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# TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 subpart Z

FOR:

**Airspan Networks Inc.**

**LTE Base Station**

**Model: Synergy 2000, 3.7GHz (B43)**

**FCC ID:PIDSYN3650**

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.  
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## Table of contents

1	Applicant information.....	3
2	Equipment under test attributes .....	3
3	Manufacturer information .....	3
4	Test details.....	3
5	Tests summary.....	4
6	EUT description.....	5
6.1	General information.....	5
6.2	Ports and lines .....	5
6.3	Support and test equipment .....	5
6.4	Changes made in the EUT .....	5
6.5	Test configuration.....	6
6.6	Transmitter characteristics .....	7
7	Transmitter tests according to 47CFR part 90 requirements.....	8
7.1	Peak output power test.....	8
7.2	Occupied bandwidth test.....	17
7.3	Emission mask test .....	31
7.4	Radiated spurious emission measurements.....	58
7.5	Spurious emissions at RF antenna connector test.....	74
7.6	Frequency stability test.....	87
8	APPENDIX A Test equipment and ancillaries used for tests.....	89
9	APPENDIX B Measurement uncertainties.....	91
10	APPENDIX C Test facility description .....	92
11	APPENDIX D Specification references .....	92
12	APPENDIX E Test equipment correction factors.....	93
13	APPENDIX F Abbreviations and acronyms.....	103



## 1 Applicant information

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

## 2 Equipment under test attributes

**Product name:** LTE Base Station  
**Product type:** Transceiver  
**Model(s):** Synergy 2000, 3.7GHz (B43)  
**Serial number:** 76E1E3173DA4  
**Hardware version:** 00A00A173DA4  
**Software release:** 14.12.50.82  
**Receipt date:** 11-May-14

## 3 Manufacturer information

**Manufacturer name:** Airspan Networks Inc.  
**Address:** 777 Yamato Rd, Suite 310, Boca Raton 33431, Florida, USA  
**Telephone:** +1 561 893 8670  
**Fax:** +1 561 893 8671  
**E-Mail:** zlevi@airspan.com  
**Contact name:** Mr. Zion Levi




## 4 Test details

**Project ID:** 25757  
**Location:** Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel  
**Test started:** 11-May-14  
**Test completed:** 19-May-14  
**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 90.1335, 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. V. Einem, test engineer	May 19, 2014	
<b>Reviewed by:</b>	Mrs. M. Cherniavsky, certification engineer	May 29, 2014	
<b>Approved by:</b>	Mr. M. Nikishin, EMC and Radio group manager	June 16, 2014	

## 6 EUT description

### 6.1 General information

A Base station radio, Synergy 2000- Band 43 TDD LTE, is part of a LTE broadband fixed cellular wireless access system. The system provides a radio link between an end-user (a subscriber) and a network to give high-speed data access. The Synergy's transceiver/receiver (Up to 64 QAM modulation, data rate up to 150 Mbps) uses OFDM and operating in TDD mode, equipped with a 2 dBi external antenna. The maximum total RF output power (not including antenna gain) is 34.91 dBm and it can be reduced by software. Information about output power vs maximum and minimum antenna gains provided in the table below.

Frequency band, MHz	RF output power, dBm	Antenna gain, dBi	EIRP, dBm
3650-3675	34.91	2	36.91
	18.91	18	36.91

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

### 6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Power	DC power	DC power supply	EUT	1	Unshielded	10
Signal	Ethernet	ETH1 port	Laptop	1	Shielded	10
Signal	Antenna	EUT	GPS external antenna	1	Coax	5
RF	Antenna	EUT	Termination 50 Ohm	2	Coax	NA
Signal*	RS-232	EUT	Laptop	1	Unshielded	2

\* For maintance only

### 6.3 Support and test equipment

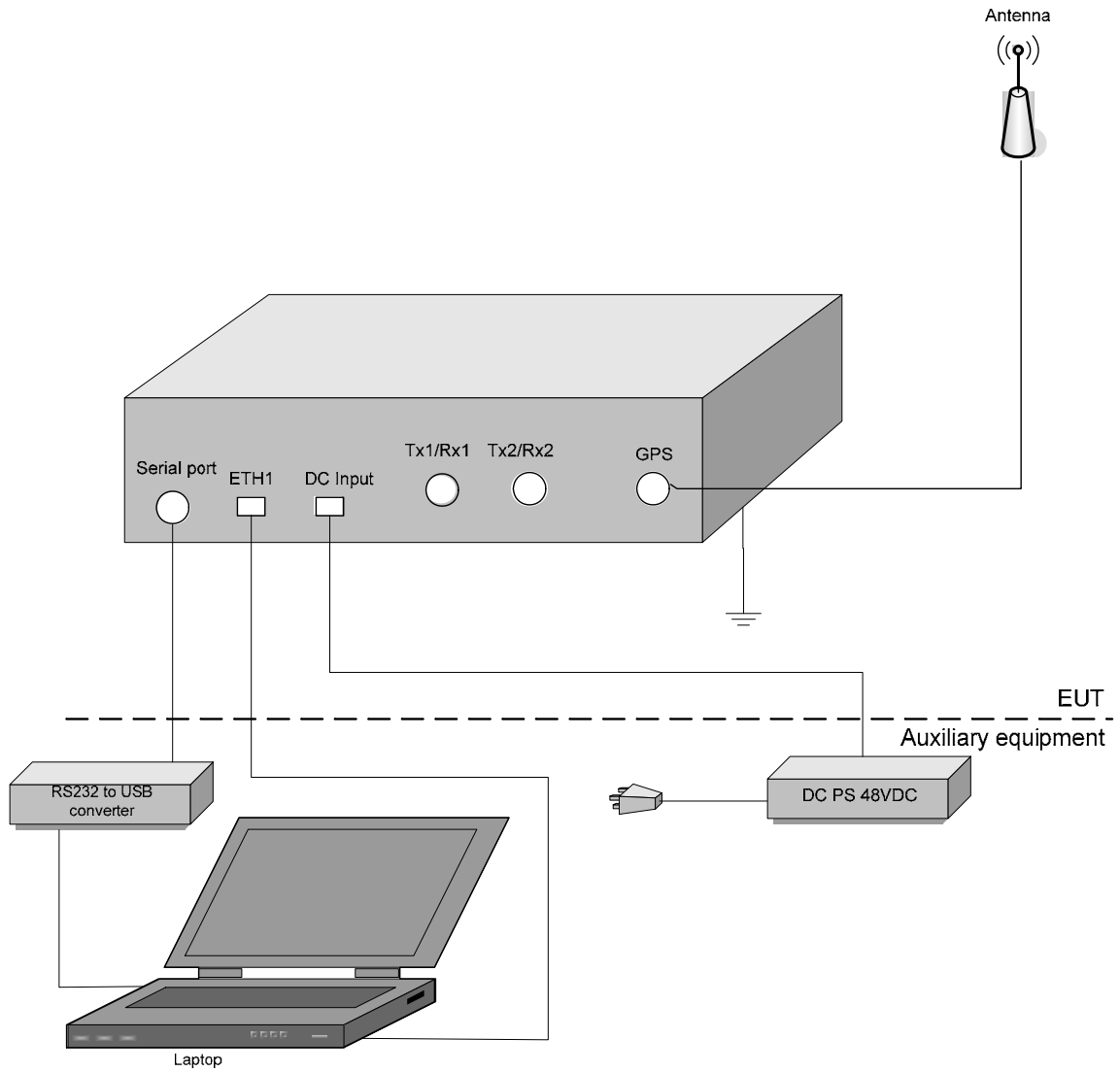
Description	Manufacturer	Model number	Serial number
DC power supply	Mean Well	PSP-600-48	RB29063683
GPS antenna	Tallysman Wireless	32-3030-0	20110606
Laptop	DELL	E6410	PO1038624
4 Port USB to RS-232 hub	ATEN INTERNATIONAL	UC2324	Z3CA2180AB40199

### 6.4 Changes made in the EUT

No changes were implemented in the EUT during testing.



## 6.5 Test configuration



## 6.6 Transmitter characteristics

Type of equipment			
V	Stand-alone (Equipment with or without its own control provisions)		
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)		
	Plug-in card (Equipment intended for a variety of host systems)		
Intended use		Condition of use	
V	fixed	Always at a distance more than 2 m from all people	
	mobile	Always at a distance more than 20 cm from all people	
	portable	May operate at a distance closer than 20 cm to human body	
Assigned frequency range		3650.0 – 3675.0 MHz	
Operating frequency range		3655 – 3670 MHz for 10 MHz EBW 3660 – 3665 MHz for 20 MHz EBW	
RF channel spacing		10 MHz, 20 MHz	
Maximum rated output power		At transmitter 50 $\Omega$ RF output connector (aggregate power of both RF chains)	
			34.20 dBm – 10 MHz OBW 34.91 dBm – 20 MHz OBW
Is transmitter output power variable?			
		No	
			continuous variable
	V	Yes	stepped variable with stepsize 0.1 dB
			minimum RF power 0 dBm
			maximum RF power dBm
Antenna connection			
unique coupling	V	standard connector	Integral
			V with temporary RF connector without temporary RF connector
Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Manual Tilt Panel Antenna, Dual Slant $\pm 45^\circ$	Argus Technologies Pty Ltd.	SSPX310M	18.0 dBi
Blade antenna	European Antennas Ltd.	SBA-3800-D1/1040	2.0 dBi
Transmitter aggregate data rate/s, Mbps			
Transmitter 99% power bandwidth	Type of modulation		
	QPSK	16QAM	64QAM
	10 MHz	15.5	30.5
20 MHz	31	61	150
Type of multiplexing	OFDMA/TDD		
Modulating test signal (baseband)	PRBS		
Maximum transmitter duty cycle in normal use	100 %		
Transmitter power source			
V	DC	Nominal rated voltage	48 VDC
Common power source for transmitter and receiver		V	yes no

<b>Test specification:</b>		<b>Section 90.1321, Maximum 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>Date(s):</b>		12-May-14	
<b>Temperature:</b> 25 °C		<b>Air Pressure:</b> 1012 hPa	
<b>Remarks:</b>		<b>Verdict:</b> PASS	
		<b>Relative Humidity:</b> 44 %	
		<b>Power Supply:</b> 48VDC	

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

### 7.1 Peak output power 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 – 3675.0	10	10	40.00
	20	20	43.00
Assigned frequency range, MHz	Occupied Bandwidth, MHz	Maximum peak power spectral density, EIRP	
		W	dBm/MHz
3650.0 – 3675.0	10	1	30
	20		

#### 7.1.2 Test procedure

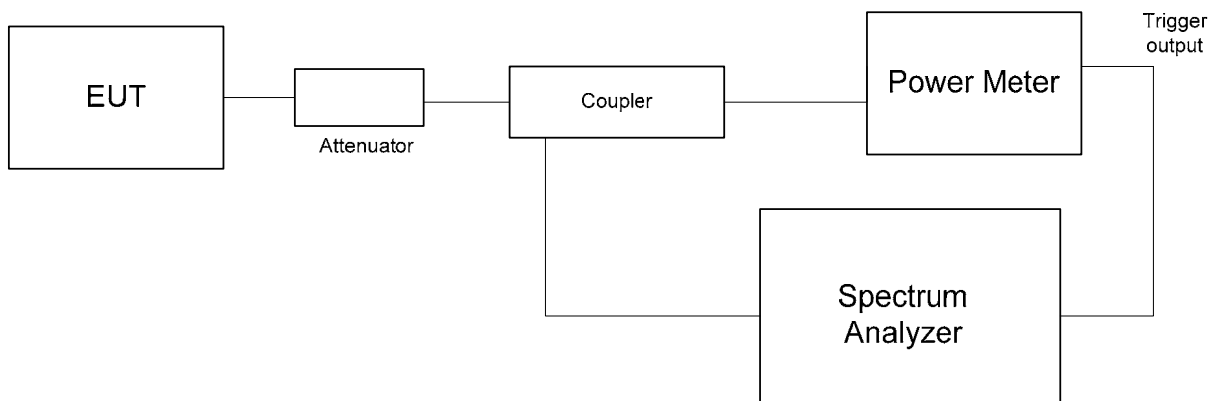
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

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 power meter as provided in Table 7.1.2 and the associated plots.

7.1.2.4 The peak output power density was measured with spectrum analyzer as provided in Table 7.1.3 and the associated plots.

Figure 7.1.1 Peak output power test setup





<b>Test specification:</b>		<b>Section 90.1321, Maximum 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(s):</b>		12-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Table 7.1.2 Peak EIRP output power test results

OPERATING FREQUENCY RANGE: 3650.0 – 3675.0 MHz  
DETECTOR USED: Average (Power Meter)  
MODULATION: QPSK/64QAM  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum (see NOTE1)  
**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	30.00	31.25	33.68	2.00	35.68	40.00	-4.32	Pass
3663.00	QPSK	30.59	31.54	34.10	2.00	36.10	40.00	-3.90	Pass
3670.00	QPSK	30.77	31.58	34.20	2.00	36.20	40.00	-3.80	Pass
3655.00	64QAM	29.90	31.20	33.61	2.00	35.61	40.00	-4.39	Pass
3663.00	64QAM	30.51	31.50	34.04	2.00	36.04	40.00	-3.96	Pass
3670.00	64QAM	30.74	31.60	34.20	2.00	36.20	40.00	-3.80	Pass

**EBW: 20 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
3660.00	QPSK	31.16	32.24	34.74	2.00	36.74	43.00	-6.26	Pass
3663.00	QPSK	31.29	32.31	34.84	2.00	36.84	43.00	-6.16	Pass
3665.00	QPSK	31.37	32.37	34.91	2.00	36.91	43.00	-6.09	Pass
3660.00	64QAM	29.70	30.21	32.97	2.00	34.97	43.00	-8.03	Pass
3663.00	64QAM	29.87	30.33	33.12	2.00	35.12	43.00	-7.88	Pass
3665.00	64QAM	29.97	30.35	33.17	2.00	35.17	43.00	-7.83	Pass

\* - Pmeas ,dBm = 10 log(10<sup>^((P(dBm,RF#1)/10)+ 10<sup>^((P(dBm, RF#2))/10))</sup>)</sup>

\*\* - EIRP total, dBm = Pmeas, dBm + Antenna Gain, dBi

NOTE1: the 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.

Power Settings	RF Chain 1		RF Chain 2	
	QPSK	64QAM	QPSK	64QAM
10MHz	20 HEX	20 HEX	20 HEX	20 HEX
20MHz	19 HEX	14 HEX	19 HEX	17 HEX

<b>Test specification:</b>		<b>Section 90.1321, Maximum 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>Date(s):</b>		12-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1012 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 44 %</b>	
		<b>Power Supply: 48VDC</b>	

**Table 7.1.3 Peak EIRP power density test results**

OPERATING FREQUENCY RANGE: 3650.0 – 3675.0 MHz  
 DETECTOR USED: Average (RMS)  
 RESOLUTION BANDWIDTH: 1000 kHz  
 VIDEO BANDWIDTH: 3000 kHz  
 MODULATION: QPSK/64QAM  
 MODULATING SIGNAL: PRBS  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum (see NOTE1)  
**EBW: 10 MHz**

Channel, MHz	Modulation	Pmeas (RF#1), dBm/MHz	Pmeas (RF#2), dBm/MHz	P <sub>meas</sub> *, dBm/MHz	Antenna gain, dBi	EIRP total**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
3655.00	QPSK	21.79	23.1	25.50	2.00	27.50	30.00	-2.50	Pass
3663.00	QPSK	22.10	23.33	25.77	2.00	27.77	30.00	-2.23	Pass
3670.00	QPSK	22.39	23.17	25.81	2.00	27.81	30.00	-2.19	Pass
3655.00	64QAM	21.73	22.83	25.33	2.00	27.33	30.00	-2.67	Pass
3663.00	64QAM	22.62	23.26	25.96	2.00	27.96	30.00	-2.04	Pass
3670.00	64QAM	22.56	23.53	26.08	2.00	28.08	30.00	-1.92	Pass

**EBW: 20 MHz**

Channel, MHz	Modulation	Pmeas (RF#1), dBm/MHz	Pmeas (RF#2), dBm/MHz	P <sub>meas</sub> *, dBm/MHz	Antenna gain, dBi	EIRP total**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
3660.00	QPSK	20.02	21.73	23.97	2.00	25.97	30.00	-4.03	Pass
3663.00	QPSK	20.25	21.49	23.92	2.00	25.92	30.00	-4.08	Pass
3665.00	QPSK	20.31	21.66	24.05	2.00	26.05	30.00	-3.95	Pass
3660.00	64QAM	19.24	19.10	22.18	2.00	24.18	30.00	-5.82	Pass
3663.00	64QAM	19.10	19.29	22.21	2.00	24.21	30.00	-5.79	Pass
3665.00	64QAM	19.09	19.59	22.36	2.00	24.36	30.00	-5.64	Pass

\* - P<sub>meas</sub>, dBm = 10 log(10<sup>(P(dBm/MHz,RF#1)/10)</sup> + 10<sup>(P(dBm/MHz, RF#2)/10)</sup>)

\*\* - EIRP total, dBm/MHz = P<sub>meas</sub>, dBm/MHz + Antenna Gain, dBi

NOTE1: The 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.

Power Settings	RF Chain 1		RF Chain 2	
	QPSK	64QAM	QPSK	64QAM
10MHz	20 HEX	20 HEX	20 HEX	20 HEX
20MHz	19 HEX	14 HEX	19 HEX	17 HEX

**Reference numbers of test equipment used**

HL 3301	HL 3302	HL 3770	HL 4229	HL 4273	HL 4275	HL 4367	HL 4575
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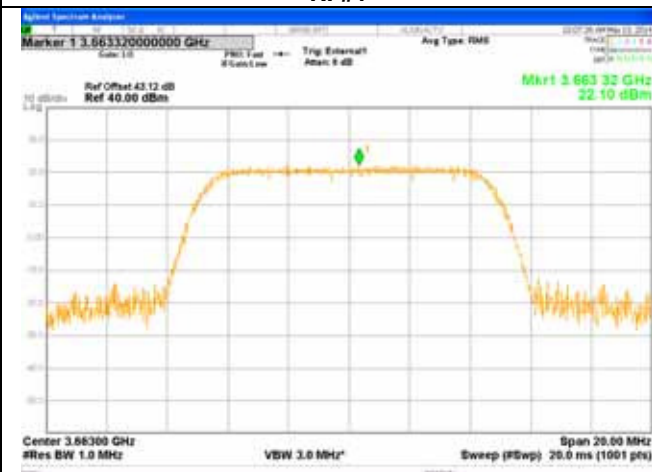
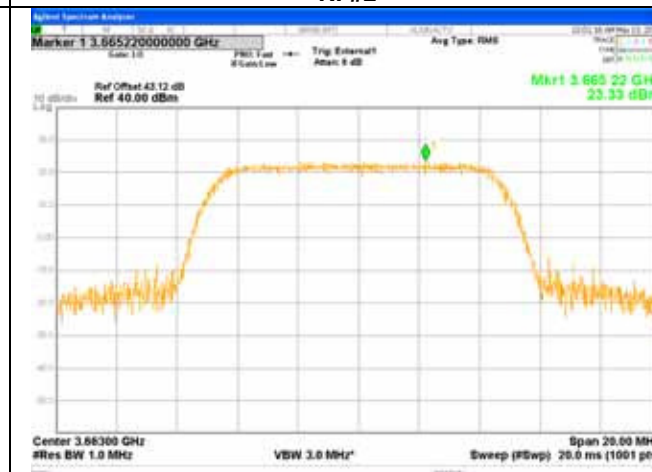
Full description is given in Appendix A.

<b>Test specification:</b>	<b>Section 90.1321, Maximum 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(s):</b>	12-May-14	<b>Relative Humidity:</b>	44 %
<b>Temperature:</b>	25 °C	<b>Air Pressure:</b>	1012 hPa
<b>Remarks:</b>		<b>Power Supply:</b>	48VDC

Plot 7.1.1 Peak output power test results at low frequency

<b>CARRIER FREQUENCY:</b>	3655.0 MHz
<b>EMISSION BANDWIDTH:</b>	10 MHz
<b>MODULATION:</b>	QPSK
<b>RF#1</b>	<b>RF#2</b>
	

Plot 7.1.2 Peak output power test results at mid frequency

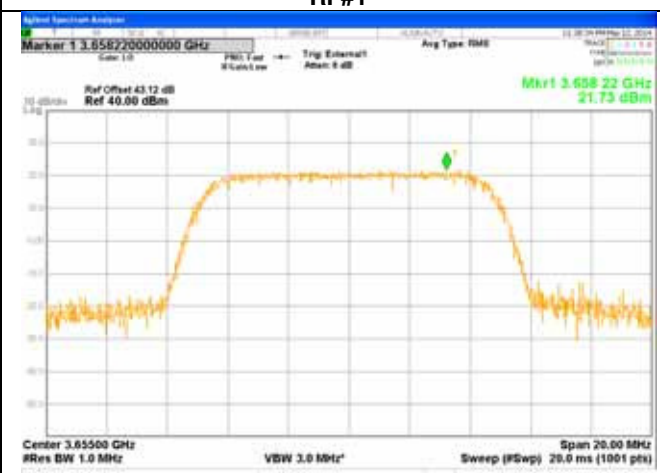
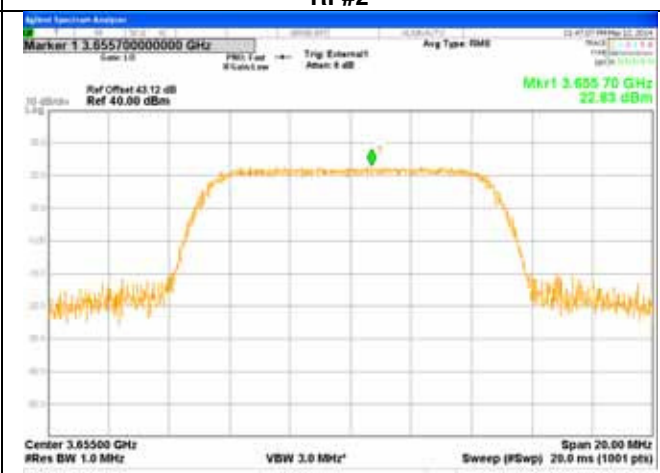
<b>CARRIER FREQUENCY:</b>	3663.0 MHz
<b>EMISSION BANDWIDTH:</b>	10 MHz
<b>MODULATION:</b>	QPSK
<b>RF#1</b>	<b>RF#2</b>
	

<b>Test specification:</b>		<b>Section 90.1321, Maximum output power</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
<b>Test mode:</b>		<b>Verdict:</b> PASS	
<b>Date(s):</b>		12-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Plot 7.1.3 Peak output power test results at high frequency

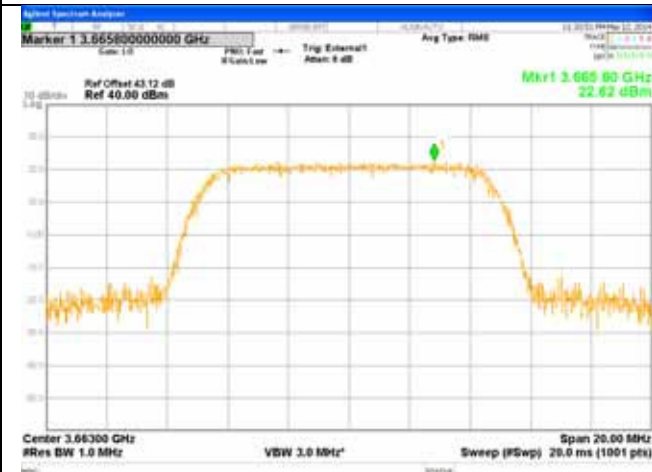
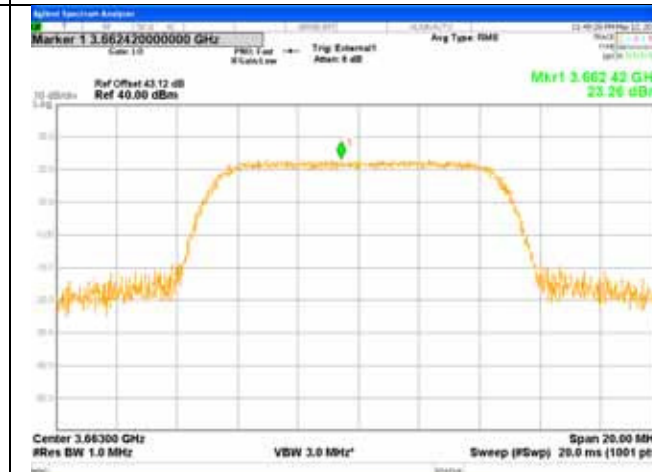
<b>CARRIER FREQUENCY:</b>	3670.0 MHz
<b>EMISSION BANDWIDTH:</b>	10 MHz
<b>MODULATION:</b>	QPSK
<b>RF#1</b>	<b>RF#2</b>
	

Plot 7.1.4 Peak output power test results at low frequency

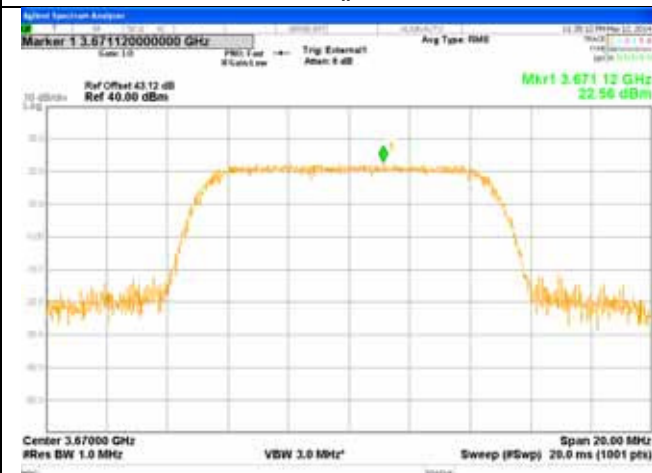
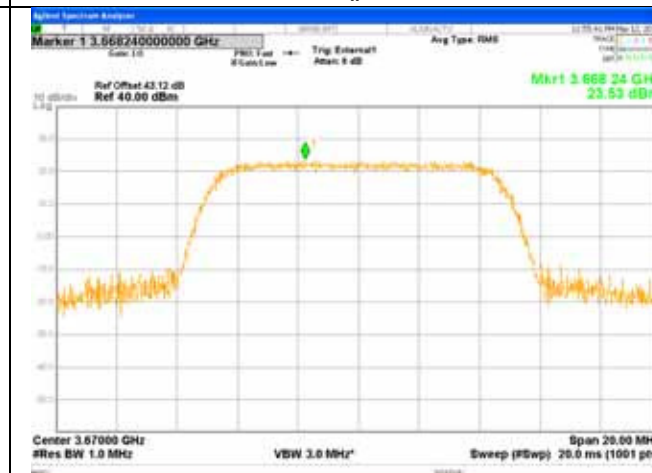
<b>CARRIER FREQUENCY:</b>	3655.0 MHz
<b>EMISSION BANDWIDTH:</b>	10 MHz
<b>MODULATION:</b>	64QAM
<b>RF#1</b>	<b>RF#2</b>
	

