

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.
This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

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
Transmitter characteristics	
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
Tested by:	Mr. V. Einem, test engineer	May 19, 2014	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	May 29, 2014	
Approved by:	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 maintenance only

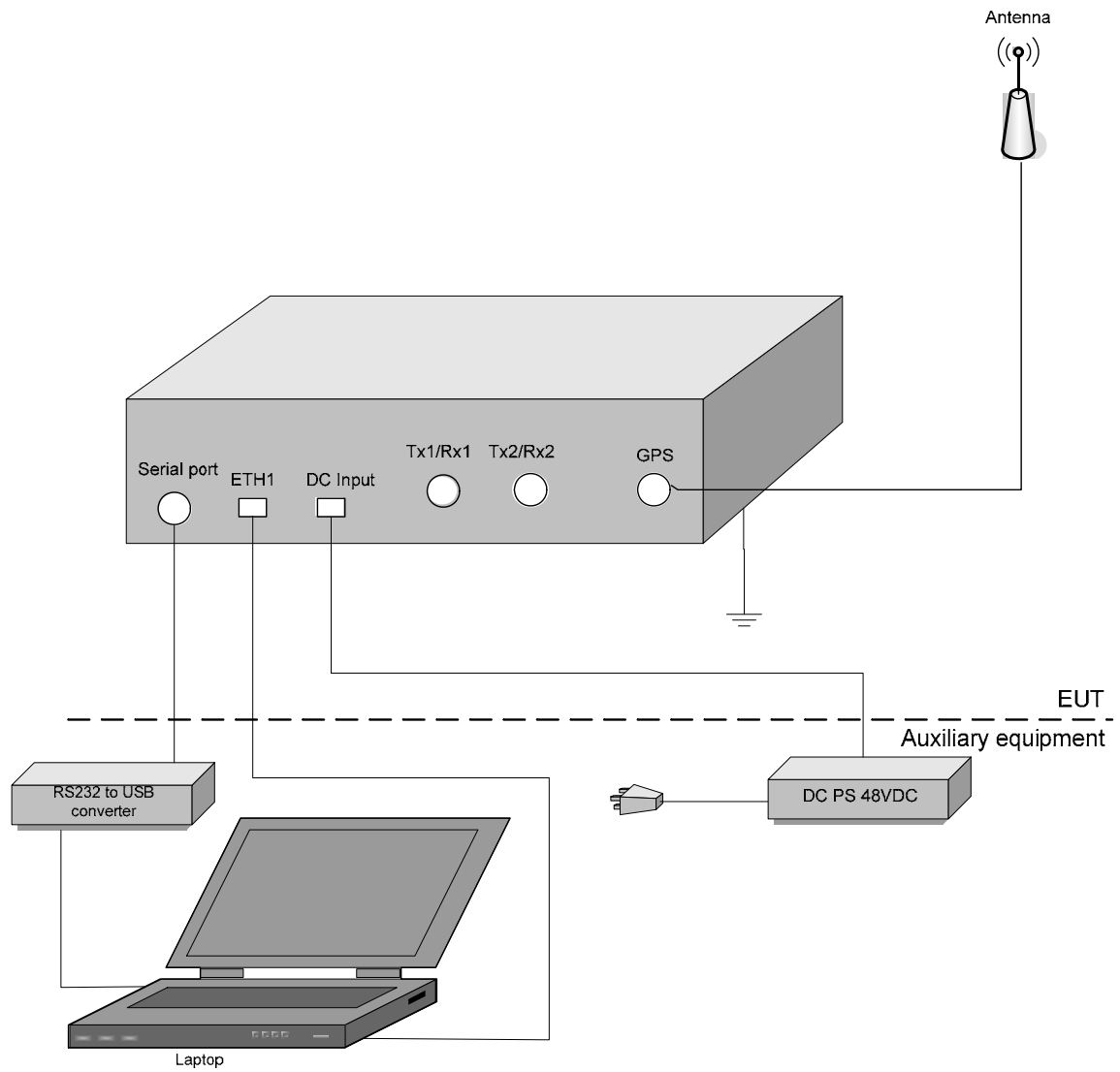
6.3 Support and test equipment

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 Ω 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			
		V	Yes	continuous variable	
				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	75
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	

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

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

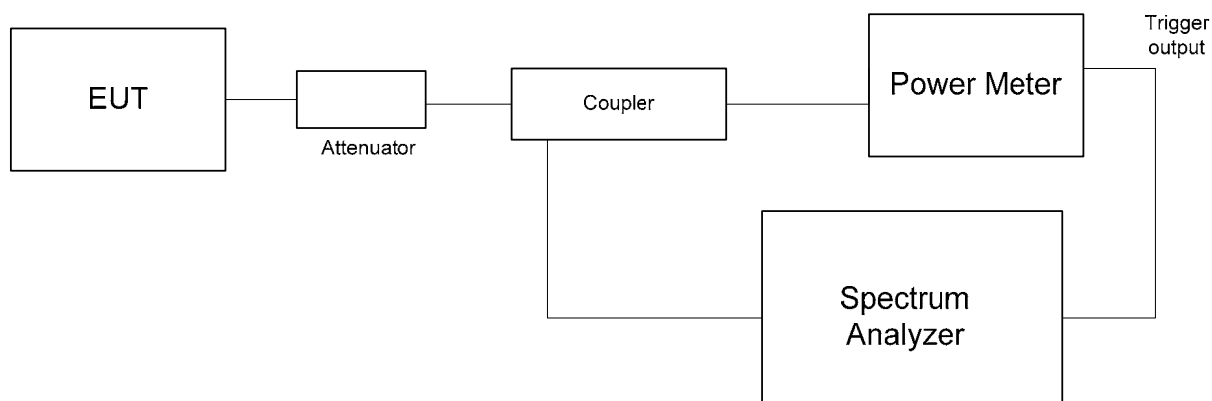
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

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



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

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 _{meas} *, 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 _{meas} *, 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

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

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

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

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

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 _{meas} *, 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 _{meas} *, 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

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

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

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

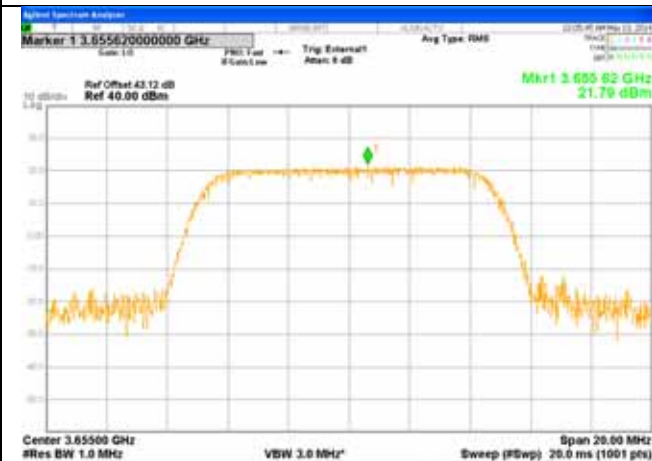
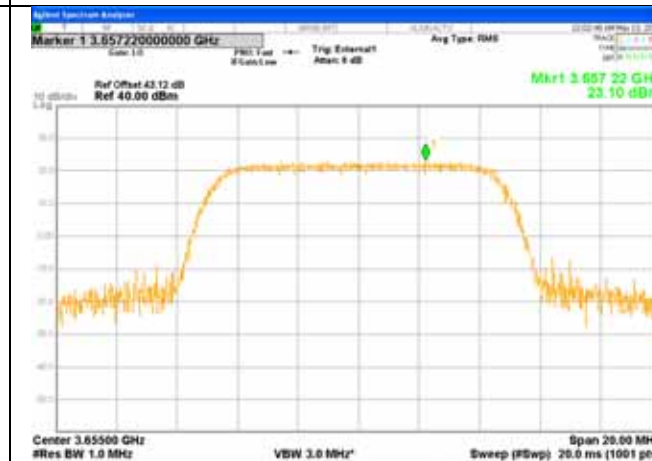
Reference numbers of test equipment used

HL 3301	HL 3302	HL 3770	HL 4229	HL 4273	HL 4275	HL 4367	HL 4575
---------	---------	---------	---------	---------	---------	---------	---------

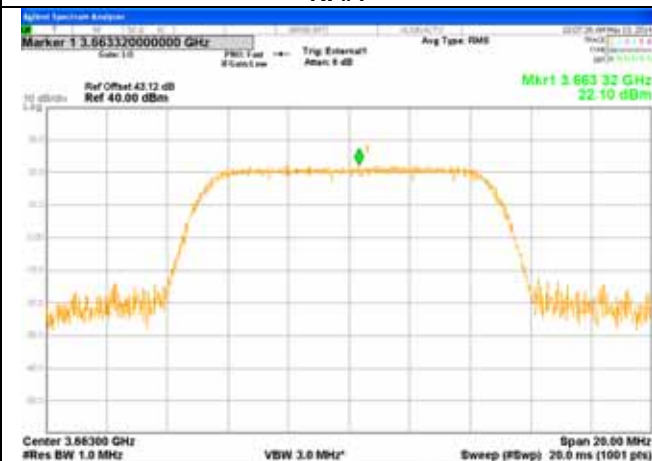
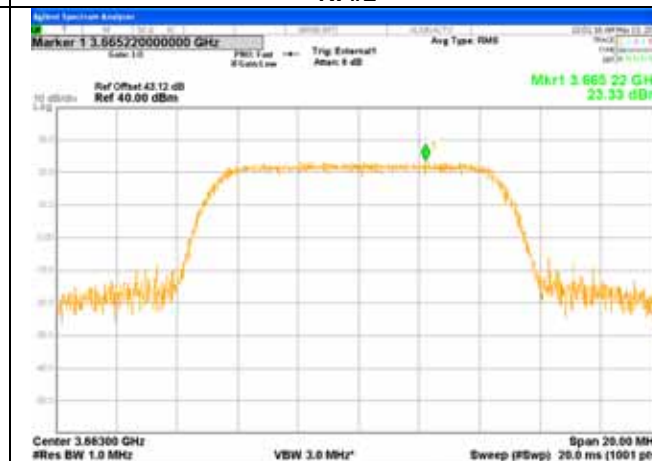
Full description is given in Appendix A.

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

Plot 7.1.1 Peak output power test results at low frequency

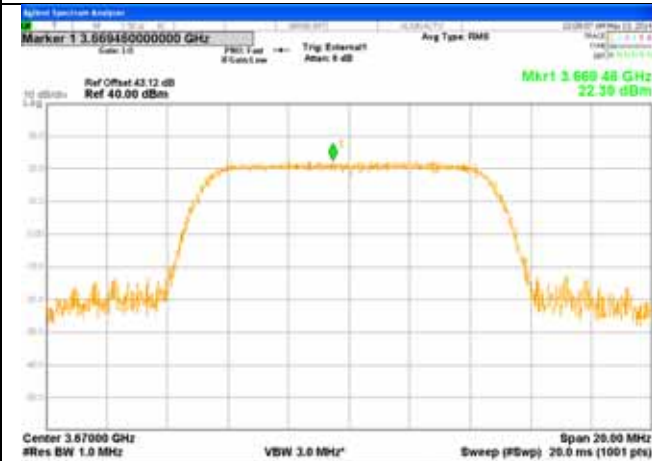
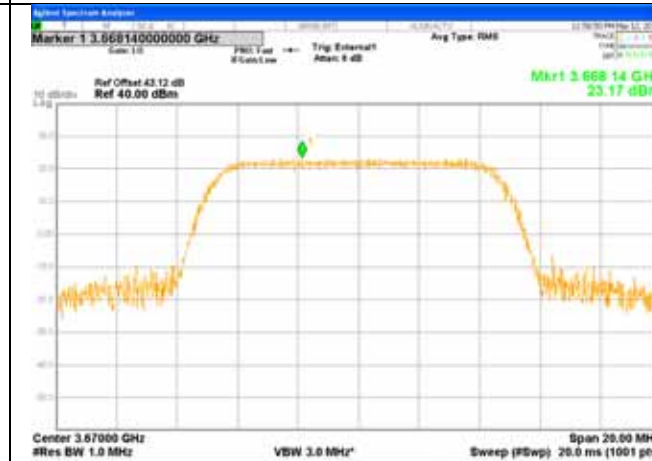
CARRIER FREQUENCY:		3655.0 MHz
EMISSION BANDWIDTH:		10 MHz
MODULATION:		QPSK
RF#1		RF#2
		

Plot 7.1.2 Peak output power test results at mid frequency

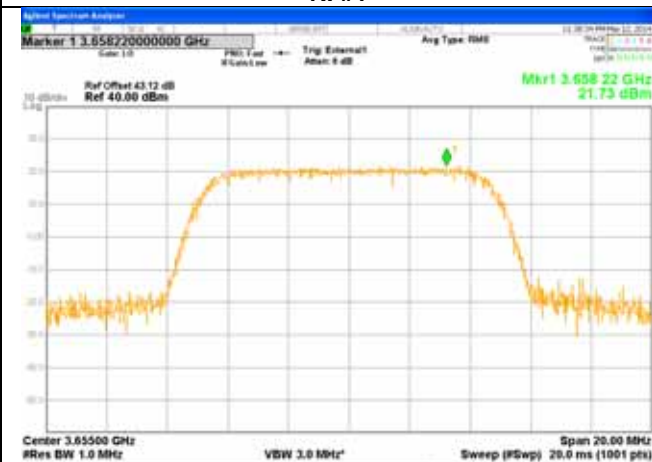
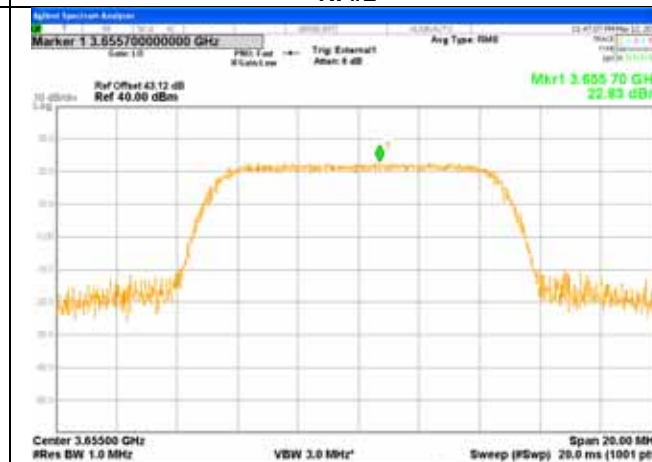
CARRIER FREQUENCY:		3663.0 MHz
EMISSION BANDWIDTH:		10 MHz
MODULATION:		QPSK
RF#1		RF#2
		

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

Plot 7.1.3 Peak output power test results at high frequency

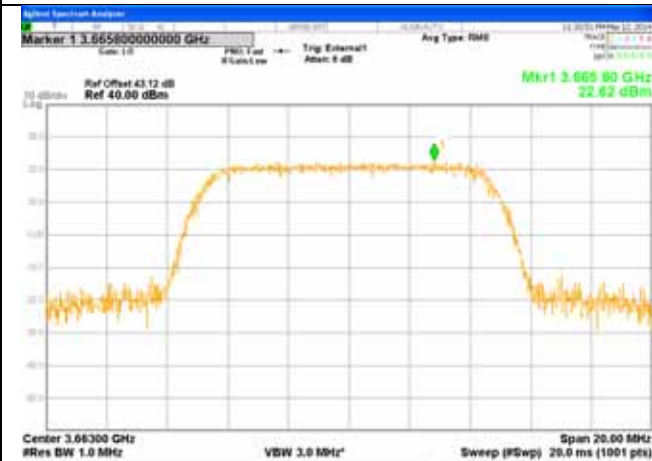
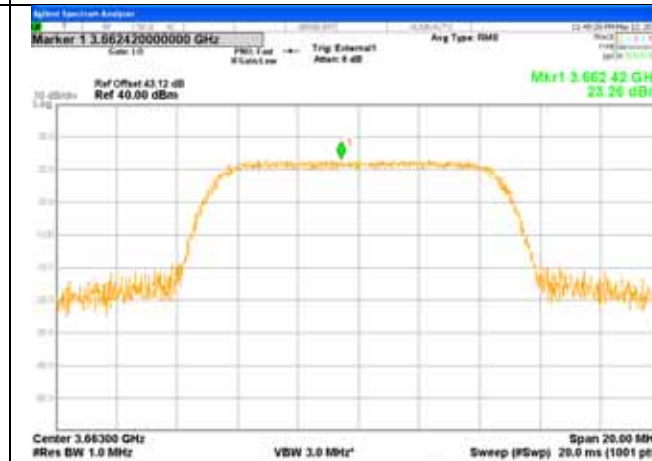
CARRIER FREQUENCY:		3670.0 MHz
EMISSION BANDWIDTH:		10 MHz
MODULATION:		QPSK
RF#1		RF#2
		

Plot 7.1.4 Peak output power test results at low frequency

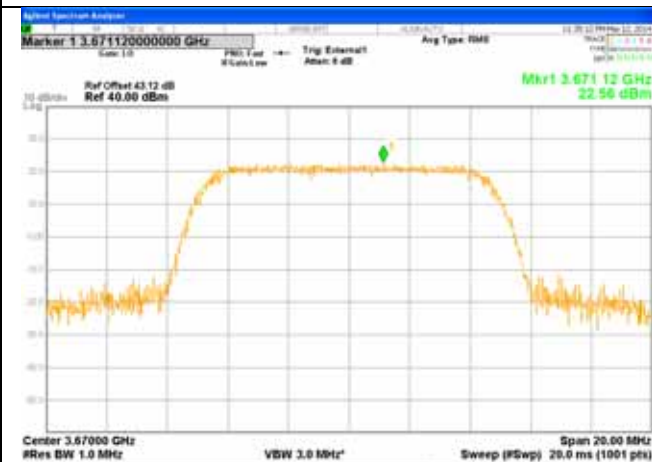
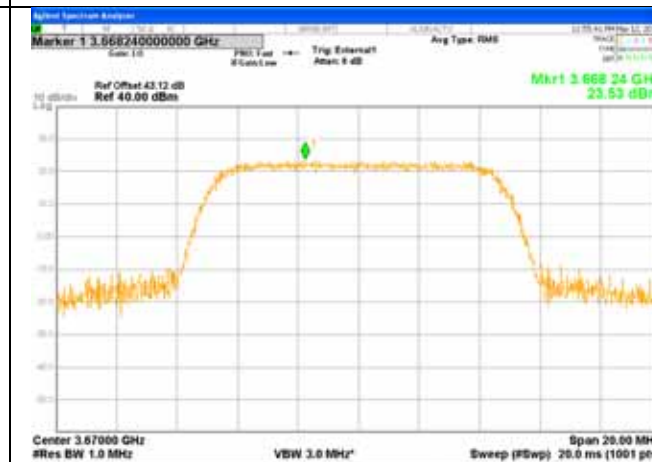
CARRIER FREQUENCY:		3655.0 MHz
EMISSION BANDWIDTH:		10 MHz
MODULATION:		64QAM
RF#1		RF#2
		

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

Plot 7.1.5 Peak output power test results at mid frequency

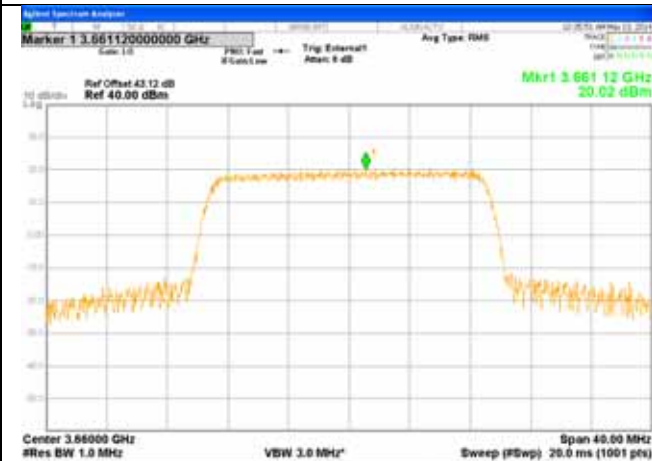
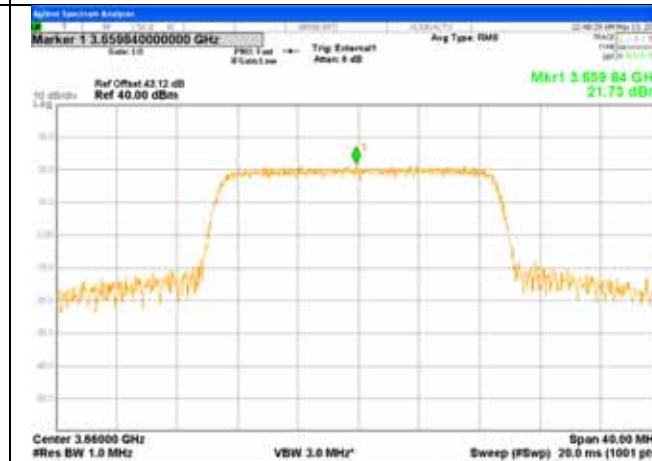
CARRIER FREQUENCY:		3663.0 MHz
EMISSION BANDWIDTH:		10 MHz
MODULATION:		64QAM
RF#1		RF#2
		

