

TEST REPORT

ACCORDING TO: FCC 47CFR part 27

FOR:

Airspan Networks Inc.

LTE Base Station

Model: Synergy 2000, 700MHz (B12, B17)

FCC ID:PIDSYN728

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Table of contents

1	Applicant information	3
2	Equipment under test attributes	3
3	Manufacturer information	3
4	Test details	3
5	Tests summary	4
6	EUT description	5
6.1	General information	5
6.2	Ports and lines	5
6.3	Support and test equipment	5
6.4	Changes made in the EUT	5
6.5	Test configuration	6
6.6	Transmitter characteristics	7
7	Transmitter tests according to 47CFR part 27	8
7.1	Output power test	8
7.2	Occupied bandwidth test	16
7.3	Band edge emission test	20
7.4	Spurious emissions at RF antenna connector test	29
7.5	Radiated spurious emission measurements	43
7.6	Frequency stability test	52
8	APPENDIX A Test equipment and ancillaries used for tests	55
9	APPENDIX B Measurement uncertainties	56
10	APPENDIX C Test facility description	57
11	APPENDIX D Specification references	57
12	APPENDIX E Test equipment correction factors	58
13	APPENDIX F Abbreviations and acronyms	63

1 Applicant information

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Contact name: Mr. Zion Levi

2 Equipment under test attributes

Product name: LTE Base Station
Product type: Transceiver
Model(s): Synergy 2000, 700MHz (B12, B17)
Serial number: 6F41DA17304C
Hardware version: D4
Software release: 14.12.50.68
Receipt date 20-Mar-14

3 Manufacturer information

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




4 Test details

Project ID: 25631
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 20-Mar-14
Test completed: 27-Mar-14
Test specification(s): FCC 47CFR part 27

5 Tests summary

Test	Status
Transmitter characteristics	
Section 27.50(c)(3), Peak output power at RF antenna connector	Pass
Section 2.1049, Occupied bandwidth	Pass
Section 27.53(f), Band edge emission at RF antenna connector	Pass
Section 27.53(f), Spurious emissions at RF antenna connector	Pass
Section 27.53(f), Radiated spurious emissions	Pass
Section 27.54, Frequency stability	Pass
Section 27.52, RF safety	Pass, exhibit provided in 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	March 27, 2014	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	April 6, 2014	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	April 23, 2014	

6 EUT description

6.1 General information

A Base station radio, Synergy 2000-Band 12 FDD LTE, is a part of 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 75 Mbps) uses OFDM and operating in FDD mode, equipped with a 13.5 dBi external antenna. The maximum total RF output power (not including antenna gain) is 33.68 dBm and it can be reduced by software.

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

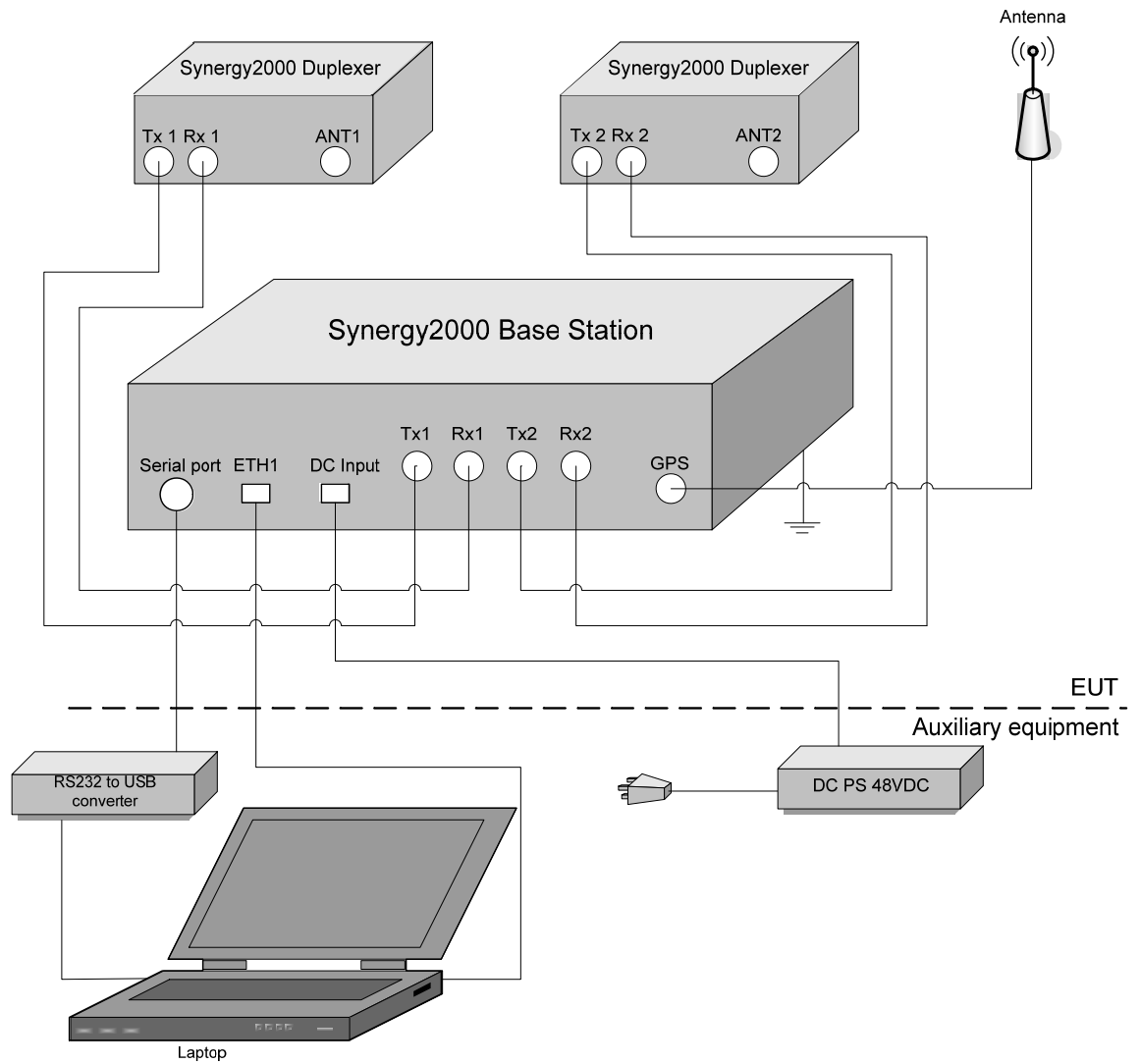
6.3 Support and test equipment

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		728.0 – 746.0 MHz			
Operating frequency range		733.0 – 741.0 MHz for 10 MHz EBW			
RF channel spacing		10 MHz			
Maximum rated output power		At transmitter 50 Ω RF output connector (aggregate power of both RF chains) 33.68 dBm			
Is transmitter output power variable?		No			
		V	Yes	continuous variable	
				stepped variable with stepsize	0.5 dB
				minimum RF power	0 dBm
				maximum RF power (single RF chain)	31 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		
Dual Polarized 60° Sector Antenna, Fixed Tilt	Alpha Wireless		AW3052		
Dual Polarized 90° Sector Antenna, Fixed Tilt	Alpha Wireless		AW3054		
OMNI Directional Antenna	MTI Wireless Edge Ltd.		MT-221023/NV		
OMNI Directional Antenna	MTI Wireless Edge Ltd.		MT-221024/NV		
Transmitter 99% power bandwidth		10 MHz			
Transmitter aggregate data rate/s, Mbps		QPSK	16QAM		
		15.5	30.5		
Type of modulation		QPSK, 16QAM, 64QAM			
Type of multiplexing		FDD			
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 27.50(c)(3), Peak output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		20-Mar-14 - 23-Mar-14	
Temperature: 23 °C	Air Pressure: 1018 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

7 Transmitter tests according to 47CFR part 27

7.1 Output power test

7.1.1 General

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

Table 7.1.1 Output power limits

Transmitter type	Assigned frequency range, MHz	Maximum output power, ERP	
		W	dBm
Fixed and base stations	728 – 746	1000/1 MHz	60.0/1 MHz

* The maximum output power limit shall be calculated by subtracting of antenna gain in dBd from maximum allowed ERP

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.

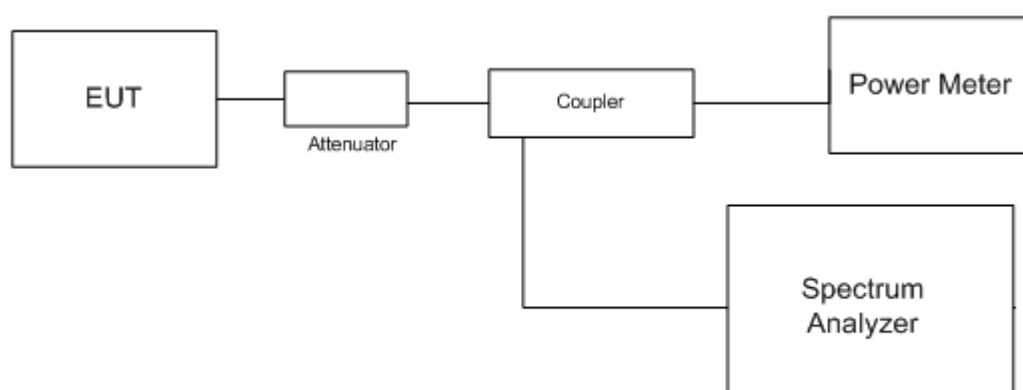
7.1.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.

7.1.2.3 The resolution bandwidth of spectrum analyzer was set to 1 MHz and the average power was integrated over EBW as provided in Table 7.1.2 and the associated plots.

7.1.2.4 The maximum output power was measured with power meter as provided in Table 7.1.2.

7.1.2.5 The test results are provided in the tables below and associated plots.

Figure 7.1.1 Maximum output power test setup





Test specification:		Section 27.50(c)(3), Peak output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		20-Mar-14 - 23-Mar-14	
Temperature: 23 °C	Air Pressure: 1018 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

Table 7.1.2 Output power test results

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
 DETECTOR USED: Average
 RESOLUTION BANDWIDTH: 1000 kHz
 VIDEO BANDWIDTH: 3000 kHz
 MODULATING SIGNAL: PRBS
 MAXIMUM ANTENNA GAIN: 13.5 dBi (11.35 dBd)
 CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	SA reading, RF#1, dBm/MHz	SA reading, RF#2, dBm/MHz	Total power*, dBm/MHz	Antenna gain, dBd	Total ERP**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
QPSK 15.5 Mbps								
733.00	20.26	20.20	23.24	11.35	34.59	60.00	-25.41	Pass
738.00	20.54	19.99	23.28	11.35	34.63	60.00	-25.37	Pass
741.00	20.24	19.86	23.06	11.35	34.41	60.00	-25.59	Pass
64QAM 75.0 Mbps								
733.00	20.98	19.96	23.51	11.35	34.86	60.00	-25.14	Pass
738.00	20.52	19.80	23.19	11.35	34.54	60.00	-25.46	Pass
741.00	20.75	19.51	23.18	11.35	34.53	60.00	-25.47	Pass

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

** - ERP total, dBm/MHz = Total power*, dBm/MHz + Antenna gain, dBd

Carrier frequency, MHz	Power meter reading, RF#1, dBm	Power meter reading, RF#2, dBm	Total RF power**, dBm	Antenna gain, dBd	Total ERP*, dBm	Limit, dBm	Margin, dB	Verdict
QPSK 15.5 Mbps								
733.00	30.62	30.32	33.48	11.35	44.83	NA	NA	Pass
738.00	30.42	30.12	33.28	11.35	44.63	NA	NA	Pass
741.00	30.32	30.07	33.21	11.35	44.56	NA	NA	Pass
64QAM 75.0 Mbps								
733.00	31.07	30.22	33.68	11.35	45.03	NA	NA	Pass
738.00	30.92	30.12	33.55	11.35	44.90	NA	NA	Pass
741.00	30.72	30.02	33.39	11.35	44.74	NA	NA	Pass

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

** - ERP total, dBm = Total RF power*, dBm + Antenna gain, dBd

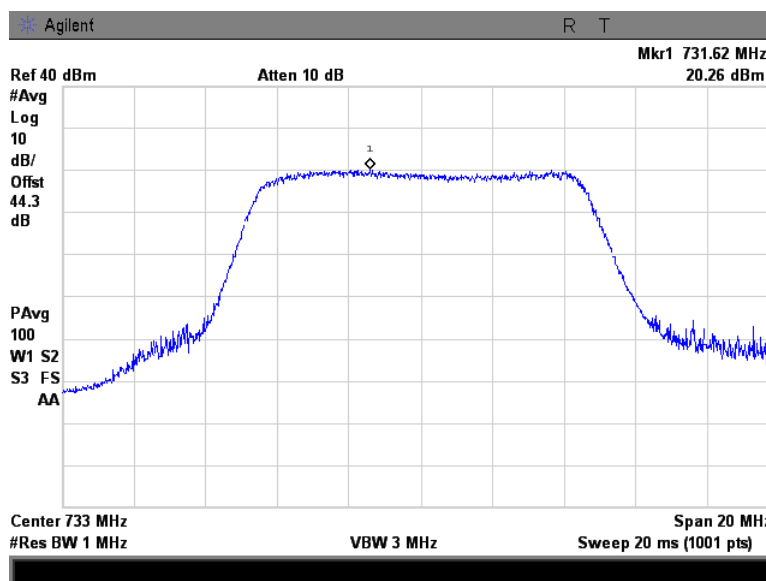
Reference numbers of test equipment used

HL 1908	HL 2780	HL 3301	HL 3302	HL 3435	HL 3442	HL 4229	HL 4274
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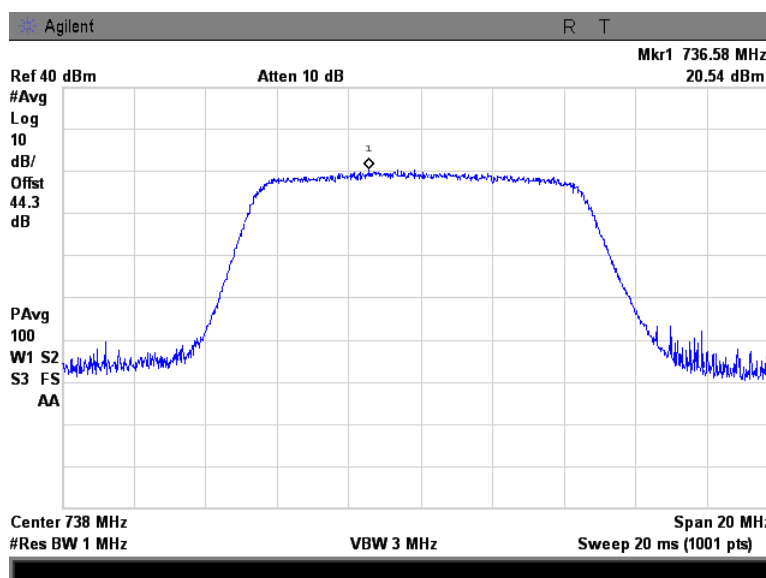
Full description is given in Appendix A.