<b>Test specification:</b> Section 90.1321, Maximum output power			
<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(s):</b> 12-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Plot 7.1.5 Peak output power test results at mid frequency

<b>CARRIER FREQUENCY:</b>	3663.0 MHz
<b>EMISSION BANDWIDTH:</b>	10 MHz
<b>MODULATION:</b>	64QAM
<b>RF#1</b>	<b>RF#2</b>
	

Plot 7.1.6 Peak output power test results at high frequency

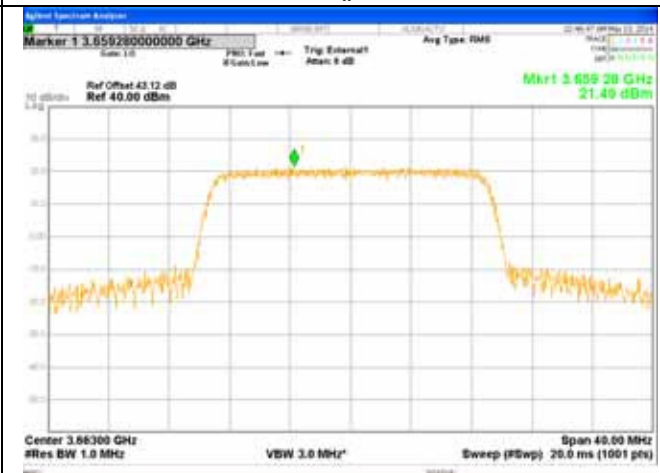
<b>CARRIER FREQUENCY:</b>	3670.0 MHz
<b>EMISSION BANDWIDTH:</b>	10 MHz
<b>MODULATION:</b>	64QAM
<b>RF#1</b>	<b>RF#2</b>
	

<b>Test specification:</b>	<b>Section 90.1321, Maximum 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(s):</b>	12-May-14	<b>Relative Humidity:</b>	44 %
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Power Supply:</b>	48VDC
<b>Remarks:</b>			

Plot 7.1.7 Peak output power test results at low frequency

<b>CARRIER FREQUENCY:</b>	3660.0 MHz
<b>EMISSION BANDWIDTH:</b>	20 MHz
<b>MODULATION:</b>	QPSK
<b>RF#1</b>	<b>RF#2</b>
	

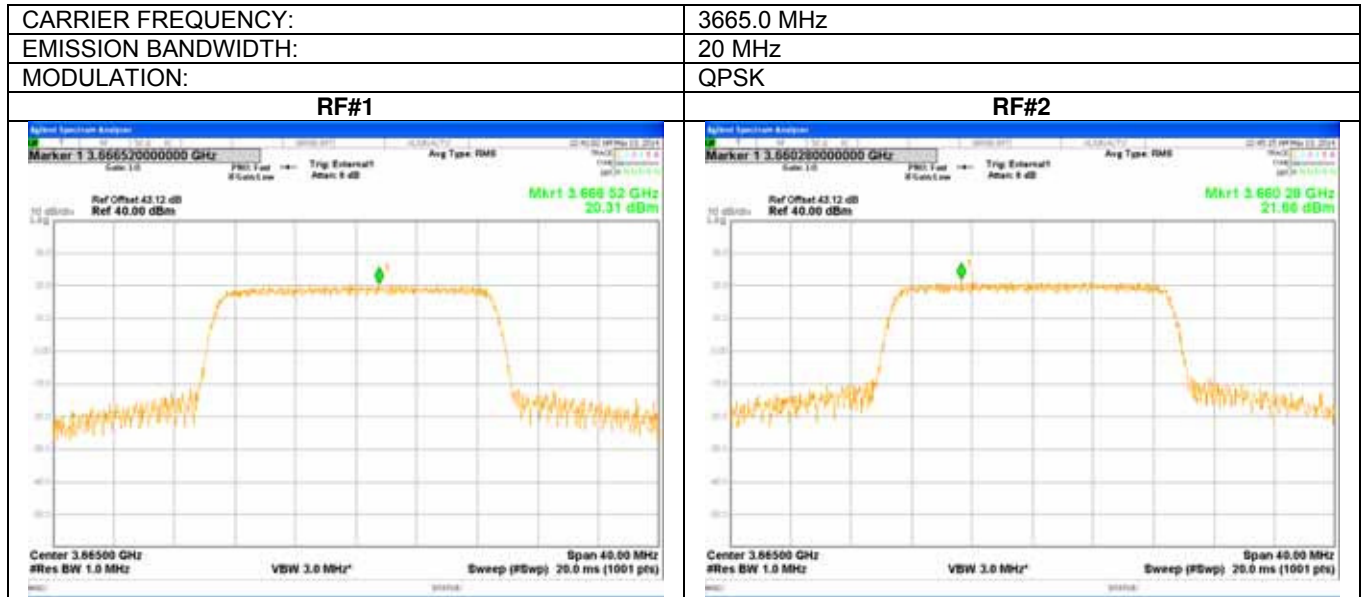
Plot 7.1.8 Peak output power test results at mid frequency

<b>CARRIER FREQUENCY:</b>	3663.0 MHz
<b>EMISSION BANDWIDTH:</b>	20 MHz
<b>MODULATION:</b>	QPSK
<b>RF#1</b>	<b>RF#2</b>
	

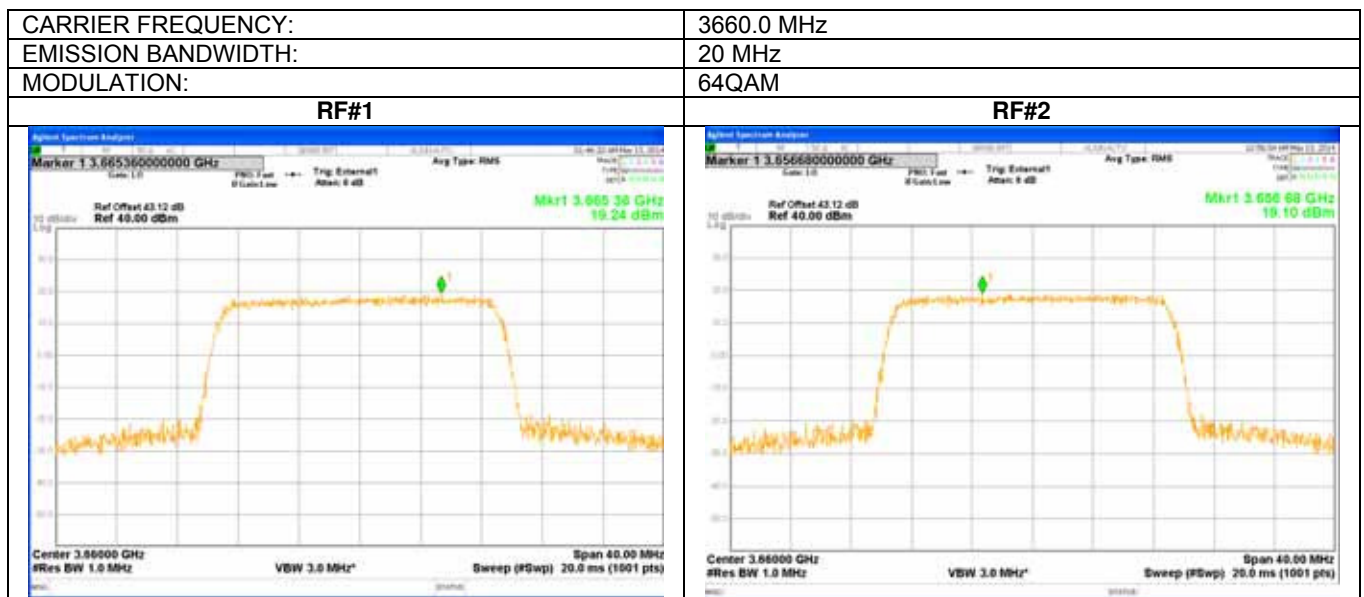


<b>Test specification:</b>		<b>Section 90.1321, Maximum output power</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		12-May-14	
<b>Temperature: 25 °C</b>	<b>Air Pressure: 1012 hPa</b>	<b>Relative Humidity: 44 %</b>	<b>Power Supply: 48VDC</b>
<b>Remarks:</b>			
		<b>Verdict:</b>	<b>PASS</b>

Plot 7.1.9 Peak output power test results at high frequency

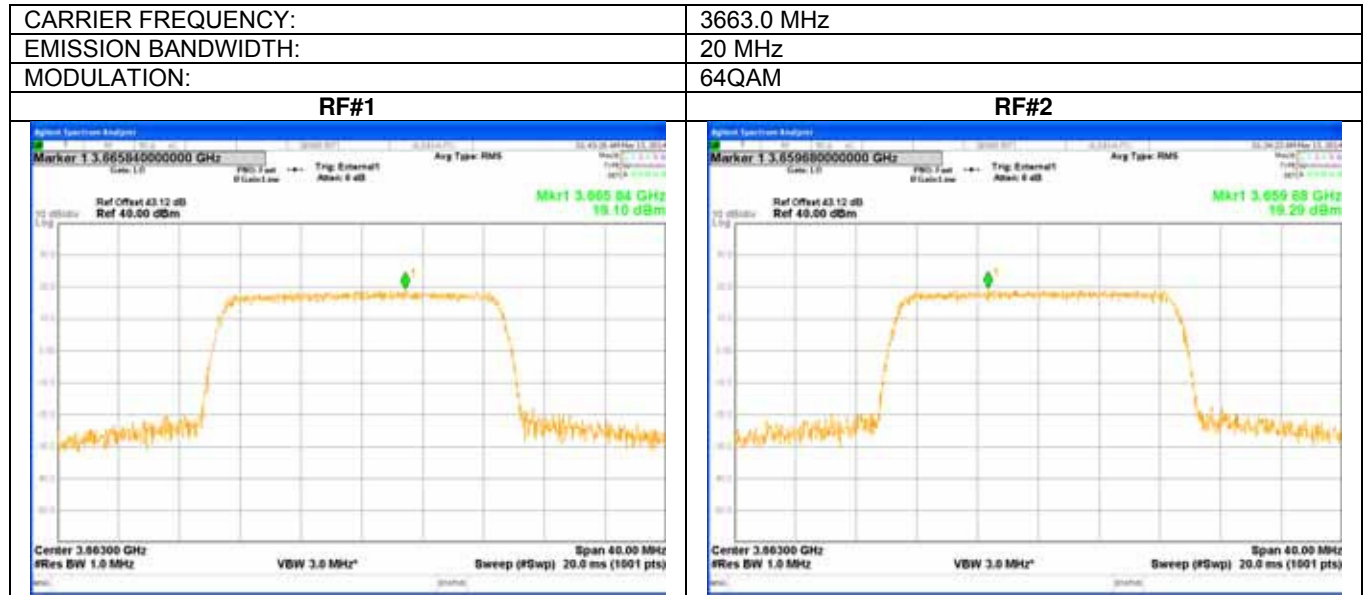


Plot 7.1.10 Peak output power test results at low frequency



<b>Test specification:</b>	<b>Section 90.1321, Maximum 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(s):</b>	12-May-14	<b>Relative Humidity:</b>	44 %
<b>Temperature:</b>	25 °C	<b>Air Pressure:</b>	1012 hPa
<b>Remarks:</b>		<b>Power Supply:</b>	48VDC

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 90.209, Occupied bandwidth</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1049	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Relative Humidity: 48 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			
		<b>Verdict: PASS</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, MHz
3650.0 – 3675.0	26	25

\* - Modulation envelope reference points are provided in terms of attenuation below the total average power.

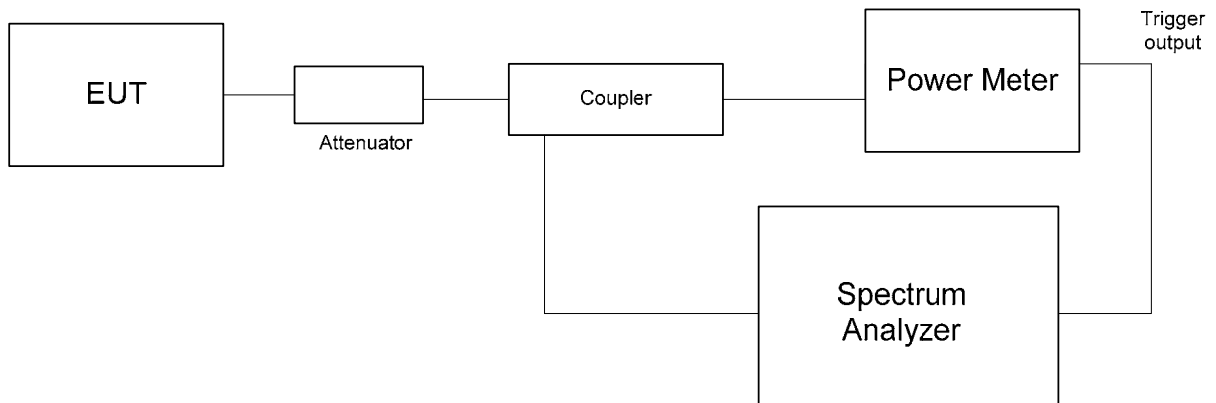
### 7.2.2 Test procedure

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 normally modulated carrier.

7.2.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup





HERMON LABORATORIES

<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>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 48 %</b>	
		<b>Power Supply: 48VDC</b>	

**Table 7.2.2 Occupied bandwidth test results**

DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1% of the Emission bandwidth  
 VIDEO BANDWIDTH: 3 times RBW  
 MODULATION ENVELOPE REFERENCE POINTS: 99% / 26 dB below total average power  
 MODULATION: QPSK/64QAM  
 MODULATING SIGNAL: PRBS  
 RF Chain: 1

Carrier frequency, MHz	Modulation	99% Occupied bandwidth, MHz	26 dBc Occupied bandwidth, MHz	Emission Bandwidth, MHz	Verdict
3652.5	QPSK	8.9362	9.400	10.0	Pass
3663.0	QPSK	8.9173	9.311	10.0	Pass
3672.5	QPSK	8.9024	9.416	10.0	Pass
3652.5	64QAM	8.9310	9.233	10.0	Pass
3663.0	64QAM	8.9111	9.371	10.0	Pass
3672.5	64QAM	8.9210	9.282	10.0	Pass
3653.5	QPSK	17.803	18.760	20.0	Pass
3663.0	QPSK	17.785	18.910	20.0	Pass
3671.5	QPSK	17.810	18.610	20.0	Pass
3653.5	64QAM	17.868	18.780	20.0	Pass
3663.0	64QAM	17.769	18.940	20.0	Pass
3671.5	64QAM	17.759	19.190	20.0	Pass

RF Chain 2

Carrier frequency, MHz	Modulation	99% Occupied bandwidth, MHz	26 dBc Occupied bandwidth, MHz	Emission Bandwidth, MHz	Verdict
3652.5	QPSK	8.9154	9.407	10.0	Pass
3663.0	QPSK	8.8992	9.556	10.0	Pass
3672.5	QPSK	8.9381	9.527	10.0	Pass
3652.5	64QAM	8.9218	9.367	10.0	Pass
3663.0	64QAM	8.9083	9.683	10.0	Pass
3672.5	64QAM	8.9372	9.440	10.0	Pass
3653.5	QPSK	17.823	18.770	20.0	Pass
3663.0	QPSK	17.793	19.040	20.0	Pass
3671.5	QPSK	17.845	18.920	20.0	Pass
3653.5	64QAM	17.799	18.880	20.0	Pass
3663.0	64QAM	17.766	18.870	20.0	Pass
3671.5	64QAM	17.790	18.870	20.0	Pass

NOTE1: Power Meter used to ensure maximum of power and power density.  
 NOTE2: Measurement was performed at the worst case of power and power density settings.

Power Settings	RF Chain 1		RF Chain 2	
	QPSK	64QAM	QPSK	64QAM
10MHz	20 HEX	20 HEX	20 HEX	20 HEX
20MHz	19 HEX	14 HEX	19 HEX	17 HEX

**Reference numbers of test equipment used**

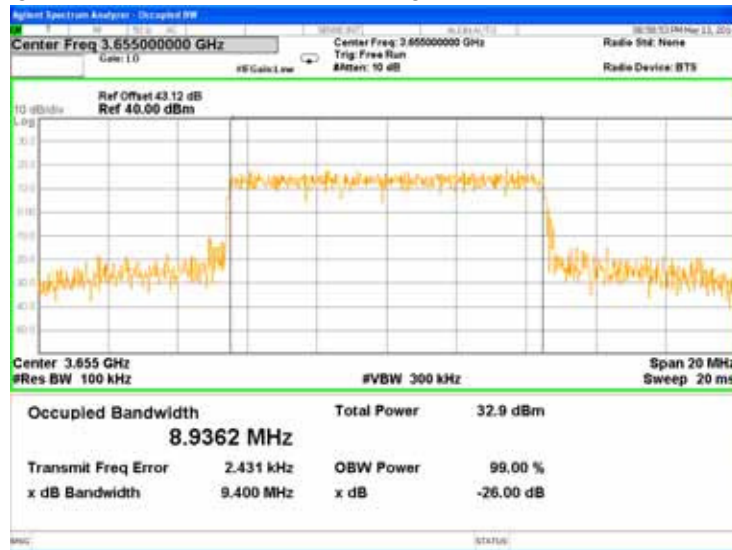
HL 3301	HL 3302	HL 3770	HL 4229	HL 4273	HL 4275	HL 4367	HL 4575
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Full description is given in Appendix A.

<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>	<b>PASS</b>
<b>Date(s):</b>	13-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1014 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

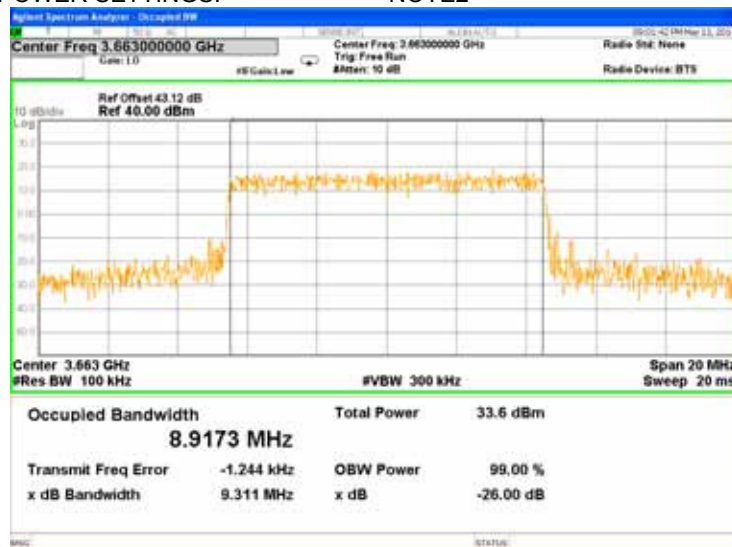
Plot 7.2.1 Occupied bandwidth test results at low carrier frequency, RF Output #1, 10 MHz EBW

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
TRANSMITTER OUTPUT POWER: NOTE2



Plot 7.2.2 Occupied bandwidth test results at mid carrier frequency, RF Output #1, 10 MHz EBW

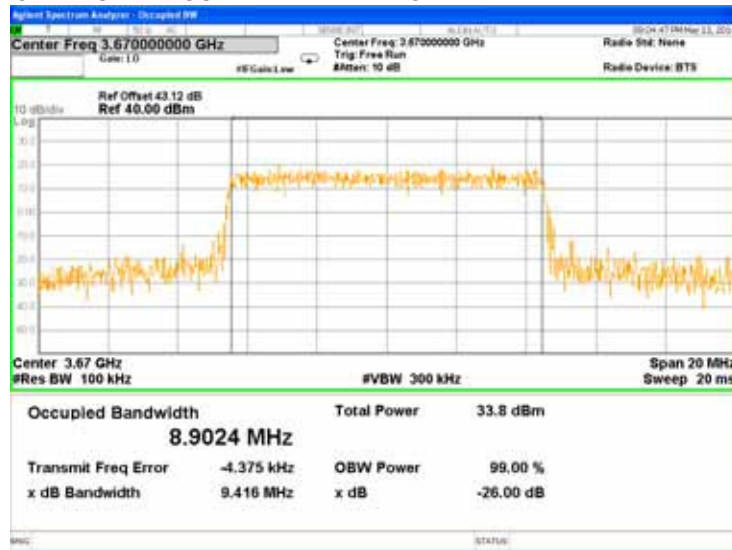
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



<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>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 48 %</b>	
		<b>Power Supply: 48VDC</b>	

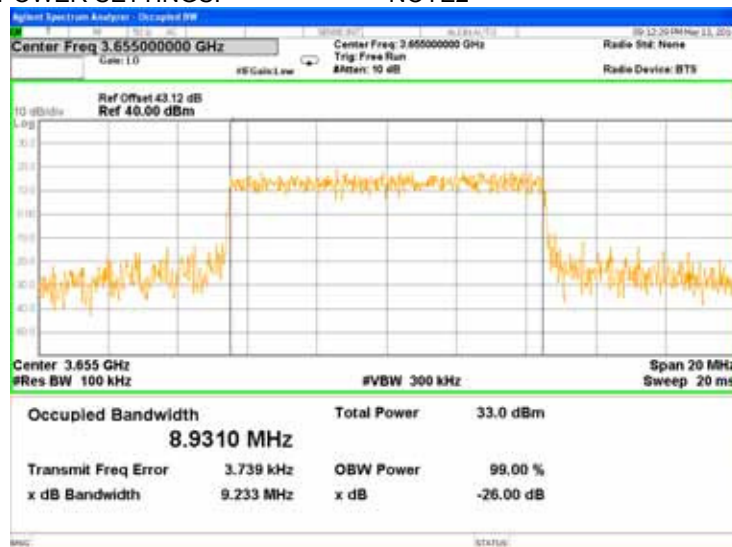
**Plot 7.2.3 Occupied bandwidth test results at high carrier frequency, RF Output #1, 10 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: QPSK  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.4 Occupied bandwidth test results at low carrier frequency, RF Output #1, 10 MHz EBW**

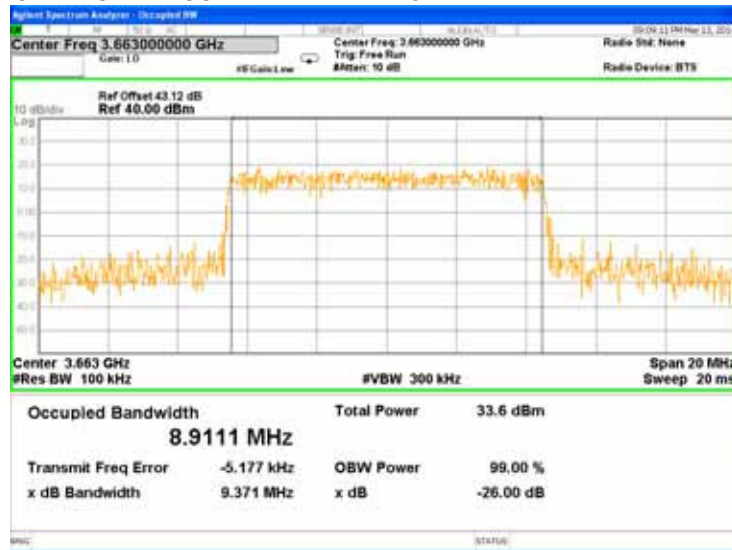
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: 64QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



<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(s):</b>	13-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1014 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

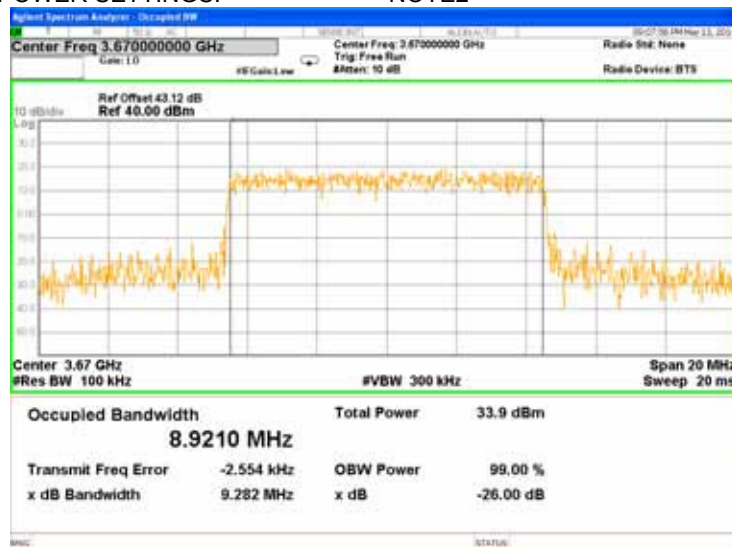
**Plot 7.2.5 Occupied bandwidth test results at mid carrier frequency, RF Output #1, 10 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: 64QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.6 Occupied bandwidth test results at high carrier frequency, RF Output #1, 10 MHz EBW**

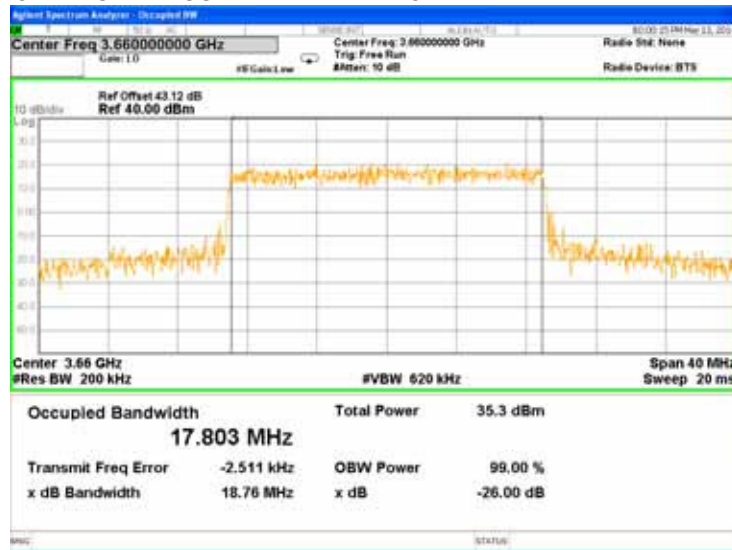
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: 64QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



<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>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 48 %</b>	
		<b>Power Supply: 48VDC</b>	