Plot 7.1.6 Peak output power test results at high frequency

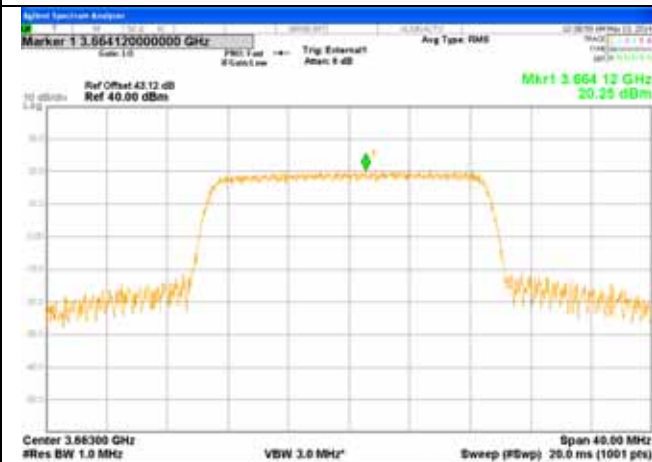
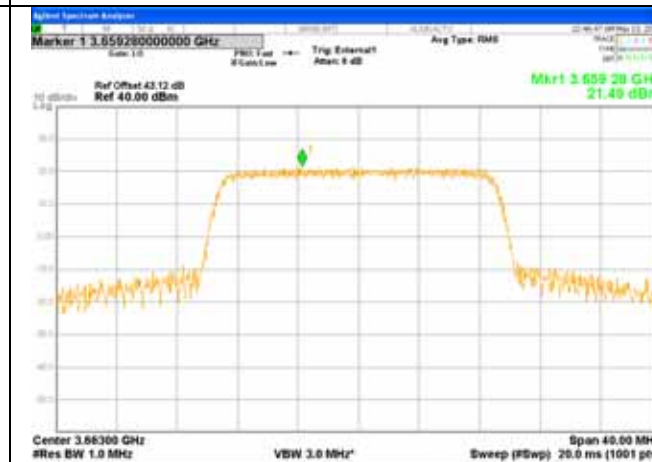
CARRIER FREQUENCY:		3670.0 MHz
EMISSION BANDWIDTH:		10 MHz
MODULATION:		64QAM
RF#1		RF#2
		

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

Plot 7.1.7 Peak output power test results at low frequency

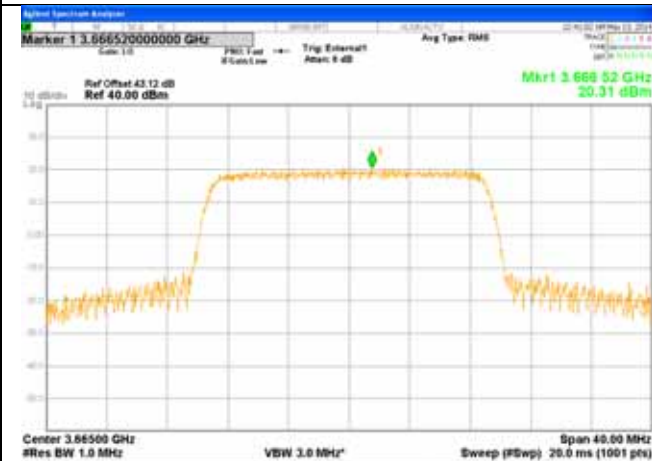
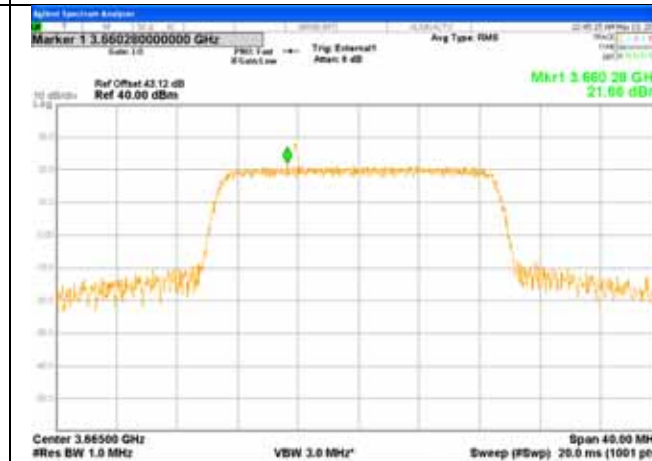
CARRIER FREQUENCY:		3660.0 MHz
EMISSION BANDWIDTH:		20 MHz
MODULATION:		QPSK
RF#1		RF#2
		

Plot 7.1.8 Peak output power test results at mid frequency

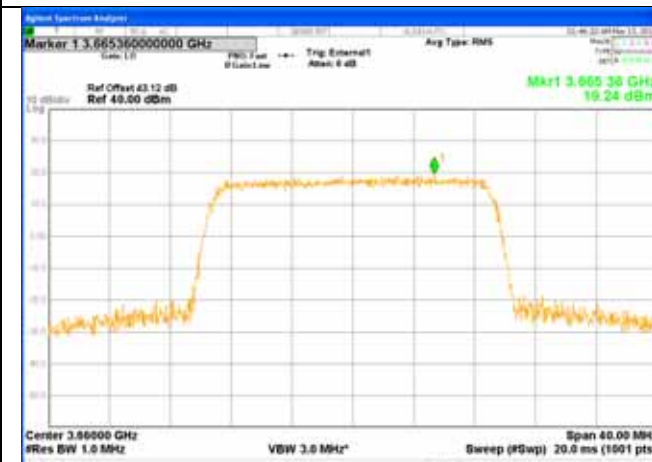
CARRIER FREQUENCY:		3663.0 MHz
EMISSION BANDWIDTH:		20 MHz
MODULATION:		QPSK
RF#1		RF#2
		

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

Plot 7.1.9 Peak output power test results at high frequency

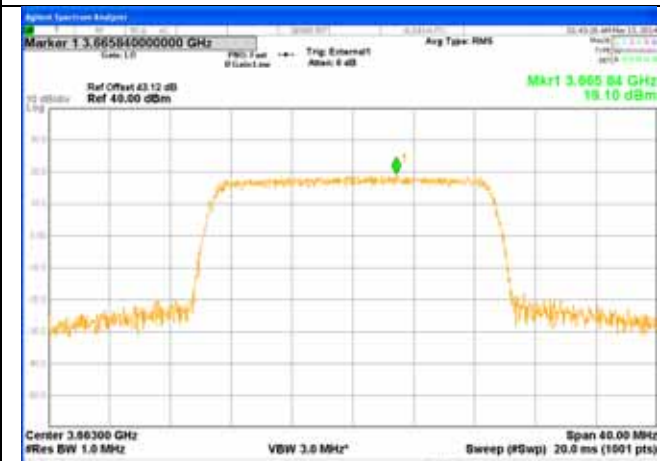
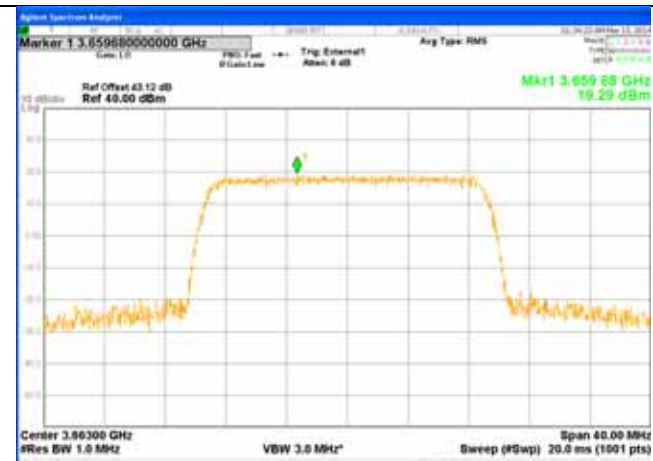
CARRIER FREQUENCY:		3665.0 MHz
EMISSION BANDWIDTH:		20 MHz
MODULATION:		QPSK
RF#1		RF#2
		

Plot 7.1.10 Peak output power test results at low frequency


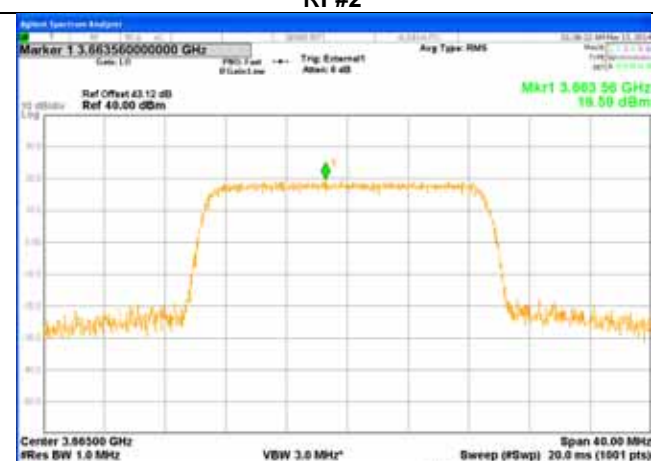
CARRIER FREQUENCY:		3660.0 MHz
EMISSION BANDWIDTH:		20 MHz
MODULATION:		64QAM
RF#1		RF#2
		

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

Plot 7.1.11 Peak output power test results at mid frequency

CARRIER FREQUENCY:		3663.0 MHz
EMISSION BANDWIDTH:		20 MHz
MODULATION:		64QAM
RF#1		RF#2
		

Plot 7.1.12 Peak output power test results at high frequency

CARRIER FREQUENCY:		3665.0 MHz
EMISSION BANDWIDTH:		20 MHz
MODULATION:		64QAM
RF#1		RF#2
		

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

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.

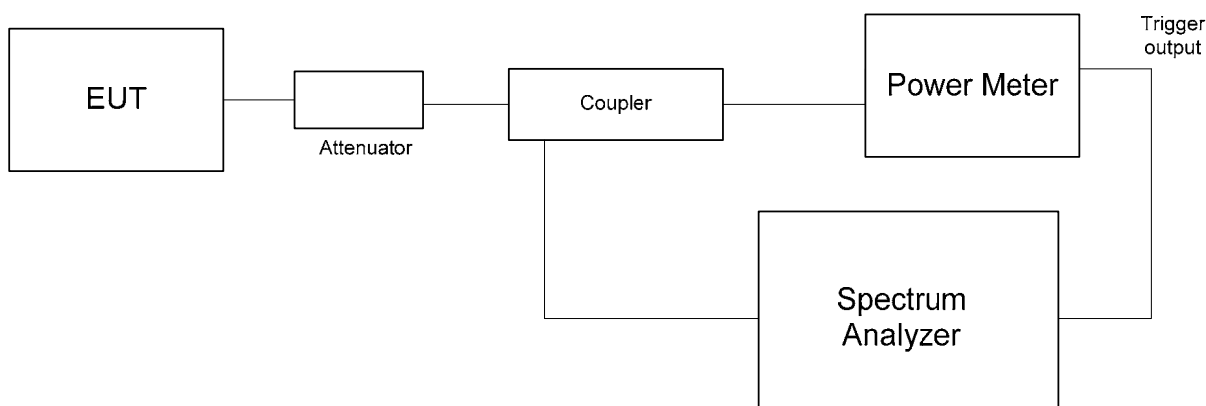
7.2.2 Test procedure

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



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

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

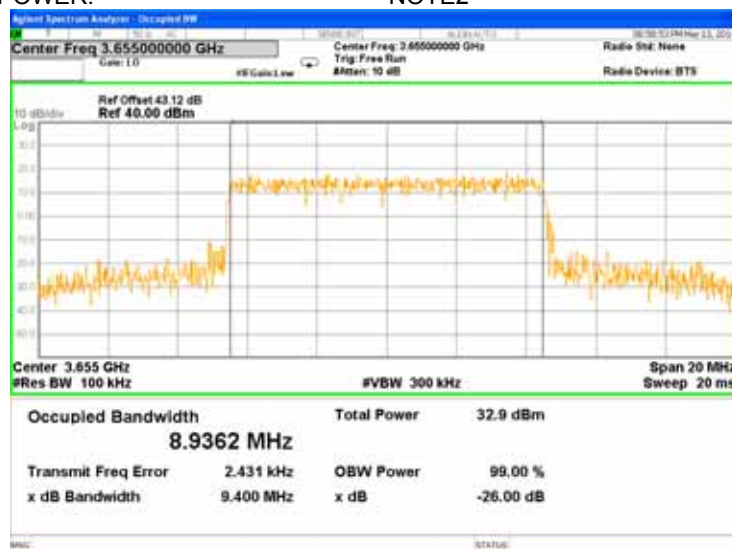
HL 3301	HL 3302	HL 3770	HL 4229	HL 4273	HL 4275	HL 4367	HL 4575
---------	---------	---------	---------	---------	---------	---------	---------

Full description is given in Appendix A.

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

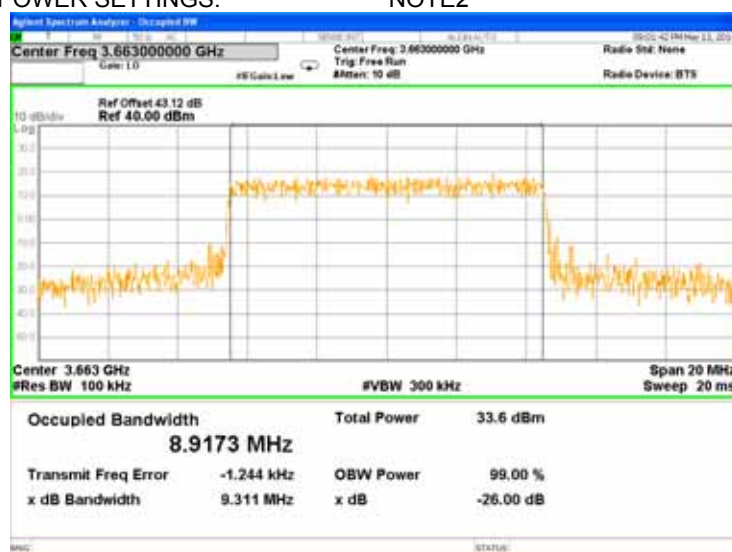
Plot 7.2.1 Occupied bandwidth test results at low carrier frequency, RF Output #1, 10 MHz EBW

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

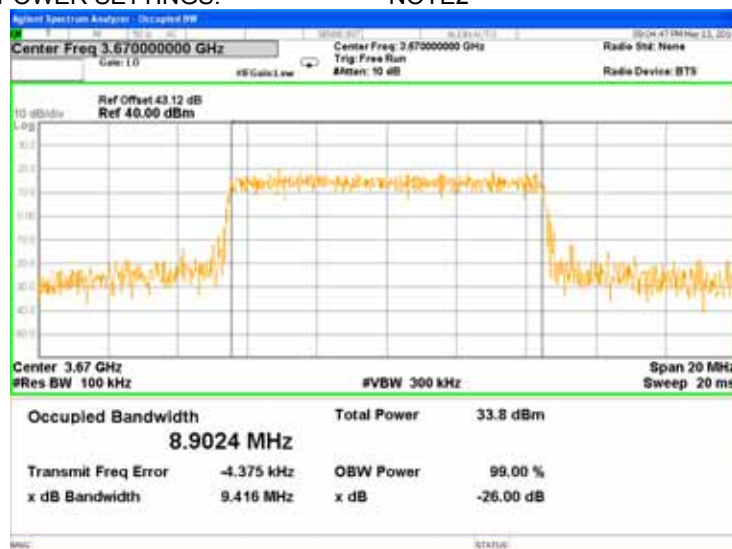
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: QPSK
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

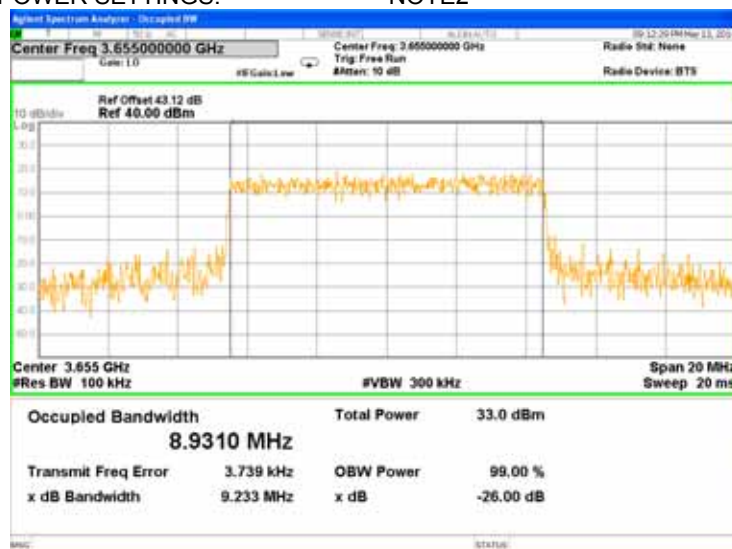
Plot 7.2.3 Occupied bandwidth test results at high carrier frequency, RF Output #1, 10 MHz EBW

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

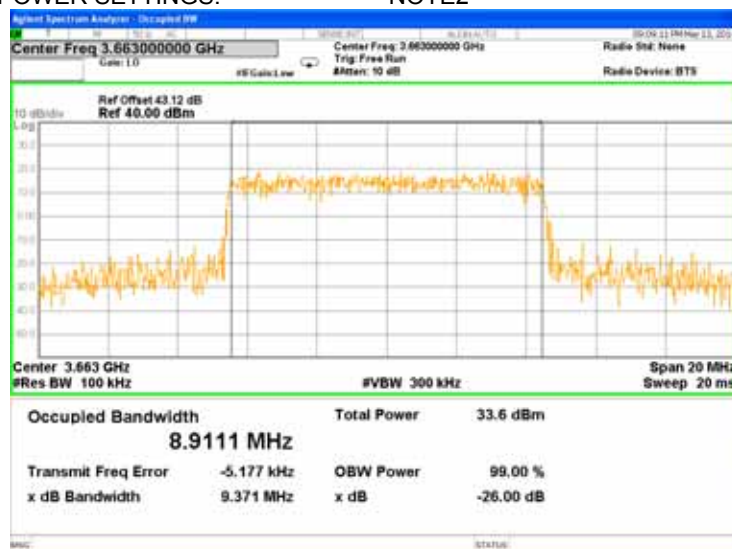
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: 64QAM
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

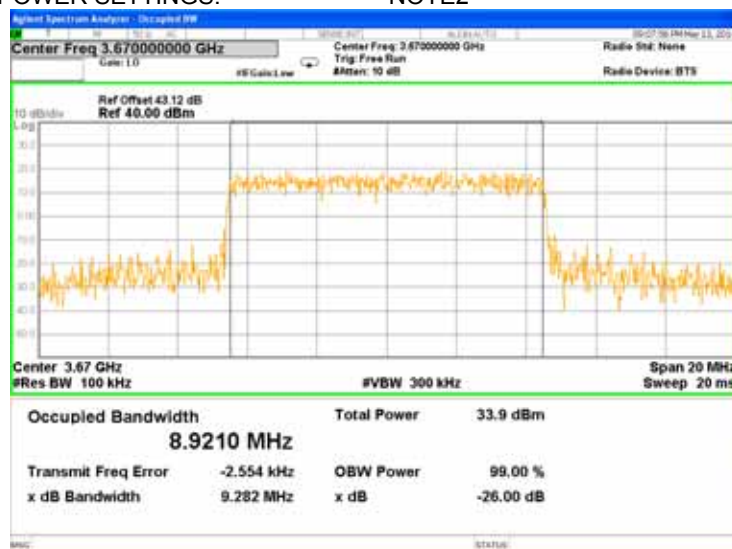
Plot 7.2.5 Occupied bandwidth test results at mid carrier frequency, RF Output #1, 10 MHz EBW

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

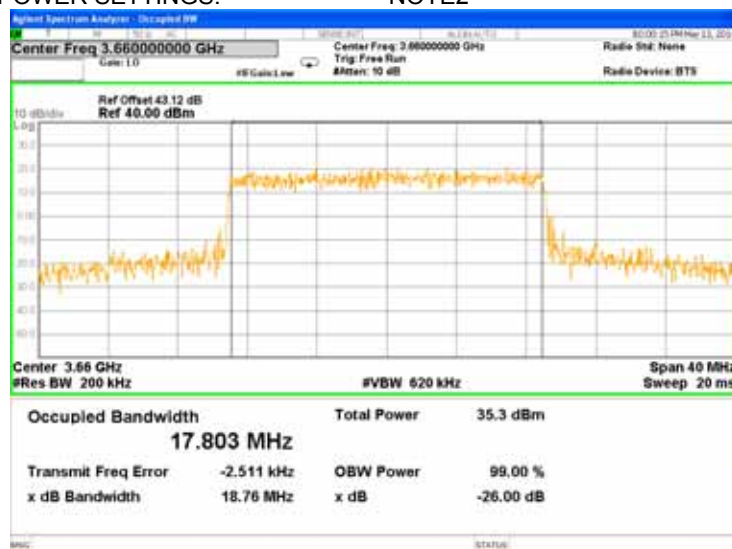
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: 64QAM
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

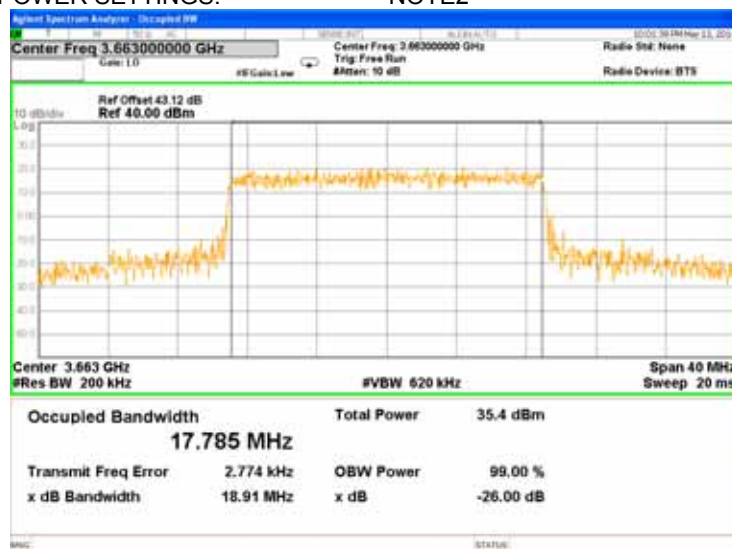
Plot 7.2.7 Occupied bandwidth test results at low carrier frequency, RF Output #1, 20 MHz EBW