Test specification:		Section 27.50(c)(3), Peak output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		20-Mar-14 - 23-Mar-14	
Temperature: 23 °C	Air Pressure: 1018 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.1 Maximum output power test results at low frequency, QPSK modulation, RF Output #1

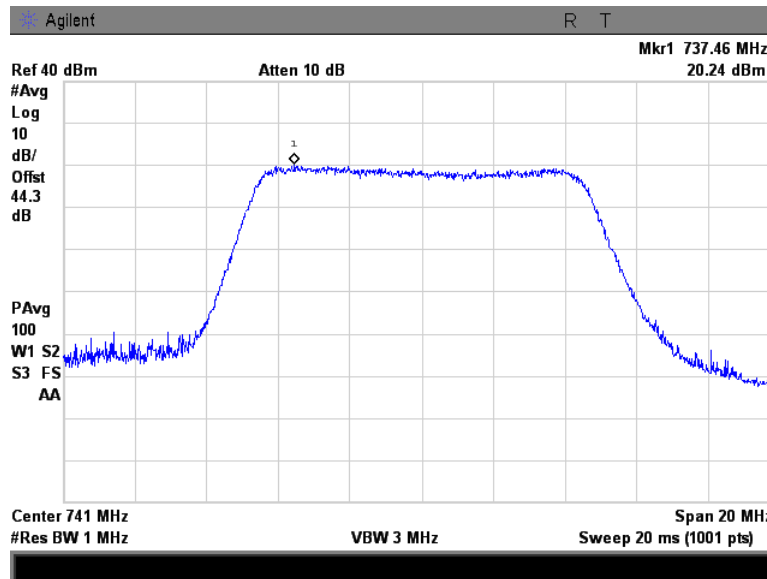


Plot 7.1.2 Maximum output power test results at medium frequency, QPSK modulation, RF Output #1

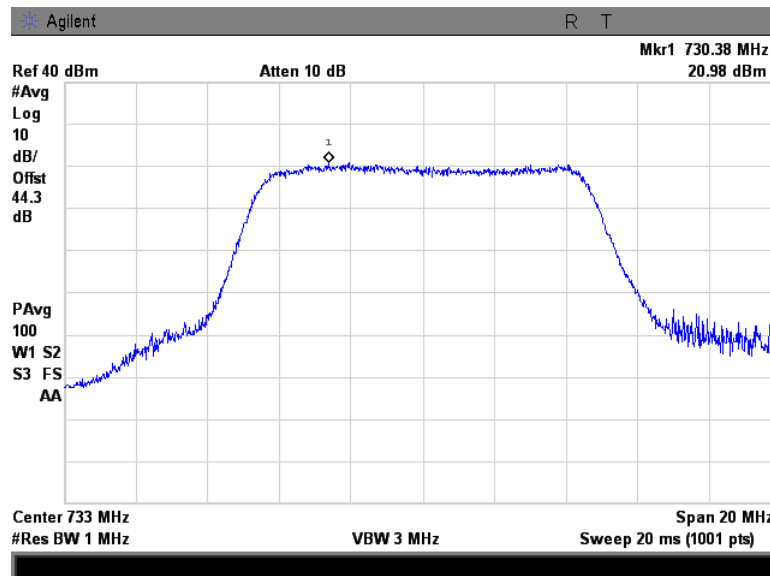


Test specification:		Section 27.50(c)(3), Peak output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		20-Mar-14 - 23-Mar-14	
Temperature: 23 °C	Air Pressure: 1018 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.3 Maximum output power test results at high frequency, QPSK modulation, RF Output #1

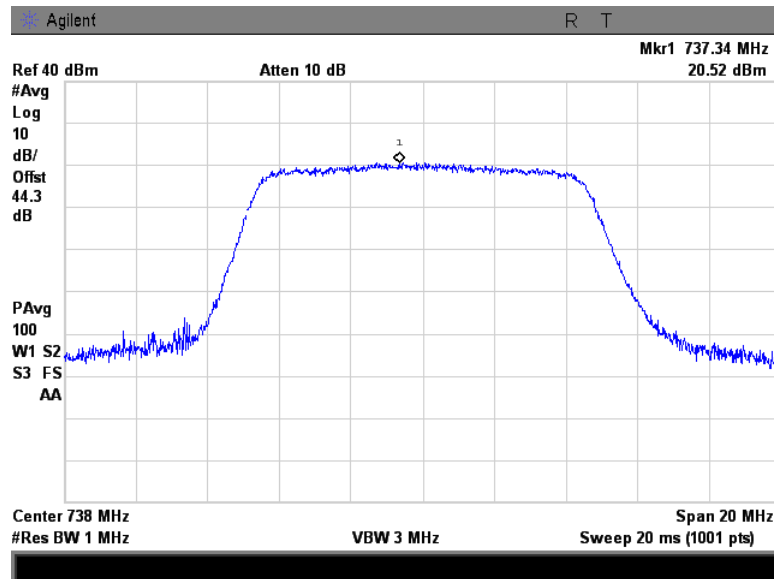


Plot 7.1.4 Maximum output power test results at low frequency, 64QAM modulation, RF Output #1

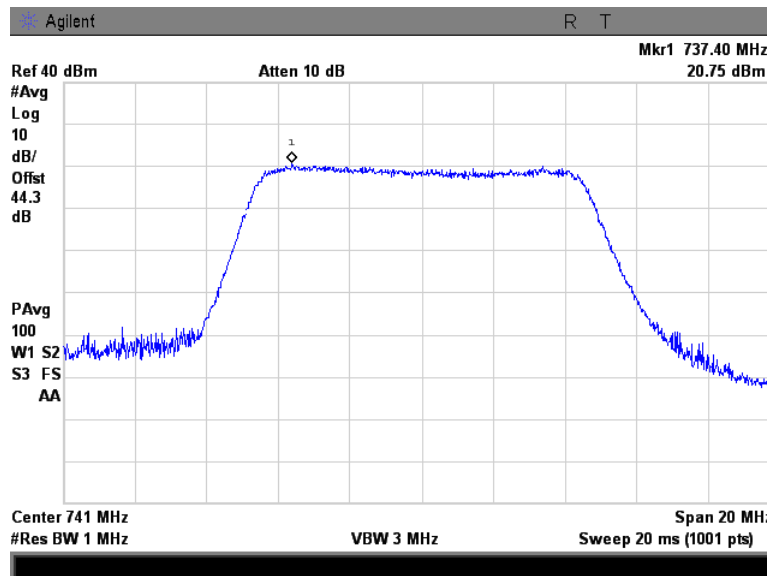


Test specification:		Section 27.50(c)(3), Peak output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		20-Mar-14 - 23-Mar-14	
Temperature: 23 °C	Air Pressure: 1018 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.5 Maximum output power test results at medium frequency, 64QAM modulation, RF Output #1

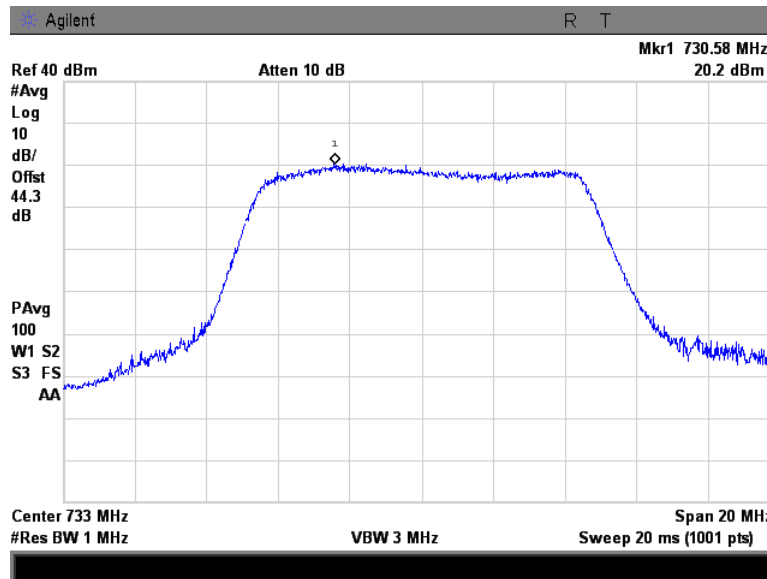


Plot 7.1.6 Maximum output power test results at high frequency, 64QAM modulation, RF Output #1

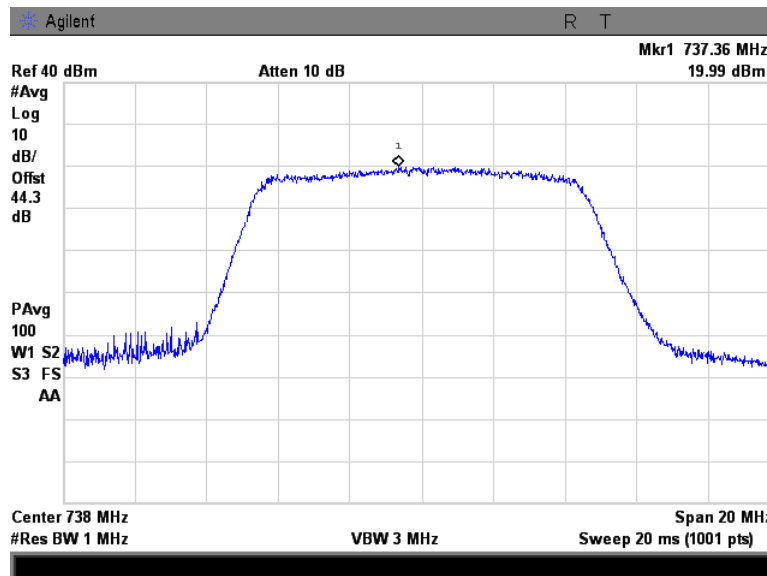


Test specification:		Section 27.50(c)(3), Peak output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		20-Mar-14 - 23-Mar-14	
Temperature: 23 °C	Air Pressure: 1018 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.7 Maximum output power test results at low frequency, QPSK modulation, RF Output #2

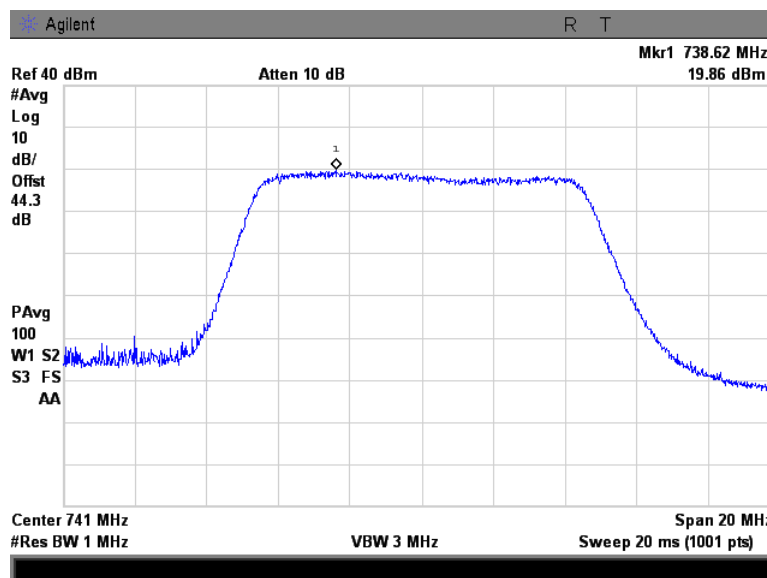


Plot 7.1.8 Maximum output power test results at medium frequency, QPSK modulation, RF Output #2

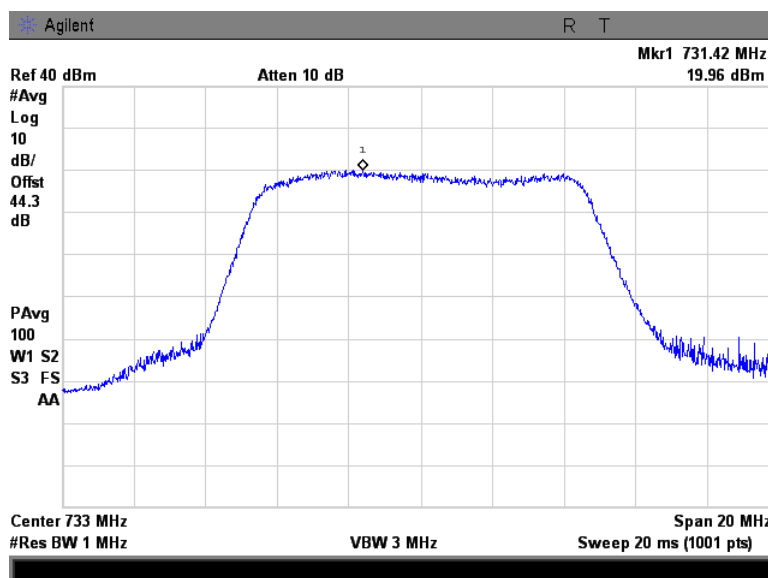


Test specification:		Section 27.50(c)(3), Peak output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		20-Mar-14 - 23-Mar-14	
Temperature: 23 °C	Air Pressure: 1018 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.9 Maximum output power test results at high frequency, QPSK modulation, RF Output #2

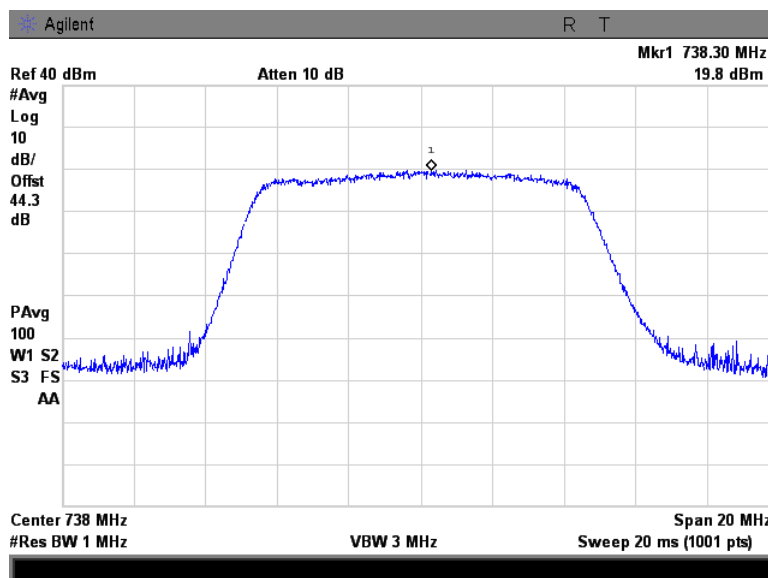


Plot 7.1.10 Maximum output power test results at low frequency, 64QAM modulation, RF Output #2

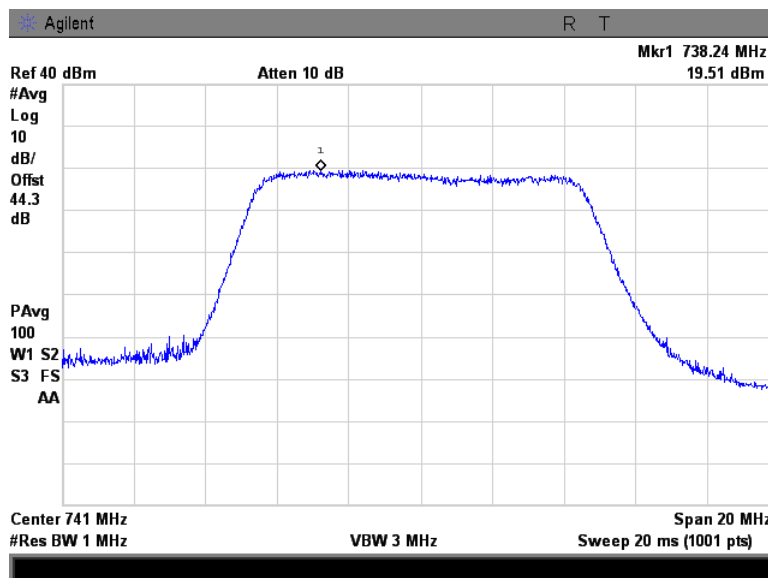


Test specification:		Section 27.50(c)(3), Peak output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		20-Mar-14 - 23-Mar-14	
Temperature: 23 °C	Air Pressure: 1018 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.11 Maximum output power test results at medium frequency, 64QAM modulation, RF Output #2



Plot 7.1.12 Maximum output power test results at high frequency, 64QAM modulation, RF Output #2



Test specification:		Section 2.1049, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 22 °C	Air Pressure: 1014 hPa	Relative Humidity: 53 %	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, kHz
728-746	26	NA

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

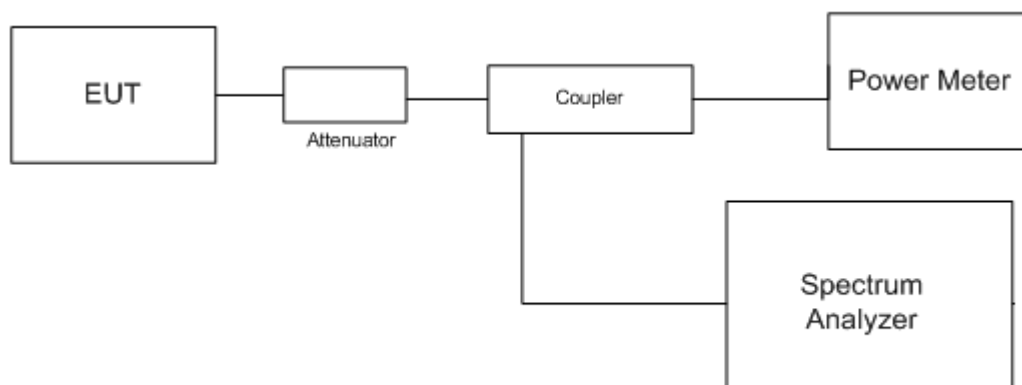
7.2.2 Test procedure

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

7.2.2.2 The EUT was set to transmit the 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 2.1049, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date(s):	23-Mar-14		
Temperature: 22 °C	Air Pressure: 1014 hPa	Relative Humidity: 53 %	Power Supply: 48VDC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 100 kHz (0.5-2% of OBW)
 VIDEO BANDWIDTH: 1000 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
 MODULATING SIGNAL: PRBS
 TESTED RF OUTPUT: #1