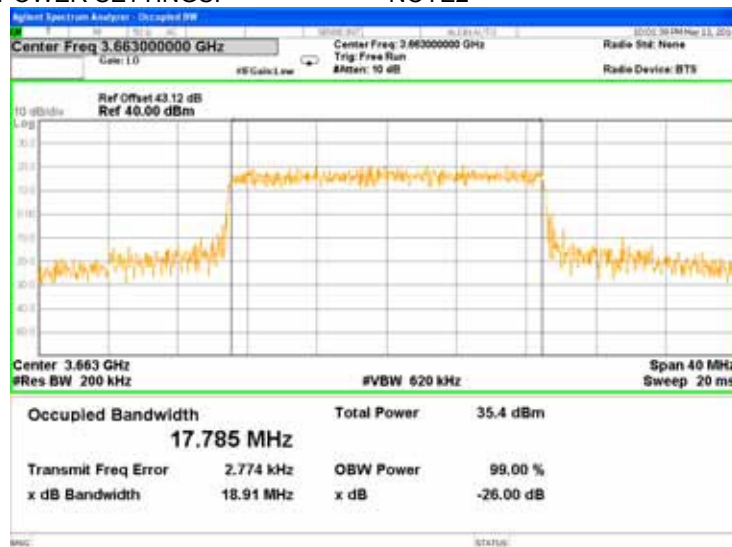
Plot 7.2.7 Occupied bandwidth test results at low carrier frequency, RF Output #1, 20 MHz EBW

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: QPSK  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



Plot 7.2.8 Occupied bandwidth test results at mid carrier frequency, RF Output #1, 20 MHz EBW

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: QPSK  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2

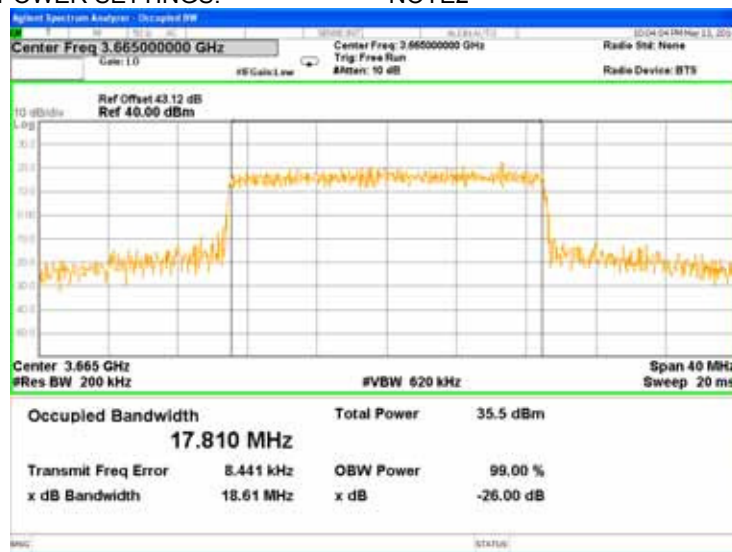




<b>Test specification:</b> Section 90.209, Occupied bandwidth			
<b>Test procedure:</b> 47 CFR, Section 2.1049			
<b>Test mode:</b> Compliance			<b>Verdict:</b> PASS
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1014 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

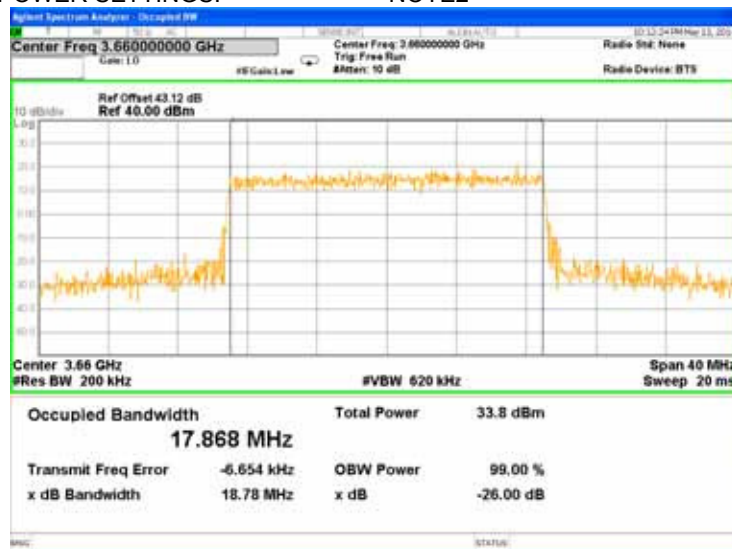
**Plot 7.2.9 Occupied bandwidth test results at high carrier frequency, RF Output #1, 20 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: QPSK  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.10 Occupied bandwidth test results at low carrier frequency, RF Output #1, 20 MHz EBW**

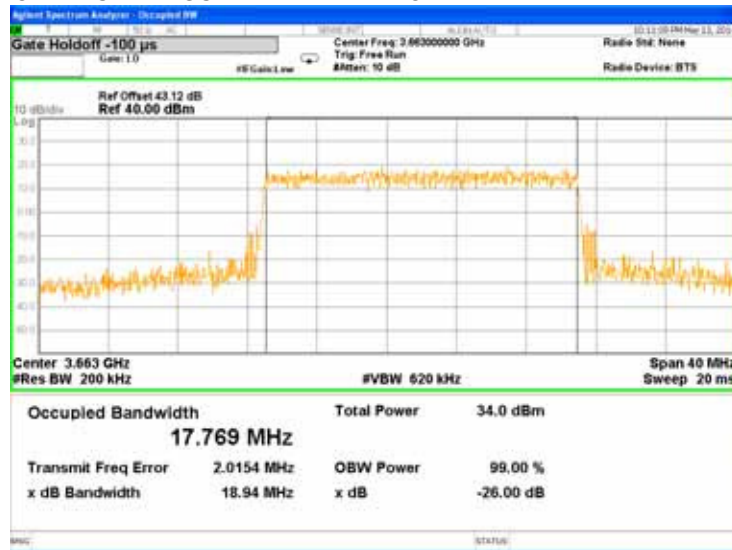
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: 64QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



<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>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Relative Humidity: 48 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			
		<b>Verdict: PASS</b>	

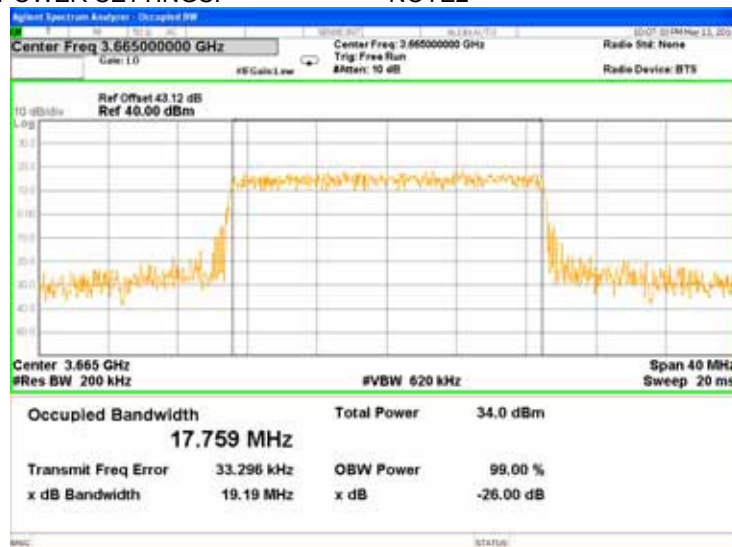
Plot 7.2.11 Occupied bandwidth test results at mid carrier frequency, RF Output #1, 20 MHz EBW

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: QPSK  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



Plot 7.2.12 Occupied bandwidth test results at high carrier frequency, RF Output #1

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: 64QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2

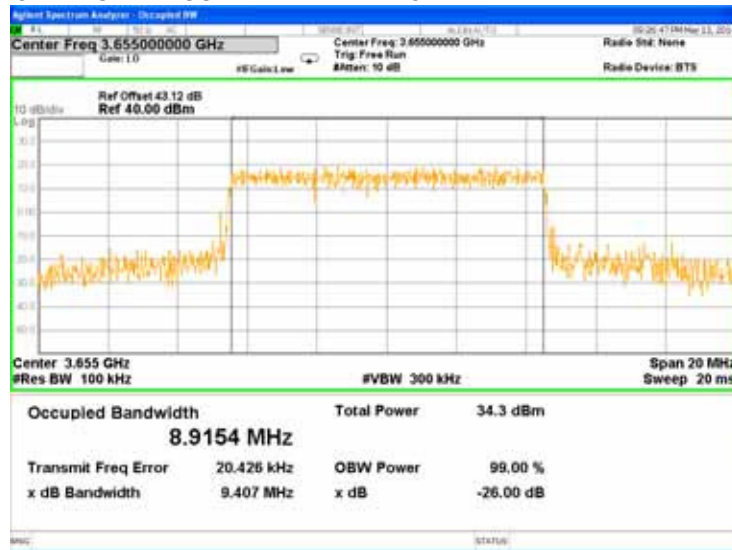




<b>Test specification:</b>		<b>Section 90.209, Occupied bandwidth</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1049	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 48 %</b>	
		<b>Power Supply: 48VDC</b>	

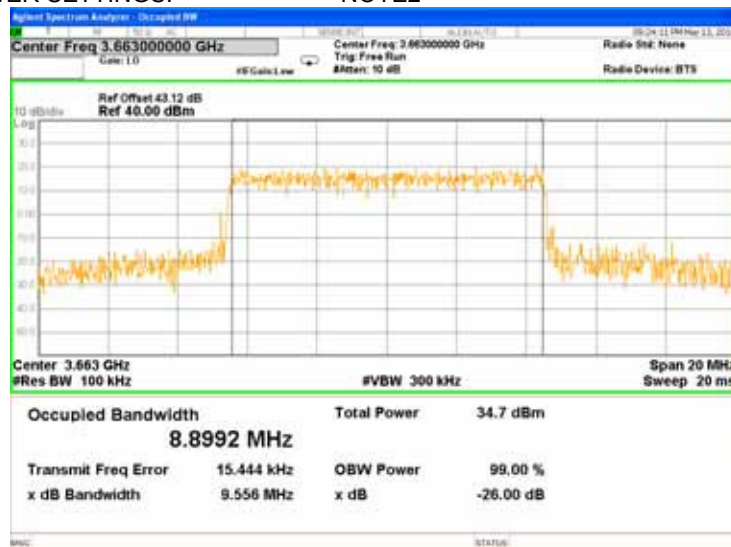
**Plot 7.2.13 Occupied bandwidth test results at low carrier frequency, RF Output #2, 10 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.14 Occupied bandwidth test results at mid carrier frequency, RF Output #2, 10 MHz EBW**

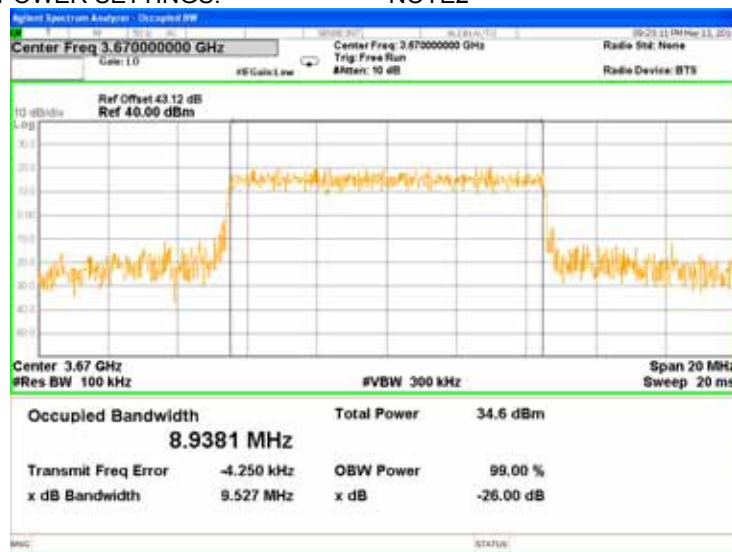
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



<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>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 48 %</b>	
		<b>Power Supply: 48VDC</b>	

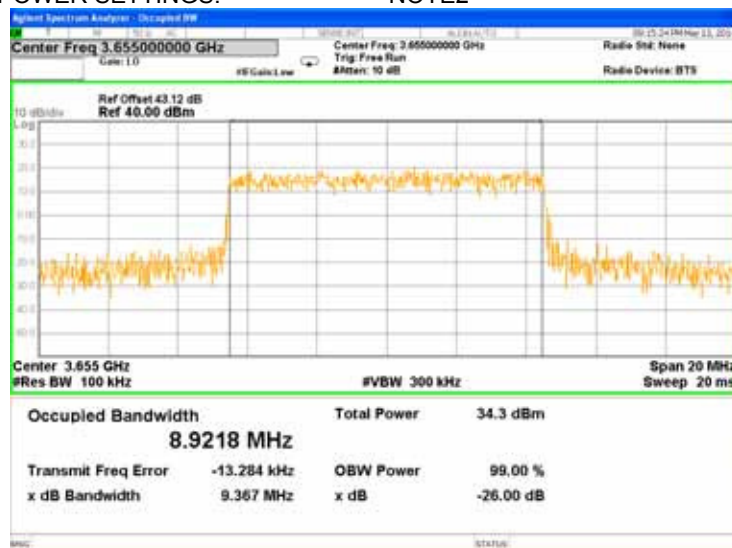
**Plot 7.2.15 Occupied bandwidth test results at high carrier frequency, RF Output #2, 10 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: QPSK  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.16 Occupied bandwidth test results at low carrier frequency, RF Output #2, 10 MHz EBW**

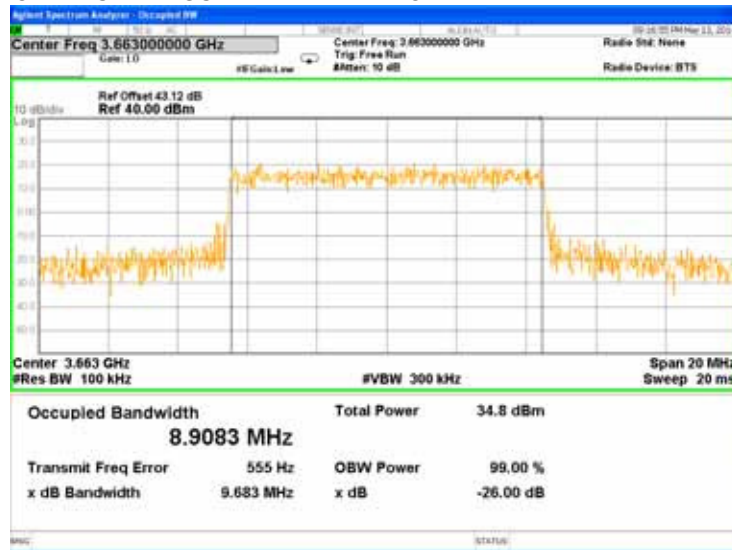
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: 64QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



<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>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 48 %</b>	
		<b>Power Supply: 48VDC</b>	

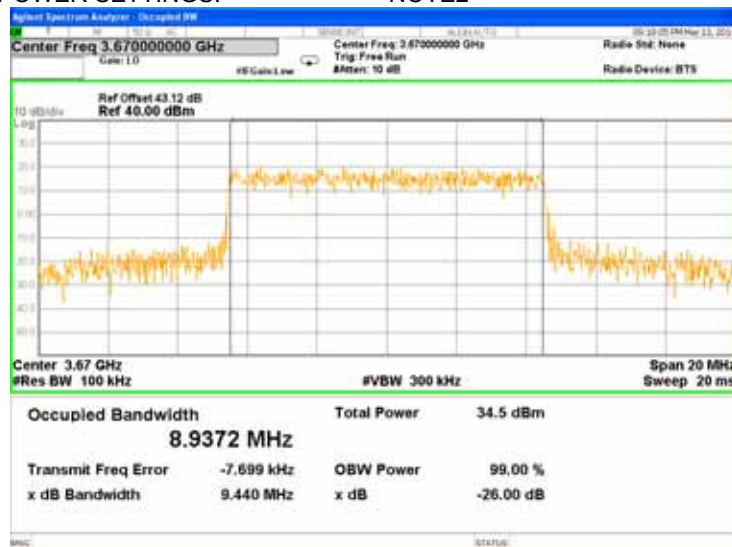
**Plot 7.2.17 Occupied bandwidth test results at mid carrier frequency, RF Output #2, 10 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: 64QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.18 Occupied bandwidth test results at high carrier frequency, RF Output #2, 10 MHz EBW**

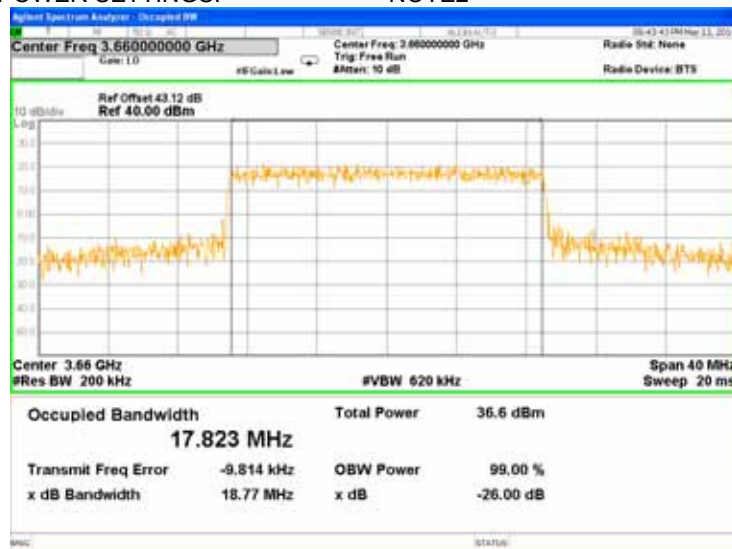
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
 DETECTOR USED: Peak  
 MODULATION: 64QAM  
 TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



<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(s):</b>	13-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1014 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

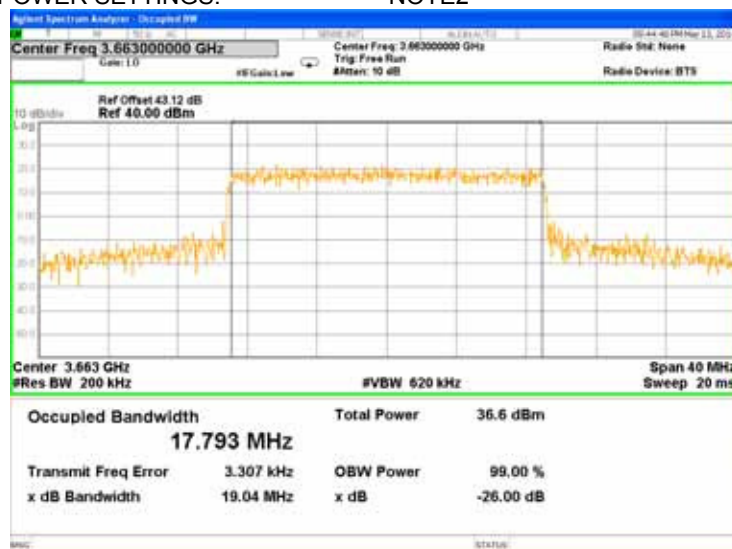
**Plot 7.2.19 Occupied bandwidth test results at low carrier frequency, RF Output #2, 20 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.20 Occupied bandwidth test results at mid carrier frequency, RF Output #2, 20 MHz EBW**

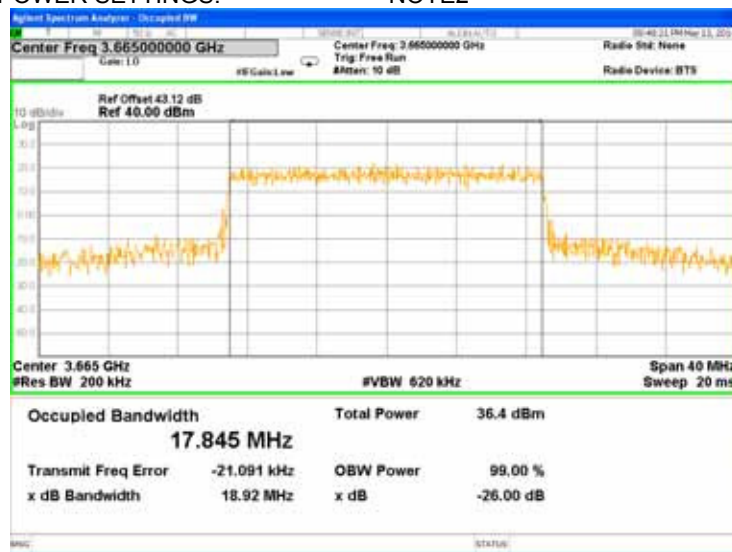
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



<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(s):</b>	13-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1014 hPa	<b>Relative Humidity:</b> 48 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

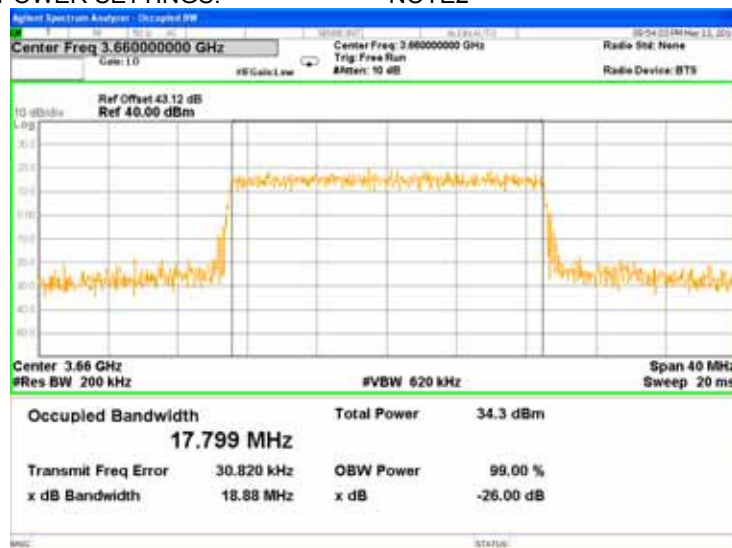
**Plot 7.2.21 Occupied bandwidth test results at high carrier frequency, RF Output #2, 20 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.22 Occupied bandwidth test results at low carrier frequency, RF Output #2, 20 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: 64QAM  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2

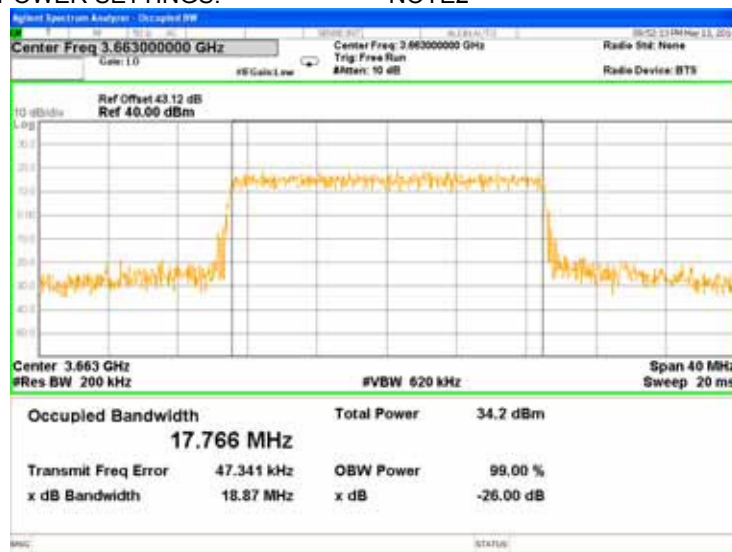




<b>Test specification:</b>		<b>Section 90.209, Occupied bandwidth</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1049	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1014 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 48 %</b>	
		<b>Power Supply: 48VDC</b>	

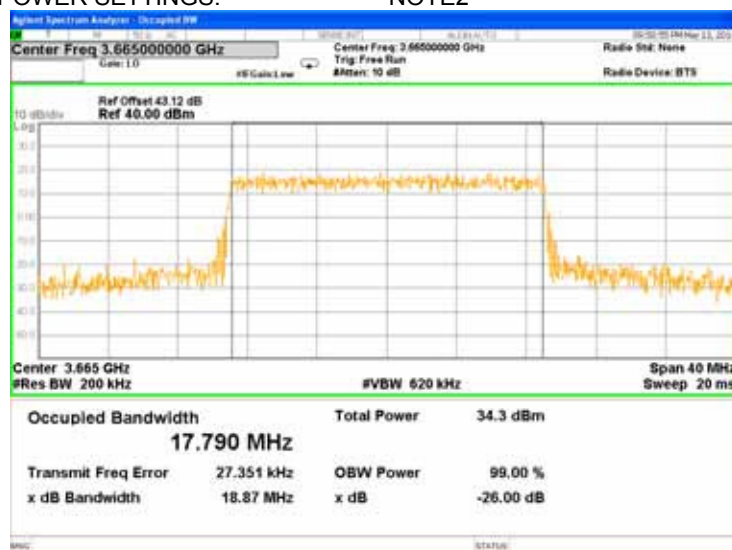
**Plot 7.2.23 Occupied bandwidth test results at mid carrier frequency, RF Output #2, 20 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: QPSK  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



**Plot 7.2.24 Occupied bandwidth test results at high carrier frequency, RF Output #2, 20 MHz EBW**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Peak  
MODULATION: 64QAM  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2





<b>Test specification:</b>	<b>FCC Section 90.210(b), Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	13-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<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
<b>Emission mask B (Emission bandwidth 10 MHz)</b>	
0 – 5 MHz	0
5 – 10.0 MHz	25
10.0 – 25.0 MHz	35
More than** 25.0 MHz	43 + 10 log(P)
<b>Emission mask B (Emission bandwidth 20 MHz)</b>	
0 – 10 MHz	0
10 – 20.0 MHz	25
20.0 – 50.0 MHz	35
More than** 50.0 MHz	43 + 10 log(P)

\* - linearly increase with frequency

\*\* - emission mask includes carrier modulation envelope within  $\pm 250$  % of the authorized bandwidth; the frequency range removed beyond  $\pm 250$  % 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.

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



<b>Test specification:</b> FCC Section 90.210(b), Emission mask	
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 13-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa
<b>Relative Humidity:</b> 44 %	
<b>Power Supply:</b> 48VDC	
<b>Remarks:</b>	

Table 7.3.2 Emission mask test results

Carrier frequency, MHz	Limit	Reference to Plot	Verdict
<b>10 MHz EBW</b>			
3655.00	Emission mask B	7.3.1, 7.3.4; 7.3.13, 7.3.16	Pass
3663.00		7.3.2, 7.3.5; 7.3.14, 7.3.17	
3670.00		7.3.3, 7.3.6; 7.3.15, 7.3.18	
<b>20 MHz EBW</b>			
3660.00	Emission mask B	7.3.7, 7.3.10; 7.3.19, 7.3.22	Pass
3663.00		7.3.8, 7.3.11; 7.3.20, 7.3.23	
3665.00		7.3.9, 7.3.12; 7.3.21, 7.3.24	

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 the worst case of power and power density settings.

