



RF TEST REPORT

Report No.: SET2016-03875

Product Name: Mini Computer (Mobile Computer)

FCC ID: V2X-PM200

Model No. : PM200

Applicant: POINTMOBILE CO.,LTD.

Address: B-9F Kabul Great Valley 32, Digital-ro9-gil, Geumcheon-gu, Seoul, Korea

Dates of Testing: 03/07/2016 — 03/22/2016

Issued by: CCIC-SET

Lab Location: Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China

Tel: 86 755 26627338 **Fax:** 86 755 26627238

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Test Report

Product Name : Mini Computer (Mobile Computer)

Brand Name : POINTMOBILE

Trade Name : POINTMOBILE

Applicant : POINTMOBILE CO.,LTD.

Applicant Address : B-9F Kabul Great Valley 32, Digital-ro9-gil, Geumcheon-gu,
Seoul, Korea

Manufacturer : POINTMOBILE CO.,LTD.

Manufacturer Address : B-9F Kabul Great Valley 32, Digital-ro9-gil, Geumcheon-gu,
Seoul, Korea

Test Standards : 47 CFR Part 15 Subpart C: Radio Frequency Devices
ANSI C63.10-2013: American National Standard for Testing
Unlicensed Wireless Devices
RSS-247 Issue 1, May 2015 Digital Transmission Systems
(DTSS), Frequency Hopping Systems (FHSS) and
Licence-Exempt Local Area Network (LE-LAN) Devices
KDB 558074D01 v03r03

Test Result : PASS

Tested by : 
2016.03.22
Lu Lei, Test Engineer

Reviewed by : 
2016.03.22
Zhu Qi, Senior EGINEER

Approved by : 
2016.03.22
Wu Li'an, Manager

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Change History		
Issue	Date	Reason for change
1.0	2016.03.22	First edition

1. General Information

1.1. EUT Description

EUT Type	Mini Computer (Mobile Computer)
Hardware Version	1
Software Version	20.00
Power Supply	3.8V DC
EUT supports Radios application	WLAN2.4GHz 802.11b/g/n (HT20)
Frequency Range	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz
Channel Number	802.11b/g/n-20MHz: 11
Bit Rate of Transmitter	802.11b: 11/5.5/2/1 Mbps 802.11g: 54/48/36/24/18/12/9/6 Mbps 802.11n : up to 65 Mbps
Modulation Type	DSSS (802.11b), OFDM (802.11g/n)
Antenna Type	Internal Antenna
Antenna Gain	2.2dBi

Note 1: The EUT is a Mini Computer, it contain WIFI operating at 2.4GHz ISM band; it supports 802.11b, 802.11g, 802.11n and they are all tested in this report.

Note 2: The frequencies allocated is $F \text{ (MHz)} = 2412 + 5 \times (n-1)$ ($1 \leq n \leq 11$). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1ch (2412MHz), 6ch(2437MHz), 11ch(2462MHz) for 802.11b/g/n-20MHz.

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 4: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC/IC Certification:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C 2013	Radio Frequency Devices
2	ANSI C63.10 2013	American National Standard for Testing Unlicensed Wireless Devices
3	RSS-GEN: Issue 4, November 2014:	General Requirements and Information for the Certification of Radio Apparatus
4	RSS-247: Issue 1, December 2015:	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Standard(s) Section		Description	Result
	FCC	IC		
1	15.203	8.3	Antenna Requirement	PASS
2	15.247(b)(3)	RSS-247 Issue1 - 5.4(4)	Peak Output Power	PASS
3	15.247(a)(2)	RSS-247 Issue1 - 5.2(1)	Bandwidth – 6dB bandwidth	PASS
4	/	RSS Gen clause - 4.6.1	99% Occupied Bandwidth	PASS
5	15.247(d)	RSS-247 Issue1 - 5.5	Conducted Spurious Emission	PASS
6	15.247(e)	RSS-247 Issue1 - 5.2(2)	Power spectral density (PSD)	PASS
7	15.205 15.247(d)	RSS-247 Issue1 - 5.5 RSS - Gen	Band Edge	PASS
8	15.209(a)	RSS-GEN	Spurious emissions radiated below 30MHz	PASS
9	15.247(d) 15.109	RSS-247 Issue1 - 5.5 RSS-Gen	Spurious emissions radiated 30 MHz to 1GHz and above 1GHz	PASS
10	15.107(a), 15.20(c)	RSS-GEN	Conducted Emission	PASS

