HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

**ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247 (DTS),
RSS-247 issue 1, RSS-Gen issue 4**

FOR:

Visonic Ltd.
Control Panel (Wi-Fi module)
Model: PM-360(433) ADT
FCC ID:WP3PM360433

Table of contents

1 Applicant information

Client name:	Visonic Ltd.
Address:	24 Habarzel street, Tel Aviv 69710, Israel
Telephone:	+972 3645 6832
Fax:	+972 3645 6788
E-mail:	zurir@tycoint.com
Contact name:	Mr. Zuri Rubin

2 Equipment under test attributes

Product name:	Wi-Fi module of Control Panel
Product type:	Transceiver
Model(s):	PM-360 (433) ADT
Serial number:	1916150170
Hardware version:	90-208059
Software release:	JS-702955
Receipt date	12-Apr-15

3 Manufacturer information

Manufacturer name:	Visonic Ltd.
Address:	24 Habarzel street, Tel Aviv 69710, Israel
Telephone:	+972 3645 6832
Fax:	+972 3645 6788
E-Mail:	zurir@tycoint.com
Contact name:	Mr. Zuri Rubin

4 Test details

Project ID:	28637
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	28-Jun-15
Test completed:	30-Jun-15
Test specification(s):	FCC 47CFR part 15 subpart C § 15.247 (FHSS); RSS-247 issue 1, RSS-Gen issue 4

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth	Pass
FCC Section 15.247(b)3/ RSS-247 section 5.4(4), Peak output power	Pass
FCC section 15.247(i) / RSS-102 section 2.5.2, RF exposure	Pass, the exhibit to the application of certification is provided
FCC Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions	Pass
FCC Section 15.247(d)/ RSS-247 section 5.5, Emissions at band edges	Pass
FCC Section 15.247(e) / RSS-247 section 5.2(2), Peak power density	Pass
FCC section 15.203 / RSS-Gen section 8.3, Antenna requirement	Pass
FCC section 15.207(a) / RSS-Gen section 8.8, Conducted emission	Pass

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer Mrs. E. Pitt, test engineer	June 30, 2015	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	August 9, 2016	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	August 14, 2016	

6 EUT description

6.1 General information

The EUT, Control panel PM-360 (433) ADT is a wireless control panel powered via external AC/DC adaptor. The panel comprises four Visonic RF boards with below radio modules:

1. PG-2 module- communication within the alarm system in 433 MHz band

2. WiFi module- approved under FCC ID:Z64-WL18SBMOD with Visonic antenna, connected to RF PCB

a. 802.11b

b. 802.11g

c. 802.11n HT20, 802.11n HT40.

3. Z-wave module with Visonic antenna connected to RF board

4. Cellular module UE910NAR modular approved with FCC ID:RI7UE910NA, IC: 5131A-UE910NA used for 3G/2G modes with Visonic antenna connected to RF board.

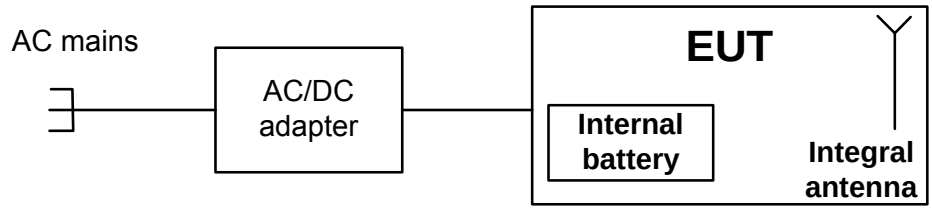
All radios could operate simalteneously.

The present test report involves the test results for certification of 2412-2462 MHz Wi-Fi transmitter as a part of a composite application for certification.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Power	AC power	AC mains	AC/DC adaptor	1	Unshielded	2.0

6.3 Test configuration

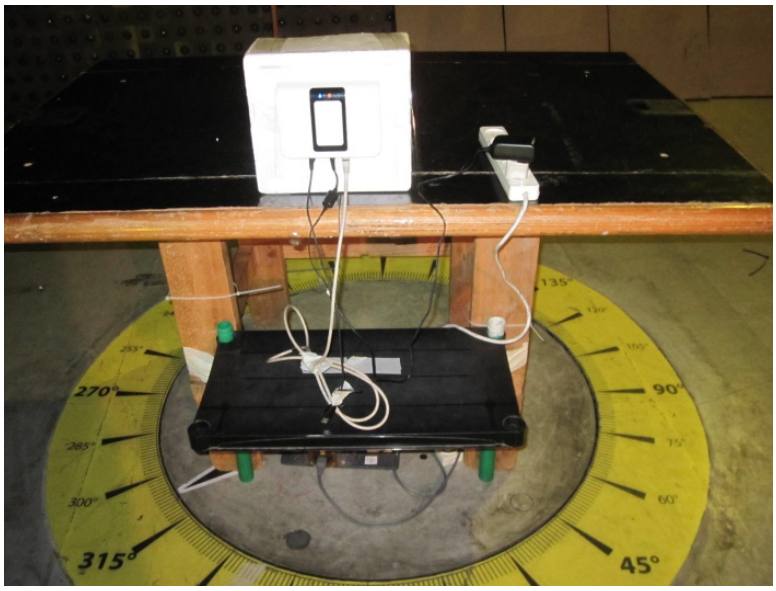


6.4 Changes made in the EUT

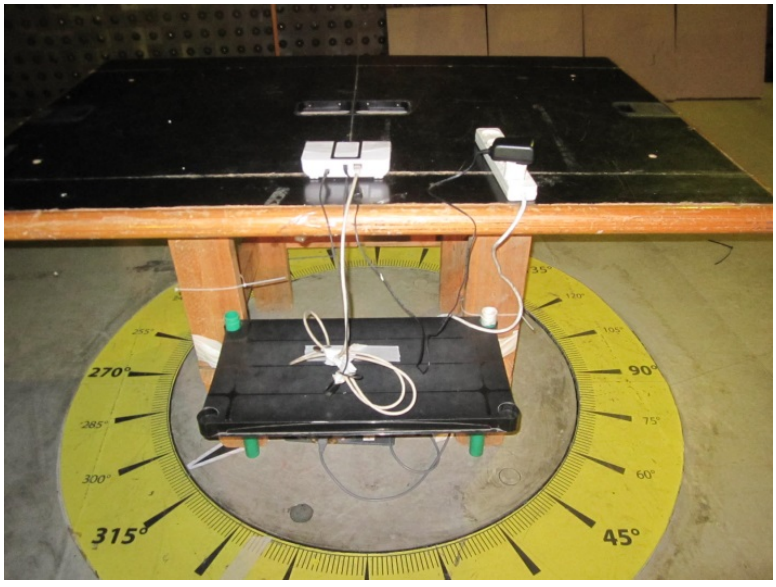
No changes were implemented in the EUT during the testing.

6.5 EUT test positions

Photograph 6.5.1 EUT in vertical position



Photograph 6.5.2 EUT in horizontal position



6.6 Transmitter characteristics

Type of equipment	
X	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**
	fixed	Always at a distance more than 2 m from all people
X	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 ranges	2400 -2483.5 MHz
Operating frequencies	2412-2462 MHz

Maximum rated output power	At transmitter 50 Ω RF output connector	dBm
	Peak output power	23.8 dBm

Is transmitter output power variable?	X	No		
		Yes		continuous variable
				stepped variable with stepsize dB
			minimum RF power	dBm
			maximum RF power	dBm

Antenna connection				
unique coupling	standard connector	X	integral	with temporary RF connector
				X without temporary RF connector

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Integral	Visonic	Printed	0 dBi

Mode:	802.11b	802.11g	802.11n HT20	802.11n HT40
Transmitter aggregate data rate/s, Mbps*	1	6	6.5 (MCS0)	13.5(MCS0)

Type of modulation	802.11b:DSSS (DBPSK/DQPSK/CCK) 802.11g/n:OFDM (BPSK/QPSK/16QAM/64QAM)

Transmitter power source					
	Battery	**Nominal rated voltage**		Battery type	Lithium
	DC	**Nominal rated voltage**			
X	AC mains	**Nominal rated voltage**	120 VAC	Frequency	

Common power source for transmitter and receiver	X	yes	no

* Data rates associated with the highest power were chosen according to the test report Doc. No.FR3N2752-01C in the original application for Wi-Fi module under FCC ID: Z64-WL18SBMOD

Test specification:	FCC section 15.247(a)(2) / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C requirements

7.1 Minimum 6 dB bandwidth

7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 6 dB bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum bandwidth, kHz
902.0 – 928.0	6.0	500.0
2400.0 – 2483.5		
5725.0 – 5850.0		

* - Modulation envelope reference points provided in terms of attenuation below the peak of modulated carrier.

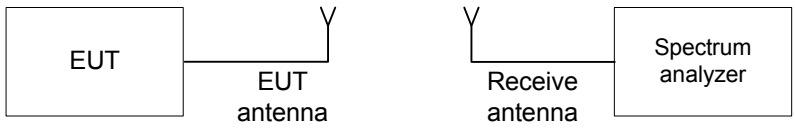
7.1.2 Test procedure

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

7.1.2.2 The EUT was set to transmit modulated carrier.

7.1.2.3 The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and associated plot.

Figure 7.1.1 The 6 dB bandwidth test setup



Test specification:	FCC section 15.247(a)(2) / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.2 The 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION ENVELOPE REFERENCE POINTS: 6.0 dBc
MODULATING SIGNAL: PRBS
MODE: 802.11b

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency				
2412.99	9107	500	-8607.0	Pass
Mid frequency				
2437.0	9554	500	-9054.0	Pass
High frequency				
2462	9054	500	-8554.0	Pass

MODE: 802.11g

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency				
2412	15064	500	-14564	Pass
Mid frequency				
2437	15111	500	-14611	Pass
High frequency				
2462	15335	500	-14835	Pass

MODE: 802.11n HT20

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency				
2412	15450	500	-14835	Pass
Mid frequency				
2437	15491	500	-14991	Pass
High frequency				
2462	15872	500	-15372	Pass

MODE: 802.11n HT40

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency				
2422	28831	500	-28331	Pass
Mid frequency				
2437	35708	500	-35208	Pass
High frequency				
2452	28759	500	-28259	Pass

Reference numbers of test equipment used

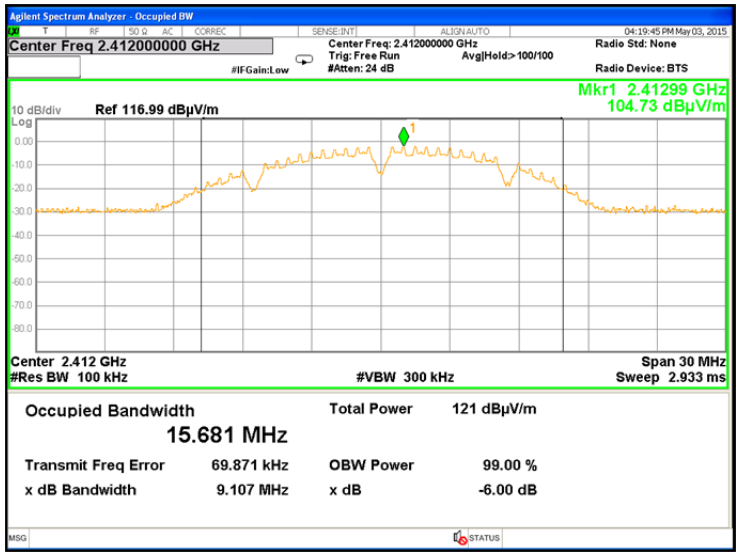
HL 3818								

Full description is given in Appendix A.

Test specification:	FCC section 15.247(a)(2) / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

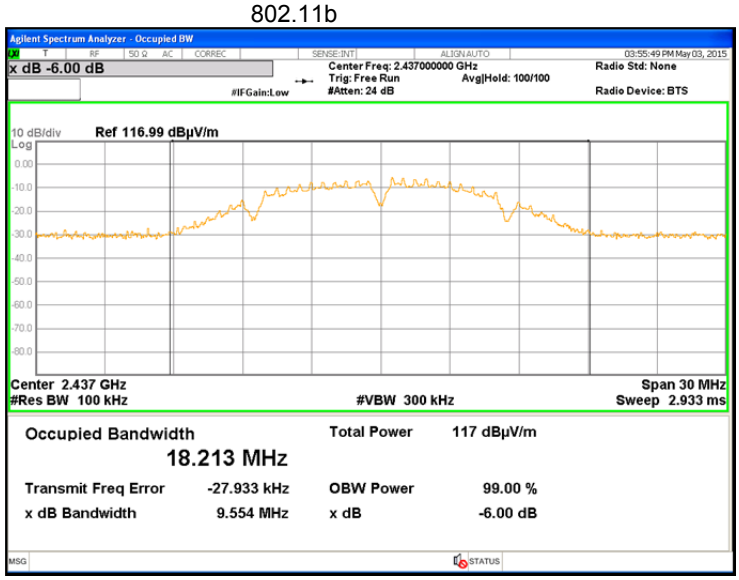
Plot 7.1.1 The 6 dB bandwidth test result at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11b



Plot 7.1.2 The 6 dB bandwidth test result at mid frequency

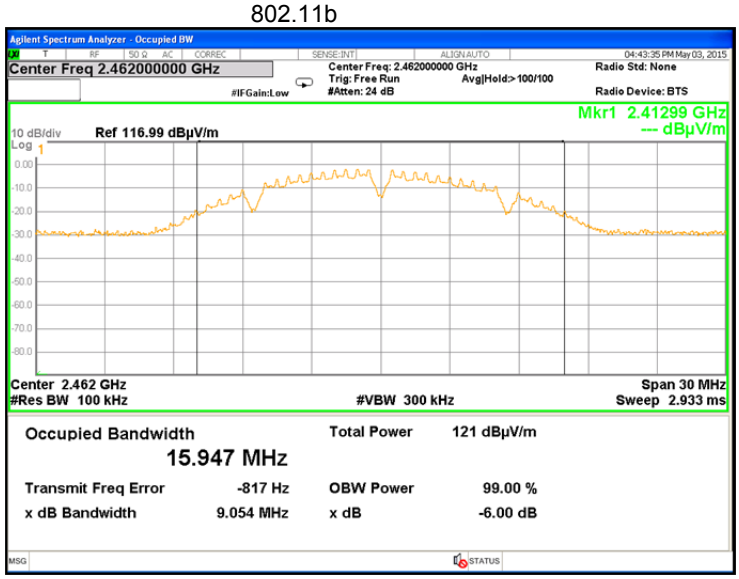
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11b



Test specification:	FCC section 15.247(a)(2) / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

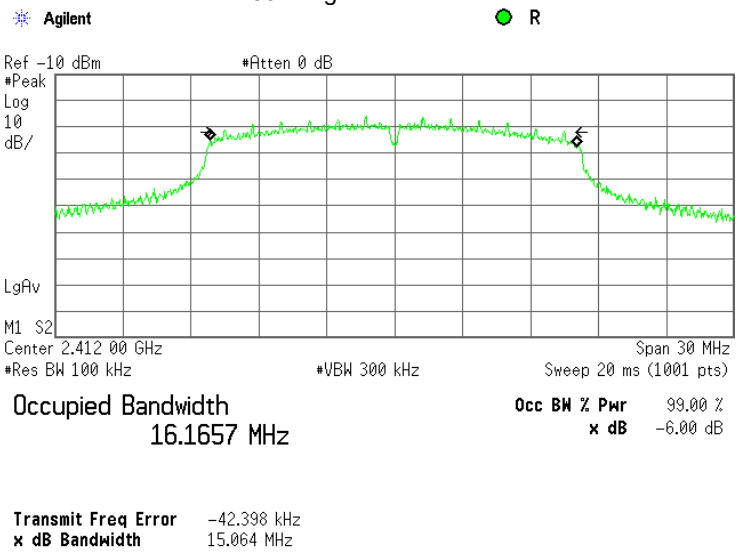
Plot 7.1.3 The 6 dB bandwidth test result at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11b



Plot 7.1.4 The 6 dB bandwidth test result at low frequency

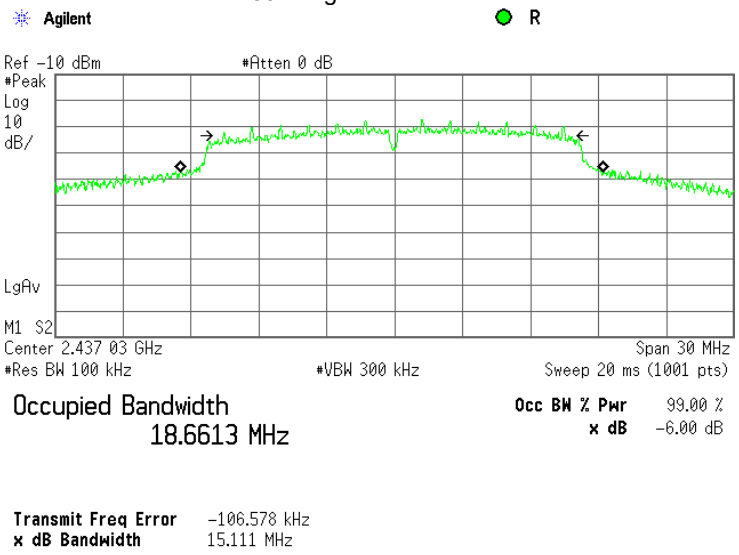
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11g



Test specification:	FCC section 15.247(a)(2) / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

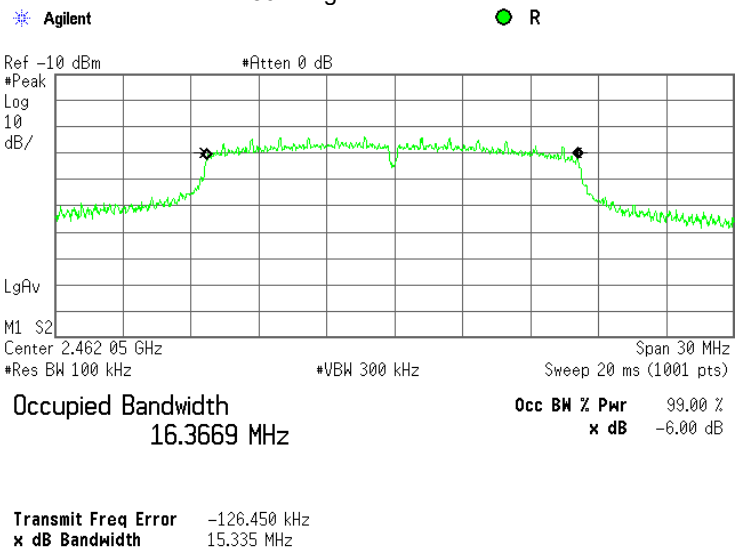
Plot 7.1.5 The 6 dB bandwidth test result at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11g



Plot 7.1.6 The 6 dB bandwidth test result at high frequency

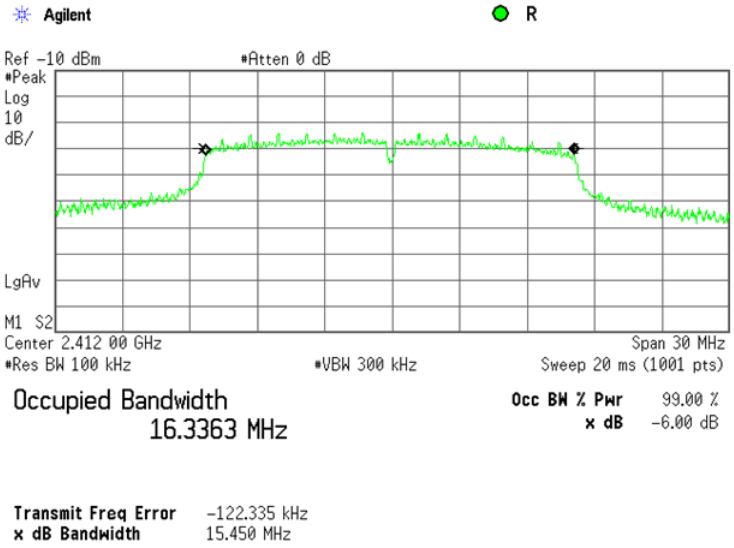
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11g



Test specification:	FCC section 15.247(a)(2) / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

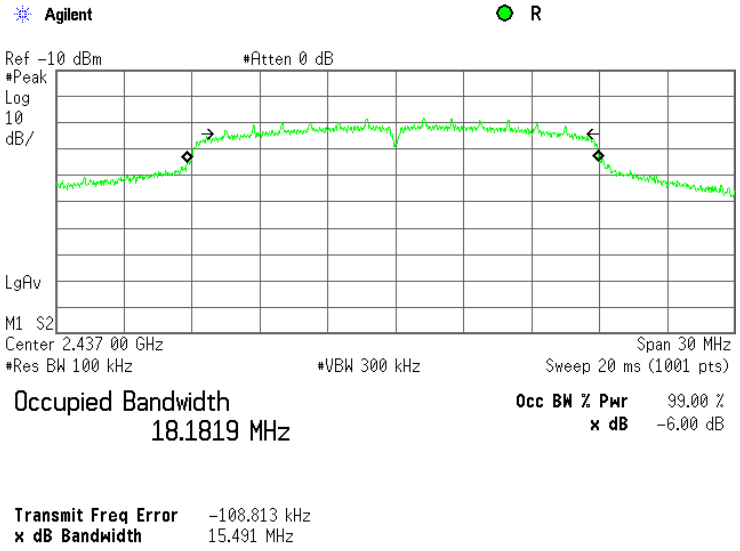
Plot 7.1.7 The 6 dB bandwidth test result at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11n HT20



Plot 7.1.8 The 6 dB bandwidth test result at mid frequency

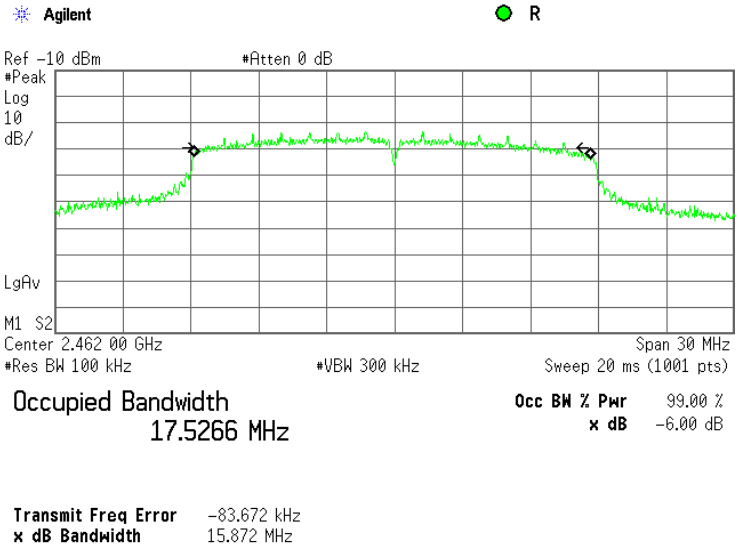
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11n HT20



Test specification:	FCC section 15.247(a)(2) / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

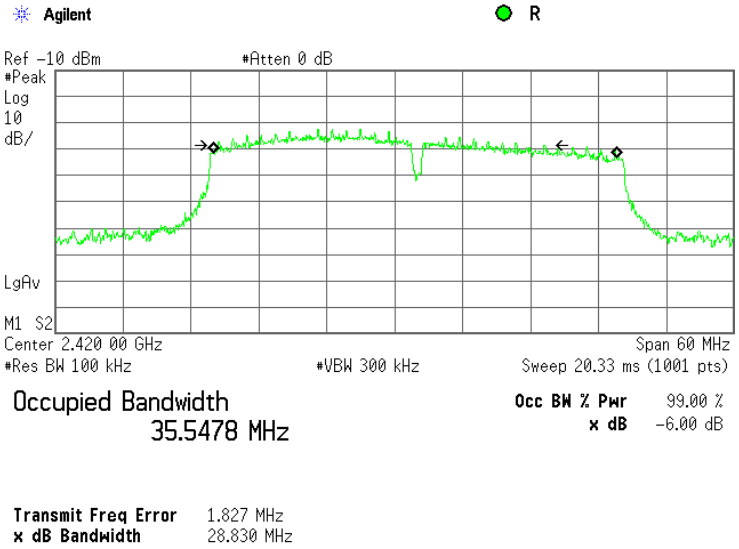
Plot 7.1.9 The 6 dB bandwidth test result at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11n HT20



Plot 7.1.10 The 6 dB bandwidth test result at low frequency

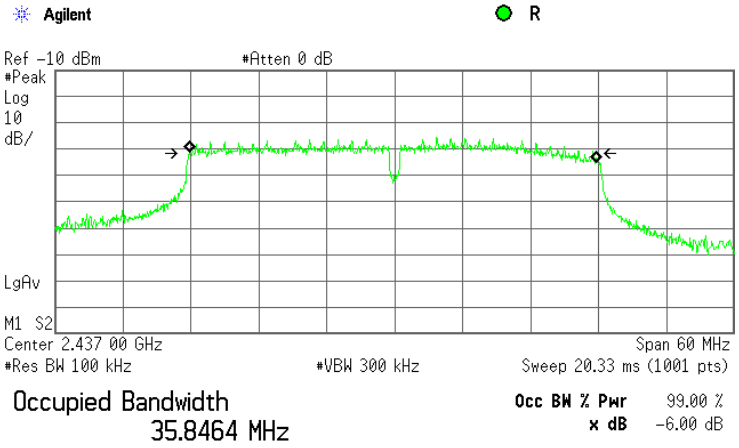
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11n HT40



Test specification:	FCC section 15.247(a)(2) / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	28-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

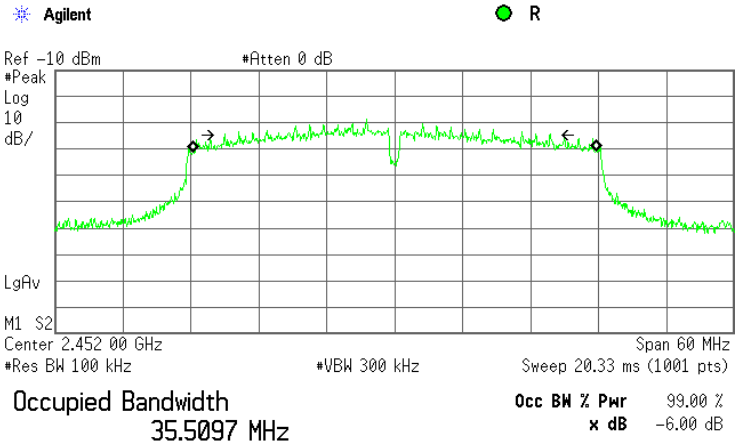
Plot 7.1.11 The 6 dB bandwidth test result at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11n HT40



Plot 7.1.12 The 6 dB bandwidth test result at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
MODE: 802.11n HT40



Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

7.2 Peak output power

7.2.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

Assigned frequency range, MHz	Maximum antenna gain, dBi	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)**
		W	dBm	
902.0 – 928.0	6.0	1.0	30.0	131.2
2400.0 – 2483.5				
5725.0 – 5850.0				

*- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

**- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×P×G)/r, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.

7.2.2 Test procedure

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

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

7.2.2.3 The resolution bandwidth of spectrum analyzer was set wider than 6 dB bandwidth of the EUT and the field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.2.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.2.2 and associated plots.

7.2.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

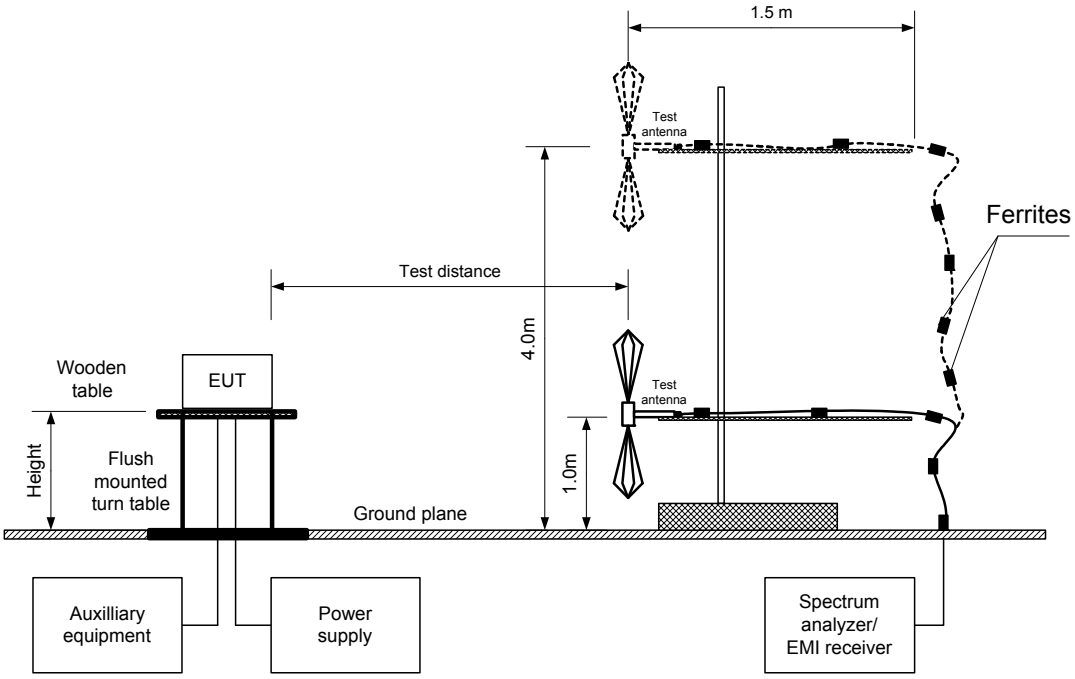
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 dB

7.2.2.6 The worst test results (the lowest margins) were recorded in Table 7.2.2.

Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

Figure 7.2.1 Setup for carrier field strength measurements



Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY BAND: 2400 – 2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
DETECTOR USED: Peak
RBW: 1 MHz
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
EUT ANTENNA GAIN: 0 dBi

MODE: 802.11b

Frequency, MHz	Field strength, dB(μV/m)	Peak output power, dBm**	OBW, MHz	Antenna polariz	Antenna height, m	Azimuth, degrees*	Total output power over Tx OBW, dBm	Limit, dBm	Margin, dB***	Verdict
2411.00	104.14	8.90	9.107	Hor	2.1	185	18.50	30.0	-11.50	Pass
2437.88	104.76	9.60	9.554	Hor	3.0	275	19.33	30.0	-10.67	
2462.88	105.27	10.1	9.054	Hor	2.4	180	19.61	30.0	-10.39	

MODE: 802.11g

Frequency, MHz	Field strength, dB(μV/m)	Peak output power, dBm**	OBW, MHz	Antenna polariz	Antenna height, m	Azimuth, degrees*	Total output power over Tx OBW, dBm	Limit, dBm	Margin, dB***	Verdict
2413.38	104.88	9.7	15.064	Hor	2.8	182	21.43	30.0	-8.57	Pass
2439.88	104.39	9.2	15.111	Hor	3.3	277	20.95	30.0	-9.05	
2461.00	104.25	9.1	15.335	Hor	3.2	300	20.88	30.0	-9.12	

MODE: 802.11n HT20

Frequency, MHz	Field strength, dB(μV/m)	Peak output power, dBm**	OBW, MHz	Antenna polariz	Antenna height, m	Azimuth, degrees*	Total output power over Tx OBW, dBm	Limit, dBm	Margin, dB***	Verdict
2410.75	107.15	12.0	15.450	Hor	2.6	330	23.81	30.0	-6.19	Pass
2434.88	106.73	11.5	15.491	Hor	3.5	350	23.40	30.0	-6.60	
2460.88	107.03	11.8	15.872	Hor	3.0	340	23.81	30.0	-6.19	

MODE: 802.11n HT40

Frequency, MHz	Field strength, dB(μV/m)	Peak output power, dBm**	OBW, MHz	Antenna polariz	Antenna height, m	Azimuth, degrees*	Total output power over Tx OBW, dBm	Limit, dBm	Margin, dB***	Verdict
2414.10	100.06	4.9	28.831	Hor	3.5	304	19.43	30.0	-10.57	Pass
2431.30	98.94	3.7	35.708	Hor	3.0	350	19.24	30.0	-10.76	
2454.40	101.57	6.4	28.759	Hor	2.8	350	20.93	30.0	-9.07	

*****- EUT front panel refer to 0 degrees position of turntable.
******- Peak output power (RBW=1MHz) was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$, where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm* (RBW=1MHz) = *Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 dB*
***- Margin = Total output power – specification limit.