Power Settings	RF Chain 1		RF Chain 2	
	QPSK	64QAM	QPSK	64QAM
10MHz	20 HEX	20 HEX	20 HEX	20 HEX
20MHz	19 HEX	14 HEX	19 HEX	17 HEX

**Reference numbers of test equipment used**

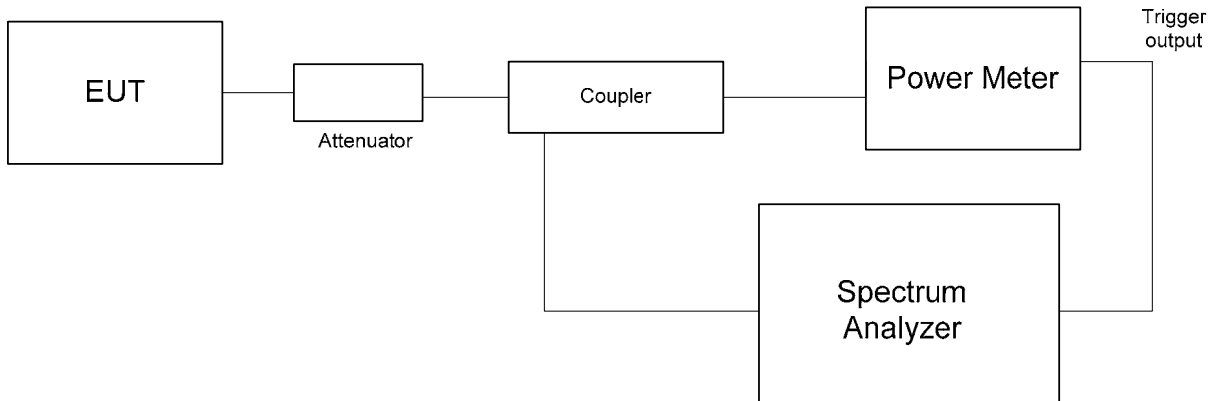
HL 3301	HL 3302	HL 3770	HL 4229	HL 4273	HL 4275	HL 4367	HL 4575
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Full description is given in Appendix A.



<b>Test specification:</b>	<b>FCC Section 90.210(b), Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict: PASS</b>	
<b>Date(s):</b>	13-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

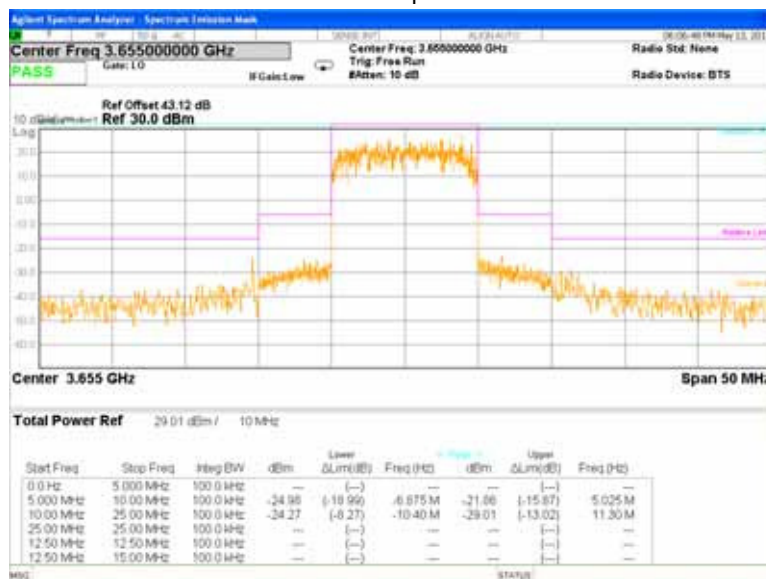
Figure 7.3.1 Emission mask test setup



<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Plot 7.3.1 Emission mask test results at low carrier frequency

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER: NOTE2  
RF Chain: 1

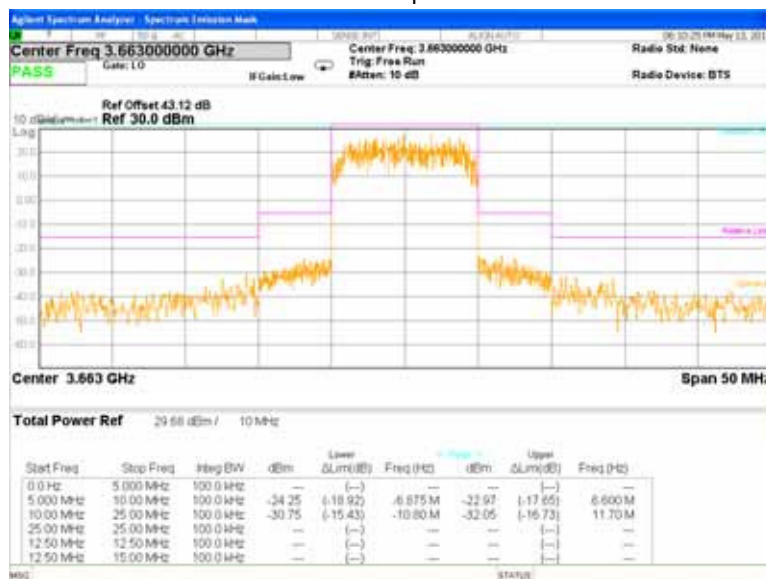


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask	
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 13-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa
	<b>Relative Humidity:</b> 44 %
	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>	

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 1



\*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 ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 1

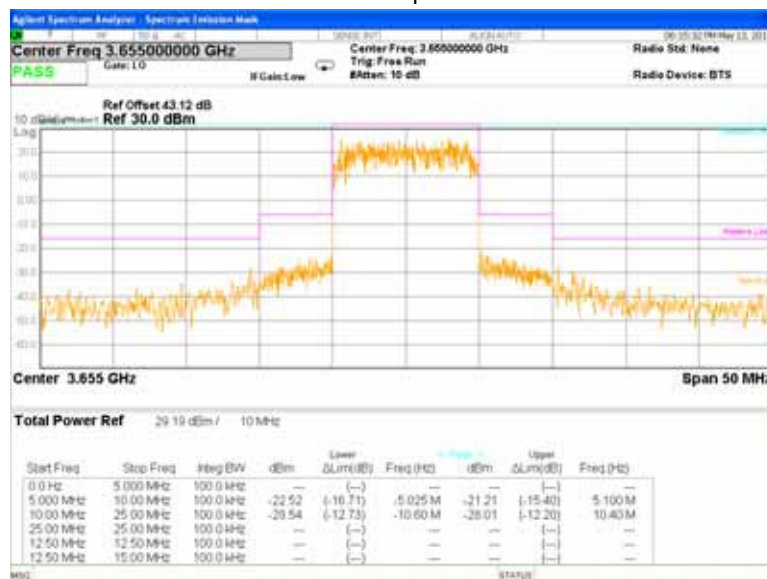


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Plot 7.3.4 Emission mask test results at low carrier frequency

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER: NOTE2  
RF Chain: 1

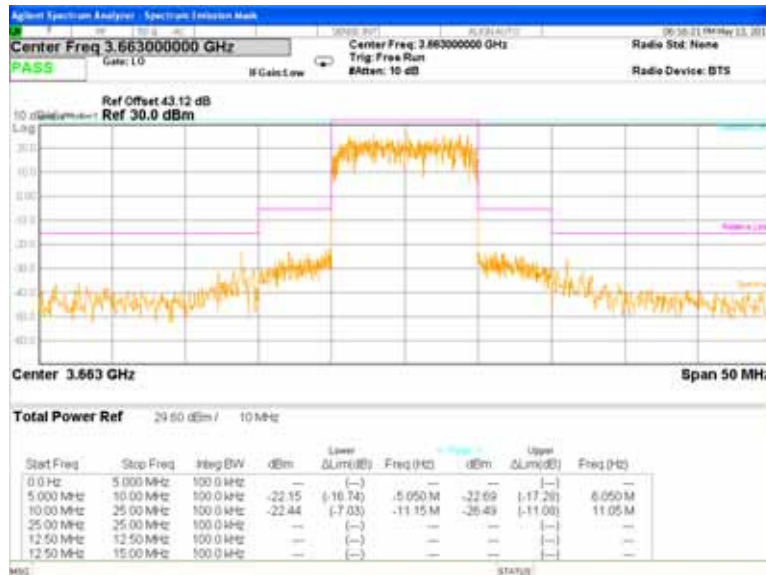


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask	
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 13-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa
	<b>Relative Humidity:</b> 44 %
	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>	

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 1

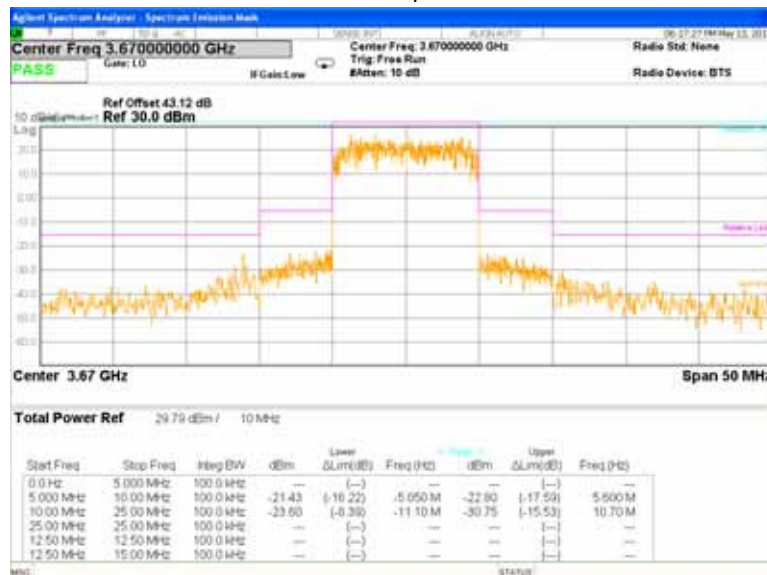


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b>	<b>FCC Section 90.210(b), Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	13-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 1

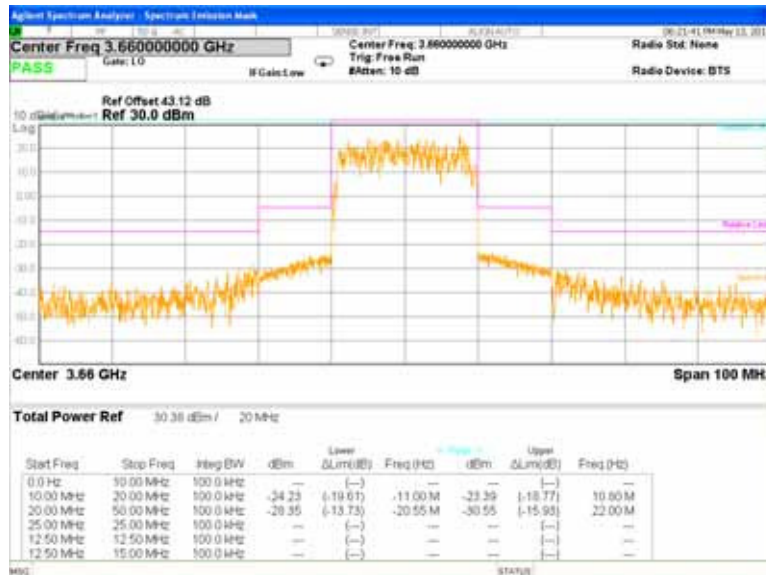


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b>		<b>FCC Section 90.210(b), Emission mask</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		13-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1012 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 44 %</b>	
		<b>Power Supply: 48VDC</b>	

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER: NOTE2  
RF Chain: 1



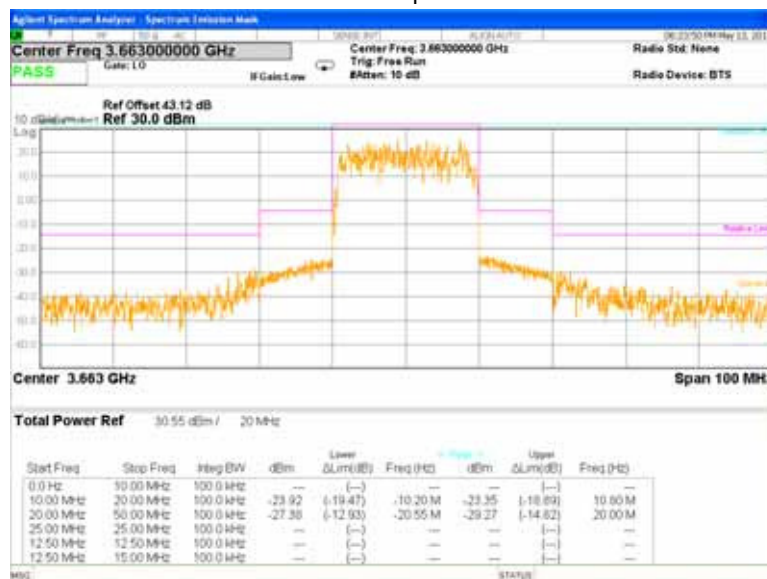
\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )



<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance			<b>Verdict:</b> PASS
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 1

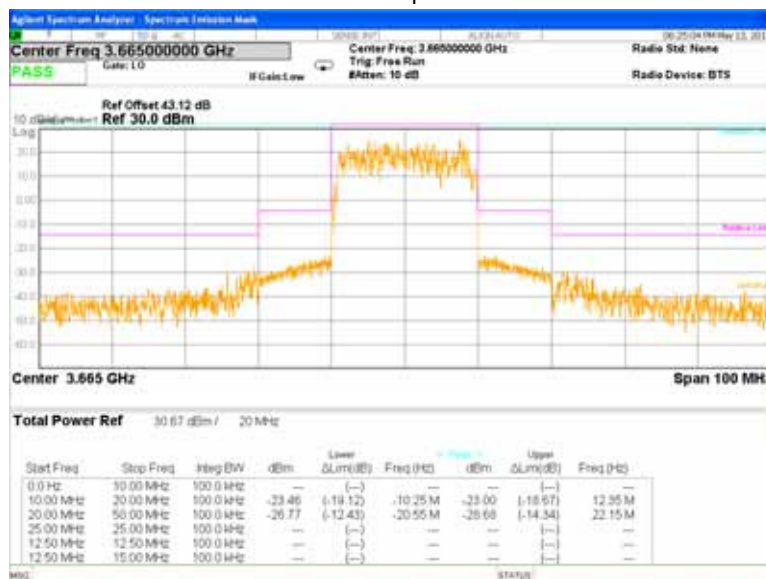


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 1

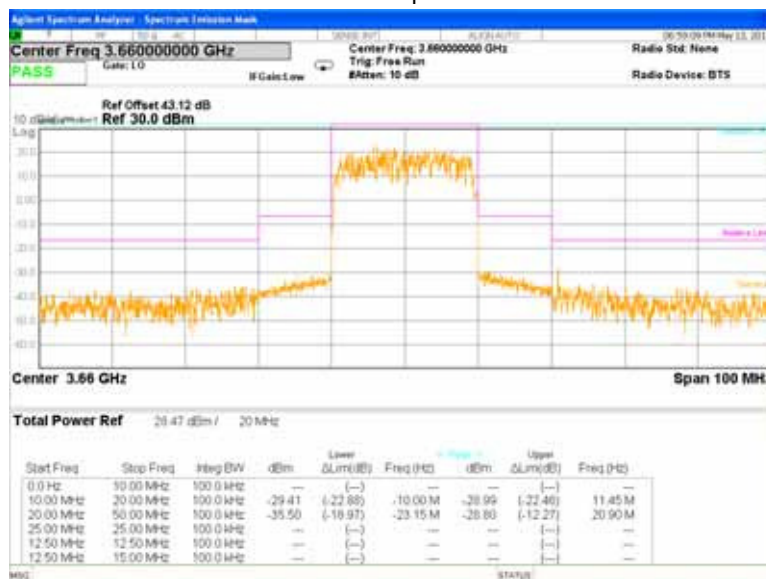


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER: NOTE2  
RF Chain: 1

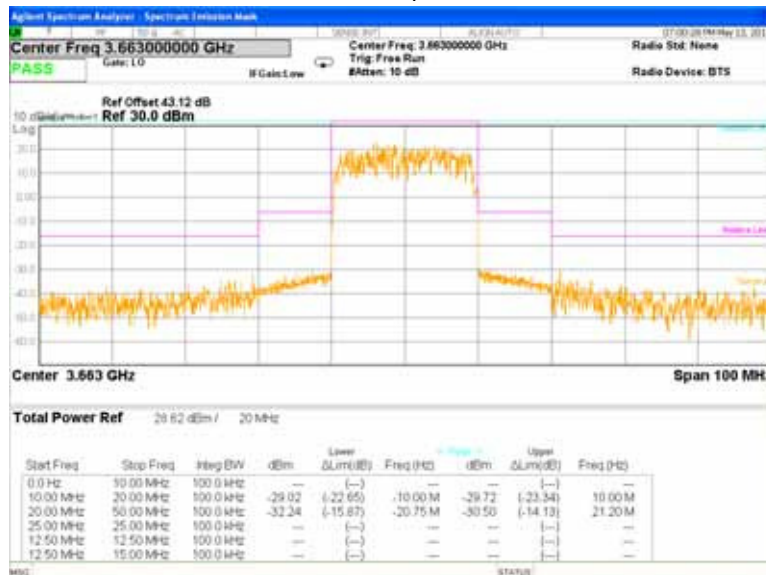


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b>		<b>FCC Section 90.210(b), Emission mask</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>		<b>Verdict:</b>	
Compliance		PASS	
<b>Date(s):</b>		13-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: 64QAM  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 1

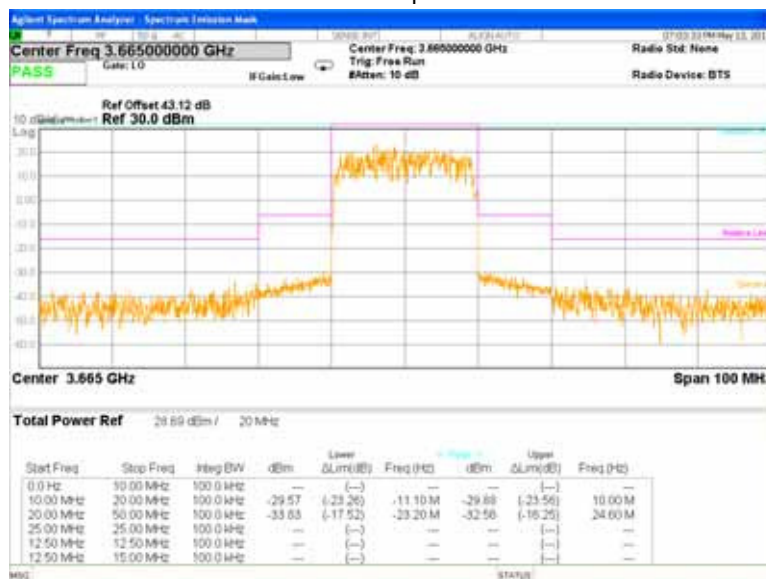


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask	
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 13-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa
	<b>Relative Humidity:</b> 44 %
	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>	

Plot 7.3.12 Emission mask test results at high carrier frequency

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 1

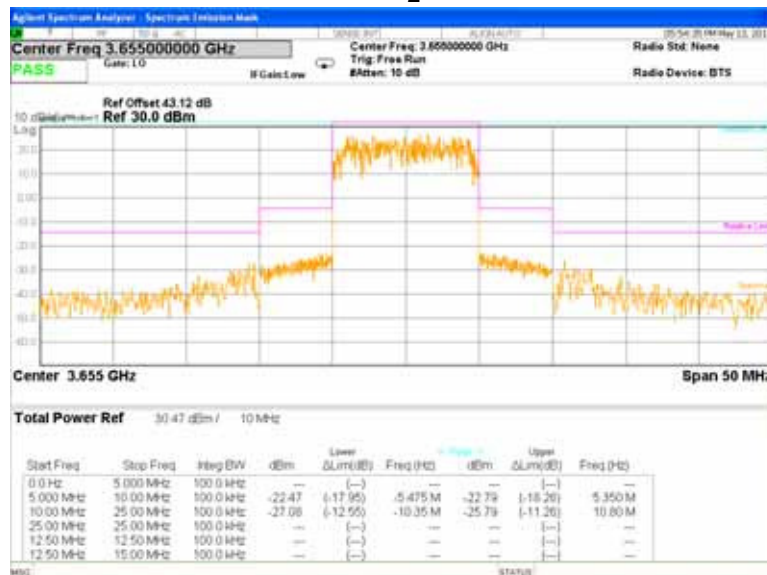


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b>		<b>FCC Section 90.210(b), Emission mask</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>		<b>Verdict: PASS</b>	
<b>Date(s):</b>		13-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.3.13 Emission mask test results at low carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER: NOTE2  
RF Chain: 2

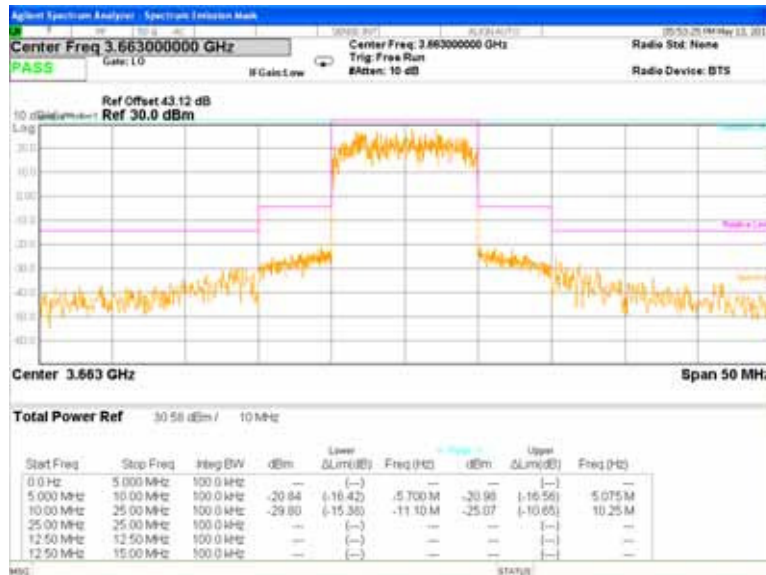


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.3.14 Emission mask test results at mid carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 2

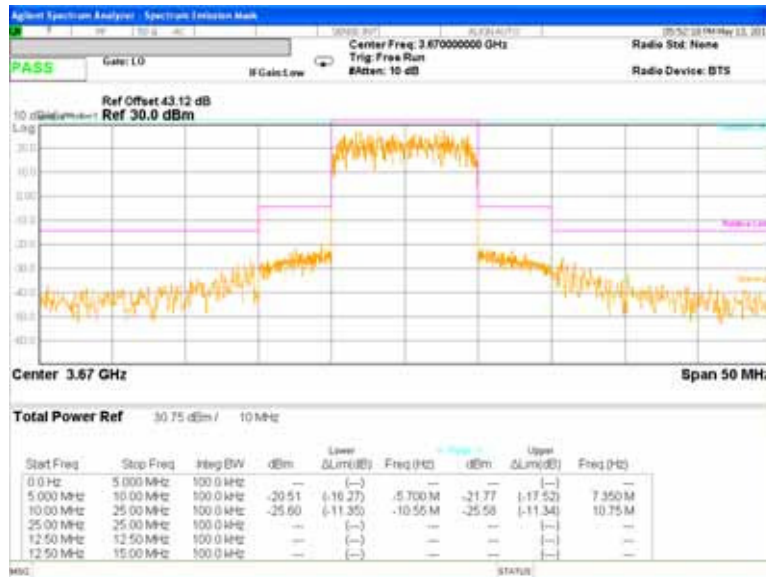


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Plot 7.3.15 Emission mask test results at high carrier frequency

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 2



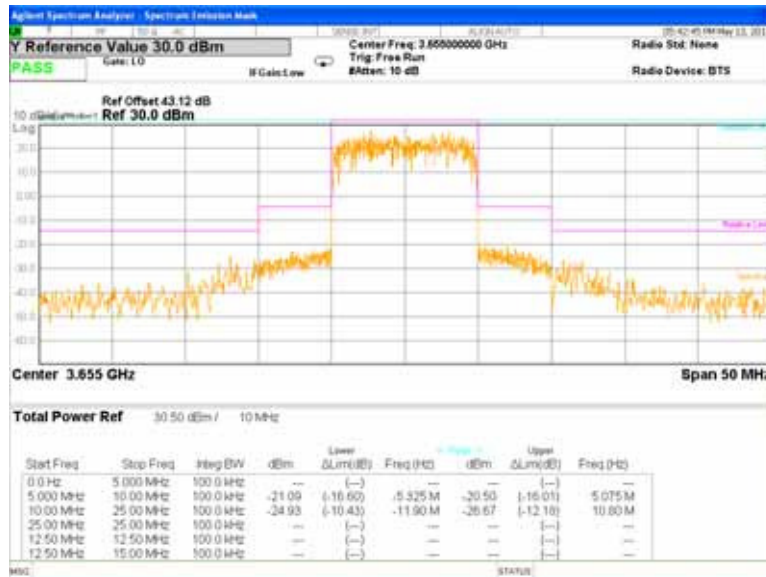
\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )



<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.3.16 Emission mask test results at low carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER: NOTE2  
RF Chain: 2

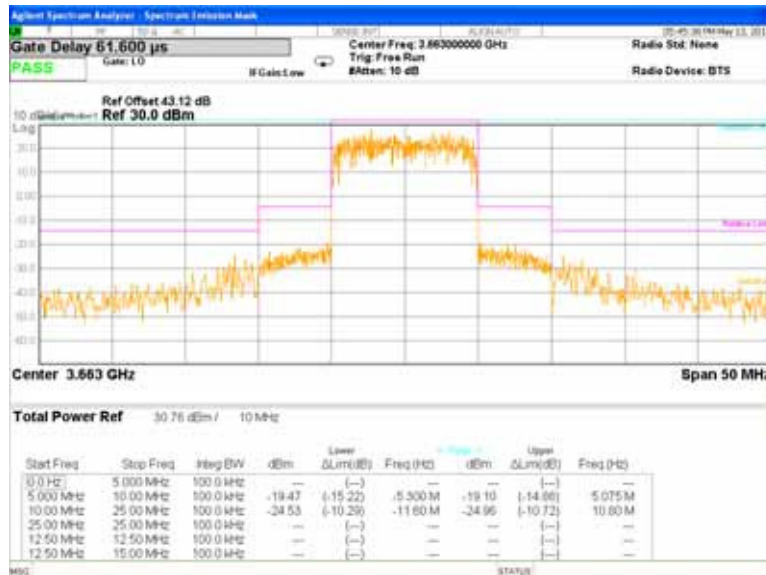


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.3.17 Emission mask test results at mid carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 2