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

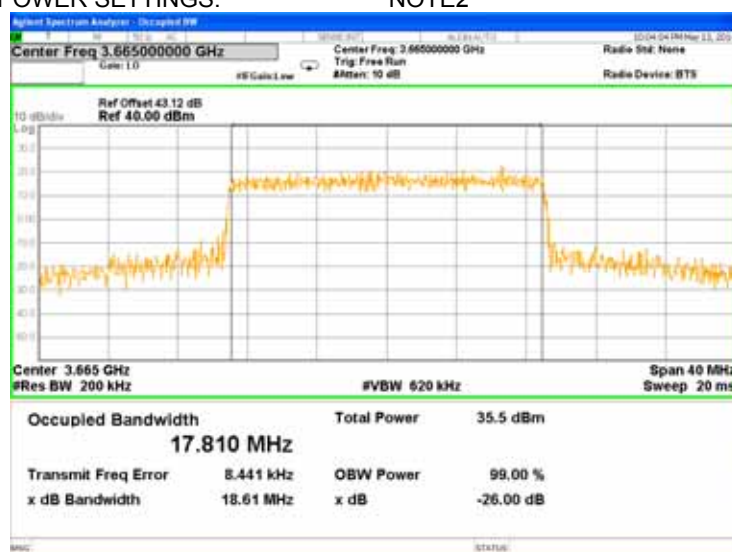
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: QPSK
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

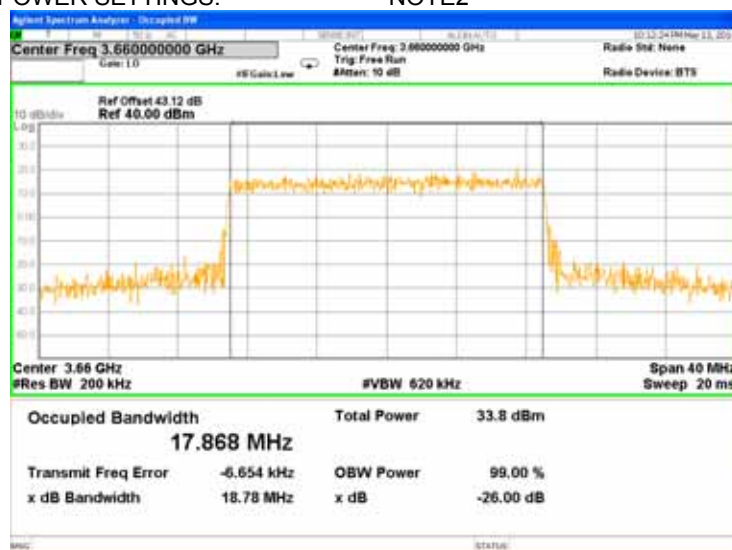
Plot 7.2.9 Occupied bandwidth test results at high carrier frequency, RF Output #1, 20 MHz EBW

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

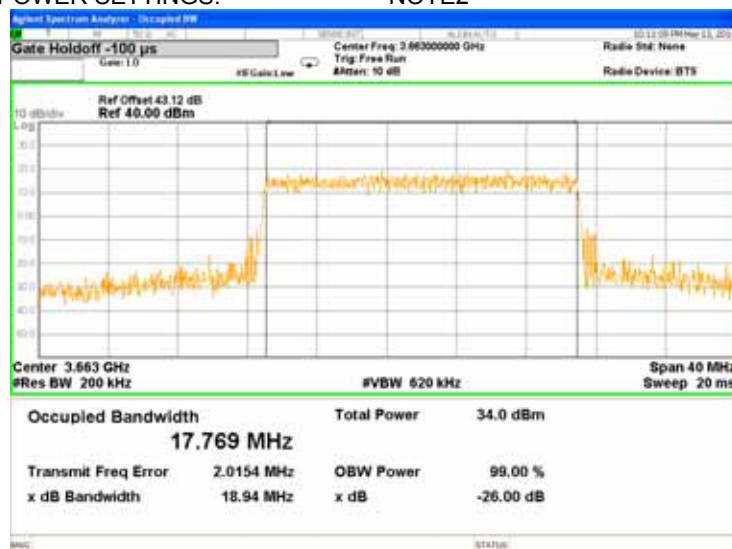
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: 64QAM
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

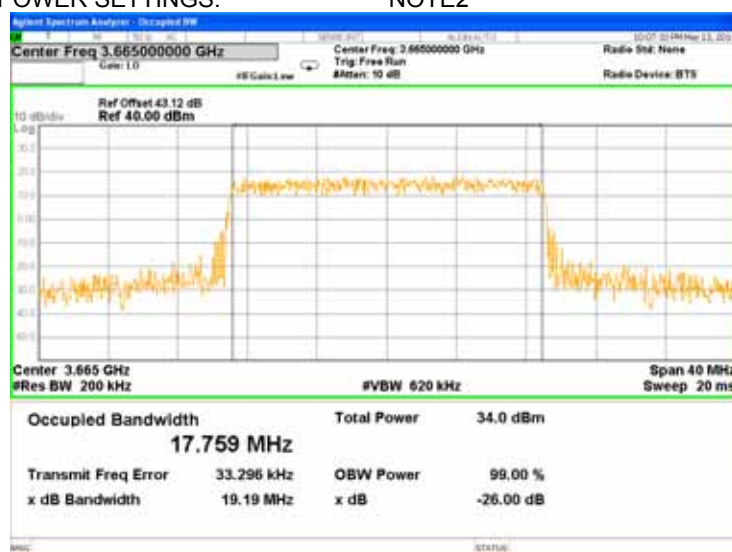
Plot 7.2.11 Occupied bandwidth test results at mid carrier frequency, RF Output #1, 20 MHz EBW

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

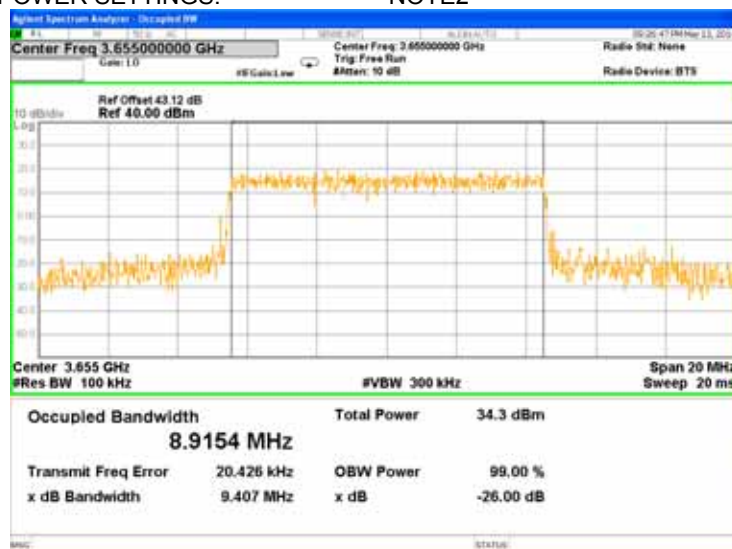
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: 64QAM
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

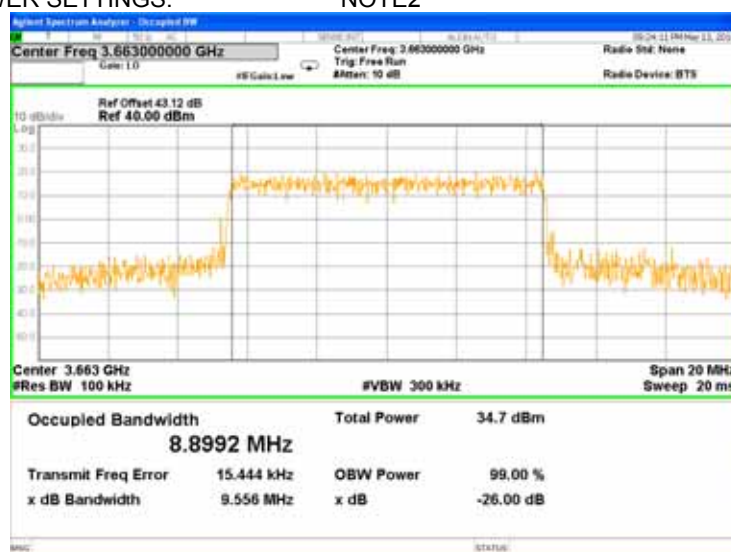
Plot 7.2.13 Occupied bandwidth test results at low carrier frequency, RF Output #2, 10 MHz EBW

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

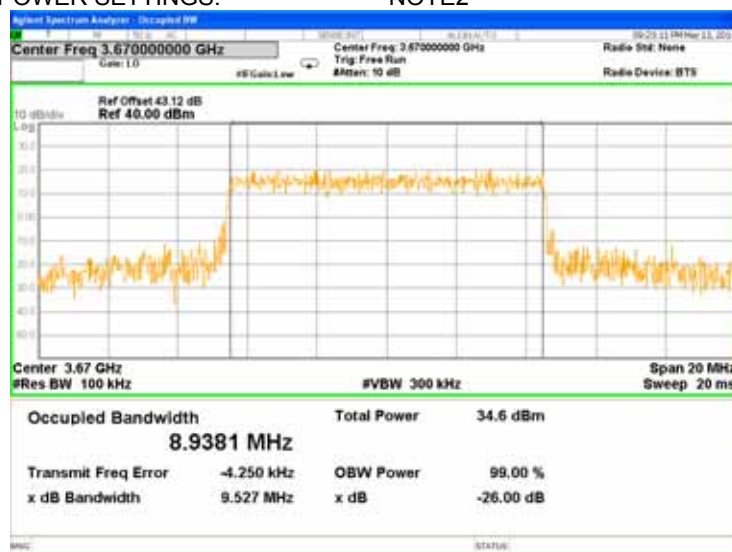
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: QPSK
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

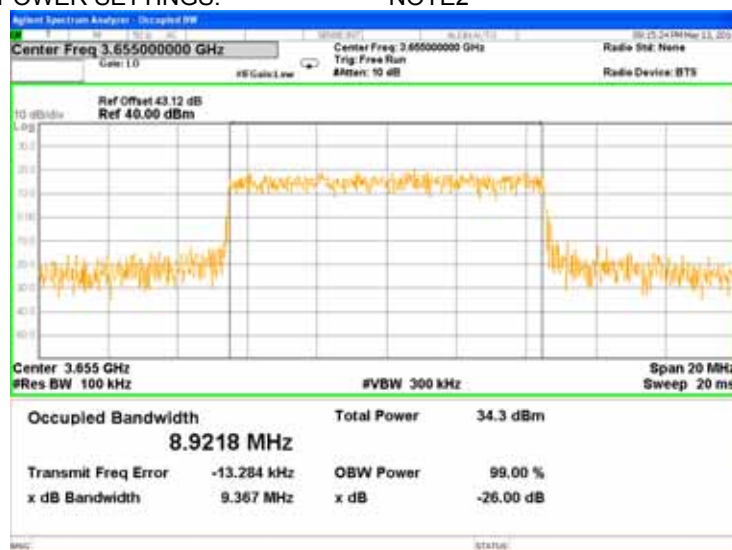
Plot 7.2.15 Occupied bandwidth test results at high carrier frequency, RF Output #2, 10 MHz EBW

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

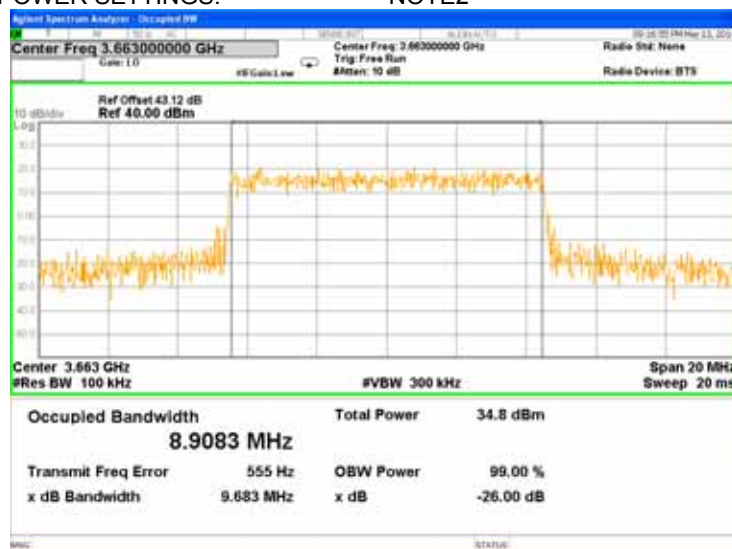
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: 64QAM
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

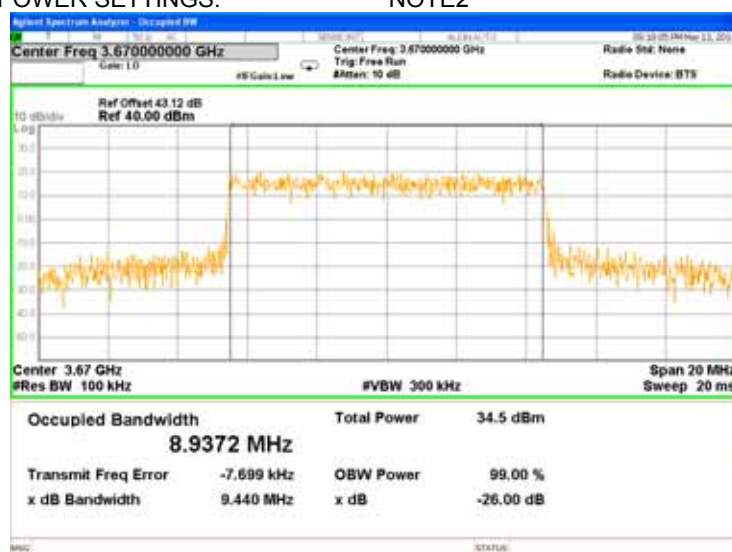
Plot 7.2.17 Occupied bandwidth test results at mid carrier frequency, RF Output #2, 10 MHz EBW

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

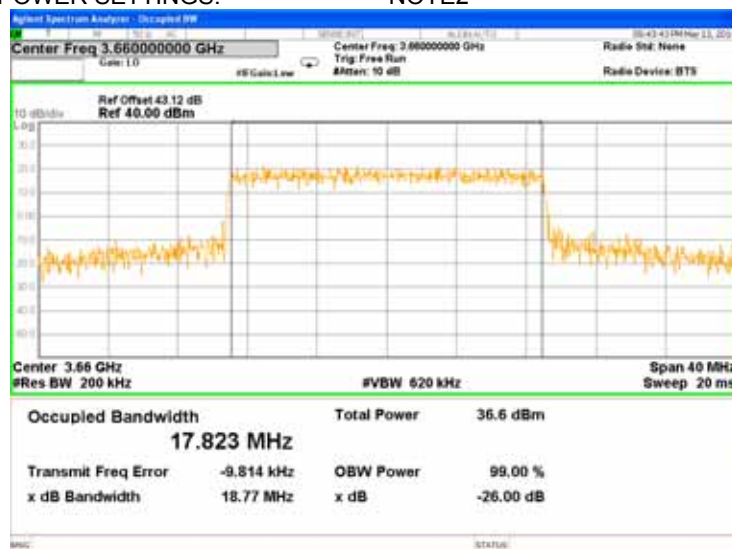
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: 64QAM
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

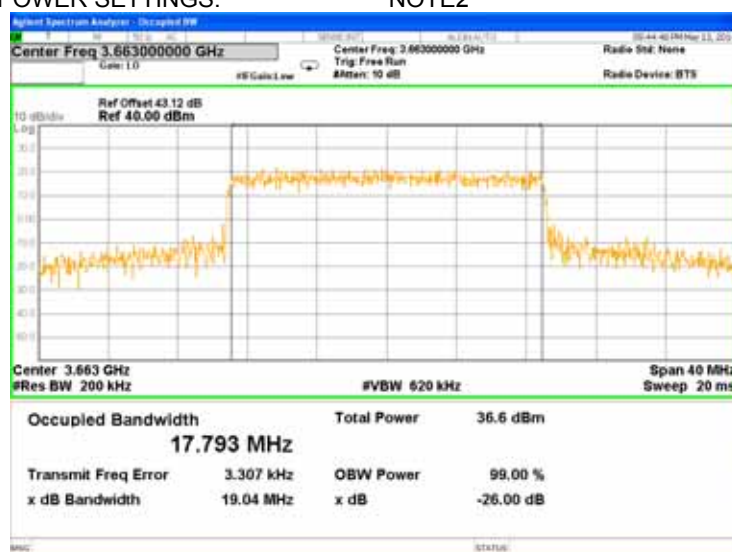
Plot 7.2.19 Occupied bandwidth test results at low carrier frequency, RF Output #2, 20 MHz EBW

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

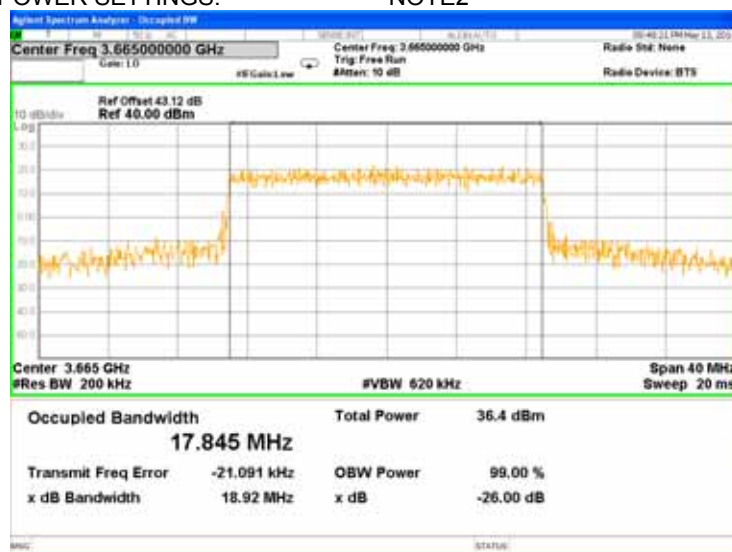
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: QPSK
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

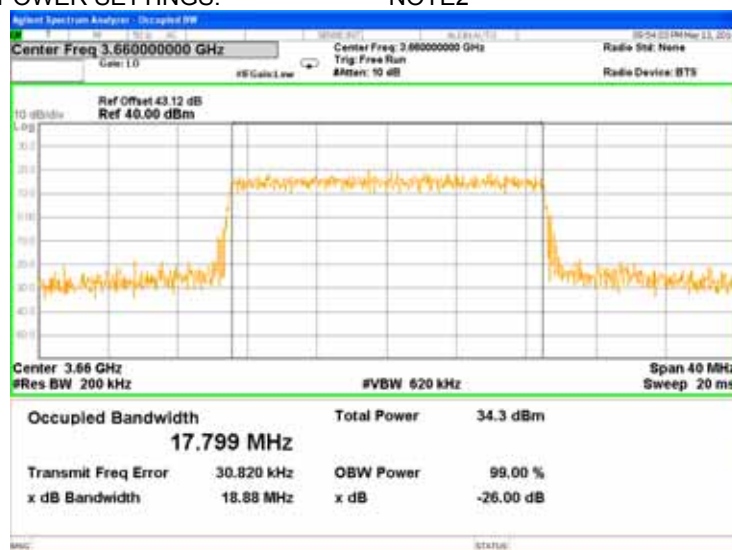
Plot 7.2.21 Occupied bandwidth test results at high carrier frequency, RF Output #2, 20 MHz EBW

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

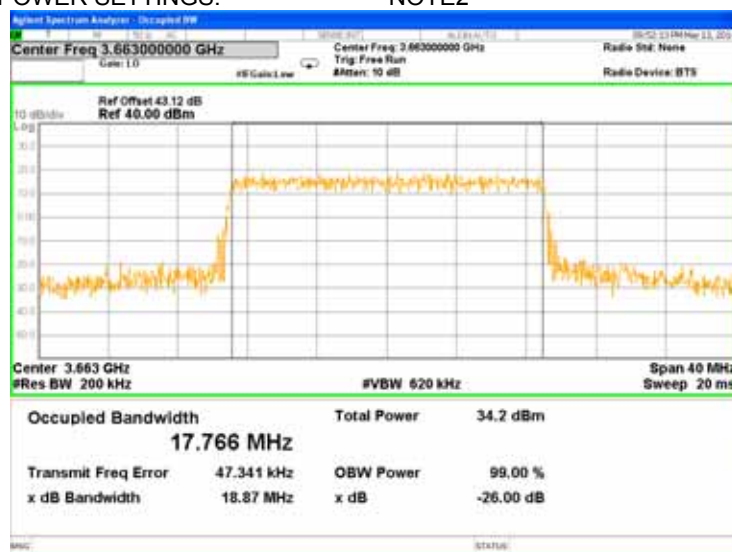
OPERATING FREQUENCY RANGE: 3650.0 - 3675.0 MHz
DETECTOR USED: Peak
MODULATION: 64QAM
TRANSMITTER OUTPUT POWER SETTINGS: NOTE2