Reference numbers of test equipment used

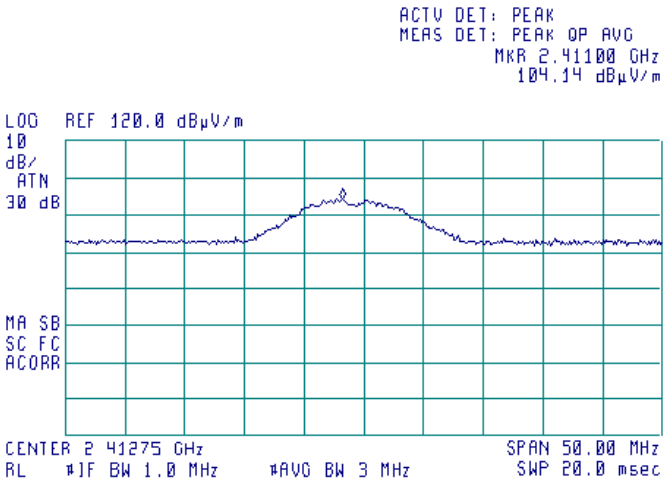
HL 0521	HL 4114	HL 4353	HL 4575	HL 4922			

Full description is given in Appendix A.

Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

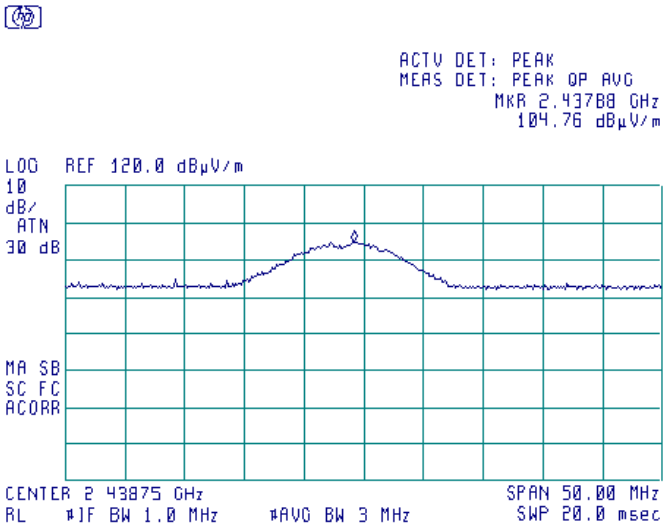
Plot 7.2.1 Field strength of carrier at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Plot 7.2.2 Field strength of carrier at mid frequency

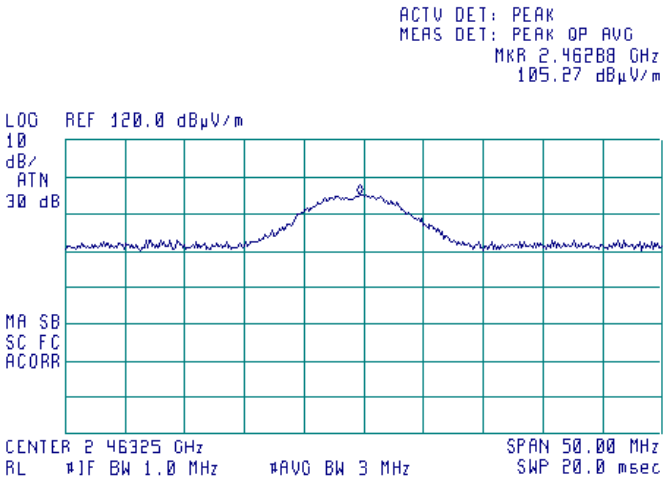
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

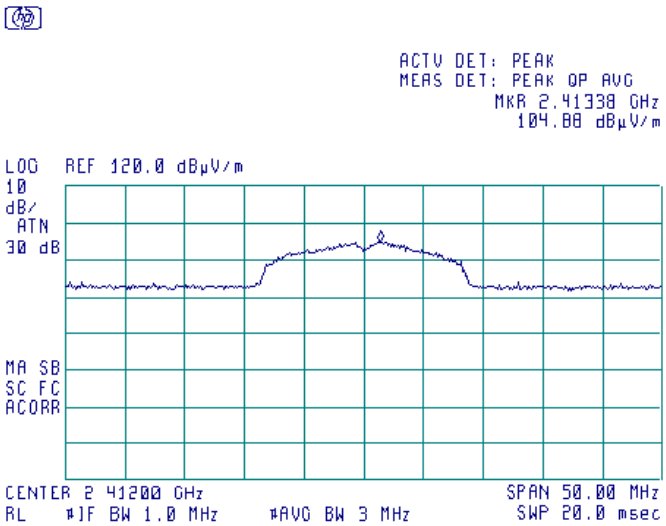
Plot 7.2.3 Field strength of carrier at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Plot 7.2.4 Field strength of carrier at low frequency

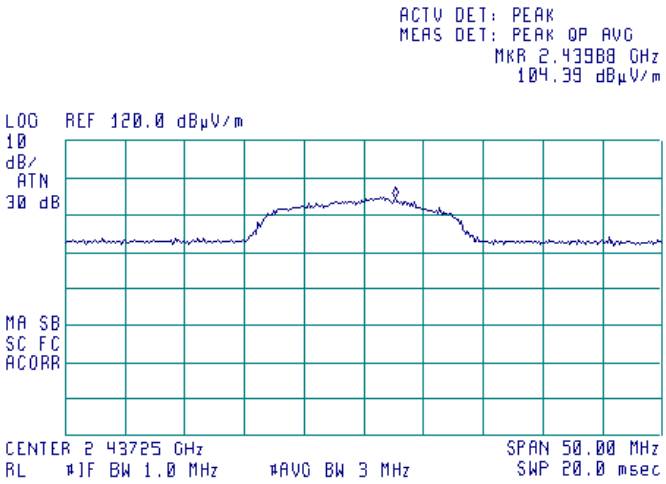
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

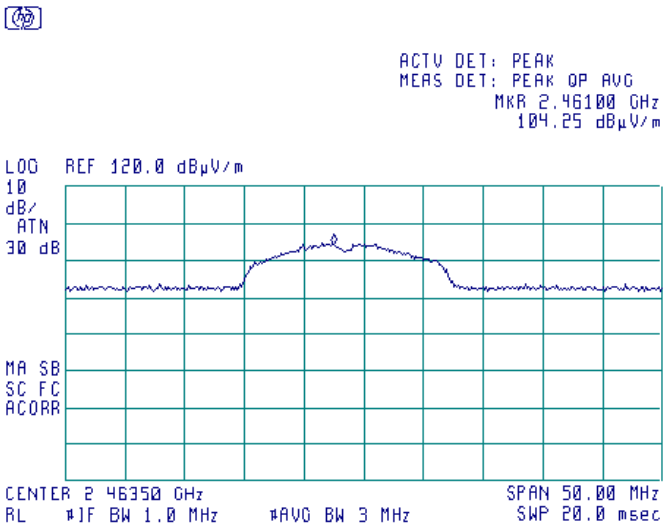
Plot 7.2.5 Field strength of carrier at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Plot 7.2.6 Field strength of carrier at high frequency

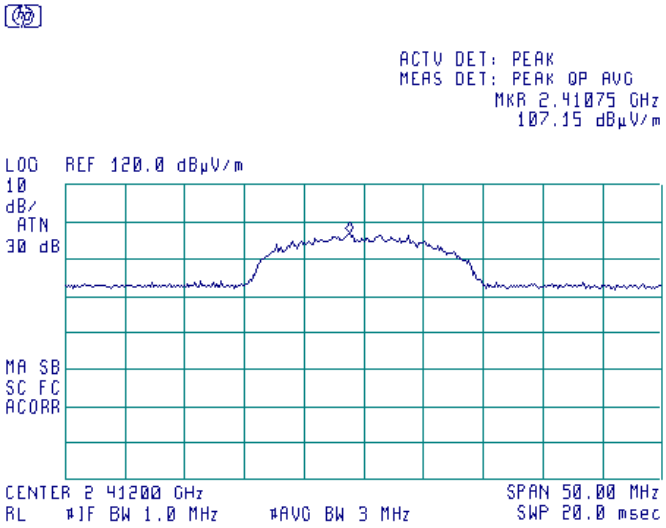
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

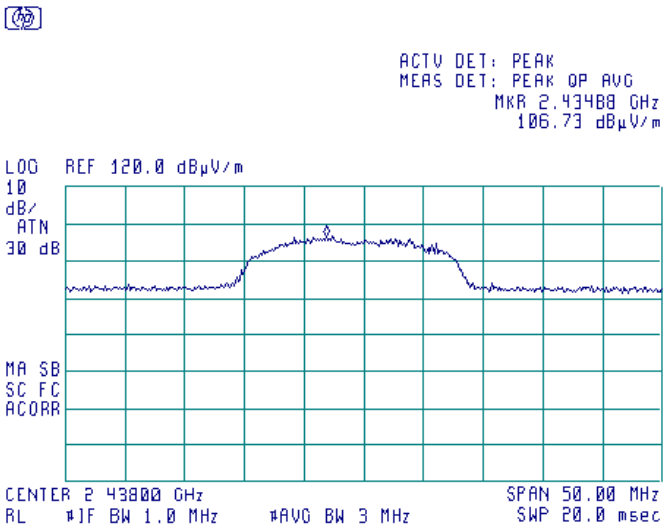
Plot 7.2.7 Field strength of carrier at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Plot 7.2.8 Field strength of carrier at mid frequency

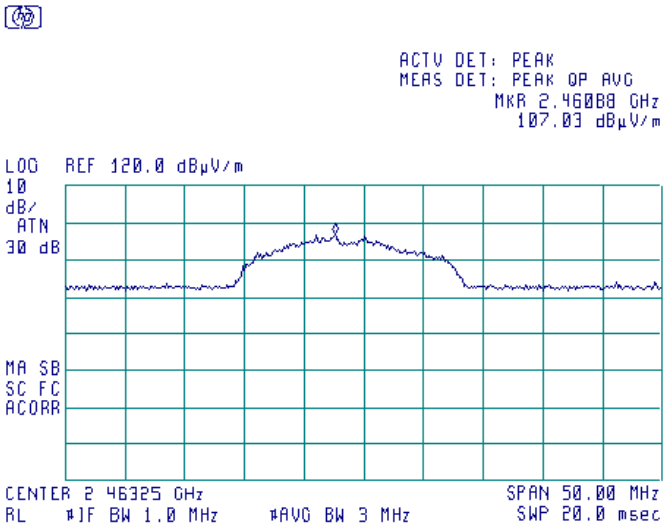
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

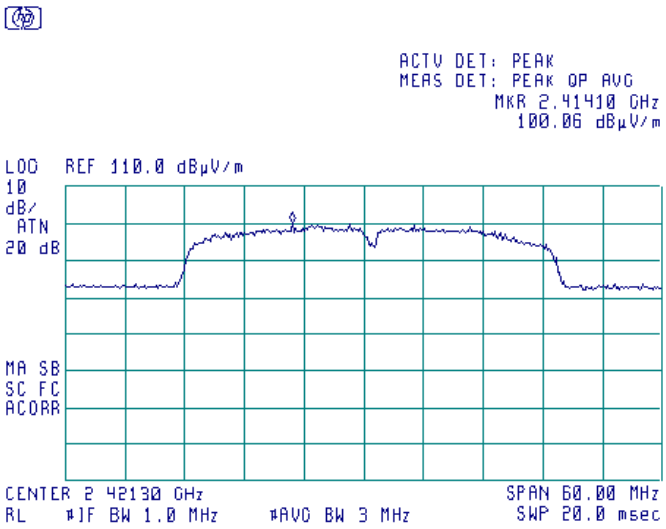
Plot 7.2.9 Field strength of carrier at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Plot 7.2.10 Field strength of carrier at low frequency

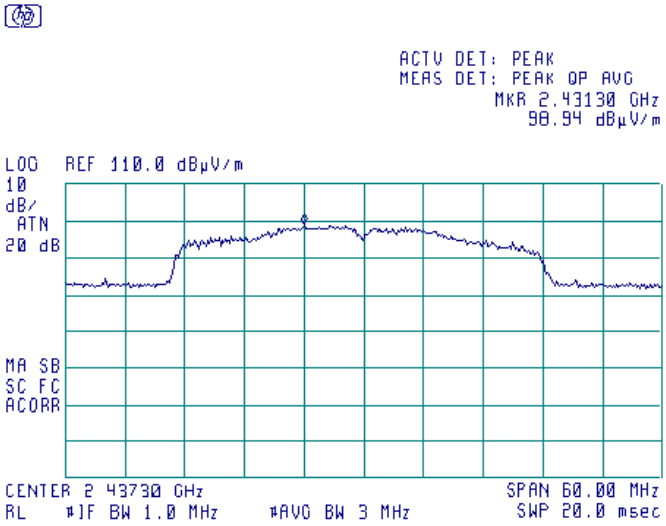
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Test specification:	FCC section 15.247(b)3 / RSS-247 section 5.4(4), Peak output power		
Test procedure:	ANSI C63.10 section 11.9.1.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

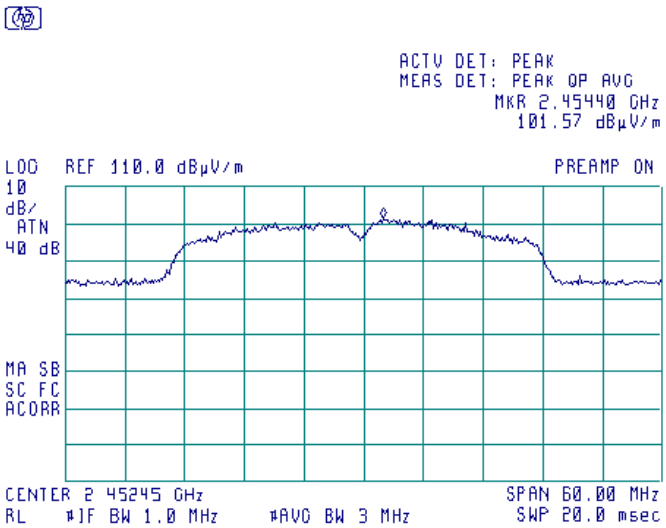
Plot 7.2.11 Field strength of carrier at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Plot 7.2.12 Field strength of carrier at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

7.3 Field strength of spurious emissions

7.3.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)*			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc***
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	20.0
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
1000 – 10thharmonic	74.0	NA	54.0	

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

**- The limit decreases linearly with the logarithm of frequency.

*** - The field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

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

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and the performance check was conducted.

7.3.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

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

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

7.3.3.1 The EUT was set up as shown in Figure 7.3.2, energized and the performance check was conducted.

7.3.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

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

Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz

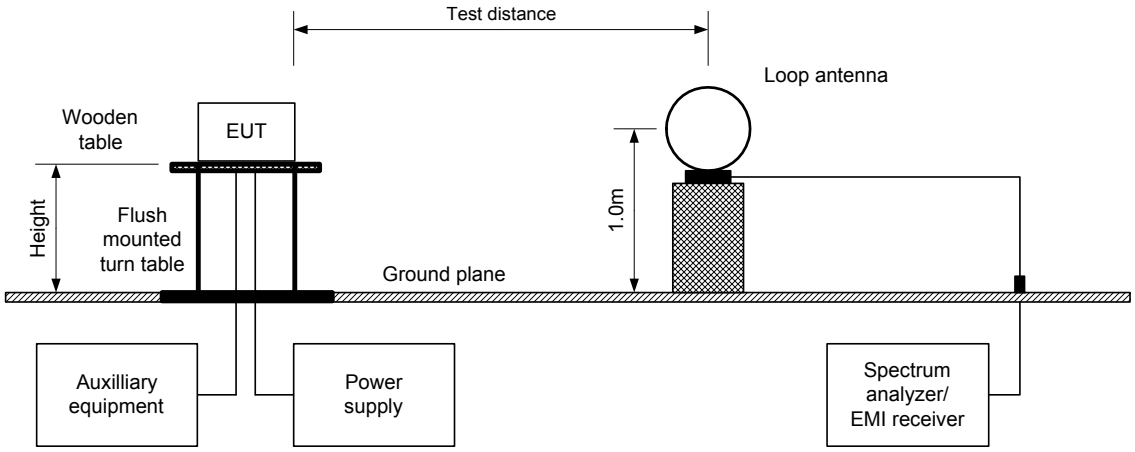
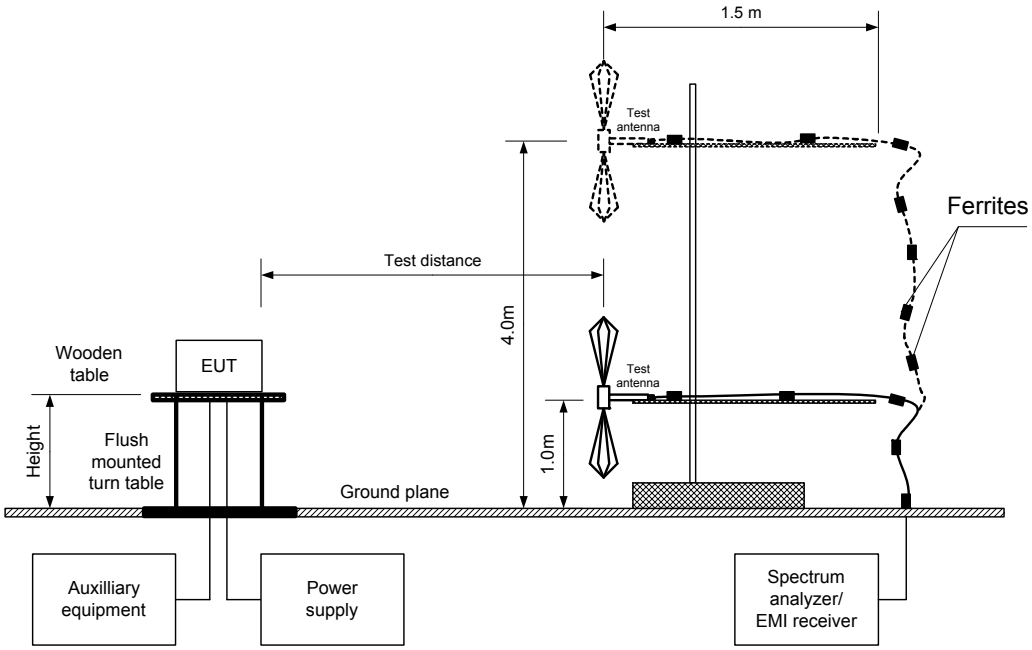


Figure 7.3.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY: 2400 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 - 25000 MHz
TEST DISTANCE: 3 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
802.11b

Frequency, MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
MODE: 802.11b									
Low carrier frequency									
No emissions were found									Pass
Mid carrier frequency									
No emissions were found									Pass
High carrier frequency									
No emissions were found									Pass
MODE: 802.11g									
Low carrier frequency									
No emissions were found									Pass
Mid carrier frequency									
No emissions were found									Pass
High carrier frequency									
No emissions were found									Pass
MODE: 802.11n HT20									
Low carrier frequency									
No emissions were found									Pass
Mid carrier frequency									
No emissions were found									Pass
High carrier frequency									
No emissions were found									Pass
MODE: 802.11n HT40									
Low carrier frequency									
No emissions were found									Pass
Mid carrier frequency									
No emissions were found									Pass
High carrier frequency									
No emissions were found									Pass

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = Attenuation below carrier – specification limit.

Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY: 2400-2483.5 MHz
INVESTIGATED FREQUENCY RANGE: 1000 – 25000 MHz
TEST DISTANCE: 3 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
TEST ANTENNA TYPE: Double ridged guide

MODE: 802.11b

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	Polarization	Height, m		Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	Measured, dB(µV/m)	Calculated, dB(µV/m)	Limit, dB(µV/m)	Margin, dB***	
MODE: 802.11b											
Low carrier frequency											
No emissions were found											Pass
Mid carrier frequency											
No emissions were found											Pass
High carrier frequency											
No emissions were found											Pass
MODE: 802.11g											
Low carrier frequency											
No emissions were found											Pass
Mid carrier frequency											
No emissions were found											Pass
High carrier frequency											
No emissions were found											Pass
MODE: 802.11n HT20											
Low carrier frequency											
No emissions were found											Pass
Mid carrier frequency											
No emissions were found											Pass
High carrier frequency											
No emissions were found											Pass
MODE: 802.11n HT40											
Low carrier frequency											
No emissions were found											Pass
Mid carrier frequency											
No emissions were found											Pass
High carrier frequency											
No emissions were found											Pass

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = Measured field strength - specification limit.
***- Margin = Calculated field strength - specification limit,
where Calculated field strength = Measured field strength + average factor.

Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.4 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY:	2400 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
TEST DISTANCE:	3 m
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
RESOLUTION BANDWIDTH:	1.0 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	> Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz)
MODE:	802.11b/g/n HT20/ n HT40

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
No emissions were found								Pass

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0604	HL 0768	HL 3818	HL 3901	HL 3903	HL 4114
HL 4224	HL 4353	HL 4722	HL 4856	HL 4932			

Full description is given in Appendix A.

Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.5 Restricted bands according to FCC section 15.205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 – 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 – 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

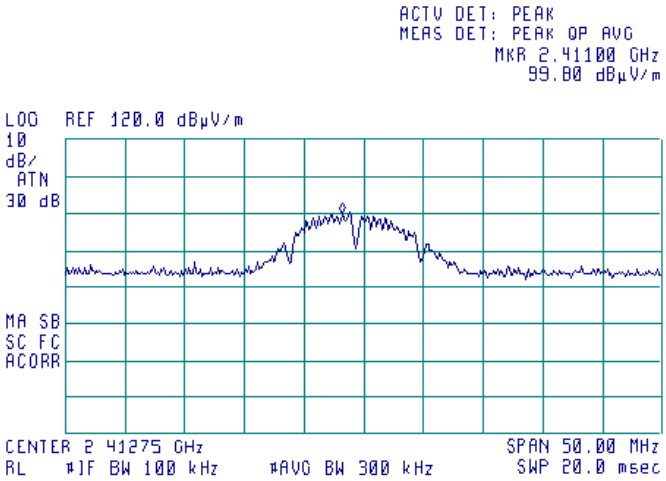
Table 7.3.6 Restricted bands according to RSS-Gen

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.291 - 8.294	16.80425 - 16.80475	399.9 - 410	3260 - 3267	10.6 - 12.7
2.1735 - 2.1905	8.362 - 8.366	25.5 - 25.67	608 - 614	3332 – 3339	13.25 - 13.4
3.020 – 3.026	8.37625 - 8.38675	37.5 - 38.25	960 – 1427	3345.8 – 3358	14.47 – 14.5
4.125 – 4.128	8.41425 - 8.41475	73 - 74.6	1435 – 1626.5	3500 – 4400	15.35 – 16.2
4.17725 – 4.17775	12.29 – 12.293	74.8 - 75.2	1645.5 – 1646.5	4500 – 5150	17.7 – 21.4
4.20725 – 4.20775	12.51975 – 12.52025	108 – 138	1660 - 1710	5350 – 5460	22.01 – 23.12
5.677 – 5.683	12.57675 – 12.57725	156.52475 – 156.52525	1718.8 - 1722.2	7250 - 7750	23.6 - 24
6.215 - 6.218	13.36 – 13.41	156.7 - 156.9	2200 - 2300	8025 – 8500	31.2 - 31.8
6.26775 - 6.26825	16.42 - 16.423	240 - 285	2310 - 2390	9000 - 9200	36.43 - 36.5
6.31175 - 6.31225	16.69475 - 16.69525	322 - 335.4	2655 - 2900	9300 - 9500	Above 38.6

Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

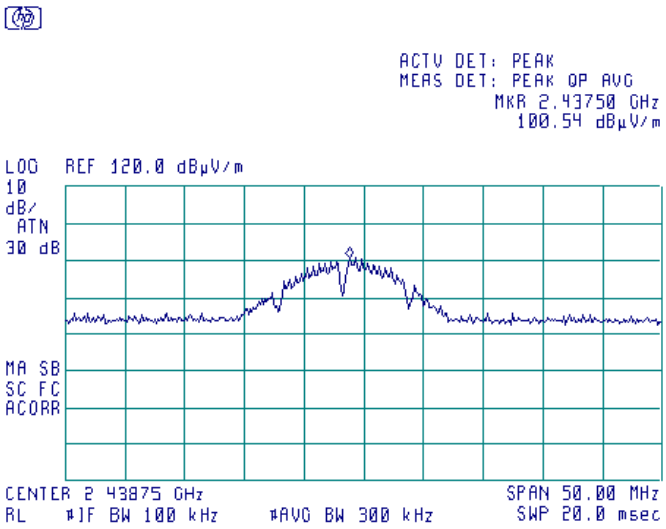
Plot 7.3.1 Radiated emission measurements at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Plot 7.3.2 Radiated emission measurements at the mid carrier frequency

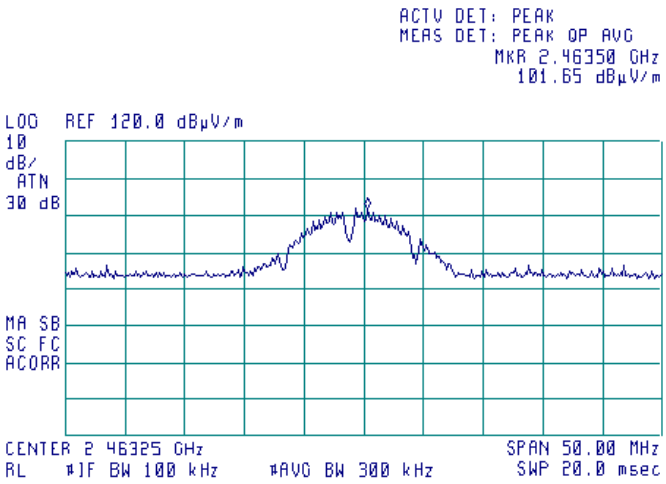
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

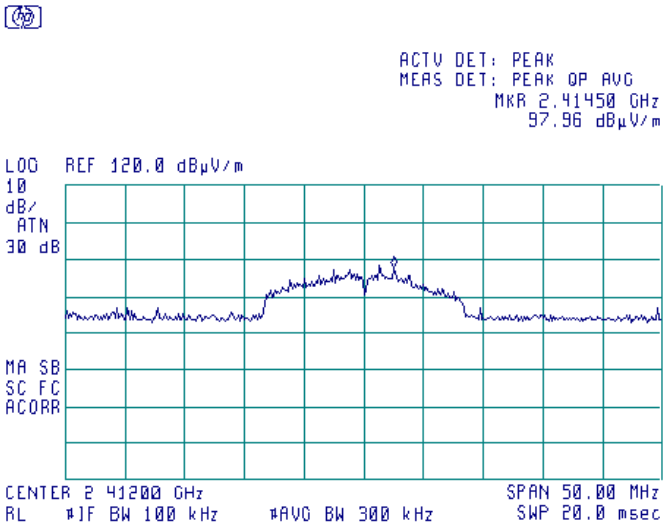
Plot 7.3.3 Radiated emission measurements at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Plot 7.3.4 Radiated emission measurements at the low carrier frequency

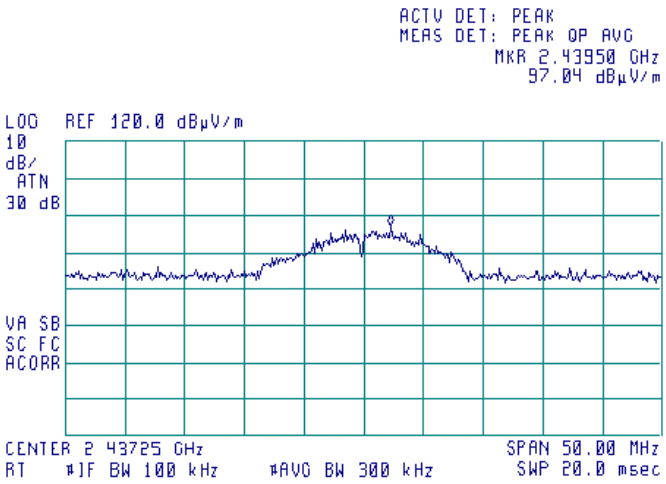
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

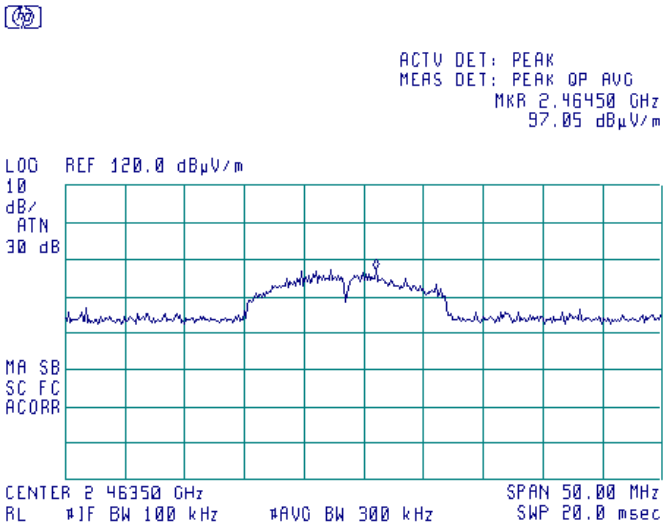
Plot 7.3.5 Radiated emission measurements at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Plot 7.3.6 Radiated emission measurements at the high carrier frequency

