FCC Test Report

Product Name	4G/LTE Broadband Router with PoE
Model No	MX-210NP
FCC ID.	QI3BIL-MX210NP

Applicant	Billion Electric Co., Ltd.
Address	8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 231, Taiwan (R.O.C.)

Date of Receipt	Feb. 13, 2018
Issue Date	May 15, 2018
Report No.	1820150R-RFUSP26V00
Report Version	V1.0

Testing Laboratory
3023

The test results relate only to the samples tested.
The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
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Issue Date: May 15, 2018
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Applicant	Billion Electric Co., Ltd.
Address	8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 231, Taiwan (R.O.C.)
Manufacturer	Billion Electric Co., Ltd.
Model No.	MX-210NP
FCC ID.	QI3BIL-MX210NP
EUT Rated Voltage	DC 12V (Power by Adapter) or DC 12V (Power by PoE)
EUT Test Voltage	DC 12V (Power by Adapter)
Trade Name	BEC, Billion
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v04
Test Result	Complied

Documented By : Jinn Chen

(Senior Adm. Specialist / Jinn Chen)

Tested By : Ivan Chuang

(Senior Engineer / Ivan Chuang)

Approved By :

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	4G/LTE Broadband Router with PoE
Trade Name	BEC, Billion
Model No.	MX-210NP
FCC ID.	QI3BIL-MX210NP
Frequency Range	2412-2462MHz for 802.11b/g/n-20BW, 2422-2452MHz for 802.11n-40BW
Number of Channels	802.11b/g/n-20MHz: 11, n-40MHz: 7
Data Speed	802.11b: 1-11Mbps, 802.11g: 6-54Mbps, 802.11n: up to 300Mbps
Channel separation	802.11b/g/n: 5 MHz
Type of Modulation	802.11b:DSSS (DBPSK, DQPSK, CCK) 802.11g/n:OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna Type	PCB Antenna
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Grand-Tek Technology	N/A	PCB Antenna	2.5dBi for 2.4 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

802.11b/g/n-20MHz Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2412 MHz	Channel 02:	2417 MHz	Channel 03:	2422 MHz	Channel 04:	2427 MHz
Channel 05:	2432 MHz	Channel 06:	2437 MHz	Channel 07:	2442 MHz	Channel 08:	2447 MHz
Channel 09:	2452 MHz	Channel 10:	2457 MHz	Channel 11:	2462 MHz		

802.11n-40MHz Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 03:	2422 MHz	Channel 04:	2427 MHz	Channel 05:	2432 MHz	Channel 06:	2437 MHz
Channel 07:	2442 MHz	Channel 08:	2447 MHz	Channel 09:	2452 MHz		

Note:

1. The EUT is an 4G/LTE Broadband Router with PoE with a built-in 2.4GHz WLAN transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report.
4. At result of pretests, module supports dual-channel transmission, only the worst case is shown in the report. (802.11b is chain B, 802.11g is chain B)
5. These tests are conducted on a sample for the purpose of demonstrating compliance of 802.11b/g/n transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices.

Test Mode:	Mode 1: Transmit (802.11b 1Mbps)
	Mode 2: Transmit (802.11g 6Mbps)
	Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)
	Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)

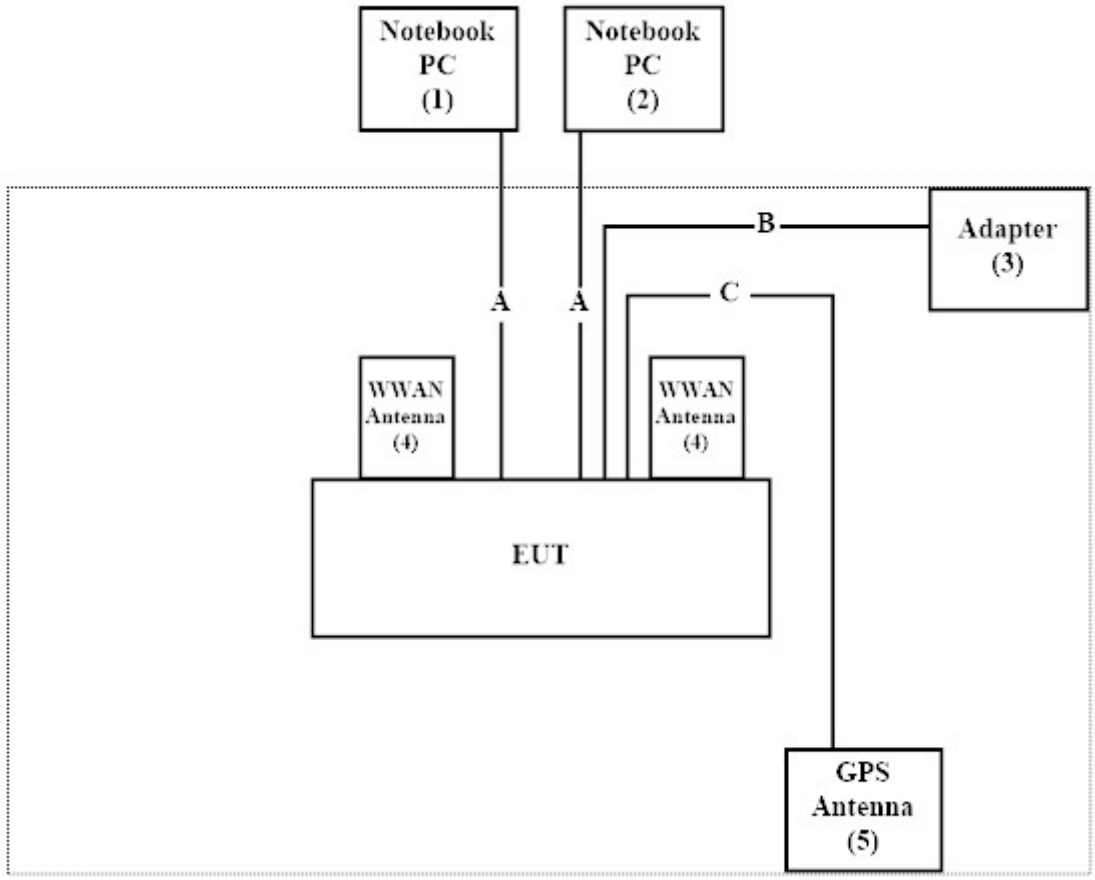
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	Inspiron 15 3000	GT5JPJ2	N/A
2	Notebook PC	DELL	Inspiron 15 3000	4V5JPJ2	N/A
3	Adapter	BILLION	BA018-120120AXU	N/A	N/A
4	WWAN Antenna	N/A	N/A	N/A	N/A
5	GPS Antenna	N/A	N/A	N/A	N/A

Signal Cable Type		Signal cable Description
A	LAN Cable	Non-shielded, 3.0m, two PCS.
B	Adapter Cable	Non-shielded, 1.5m
C	GPS Antenna Cable	Non-shielded, 5.0m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software “MT7603 QA V0.0.0.60” on the Notebook PC.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:
http://www.dekra.com.tw/english/about/certificates.aspx?bval=5
The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

1.7. List of Test Item and Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101601	2018.02.08	2019.02.07
X	Two-Line V-Network	R&S	ENV216	101306	2018.03.09	2019.03.08
X	Two-Line V-Network	R&S	ENV216	101307	2018.03.20	2019.03.19
X	Coaxial Cable	Quietek	RG400_BNC	RF001	2017.05.24	2018.05.23

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

For Conducted measurements /ASR4

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103464	2018.01.23	2019.01.22
X	Power Meter	Anritsu	ML2496A	1548003	2017.12.11	2018.12.10
X	Power Sensor	Anritsu	MA2411B	1531024	2017.12.11	2018.12.10
X	Power Sensor	Anritsu	MA2411B	1531025	2017.12.11	2018.12.10
	Bluetooth Tester	R&S	CBT	101238	2018.01.18	2019.01.17

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : DEKRA Conduction Test System V9.0.1

For Radiated measurements /ACB1

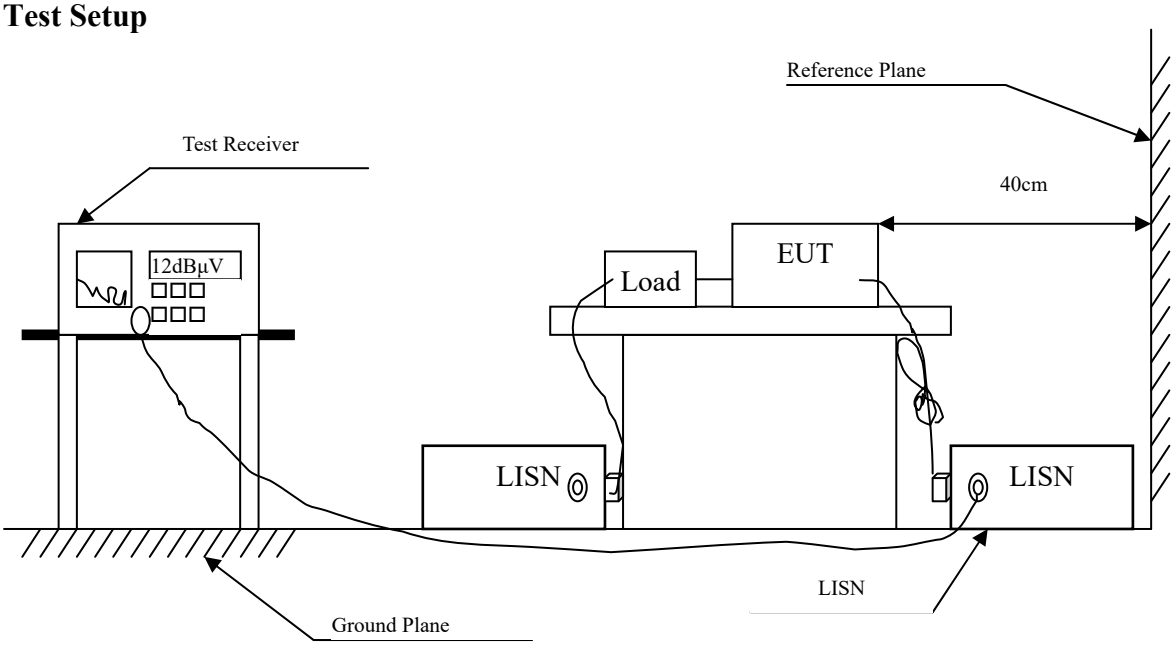
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2018.01.26	2019.01.25
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2018.04.02	2019.04.01
X	Horn Antenna	ETS-Lindgren	3117	00203800	2017.11.10	2018.11.09
X	Horn Antenna	Com-Power	AH-840	101087	2017.05.24	2018.05.23
X	Pre-Amplifier	EMCI	EMC001330	980316	2017.05.16	2018.05.15
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2017.05.17	2018.05.16
X	Pre-Amplifier	EMCI	EMC05820SE	980310	2017.05.17	2018.05.16
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2017.05.17	2018.05.16
X	Filter	MICRO TRONICS	BRM50702	G251	2017.08.30	2018.08.29
	Filter	MICRO TRONICS	BRM50716	G188	2017.08.30	2018.08.29
X	EMI Test Receiver	R&S	ESR7	101602	2017.12.11	2018.12.10
X	Spectrum Analyzer	R&S	FSV40	101148	2018.02.08	2019.02.07
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2017.05.25	2018.05.24
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2017.08.11	2018.08.10

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBµV) Limit		
Frequency MHz	Limits	
	QP	AVG
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Uncertainty

± 2.35 dB

2.5. Test Result of Conducted Emission

Product : 4G/LTE Broadband Router with PoE
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW) (2437MHz)
Test Date : 2018/05/11

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 1					
Quasi-Peak					
0.159	9.631	31.001	40.632	-25.111	65.743
0.450	9.696	26.518	36.215	-21.214	57.429
2.300	9.763	13.668	23.431	-32.569	56.000
6.900	9.879	25.433	35.312	-24.688	60.000
14.000	10.003	13.268	23.271	-36.729	60.000
27.000	10.120	16.823	26.943	-33.057	60.000
Average					
0.159	9.631	18.905	28.536	-27.207	55.743
0.450	9.696	17.715	27.412	-20.017	47.429
2.300	9.763	5.696	15.459	-30.541	46.000
6.900	9.879	14.336	24.215	-25.785	50.000
14.000	10.003	7.038	17.041	-32.959	50.000
27.000	10.120	7.639	17.759	-32.241	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 4G/LTE Broadband Router with PoE
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW) (2437MHz)
Test Date : 2018/05/11

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV	dB	dBµV
LINE 2					
Quasi-Peak					
0.161	9.628	31.046	40.674	-25.012	65.686
0.440	9.688	27.199	36.888	-20.826	57.714
2.000	9.750	14.119	23.869	-32.131	56.000
7.400	9.883	21.542	31.425	-28.575	60.000
14.000	10.007	13.927	23.934	-36.066	60.000
27.710	10.172	15.388	25.560	-34.440	60.000
Average					
0.161	9.628	11.635	21.263	-34.423	55.686
0.440	9.688	21.071	30.760	-16.954	47.714
2.000	9.750	6.545	16.295	-29.705	46.000
7.400	9.883	13.141	23.024	-26.976	50.000
14.000	10.007	7.937	17.944	-32.056	50.000
27.710	10.172	11.008	21.180	-28.820	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Setup

3.2. Limits

The maximum peak power shall be less 1 Watt.

3.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method. The maximum average conducted output power using KDB 558074 section 9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

3.4. Uncertainty

±0.86 dB

3.5. Test Result of Peak Power Output

Product : 4G/LTE Broadband Router with PoE
Test Item : Peak Power Output Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps)
Test Date : 2018/05/07

Chain A

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)				Peak Power	Required Limit	Result
		1	2	5.5	11	1		
		Measurement Level (dBm)						
01	2412	15.75	--	--	--	17.24	<30dBm	Pass
06	2437	15.66	15.61	15.58	15.52	17.55	<30dBm	Pass
11	2462	16.58	--	--	--	18.98	<30dBm	Pass

Note: Peak Power Output Value =Reading value on power meter + cable loss

Chain B

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)				Peak Power	Required Limit	Result
		1	2	5.5	11	1		
		Measurement Level (dBm)						
01	2412	15.84	--	--	--	17.64	<30dBm	Pass
06	2437	15.86	15.81	15.76	15.74	17.68	<30dBm	Pass
11	2462	17.72	--	--	--	19.52	<30dBm	Pass

Note: Peak Power Output Value =Reading value on power meter + cable loss

Product : 4G/LTE Broadband Router with PoE
Test Item : Peak Power Output Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps)
Test Date : 2018/05/07

Chain A

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		6	9	12	18	24	36	48	54	6		
		Measurement Level (dBm)										
01	2412	16.98	--	--	--	--	--	--	--	22.05	<30dBm	Pass
06	2437	18.02	17.98	17.95	17.91	17.87	17.86	17.85	17.81	22.98	<30dBm	Pass
11	2462	16.55	--	--	--	--	--	--	--	22.51	<30dBm	Pass

Note: Peak Power Output Value =Reading value on power meter + cable loss

Chain B

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		6	9	12	18	24	36	48	54	6		
		Measurement Level (dBm)										
01	2412	17.07	--	--	--	--	--	--	--	22.87	<30dBm	Pass
06	2437	18.18	18.15	18.11	18.09	18.05	18.04	17.99	17.95	23.12	<30dBm	Pass
11	2462	16.93	--	--	--	--	--	--	--	22.72	<30dBm	Pass

Note: Peak Power Output Value =Reading value on power meter + cable loss

Product : 4G/LTE Broadband Router with PoE
Test Item : Peak Power Output Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)
Test Date : 2018/05/07

Chain A

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		14.4	28.9	43.3	57.8	86.7	115.6	130	144.4	14.4		
		Measurement Level (dBm)										
01	2412	13.23	--	--	--	--	--	--	--	20.43	<30dBm	Pass
06	2437	17.02	17.01	16.99	16.95	16.92	16.88	16.84	16.82	21.41	<30dBm	Pass
11	2462	16.01	--	--	--	--	--	--	--	21.87	<30dBm	Pass

Note: Peak Power Output Value =Reading value on power meter + cable loss

Chain B

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		14.4	28.9	43.3	57.8	86.7	115.6	130	144.4	14.4		
		Measurement Level (dBm)										
01	2412	13.02	--	--	--	--	--	--	--	20.01	<30dBm	Pass
06	2437	16.59	16.55	16.51	16.49	16.45	16.41	16.38	16.34	21.44	<30dBm	Pass
11	2462	15.81	--	--	--	--	--	--	--	21.06	<30dBm	Pass

Note: Peak Power Output Value =Reading value on power meter + cable loss

Chain A+B

Channel	Frequency (MHz)	Data Rata (Mbps)	Chain A Power (dBm)	Chain B Power (dBm)	Chain A+B Power (dBm)	Limit (dBm)	Result
01	2412	14.4	20.43	20.01	23.24	<30dBm	Pass
06	2437	14.4	21.41	21.44	24.44	<30dBm	Pass
11	2462	14.4	21.87	21.06	24.49	<30dBm	Pass

Note: Peak Power Output Value (dBm) = 10*LOG (Chain A (mW)+ Chain B (mW))

Product : 4G/LTE Broadband Router with PoE
Test Item : Peak Power Output Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)
Test Date : 2018/05/07

Chain A

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		30	60	90	120	180	240	270	300	30		
		Measurement Level (dBm)										
03	2422	12.05	--	--	--	--	--	--	--	20.01	<30dBm	Pass
06	2437	14.47	14.45	14.41	14.38	14.36	14.31	14.28	14.25	21.02	<30dBm	Pass
09	2452	13.54	--	--	--	--	--	--	--	20.14	<30dBm	Pass

Note: Peak Power Output Value =Reading value on power meter + cable loss

Chain B

Channel No	Frequency (MHz)	Average Power For different Data Rate (Mbps)								Peak Power	Required Limit	Result
		30	60	90	120	180	240	270	300	30		
		Measurement Level (dBm)										
03	2422	11.86	--	--	--	--	--	--	--	19.92	<30dBm	Pass
06	2437	14.32	14.31	14.28	14.26	14.24	14.19	14.15	14.11	20.72	<30dBm	Pass
09	2452	13.19	--	--	--	--	--	--	--	20.01	<30dBm	Pass

Note: Peak Power Output Value =Reading value on power meter + cable loss

Chain A+B

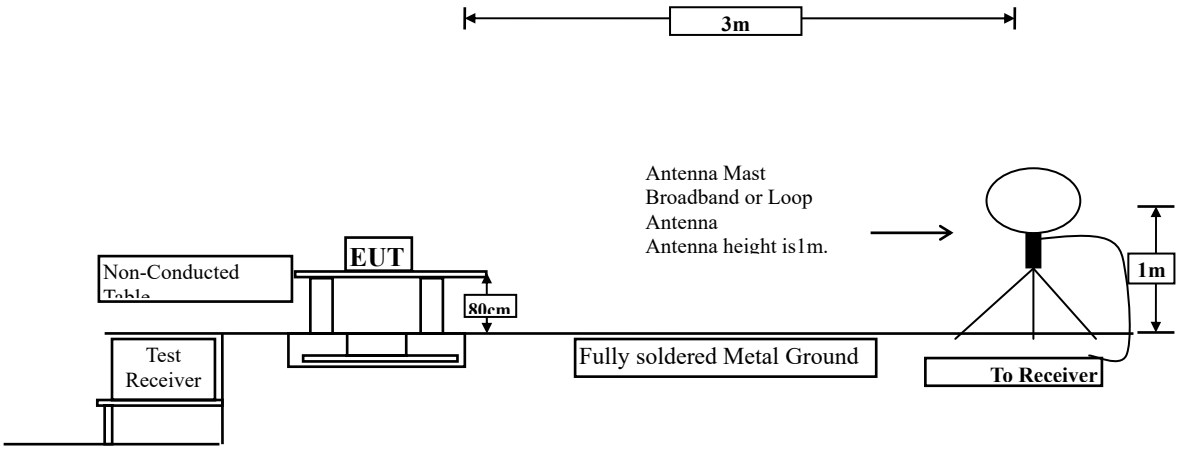
Channel	Frequency (MHz)	Data Rata (Mbps)	Chain A Power (dBm)	Chain B Power (dBm)	Chain A+B Power (dBm)	Limit (dBm)	Result
03	2422	30	20.01	19.92	22.98	<30dBm	Pass
06	2437	30	21.02	20.72	23.88	<30dBm	Pass
09	2452	30	20.14	20.01	23.09	<30dBm	Pass

Note: Peak Power Output Value (dBm) = 10*LOG (Chain A (mW)+ Chain B (mW))

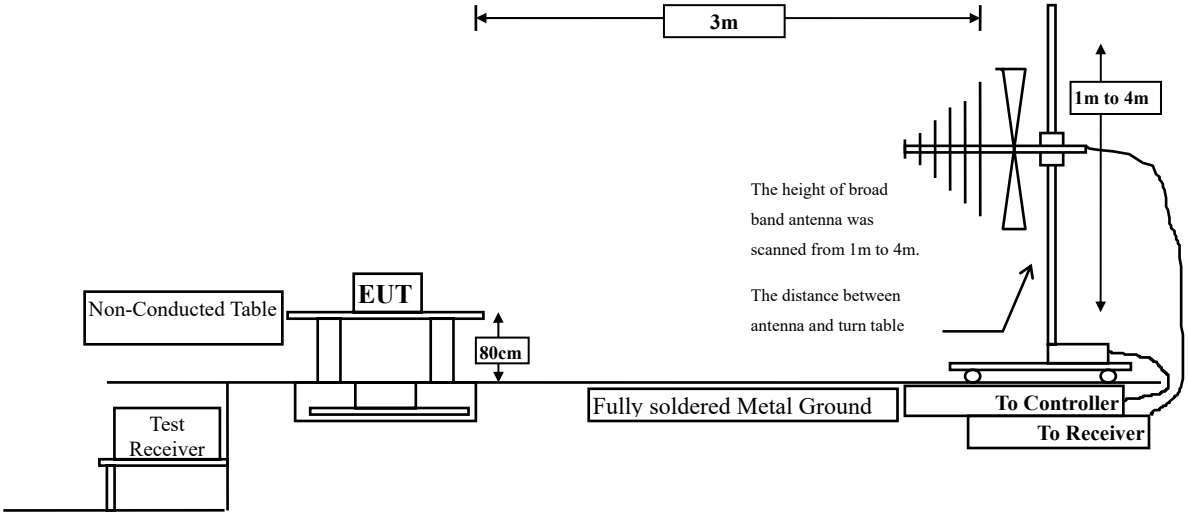
4. Radiated Emission

4.1. Test Setup

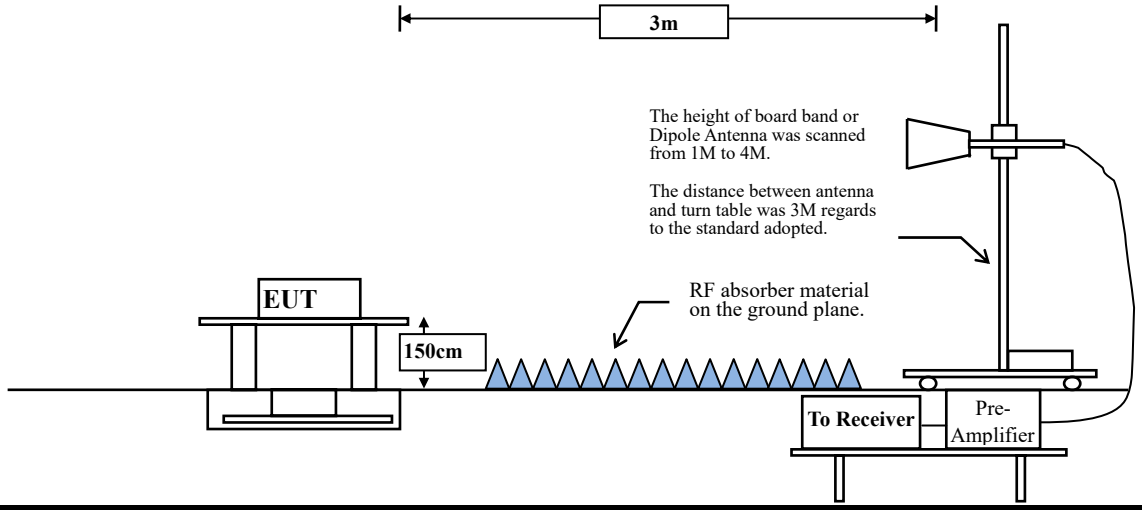
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.2. Limits

➢ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.
Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.
The turn table is rotated 360 degrees to determine the position of the maximum emission level.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level.
This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.
The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.
Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.
The measurement is divided into the Preliminary Measurement and the Final Measurement.
The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.
The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

VBW ≥ 3 x RBW.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle ≥ 98 %

VBW ≥ 1/T, when duty cycle < 98 %

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
802.11b	98.64	8.4130	--	10
802.11g	90.52	1.3840	723	1k
802.11n20	85.22	0.6681	1497	2k
802.11n40	68.47	0.3463	2888	3k

Note: Duty Cycle Refer to Section 9

4.4. Uncertainty

Horizontal polarization：

30-300MHz: ±4.08dB；300M-1GHz: ±3.86dB；1-18GHz: ±3.77dB；18-40GHz: ±3.98dB

Vertical polarization：

30-300MHz: ±4.81dB；300M-1GHz: ±3.87dB；1-18GHz：±3.83dB；18-40GHz: ±3.98dB

4.5. Test Result of Radiated Emission

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4824.000	-6.117	60.560	54.443	-19.557	74.000
7236.000	-3.110	51.340	48.230	-25.770	74.000
9648.000	-0.709	46.550	45.841	-28.159	74.000
Average Detector:					
4824.000	-6.117	57.940	51.823	-2.177	54.000
Vertical					
Peak Detector:					
4824.000	-6.117	60.760	54.643	-19.357	74.000
7236.000	-3.110	55.490	52.380	-21.620	74.000
9648.000	-0.709	46.310	45.601	-28.399	74.000
Average Detector:					
4824.000	-6.117	58.540	52.423	-1.577	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2437 MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4874.000	-6.080	60.910	54.830	-19.170	74.000
7311.000	-3.045	52.350	49.306	-24.694	74.000
9748.000	-0.536	46.100	45.563	-28.437	74.000
Average Detector:					
4874.000	-6.080	58.390	52.310	-1.690	54.000
Vertical					
Peak Detector:					
4874.000	-6.080	61.540	55.460	-18.540	74.000
7311.000	-3.045	50.800	47.756	-26.244	74.000
9748.000	-0.536	46.100	45.563	-28.437	74.000
Average Detector:					
4874.000	-6.080	59.010	52.930	-1.070	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462 MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
Peak Detector:					
4924.000	-6.060	59.210	53.150	-20.850	74.000
7386.000	-2.923	50.790	47.867	-26.133	74.000
9848.000	-0.441	46.850	46.410	-27.590	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
4924.000	-6.060	61.070	55.010	-18.990	74.000
7386.000	-2.923	53.180	50.257	-23.743	74.000
9848.000	-0.441	46.880	46.440	-27.560	74.000
Average Detector:					
4924.000	-6.060	58.830	52.770	-1.230	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
Peak Detector:					
4824.000	-6.117	61.490	55.373	-18.627	74.000
7236.000	-3.110	53.440	50.330	-23.670	74.000
9648.000	-0.709	46.520	45.811	-28.189	74.000
Average Detector:					
4824.000	-6.117	45.610	39.493	-14.507	54.000
Vertical					
Peak Detector:					
4824.000	-6.117	64.870	58.753	-15.247	74.000
7236.000	-3.110	56.360	53.250	-20.750	74.000
9648.000	-0.709	46.820	46.111	-27.889	74.000
Average Detector:					
4824.000	-6.117	49.370	43.253	-10.747	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2437 MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4874.000	-6.080	61.790	55.710	-18.290	74.000
7311.000	-3.045	56.350	53.306	-20.694	74.000
9748.000	-0.536	46.780	46.243	-27.757	74.000
Average Detector:					
4874.000	-6.080	47.600	41.520	-12.480	54.000
Vertical					
Peak Detector:					
4874.000	-6.080	66.460	60.380	-13.620	74.000
7311.000	-3.045	59.540	56.496	-17.504	74.000
9748.000	-0.536	47.100	46.563	-27.437	74.000
Average Detector:					
4874.000	-6.080	51.580	45.500	-28.500	54.000
7311.000	-3.045	42.050	39.006	-14.994	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462 MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
Peak Detector:					
4924.000	-6.060	58.670	52.610	-21.390	74.000
7386.000	-2.923	54.790	51.867	-22.133	74.000
9848.000	-0.441	46.850	46.410	-27.590	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
4924.000	-6.060	61.550	55.490	-18.510	74.000
7386.000	-2.923	58.270	55.347	-18.653	74.000
9848.000	-0.441	46.610	46.170	-27.830	74.000
Average Detector:					
4924.000	-6.060	47.250	41.190	-12.810	54.000
7386.000	-2.923	41.640	38.717	-15.283	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)(2412MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4824.000	-6.117	53.820	47.703	-26.297	74.000
7236.000	-3.110	56.850	53.740	-20.260	74.000
9648.000	-0.709	46.880	46.171	-27.829	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
4824.000	-6.117	57.380	51.263	-22.737	74.000
7236.000	-3.110	63.170	60.060	-13.940	74.000
9648.000	-0.709	46.690	45.981	-28.019	74.000
Average Detector:					
7236.000	-3.110	43.420	40.310	-13.690	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW) (2437 MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4874.000	-6.080	61.960	55.880	-18.120	74.000
7311.000	-3.045	69.880	66.836	-7.164	74.000
9748.000	-0.536	46.570	46.033	-27.967	74.000
Average Detector:					
4874.000	-6.080	46.400	40.320	-13.680	54.000
7311.000	-3.045	49.930	46.886	-7.114	54.000
Vertical					
Peak Detector:					
4874.000	-6.080	66.760	60.680	-13.320	74.000
7311.000	-3.045	70.180	67.136	-6.864	74.000
9748.000	-0.536	46.880	46.343	-27.657	74.000
Average Detector:					
4874.000	-6.080	54.230	48.150	-25.850	54.000
7311.000	-3.045	55.780	52.736	-1.264	54.000

