FCC Test Report

Equipment **Model No.**	:	**Powerline 200 WiFi Range Extender** **XAVN2001v2**
Equipment **Model No.**	:	**Powerline 500 WiFi Range Extender** **XWN5001**
Brand Name	:	**NETGEAR**
FCC ID	:	**PY312200195**
Standard	:	**47 CFR FCC Part 15.247**
Applicant	:	**NETGEAR, INC.** **350 East Plumeria Drive, San Jose, CA 95134, United States**
Manufacturer	:	**DELTA NETWORKS, INC.** **252, Shang Ying Road, Kuei San Taoyuan Shien 333, Taiwan, R.O.C.**

The product sample received on Jun. 06, 2012 and completely tested on Jun. 19, 2012. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Wayne Hsu / Assistant Manager

Testing Laboratory
1190

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Summary of Test Result

Conformance Test Specifications					
Report Clause	**Ref. Std. Clause**	**Description**	**Measured**	**Limit**	**Result**
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	0.16241MHz: 41.83dBuV (13.51dB) - AV 53.07dBuV (12.27dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	6dB Bandwidth Unit [MHz] 2412-2462MHz: 10.34-DSSS 2412-2462MHz: 17.80-OFDM 2422-2452MHz: 36.36-OFDM	≥500kHz	Complied
3.3	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm] 2412-2462MHz: 25.76-DSSS 2412-2462MHz: 27.28-OFDM 2422-2452MHz: 25.71-OFDM	Power [dBm] 2412-2462MHz: 30 2422-2452MHz: 30	Complied
3.4	15.247(d)	Power Spectral Density	PSD [dBm/3kHz] 2412-2462MHz: -8.06-DSSS 2412-2462MHz: -11.27-OFDM 2422-2452MHz: -14.89-OFDM	PSD [dBm/3kHz] 2412-2462MHz: 8 2422-2452MHz: 8	Complied
3.5	15.247(c)	Transmitter Radiated Bandedge Emissions	Non-Restricted Bands: 2400.00MHz: 29.62dB Restricted Bands [dBuV/m at 3m]: 2484.56MHz: 67.52 (Margin 6.48dB) - PK 52.86 (Margin 1.14dB) - AV	Non-Restricted Bands: > 20 dB Restricted Bands: FCC 15.209	Complied
3.6	15.247(c)	Transmitter Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 4824.00MHz: 59.55 (Margin 14.45dB) - PK 53.00 (Margin 1dB) - AV	Non-Restricted Bands: > 20 dB Restricted Bands: FCC 15.209	Complied

Revision History

Report No.	Version	Description	Issued Date
FR260110	Rev. 01	Initial issue of report	Jun. 28, 2012

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information				
Frequency Range (MHz)	**IEEE Std. 802.11 Protocol**	**Ch. Frequency (MHz)**	**Channel Number**	**RF Output Power (dBm)**
2400-2483.5	b	2412-2462	1-11 [11]	25.76
2400-2483.5	g	2412-2462	1-11 [11]	27.28
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	26.31
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	25.71

Note 1: IEEE Std. 802.11-2007 modulation consists of IEEE Std. 802.11g-2003 and IEEE Std. 802.11b-1999.
Note 2: IEEE Std. 802.11n-2009 modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40.
Note 3: RF output power specifies that Maximum Peak Conducted Output Power.

Transmitter Chains & Receiver Chains Information					
IEEE Std. 802.11 Protocol	**Number of Transmit Chains (N_{TX})**	**Number of Receive Chains (N_{RX})**	**Correlation Signals with Multiple N_{TX}**	**99% Emission Bandwidth (MHz)**	**Co-location**
b	2	2	N/A	14.25	N/A
g	2	2	Correlated	18.63	N/A
n (HT20)	2	2	Uncorrelated	18.11	N/A
n (HT40)	2	2	Uncorrelated	37.74	N/A

Note 1: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)

1.1.2 Antenna Information

Antenna Category	
☐	Equipment placed on the market without antennas
☒	Integral antenna (antenna permanently attached)
	☒ Temporary RF connector provided
	☐ No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
☐	External antenna (dedicated antennas)
	☐ Single power level with corresponding antenna(s). Power Level (PL): 1
	☐ Multiple power level and corresponding antenna(s). Power Level (PL): 1~…
	☐ No RF connector provided
	☐ Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
	☐ RF connector provided
	☐ Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type…)
	☐ Standard antenna connector. (e.g., SMA, N, BNC, and TNC type…)

Antenna General Information							
Antenna Port (Total 2 Port)					1(TX/RX), 2(TX/RX)		
Maximum RF Output Power Level (PL)					1		
Transmit Chains Power Distribution					☒ symmetrical distribution ☐ asymmetrical distribution		
Ant. No.	**PL**	**Ant. Port** [Ant No. *X* connect to Ant. Port *Y*]	**Ant. Cat.**	**Ant. Type**	**G_{ANT} (dBi)**	**DG (dBi)** [correlated] **N_{TX} = 2**	**DG (dBi)** [uncorrelated] **N_{TX} = 2**
1	1	1	Integral	PIFA	2.41	5.7	2.7
		2	Integral	PIFA	3.02		
☒	The equipment is normally installed and point-to-point or point-to-multipoint systems.						

Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain (DG) = G_{ANT} + 10 log(N) dBi
All transmit signals are completely uncorrelated, Directional Gain (DG)= G_{ANT}

Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain (DG) =
$10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N]$ dBi
All transmit signals are completely uncorrelated, Directional Gain (DG) =
$10 \log[(10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10})/N]$ dBi

1.1.3 Type of EUT

Identify EUT	
Presentation of Equipment	☐ Production ; ☒ Pre-Production ; ☐ Prototype
Type of EUT	
☒	Stand-alone
☐	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: …
☐	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: …
☐	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle		
☐ Operated normally mode for worst duty cycle		
☒ Operated test mode for worst duty cycle		
Test Signal Duty Cycle (x)	**Power Duty Factor [dB] – (10 log 1/x)**	**Voltage Duty Factor [dB] – (20 log 1/x)**
☒ 100% - IEEE 802.11b	0	0
☒ 100% - IEEE 802.11g	0	0
☒ 100% - IEEE 802.11n (HT20)	0	0
☒ 100% - IEEE 802.11n (HT40)	0	0

1.1.5 EUT Operational Condition

Supply Voltage	☒ AC mains	☐ DC	
Type of DC Source	☒ Internal DC supply	☐ External DC adapter	☐ Battery

1.2 Accessories and Support Equipment

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**Serial No.**
1	Notebook	DELL	E6220	FCC ID. QDS-BRCM1005-D
2	Mouse	Logitech M90	M-U0026	DoC
3	Earphone	E-books	E-EPC040	N/A
4	Notebook (Remote Workstation)	DELL	1340	FCC ID. E2K4965AGNM
5	Notebook (Remote Workstation)	DELL	M1330	FCC ID. E2K4965AGNM

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2009
- FCC KDB 558074 D01 - Guidance for Performing Compliance Measurements on DTS
- FCC KDB 662911 - Emissions Testing of Transmitters with Multiple Outputs
- FCC KDB 412172 - Guidelines for Determining the ERP and EIRP

1.4 Testing Location Information

Testing Location					
☒	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.			
		TEL : 886-3-327-3456 FAX : 886-3-318-0055			
☒	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.			
		TEL : 886-3-656-9065 FAX : 886-3-656-9085			
Test Condition		**Test Site No.**	**Test Engineer**	**Test Environment**	**Test Date**
RF Conducted		TH06-HY	Shiming	29.2°C / 64%	13-Jun-12
AC Conduction		CO01-CB	Kane	24°C / 66%	07-Jun-12
Radiated Emission		03CH02-HY	Hsiao	25.2°C / 54%	13-Jun-12 ~ 19-Jun-12

1.5 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty			
Test Item		**Uncertainty**	**Limit**
AC power-line conducted emissions		±2.26 dB	N/A
Emission bandwidth, 6dB bandwidth		±1.42 %	N/A
RF output power, conducted		±0.63 dB	N/A
Power density, conducted		±0.81 dB	N/A
Unwanted emissions, conducted	30 – 1000 MHz	±0.51 dB	N/A
	1 – 18 GHz	±0.67 dB	N/A
	18 – 40 GHz	±0.83 dB	N/A
	40 – 200 GHz	N/A	N/A
All emissions, radiated	30 – 1000 MHz	±2.56 dB	N/A
	1 – 18 GHz	±3.59 dB	N/A
	18 – 40 GHz	±3.82 dB	N/A
	40 – 200 GHz	N/A	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.42 %	N/A
Duty Cycle		±1.42 %	N/A

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing						
Power Level		1				
IEEE 802.11 Protocol	**Number of Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Worst Data Rate / MCS**	**Worst Modulation Mode**	**RF Output Power (dBm)**	**Power Spectral Density (dBm/3kHz)**
b	2	1-11 Mbps	11Mbps	11B-20M	25.76	-8.06
g	2	6-54 Mbps	6Mbps	11G-20M	27.28	-11.27
n (HT20)	2	MCS 0-15	MCS 8	11N2.4G-20M	26.31	-11.92
n (HT40)	2	MCS 0-15	MCS 8	11N2.4G-40M	25.71	-14.89

Note 1: IEEE Std. 802.11-2007 modulation consists of IEEE Std. 802.11g-2003 and IEEE Std. 802.11b-1999.
Note 2: IEEE Std. 802.11n-2009 modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Worst modulation mode of Guard Interval (GI) is 400ns.
Note 3: Modulation modes consist of 11B-20M, 11G-20M, 11N2.4G-20M, 11N2.4G-40M:
11B: IEEE 802.11b, 11G: IEEE 802.11g, 11N2.4G: IEEE 802.11n (2.4GHz Band)
20M/40M: Channel Bandwidth 20MHz/40MHz
Note 4: RF output power specifies that Maximum Peak Conducted Output Power.

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration		
IEEE 802.11 Protocol	**Worst Modulation Mode**	**Test Channel Frequencies (MHz) – FX (Frequencies Abbreviations)**
b	11B-20M	2412-(F1), 2437-(F2), 2462-(F3)
g	11G-20M	2412-(F1), 2437-(F2), 2462-(F3)
n (HT20)	11N2.4G-20M	2412-(F1), 2437-(F2), 2462-(F3)
n (HT40)	11N2.4G-40M	2422-(F4), 2437-(F5), 2452-(F6)

Note 1: Modulation modes consist of 11B-20M, 11G-20M, 11N2.4G-20M, 11N2.4G-40M:
11B: IEEE 802.11b, 11G: IEEE 802.11g, 11N2.4G: IEEE 802.11n (2.4GHz Band)
20M/40M: Channel Bandwidth 20M/40M

2.3 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter					
Power Level		1			
Test Software Version		Atheros Radio Test 2 (ART2-GUI)			
Worst Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Frequency (MHz)**	**Power Setting**	**Worst Data Rate / MCS**	**RF Output Power (dBm)**
11B-20M	2	2412	15.5 ; 15.5	11 Mbps	23.81
11B-20M	2	2437	15 ; 15	11 Mbps	23.89
11B-20M	2	2462	17 ; 17	11 Mbps	25.76
11G-20M	2	2412	11.5	6 Mbps	21.91
11G-20M	2	2437	17	6 Mbps	27.28
11G-20M	2	2462	9.5	6 Mbps	20.42
11N2.4G-20M	2	2412	10 ; 10	MCS 8	20.56
11N2.4G-20M	2	2437	16 ; 16	MCS 8	26.31
11N2.4G-20M	2	2462	9.5 ; 9.5	MCS 8	20.63
11N2.4G-40M	2	2422	7.5 ; 7.5	MCS 8	18.19
11N2.4G-40M	2	2437	15 ; 15	MCS 8	25.71
11N2.4G-40M	2	2452	8 ; 8	MCS 8	19.45

Note 1: Modulation modes consist of 11B-20M, 11G-20M, 11N2.4G-20M, 11N2.4G-40M:
11B: IEEE 802.11b, 11G: IEEE 802.11g, 11N2.4G: IEEE 802.11n (2.4GHz Band)
20M/40M: Channel Bandwidth 20MHz/40MHz
Note 2: RF output power specifies that Maximum Peak Conducted Output Power.

2.4 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests				
Tests Item	AC power-line conducted emissions			
Condition	AC power-line conducted measurement for line and neutral			
Operating Mode	**Operating Mode Description**	**Worst Modulation Mode**	**Test Freq.**	**Power Level**
1	Normal Link	11N2.4G-20M	F2	1

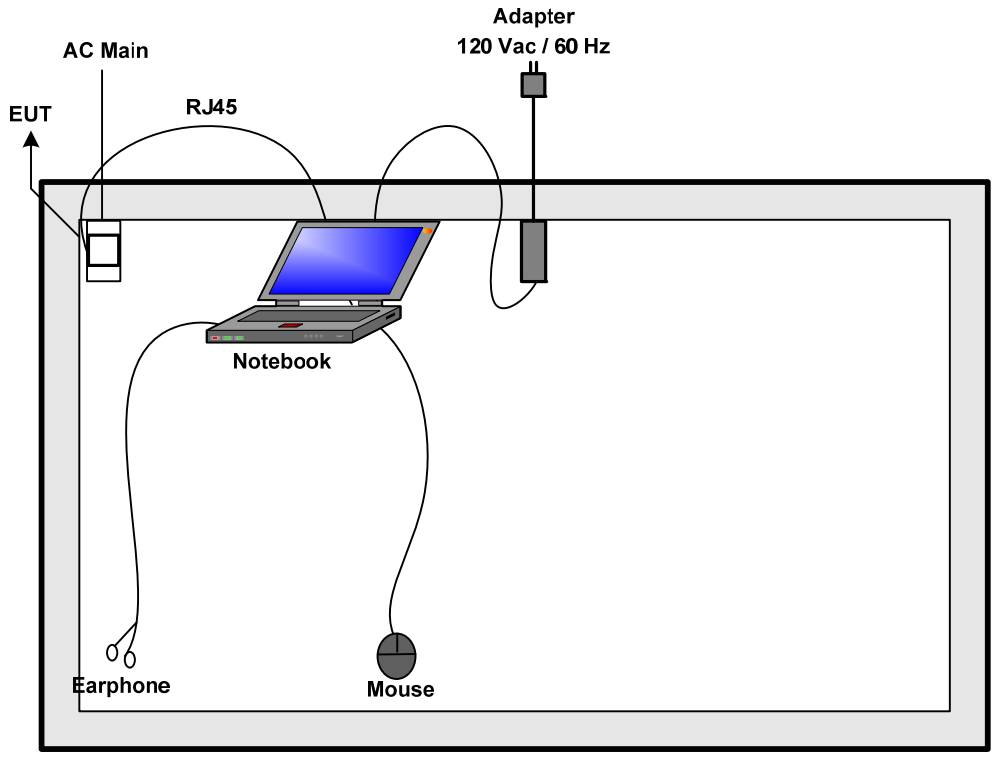
The Worst Case Mode for Following Conformance Tests				
Tests Item	RF Output Power Power Spectral Density 6 dB Bandwidth			
Test Condition	Conducted measurement at transmit chains			
Worst Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Worst Data Rate / MCS**	**Test Frequency**	**Power Level**
11B-20M	2	11Mbps	F1, F2, F3	1
11G-20M	2	6Mbps	F1, F2, F3	1
11N2.4G-20M	2	MCS 8	F1, F2, F3	1
11N2.4G-40M	2	MCS 8	F4, F5, F6	1