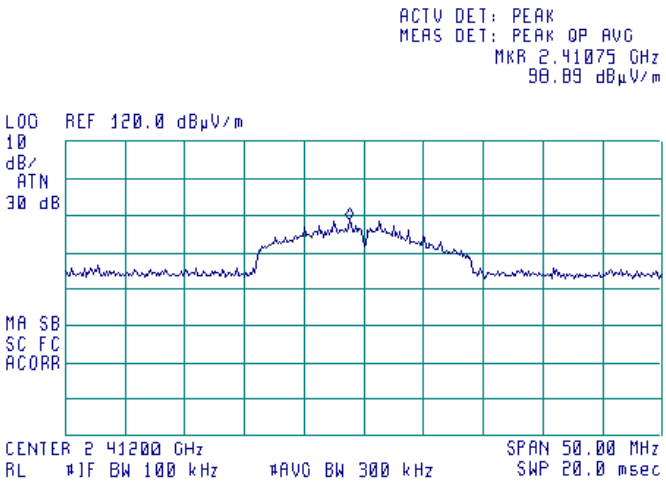
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

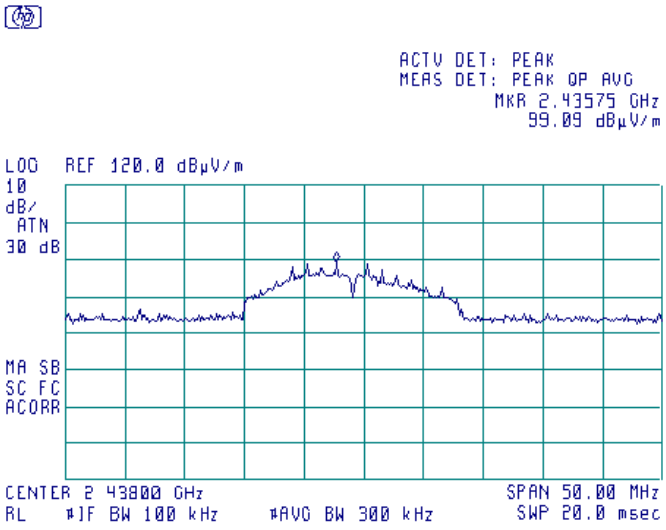
Plot 7.3.7 Radiated emission measurements at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Plot 7.3.8 Radiated emission measurements at the mid carrier frequency

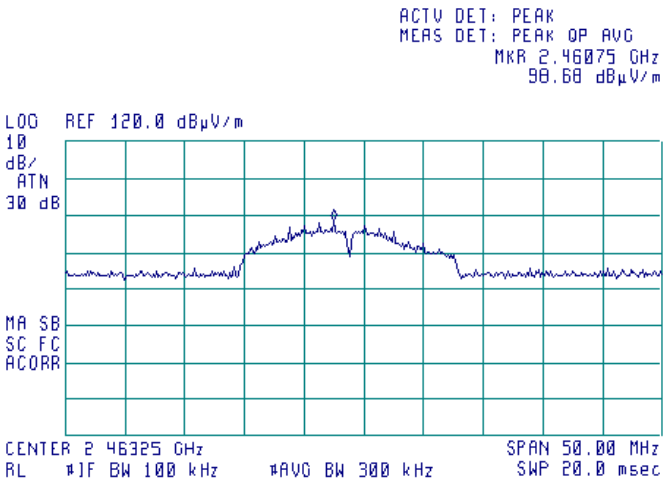
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

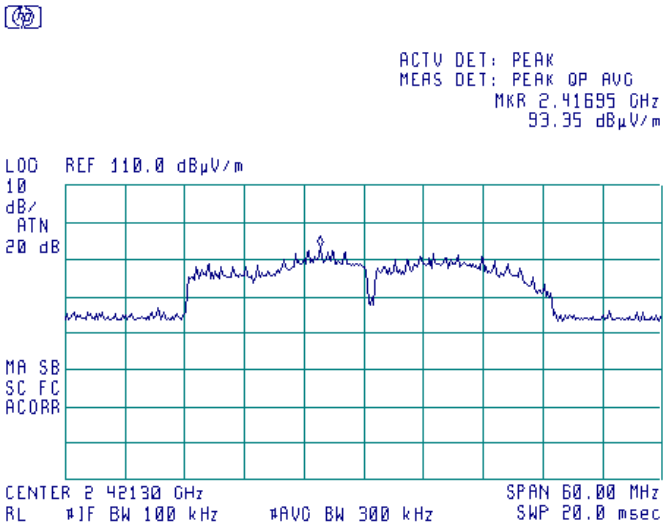
Plot 7.3.9 Radiated emission measurements at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Plot 7.3.10 Radiated emission measurements at the low carrier frequency

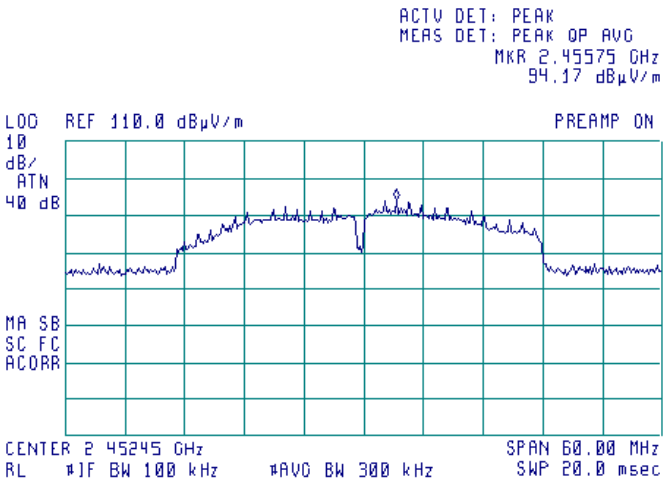
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.11 Radiated emission measurements at the high carrier frequency

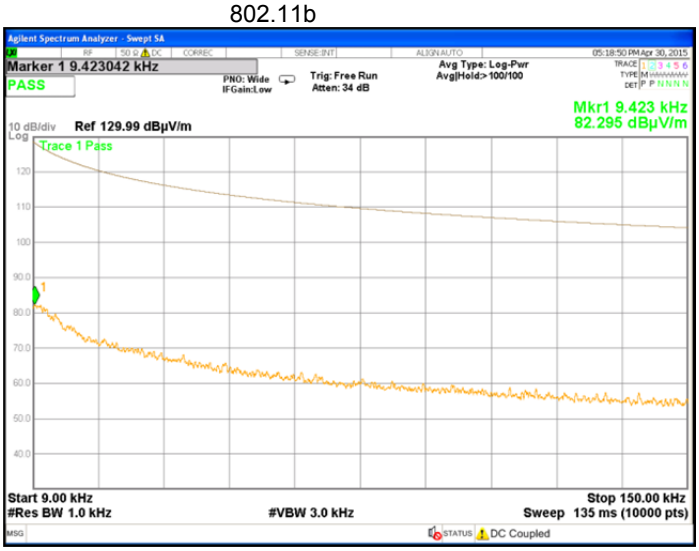
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

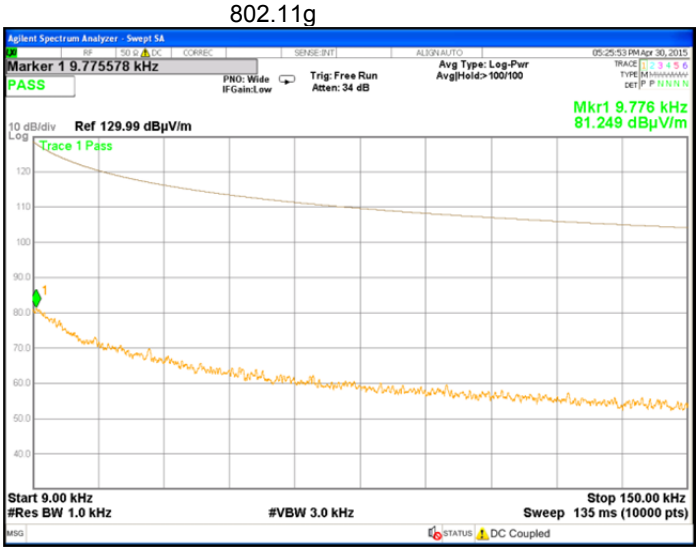
Plot 7.3.12 Radiated emission measurements from 9 to 150 kHz at the low, mid, high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
MODE: 802.11b



Plot 7.3.13 Radiated emission measurements from 9 to 150 kHz at the low, mid, high carrier frequency

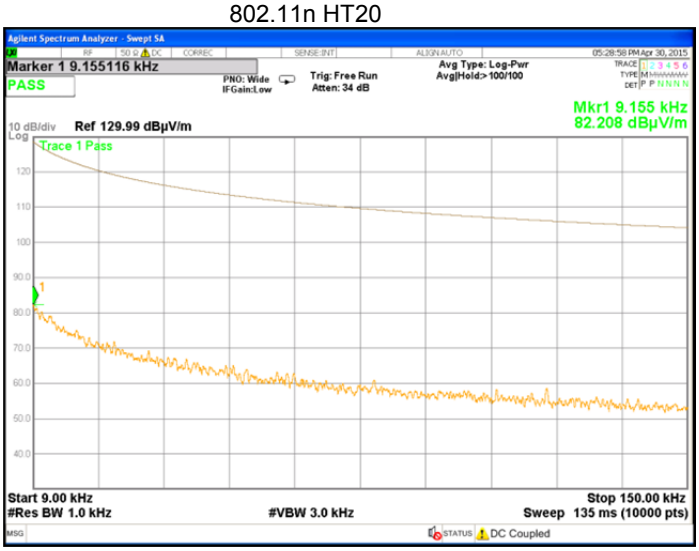
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
MODE: 802.11g



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

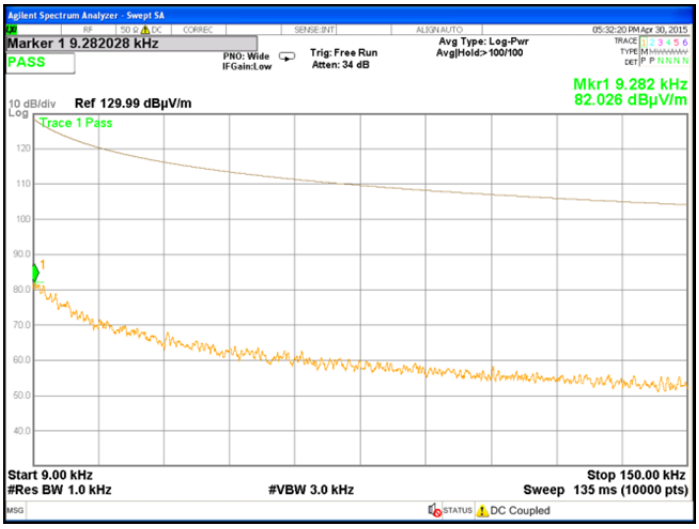
Plot 7.3.14 Radiated emission measurements from 9 to 150 kHz at the low, mid, high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
MODE: 802.11n HT20



Plot 7.3.15 Radiated emission measurements from 9 to 150 kHz at the low, mid, high carrier frequency

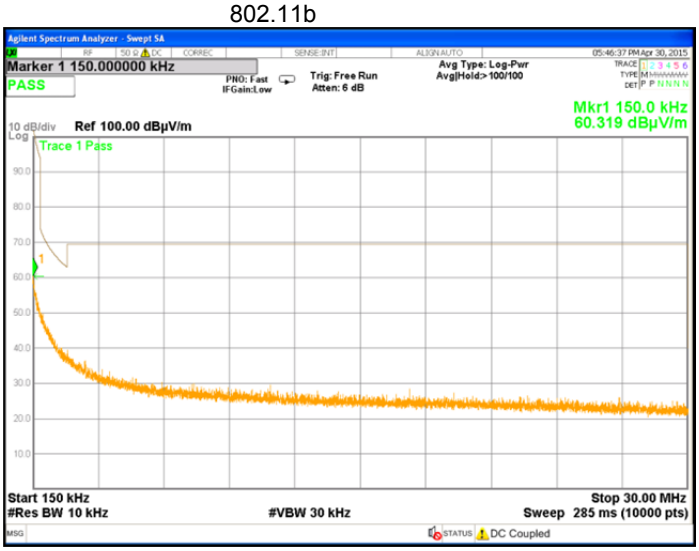
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
MODE: 802.11n HT40



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

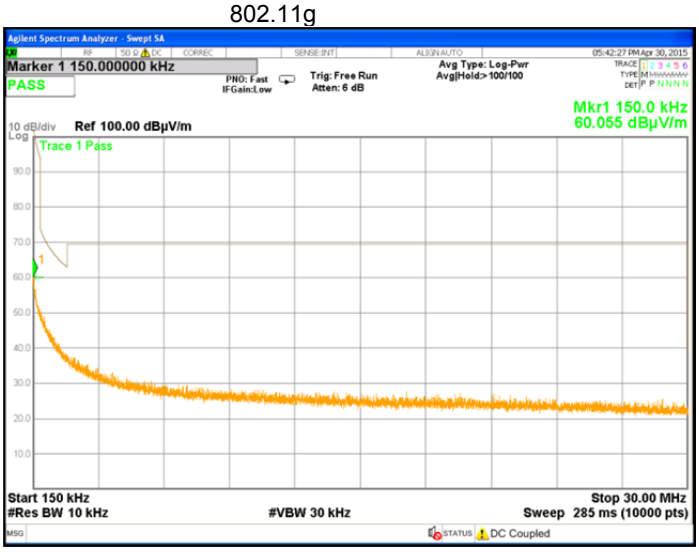
Plot 7.3.16 Radiated emission measurements from 0.15 to 30 MHz at the low, mid, high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
MODE: 802.11b



Plot 7.3.17 Radiated emission measurements from 0.15 to 30 MHz at the low, mid, high carrier frequency

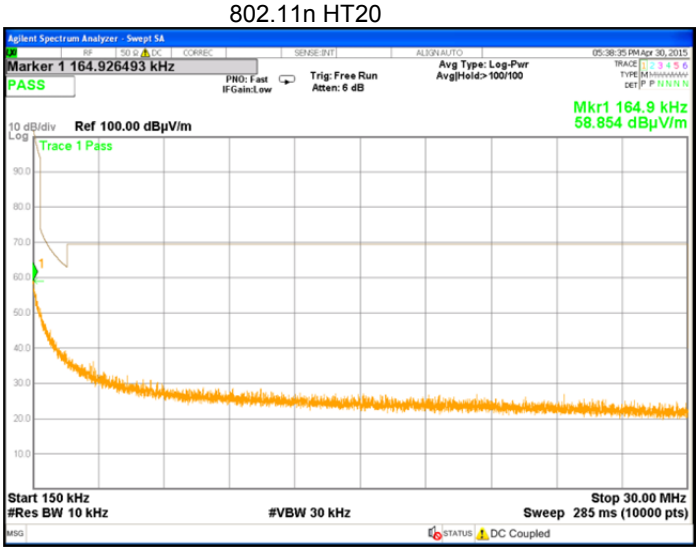
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
MODE: 802.11g



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

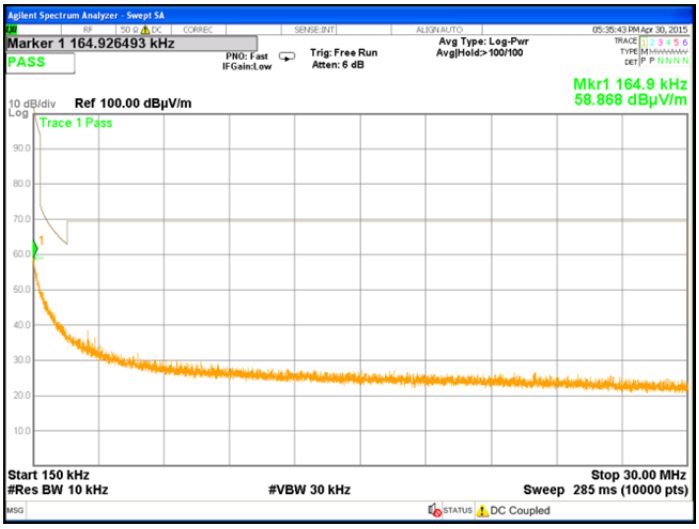
Plot 7.3.18 Radiated emission measurements from 0.15 to 30 MHz at the low, mid, high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
MODE: 802.11n HT20



Plot 7.3.19 Radiated emission measurements from 0.15 to 30 MHz at the low, mid, high carrier frequency

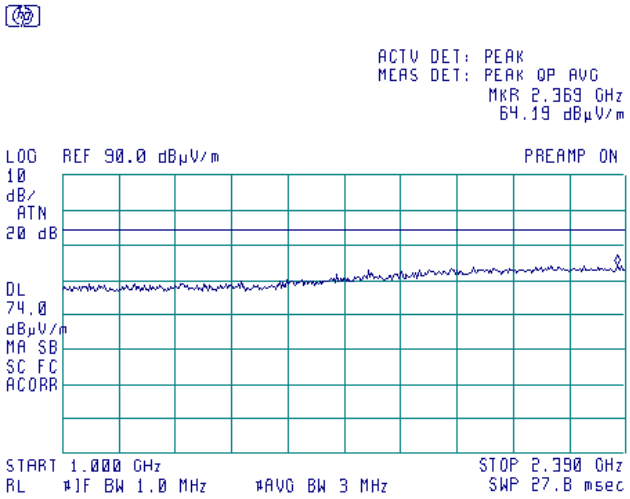
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
MODE: 802.11n HT40

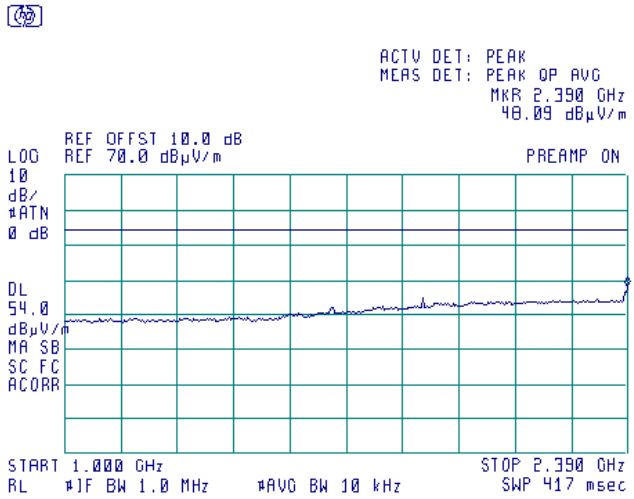


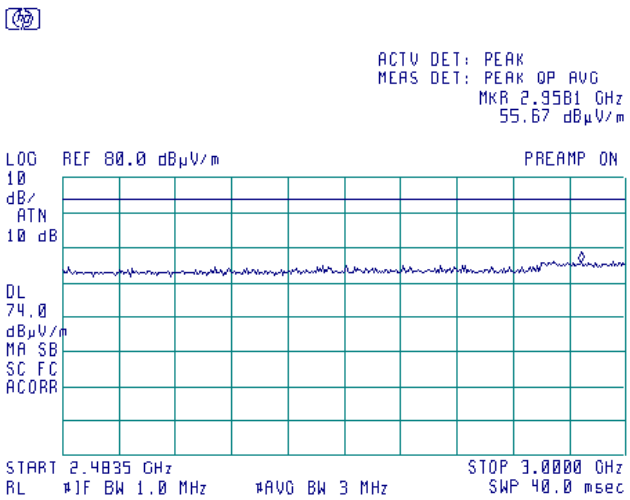
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

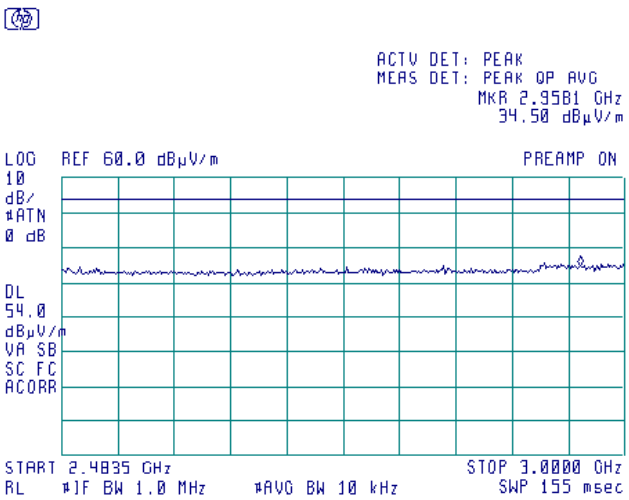
Plot 7.3.20 Radiated emission measurements from 1000 to 3000 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b





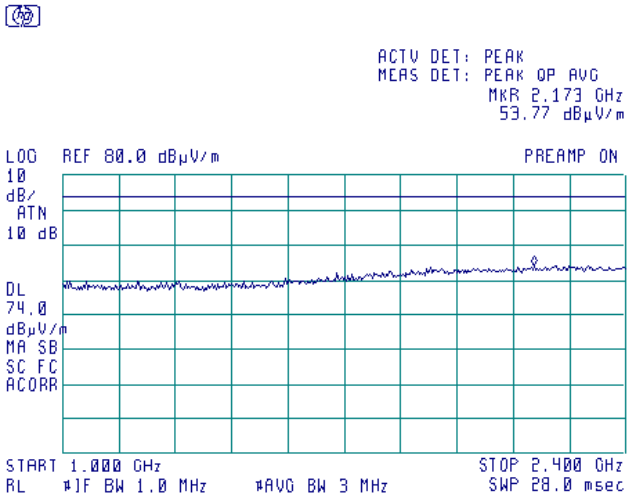


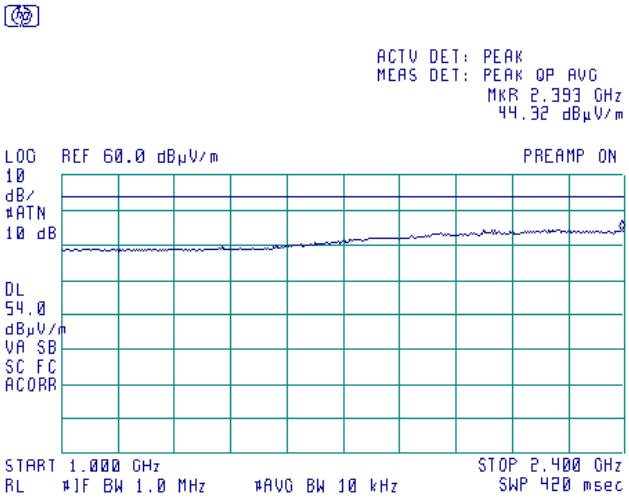


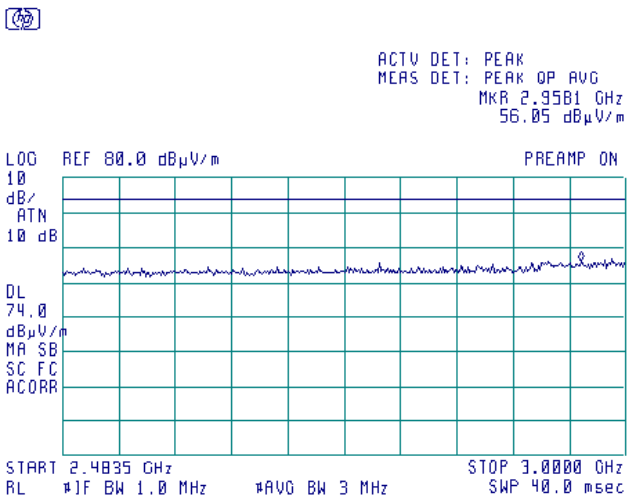
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

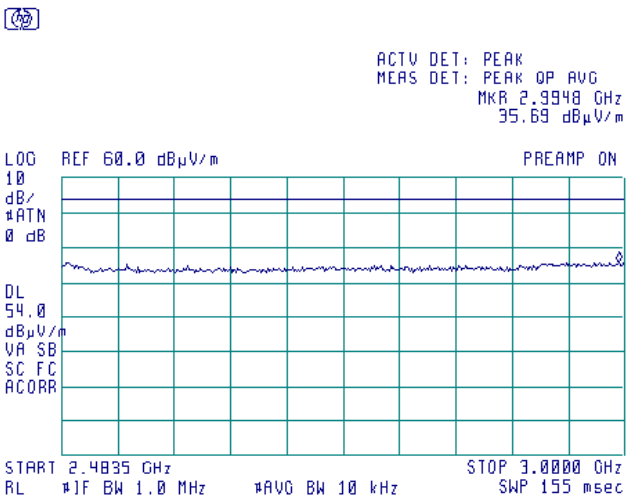
Plot 7.3.21 Radiated emission measurements from 1000 to 3000 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b





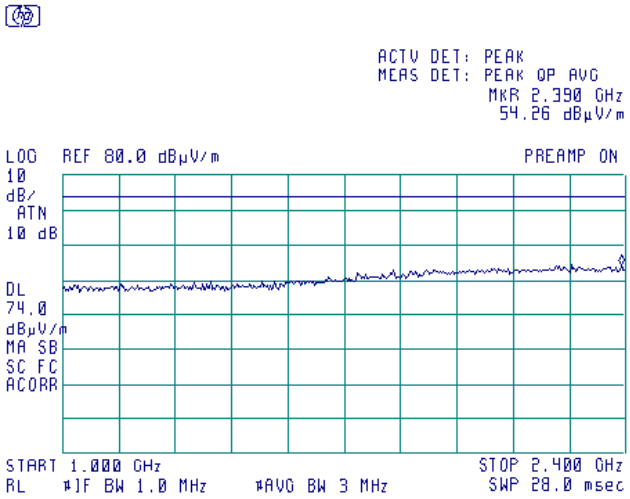


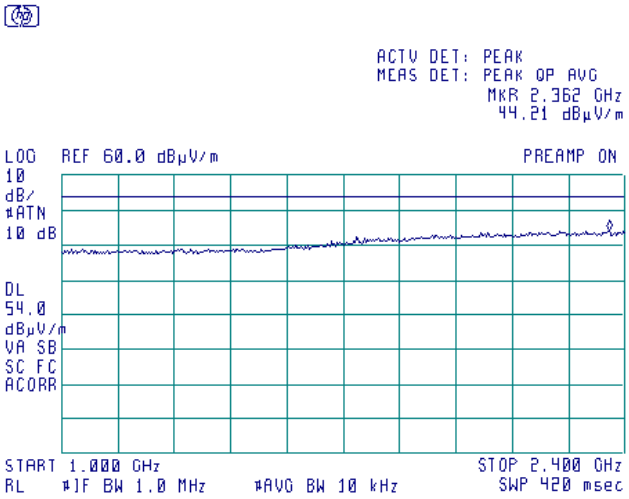


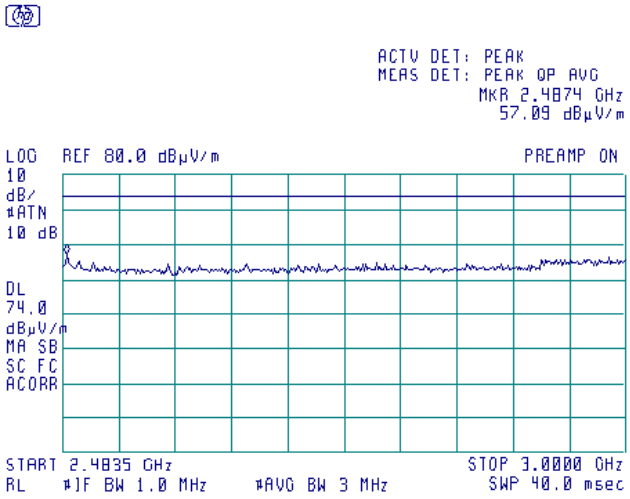
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

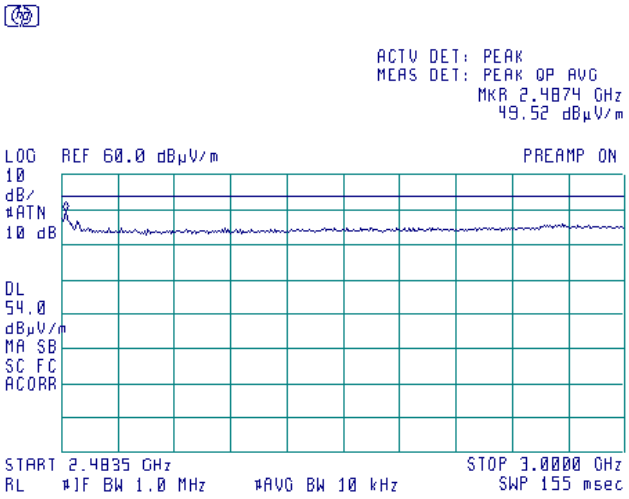
Plot 7.3.22 Radiated emission measurements from 1000 to 3000 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b





