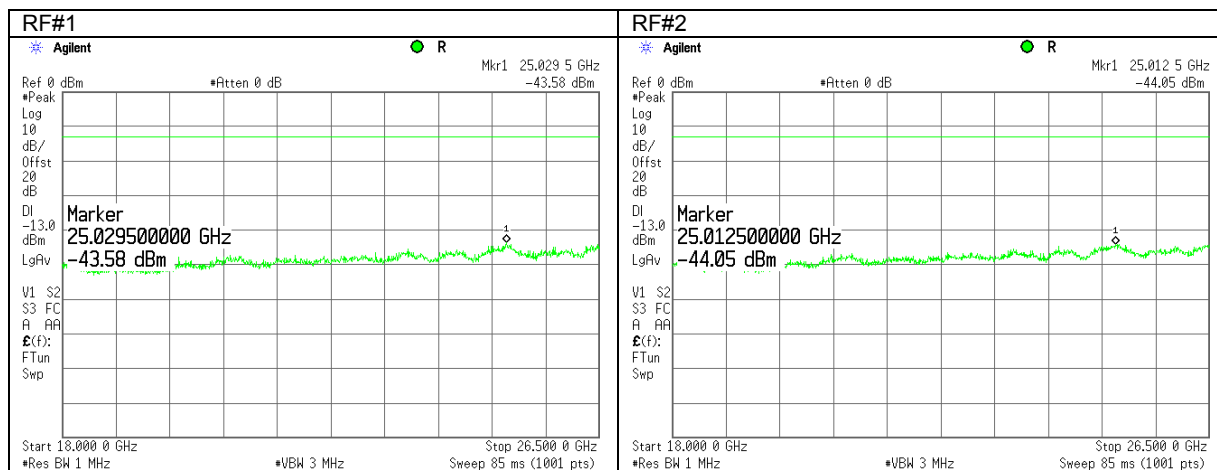


|                      |                                                              |                         |                      |
|----------------------|--------------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1323, Conducted spurious emissions                |                         |                      |
| Test procedure:      | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                         |                      |
| Test mode:           | Compliance                                                   | Verdict: PASS           |                      |
| Date:                | 3/28/2011                                                    |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1021 hPa                                       | Relative Humidity: 43 % | Power Supply: 48 VDC |
| Remarks:             |                                                              |                         |                      |

Plot 7.5.17 Spurious emission measurements in 18000 - 26500 MHz at mid carrier frequency

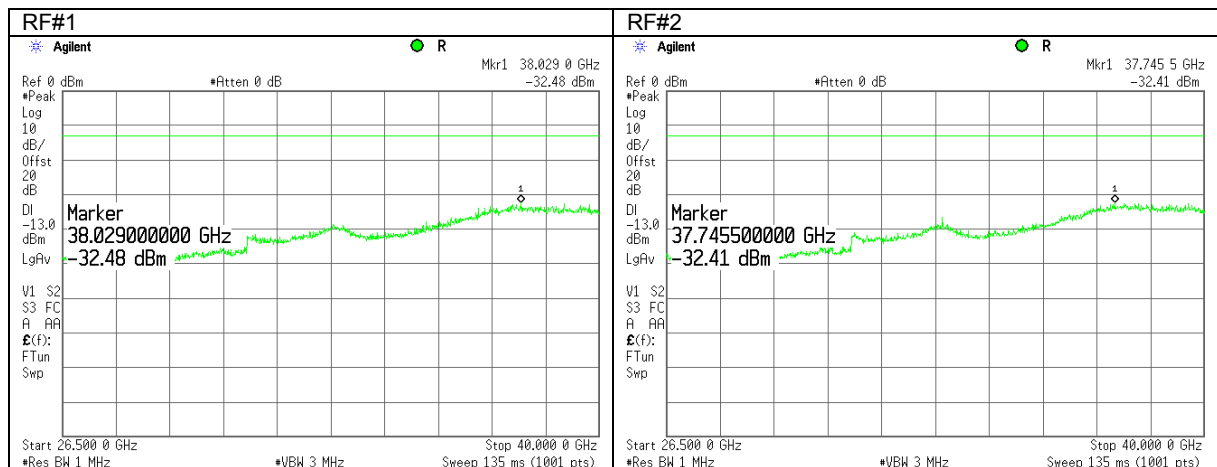


Plot 7.5.18 Spurious emission measurements in 18000 - 26500 MHz at high carrier frequency

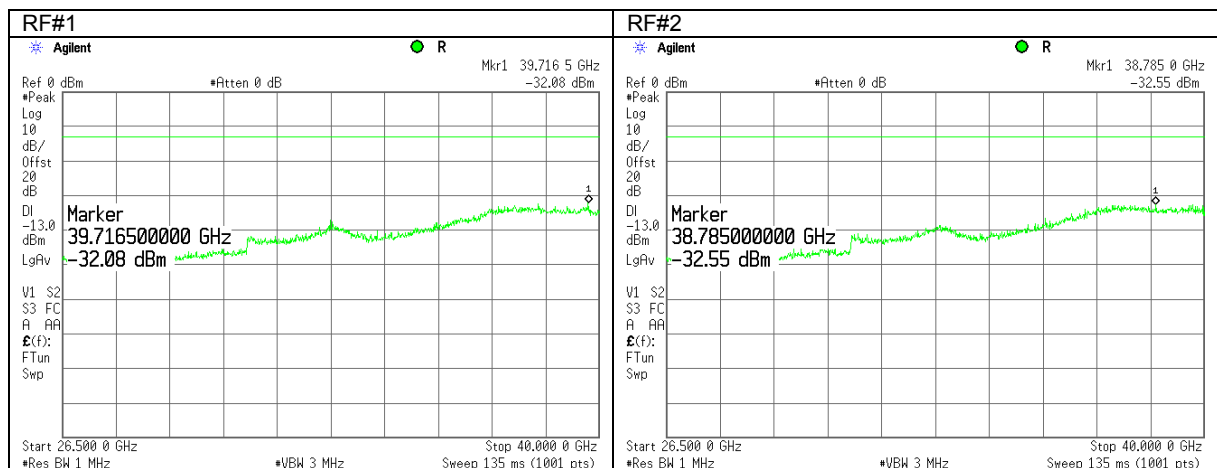


|                             |                               |                                                              |                             |
|-----------------------------|-------------------------------|--------------------------------------------------------------|-----------------------------|
| <b>Test specification:</b>  |                               | <b>Section 90.1323, Conducted spurious emissions</b>         |                             |
| <b>Test procedure:</b>      |                               | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                             |
| <b>Test mode:</b>           | Compliance                    | <b>Verdict:</b> PASS                                         |                             |
| <b>Date:</b>                | 3/28/2011                     |                                                              |                             |
| <b>Temperature:</b> 22.4 °C | <b>Air Pressure:</b> 1021 hPa | <b>Relative Humidity:</b> 43 %                               | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                               |                                                              |                             |

Plot 7.5.19 Spurious emission measurements in 26500 - 40000 MHz range at low carrier frequency

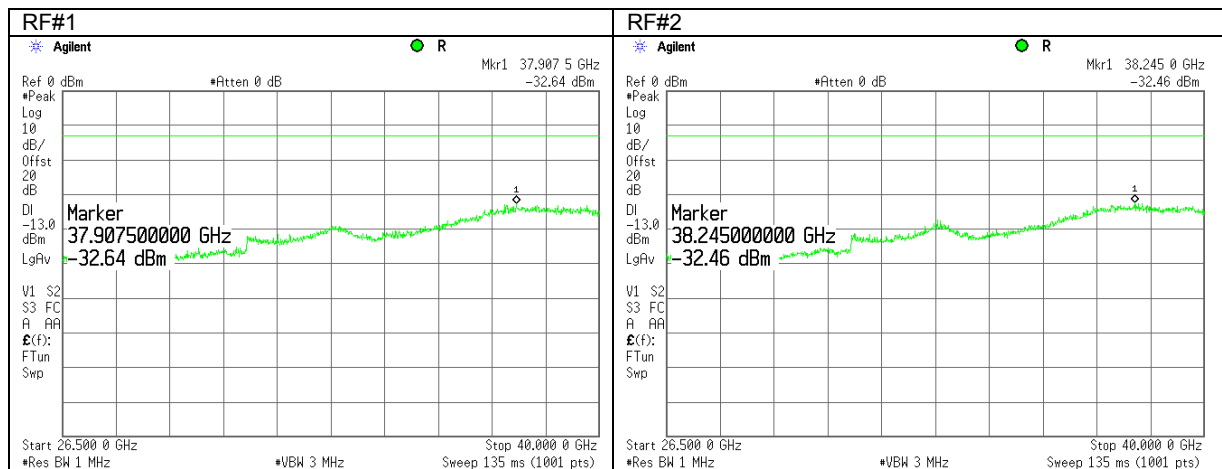


Plot 7.5.20 Spurious emission measurements in 26500 - 40000 MHz at mid carrier frequency



|                      |                                                              |                         |                      |
|----------------------|--------------------------------------------------------------|-------------------------|----------------------|
| Test specification:  | Section 90.1323, Conducted spurious emissions                |                         |                      |
| Test procedure:      | 47 CFR, Sections 2.1051 and 90.1323; FCC guidance 662911 D01 |                         |                      |
| Test mode:           | Compliance                                                   | Verdict: PASS           |                      |
| Date:                | 3/28/2011                                                    |                         |                      |
| Temperature: 22.4 °C | Air Pressure: 1021 hPa                                       | Relative Humidity: 43 % | Power Supply: 48 VDC |
| Remarks:             |                                                              |                         |                      |

Plot 7.5.21 Spurious emission measurements in 26500 - 40000 MHz at high carrier frequency



|                             |                                                     |                                |                             |
|-----------------------------|-----------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.213, Frequency stability</b>          |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 |                                |                             |
| <b>Test mode:</b>           | Compliance                                          | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/29/2011 - 3/30/2011                               |                                |                             |
| <b>Temperature:</b> 23.2 °C | <b>Air Pressure:</b> 1020 hPa                       | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                     |                                |                             |