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
QPSK				
733.0	9721	NA	NA	NA
738.0	9685	NA	NA	NA
741.0	9721	NA	NA	NA
64QAM				
733.0	9683	NA	NA	NA
738.0	9632	NA	NA	NA
741.0	9727	NA	NA	NA

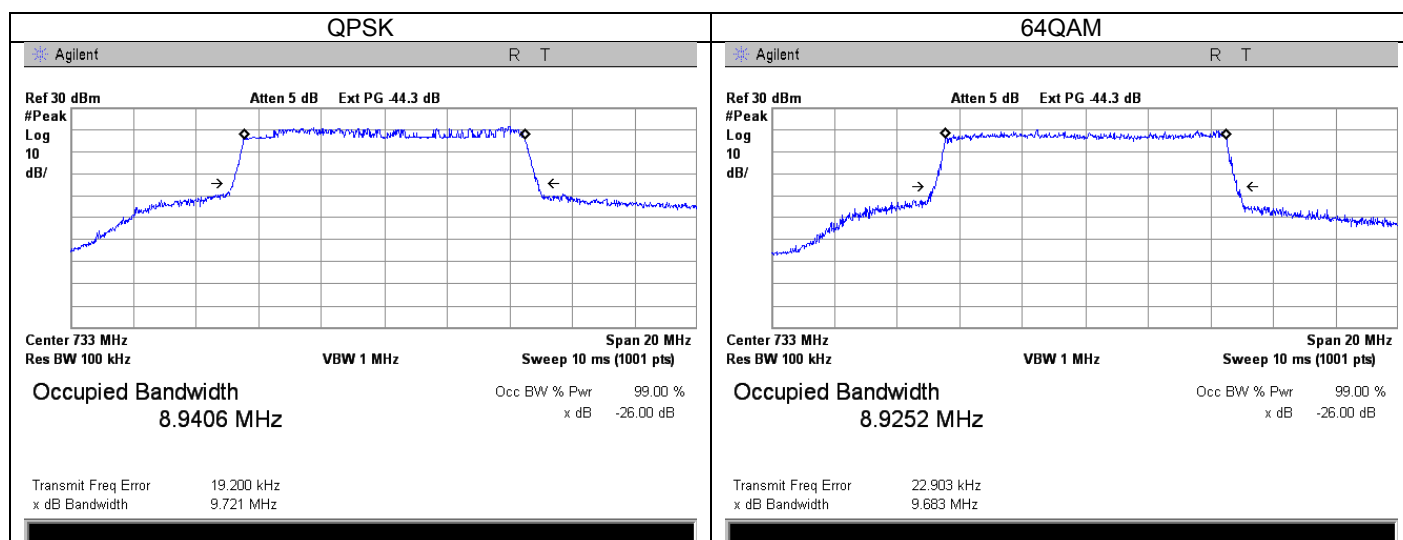
Reference numbers of test equipment used

HL 1908	HL 2780	HL 3301	HL 3302	HL 3435	HL 3442	HL 4229	HL 4274
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Full description is given in Appendix A.

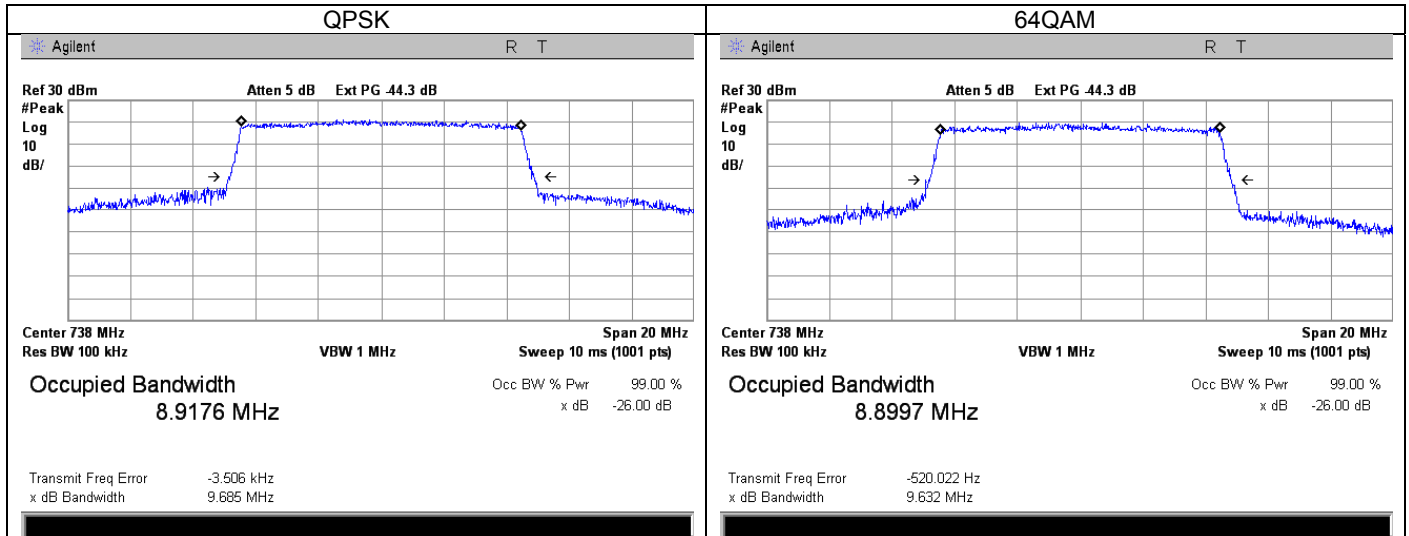
Test specification:		Section 2.1049, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 22 °C	Air Pressure: 1014 hPa	Relative Humidity: 53 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.1 Occupied bandwidth test result at low frequency, RF# 1

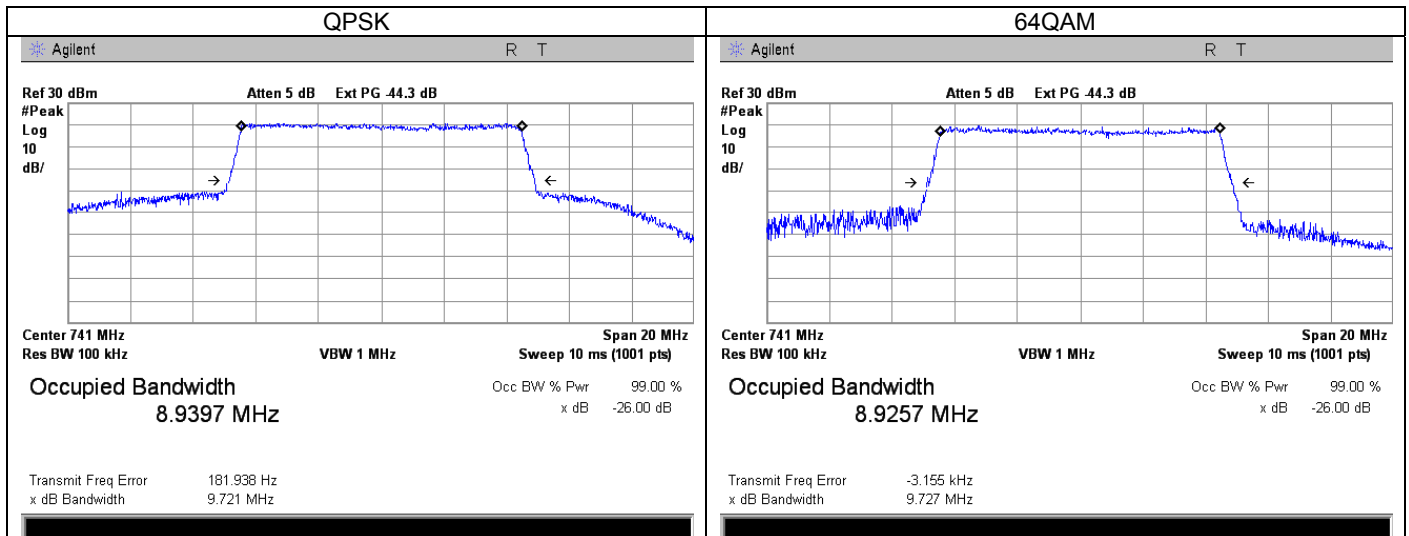


Test specification:		Section 2.1049, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 22 °C	Air Pressure: 1014 hPa	Relative Humidity: 53 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.2 Occupied bandwidth test result at mid frequency, RF# 1



Plot 7.2.3 Occupied bandwidth test result at high frequency, RF# 1



Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

7.3 Band edge emission 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 Band edge emission limits

Investigated band, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm	RBW, kHz
0.009 - 7500	43+10logP(W)	-13.0	100
100 kHz bands immediately outside and adjacent to a licensee's frequency block	43+10logP(W)	-13.0	30

OBW (MHz)	Investigated Band Edge	Attenuation below carrier, dBc
728.0 - 740.0 MHz Channel (Block A high + Block B high)		
10	727.9 – 728.0 MHz	43+10logP(W) (RBW = 30 kHz)
	740.0 – 740.1 MHz	
734.0 - 746.0 MHz Channel (Block B high + Block C high)		
10	733.9 – 734.0 MHz	43+10logP(W) (RBW = 30 kHz)
	746.0 – 746.1 MHz	

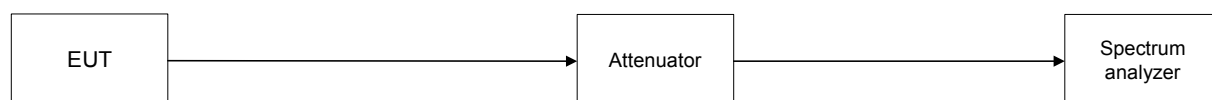
* - P is a transmitter output power in watts.

7.3.2 Test procedure

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

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

Figure 7.3.1 Band edge emission test setup for single output





Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Table 7.3.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
 RBW: 100 kHz
 DETECTOR USED: Average
 VIDEO BANDWIDTH: \geq Resolution bandwidth
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER: Maximum
 EBW: 10 MHz
 NUMBER OF RF OUTPUTS: N = 2

TESTED RF OUTPUT: #1

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm**	Limit, dBm	Margin, dB*	Verdict
QPSK, 10.0 MHz CBW, 733.0 MHz								
728.0	-24.34	Included	Included	100	-21.34	-13.00	-8.34	Pass
738.0	-24.12	Included	Included	100	-21.12	-13.00	-8.12	Pass
QPSK, 10.0 MHz CBW, 738.0 MHz								
733.0	-25.04	Included	Included	100	-22.04	-13.00	-9.04	Pass
743.0	-27.94	Included	Included	100	-24.94	-13.00	-11.94	Pass
QPSK, 10.0 MHz CBW, 741.0 MHz								
736.0	-24.18	Included	Included	100	-21.18	-13.00	-8.18	Pass
746.0	-24.17	Included	Included	100	-21.17	-13.00	-8.17	Pass
64QAM, 10.0 MHz CBW, 733.0 MHz								
728.0	-23.85	Included	Included	100	-20.85	-13.00	-7.85	Pass
738.0	-23.31	Included	Included	100	-20.31	-13.00	-7.31	Pass
64QAM, 10.0 MHz CBW, 738.0 MHz								
733.0	-24.48	Included	Included	100	-21.48	-13.00	-8.48	Pass
743.0	-28.50	Included	Included	100	-25.50	-13.00	-12.50	Pass
64QAM, 10.0 MHz CBW, 741.0 MHz								
736.0	-24.76	Included	Included	100	-21.76	-13.00	-8.76	Pass
746.0	-26.75	Included	Included	100	-23.75	-13.00	-10.75	Pass

* - Margin = Spurious emission – specification limit

** - Spurious emission, dBm = SA reading + 10log(N)



Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Table 7.3.2 Emission mask test results (continued)

TESTED RF OUTPUT:

#2

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm**	Limit, dBm	Margin, dB*	Verdict
QPSK, 10.0 MHz CBW, 733.0 MHz								
728.0	-25.28	Included	Included	100	-22.28	-13.00	-9.28	Pass
738.0	-25.30	Included	Included	100	-22.30	-13.00	-9.30	Pass
QPSK, 10.0 MHz CBW, 738.0 MHz								
733.0	-27.14	Included	Included	100	-24.14	-13.00	-11.14	Pass
743.0	-28.35	Included	Included	100	-25.35	-13.00	-12.35	Pass
QPSK, 10.0 MHz CBW, 741.0 MHz								
736.0	-26.49	Included	Included	100	-23.49	-13.00	-10.49	Pass
746.0	-26.88	Included	Included	100	-23.88	-13.00	-10.88	Pass
64QAM, 10.0 MHz CBW, 733.0 MHz								
728.0	-28.40	Included	Included	100	-25.40	-13.00	-12.40	Pass
738.0	-25.20	Included	Included	100	-22.20	-13.00	-9.20	Pass
64QAM, 10.0 MHz CBW, 738.0 MHz								
733.0	-26.82	Included	Included	100	-23.82	-13.00	-10.82	Pass
743.0	-27.74	Included	Included	100	-24.74	-13.00	-11.74	Pass
64QAM, 10.0 MHz CBW, 741.0 MHz								
736.0	-26.65	Included	Included	100	-23.65	-13.00	-10.65	Pass
746.0	-28.07	Included	Included	100	-25.07	-13.00	-12.07	Pass

* - Margin = Spurious emission – specification limit

** - Spurious Emission, dBm = SA Reading + 10log(N)

Reference numbers of test equipment used

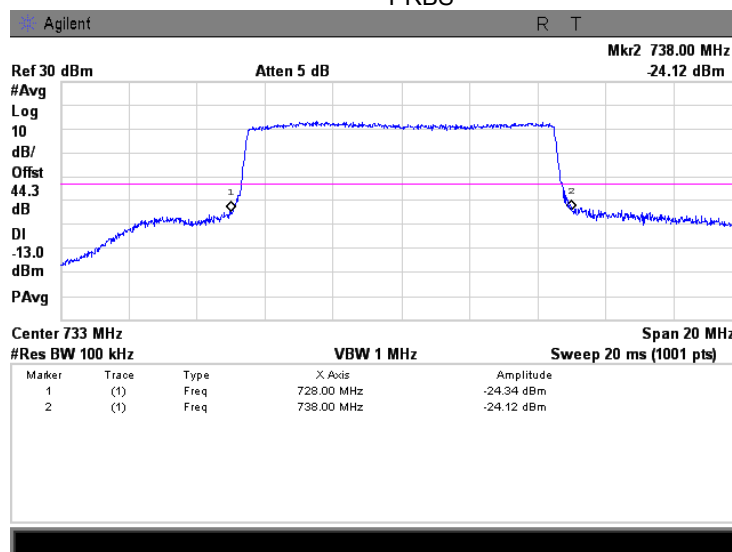
HL 1908	HL 2780	HL 3301	HL 3302	HL 3435	HL 3442	HL 4229	HL 4274
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Full description is given in Appendix A.

Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

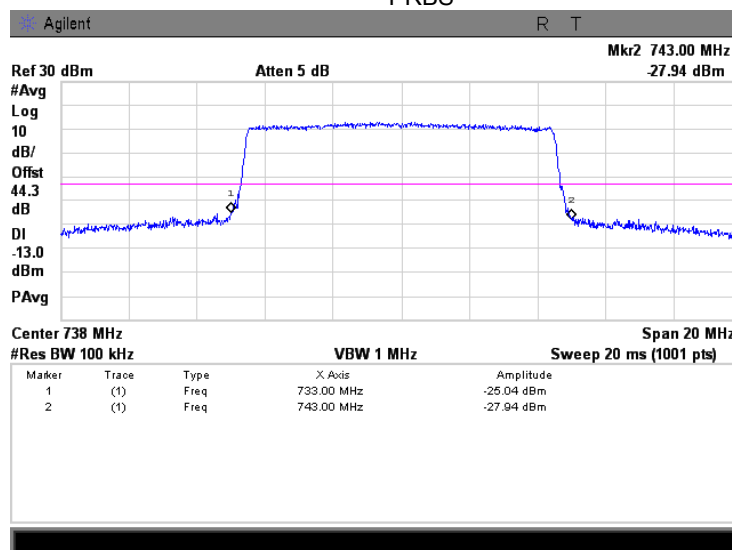
Plot 7.3.1 Emission mask test results at low carrier frequency, RF#1

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: QPSK
MODULATING SIGNAL: PRBS



Plot 7.3.2 Emission mask test results at mid carrier frequency, RF#1

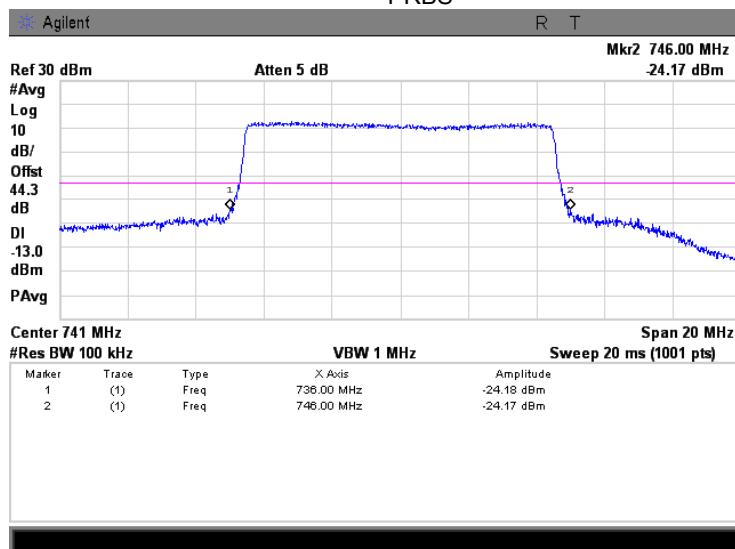
ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: QPSK
MODULATING SIGNAL: PRBS



Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

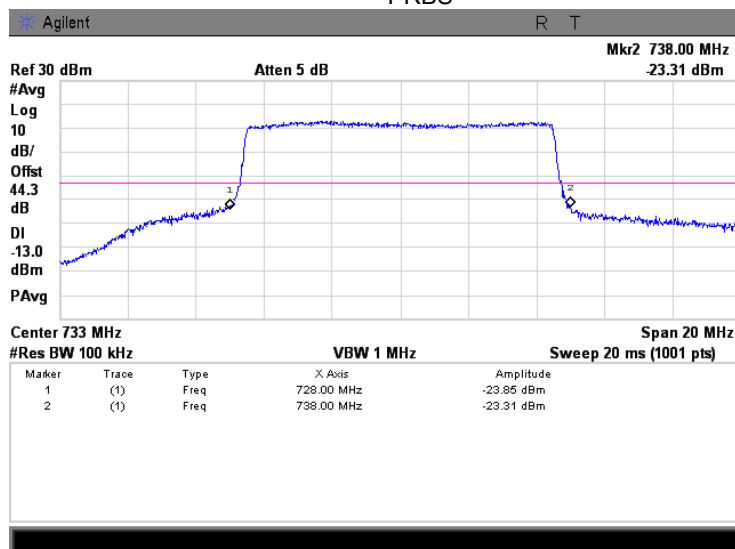
Plot 7.3.3 Emission mask test results at high carrier frequency, RF#1

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: QPSK
MODULATING SIGNAL: PRBS



Plot 7.3.4 Emission mask test results at low carrier frequency, RF#1

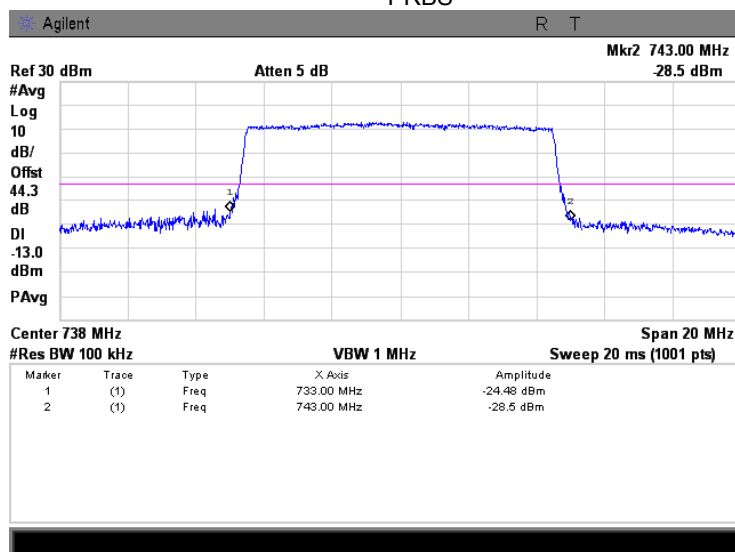
ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: 64QAM
MODULATING SIGNAL: PRBS



Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

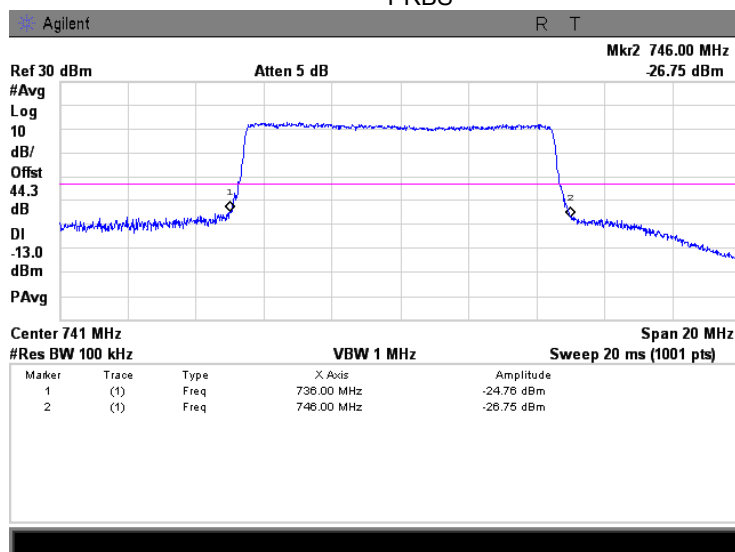
Plot 7.3.5 Emission mask test results at mid carrier frequency, RF#1

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: 64QAM
MODULATING SIGNAL: PRBS



Plot 7.3.6 Emission mask test results at high carrier frequency, RF#1

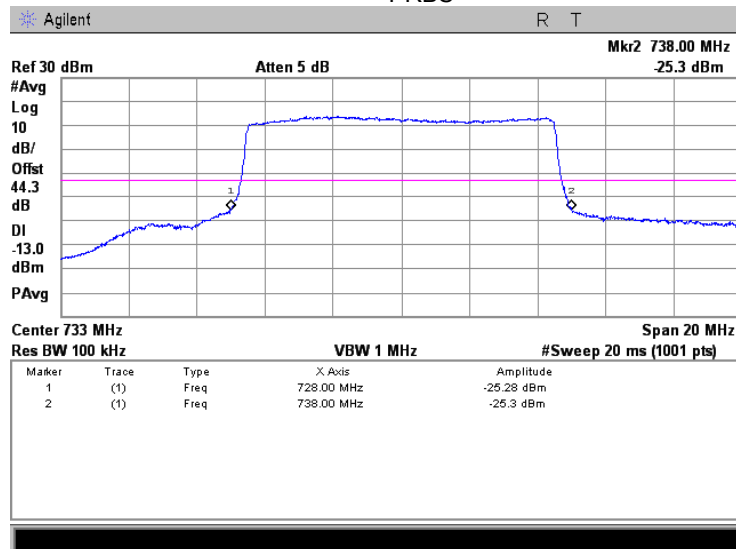
ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: 64QAM
MODULATING SIGNAL: PRBS



Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

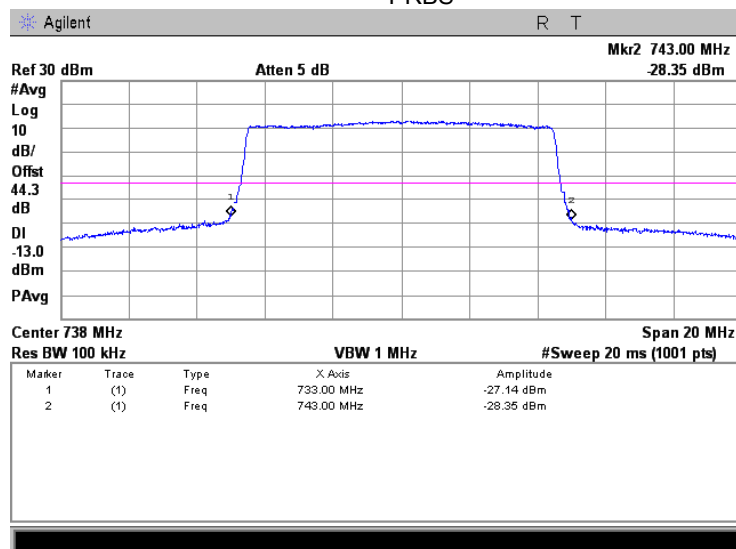
Plot 7.3.7 Emission mask test results at low carrier frequency, RF#2

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: QPSK
MODULATING SIGNAL: PRBS



Plot 7.3.8 Emission mask test results at mid carrier frequency, RF#2

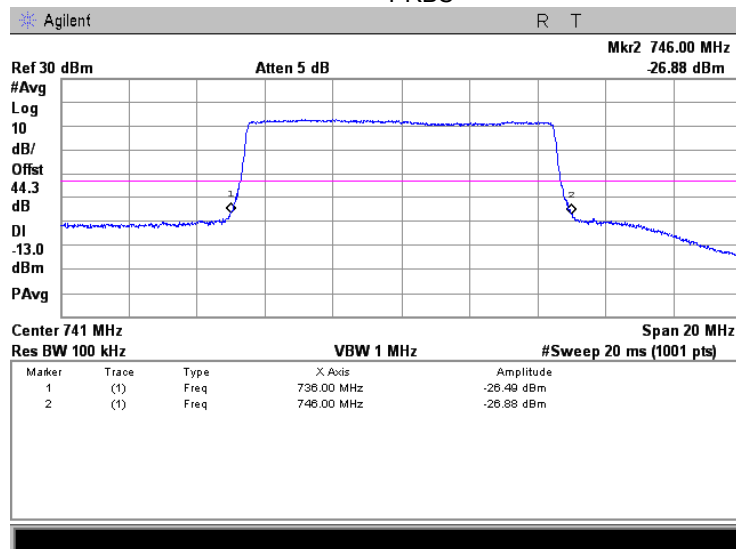
ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: QPSK
MODULATING SIGNAL: PRBS



Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

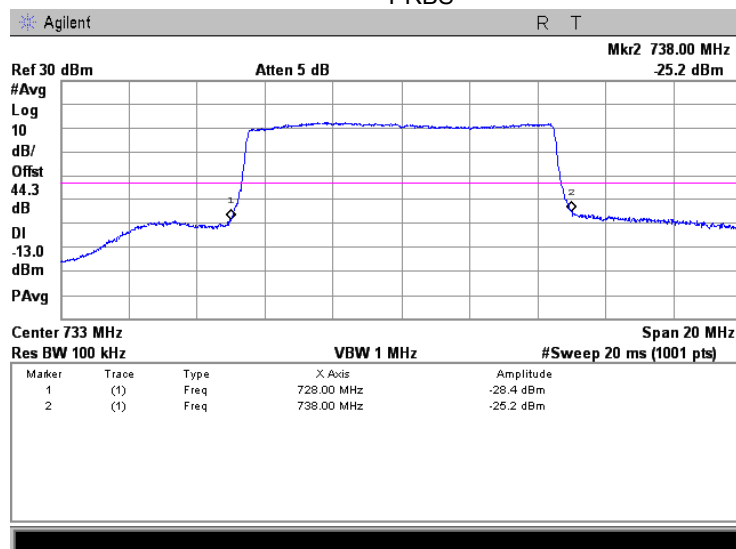
Plot 7.3.9 Emission mask test results at high carrier frequency, RF#2

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: QPSK
MODULATING SIGNAL: PRBS



Plot 7.3.10 Emission mask test results at low carrier frequency, RF#2

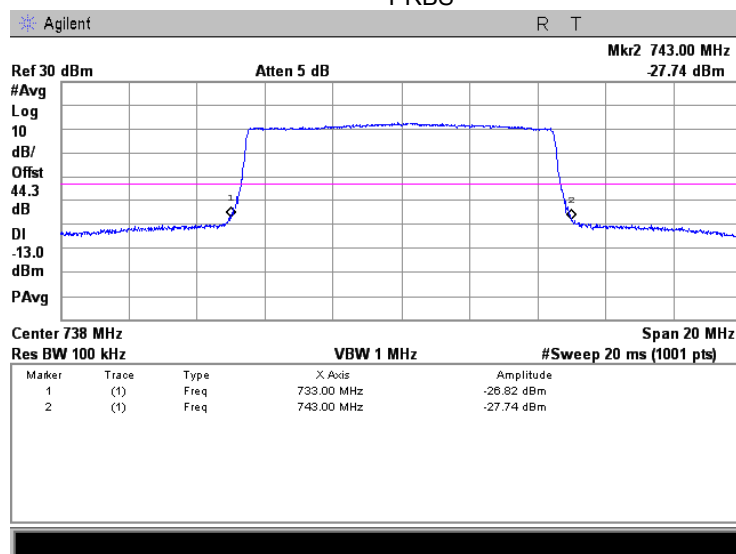
ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: 64QAM
MODULATING SIGNAL: PRBS



Test specification:		Section 27.53(f), Band edge emission	
Test procedure:		47 CFR, Sections 2.1051 and 27.53(f)	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

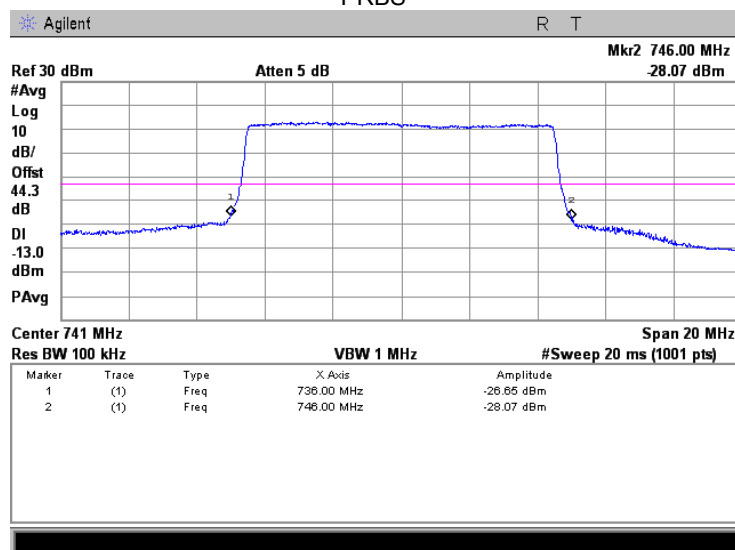
Plot 7.3.11 Emission mask test results at mid carrier frequency, RF#2

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: 64QAM
MODULATING SIGNAL: PRBS



Plot 7.3.12 Emission mask test results at high carrier frequency, RF#2

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
DETECTOR USED: Average
MODULATION: 64QAM
MODULATING SIGNAL: PRBS





Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

7.4 Spurious emissions at RF antenna connector test

7.4.1 General

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

Table 7.4.1 Spurious emission limits

Investigated band, MHz	Attenuation below carrier, dBc	Spurious emissions, dBm	RBW, kHz
0.009 - 10th harmonic*	$43+10\log P(W)^{**}$	-13.0	100
100 kHz bands immediately outside and adjacent to a licensee's frequency block	$43+10\log P(W)^{**}$	-13.0	30

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

** - P is transmitter output power in watts

7.4.2 Test procedure

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

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

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

Figure 7.4.1 Spurious emission test setup, single output





Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:	Compliance	Verdict:	PASS
Date(s):	23-Mar-14		
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Table 7.4.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 728.0 – 746.0 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 7500 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 75 Mbps
 TRANSMITTER OUTPUT POWER: Maximum
 NUMBER OF RF OUTPUTS: N = 2

TESTED RF OUTPUT: #1

Frequency, MHz	SA reading, dBm	Attenuation, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency								
No spurious emissions were found								Pass
Mid carrier frequency								
No spurious emissions were found								Pass
High carrier frequency								
No spurious emissions were found								Pass

*- Margin = Spurious emission – specification limit.

TESTED RF OUTPUT: #2

Frequency, MHz	SA reading, dBm	Attenuation, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency								
No spurious emissions were found								Pass
Mid carrier frequency								
No spurious emissions were found								Pass
High carrier frequency								
No spurious emissions were found								Pass

*- Margin = Spurious emission – specification limit.