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

These RF tests were performed according to the method of measurements prescribed in KDB558074 D01 V03r03.

1.3. Description of test environment test modes

For 20MHz bandwidth systems, use Channel 1~ Channel 11

Channel No.	Frequency	Channel No.	Frequency	Channel No.	Frequency
1	2412MHz	5	2432MHz	9	2452MHz
2	2417MHz	6	2437MHz	10	2457MHz
3	2422MHz	7	2442MHz	11	2462MHz
4	2427MHz	8	2447MHz		

Test Items	Mode	Data Rate	Channel
Peak Conducted Output Power Power Spectral Density 6dB Bandwidth Conducted and Spurious Emission Radiated and Spurious Emission	11b/DSSS	1 Mbps	1/6/11
	11g/OFDM	6 Mbps	1/6/11
	11n(20MHz)/OFDM	MCS 0	1/6/11
Band Edge	11b/DSSS	1 Mbps	1/11
	11g/OFDM	6 Mbps	1/11
	11n(20MHz)/OFDM	MCS 0	1/11

Operating Environment		
Temperature		24°C
Humidity		57 % RH
Atmospheric Pressure		1010 mbar
Test mode:		
Continuously transmitting mode	Keeps the EUT in 100% duty cycle transmitting; duty cycle factor is not required.	

1.4. Table for Supporting Units

No.	Equipment	Brand Name	Model Name	Manufacturer	Serial No.	Note
1	Notebook	DELL	PP11L	DELL	H5914A03	FCC DOC

1.5. Test Facilities

CNAS-Lab Code: L1659

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659. A 12.8*6.8*6.4 (m) fully anechoic chamber was used for the radiated spurious emissions test.

FCC-Registration No.: 406086

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 406086, valid time is until October 28, 2017.

IC-Registration No.: 11185A-1

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on July. 15, 2013, valid time is until July. 15, 2016.

2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

And according to FCC 47 CFR Section 15.247(c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

2.1.2. Antenna Information

Antenna Category: Internal antenna

An Internal antenna was placed on PCB, can't be removed.

Antenna General Information:

No.	EUT Model	Ant. Cat.	Gain(dBi)
1	Mini Computer (Mobile Computer)	Internal	2.2

2.1.3. Result: comply

The module contain a unique antenna connector, and be marketed and operated only with specific antenna(s).

2.2. Peak Output Power

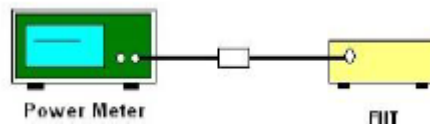
2.2.1. Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.2.3. Test Setup



2.2.4. Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r03.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

2.2.5. Test Result

Test mode	Channel	Frequency (MHz)	RF Power(dBm)	Gain(dBi) Calculated	Radiated power (dBm)	Limit (dBm)	Verdict
802.11b	1	2412	18.93	2.2	21.13	30	PASS
	6	2437	19.00		21.20		PASS
	11	2462	19.05		21.25		PASS
802.11g	1	2412	17.33		19.53		PASS
	6	2437	16.95		19.15		PASS
	11	2462	17.09		19.29		PASS
802.11n20	1	2412	16.78		18.98		PASS
	6	2437	16.98		19.18		PASS
	11	2462	17.02		19.22		PASS

Note: All data rates are testing, but the worse case data rate was record in the report.