## 7.6 Frequency stability test

### 7.6.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.6.1. The test results are provided in Table 7.6.2.

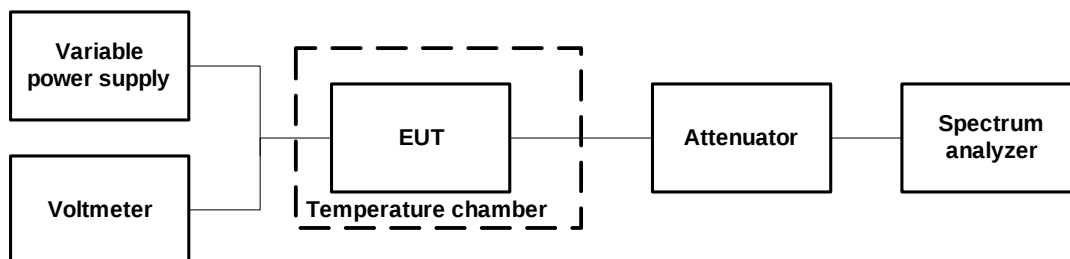
Table 7.6.1 Frequency stability limits

| Assigned frequency, MHz | Maximum allowed frequency displacement                                                                                              |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 3650.0 – 3700.0         | 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



|                             |                                                     |                                |                             |
|-----------------------------|-----------------------------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b>  | <b>Section 90.213, Frequency stability</b>          |                                |                             |
| <b>Test procedure:</b>      | 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2 |                                |                             |
| <b>Test mode:</b>           | Compliance                                          | <b>Verdict:</b>                | <b>PASS</b>                 |
| <b>Date:</b>                | 3/29/2011 - 3/30/2011                               |                                |                             |
| <b>Temperature:</b> 23.2 °C | <b>Air Pressure:</b> 1020 hPa                       | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>             |                                                     |                                |                             |

Table 7.6.2 Frequency stability test results

ASSIGNED FREQUENCY: 3650.0 – 3700.0 MHz  
 NOMINAL POWER VOLTAGE: 48 VDC  
 TEMPERATURE STABILIZATION PERIOD: 20 min  
 POWER DURING TEMPERATURE TRANSITION: Off  
 SPECTRUM ANALYZER MODE: Counter  
 RESOLUTION BANDWIDTH: 1 kHz  
 VIDEO BANDWIDTH: 3 kHz  
 MODULATION: Unmodulated

| Modulation:              |              | Unmodulated    |             |             |             |             |             |              |                         |          |                         |          |  |
|--------------------------|--------------|----------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------------------|----------|-------------------------|----------|--|
| T, °C                    | Voltage, VDC | Frequency, MHz |             |             |             |             |             |              | Max frequency drift, Hz |          | Max frequency drift,ppm |          |  |
|                          |              | Start up       | 1st min     | 2nd min     | 3rd min     | 4th min     | 5th min     | 10th min     | Positive                | Negative | Positive                | Negative |  |
| Low channel 3651.75 MHz  |              |                |             |             |             |             |             |              |                         |          |                         |          |  |
| -30                      | nominal      | 3651.745638    | 3651.745648 | 3651.745658 | 3651.745648 | 3651.745648 | 3651.745648 | 3651.745638  | 20.0                    | 0.0      | 0.01                    | 0.00     |  |
| -20                      | nominal      | 3651.745637    | NA          | NA          | NA          | NA          | NA          | 3651.745646  | 8.0                     | -1.0     | 0.00                    | 0.00     |  |
| -10                      | nominal      | 3651.745660    | NA          | NA          | NA          | NA          | NA          | 3651.745650  | 22.0                    | 0.0      | 0.01                    | 0.00     |  |
| 0                        | nominal      | 3651.745653    | 3651.745653 | 3651.745663 | 3651.745663 | 3651.745653 | 3651.745663 | 3651.745674  | 36.0                    | 0.0      | 0.01                    | 0.00     |  |
| 10                       | nominal      | 3651.745666    | NA          | NA          | NA          | NA          | NA          | 3651.745655  | 28.0                    | 0.0      | 0.01                    | 0.00     |  |
| 20                       | 55.2         | 3651.745656    | NA          | NA          | NA          | NA          | NA          | 3651.745657  | 19.0                    | 0.0      | 0.01                    | 0.00     |  |
| 20                       | 48.0         | 3651.745731    | NA          | NA          | NA          | NA          | NA          | 3651.745638* | 93.0                    | 0.0      | 0.03                    | 0.00     |  |
| 20                       | 40.8         | 3651.745654    | NA          | NA          | NA          | NA          | NA          | 3651.745666  | 28.0                    | 0.0      | 0.01                    | 0.00     |  |
| 30                       | nominal      | 3651.745645    | 3651.745665 | 3651.745665 | 3651.745665 | 3651.745665 | 3651.745656 | 3651.745656  | 27.0                    | 0.0      | 0.01                    | 0.00     |  |
| 40                       | nominal      | 3651.745679    | NA          | NA          | NA          | NA          | NA          | 3651.745669  | 41.0                    | 0.0      | 0.01                    | 0.00     |  |
| 50                       | nominal      | 3651.745696    | 3651.745675 | 3651.745672 | 3651.745674 | 3651.745679 | 3651.745684 | 3651.745686  | 58.0                    | 0.0      | 0.02                    | 0.00     |  |
| Mid Channel 3675.0 MHz   |              |                |             |             |             |             |             |              |                         |          |                         |          |  |
| -30                      | nominal      | 3674.995610    | 3674.995610 | 3674.995620 | 3674.995620 | 3674.995610 | 3674.995631 | 3674.995631  | 15.0                    | -6.0     | 0.00                    | 0.00     |  |
| -20                      | nominal      | 3674.995608    | NA          | NA          | NA          | NA          | NA          | 3674.995619  | 3.0                     | -8.0     | 0.00                    | 0.00     |  |
| -10                      | nominal      | 3674.995622    | NA          | NA          | NA          | NA          | NA          | 3674.995623  | 7.0                     | 0.0      | 0.00                    | 0.00     |  |
| 0                        | nominal      | 3674.995625    | 3674.995645 | 3674.995635 | 3674.995635 | 3674.995625 | 3674.995635 | 3674.995635  | 29.0                    | 0.0      | 0.01                    | 0.00     |  |
| 10                       | nominal      | 3674.995638    | NA          | NA          | NA          | NA          | NA          | 3674.995634  | 22.0                    | 0.0      | 0.01                    | 0.00     |  |
| 20                       | 55.2         | 3674.995649    | NA          | NA          | NA          | NA          | NA          | 3674.995610  | 33.0                    | -6.0     | 0.01                    | 0.00     |  |
| 20                       | 48.0         | 3674.995611    | NA          | NA          | NA          | NA          | NA          | 3674.995616* | 0.0                     | -5.0     | 0.00                    | 0.00     |  |
| 20                       | 40.8         | 3674.995613    | NA          | NA          | NA          | NA          | NA          | 3674.995626  | 10.0                    | -3.0     | 0.00                    | 0.00     |  |
| 30                       | nominal      | 3674.995645    | 3674.995647 | 3674.995637 | 3674.995637 | 3674.995627 | 3674.995637 | 3674.995638  | 31.0                    | 0.0      | 0.01                    | 0.00     |  |
| 40                       | nominal      | 3674.995672    | NA          | NA          | NA          | NA          | NA          | 3674.995663  | 56.0                    | 0.0      | 0.02                    | 0.00     |  |
| 50                       | nominal      | 3674.995657    | 3674.995657 | 3674.995647 | 3674.995637 | 3674.995638 | 3674.995648 | 3674.995648  | 41.0                    | 0.0      | 0.01                    | 0.00     |  |
| High channel 3698.25 MHz |              |                |             |             |             |             |             |              |                         |          |                         |          |  |
| -30                      | nominal      | 3698.245593    | 3698.245593 | 3698.245593 | 3698.245593 | 3698.245583 | 3698.245583 | 3698.245584  | 19.0                    | 0.0      | 0.01                    | 0.00     |  |
| -20                      | nominal      | 3698.245598    | NA          | NA          | NA          | NA          | NA          | 3698.245581  | 24.0                    | 0.0      | 0.01                    | 0.00     |  |
| -10                      | nominal      | 3698.245605    | NA          | NA          | NA          | NA          | NA          | 3698.245605  | 31.0                    | 0.0      | 0.01                    | 0.00     |  |
| 0                        | nominal      | 3698.245587    | 3698.245597 | 3698.245607 | 3698.245607 | 3698.245597 | 3698.245597 | 3698.245597  | 33.0                    | 0.0      | 0.01                    | 0.00     |  |
| 10                       | nominal      | 3698.245610    | NA          | NA          | NA          | NA          | NA          | 3698.245609  | 36.0                    | 0.0      | 0.01                    | 0.00     |  |
| 20                       | 55.2         | 3698.245593    | NA          | NA          | NA          | NA          | NA          | 3698.245614  | 40.0                    | 0.0      | 0.01                    | 0.00     |  |
| 20                       | 48.0         | 3698.245589    | NA          | NA          | NA          | NA          | NA          | 3698.245574* | 15.0                    | 0.0      | 0.00                    | 0.00     |  |
| 20                       | 40.8         | 3698.245595    | NA          | NA          | NA          | NA          | NA          | 3698.245585  | 21.0                    | 0.0      | 0.01                    | 0.00     |  |
| 30                       | nominal      | 3698.245608    | 3698.245579 | 3698.245619 | 3698.245609 | 3698.245609 | 3698.245599 | 3698.245609  | 45.0                    | 0.0      | 0.01                    | 0.00     |  |
| 40                       | nominal      | 3698.245616    | NA          | NA          | NA          | NA          | NA          | 3698.245636  | 62.0                    | 0.0      | 0.02                    | 0.00     |  |
| 50                       | nominal      | 3698.245609    | 3698.245639 | 3698.245619 | 3698.245629 | 3698.245629 | 3698.245619 | 3698.245619  | 65.0                    | 0.0      | 0.02                    | 0.00     |  |

\* - Reference frequency

Note1: As no limit is specified by the applicable rule for 3650.0 – 3700.0 MHz band the test results are given in Table above for information purpose only.

