FCC Test Report

Equipment	:	**802.11n Dual-band Unified Access Point**
Brand Name	:	**D-Link**
Model No.	:	**DWL-6700AP**
FCC ID	:	**KA2WL6700APA1**
Standard	:	**47 CFR FCC Part 15.247**
Operating Band	:	**2400 MHz – 2483.5 MHz**
FCC Classification	:	**DTS**
Applicant	:	**D-Link Corporation** **No. 289, Xinhu 3rd Rd., Neihu District, Taipei City 11494, Taiwan, R. O. C.**

The product sample received on Sep. 04, 2014 and completely tested on Mar. 05, 2015. 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:

James Fan / Assistant Manager

Testing Laboratory
1190

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APPENDIX A. TEST PHOTOS A1-A5

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	[dBuV]: 19.709MHz 47.26 (Margin 12.74dB) – QP 43.21 (Margin 6.79dB) – AV	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	6dB Bandwidth [MHz] 20M: 9.57 / 40M: 35.13	≥500kHz	Complied
3.3	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm]: 29.98	Power [dBm]: 30	Complied
3.4	15.247(e)	Power Spectral Density	PSD [dBm/3kHz]: 2.43	PSD [dBm/3kHz]: 8	Complied
3.5	15.247(d)	Emissions in non-restricted frequency bands	Out-of -band emissions are 20dB below the highest power	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.6	15.247(d)	Transmitter Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 2483.50MHz 73.00 (Margin 1.00dB) – PK	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied

Revision History

Report No.	Version	Description	Issued Date
FR4N1913AC	Rev. 01	Initial issue of report	Apr. 28, 2015
FR4N1913AC	Rev. 02	Revised ANSI C63.10 version from 2013 to 2009	Jun. 24, 2015

1 General Description

1.1 Information

This device has two versions for different sources of SAW filter for 2.4G RF part. Two versions were both tested in this test report.

1.1.1 RF General Information

RF General Information					
Frequency Range (MHz)	**IEEE Std. 802.11**	**Ch. Freq. (MHz)**	**Channel Number**	**Transmit Chains (N_{TX})**	**RF Output Power (dBm)**
2400-2483.5	b	2412-2462	1-11 [11]	1 NOTE 4	24.90
2400-2483.5	b	2412-2462	1-11 [11]	2	26.53
2400-2483.5	g	2412-2462	1-11 [11]	1 NOTE 4	29.30
2400-2483.5	g	2412-2462	1-11 [11]	2	29.98
2400-2483.5	HT20	2412-2462	1-11 [11]	2	29.93
2400-2483.5	HT40	2422-2452	3-9 [7]	2	29.68
Note 1: RF output power specifies that Maximum Peak Conducted Output Power. Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation. Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation. Note 4: 802.11b/g supports 1Tx and 2Tx function. Only chain 0 transmits under 1Tx mode.					

1.1.2 Antenna Information

Antenna Category		
☒	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).	
	☐ Multiple power level and corresponding antenna(s).	
	☐ 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				
No.	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)	
			2400~2483.5	5150~5850
1	Chip	N/A	2	-
2	Patch	N/A	-	8.08

1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
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.: …

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)**
☒ 100.00% - IEEE 802.11b – 1Tx	0.00
☒ 100.00% - IEEE 802.11b – 2Tx	0.00
☒ 98.33% - IEEE 802.11g – 1Tx	0.07
☒ 98.33% - IEEE 802.11g – 2Tx	0.07
☒ 98.20% - IEEE 802.11n (HT20) – 2Tx	0.08
☒ 96.84% - IEEE 802.11n (HT40) – 2Tx	0.14

1.1.5 EUT Operational Condition

Power Supply Type	24Vdc from POE

1.2 Accessories and Support Equipment

Accessories		
No.	**Equipment**	**Description**
1	POE	Brand: GME. Model: GFP241DA-240100HB I/P: 100-240Vac, 50-60Hz, 0.55A O/P: 24Vdc, 1A Power line: 0.75m non-shielded without core
2	RJ45 Cable	2m shielded w/o core.

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5420	DoC

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 15.247
- ANSI C63.10-2009
- FCC KDB 558074 D01 DTS Meas Guidance v03r02
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01

Note: FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014

1.4 Testing Location Information

Testing Location					
☒	HWA YA	ADD :	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.		
		TEL :	886-3-327-3456	FAX :	886-3-327-0973

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Aaron Liang	22°C / 62%	Feb. 06 ~ Mar. 03, 2015
AC Conduction	CO04-HY	Skys Huang	22°C / 61%	Jan. 27 ~ Mar. 05, 2015
Radiated Emission	03CH03-HY	Mark Liao	21-24°C / 65-68%	Feb. 02 ~ Feb. 27, 2015
Test site registered number [643075] with FCC Test site registered number [4086B-1] with IC				

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			
Modulation Mode	**Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Worst Data Rate / MCS**
11b	1	1-11 Mbps	1 Mbps
11b	2	1-11 Mbps	1 Mbps
11g	1	6-54 Mbps	6 Mbps
11g	2	6-54 Mbps	6 Mbps
HT20	2	MCS 0-15	MCS 0
HT40	2	MCS 0-15	MCS 0

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration	
IEEE Std. 802.11	**Test Channel Frequencies (MHz)**
b, g, n (HT-20)	2412-(F1), 2437-(F2), 2462-(F3)
n (HT-40)	2422-(F4), 2437-(F5), 2452-(F6)

2.3 The Worst Case Power Setting Parameter

Sample 01

The Worst Case Power Setting Parameter (2400-2483.5MHz band)							
Test Software	ART2-GUI, Version: ver_4_6_78_ap13x_Bin						
Modulation Mode	**N_{TX}**	**Test Frequency (MHz)**					
		NCB: 20MHz			**NCB: 40MHz**		
		2412	**2437**	**2462**	**2422**	**2437**	**2452**
11b,1-11Mbps	1	22.5	22	23	--	--	--
11b,1-11Mbps	2	21.5	21.5	21.5	--	--	--
11g,6-54Mbps	1	21.5	27	20.5	--	--	--
11g,6-54Mbps	2	19	19	19.5	--	--	--
HT20,M0-15	2	19.5	19	19.5	--	--	--
HT40,M0-15	2	--	--	--	18	18.5	17.5

Sample 02

The Worst Case Power Setting Parameter (2400-2483.5MHz band)							
Test Software	ART2-GUI, Version: ver_4_6_78_ap13x_Bin						
Modulation Mode	**N_{TX}**	**Test Frequency (MHz)**					
		NCB: 20MHz			**NCB: 40MHz**		
		2412	**2437**	**2462**	**2422**	**2437**	**2452**
11b,1-11Mbps	1	22.5	22.5	24	--	--	--
11b,1-11Mbps	2	22	22.5	23.5	--	--	--
11g,6-54Mbps	1	21	27	20	--	--	--
11g,6-54Mbps	2	20.5	20	20	--	--	--
HT20,M0-15	2	20.5	20	20	--	--	--
HT40,M0-15	2	--	--	--	18	19.5	19

2.4 The Worst Case Measurement Configuration

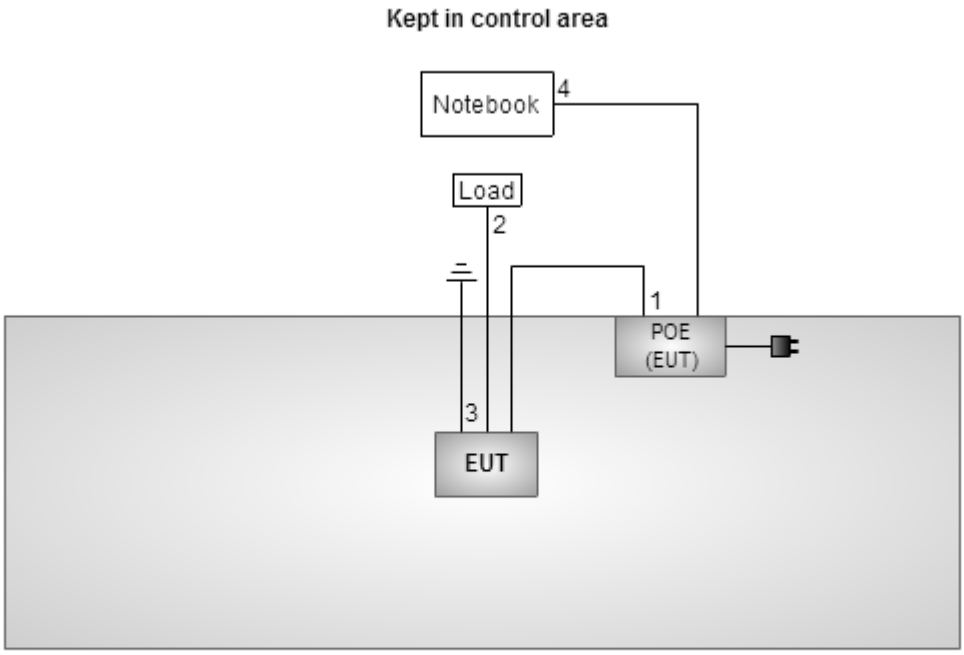
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	Sample 01: AC Power & Radio link (WLAN)
2	Sample 02: AC Power & Radio link (WLAN)

The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power,6dB bandwidth, Power Spectral Density
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11b,11g
Operating Mode	Operating Mode Description
1	Sample 01: 1Tx / Chain 0
2	Sample 01: 2Tx
3	Sample 02: 1Tx / Chain 0
4	Sample 02: 2Tx
Modulation Mode	HT20, HT40
Operating Mode	Operating Mode Description
1	Sample 01: 2Tx
2	Sample 02: 2Tx

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions		
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.		
User Position	☒ EUT will be placed in fixed position.		
	☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed three orthogonal planes. The worst planes are Y-plane		
	☐ 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. The worst planes is X.		
Modulation Mode	11b,11g		
Operating Mode	☒ 1. Sample 01: 1Tx / Chain 0		
	☒ 2. Sample 01: 2Tx		
	☒ 3. Sample 02: 1Tx / Chain 0		
	☒ 4. Sample 02: 2Tx		
Modulation Mode	HT20, HT40		
Operating Mode	☒ 2. Sample 01: 2Tx		
	☒ 4. Sample 02: 2Tx		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**

2.5 Test Setup Diagram

Test Setup Diagram



1. RJ45, 2m shielded w/o core
2. RJ45, 1.5m non-shielded w/o core
3. Ground, 1m non-shielded w/o core
4. RJ45, 10m shielded w/o core

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

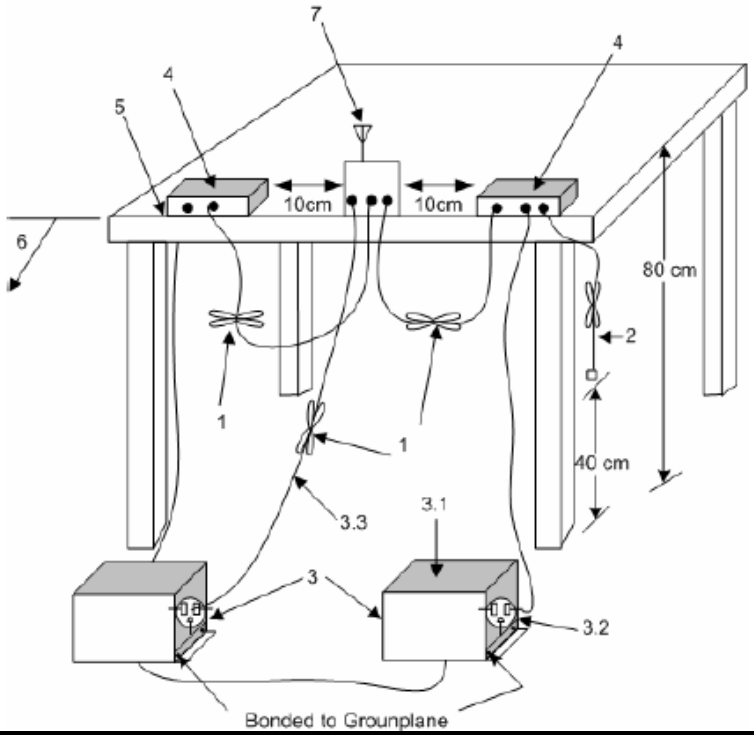
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

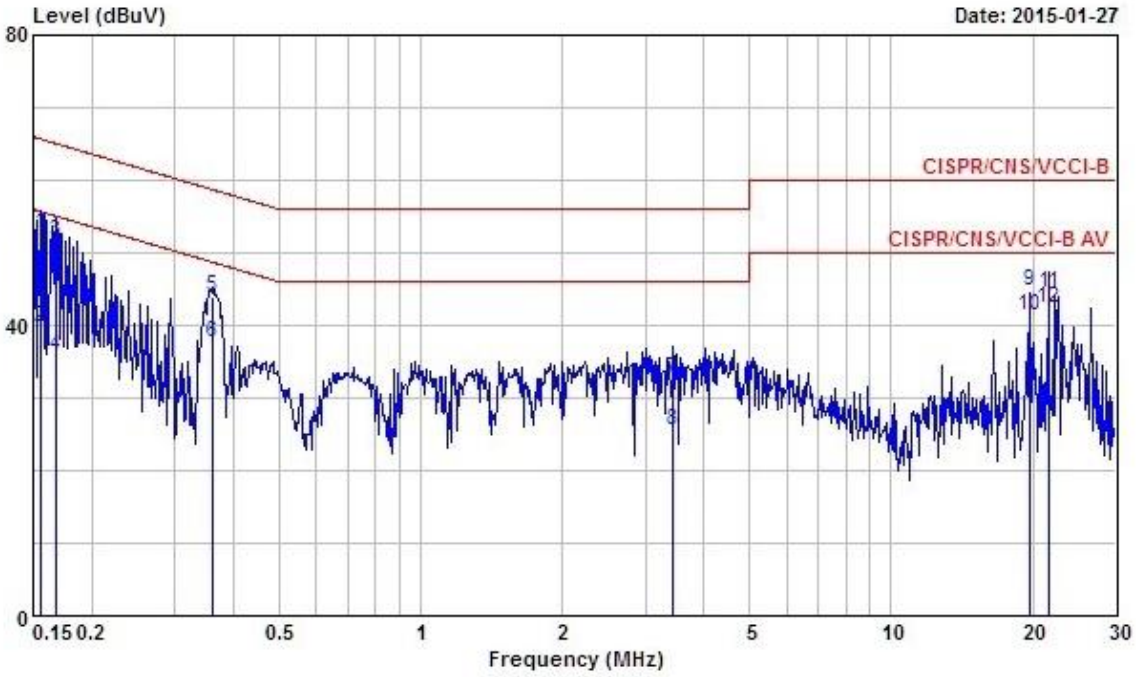
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

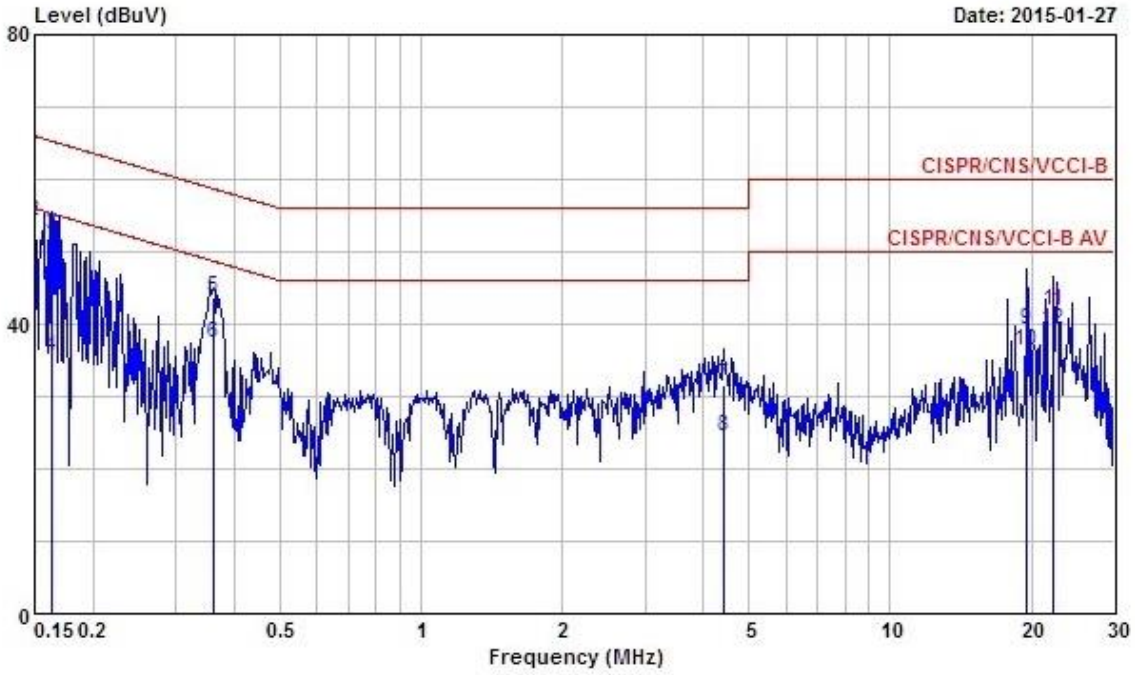
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1556680	52.57	-13.12	65.69	52.20	0.02	0.35	QP
2	0.1556680	39.79	-15.90	55.69	39.42	0.02	0.35	Average
3	0.1676540	51.51	-13.57	65.08	51.09	0.02	0.40	QP
4	0.1676540	35.80	-19.28	55.08	35.38	0.02	0.40	Average
5	0.3614620	44.05	-14.64	58.69	43.44	0.03	0.58	QP
6	0.3614620	37.73	-10.96	48.69	37.12	0.03	0.58	Average
7	3.440	32.60	-23.40	56.00	31.80	0.08	0.72	QP
8	3.440	25.48	-20.52	46.00	24.68	0.08	0.72	Average
9	19.709	44.84	-15.16	60.00	43.81	0.32	0.71	QP
10	19.709	41.41	-8.59	50.00	40.38	0.32	0.71	Average
11	21.665	44.57	-15.43	60.00	43.56	0.35	0.66	QP
12 @	21.665	42.31	-7.69	50.00	41.30	0.35	0.66	Average