2.3. Bandwidth

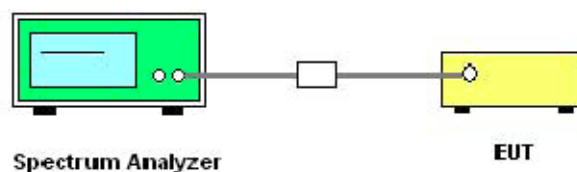
2.3.1. Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.3.3. Test Setup



2.3.4. Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r03.

2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

3. Set to the maximum power setting and enable the EUT transmit continuously.

4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz.

Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.

5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30 kHz and set the Video bandwidth (VBW) = 100 kHz.

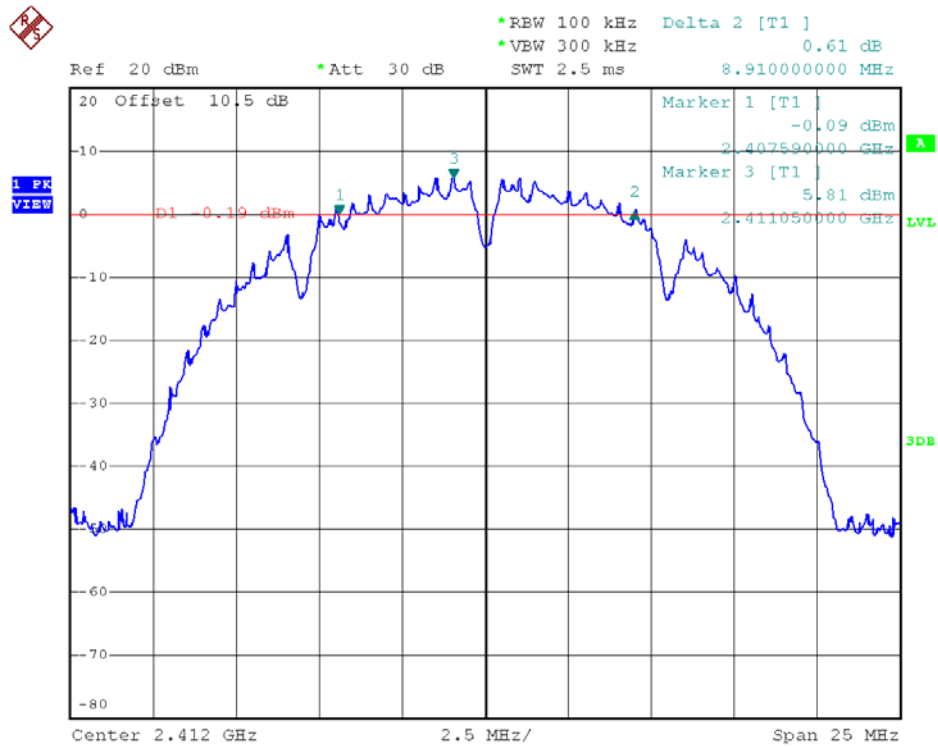
6. Measure and record the results in the test report.