Reference numbers of test equipment used

|         |         |         |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|
| HL 1455 | HL 3286 | HL 3818 |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|

Full description is given in Appendix A.

|                     |                        |                                               |                      |
|---------------------|------------------------|-----------------------------------------------|----------------------|
| Test specification: |                        | Section 90.203 (o), Contention based protocol |                      |
| Test procedure:     |                        |                                               |                      |
| Test mode:          | Compliance             | Verdict: PASS                                 |                      |
| Date:               | 5/13/2011 – 5/16/2011  |                                               |                      |
| Temperature: 23.2°C | Air Pressure: 1007 hPa | Relative Humidity: 46 %                       | Power Supply: 48 VDC |
| Remarks:            |                        |                                               |                      |

## 8 Contention Based Protocol

### 8.1 General

This test was performed to verify the EUT contention-based protocol function. Contention-based protocol is defined as:

A protocol that allows multiple users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate. Such a protocol may consist of procedures for initiating new transmissions, procedures for determining the state of the channel (available or unavailable), and procedures for managing retransmissions in the event of a busy channel. Contention-based protocols shall fall into one of two categories:

- (1) An unrestricted contention-based protocol is one which can avoid co-frequency interference with devices using all other types of contention-based protocols.
- (2) A restricted contention-based protocol is one that does not qualify as unrestricted.

The EUT is WiMax Base station capable to operate in TDD mode in the full 3650.0 – 3700.0 MHz band and using unrestricted Contention Based Protocol. The EUT equipped with "listen before transmit" function that performs channel measurements across transmission bandwidth at the beginning of each downlink frame prior to transmission.

In case a signal level measured is above the RSL Turn-off level the EUT will not transmit for the next timeslot (defined by Backoff frame parameter).

The EUT RSL turn-off level and Backoff frame are operator/user defined.

### 8.2 Test procedure

The EUT is equipped with two Tx/Rx chains. As both transmit chains operate simultaneously and only Tx1/Rx1 chain is equipped with contention-based protocol function the test was performed while interferer signal is injected in Tx<sub>1</sub>/Rx<sub>1</sub> port, the EUT operation monitored by a spectrum analyzer connected to the Tx<sub>1</sub>/Rx<sub>1</sub> port.

The EUT was set to transmit as shown in Figure 8.2.1 and the transmission was verified by the spectrum analyzer.

The signal generator was connected as shown in Figure 8.2.1, interferer signal was generated and EUT response was monitored and reported at Table 8.2.1 to Table 8.2.2.

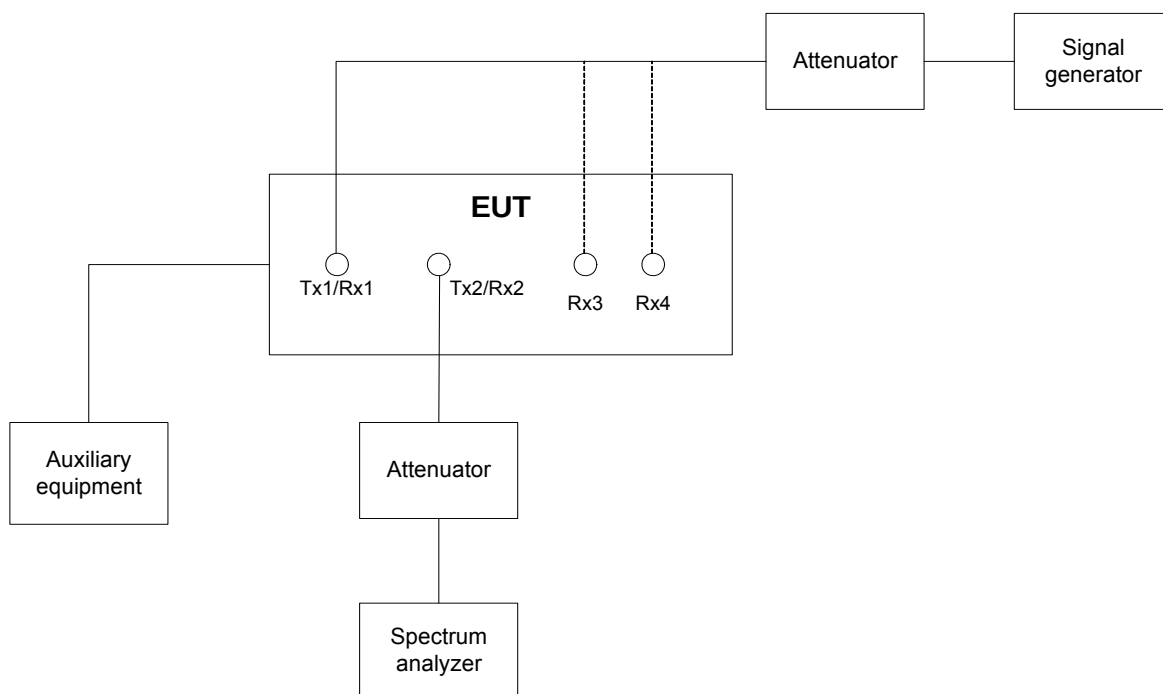
Plot 8.2.1 shows an example of EUT transmission operation while detecting an interferer signal at its RSL turn-off level.

The combination of EUT transmission bandwidth, channel, interferer signal type and level was chosen according to Table 8.2.1 to Table 8.2.2.

The OFDM interferer signal parameters are shown in Plot 8.1.1.

|                     |                        |                                               |                      |
|---------------------|------------------------|-----------------------------------------------|----------------------|
| Test specification: |                        | Section 90.203 (o), Contention based protocol |                      |
| Test procedure:     |                        |                                               |                      |
| Test mode:          | Compliance             | Verdict: PASS                                 |                      |
| Date:               | 5/13/2011 – 5/16/2011  |                                               |                      |
| Temperature: 23.2°C | Air Pressure: 1007 hPa | Relative Humidity: 46 %                       | Power Supply: 48 VDC |
| Remarks:            |                        |                                               |                      |

Figure 8.2.1 Set-up for contention-based protocol verification test



|                                                                          |                               |                                |                             |
|--------------------------------------------------------------------------|-------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b> Section 90.203 (o), Contention based protocol |                               |                                |                             |
| <b>Test procedure:</b>                                                   |                               |                                |                             |
| <b>Test mode:</b>                                                        | Compliance                    | <b>Verdict:</b> PASS           |                             |
| <b>Date:</b>                                                             | 5/13/2011 – 5/16/2011         |                                |                             |
| <b>Temperature:</b> 23.2°C                                               | <b>Air Pressure:</b> 1007 hPa | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>                                                          |                               |                                |                             |

Table 8.2.1 Contention Base Protocol test results

| INTERFERER SIGNAL INJECTION: |                               |                        |                                  | To port Tx <sub>1</sub> /Rx <sub>1</sub> |            |            |                        |                   |         |
|------------------------------|-------------------------------|------------------------|----------------------------------|------------------------------------------|------------|------------|------------------------|-------------------|---------|
| EUT TRANSMISSION MONITORING: |                               |                        |                                  | At port Tx <sub>2</sub> /Rx <sub>2</sub> |            |            |                        |                   |         |
| Test number                  | Wanted signal characteristics |                        |                                  | Interferer signal characteristics        |            |            | Results                |                   |         |
|                              | Channel frequency, MHz        | Channel Bandwidth, MHz | RSL turn-off level settings, dBm | Frequency, MHz                           | Modulation | Level, dBm | Interference detection | Tx OFF time, ms** | Verdict |
| 1                            | 3652.5                        | 5                      | -65                              | 3652.5                                   | CW         | -65        | Yes                    | 6.50              | Pass    |
| 2                            | 3652.5                        |                        | -65                              | 3652.5                                   | CW         | -70        | No                     | NA                | Pass    |
| 3                            | 3652.5                        |                        | -85                              | 3652.5                                   | CW         | -85        | Yes                    | 7.80              | Pass    |
| 4                            | 3652.5                        |                        | -85                              | 3652.5                                   | CW         | -90        | No                     | NA                | Pass    |
| 5                            | 3675.0                        |                        | -65                              | 3675.0                                   | CW         | -65        | Yes                    | 5.88              | Pass    |
| 6                            | 3675.0                        |                        | -65                              | 3675.0                                   | CW         | -70        | No                     | NA                | Pass    |
| 7                            | 3675.0                        |                        | -85                              | 3675.0                                   | CW         | -85        | Yes                    | 7.75              | Pass    |
| 8                            | 3675.0                        |                        | -85                              | 3675.0                                   | CW         | -90        | No                     | NA                | Pass    |
| 9                            | 3675.0                        |                        | -85                              | 3672.5                                   | CW         | -85        | Yes                    | 6.25              | Pass    |
| 10                           | 3675.0                        |                        | -85                              | 3677.5                                   | CW         | -85        | Yes                    | 8.75              | Pass    |
| 11                           | 3675.0                        |                        | -85                              | 3675.0                                   | OFDMA      | -85        | Yes                    | 6.00              | Pass    |
| 12                           | 3697.5                        |                        | -65                              | 3697.5                                   | CW         | -65        | Yes                    | 5.88              | Pass    |
| 13                           | 3697.5                        |                        | -65                              | 3697.5                                   | CW         | -70        | No                     | NA                | Pass    |
| 14                           | 3697.5                        |                        | -85                              | 3697.5                                   | CW         | -85        | Yes                    | 6.39              | Pass    |
| 15                           | 3697.5                        |                        | -85                              | 3697.5                                   | CW         | -90        | No                     | NA                | Pass    |
| 16                           | 3653.5                        | 7                      | -85                              | 3653.5                                   | CW         | -85        | Yes                    | 7.80              | Pass    |
| 17                           | 3675.0                        |                        | -85                              | 3675.0                                   | OFDMA      | -85        | Yes                    | 8.50              | Pass    |
| 18                           | 3696.5                        |                        | -85                              | 3696.5                                   | CW         | -85        | Yes                    | 6.50              | Pass    |
| 19                           | 3655.0                        | 10                     | -85                              | 3655.0                                   | CW         | -85        | Yes                    | 6.70              | Pass    |
| 20                           | 3675.0                        |                        | -85                              | 3670.0                                   | CW         | -85        | Yes                    | 7.80              | Pass    |
| 21                           | 3675.0                        |                        | -85                              | 3680.0                                   | CW         | -85        | Yes                    | 8.72              | Pass    |
| 22                           | 3675.0                        |                        | -85                              | 3675.0                                   | OFDMA      | -85        | Yes                    | 7.81              | Pass    |
| 23                           | 3695.0                        |                        | -85                              | 3695.0                                   | CW         | -85        | Yes                    | 6.90              | Pass    |
| 24                           | 3655.0                        | 10                     | -85                              | 3655.0                                   | CW         | -85        | Yes                    | 6.10              | Pass    |
| 25                           | 3675.0                        |                        | -85                              | 3670.0                                   | CW         | -85        | Yes                    | 7.34              | Pass    |
| 26                           | 3675.0                        |                        | -85                              | 3680.0                                   | CW         | -85        | Yes                    | 6.75              | Pass    |
| 27                           | 3675.0                        |                        | -85                              | 3675.0                                   | OFDMA      | -85        | Yes                    | 8.25              | Pass    |
| 28                           | 3695.0                        |                        | -85                              | 3695.0                                   | CW         | -85        | Yes                    | 7.30              | Pass    |