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

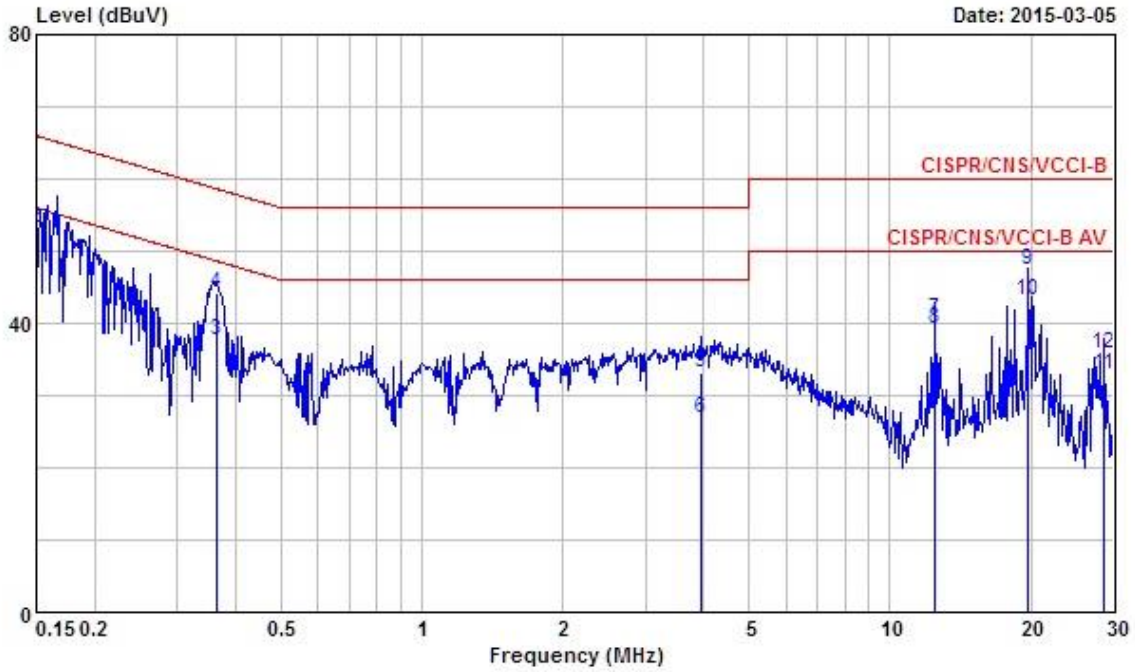
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1500000	34.49	-21.51	56.00	34.12	0.03	0.34	Average
2	0.1500000	54.20	-11.80	66.00	53.83	0.03	0.34	QP
3	0.1632710	52.26	-13.04	65.30	51.85	0.03	0.38	QP
4	0.1632710	35.64	-19.66	55.30	35.23	0.03	0.38	Average
5	0.3621020	43.77	-14.91	58.68	43.16	0.03	0.58	QP
6	0.3621020	37.28	-11.40	48.68	36.67	0.03	0.58	Average
7	4.410	31.67	-24.33	56.00	30.85	0.11	0.71	QP
8	4.410	24.37	-21.63	46.00	23.55	0.11	0.71	Average
9	19.516	39.19	-20.81	60.00	38.17	0.31	0.71	QP
10	19.516	36.21	-13.79	50.00	35.19	0.31	0.71	Average
11	22.315	41.86	-18.14	60.00	40.87	0.34	0.65	QP
12	22.315	39.17	-10.83	50.00	38.18	0.34	0.65	Average

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

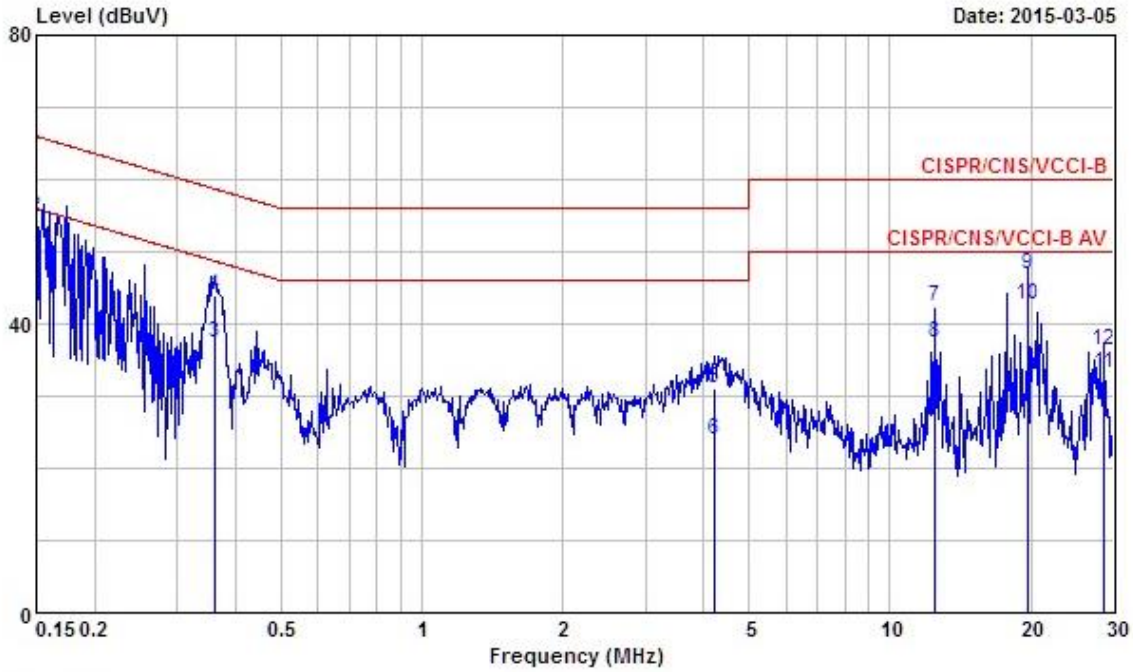
AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1500000	35.81	-20.19	56.00	35.45	0.02	0.34	Average
2	0.1500000	53.23	-12.77	66.00	52.87	0.02	0.34	QP
3	0.3640320	37.74	-10.90	48.64	37.12	0.03	0.59	Average
4	0.3640320	44.10	-14.54	58.64	43.48	0.03	0.59	QP
5	3.960	33.27	-22.73	56.00	32.48	0.09	0.70	QP
6	3.960	26.74	-19.26	46.00	25.95	0.09	0.70	Average
7	12.466	40.47	-19.53	60.00	39.44	0.23	0.80	QP
8	12.466	39.12	-10.88	50.00	38.09	0.23	0.80	Average
9	19.709	47.26	-12.74	60.00	46.23	0.32	0.71	QP
10	19.709	43.21	-6.79	50.00	42.18	0.32	0.71	Average
11	28.685	32.98	-17.02	50.00	32.02	0.43	0.53	Average
12	28.685	35.88	-24.12	60.00	34.92	0.43	0.53	QP

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

AC Power-line Conducted Emissions Result			
Operating Mode	2	**Power Phase**	Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1500000	34.45	-21.55	56.00	34.08	0.03	0.34	Average
2	0.1500000	54.70	-11.30	66.00	54.33	0.03	0.34	QP
3	0.3615320	37.49	-11.20	48.69	36.88	0.03	0.58	Average
4	0.3615320	43.96	-14.73	58.69	43.35	0.03	0.58	QP
5	4.220	31.17	-24.83	56.00	30.36	0.10	0.71	QP
6	4.220	23.88	-22.12	46.00	23.07	0.10	0.71	Average
7	12.500	42.29	-17.71	60.00	41.26	0.23	0.80	QP
8	12.500	37.30	-12.70	50.00	36.27	0.23	0.80	Average
9	19.708	46.80	-13.20	60.00	45.78	0.31	0.71	QP
10	19.708	42.66	-7.34	50.00	41.64	0.31	0.71	Average
11	28.685	33.23	-16.77	50.00	32.28	0.42	0.53	Average
12	28.685	36.23	-23.77	60.00	35.28	0.42	0.53	QP

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

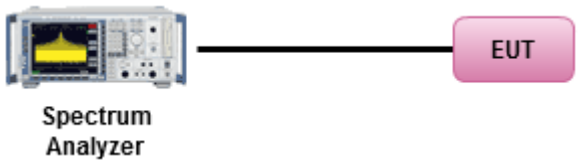
3.2.2 Measuring Instruments

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 D01 DTS Meas Guidance v03r02, clause 8.1 Option 1 for 6 dB bandwidth measurement.
	☐	Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 8.2 Option 2 for 6 dB bandwidth measurement.
	☐	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
☒	For conducted measurement.	
	☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
	☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
	☒	The EUT supports 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 1.
		☒ 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.

3.2.4 Test Setup

Emission Bandwidth


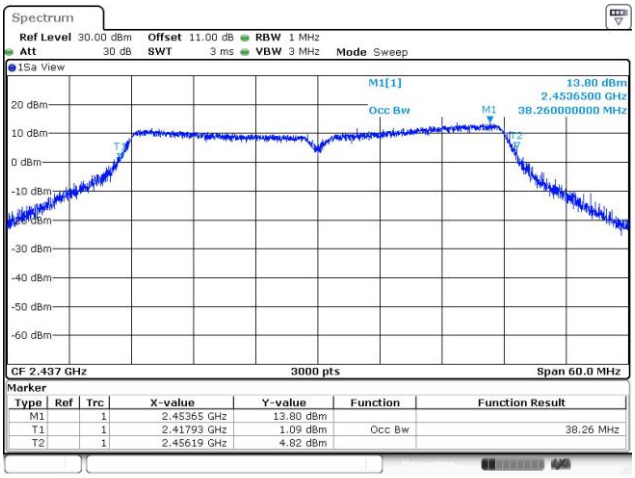
3.2.5 Test Result of Emission Bandwidth

Sample 01

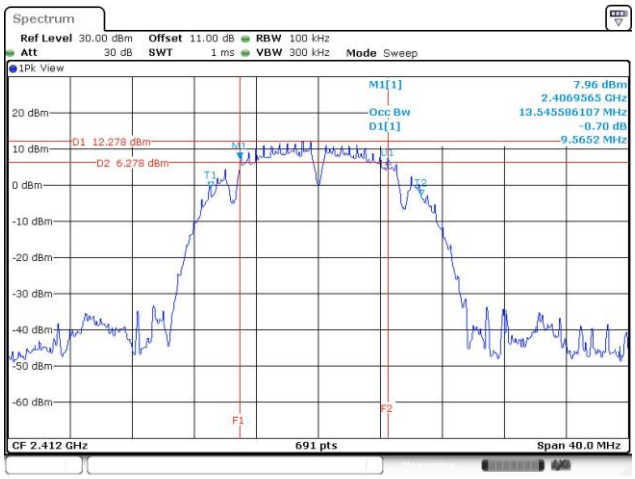
Emission Bandwidth Result										
Condition			Emission Bandwidth (MHz)							
Modulation Mode	N_{TX}	Freq. (MHz)	99% Bandwidth				6dB Bandwidth			
			Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4
11b	1	2412	13.53	--	--	--	9.57	--	--	--
11b	1	2437	13.76	--	--	--	10.03	--	--	--
11b	1	2462	13.85	--	--	--	9.57	--	--	--
11b	2	2412	13.57	13.45	--	--	10.09	10.09	--	--
11b	2	2437	13.77	13.91	--	--	10.09	10.09	--	--
11b	2	2462	13.86	13.64	--	--	10.03	9.57	--	--
11g	1	2412	16.87	--	--	--	16.00	--	--	--
11g	1	2437	19.54	--	--	--	15.77	--	--	--
11g	1	2462	17.25	--	--	--	15.71	--	--	--
11g	2	2412	16.83	16.58	--	--	16.06	16.35	--	--
11g	2	2437	17.04	16.93	--	--	15.77	16.35	--	--
11g	2	2462	17.21	16.73	--	--	16.35	15.71	--	--
HT-20	2	2412	17.93	17.79	--	--	16.70	17.22	--	--
HT-20	2	2437	18.11	18.12	--	--	17.33	17.39	--	--
HT-20	2	2462	18.32	17.97	--	--	16.35	15.71	--	--
HT-40	2	2422	38.50	37.48	--	--	36.41	36.41	--	--
HT-40	2	2437	37.96	38.26	--	--	36.06	36.06	--	--
HT-40	2	2452	37.34	37.02	--	--	35.59	35.13	--	--
Limit			N/A				≥500 kHz			
Result			Complied							
Note 1: N_{TX} = Number of Transmit Chains										

Worst Emission Bandwidth Plots

99% Bandwidth



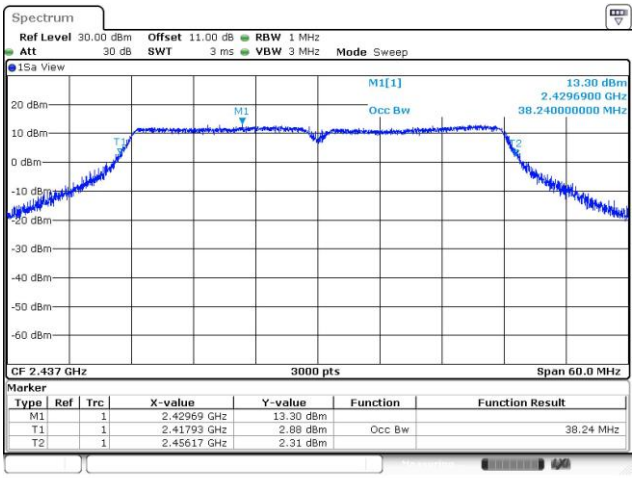
6dB Bandwidth

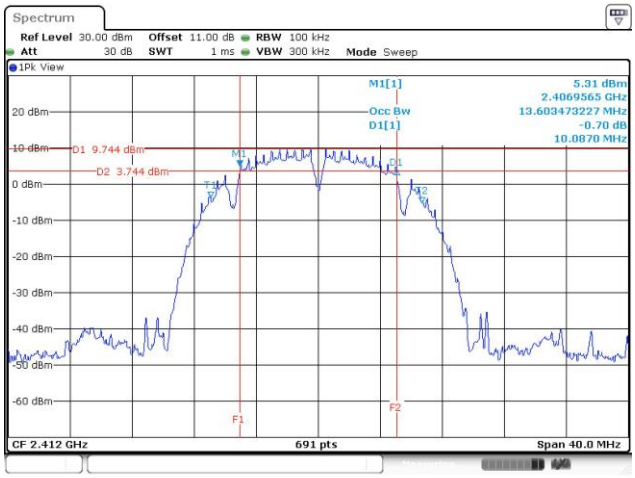


Sample 02

Emission Bandwidth Result										
Condition			Emission Bandwidth (MHz)							
Modulation Mode	N_{TX}	Freq. (MHz)	99% Bandwidth				6dB Bandwidth			
			Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4
11b	1	2412	13.83	--	--	--	10.09	--	--	--
11b	1	2437	13.79	--	--	--	10.09	--	--	--
11b	1	2462	13.83	--	--	--	10.09	--	--	--
11b	2	2412	13.88	13.81	--	--	10.09	10.09	--	--
11b	2	2437	13.89	13.79	--	--	10.09	10.09	--	--
11b	2	2462	13.86	13.78	--	--	10.09	10.09	--	--
11g	1	2412	17.14	--	--	--	16.35	--	--	--
11g	1	2437	23.13	--	--	--	16.35	--	--	--
11g	1	2462	17.09	--	--	--	16.35	--	--	--
11g	2	2412	17.07	16.80	--	--	16.35	16.35	--	--
11g	2	2437	17.07	16.84	--	--	16.35	16.35	--	--
11g	2	2462	16.99	16.82	--	--	16.35	16.35	--	--
HT-20	2	2412	18.09	17.97	--	--	17.62	17.62	--	--
HT-20	2	2437	18.12	18.06	--	--	17.57	17.57	--	--
HT-20	2	2462	18.04	18.03	--	--	17.51	17.57	--	--
HT-40	2	2422	38.18	38.10	--	--	36.41	36.41	--	--
HT-40	2	2437	38.24	37.90	--	--	36.41	36.41	--	--
HT-40	2	2452	38.12	37.94	--	--	36.41	36.41	--	--
Limit			N/A				≥500 kHz			
Result			Complied							
Note 1: N_{TX} = Number of Transmit Chains										

Worst Emission Bandwidth Plots	
99% Bandwidth	**6dB Bandwidth**





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			
☒	2400-2483.5 MHz Band:		
	☒	If G_{TX} ≤ 6 dBi, then P_{Out} ≤ 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 + 8dB dBm
e.i.r.p. Power Limit:			
☒	2400-2483.5 MHz Band		
	☒	Point-to-multipoint systems (P2M): P_{eirp} ≤ 36 dBm (4 W)	
	☐	Point-to-point systems (P2P): P_{eirp} ≤ MAX(36, [P_{Out} + G_{TX}]) dBm	
	☐	Smart antenna system (SAS)	
		☐	Single beam: P_{eirp} ≤ MAX(36, P_{Out} + G_{TX}) dBm
		☐	Overlap beam: P_{eirp} ≤ MAX(36, P_{Out} + G_{TX}) dBm
		☐	Aggregate power on all beams: P_{eirp} ≤ MAX(36, [P_{Out} + G_{TX} + 8]) dBm
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.			