Note:
1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW) (2462 MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
Peak Detector:					
4924.000	-6.060	56.480	50.420	-23.580	74.000
7386.000	-2.923	56.340	53.417	-20.583	74.000
9848.000	-0.441	46.210	45.770	-28.230	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
4924.000	-6.060	60.410	54.350	-19.650	74.000
7386.000	-2.923	63.370	60.447	-13.553	74.000
9848.000	-0.441	46.840	46.400	-27.600	74.000
Average Detector:					
4924.000	-6.060	47.000	40.940	-13.060	54.000
7386.000	-2.923	47.470	44.547	-9.453	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)(2422MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4844.000	-6.104	49.370	43.266	-30.734	74.000
7266.000	-3.099	50.980	47.881	-26.119	74.000
9688.000	-0.649	46.280	45.631	-28.369	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
4844.000	-6.104	53.660	47.556	-26.444	74.000
7266.000	-3.099	54.190	51.091	-22.909	74.000
9688.000	-0.649	46.950	46.301	-27.699	74.000
Average Detector:					
--	--	--	--	--	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW) (2437 MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4874.000	-6.080	58.590	52.510	-21.490	74.000
7311.000	-3.045	64.690	61.646	-12.354	74.000
9748.000	-0.536	46.410	45.873	-28.127	74.000
Average Detector:					
7311.000	-3.045	50.940	47.896	-6.104	54.000
Vertical					
Peak Detector:					
4874.000	-6.080	62.870	56.790	-17.210	74.000
7311.000	-3.045	67.160	64.116	-9.884	74.000
9748.000	-0.536	46.720	46.183	-27.817	74.000
Average Detector:					
4874.000	-6.080	50.470	44.390	-9.610	54.000
7311.000	-3.045	53.430	50.386	-3.614	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : Harmonic Radiated Emission Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW) (2452 MHz)
Test Date : 2018/05/07

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Peak Detector:					
4904.000	-6.090	51.510	45.420	-28.580	74.000
7356.000	-2.975	49.440	46.466	-27.534	74.000
9808.000	-0.484	47.100	46.617	-27.383	74.000
Average Detector:					
--	--	--	--	--	54.000
Vertical					
Peak Detector:					
4904.000	-6.090	51.690	45.600	-28.400	74.000
7356.000	-2.975	51.300	48.326	-25.674	74.000
9808.000	-0.484	46.980	46.497	-27.503	74.000
Average Detector:					
--	--	--	--	--	54.000

Note:
1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 4G/LTE Broadband Router with PoE
Test Item : General Radiated Emission Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps)(2437 MHz)
Test Date : 2018/05/05

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
108.725	-14.603	50.792	36.190	-7.310	43.500
360.362	-8.975	45.838	36.863	-9.137	46.000
524.841	-5.636	39.746	34.110	-11.890	46.000
666.826	-3.518	31.734	28.217	-17.783	46.000
798.971	-1.726	34.129	32.403	-13.597	46.000
933.928	0.047	37.660	37.707	-8.293	46.000
Vertical					
104.507	-15.341	51.124	35.782	-7.718	43.500
222.594	-13.235	42.914	29.679	-16.321	46.000
360.362	-8.975	46.182	37.207	-8.793	46.000
536.087	-5.459	37.812	32.353	-13.647	46.000
749.768	-2.088	33.662	31.574	-14.426	46.000
938.145	0.091	40.526	40.617	-5.383	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : 4G/LTE Broadband Router with PoE
Test Item : General Radiated Emission Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps)(2437 MHz)
Test Date : 2018/05/05

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
108.725	-14.603	50.327	35.725	-7.775	43.500
225.406	-13.141	39.736	26.595	-19.405	46.000
360.362	-8.975	45.208	36.233	-9.767	46.000
540.304	-5.392	37.545	32.153	-13.847	46.000
796.159	-1.747	34.124	32.377	-13.623	46.000
938.145	0.091	37.116	37.207	-8.793	46.000
Vertical					
108.725	-14.603	50.796	36.194	-7.306	43.500
222.594	-13.235	42.189	28.954	-17.046	46.000
361.768	-8.943	46.488	37.545	-8.455	46.000
512.188	-5.834	36.990	31.156	-14.844	46.000
796.159	-1.747	34.267	32.520	-13.480	46.000
938.145	0.091	39.857	39.948	-6.052	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : 4G/LTE Broadband Router with PoE
Test Item : General Radiated Emission Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)(2437 MHz)
Test Date : 2018/05/05

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
108.725	-14.603	50.446	35.844	-7.656	43.500
360.362	-8.975	45.262	36.287	-9.713	46.000
531.870	-5.525	36.236	30.711	-15.289	46.000
682.290	-3.299	31.458	28.159	-17.841	46.000
800.377	-1.711	34.492	32.780	-13.220	46.000
938.145	0.091	36.816	36.907	-9.093	46.000
Vertical					
108.725	-14.603	51.457	36.855	-6.645	43.500
222.594	-13.235	42.409	29.174	-16.826	46.000
361.768	-8.943	46.642	37.699	-8.301	46.000
534.681	-5.481	35.394	29.913	-16.087	46.000
794.754	-1.758	34.718	32.961	-13.039	46.000
938.145	0.091	40.397	40.488	-5.512	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : 4G/LTE Broadband Router with PoE
Test Item : General Radiated Emission Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)(2437 MHz)
Test Date : 2018/05/05

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBµV	dBµV/m	dB	dBµV/m
Horizontal					
108.725	-14.603	50.731	36.129	-7.371	43.500
360.362	-8.975	45.555	36.580	-9.420	46.000
526.246	-5.614	36.234	30.621	-15.379	46.000
664.014	-3.556	31.017	27.461	-18.539	46.000
797.565	-1.736	33.505	31.769	-14.231	46.000
938.145	0.091	37.225	37.316	-8.684	46.000
Vertical					
108.725	-14.603	50.869	36.267	-7.233	43.500
222.594	-13.235	41.774	28.539	-17.461	46.000
360.362	-8.975	46.354	37.379	-8.621	46.000
524.841	-5.636	34.329	28.693	-17.307	46.000
797.565	-1.736	34.285	32.549	-13.451	46.000
938.145	0.091	41.282	41.373	-4.627	46.000

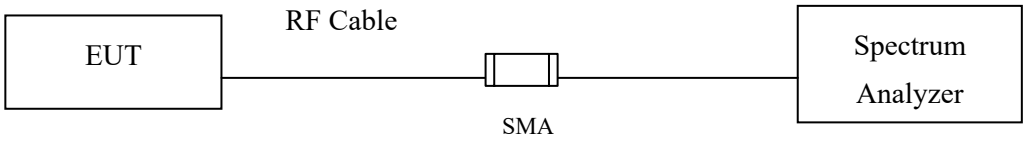
Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

5. RF antenna conducted test

5.1. Test Setup

RF antenna Conducted Measurement:



5.2. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

5.3. Test Procedure

The EUT was tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.
Set RBW = 100 kHz, Set VBW> RBW, scan up through 10th harmonic.

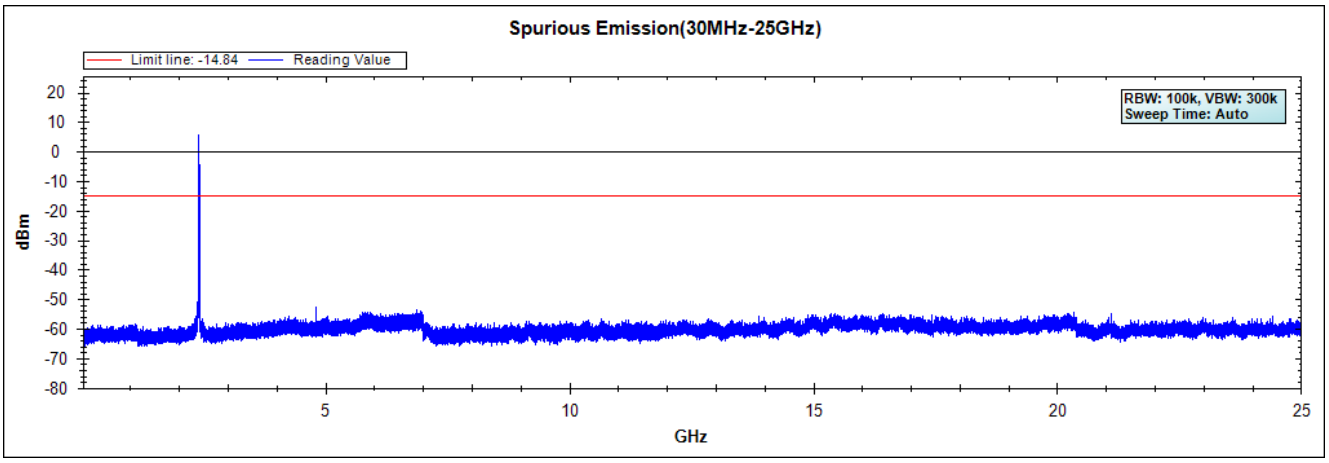
5.4. Uncertainty

±1.23dB

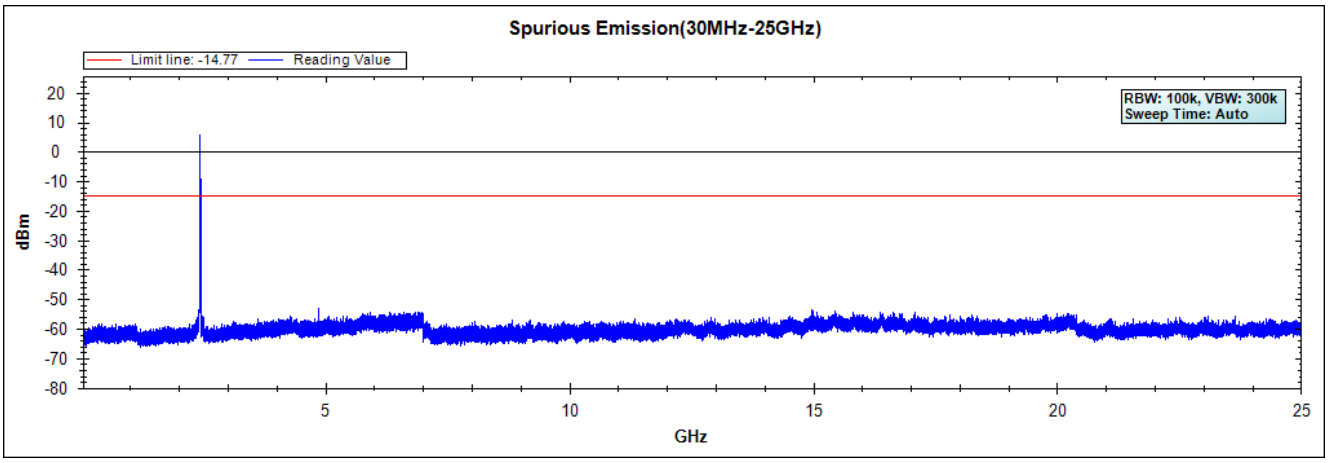
5.5. Test Result of RF antenna conducted test

Product : 4G/LTE Broadband Router with PoE
Test Item : RF antenna conducted test
Test Mode : Mode 1: Transmit (802.11b 1Mbps)
Test Date : 2018/05/07

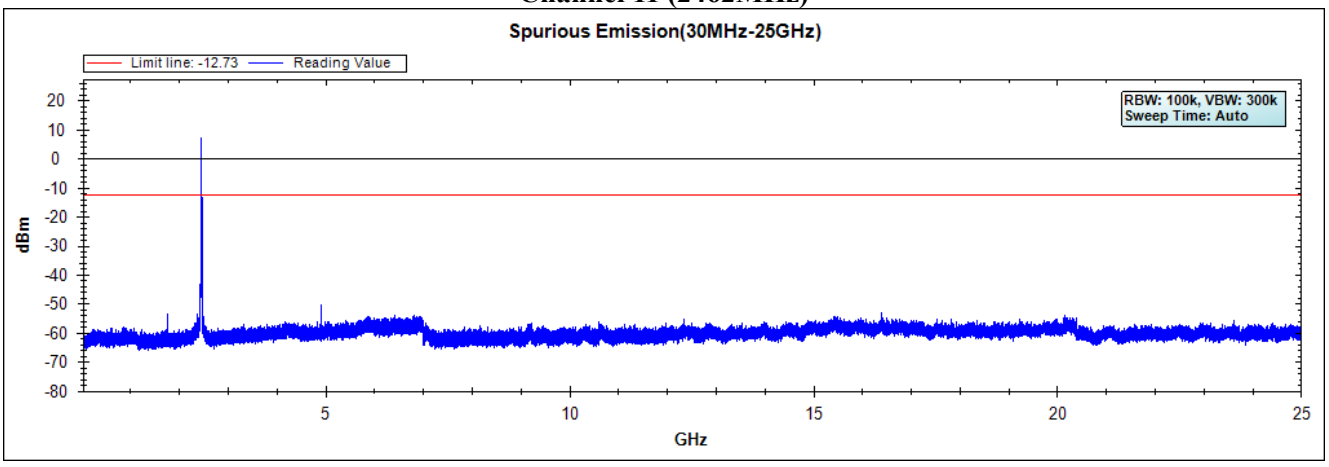
Channel 01 (2412MHz)



Channel 06 (2437MHz)



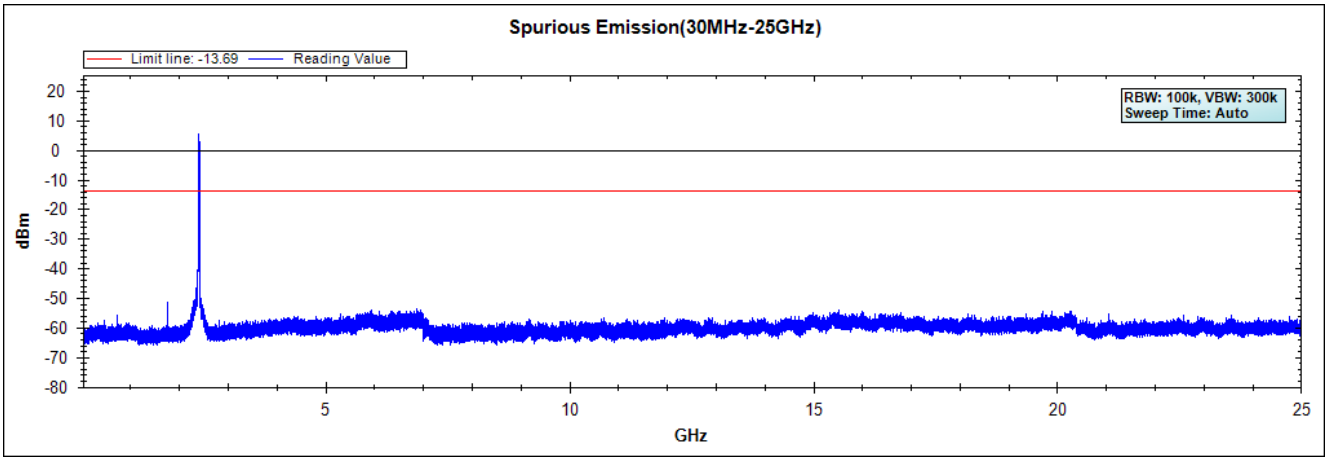
Channel 11 (2462MHz)



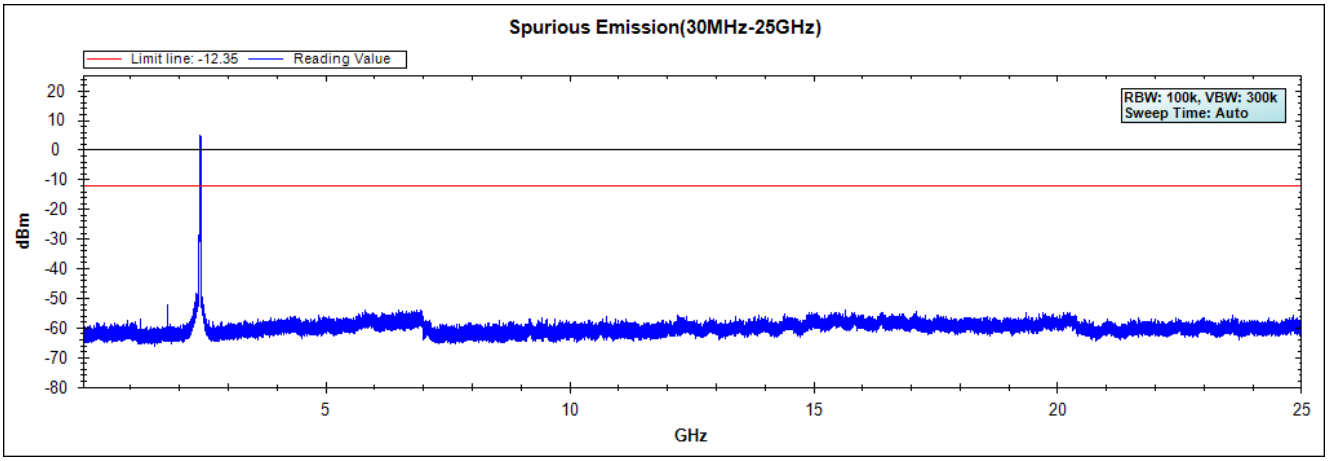
Note: The above test pattern is synthesized by multiple of the frequency range.

Product	:	4G/LTE Broadband Router with PoE
Test Item	:	RF Antenna Conducted Spurious
Test Mode	:	Mode 2: Transmit (802.11g 6Mbps)
Test Date	:	2018/05/07

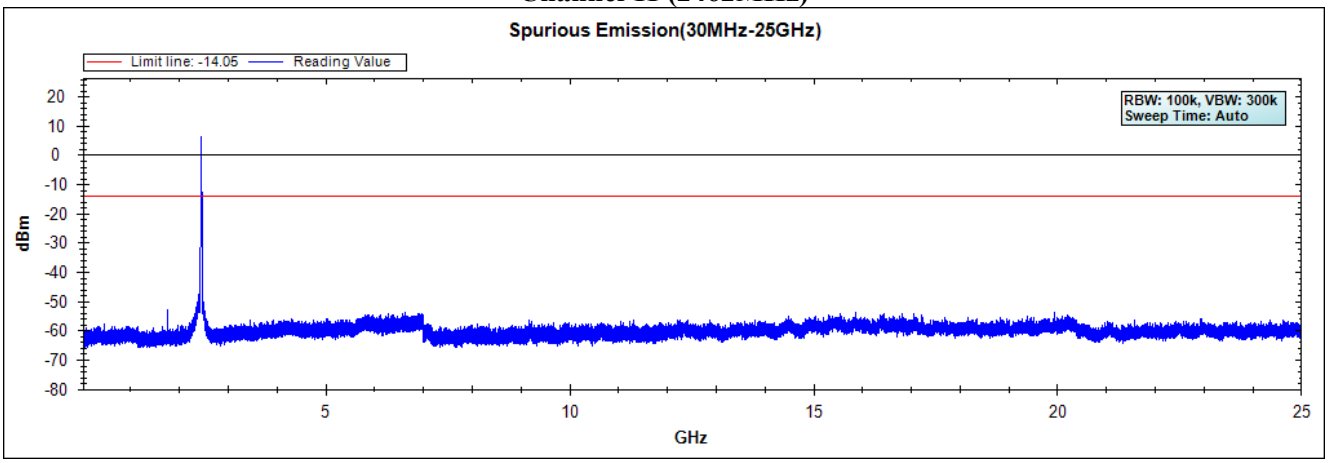
Channel 01 (2412MHz)



Channel 06 (2437MHz)



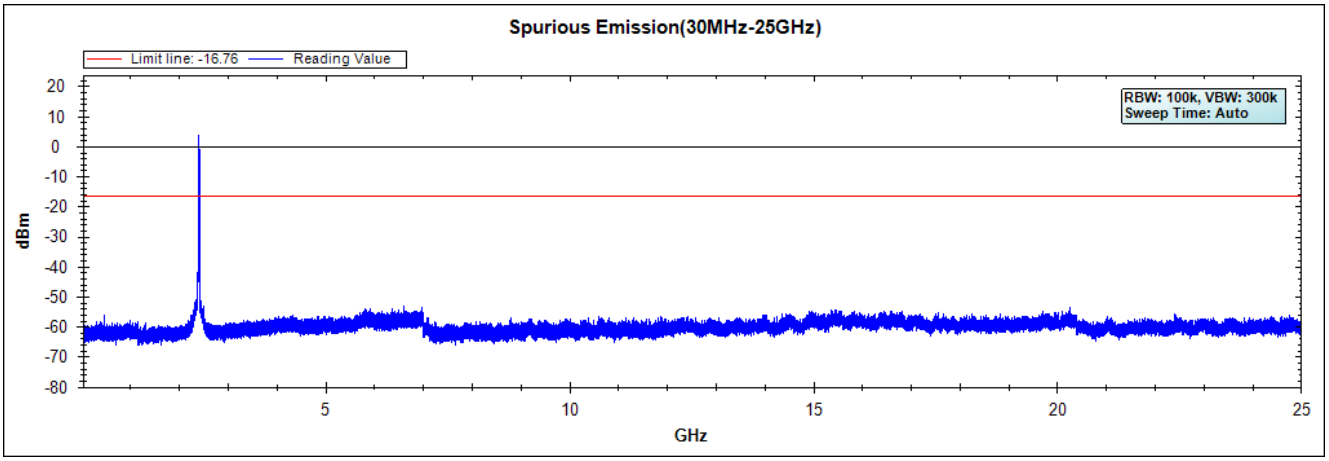
Channel 11 (2462MHz)



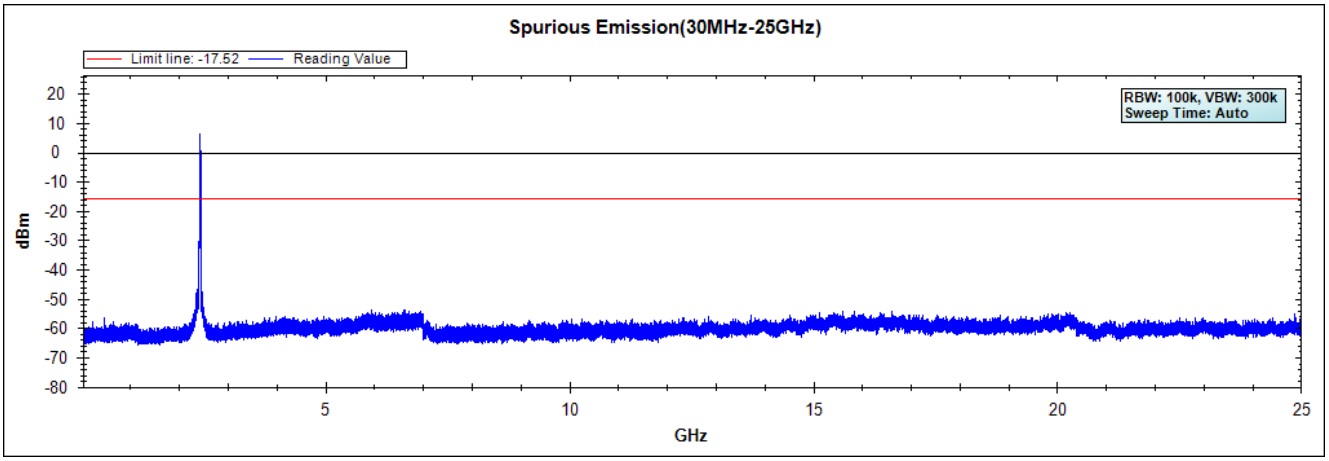
Note: The above test pattern is synthesized by multiple of the frequency range.

Product : 4G/LTE Broadband Router with PoE
Test Item : RF Antenna Conducted Spurious
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)
Test Date : 2018/05/07

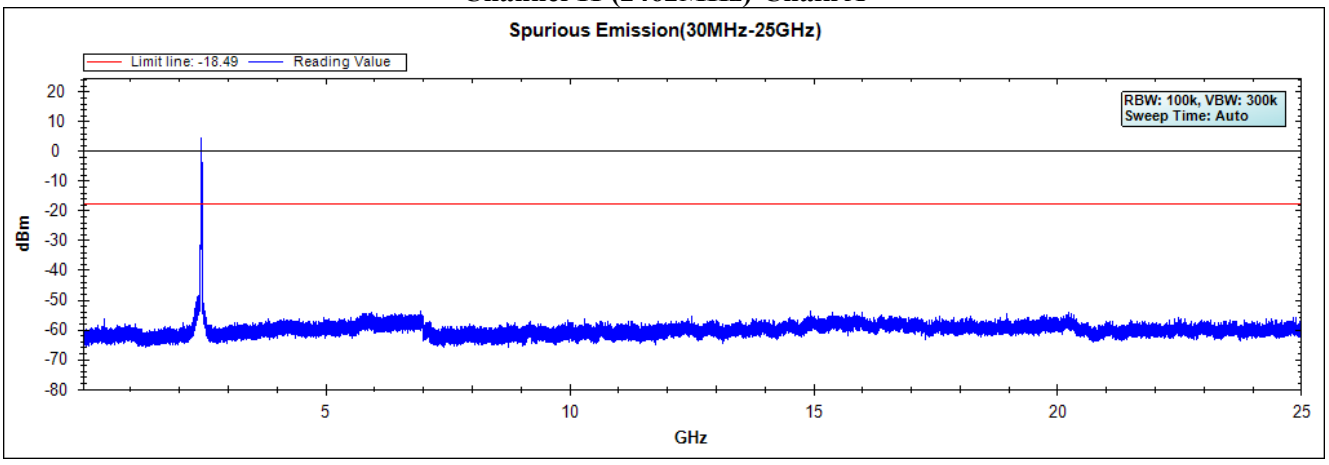
Channel 01 (2412MHz)-Chain A



Channel 06 (2437MHz)-Chain A



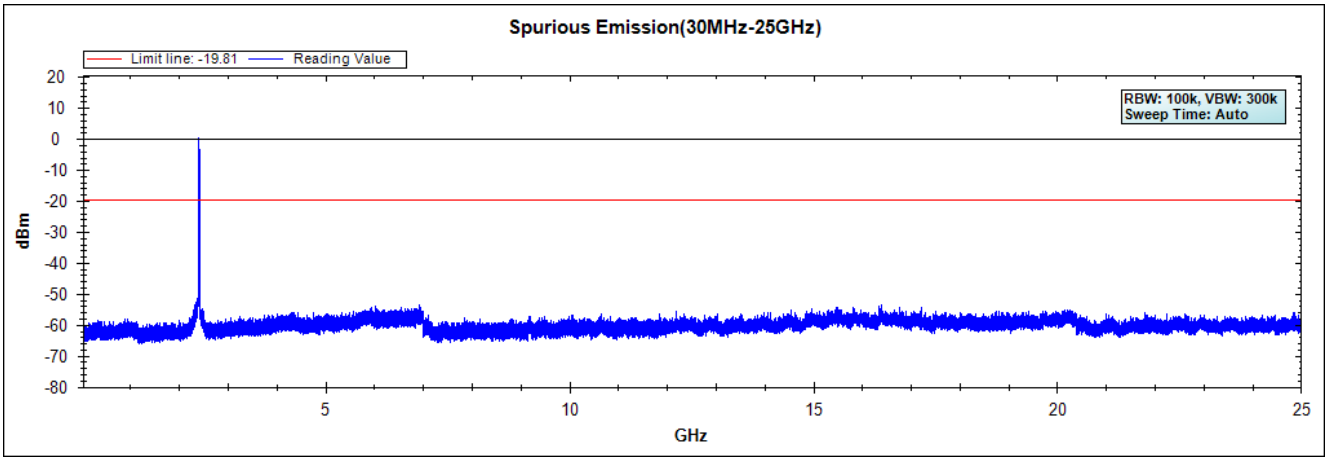
Channel 11 (2462MHz)-Chain A



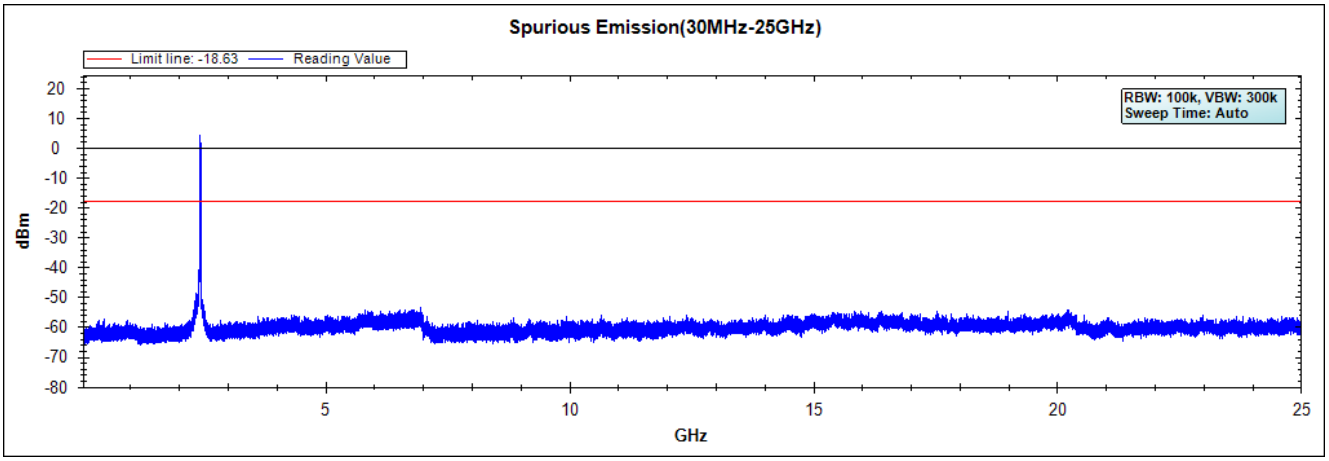
Note: The above test pattern is synthesized by multiple of the frequency range.