2.3.5. Test Results of 6dB Bandwidth and 99% Bandwidth

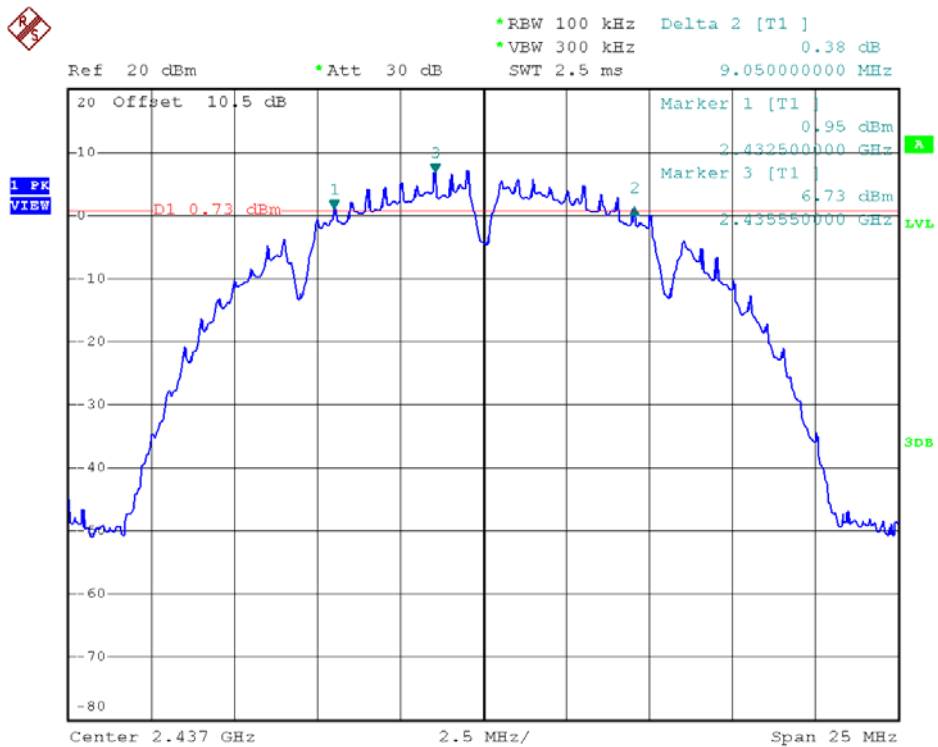
Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limits (MHz)	Result
802.11b	1	2412	8.91	13.95	≥ 0.5	PASS
	6	2437	9.05	13.95		PASS
	11	2462	9.15	14.00		PASS
802.11g	1	2412	15.50	16.40		PASS
	6	2437	15.50	16.45		PASS
	11	2462	15.50	16.45		PASS
802.11n20	1	2412	15.80	17.65		PASS
	6	2437	15.50	17.60		PASS
	11	2462	15.50	17.60		PASS

2.3.6. Test Results (plots) of 6dB Bandwidth

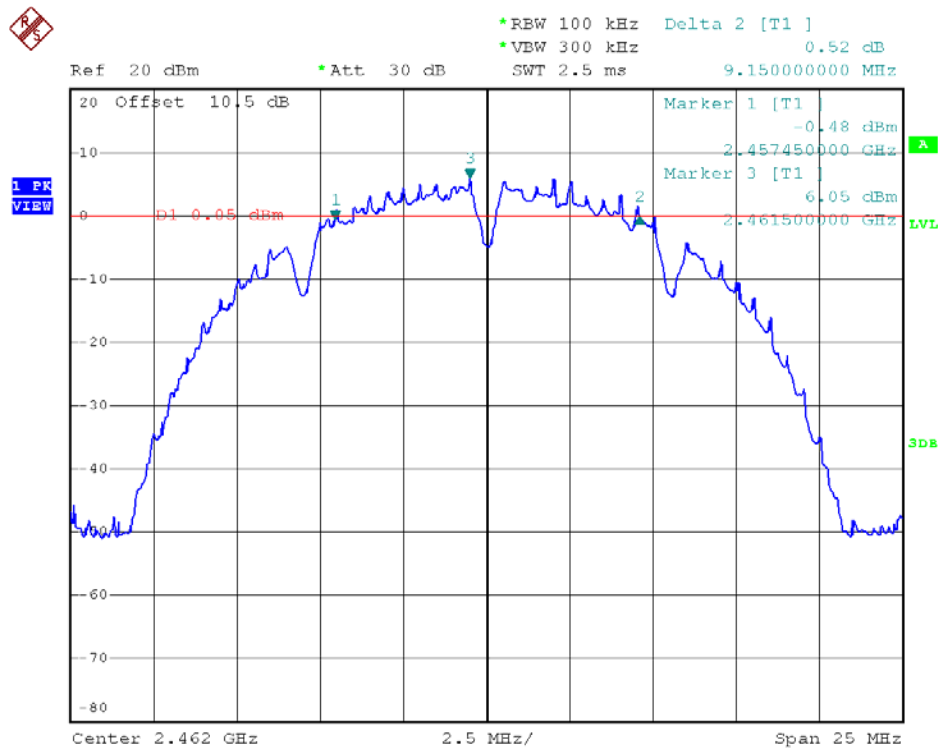
802.11b - 6 dB Bandwidth Plot on channel 1