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

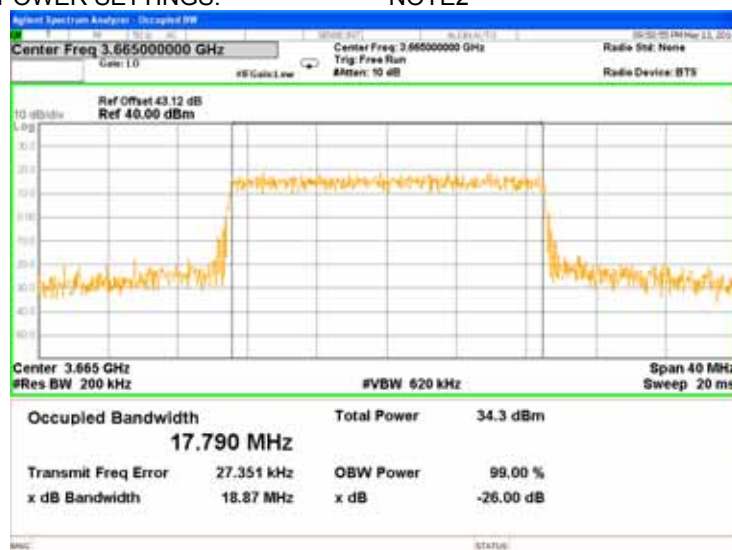
Plot 7.2.23 Occupied bandwidth test results at mid carrier frequency, RF Output #2, 20 MHz EBW

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



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

7.3 Emission mask test

7.3.1 General

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

Table 7.3.1 Emission mask limits

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask B (Emission bandwidth 10 MHz)	
0 – 5 MHz	0
5 – 10.0 MHz	25
10.0 – 25.0 MHz	35
More than** 25.0 MHz	43 + 10 log(P)
Emission mask B (Emission bandwidth 20 MHz)	
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 ± 250 % of the authorized bandwidth; the frequency range removed beyond ± 250 % of the authorized bandwidth from carrier was investigated as spurious emission

7.3.2 Test procedure

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

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

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

Table 7.3.2 Emission mask test results

Carrier frequency, MHz	Limit	Reference to Plot	Verdict
10 MHz EBW			
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	
20 MHz EBW			
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

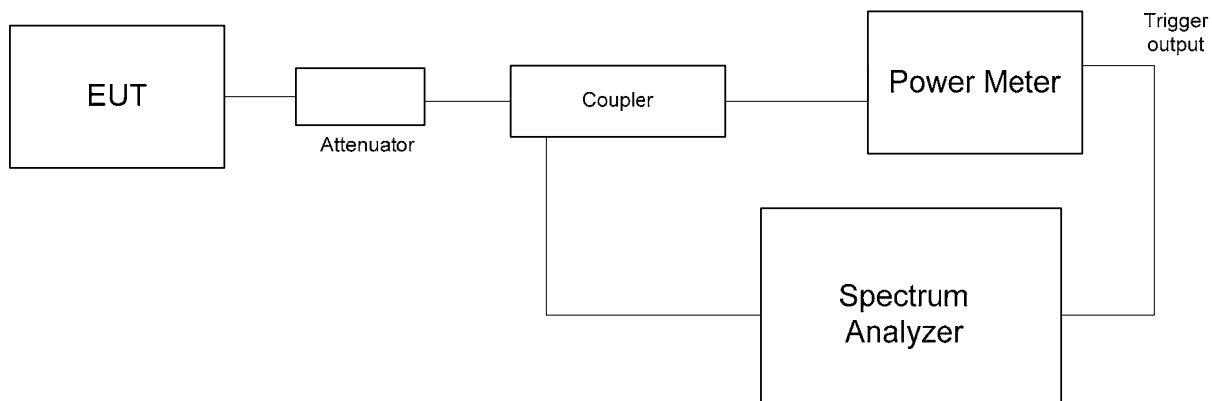
Reference numbers of test equipment used

HL 3301	HL 3302	HL 3770	HL 4229	HL 4273	HL 4275	HL 4367	HL 4575
---------	---------	---------	---------	---------	---------	---------	---------

Full description is given in Appendix A.