Product	:	4G/LTE Broadband Router with PoE
Test Item	:	RF Antenna Conducted Spurious
Test Mode	:	Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)
Test Date	:	2018/05/07

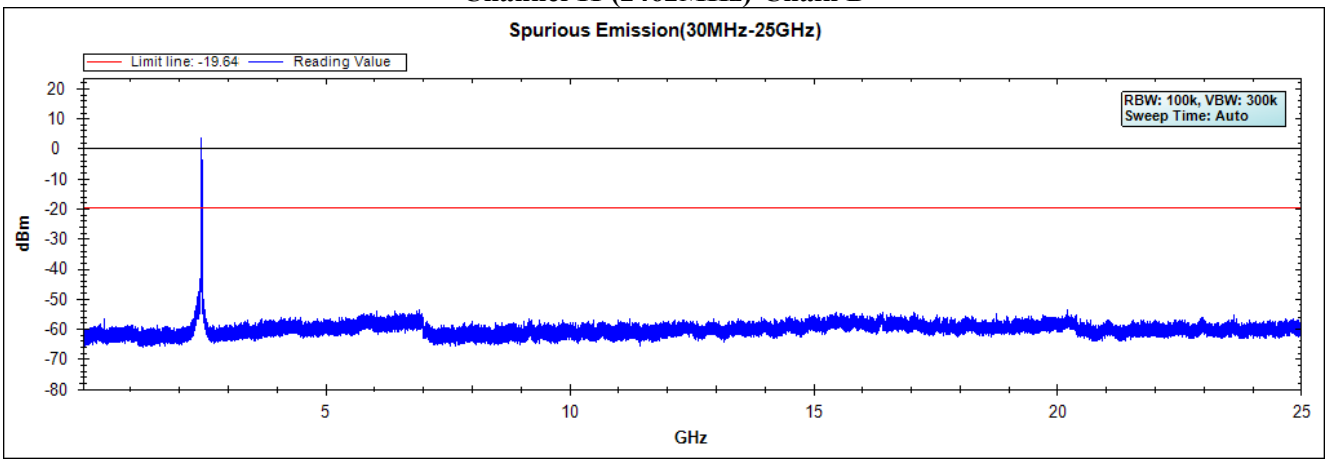
Channel 01 (2412MHz)-Chain B



Channel 06 (2437MHz)-Chain B



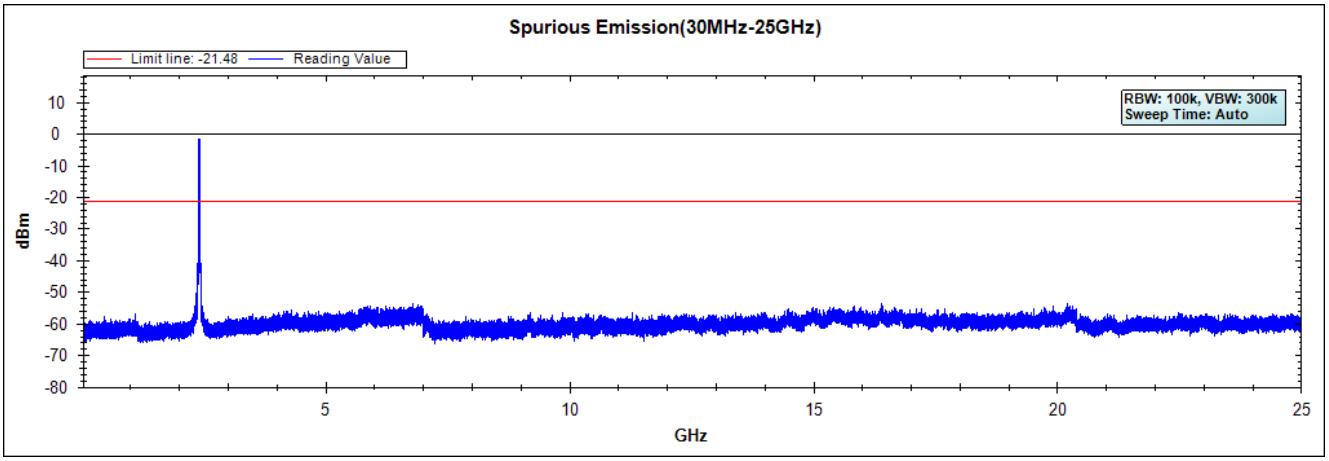
Channel 11 (2462MHz)-Chain B



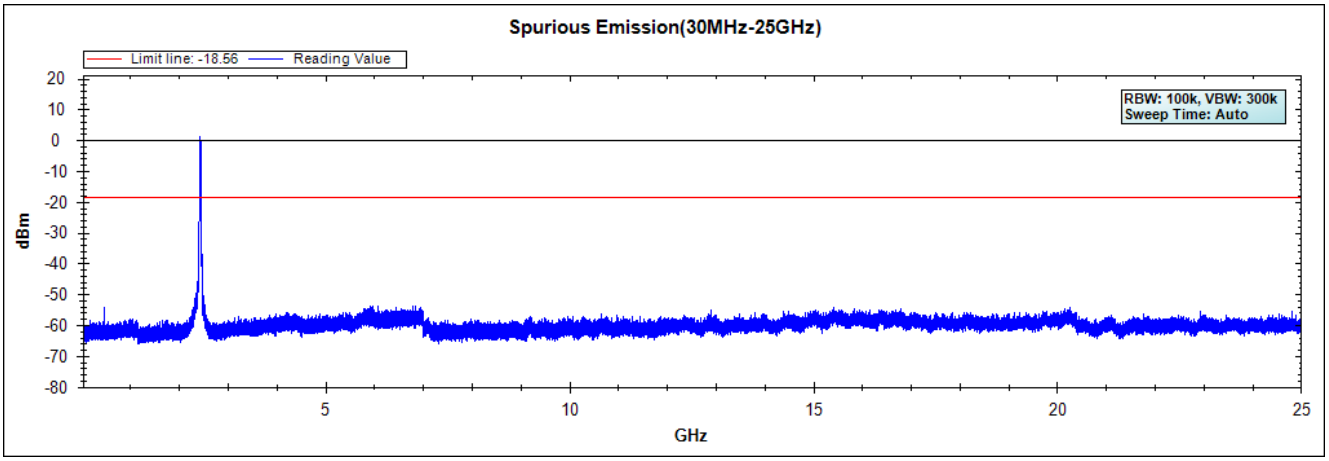
Note: The above test pattern is synthesized by multiple of the frequency range.

Product : 4G/LTE Broadband Router with PoE
Test Item : RF Antenna Conducted Spurious
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)
Test Date : 2018/05/07

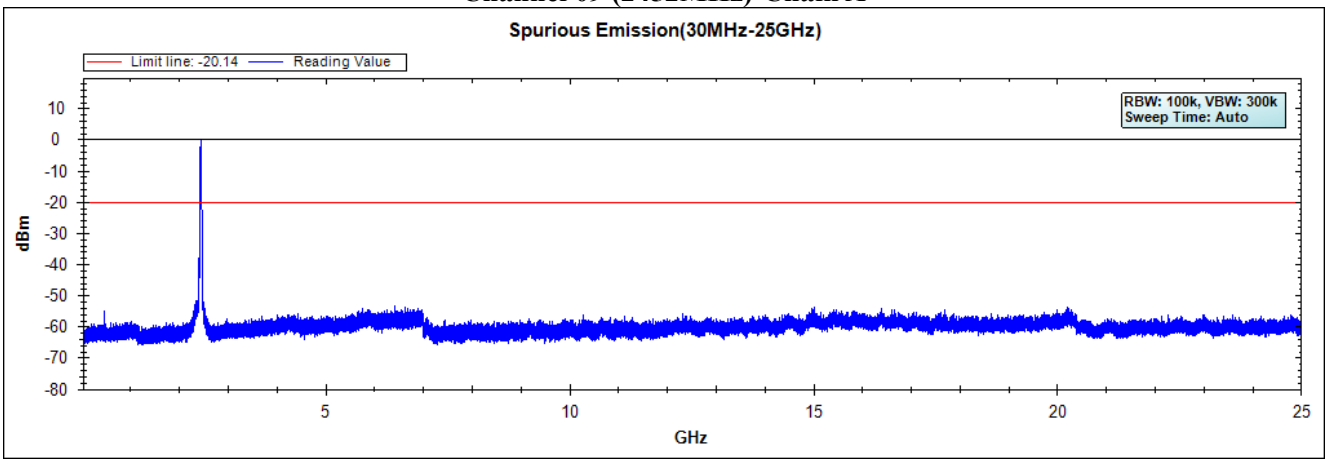
Channel 03 (2422MHz)-Chain A



Channel 06 (2437MHz)-Chain A



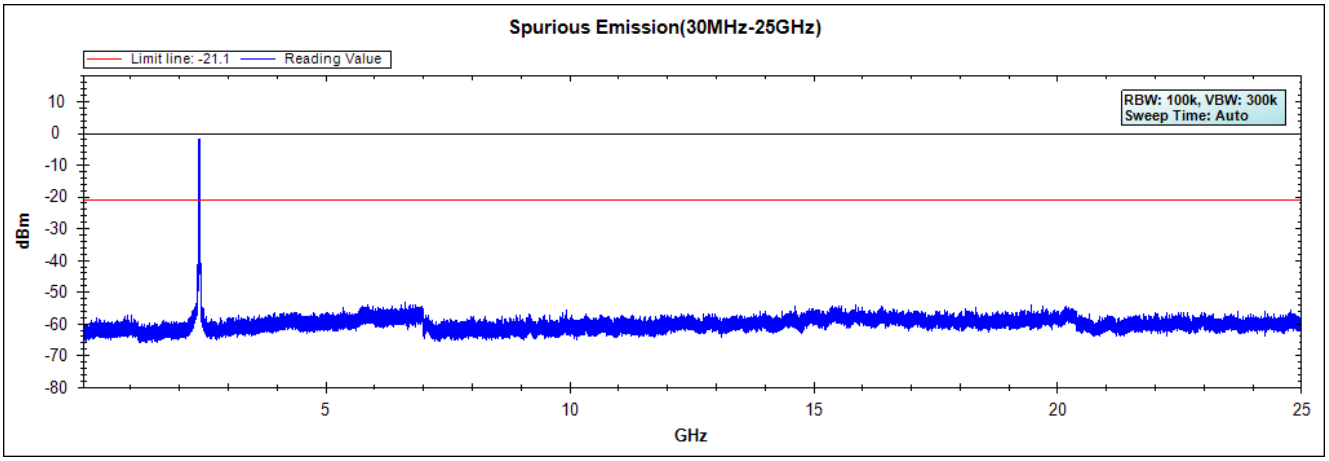
Channel 09 (2452MHz)-Chain A



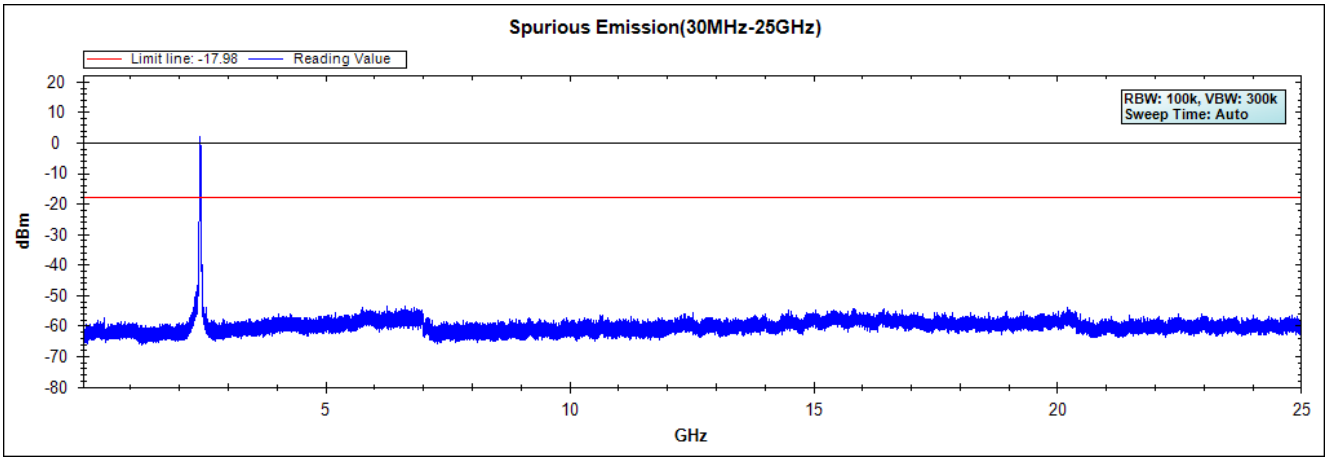
Note: The above test pattern is synthesized by multiple of the frequency range.

Product	:	4G/LTE Broadband Router with PoE
Test Item	:	RF Antenna Conducted Spurious
Test Mode	:	Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)
Test Date	:	2018/05/07

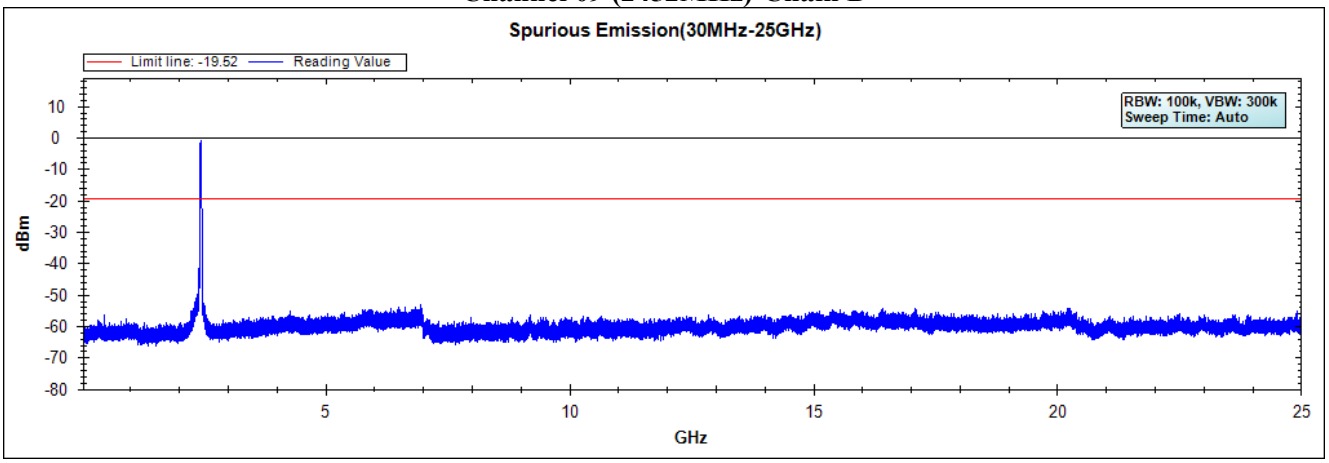
Channel 03 (2422MHz)-Chain B



Channel 06 (2437MHz)-Chain B



Channel 09 (2452MHz)-Chain B

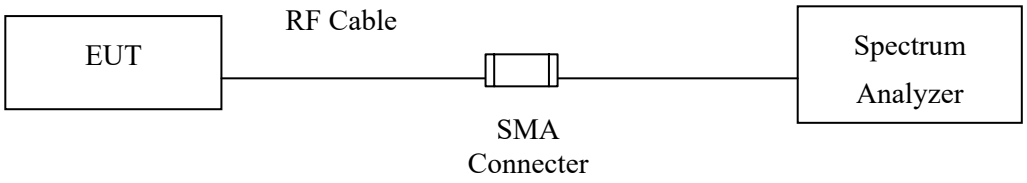


Note: The above test pattern is synthesized by multiple of the frequency range.

6. Band Edge

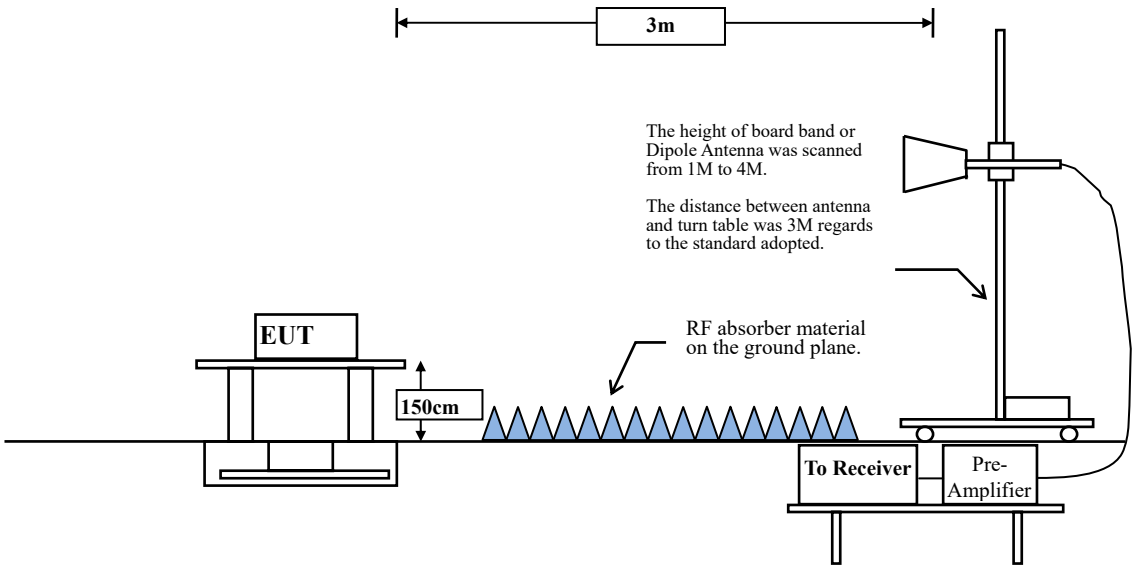
6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:

Above 1GHz



6.2. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.
The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

VBW ≥ 3 x RBW.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle ≥ 98 %

VBW ≥ 1/T, when duty cycle < 98 %

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
802.11b	98.64	8.4130	--	10
802.11g	90.52	1.3840	723	1k
802.11n20	85.22	0.6681	1497	2k

Note: Duty Cycle Refer to Section 9

6.4. Uncertainty

Conducted: ±1.23dB

Radiated:

Horizontal polarization：1-18GHz: ±3.77dB

Vertical polarization：1-18GHz : ±3.83dB

6.5. Test Result of Band Edge

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)
Test Date : 2018/05/05

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2386.377	10.246	52.426	62.673	74.00	54.00	Pass
01 (Peak)	2390.000	10.262	48.416	58.678	74.00	54.00	Pass
01 (Peak)	2398.841	10.298	70.300	80.598	--	--	Pass
01 (Peak)	2400.000	10.304	69.729	80.032	--	--	Pass
01 (Peak)	2413.333	10.358	103.451	113.808	--	--	--
01 (Average)	2387.101	10.250	37.461	47.711	74.00	54.00	Pass
01 (Average)	2390.000	10.262	35.775	46.037	74.00	54.00	Pass
01 (Average)	2412.319	10.353	95.120	105.473	--	--	--

Figure Channel 01: Horizontal (Peak)

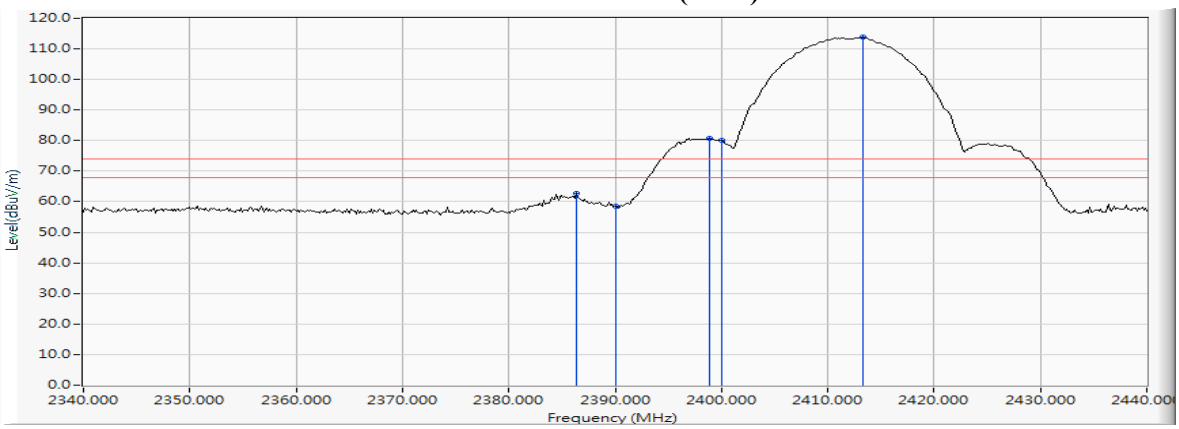
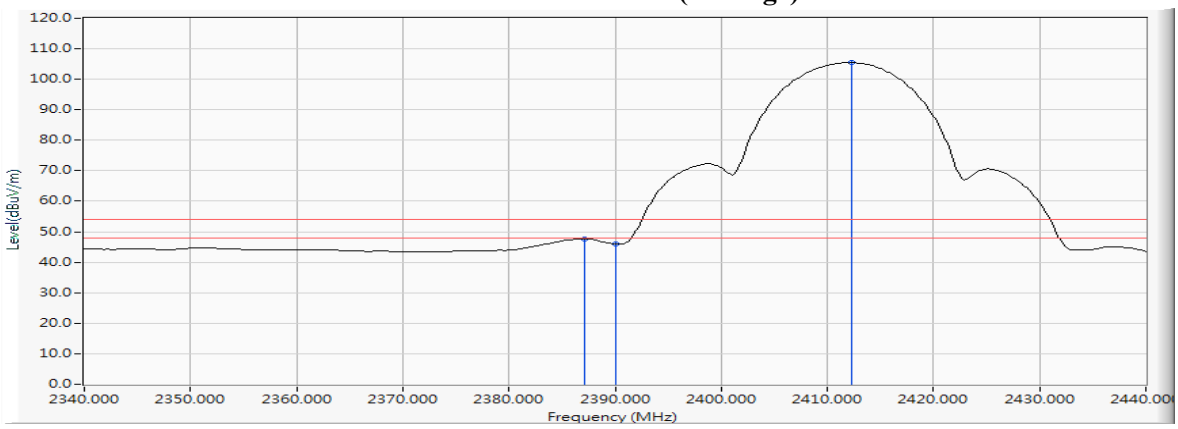


Figure Channel 01: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2412MHz)
Test Date : 2018/05/05

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
01 (Peak)	2386.087	10.245	49.091	59.337	74.00	54.00	Pass
01 (Peak)	2390.000	10.262	46.996	57.258	74.00	54.00	Pass
01 (Peak)	2398.696	10.298	68.404	78.702	--	--	Pass
01 (Peak)	2400.000	10.304	67.749	78.052	--	--	Pass
01 (Peak)	2413.333	10.358	102.144	112.501	--	--	--
01 (Average)	2387.246	10.250	34.965	45.216	74.00	54.00	Pass
01 (Average)	2390.000	10.262	33.742	44.004	74.00	54.00	Pass
01 (Average)	2412.319	10.353	93.750	104.103	--	--	--

Figure Channel 01: Vertical (Peak)

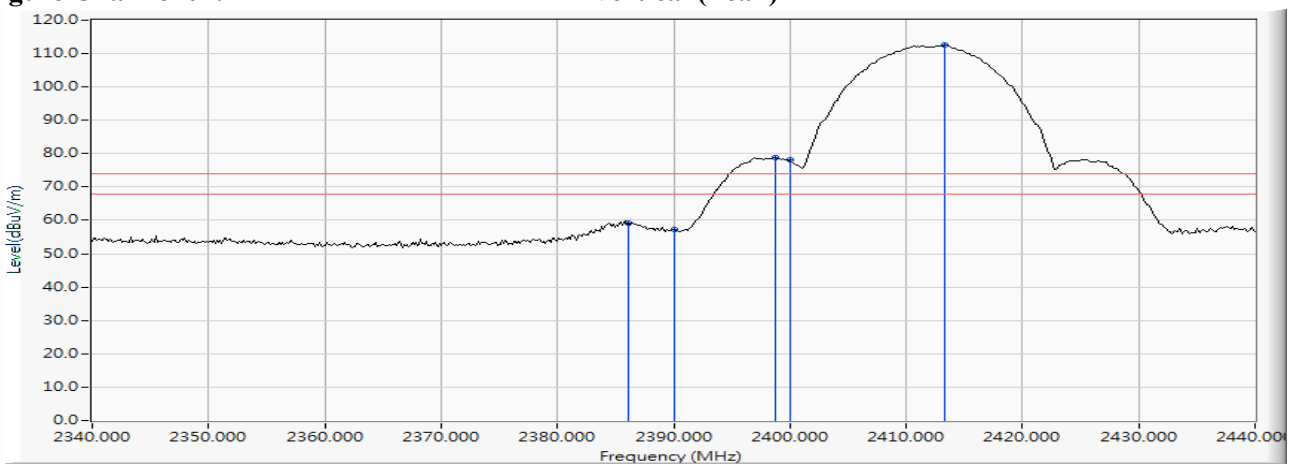
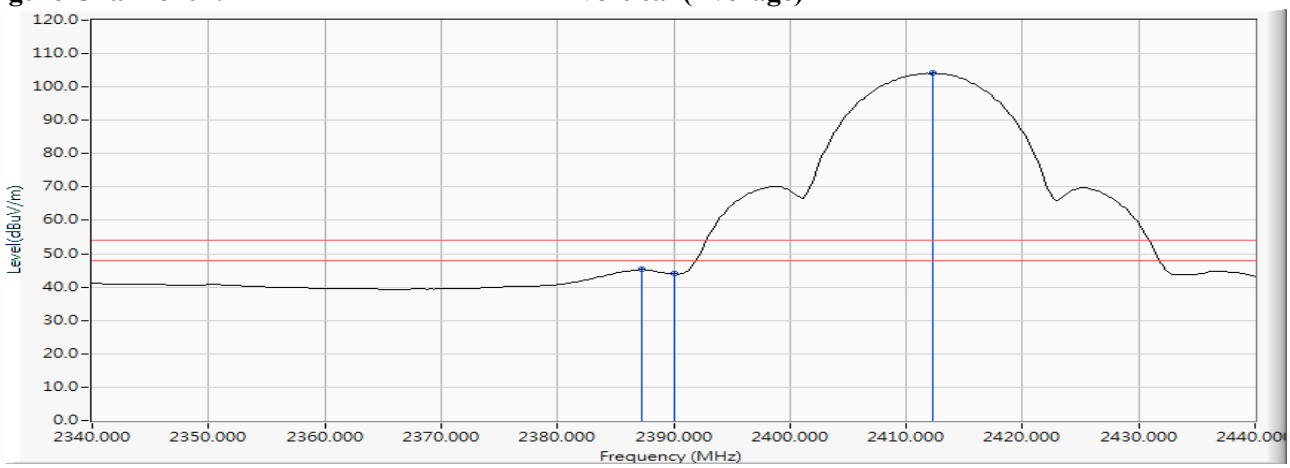


Figure Channel 01: Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462MHz)
Test Date : 2018/05/05

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2461.326	10.547	101.062	111.609	--	--	--
11 (Peak)	2483.500	10.640	44.194	54.835	74.00	54.00	Pass
11 (Peak)	2487.703	10.658	45.549	56.206	74.00	54.00	Pass
11 (Average)	2461.616	10.549	92.934	103.482	--	--	--
11 (Average)	2483.500	10.640	31.354	41.995	74.00	54.00	Pass
11 (Average)	2486.543	10.653	31.887	42.540	74.00	54.00	Pass

Figure Channel 11: Horizontal (Peak)

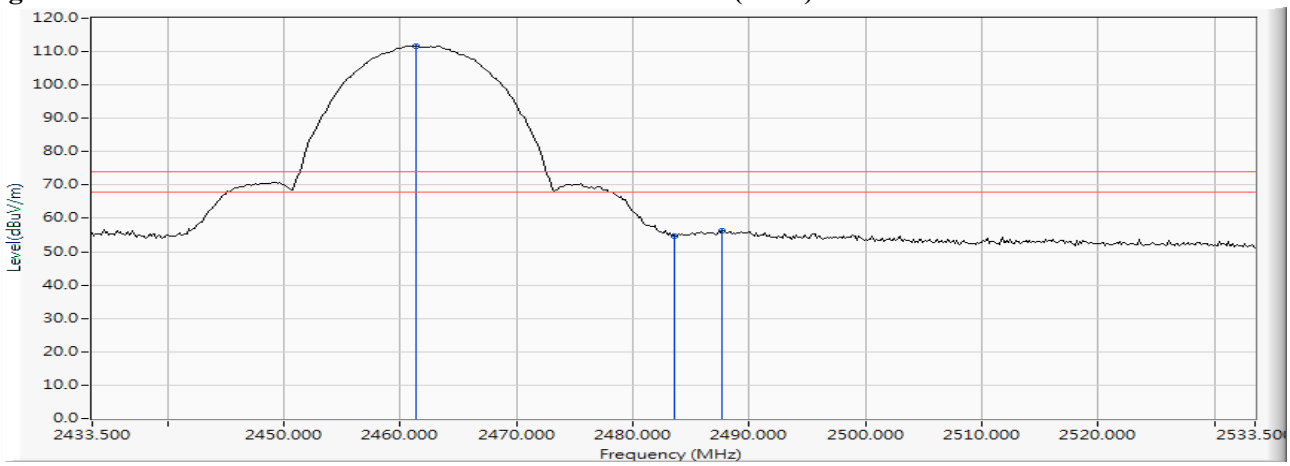
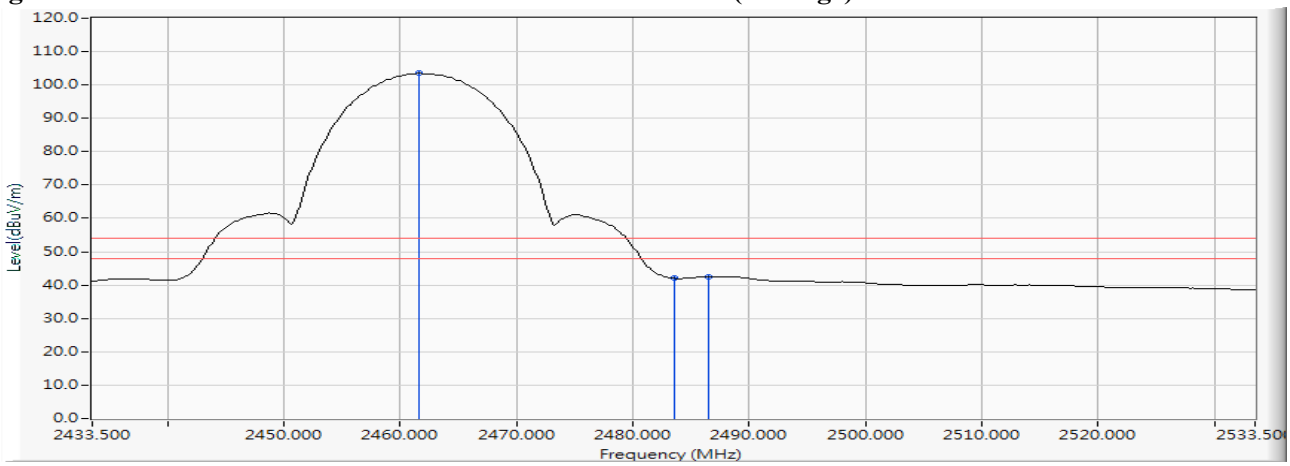


Figure Channel 11: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps) (2462MHz)
Test Date : 2018/05/05