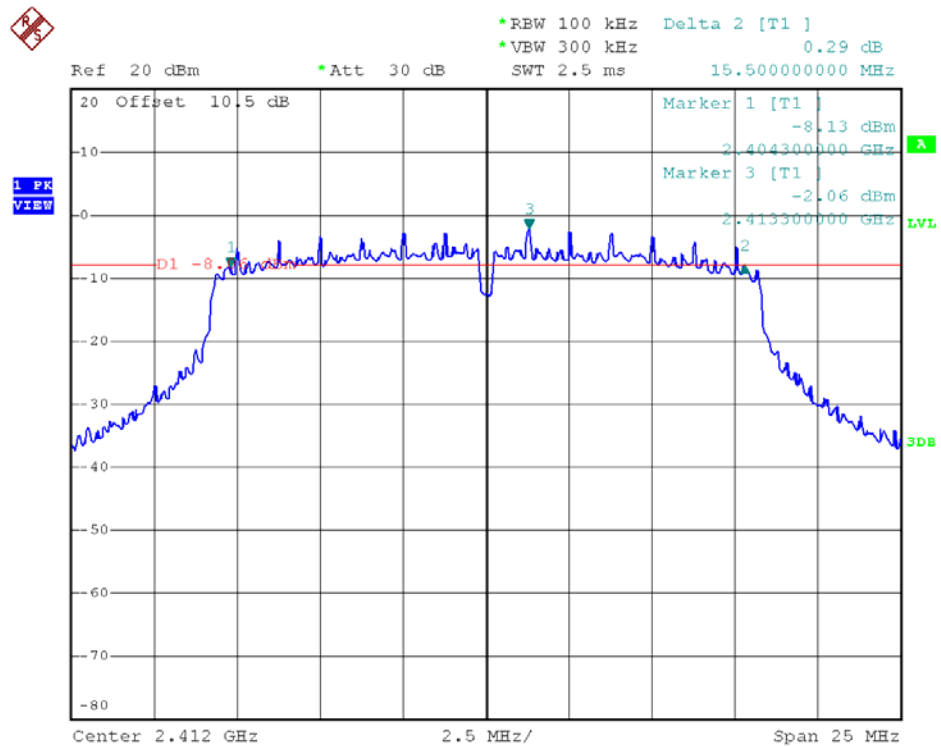
802.11b - 6 dB Bandwidth Plot on channel 6