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

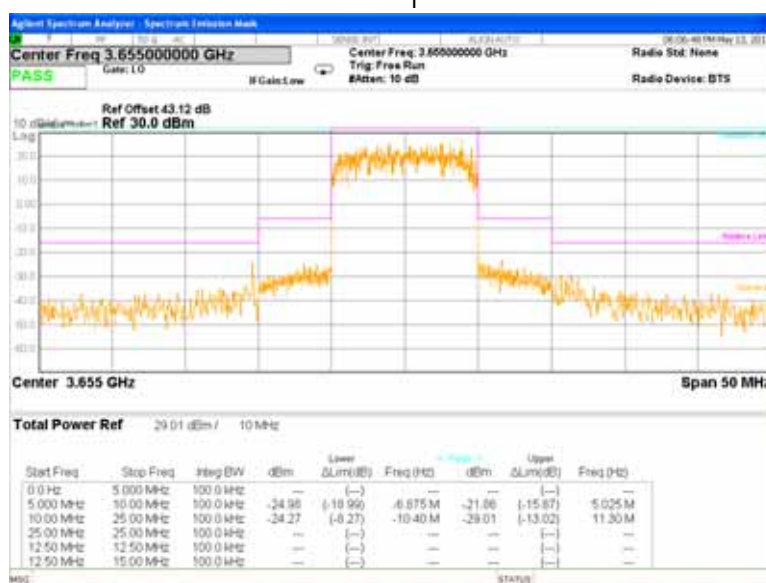
Figure 7.3.1 Emission mask test setup



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

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

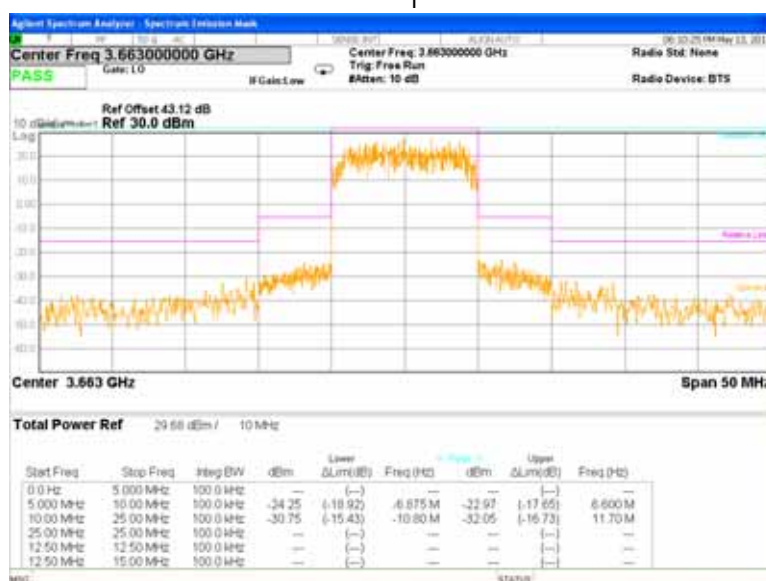


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

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

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

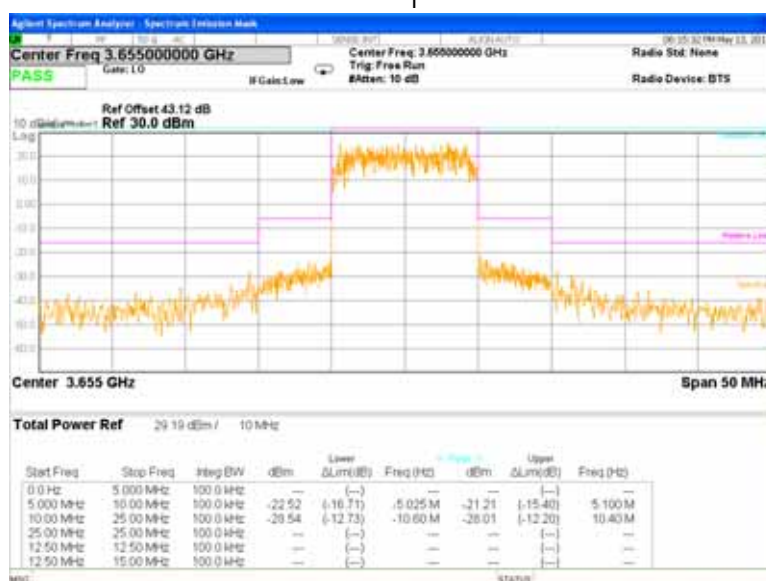


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

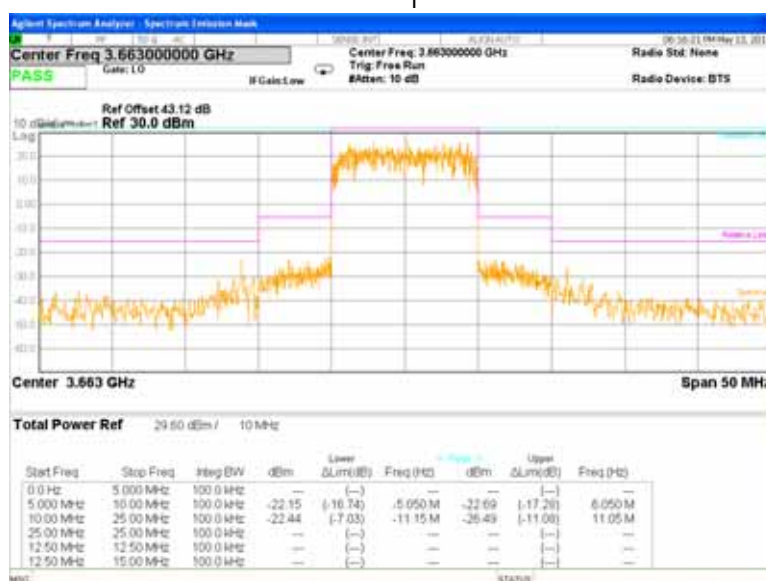


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

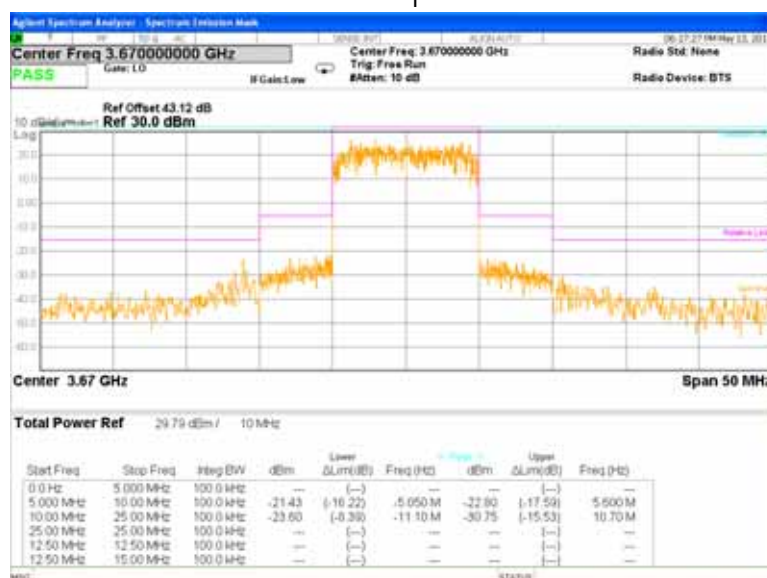


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

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

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

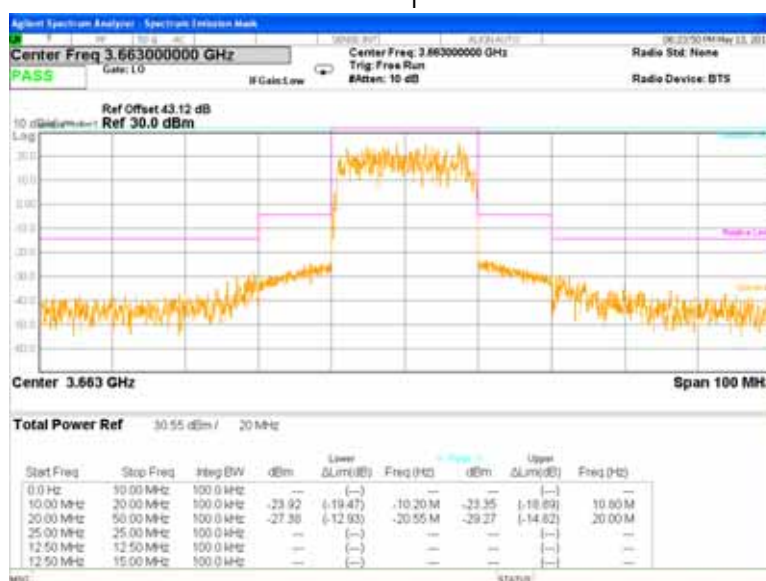


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

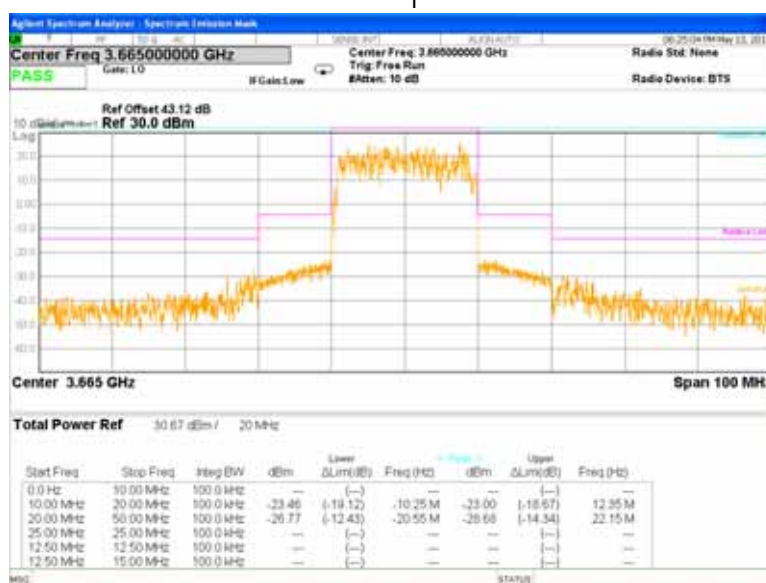


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

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

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

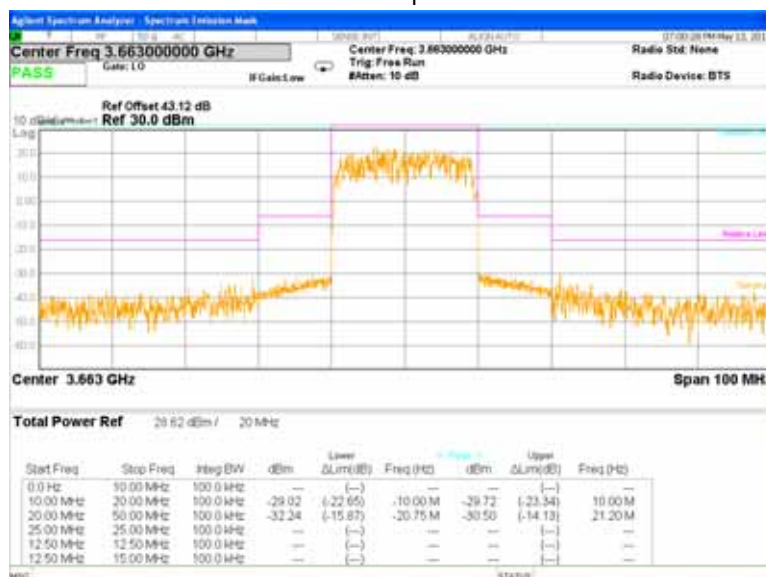


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

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

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

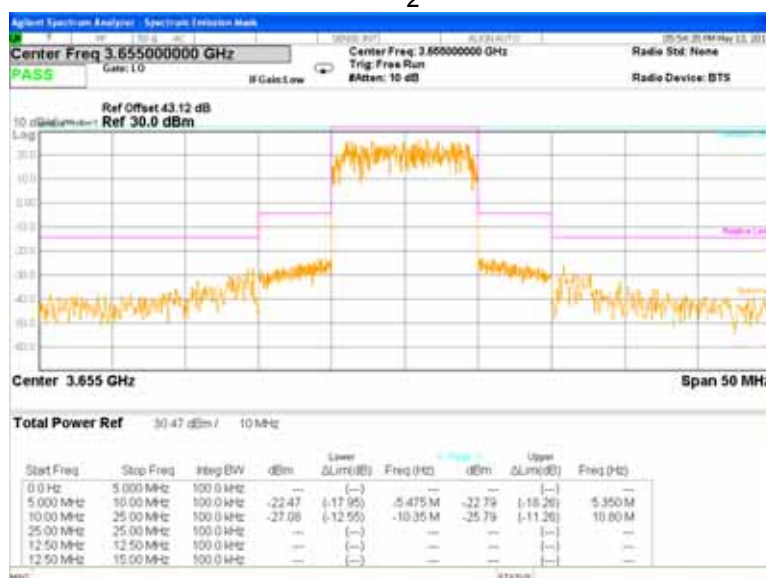


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

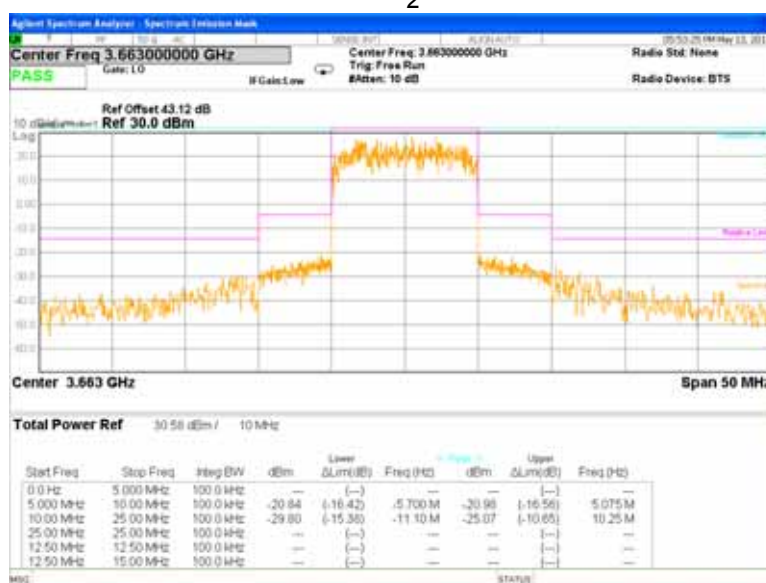


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

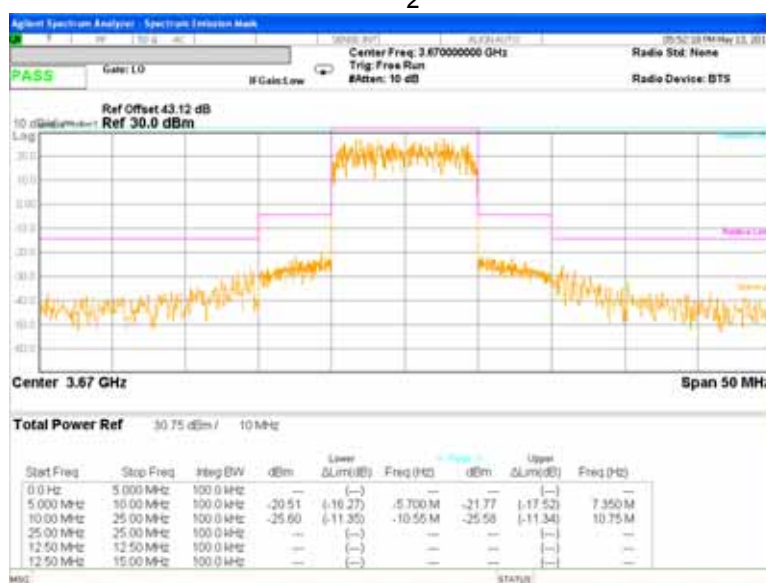


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

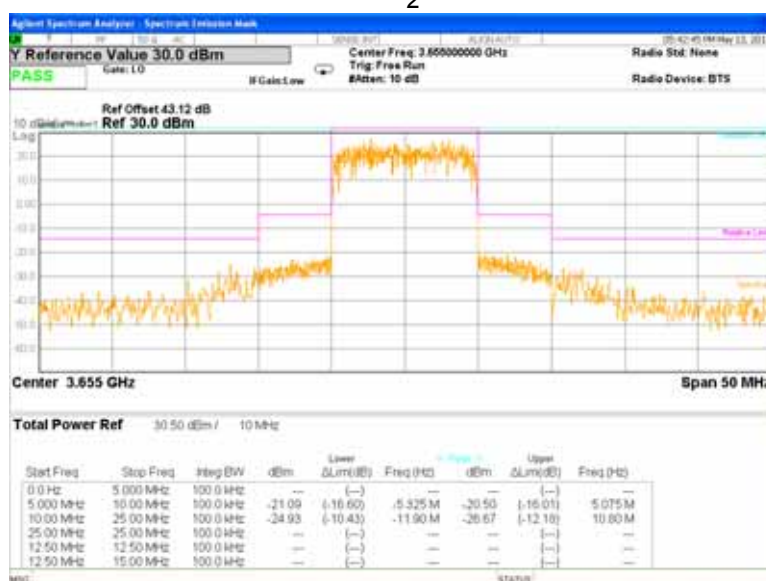


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

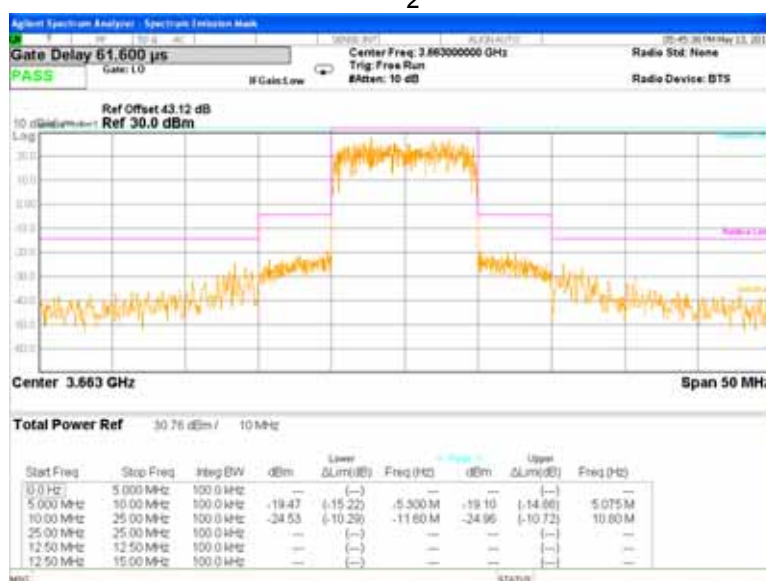


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

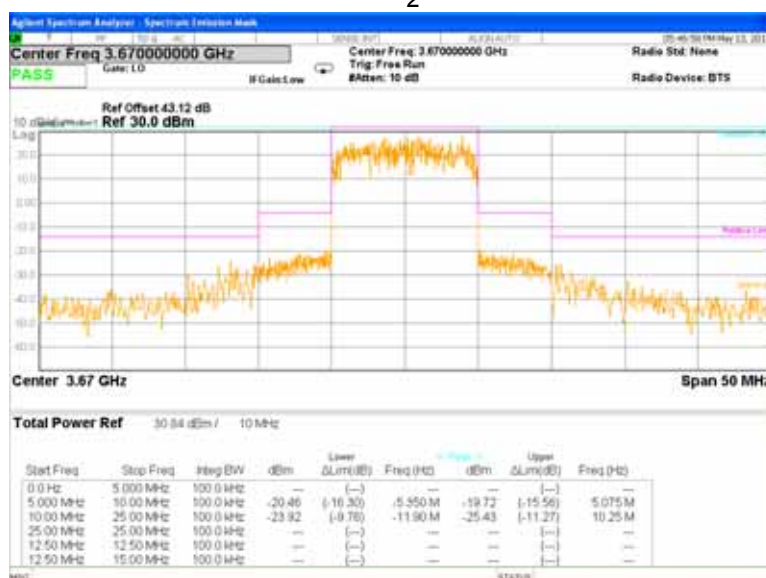


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

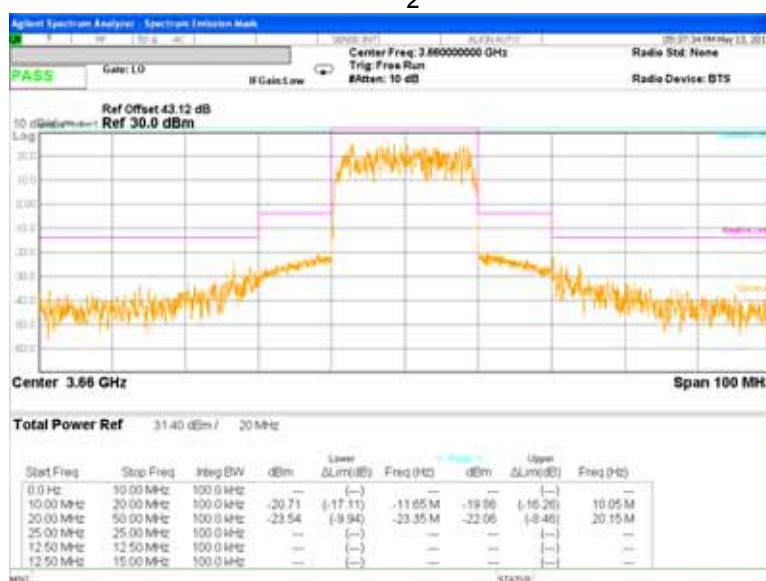


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

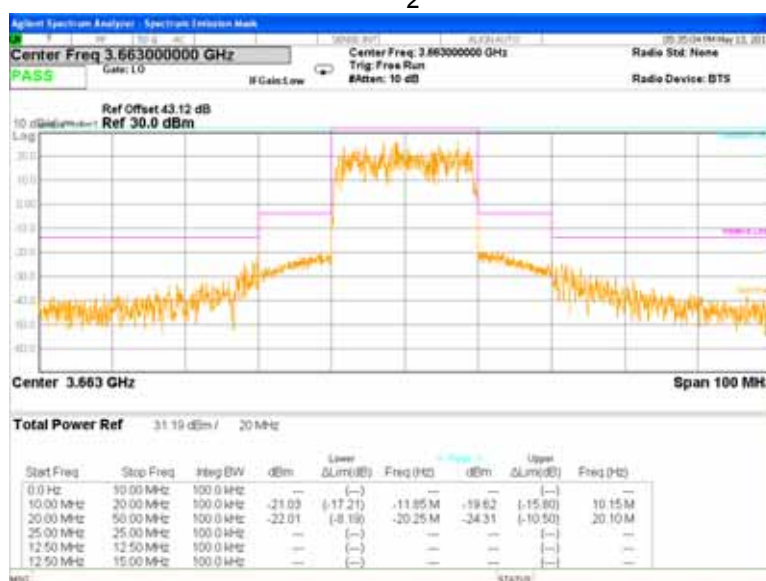


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

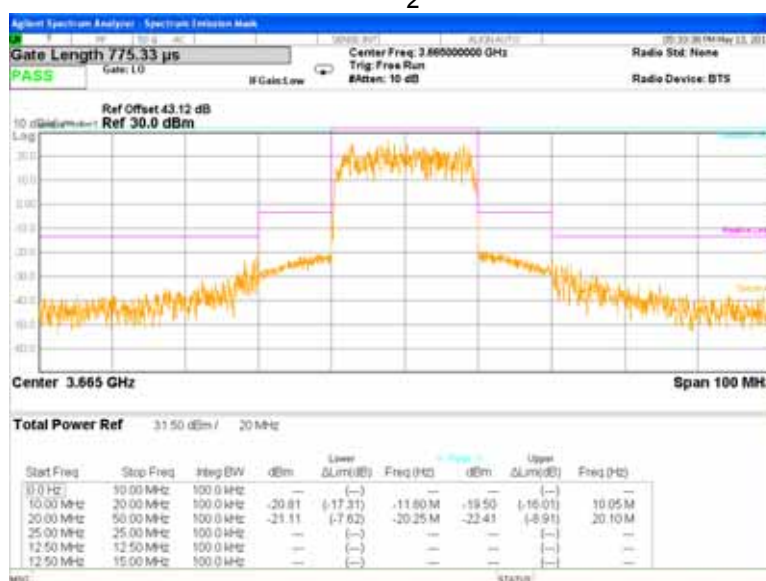


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

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

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

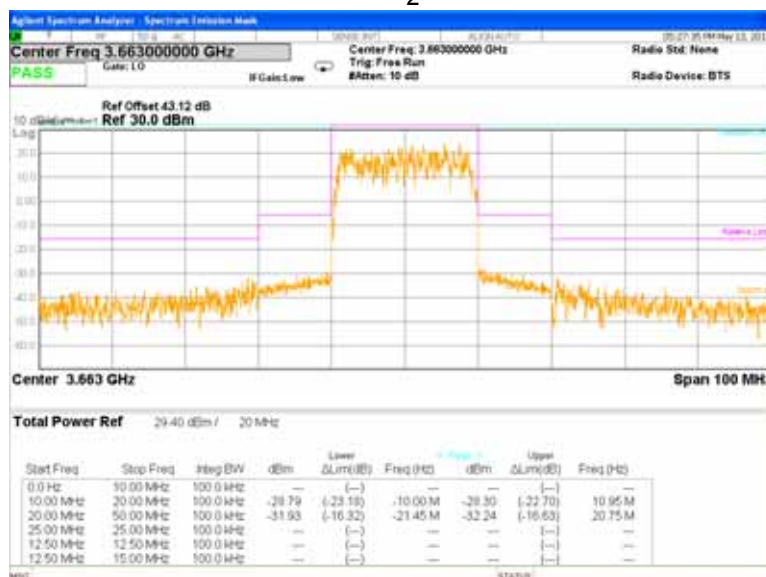


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

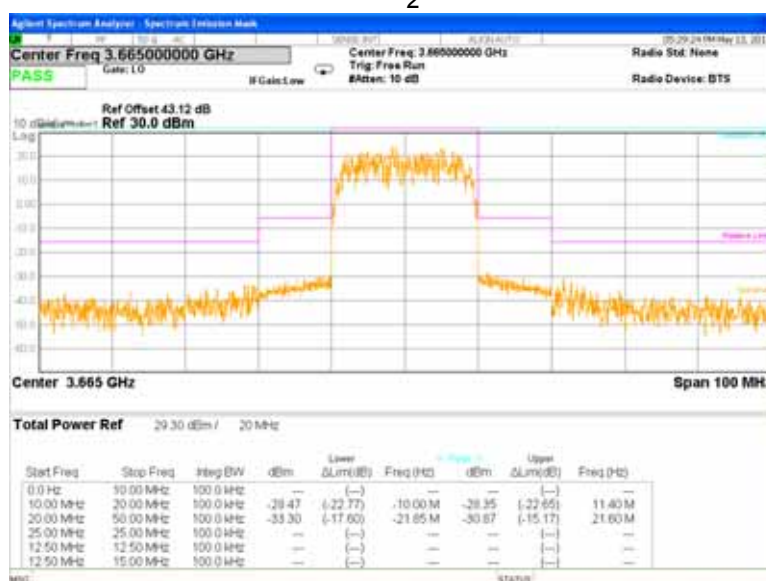


*Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW ($10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$)

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

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

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

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 th 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.

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

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

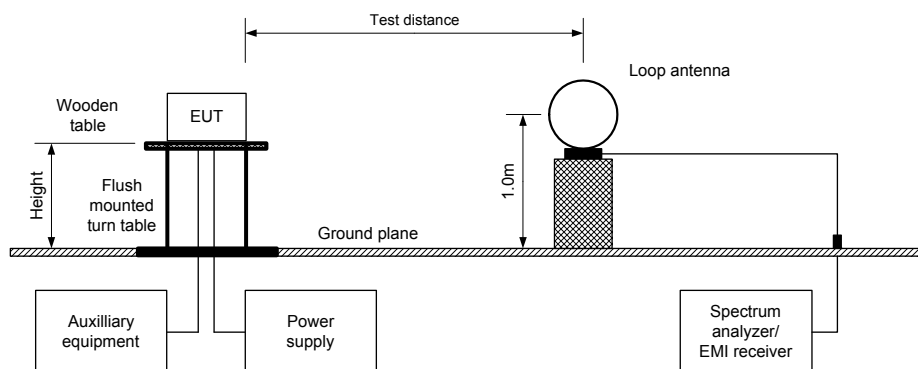
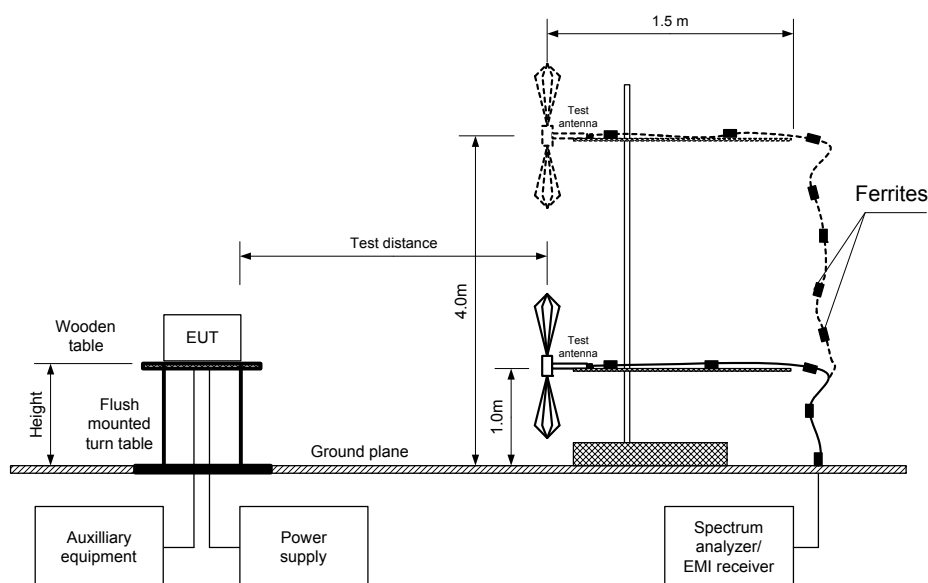


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz



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

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
Low carrier frequency 3660.0 MHz							
All spurious emissions are 20 dB below the limit							
Mid carrier frequency 3663.0 MHz							
All spurious emissions are 20 dB below the limit							
High carrier frequency 3665.0 MHz							
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.

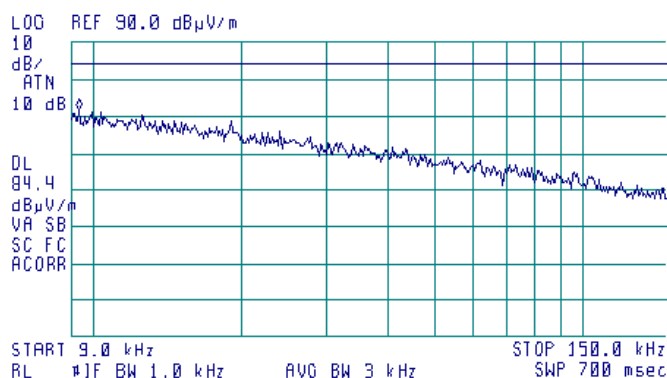
Test specification:		Section 90.1323, Radiated spurious emissions	
Test procedure:		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		14-May-14 - 15-May-14	
Temperature: 25 °C	Air Pressure: 1016 hPa	Relative Humidity: 53 %	Power Supply: 48VDC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

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



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.4 kHz
71.81 dBμV/m

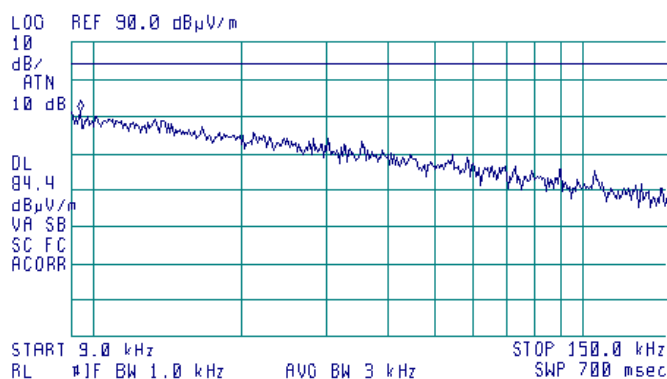


Plot 7.4.2 Radiated emission measurements in 9 - 150 kHz range

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



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.5 kHz
71.96 dBμV/m



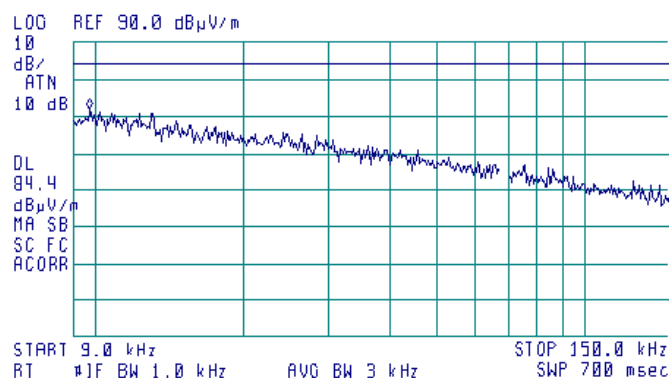
Test specification:		Section 90.1323, Radiated spurious emissions	
Test procedure:		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		14-May-14 - 15-May-14	
Temperature: 25 °C	Air Pressure: 1016 hPa	Relative Humidity: 53 %	Power Supply: 48VDC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

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



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.8 kHz
72.19 dBμV/m

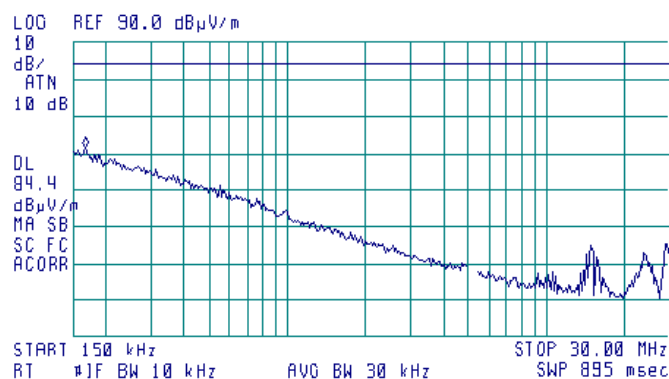


Plot 7.4.4 Radiated emission measurements in 0.15 - 30 MHz range

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



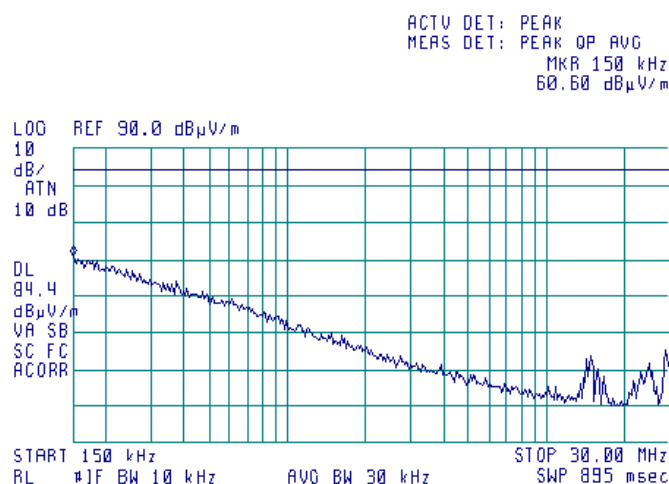
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 170 kHz
61.48 dBμV/m



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

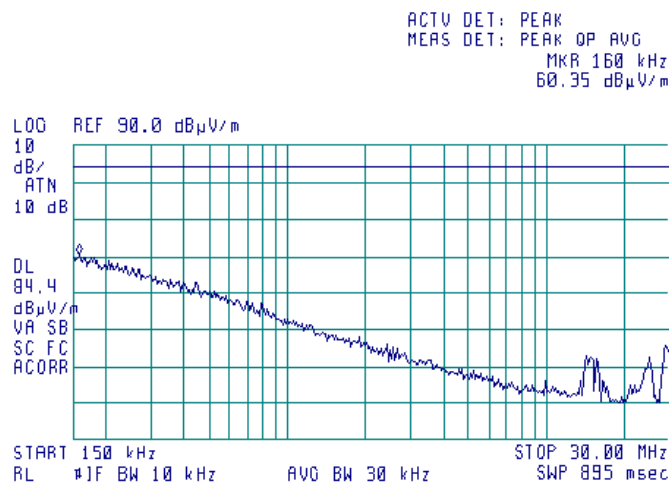
Plot 7.4.5 Radiated emission measurements in 0.15 - 30 MHz range

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



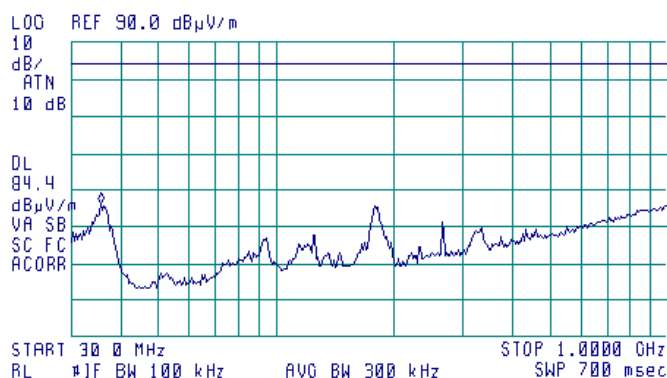
Test specification:		Section 90.1323, Radiated spurious emissions	
Test procedure:		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		14-May-14 - 15-May-14	
Temperature: 25 °C	Air Pressure: 1016 hPa	Relative Humidity: 53 %	Power Supply: 48VDC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

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



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 36.0 MHz
46.29 dBμV/m

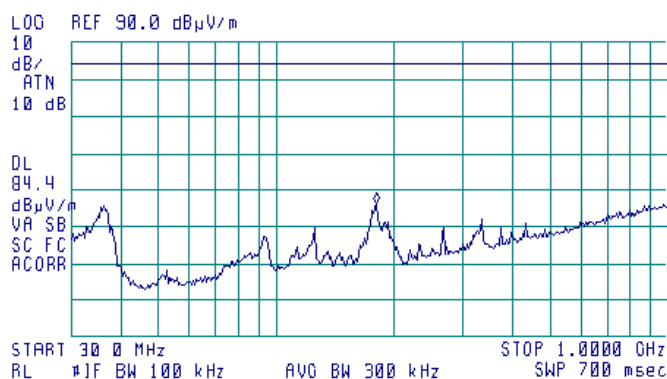


Plot 7.4.8 Radiated emission measurements in 30 - 1000 MHz range

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



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 180.4 MHz
46.27 dBμV/m



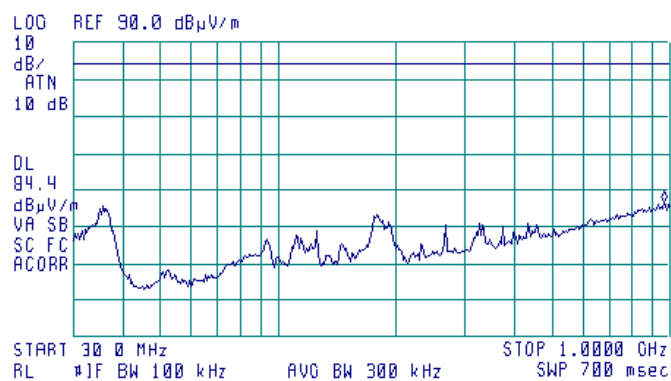
Test specification:		Section 90.1323, Radiated spurious emissions	
Test procedure:		47 CFR, Section 2.1053; 90.1323; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		14-May-14 - 15-May-14	
Temperature: 25 °C	Air Pressure: 1016 hPa	Relative Humidity: 53 %	Power Supply: 48VDC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