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
11 (Peak)	2463.355	10.555	101.498	112.054	--	--	--
11 (Peak)	2483.500	10.640	43.635	54.276	74.00	54.00	Pass
11 (Peak)	2486.109	10.652	45.833	56.484	74.00	54.00	Pass
11 (Average)	2462.341	10.551	93.284	103.835	--	--	--
11 (Average)	2483.500	10.640	31.084	41.725	74.00	54.00	Pass
11 (Average)	2486.543	10.653	31.415	42.068	74.00	54.00	Pass

Figure Channel 11: Vertical (Peak)

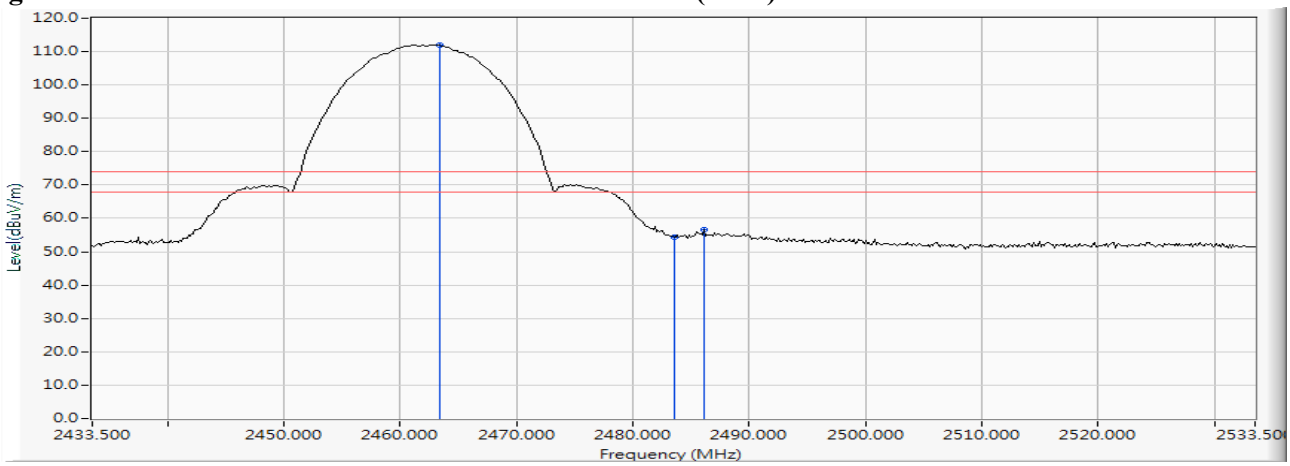
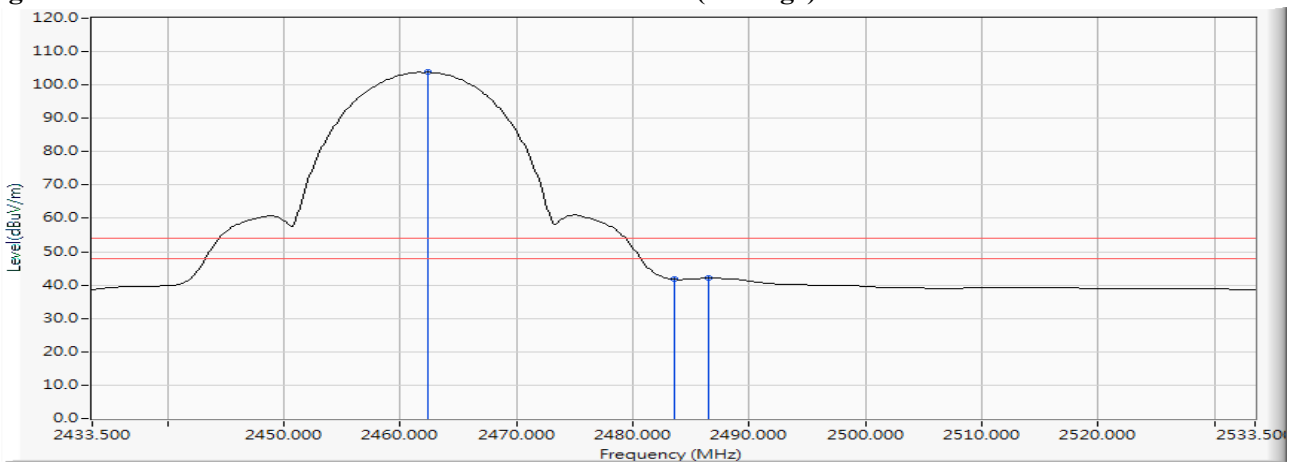


Figure Channel 11: Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)
Test Date : 2018/05/05

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2390.000	10.262	62.881	73.143	74.00	54.00	Pass
01 (Peak)	2398.696	10.298	78.075	88.373	--	--	Pass
01 (Peak)	2400.000	10.304	77.716	88.019	--	--	Pass
01 (Peak)	2412.464	10.354	102.797	113.151	--	--	--
01 (Average)	2390.000	10.262	42.719	52.981	74.00	54.00	Pass
01 (Average)	2412.899	10.355	88.827	99.183	--	--	--

Figure Channel 01: Horizontal (Peak)

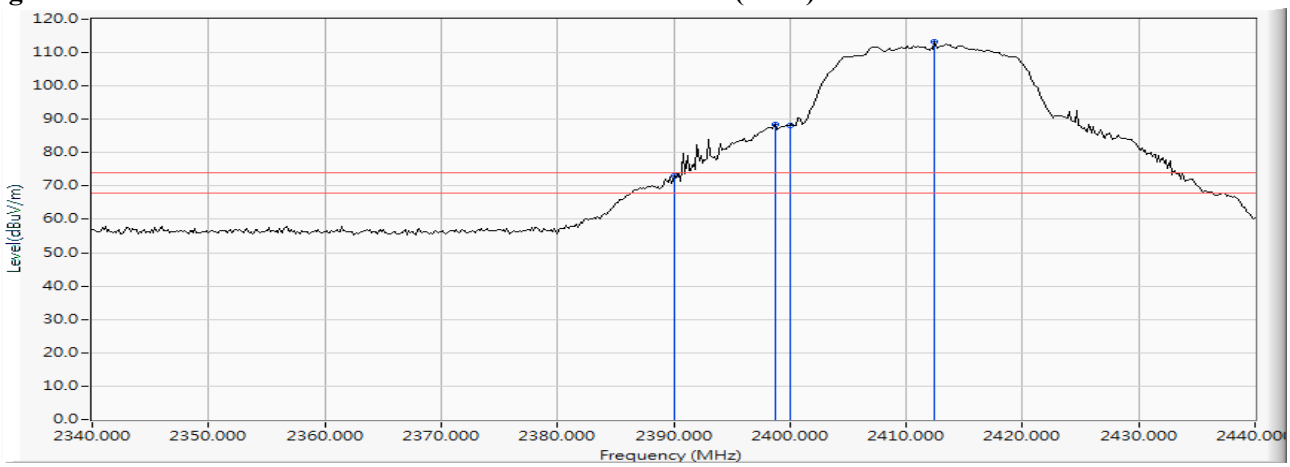
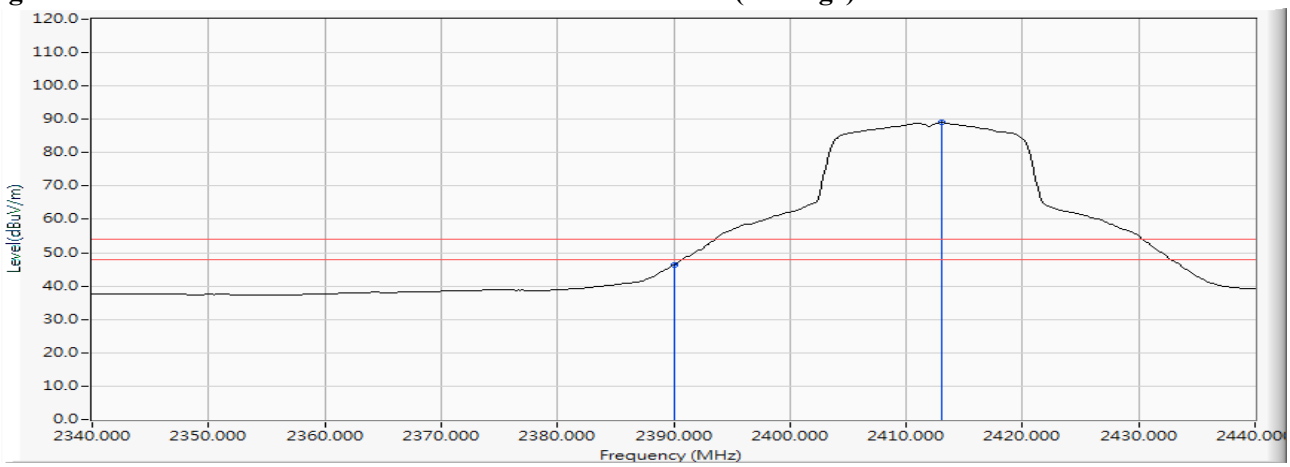


Figure Channel 01: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2412MHz)
Test Date : 2018/05/05

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
01 (Peak)	2390.000	10.262	59.748	70.010	74.00	54.00	Pass
01 (Peak)	2400.000	10.304	73.969	84.272	--	--	Pass
01 (Peak)	2413.478	10.358	95.968	106.326	--	--	--
01 (Average)	2390.000	10.262	39.385	49.647	74.00	54.00	Pass
01 (Average)	2413.043	10.357	83.021	93.377	--	--	--

Figure Channel 01: Vertical (Peak)

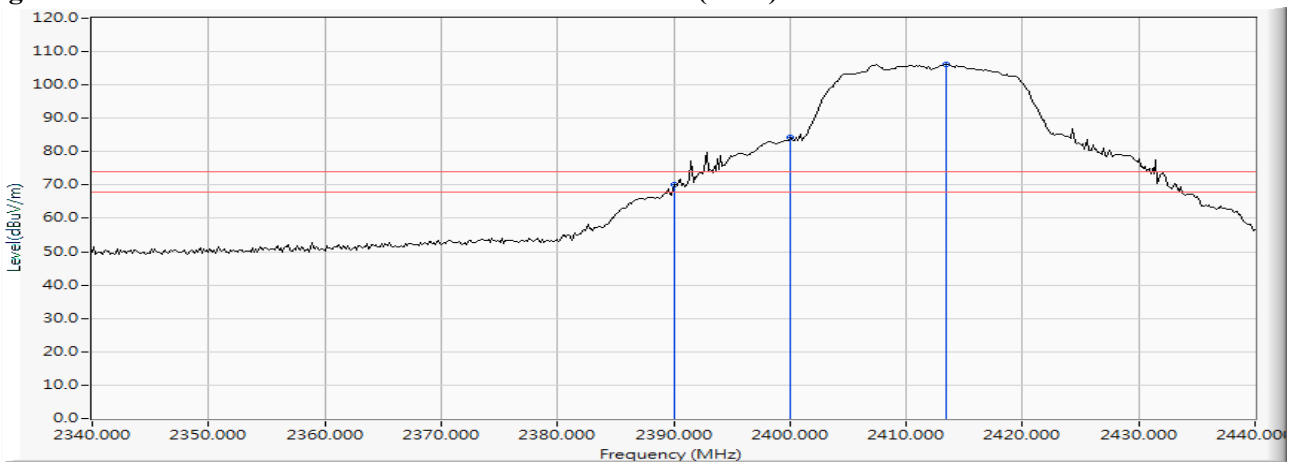
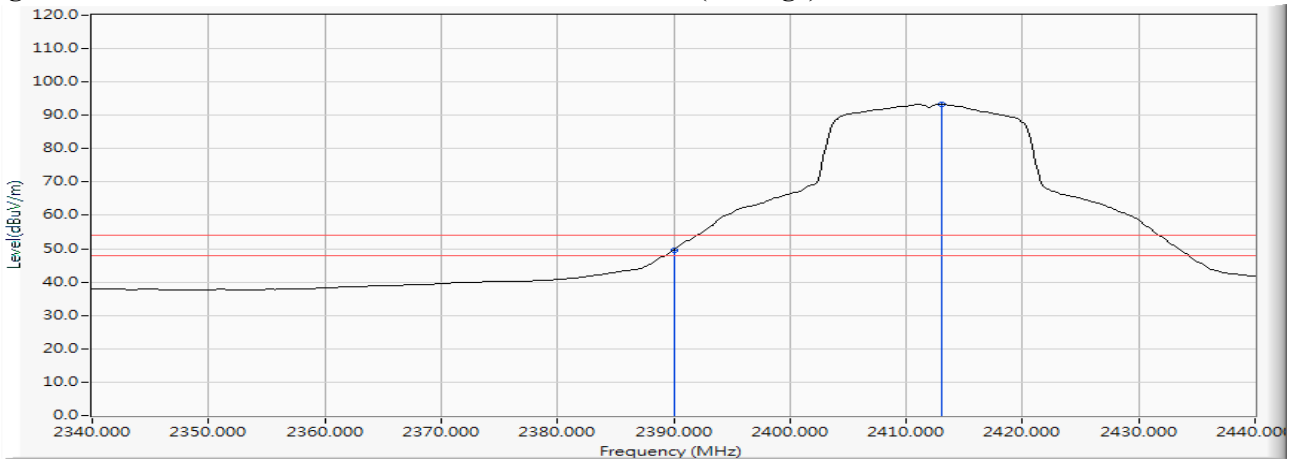


Figure Channel 01: Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462MHz)
Test Date : 2018/05/05

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2457.268	10.529	101.205	111.734	--	--	--
11 (Peak)	2483.500	10.640	59.253	69.894	74.00	54.00	Pass
11 (Peak)	2483.790	10.643	61.289	71.931	74.00	54.00	Pass
11 (Average)	2461.036	10.545	87.982	98.527	--	--	--
11 (Average)	2483.500	10.640	41.238	51.879	74.00	54.00	Pass

Figure Channel 11: Horizontal (Peak)

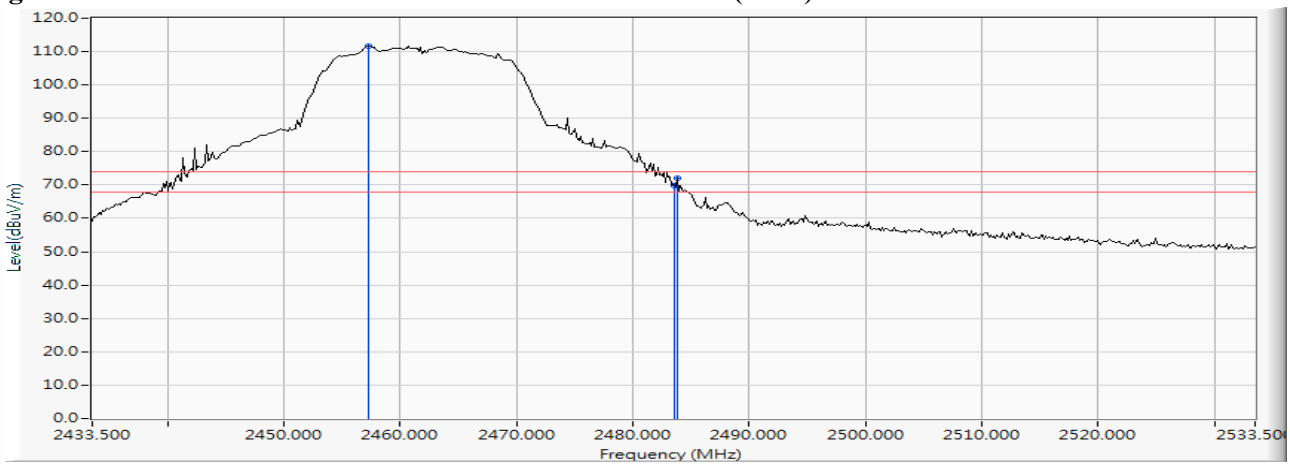
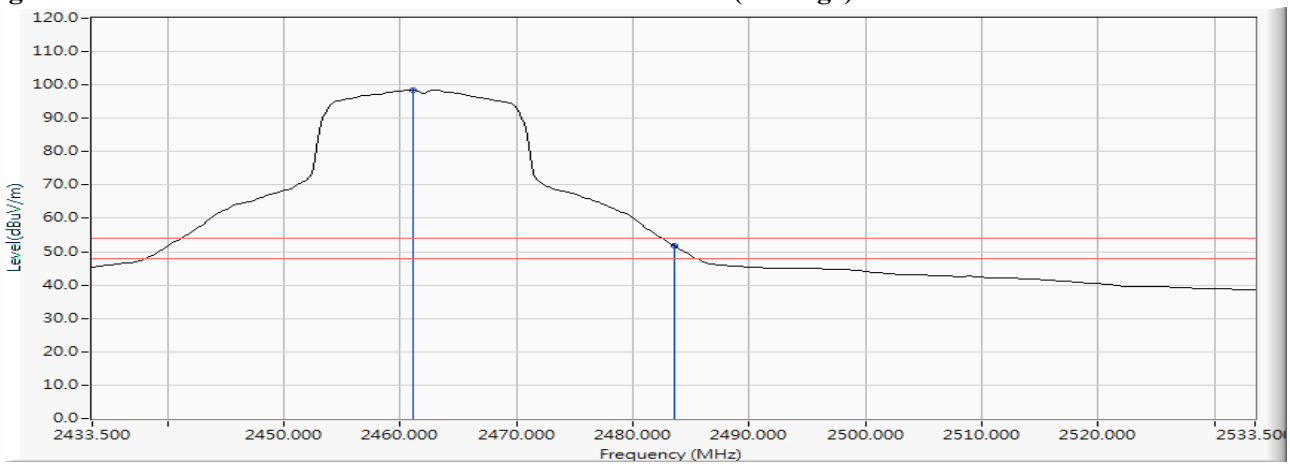


Figure Channel 11: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps) (2462MHz)
Test Date : 2018/05/05

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2463.355	10.555	97.570	108.126	--	--	--
11 (Peak)	2483.500	10.640	57.002	67.643	74.00	54.00	Pass
11 (Average)	2462.920	10.554	84.655	95.209	--	--	--
11 (Average)	2483.500	10.640	38.026	48.667	74.00	54.00	Pass

Figure Channel 11: Vertical (Peak)

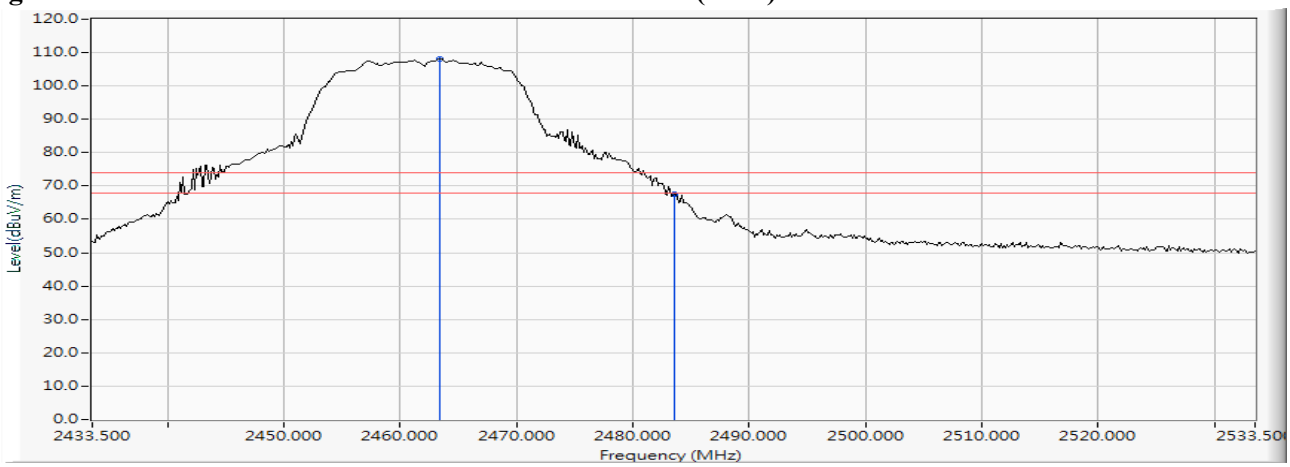
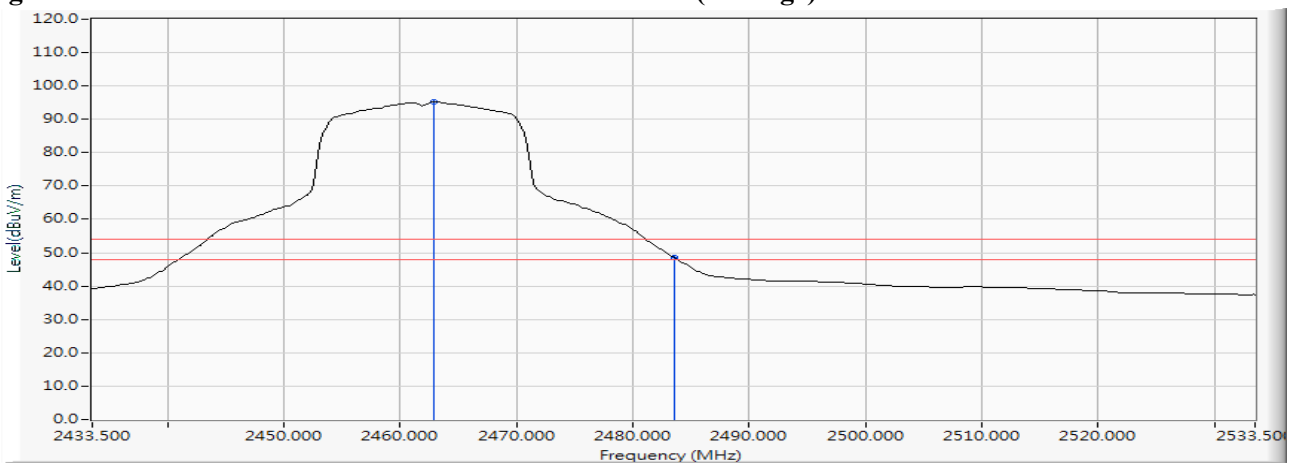


Figure Channel 11: Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW) (2412MHz)
Test Date : 2018/05/05

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
01 (Peak)	2389.275	10.260	60.582	70.841	74.00	54.00	Pass
01 (Peak)	2390.000	10.262	60.483	70.745	74.00	54.00	Pass
01 (Peak)	2398.551	10.297	71.122	81.419	--	--	Pass
01 (Peak)	2400.000	10.304	69.873	80.176	--	--	Pass
01 (Peak)	2410.435	10.345	101.165	111.511	--	--	--
01 (Average)	2390.000	10.262	42.974	53.236	74.00	54.00	Pass
01 (Average)	2410.870	10.348	82.704	93.051	--	--	--

Figure Channel 01: Horizontal (Peak)

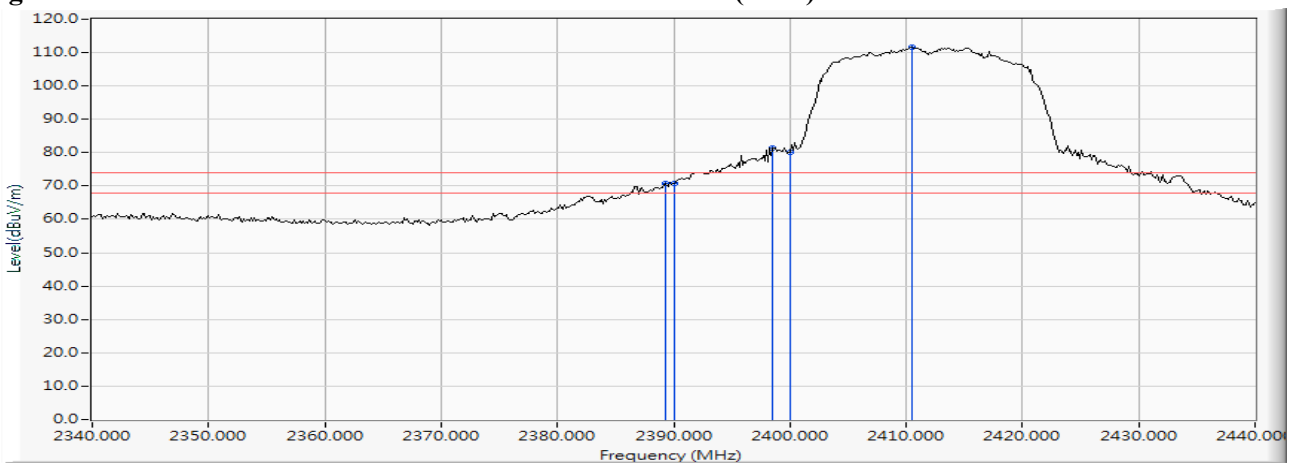
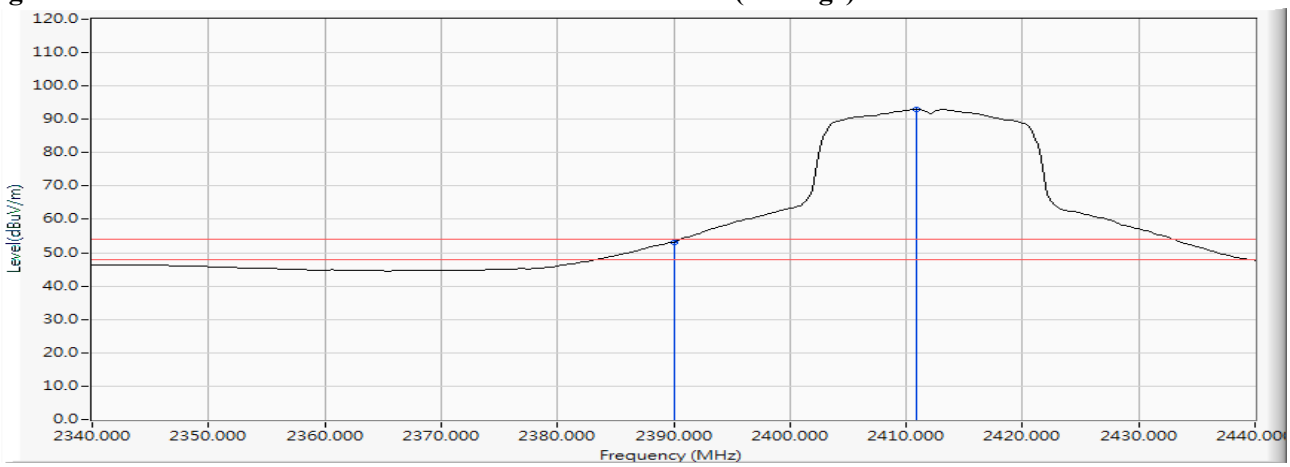


Figure Channel 01: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW) (2412MHz)
Test Date : 2018/05/05

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
01 (Peak)	2389.855	10.262	53.783	64.045	74.00	54.00	Pass
01 (Peak)	2390.000	10.262	53.718	63.980	74.00	54.00	Pass
01 (Peak)	2398.841	10.298	66.065	76.363	--	--	Pass
01 (Peak)	2400.000	10.304	63.786	74.089	--	--	Pass
01 (Peak)	2413.768	10.359	97.017	107.376	--	--	--
01 (Average)	2390.000	10.262	34.563	44.825	74.00	54.00	Pass
01 (Average)	2413.188	10.357	78.843	89.200	--	--	--

Figure Channel 01: Vertical (Peak)

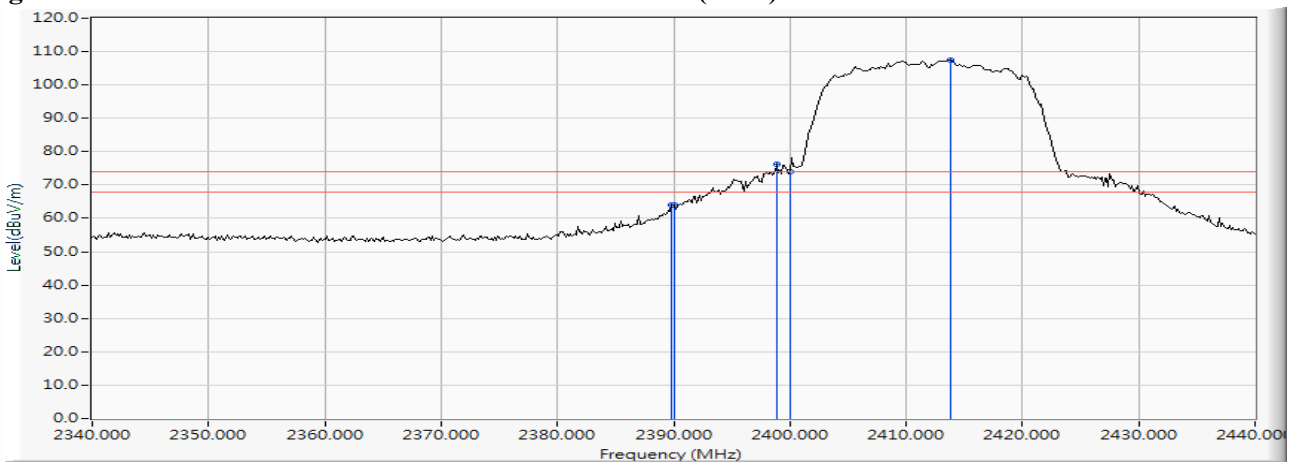
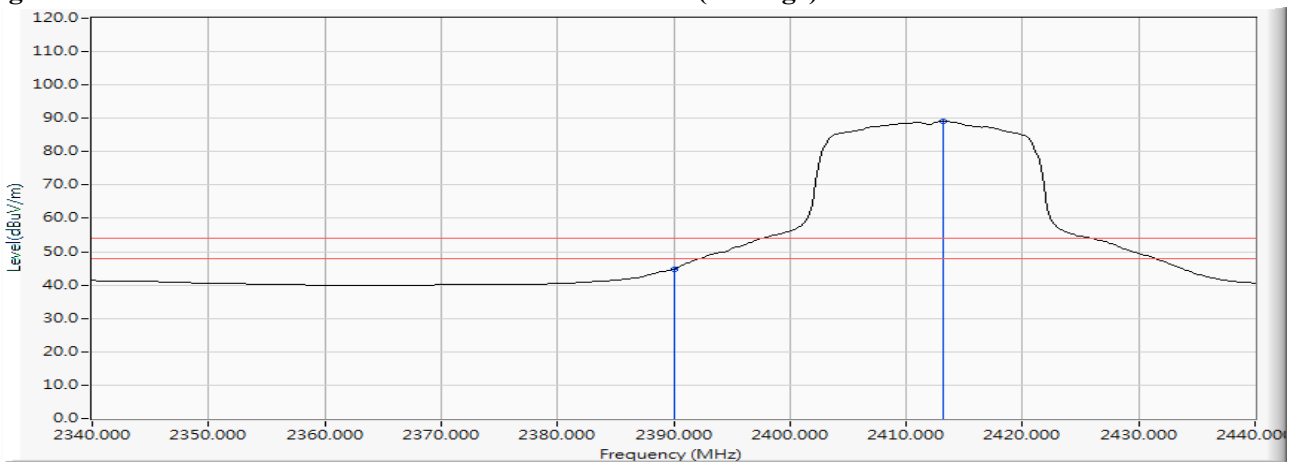