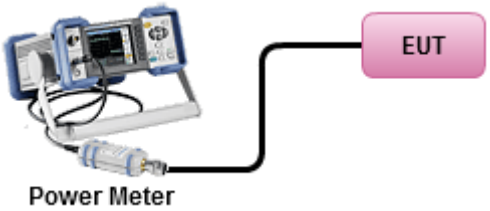
3.3.2 Measuring Instruments

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 D01 DTS Meas Guidance v03r02, clause 9.1.1 (RBW ≥ DTS BW).
	☒ Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 9.1.2 (Peak power meter)
☒	Maximum Conducted Output Power (Reference only)
	☐ Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).
	☐ Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 9.2.2.3 Method AVGSA-1 Alt. (slow sweep speed)
	☐ Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging).
	☐ Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed)
	RF power meter and average over on/off periods with duty factor or gated trigger
	☒ Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 9.2.3.2 Method AVGPM-G (using a gated RF average power meter)
☒	For conducted measurement.
	☒ The EUT supports single transmit chain and measurements performed on this transmit chain.
	☐ The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
	☒ The EUT supports multiple transmit chains using options given below: 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: $P_{total} = P_1 + P_2 + \ldots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup

RF Output Power (Power Meter)


3.3.5 Directional Gain for Power Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	2	-	-
Maximum G_{ANT} (dBi)		2	2	-	-
Modulation Mode	**DG (dBi)**	**N_{TX}**	**N_{SS}**	**STBC**	**Array Gain (dB)**
11b,1-11Mbps	2	1	1	-	-
11b,1-11Mbps	2	2	1		
11g,6-54Mbps	2	1	1		
11g,6-54Mbps	2	2	1	-	-
HT20,M0-15	2	2	1	-	-
HT40,M0-15	2	2	1	-	-

3.3.6 Test Result of Maximum Conducted Output Power

Sample 01

Maximum Peak Conducted Output Power											
Condition			RF Output Power (dBm)								
Modulation Mode	N_{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11b	1	2412	23.58	--	--	--	23.58	30.00	2.00	25.58	36.00
11b	1	2437	23.63	--	--	--	23.63	30.00	2.00	25.63	36.00
11b	1	2462	24.76	--	--	--	24.76	30.00	2.00	26.76	36.00
11b	2	2412	22.19	22.73	--	--	25.48	30.00	2.00	27.48	36.00
11b	2	2437	23.09	23.21	--	--	26.16	30.00	2.00	28.16	36.00
11b	2	2462	23.48	23.45	--	--	26.48	30.00	2.00	28.48	36.00
11g	1	2412	27.85	--	--	--	27.85	30.00	2.00	29.85	36.00
11g	1	2437	29.03	--	--	--	29.03	30.00	2.00	31.03	36.00
11g	1	2462	27.54	--	--	--	27.54	30.00	2.00	29.54	36.00
11g	2	2412	26.55	26.43	--	--	29.50	30.00	2.00	31.50	36.00
11g	2	2437	26.62	26.95	--	--	29.80	30.00	2.00	31.80	36.00
11g	2	2462	26.58	26.92	--	--	29.76	30.00	2.00	31.76	36.00
HT-20	2	2412	26.84	26.93	--	--	**29.90**	30.00	2.00	31.90	36.00
HT-20	2	2437	26.43	26.98	--	--	29.72	30.00	2.00	31.72	36.00
HT-20	2	2462	26.78	26.43	--	--	29.62	30.00	2.00	31.62	36.00
HT-40	2	2422	24.55	25.21	--	--	27.90	30.00	2.00	29.90	36.00
HT-40	2	2437	26.35	26.78	--	--	29.58	30.00	2.00	31.58	36.00
HT-40	2	2452	26.19	26.28	--	--	29.25	30.00	2.00	31.25	36.00
Result			Complied								

Sample 02

Maximum Peak Conducted Output Power											
Condition			RF Output Power (dBm)								
Modulation Mode	N_{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11b	1	2412	23.22	--	--	--	23.22	30.00	2.00	25.22	36.00
11b	1	2437	23.52	--	--	--	23.52	30.00	2.00	25.52	36.00
11b	1	2462	24.90	--	--	--	24.90	30.00	2.00	26.90	36.00
11b	2	2412	22.21	22.38	--	--	25.31	30.00	2.00	27.31	36.00
11b	2	2437	23.26	23.05	--	--	26.17	30.00	2.00	28.17	36.00
11b	2	2462	23.32	23.72	--	--	26.53	30.00	2.00	28.53	36.00
11g	1	2412	27.82	--	--	--	27.82	30.00	2.00	29.82	36.00
11g	1	2437	29.30	--	--	--	29.30	30.00	2.00	31.30	36.00
11g	1	2462	27.03	--	--	--	27.03	30.00	2.00	29.03	36.00
11g	2	2412	26.67	27.11	--	--	29.91	30.00	2.00	31.91	36.00
11g	2	2437	26.72	27.20	--	--	**29.98**	30.00	2.00	31.98	36.00
11g	2	2462	26.74	27.03	--	--	29.90	30.00	2.00	31.90	36.00
HT-20	2	2412	26.65	27.06	--	--	29.87	30.00	2.00	31.87	36.00
HT-20	2	2437	26.64	27.15	--	--	29.91	30.00	2.00	31.91	36.00
HT-20	2	2462	26.67	27.15	--	--	29.93	30.00	2.00	31.93	36.00
HT-40	2	2422	24.56	24.95	--	--	27.77	30.00	2.00	29.77	36.00
HT-40	2	2437	26.39	26.93	--	--	29.68	30.00	2.00	31.68	36.00
HT-40	2	2452	25.92	26.42	--	--	29.19	30.00	2.00	31.19	36.00
Result			Complied								

Sample 01

Maximum Conducted (Average) Output Power											
Condition			RF Output Power (dBm)								
Modulation Mode	N_{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11b	1	2412	21.19	--	--	--	21.19	30.00	2.00	23.19	36.00
11b	1	2437	21.22	--	--	--	21.22	30.00	2.00	23.22	36.00
11b	1	2462	22.33	--	--	--	22.33	30.00	2.00	24.33	36.00
11b	2	2412	19.88	20.27	--	--	23.09	30.00	2.00	25.09	36.00
11b	2	2437	20.73	20.81	--	--	23.78	30.00	2.00	25.78	36.00
11b	2	2462	21.12	21.05	--	--	24.10	30.00	2.00	26.10	36.00
11g	1	2412	20.32	--	--	--	20.32	30.00	2.00	22.32	36.00
11g	1	2437	25.14	--	--	--	**25.14**	30.00	2.00	27.14	36.00
11g	1	2462	20.06	--	--	--	20.06	30.00	2.00	22.06	36.00
11g	2	2412	18.06	17.85	--	--	20.97	30.00	2.00	22.97	36.00
11g	2	2437	18.11	18.45	--	--	21.29	30.00	2.00	23.29	36.00
11g	2	2462	18.35	18.11	--	--	21.24	30.00	2.00	23.24	36.00
HT-20	2	2412	18.32	18.04	--	--	21.19	30.00	2.00	23.19	36.00
HT-20	2	2437	18.11	18.35	--	--	21.24	30.00	2.00	23.24	36.00
HT-20	2	2462	18.32	18.02	--	--	21.18	30.00	2.00	23.18	36.00
HT-40	2	2422	15.66	16.05	--	--	18.87	30.00	2.00	20.87	36.00
HT-40	2	2437	17.82	18.06	--	--	20.95	30.00	2.00	22.95	36.00
HT-40	2	2452	16.85	17.78	--	--	20.35	30.00	2.00	22.35	36.00
Result			Complied								

Note: AV power is for reference only.

Sample 02

Maximum Conducted (Average) Output Power											
Condition			RF Output Power (dBm)								
Modulation Mode	N_{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11b	1	2412	20.91	--	--	--	20.91	30.00	2.00	22.91	36.00
11b	1	2437	21.22	--	--	--	21.22	30.00	2.00	23.22	36.00
11b	1	2462	22.51	--	--	--	22.51	30.00	2.00	24.51	36.00
11b	2	2412	19.89	20.02	--	--	22.97	30.00	2.00	24.97	36.00
11b	2	2437	20.96	20.75	--	--	23.87	30.00	2.00	25.87	36.00
11b	2	2462	20.93	21.30	--	--	24.13	30.00	2.00	26.13	36.00
11g	1	2412	19.73	--	--	--	19.73	30.00	2.00	21.73	36.00
11g	1	2437	25.08	--	--	--	**25.08**	30.00	2.00	27.08	36.00
11g	1	2462	18.88	--	--	--	18.88	30.00	2.00	20.88	36.00
11g	2	2412	18.11	18.28	--	--	21.21	30.00	2.00	23.21	36.00
11g	2	2437	18.25	18.20	--	--	21.24	30.00	2.00	23.24	36.00
11g	2	2462	18.21	18.02	--	--	21.13	30.00	2.00	23.13	36.00
HT-20	2	2412	18.25	18.38	--	--	21.33	30.00	2.00	23.33	36.00
HT-20	2	2437	18.13	18.15	--	--	21.15	30.00	2.00	23.15	36.00
HT-20	2	2462	18.18	18.05	--	--	21.13	30.00	2.00	23.13	36.00
HT-40	2	2422	15.85	16.03	--	--	18.95	30.00	2.00	20.95	36.00
HT-40	2	2437	17.92	18.08	--	--	21.01	30.00	2.00	23.01	36.00
HT-40	2	2452	17.48	17.50	--	--	20.50	30.00	2.00	22.50	36.00
Result			Complied								

Note: AV power is for reference only.

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

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

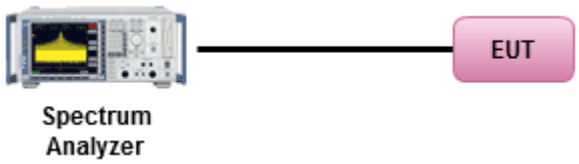
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method			
☒	Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).		
	☒	Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 10.2 Method PKPSD (RBW=3kHz; detector=peak)..	
	☐	Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 10.3 Method AVGPSD-1 (spectral trace averaging).	
	☐	Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 10.4 Method AVGPSD-1 Alt. (slow sweep speed)	
	☐	Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 10.5 Method AVGPSD-2 (spectral trace averaging).	
	☐	Refer as FCC KDB 558074 D01 DTS Meas Guidance v03r02, clause 10.6 Method AVGPSD-2 Alt. (slow sweep speed)	
☒	For conducted measurement.		
	☒	The EUT supports single transmit chain and measurements performed on this transmit chain.	
	☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.	
	☒	The EUT supports 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.
		☐	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.

3.4.4 Test Setup

Power Spectral Density


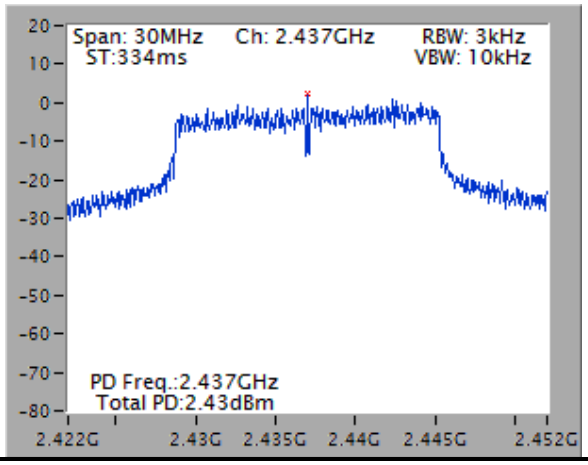
3.4.5 Test Result of Power Spectral Density

Sample 01

Power Spectral Density Result				
Condition			**Power Spectral Density (dBm/3kHz)**	
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Sum Chain**	**Power Limit**
11b	1	2412	-2.92	8.00
11b	1	2437	-3.03	8.00
11b	1	2462	-1.85	8.00
11b	2	2412	-1.06	8.00
11b	2	2437	-0.73	8.00
11b	2	2462	0.33	8.00
11g	1	2412	-4.79	8.00
11g	1	2437	2.43	8.00
11g	1	2462	-4.59	8.00
11g	2	2412	-5.47	8.00
11g	2	2437	-3.41	8.00
11g	2	2462	-3.48	8.00
HT-20	2	2412	-5.18	8.00
HT-20	2	2437	-4.29	8.00
HT-20	2	2462	-3.97	8.00
HT-40	2	2422	-8.46	8.00
HT-40	2	2437	-6.65	8.00
HT-40	2	2452	-7.68	8.00
Result			**Complied**	

Note: Test results for 2TX mode are bin-by-bin summing measured value of each TX port.

Worst Power Spectral Density Plots

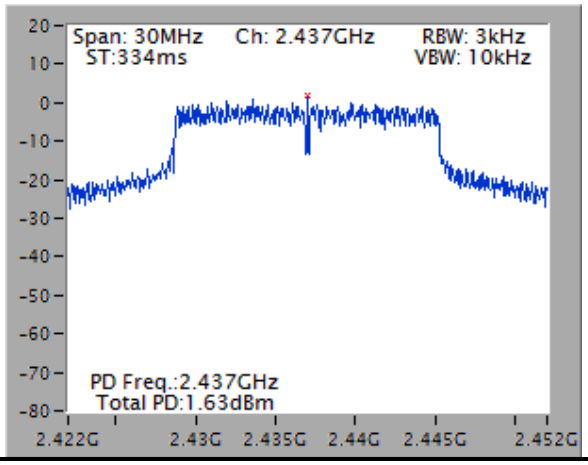


Sample 02

Power Spectral Density Result				
Condition			**Power Spectral Density (dBm/3kHz)**	
Modulation Mode	**N_{TX}**	**Freq. (MHz)**	**Sum Chain**	**Power Limit**
11b	1	2412	-3.35	8.00
11b	1	2437	-3.75	8.00
11b	1	2462	-1.78	8.00
11b	2	2412	-1.63	8.00
11b	2	2437	-1.11	8.00
11b	2	2462	-0.23	8.00
11g	1	2412	-5.46	8.00
11g	1	2437	1.63	8.00
11g	1	2462	-5.60	8.00
11g	2	2412	-4.44	8.00
11g	2	2437	-3.76	8.00
11g	2	2462	-3.33	8.00
HT-20	2	2412	-5.60	8.00
HT-20	2	2437	-4.31	8.00
HT-20	2	2462	-4.51	8.00
HT-40	2	2422	-8.60	8.00
HT-40	2	2437	-7.13	8.00
HT-40	2	2452	-8.19	8.00
Result			**Complied**	

Note: Test results for 2TX mode are bin-by-bin summing measured value of each TX port.