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



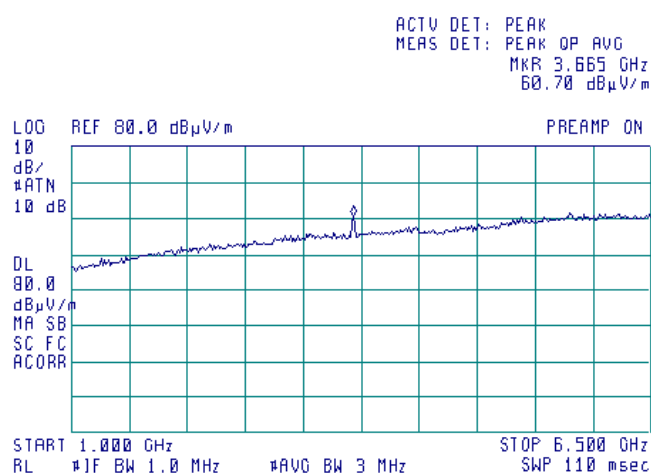
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 961.9 MHz
46.70 dBμV/m



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

Plot 7.4.10 Radiated emission measurements in 1000 – 6500 MHz range

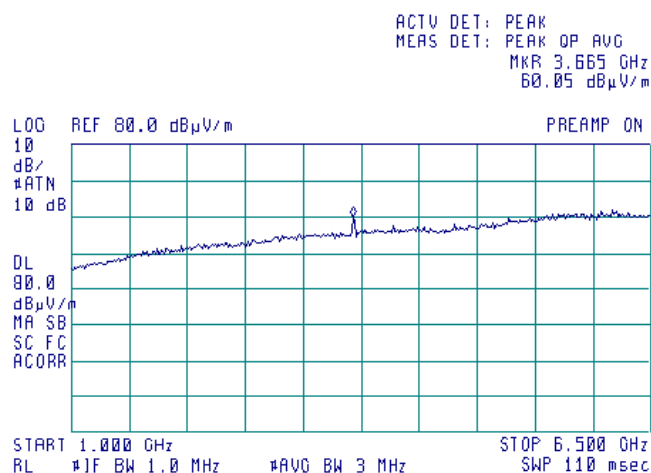
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



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

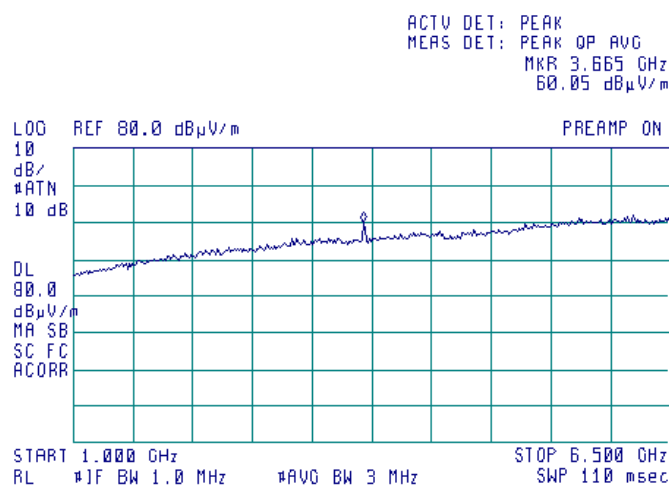


3663.0 MHz is mid carrier frequency

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

Plot 7.4.12 Radiated emission measurements in 1000 – 6500 MHz range

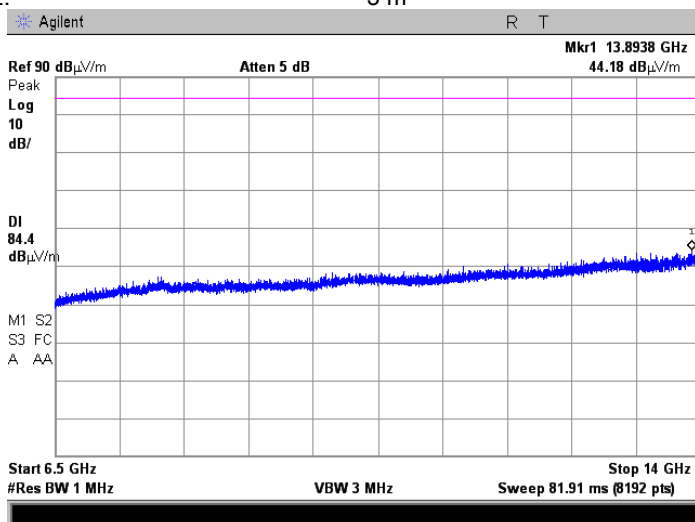
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



3665.0 MHz is high carrier frequency

Plot 7.4.13 Radiated emission measurements in 6500 – 14000 MHz range

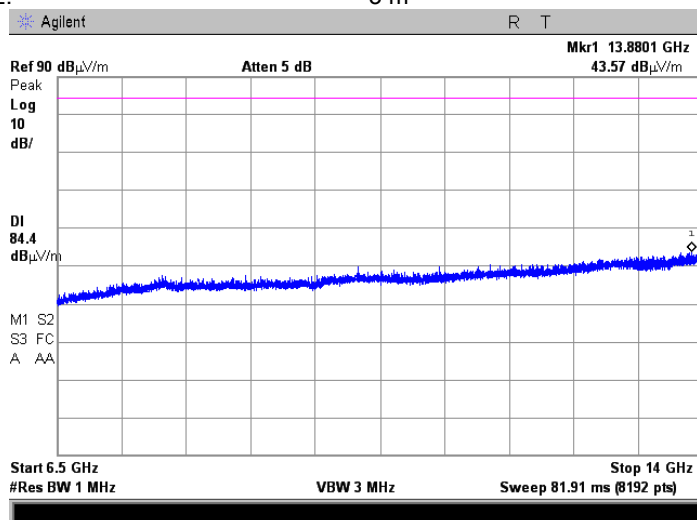
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



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

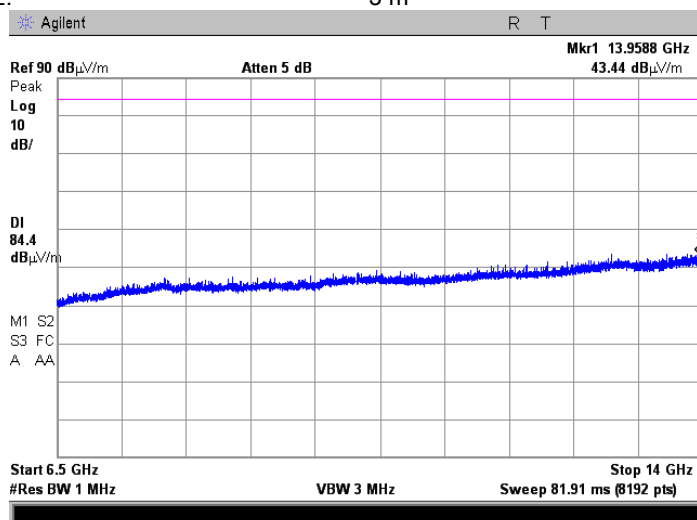
Plot 7.4.14 Radiated emission measurements in 6500 – 14000 MHz range

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

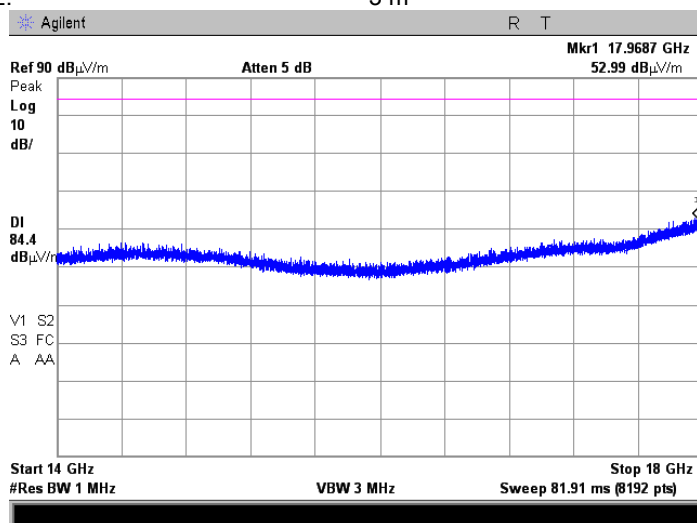
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



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

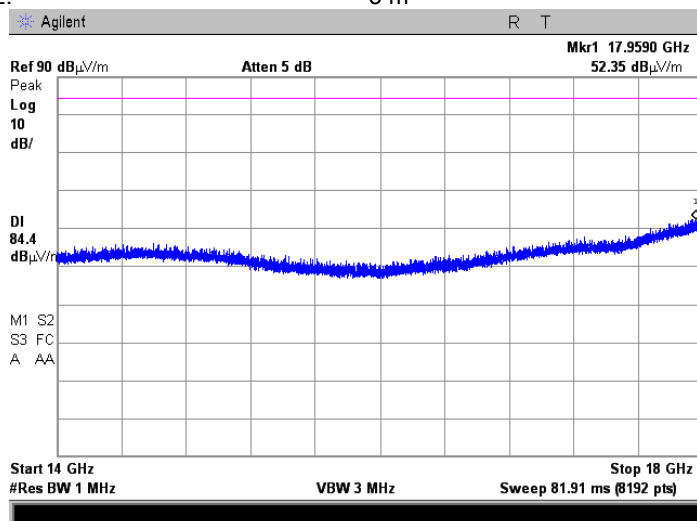
Plot 7.4.16 Radiated emission measurements in 14000 – 18000 MHz range

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

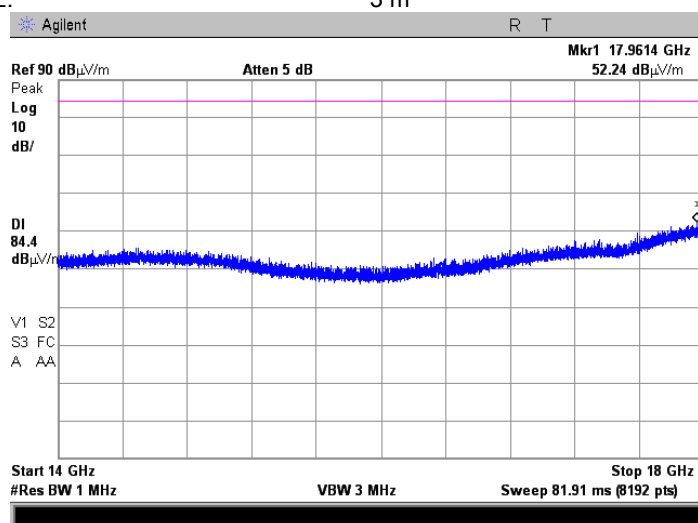
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



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

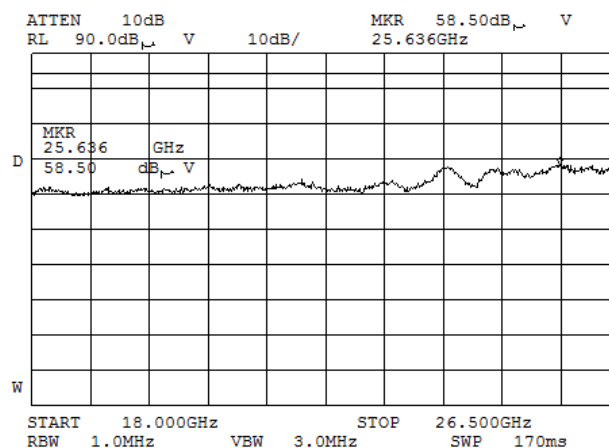
Plot 7.4.18 Radiated emission measurements in 14000 – 18000 MHz range

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

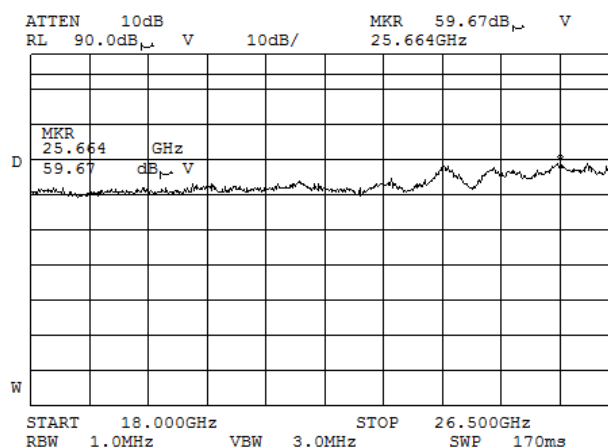


dBuV units correspond to dBuV/m

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

Plot 7.4.20 Radiated emission measurements in 18000 – 26500 MHz range

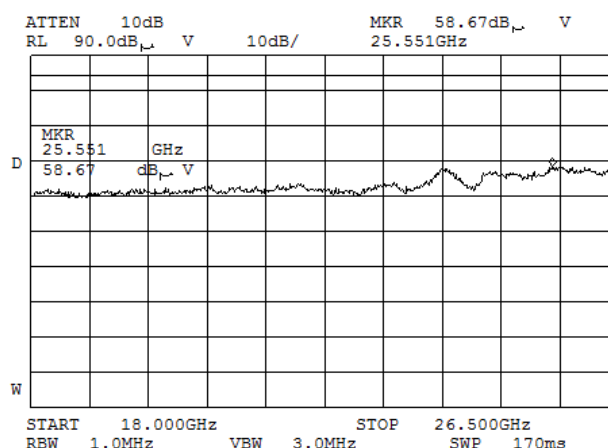
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



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

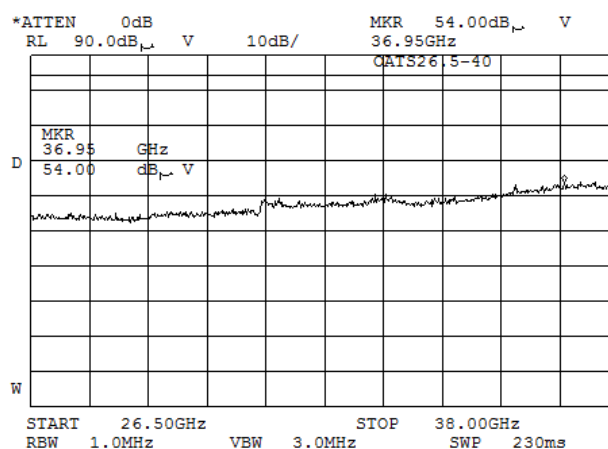


dBuV units correspond to dBuV/m

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

Plot 7.4.22 Radiated emission measurements in 26500 – 38000 MHz range

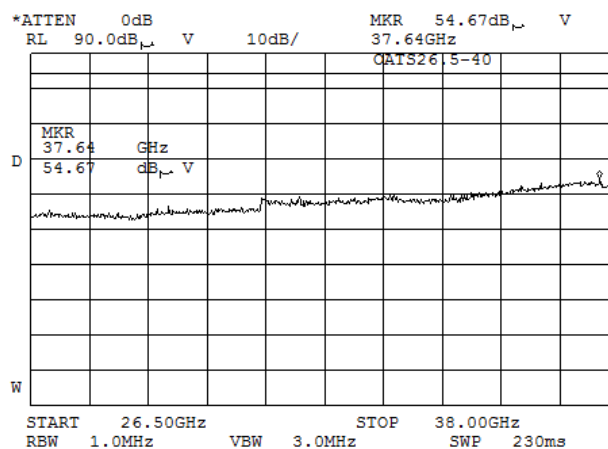
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



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

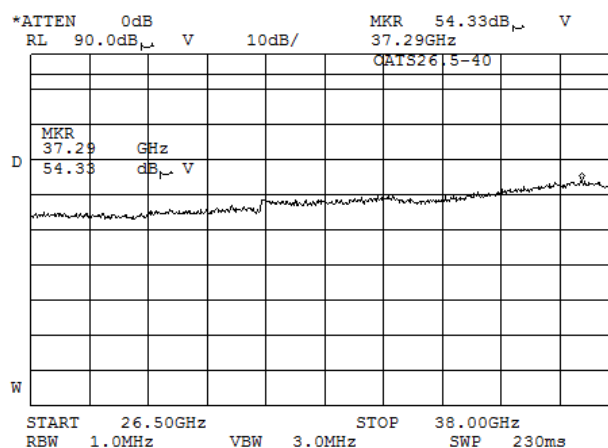


dBuV units correspond to dBuV/m

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

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

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

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 ± 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



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

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

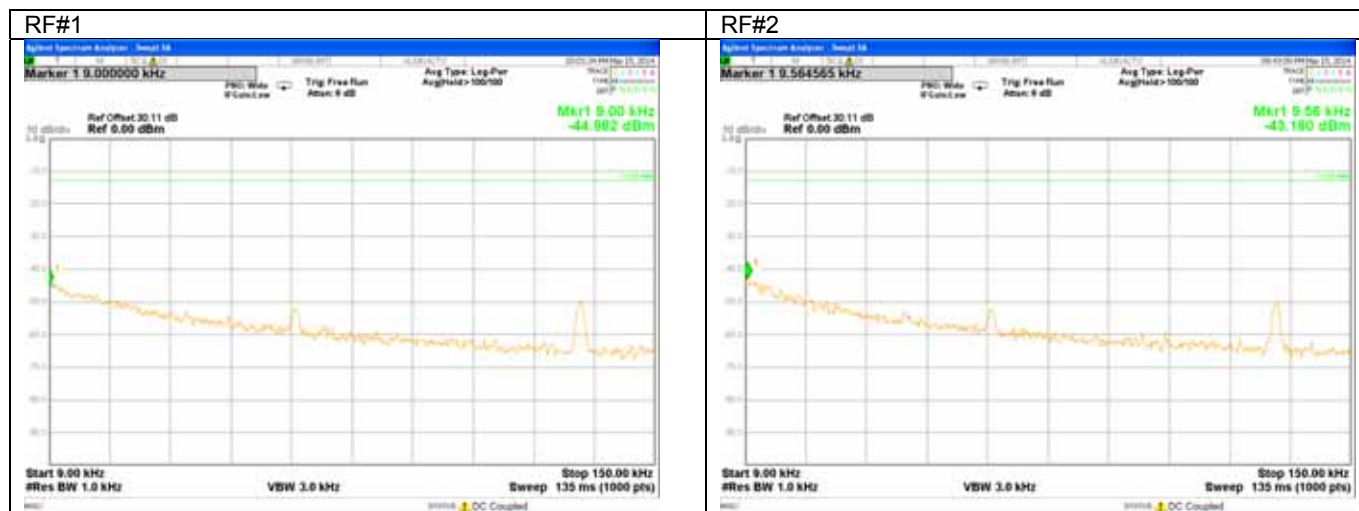
Reference numbers of test equipment used

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

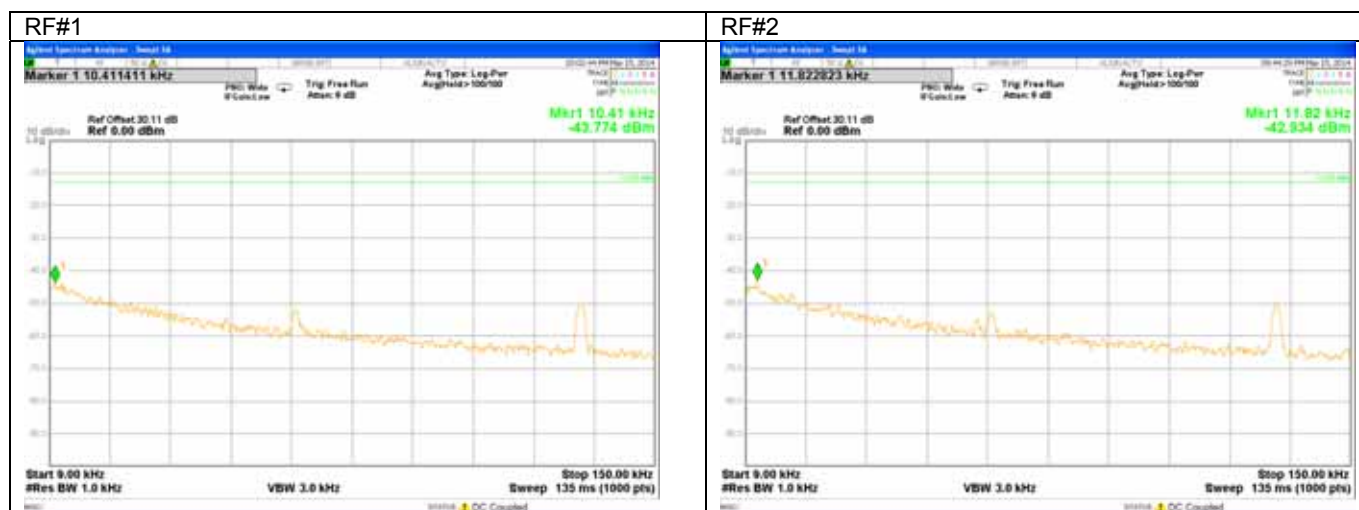
Full description is given in Appendix A.