The Worst Case Mode for Following Conformance Tests				
Tests Item	Transmitter Radiated Bandedge Emissions			
Test Condition	Radiated measurement			
Worst Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Worst Data Rate / MCS**	**Test Frequency**	**Power Level**
11B-20M	2	11Mbps	F1, F3	1
11G-20M	2	6Mbps	F1, F3	1
11N2.4G-20M	2	MCS 8	F1, F3	1
11N2.4G-40M	2	MCS 8	F4, F6	1

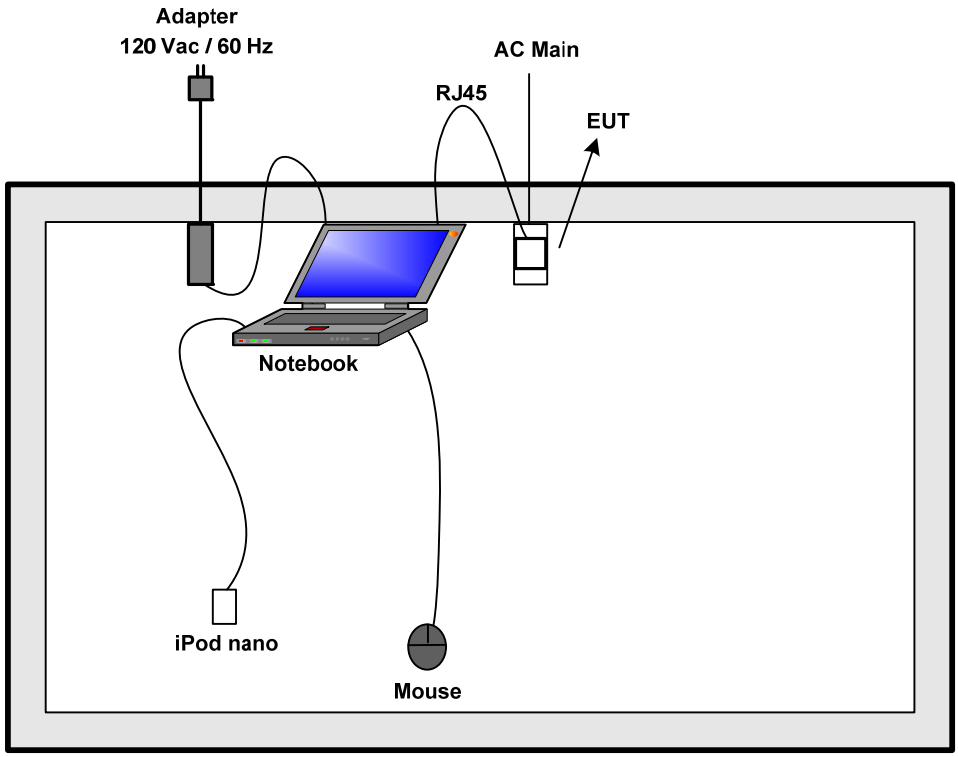
The Worst Case Mode for Following Conformance Tests						
Tests Item	Transmitter Radiated Unwanted Emissions					
Test Condition	Radiated measurement					
User Position	☒ EUT will be placed in fixed position.					
	☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two or three orthogonal planes.					
	☐ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes.					
Operating Mode < 1GHz	☒ 1. Normal Link					
Worst Modulation Mode	**Number of Transmit Chains (N_{TX})**	**Worst Data Rate / MCS**	**Test Frequency**	**Power Level**	**Ant No.**	**Worst Orthogonal Planes of EUT**
11B-20M	2	11Mbps	F1, F2, F3	1	1	X Plane
11G-20M	2	6Mbps	F1, F2, F3	1	1	X Plane
11N2.4G-20M	2	MCS 8	F1, F2, F3	1	1	X Plane
11N2.4G-40M	2	MCS 8	F4, F5, F6	1	1	X Plane
Orthogonal Planes of EUT	**X Plane**		**Y Plane**		**Z Plane**	
						

2.5 Test Setup Diagram

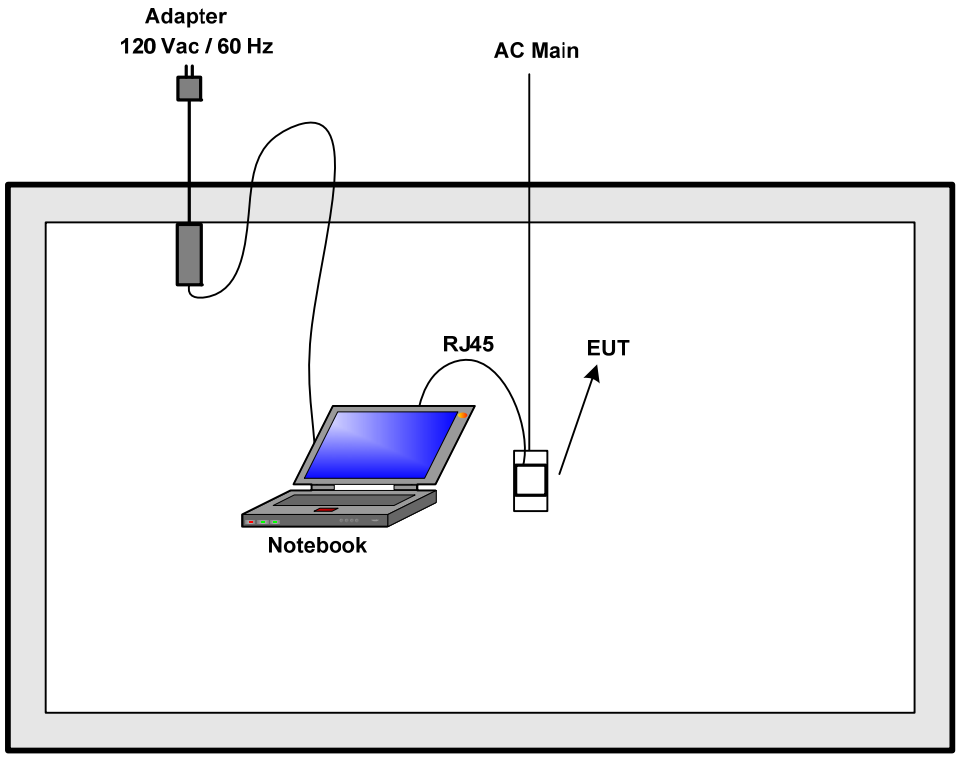
Test Setup Diagram – AC Line Conducted Emission Test	
Operating Mode	**Normal Link**



Test Setup Diagram - Radiated Test	
Operating Mode	**Normal Link (Below 1GHz)**



Operating Mode	**Normal (Above 1GHz)**



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments

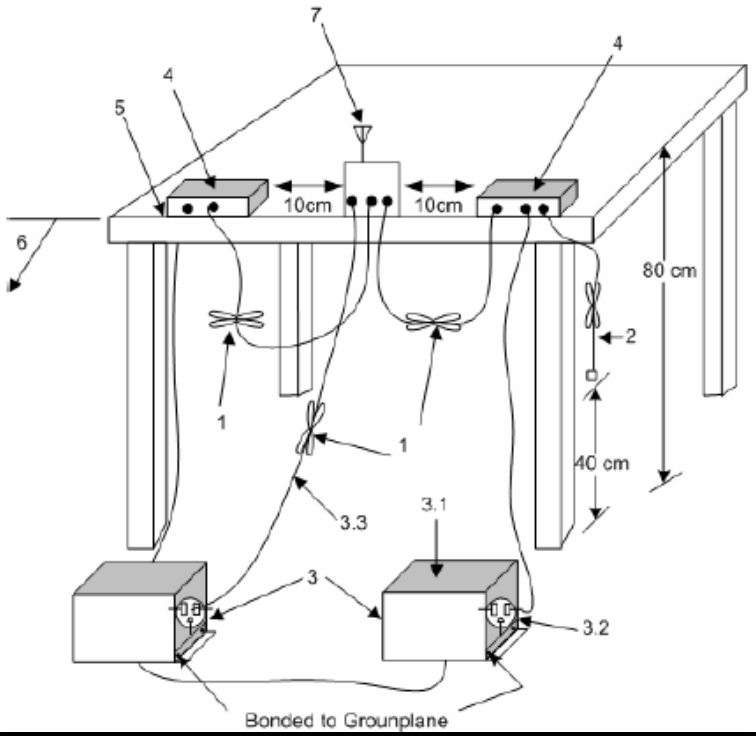
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method
☒ Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

AC Power-line Conducted Emissions



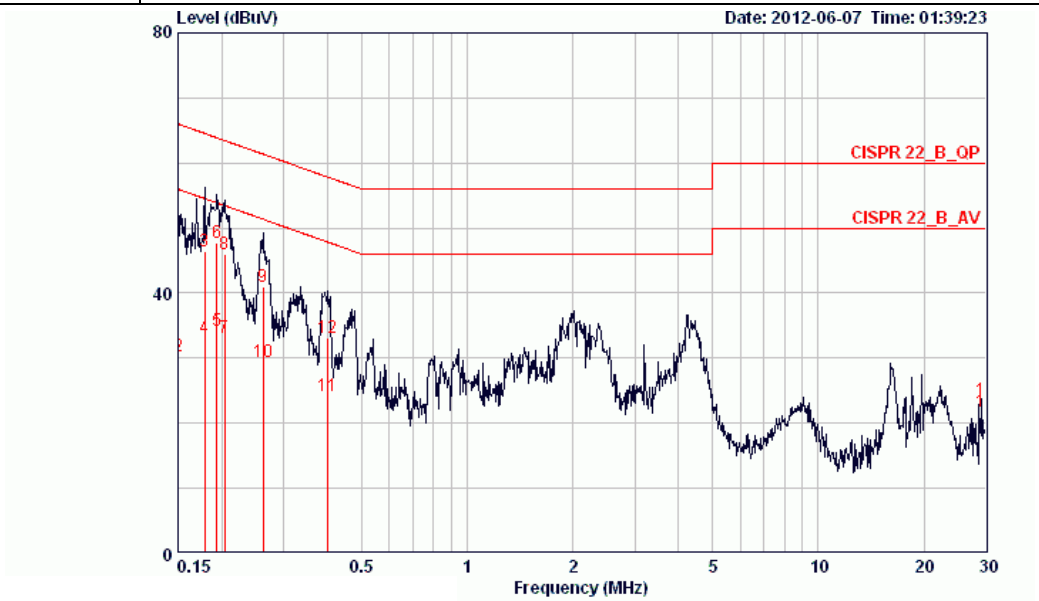
3.1.5 Test Result of AC Power-line Conducted Emissions

AC Power-line Conducted Emissions Result					
Modulation Mode	11N2.4G-20M	**Power Level**	1	**Test Freq. (FX)**	F2
Operating Mode	1	**Ant. No.**	1	**Power Phase**	Neutral
Operating Function	Normal Link				

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.16241	53.07	-12.27	65.34	52.81	0.06	0.20	QP
2 @	0.16241	41.83	-13.51	55.34	41.57	0.06	0.20	AVERAGE
3 @	0.16501	39.57	-15.64	55.21	39.31	0.06	0.20	AVERAGE
4 @	0.16501	52.55	-12.66	65.21	52.29	0.06	0.20	QP
5 @	0.17491	46.89	-17.83	64.72	46.64	0.05	0.20	QP
6 @	0.17491	34.76	-19.96	54.72	34.51	0.05	0.20	AVERAGE
7 @	0.19447	45.88	-17.96	63.84	45.63	0.05	0.20	QP
8 @	0.19447	34.88	-18.96	53.84	34.63	0.05	0.20	AVERAGE
9	0.22918	42.41	-20.07	62.48	42.16	0.05	0.20	QP
10	0.22918	30.99	-21.49	52.48	30.74	0.05	0.20	AVERAGE
11 @	0.26164	31.85	-19.53	51.38	31.60	0.05	0.20	AVERAGE
12	0.26164	40.19	-21.19	61.38	39.94	0.05	0.20	QP

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)

AC Power-line Conducted Emissions Result					
Modulation Mode	11N2.4G-20M	**Power Level**	1	**Test Freq. (FX)**	F2
Operating Mode	1	**Ant. No.**	1	**Power Phase**	Line
Operating Function	Normal Link				



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15000	44.44	-21.56	66.00	44.18	0.06	0.20	QP
2	0.15000	30.36	-25.64	56.00	30.10	0.06	0.20	AVERAGE
3 @	0.17866	46.38	-18.16	64.55	46.13	0.05	0.20	QP
4	0.17866	33.18	-21.36	54.55	32.93	0.05	0.20	AVERAGE
5 @	0.19344	34.19	-19.70	53.89	33.94	0.05	0.20	AVERAGE
6 @	0.19344	47.80	-16.09	63.89	47.55	0.05	0.20	QP
7	0.20396	33.03	-20.42	53.45	32.78	0.05	0.20	AVERAGE
8 @	0.20396	46.06	-17.39	63.45	45.81	0.05	0.20	QP
9	0.26164	40.99	-20.38	61.38	40.76	0.03	0.20	QP
10	0.26164	29.36	-22.01	51.38	29.13	0.03	0.20	AVERAGE
11	0.40187	24.20	-23.61	47.81	23.99	0.01	0.20	AVERAGE
12	0.40187	33.16	-24.65	57.81	32.95	0.01	0.20	QP
13	30.000	21.81	-28.19	50.00	20.85	0.36	0.60	AVERAGE
14	30.000	23.58	-36.42	60.00	22.62	0.36	0.60	QP

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

3.2 6dB Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
☒ 6 dB bandwidth ≥ 500 kHz.

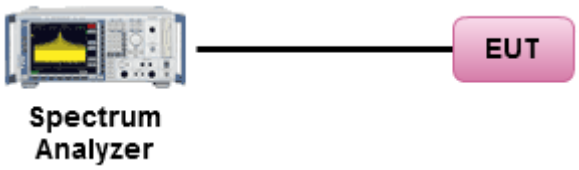
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method			
☒	For the emission bandwidth shall be measured using one of the options below:		
	☒	Refer as FCC KDB 558074, clause 5.1.1 Option 1 for 6 dB bandwidth measurement.	
	☐	Refer as FCC KDB 558074, clause 5.1.2 Option 2 for 6 dB bandwidth measurement.	
	☐	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.	
☒	For conducted measurement.		
	☒	For conducted measurements on devices with multiple transmit chains using options given below:	
		☐	Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 3.
		☒	Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.
		☐	Option 3: A power splitter/combiner shall be used to combine all the transmit chains (antenna outputs) into a single test point and record a single test point EBW.
☐	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.		