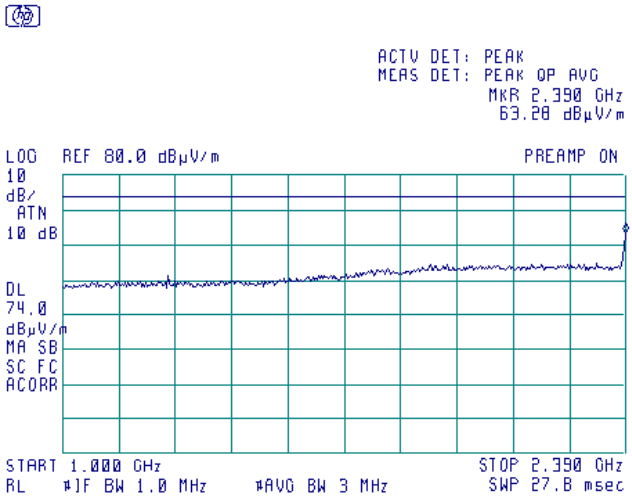


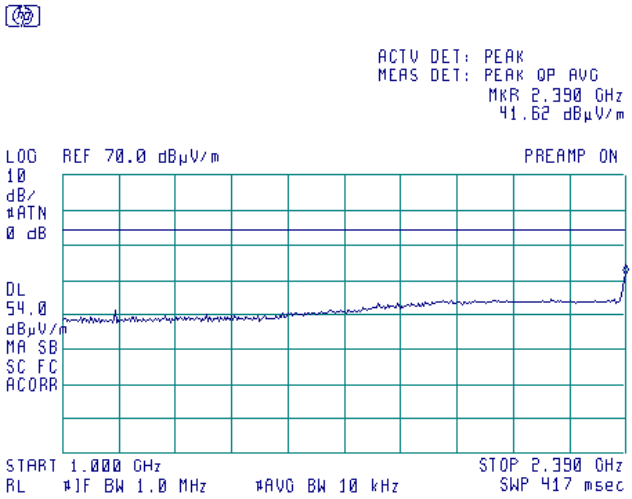


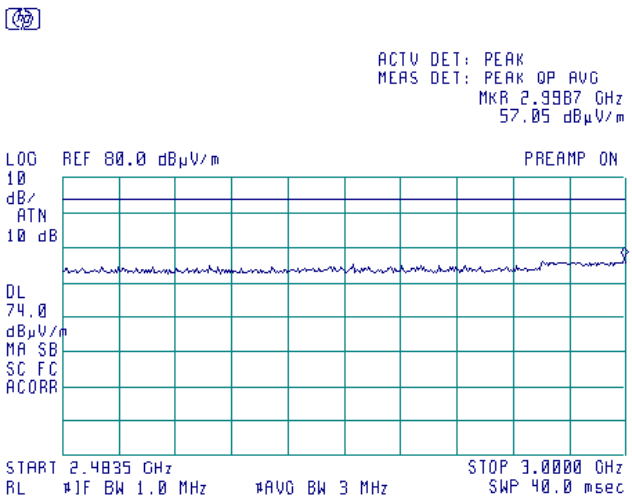
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

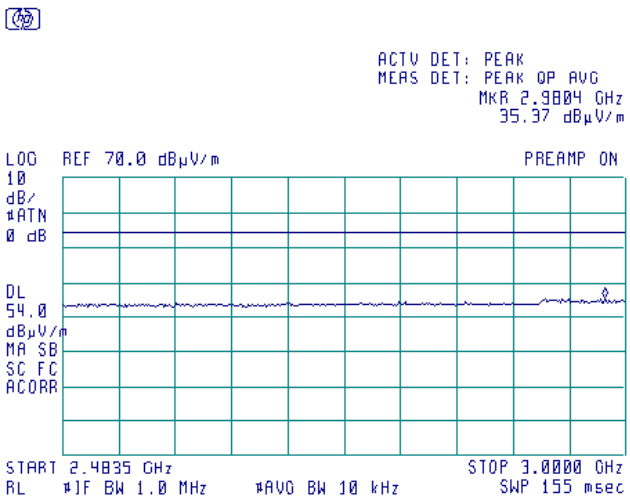
Plot 7.3.23 Radiated emission measurements from 1000 to 3000 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g





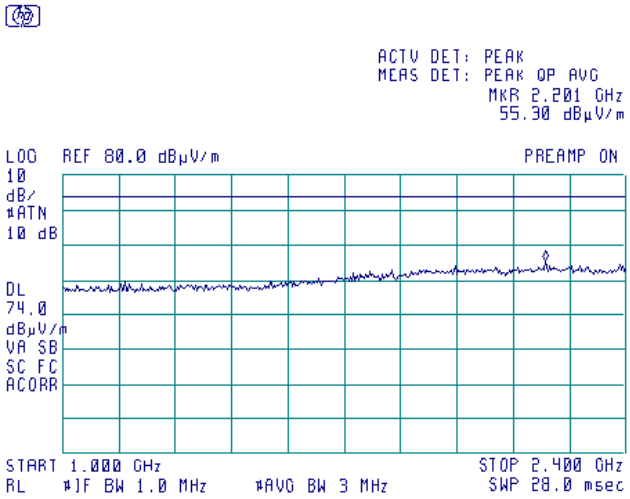


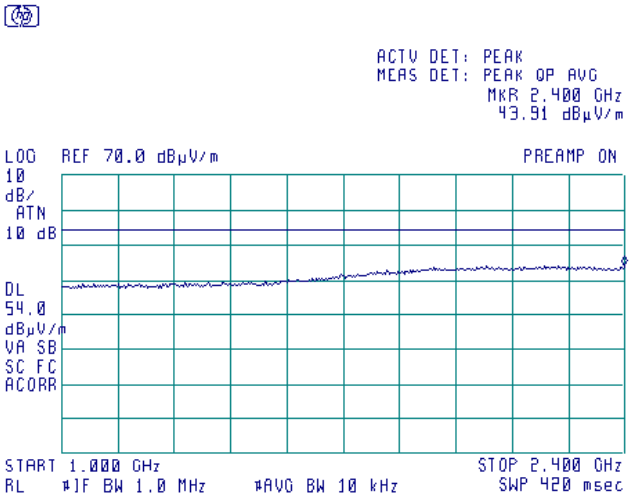


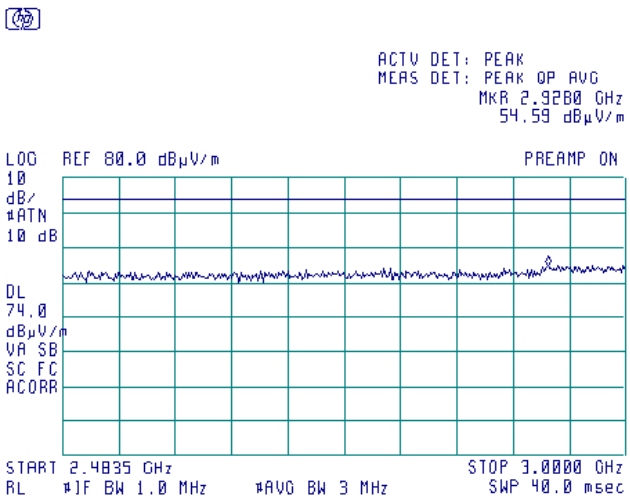
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

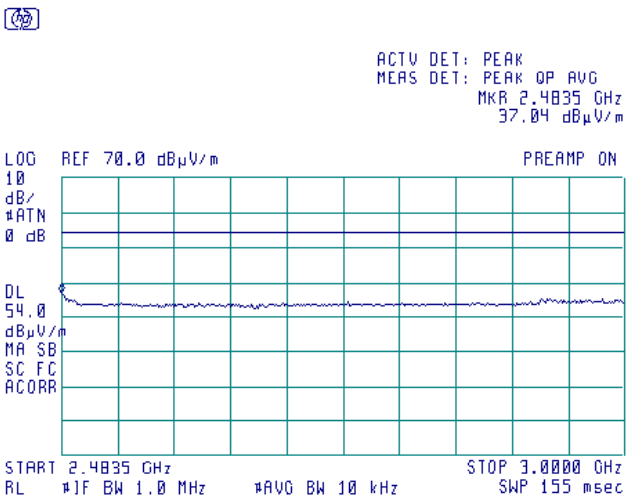
Plot 7.3.24 Radiated emission measurements from 1000 to 3000 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g





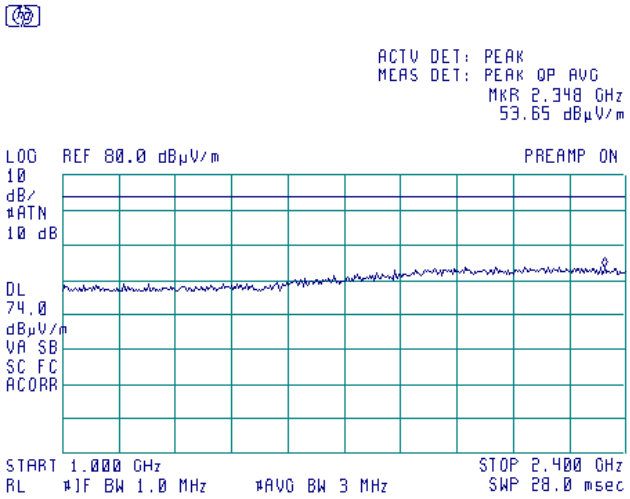


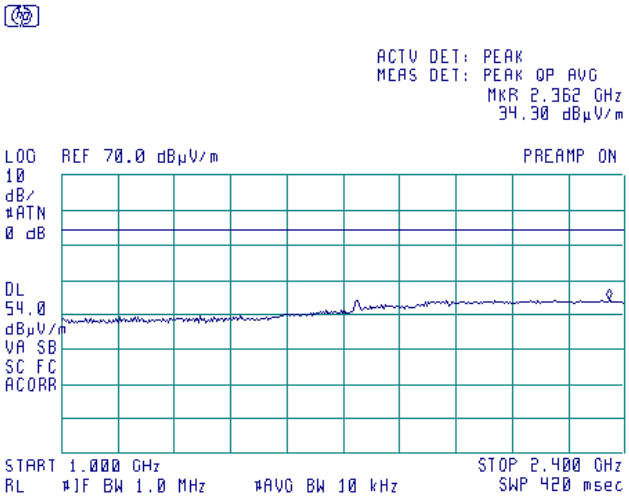


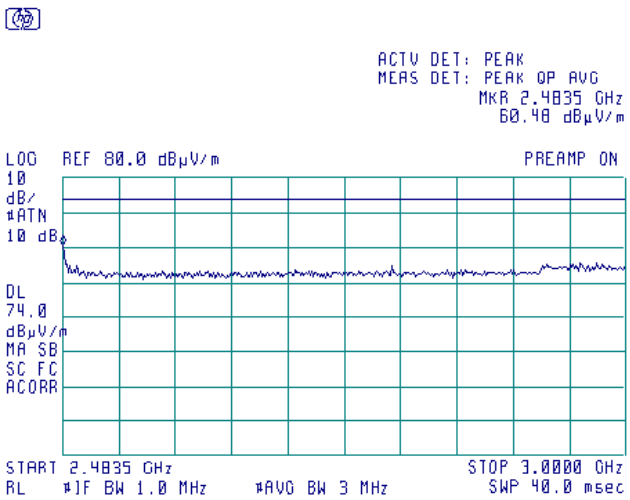
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

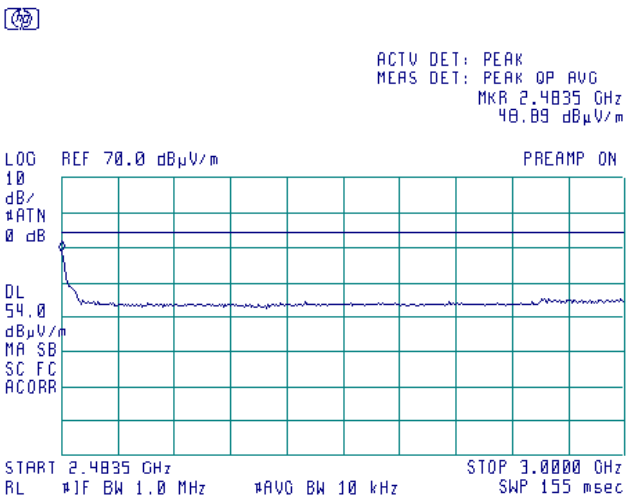
Plot 7.3.25 Radiated emission measurements from 1000 to 3000 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g





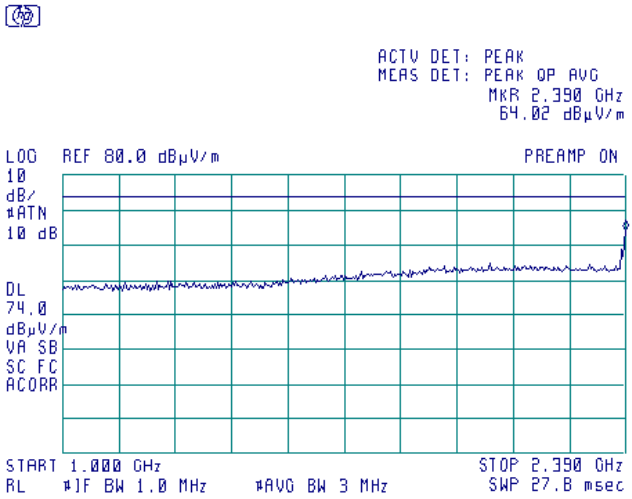


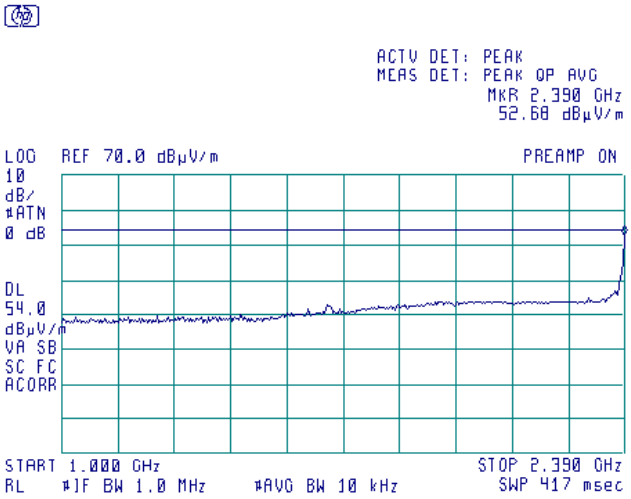


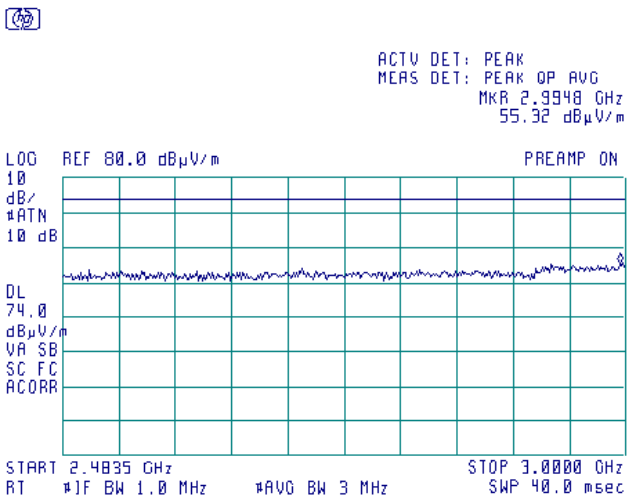
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

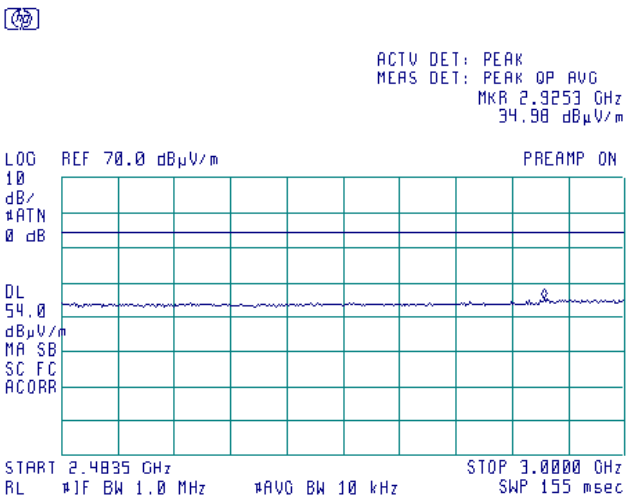
Plot 7.3.26 Radiated emission measurements from 1000 to 3000 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20





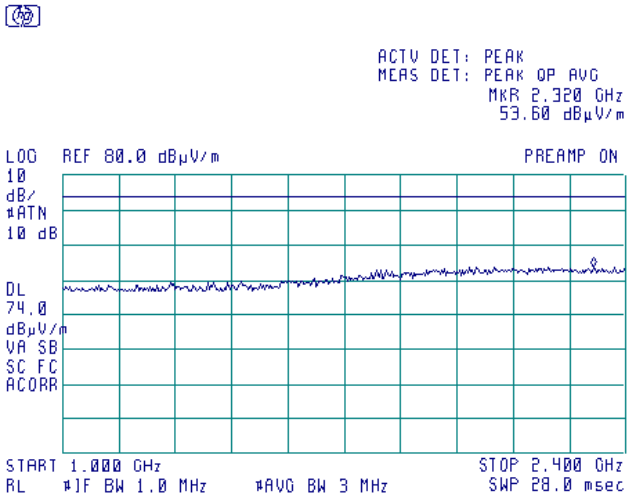


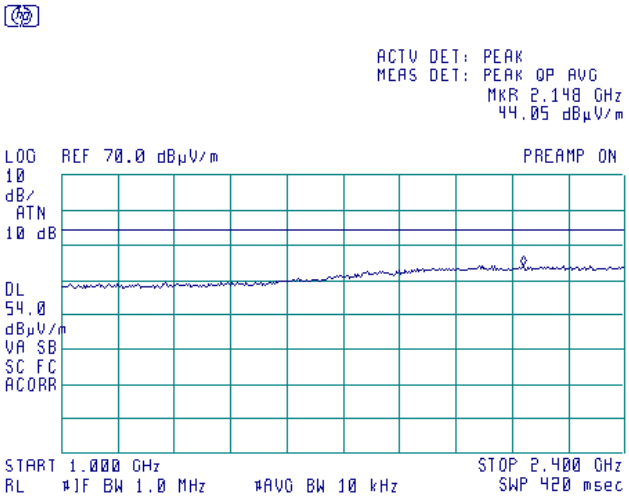


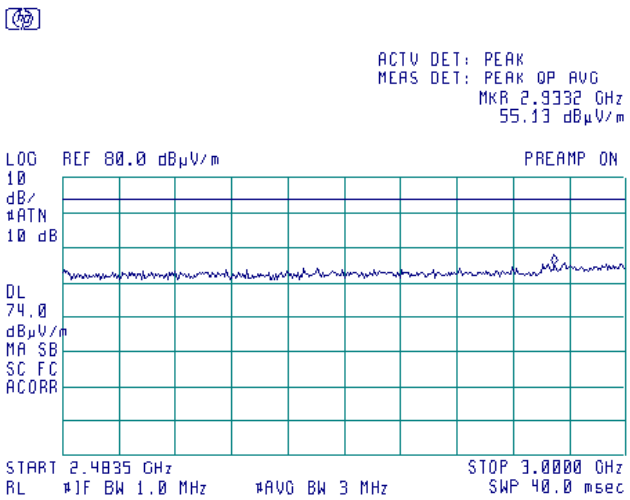
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

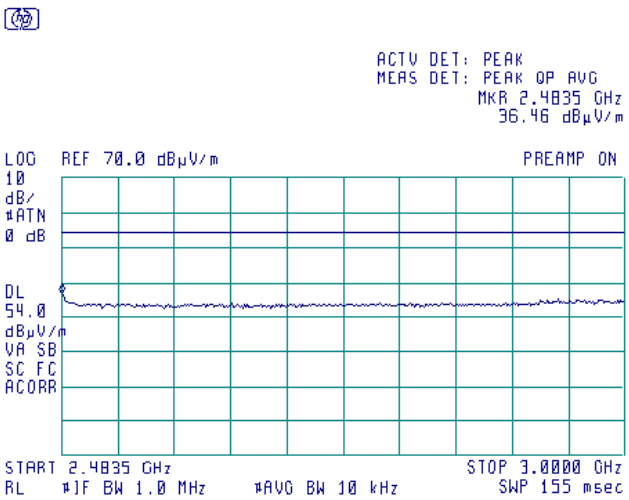
Plot 7.3.27 Radiated emission measurements from 1000 to 3000 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20





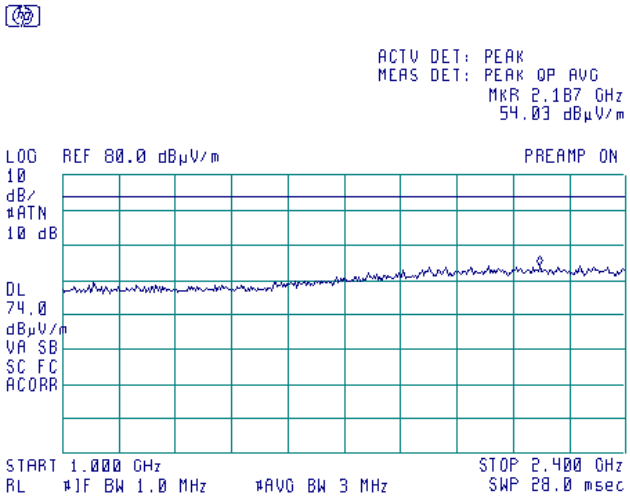


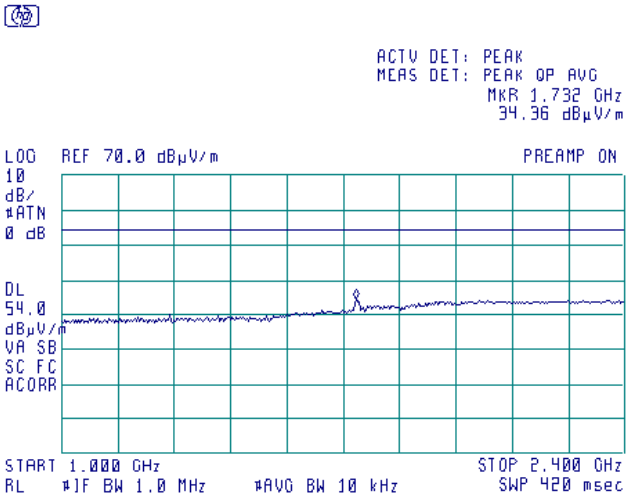


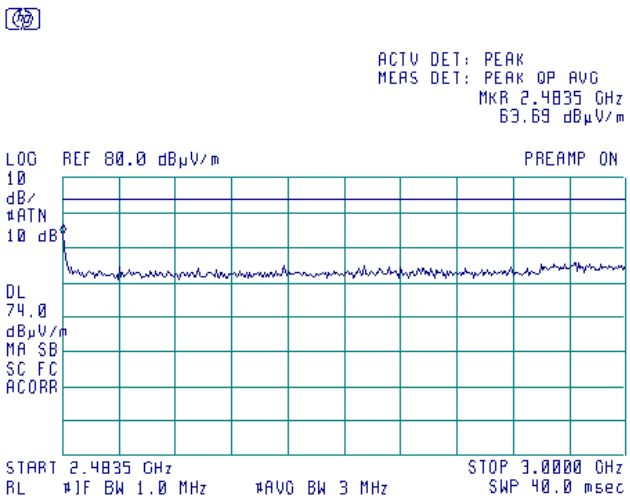
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

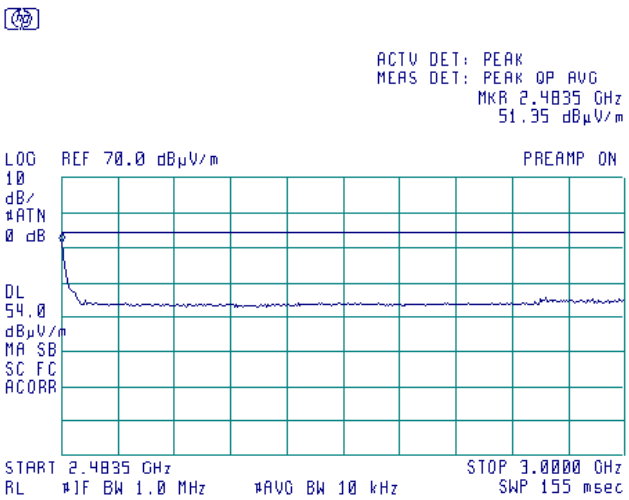
Plot 7.3.28 Radiated emission measurements from 1000 to 3000 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20





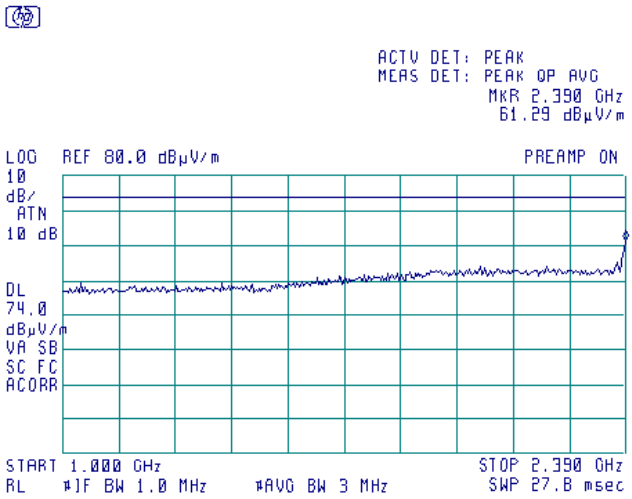


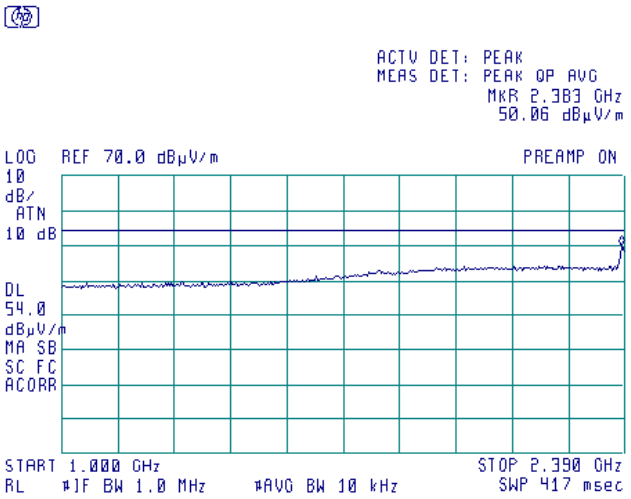


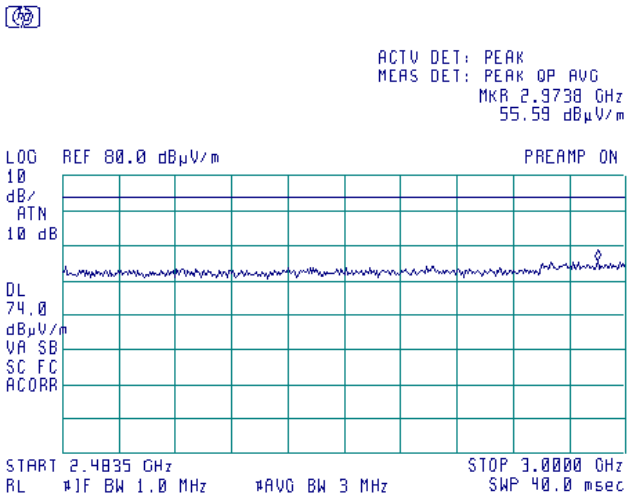
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

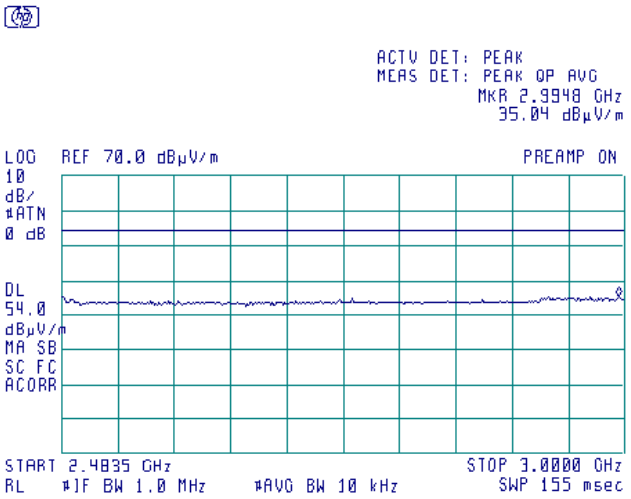
Plot 7.3.29 Radiated emission measurements from 1000 to 3000 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40





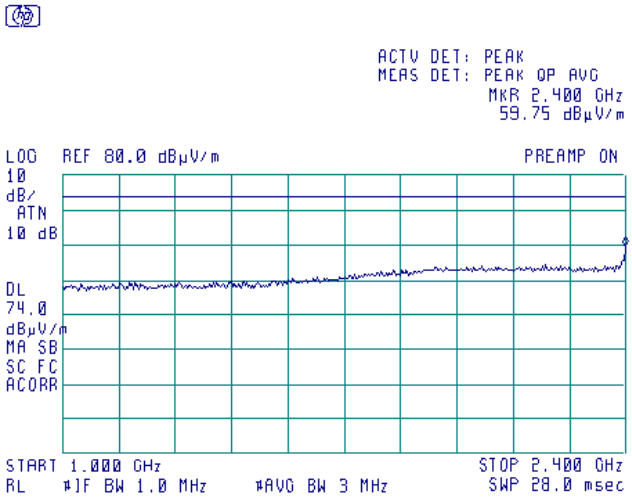


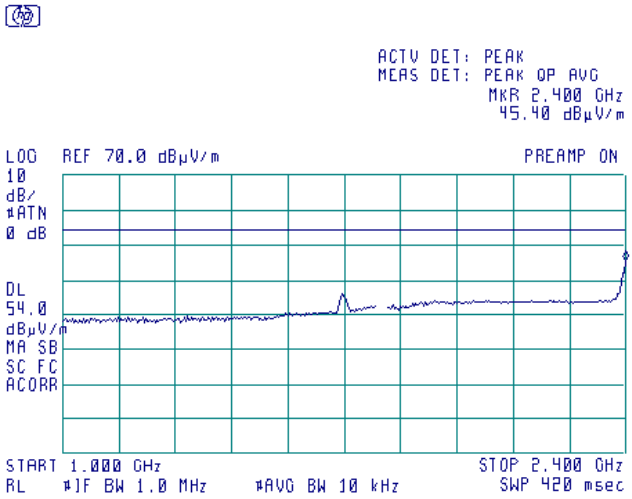


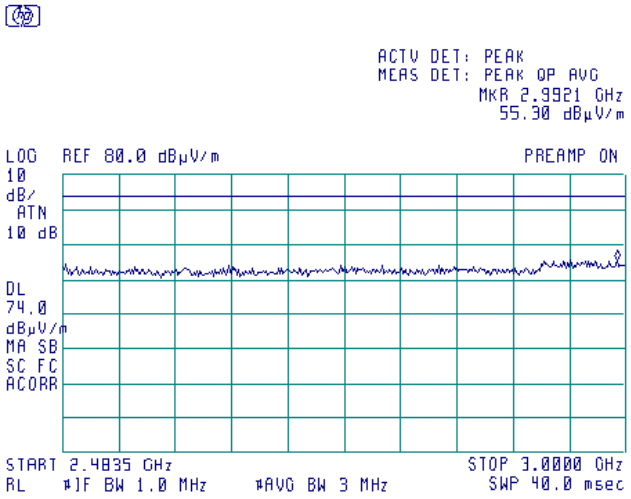
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