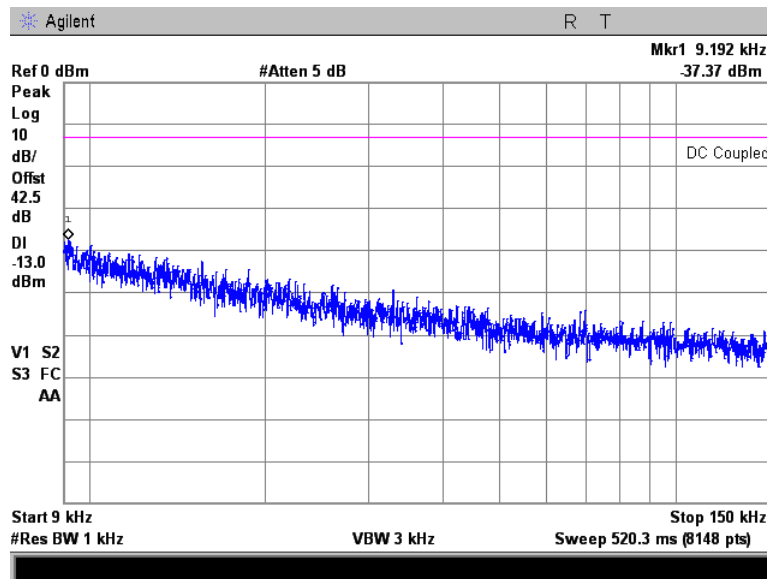
Reference numbers of test equipment used

HL 2909	HL 3435	HL 3442	HL 4229	HL 4274			
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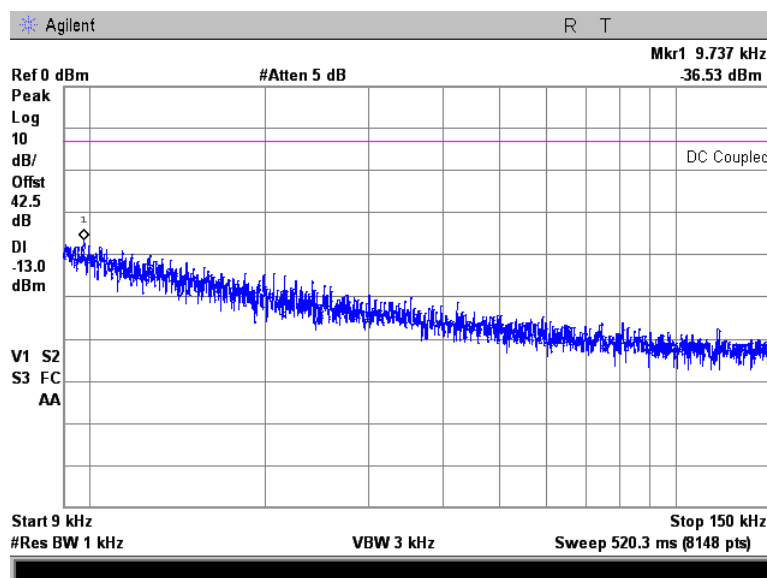
Full description is given in Appendix A.

Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

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

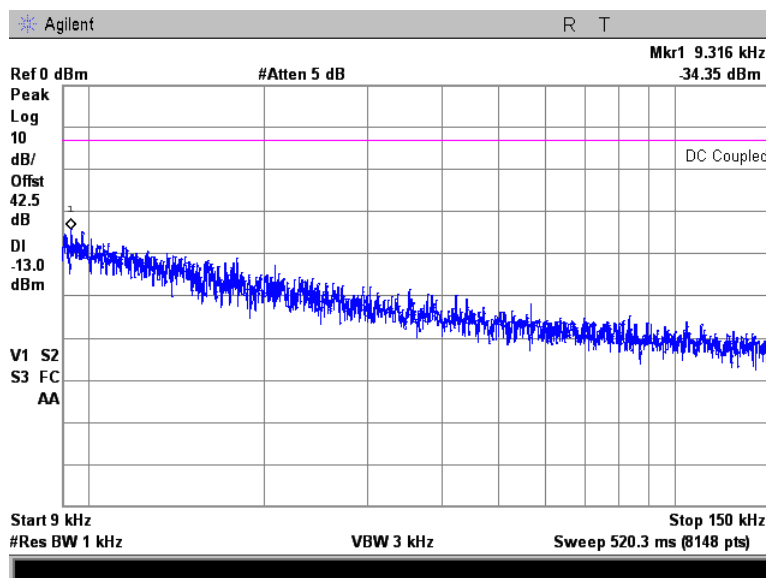


Plot 7.4.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency, RF# 1

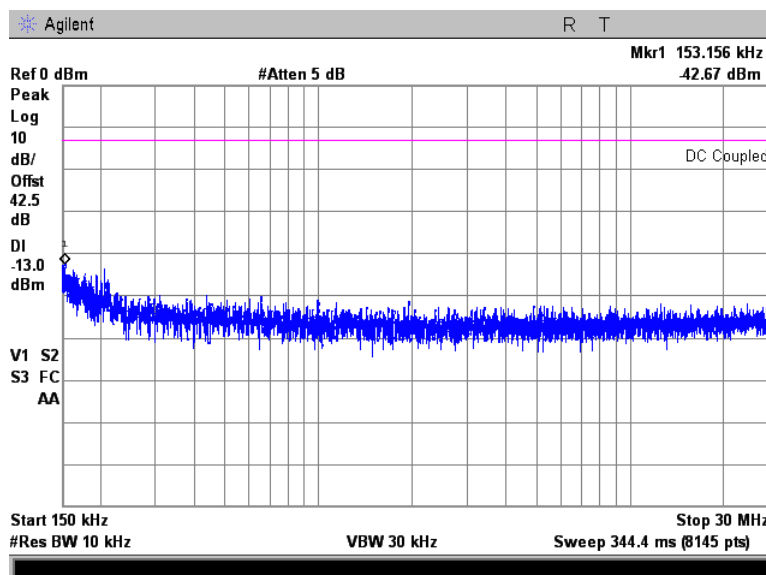


Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

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

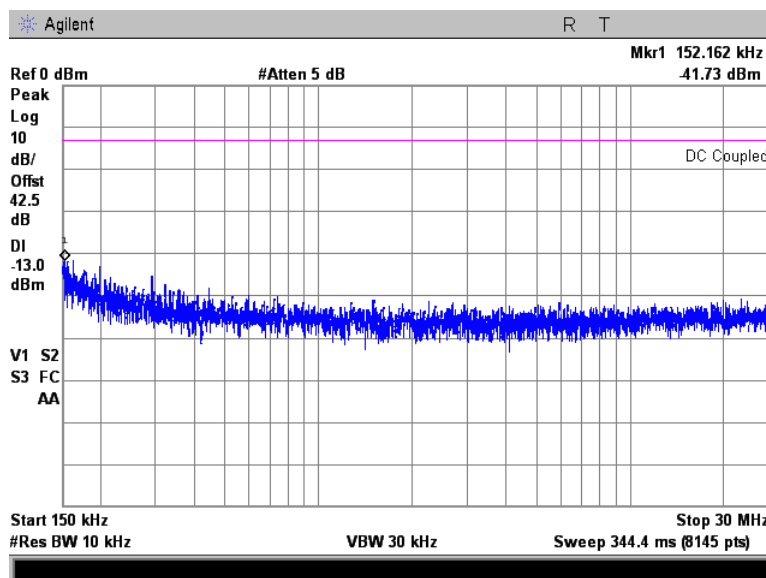


Plot 7.4.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency, RF# 1

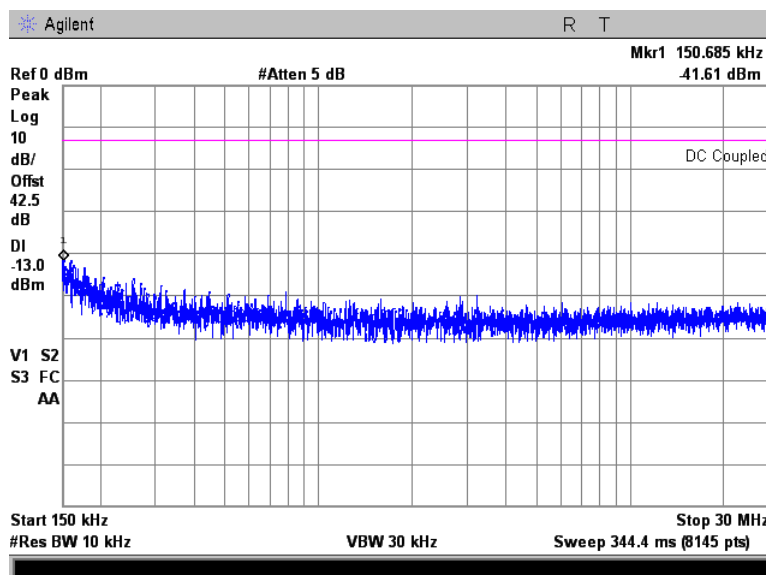


Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.5 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency, RF# 1

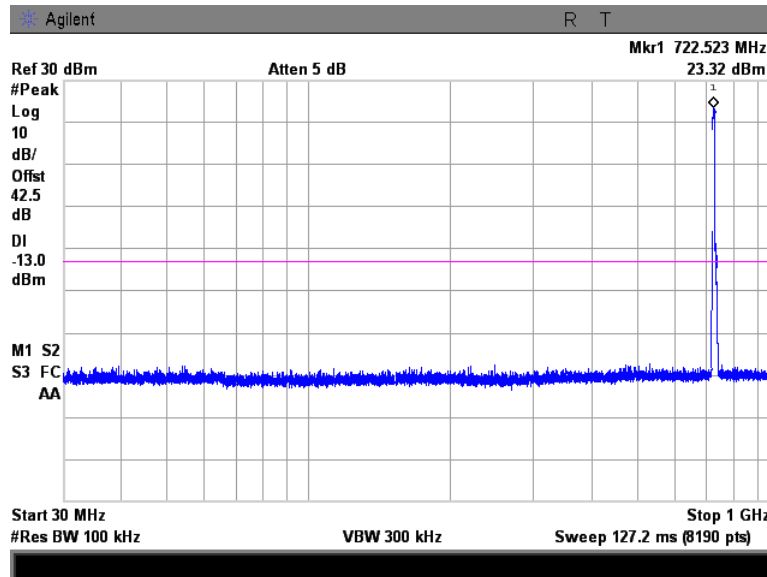


Plot 7.4.6 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency, RF# 1



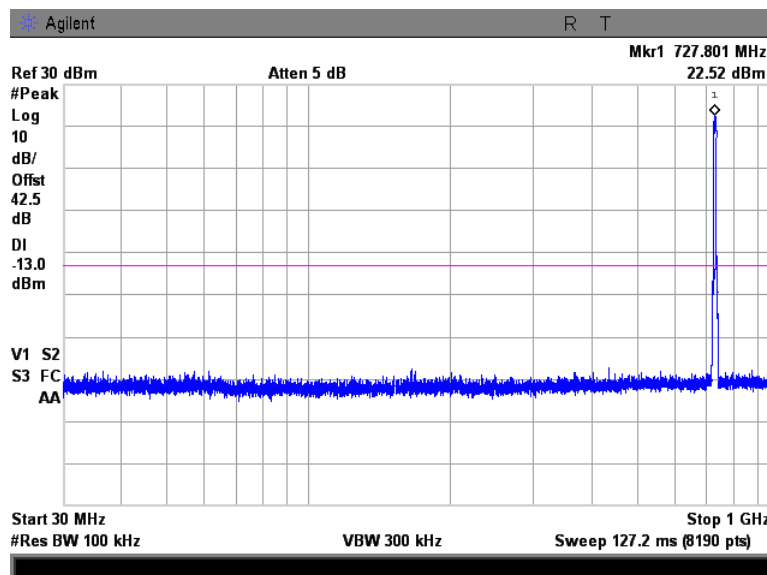
Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.7 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency, RF# 1



Note: Fundamental frequency is shown, not exact marker frequency caused by limitation of measurement equipment

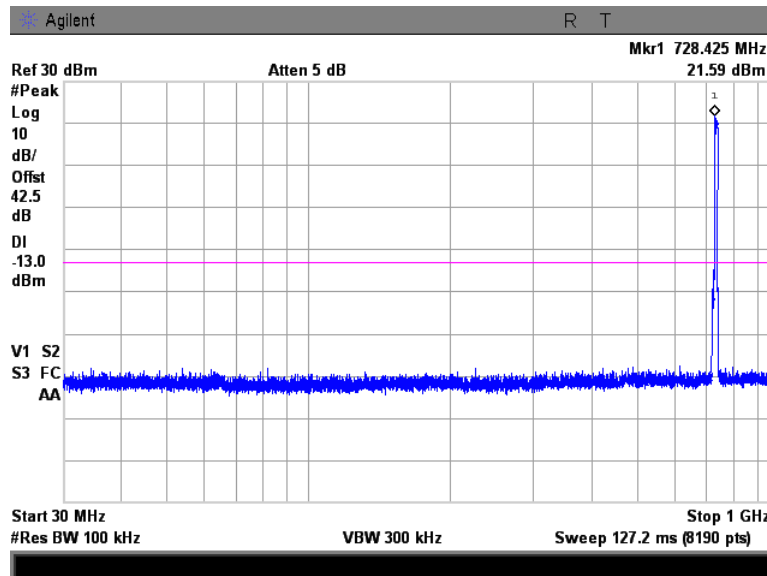
Plot 7.4.8 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency, RF# 1



Note: Fundamental frequency is shown, not exact marker frequency caused by limitation of measurement equipment

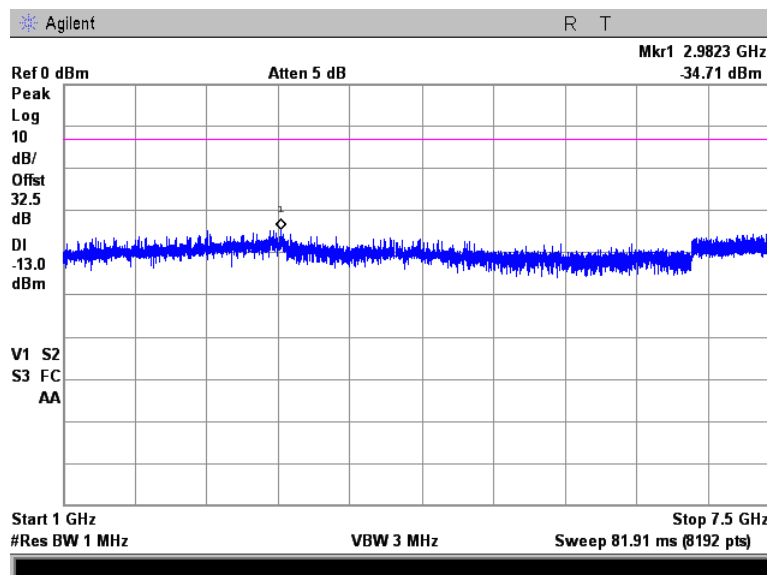
Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.9 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency, RF# 1



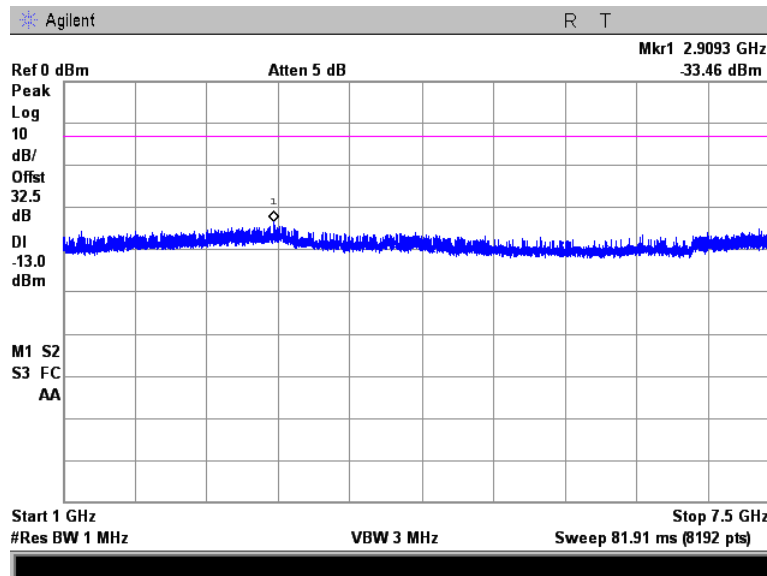
Note: Fundamental frequency is shown, not exact marker frequency caused by limitation of measurement equipment

Plot 7.4.10 Spurious emission measurements in 1000 - 7500MHz range at low carrier frequency, RF# 1

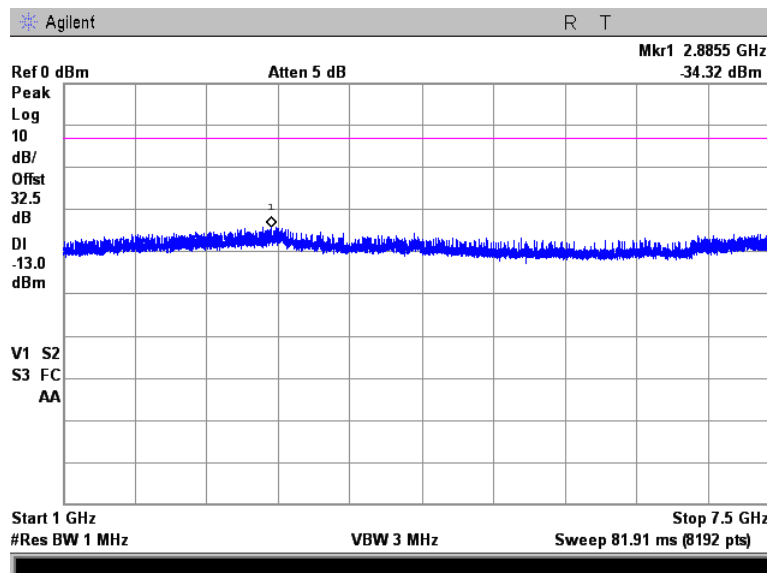


Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.11 Spurious emission measurements in 1000 - 7500 MHz at mid carrier frequency, RF# 1