3.2.4 Test Setup

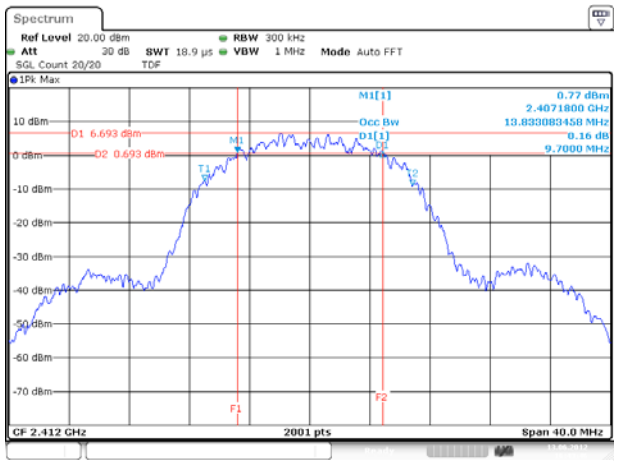
Emission Bandwidth


3.2.5 Test Result of Emission Bandwidth

Emission Bandwidth Result										
Power Level	**1**		**Emission Bandwidth (MHz)**							
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**99% Bandwidth**				**6dB Bandwidth**			
			Chain-Port 1	**Chain-Port 2**	**-**	**-**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**
11B-20M	2	2412	13.83	13.75	-	-	9.70	9.26	-	-
11B-20M	2	2437	13.89	13.65	-	-	9.66	10.34	-	-
11B-20M	2	2462	14.25	13.81	-	-	9.72	9.80	-	-
11G-20M	2	2412	16.53	16.67	-	-	16.44	16.38	-	-
11G-20M	2	2437	18.63	17.15	-	-	16.34	16.46	-	-
11G-20M	2	2462	16.91	16.83	-	-	16.38	16.32	-	-
11N2.4G-20M	2	2412	17.89	17.77	-	-	17.62	17.80	-	-
11N2.4G-20M	2	2437	18.05	17.93	-	-	17.64	17.54	-	-
11N2.4G-20M	2	2462	17.93	18.11	-	-	17.68	17.34	-	-
11N2.4G-40M	2	2412	36.42	36.42	-	-	36.36	34.72	-	-
11N2.4G-40M	2	2437	37.74	36.94	-	-	36.12	36.24	-	-
11N2.4G-40M	2	2462	36.66	36.34	-	-	35.68	35.92	-	-
Limit			**N/A**				**≥500 kHz**			
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

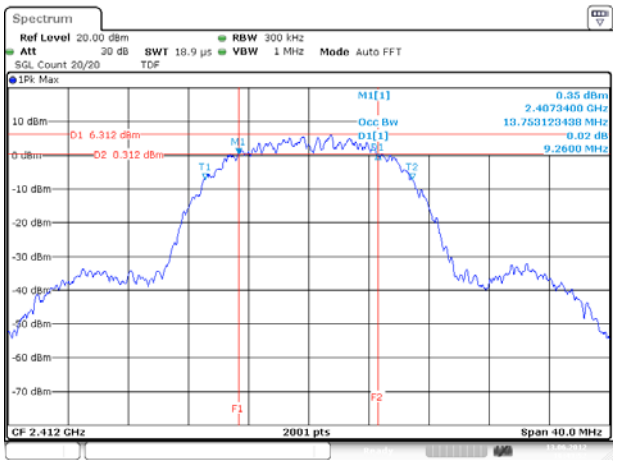
Emission Bandwidth Plots

11B-20M – F1 [Port 1]



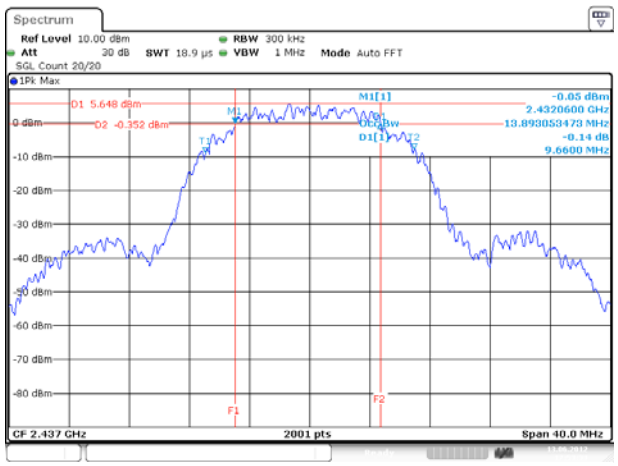
Date: 13.JUN.2012 16:43:45

11B-20M – F1 [Port 2]



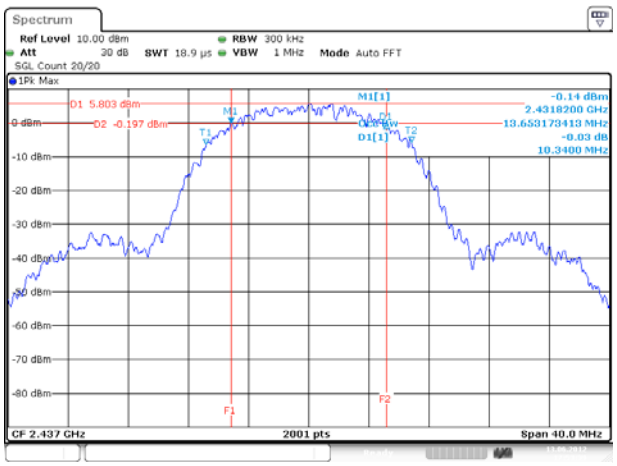
Date: 13.JUN.2012 16:43:52

11B-20M – F2 [Port 1]



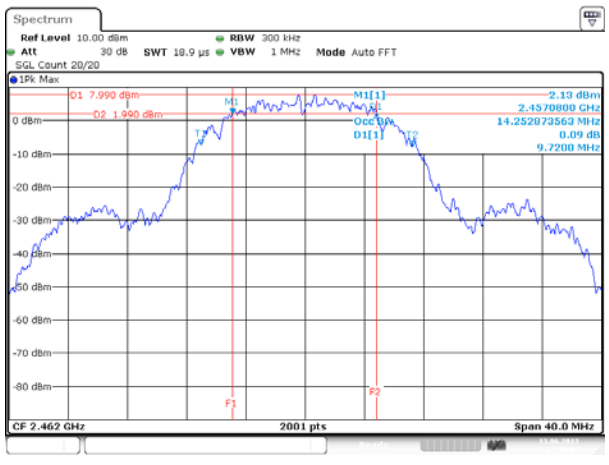
Date: 13.JUN.2012 17:53:33

11B-20M – F2 [Port 2]



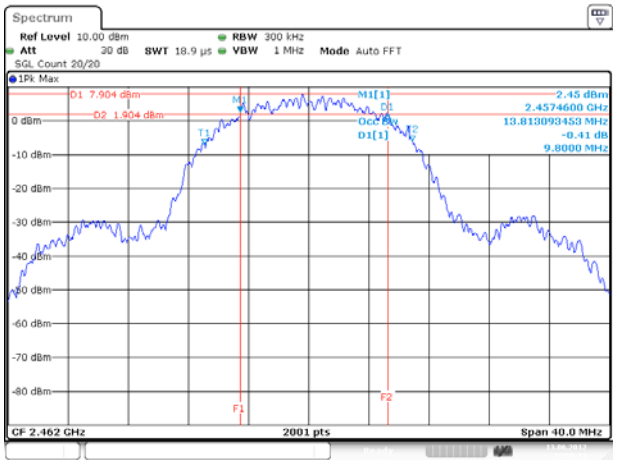
Date: 13.JUN.2012 17:53:40

11B-20M – F3 [Port 1]



Date: 13.JUN.2012 17:58:07

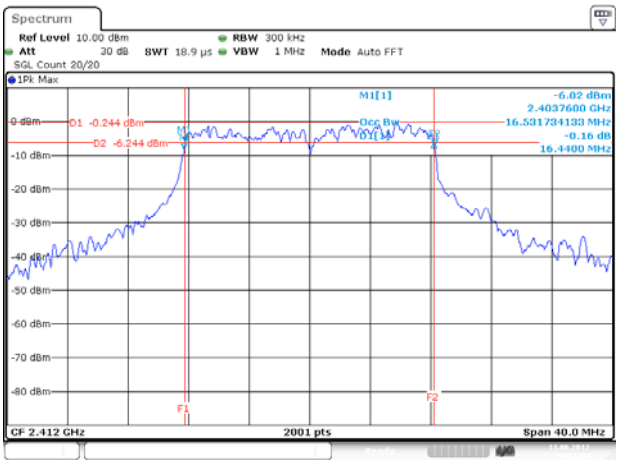
11B-20M – F3 [Port 2]



Date: 13.JUN.2012 17:58:14

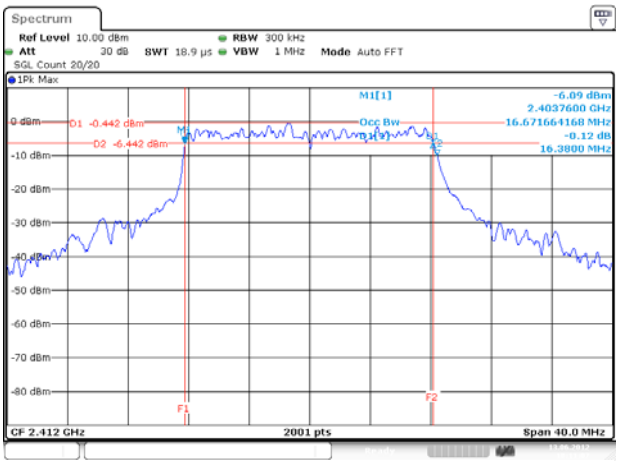
Emission Bandwidth Plots

11G-20M – F1 [Port 1]



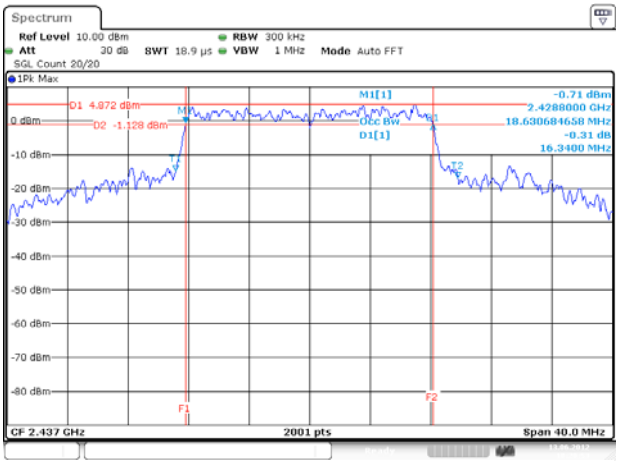
Date: 13.JUN.2012 18:11:01

11G-20M – F1 [Port 2]



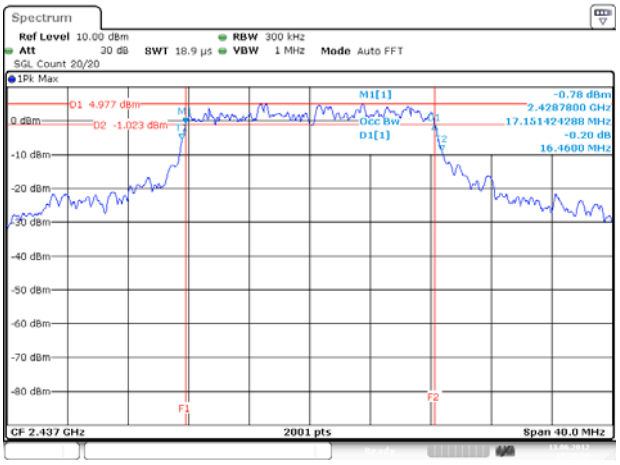
Date: 13.JUN.2012 18:11:07

11G-20M – F2 [Port 1]



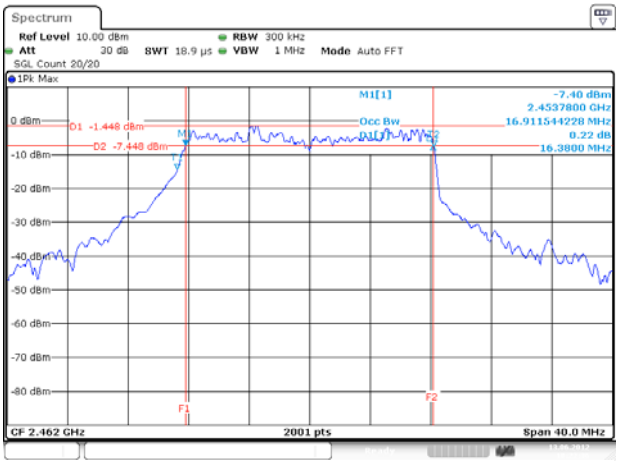
Date: 13.JUN.2012 18:20:52

11G-20M – F2 [Port 2]



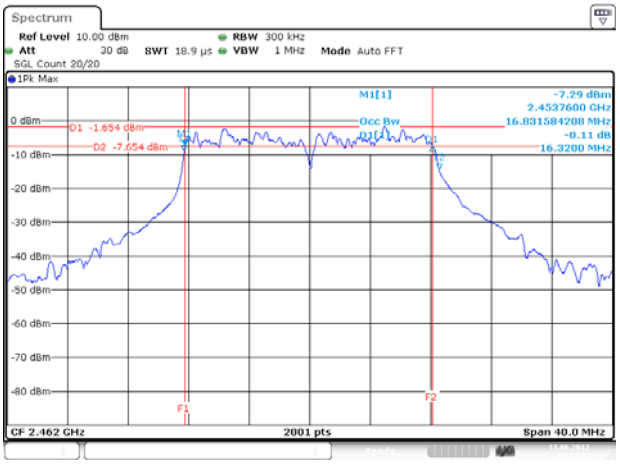
Date: 13.JUN.2012 18:20:59

11G-20M – F3 [Port 1]



Date: 13.JUN.2012 18:22:36

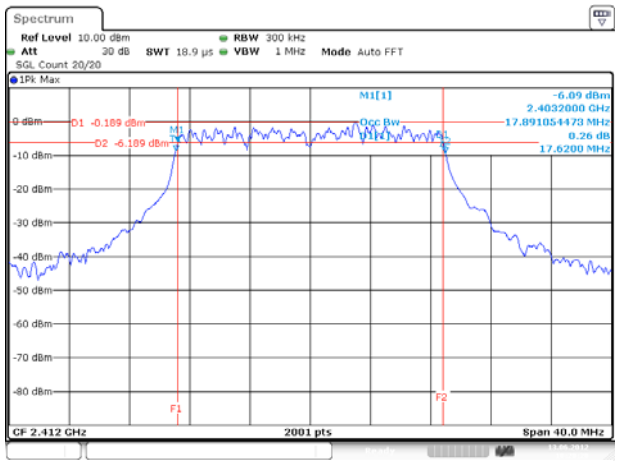
11G-20M – F3 [Port 2]



Date: 13.JUN.2012 18:22:43

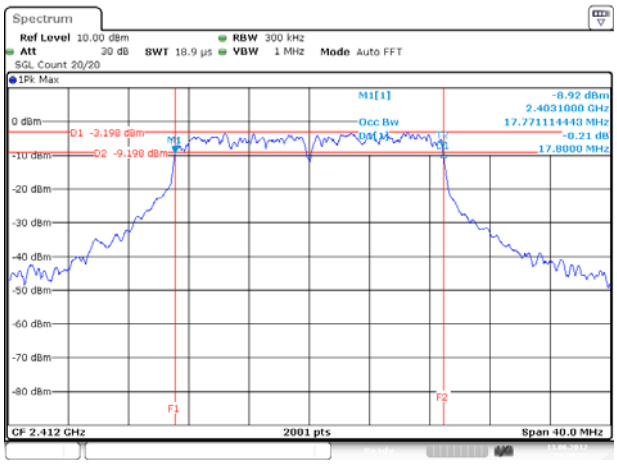
Emission Bandwidth Plots

11N2.4G-20M – F1 [Port 1]