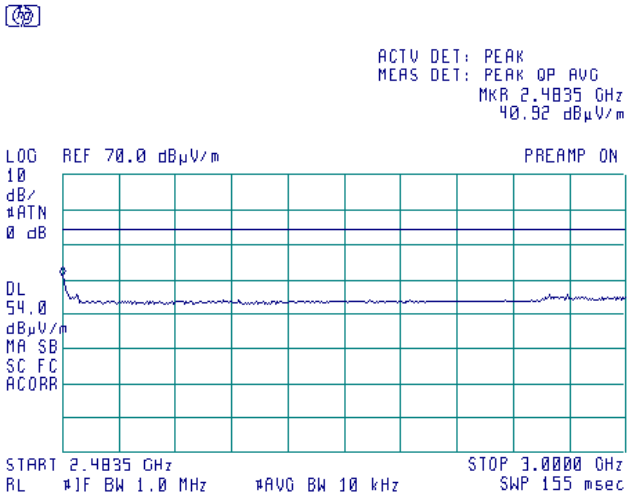
Plot 7.3.30 Radiated emission measurements from 1000 to 3000 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40





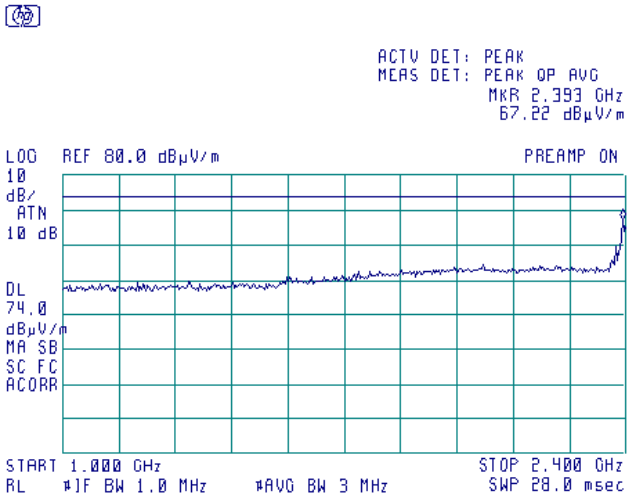


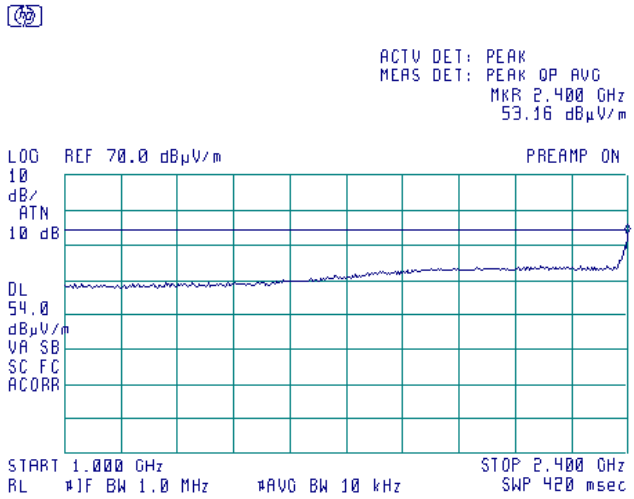


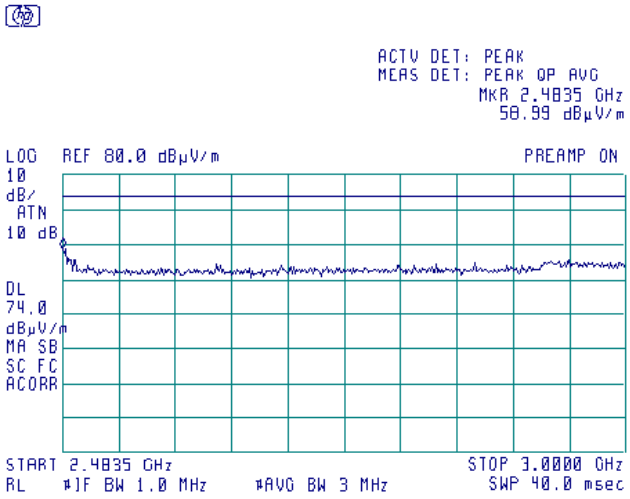
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

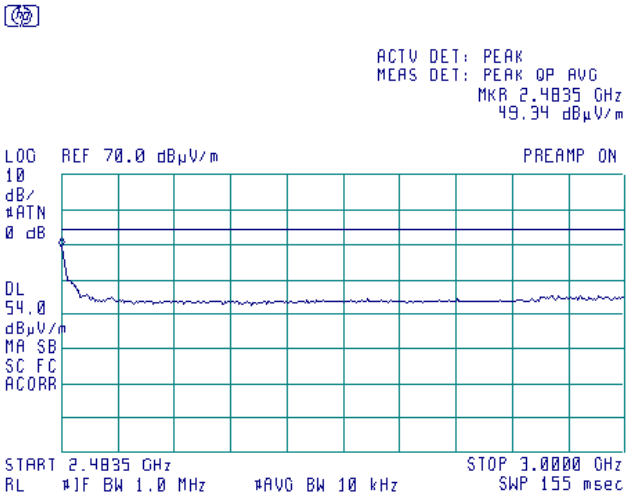
Plot 7.3.31 Radiated emission measurements from 1000 to 3000 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40





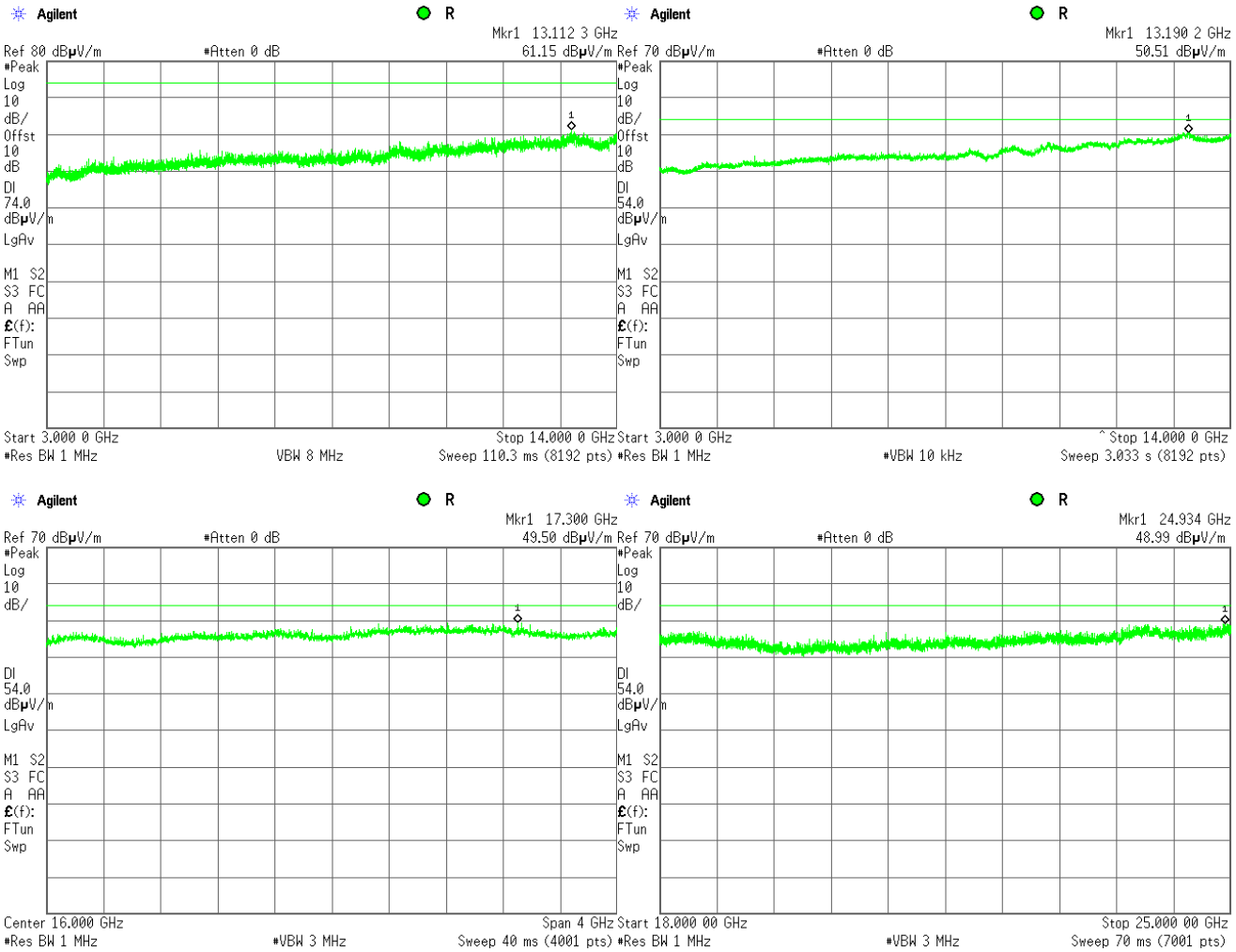




Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.32 Radiated emission measurements from 3000 to 25000 MHz at the low carrier frequency

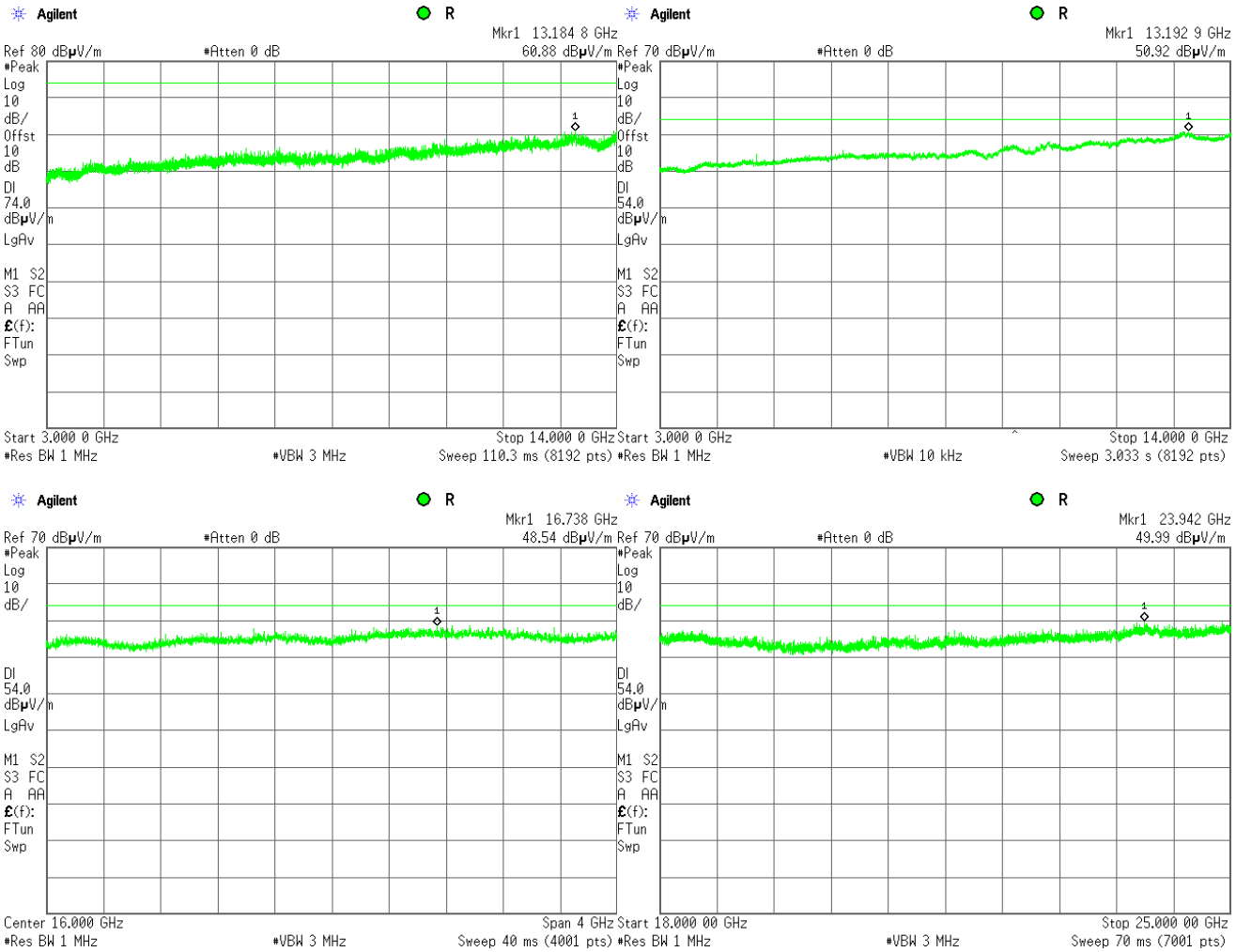
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11b



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.33 Radiated emission measurements from 3000 to 25000 MHz at the mid carrier frequency

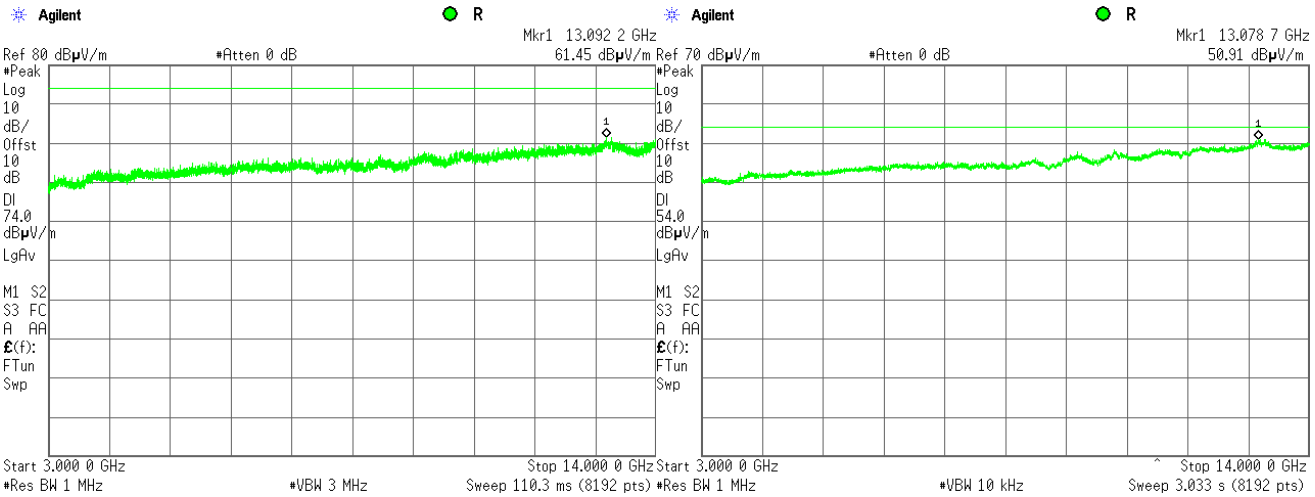
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b

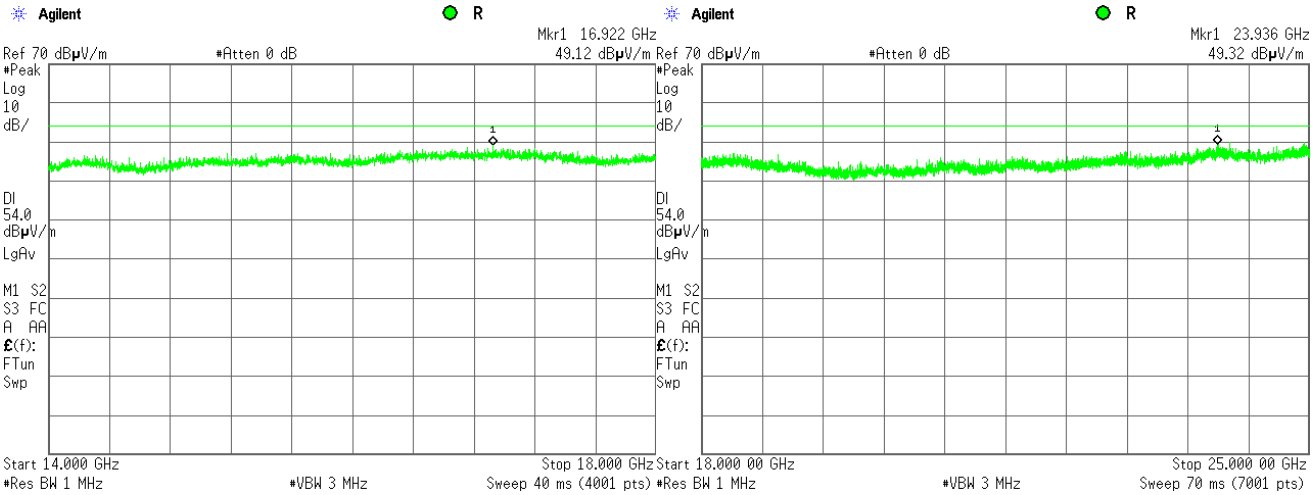


Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.34 Radiated emission measurements from 3000 to 25000 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b

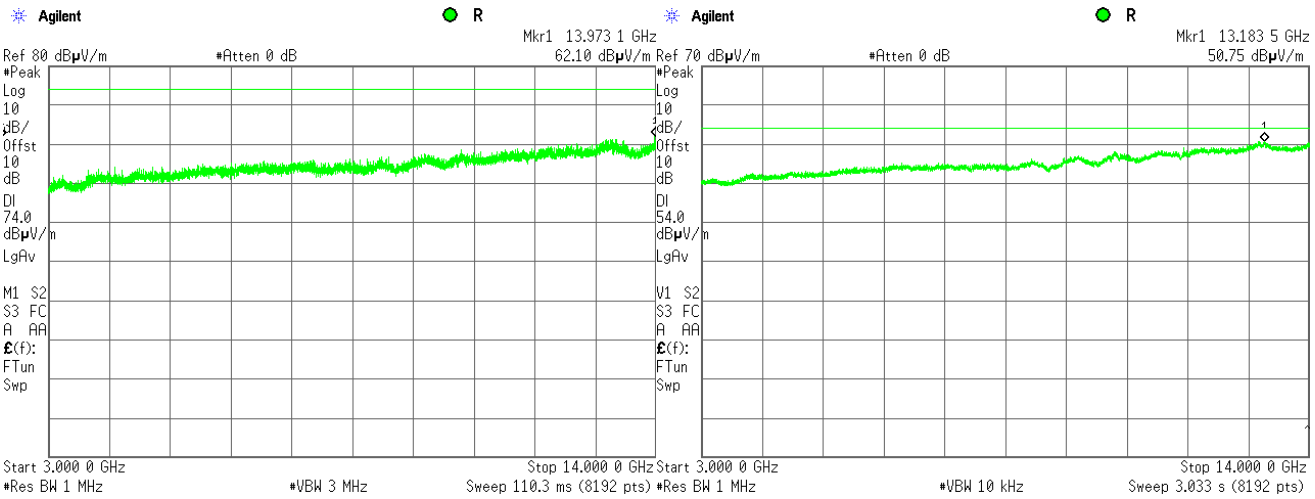


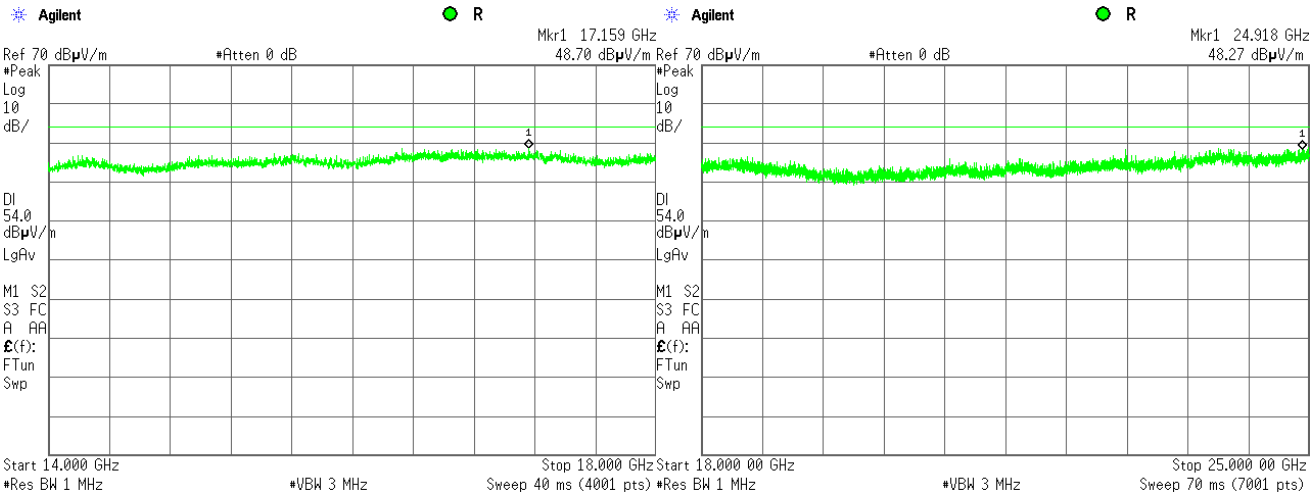


Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.35 Radiated emission measurements from 3000 to 25000 MHz at the low carrier frequency

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11g

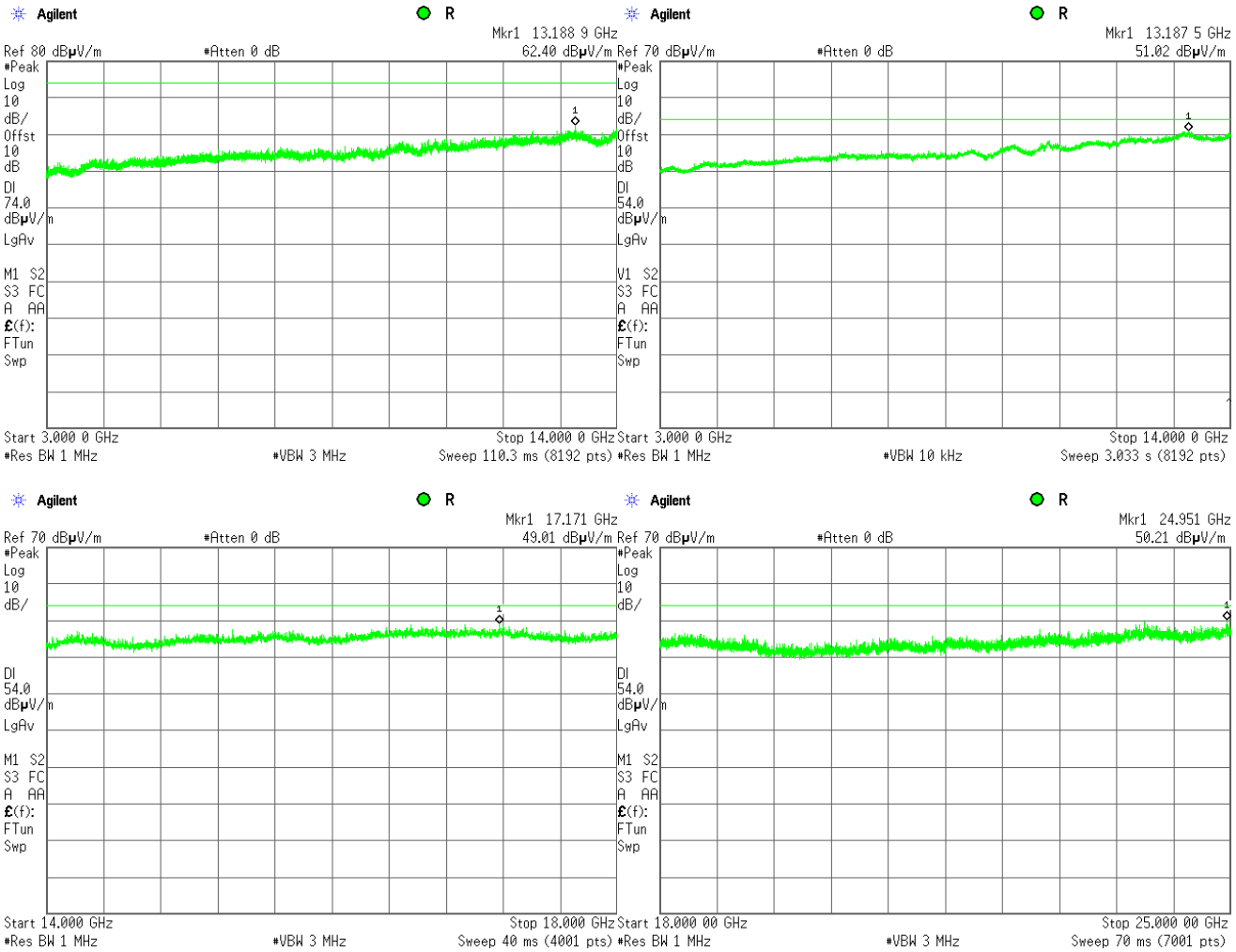




Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.36 Radiated emission measurements from 3000 to 25000 MHz at the mid carrier frequency

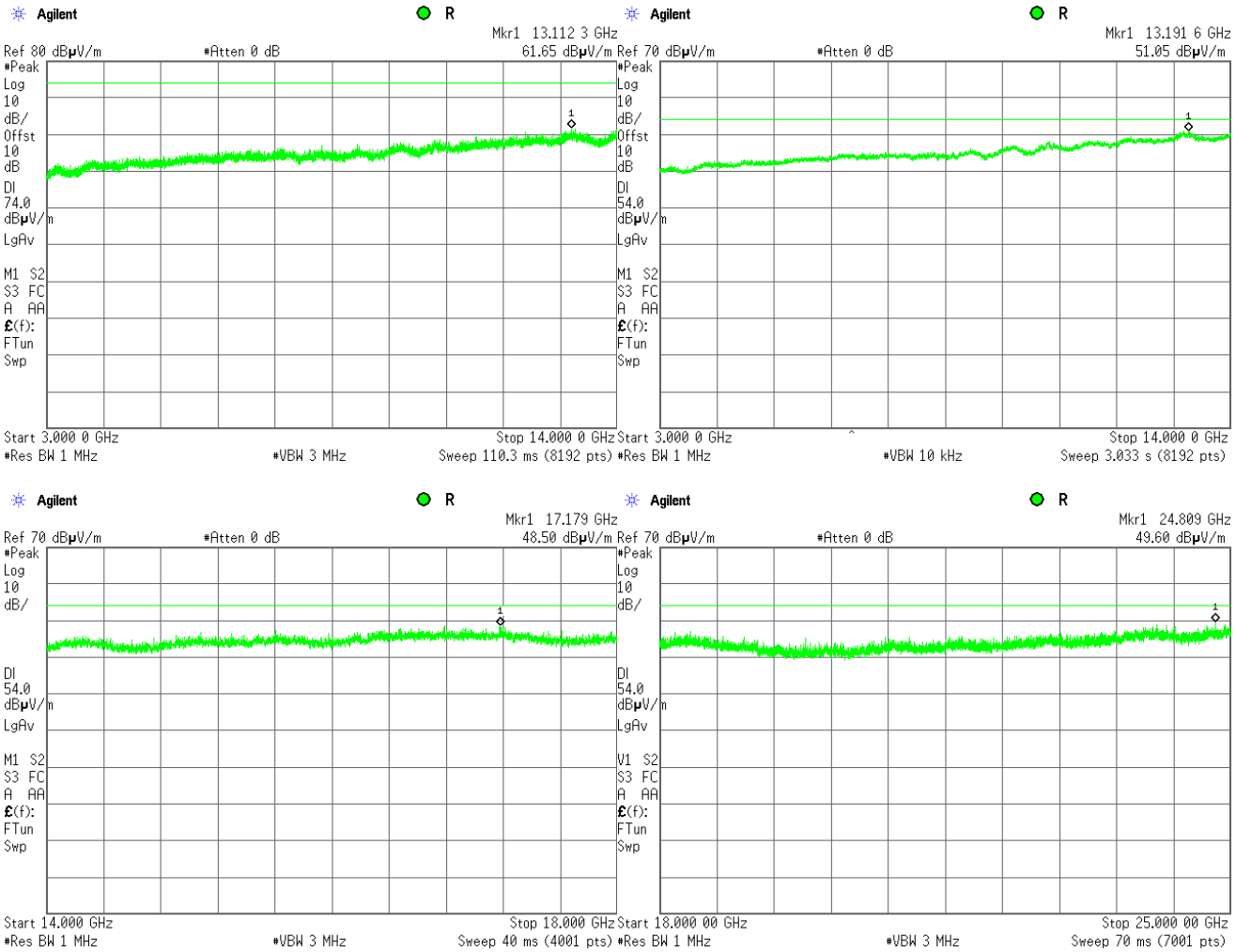
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11g



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.37 Radiated emission measurements from 3000 to 25000 MHz at the high carrier frequency

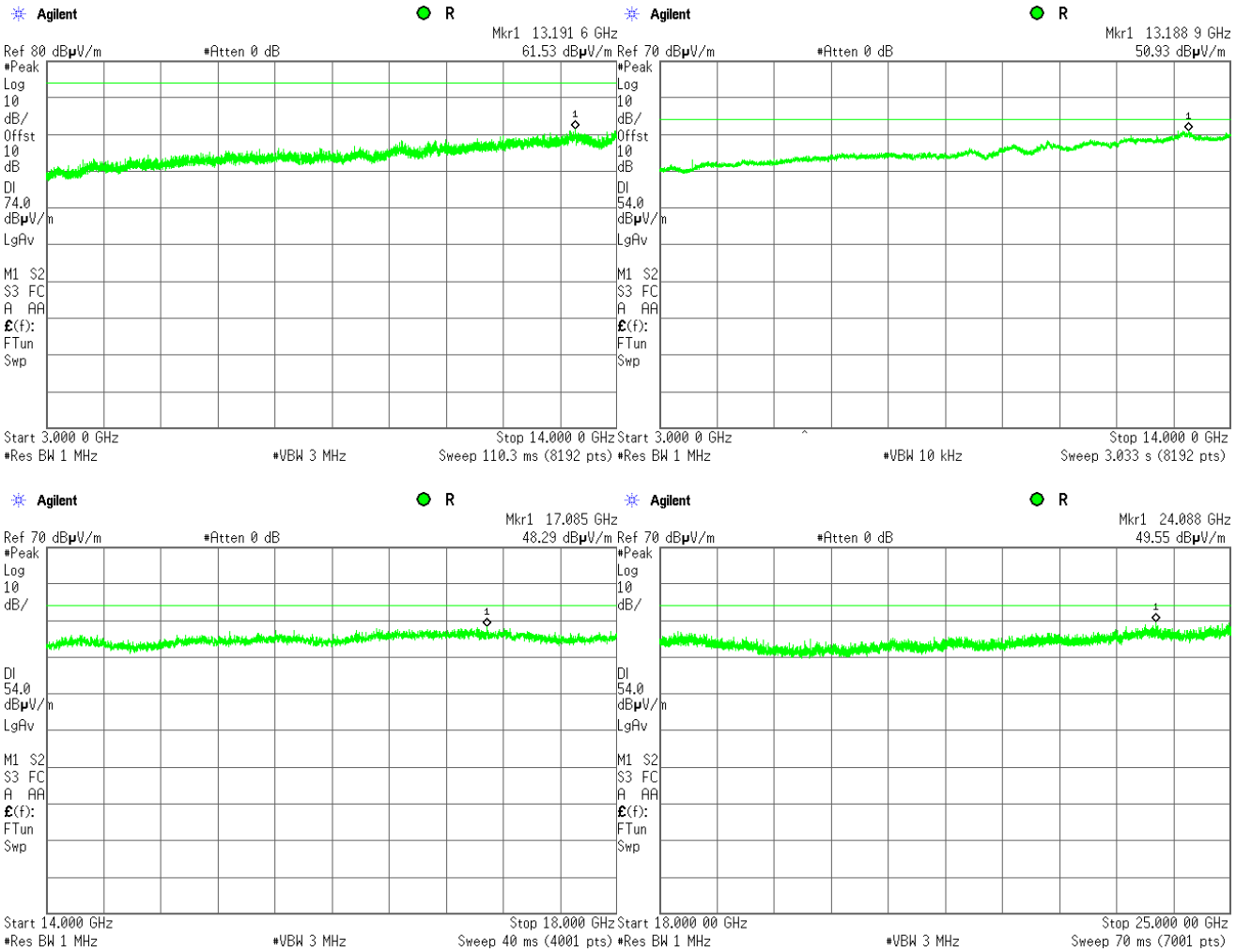
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11g