Worst Power Spectral Density Plots



3.5 Emissions in non-restricted frequency bands

3.5.1 Emissions in non-restricted frequency bands limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz

3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Reference level measurement

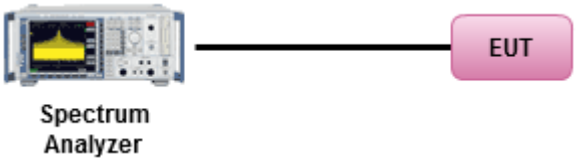
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.5.4 Test Setup

Transmitter Radiated Bandedge Emissions

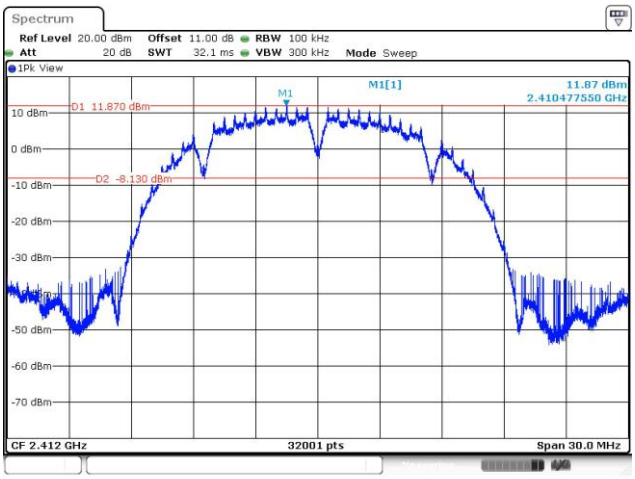
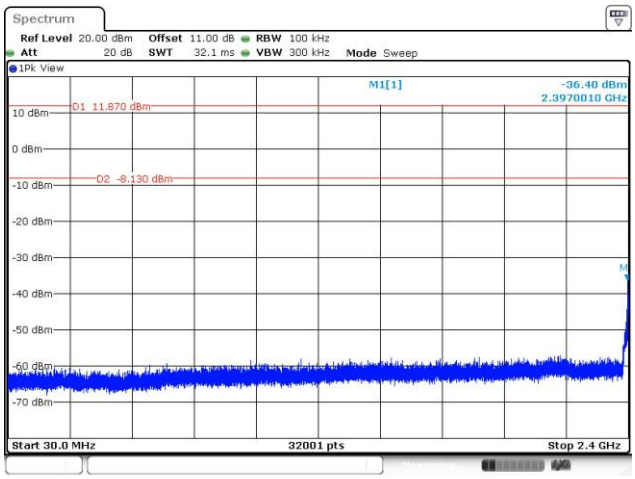
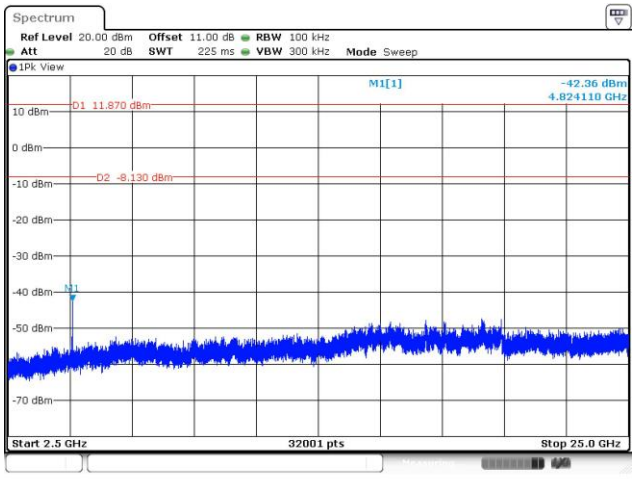
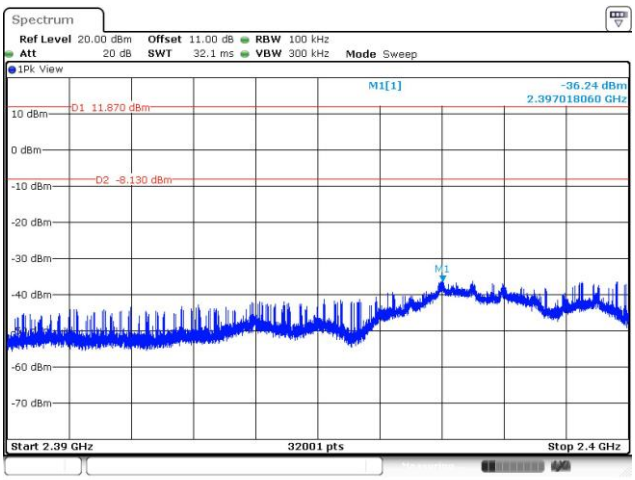


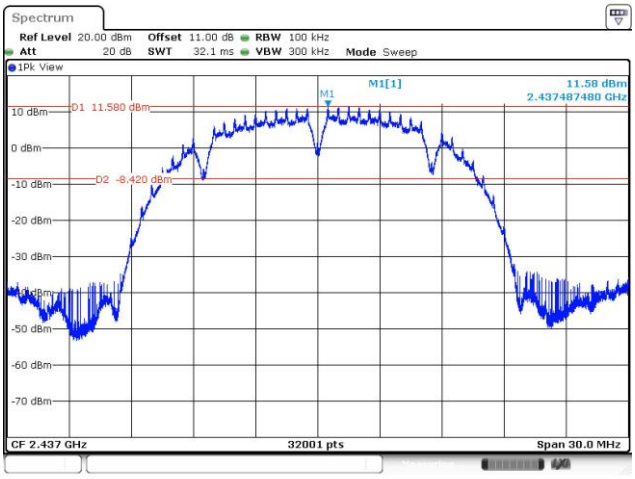
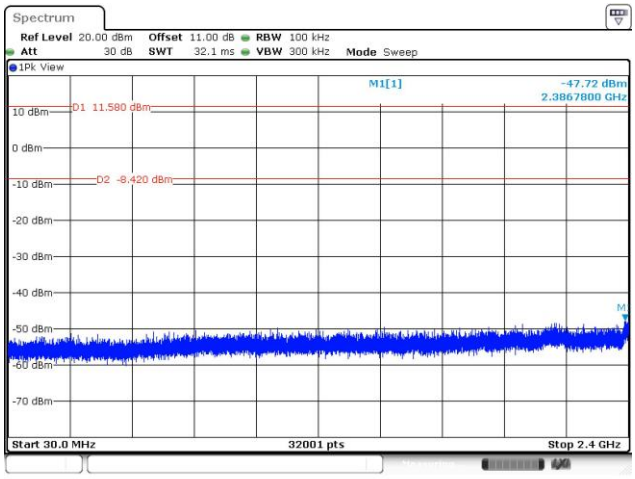
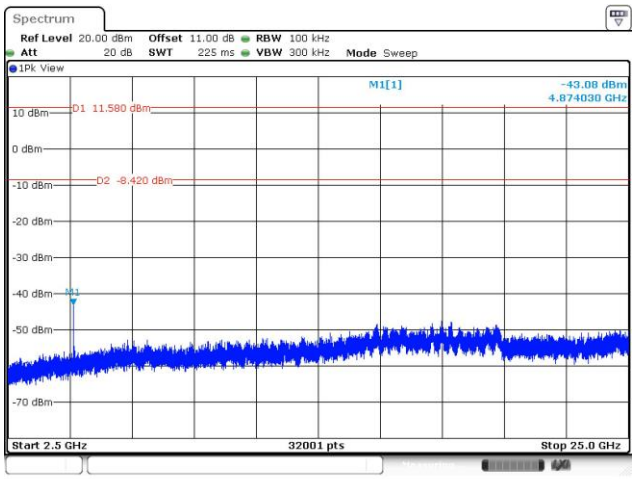
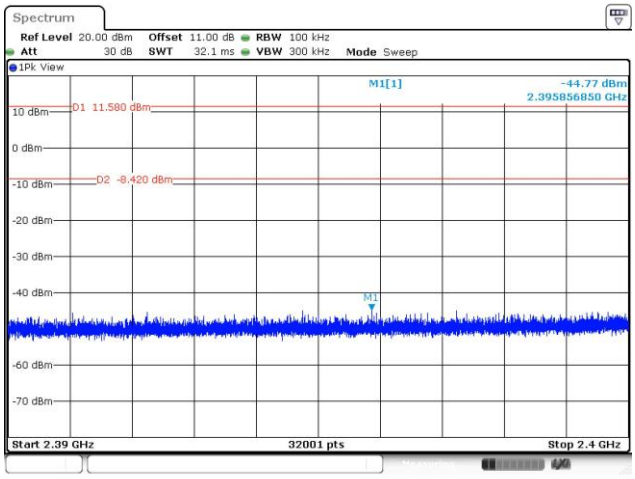
3.5.5 Test Result of Emissions in non-restricted frequency bands

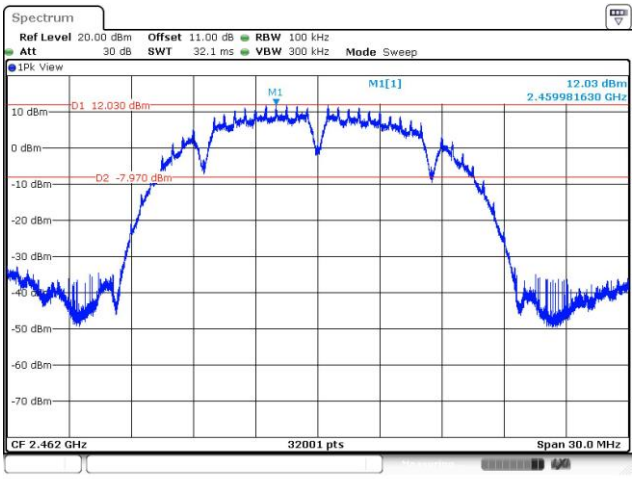
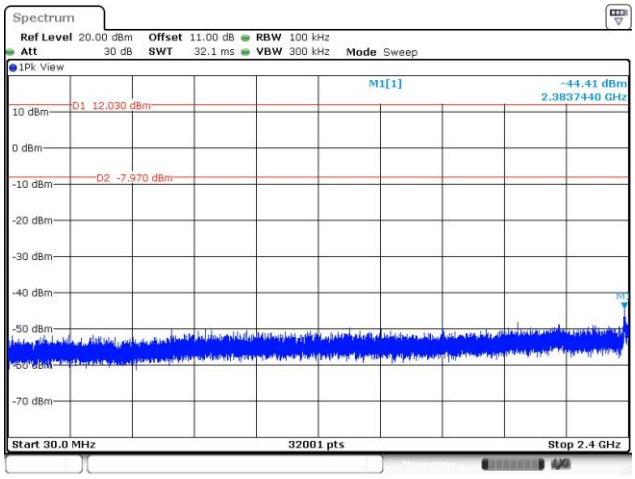
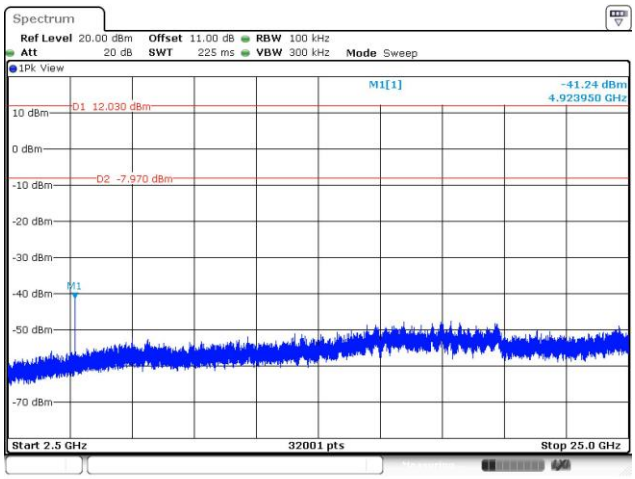
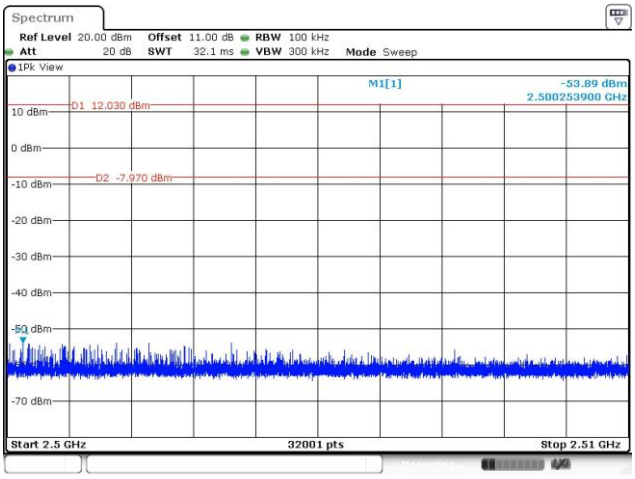
This test item is performed on each TX output individually without summing or adding 10 log(N_{ANT}) since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

3.5.6 Test Result of Emissions in non-restricted frequency bands

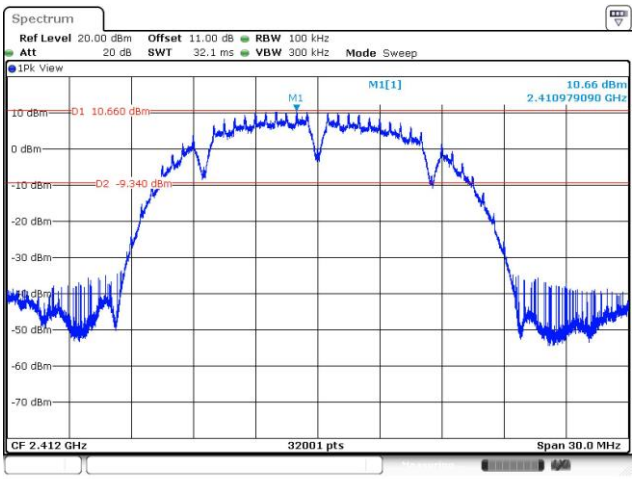
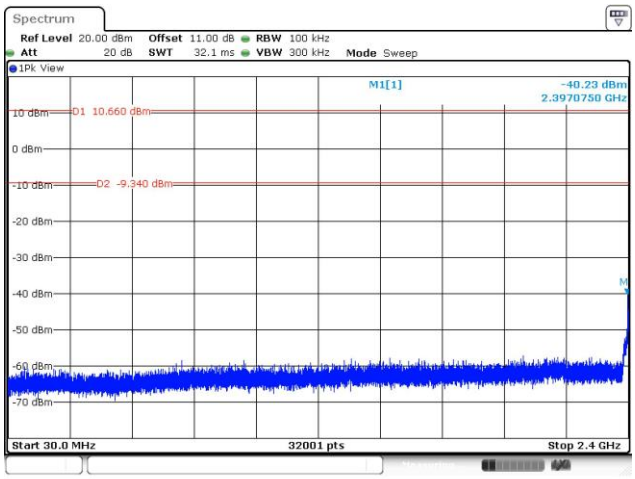
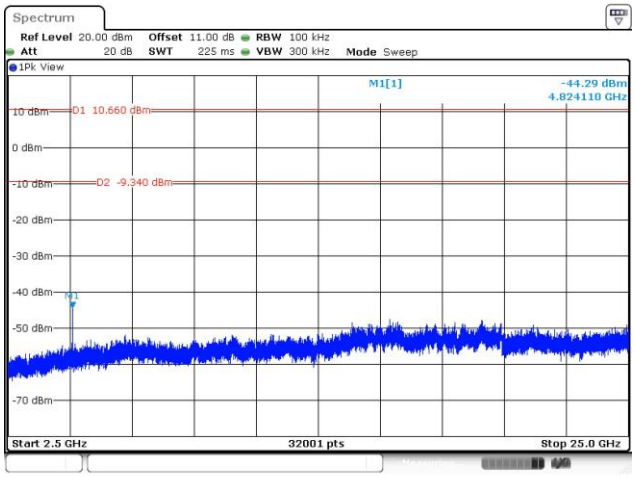
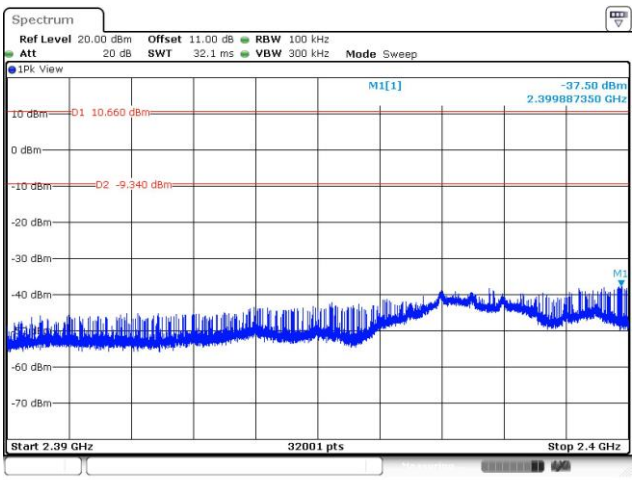
Sample 01 / 802.11b – 1Tx