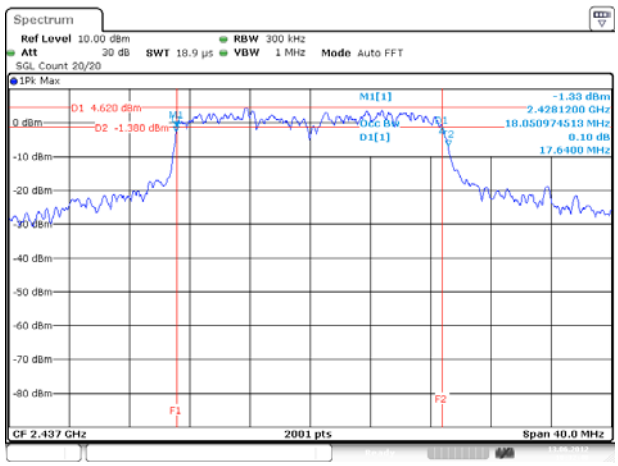
Date: 13.JUN.2012 18:28:29

11N2.4G-20M – F1 [Port 2]



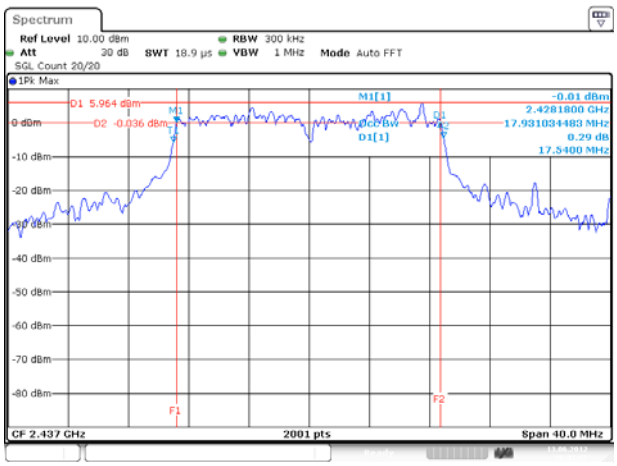
Date: 13.JUN.2012 18:28:35

11N2.4G-20M – F2 [Port 1]



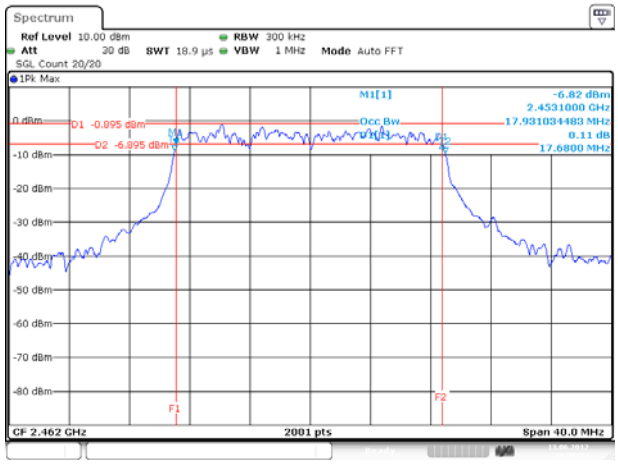
Date: 13.JUN.2012 18:32:49

11N2.4G-20M – F2 [Port 2]



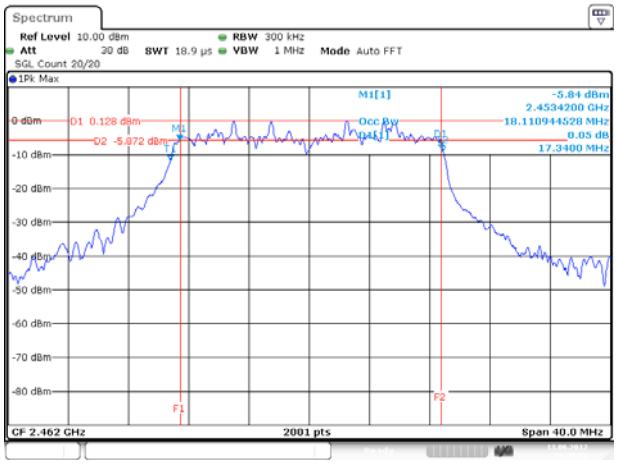
Date: 13.JUN.2012 18:32:56

11N2.4G-20M – F3 [Port 1]



Date: 13.JUN.2012 18:35:53

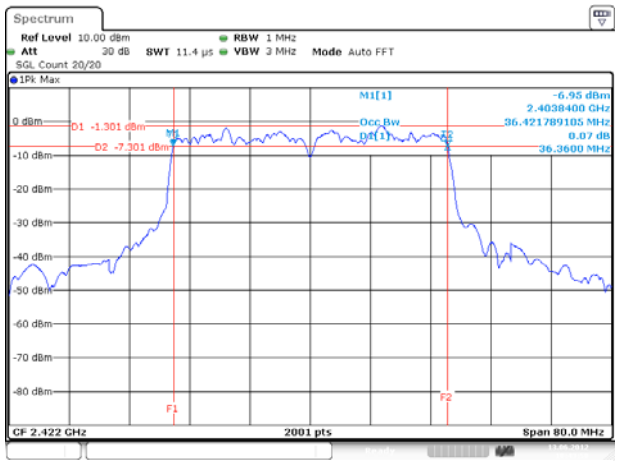
11N2.4G-20M – F3 [Port 2]



Date: 13.JUN.2012 18:36:00

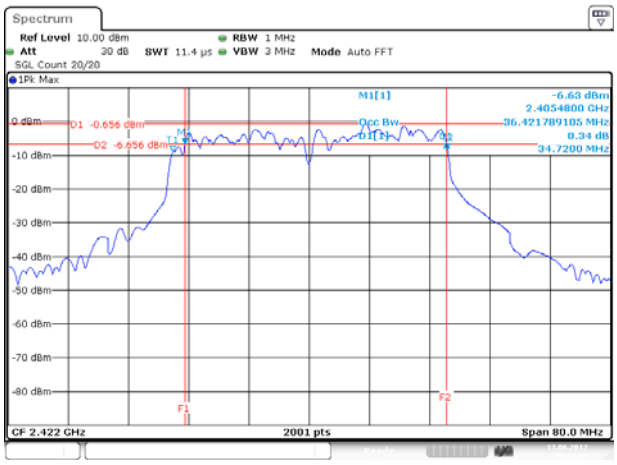
Emission Bandwidth Plots

11N2.4G-40M – F4 [Port 1]



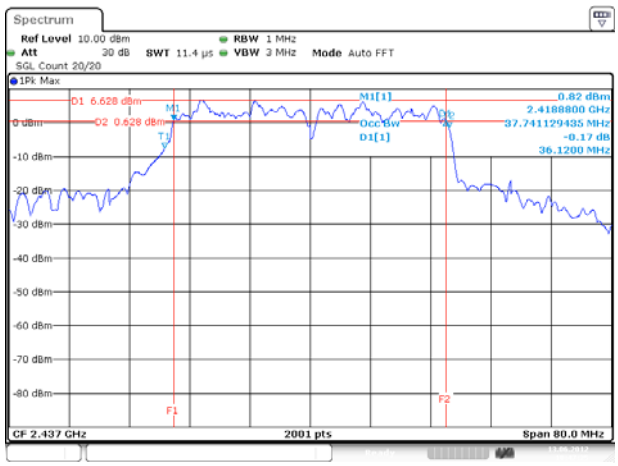
Date: 13.JUN.2012 18:43:58

11N2.4G-40M – F4 [Port 2]



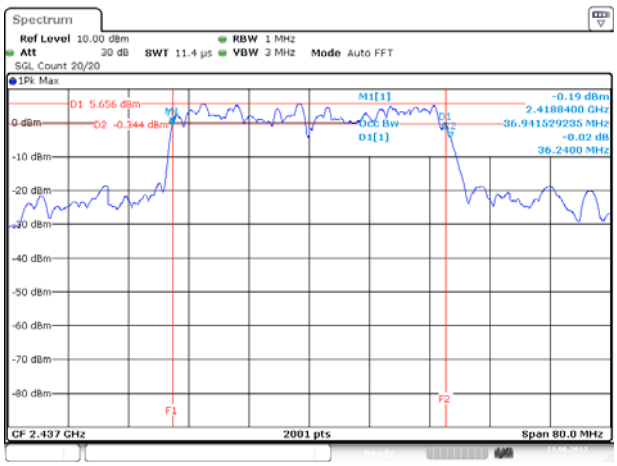
Date: 13.JUN.2012 18:44:05

11N2.4G-40M – F5 [Port 1]



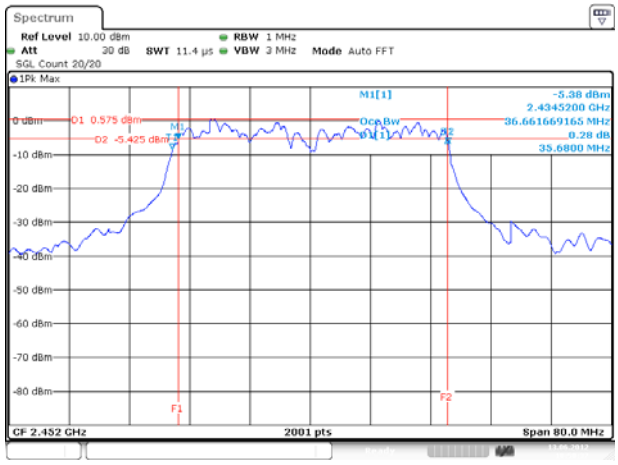
Date: 13.JUN.2012 18:47:26

11N2.4G-40M – F5 [Port 2]



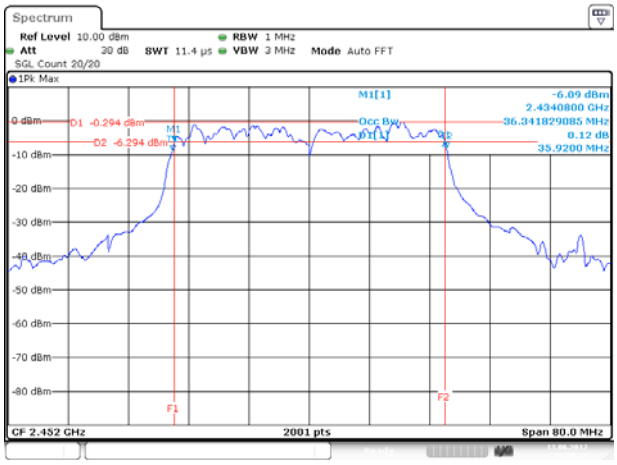
Date: 13.JUN.2012 18:47:33

11N2.4G-40M – F6 [Port 1]



Date: 13.JUN.2012 18:50:38

11N2.4G-40M – F6 [Port 2]



Date: 13.JUN.2012 18:50:45

3.3 RF Output Power

3.3.1 RF Output Power Limit

RF Output Power Limit			
Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit			
☐	902-928 MHz Band:		
	☐	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)	
	☐	If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)$ dBm	
☒	2400-2483.5 MHz Band:		
	☒	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)	
	☒	Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)$ dBm	
	☐	Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm	
	☐	Smart antenna system (SAS):	
		☐	Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm
		☐	Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm
		☐	Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3 + 8$dB dBm
☐	5725-5850 MHz Band:		
	☐	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)	
	☐	Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)$ dBm	
	☐	Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30$ dBm	
e.i.r.p. Power Limit:			
☐	902-928 MHz Band: $P_{eirp} \leq 36$ dBm (4 W)		
☒	2400-2483.5 MHz Band		
	☒	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)	
	☐	Point-to-point systems (P2P): $P_{eirp} \leq MAX(36, [P_{Out} + G_{TX}])$ dBm	
	☐	Smart antenna system (SAS)	
		☐	Single beam: $P_{eirp} \leq MAX(36, P_{Out} + G_{TX})$ dBm
		☐	Overlap beam: $P_{eirp} \leq MAX(36, P_{Out} + G_{TX})$ dBm
		☐	Aggregate power on all beams: $P_{eirp} \leq MAX(36, [P_{Out} + G_{TX} + 8])$ dBm
☐	5725-5850 MHz Band		
	☐	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)	
	☐	Point-to-point systems (P2P): N/A	
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, **G_{TX}** = the maximum transmitting antenna directional gain in dBi. **P_{eirp}** = e.i.r.p. Power in dBm.			

3.3.2 Measuring Instruments

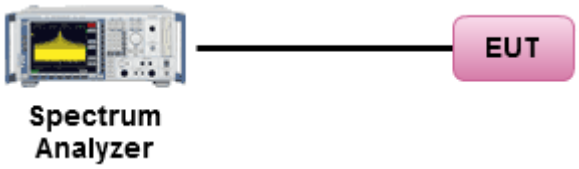
Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method		
☒	Maximum Peak Conducted Output Power	
	☐	Refer as FCC KDB 558074, clause 5.2.1.1 Option 1 (RBW > EBW method).
	☒	Refer as FCC KDB 558074, clause 5.2.1.2 Option 2 (integrated band power method).
	☐	Refer as ANSI C63.10, clause 6.10.2.1 a) for peak power meter.
	☐	Refer as ANSI C63.10, clause 6.10.2.1 a) for spectrum analyzer - (RBW ≥ EBW).
	☐	Refer as ANSI C63.10, clause 6.10.2.1 b) for spectrum analyzer - BW correction factor.
☒	Maximum Conducted Output Power	
	☐	Refer as FCC KDB 558074, clause 5.2.2.1 Option 1 (RMS detection with slow sweep speed).
	☒	Refer as FCC KDB 558074, clause 5.2.2.2 Option 2 (spectral trace averaging).
	☐	Refer as ANSI C63.10, clause 6.10.3.1 for spectrum analyzer - Method 1 (trace averaging).
	☐	Refer as ANSI C63.10, clause 6.10.3.2 for spectrum analyzer - Method 2 (zero-span averaging).
	☐	Refer as ANSI C63.10, clause 6.10.3.2 for spectrum analyzer - Method 3 (band power max-hold).
☒	Refer as FCC KDB 558074, clause 2 for conducted measurement.	
	☒	For conducted measurements on devices with multiple transmit chains: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	☒	If multiple transmit chains, EIRP calculation could be following as methods:
		☐ Method 1: $EIRP_1 = P_1 + G_{ANT1}$; $EIRP_2 = P_2 + G_{ANT2}$; … $EIRP_n = Pn + G_{ANTn}$ $EIRP_{total} = EIRP_1 + EIRP_2 + … + EIRP_n$ (calculated in linear unit [mW] and transfer to log unit [dBm])
		☒ Method 2: $P_{total} = P_1 + P_2 + … + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$
☐	Refer as FCC KDB 558074, clause 2 for radiated measurement.	