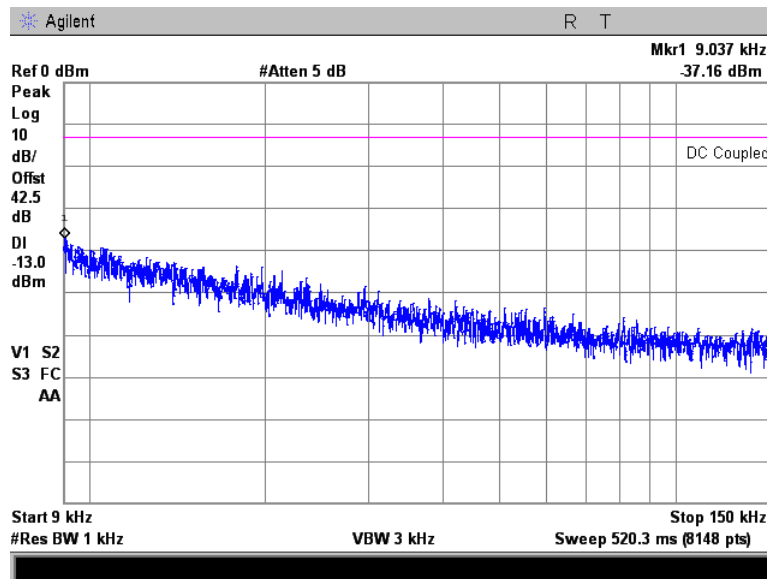


Plot 7.4.12 Spurious emission measurements in 1000 - 7500 MHz at high carrier frequency, RF# 1

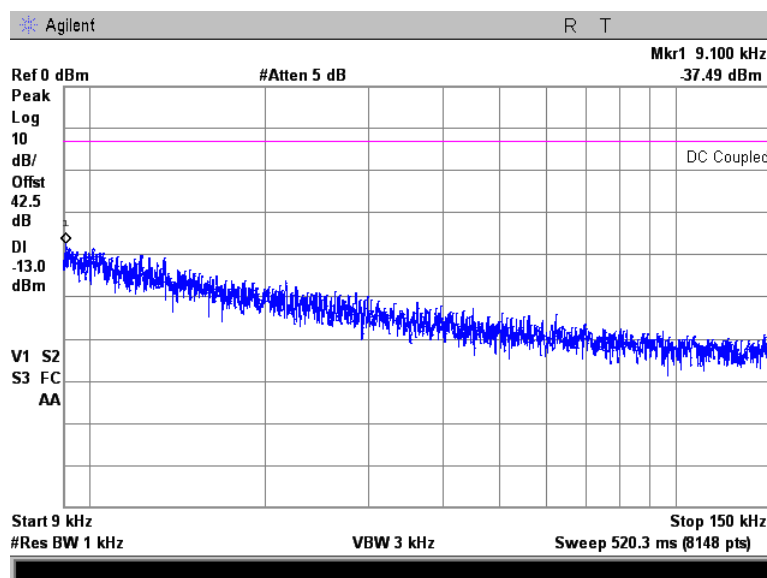


Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.13 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency, RF# 2

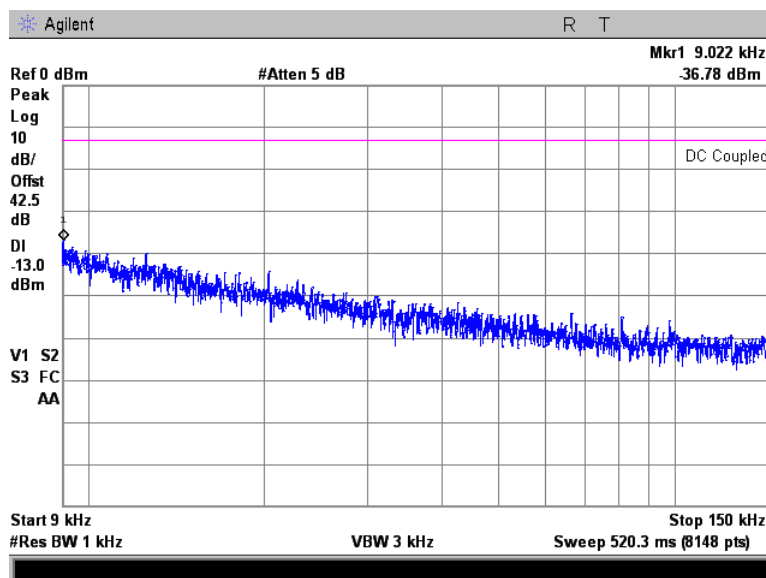


Plot 7.4.14 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency, RF# 2

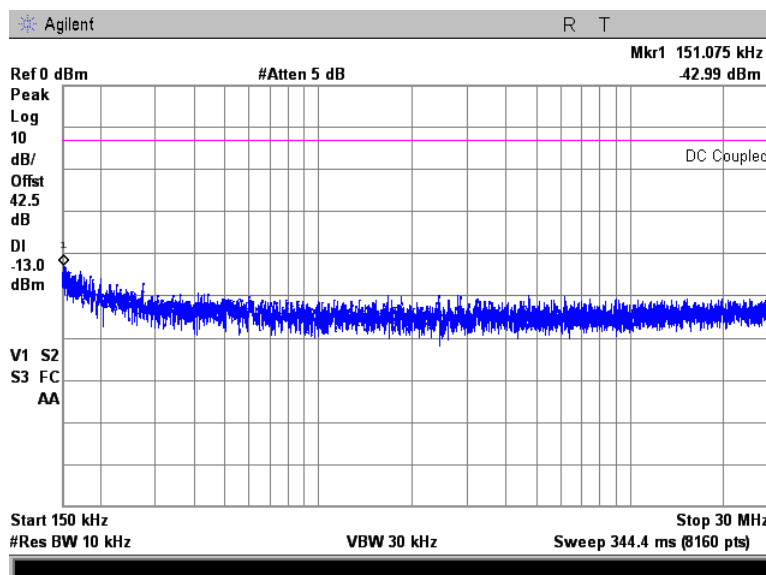


Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.15 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency, RF# 2

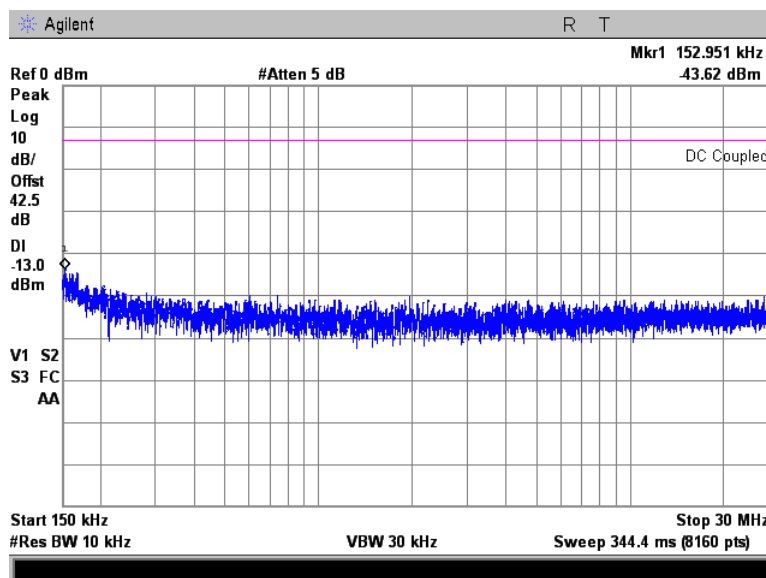


Plot 7.4.16 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency, RF# 2

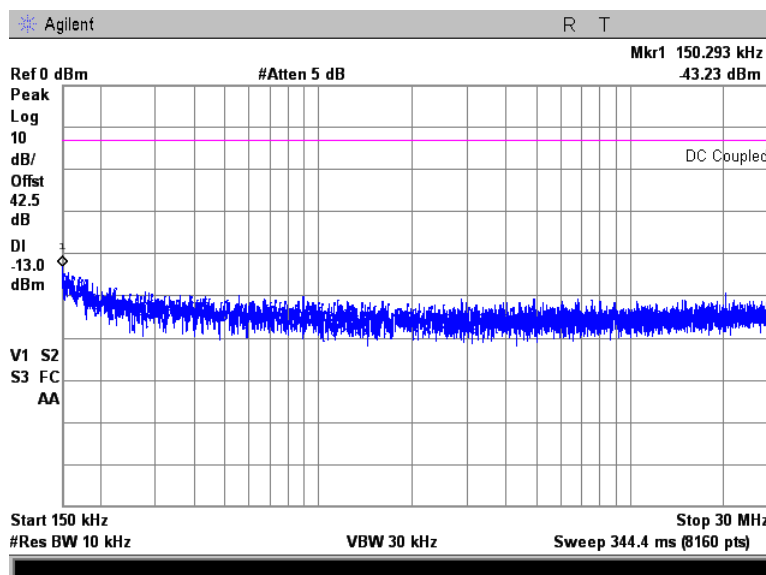


Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.17 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency, RF# 2

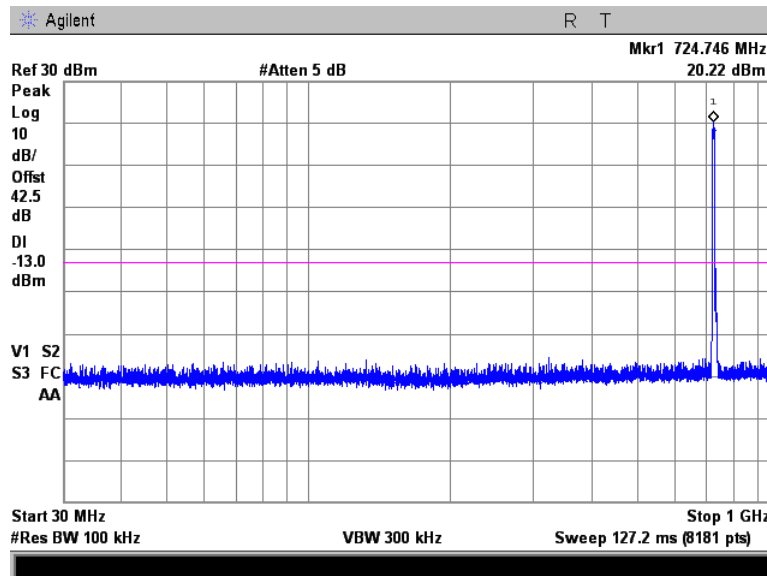


Plot 7.4.18 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency, RF# 2



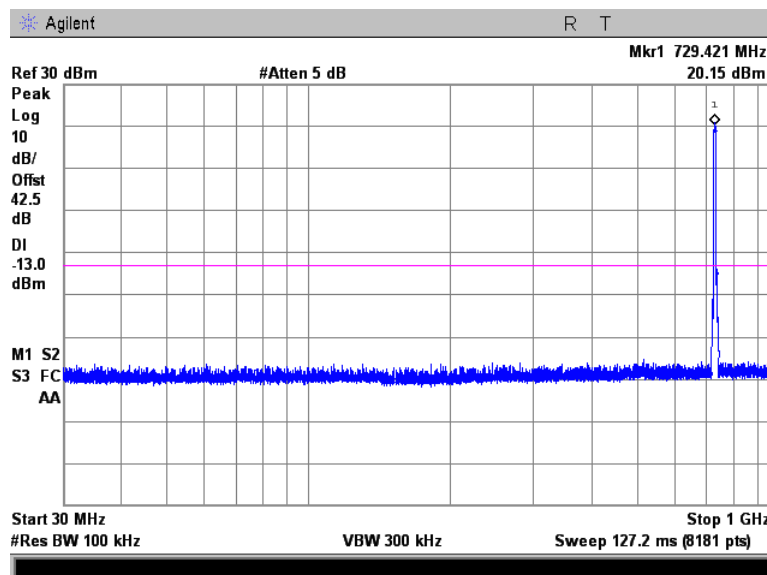
Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.19 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency, RF# 2



Note: Fundamental frequency is shown, not exact marker frequency caused by limitation of measurement equipment

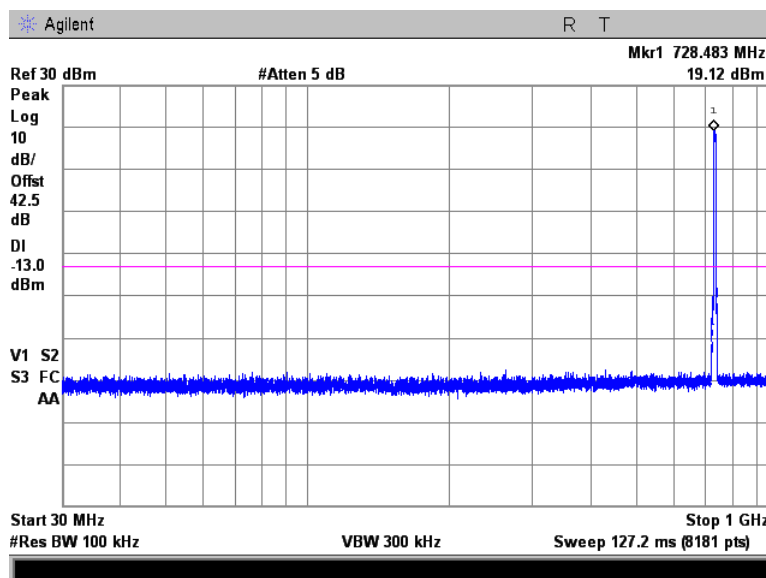
Plot 7.4.20 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency, RF# 2



Note: Fundamental frequency is shown, not exact marker frequency caused by limitation of measurement equipment

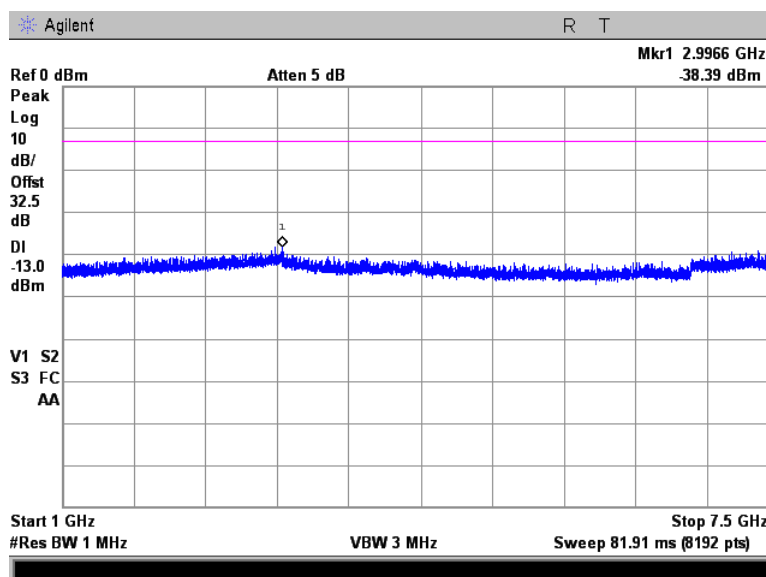
Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.21 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency, RF# 2



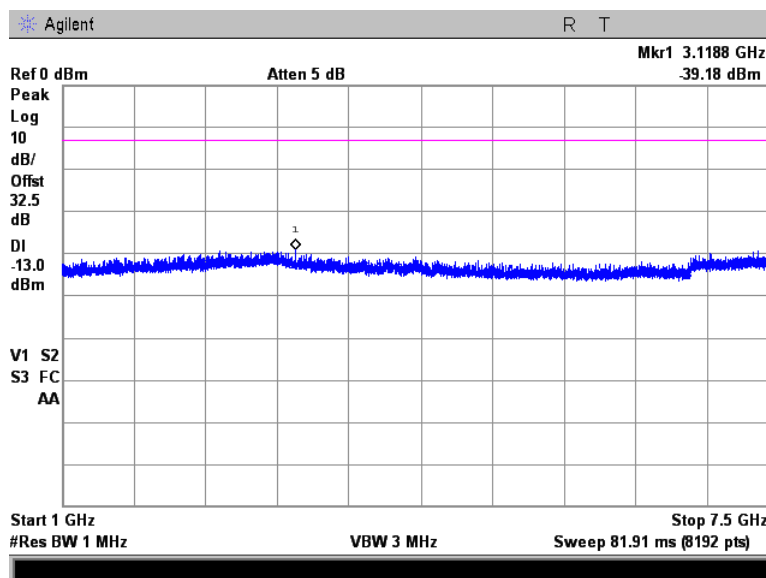
Note: Fundamental frequency is shown, not exact marker frequency caused by limitation of measurement equipment