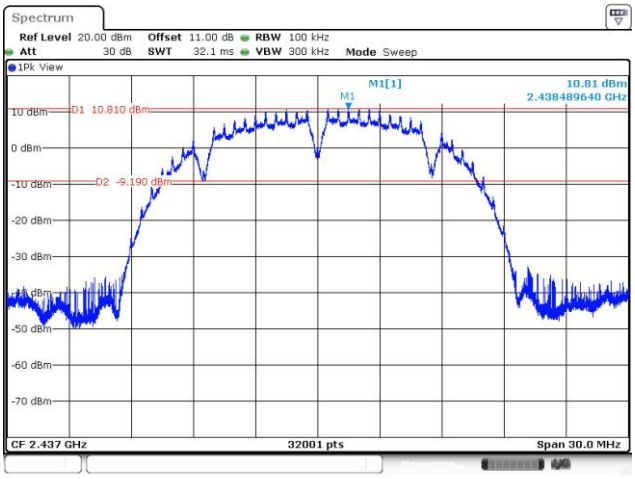
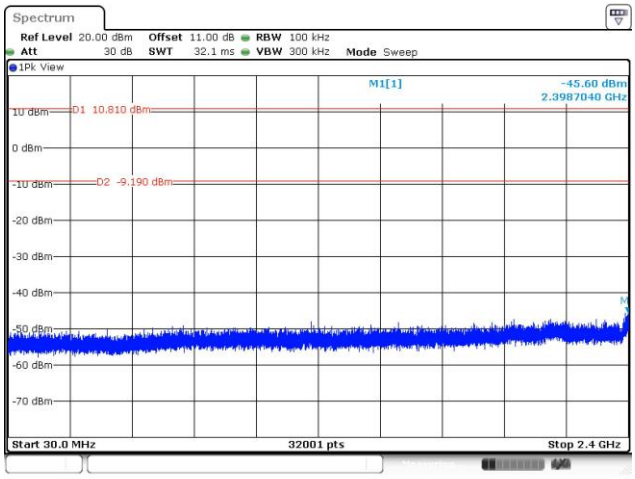
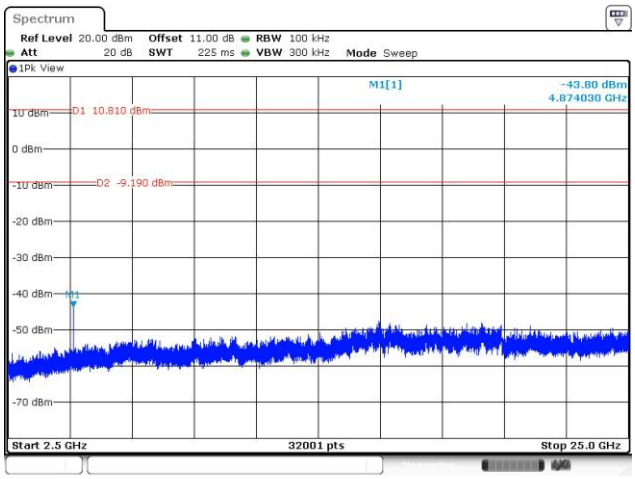
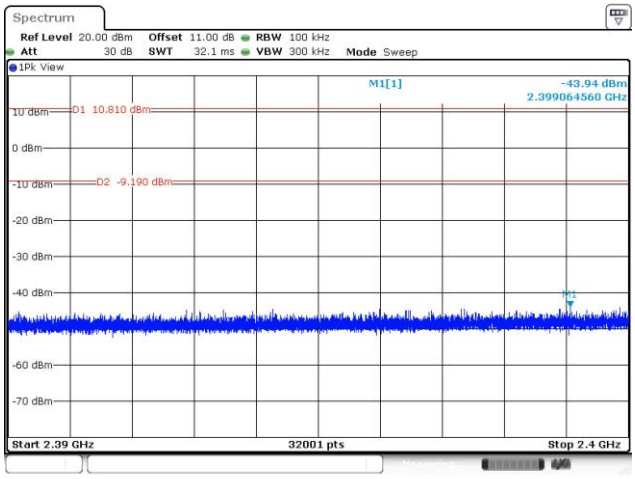
Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

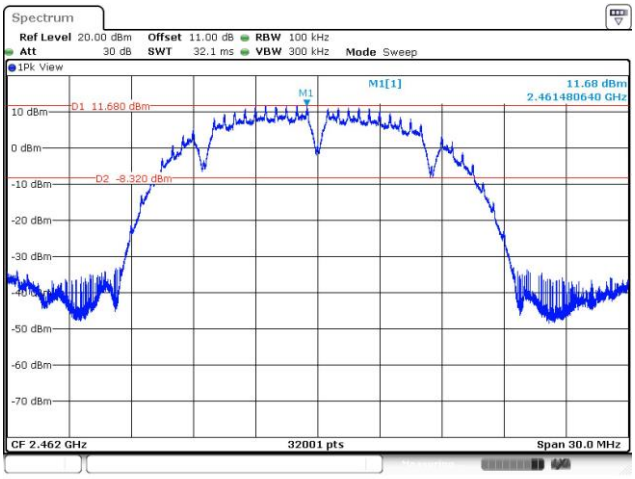
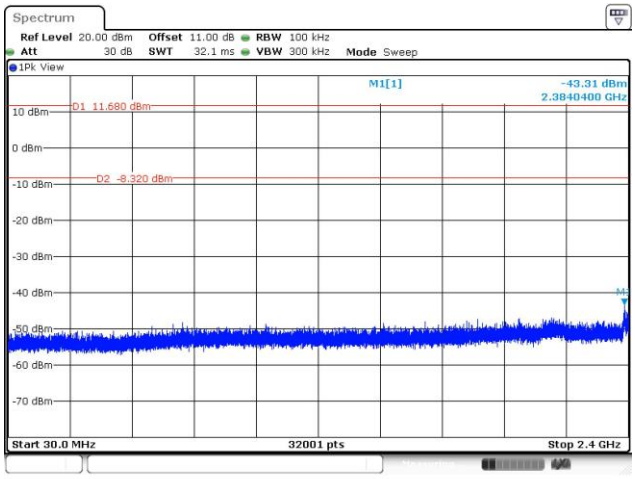
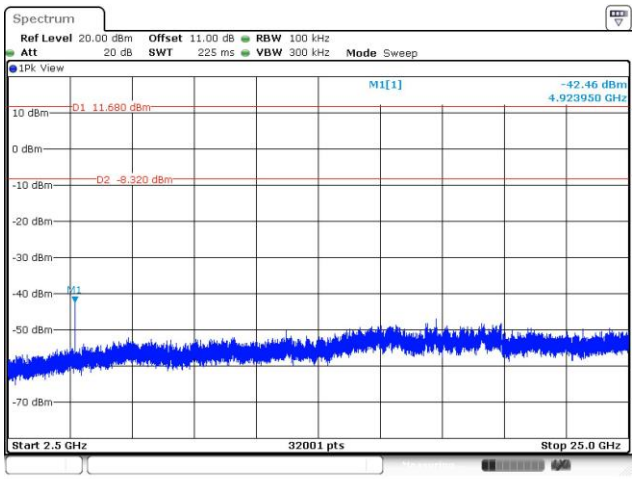
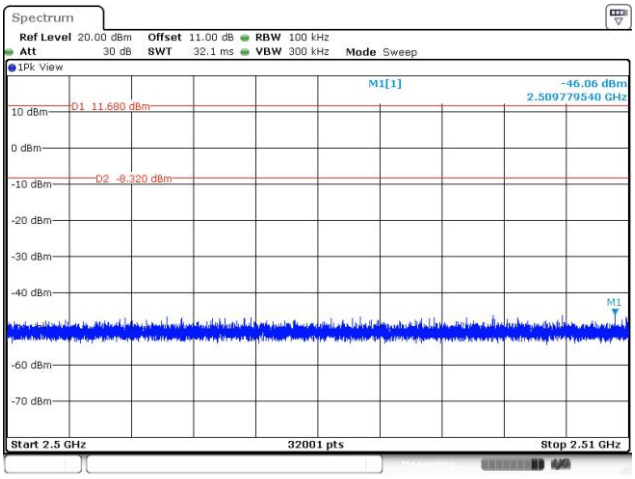
Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

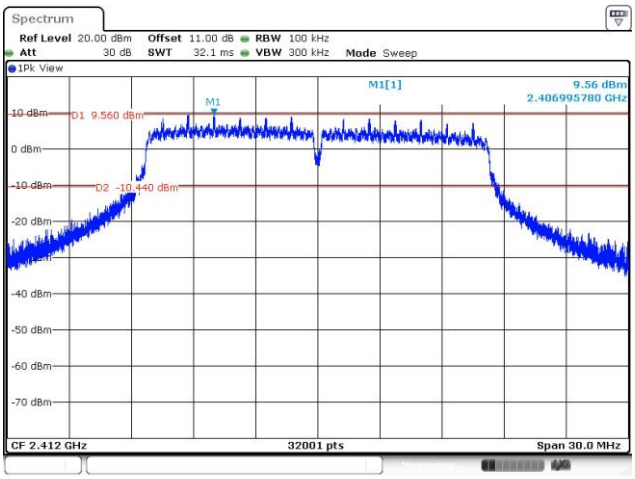
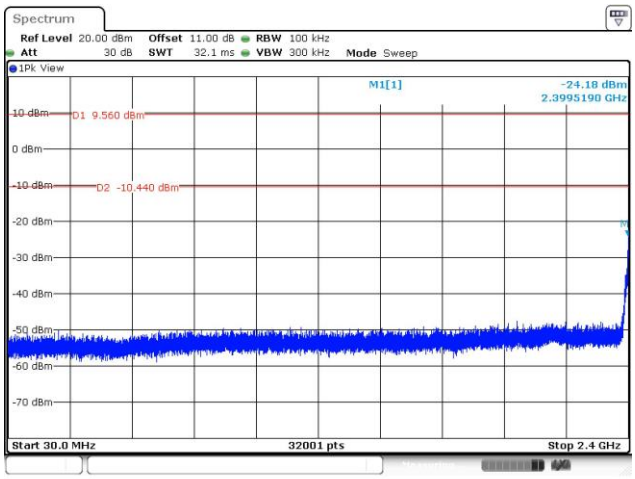
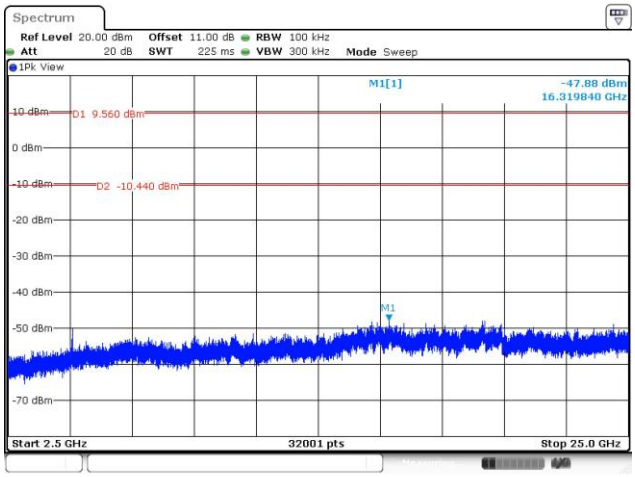
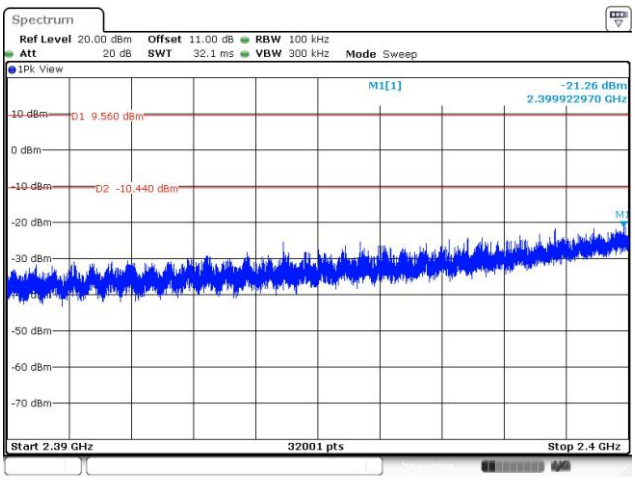
802.11b – 2Tx

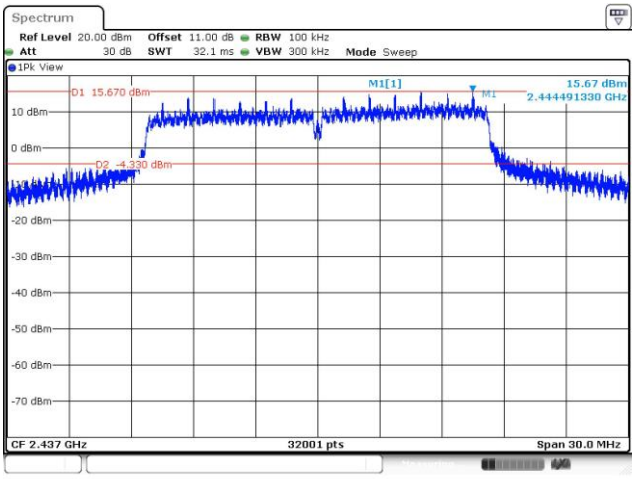
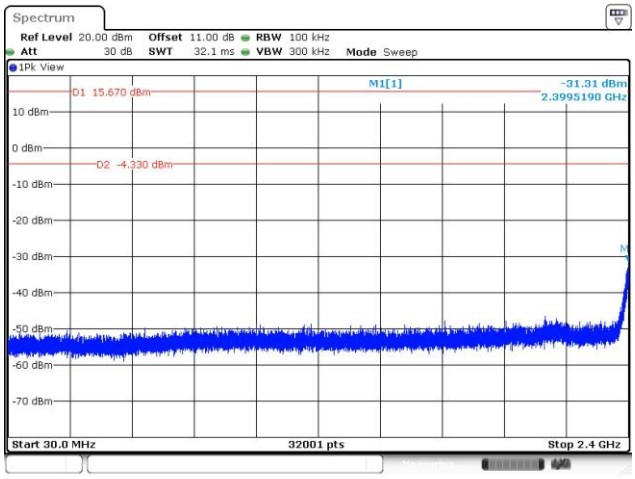
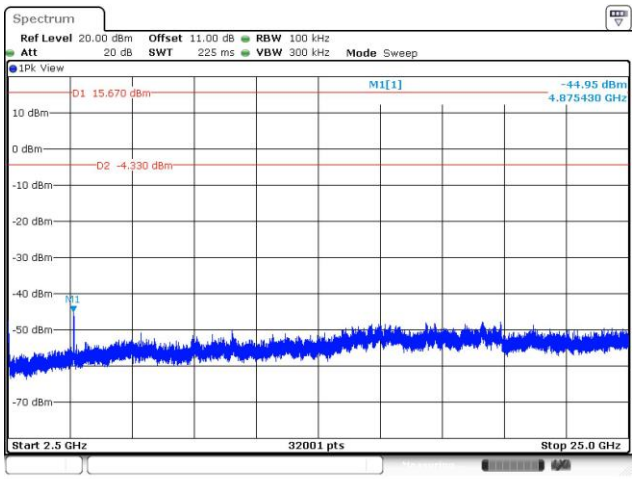
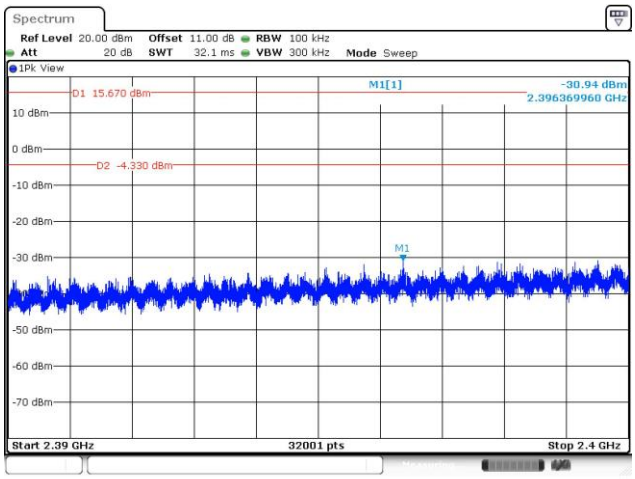
Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