3.3.4 Test Setup

RF Output Power (Spectrum Analyzer)



3.3.5 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result										
Power Level		1	**RF Output Power (dBm)**							
Directional Gain (dBi)		5.7								
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**	**Sum Chain**	**Power Limit**	**EIRP Power**	**EIRP Limit**
11B-20M	2	2412	21.06	20.53			23.81	30	29.54	36
11B-20M	2	2437	20.74	21.01			23.89	30	29.62	36
11B-20M	2	2462	22.89	22.61			25.76	30	31.49	36
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

Maximum Peak Conducted Output Power Result										
Power Level		1	**RF Output Power (dBm)**							
Directional Gain (dBi)		5.7								
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**	**Sum Chain**	**Power Limit**	**EIRP Power**	**EIRP Limit**
11G-20M	2	2412	18.90	18.90			21.91	30	27.64	36
11G-20M	2	2437	24.35	24.18			27.28	30	33.01	36
11G-20M	2	2462	17.50	17.32			20.42	30	26.15	36
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

Maximum Peak Conducted Output Power Result										
Power Level		1	**RF Output Power (dBm)**							
Directional Gain (dBi)		2.7								
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**	**Sum Chain**	**Power Limit**	**EIRP Power**	**EIRP Limit**
11N2.4G-20M	2	2412	17.88	17.20			20.56	30	23.29	36
11N2.4G-20M	2	2437	23.33	23.26			26.31	30	29.03	36
11N2.4G-20M	2	2462	17.92	17.29			20.63	30	23.35	36
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

Maximum Peak Conducted Output Power Result										
Power Level		1	**RF Output Power (dBm)**							
Directional Gain (dBi)		2.7								
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**	**Sum Chain**	**Power Limit**	**EIRP Power**	**EIRP Limit**
11N2.4G-40M	2	2422	15.16	15.19			18.19	30	20.91	36
11N2.4G-40M	2	2437	22.71	22.69			25.71	30	28.44	36
11N2.4G-40M	2	2452	16.06	16.79			19.45	30	22.18	36
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

3.3.6 Test Result of Maximum Conducted Output Power

Maximum Conducted Output Power Result										
Power Level		1	**RF Output Power (dBm)**							
Directional Gain (dBi)		5.7								
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**	**Sum Chain**	**Power Limit**	**EIRP Power**	**EIRP Limit**
11B-20M	2	2412	15.09	14.54	-	-	17.83	30	23.56	36
11B-20M	2	2437	14.69	15.00	-	-	17.86	30	23.59	36
11B-20M	2	2462	16.89	16.58	-	-	19.75	30	25.48	36
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

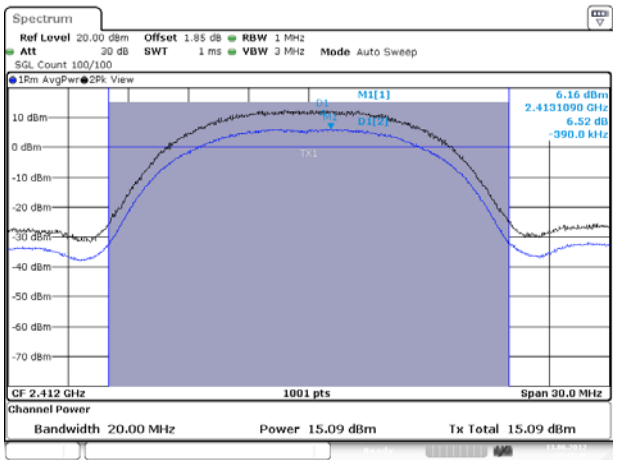
Maximum Conducted Output Power Result										
Power Level		1	**RF Output Power (dBm)**							
Directional Gain (dBi)		5.7								
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**	**Sum Chain**	**Power Limit**	**EIRP Power**	**EIRP Limit**
11G-20M	2	2412	11.52	11.28	-	-	14.41	30	20.14	36
11G-20M	2	2437	17.01	16.65	-	-	19.84	30	25.57	36
11G-20M	2	2462	10.10	9.68	-	-	12.91	30	18.64	36
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

Maximum Conducted Output Power Result										
Power Level		1	**RF Output Power (dBm)**							
Directional Gain (dBi)		2.7								
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**	**Sum Chain**	**Power Limit**	**EIRP Power**	**EIRP Limit**
11N2.4G-20M	2	2412	9.87	9.25	-	-	12.58	30	15.31	36
11N2.4G-20M	2	2437	15.47	15.38	-	-	18.44	30	21.16	36
11N2.4G-20M	2	2462	9.93	9.24	-	-	12.61	30	15.33	36
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

Maximum Conducted Output Power Result										
Power Level		1	**RF Output Power (dBm)**							
Directional Gain (dBi)		2.7								
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Chain-Port 1**	**Chain-Port 2**	**-**	**-**	**Sum Chain**	**Power Limit**	**EIRP Power**	**EIRP Limit**
11N2.4G-40M	2	2422	7.01	6.97	-	-	10.00	30	12.73	36
11N2.4G-40M	2	2437	14.74	14.55	-	-	17.66	30	20.38	36
11N2.4G-40M	2	2452	7.97	8.63	-	-	11.32	30	14.05	36
Result			**Complied**							
Note 1: N_{TX} = Number of Transmit Chains										

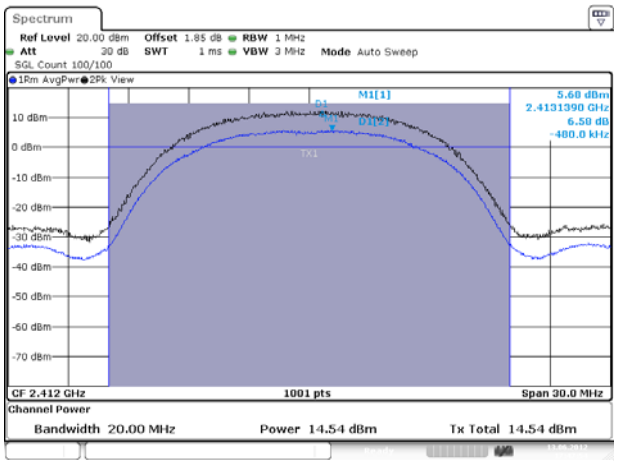
Maximum Conducted Output Power Plots

11B-20M – F1 [Port 1]



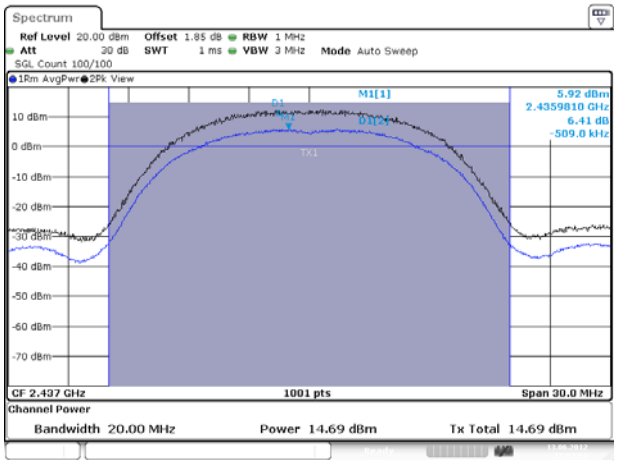
Date: 13.JUN.2012 17:47:47

11B-20M – F1 [Port 2]



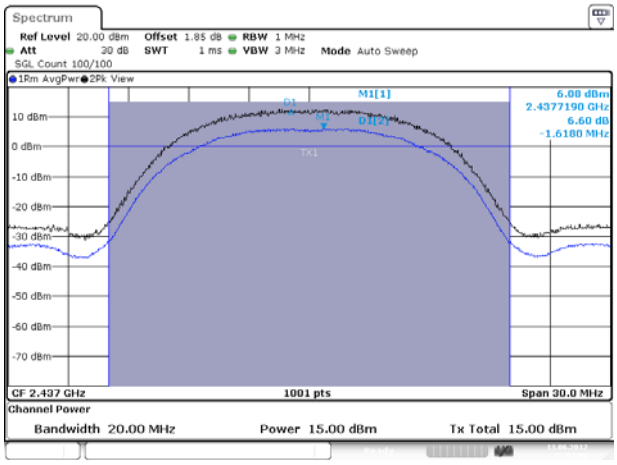
Date: 13.JUN.2012 17:47:54

11B-20M – F2 [Port 1]



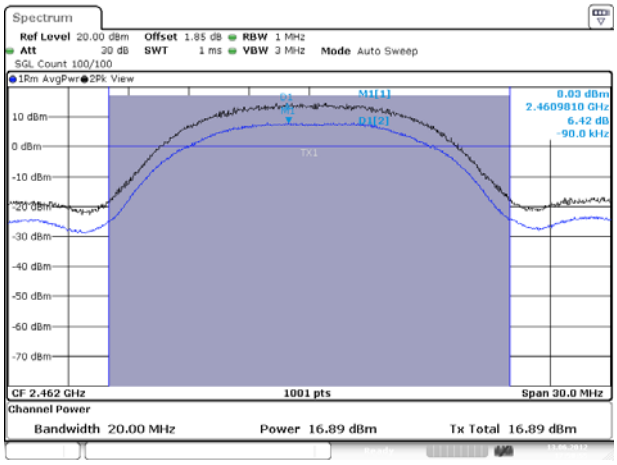
Date: 13.JUN.2012 17:53:54

11B-20M – F2 [Port 2]



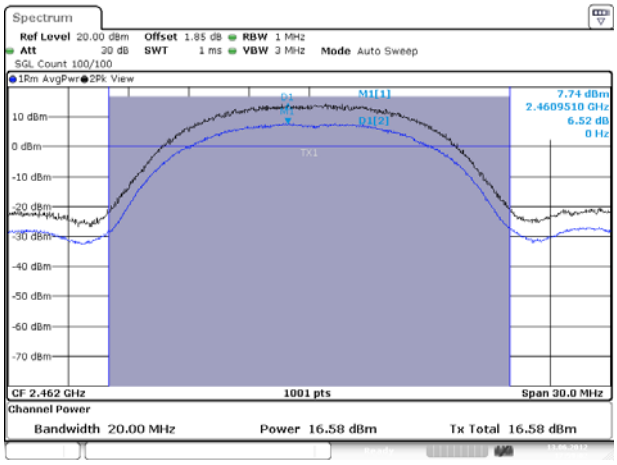
Date: 13.JUN.2012 17:54:01

11B-20M – F3 [Port 1]



Date: 13.JUN.2012 17:58:56

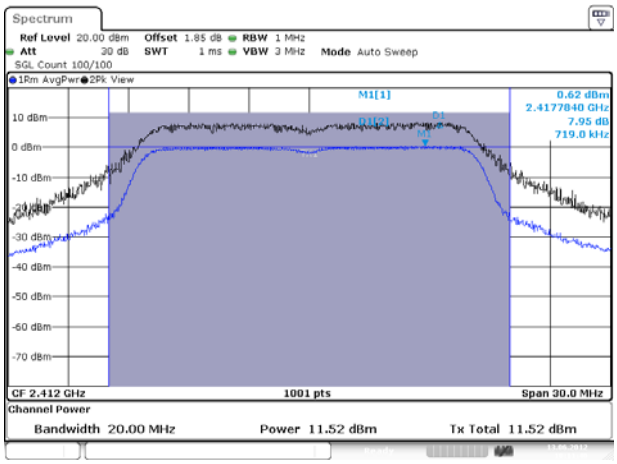
11B-20M – F3 [Port 2]



Date: 13.JUN.2012 17:59:03

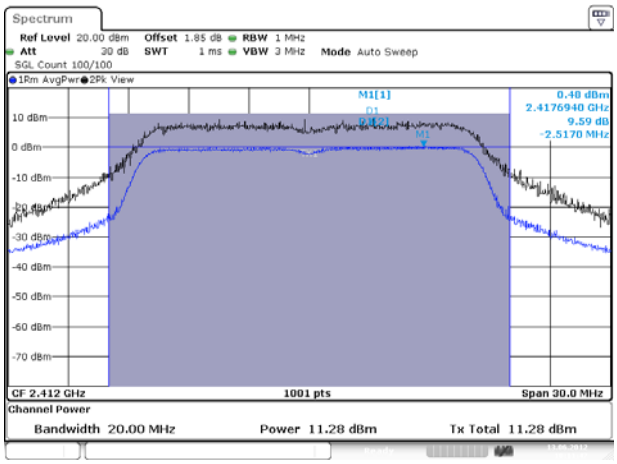
Maximum Conducted Output Power Plots

11G-20M – F1 [Port 1]



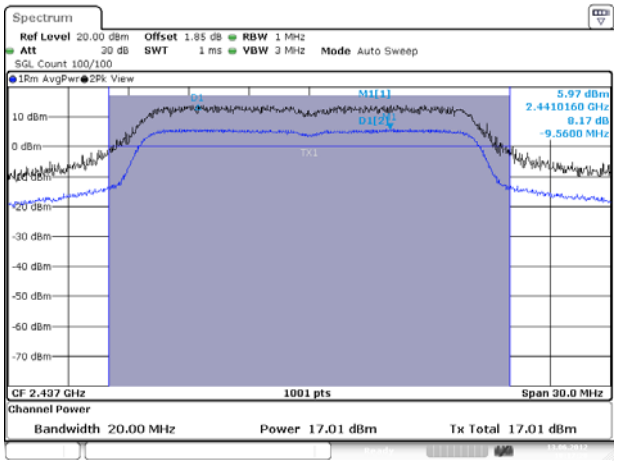
Date: 13.JUN.2012 18:11:40

11G-20M – F1 [Port 2]



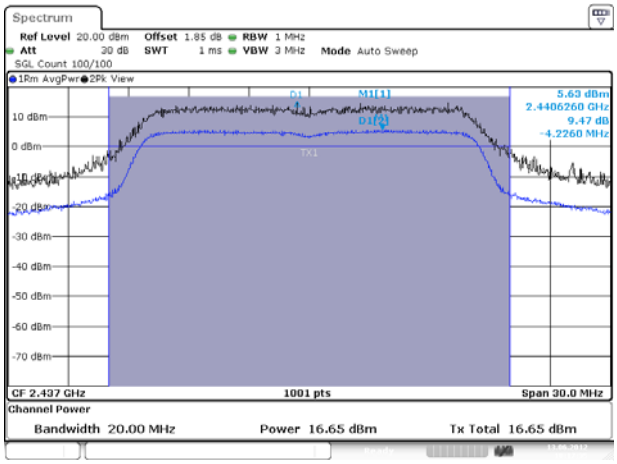
Date: 13.JUN.2012 18:11:48

11G-20M – F2 [Port 1]



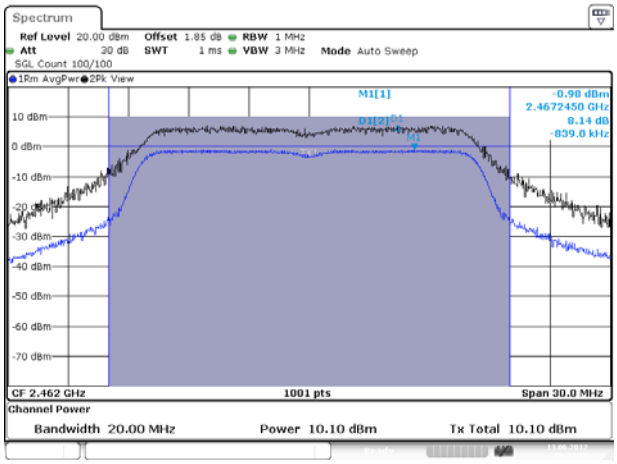
Date: 13.JUN.2012 18:17:29

11G-20M – F2 [Port 2]