Plot 7.4.22 Spurious emission measurements in 1000 - 7500MHz range at low carrier frequency, RF# 2

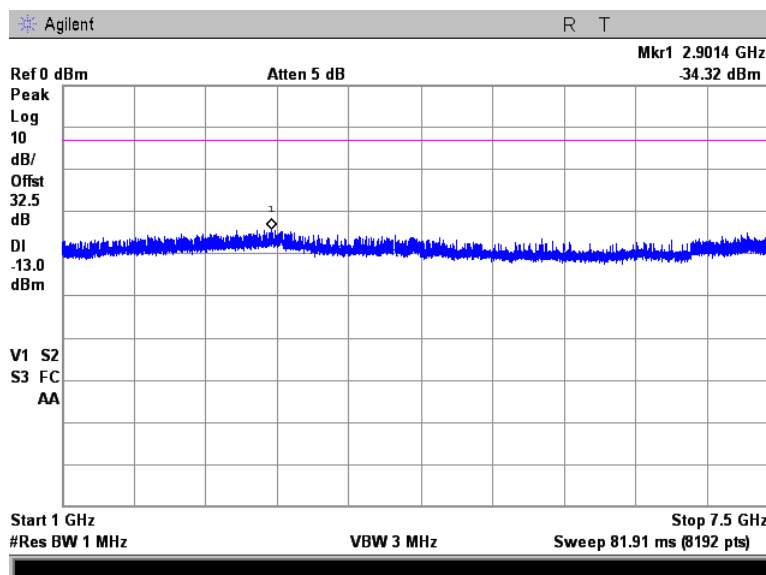


Test specification:		Section 27.53, Spurious emissions at RF antenna connector	
Test procedure:		47 CFR, Sections 2.1051, 27.53	
Test mode:		Compliance	Verdict: PASS
Date(s):		23-Mar-14	
Temperature: 23 °C	Air Pressure: 1014 hPa	Relative Humidity: 51 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.23 Spurious emission measurements in 1000 - 7500 MHz at mid carrier frequency, RF# 2



Plot 7.4.24 Spurious emission measurements in 1000 - 7500 MHz at high carrier frequency, RF# 2





Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

7.5 Radiated spurious emission measurements

7.5.1 General

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

Table 7.5.1 Radiated spurious emission test limits

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

* - Excluding the band emission

** - P is transmitter output power in Watts

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

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

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

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

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

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

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

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

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

Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

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

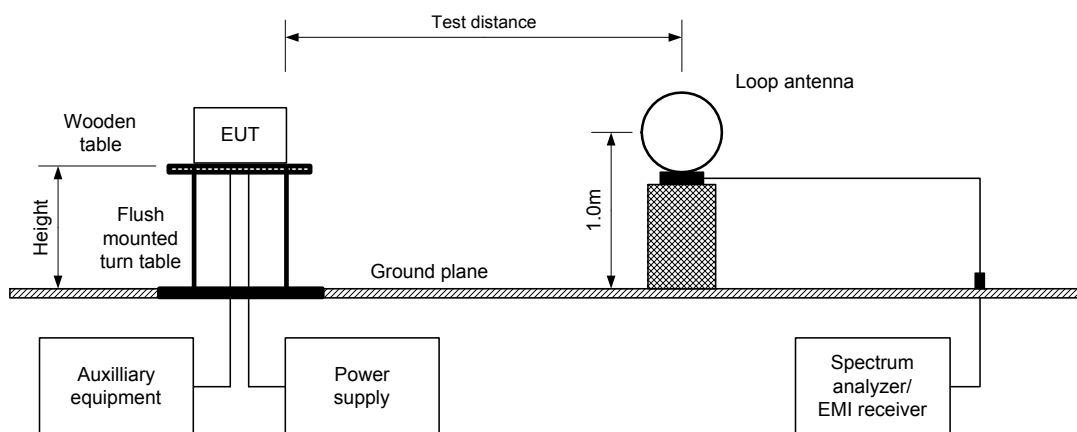
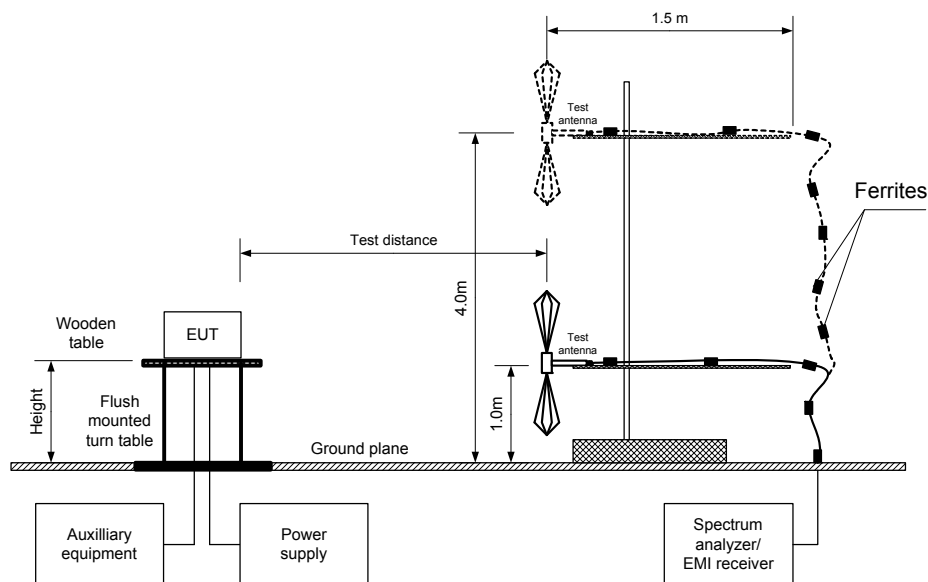


Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz





Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

Table 7.5.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 728 – 746 MHz
 TEST DISTANCE: 3 m
 TEST SITE: Semi anechoic chamber
 EUT HEIGHT: 0.8 m
 INVESTIGATED FREQUENCY RANGE: 0.009 – 7500 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: 75 Mbps
 TRANSMITTER OUTPUT POWER: Maximum

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

Verdict: Pass

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

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

Reference numbers of test equipment used

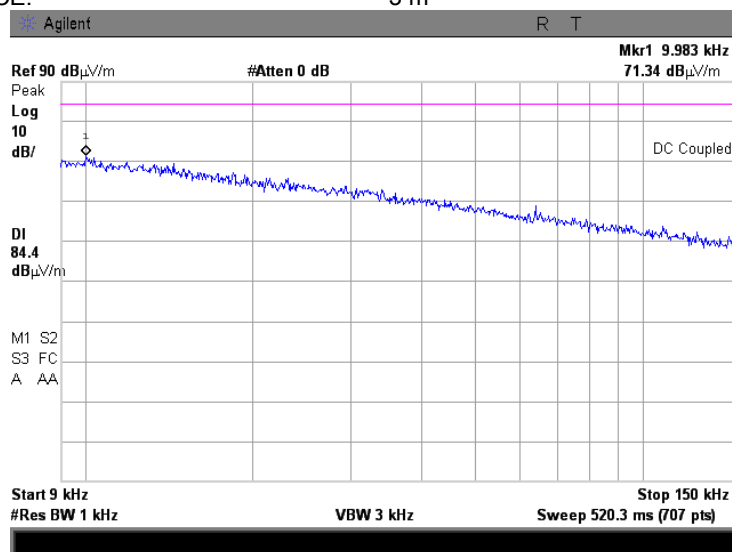
HL 0446	HL 0604	HL 1984	HL 2780	HL 2871	HL 4160	HL 4353	
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Full description is given in Appendix A.

Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

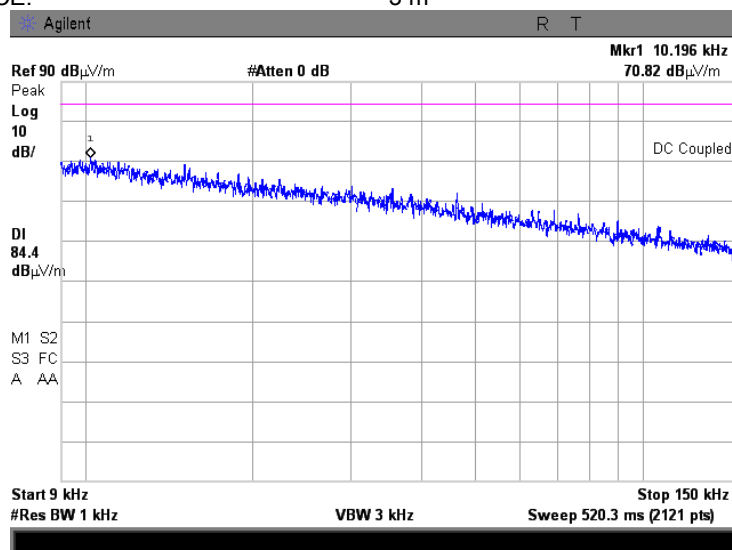
Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.5.2 Radiated emission measurements in 9 - 150 kHz range

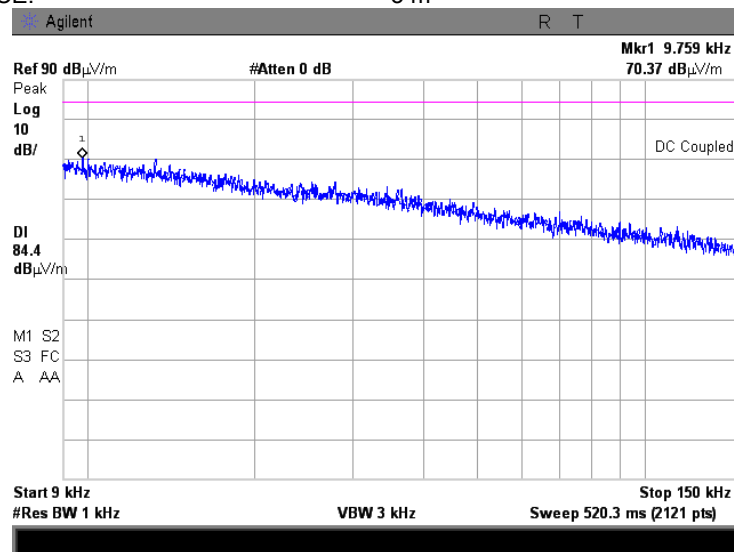
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

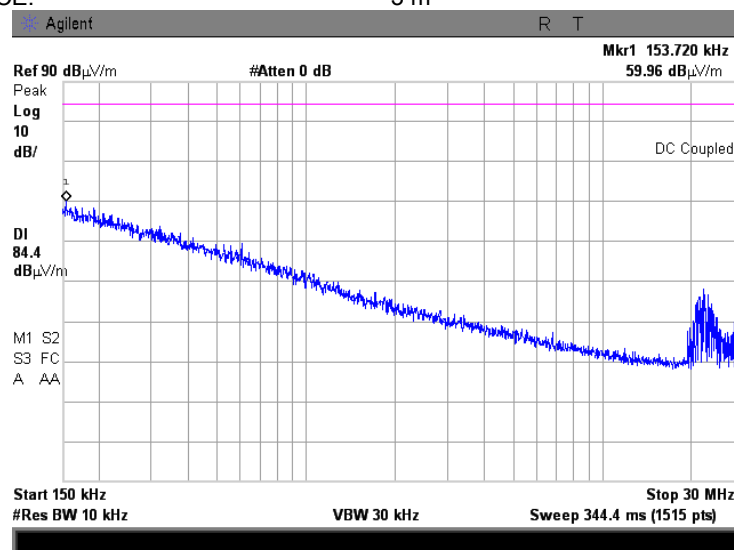
Plot 7.5.3 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.5.4 Radiated emission measurements in 0.15 - 30 MHz range

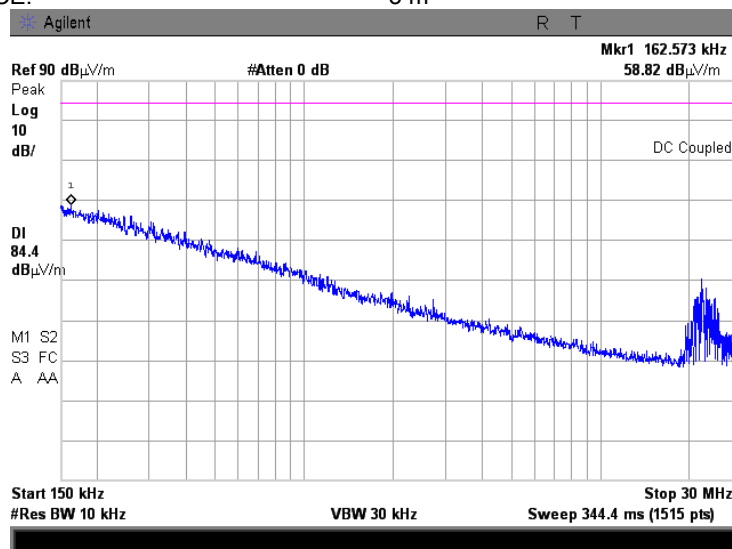
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

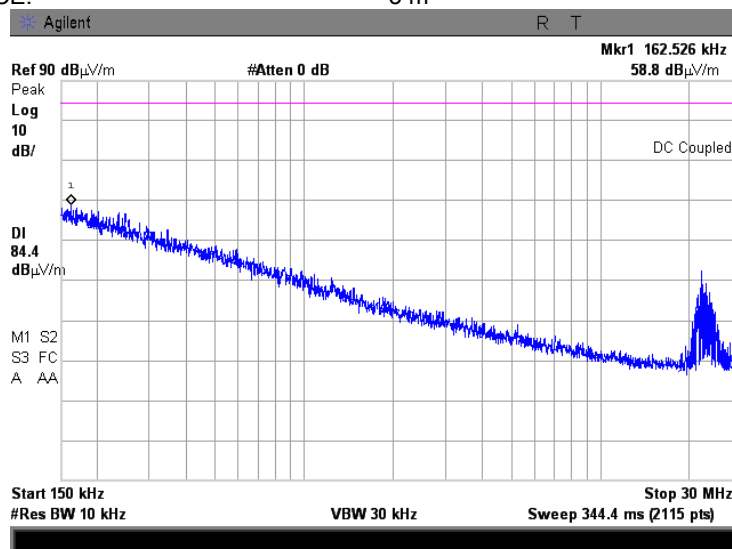
Plot 7.5.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.5.6 Radiated emission measurements in 0.15 - 30 MHz range

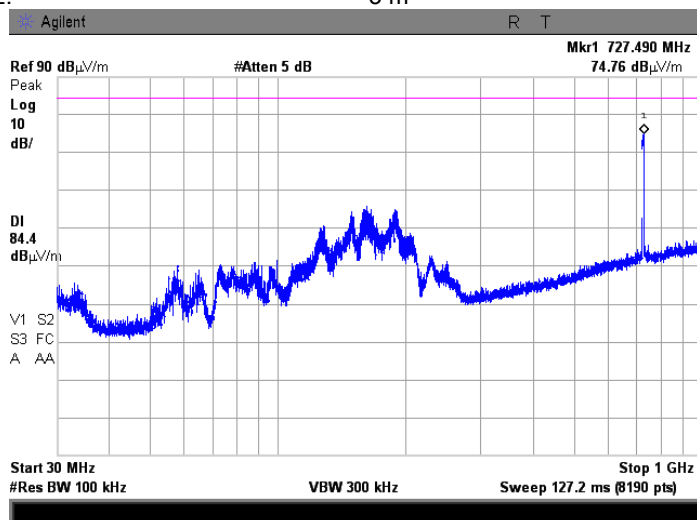
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.7 Radiated emission measurements in 30 - 1000 MHz range

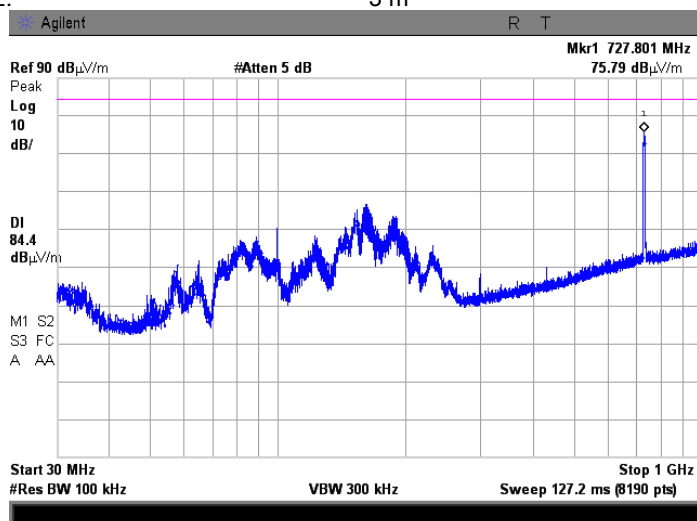
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Note: Fundamental frequency is shown