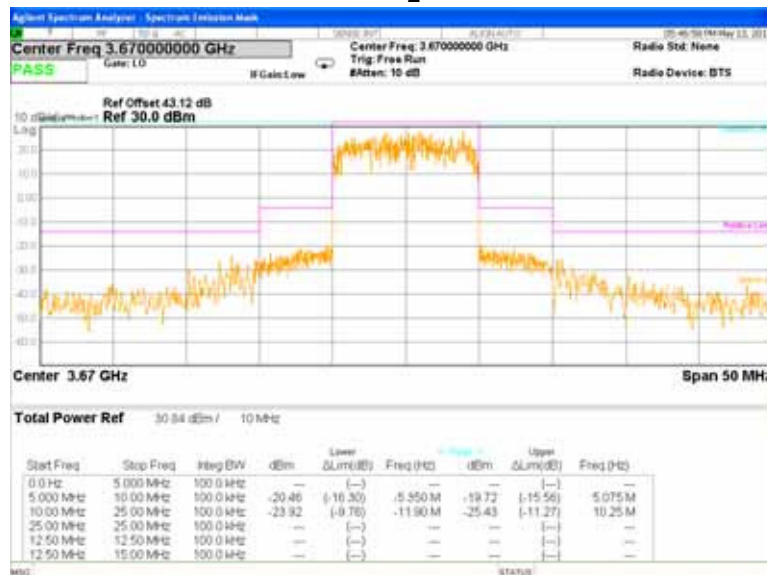


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b>	<b>FCC Section 90.210(b), Emission mask</b>		
<b>Test procedure:</b>	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	13-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Plot 7.3.18 Emission mask test results at high carrier frequency

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 10 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 2

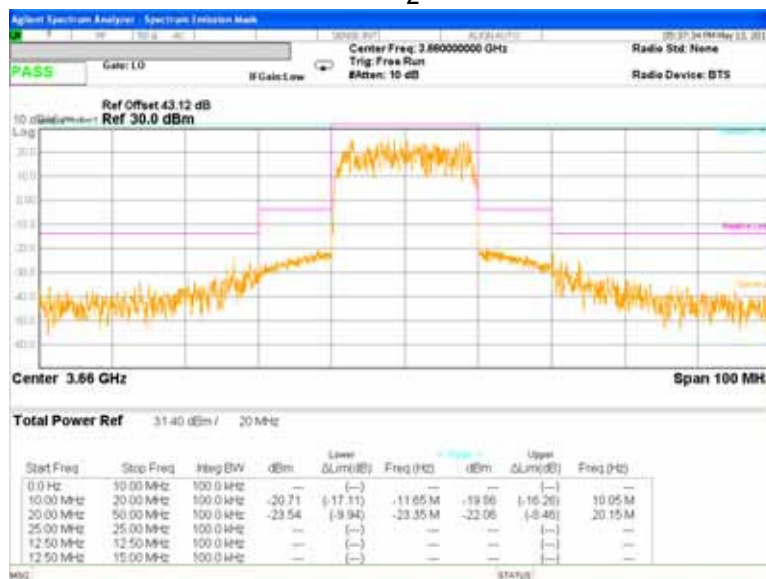


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Plot 7.3.19 Emission mask test results at low carrier frequency

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER: NOTE2  
RF Chain: 2

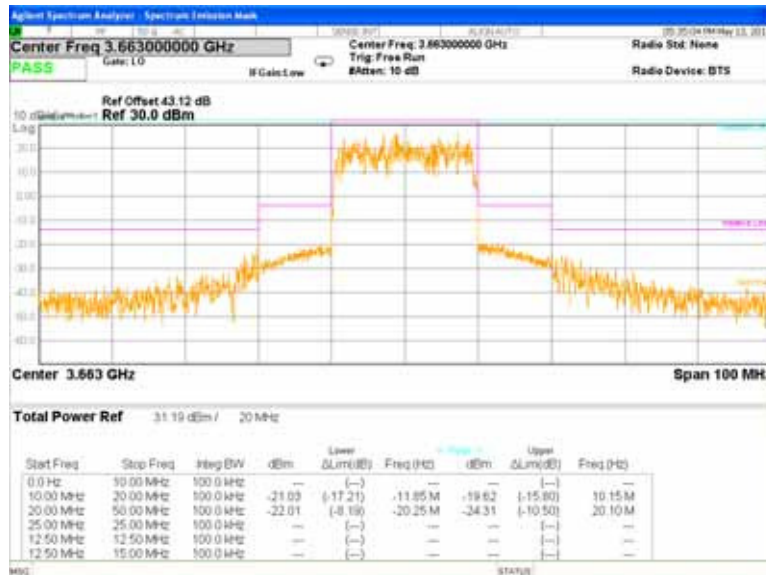


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask	
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 13-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa
	<b>Relative Humidity:</b> 44 %
	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>	

**Plot 7.3.20 Emission mask test results at mid carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 2

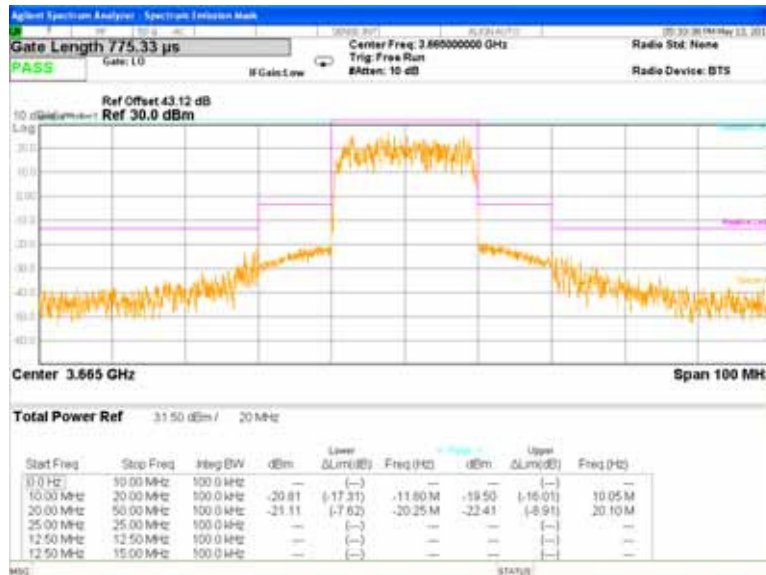


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.3.21 Emission mask test results at high carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 2

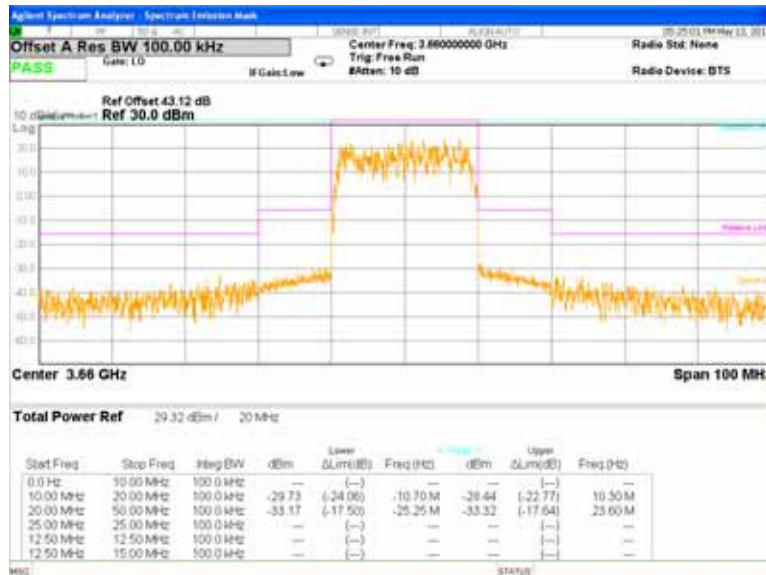


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.3.22 Emission mask test results at low carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER: NOTE2  
RF Chain: 2



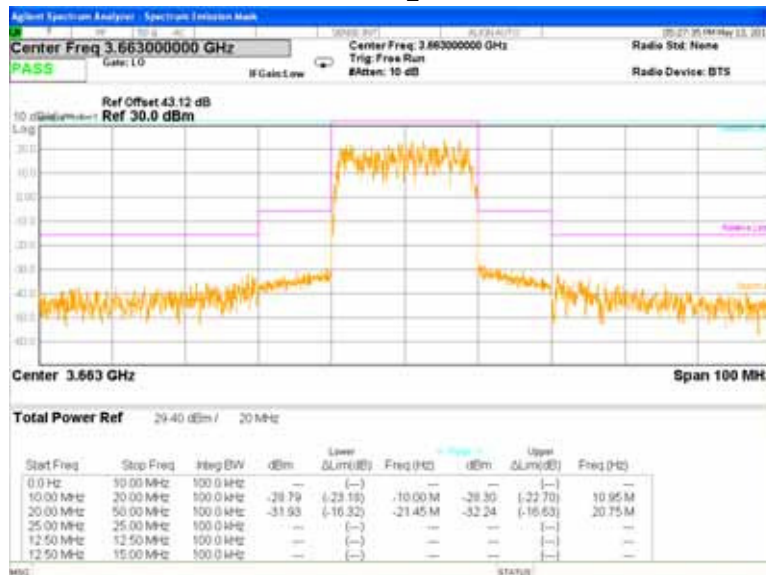
\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )



<b>Test specification:</b>		<b>FCC Section 90.210(b), Emission mask</b>	
<b>Test procedure:</b>		47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>		<b>Verdict:</b>	
Compliance		PASS	
<b>Date(s):</b>		13-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.3.23 Emission mask test results at mid carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: QPSK  
MODULATING SIGNAL: 64QAM  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 2

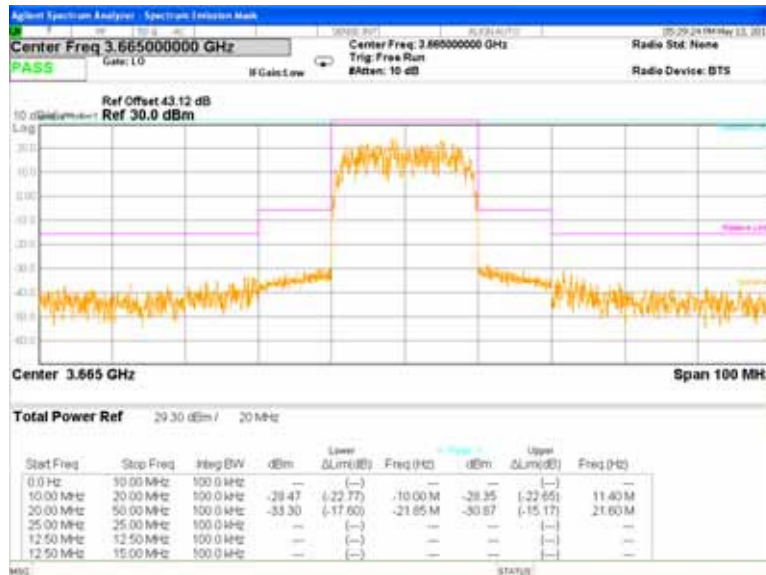


\*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b> FCC Section 90.210(b), Emission mask			
<b>Test procedure:</b> 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 13-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1012 hPa	<b>Relative Humidity:</b> 44 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.3.24 Emission mask test results at high carrier frequency**

OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz  
DETECTOR USED: Average  
MODULATION: 64QAM  
MODULATING SIGNAL: PRBS  
CHANNEL BANDWIDTH: 20 MHz  
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2  
RF Chain: 2



\*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 ( $10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$ )

<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Remarks:</b>		<b>Verdict: PASS</b>	
		<b>Relative Humidity: 53 %</b>	
		<b>Power Supply: 48VDC</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, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		<b>Verdict:</b>	
Compliance		PASS	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

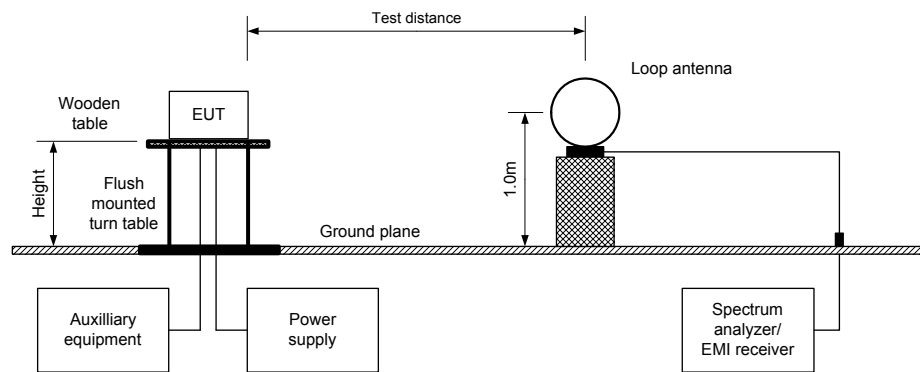
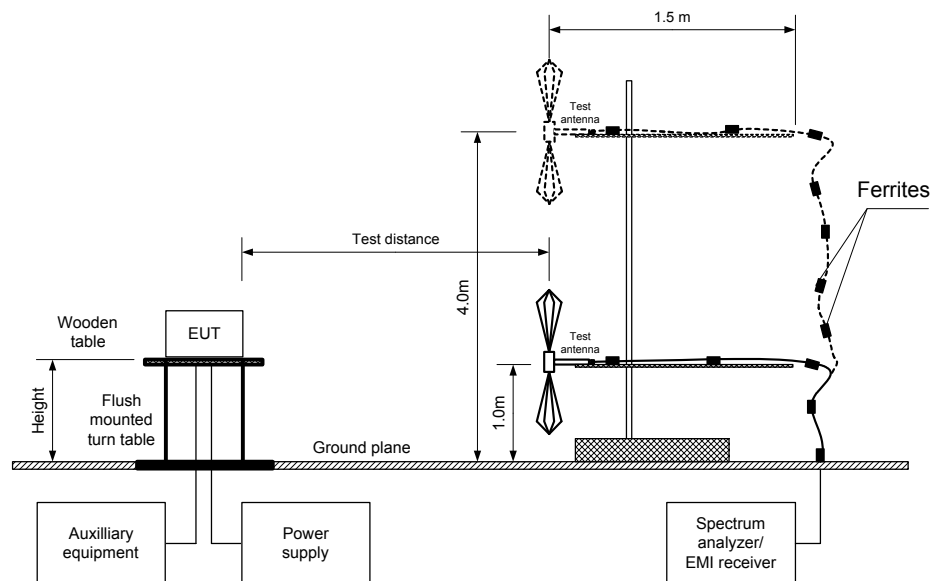


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz



<b>Test specification:</b>	<b>Section 90.1323, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	14-May-14 - 15-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz  
TEST DISTANCE: 3 m  
TEST SITE: Semi anechoic chamber / OATS  
EUT HEIGHT: 0.8 m  
INVESTIGATED FREQUENCY RANGE: 0.009 – 36750 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: 20 MHz (Highest power settings)  
MODULATION: QPSK (worst case power and power density)  
MODE: MIMO  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: See Note 1

Frequency, MHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
<b>Low carrier frequency 3660.0 MHz</b>							
All spurious emissions are 20 dB below the limit							
<b>Mid carrier frequency 3663.0 MHz</b>							
All spurious emissions are 20 dB below the limit							
<b>High carrier frequency 3665.0 MHz</b>							
All spurious emissions are 20 dB below the limit							

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

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

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.

Power Settings	RF Chain 1		RF Chain 2	
	QPSK	64QAM	QPSK	64QAM
10MHz	20 HEX	20 HEX	20 HEX	20 HEX
20MHz	19 HEX	14 HEX	19 HEX	17 HEX

**Reference numbers of test equipment used**

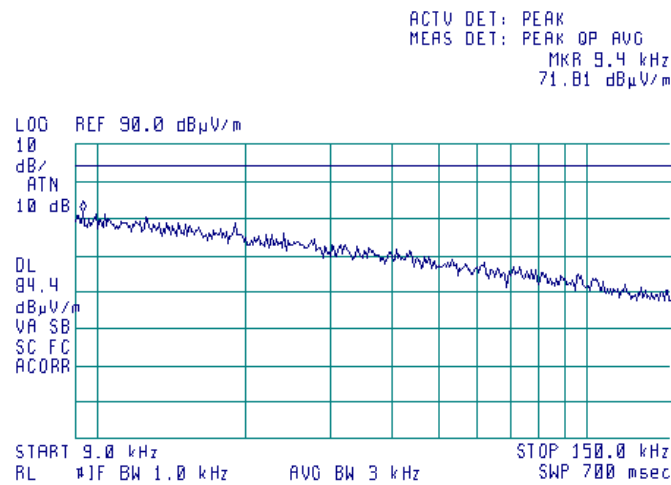
HL 0446	HL 0521	HL 0604	HL 0768	HL 0769	HL 1424	HL 2432	HL 2871
HL 2909	HL 3535	HL 3901	HL 4160	HL 4353			

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, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Relative Humidity: 53 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			

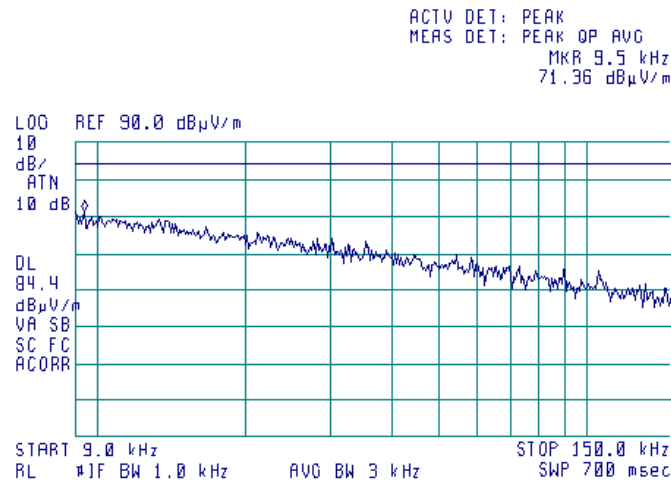
Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

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

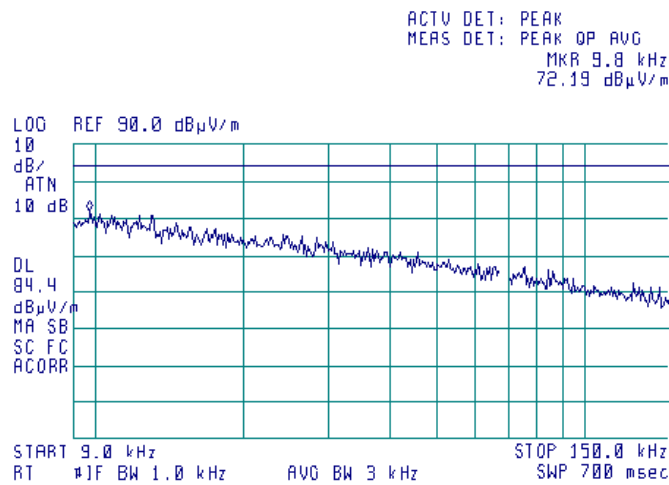
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Mid  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Relative Humidity: 53 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			
		<b>Verdict: PASS</b>	

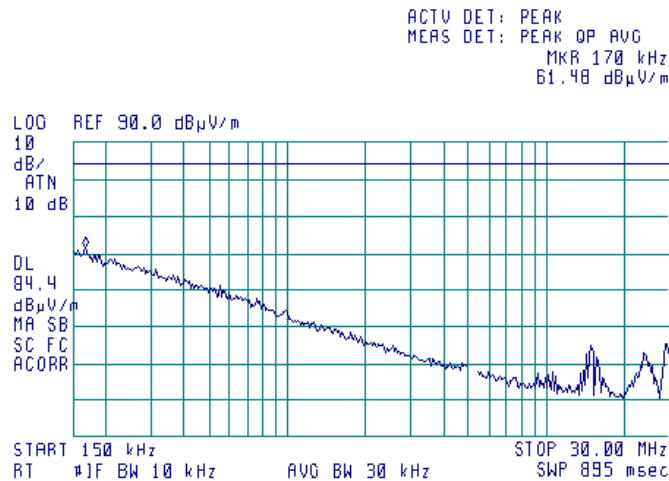
**Plot 7.4.3 Radiated emission measurements in 9 - 150 kHz range**

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

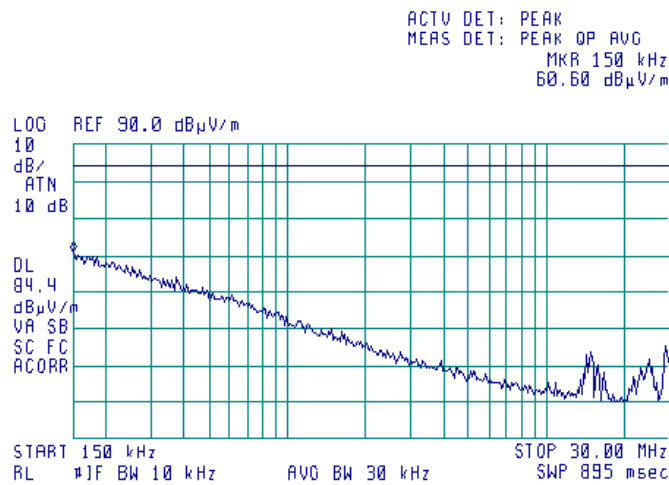




<b>Test specification:</b>	<b>Section 90.1323, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	14-May-14 - 15-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

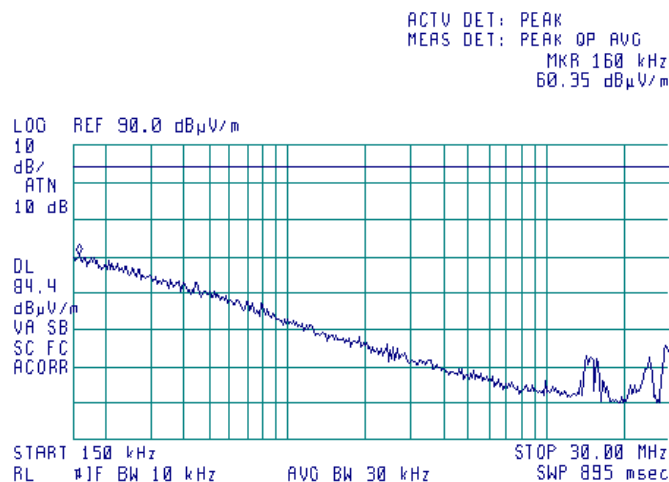
**Plot 7.4.5 Radiated emission measurements in 0.15 - 30 MHz range**

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**

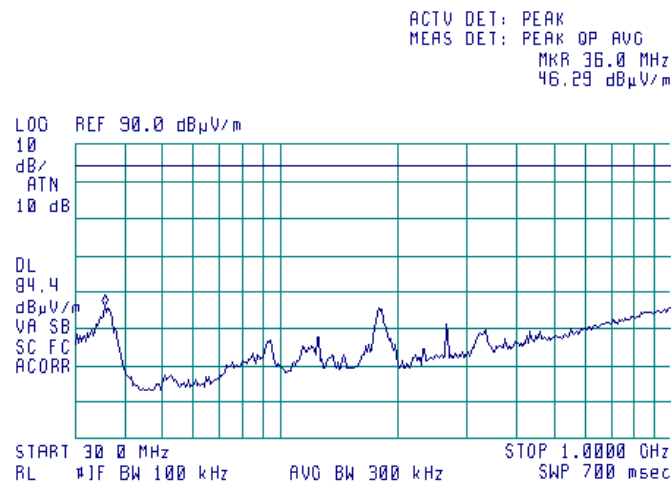
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Relative Humidity: 53 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			
		<b>Verdict: PASS</b>	

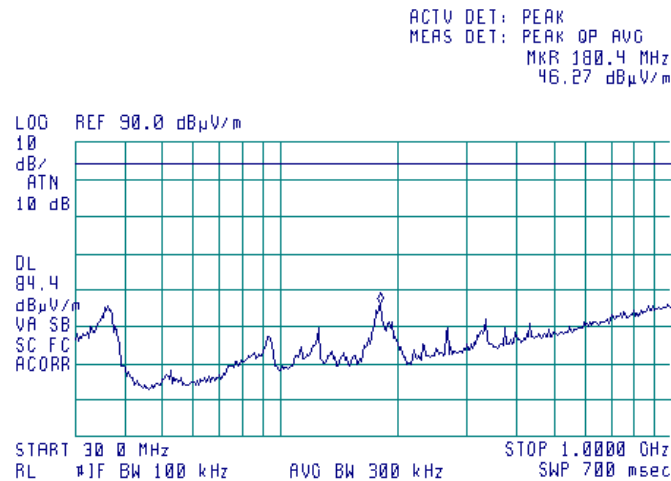
**Plot 7.4.7 Radiated emission measurements in 30 - 1000 MHz range**

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



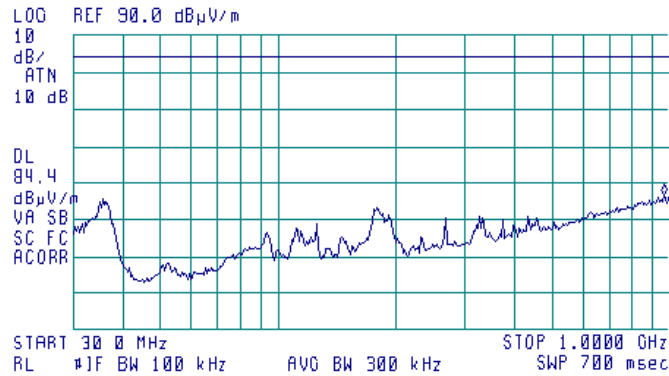
<b>Test specification:</b>	<b>Section 90.1323, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	14-May-14 - 15-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 48VDC
<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



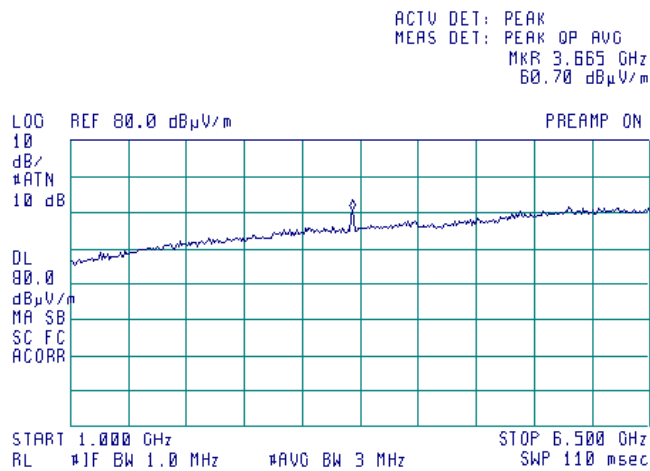
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 961.9 MHz  
46.70 dBµV/m