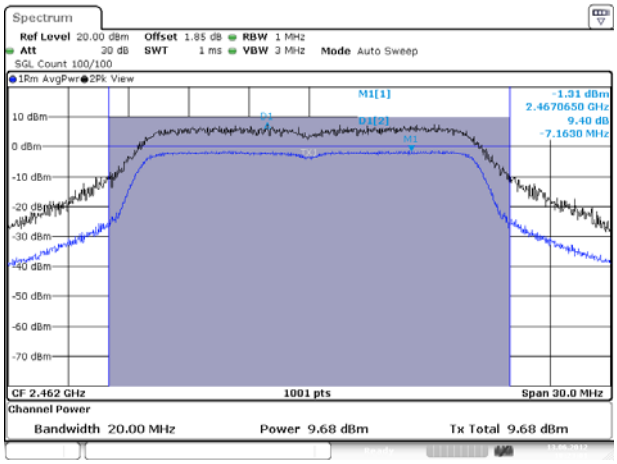
Date: 13.JUN.2012 18:17:36

11G-20M – F3 [Port 1]



Date: 13.JUN.2012 18:22:55

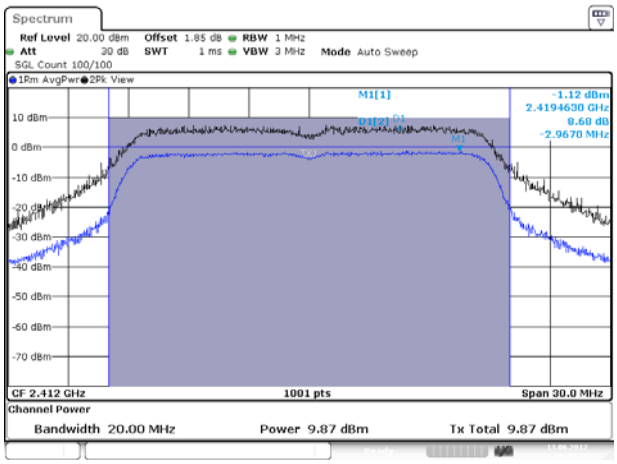
11G-20M – F3 [Port 2]



Date: 13.JUN.2012 18:23:02

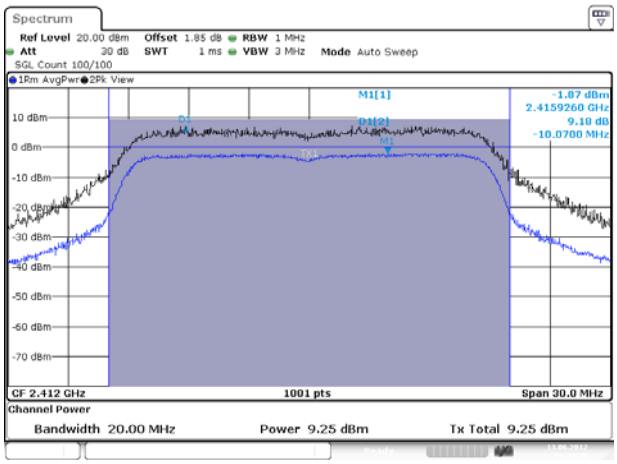
Maximum Conducted Output Power Plots

11N2.4G-20M – F1 [Port 1]



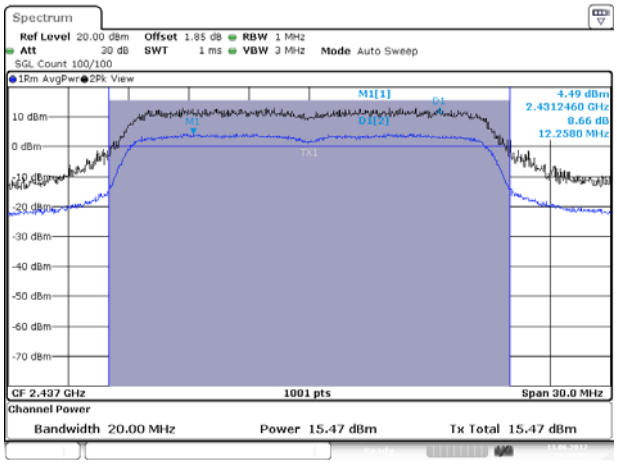
Date: 13.JUN.2012 18:29:29

11N2.4G-20M – F1 [Port 2]



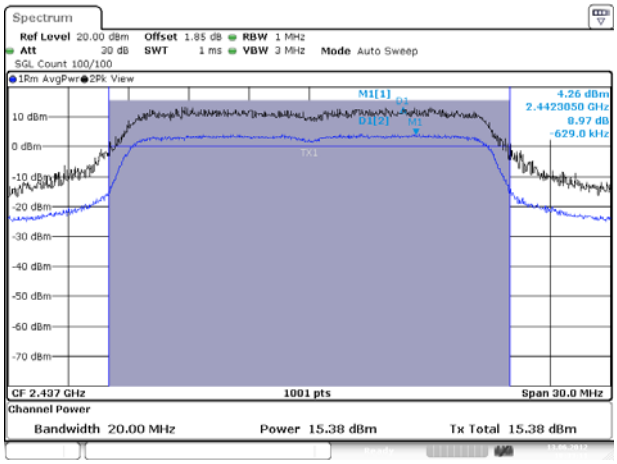
Date: 13.JUN.2012 18:29:36

11N2.4G-20M – F2 [Port 1]



Date: 13.JUN.2012 18:33:04

11N2.4G-20M – F2 [Port 2]



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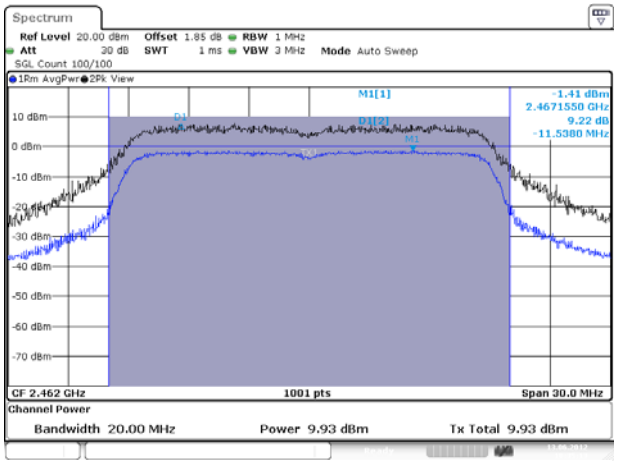
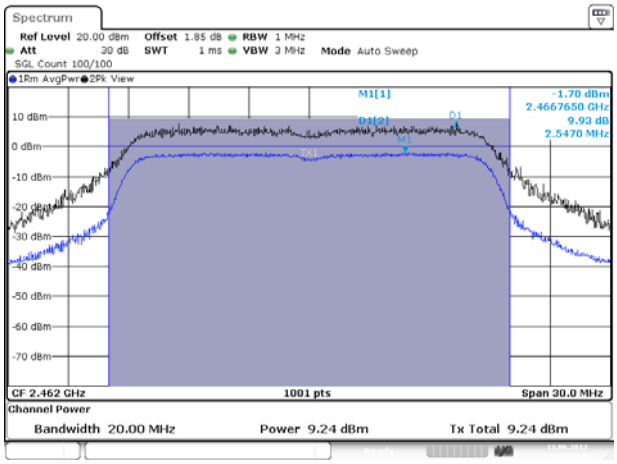
11N2.4G-20M – F3 [Port 1]



Date: 13.JUN.2012 18:35:13

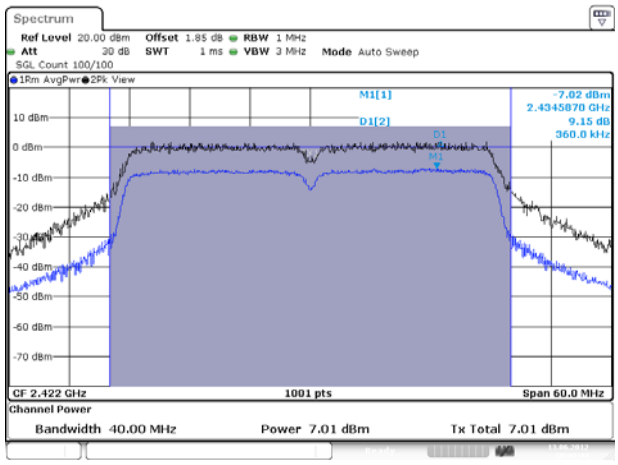
11N2.4G-20M – F3 [Port 2]



Date: 13.JUN.2012 18:35:21

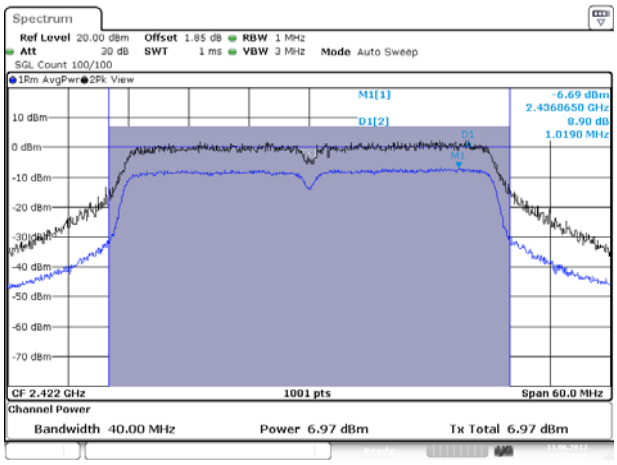
Maximum Conducted Output Power Plots

11N2.4G-40M – F1 [Port 1]



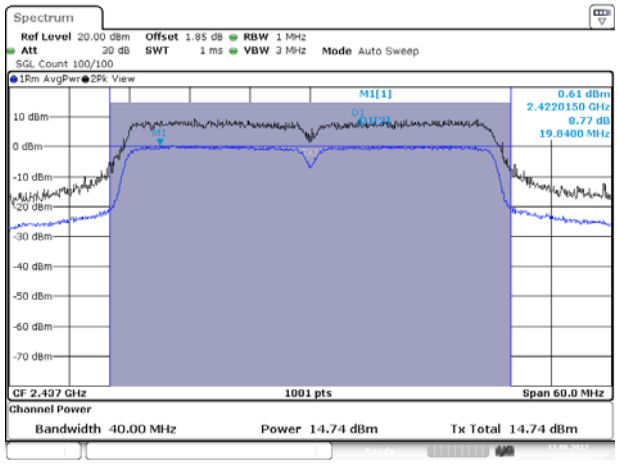
Date: 13.JUN.2012 18:42:43

11N2.4G-40M – F1 [Port 2]



Date: 13.JUN.2012 18:42:51

11N2.4G-40M – F2 [Port 1]



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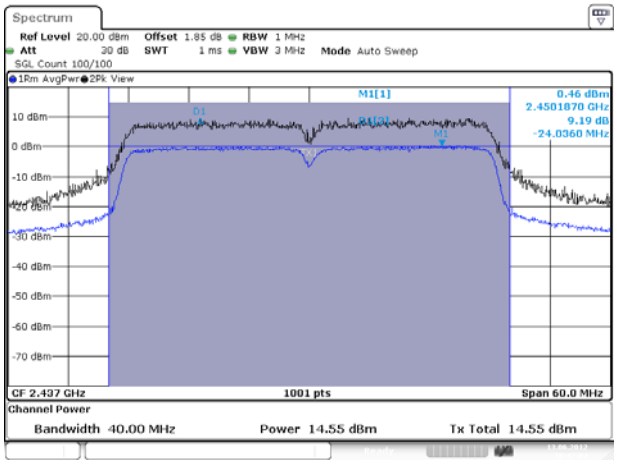
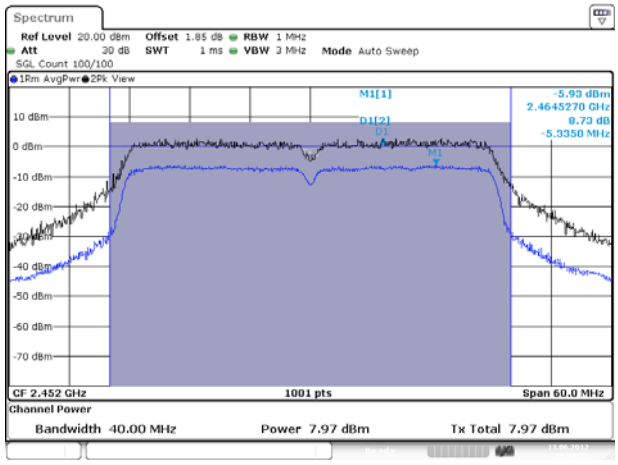
11N2.4G-40M – F2 [Port 2]



Date: 13.JUN.2012 18:47:04

11N2.4G-40M – F3 [Port 1]



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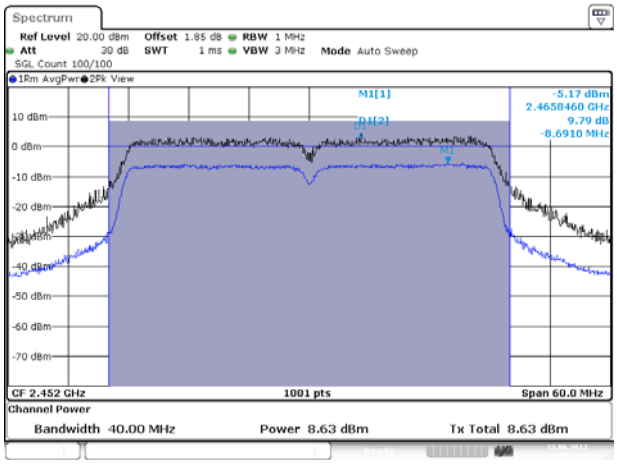
11N2.4G-40M – F3 [Port 2]



Date: 13.JUN.2012 18:50:00

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit
☒ Power Spectral Density (PSD) ≤ 8 dBm/3kHz

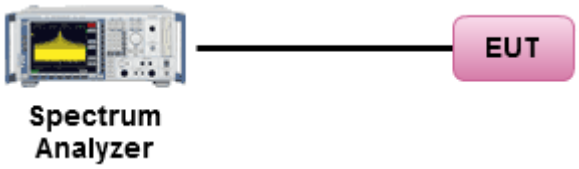
3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method			
☒	Power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the power spectral density. In addition, the use of a peak PSD procedure will always result in a “worst-case” measured level for comparison to the limit. Therefore, whenever the DTS bandwidth exceeds 500 kHz, it is acceptable to utilize the peak PSD procedure to demonstrate compliance to the PSD limit, regardless of how the fundamental output power was measured. For the power spectral density shall be measured using below options:		
	☒	Refer as FCC KDB 558074, clause 5.3.1 Option 1 (peak PSD; BWCF=-15.2dB).	
	☐	Refer as FCC KDB 558074, clause 5.3.2 Option 2 (average PSD; BWCF=-15.2dB).	
	☐	Refer as ANSI C63.10, clause 6.11.2.3 for PSD for DTS - (RBW=3kHz; sweep=100s).	
	☐	Refer as ANSI C63.10, clause 6.11.2.4 for Alternative PSD for DTS - (RBW=3kHz; average=100)	
☒	Refer as FCC KDB 558074, clause 2 for conducted measurement.		
	☒	For conducted measurements on devices with multiple transmit chains using options given below:	
		☒	Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the N_{TX} output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace. The new data trace samples added 100 kHz segment and found the highest value of each 100 kHz segments. Add the bandwidth correction factor (BWCF) [-15.2 dB] adjusting in power spectral density per 3kHz.
		☐	Option 2: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.
☐	Refer as FCC KDB 558074, clause 2 for radiated measurement.		