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

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



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

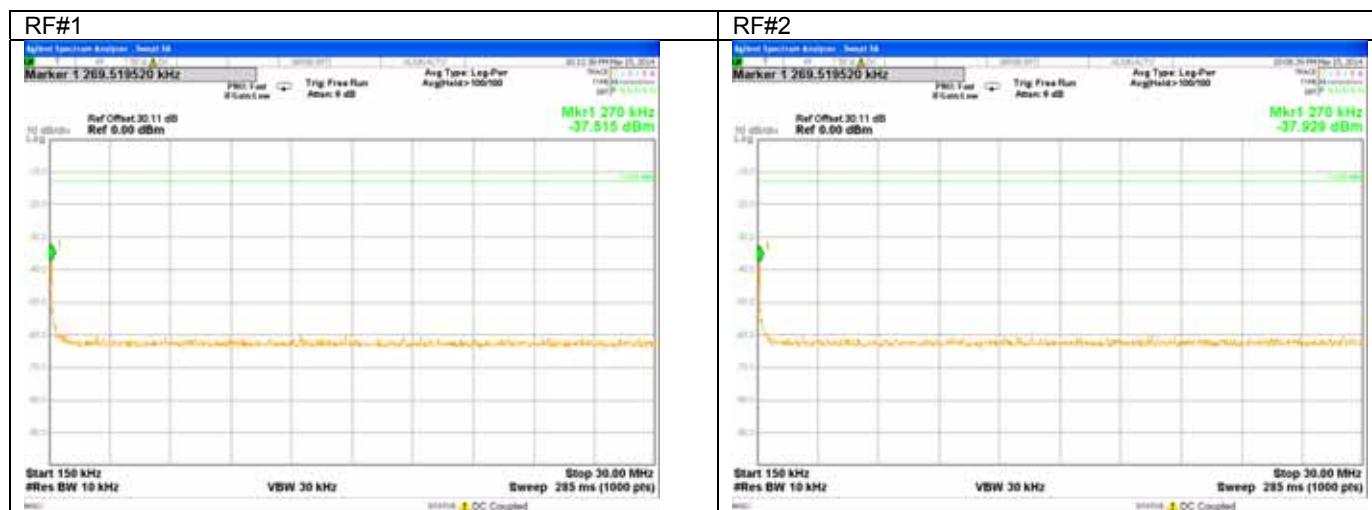


Test specification:		Section 90.1323, Conducted spurious emissions	
Test procedure:		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-May-14	
Temperature: 25 °C	Air Pressure: 1011 hPa	Relative Humidity: 43 %	Power Supply: 48VDC
Remarks:			

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

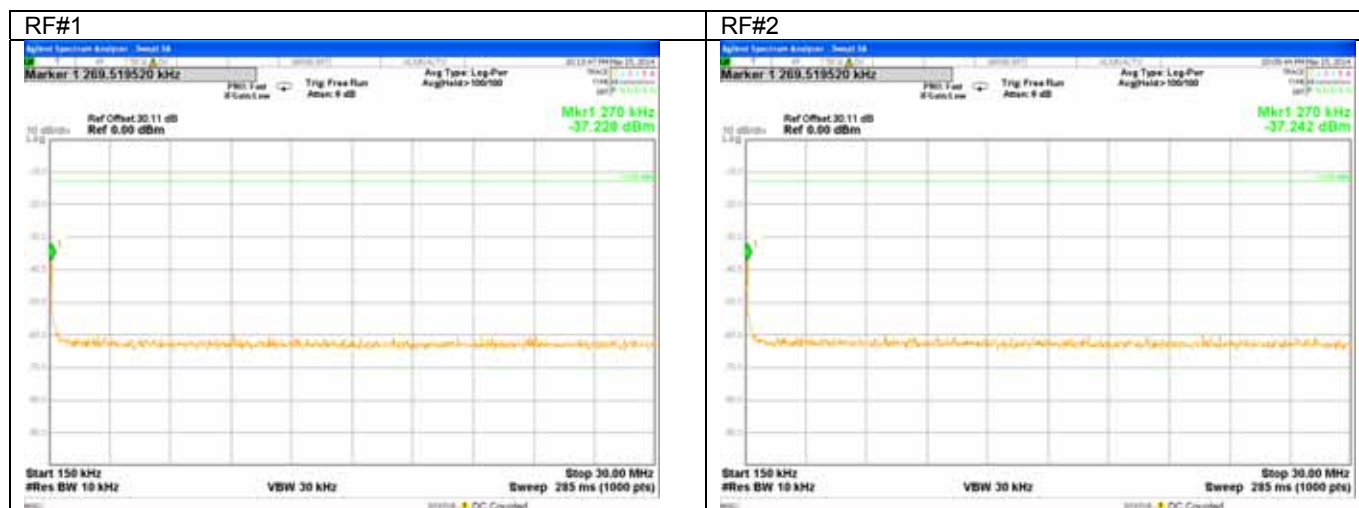


Test specification:		Section 90.1323, Conducted spurious emissions	
Test procedure:		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-May-14	
Temperature: 25 °C	Air Pressure: 1011 hPa	Relative Humidity: 43 %	Power Supply: 48VDC
Remarks:			

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

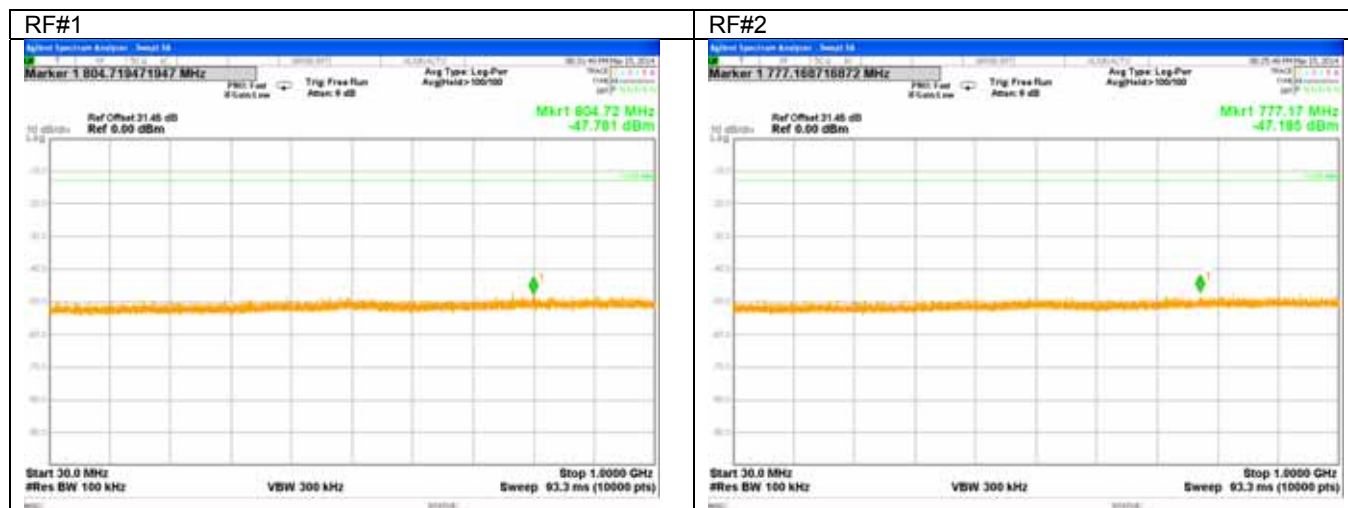


Plot 7.5.6 Spurious emission measurements in 0.15 – 30.0 MHz range at high carrier frequency

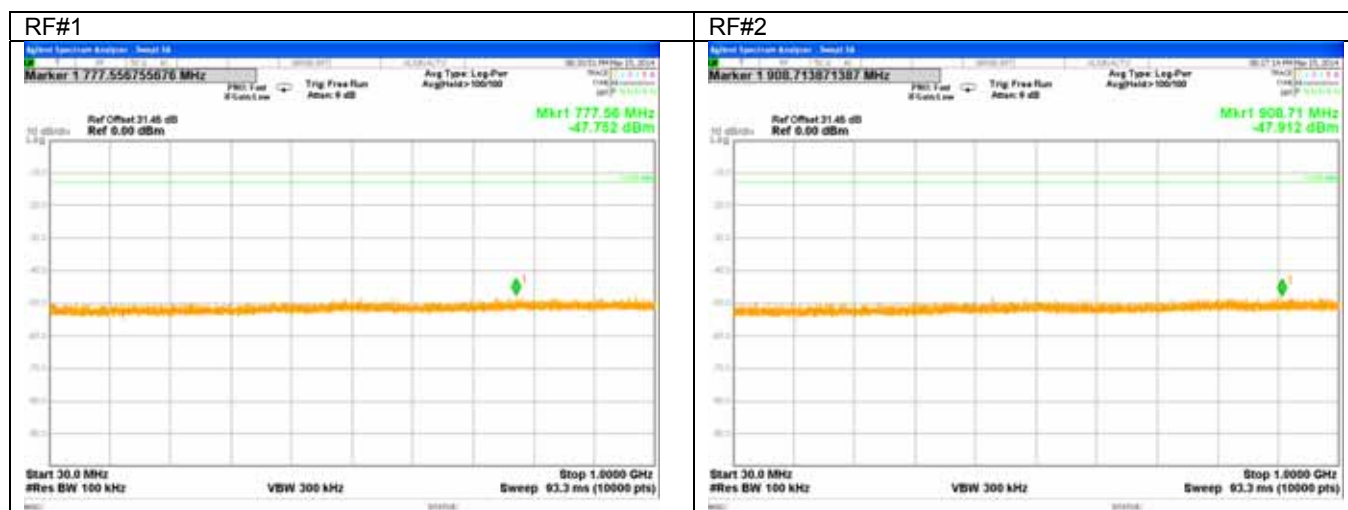


Test specification:		Section 90.1323, Conducted spurious emissions	
Test procedure:		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-May-14	
Temperature: 25 °C	Air Pressure: 1011 hPa	Relative Humidity: 43 %	Power Supply: 48VDC
Remarks:			

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

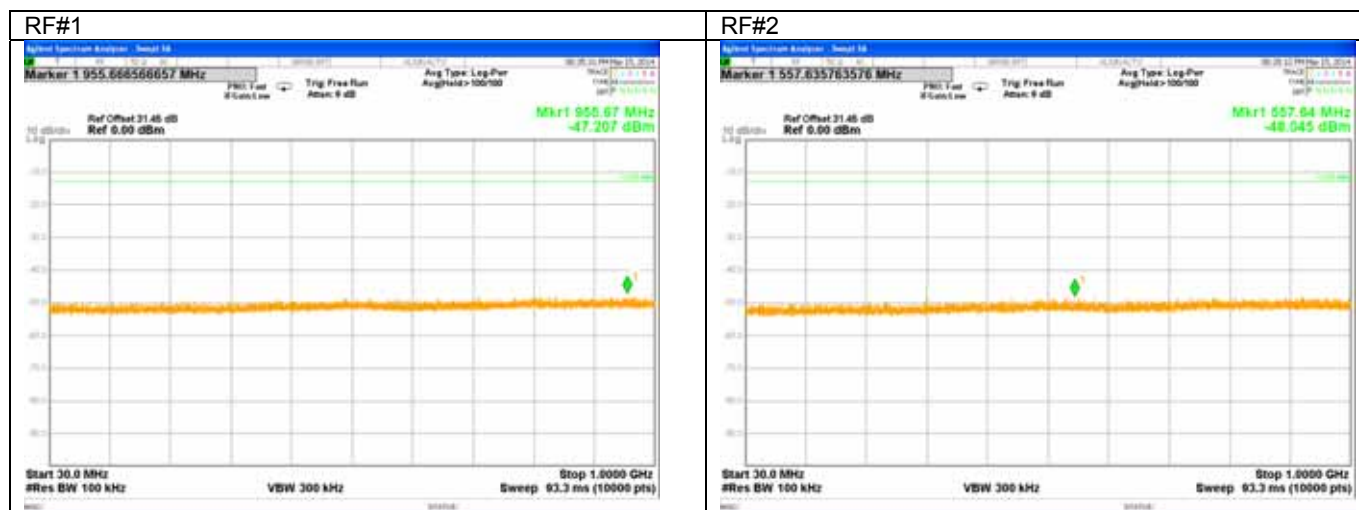


Plot 7.5.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency

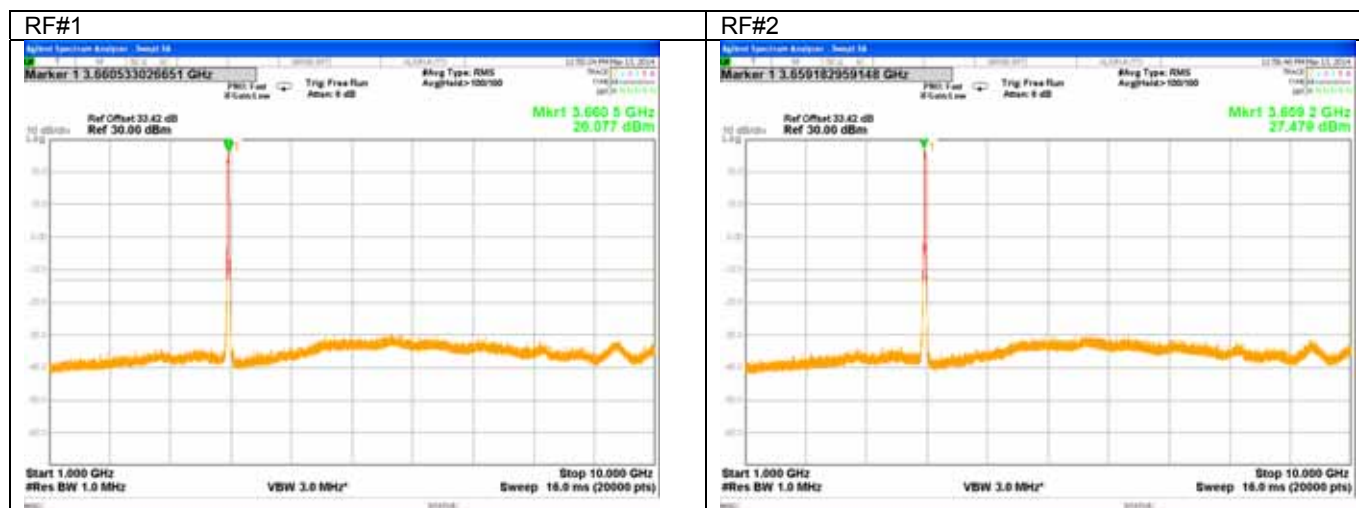


Test specification:		Section 90.1323, Conducted spurious emissions	
Test procedure:		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-May-14	
Temperature: 25 °C	Air Pressure: 1011 hPa	Relative Humidity: 43 %	Power Supply: 48VDC
Remarks:			

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



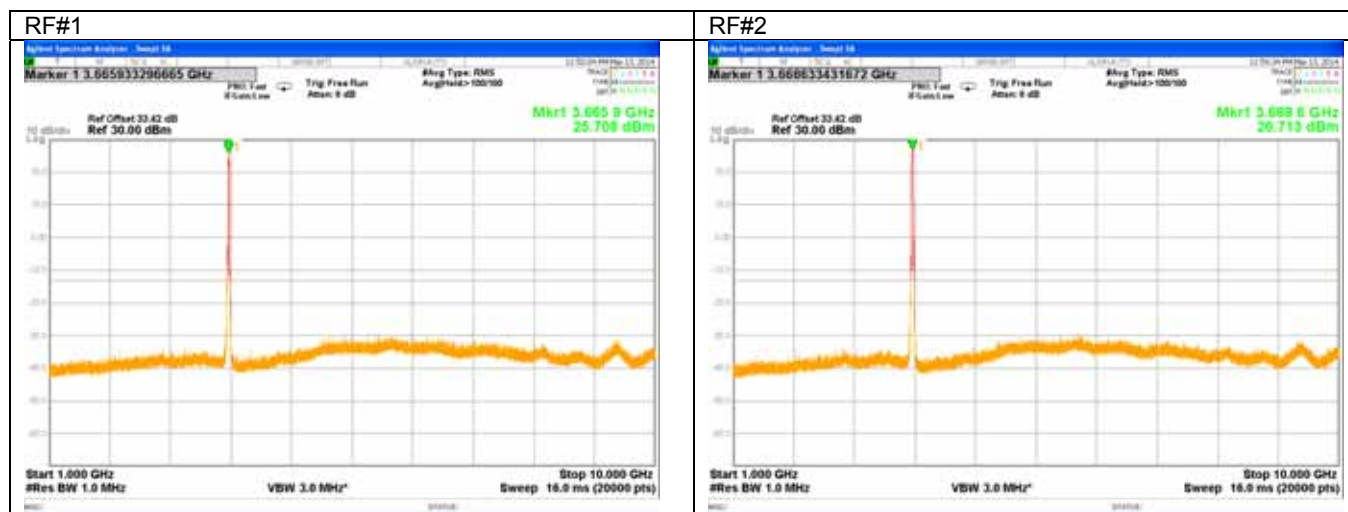
Plot 7.5.10 Spurious emission measurements in 1000 - 10000 MHz range at low carrier frequency



3650.0 MHz is low carrier frequency

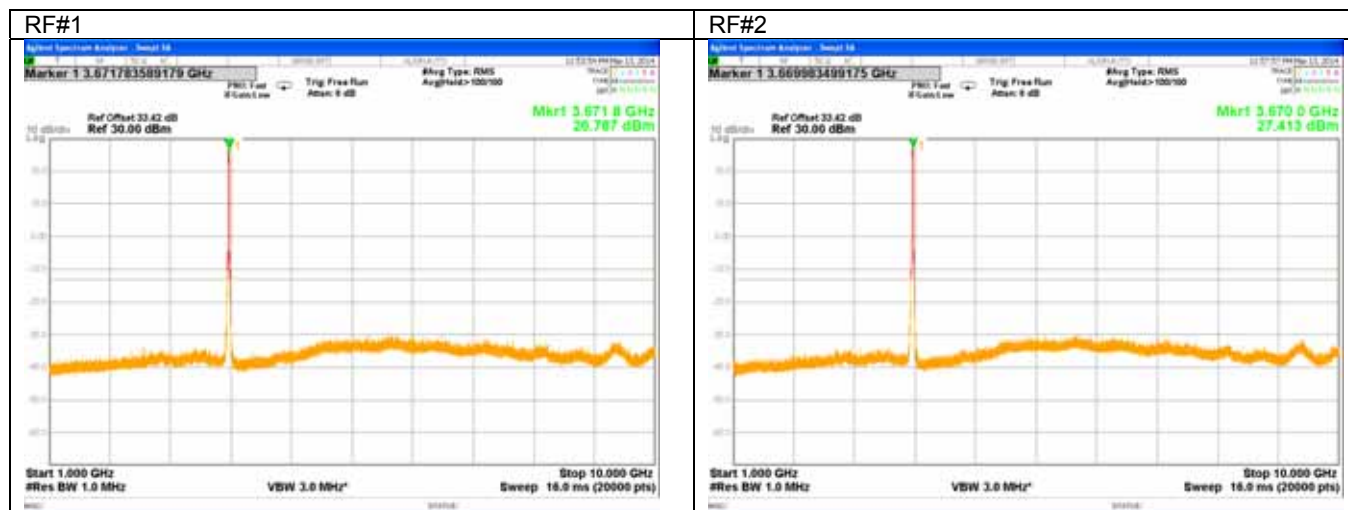
Test specification:		Section 90.1323, Conducted spurious emissions	
Test procedure:		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-May-14	
Temperature: 25 °C	Air Pressure: 1011 hPa	Relative Humidity: 43 %	Power Supply: 48VDC
Remarks:			

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



3663.0 MHz is mid carrier frequency

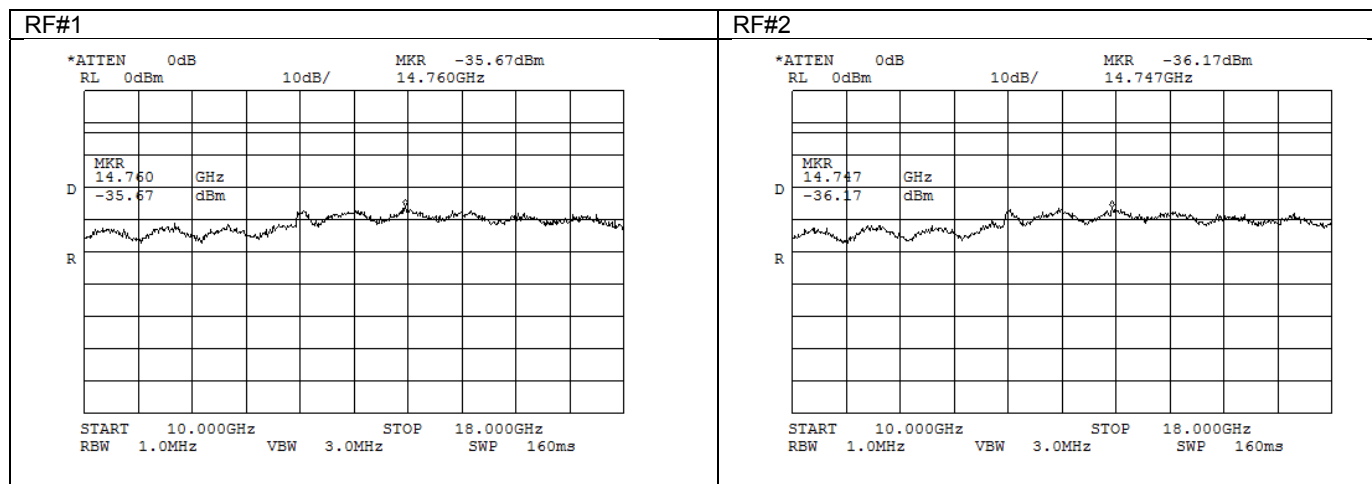
Plot 7.5.12 Spurious emission measurements in 1000 - 10000 MHz range at high carrier frequency