<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Relative Humidity: 53 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			
		<b>Verdict: PASS</b>	

**Plot 7.4.10 Radiated emission measurements in 1000 – 6500 MHz range**

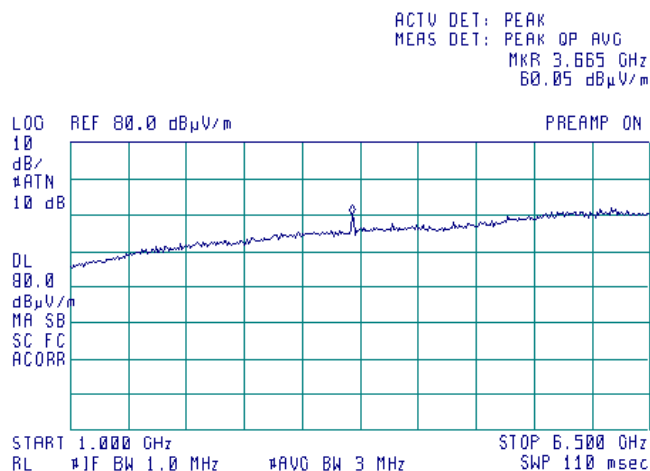
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



3650.0 MHz is low carrier frequency

**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

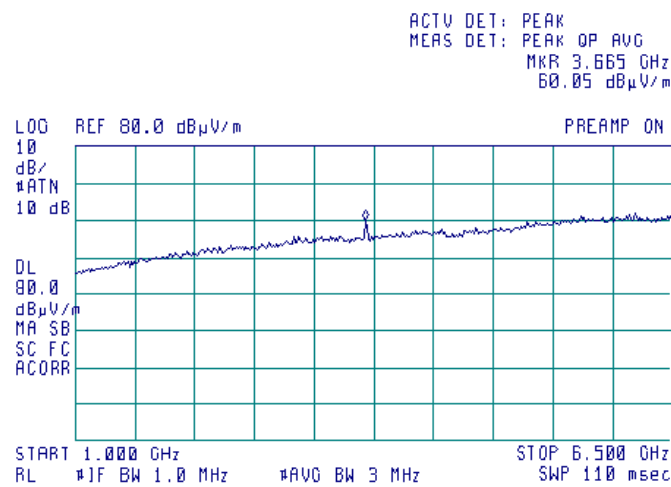


3663.0 MHz is mid carrier frequency

<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Relative Humidity: 53 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			

Plot 7.4.12 Radiated emission measurements in 1000 – 6500 MHz range

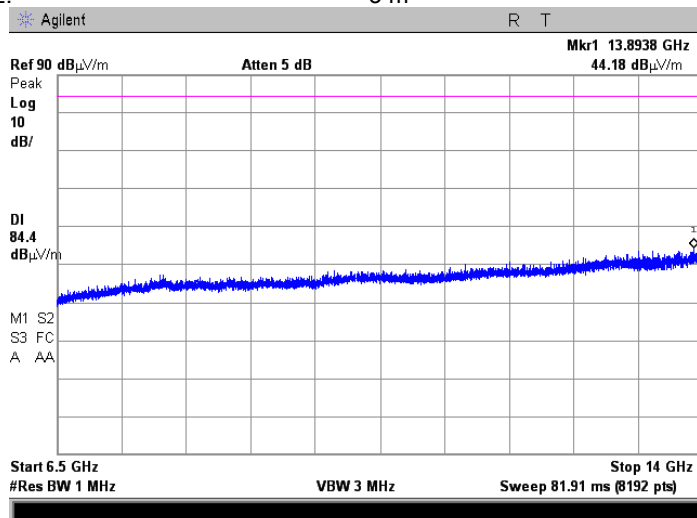
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



3665.0 MHz is high carrier frequency

Plot 7.4.13 Radiated emission measurements in 6500 – 14000 MHz range

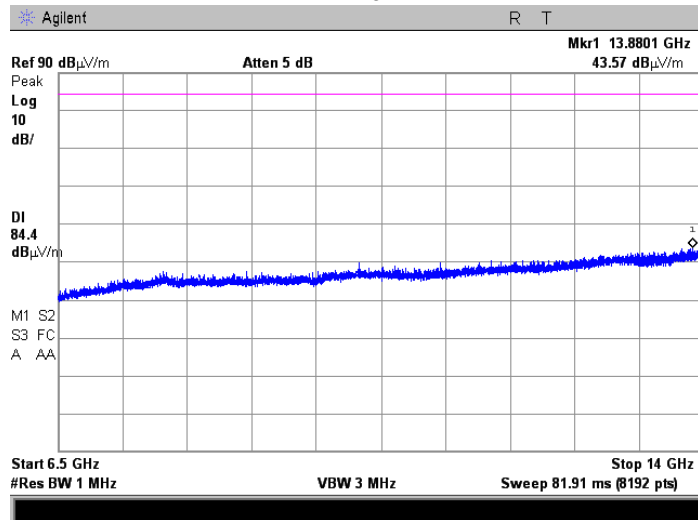
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: Low  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Relative Humidity: 53 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			
		<b>Verdict: PASS</b>	

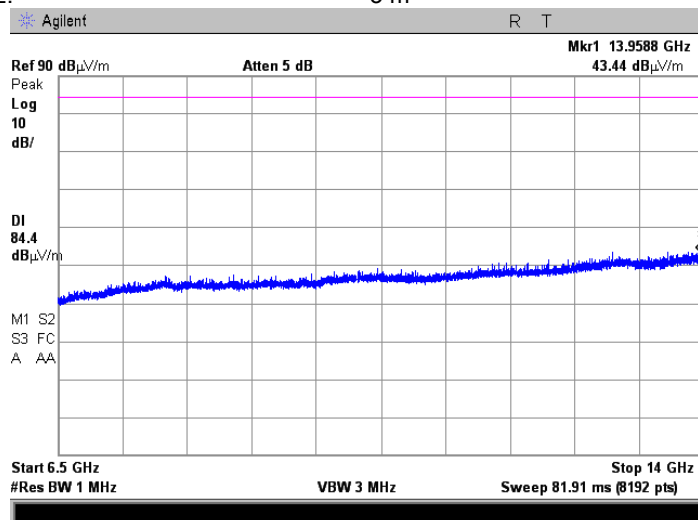
**Plot 7.4.14 Radiated emission measurements in 6500 – 14000 MHz range**

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



**Plot 7.4.15 Radiated emission measurements in 6500 – 14000 MHz range**

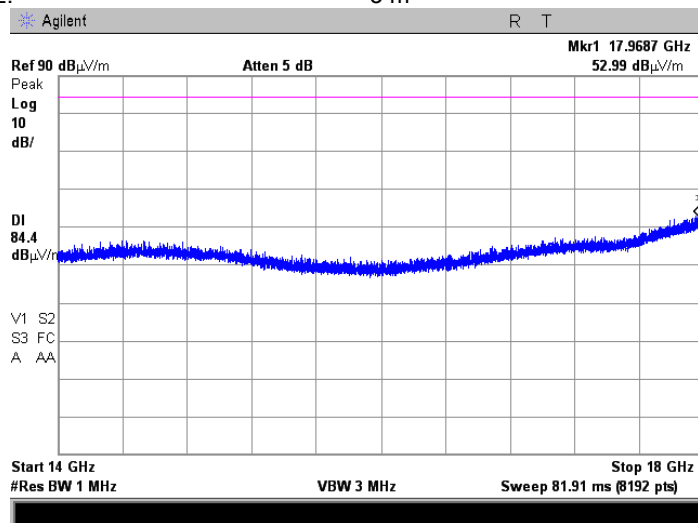
TEST SITE: Semi anechoic chamber  
 CARRIER FREQUENCY: High  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



<b>Test specification:</b>	<b>Section 90.1323, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	14-May-14 - 15-May-14		
<b>Temperature: 25 °C</b>	<b>Air Pressure: 1016 hPa</b>	<b>Relative Humidity: 53 %</b>	<b>Power Supply: 48VDC</b>
<b>Remarks:</b>			

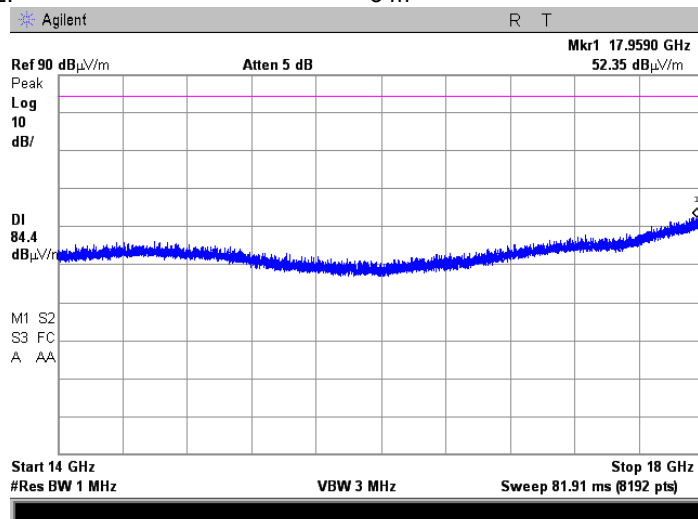
**Plot 7.4.16 Radiated emission measurements in 14000 – 18000 MHz range**

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



**Plot 7.4.17 Radiated emission measurements in 14000 – 18000 MHz range**

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

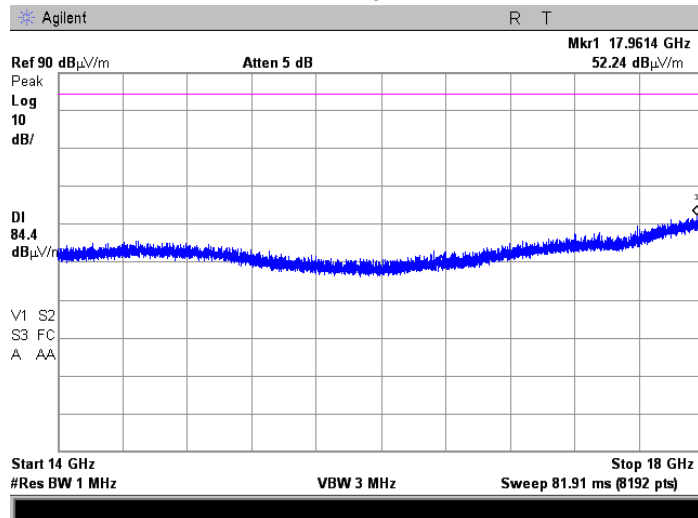




<b>Test specification:</b>	<b>Section 90.1323, Radiated spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	14-May-14 - 15-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

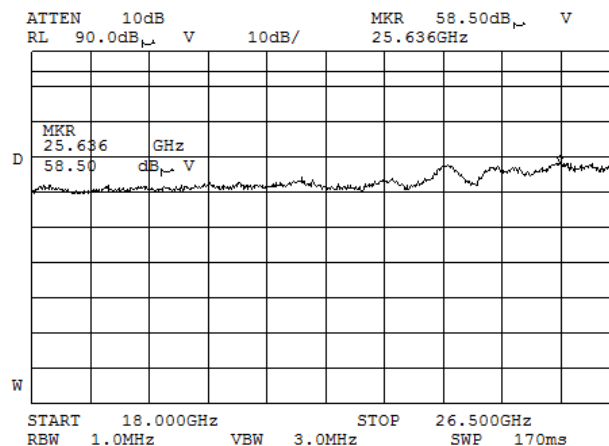
**Plot 7.4.18 Radiated emission measurements in 14000 – 18000 MHz range**

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



**Plot 7.4.19 Radiated emission measurements in 18000 – 26500 MHz range**

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

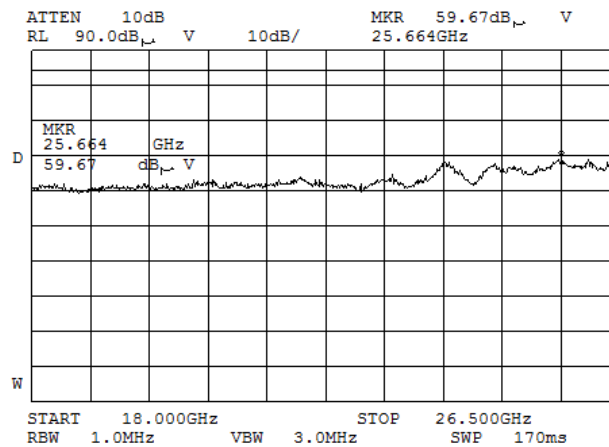


dBuV units correspond to dBuV/m

<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Relative Humidity: 53 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			
		<b>Verdict: PASS</b>	

**Plot 7.4.20 Radiated emission measurements in 18000 – 26500 MHz range**

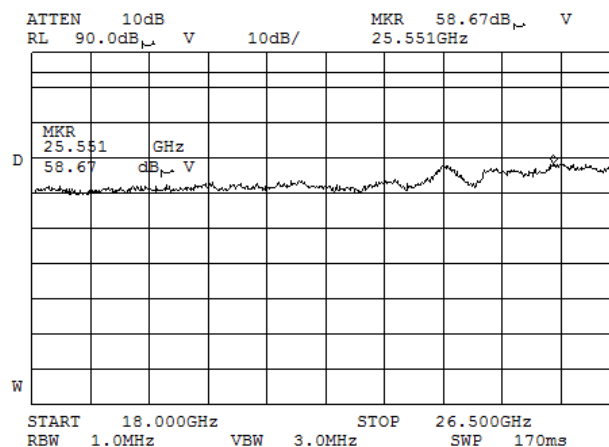
TEST SITE: OATS  
 CARRIER FREQUENCY: Mid  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 TEST DISTANCE: 3 m



dBuV units correspond to dBuV/m

**Plot 7.4.21 Radiated emission measurements in 18000 – 26500 MHz range**

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

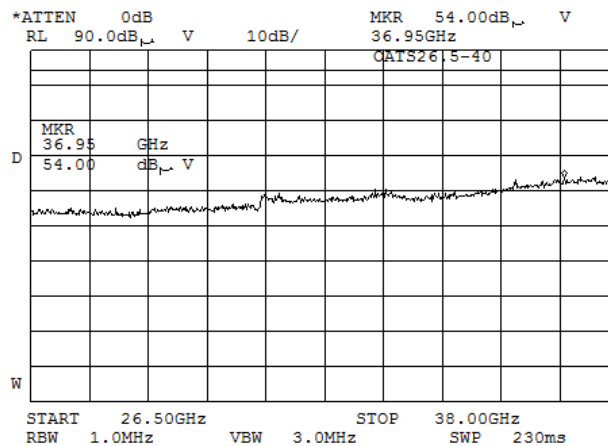


dBuV units correspond to dBuV/m

<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature: 25 °C</b>		<b>Air Pressure: 1016 hPa</b>	
<b>Relative Humidity: 53 %</b>		<b>Power Supply: 48VDC</b>	
<b>Remarks:</b>			
		<b>Verdict: PASS</b>	

**Plot 7.4.22 Radiated emission measurements in 26500 – 38000 MHz range**

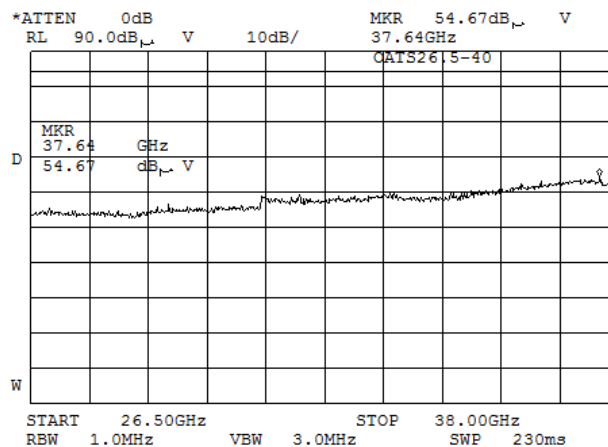
TEST SITE: OATS  
CARRIER FREQUENCY: Low  
ANTENNA POLARIZATION: Vertical and Horizontal  
TEST DISTANCE: 3 m



dBuV units correspond to dBuV/m

**Plot 7.4.23 Radiated emission measurements in 26500 – 38000 MHz range**

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

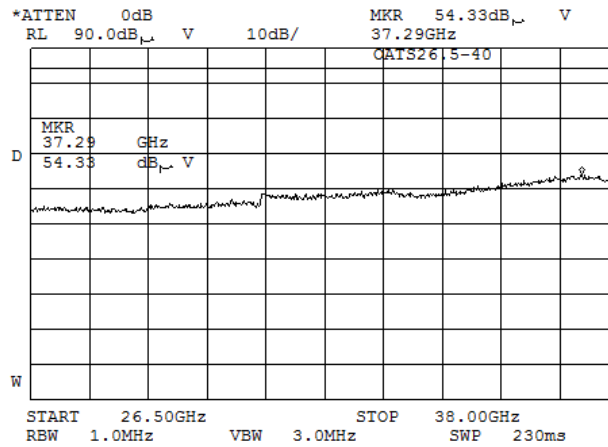


dBuV units correspond to dBuV/m

<b>Test specification:</b>		<b>Section 90.1323, Radiated spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
<b>Test mode:</b>		<b>Verdict:</b>	
Compliance		PASS	
<b>Date(s):</b>		14-May-14 - 15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1016 hPa	<b>Relative Humidity:</b> 53 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

**Plot 7.4.24 Radiated emission measurements in 26500 – 38000 MHz range**

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



dBuV units correspond to dBuV/m

<b>Test specification:</b>	<b>Section 90.1323, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	15-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 48VDC
<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.

**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

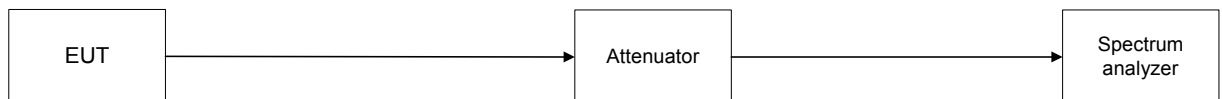
### 7.5.2 Test procedure

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 the associated plots.

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





<b>Test specification:</b>		<b>Section 90.1323, Conducted spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>		Compliance	
<b>Date(s):</b>		15-May-14	
<b>Temperature:</b> 25 °C		<b>Air Pressure:</b> 1011 hPa	
		<b>Relative Humidity:</b> 43 %	
		<b>Power Supply:</b> 48VDC	
<b>Remarks:</b>			

**Table 7.5.2 Spurious emission test results**

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 36750 MHz  
 DETECTOR USED: Peak  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 MODULATION: QPSK  
 MODULATING SIGNAL: PRBS  
 EMISSION BANDWIDTH: 20 MHz (worst case output power and density)  
 TRANSMITTER OUTPUT POWER: See Note 2

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
All spurious emissions are 20 dB below the limit								Pass

\*- Margin = Spurious emission – specification limit.

NOTE1: The spurious emissions worst case was found during single antenna mode configuration.

NOTE2: Measurement was performed at QPSK modulation and 20 MHz EBW - the worst case according to power and power density tests.

Power Settings	RF Chain 1		RF Chain 2	
	QPSK	64QAM	QPSK	64QAM
10MHz	20 HEX	20 HEX	20 HEX	20 HEX
20MHz	19 HEX	14 HEX	19 HEX	17 HEX

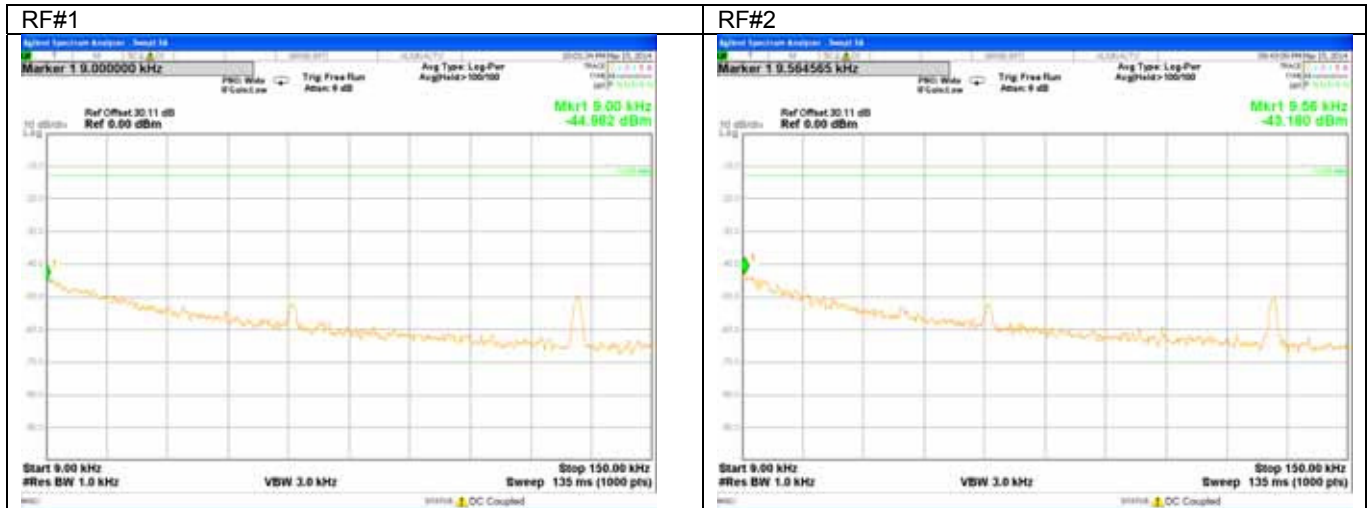
**Reference numbers of test equipment used**

HL 1424	HL 3322	HL 3455	HL 3770	HL 3901	HL 3903	HL 4229	HL 4273
HL 4575							

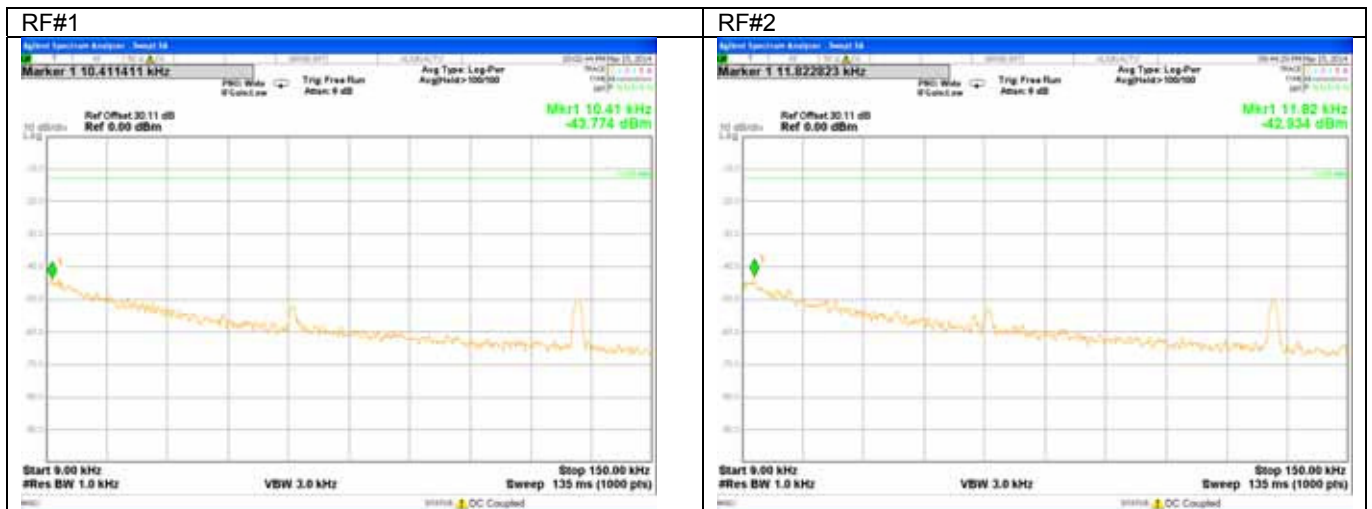
Full description is given in Appendix A.