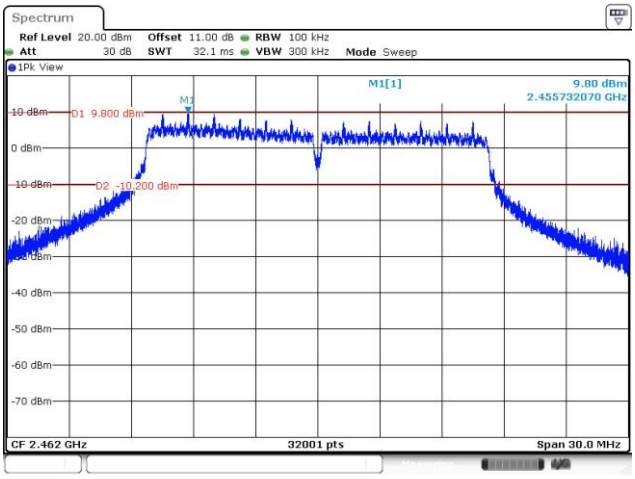
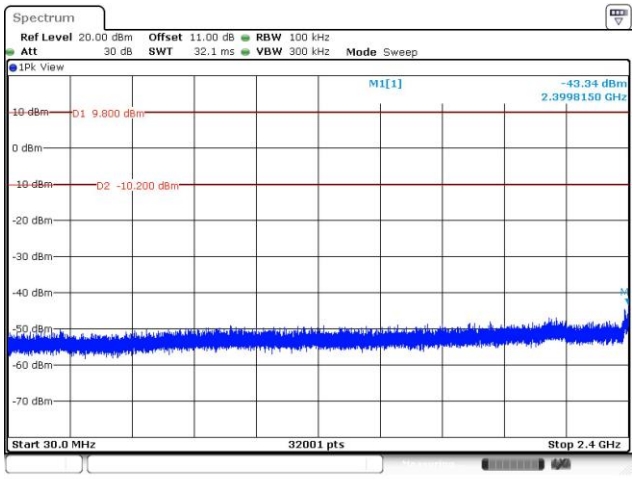
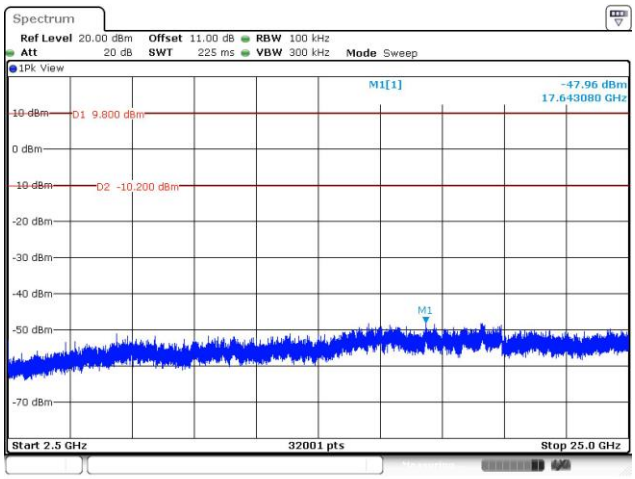
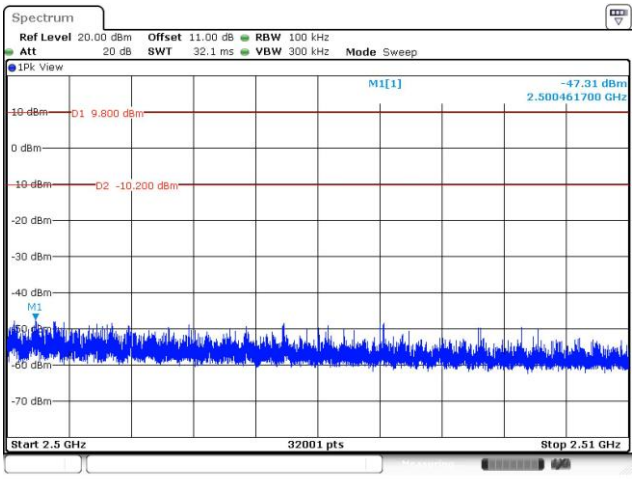
Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

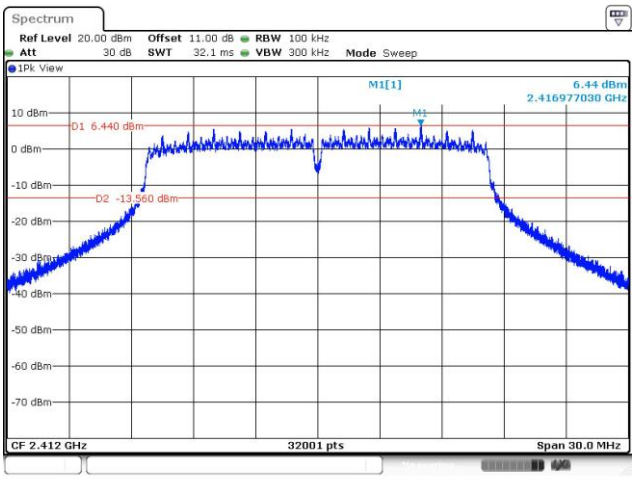
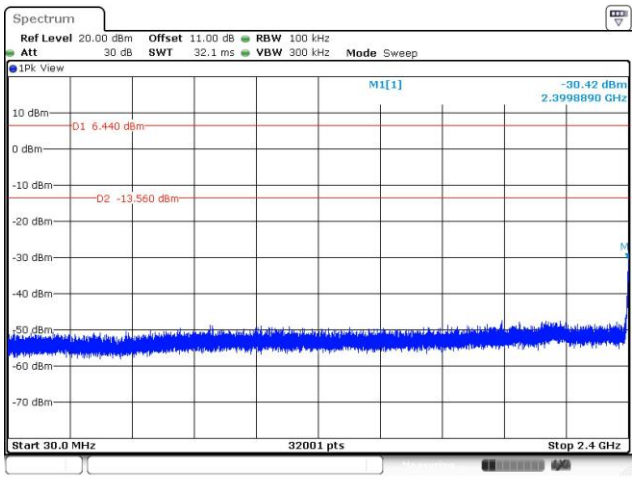
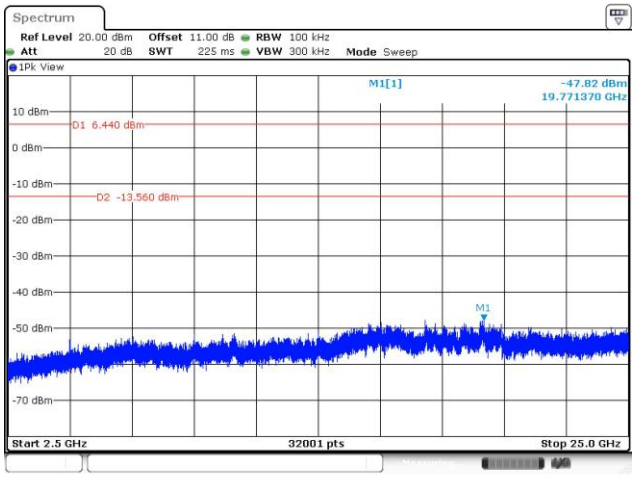
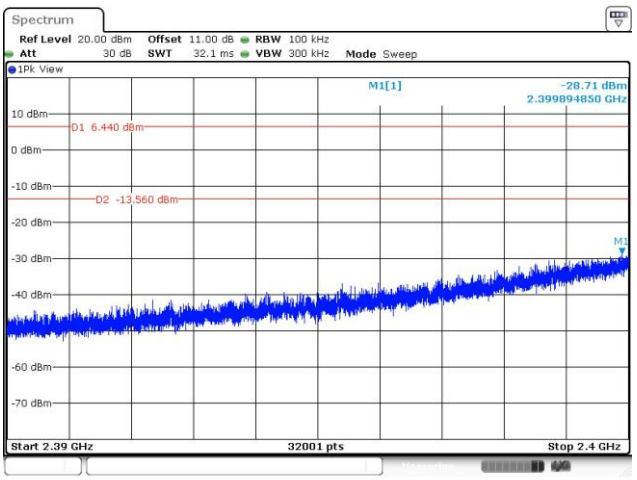
802.11g – 1Tx

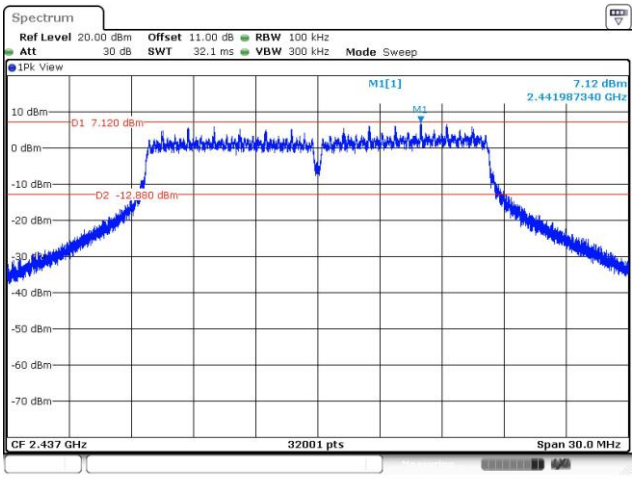
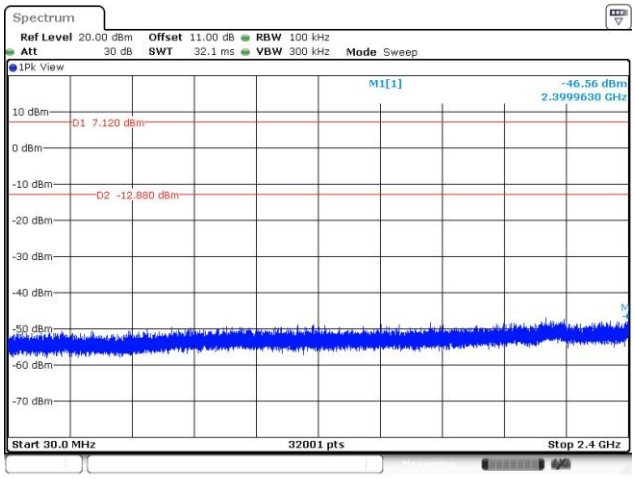
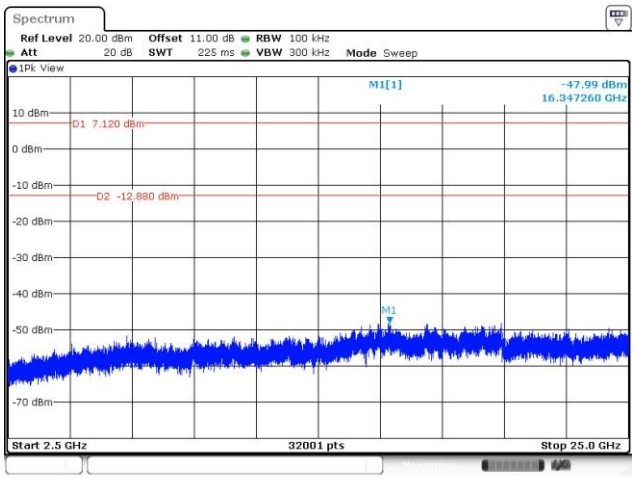
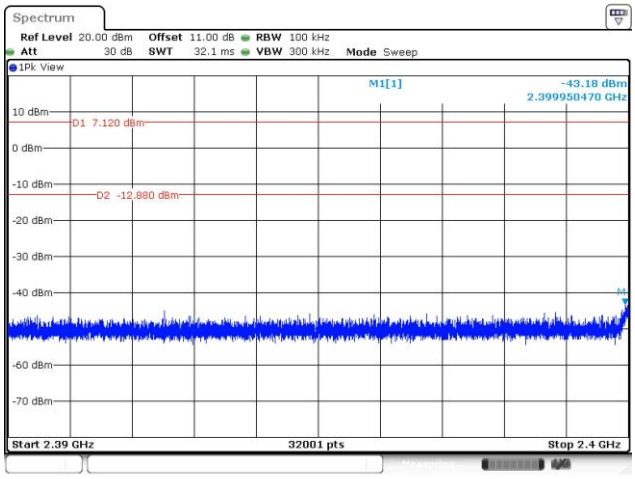
Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

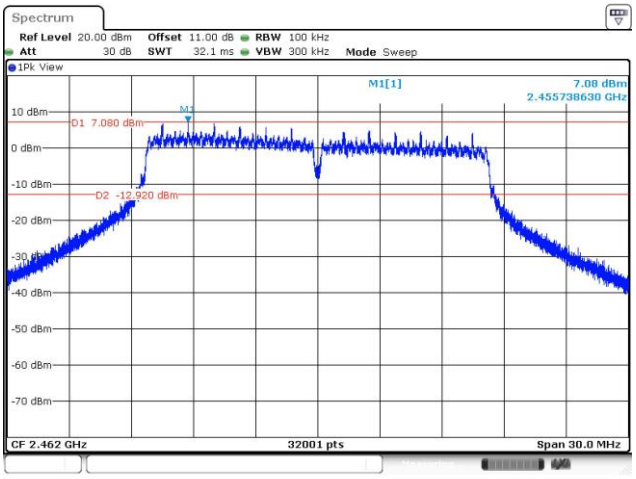
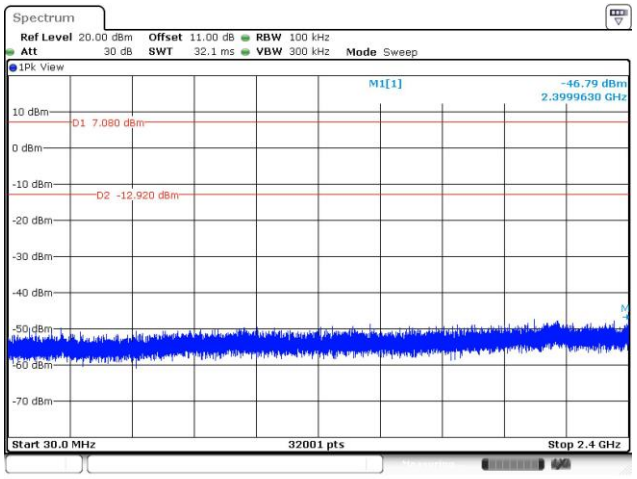
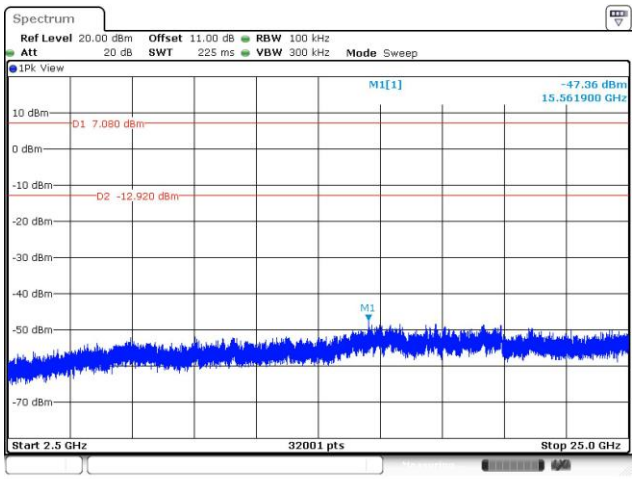
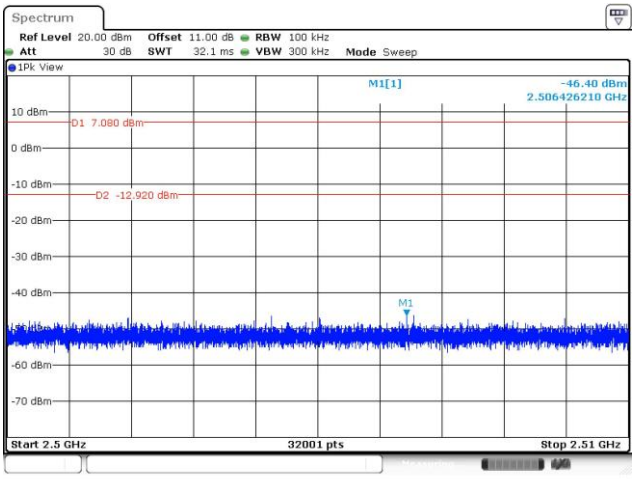
Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

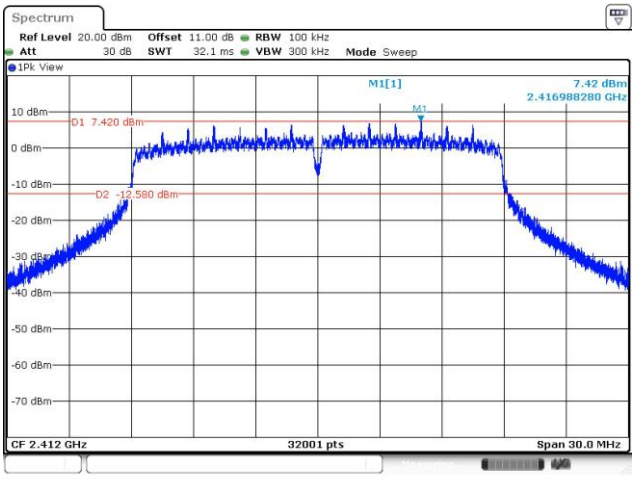
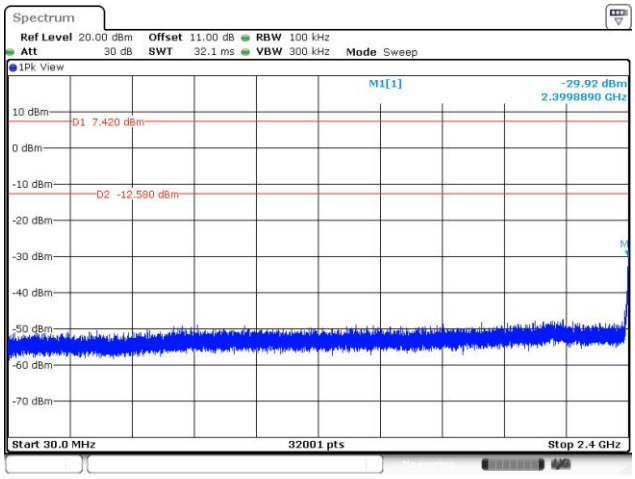
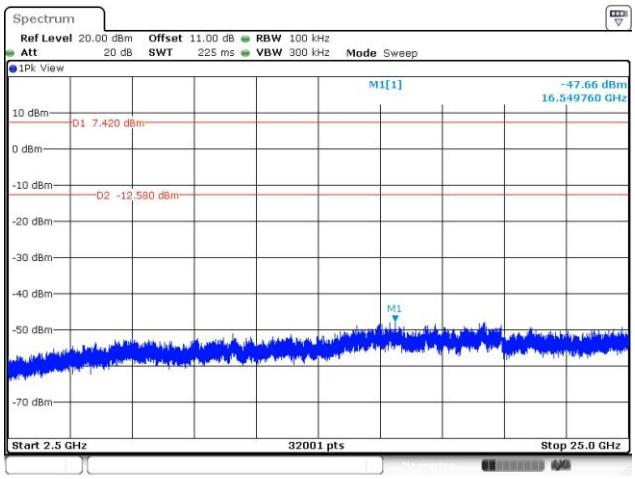
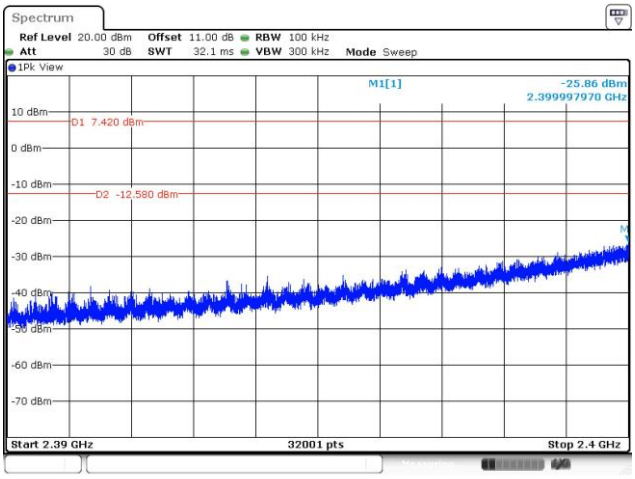
802.11g – 2Tx