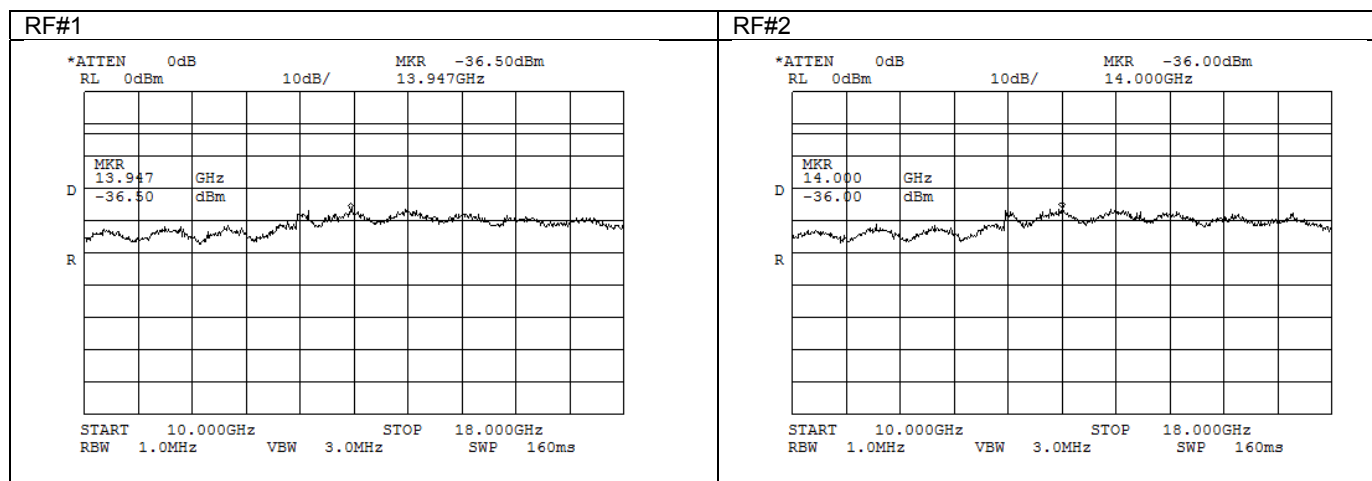
3665.0 MHz is high carrier frequency

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

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

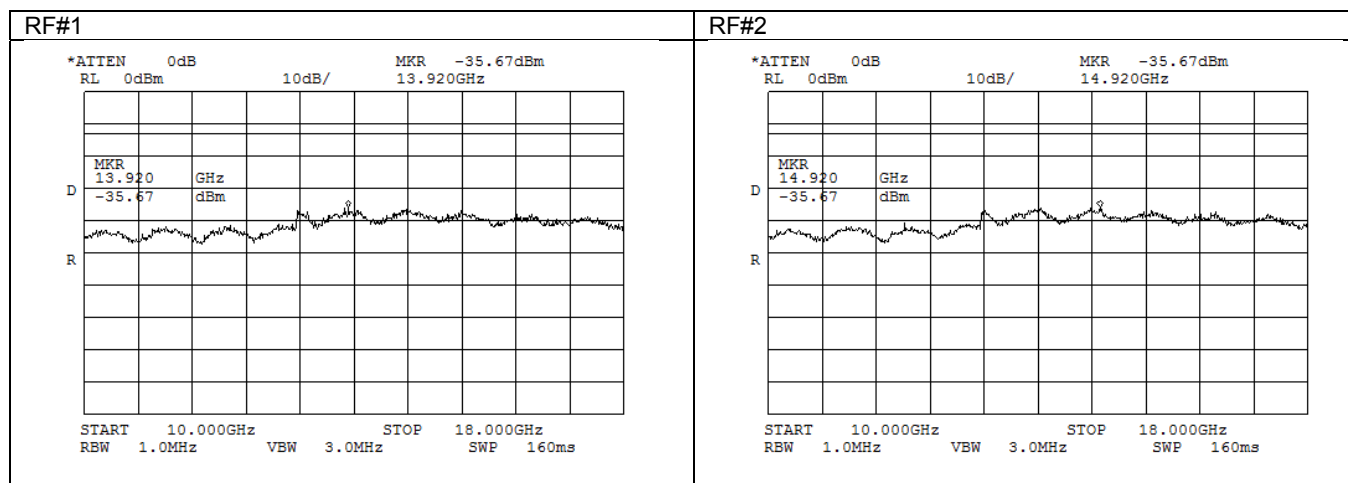


Plot 7.5.14 Spurious emission measurements in 10000 - 18000 MHz at mid carrier frequency

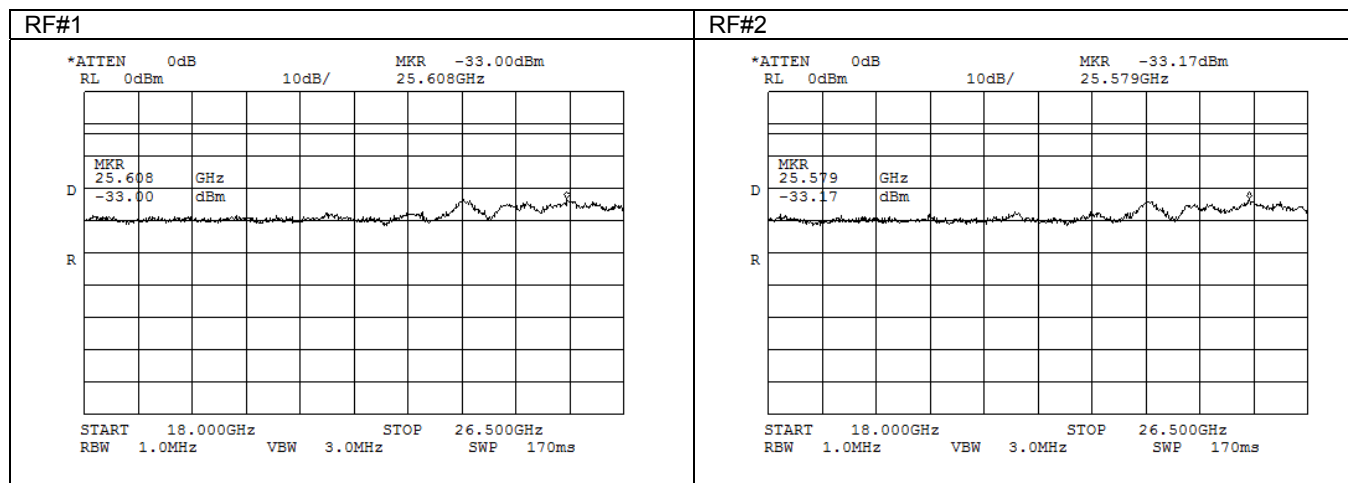


Test specification:		Section 90.1323, Conducted spurious emissions	
Test procedure:		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-May-14	
Temperature: 25 °C	Air Pressure: 1011 hPa	Relative Humidity: 43 %	Power Supply: 48VDC
Remarks:			

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

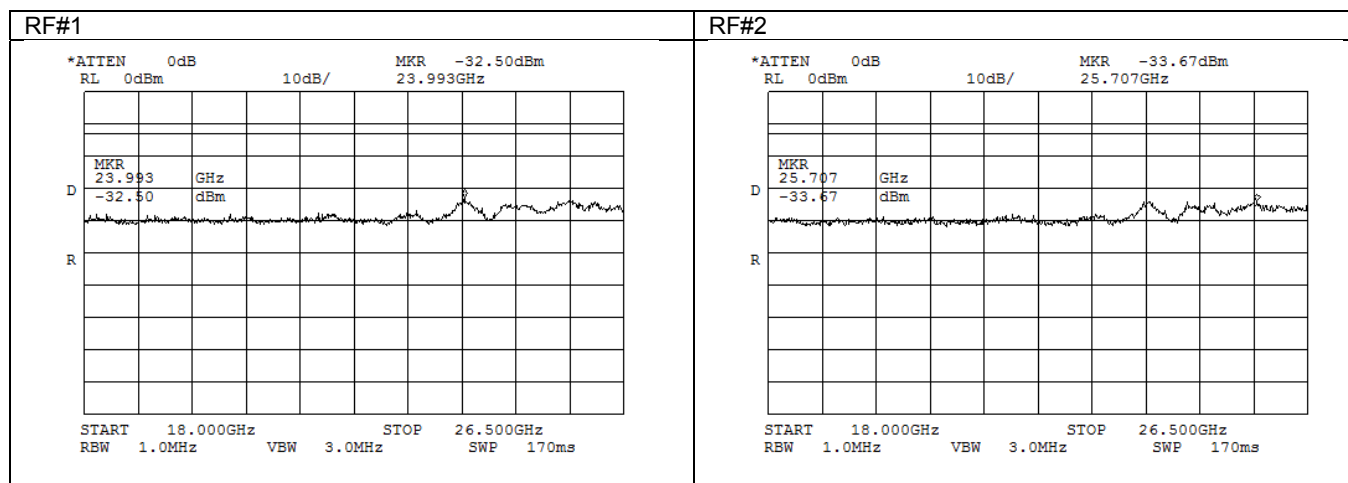


Plot 7.5.16 Spurious emission measurements in 18000 - 26500 MHz range at low carrier frequency

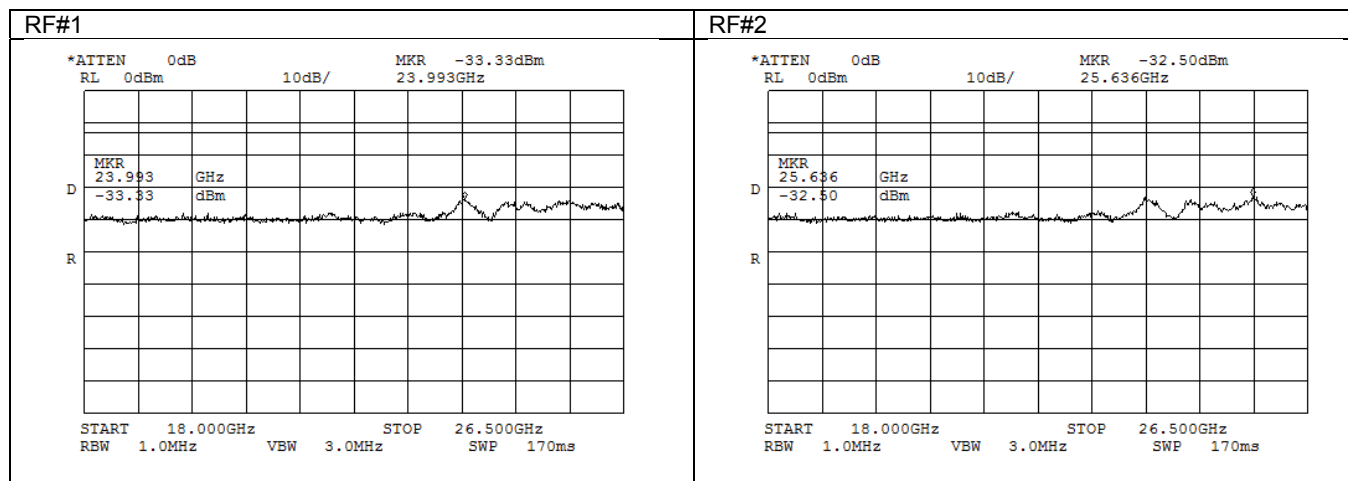


Test specification:		Section 90.1323, Conducted spurious emissions	
Test procedure:		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-May-14	
Temperature: 25 °C	Air Pressure: 1011 hPa	Relative Humidity: 43 %	Power Supply: 48VDC
Remarks:			

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

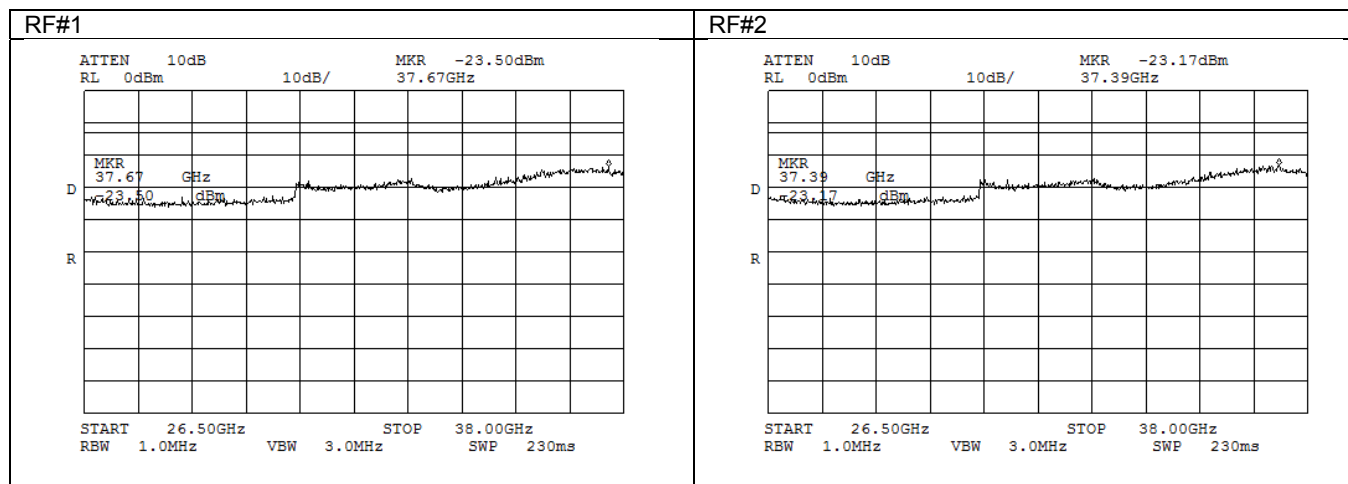


Plot 7.5.18 Spurious emission measurements in 18000 - 26500 MHz at high carrier frequency

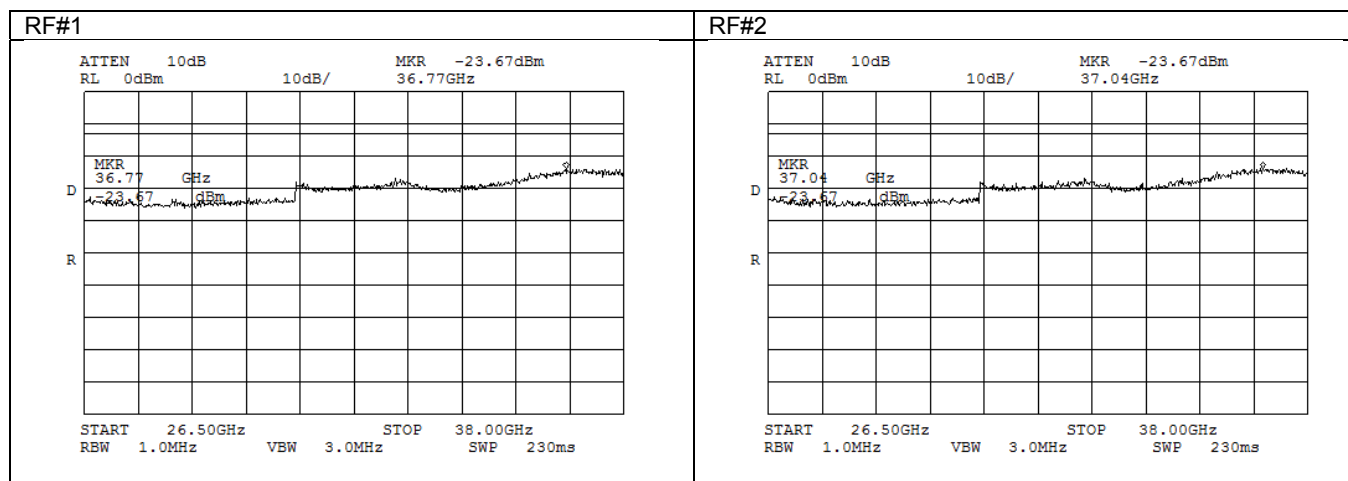


Test specification:		Section 90.1323, Conducted spurious emissions	
Test procedure:		47 CFR, Section 2.1051; 90.1323; TIA/EIA-603-C, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-May-14	
Temperature: 25 °C	Air Pressure: 1011 hPa	Relative Humidity: 43 %	Power Supply: 48VDC
Remarks:			

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

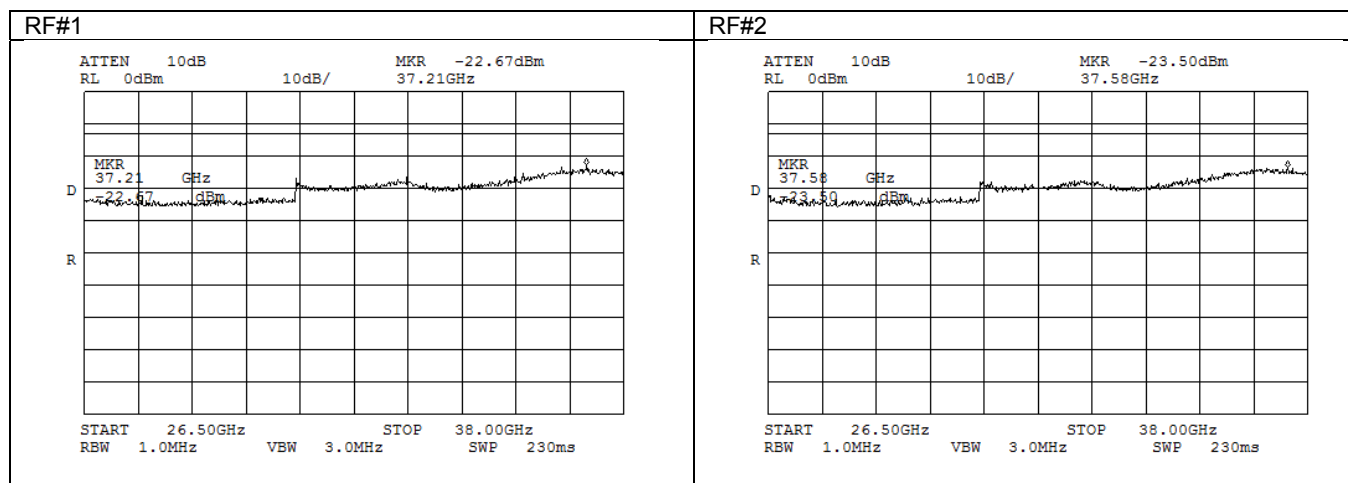


Plot 7.5.20 Spurious emission measurements in 26500s - 38000 MHz range at mid carrier frequency



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

Plot 7.5.21 Spurious emission measurements in 26500 - 38000 MHz range at high carrier frequency



Test specification:		Section 90.213, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-May-14 - 19-May-14	
Temperature: 25 °C	Air Pressure: 1015 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

7.6 Frequency stability test

7.6.1 General

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

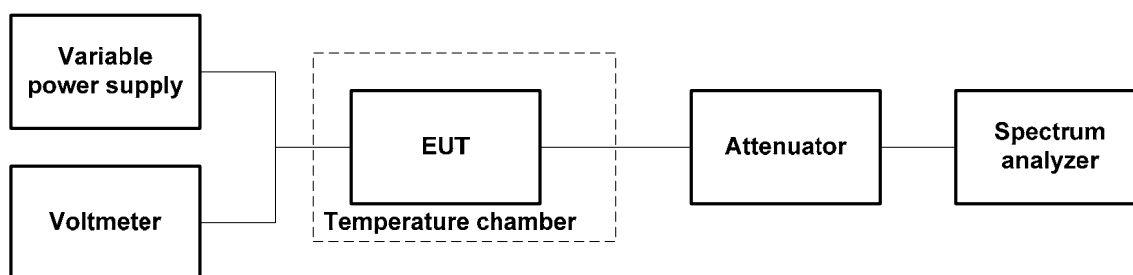
Table 7.6.1 Frequency stability limits

Assigned frequency, 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



Test specification:		Section 90.213, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		18-May-14 - 19-May-14	
Temperature: 25 °C	Air Pressure: 1015 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

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
Low channel 3655.0 MHz													
-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	
Mid Channel 3663.0 MHz													
-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	
High channel 3670.0 MHz													
-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		
---------	---------	---------	---------	---------	---------	--	--

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	12025101 003	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	MY480301 10	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
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	$\pm 8\%$
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 $\pm 13.9\%$
Duty cycle, timing (Tx ON / OFF) and average factor measurements	$\pm 1.0\%$

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

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

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

10 APPENDIX C Test facility description

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.

Address: P.O. Box 23, Binyamina 30500, Israel.
Telephone: +972 4628 8001
Fax: +972 4628 8277
e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

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(μ V) to convert it into field strength in dB(μ 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(μ V) to convert it into field strength in dB(μ 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(μ V) to convert it into field strength in dB(μ 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(μ V) to convert it into field strength in dB(μ 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(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ 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
μ s	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt

END OF DOCUMENT