Plot 7.5.8 Radiated emission measurements in 30 - 1000 MHz range

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

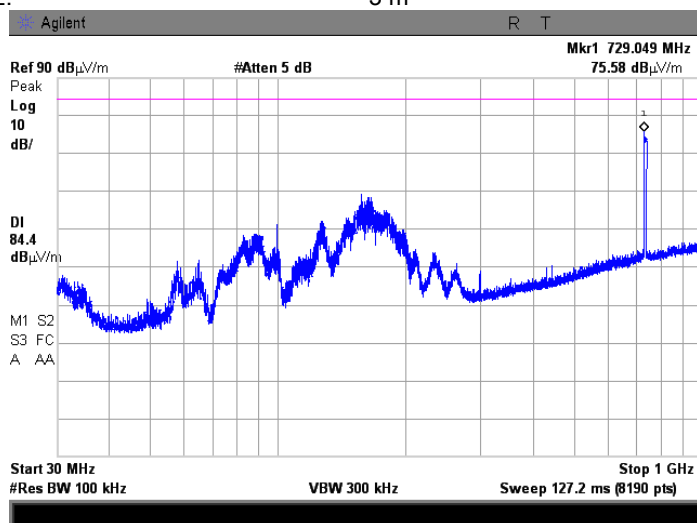


Note: Fundamental frequency is shown

Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.9 Radiated emission measurements in 30 - 1000 MHz range

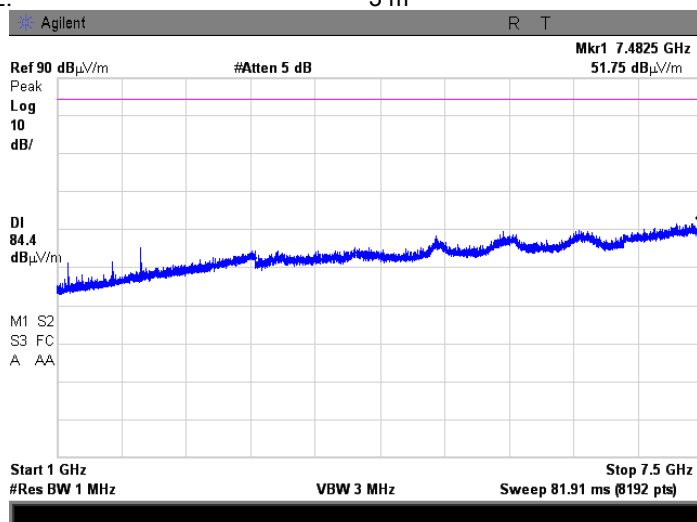
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Note: Fundamental frequency is shown

Plot 7.5.10 Radiated emission measurements in 1000 – 7500 MHz range

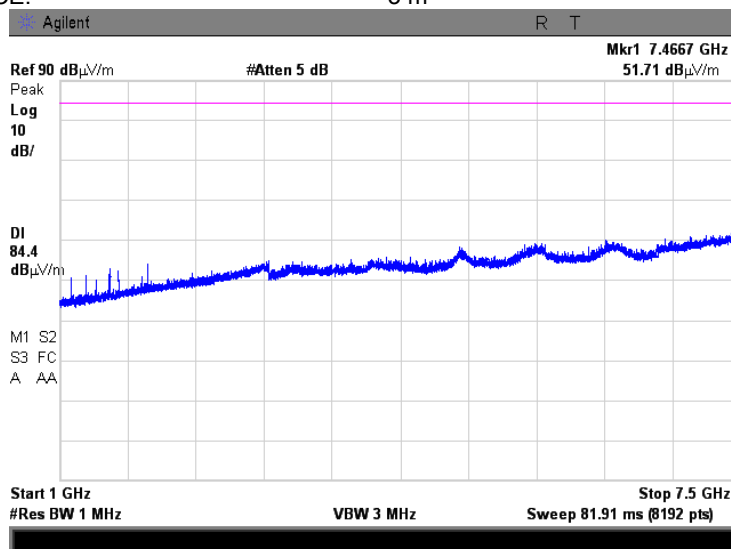
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:		Section 27.53, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053; TIA/EIA-603-C, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		27-Mar-14	
Temperature: 22 °C	Air Pressure: 1020 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

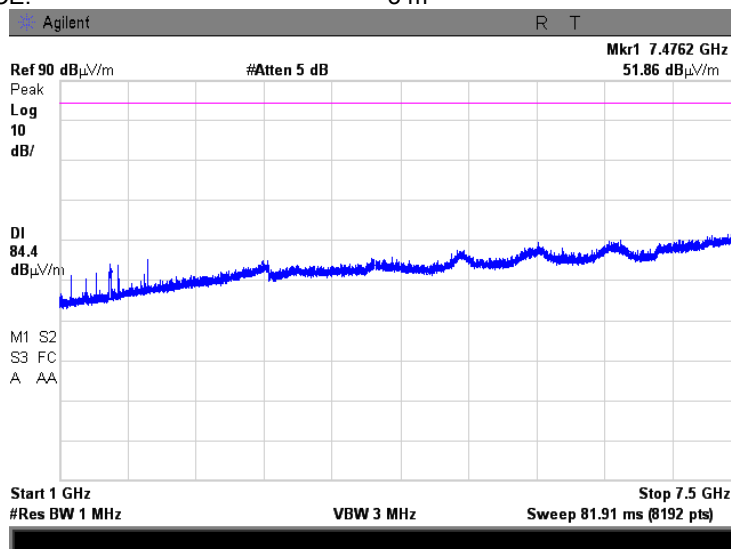
Plot 7.5.11 Radiated emission measurements in 1000 – 7500 MHz range

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



Plot 7.5.12 Radiated emission measurements in 1000 – 7500 MHz range

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



Test specification:		Section 27.54, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		24-Mar-14 - 25-Mar-14	
Temperature: 23 °C	Air Pressure: 1013 hPa	Relative Humidity: 56 %	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.

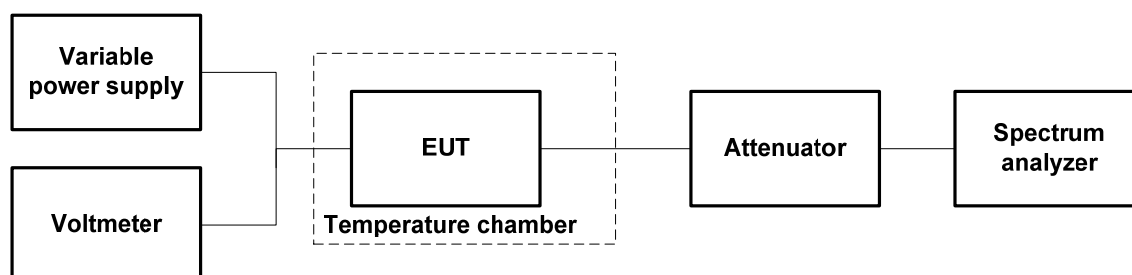
Table 7.6.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement
728.0 – 746.0	The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

7.6.2 Test procedure

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

Figure 7.6.1 Frequency stability test setup



Test specification:		Section 27.54, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		24-Mar-14 - 25-Mar-14	
Temperature: 23 °C	Air Pressure: 1013 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY: 728.0 – 746.0 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	
		Start up	1 st min	2 nd min	3 rd min	4 th min	5 th min	10 th min	Positive	Negative
Low carrier frequency										
-30	nominal	733.960016	733.960016	733.960016	733.960015	733.960016	733.960016	733.960017	2.00	0.00
-20	nominal	733.960016	NA	NA	NA	NA	NA	733.960014	1.00	1.00
-10	nominal	733.960017	NA	NA	NA	NA	NA	733.960016	2.00	0.00
0	nominal	733.960016	733.960016	733.960016	733.960015	733.960015	733.960016	733.960016	1.00	0.00
10	nominal	733.960016	NA	NA	NA	NA	NA	733.960015	1.00	0.00
20	15% 55.2	733.960015	NA	NA	NA	NA	NA	733.960015	0.00	0.00
20	Nominal	733.960015	NA	NA	NA	NA	NA	733.960015*	0.00	0.00
20	-15% 40.8	733.960015	NA	NA	NA	NA	NA	733.960015	0.00	0.00
30	nominal	733.960015	733.960015	733.960015	733.960015	733.960015	733.960015	733.960016	1.00	0.00
40	nominal	733.960016	NA	NA	NA	NA	NA	733.960016	1.00	0.00
50	nominal	733.960016	NA	NA	NA	NA	NA	733.960015	1.00	0.00
Mid carrier frequency										
-30	nominal	738.960017	738.960017	738.960017	738.960017	738.960015	738.960014	738.960017	1.00	2.00
-20	nominal	738.960016	NA	NA	NA	NA	NA	738.960015	0.00	1.00
-10	nominal	738.960017	NA	NA	NA	NA	NA	738.960019	3.00	0.00
0	nominal	738.960015	738.960016	738.960016	738.960016	738.960015	738.960016	738.960016	0.00	1.00
10	nominal	738.960016	NA	NA	NA	NA	NA	738.960016	0.00	0.00
20	15%	738.960017	NA	NA	NA	NA	NA	738.960017	1.00	0.00
20	nominal	738.960017	NA	NA	NA	NA	NA	738.960016*	1.00	0.00
20	-15%	738.960015	NA	NA	NA	NA	NA	738.960015	0.00	1.00
30	nominal	738.960016	738.960016	738.960016	738.960016	738.960016	738.960015	738.960015	0.00	1.00
40	nominal	738.960017	NA	NA	NA	NA	NA	738.960016	1.00	0.00
50	nominal	738.960016	NA	NA	NA	NA	NA	738.960016	0.00	0.00
High carrier frequency										
-30	nominal	741.960016	741.960016	741.960016	741.960016	741.960017	741.960017	741.960017	2.00	0.00
-20	nominal	741.960015	NA	NA	NA	NA	NA	741.960016	1.00	0.00
-10	nominal	741.960018	NA	NA	NA	NA	NA	741.960016	3.00	0.00
0	nominal	741.960016	741.960017	741.960016	741.960015	741.960016	741.960016	741.960017	2.00	0.00
10	nominal	741.960015	NA	NA	NA	NA	NA	741.960016	1.00	0.00
20	15%	741.960015	NA	NA	NA	NA	NA	741.960016	1.00	0.00
20	nominal	741.960015	NA	NA	NA	NA	NA	741.960015*	0.00	0.00
20	-15%	741.960015	NA	NA	NA	NA	NA	741.960015	0.00	0.00
30	nominal	741.960014	741.960014	741.960015	741.960015	741.960015	741.960014	741.960015	0.00	1.00
40	nominal	741.960016	NA	NA	NA	NA	NA	741.960016	1.00	0.00
50	nominal	741.960016	NA	NA	NA	NA	NA	741.960015	1.00	0.00

NOTE: Frequency stability test results are sufficient enough to ensure that the fundamental emissions stay within the authorized bands of operation

* - Reference frequency



HERMON LABORATORIES

Report ID: AIRRAD_FCC.25631.docx
Date of Issue: 6-Apr-14

Test specification:		Section 27.54, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		24-Mar-14 - 25-Mar-14	
Temperature: 23 °C	Air Pressure: 1013 hPa	Relative Humidity: 56 %	Power Supply: 48VDC
Remarks:			

Table 7.6.3 Maximum frequency displacement

Channel	Maximum frequency displacement			
	Hz		ppm	
	Positive	Negative	Positive	Negative
Low	2.00	1.00	0.00	0.00
Mid	3.00	2.00	0.00	0.00
High	3.00	1.00	0.00	0.00

Reference numbers of test equipment used

HL 1424	HL 1476	HL 3286	HL 3308	HL 4164	HL 4229		
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Full description is given in Appendix A.

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	21-Jan-14	21-Jan-15
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	04-Jun-13	04-Jun-14
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	10-Oct-13	10-Oct-14
1476	Cable, 1 m	Harbour Industries	MIL 17/60-RG142	1476	09-Sep-13	09-Sep-14
1908	Power Splitter / Combiner 0.5-1 GHz	Mini-Circuits	ZAPD-1	1908	02-Jul-12	02-Jul-15
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Jan-14	03-Jan-15
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	10-Jul-13	10-Jul-14
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	04-Dec-13	04-Dec-14
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
3435	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW-S10W5+	NA	09-Mar-14	09-Mar-15
3442	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	09-Mar-14	09-Mar-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
4229	Precision Fixed Attenuator, 50 Ohm, 5W, 10dB, DC to 18000 MHz	Mini-Circuits	BW-N10W5+	NA	07-Mar-14	07-Mar-15
4274	Test Cable , DC-18 GHz, 1.8 m, SMA/M - N/M	Mini-Circuits	CBL-6FT-SMNM+	70047	27-Nov-13	27-Nov-14

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	$\pm 8\%$
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.

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11 APPENDIX D Specification references

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

12 APPENDIX E Test equipment correction factors

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

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

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(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
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

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

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(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
Test cable, Mini-Circuits, S/N 70047, 18 GHz, 1.8 m, SMA/M - N/M
CBL-6FT-SMNM+, HL 4274

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.07	4800	1.69	9800	2.62	14800	3.42
30	0.11	4900	1.70	9900	2.63	14900	3.39
50	0.14	5000	1.72	10000	2.64	15000	3.38
100	0.21	5100	1.75	10100	2.64	15100	3.40
200	0.26	5200	1.76	10200	2.66	15200	3.41
300	0.30	5300	1.77	10300	2.67	15300	3.40
400	0.37	5400	1.79	10400	2.68	15400	3.39
500	0.44	5500	1.82	10500	2.68	15500	3.41
600	0.49	5600	1.85	10600	2.70	15600	3.44
700	0.54	5700	1.86	10700	2.71	15700	3.46
800	0.58	5800	1.87	10800	2.73	15800	3.45
900	0.63	5900	1.91	10900	2.74	15900	3.47
1000	0.67	6000	1.94	11000	2.76	16000	3.51
1100	0.71	6100	1.97	11100	2.77	16100	3.56
1200	0.75	6200	1.98	11200	2.78	16200	3.55
1300	0.78	6300	1.99	11300	2.79	16300	3.54
1400	0.81	6400	2.02	11400	2.80	16400	3.57
1500	0.85	6500	2.05	11500	2.82	16500	3.62
1600	0.88	6600	2.06	11600	2.83	16600	3.61
1700	0.91	6700	2.06	11700	2.84	16700	3.60
1800	0.94	6800	2.08	11800	2.85	16800	3.62
1900	0.97	6900	2.10	11900	2.87	16900	3.68
2000	1.00	7000	2.12	12000	2.88	17000	3.70
2100	1.03	7100	2.12	12100	2.89	17100	3.68
2200	1.06	7200	2.13	12200	2.90	17200	3.70
2300	1.08	7300	2.16	12300	2.92	17300	3.80
2400	1.11	7400	2.19	12400	2.94	17400	3.84
2500	1.14	7500	2.22	12500	2.95	17500	3.83
2600	1.16	7600	2.23	12600	2.96	17600	3.83
2700	1.19	7700	2.26	12700	2.98	17700	3.86
2800	1.21	7800	2.30	12800	3.00	17800	3.86
2900	1.27	7900	2.33	12900	3.02	17900	3.80
3000	1.29	8000	2.35	13000	3.03	18000	3.79
3100	1.32	8100	2.37	13100	3.06		
3200	1.35	8200	2.41	13200	3.08		
3300	1.37	8300	2.44	13300	3.09		
3400	1.38	8400	2.47	13400	3.10		
3500	1.41	8500	2.48	13500	3.13		
3600	1.43	8600	2.51	13600	3.17		
3700	1.46	8700	2.53	13700	3.17		
3800	1.47	8800	2.55	13800	3.18		
3900	1.49	8900	2.56	13900	3.22		
4000	1.52	9000	2.57	14000	3.26		
4100	1.55	9100	2.58	14100	3.28		
4200	1.56	9200	2.59	14200	3.30		
4300	1.58	9300	2.59	14300	3.35		
4400	1.60	9400	2.60	14400	3.39		
4500	1.63	9500	2.60	14500	3.39		
4600	1.65	9600	2.61	14600	3.39		
4700	1.67	9700	2.61	14700	3.41		

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