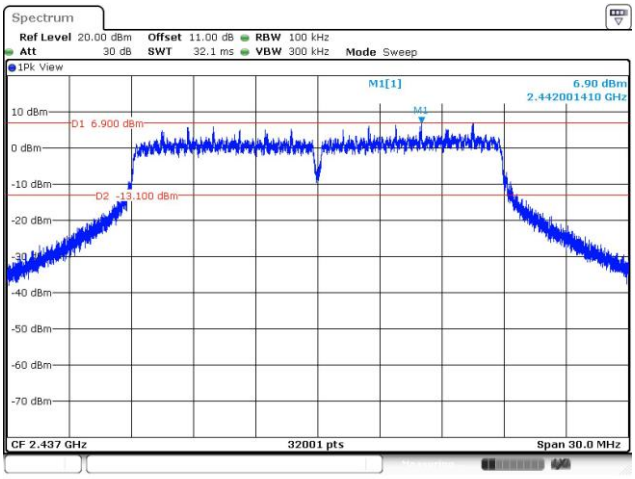
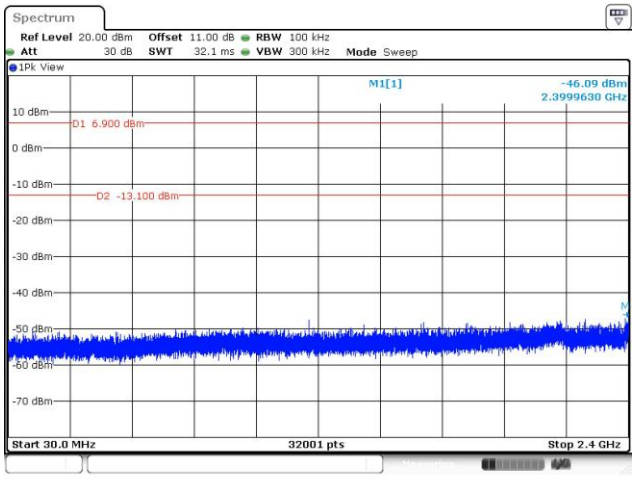
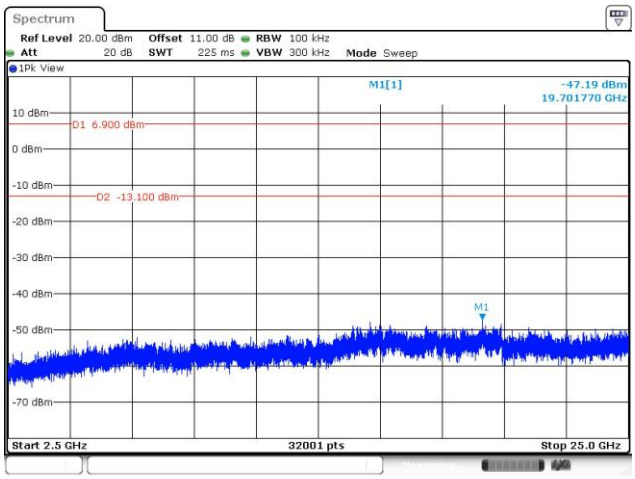
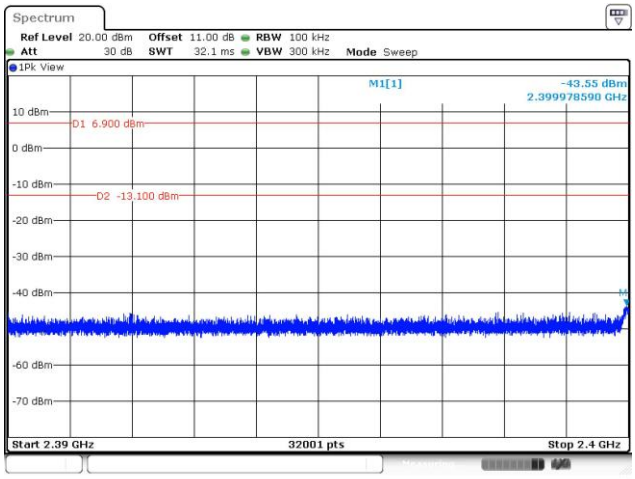
Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

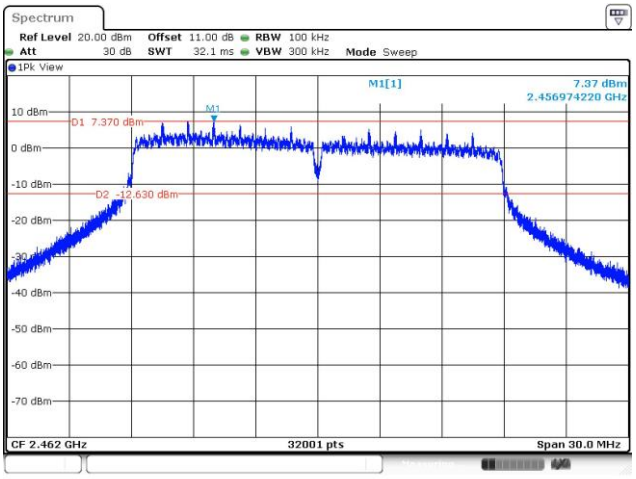
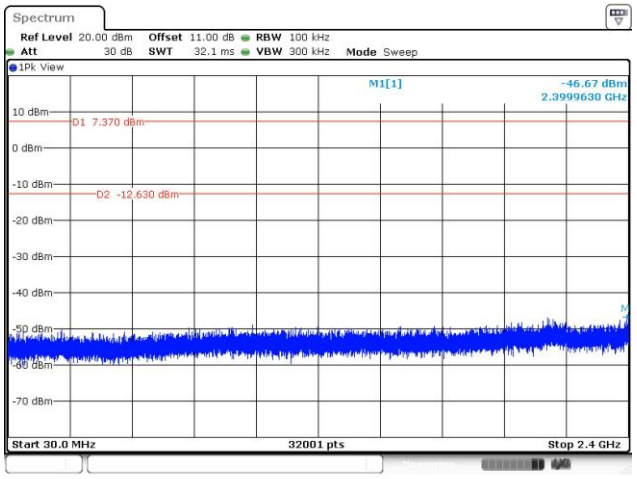
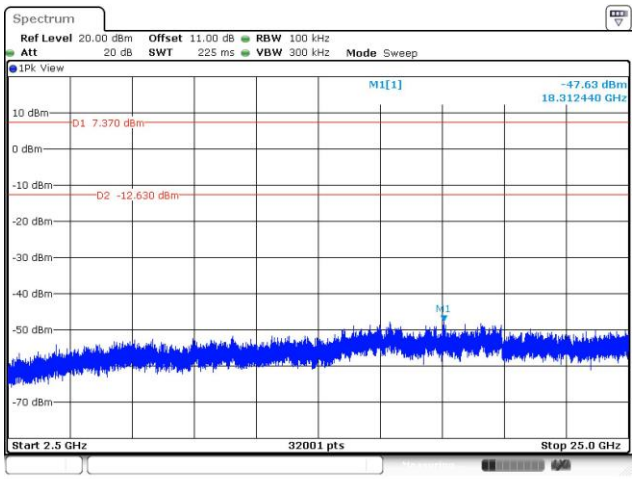
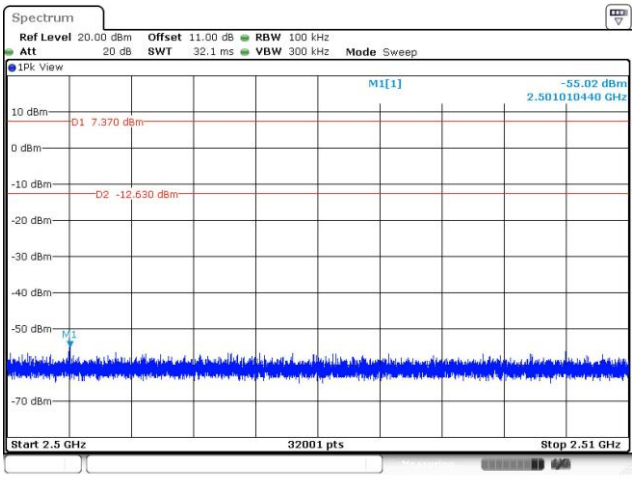
Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

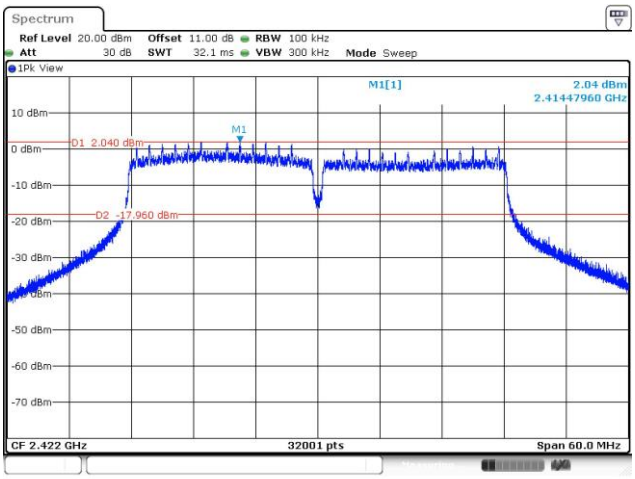
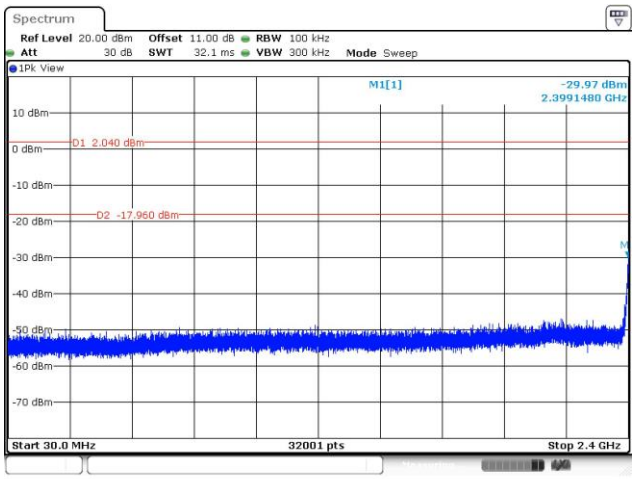
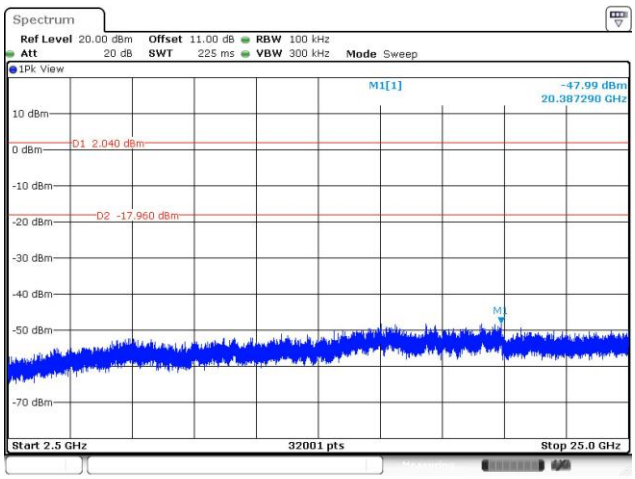
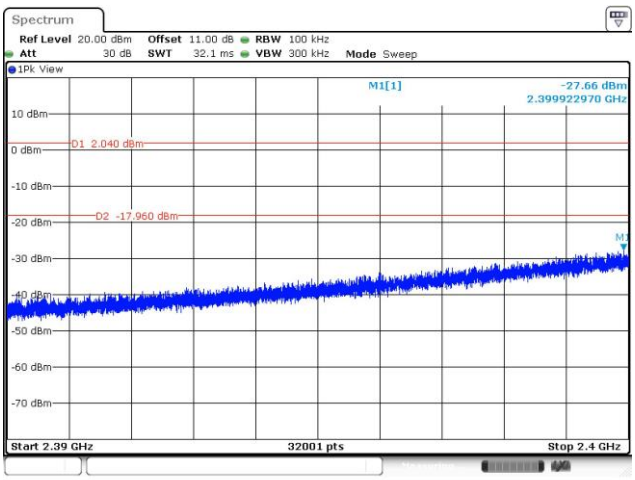
802.11n HT20 – 2Tx

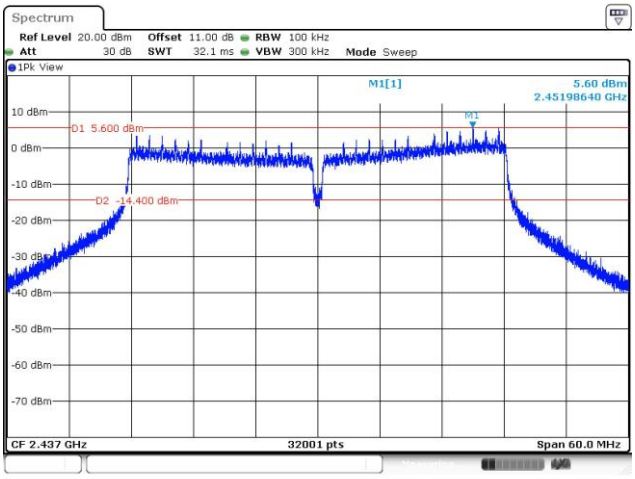
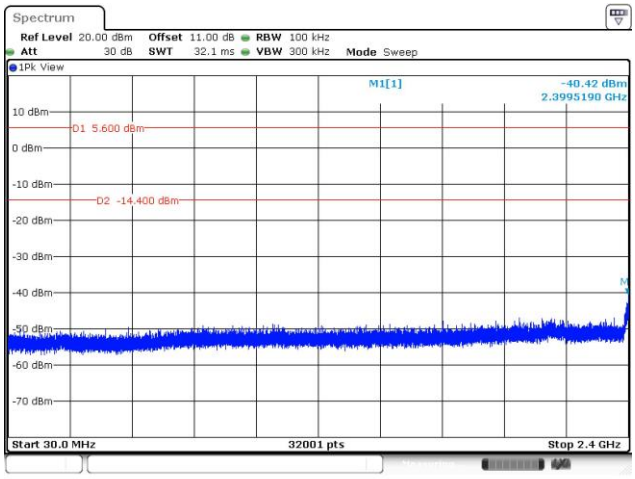
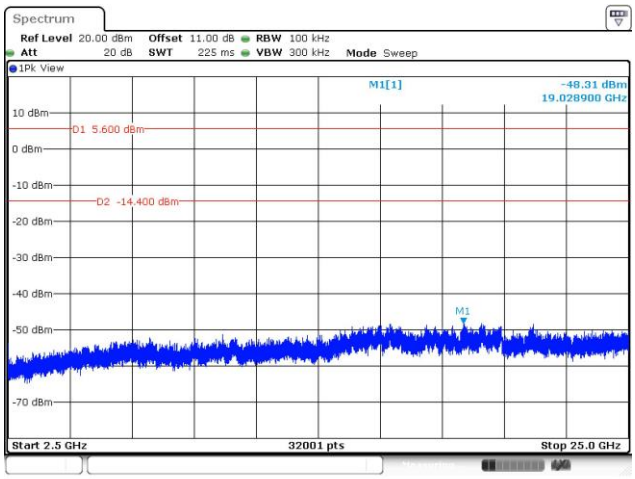
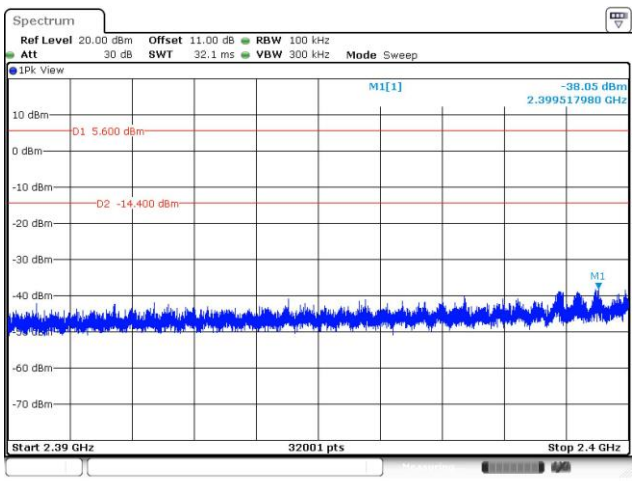
Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