<b>Test specification:</b> Section 90.1323, Conducted spurious emissions			
<b>Test procedure:</b> 47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance			<b>Verdict:</b> PASS
<b>Date(s):</b> 15-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

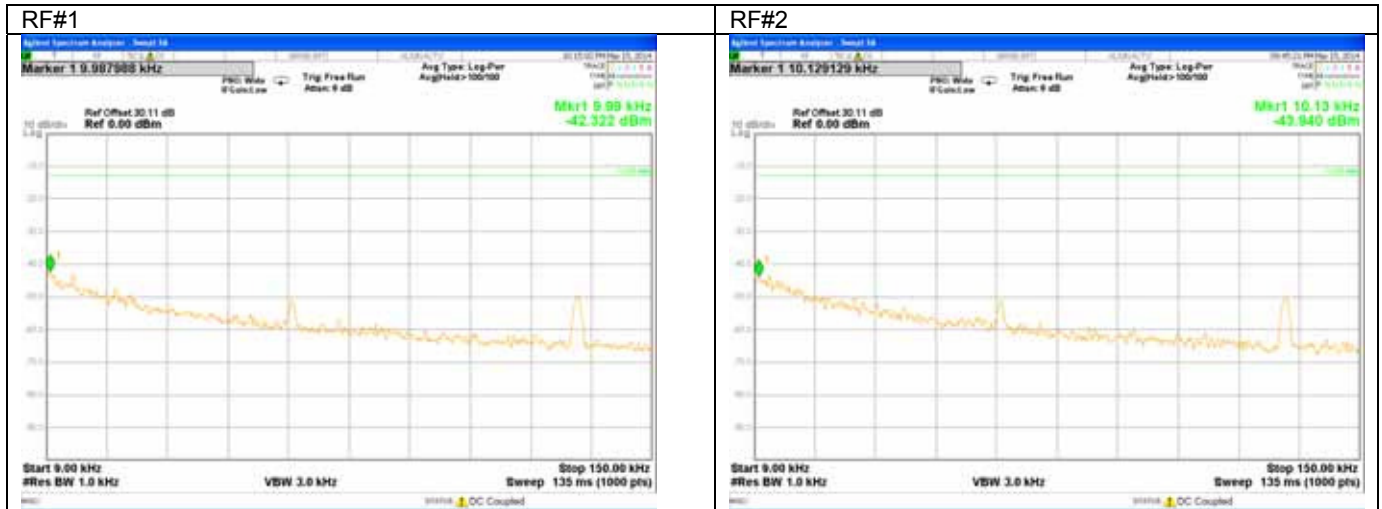


Plot 7.5.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

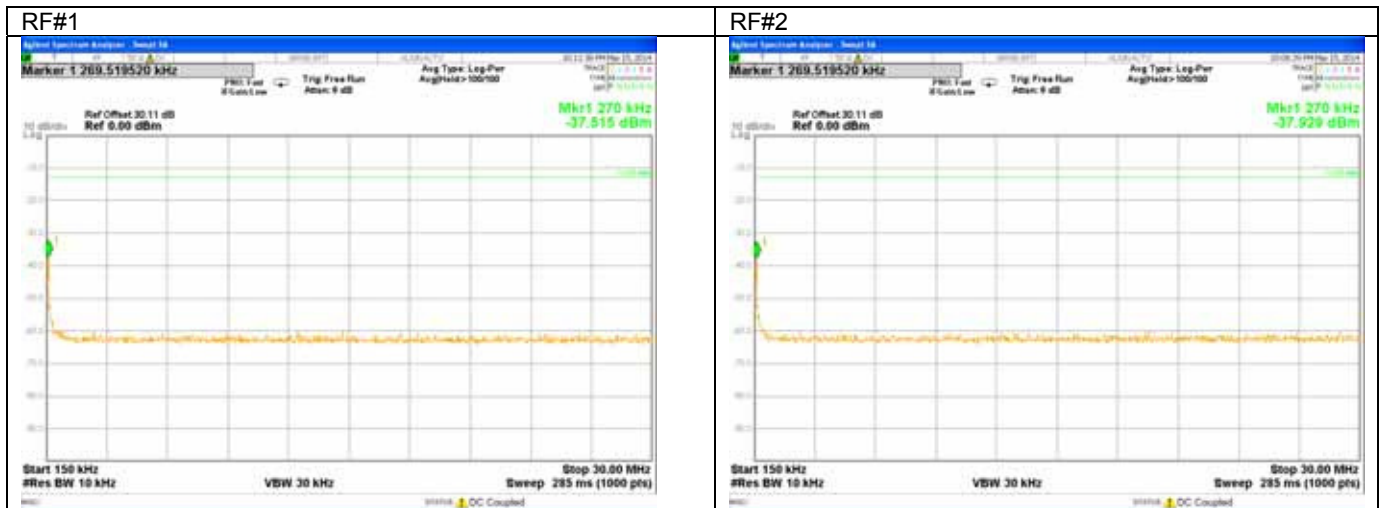


<b>Test specification:</b> Section 90.1323, Conducted spurious emissions			
<b>Test procedure:</b> 47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS		
<b>Date(s):</b> 15-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 48VDC
<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> Section 90.1323, Conducted spurious emissions			
<b>Test procedure:</b> 47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 15-May-14			
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

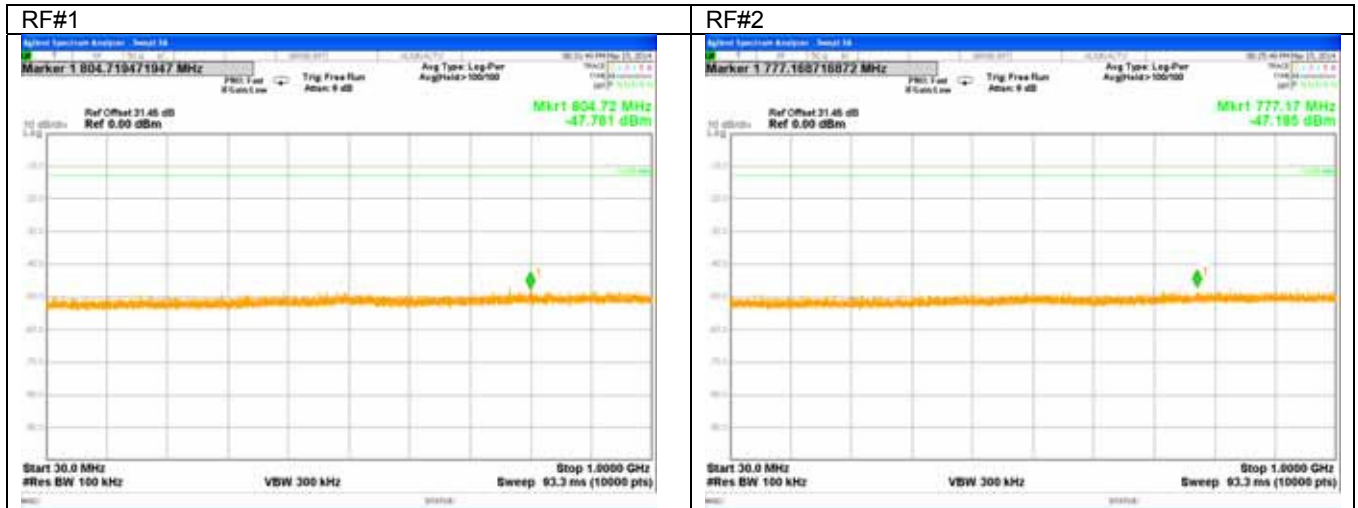


Plot 7.5.6 Spurious emission measurements in 0.15 – 30.0 MHz range at high carrier frequency

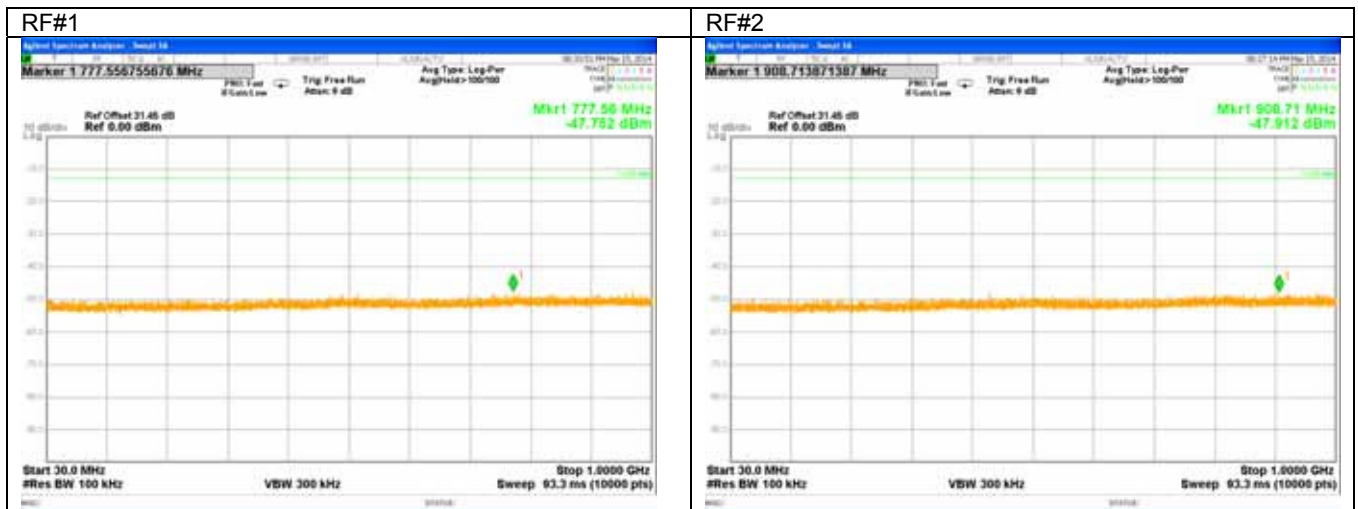


<b>Test specification:</b>		<b>Section 90.1323, Conducted spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>		<b>Verdict:</b>	
Compliance		PASS	
<b>Date(s):</b>		15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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

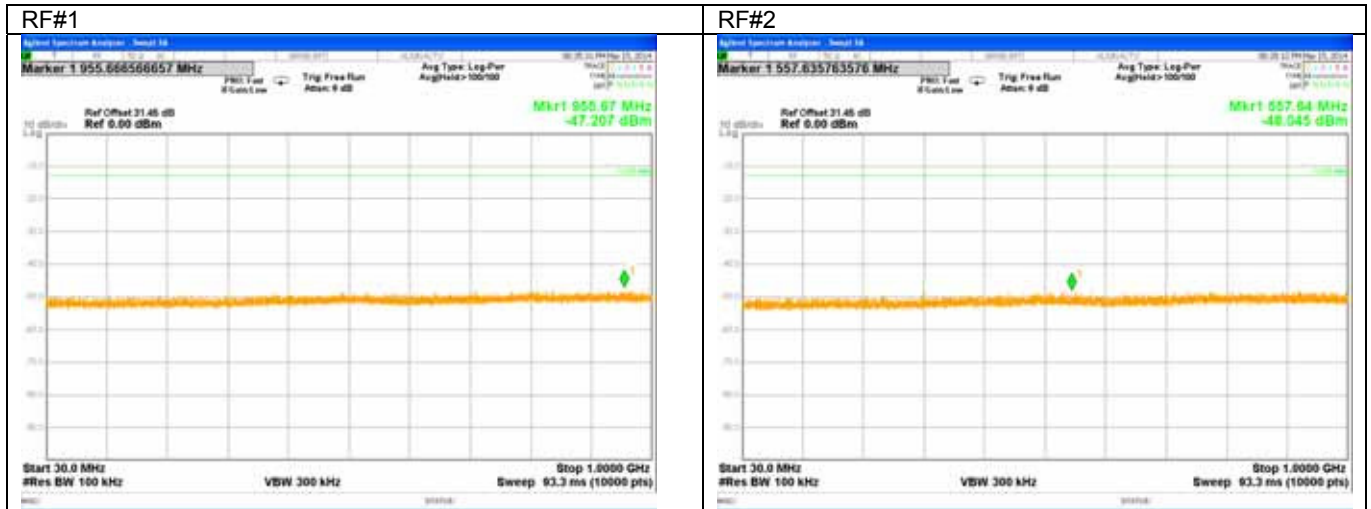


Plot 7.5.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency

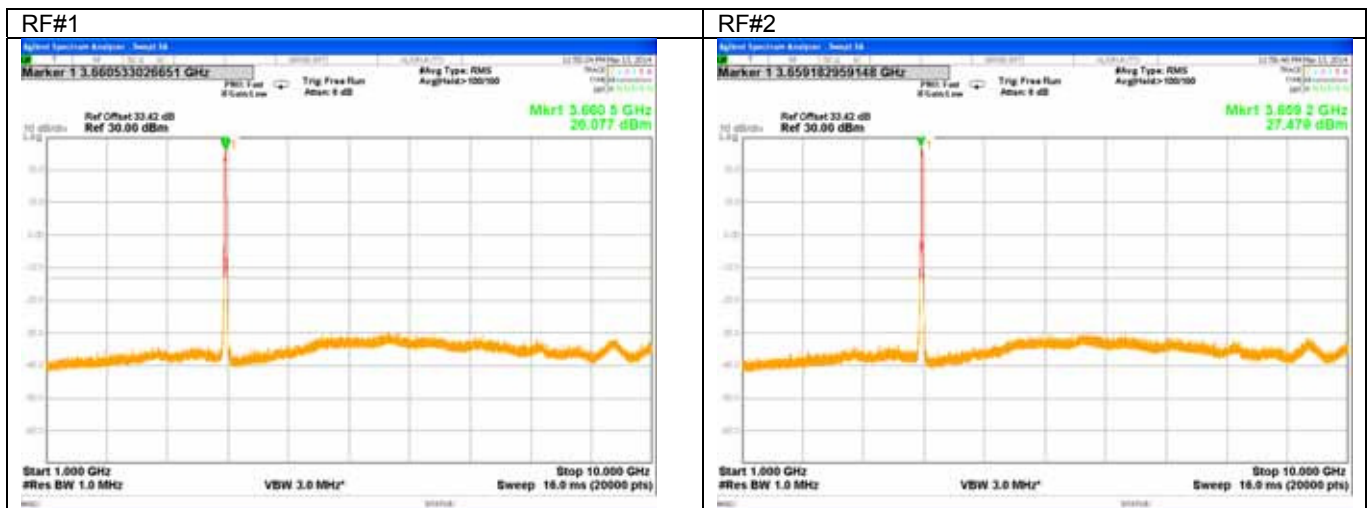


<b>Test specification:</b>		<b>Section 90.1323, Conducted spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>		<b>Verdict:</b> PASS	
<b>Date(s):</b>		15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

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



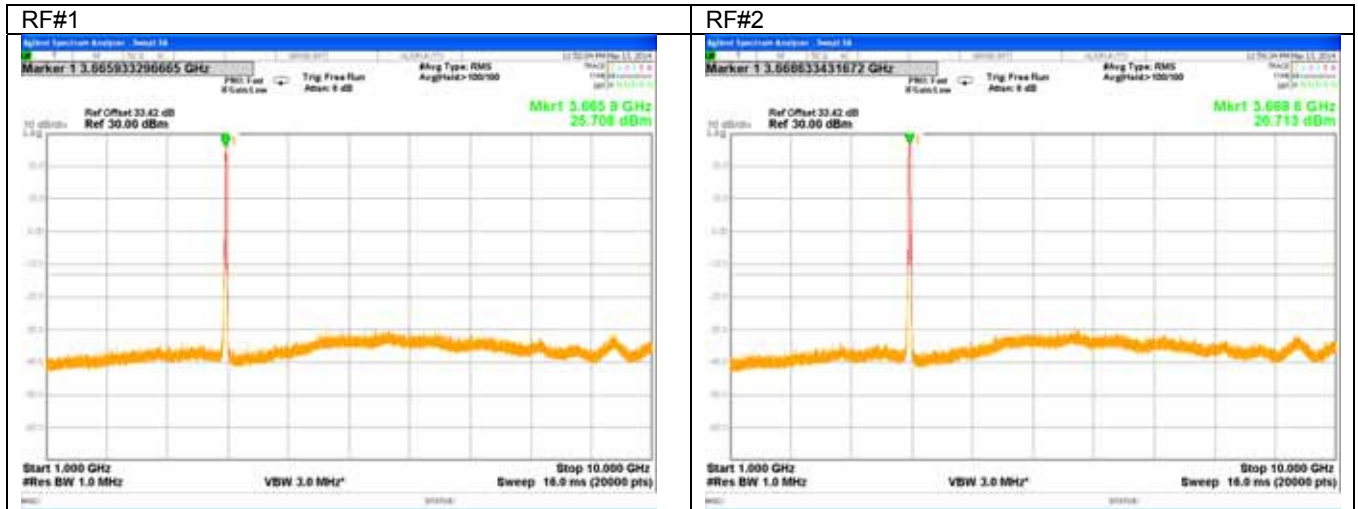
Plot 7.5.10 Spurious emission measurements in 1000 - 10000 MHz range at low carrier frequency



3650.0 MHz is low carrier frequency

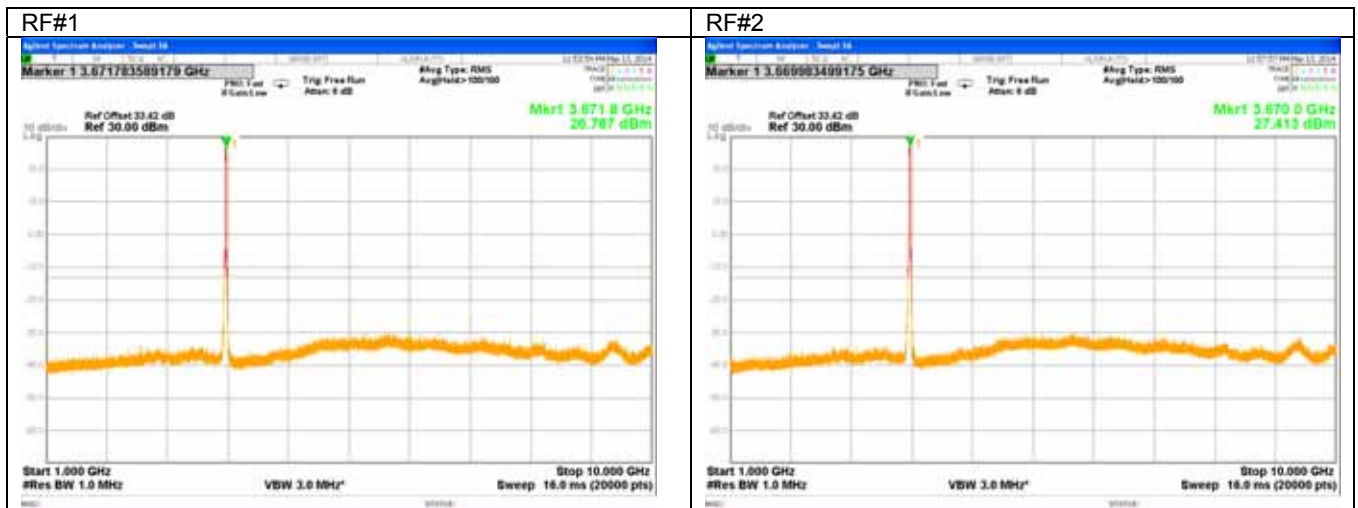
<b>Test specification:</b>	<b>Section 90.1323, Conducted spurious emissions</b>		
<b>Test procedure:</b>	47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13		
<b>Test mode:</b>	Compliance	<b>Verdict:</b>	<b>PASS</b>
<b>Date(s):</b>	15-May-14		
<b>Temperature: 25 °C</b>	<b>Air Pressure: 1011 hPa</b>	<b>Relative Humidity: 43 %</b>	<b>Power Supply: 48VDC</b>
<b>Remarks:</b>			

Plot 7.5.11 Spurious emission measurements in 1000 - 10000 MHz range at mid carrier frequency



3663.0 MHz is mid carrier frequency

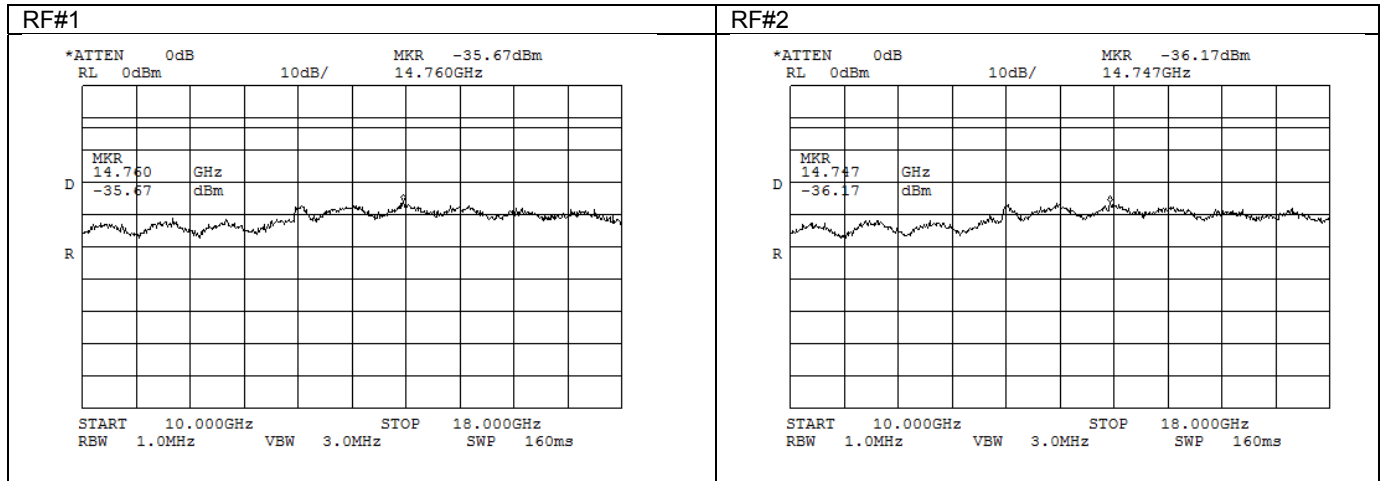
Plot 7.5.12 Spurious emission measurements in 1000 - 10000 MHz range at high carrier frequency



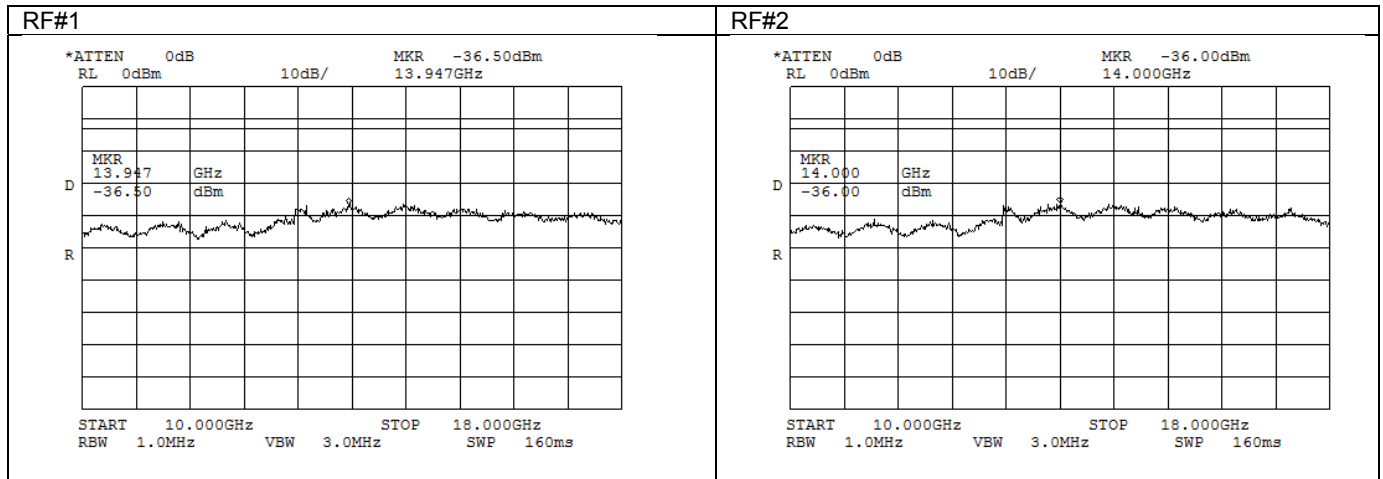
3665.0 MHz is high carrier frequency

<b>Test specification:</b>		<b>Section 90.1323, Conducted spurious emissions</b>	
<b>Test procedure:</b>		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b>		<b>Verdict:</b>	
Compliance		PASS	
<b>Date(s):</b>		15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa	<b>Relative Humidity:</b> 43 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Plot 7.5.13 Spurious emission measurements in 10000 - 18000 MHz range at low carrier frequency

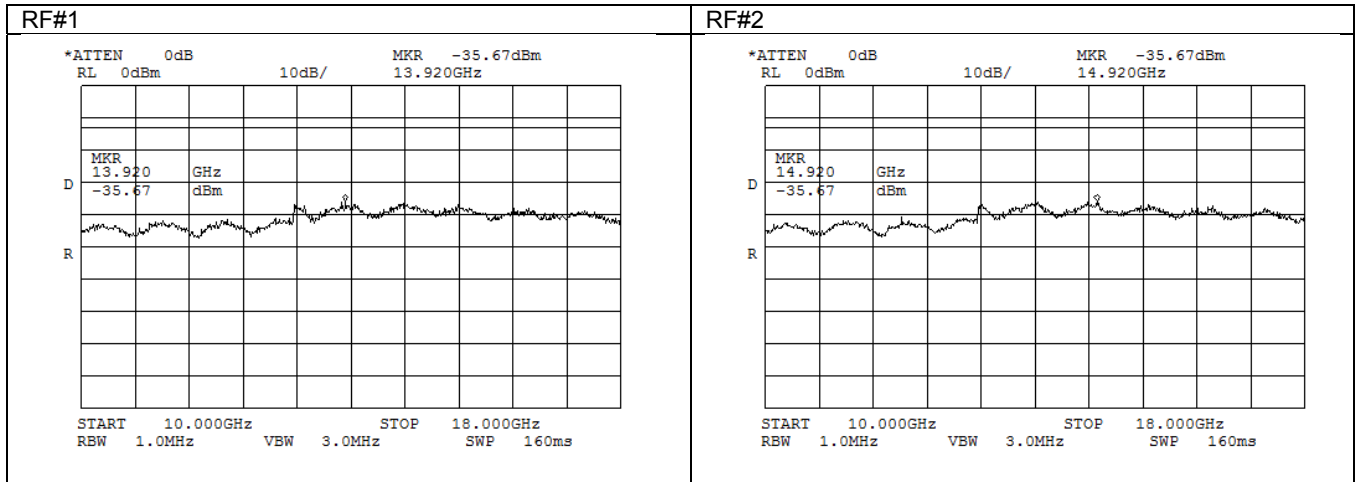


Plot 7.5.14 Spurious emission measurements in 10000 - 18000 MHz at mid carrier frequency

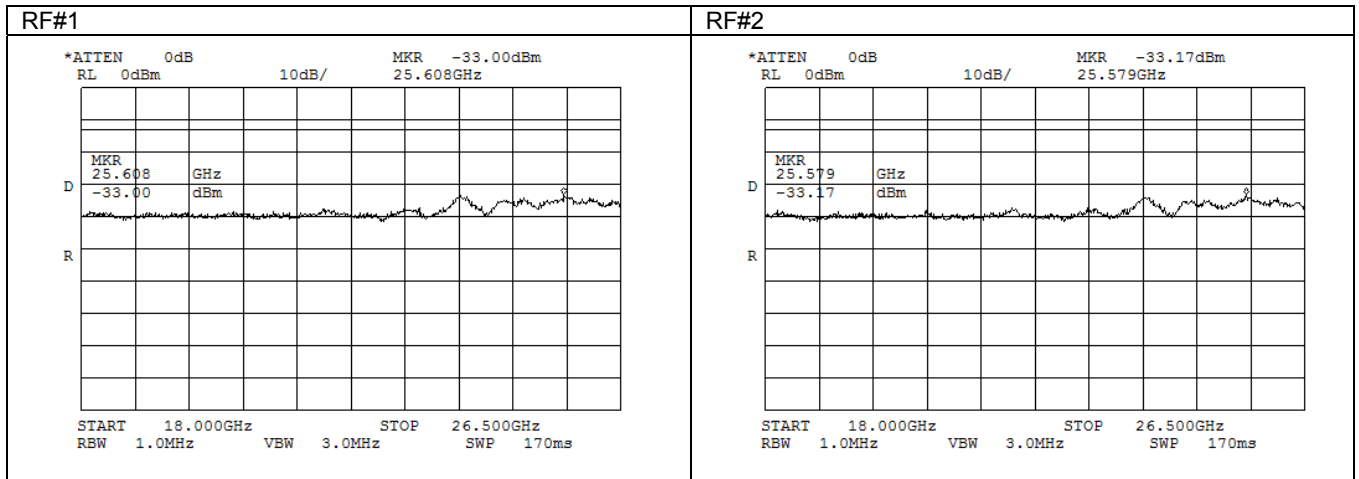


<b>Test specification:</b> Section 90.1323, Conducted spurious emissions	
<b>Test procedure:</b> 47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa
	<b>Relative Humidity:</b> 43 %
	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>	

Plot 7.5.15 Spurious emission measurements in 10000 - 18000 MHz at high carrier frequency