3.4.4 Test Setup

Power Spectral Density


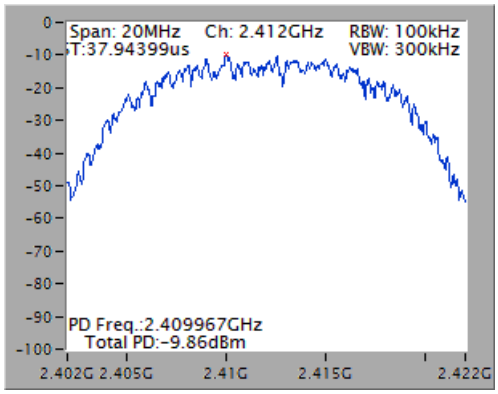
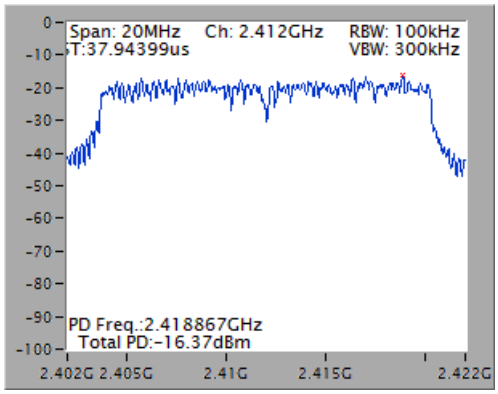
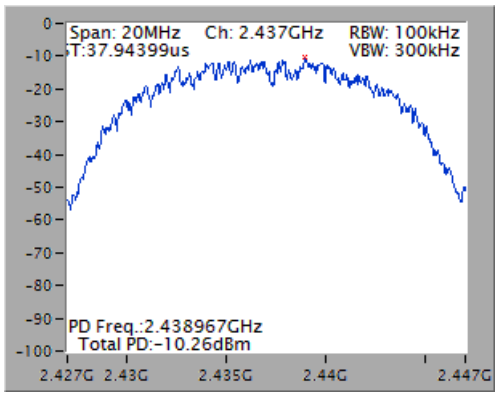
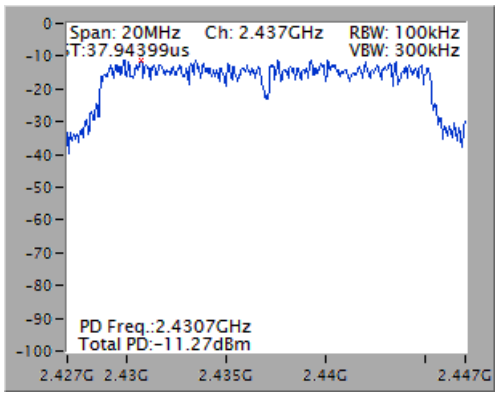
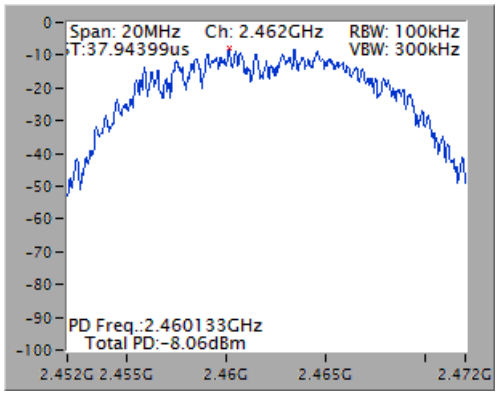
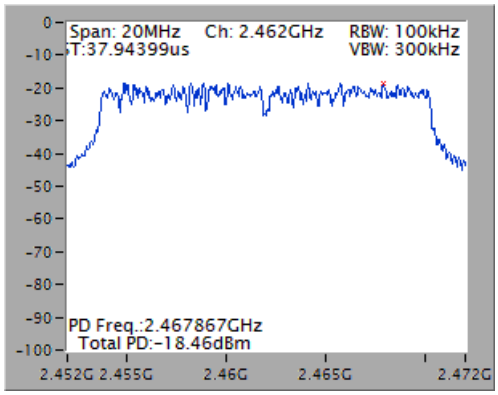
3.4.5 Test Result of Power Spectral Density

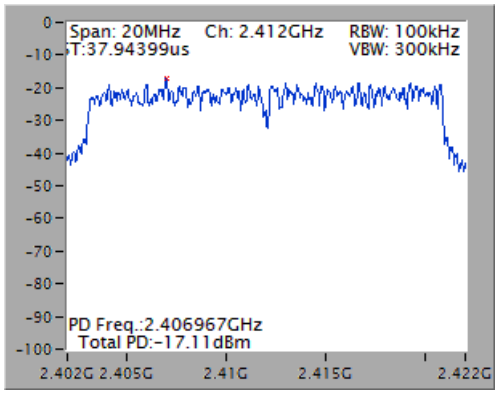
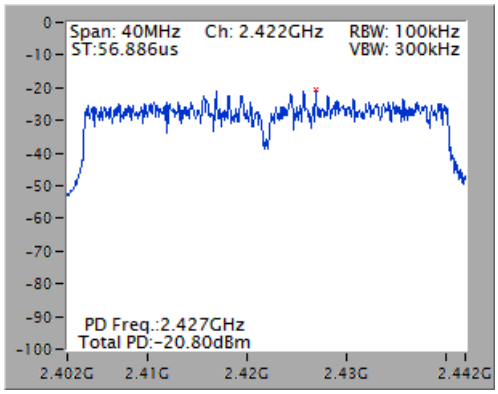
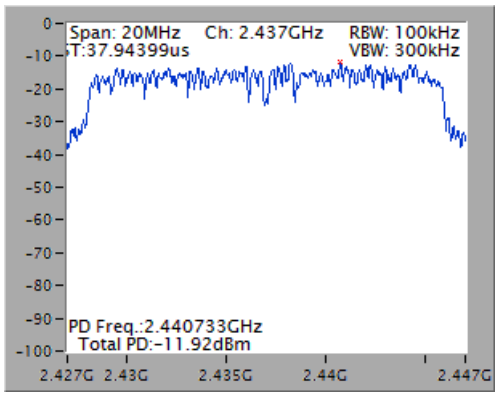
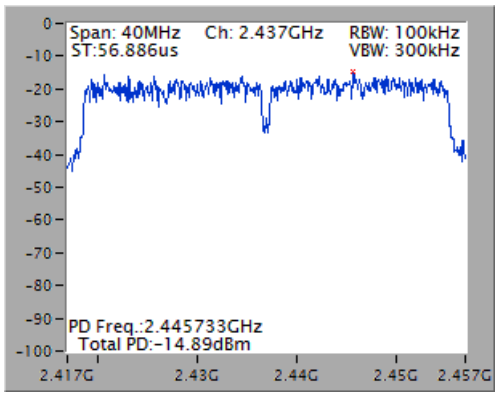
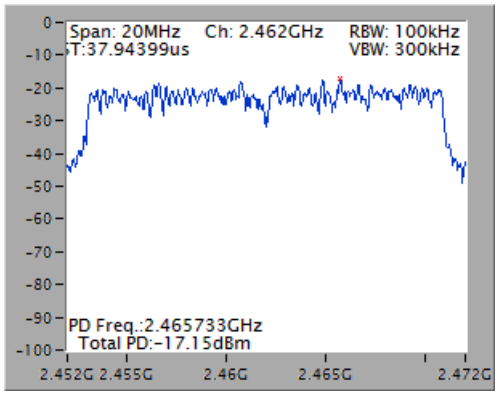
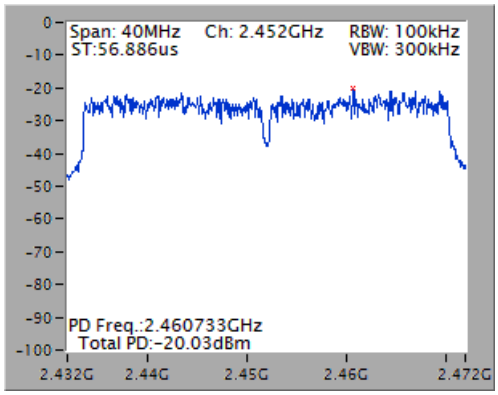
Power Spectral Density Result							
Power Level		1	**Power Spectral Density (dBm/3kHz)**				
Directional Gain (dBi)		5.7					
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Sum All Chains**	**-**	**-**	**-**	**PSD Limit**
11B-20M	2	2412	-9.86	-	-	-	8
11B-20M	2	2437	-10.26	-	-	-	8
11B-20M	2	2462	-8.06	-	-	-	8
Result			**Complied**				
Note 1: N_{TX} = Number of Transmit Chains Note 2: PSD [dBm/3kHz] = sum each transmit chains by bin-to-bin PSD [dBm/100kHz] + BWFC [-15.2 dB]							

Power Spectral Density Result							
Power Level		1	**Power Spectral Density (dBm/3kHz)**				
Directional Gain (dBi)		5.7					
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Sum All Chains**	**-**	**-**	**-**	**PSD Limit**
11G-20M	2	2412	-16.37	-	-	-	8
11G-20M	2	2437	-11.27	-	-	-	8
11G-20M	2	2462	-18.46	-	-	-	8
Result			**Complied**				
Note 1: N_{TX} = Number of Transmit Chains Note 2: PSD [dBm/3kHz] = sum each transmit chains by bin-to-bin PSD [dBm/100kHz] + BWFC [-15.2 dB]							

Power Spectral Density Result							
Power Level		1	**Power Spectral Density (dBm/3kHz)**				
Directional Gain (dBi)		2.7					
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Sum All Chains**	**-**	**-**	**-**	**PSD Limit**
11N2.4G-20M	2	2412	-17.11	-	-	-	8
11N2.4G-20M	2	2437	-11.92	-	-	-	8
11N2.4G-20M	2	2462	-17.15	-	-	-	8
Result			**Complied**				
Note 1: N_{TX} = Number of Transmit Chains Note 2: PSD [dBm/3kHz] = sum each transmit chains by bin-to-bin PSD [dBm/100kHz] + BWFC [-15.2 dB]							

Power Spectral Density Result							
Power Level		1	**Power Spectral Density (dBm/3kHz)**				
Directional Gain (dBi)		2.7					
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Sum All Chains**	**-**	**-**	**-**	**PSD Limit**
11N2.4G-40M	2	2422	-20.80	-	-	-	8
11N2.4G-40M	2	2437	-14.89	-	-	-	8
11N2.4G-40M	2	2452	-20.03	-	-	-	8
Result			**Complied**				
Note 1: N_{TX} = Number of Transmit Chains Note 2: PSD [dBm/3kHz] = sum each transmit chains by bin-to-bin PSD [dBm/100kHz] + BWFC [-15.2 dB]							

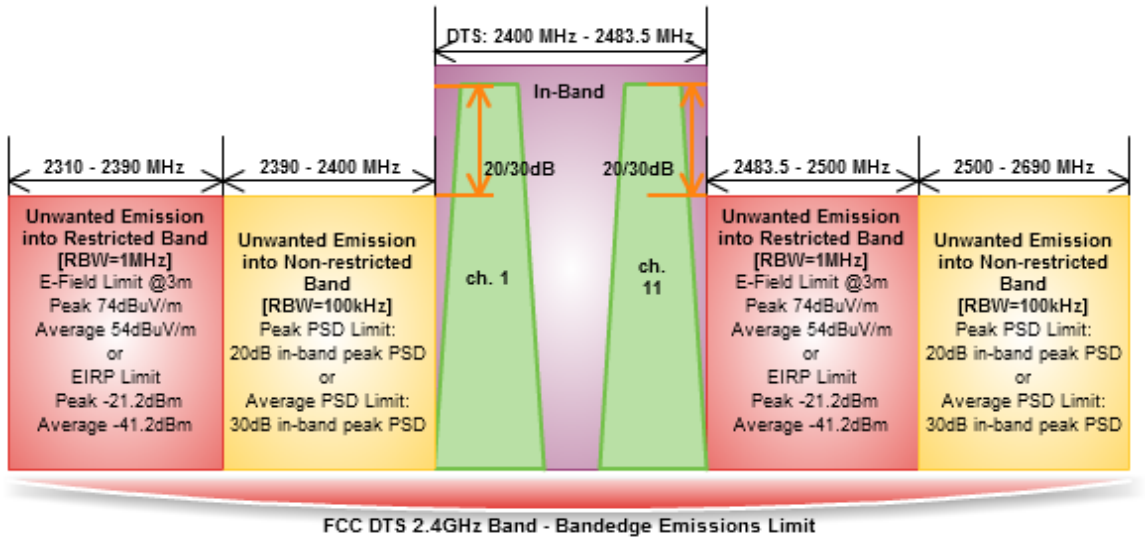
Power Spectral Density Plots	
11B-20M – F1 [Sum All Chains]	**11G-20M – F1 [Sum All Chains]**
	
11B-20M – F2 [Sum All Chains]	**11G-20M – F2 [Sum All Chains]**
	
11B-20M – F3 [Sum All Chains]	**11G-20M – F3 [Sum All Chains]**
	

Power Spectral Density Plots	
11N2.4G-20M – F1 [Sum All Chains]	**11N2.4G-40M – F4 [Sum All Chains]**
	
11N2.4G-20M – F2 [Sum All Chains]	**11N2.4G-40M – F5 [Sum All Chains]**
	
11N2.4G-20M – F3 [Sum All Chains]	**11N2.4G-40M – F6 [Sum All Chains]**
	

3.5 Transmitter Radiated Bandedge Emissions

3.5.1 Transmitter Radiated Bandedge Emissions Limit

Transmitter Radiated Bandedge Emissions Limit



3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

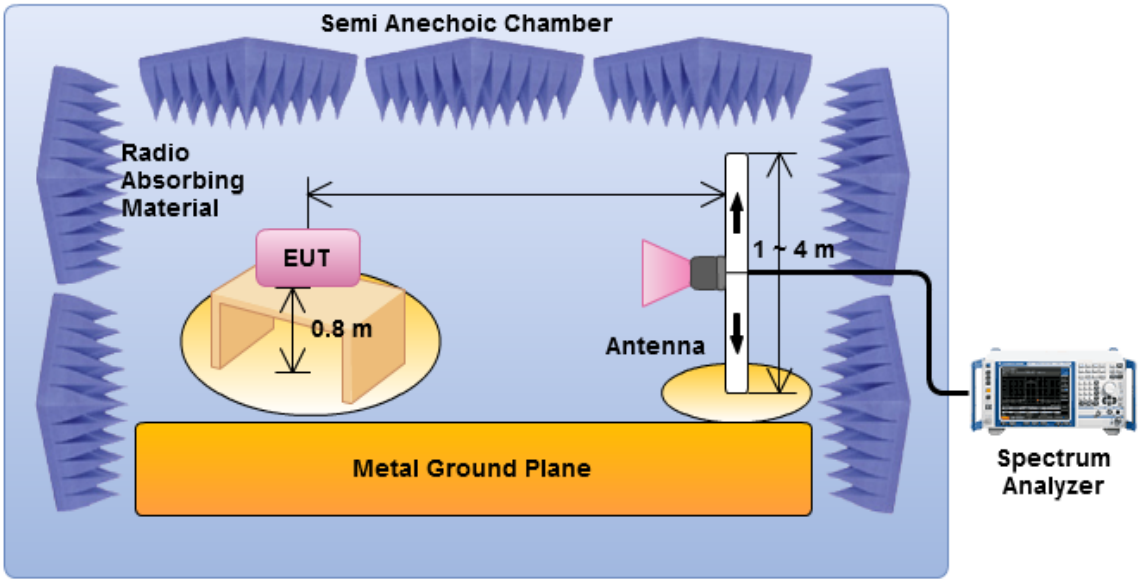
3.5.3 Test Procedures

Test Method – General Information			
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
☒	Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC KDB 558074, clause 5.4.1 for unwanted emissions into non-restricted bands.	
	☒	Refer as FCC KDB 558074, clause 5.4.2 for unwanted emissions into restricted bands.	
		☐	Refer as FCC KDB 558074, clause 5.4.2.2.2.1 Option 1 (Power Averaging).
		☐	Refer as FCC KDB 558074, clause 5.4.2.2.2.2 Option 2 (Trace Averaging).
		☒	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). – Duty cycle ≥ 98%.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒	Refer as FCC KDB 558074, clause 5.4.2.2.3 measurement procedure peak limit.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☒	For the transmitter bandedge emissions shall be measured using following options below:		
	☒	Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.	
	☐	Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.	