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.38 Radiated emission measurements from 3000 to 25000 MHz at the low carrier frequency

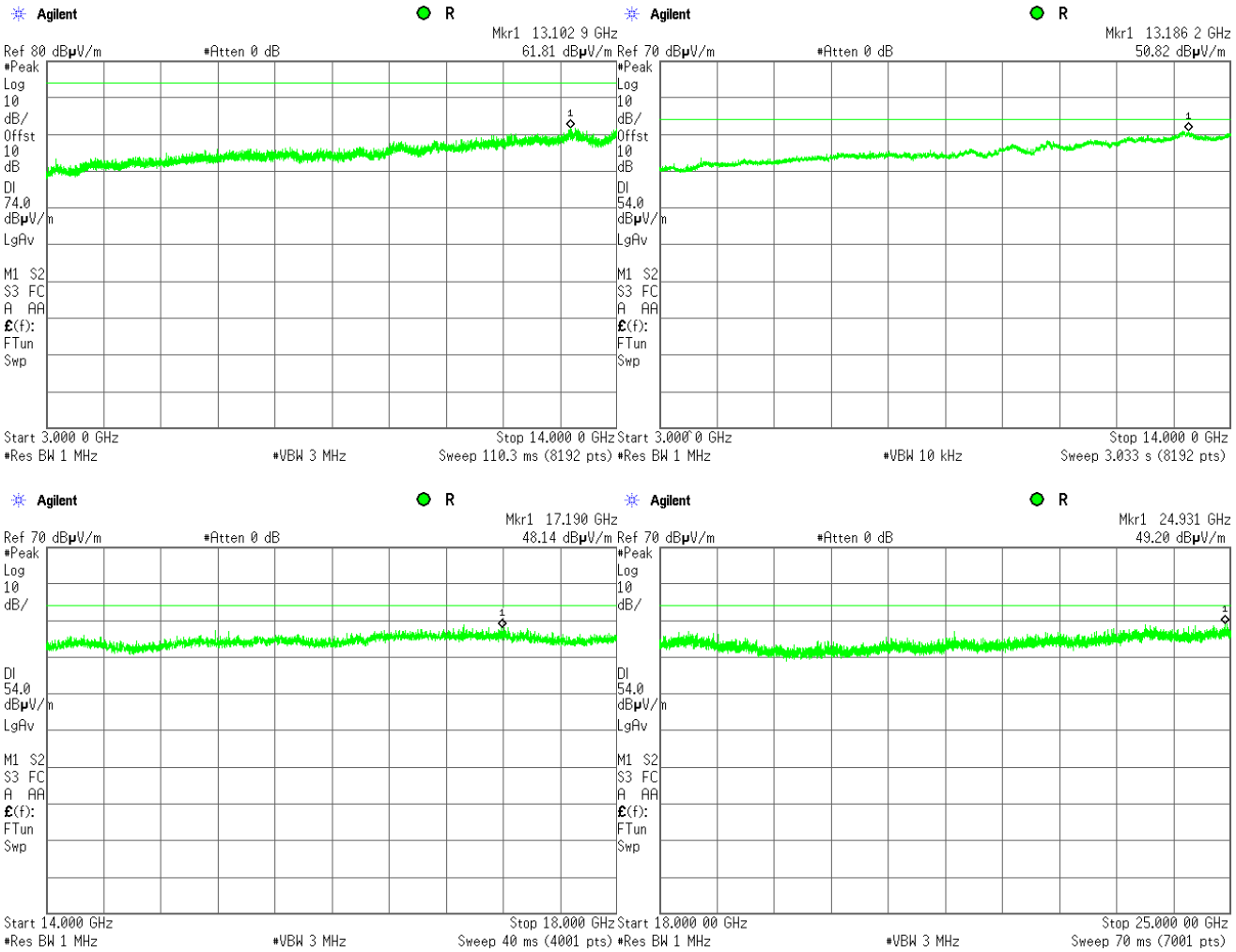
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11n HT20



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.39 Radiated emission measurements from 3000 to 25000 MHz at the mid carrier frequency

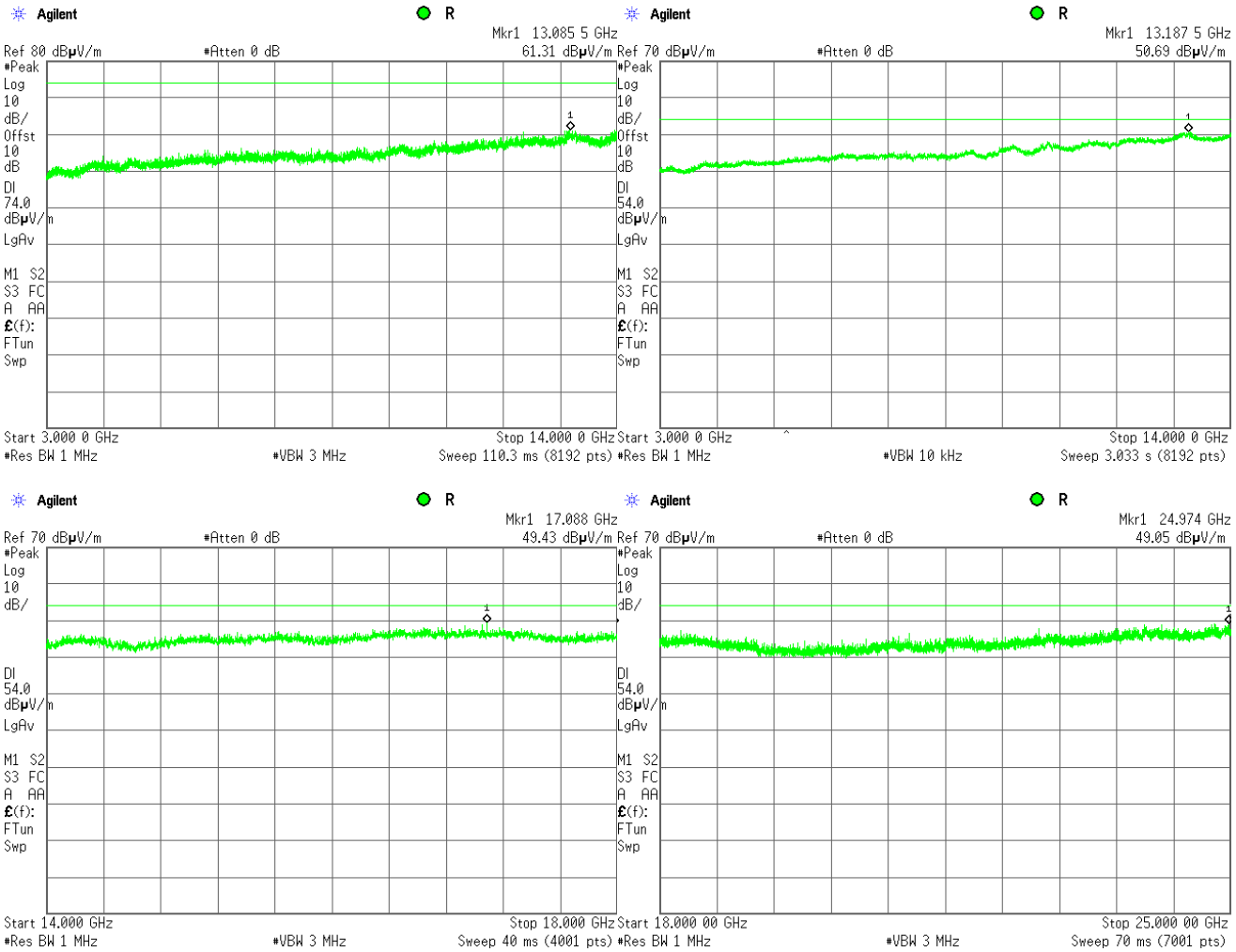
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.40 Radiated emission measurements from 3000 to 25000 MHz at the high carrier frequency

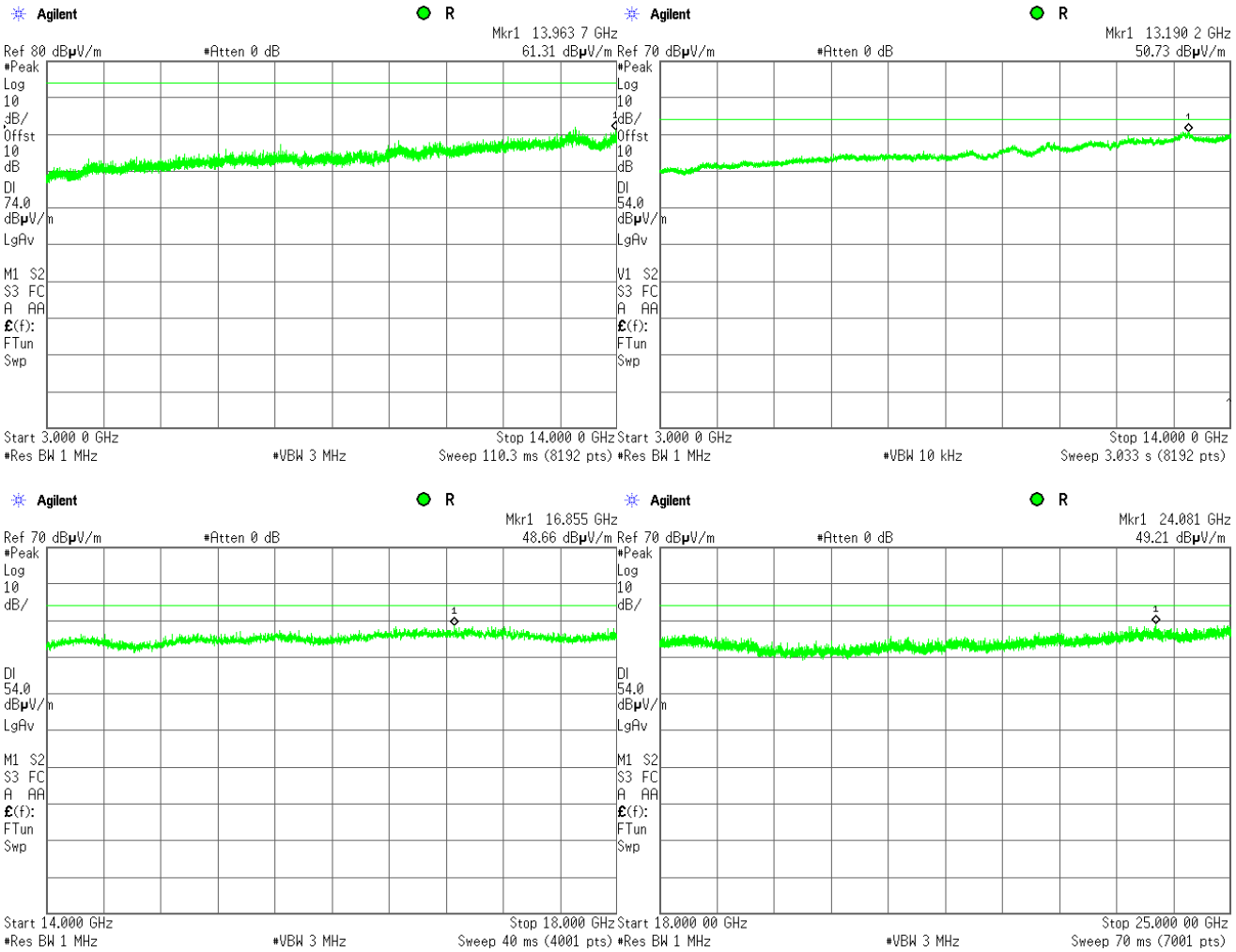
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.41 Radiated emission measurements from 3000 to 25000 MHz at the low carrier frequency

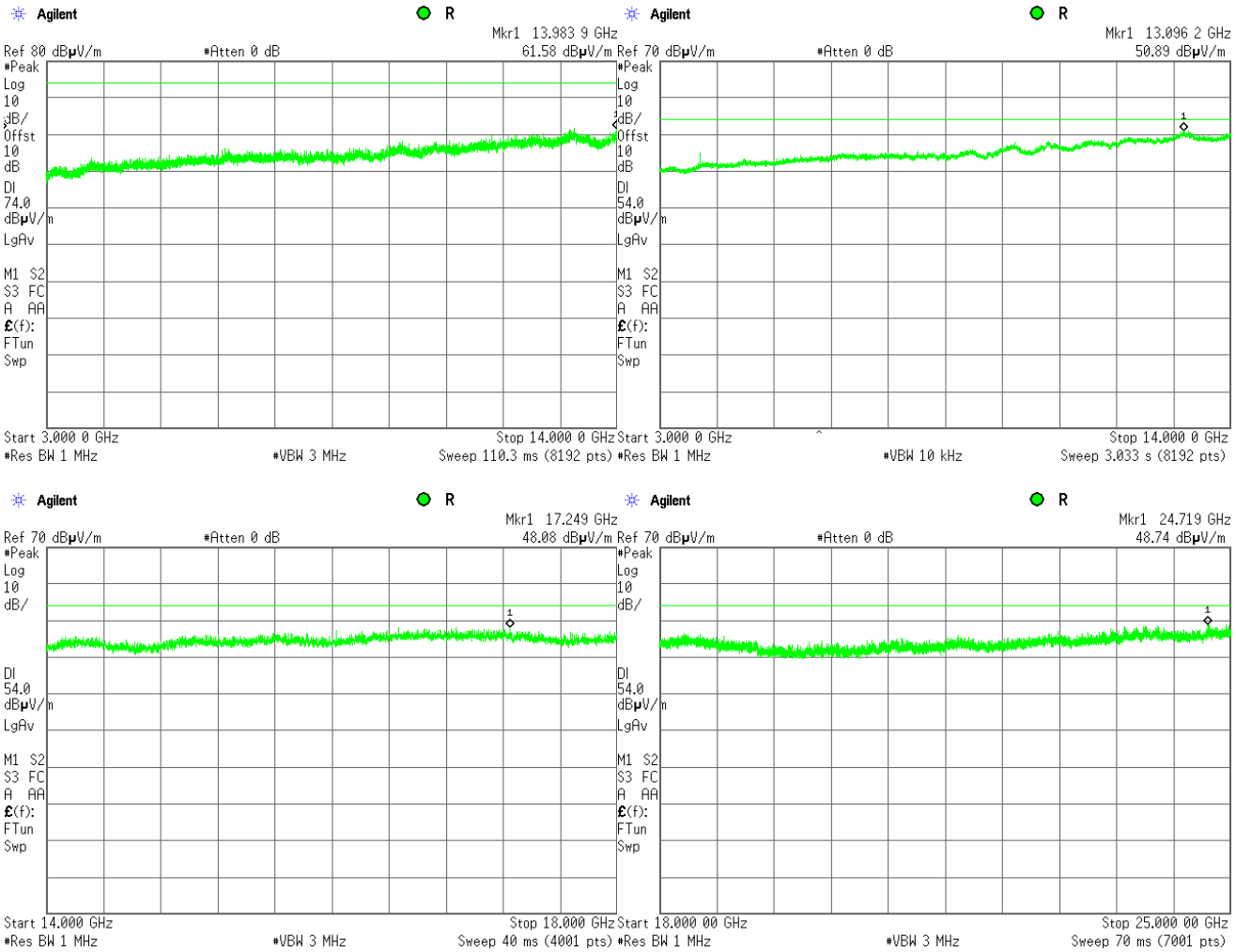
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11n HT40



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.42 Radiated emission measurements from 3000 to 25000 MHz at the mid carrier frequency

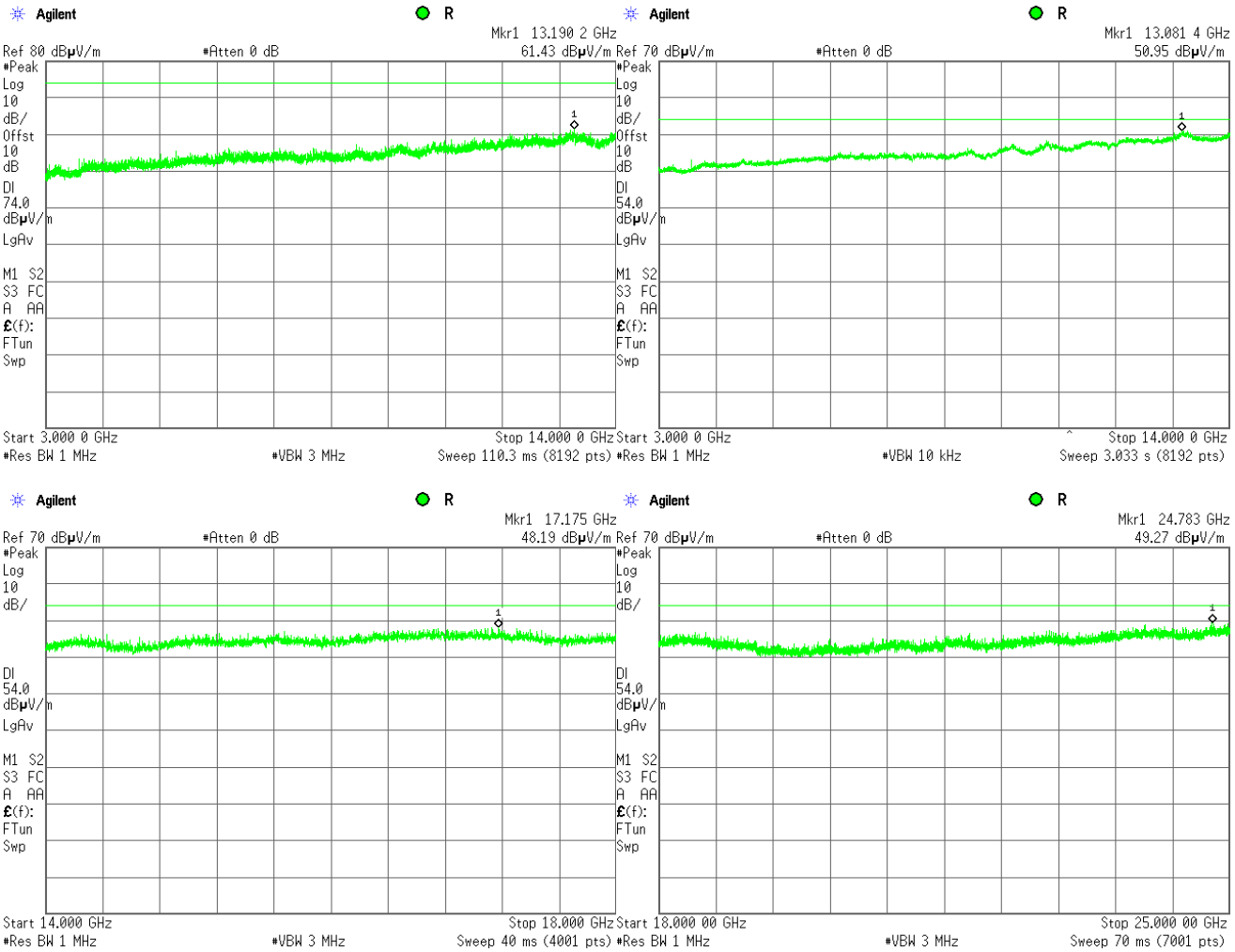
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.43 Radiated emission measurements from 3000 to 25000 MHz at the high carrier frequency

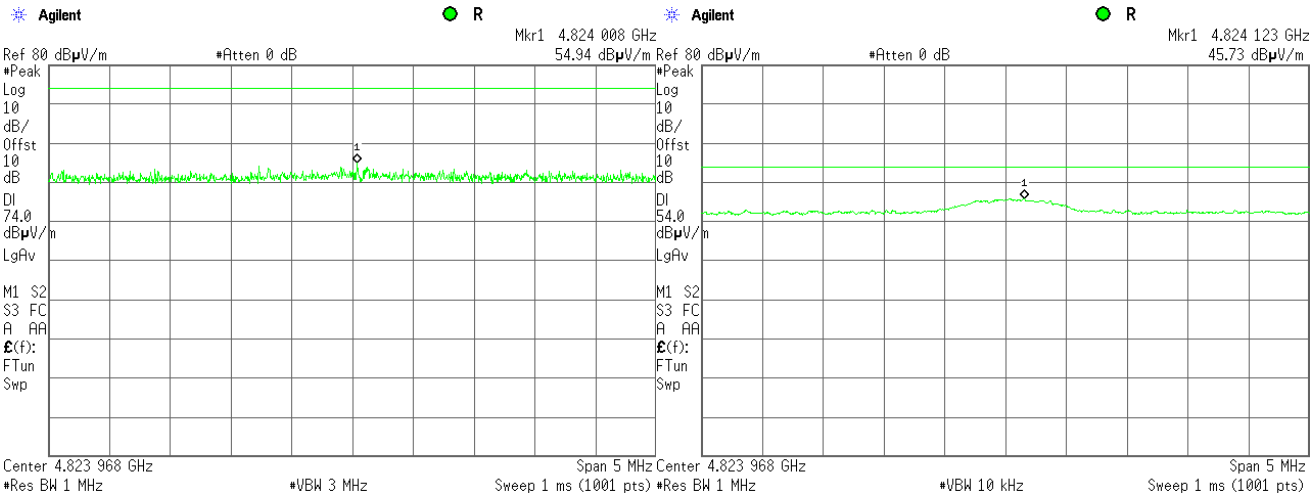
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

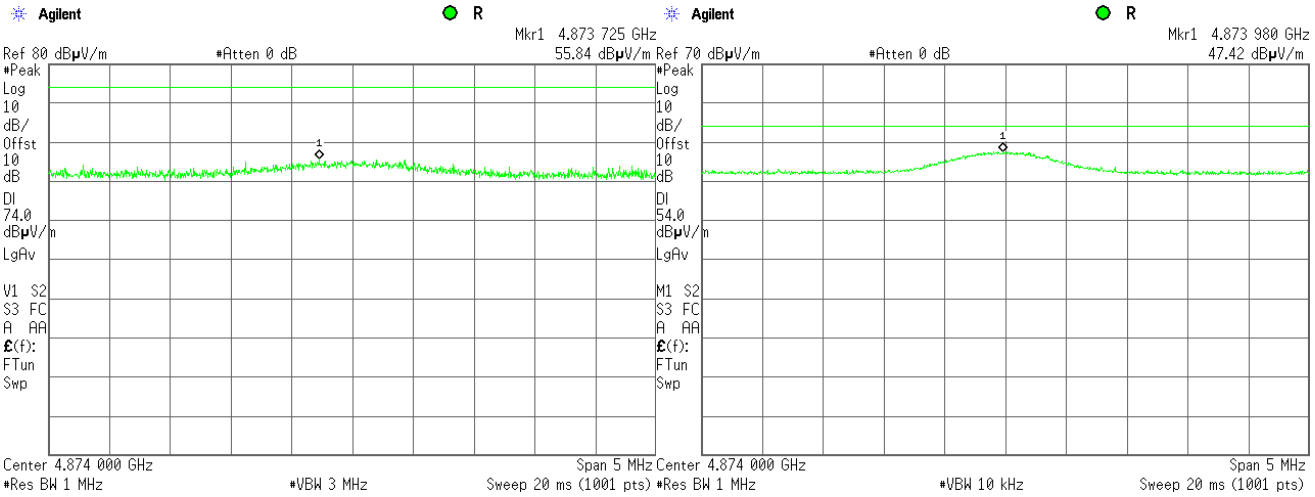
Plot 7.3.44 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Plot 7.3.45 Radiated emission measurements at the second harmonic of mid carrier frequency

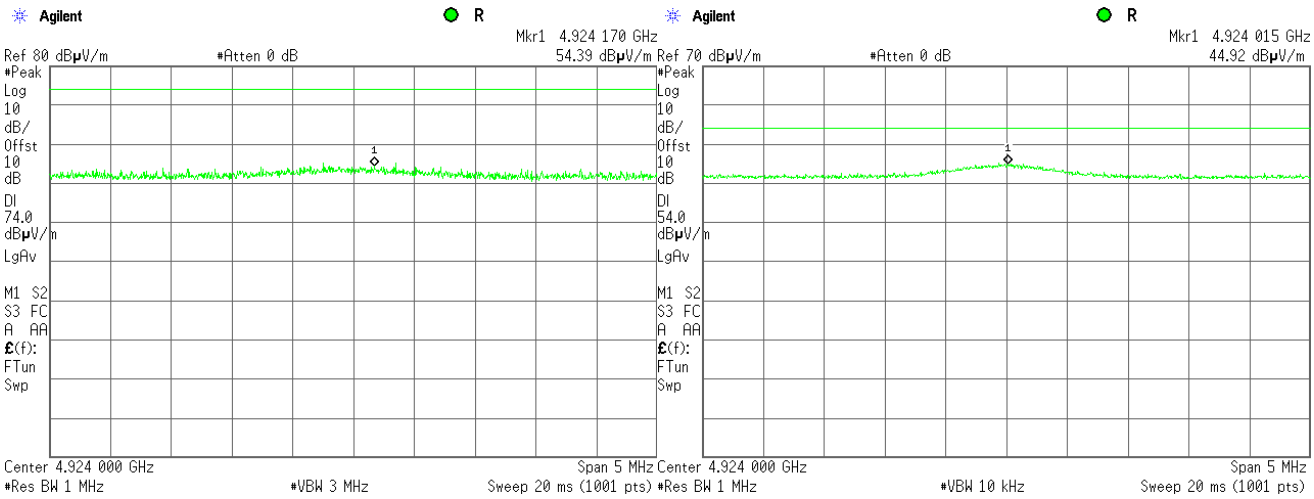
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.46 Radiated emission measurements at the second harmonic of high carrier frequency

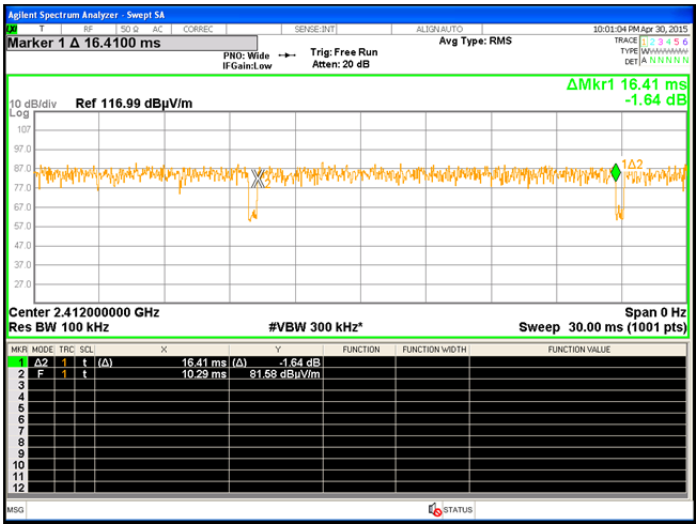
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11b



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

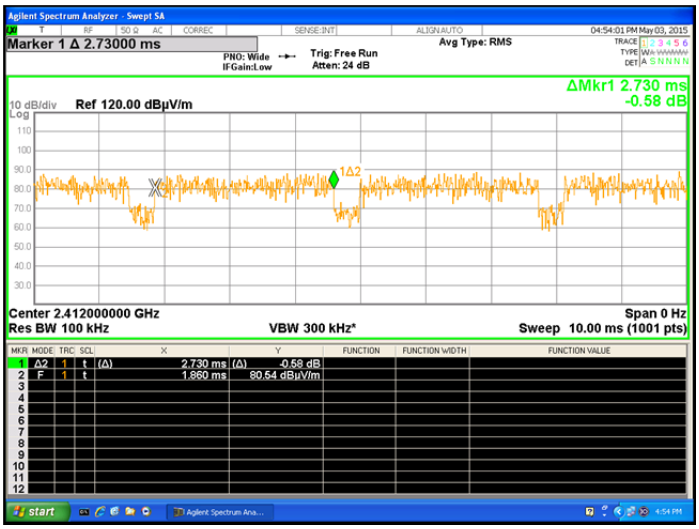
Plot 7.3.47 Transmission pulse duration

MODE: 802.11b



Plot 7.3.48 Transmission pulse duration

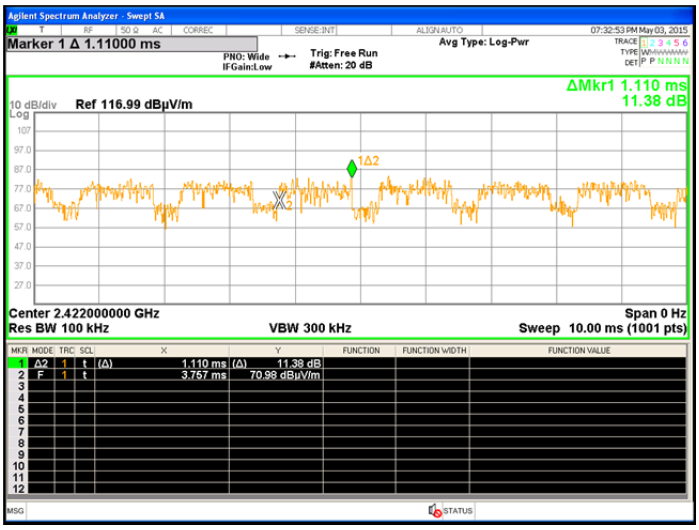
MODE: 802.11g



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

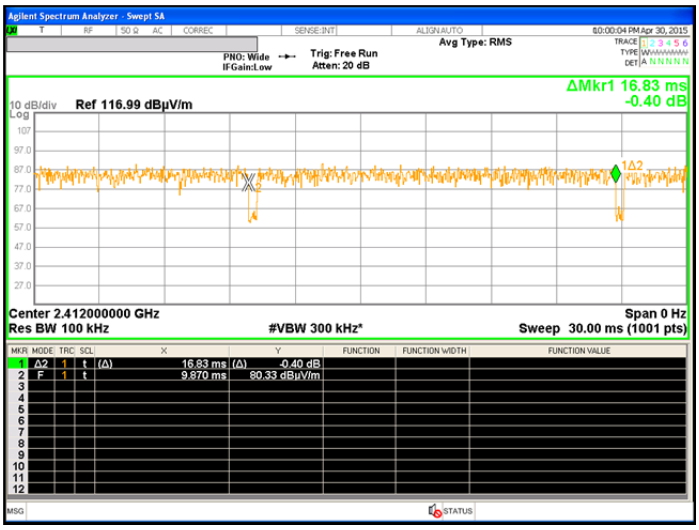
Plot 7.3.49 Transmission pulse duration

MODE: 802.11n HT40



Plot 7.3.50 Transmission pulse period

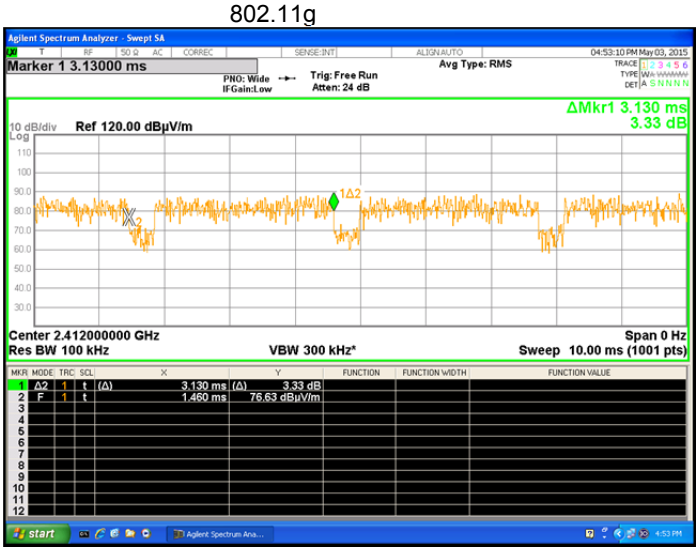
MODE: 802.11b



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 25 ºC	Air Pressure: 1010 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

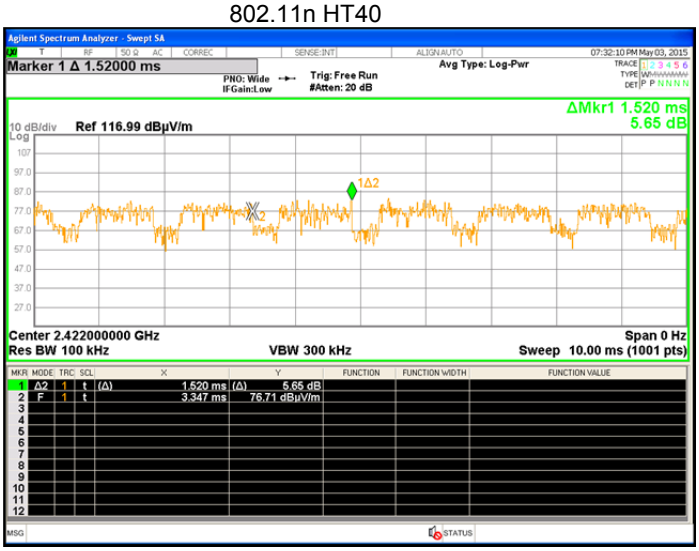
Plot 7.3.51 Transmission pulse period

MODE: 802.11g



Plot 7.3.52 Transmission pulse period

MODE: 802.11n HT40



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.4 Band edge radiated emissions

7.4.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Band edge emission limits

Output power	Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(μV/m)	
			Peak	Average
Peak	902.0 – 928.0	20.0	74.0	54.0
	2400.0 – 2483.5			
	5725.0 – 5850.0			

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized normally modulated at the maximum data rate and its proper operation was checked.