Figure Channel 01: Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW) (2462MHz)
Test Date : 2018/05/05

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
11 (Peak)	2464.804	10.562	100.596	111.158	--	--	--
11 (Peak)	2483.500	10.640	61.859	72.500	74.00	54.00	Pass
11 (Average)	2463.065	10.554	82.119	92.673	--	--	--
11 (Average)	2483.500	10.640	42.391	53.032	74.00	54.00	Pass

Figure Channel 11: Horizontal (Peak)

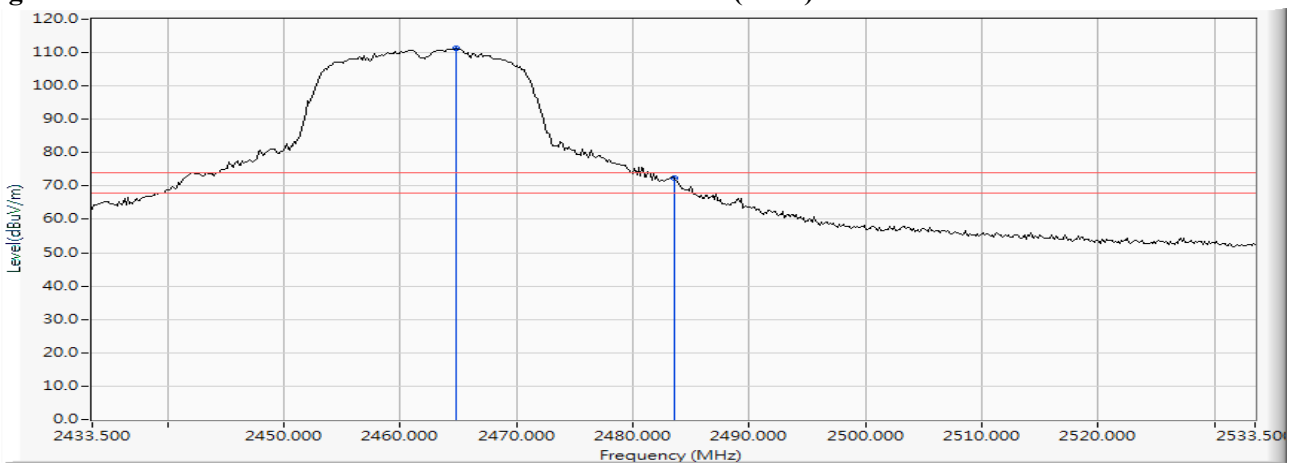
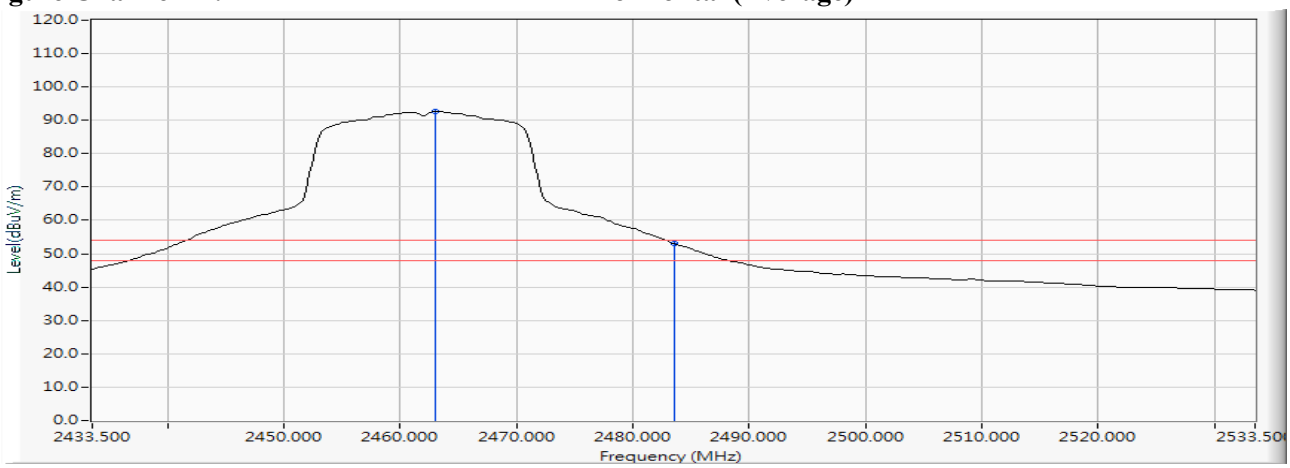


Figure Channel 11: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW) (2462MHz)
Test Date : 2018/05/05

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
11 (Peak)	2465.384	10.565	99.238	109.803	--	--	--
11 (Peak)	2483.500	10.640	59.631	70.272	74.00	54.00	Pass
11 (Average)	2460.891	10.544	81.424	91.969	--	--	--
11 (Average)	2483.500	10.640	41.031	51.672	74.00	54.00	Pass

Figure Channel 11: Vertical (Peak)

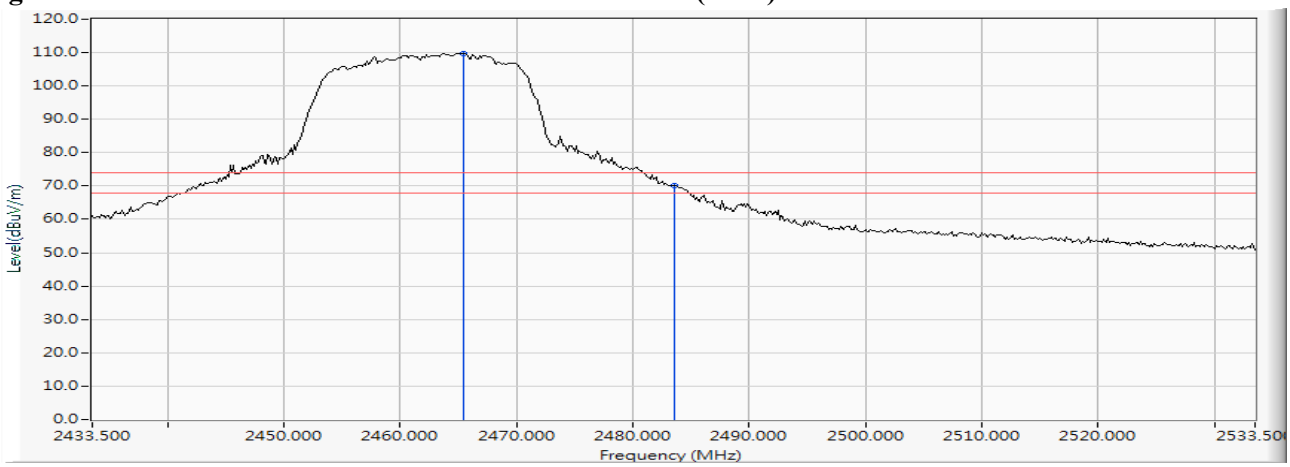
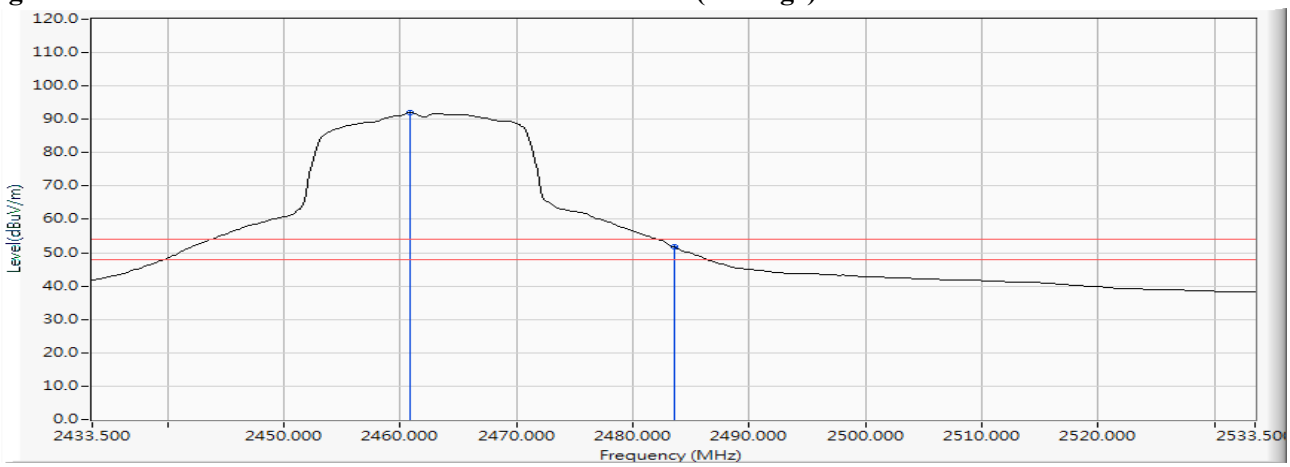


Figure Channel 11: Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW) (2422MHz)
Test Date : 2018/05/07

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
01 (Peak)	2385.652	10.244	59.017	69.261	74.00	54.00	Pass
01 (Peak)	2390.000	10.262	57.628	67.890	74.00	54.00	Pass
01 (Peak)	2400.000	10.304	62.015	72.318	--	--	Pass
01 (Peak)	2427.681	10.417	97.120	107.537	--	--	--
01 (Average)	2390.000	10.262	42.673	52.935	74.00	54.00	Pass
01 (Average)	2424.348	10.402	86.407	96.809	--	--	--

Figure Channel 01: Horizontal (Peak)

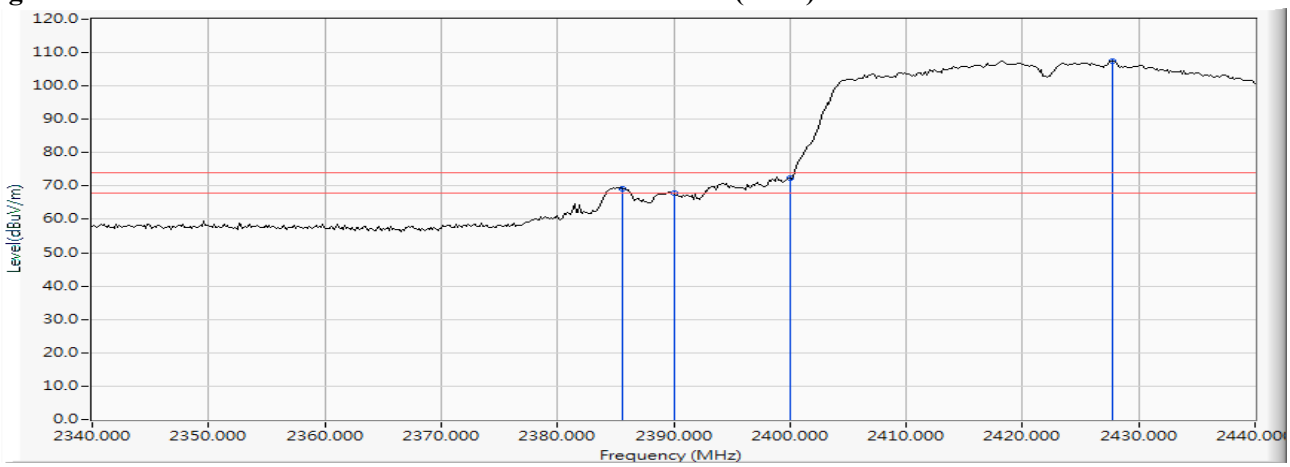
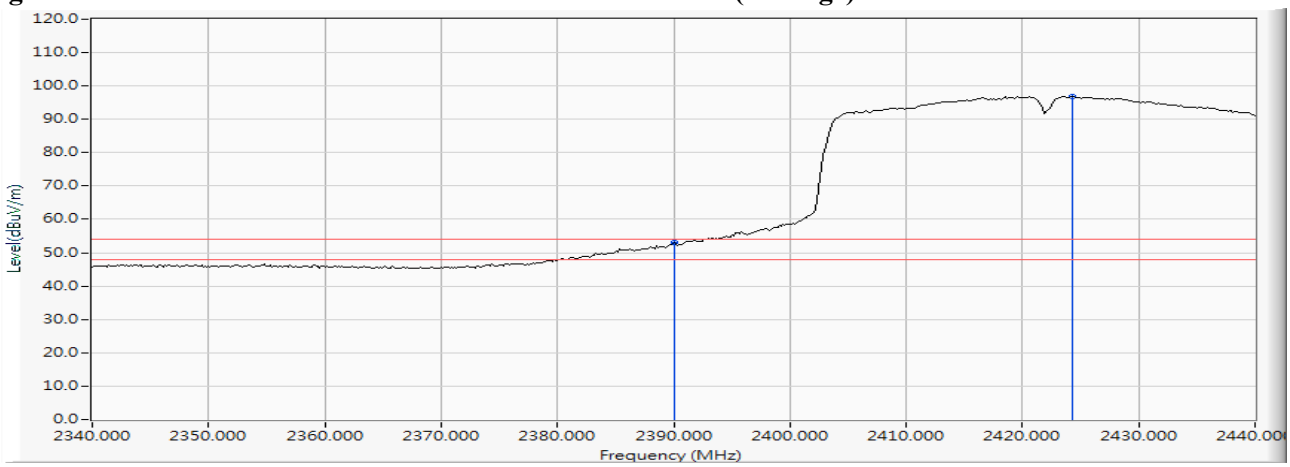


Figure Channel 01: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW) (2422MHz)
Test Date : 2018/05/07

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
01 (Peak)	2388.261	10.255	58.025	68.280	74.00	54.00	Pass
01 (Peak)	2390.000	10.262	52.236	62.498	74.00	54.00	Pass
01 (Peak)	2400.000	10.304	58.824	69.127	--	--	Pass
01 (Peak)	2420.725	10.386	92.733	103.120	--	--	--
01 (Average)	2390.000	10.262	38.474	48.736	74.00	54.00	Pass
01 (Average)	2423.768	10.400	82.183	92.583	--	--	--

Figure Channel 01: Vertical (Peak)

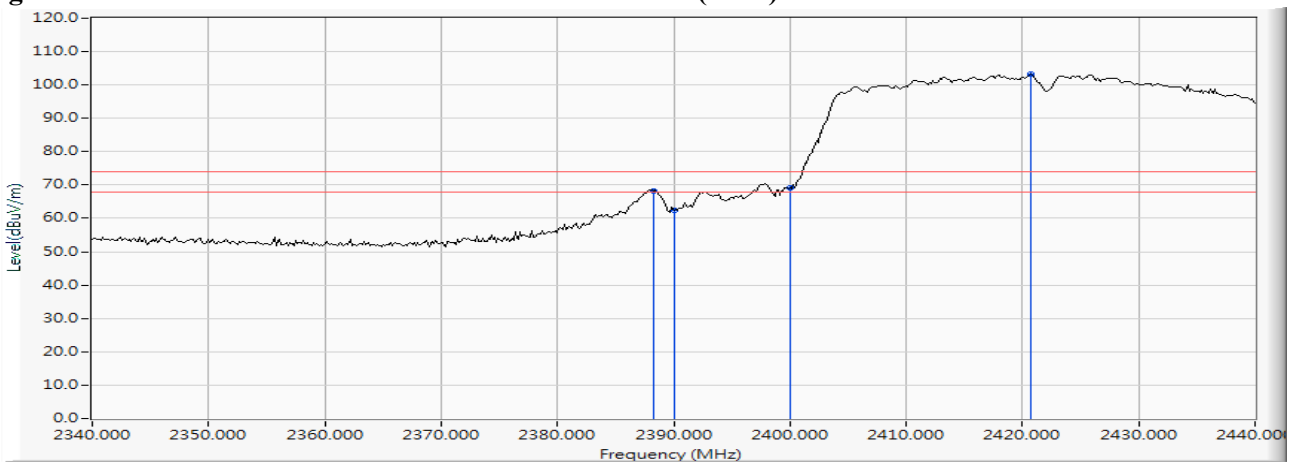
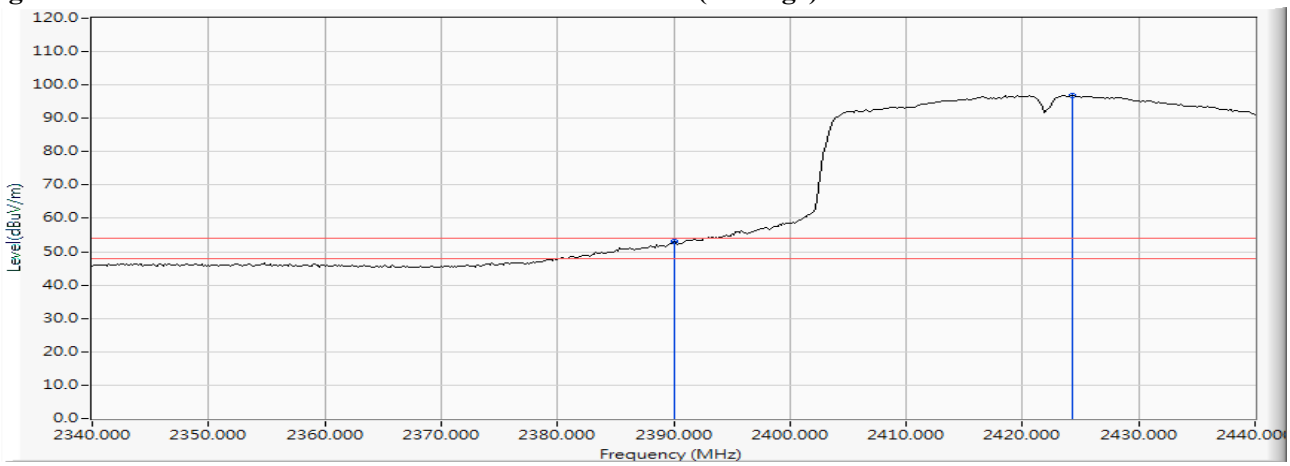


Figure Channel 01: Vertical (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW) (2452MHz)
Test Date : 2018/05/07

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
11 (Peak)	2457.848	10.532	93.944	104.475	--	--	--
11 (Peak)	2483.500	10.640	58.728	69.369	74.00	54.00	Pass
11 (Peak)	2484.370	10.645	60.806	71.451	74.00	54.00	Pass
11 (Average)	2453.645	10.514	83.045	93.560	--	--	--
11 (Average)	2483.500	10.640	41.279	51.920	74.00	54.00	Pass

Figure Channel 11: Horizontal (Peak)

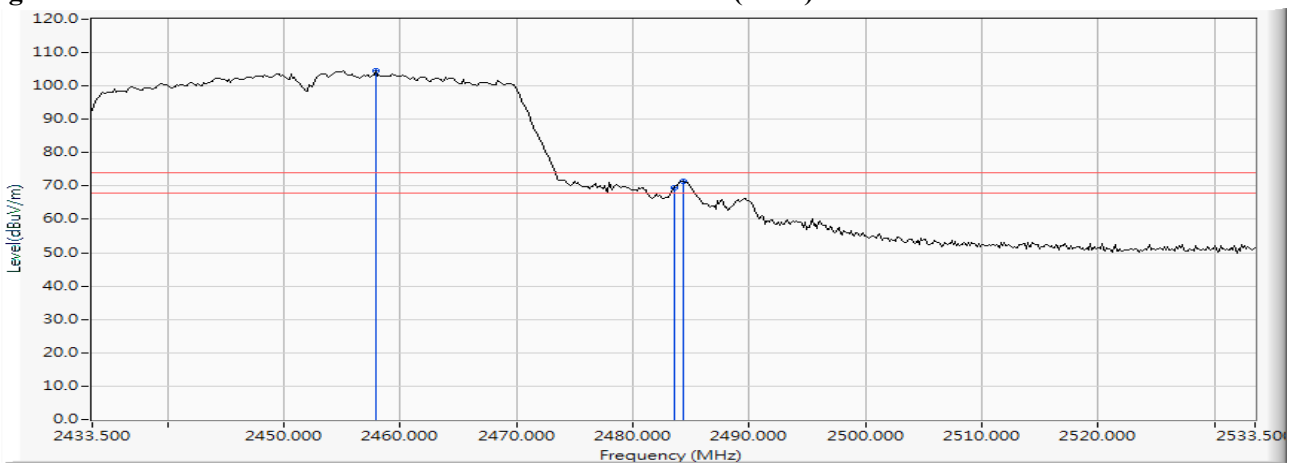
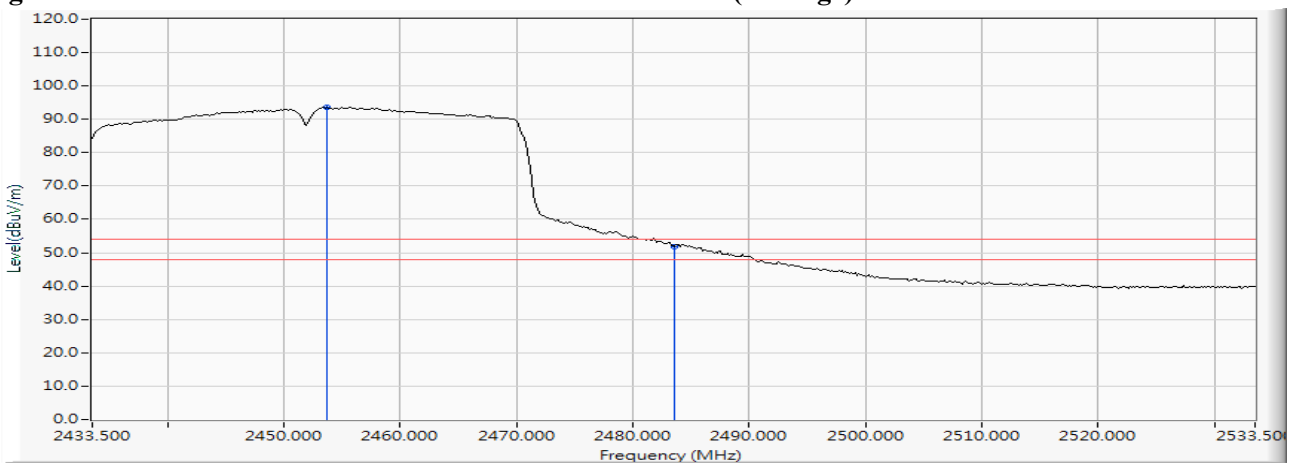


Figure Channel 11: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 4G/LTE Broadband Router with PoE
Test Item : Band Edge Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW) (2452MHz)
Test Date : 2018/05/07

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Result
11 (Peak)	2458.428	10.534	92.273	102.807	--	--	--
11 (Peak)	2483.500	10.640	54.379	65.020	74.00	54.00	Pass
11 (Peak)	2484.804	10.646	57.684	68.330	74.00	54.00	Pass
11 (Average)	2458.138	10.533	81.602	92.135	--	--	--
11 (Average)	2483.500	10.640	40.481	51.122	74.00	54.00	Pass

Figure Channel 11: Vertical (Peak)

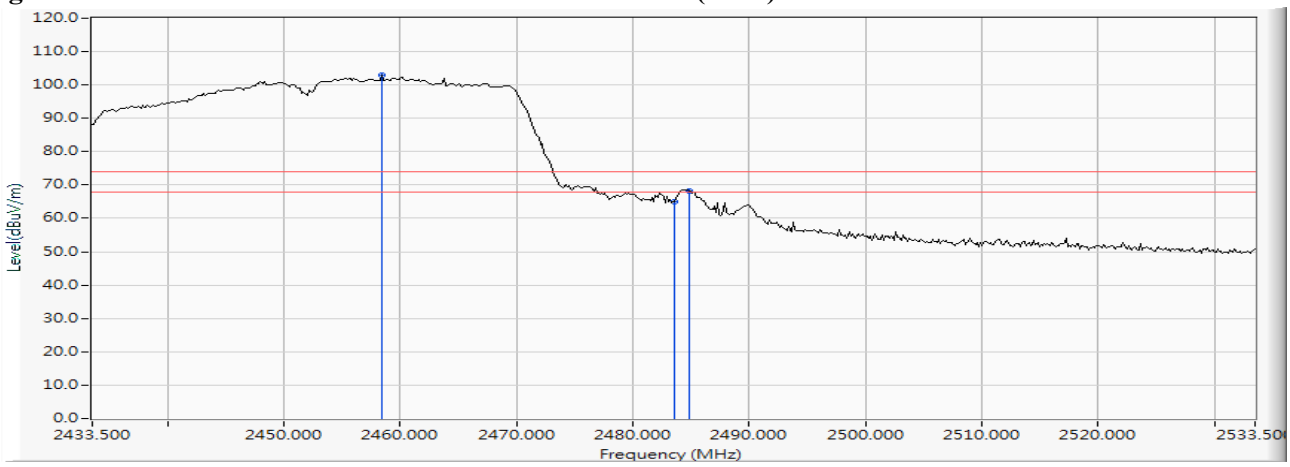
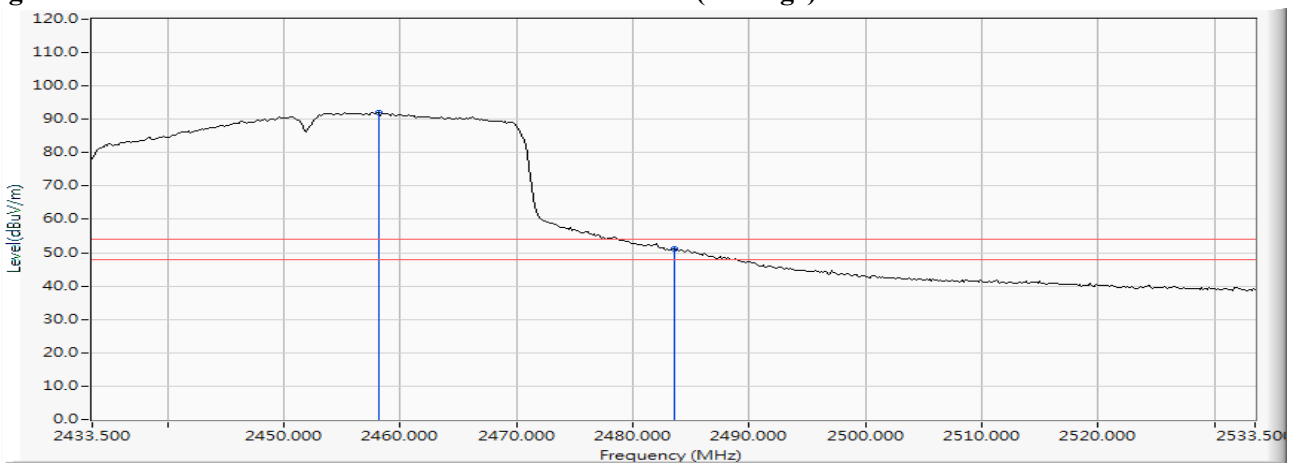


Figure Channel 11: Vertical (Average)

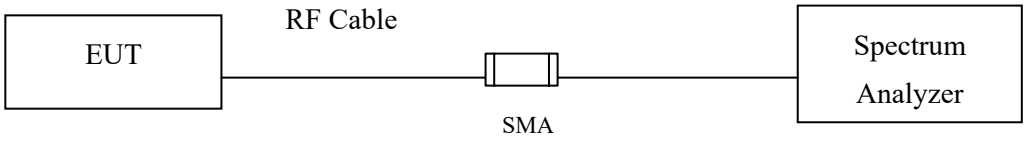


Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

The EUT was setup according to ANSI C63.4: 2014; tested according to DTS test procedure of Jan KDB558074 for compliance to FCC 47CFR 15.247 requirements.