\* - Interference and wanted signal durations are measured in ms and each frame duration is 5 ms

\*\* - Tx OFF time is measured as a time period from the start of interference signal (interference signal exceeds the threshold level) and till the EUT ceases to transmit.

|                                                                          |                               |                                |                             |
|--------------------------------------------------------------------------|-------------------------------|--------------------------------|-----------------------------|
| <b>Test specification:</b> Section 90.203 (o), Contention based protocol |                               |                                |                             |
| <b>Test procedure:</b>                                                   |                               |                                |                             |
| <b>Test mode:</b>                                                        | Compliance                    | <b>Verdict:</b> PASS           |                             |
| <b>Date:</b>                                                             | 5/13/2011 – 5/16/2011         |                                |                             |
| <b>Temperature:</b> 23.2°C                                               | <b>Air Pressure:</b> 1007 hPa | <b>Relative Humidity:</b> 46 % | <b>Power Supply:</b> 48 VDC |
| <b>Remarks:</b>                                                          |                               |                                |                             |

Table 8.2.2 Contention Base Protocol test results

| INTERFERER SIGNAL INJECTION: |                               |                        |                                  | To port Tx <sub>2</sub> /Rx <sub>2</sub> |            |            |                        |                   |         |
|------------------------------|-------------------------------|------------------------|----------------------------------|------------------------------------------|------------|------------|------------------------|-------------------|---------|
| EUT TRANSMISSION MONITORING: |                               |                        |                                  | At port Tx <sub>1</sub> /Rx <sub>1</sub> |            |            |                        |                   |         |
| Test number                  | Wanted signal characteristics |                        |                                  | Interferer signal characteristics        |            |            | Results                |                   |         |
|                              | Channel frequency, MHz        | Channel Bandwidth, MHz | RSL turn-off level settings, dBm | Frequency, MHz                           | Modulation | Level, dBm | Interference detection | Tx OFF time, ms** | Verdict |
| 29                           | 3655.0                        | 10                     | -85                              | 3655.0                                   | CW         | -85        | Yes                    | 6.56              | Pass    |
| 30                           | 3675.0                        |                        | -85                              | 3670.0                                   | CW         | -85        | Yes                    | 5.24              | Pass    |
| 31                           | 3675.0                        |                        | -85                              | 3680.0                                   | CW         | -85        | Yes                    | 7.42              | Pass    |
| 32                           | 3675.0                        |                        | -85                              | 3675.0                                   | OFDMA      | -85        | Yes                    | 6.27              | Pass    |
| 33                           | 3695.0                        |                        | -85                              | 3695.0                                   | CW         | -85        | Yes                    | 8.45              | Pass    |

\* - Interference and wanted signal durations are measured in ms and each frame duration is 5 ms

\*\* - Tx OFF time is measured as a time period from the start of interference signal (interference signal exceeds the threshold level) and till the EUT ceases to transmit.

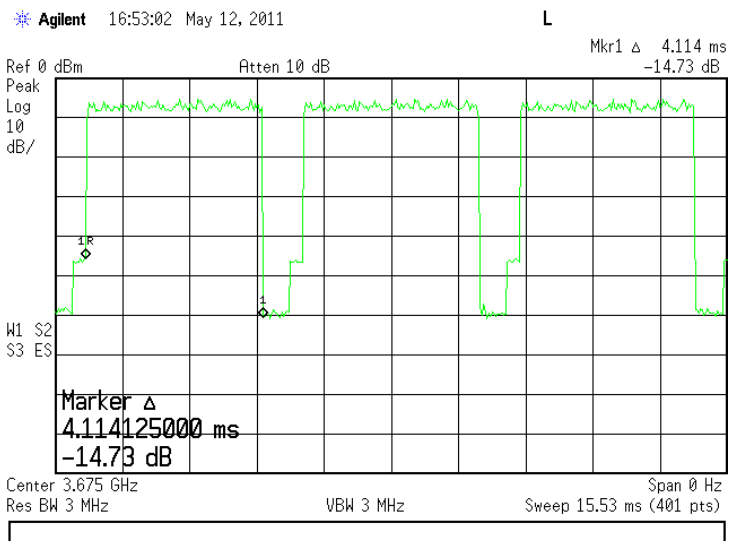
**Reference numbers of test equipment used**

|         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| HL 2016 | HL 2017 | HL 2952 | HL 3301 | HL 3559 | HL 3667 | HL 3818 | HL 3868 |
|---------|---------|---------|---------|---------|---------|---------|---------|

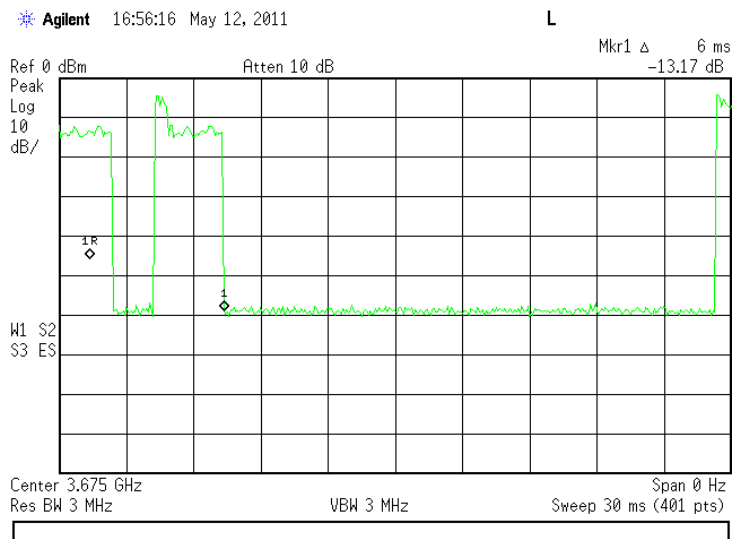
Full description is given in Appendix A.

|                     |                        |                                               |                      |
|---------------------|------------------------|-----------------------------------------------|----------------------|
| Test specification: |                        | Section 90.203 (o), Contention based protocol |                      |
| Test procedure:     |                        |                                               |                      |
| Test mode:          | Compliance             | Verdict: PASS                                 |                      |
| Date:               | 5/13/2011 – 5/16/2011  |                                               |                      |
| Temperature: 23.2°C | Air Pressure: 1007 hPa | Relative Humidity: 46 %                       | Power Supply: 48 VDC |
| Remarks:            |                        |                                               |                      |

**Plot 8.2.1 OFDMA signal interferer pulse width**



**Plot 8.2.2 Tx off example**



## 9 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                              | 29-Jun-10        | 29-Jun-11       |
| 0521  | EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz | Hewlett Packard      | 8546A               | 3617A<br>00319,<br>3448A002<br>53 | 25-Aug-10        | 25-Aug-11       |
| 0604  | Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz               | EMCO                 | 3141                | 9611-1011                         | 11-Jan-11        | 11-Jan-12       |
| 0768  | Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain            | Quinstar Technology  | QWH-4200-BA         | 110                               | 26-Jan-11        | 26-Jan-14       |
| 0769  | Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain             | Quinstar Technology  | QWH-2800-BA         | 112                               | 26-Jan-11        | 26-Jan-14       |
| 1424  | Spectrum Analyzer, 30 Hz- 40 GHz                                      | Agilent Technologies | 8564EC              | 3946A002<br>19                    | 31-Aug-10        | 31-Aug-11       |
| 1455  | Cable, 1.3 m, N/N -type                                               | Harbour Industries   | MIL 17/60-<br>RG142 | 1455                              | 01-Sep-10        | 01-Sep-11       |
| 1906  | Power Divider, 0.5-18.0 GHz, 80 W                                     | Omni Spectra         | 2090-<br>6204-00    | 1906                              | 01-Dec-10        | 01-Dec-12       |
| 1984  | Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W                | EMC Test Systems     | 3115                | 9911-5964                         | 11-Jun-10        | 11-Jun-11       |
| 2013  | Power Divider, 0.5-18.0 GHz, 80 W                                     | Omni Spectra         | 2090-<br>6204-00    | 2013                              | 01-Dec-10        | 01-Dec-12       |
| 2016  | Attenuator, Manual Step, 0-9/1 dB, 0-8 GHz, 2 W                       | Midwest Microwave    | 1072                | 1315                              | 7-Feb-11         | 7-Feb-12        |
| 2017  | Attenuator, Manual Step, 0-60/10 dB, 0-8.0 GHz                        | Midwest Microwave    | 1071                | 2017                              | 7-Feb-11         | 7-Feb-12        |
| 2871  | Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA                    | Huber-Suhner         | 198-8155-<br>00     | 2871                              | 14-Sep-10        | 14-Sep-11       |
| 2951  | Cable, RF, 18 GHz, 0.9 m, SMA-SMA                                     | Gore                 | 10020014            | NA                                | 04-Oct-10        | 04-Oct-11       |
| 2952  | Cable, RF, 18 GHz, 1.2 m, SMA-SMA                                     | Gore                 | 10020014            | NA                                | 04-Oct-10        | 04-Oct-11       |
| 2953  | Cable, RF, 18 GHz, 1.2 m, SMA-SMA                                     | Gore                 | 10020014            | NA                                | 04-Oct-10        | 04-Oct-11       |
| 3123  | Microwave Cable Assembly, 18 GHz, 5.0 m, SMA - SMA                    | Huber-Suhner         | 198-9155-<br>00     | 3123                              | 03-Oct-10        | 03-Oct-11       |
| 3286  | Temperature Chamber, (-50 to +170) °C                                 | Thermotron           | EL-8-CH-<br>1-1-CO2 | 21-9048                           | 12-Sep-10        | 12-Sep-11       |
| 3301  | Power Meter, P-series, 50 MHz to 40 GHz                               | Agilent Technologies | N1911A              | MY451010<br>57                    | 13-Dec-10        | 13-Dec-11       |
| 3302  | Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm            | Agilent Technologies | N1922A              | MY452405<br>86                    | 13-Dec-10        | 13-Dec-11       |
| 3455  | Medium Power Fixed Coaxial Attenuator DC to 40 GHz, 20 dB, 5 W        | Aeroflex / Weinschel | 75A-20-12           | 1182                              | 27-Mar-11        | 27-Mar-12       |
| 3472  | Cable, Coax, Microwave, DC-18 GHz, SMA-SMA, 1.0 m                     | Gore                 | GORE<br>65474       | 1003478                           | 09-May-11        | 09-May-12       |
| 3473  | Cable, Coax, Microwave, DC-18 GHz, SMA-SMA, 0.6 m                     | Gore                 | GORE<br>65474       | 1003478                           | 09-May-11        | 09-May-12       |
| 3474  | Cable, Coax, Microwave, DC-18 GHz, SMA-SMA, 0.6 m                     | Gore                 | GORE<br>65475       | 1640102                           | 09-May-11        | 09-May-12       |