Test Method
☐ Refer as FCC KDB 558074, clause 2 for conducted measurement.
☐ For unwanted emissions into non-restricted bands (relative emission limits).
☐ For conducted measurements on devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs.
☐ For unwanted emissions into restricted bands. Test conducted spurious emissions and radiated by the cabinet with the antenna connector(s) terminated by a specified load (cabinet radiation).
☐ Refer as FCC KDB 558074, clause 5.4.2.2.1 unwanted emissions in restricted bands on frequencies ≤ 1000 MHz
☐ Refer as FCC KDB 558074, clause 5.4.2.2.2 unwanted emissions in restricted bands on frequencies > 1000 MHz
☐ For conducted measurements on devices with multiple transmit chains using options given below:
☐ Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, out-of-band and spurious emission measurement. The trace data for each transmit chain has to be individually recorded and each transmit chain trace data shall be added and compared with the limit.
☐ Option 2: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.
☒ Refer as FCC KDB 558074, clause 2 for radiated measurement.
☒ Refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.

3.5.4 Test Setup

Transmitter Radiated Bandedge Emissions

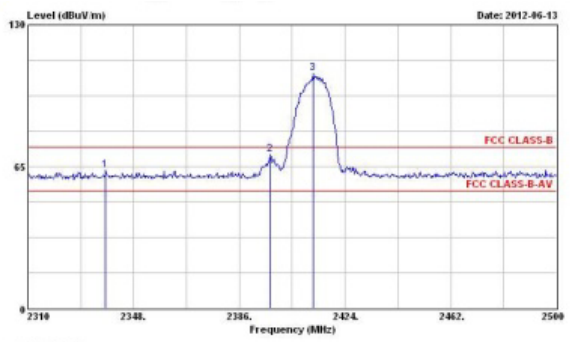


Electric field tests shall be performed in transmitter bandedge emissions using a calibrated horn antenna.

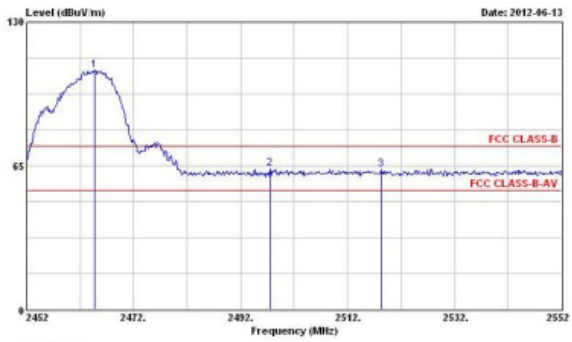
3.5.5 Test Result of Transmitter Radiated Bandedge Emissions

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	**Gain** (dBi)	5.7	**Non-restricted Band Emissions**					
Modulation	11B-20M								
Non-restricted Band (MHz)	**N_{TX}**	**Test Ch. Freq. (MHz)**	**In-band PSD [i]** (dBuV/100kHz)	**NBE Freq. (MHz)**	**Out-band PSD [o]** (dBuV/100kHz)	**[i] – [o] (dB)**	**Limit (dB)**	**Level Type**	**Pol.** note 1
2390-2400	2	2412	107.74	2397.21	70.73	37.01	20	PK	V
2500-2690	2	2462	108.10	2518.30	63.50	44.60	20	PK	V

Low Band



Up Band



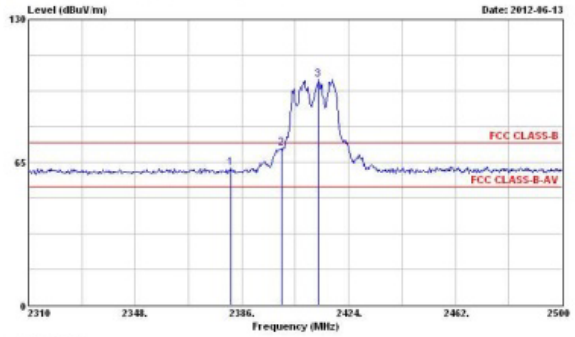
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	**Gain** (dBi)	5.7	**Restricted Band Emissions**					
Modulation	11B-20M								
Restricted Band (MHz)	**N_{TX}**	**Test Ch. Freq. (MHz)**	**In-band PSD [i]** (dBuV/1MHz)	**RBE Freq. (MHz)**	**Measure Distance (m)**	**Out-Band Level (dBuV/m)**	**Limit** (dBuV/m)	**Level Type**	**Pol.** note 1
2310-2390	2	2412	113.18	2389.61	3	62.35	74	PK	V
2310-2390	2	2412	103.77	2362.82	3	50.27	54	AV	V
2483.5-2500	2	2462	115.24	2487.40	3	63.01	74	PK	V
2483.5-2500	2	2462	105.45	2487.50	3	50.72	54	AV	V

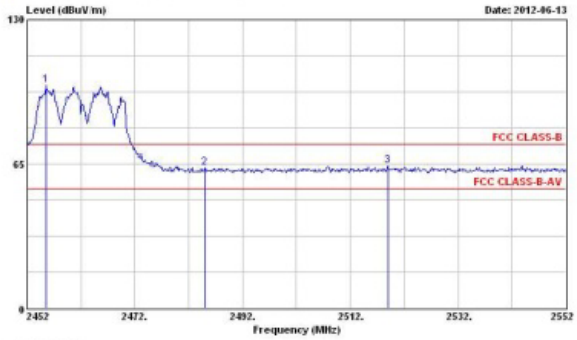
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	**Gain (dBi)**	5.7	**Non-restricted Band Emissions**					
Modulation	11G-20M								
Non-restricted Band (MHz)	**N_{TX}**	**Test Ch. Freq. (MHz)**	**In-band PSD [i] (dBuV/100kHz)**	**NBE Freq. (MHz)**	**Out-band PSD [o] (dBuV/100kHz)**	**[i] – [o] (dB)**	**Limit (dB)**	**Level Type**	**Pol. note 1**
2390-2400	2	2412	102.80	2400.00	71.22	31.58	20	PK	V
2500-2690	2	2462	100.30	2519.00	64.19	36.11	20	PK	V

Low Band



Up Band



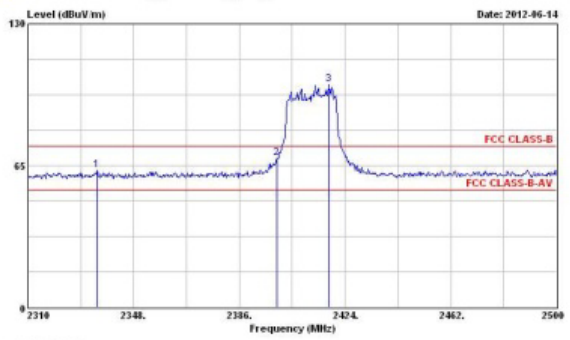
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	**Gain (dBi)**	5.7	**Restricted Band Emissions**					
Modulation	11G-20M								
Restricted Band (MHz)	**N_{TX}**	**Test Ch. Freq. (MHz)**	**In-band PSD [i] (dBuV/1MHz)**	**RBE Freq. (MHz)**	**Measure Distance (m)**	**Out-Band Level (dBuV/m)**	**Limit (dBuV/m)**	**Level Type**	**Pol. note 1**
2310-2390	2	2412	109.44	2389.42	3	69.42	74	PK	V
2310-2390	2	2412	99.53	2389.42	3	51.96	54	AV	V
2483.5-2500	2	2462	106.82	2484.20	3	63.36	74	PK	V
2483.5-2500	2	2462	96.14	2484.70	3	49.89	54	AV	V

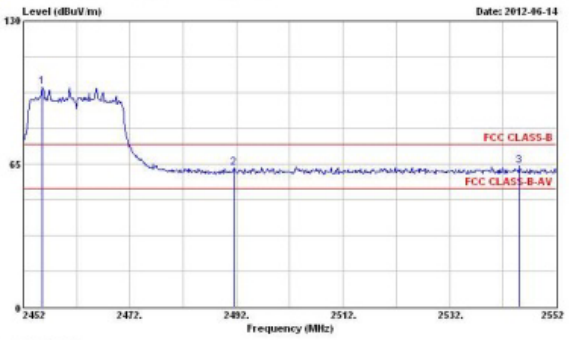
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	**Gain (dBi)**	2.7	**Non-restricted Band Emissions**					
Modulation	11N2.4G-20M								
Non-restricted Band (MHz)	**N_{TX}**	**Test Ch. Freq. (MHz)**	**In-band PSD [i] (dBuV/100kHz)**	**NBE Freq. (MHz)**	**Out-band PSD [o] (dBuV/100kHz)**	**[i] – [o] (dB)**	**Limit (dB)**	**Level Type**	**Pol. note 1**
2390-2400	2	2412	102.00	2399.49	68.48	33.52	20	PK	V
2500-2690	2	2462	100.27	2545.10	64.03	36.24	20	PK	V

Low Band



Up Band



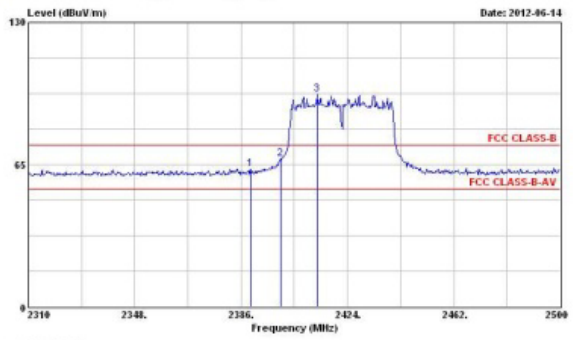
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	**Gain (dBi)**	2.7	**Restricted Band Emissions**					
Modulation	11N2.4G-20M								
Restricted Band (MHz)	**N_{TX}**	**Test Ch. Freq. (MHz)**	**In-band PSD [i] (dBuV/1MHz)**	**RBE Freq. (MHz)**	**Measure Distance (m)**	**Out-Band Level (dBuV/m)**	**Limit (dBuV/m)**	**Level Type**	**Pol. note 1**
2310-2390	2	2412	108.95	2390.00	3	66.42	74	PK	V
2310-2390	2	2412	94.64	2390.00	3	51.53	54	AV	V
2483.5-2500	2	2462	105.82	2483.90	3	63.82	74	PK	V
2483.5-2500	2	2462	91.68	2483.50	3	50.44	54	AV	V

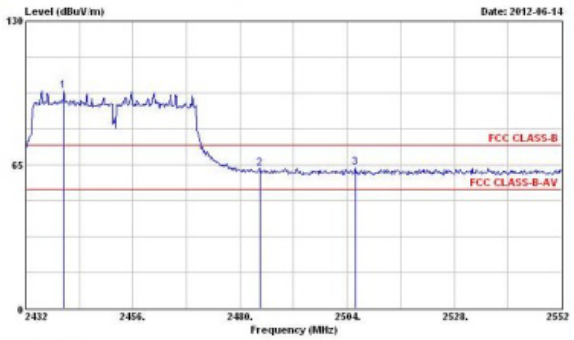
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	**Gain (dBi)**	2.7	**Non-restricted Band Emissions**					
Modulation	11N2.4G-40M								
Non-restricted Band (MHz)	**N_{TX}**	**Test Ch. Freq. (MHz)**	**In-band PSD [i] (dBuV/100kHz)**	**NBE Freq. (MHz)**	**Out-band PSD [o] (dBuV/100kHz)**	**[i] – [o] (dB)**	**Limit (dB)**	**Level Type**	**Pol. note 1**
2390-2400	2	2422	96.99	2400.00	67.37	29.62	20	PK	V
2500-2690	2	2452	98.55	2505.80	63.59	35.26	20	PK	V

Low Band



Up Band



Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	**Gain (dBi)**	2.7	**Restricted Band Emissions**					
Modulation	11N2.4G-40M								
Restricted Band (MHz)	**N_{TX}**	**Test Ch. Freq. (MHz)**	**In-band PSD [i] (dBuV/1MHz)**	**RBE Freq. (MHz)**	**Measure Distance (m)**	**Out-Band Level (dBuV/m)**	**Limit (dBuV/m)**	**Level Type**	**Pol. note 1**
2310-2390	2	2422	103.30	2389.42	3	65.29	74	PK	V
2310-2390	2	2422	87.95	2389.61	3	52.10	54	AV	V
2483.5-2500	2	2452	104.10	2484.08	3	67.52	74	PK	V
2483.5-2500	2	2452	88.55	2484.56	3	52.86	54	AV	V

Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).

3.6 Transmitter Radiated Unwanted Emissions

3.6.1 Transmitter Radiated Unwanted Emissions Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Un-restricted Band Emissions Limit	
RF output power procedure	**Limit (dB)**
Peak output power procedure	20
Average output power procedure	30

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method – General Information			
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).		
	☒	Measurements in the frequency range 10 GHz - 18GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.	
	☒	Measurements in the frequency range above 18 GHz - 25GHz are typically made at a closer distance 0.5m, because the instrumentation noise floor is typically close to the radiated emission limit.	
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC KDB 558074, clause 5.4.1 for unwanted emissions into non-restricted bands.	
	☒	Refer as FCC KDB 558074, clause 5.4.2 for unwanted emissions into restricted bands.	
		☐	Refer as FCC KDB 558074, clause 5.4.2.2.2.1 Option 1 (Power Averaging).
		☐	Refer as FCC KDB 558074, clause 5.4.2.2.2.2 Option 2 (Trace Averaging).
		☒	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW) – Duty cycle ≥ 98%.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒	Refer as FCC KDB 558074, clause 5.4.2.2.3 measurement procedure peak limit.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.

Test Method				
☐ Refer as FCC KDB 558074, clause 2 for conducted measurement.				
	☐ For unwanted emissions into non-restricted bands (relative emission limits).			
		☐ For conducted measurements on devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs.		
	☐ For unwanted emissions into restricted bands. Test conducted spurious emissions and radiated by the cabinet with the antenna connector(s) terminated by a specified load (cabinet radiation).			
		☐ Refer as FCC KDB 558074, clause 5.4.2.2.1 unwanted emissions in restricted bands on frequencies ≤ 1000 MHz		
		☐ Refer as FCC KDB 558074, clause 5.4.2.2.2 unwanted emissions in restricted bands on frequencies > 1000 MHz		
		☐ For conducted measurements on devices with multiple transmit chains using options given below:		
			☐ Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, out-of-band and spurious emission measurement. The trace data for each transmit chain has to be individually recorded and each transmit chain trace data shall be added and compared with the limit.	
			☐ Option 2: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.	
☒ For radiated measurement.				
	☒ Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.			
	☒ Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.			
	☒ Refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.			