7.4. Uncertainty

± 279.2Hz

7.5. Test Result of 6dB Bandwidth

Product : 4G/LTE Broadband Router with PoE
Test Item : 6dB Bandwidth Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2412	9650	>500	Pass
06	2437	9650	>500	Pass
11	2462	10100	>500	Pass

Figure Channel 01:

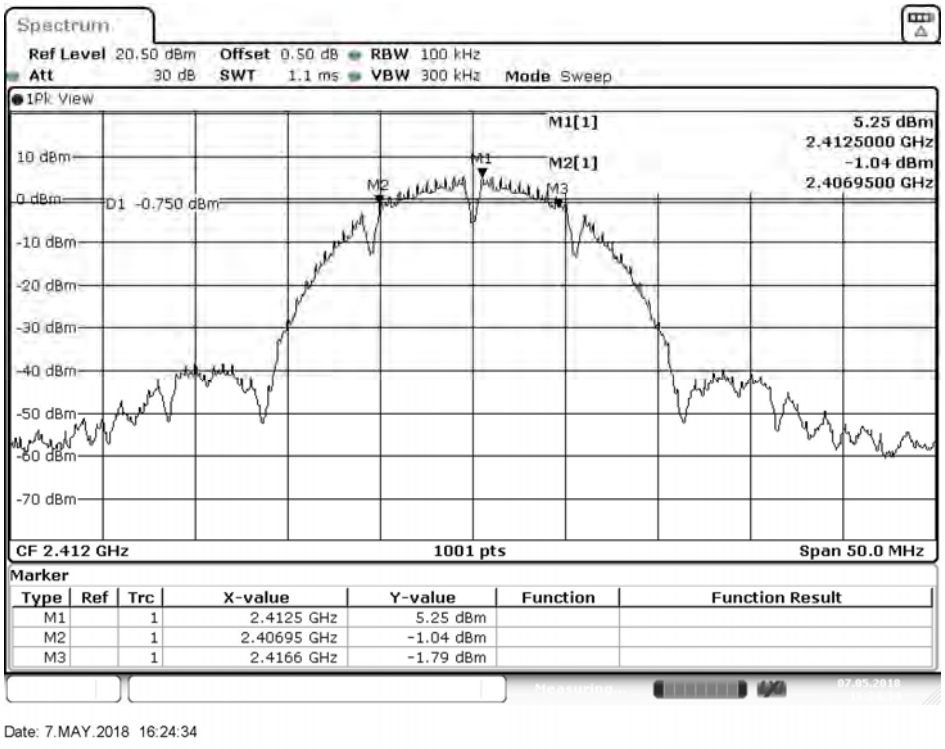
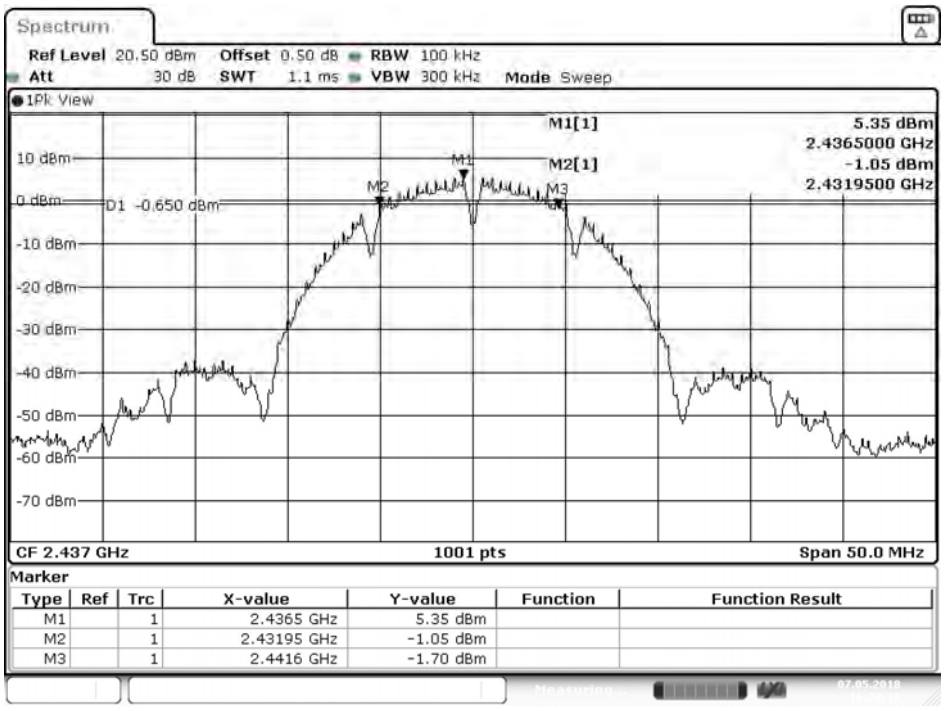
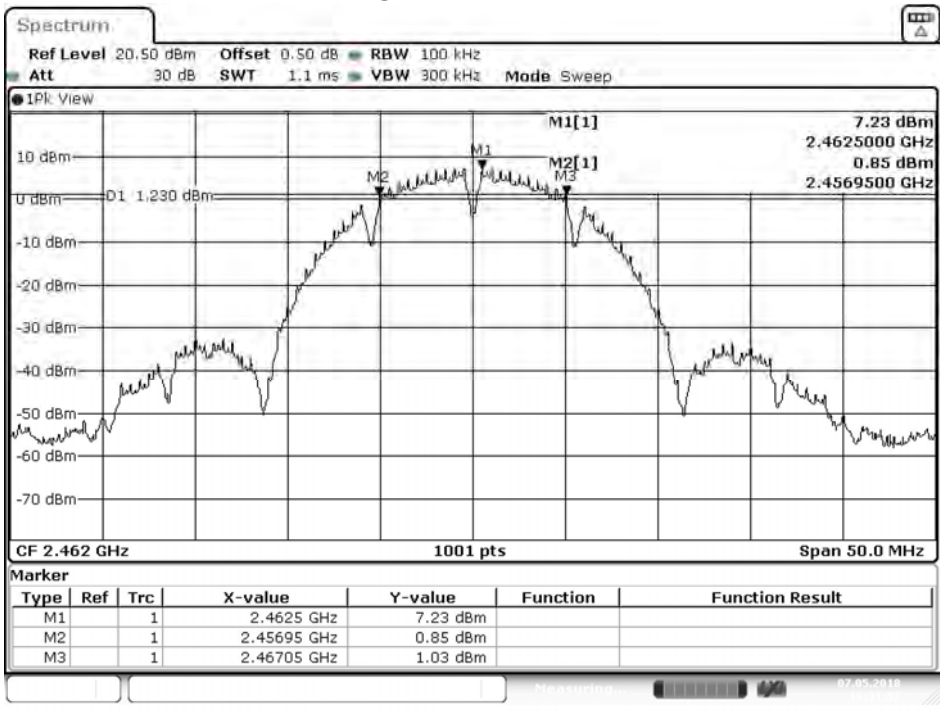


Figure Channel 06:



Date: 7.MAY.2018 16:28:16

Figure Channel 11:



Date: 7.MAY.2018 16:31:57

Product : 4G/LTE Broadband Router with PoE
Test Item : 6dB Bandwidth Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2412	15200	>500	Pass
06	2437	15200	>500	Pass
11	2462	14000	>500	Pass

Figure Channel 01:

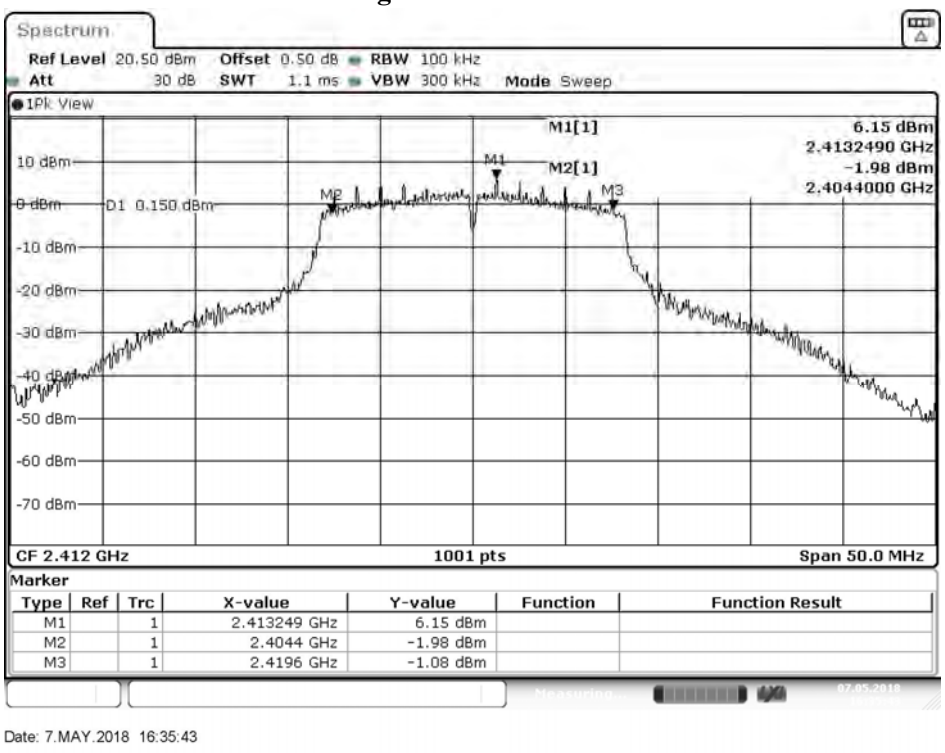
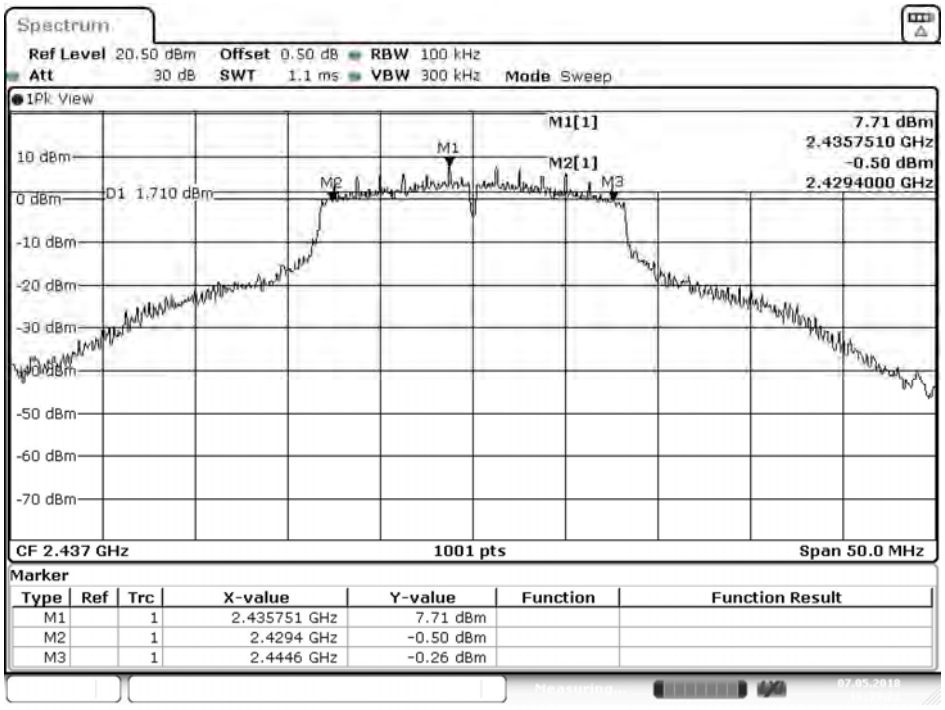
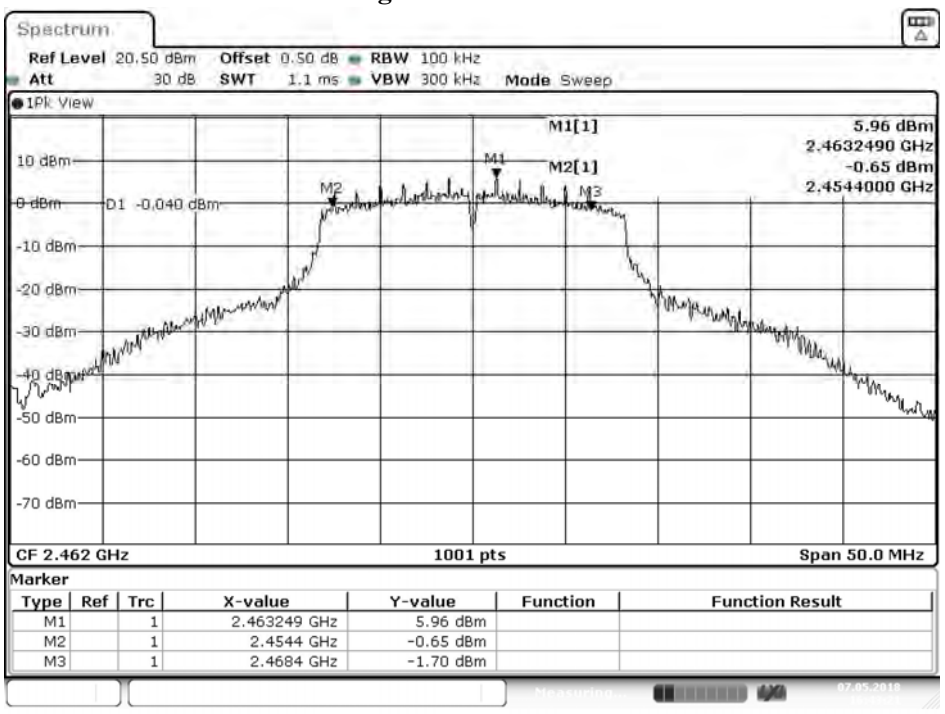


Figure Channel 06:



Date: 7.MAY.2018 16:39:22

Figure Channel 11:



Date: 7.MAY.2018 16:43:22

Product : 4G/LTE Broadband Router with PoE
Test Item : 6dB Bandwidth Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)

Chain A

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2412	15200	>500	Pass
06	2437	15200	>500	Pass
11	2462	15200	>500	Pass

Figure Channel 01: (Chain A)

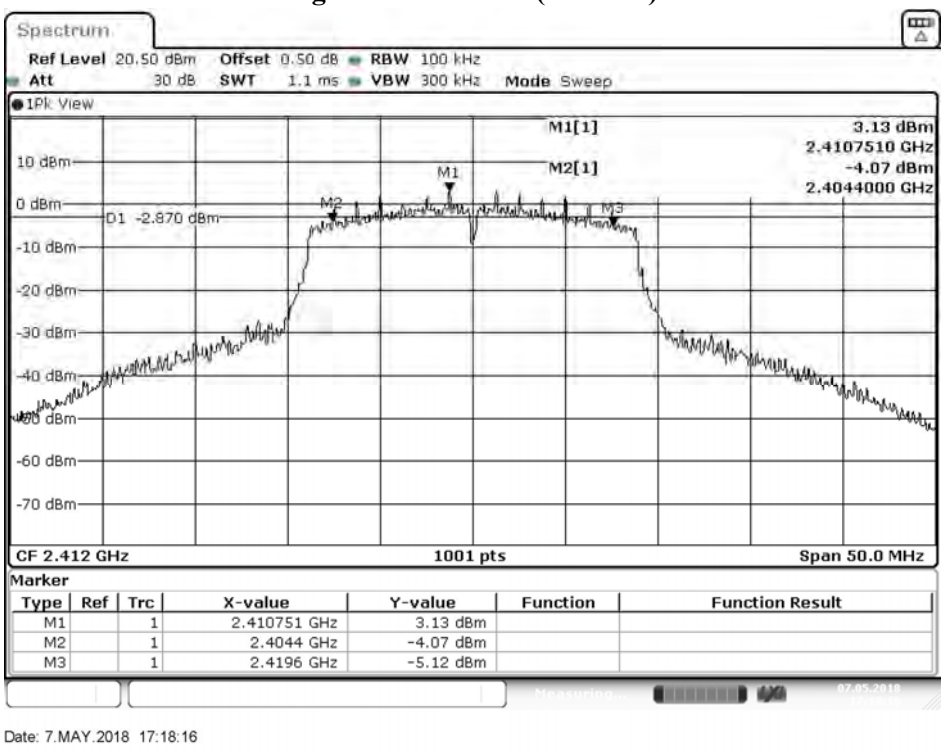
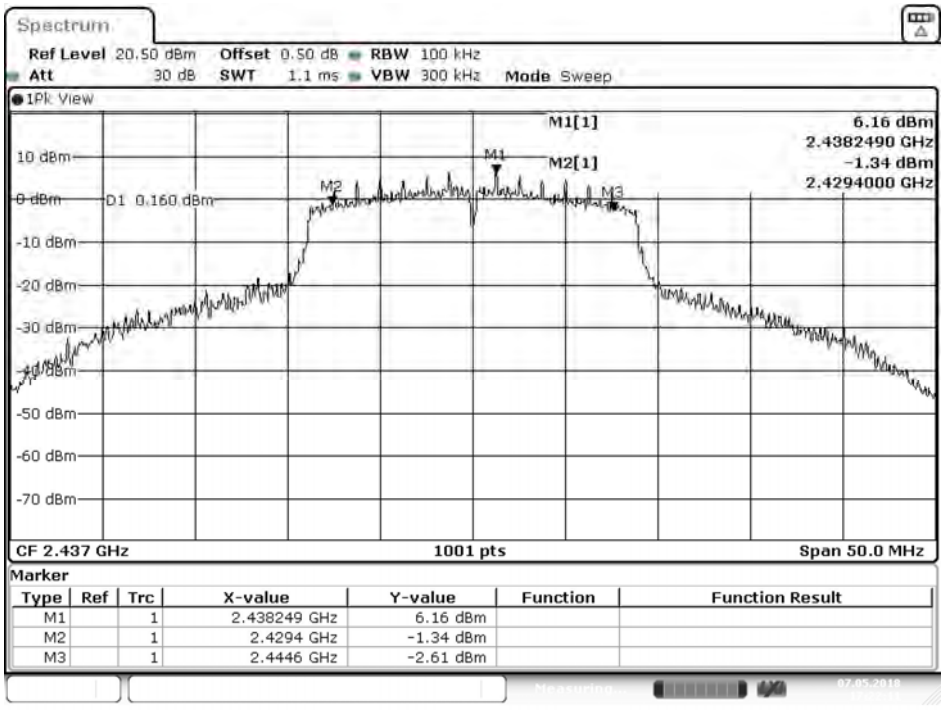
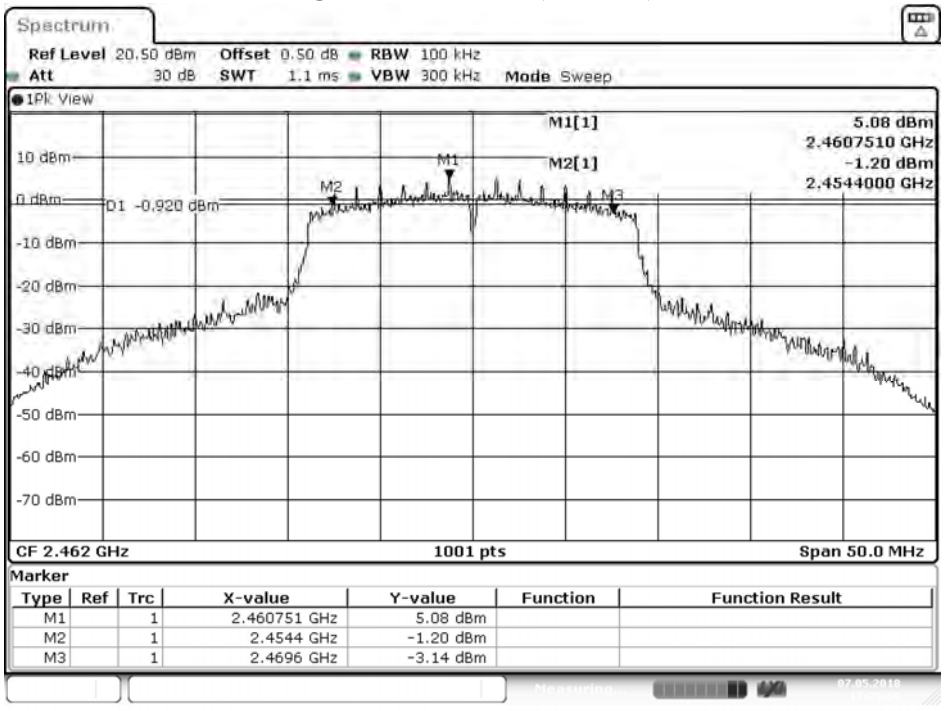


Figure Channel 06: (Chain A)



Date: 7.MAY.2018 17:22:11

Figure Channel 11: (Chain A)



Date: 7.MAY.2018 17:25:50

Product : 4G/LTE Broadband Router with PoE
Test Item : 6dB Bandwidth Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)

Chain B

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2412	15200	>500	Pass
06	2437	15200	>500	Pass
11	2462	15450	>500	Pass

Figure Channel 01: (Chain B)

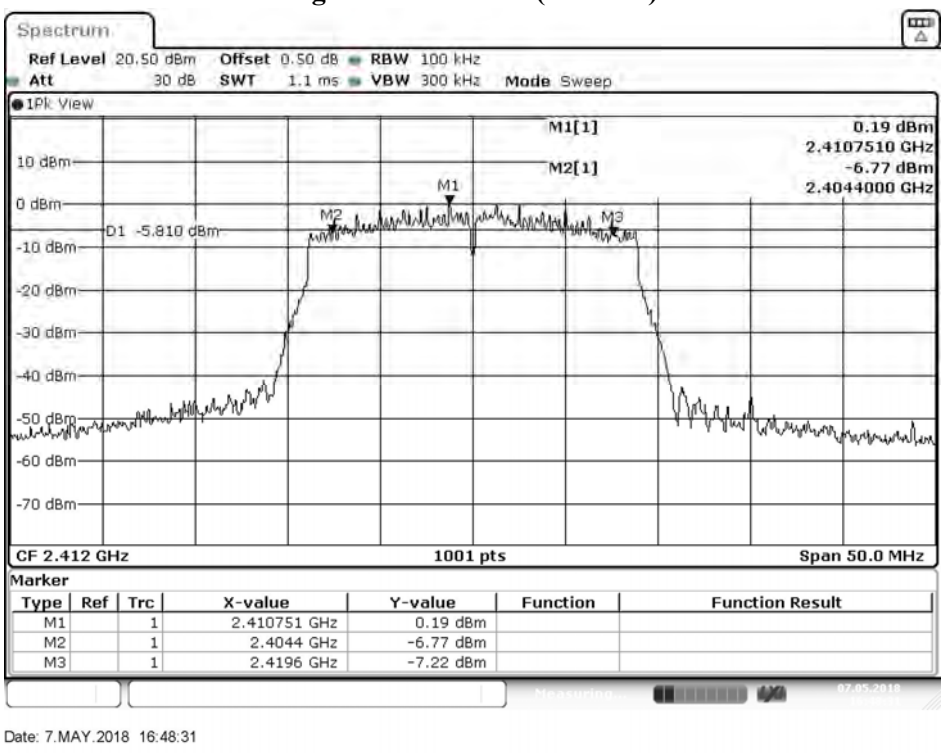
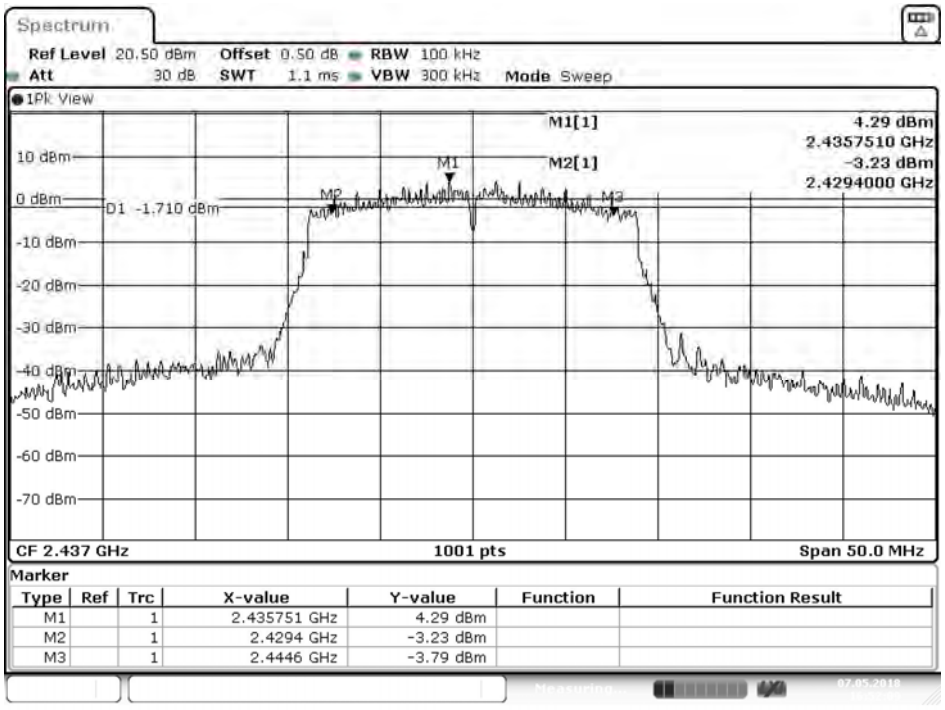
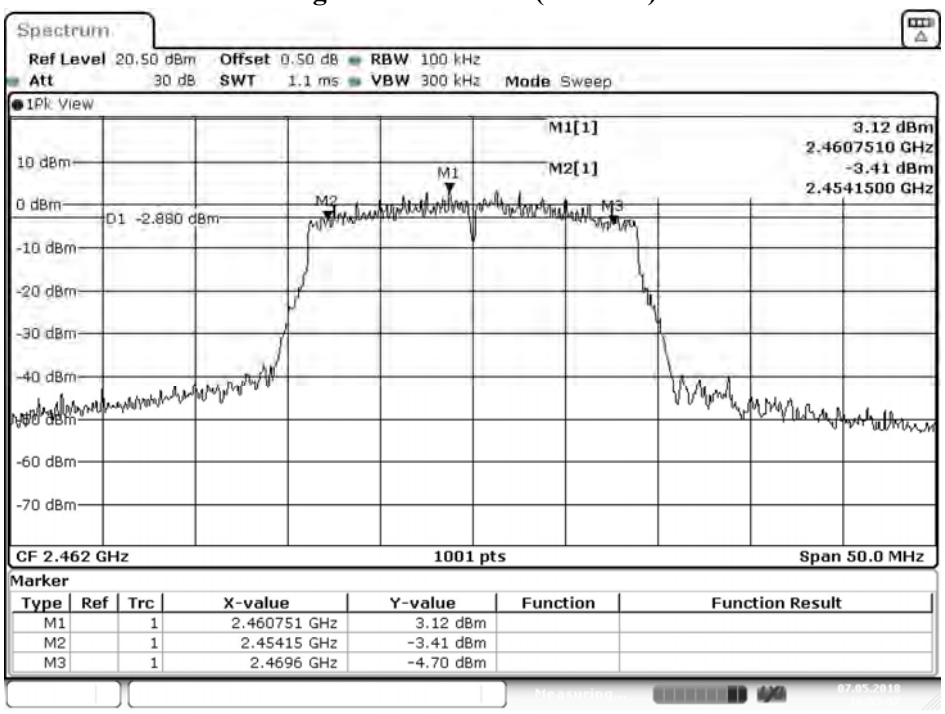


Figure Channel 06: (Chain B)



Date: 7.MAY.2018 16:52:10

Figure Channel 11: (Chain B)



Date: 7.MAY.2018 16:55:57

Product : 4G/LTE Broadband Router with PoE
Test Item : 6dB Bandwidth Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)

Chain A

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
03	2422	35200	>500	Pass
06	2437	35300	>500	Pass
09	2452	35200	>500	Pass

Figure Channel 03: (Chain A)

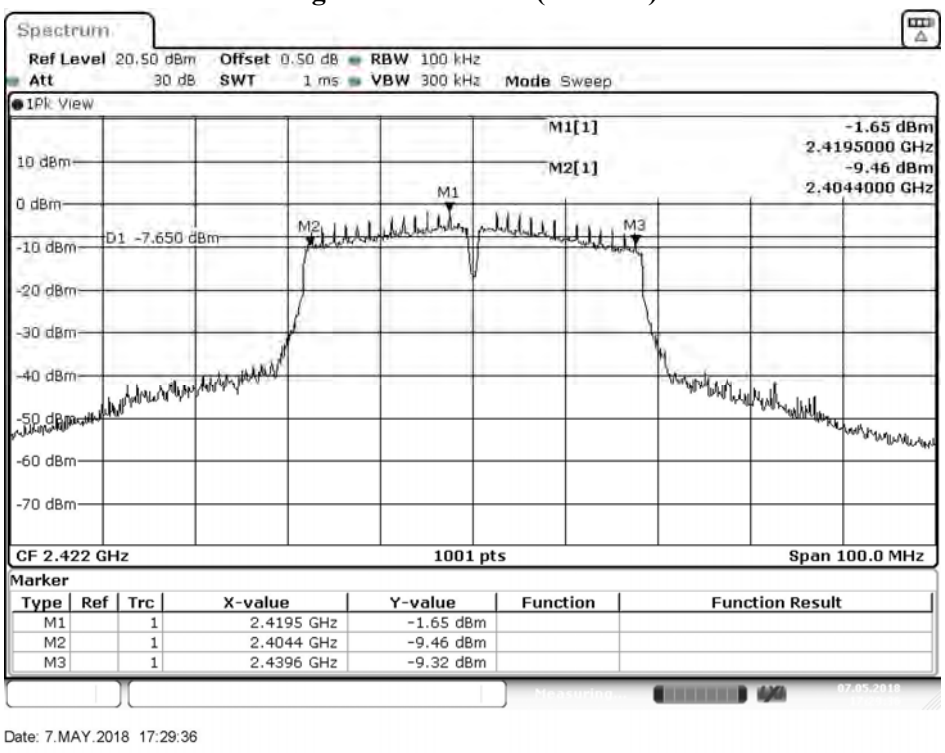
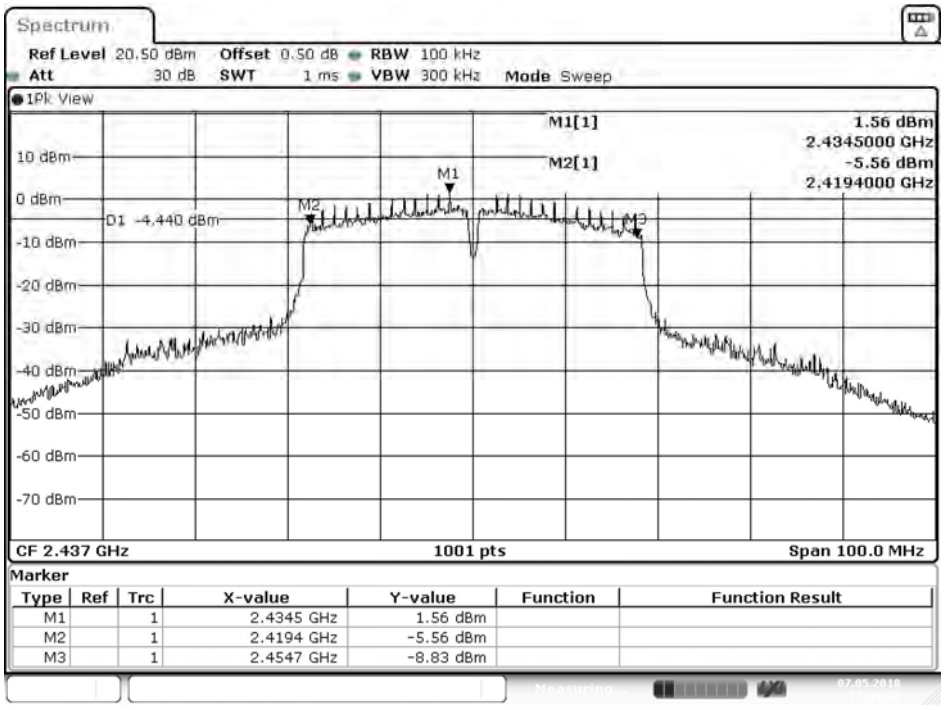
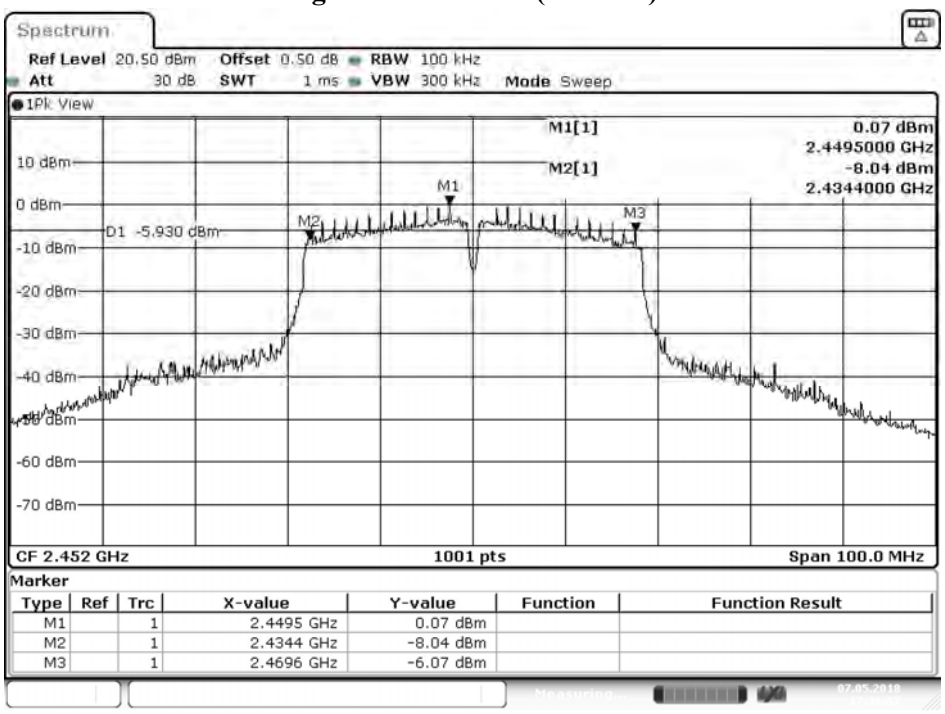