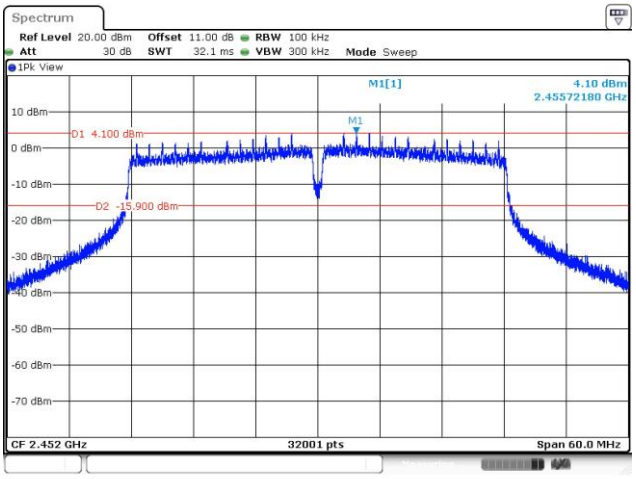
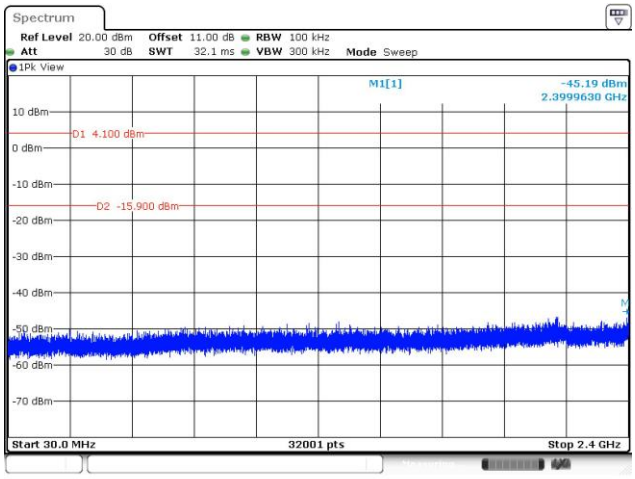
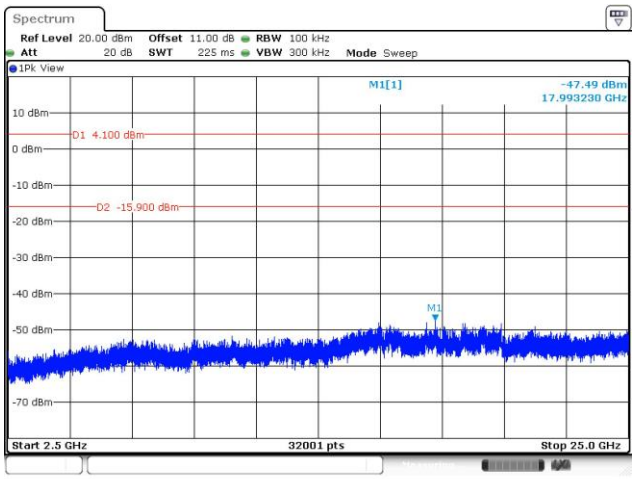
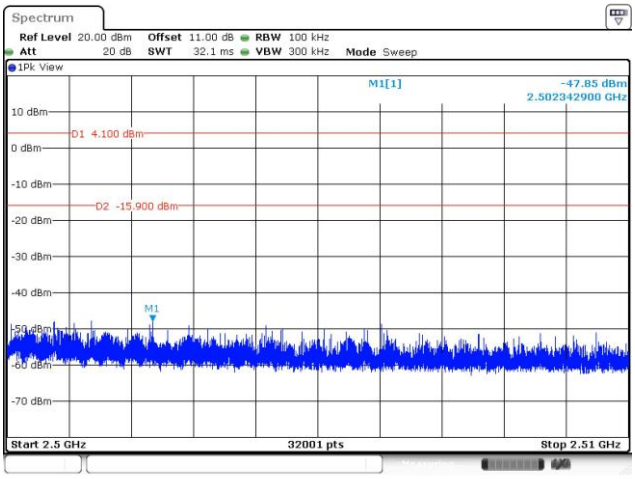
Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

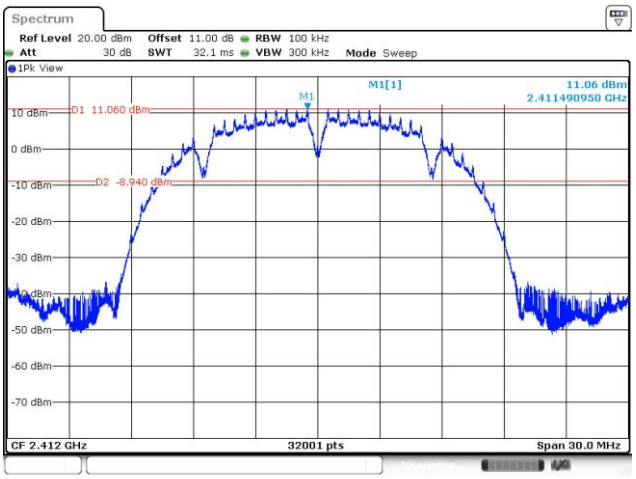
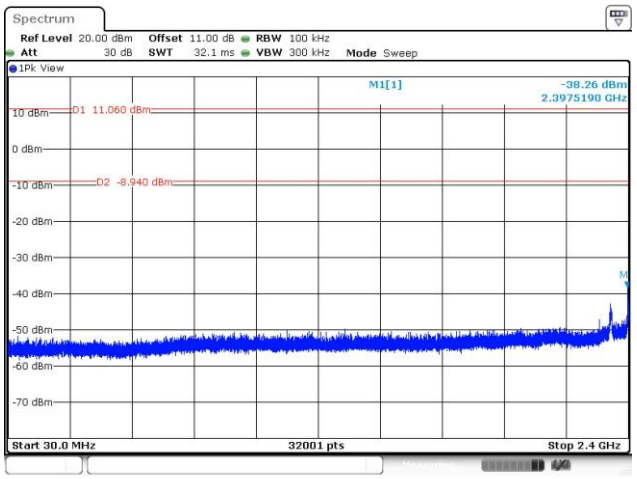
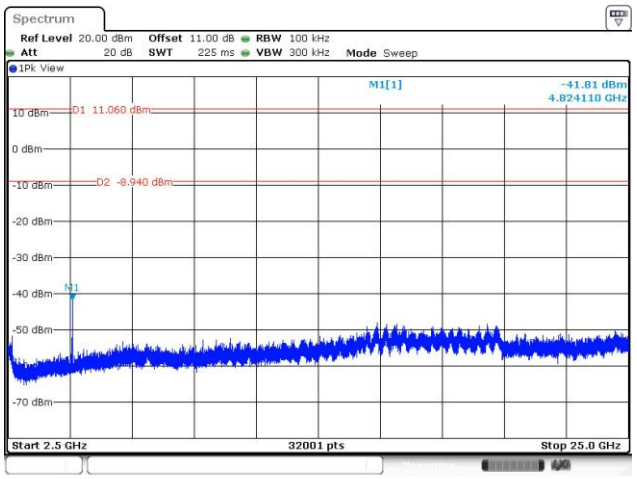
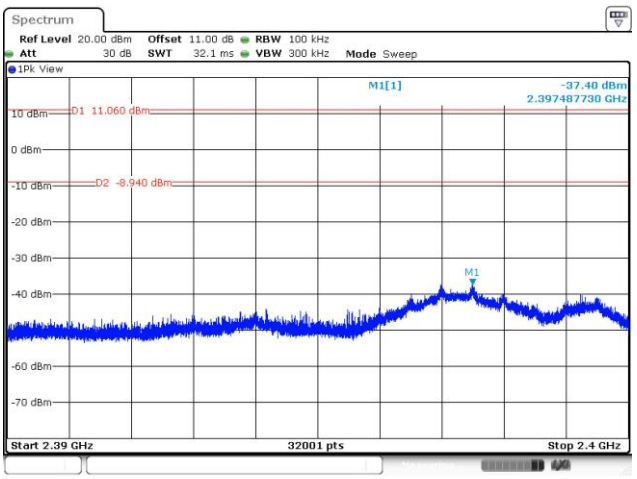
802.11n HT40 – 2Tx

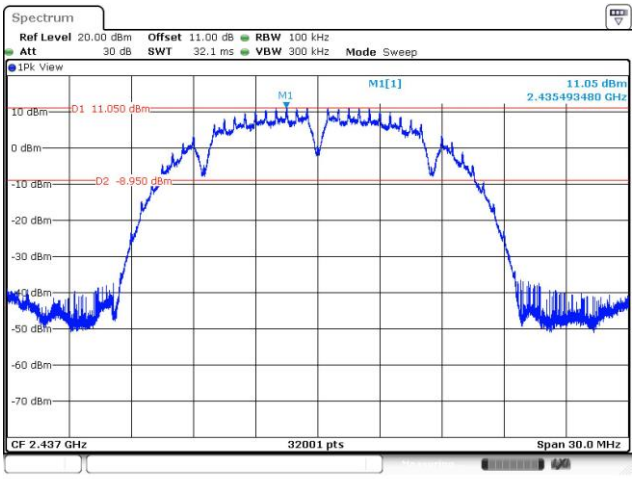
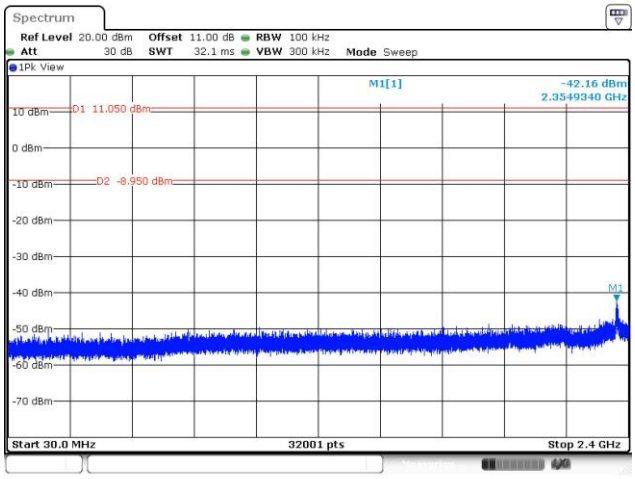
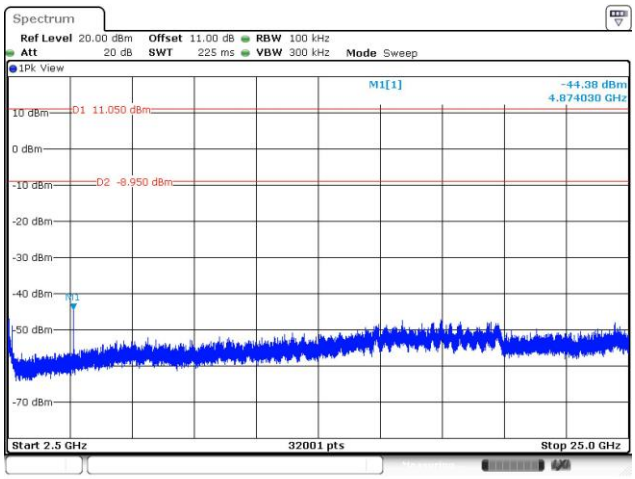
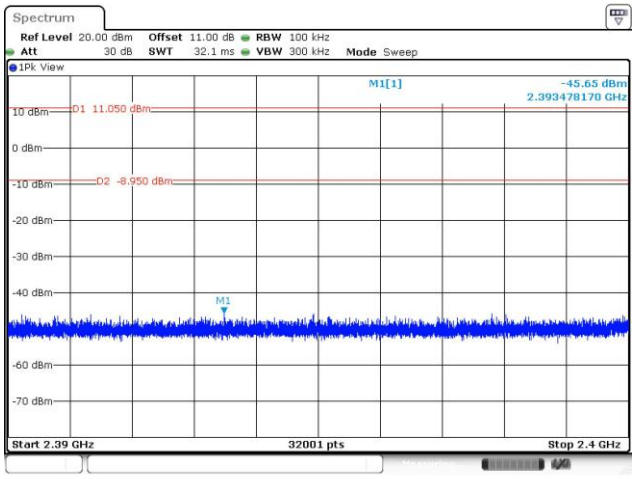
Reference Level	Tx 2422MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

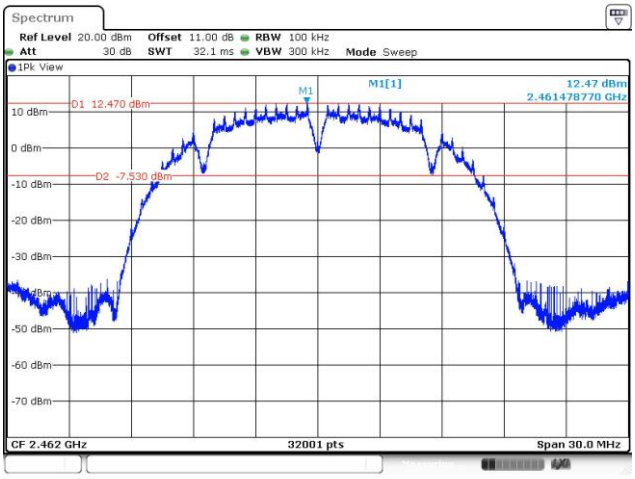
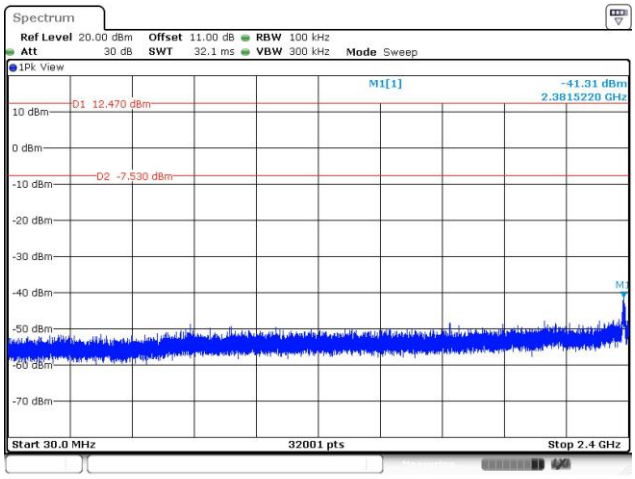
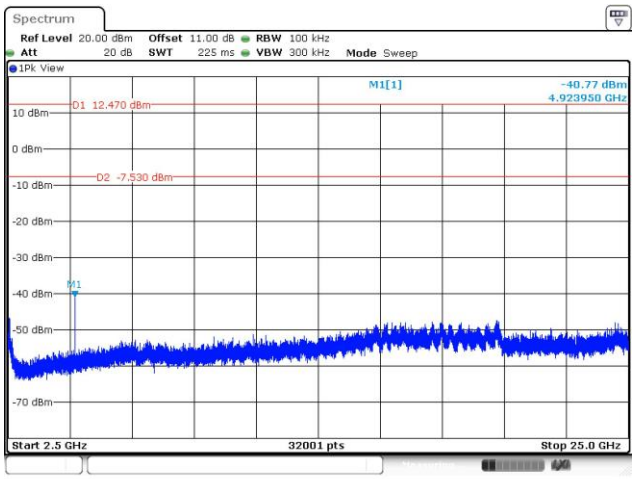
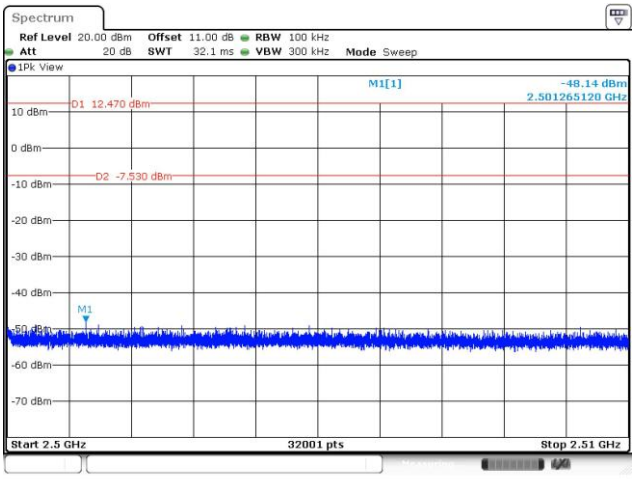
Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2452MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Sample 02
802.11b – 1Tx

Reference Level	Tx 2412MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2437MHz / 30MHz~25GHz (down 20dBc)
	
---	
---	

Reference Level	Tx 2462MHz / 30MHz~25GHz (down 20dBc)
	
---	
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