| HL No | Description                                                  | Manufacturer         | Model           | Ser. No.    | Last Cal./ Check | Due Cal./ Check |
|-------|--------------------------------------------------------------|----------------------|-----------------|-------------|------------------|-----------------|
| 3534  | Amplifier, low noise, 6 to 18 GHz                            | Quinstar Technology  | QLJ-06184040-J0 | 11159001002 | 30-Dec-10        | 30-Dec-11       |
| 3535  | Amplifier, low noise, 18 to 40 GHz                           | Quinstar Technology  | QLJ-18404537-J0 | 11159003001 | 06-Dec-10        | 06-Dec-11       |
| 3559  | Cable 40 GHz, SMA-SMA, 0.95 m, Blue                          | Gore                 | PHASEFL EX      | 03771245    | 13-Jun-10        | 13-Jun-11       |
| 3623  | Cable RF, 6.0 m, N type-N type, DC-6.5 GHz                   | Belden               | MIL C-17        | NA          | 27-May-10        | 27-May-11       |
| 3768  | Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W                 | Mini-Circuits        | BW-N20W5+       | NA          | 31-Aug-10        | 31-Aug-11       |
| 3776  | Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W                 | Mini-Circuits        | BW-N10W5+       | NA          | 31-Aug-10        | 31-Aug-11       |
| 3782  | Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz | Mini-Circuits        | BW-S10W5+       | NA          | 07-Dec-10        | 07-Dec-11       |
| 3787  | Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz | Mini-Circuits        | BW-S10W5+       | NA          | 07-Dec-10        | 07-Dec-11       |
| 3818  | PSA Series Spectrum Analyzer, 3 Hz- 44 GHz                   | Agilent Technologies | E4446A          | MY48250288  | 25-Sep-09        | 25-Sep-11       |
| 3868  | Directional coupler, 2 GHz to 8 GHz, 10 dB, SMA Female       | Narda                | 4203-10         | 06978       | 13-Dec-10        | 13-Dec-12       |
| 3901  | Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA           | Huber-Suhner         | SUCOFLEX 102A   | 1225/2A     | 07-Feb-11        | 07-Feb-12       |

## 10 APPENDIX B Measurement uncertainties

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

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

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

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

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

## 11 APPENDIX C Test laboratory 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 and IC 2186A-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), 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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Telephone: +972 4628 8001  
Fax: +972 4628 8277  
e-mail: mail@hermonlabs.com  
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

## 12 APPENDIX D Specification references

|                         |                                                                                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC 47CFR part 90: 2010 | Private land mobile radio services                                                                                                                                   |
| 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                                                                                  |
| 662911 D01: 4/04/2011   | FCC Guidance for Multiple Transmitter Output v01                                                                                                                     |

### 13 APPENDIX E Test equipment correction factors

**Antenna Factor**  
**Active Loop Antenna**  
EMC Test Systems, model 6502, S/N 2857, HL 0446

| Frequency,<br>MHz | Magnetic Antenna Factor,<br>dB(S/m) | Electric Antenna Factor,<br>dB(1/m) |
|-------------------|-------------------------------------|-------------------------------------|
| 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                               | 9.7                                 |
| 0.750             | -41.9                               | 9.6                                 |
| 1.000             | -41.4                               | 10.1                                |
| 2.000             | -41.5                               | 10.0                                |
| 3.000             | -41.4                               | 10.1                                |
| 4.000             | -41.4                               | 10.1                                |
| 5.000             | -41.5                               | 10.0                                |
| 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(S/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ A/m).  
Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

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

| Frequency min,<br>GHz | Frequency max,<br>GHz | Antenna factor,<br>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( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

**Antenna factor**

**Biconilog antenna EMCO, model 3141, serial number 1011, HL 0604**

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

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

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

| Frequency,<br>MHz | Antenna factor,<br>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( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).

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

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>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**  
**Cable coaxial, Gore, 18 GHz, 0.9 m, SMA-SMA, S/N 10020014**  
**HL 2951**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.07              | 5750              | 0.77              | 12000             | 1.23              |
| 30                | 0.06              | 6000              | 0.78              | 12250             | 1.25              |
| 100               | 0.09              | 6250              | 0.81              | 12500             | 1.26              |
| 250               | 0.15              | 6500              | 0.83              | 12750             | 1.26              |
| 500               | 0.21              | 6750              | 0.84              | 13000             | 1.30              |
| 750               | 0.27              | 7000              | 0.85              | 13250             | 1.30              |
| 1000              | 0.31              | 7250              | 0.88              | 13500             | 1.30              |
| 1250              | 0.36              | 7500              | 0.88              | 13750             | 1.29              |
| 1500              | 0.38              | 7750              | 0.93              | 14000             | 1.23              |
| 1750              | 0.42              | 8000              | 0.92              | 14250             | 1.32              |
| 2000              | 0.44              | 8250              | 0.94              | 14500             | 1.27              |
| 2250              | 0.47              | 8500              | 0.99              | 14750             | 1.27              |
| 2500              | 0.50              | 8750              | 0.97              | 15000             | 1.34              |
| 2750              | 0.52              | 9000              | 1.01              | 15250             | 1.36              |
| 3000              | 0.54              | 9250              | 1.05              | 15500             | 1.35              |
| 3250              | 0.57              | 9500              | 1.08              | 15750             | 1.36              |
| 3500              | 0.58              | 9750              | 1.10              | 16000             | 1.43              |
| 3750              | 0.61              | 10000             | 1.09              | 16250             | 1.38              |
| 4000              | 0.63              | 10250             | 1.09              | 16500             | 1.42              |
| 4250              | 0.66              | 10500             | 1.07              | 16750             | 1.49              |
| 4500              | 0.68              | 10750             | 1.10              | 17000             | 1.53              |
| 4750              | 0.70              | 11000             | 1.09              | 17250             | 1.59              |
| 5000              | 0.71              | 11250             | 1.09              | 17500             | 1.65              |
| 5250              | 0.74              | 11500             | 1.13              | 17750             | 1.82              |
| 5500              | 0.77              | 11750             | 1.12              | 18000             | 2.09              |

**Cable loss**  
**Cable coaxial, Gore, 18 GHz, 1.2 m, SMA-SMA, S/N 10020014**  
**HL 2952**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.03              | 5750              | 0.97              | 12000             | 1.50              |
| 30                | 0.05              | 6000              | 1.01              | 12250             | 1.45              |
| 100               | 0.11              | 6250              | 1.03              | 12500             | 1.48              |
| 250               | 0.19              | 6500              | 1.06              | 12750             | 1.57              |
| 500               | 0.26              | 6750              | 1.08              | 13000             | 1.51              |
| 750               | 0.32              | 7000              | 1.10              | 13250             | 1.64              |
| 1000              | 0.38              | 7250              | 1.13              | 13500             | 1.60              |
| 1250              | 0.43              | 7500              | 1.13              | 13750             | 1.63              |
| 1500              | 0.47              | 7750              | 1.21              | 14000             | 1.59              |
| 1750              | 0.53              | 8000              | 1.20              | 14250             | 1.66              |
| 2000              | 0.55              | 8250              | 1.24              | 14500             | 1.60              |
| 2250              | 0.59              | 8500              | 1.29              | 14750             | 1.65              |
| 2500              | 0.63              | 8750              | 1.23              | 15000             | 1.72              |
| 2750              | 0.66              | 9000              | 1.27              | 15250             | 1.68              |
| 3000              | 0.69              | 9250              | 1.27              | 15500             | 1.73              |
| 3250              | 0.72              | 9500              | 1.29              | 15750             | 1.70              |
| 3500              | 0.75              | 9750              | 1.30              | 16000             | 1.82              |
| 3750              | 0.78              | 10000             | 1.38              | 16250             | 1.79              |
| 4000              | 0.82              | 10250             | 1.44              | 16500             | 1.81              |
| 4250              | 0.84              | 10500             | 1.47              | 16750             | 1.91              |
| 4500              | 0.86              | 10750             | 1.45              | 17000             | 1.92              |
| 4750              | 0.90              | 11000             | 1.50              | 17250             | 1.98              |
| 5000              | 0.91              | 11250             | 1.46              | 17500             | 2.05              |
| 5250              | 0.94              | 11500             | 1.47              | 17750             | 2.04              |
| 5500              | 0.96              | 11750             | 1.44              | 18000             | 2.05              |