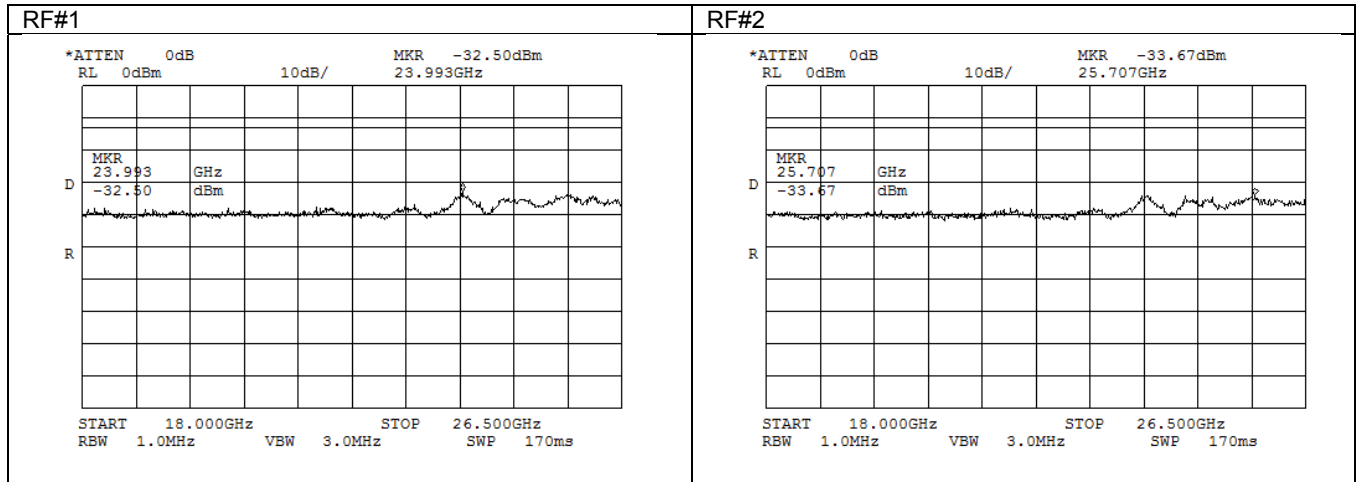


Plot 7.5.16 Spurious emission measurements in 18000 - 26500 MHz range at low carrier frequency

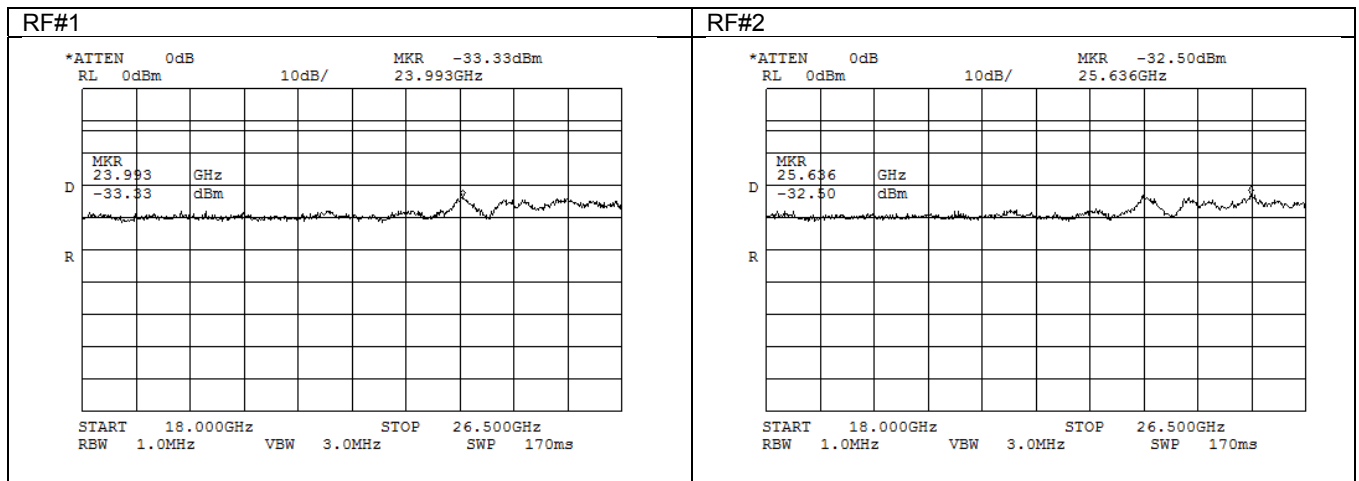


<b>Test specification:</b> Section 90.1323, Conducted spurious emissions	
<b>Test procedure:</b> 47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa
	<b>Relative Humidity:</b> 43 %
	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>	

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

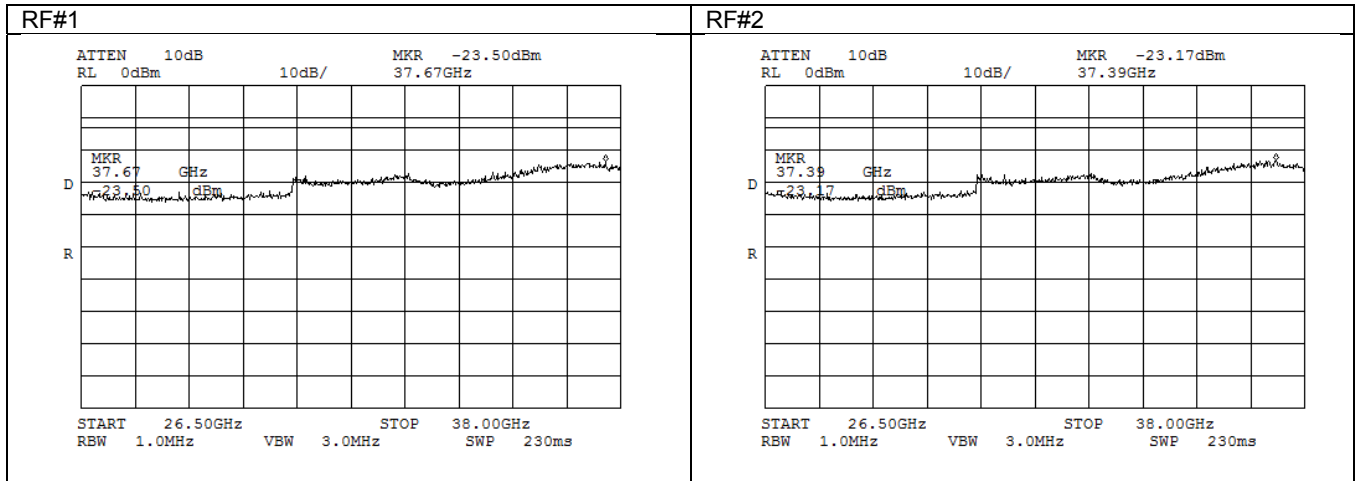


Plot 7.5.18 Spurious emission measurements in 18000 - 26500 MHz at high carrier frequency

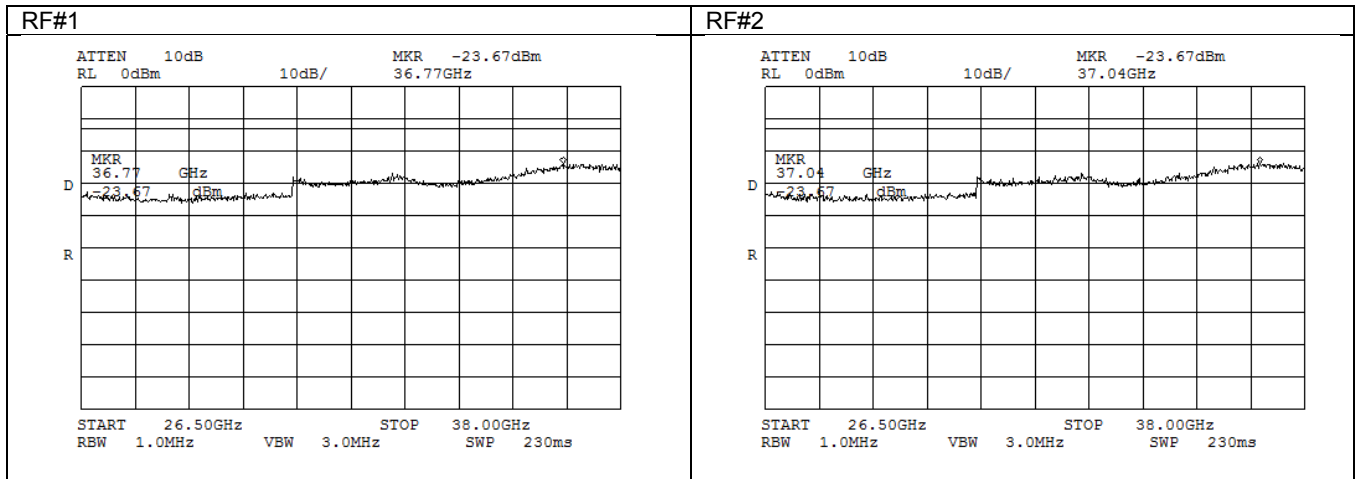


<b>Test specification:</b> Section 90.1323, Conducted spurious emissions	
<b>Test procedure:</b> 47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa
	<b>Relative Humidity:</b> 43 %
	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>	

Plot 7.5.19 Spurious emission measurements in 26500 - 38000 MHz range at low carrier frequency



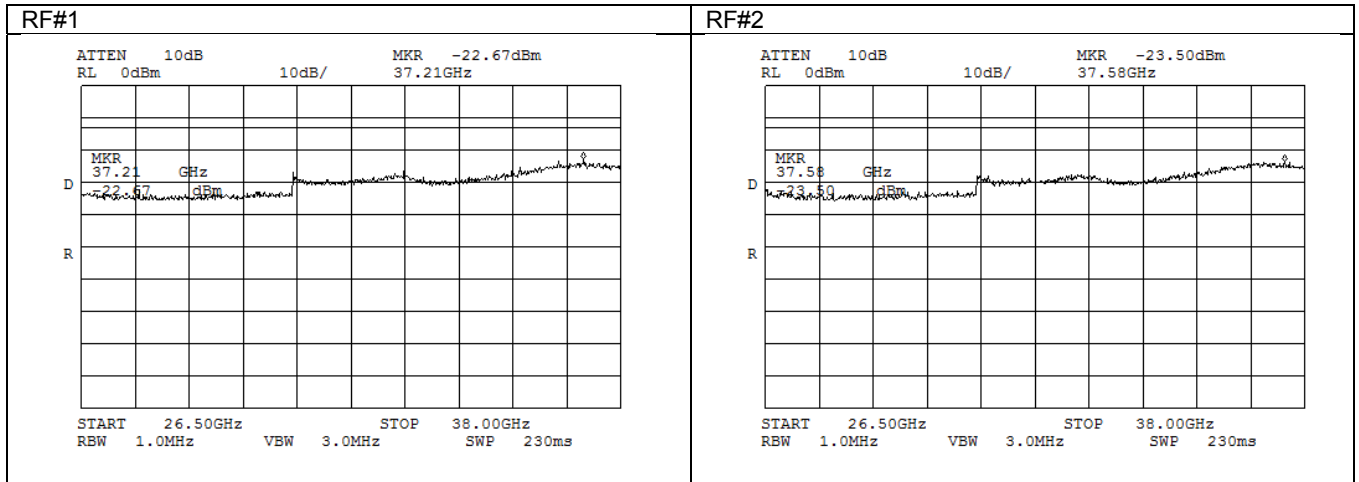
Plot 7.5.20 Spurious emission measurements in 26500s - 38000 MHz range at mid carrier frequency





<b>Test specification:</b> Section 90.1323, Conducted spurious emissions	
<b>Test procedure:</b> 47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
<b>Test mode:</b> Compliance	<b>Verdict:</b> PASS
<b>Date(s):</b> 15-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1011 hPa
<b>Relative Humidity:</b> 43 %	
<b>Power Supply:</b> 48VDC	
<b>Remarks:</b>	

Plot 7.5.21 Spurious emission measurements in 26500 - 38000 MHz range 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>	PASS
<b>Date(s):</b>	18-May-14 - 19-May-14		
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1015 hPa	<b>Relative Humidity:</b> 39 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

## 7.6 Frequency stability test

### 7.6.1 General

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

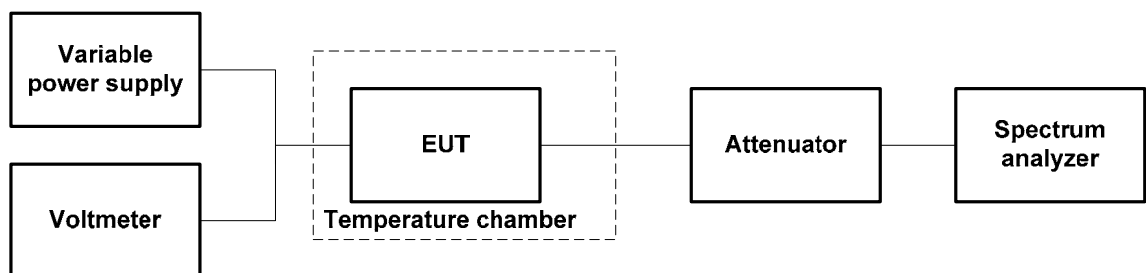
Table 7.6.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
3650.0 – 3675.0	NA	

### 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> PASS
<b>Date(s):</b>		18-May-14 - 19-May-14	
<b>Temperature:</b> 25 °C	<b>Air Pressure:</b> 1015 hPa	<b>Relative Humidity:</b> 39 %	<b>Power Supply:</b> 48VDC
<b>Remarks:</b>			

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY: 3650.0 – 3675.0 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

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
<b>Low channel 3655.0 MHz</b>												
-30	nominal	3655.972920	3655.973520	3655.972760	3655.972000	3655.972280	3655.972750	3655.972770	0.00	-2620.00	0.00	-0.72
-20	nominal	3655.973120	NA	NA	NA	NA	NA	3655.972830	0.00	-1790.00	0.00	-0.49
-10	nominal	3655.973200	NA	NA	NA	NA	NA	3655.973650	0.00	-1420.00	0.00	-0.39
0	nominal	3655.974020	3655.973450	3655.973890	3655.972880	3655.973340	3655.972970	3655.972860	0.00	-1760.00	0.00	-0.48
10	nominal	3655.973470	NA	NA	NA	NA	NA	3655.974250	0.00	-1150.00	0.00	-0.31
20	55.2	3655.975490	NA	NA	NA	NA	NA	3655.973640	870.00	-980.00	0.24	-0.27
20	48.0	3655.975230	NA	NA	NA	NA	NA	3655.974620	610.00	0.00	0.17	0.00
20	40.8	3655.974670	NA	NA	NA	NA	NA	3655.974110	50.00	-510.00	0.01	-0.14
30	nominal	3655.974830	3655.975770	3655.975170	3655.975000	3655.974870	3655.976100	3655.974580	1480.00	-40.00	0.40	-0.01
40	nominal	3655.975930	NA	NA	NA	NA	NA	3655.976060	1440.00	0.00	0.39	0.00
50	nominal	3655.974530	3655.974610	3655.974590	3655.974670	3655.974100	3655.974270	3655.974870	250.00	-520.00	0.07	-0.14
<b>Mid Channel 3663.0 MHz</b>												
-30	nominal	3663.973120	3663.972600	3663.972270	3663.972190	3663.973280	3663.973000	3663.972110	0.00	-2280.00	0.00	-0.62
-20	nominal	3663.972310	NA	NA	NA	NA	NA	3663.973170	0.00	-2080.00	0.00	-0.57
-10	nominal	3663.972660	NA	NA	NA	NA	NA	3663.972890	0.00	-1730.00	0.00	-0.47
0	nominal	3663.974680	3663.973830	3663.973970	3663.973740	3663.973040	3663.973550	3663.972910	290.00	-1480.00	0.08	-0.40
10	nominal	3663.973940	NA	NA	NA	NA	NA	3663.973010	0.00	-1380.00	0.00	-0.38
20	55.2	3663.974760	NA	NA	NA	NA	NA	3663.974500	370.00	0.00	0.10	0.00
20	48.0	3663.974740	NA	NA	NA	NA	NA	3663.974390	350.00	0.00	0.10	0.00
20	40.8	3663.973970	NA	NA	NA	NA	NA	3663.974380	0.00	-420.00	0.00	-0.11
30	nominal	3663.974600	3663.974860	3663.974650	3663.974560	3663.974250	3663.974130	3663.973950	470.00	-440.00	0.13	-0.12
40	nominal	3663.975530	NA	NA	NA	NA	NA	3663.974590	1140.00	0.00	0.31	0.00
50	nominal	3663.974560	3663.976070	3663.974870	3663.974900	3663.974840	3663.974420	3663.974750	1680.00	0.00	0.46	0.00
<b>High channel 3670.0 MHz</b>												
-30	nominal	3670.972940	3670.972470	3670.973030	3670.972570	3670.973020	3670.972590	3670.972360	0.00	-2280.00	0.00	-0.62
-20	nominal	3670.973390	NA	NA	NA	NA	NA	3670.973670	0.00	-1250.00	0.00	-0.34
-10	nominal	3670.973340	NA	NA	NA	NA	NA	3670.973970	0.00	-1300.00	0.00	-0.35
0	nominal	3670.973390	3670.973080	3670.973740	3670.972760	3670.973480	3670.972640	3670.974230	0.00	-2000.00	0.00	-0.54
10	nominal	3670.974090	NA	NA	NA	NA	NA	3670.973640	0.00	-1000.00	0.00	-0.27
20	55.2	3670.974620	NA	NA	NA	NA	NA	3670.974160	0.00	-480.00	0.00	-0.13
20	48.0	3670.974840	NA	NA	NA	NA	NA	3670.974640	200.00	0.00	0.05	0.00
20	40.8	3670.974760	NA	NA	NA	NA	NA	3670.974330	120.00	-310.00	0.03	-0.08
30	nominal	3670.974250	3670.974070	3670.974150	3670.974680	3670.973770	3670.973870	3670.974120	40.00	-870.00	0.01	-0.24
40	nominal	3670.974380	NA	NA	NA	NA	NA	3670.974850	210.00	-260.00	0.06	-0.07
50	nominal	3670.974500	3670.974660	3670.974280	3670.974680	3670.974650	3670.975720	3670.975430	1080.00	-360.00	0.29	-0.10

Channel	Maximum frequency displacement			
	ppm		Hz	
	Negative	Positive	Negative	Positive
3655.0	1480.00	-2620.00	0.40	-0.72
3663.0	1680.00	-2280.00	0.46	-0.62
3670.0	1080.00	-2280.00	0.29	-0.62

Note1: As no limit is specified by the applicable rule for 3650.0 – 3675.0 MHz band the test results are given in Table above is for information purpose only.

Reference numbers of test equipment used

HL 1424	HL 1480	HL 3286	HL 3308	HL 4164	HL 4229	
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Full description is given in Appendix A.

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

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	21-Jan-14	21-Jan-15
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	28-Oct-13	28-Oct-14
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	04-Jun-13	04-Jun-14
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	12-Dec-12	12-Dec-15
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	12-Dec-12	12-Dec-15
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	10-Oct-13	10-Oct-14
1480	Cable, 1 m	Harbour Industries	MIL 17/60-RG142	1480	02-Dec-13	02-Dec-14
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	03-Jan-14	03-Jan-15
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	04-Dec-13	04-Dec-14
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	23-Dec-13	23-Dec-14
3286	Temperature Chamber, (-50 to +170) °C	Thermotron	EL-8-CH-1-1-CO2	21-9048	30-Sep-13	30-Sep-14
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY451010 57	12-Feb-14	12-Feb-15
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY452405 86	12-Feb-14	12-Feb-15
3308	Multimeter	Fluke	115C	94321808	14-Jul-13	14-Jul-14
3322	Attenuator DC to 22 GHz, 30 dB, 50 W	Aeroflex / Weinschel	86-30-12	448	16-Sep-13	16-Sep-14
3455	Medium Power Fixed Coaxial Attenuator DC to 40 GHz, 20 dB, 5 W	Aeroflex / Weinschel	75A-20-12	1182	09-Mar-14	09-Mar-15
3535	Amplifier, low noise, 18 to 40 GHz	Quinstar Technology	QLJ-18404537-J0	111590030 01	30-Dec-13	30-Dec-14
3770	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	NA	25-Aug-13	25-Aug-14
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1225/2A	06-Feb-14	06-Feb-15
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	06-Feb-14	06-Feb-15
4160	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out	Agilent Technologies	87405C	MY470105 94	11-Aug-13	11-Aug-14
4164	DC Power Supply, 60V, 5A	Standig	605D	NA	15-Jan-14	15-Jan-15



HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
4229	Precision Fixed Attenuator, 50 Ohm, 5W, 10dB, DC to 18000 MHz	Mini-Circuits	BW-N10W5+	NA	07-Mar-14	07-Mar-15
4273	Test Cable , DC-18 GHz, 1.8 m, SMA/M - N/M	Mini-Circuits	CBL-6FT-SMNM+	70045	27-Nov-13	27-Nov-14
4275	Test Cable , DC-18 GHz, 1.8 m, SMA/M - N/M	Mini-Circuits	CBL-6FT-SMNM+	70050	27-Nov-13	27-Nov-14
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101003	16-Mar-14	16-Mar-15
4367	Directional coupler, 1 GHz to 18 GHz, 10 dB, SMA Female	Tiger Micro-Electronics Institute	TGD-A1101-10	01e-JSDE805-006	30-Dec-13	30-Dec-14
4575	EXA Signal Analyzer, 9 kHz - 26.5 GHz	Agilent Technologies	N9010A	MY48030110	29-Apr-14	29-Apr-15

## 9 APPENDIX B Measurement uncertainties

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

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

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

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

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

## 10 APPENDIX C Test facility description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

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

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## 11 APPENDIX D Specification references

47CFR part 27: 2013	Private land mobile radio services
47CFR part 1: 2013	Practice and procedure
47CFR part 2: 2013	Frequency allocations and radio treaty matters; general rules and regulations
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

## 12 APPENDIX E Test equipment correction factors

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

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

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



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

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

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

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

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

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

**Antenna factor**  
**Double-ridged guide horn antenna**  
**Model 3115, serial number: 00027177, HL 2432**

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

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

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

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



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

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

**Cable loss**  
**Microwave Cable Assembly, Huber-Suhner, 40 GHz, 1.5 m, SMA-SMA, S/N 1226/2A**  
**HL 3903**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	-0.02	9500	1.84	21000	2.98
100	0.15	10000	1.86	22000	3.07
500	0.38	10500	1.93	23000	3.13
1000	0.56	11000	1.99	24000	3.21
1500	0.69	11500	2.04	25000	3.26
2000	0.82	12000	2.10	26000	3.48
2500	0.90	12500	2.15	27000	3.44
3000	0.98	13000	2.21	28000	3.53
3500	1.06	13500	2.25	29000	3.59
4000	1.11	14000	2.29	30000	3.66
4500	1.17	14500	2.34	31000	3.70
5000	1.24	15000	2.36	32000	3.79
5500	1.32	15500	2.40	33000	3.88
6000	1.40	16000	2.45	34000	3.94
6500	1.50	16500	2.48	35000	3.91
7000	1.56	17000	2.56	36000	4.05
7500	1.62	17500	2.58	37000	4.22
8000	1.68	18000	2.60	38000	4.25
8500	1.74	19000	2.84	39000	4.27
9000	1.78	20000	2.88	40000	4.33



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

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



**Cable loss**  
**Test cable, Mini-Circuits, S/N 70050, 18 GHz, 1.8 m, SMA/M - N/M**  
**CBL-6FT-SMNM+, HL 4275**

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.08	5000	1.71	10200	2.64	15400	3.46
30	0.11	5100	1.73	10300	2.65	15500	3.47
50	0.14	5200	1.75	10400	2.66	15600	3.52
100	0.21	5300	1.76	10500	2.67	15700	3.55
200	0.30	5400	1.77	10600	2.70	15800	3.55
300	0.37	5500	1.82	10700	2.71	15900	3.55
400	0.43	5600	1.84	10800	2.72	16000	3.61
500	0.49	5700	1.86	10900	2.73	16100	3.62
600	0.54	5800	1.86	11000	2.75	16200	3.63
700	0.58	5900	1.89	11100	2.77	16300	3.62
800	0.62	6000	1.94	11200	2.78	16400	3.66
900	0.66	6100	1.95	11300	2.80	16500	3.71
1000	0.70	6200	1.96	11400	2.82	16600	3.71
1100	0.74	6300	1.97	11500	2.83	16700	3.67
1200	0.78	6400	2.01	11600	2.84	16800	3.69
1300	0.81	6500	2.03	11700	2.86	16900	3.74
1400	0.84	6600	2.02	11800	2.88	17000	3.73
1500	0.88	6700	2.02	11900	2.89	17100	3.71
1600	0.91	6800	2.05	12000	2.90	17200	3.73
1700	0.94	6900	2.06	12100	2.92	17300	3.77
1800	0.97	7000	2.07	12200	2.93	17400	3.77
1900	1.00	7100	2.07	12300	2.94	17500	3.76
2000	1.02	7200	2.08	12400	2.96	17600	3.76
2100	1.05	7300	2.11	12500	2.98	17700	3.78
2200	1.07	7400	2.13	12600	2.99	17800	3.80
2300	1.10	7500	2.15	12700	3.01	17900	3.79
2400	1.13	7600	2.16	12800	3.03	18000	3.78
2500	1.15	7700	2.18	12900	3.05		
2600	1.18	7800	2.21	13000	3.07		
2700	1.20	7900	2.24	13100	3.09		
2800	1.24	8000	2.25	13200	3.12		
2900	1.26	8100	2.26	13300	3.13		
3000	1.28	8200	2.29	13400	3.14		
3100	1.30	8300	2.31	13500	3.16		
3200	1.33	8400	2.33	13600	3.18		
3300	1.36	8500	2.33	13700	3.19		
3400	1.37	8600	2.34	13800	3.21		
3500	1.39	8700	2.36	13900	3.23		
3600	1.42	8800	2.38	14000	3.25		
3700	1.45	8900	2.39	14100	3.26		
3800	1.46	9000	2.40	14200	3.27		
3900	1.48	9100	2.42	14300	3.30		
4000	1.50	9200	2.45	14400	3.32		
4100	1.53	9300	2.46	14500	3.33		
4200	1.55	9400	2.48	14600	3.34		
4300	1.57	9500	2.50	14700	3.36		
4400	1.59	9600	2.52	14800	3.39		
4500	1.61	9700	2.54	14900	3.40		
4600	1.64	9800	2.56	15000	3.41		
4700	1.66	9900	2.58	15100	3.41		
4800	1.67	10000	2.60	15200	3.44		
4900	1.69	10100	2.61	15300	3.46		





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

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

## 13 APPENDIX F Abbreviations and acronyms

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

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