7.4.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.

7.4.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.

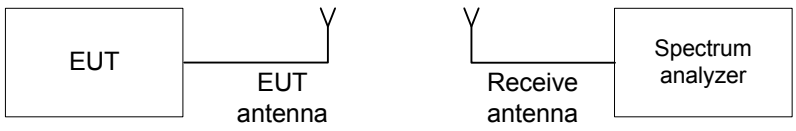
7.4.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.

7.4.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.4.2 and associated plots and referenced to the highest emission level measured within the authorized band.

7.4.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

7.4.2.7 The above procedure was repeated with the frequency hopping function enabled.

Figure 7.4.1 Band edge emission test setup



Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 2400-2483.5 MHz
DETECTOR USED: Peak
MODULATING SIGNAL: PRBS
RESOLUTION BANDWIDTH: ≥ 1% of the span
VIDEO BANDWIDTH: ≥ RBW

MODE: 802.11b

Frequency, MHz	Band edge emission, dB(µV/m)	Emission at carrier, dB(µV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
2.400	58.29	99.80	41.51	20.00	-21.51	Pass

Frequency, MHz	Band edge emission, dBµV/m, peak	Limit, dBµV/m	Margin, dB**	Band edge emission, dBµV/m, average	Limit, dBµV/m	Margin, dB**	Verdict
2.3890	55.42	74	-18.58	48.10	54	-5.90	Pass
2483.5	57.09		-16.91	49.52		-4.48	

MODE: 802.11g

Frequency, MHz	Band edge emission, dB(µV/m)	Emission at carrier, dB(µV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
2.400	64.38	97.96	33.58	20.00	-13.58	Pass

Frequency, MHz	Band edge emission, dBµV/m, peak	Limit, dBµV/m	Margin, dB**	Band edge emission, dBµV/m, average	Limit, dBµV/m	Margin, dB**	Verdict
2.3890	63.52	74	-10.48	46.57	54	-7.43	Pass
2483.5	68.32		-5.68	51.22		-2.78	

MODE: 802.11n HT20

Frequency, MHz	Band edge emission, dB(µV/m)	Emission at carrier, dB(µV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
2400	67.51	98.89	31.38	20.00	-11.38	Pass

Frequency, MHz	Band edge emission, dBµV/m, peak	Limit, dBµV/m	Margin, dB**	Band edge emission, dBµV/m, average	Limit, dBµV/m	Margin, dB**	Verdict
2.3890	69.99	74	-4.01	51.68	54	-2.32	Pass
2483.5	68.92		-5.08	49.59		-4.41	

MODE: 802.11n HT40

Frequency, MHz	Band edge emission, dB(µV/m)	Emission at carrier, dB(µV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
2.400	66.18	93.35	27.17	20.00	-7.17	Pass

Frequency, MHz	Band edge emission, dBµV/m, peak	Limit, dBµV/m	Margin, dB**	Band edge emission, dBµV/m, average	Limit, dBµV/m	Margin, dB**	Verdict
2.3890	67.18	74	-6.82	53.90	54	-0.10	Pass
2483.5	66.04		-7.96	48.78		-5.22	

Reference numbers of test equipment used

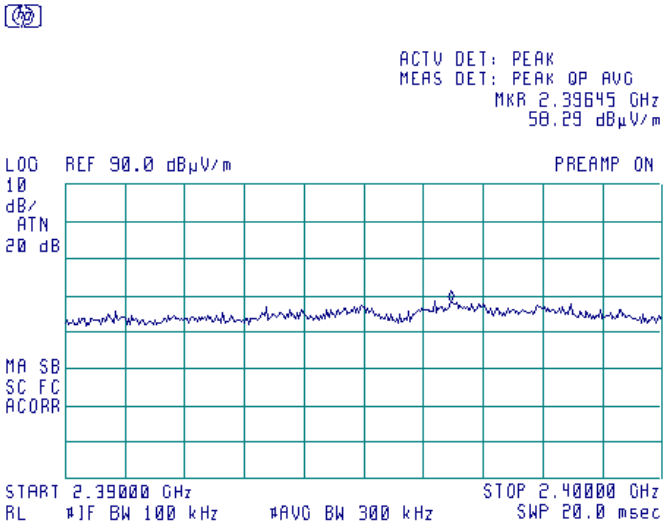
HL 0521	HL 1984	HL 4114	HL 4353	HL 4722			

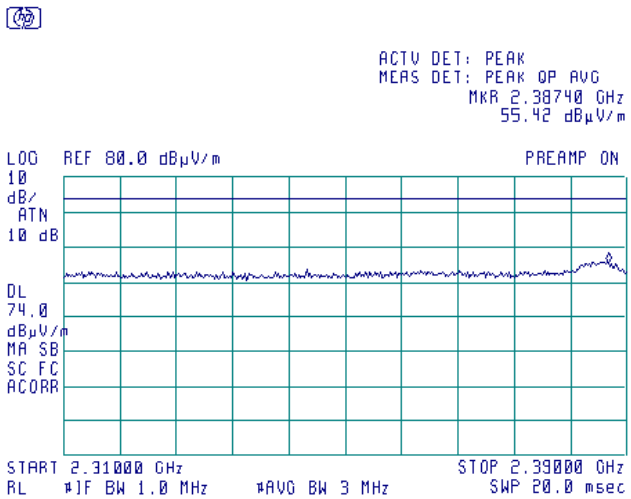
Full description is given in Appendix A.

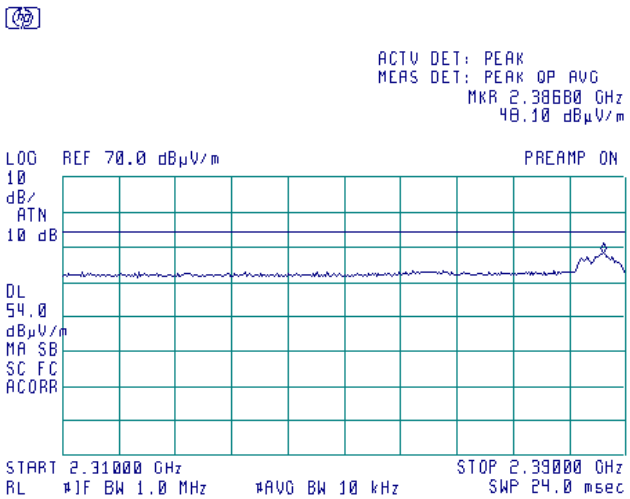
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.1 The highest emission level within the assigned band at low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



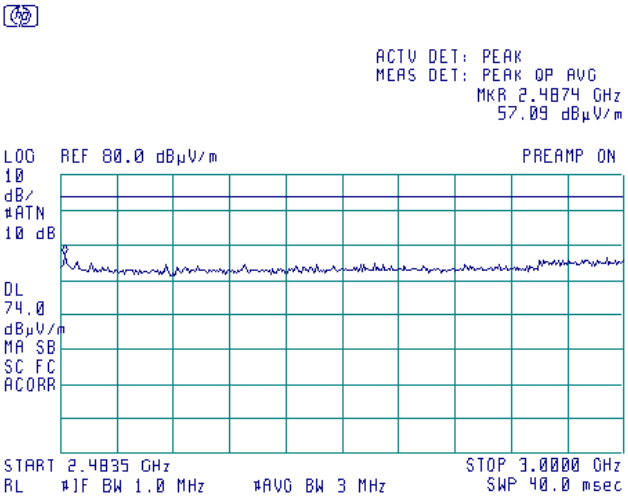


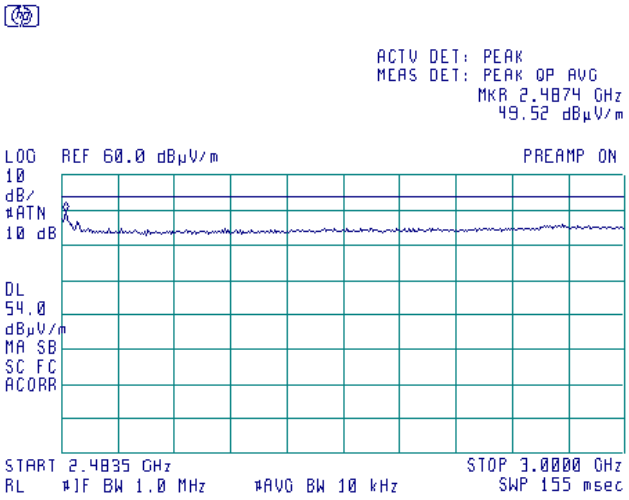


Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.2 The highest emission level within the assigned band at high carrier frequency

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
WiFi Standard	802.11b

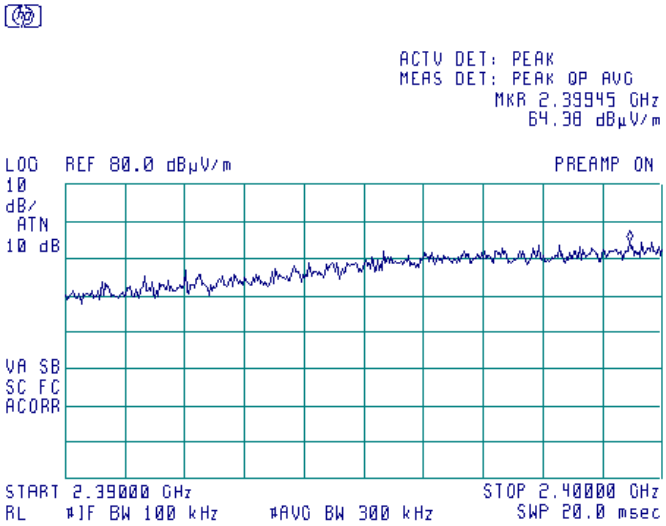


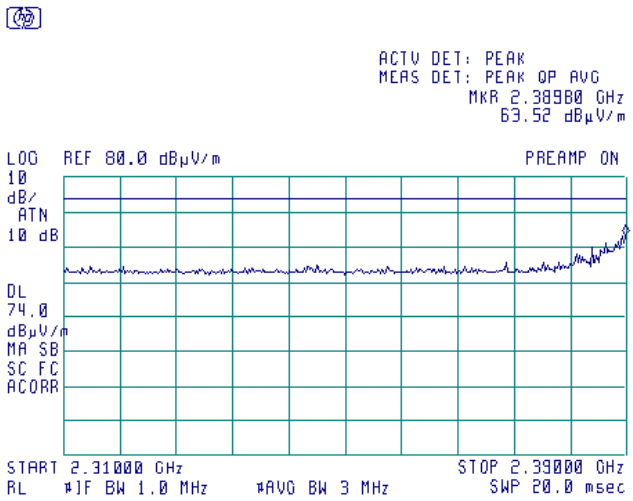


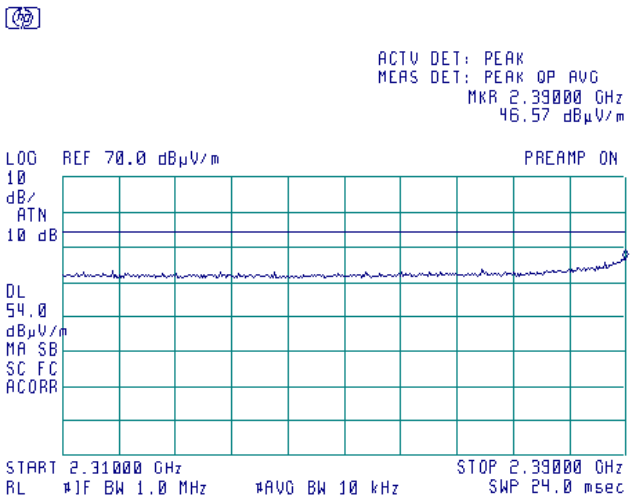
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.3 The highest emission level within the assigned band at low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



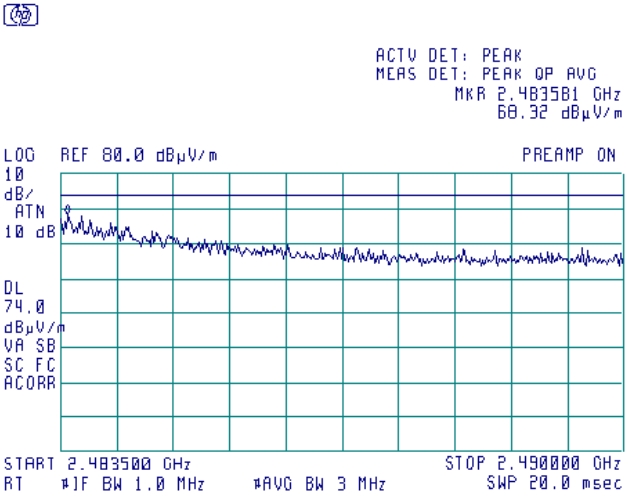


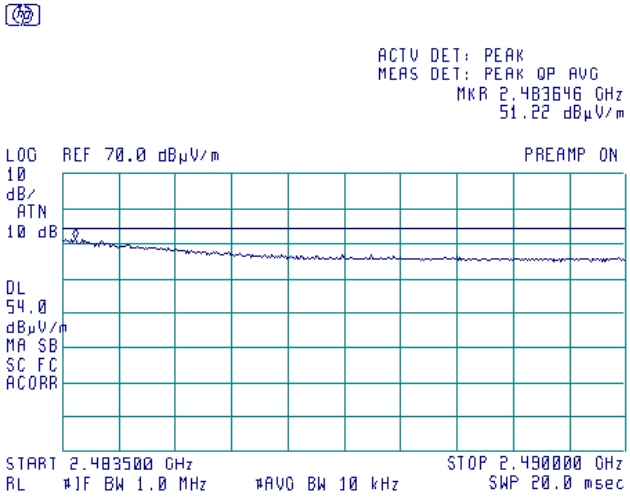


Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.4 The highest emission level within the assigned band at high carrier frequency

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11g

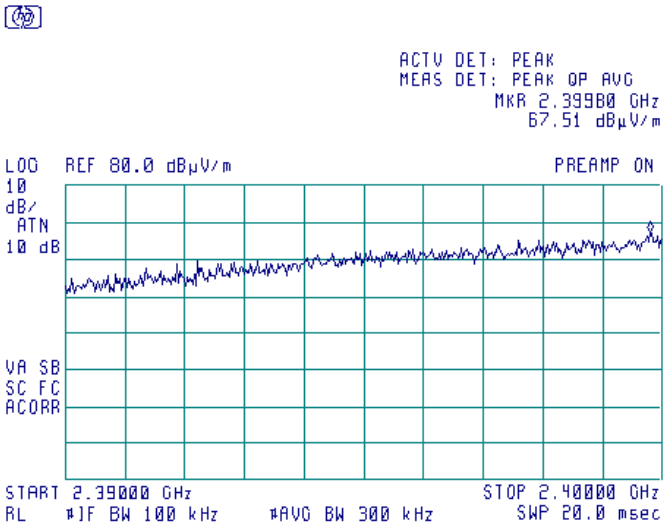


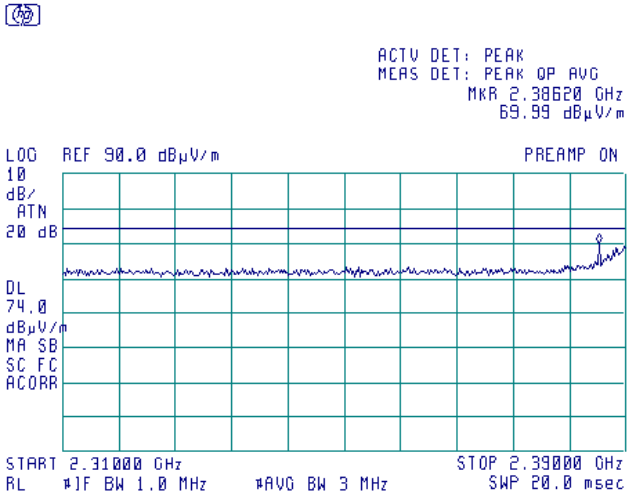


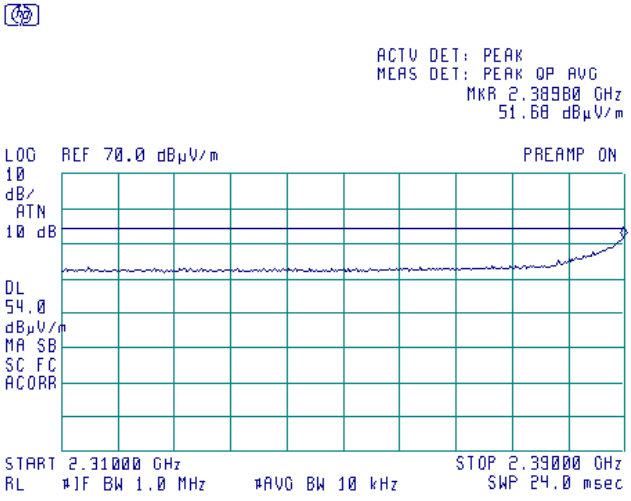
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.5 The highest emission level within the assigned band at low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



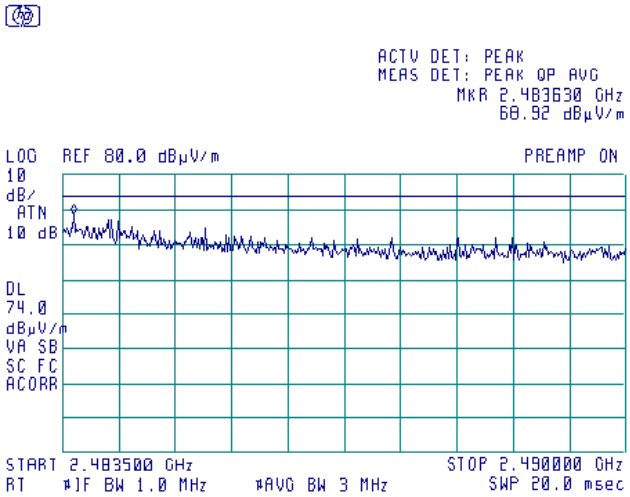


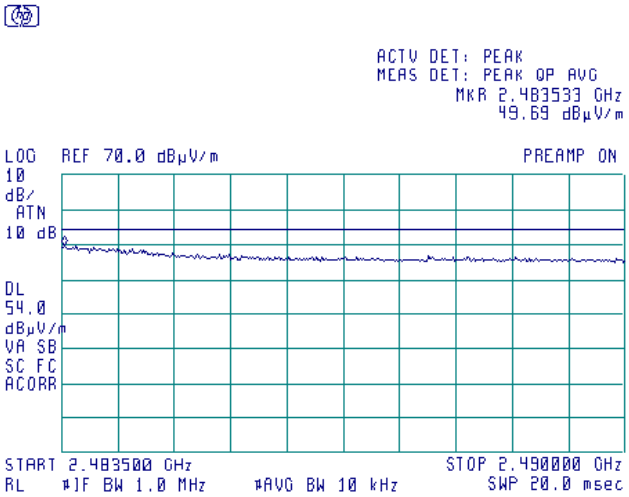


Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.6 The highest emission level within the assigned band at high carrier frequency

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11n HT20

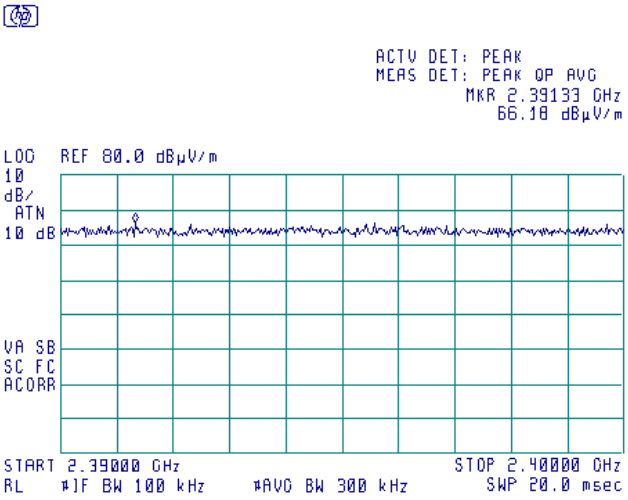


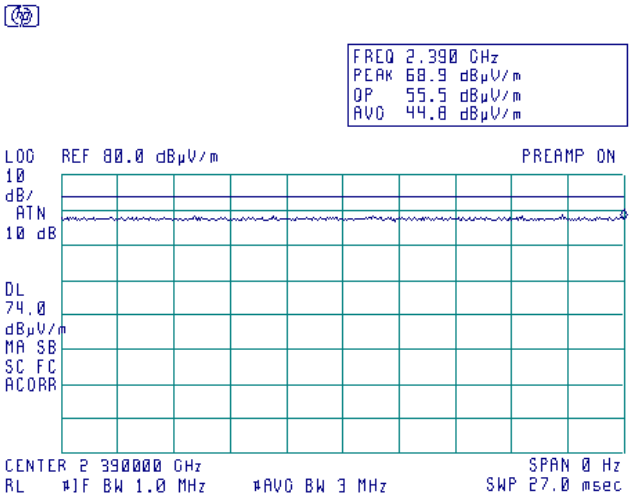


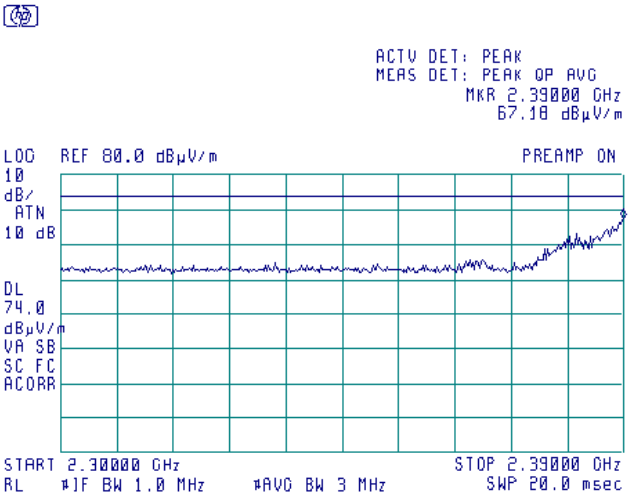
Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

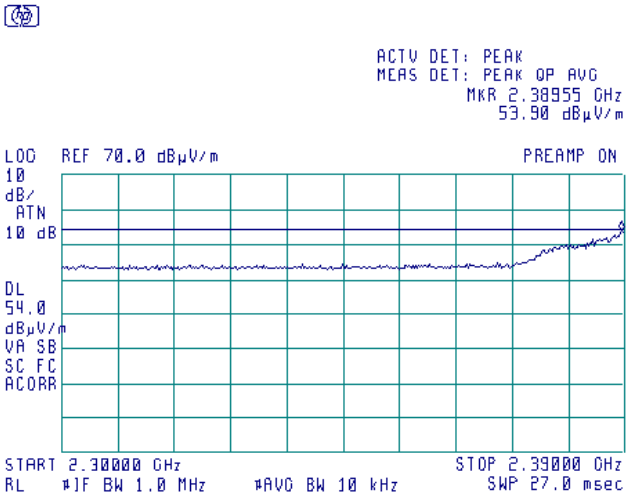
Plot 7.4.7 The highest emission level within the assigned band at low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40





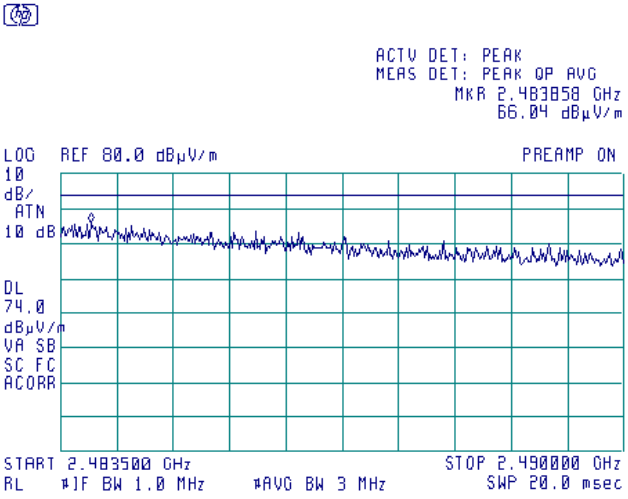


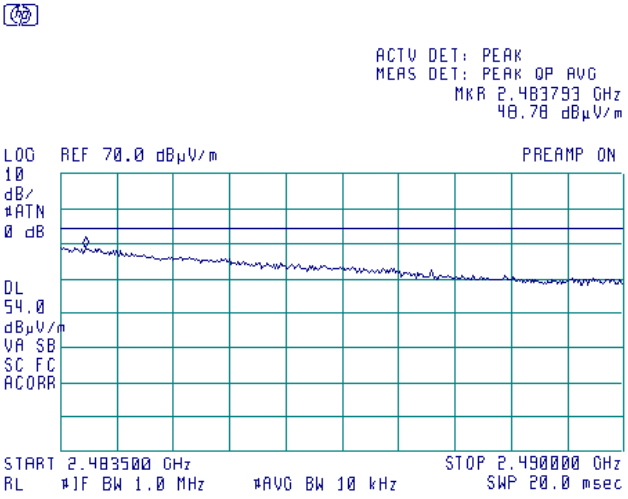


Test specification:	FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.8 The highest emission level within the assigned band at high carrier frequency

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
MODE:	802.11n HT40





Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

7.5 Peak spectral power density

7.5.1 General

This test was performed to measure the peak spectral power density radiated by the transmitter RF antenna. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm	Equivalent field strength limit @ 3m, dB(μV/m)*
902.0 – 928.0	3.0	8.0	103.2
2400.0 – 2483.5			
5725.0 – 5850.0			

* - Equivalent field strength limit was calculated from the peak spectral power density as follows: E=sqrt(30×P)/r, where P is peak spectral power density and r is antenna to EUT distance in meters.

7.5.2 Test procedure for field strength measurements

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 to end user RF output power.