**Cable loss**  
**Cable coaxial, Gore, 25.5 GHz, 1.2 m, SMA-SMA, S/N 10020014**  
**HL 2953**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.06              | 8750              | 1.28              | 18000             | 1.84              |
| 30                | 0.06              | 9000              | 1.30              | 18250             | 1.91              |
| 100               | 0.12              | 9250              | 1.35              | 18500             | 1.94              |
| 250               | 0.19              | 9500              | 1.34              | 18750             | 1.92              |
| 500               | 0.27              | 9750              | 1.36              | 19000             | 1.95              |
| 750               | 0.34              | 10000             | 1.33              | 19250             | 2.00              |
| 1000              | 0.40              | 10250             | 1.38              | 19500             | 1.96              |
| 1250              | 0.45              | 10500             | 1.39              | 19750             | 2.02              |
| 1500              | 0.50              | 10750             | 1.39              | 20000             | 1.92              |
| 1750              | 0.54              | 11000             | 1.43              | 20250             | 2.04              |
| 2000              | 0.57              | 11250             | 1.42              | 20500             | 2.00              |
| 2250              | 0.60              | 11500             | 1.48              | 20750             | 2.09              |
| 2500              | 0.64              | 11750             | 1.49              | 21000             | 2.01              |
| 2750              | 0.67              | 12000             | 1.59              | 21250             | 2.07              |
| 3000              | 0.70              | 12250             | 1.50              | 21500             | 2.20              |
| 3250              | 0.74              | 12500             | 1.55              | 21750             | 2.10              |
| 3500              | 0.76              | 12750             | 1.55              | 22000             | 2.24              |
| 3750              | 0.80              | 13000             | 1.61              | 22250             | 2.25              |
| 4000              | 0.83              | 13250             | 1.62              | 22500             | 2.12              |
| 4250              | 0.85              | 13500             | 1.56              | 22750             | 2.05              |
| 4500              | 0.87              | 13750             | 1.61              | 23000             | 2.10              |
| 4750              | 0.91              | 14000             | 1.57              | 23250             | 2.03              |
| 5000              | 0.92              | 14250             | 1.66              | 23500             | 2.08              |
| 5250              | 0.96              | 14500             | 1.58              | 23750             | 2.14              |
| 5500              | 0.99              | 14750             | 1.69              | 24000             | 2.16              |
| 5750              | 0.99              | 15000             | 1.71              | 24250             | 2.25              |
| 6000              | 1.03              | 15250             | 1.74              | 24500             | 2.17              |
| 6250              | 1.05              | 15500             | 1.75              | 24750             | 2.32              |
| 6500              | 1.07              | 15750             | 1.72              | 25000             | 2.32              |
| 6750              | 1.08              | 16000             | 1.89              | 25250             | 2.32              |
| 7000              | 1.12              | 16250             | 1.79              | 25500             | 2.41              |
| 7250              | 1.13              | 16500             | 1.84              | 25750             | 2.31              |
| 7500              | 1.15              | 16750             | 1.82              | 26000             | 2.28              |
| 7750              | 1.20              | 17000             | 1.79              | 26250             | 2.32              |
| 8000              | 1.20              | 17250             | 1.78              | 26500             | 2.29              |
| 8250              | 1.23              | 17500             | 1.85              |                   |                   |
| 8500              | 1.27              | 17750             | 1.83              |                   |                   |

**Cable loss**  
**Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00**  
**HL 3123**

| Frequency,<br>MHz | Cable<br>loss, dB | Frequency,<br>MHz | Cable<br>loss, dB | Frequency,<br>MHz | Cable<br>loss, dB | Frequency,<br>MHz | Cable<br>loss, dB | Frequency,<br>MHz | Cable<br>loss, dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.11              | 3600              | 1.97              | 7400              | 3.12              | 11200             | 3.90              | 15100             | 4.74              |
| 30                | 0.17              | 3700              | 1.97              | 7500              | 3.13              | 11300             | 3.93              | 15200             | 4.70              |
| 50                | 0.25              | 3800              | 2.03              | 7600              | 3.16              | 11400             | 3.88              | 15300             | 4.73              |
| 100               | 0.32              | 3900              | 2.04              | 7700              | 3.18              | 11500             | 3.87              | 15400             | 4.78              |
| 200               | 0.46              | 4000              | 2.10              | 7800              | 3.20              | 11600             | 3.90              | 15500             | 4.75              |
| 300               | 0.58              | 4100              | 1.97              | 7900              | 3.23              | 11700             | 3.86              | 15600             | 4.76              |
| 400               | 0.65              | 4200              | 1.97              | 8000              | 3.25              | 11800             | 3.88              | 15700             | 4.75              |
| 500               | 0.74              | 4300              | 2.03              | 8100              | 3.26              | 11900             | 3.86              | 15800             | 4.78              |
| 600               | 0.82              | 4400              | 2.04              | 8200              | 3.28              | 12000             | 3.89              | 15900             | 4.79              |
| 700               | 0.89              | 4500              | 2.10              | 8300              | 3.31              | 12100             | 3.94              | 16000             | 4.73              |
| 800               | 0.95              | 4600              | 1.97              | 8400              | 3.31              | 12200             | 3.92              | 16100             | 4.78              |
| 900               | 1.01              | 4700              | 1.97              | 8500              | 3.32              | 12300             | 3.96              | 16200             | 4.84              |
| 1000              | 1.07              | 4800              | 2.03              | 8600              | 3.34              | 12400             | 4.01              | 16300             | 4.90              |
| 1100              | 1.11              | 4900              | 2.04              | 8700              | 3.35              | 12500             | 4.07              | 16400             | 4.87              |
| 1200              | 1.17              | 5000              | 2.10              | 8800              | 3.37              | 12600             | 4.08              | 16500             | 4.90              |
| 1300              | 1.22              | 5100              | 2.53              | 8900              | 3.39              | 12700             | 4.17              | 16600             | 4.98              |
| 1400              | 1.27              | 5200              | 2.55              | 9000              | 3.42              | 12800             | 4.26              | 16700             | 5.05              |
| 1500              | 1.29              | 5300              | 2.60              | 9100              | 3.43              | 12900             | 4.16              | 16800             | 5.04              |
| 1600              | 1.35              | 5400              | 2.61              | 9200              | 3.51              | 13000             | 4.21              | 16900             | 5.02              |
| 1700              | 1.40              | 5500              | 2.64              | 9300              | 3.52              | 13100             | 4.24              | 17000             | 5.09              |
| 1800              | 1.44              | 5600              | 2.70              | 9400              | 3.54              | 13200             | 4.27              | 17100             | 5.07              |
| 1900              | 1.51              | 5700              | 2.67              | 9500              | 3.63              | 13300             | 4.31              | 17200             | 5.10              |
| 2000              | 1.49              | 5800              | 2.71              | 9600              | 3.61              | 13400             | 4.33              | 17300             | 5.13              |
| 2100              | 1.55              | 5900              | 2.74              | 9700              | 3.71              | 13500             | 4.25              | 17400             | 5.23              |
| 2200              | 1.58              | 6000              | 2.80              | 9800              | 3.66              | 13600             | 4.27              | 17500             | 5.21              |
| 2300              | 1.62              | 6100              | 2.79              | 9900              | 3.77              | 13700             | 4.33              | 17600             | 5.22              |
| 2400              | 1.72              | 6200              | 2.81              | 10000             | 3.75              | 13800             | 4.33              | 17700             | 5.36              |
| 2500              | 1.76              | 6300              | 2.83              | 10100             | 3.77              | 13900             | 4.31              | 17800             | 5.35              |
| 2600              | 1.78              | 6400              | 2.86              | 10200             | 3.80              | 14000             | 4.30              | 17900             | 5.45              |
| 2700              | 1.80              | 6500              | 2.88              | 10300             | 3.79              | 14100             | 4.30              | 18000             | 5.43              |
| 2800              | 1.86              | 6600              | 2.90              | 10400             | 3.87              | 14200             | 4.31              |                   |                   |
| 2900              | 1.90              | 6700              | 2.92              | 10500             | 3.83              | 14300             | 4.37              |                   |                   |
| 3000              | 1.90              | 6800              | 2.98              | 10600             | 3.88              | 14400             | 4.35              |                   |                   |
| 3100              | 1.97              | 6900              | 2.98              | 10700             | 3.86              | 14600             | 4.53              |                   |                   |
| 3200              | 1.97              | 7000              | 3.00              | 10800             | 3.87              | 14700             | 4.50              |                   |                   |
| 3300              | 2.03              | 7100              | 3.02              | 10900             | 3.90              | 14800             | 4.62              |                   |                   |
| 3400              | 2.04              | 7200              | 3.04              | 11000             | 3.84              | 14900             | 4.65              |                   |                   |
| 3500              | 2.10              | 7300              | 3.06              | 11100             | 3.88              | 15000             | 4.79              |                   |                   |