Figure Channel 06: (Chain A)



Date: 7.MAY.2018 17:33:20

Figure Channel 09: (Chain A)



Date: 7.MAY.2018 17:36:57

Product : 4G/LTE Broadband Router with PoE
Test Item : 6dB Bandwidth Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)

Chain B

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
03	2422	35200	>500	Pass
06	2437	35300	>500	Pass
09	2452	35200	>500	Pass

Figure Channel 03: (Chain B)

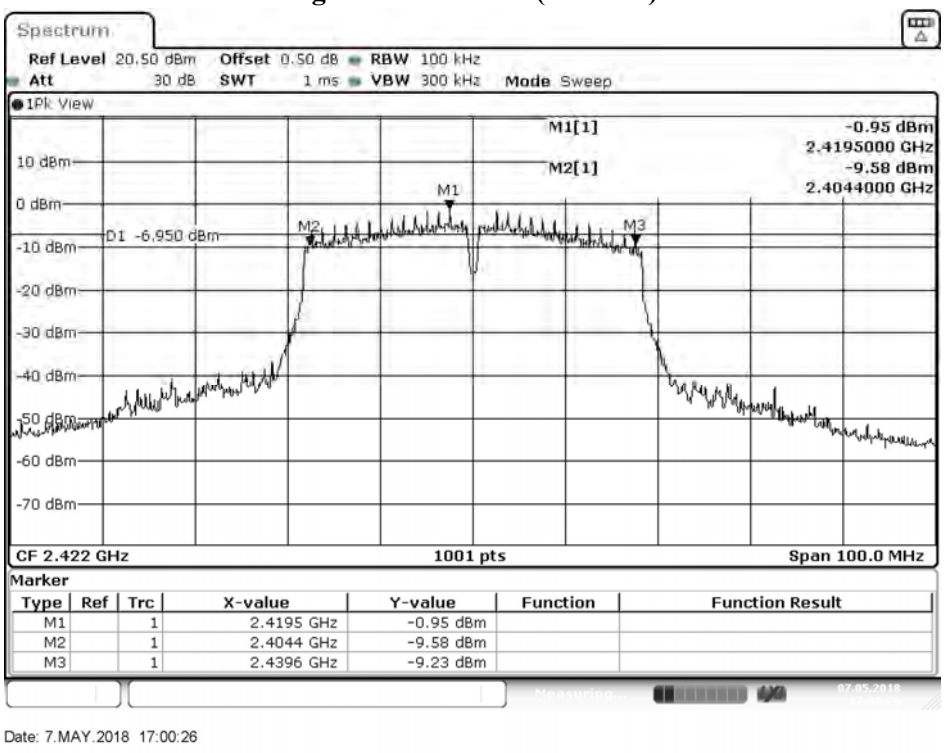
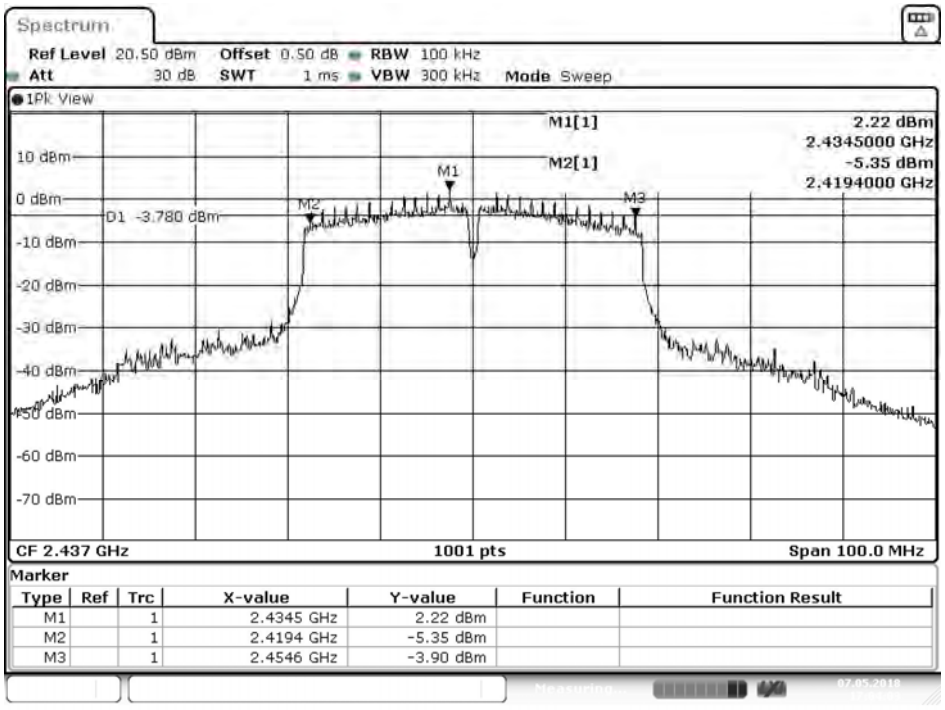
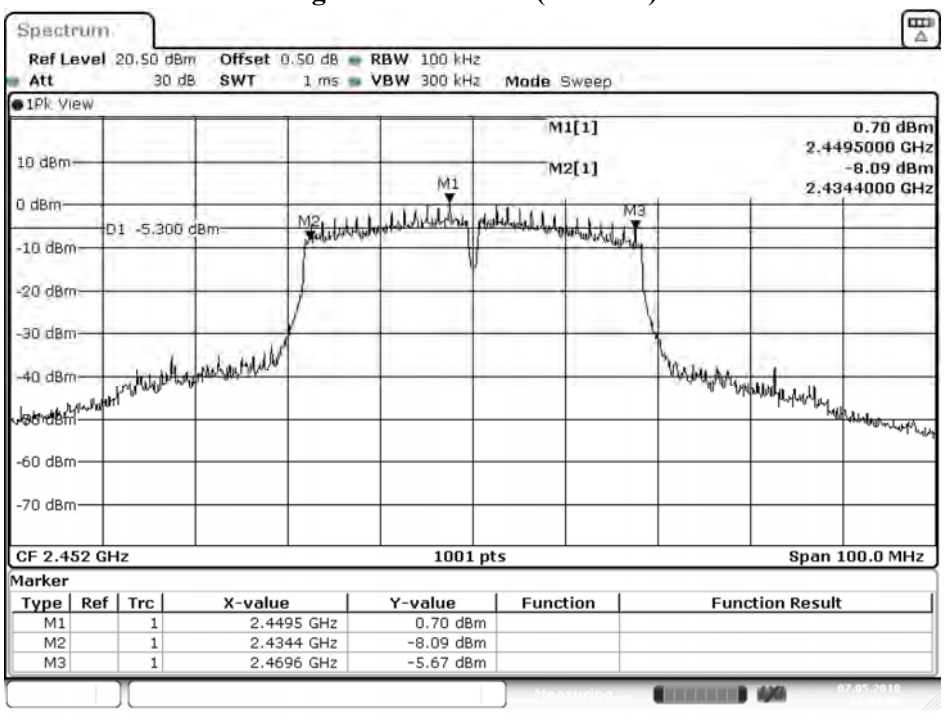


Figure Channel 06: (Chain B)



Date: 7.MAY.2018 17:04:04

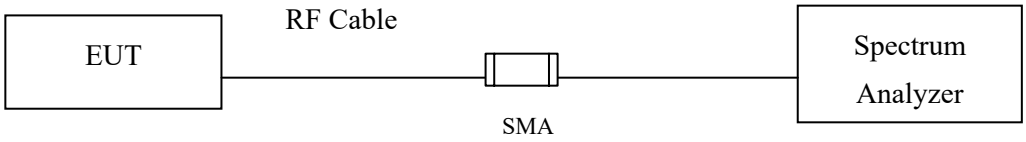
Figure Channel 09: (Chain B)



Date: 7.MAY.2018 17:09:09

8. Power Density

8.1. Test Setup



8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

8.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013; tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.
The maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

8.4. Uncertainty

± 1.23 dB

8.5. Test Result of Power Density

Product : 4G/LTE Broadband Router with PoE
Test Item : Power Density Data
Test Mode : Mode 1: Transmit (802.11b 1Mbps)

Channel No.	Frequency (MHz)	PPSD/MHz (dBm)	Limit (dBm)	Result
01	2412.000	5.160	≦8dBm	Pass
06	2437.000	5.230	≦8dBm	Pass
11	2462.000	7.270	≦8dBm	Pass

Figure Channel 1:

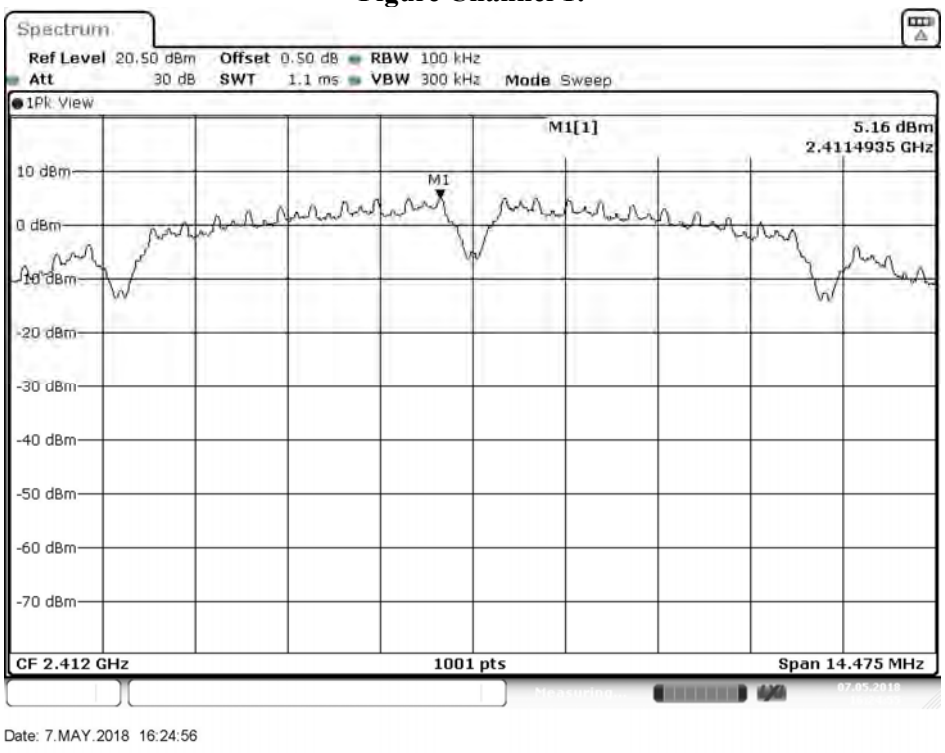
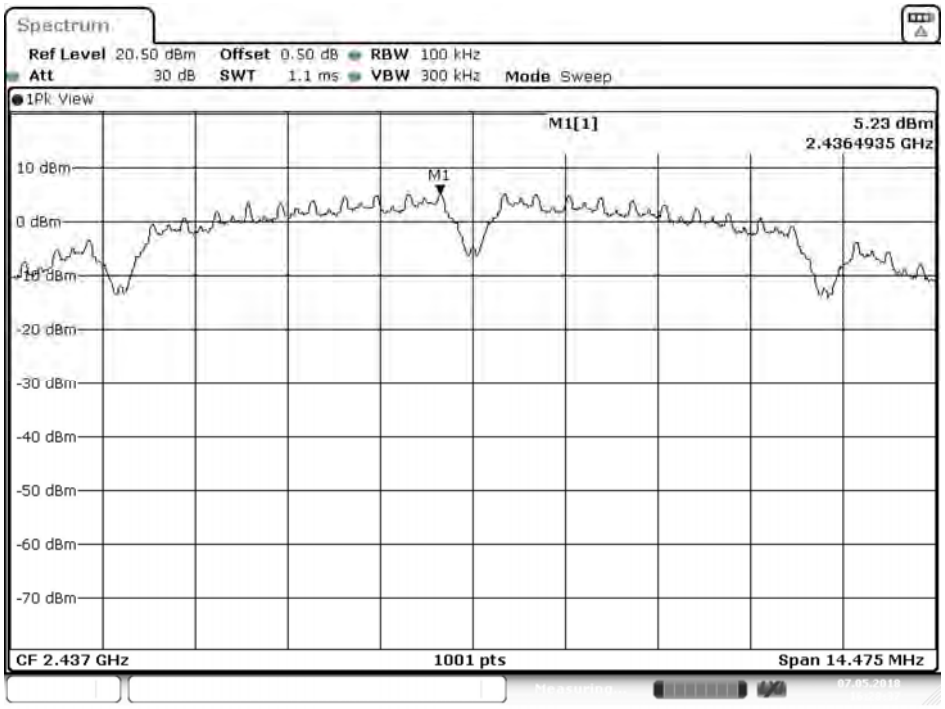
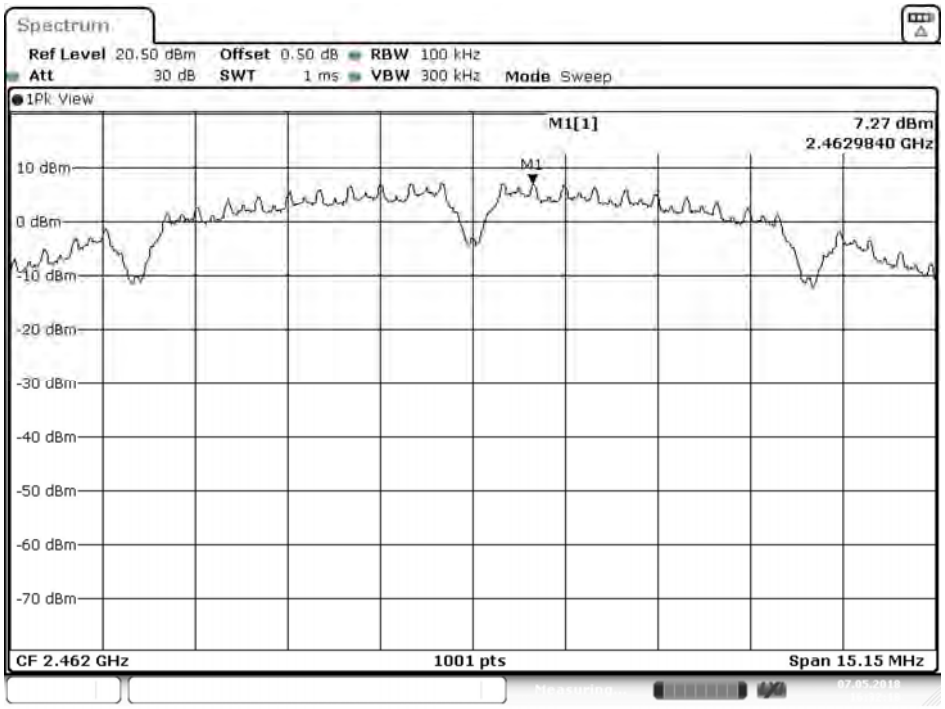


Figure Channel 6:



Date: 7.MAY.2018 16:28:37

Figure Channel 11:



Date: 7.MAY.2018 16:32:18

Product : 4G/LTE Broadband Router with PoE
Test Item : Power Density Data
Test Mode : Mode 2: Transmit (802.11g 6Mbps)

Channel No.	Frequency (MHz)	PPSD/MHz (dBm)	Limit (dBm)	Result
01	2412.000	6.310	≦8dBm	Pass
06	2437.000	7.650	≦8dBm	Pass
11	2462.000	5.950	≦8dBm	Pass

Figure Channel 1:

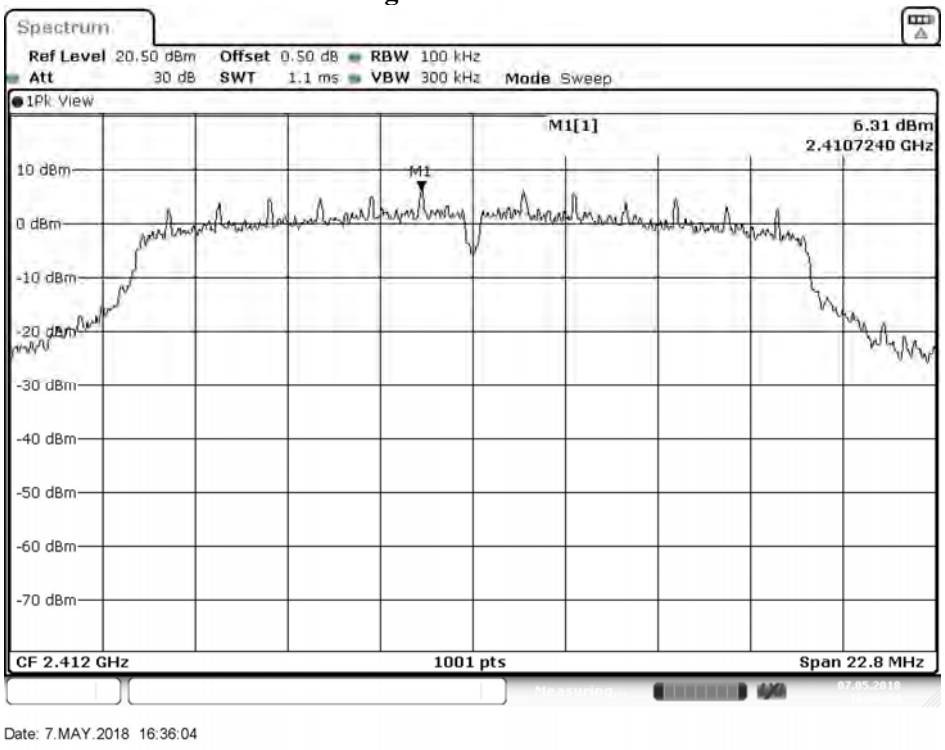


Figure Channel 6:

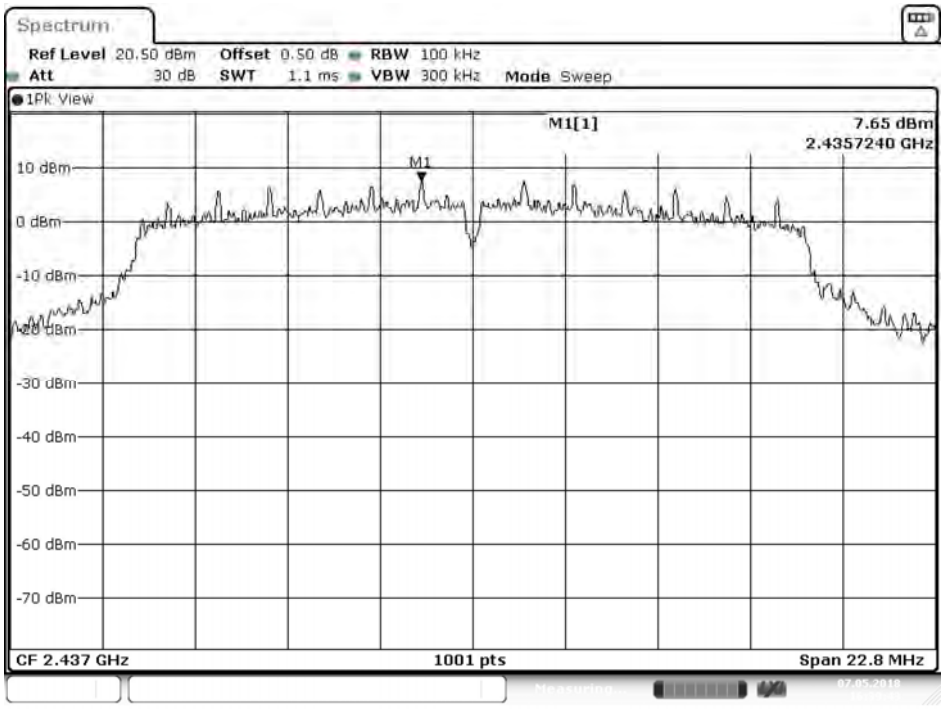
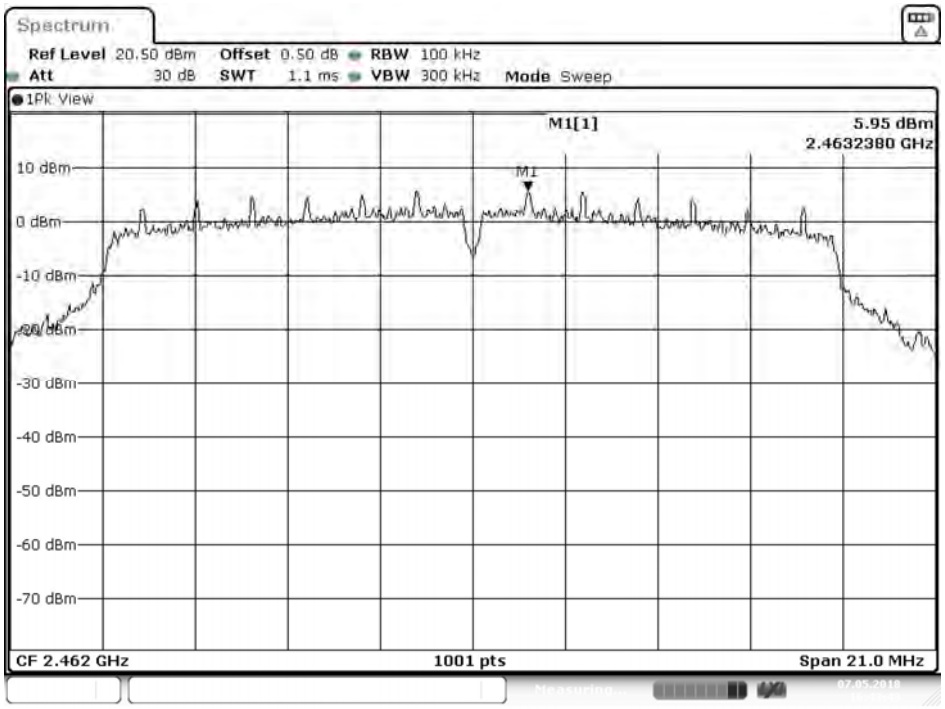


Figure Channel 11:



Product : 4G/LTE Broadband Router with PoE
Test Item : Power Density Data
Test Mode : Mode 3: Transmit (802.11n MCS8 14.4Mbps 20M-BW)

Channel No.	Frequency (MHz)	Chain	PPSD/MHz (dBm)	Total PPSD/MHz (dBm)	Limit (dBm)	Result
01	2412.000	A	3.240	6.250	≦8dBm	Pass
		B	0.190	3.200	≦8dBm	Pass
06	2437.000	A	2.480	5.490	≦8dBm	Pass
		B	1.370	4.380	≦8dBm	Pass
11	2462.000	A	1.510	4.520	≦8dBm	Pass
		B	0.360	3.370	≦8dBm	Pass

Note : The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Figure Channel 1: (Chain A)

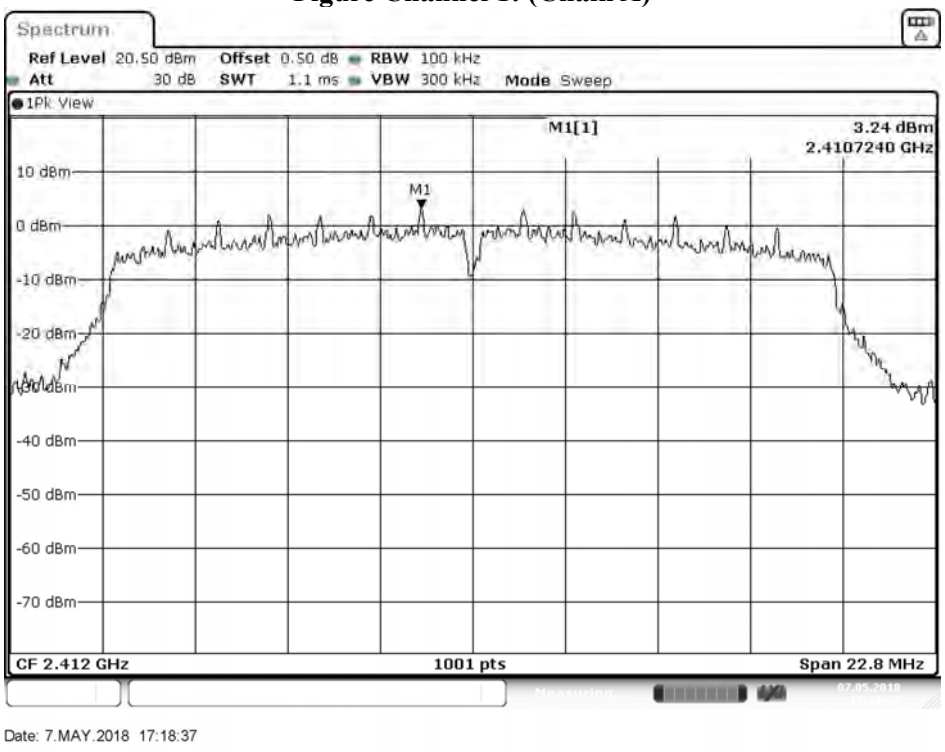
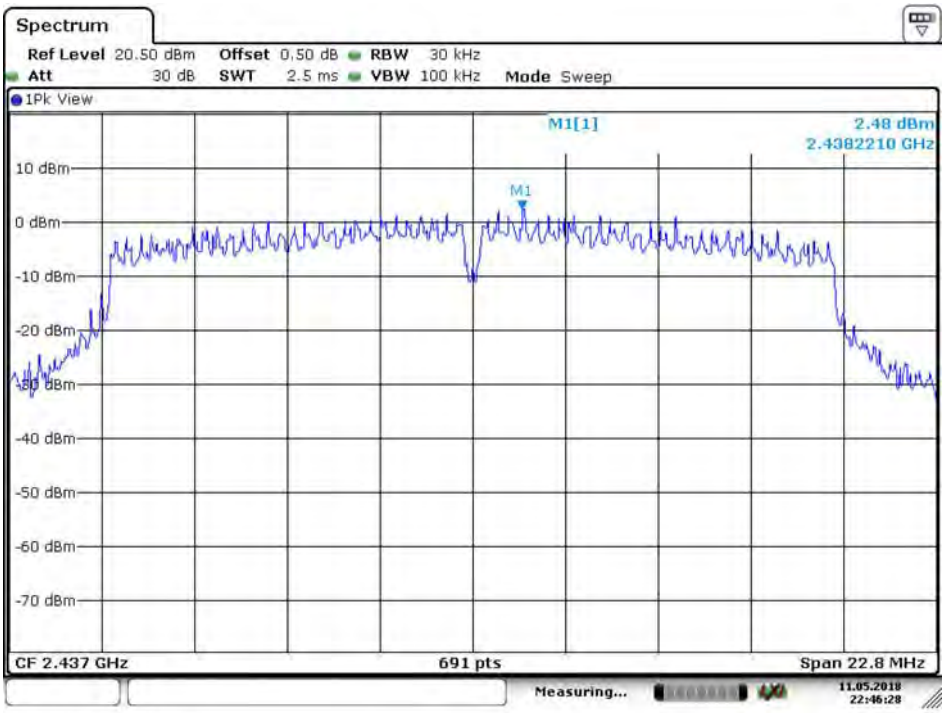
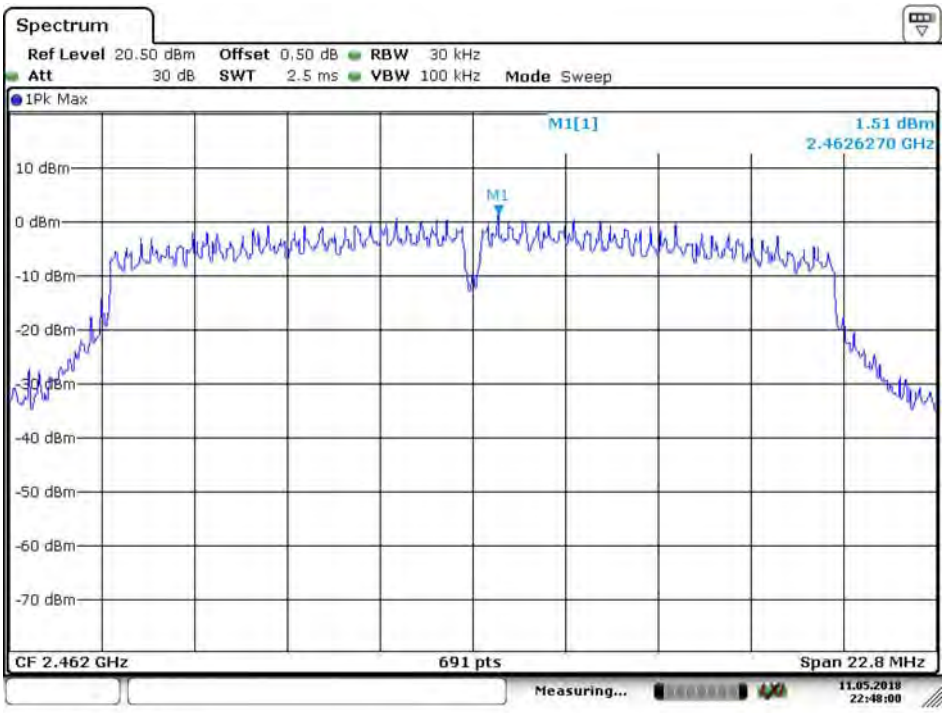


Figure Channel 6: (Chain A)