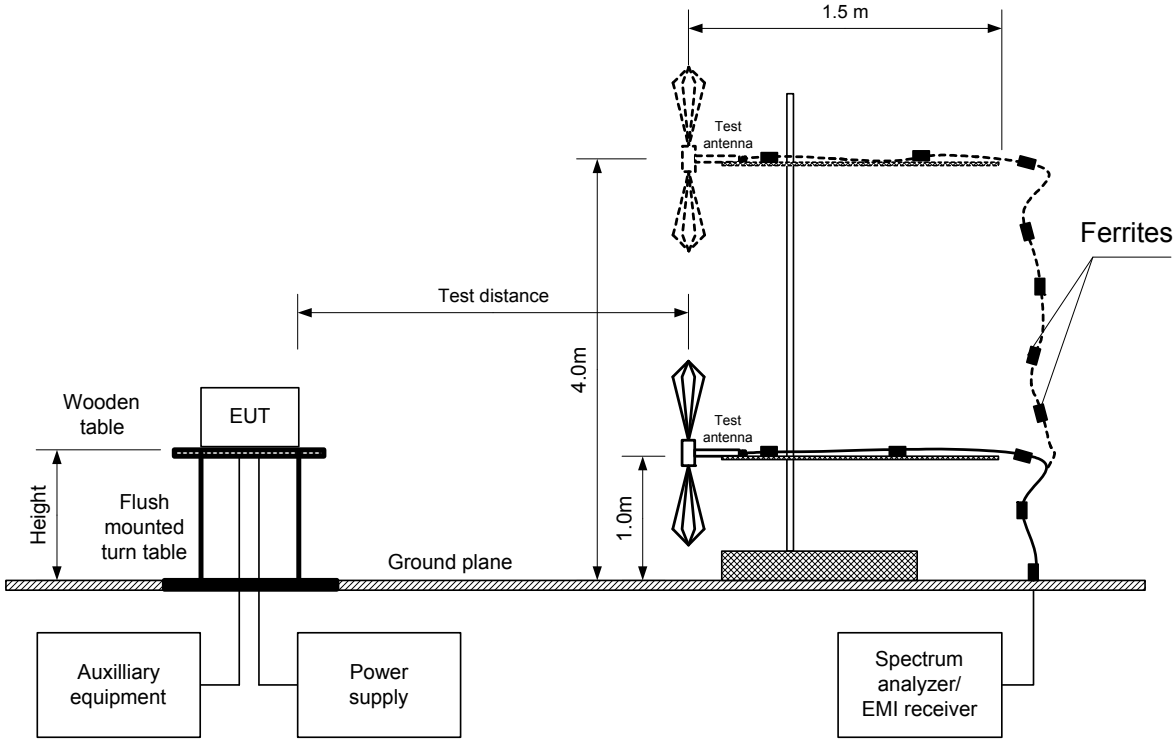
7.5.2.3 The field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.5.2.4 The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in peak hold mode with resolution bandwidth set to 3.0 kHz, video bandwidth wider than resolution bandwidth, auto sweep time and sufficient number of sweeps was allowed for trace stabilization. The spectrum lines spacing was verified to be wider than 3 kHz. Otherwise the resolution bandwidth was reduced until individual spectrum lines were resolved and the power of individual spectrum lines was integrated over 3 kHz band.

7.5.2.5 The peak of emission was zoomed with span set just wide enough to capture the emission peak area and sweep time was set equal to span width divided by resolution bandwidth. Spectrum analyzer was set in peak hold mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in Table 7.5.2 and associated plots.

Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements



Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY: 2400-2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
DETECTOR USED: RMS
RESOLUTION BANDWIDTH: 10 kHz
VIDEO BANDWIDTH: 30 kHz
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)

MODE: 802.11b

Frequency, MHz	Field strength, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
2409.00	90.25	0	103.2	-12.95	Horizontal	2.1	185
2438.13	91.98	0	103.2	-11.22	Horizontal	3.0	275
2462.75	93.21	0	103.2	-9.99	Horizontal	2.4	180

MODE: 802.11g

Frequency, MHz	Field strength, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
2413.00	89.81	0	103.2	-13.39	Horizontal	2.8	182
2438.38	89.49	0	103.2	-13.71	Horizontal	3.3	277
2463.25	88.29	0	103.2	-14.91	Horizontal	3.2	300

MODE: 802.11n HT20

Frequency, MHz	Field strength, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
2407.63	89.10	0	103.2	-14.10	Horizontal	2.6	330
2435.75	99.70	0	103.2	-3.50	Horizontal	3.5	350
2459.88	88.79	0	103.2	-14.41	Horizontal	3.0	340

MODE: 802.11n HT40

Frequency, MHz	Field strength, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
2417.10	82.96	0	103.2	-20.24	Horizontal	3.5	304
2434.60	82.28	0	103.2	-20.92	Horizontal	3.0	350
2459.20	83.94	0	103.2	-19.26	Horizontal	2.8	350

*****- Margin = Field strength - EUT antenna gain - calculated field strength limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

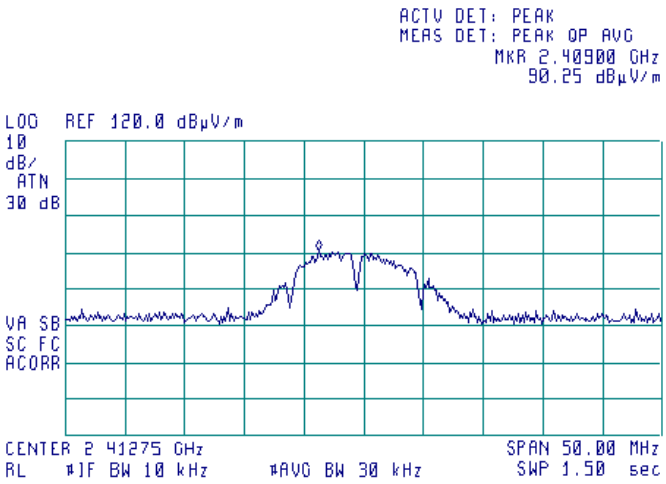
HL 4114	HL 4353	HL 4575	HL 4922				

Full description is given in Appendix A.

Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

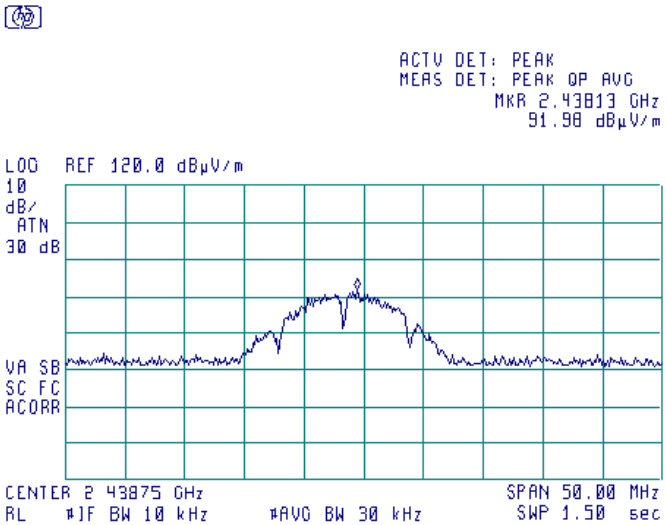
Plot 7.5.1 Peak spectral power density at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Plot 7.5.2 Peak spectral power density at mid frequency

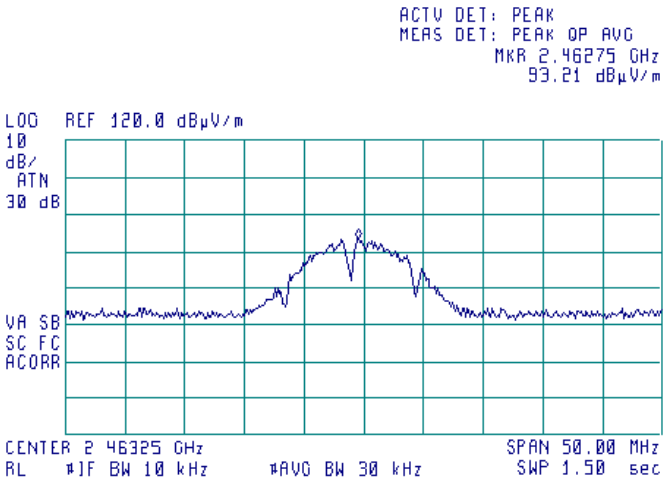
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

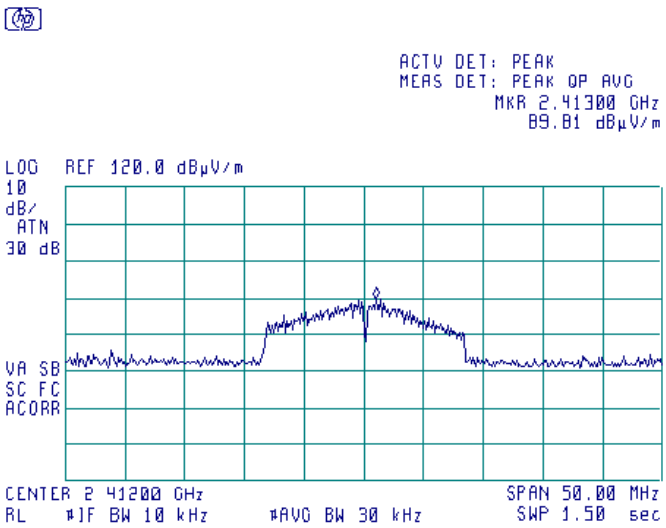
Plot 7.5.3 Peak spectral power density at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11b



Plot 7.5.4 Peak spectral power density at low frequency

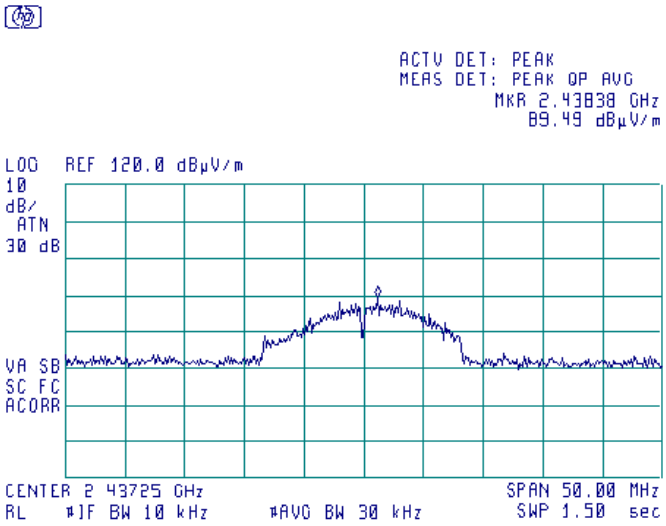
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

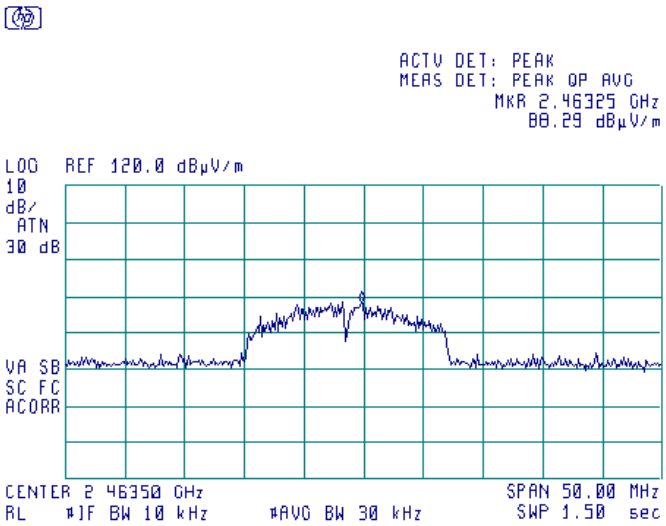
Plot 7.5.5 Peak spectral power density at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Plot 7.5.6 Peak spectral power density at high frequency

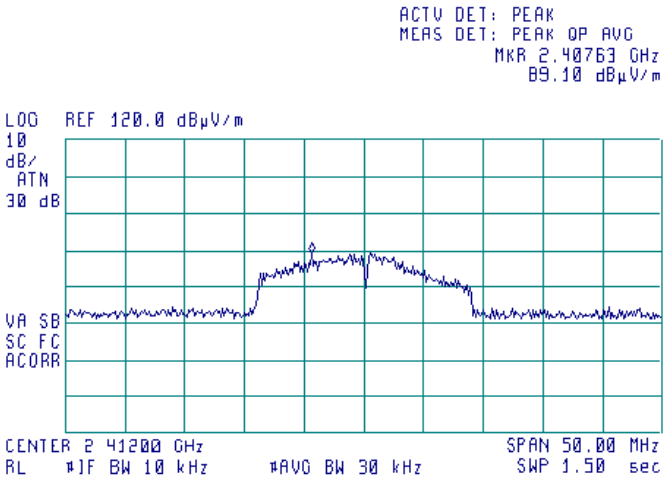
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11g



Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

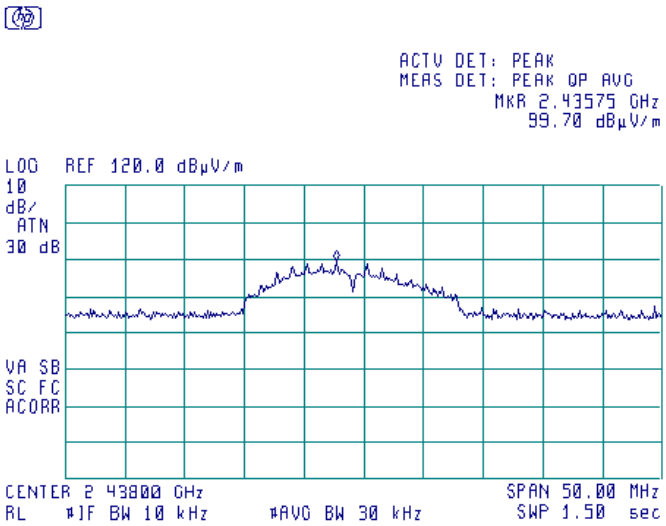
Plot 7.5.7 Peak spectral power density at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Plot 7.5.8 Peak spectral power density at mid frequency

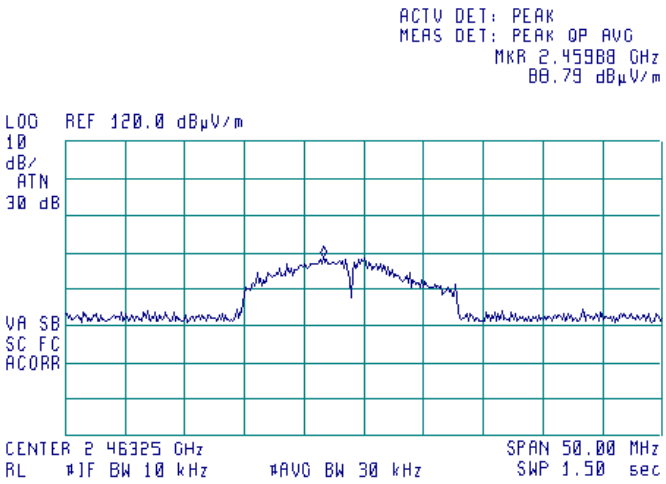
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

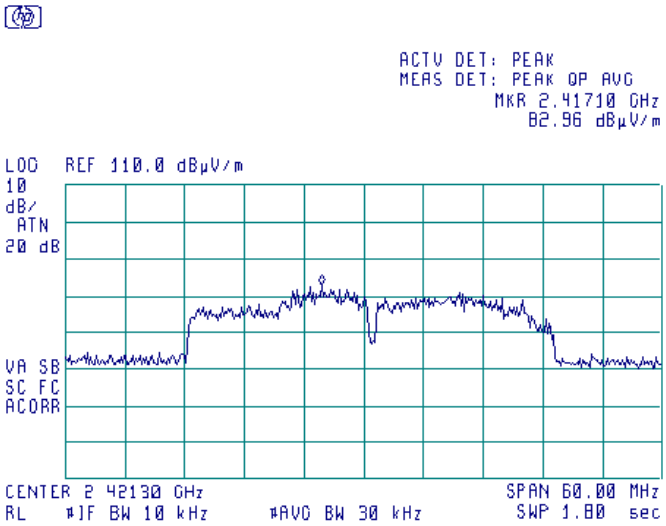
Plot 7.5.9 Peak spectral power density at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT20



Plot 7.5.10 Peak spectral power density at low frequency

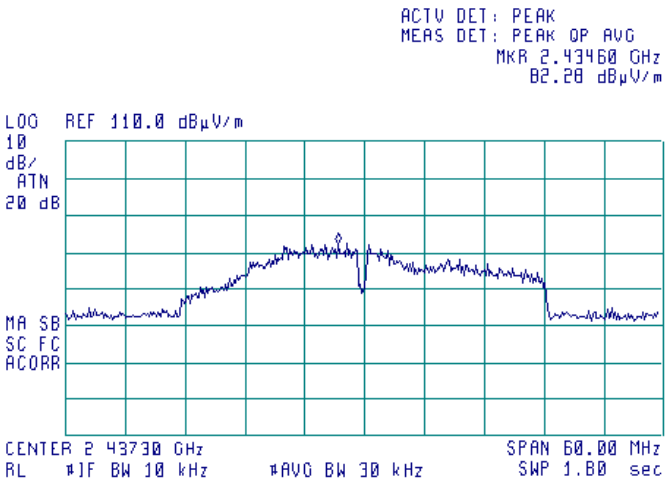
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Test specification:	FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	30-Jun-15		
Temperature: 25 ºC	Air Pressure: 1008 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

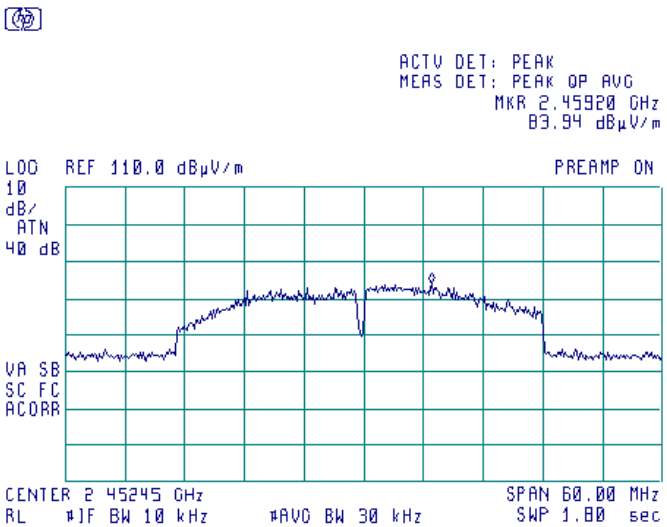
Plot 7.5.11 Peak spectral power density at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Plot 7.5.12 Peak spectral power density at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
MODE: 802.11n HT40



Test specification:	Section 15.203, RSS-Gen section 8.3, Antenna requirements		
Test procedure:			
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-15		
Temperature: 23 ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 60 %	**Power Supply:** 120 VAC
Remarks:			

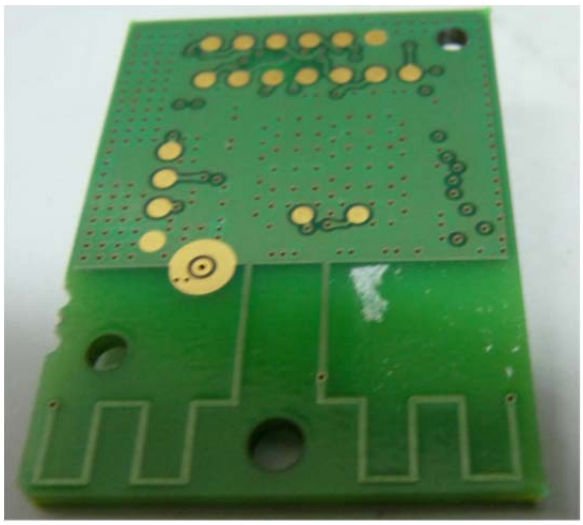
7.6 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.
The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.6.1.

Table 7.6.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Photograph 7.6.1 Antenna assembly



Test specification:	Section 15.207(a) / RSS-Gen, Section 8.8, Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 22 ºC	Air Pressure: 1011 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

7.7 Conducted emissions

7.7.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μV)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* The limit decreases linearly with the logarithm of frequency.

7.7.2 Test procedure

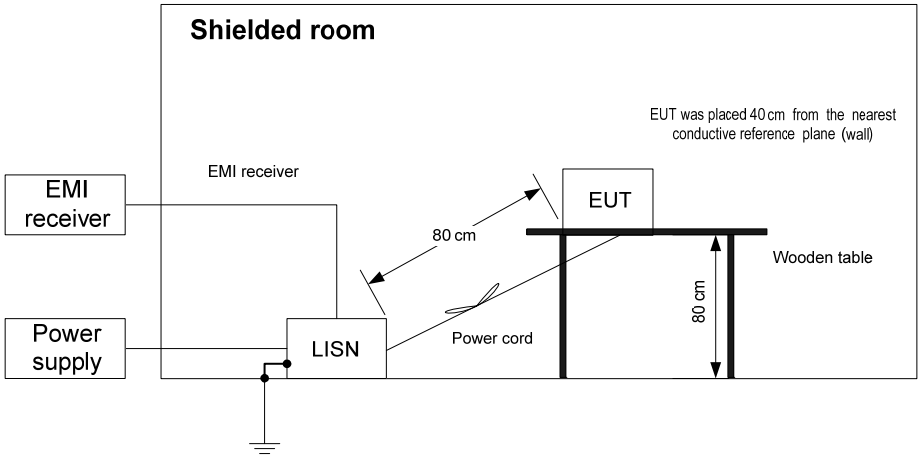
7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and the performance check was conducted.

7.7.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.7.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

7.7.2.3 The position of the device cables was varied to determine maximum emission level.

7.7.2.4 The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.

Figure 7.7.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.207(a) / RSS-Gen, Section 8.8, Conducted emission**		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	29-Jun-15		
Temperature: 22 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 39 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.7.2 Conducted emission test results

LINE: AC mains
EUT OPERATING MODE: Transmit
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.150	53.02	51.09	66.00	-14.91	38.45	56.00	-17.55	L1	Pass
0.160	50.67	43.35	65.48	-22.13	28.74	55.48	-26.74		
0.189	47.92	42.50	64.05	-21.55	26.00	54.05	-28.05		
0.409	37.40	32.88	57.68	-24.80	23.67	47.68	-24.01		
7.805	29.73	25.47	60.00	-34.53	17.33	50.00	-32.67		
0.150	52.73	50.78	65.96	-15.18	35.23	55.96	-20.73	L2	Pass
0.163	52.86	43.57	65.35	-21.78	22.17	55.35	-33.18		
0.194	48.54	45.03	63.88	-18.85	26.95	53.88	-26.93		
0.280	39.65	37.42	60.85	-23.43	18.12	50.85	-32.73		
0.510	28.69	25.27	56.00	-30.73	13.29	46.00	-32.71		
0.597	27.47	21.83	56.00	-34.17	10.33	46.00	-35.67		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

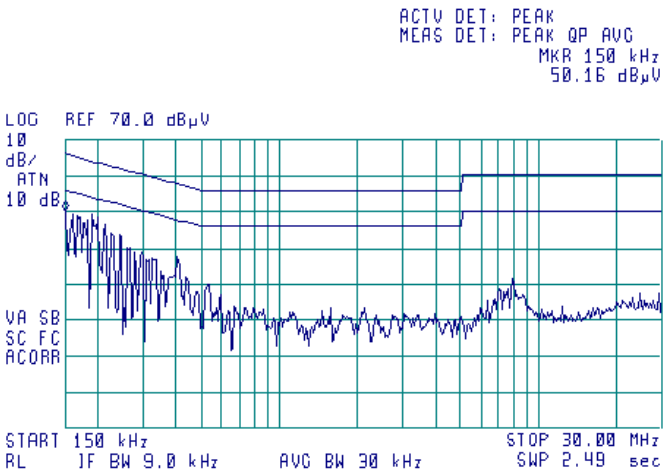
HL 0447	HL 1425	HL 1513	HL 3612	HL 3774	HL 4527		

Full description is given in Appendix A.

Test specification:	Section 15.207(a) / RSS-Gen, Section 8.8, Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Jun-15		
Temperature: 22 ºC	Air Pressure: 1011 hPa	Relative Humidity: 39 %	Power Supply: 120 VAC
Remarks:			

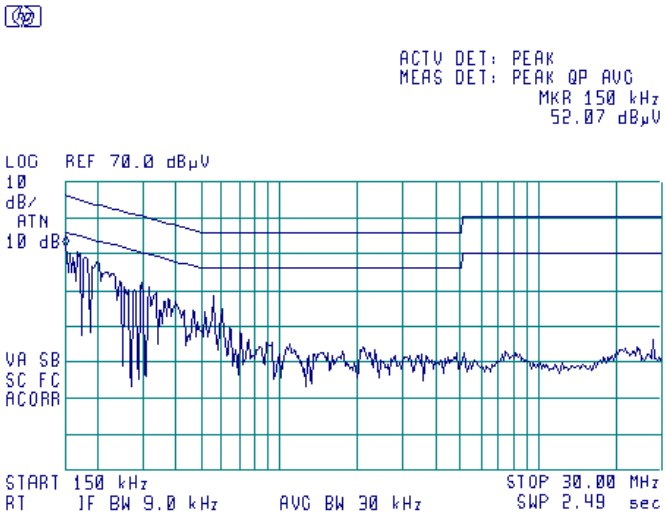
Plot 7.7.1 Conducted emission measurements

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.7.2 Conducted emission measurements

LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



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	13-Jan-15	13-Jan-16
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	13-Oct-15	13-Oct-16
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	22-Oct-14	22-Oct-15
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	15-May-15	15-May-16
0768	Antenna Standard Gain Horn,18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	25-Dec-14	25-Dec-15
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	24-Dec-14	24-Dec-15
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	08-Sep-15	08-Sep-16
1984	Antenna, Double-Ridged Waveguide Horn, 1 to 18 GHz, 300 W	EMC Test Systems	3115	9911-5964	17-Apr-15	17-Apr-16
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	07-Dec-14	07-Dec-15
3774	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	NA	30-Dec-14	30-Dec-15
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	29-Apr-15	29-Apr-16
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1225/2A	10-Feb-15	10-Feb-16
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	10-Feb-15	10-Feb-16
4114	Antenna, Double-Ridged Waveguide Horn, 1 to 18 GHz	ETS Lindgren	3117	00123515	19-Dec-14	19-Dec-15
4224	Precision Fixed Attenuator, 50 Ohm, 5W, 10dB, DC to 18000 MHz	Mini-Circuits	BW-N10W5+	NA	09-Mar-15	09-Mar-16
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 003	15-Mar-15	15-Mar-16
4527	DC block , 50 Ohm, 10 MHz to 6 GHz	Mini-Circuits	BLK-6-N+	NA	13-Jan-15	13-Jan-17
4575	EXA Signal Analyzer, 9 kHz - 26.5 GHz	Agilent Technologies	N9010A	MY480301 10	05-Feb-15	05-Feb-16
4722	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	51228701 001	31-Aug-15	31-Aug-16
4856	Amplifier, solid state, 18 GHz to 40 GHz, 20 dBm output power	Quinstar Technology	QGW-18402023-JO	167790010 01	03-Apr-15	03-Apr-16
4922	Low Pass Filter, 50 Ohm, DC to 630 MHz, SMA/M-SMA/F	Mini-Circuits	VLF-630+	NA	01-Oct-15	01-Oct-17
4932	Microwave preamplifier, 500 MHz to 18 GHz, 40 dB Gain	Com-Power Corporation	PAM-118A	551029	18-Nov-14	18-Nov-15

*Calibration was valid at the testing time.

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB 12.4 GHz to 40 GHz: ± 2.3 dB
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
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

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 laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.
Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file number IC 2186A-1 for OATS), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, 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 IL1001.

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11 APPENDIX D Specification references

FCC 47CFR part 15: 2015	Radio Frequency Devices
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-247 Issue 1: 2015	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence- Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4: 2014	General Requirements for Compliance of Radio Apparatus

12 APPENDIX E Test equipment correction factors

Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories, HL 0447

Frequency, kHz	Correction factor, dB
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

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

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

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

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

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

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

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

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

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

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

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

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

Antenna factor
Double-ridged waveguide horn antenna
ETS Lindgren, Model 3117, serial number: 00123515, HL 4114

Frequency, MHz	Antenna factor, dB/m		
	Measured	Manufacturer	Deviation
1000	28.0	28.4	-0.4
1500	28.0	27.4	0.6
2000	31.2	30.9	0.3
2500	32.5	33.4	-0.9
3000	32.9	32.6	0.3
3500	32.7	32.8	-0.1
4000	33.1	33.4	-0.3
4500	33.8	33.9	-0.1
5000	33.8	34.1	-0.3
5500	34.4	34.5	-0.1
6000	35.0	35.2	-0.2
6500	35.4	35.5	-0.1
7000	35.7	35.7	0.0
7500	35.9	35.7	0.2
8000	35.8	35.8	0.0
8500	35.9	35.8	0.1
9000	36.3	36.2	0.1
9500	36.6	36.6	0.0
10000	37.1	37.1	0.0
10500	37.6	37.5	0.1
11000	37.9	37.7	0.2
11500	38.5	38.1	0.4
12000	39.2	38.7	0.5
12500	39.0	38.9	0.1
13000	39.1	39.1	0.0
13500	38.9	38.8	0.1
14000	39.0	38.8	0.2
14500	39.6	39.9	-0.3
15000	39.9	39.7	0.2
15500	39.9	40.1	-0.2
16000	40.7	40.8	-0.1
16500	41.3	41.8	-0.5
17000	42.5	42.1	0.4
17500	41.3	41.2	0.1
18000	41.4	40.9	0.5

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

Cable loss
Cable coaxial, RG-214/U, N type-N type, 17 m
Teldor, HL 3612

Frequency, MHz	Cable loss, dB
0.1	0.05
0.5	0.07
1	0.10
3	0.22
5	0.29
10	0.39
30	0.68
50	0.90
100	1.27
150	1.58
200	1.80
250	2.12
300	2.36
350	2.60
400	2.82
450	2.99
500	3.23
550	3.40
600	3.56
650	3.71
700	3.90
750	4.04
800	4.23
850	4.39
900	4.55
950	4.65
1000	4.79

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
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		

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M, NC29-N1N1-244, S/N 51228701001
HL 4722

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.22	9000	2.93
100	0.30	9500	3.06
300	0.52	10000	3.16
500	0.66	10500	3.20
1000	0.93	11000	3.34
1500	1.15	11500	3.39
2000	1.33	12000	3.48
2500	1.49	12500	3.55
3000	1.64	13000	3.66
3500	1.77	13500	3.75
4000	1.90	14000	3.76
4500	2.03	14500	3.87
5000	2.17	15000	3.98
5500	2.30	15500	4.01
6000	2.39	16000	4.14
6500	2.51	16500	4.15
7000	2.59	17000	4.32
7500	2.67	17500	4.36
8000	2.76	18000	4.38
8500	2.84		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

END OF DOCUMENT