**Cable loss**  
**Cable coaxial, Microwave, SMA-SMA, 18 GHz, 1.0 m**  
**Gore, HL 3472**

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 10             | 0.01           | 5000           | 0.47           | 10200          | 0.72           | 15500          | 0.75           |
| 30             | 0.03           | 5100           | 0.47           | 10300          | 0.67           | 15600          | 0.89           |
| 50             | 0.04           | 5200           | 0.47           | 10400          | 0.77           | 15700          | 0.82           |
| 100            | 0.04           | 5300           | 0.47           | 10500          | 0.67           | 15800          | 0.89           |
| 200            | 0.08           | 5400           | 0.49           | 10600          | 0.74           | 15900          | 0.89           |
| 300            | 0.11           | 5500           | 0.48           | 10700          | 0.81           | 16000          | 0.93           |
| 400            | 0.11           | 5600           | 0.49           | 10800          | 0.77           | 16100          | 0.90           |
| 500            | 0.12           | 5700           | 0.49           | 10900          | 0.82           | 16200          | 0.92           |
| 600            | 0.14           | 5800           | 0.51           | 11000          | 0.86           | 16300          | 0.90           |
| 700            | 0.15           | 5900           | 0.50           | 11100          | 0.78           | 16400          | 0.94           |
| 800            | 0.16           | 6000           | 0.51           | 11200          | 0.82           | 16500          | 0.93           |
| 900            | 0.18           | 6100           | 0.53           | 11300          | 0.77           | 16600          | 0.95           |
| 1000           | 0.17           | 6200           | 0.52           | 11400          | 0.84           | 16700          | 0.98           |
| 1100           | 0.19           | 6300           | 0.53           | 11500          | 0.74           | 16800          | 1.00           |
| 1200           | 0.22           | 6400           | 0.54           | 11600          | 0.81           | 16900          | 0.94           |
| 1300           | 0.21           | 6500           | 0.55           | 11700          | 0.73           | 17000          | 1.00           |
| 1400           | 0.22           | 6600           | 0.54           | 11800          | 0.75           | 17100          | 0.93           |
| 1500           | 0.23           | 6700           | 0.57           | 11900          | 0.73           | 17200          | 1.00           |
| 1600           | 0.24           | 6800           | 0.54           | 12000          | 0.75           | 17300          | 0.93           |
| 1700           | 0.24           | 6900           | 0.58           | 12100          | 0.66           | 17400          | 0.93           |
| 1800           | 0.25           | 7000           | 0.58           | 12200          | 0.66           | 17500          | 0.96           |
| 1900           | 0.26           | 7100           | 0.58           | 12300          | 0.72           | 17600          | 0.94           |
| 2000           | 0.28           | 7200           | 0.61           | 12400          | 0.64           | 17700          | 0.99           |
| 2100           | 0.27           | 7300           | 0.59           | 12500          | 0.75           | 17800          | 0.97           |
| 2200           | 0.29           | 7400           | 0.55           | 12600          | 0.67           | 17900          | 0.90           |
| 2300           | 0.29           | 7500           | 0.63           | 12700          | 0.75           | 18000          | 0.78           |
| 2400           | 0.30           | 7600           | 0.60           | 12800          | 0.66           |                |                |
| 2500           | 0.30           | 7700           | 0.61           | 12900          | 0.81           |                |                |
| 2600           | 0.32           | 7800           | 0.64           | 13000          | 0.75           |                |                |
| 2700           | 0.32           | 7900           | 0.60           | 13100          | 0.80           |                |                |
| 2800           | 0.33           | 8000           | 0.58           | 13200          | 0.80           |                |                |
| 2900           | 0.34           | 8100           | 0.61           | 13300          | 0.81           |                |                |
| 3000           | 0.34           | 8200           | 0.62           | 13400          | 0.88           |                |                |
| 3100           | 0.35           | 8300           | 0.62           | 13500          | 0.82           |                |                |
| 3200           | 0.35           | 8400           | 0.68           | 13600          | 1.00           |                |                |
| 3300           | 0.36           | 8500           | 0.63           | 13700          | 0.93           |                |                |
| 3400           | 0.37           | 8600           | 0.61           | 13800          | 0.86           |                |                |
| 3500           | 0.38           | 8700           | 0.63           | 13900          | 0.84           |                |                |
| 3600           | 0.38           | 8800           | 0.62           | 14000          | 1.00           |                |                |
| 3700           | 0.40           | 8900           | 0.64           | 14100          | 0.86           |                |                |
| 3800           | 0.40           | 9000           | 0.62           | 14200          | 0.98           |                |                |
| 3900           | 0.40           | 9100           | 0.64           | 14300          | 0.99           |                |                |
| 4000           | 0.40           | 9200           | 0.62           | 14400          | 0.82           |                |                |
| 4100           | 0.43           | 9300           | 0.62           | 14600          | 0.89           |                |                |
| 4200           | 0.43           | 9400           | 0.62           | 14700          | 0.84           |                |                |
| 4300           | 0.43           | 9500           | 0.63           | 14800          | 0.90           |                |                |
| 4400           | 0.44           | 9600           | 0.64           | 14900          | 0.89           |                |                |
| 4500           | 0.45           | 9700           | 0.60           | 15000          | 0.89           |                |                |
| 4600           | 0.45           | 9800           | 0.65           | 15100          | 0.86           |                |                |
| 4700           | 0.46           | 9900           | 0.60           | 15200          | 0.87           |                |                |
| 4800           | 0.46           | 10000          | 0.67           | 15300          | 0.86           |                |                |
| 4900           | 0.46           | 10100          | 0.69           | 15400          | 0.87           |                |                |

**Cable loss**  
**Cable coaxial, Microwave, SMA-SMA, 18 GHz, 0.6 m**  
**Gore, HL 3473**

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 10             | 0.01           | 5000           | 0.48           | 10200          | 0.72           | 15500          | 0.85           |
| 30             | 0.03           | 5100           | 0.48           | 10300          | 0.70           | 15600          | 0.93           |
| 50             | 0.04           | 5200           | 0.48           | 10400          | 0.75           | 15700          | 0.87           |
| 100            | 0.04           | 5300           | 0.48           | 10500          | 0.68           | 15800          | 0.88           |
| 200            | 0.08           | 5400           | 0.50           | 10600          | 0.77           | 15900          | 0.94           |
| 300            | 0.11           | 5500           | 0.48           | 10700          | 0.80           | 16000          | 0.94           |
| 400            | 0.12           | 5600           | 0.50           | 10800          | 0.77           | 16100          | 0.99           |
| 500            | 0.13           | 5700           | 0.50           | 10900          | 0.85           | 16200          | 0.96           |
| 600            | 0.15           | 5800           | 0.52           | 11000          | 0.83           | 16300          | 0.96           |
| 700            | 0.15           | 5900           | 0.51           | 11100          | 0.79           | 16400          | 0.94           |
| 800            | 0.17           | 6000           | 0.52           | 11200          | 0.82           | 16500          | 0.94           |
| 900            | 0.19           | 6100           | 0.54           | 11300          | 0.79           | 16600          | 1.03           |
| 1000           | 0.18           | 6200           | 0.53           | 11400          | 0.81           | 16700          | 1.04           |
| 1100           | 0.20           | 6300           | 0.54           | 11500          | 0.76           | 16800          | 1.07           |
| 1200           | 0.22           | 6400           | 0.55           | 11600          | 0.78           | 16900          | 0.94           |
| 1300           | 0.22           | 6500           | 0.56           | 11700          | 0.74           | 17000          | 1.05           |
| 1400           | 0.23           | 6600           | 0.56           | 11800          | 0.76           | 17100          | 0.96           |
| 1500           | 0.24           | 6700           | 0.60           | 11900          | 0.79           | 17200          | 1.07           |
| 1600           | 0.25           | 6800           | 0.55           | 12000          | 0.74           | 17300          | 0.98           |
| 1700           | 0.25           | 6900           | 0.60           | 12100          | 0.69           | 17400          | 1.16           |
| 1800           | 0.26           | 7000           | 0.59           | 12200          | 0.69           | 17500          | 1.05           |
| 1900           | 0.27           | 7100           | 0.60           | 12300          | 0.75           | 17600          | 1.13           |
| 2000           | 0.29           | 7200           | 0.61           | 12400          | 0.66           | 17700          | 1.05           |
| 2100           | 0.28           | 7300           | 0.60           | 12500          | 0.76           | 17800          | 1.22           |
| 2200           | 0.30           | 7400           | 0.57           | 12600          | 0.70           | 17900          | 1.02           |
| 2300           | 0.30           | 7500           | 0.63           | 12700          | 0.77           | 18000          | 1.04           |
| 2400           | 0.31           | 7600           | 0.60           | 12800          | 0.69           |                |                |
| 2500           | 0.31           | 7700           | 0.63           | 12900          | 0.79           |                |                |
| 2600           | 0.33           | 7800           | 0.66           | 13000          | 0.81           |                |                |
| 2700           | 0.33           | 7900           | 0.61           | 13100          | 0.83           |                |                |
| 2800           | 0.35           | 8000           | 0.58           | 13200          | 0.80           |                |                |
| 2900           | 0.35           | 8100           | 0.62           | 13300          | 0.82           |                |                |
| 3000           | 0.35           | 8200           | 0.62           | 13400          | 0.90           |                |                |
| 3100           | 0.35           | 8300           | 0.63           | 13500          | 0.85           |                |                |
| 3200           | 0.36           | 8400           | 0.67           | 13600          | 1.04           |                |                |
| 3300           | 0.38           | 8500           | 0.63           | 13700          | 0.93           |                |                |
| 3400           | 0.38           | 8600           | 0.61           | 13800          | 0.91           |                |                |
| 3500           | 0.40           | 8700           | 0.64           | 13900          | 0.89           |                |                |
| 3600           | 0.40           | 8800           | 0.62           | 14000          | 0.96           |                |                |
| 3700           | 0.40           | 8900           | 0.64           | 14100          | 0.88           |                |                |
| 3800           | 0.41           | 9000           | 0.64           | 14200          | 1.01           |                |                |
| 3900           | 0.41           | 9100           | 0.64           | 14300          | 0.99           |                |                |
| 4000           | 0.41           | 9200           | 0.63           | 14400          | 0.83           |                |                |
| 4100           | 0.45           | 9300           | 0.63           | 14600          | 0.88           |                |                |
| 4200           | 0.43           | 9400           | 0.63           | 14700          | 0.91           |                |                |
| 4300           | 0.46           | 9500           | 0.64           | 14800          | 0.91           |                |                |
| 4400           | 0.44           | 9600           | 0.65           | 14900          | 0.88           |                |                |
| 4500           | 0.47           | 9700           | 0.62           | 15000          | 0.89           |                |                |
| 4600           | 0.46           | 9800           | 0.66           | 15100          | 0.91           |                |                |
| 4700           | 0.47           | 9900           | 0.61           | 15200          | 0.88           |                |                |
| 4800           | 0.47           | 10000          | 0.70           | 15300          | 0.94           |                |                |
| 4900           | 0.48           | 10100          | 0.70           | 15400          | 0.91           |                |                |