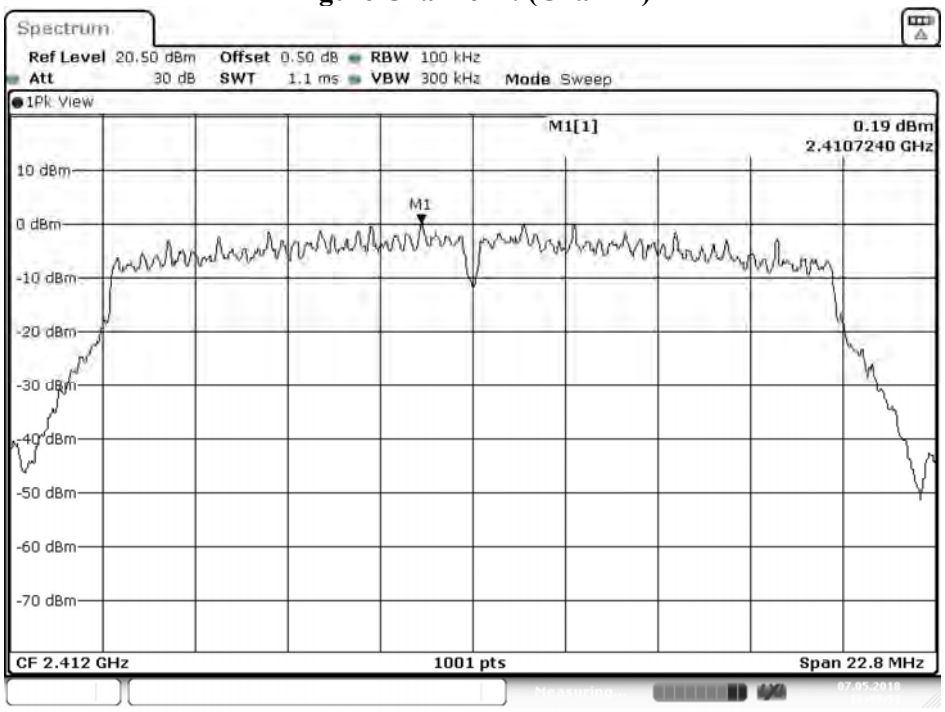
Date: 11.MAY.2018 22:46:28

Figure Channel 11: (Chain A)



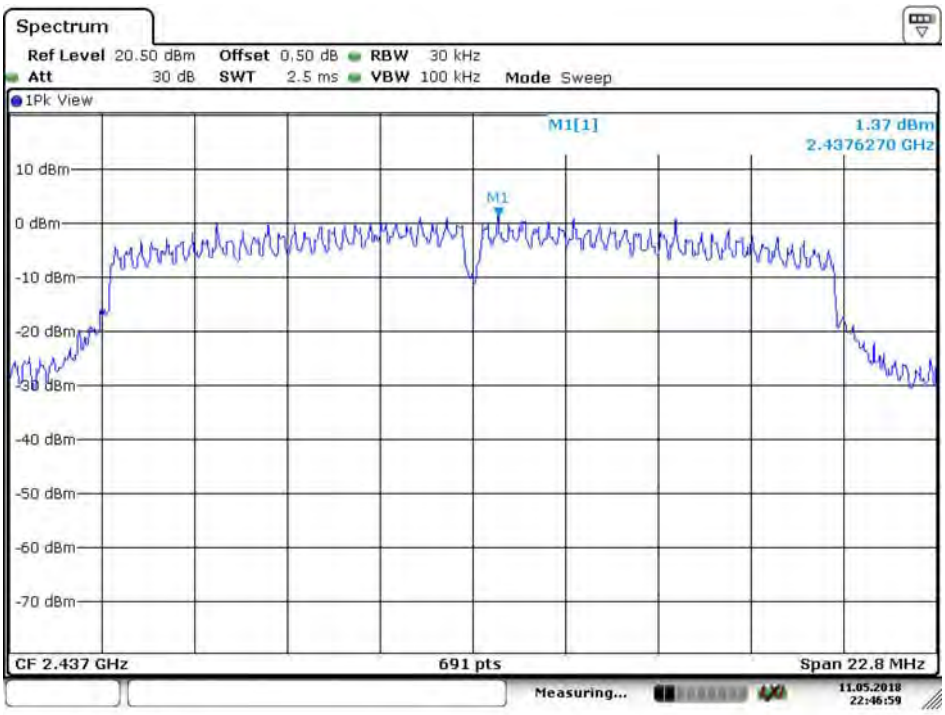
Date: 11.MAY.2018 22:48:01

Figure Channel 1: (Chain B)



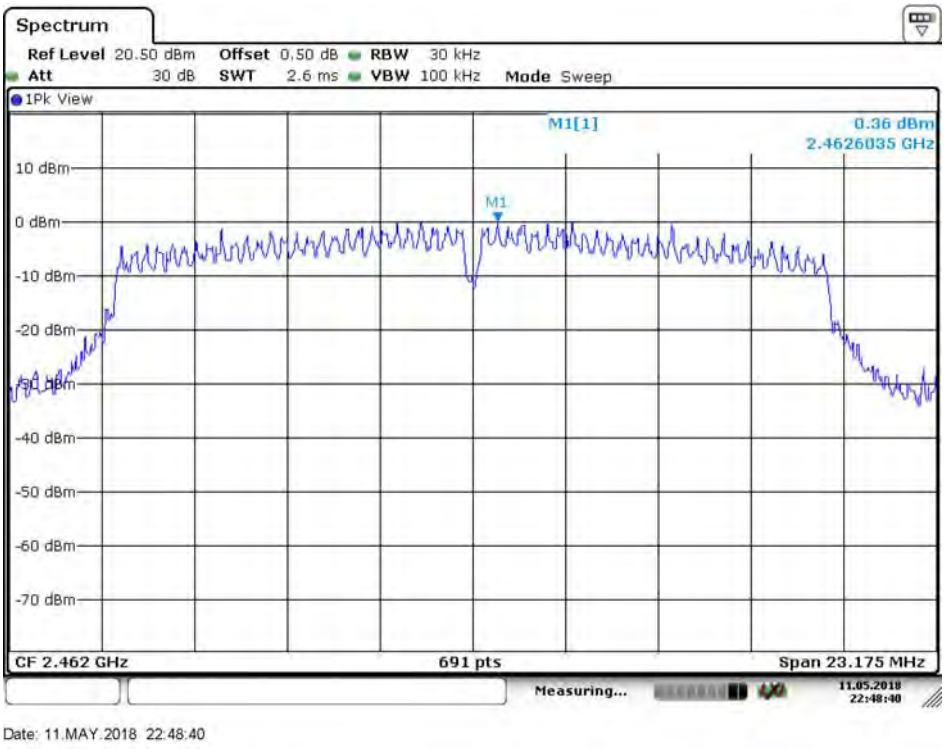
Date: 7.MAY.2018 16:48:53

Figure Channel 6: (Chain B)



Date: 11.MAY.2018 22:46:59

Figure Channel 11: (Chain B)



Product : 4G/LTE Broadband Router with PoE
Test Item : Power Density Data
Test Mode : Mode 4: Transmit (802.11n MCS8 30Mbps 40M-BW)

Channel No.	Frequency (MHz)	Chain	PPSD/MHz (dBm)	Total PPSD/MHz (dBm)	Limit (dBm)	Result
03	2422.000	A	-1.480	1.530	≦8dBm	Pass
		B	-1.100	1.910	≦8dBm	Pass
06	2437.000	A	1.440	4.450	≦8dBm	Pass
		B	2.020	5.030	≦8dBm	Pass
09	2452.000	A	-0.140	2.870	≦8dBm	Pass
		B	0.480	3.490	≦8dBm	Pass

Note : The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Figure Channel 3: (Chain A)

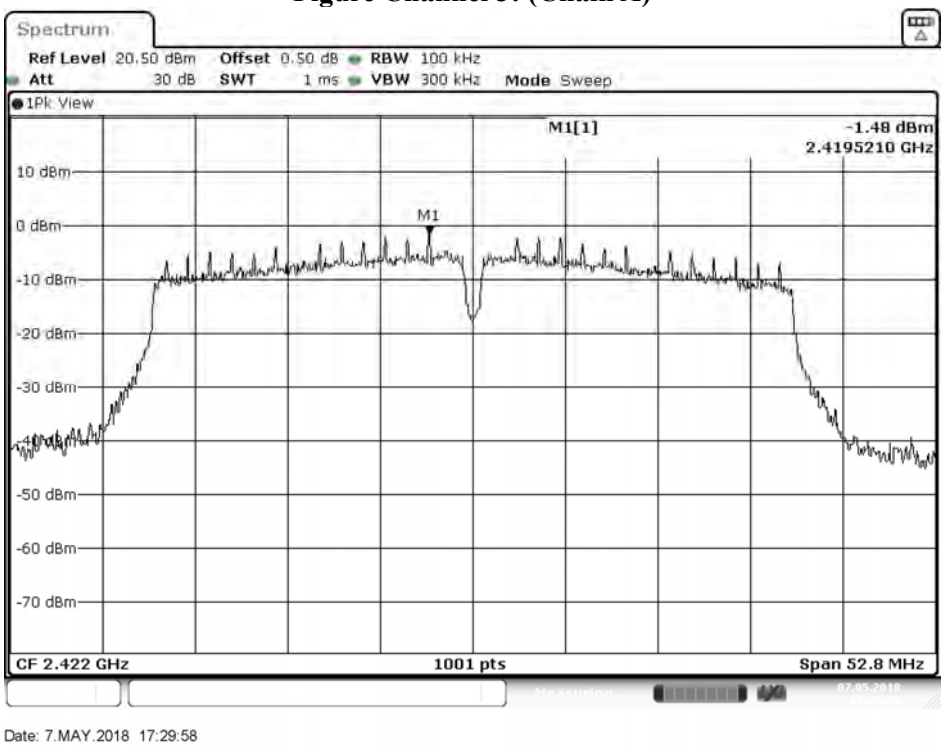


Figure Channel 6: (Chain A)

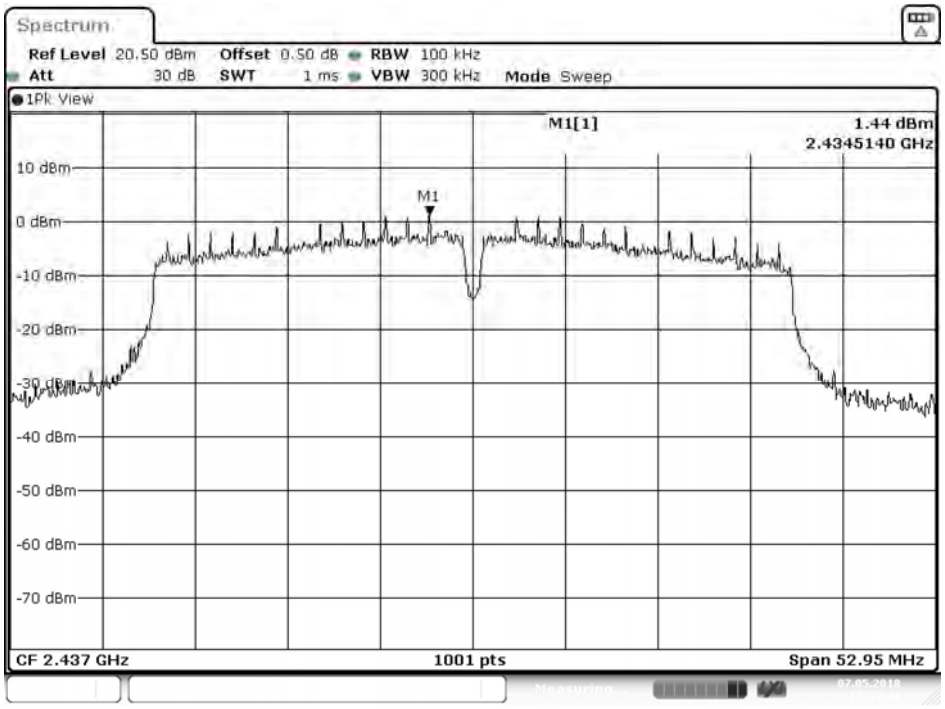


Figure Channel 9: (Chain A)

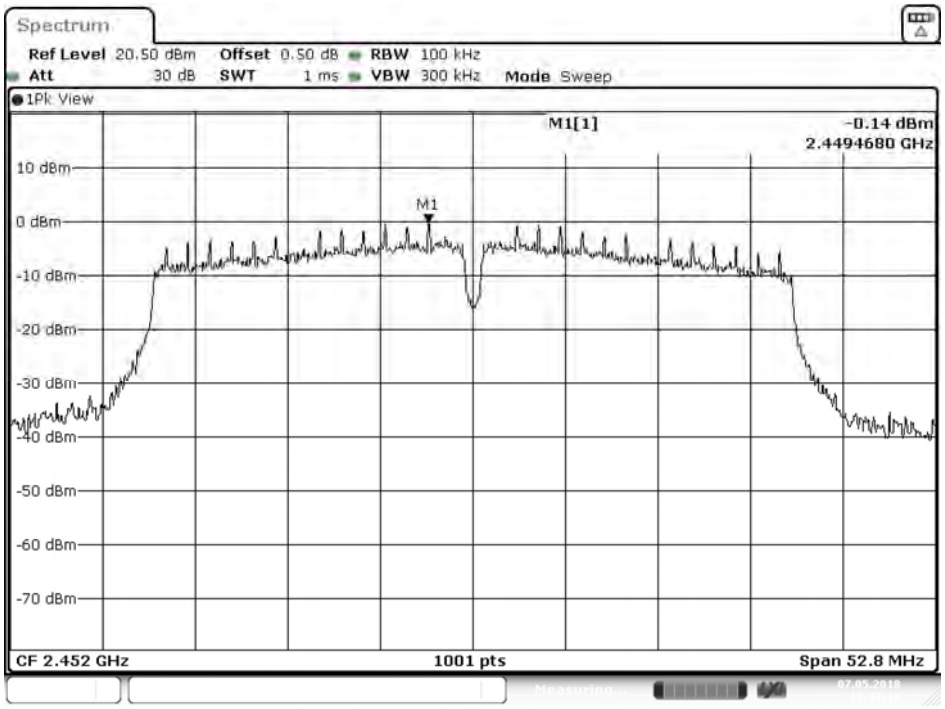


Figure Channel 3: (Chain B)

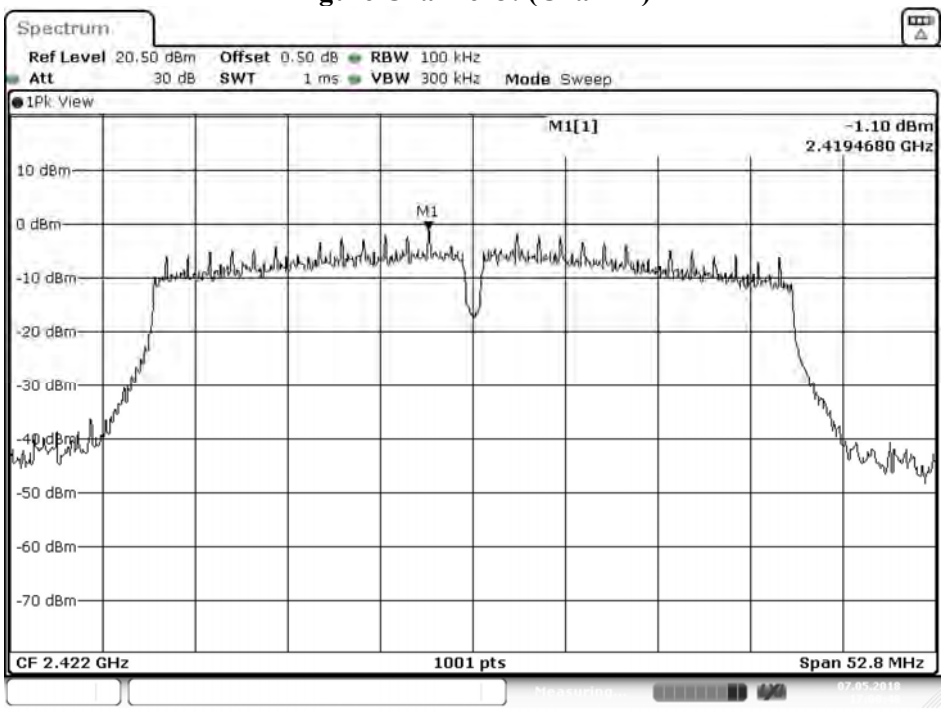


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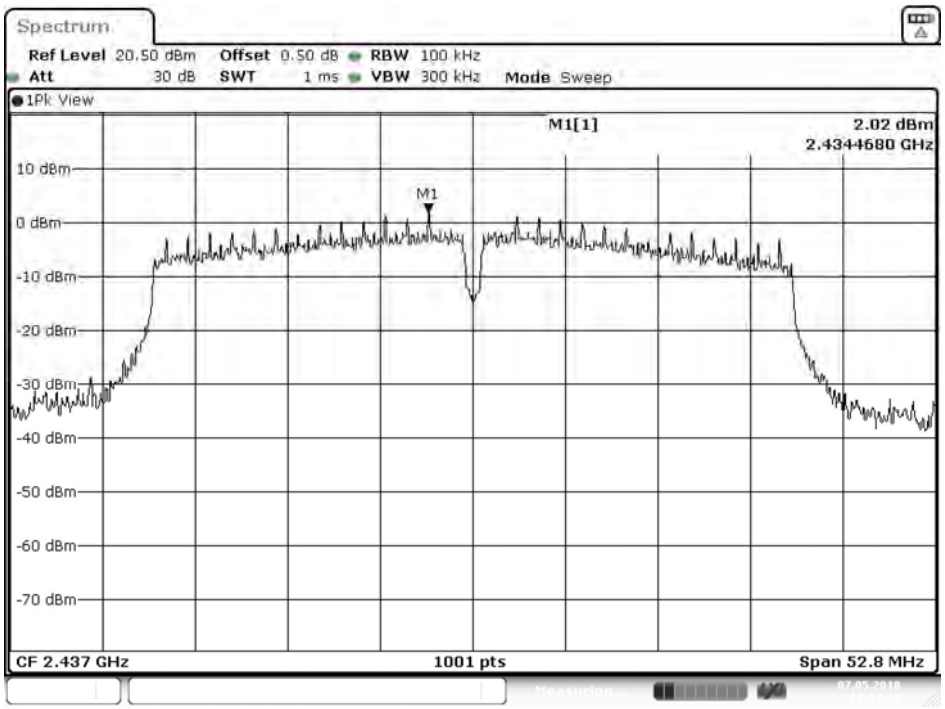
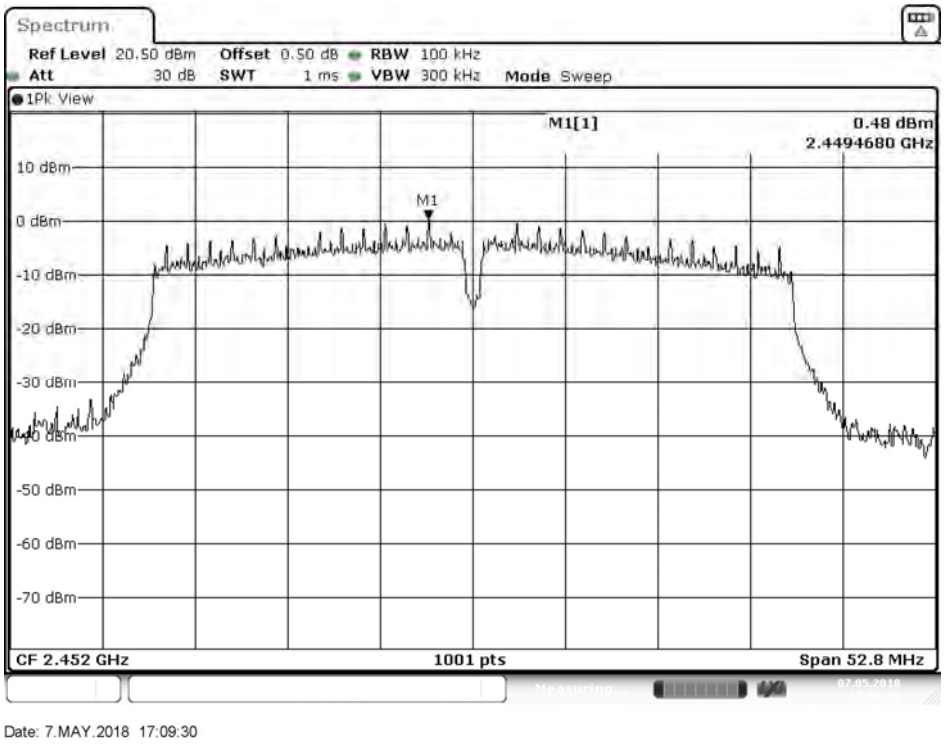
Figure Channel 6: (Chain B)



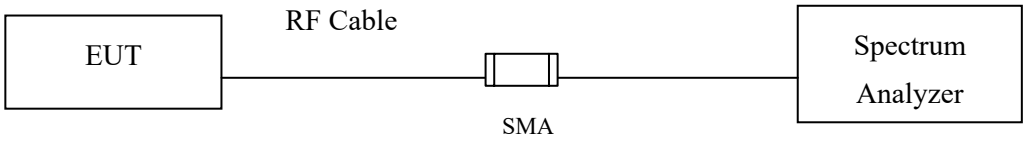
Date: 7.MAY.2018 17:04:26

Figure Channel 9: (Chain B)



9. Duty Cycle

9.1. Test Setup



9.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

9.3. Uncertainty

± 2.31msec

9.4. Test Result of Duty Cycle

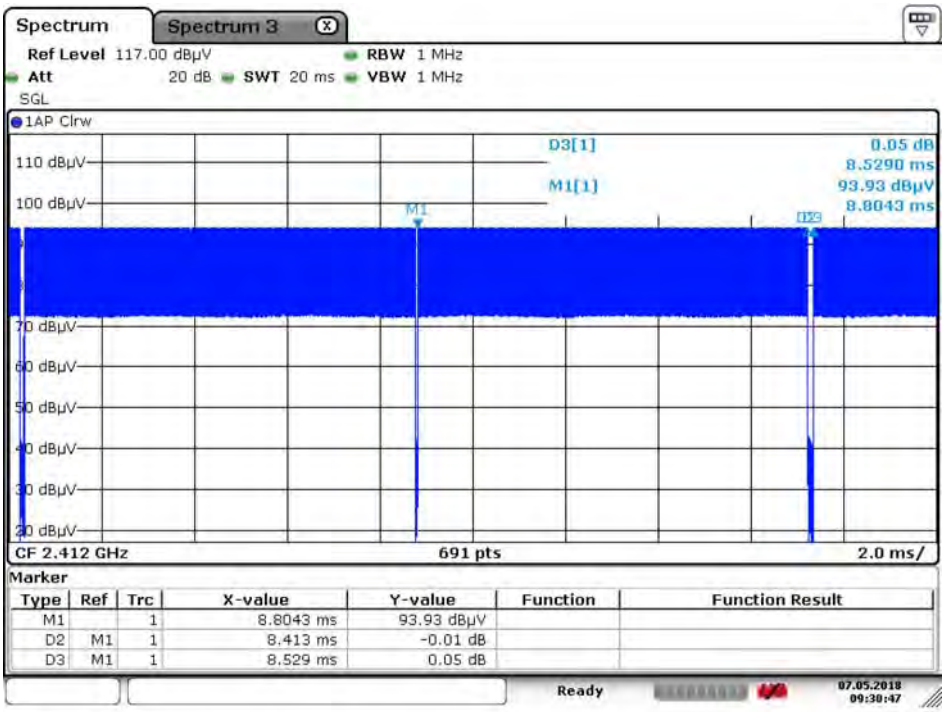
Product : 4G/LTE Broadband Router with PoE
Test Item : Duty Cycle
Test Mode : Transmit

Duty Cycle Formula:
Duty Cycle = Ton / (Ton + Toff)
Duty Factor = 10 Log (1/Duty Cycle)

Results:

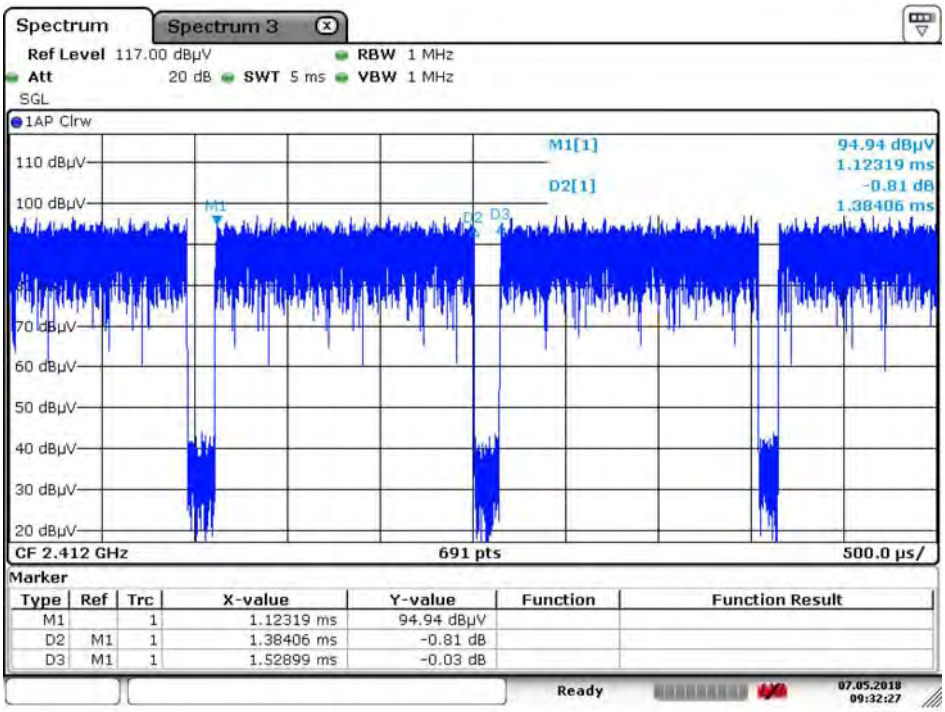
2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b	8.4130	8.5290	98.64	0.06
802.11g	1.3840	1.5289	90.52	0.43
802.11n20	0.6681	0.7840	85.22	0.69
802.11n40	0.3463	0.5058	68.47	1.65

802.11b



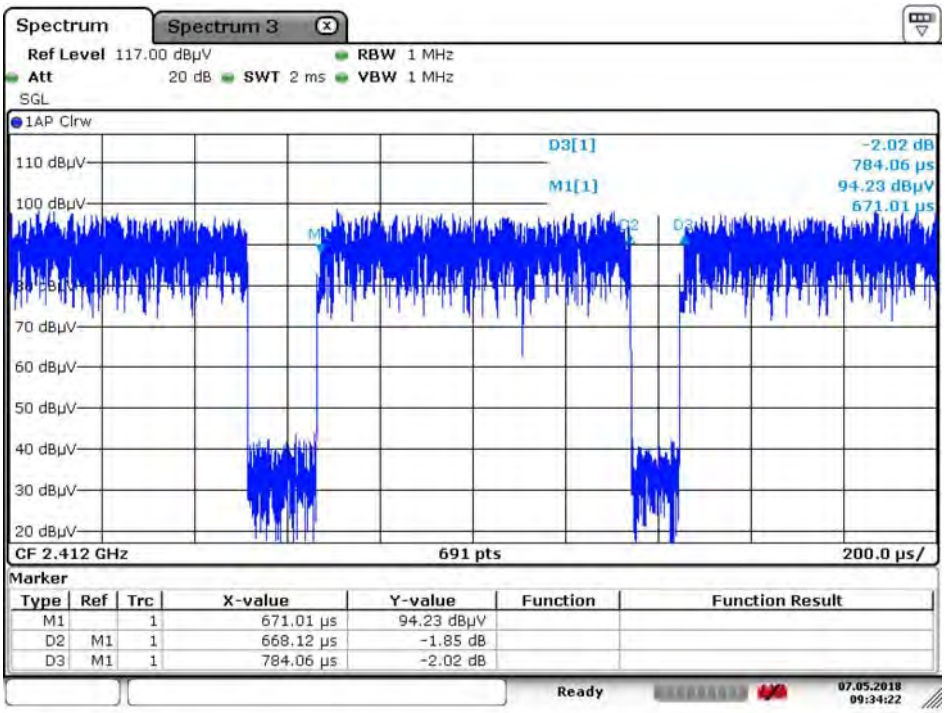
Date: 7.MAY.2018 09:30:48

802.11g



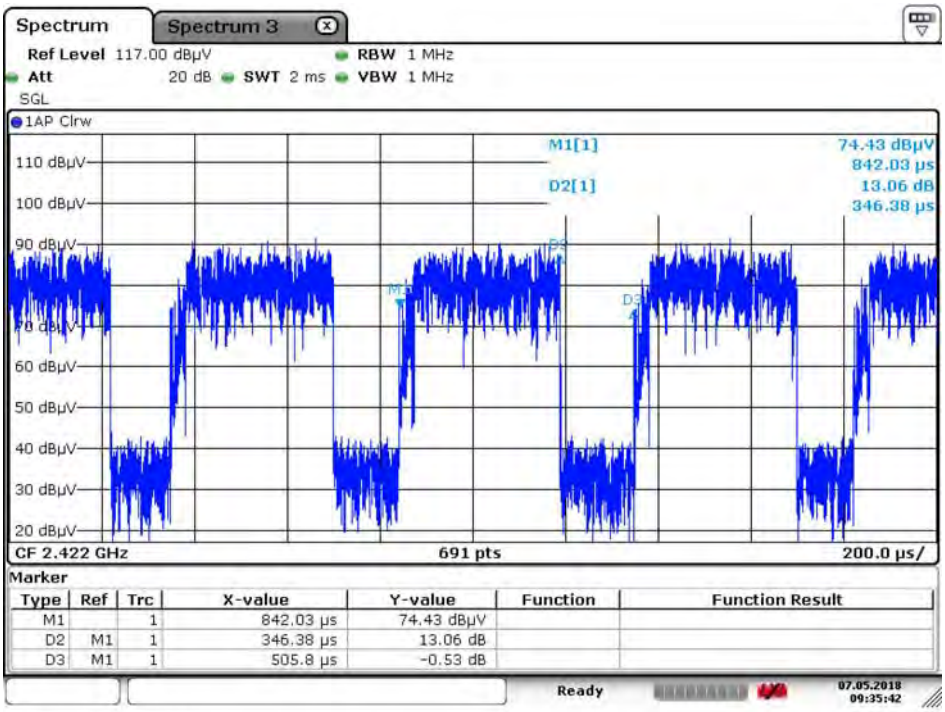
Date: 7.MAY.2018 09:32:28

802.11n20



Date: 7.MAY.2018 09:34:22

802.11n40



Date: 7.MAY.2018 09:35:43

10. EMI Reduction Method During Compliance Testing

No modification was made during testing.