**Cable loss**  
**Cable coaxial, Microwave, SMA-SMA, 18 GHz, 0.6 m**  
**Gore, HL 3474**

| Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB | Frequency, MHz | Cable loss, dB |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 10             | 0.00           | 5000           | 0.44           | 10200          | 0.72           | 15500          | 0.84           |
| 30             | 0.02           | 5100           | 0.44           | 10300          | 0.68           | 15600          | 0.95           |
| 50             | 0.03           | 5200           | 0.44           | 10400          | 0.75           | 15700          | 0.82           |
| 100            | 0.03           | 5300           | 0.44           | 10500          | 0.64           | 15800          | 0.94           |
| 200            | 0.07           | 5400           | 0.46           | 10600          | 0.75           | 15900          | 0.91           |
| 300            | 0.10           | 5500           | 0.45           | 10700          | 0.80           | 16000          | 0.91           |
| 400            | 0.11           | 5600           | 0.46           | 10800          | 0.77           | 16100          | 0.86           |
| 500            | 0.12           | 5700           | 0.47           | 10900          | 0.80           | 16200          | 0.86           |
| 600            | 0.14           | 5800           | 0.48           | 11000          | 0.79           | 16300          | 0.86           |
| 700            | 0.14           | 5900           | 0.48           | 11100          | 0.70           | 16400          | 0.84           |
| 800            | 0.15           | 6000           | 0.49           | 11200          | 0.76           | 16500          | 0.83           |
| 900            | 0.18           | 6100           | 0.51           | 11300          | 0.70           | 16600          | 0.87           |
| 1000           | 0.17           | 6200           | 0.50           | 11400          | 0.73           | 16700          | 0.90           |
| 1100           | 0.18           | 6300           | 0.50           | 11500          | 0.67           | 16800          | 0.91           |
| 1200           | 0.21           | 6400           | 0.51           | 11600          | 0.74           | 16900          | 0.90           |
| 1300           | 0.20           | 6500           | 0.51           | 11700          | 0.64           | 17000          | 0.97           |
| 1400           | 0.21           | 6600           | 0.52           | 11800          | 0.68           | 17100          | 0.94           |
| 1500           | 0.22           | 6700           | 0.54           | 11900          | 0.67           | 17200          | 1.01           |
| 1600           | 0.23           | 6800           | 0.51           | 12000          | 0.71           | 17300          | 0.97           |
| 1700           | 0.23           | 6900           | 0.55           | 12100          | 0.64           | 17400          | 1.02           |
| 1800           | 0.24           | 7000           | 0.54           | 12200          | 0.64           | 17500          | 1.06           |
| 1900           | 0.25           | 7100           | 0.55           | 12300          | 0.71           | 17600          | 1.01           |
| 2000           | 0.27           | 7200           | 0.55           | 12400          | 0.62           | 17700          | 1.10           |
| 2100           | 0.26           | 7300           | 0.54           | 12500          | 0.80           | 17800          | 1.16           |
| 2200           | 0.28           | 7400           | 0.52           | 12600          | 0.69           | 17900          | 1.12           |
| 2300           | 0.28           | 7500           | 0.58           | 12700          | 0.85           | 18000          | 1.00           |
| 2400           | 0.28           | 7600           | 0.56           | 12800          | 0.67           |                |                |
| 2500           | 0.29           | 7700           | 0.57           | 12900          | 0.84           |                |                |
| 2600           | 0.30           | 7800           | 0.62           | 13000          | 0.76           |                |                |
| 2700           | 0.31           | 7900           | 0.57           | 13100          | 0.85           |                |                |
| 2800           | 0.32           | 8000           | 0.55           | 13200          | 0.77           |                |                |
| 2900           | 0.32           | 8100           | 0.59           | 13300          | 0.82           |                |                |
| 3000           | 0.32           | 8200           | 0.59           | 13400          | 0.79           |                |                |
| 3100           | 0.33           | 8300           | 0.60           | 13500          | 0.82           |                |                |
| 3200           | 0.33           | 8400           | 0.66           | 13600          | 0.91           |                |                |
| 3300           | 0.35           | 8500           | 0.60           | 13700          | 0.81           |                |                |
| 3400           | 0.35           | 8600           | 0.59           | 13800          | 0.76           |                |                |
| 3500           | 0.36           | 8700           | 0.59           | 13900          | 0.75           |                |                |
| 3600           | 0.36           | 8800           | 0.58           | 14000          | 0.81           |                |                |
| 3700           | 0.37           | 8900           | 0.60           | 14100          | 0.77           |                |                |
| 3800           | 0.38           | 9000           | 0.60           | 14200          | 0.89           |                |                |
| 3900           | 0.38           | 9100           | 0.60           | 14300          | 0.92           |                |                |
| 4000           | 0.38           | 9200           | 0.57           | 14400          | 0.78           |                |                |
| 4100           | 0.41           | 9300           | 0.57           | 14600          | 0.85           |                |                |
| 4200           | 0.40           | 9400           | 0.58           | 14700          | 0.83           |                |                |
| 4300           | 0.41           | 9500           | 0.60           | 14800          | 0.95           |                |                |
| 4400           | 0.42           | 9600           | 0.62           | 14900          | 0.89           |                |                |
| 4500           | 0.43           | 9700           | 0.58           | 15000          | 0.96           |                |                |
| 4600           | 0.42           | 9800           | 0.63           | 15100          | 0.90           |                |                |
| 4700           | 0.44           | 9900           | 0.58           | 15200          | 0.96           |                |                |
| 4800           | 0.43           | 10000          | 0.67           | 15300          | 0.90           |                |                |
| 4900           | 0.44           | 10100          | 0.69           | 15400          | 0.95           |                |                |

**Cable loss**  
**Cable coaxial, GORE, PHASEFLEX, 40 GHz, 0.95 m, SMA-SMA, S/N 03771245**  
**HL 3559**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable<br>loss,dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| 30                | 0.08              | 10000             | 0.96              | 20500             | 1.59              | 31000             | 2.24             |
| 100               | 0.10              | 10500             | 0.99              | 21000             | 1.63              | 31500             | 2.71             |
| 500               | 0.22              | 11000             | 1.02              | 21500             | 1.70              | 32000             | 2.47             |
| 1000              | 0.32              | 11500             | 1.07              | 22000             | 1.71              | 32500             | 2.37             |
| 1500              | 0.40              | 12000             | 1.13              | 22500             | 1.60              | 33000             | 2.35             |
| 2000              | 0.41              | 12500             | 1.16              | 23000             | 1.58              | 33500             | 2.34             |
| 2500              | 0.44              | 13000             | 1.26              | 23500             | 1.64              | 34000             | 2.31             |
| 3000              | 0.53              | 13500             | 1.26              | 24000             | 1.68              | 34500             | 2.43             |
| 3500              | 0.54              | 14000             | 1.22              | 24500             | 1.79              | 35000             | 2.45             |
| 4000              | 0.62              | 14500             | 1.26              | 25000             | 1.86              | 35500             | 2.48             |
| 4500              | 0.62              | 15000             | 1.27              | 25500             | 1.77              | 36000             | 3.60             |
| 5000              | 0.67              | 15500             | 1.29              | 26000             | 1.78              | 36500             | 2.62             |
| 5500              | 0.70              | 16000             | 1.39              | 26500             | 1.83              | 37000             | 2.45             |
| 6000              | 0.72              | 16500             | 1.50              | 27000             | 1.87              | 37500             | 2.47             |
| 6500              | 0.76              | 17000             | 1.49              | 27500             | 1.97              | 38000             | 2.38             |
| 7000              | 0.83              | 17500             | 1.37              | 28000             | 2.69              | 38500             | 2.41             |
| 7500              | 0.85              | 18000             | 1.40              | 28500             | 1.94              | 39000             | 2.56             |
| 8000              | 0.89              | 18500             | 1.41              | 29000             | 2.02              | 39500             | 2.71             |
| 8500              | 0.91              | 19000             | 1.48              | 29500             | 2.05              | 40000             | 2.69             |
| 9000              | 0.95              | 19500             | 1.61              | 30000             | 2.11              |                   |                  |
| 9500              | 0.96              | 20000             | 1.59              | 30500             | 2.11              |                   |                  |

**Cable loss**  
**Cable coaxial, MIL C-17, N type-N type, 6 m**  
**Belden, HL 3623**

| Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB | Frequency,<br>MHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 10                | 0.13              | 2600              | 4.38              | 5400              | 7.76              |
| 30                | 0.25              | 2700              | 4.53              | 5500              | 7.79              |
| 50                | 0.33              | 2800              | 4.64              | 5600              | 7.88              |
| 100               | 0.49              | 2900              | 4.79              | 5700              | 7.93              |
| 200               | 0.76              | 3000              | 4.93              | 5800              | 8.05              |
| 300               | 0.97              | 3100              | 5.02              | 5900              | 8.03              |
| 400               | 1.18              | 3200              | 5.18              | 6000              | 8.07              |
| 500               | 1.38              | 3300              | 5.27              | 6100              | 8.14              |
| 600               | 1.54              | 3400              | 5.41              | 6200              | 8.21              |
| 700               | 1.71              | 3500              | 5.57              | 6300              | 8.28              |
| 800               | 1.88              | 3600              | 5.65              | 6400              | 8.35              |
| 900               | 2.04              | 3700              | 5.82              | 6500              | 8.43              |
| 1000              | 2.19              | 3800              | 5.89              |                   |                   |
| 1100              | 2.38              | 3900              | 6.02              |                   |                   |
| 1200              | 2.61              | 4000              | 6.15              |                   |                   |
| 1300              | 2.63              | 4100              | 6.26              |                   |                   |
| 1400              | 2.79              | 4200              | 6.37              |                   |                   |
| 1500              | 2.90              | 4300              | 6.52              |                   |                   |
| 1600              | 3.08              | 4400              | 6.63              |                   |                   |
| 1700              | 3.21              | 4500              | 6.74              |                   |                   |
| 1800              | 3.31              | 4600              | 6.86              |                   |                   |
| 1900              | 3.47              | 4700              | 6.98              |                   |                   |
| 2000              | 3.59              | 4800              | 7.09              |                   |                   |
| 2100              | 3.74              | 4900              | 7.17              |                   |                   |
| 2200              | 3.86              | 5000              | 7.30              |                   |                   |
| 2300              | 3.98              | 5100              | 7.41              |                   |                   |
| 2400              | 4.12              | 5200              | 7.59              |                   |                   |
| 2500              | 4.24              | 5300              | 7.71              |                   |                   |

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

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

## 14 APPENDIX F Abbreviations and acronyms

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

END OF DOCUMENT