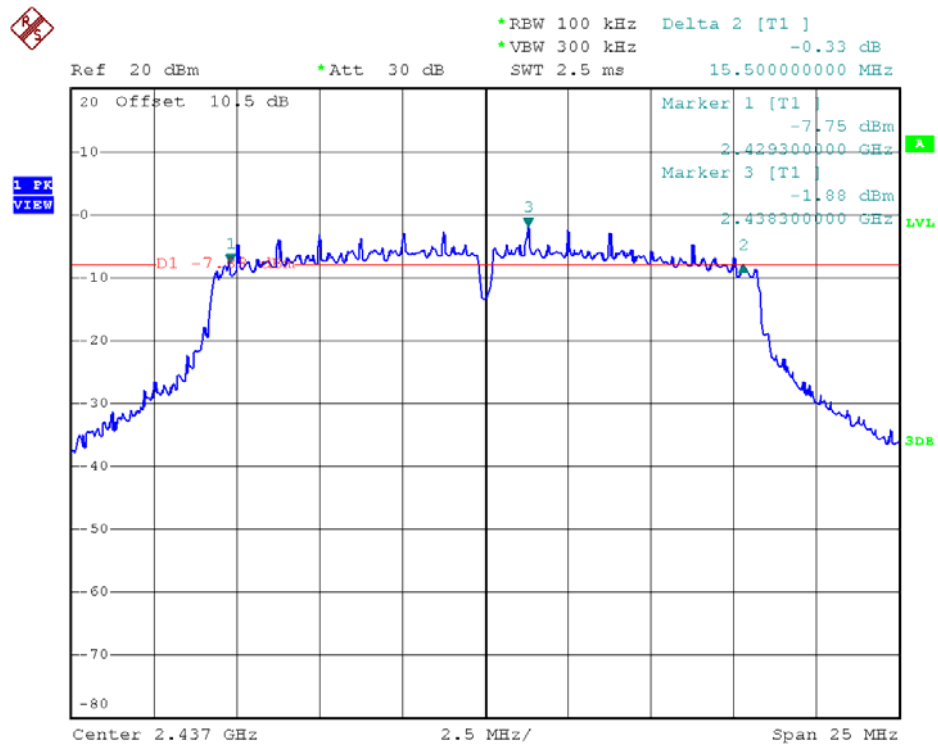
802.11b - 6 dB Bandwidth Plot on channel 11



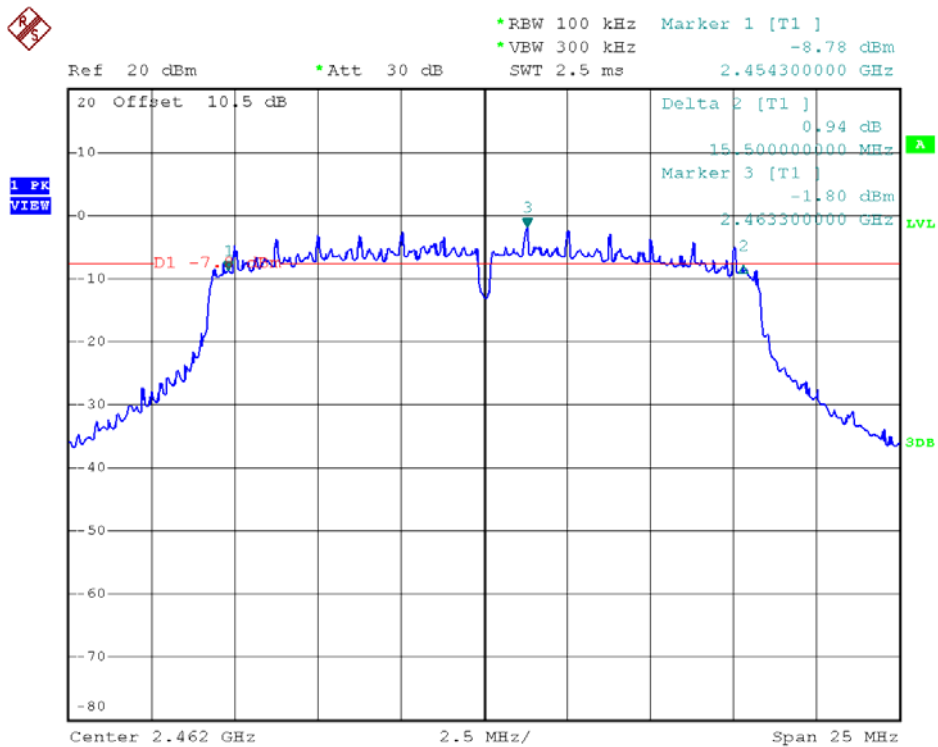
802.11g - 6 dB Bandwidth Plot on channel 1

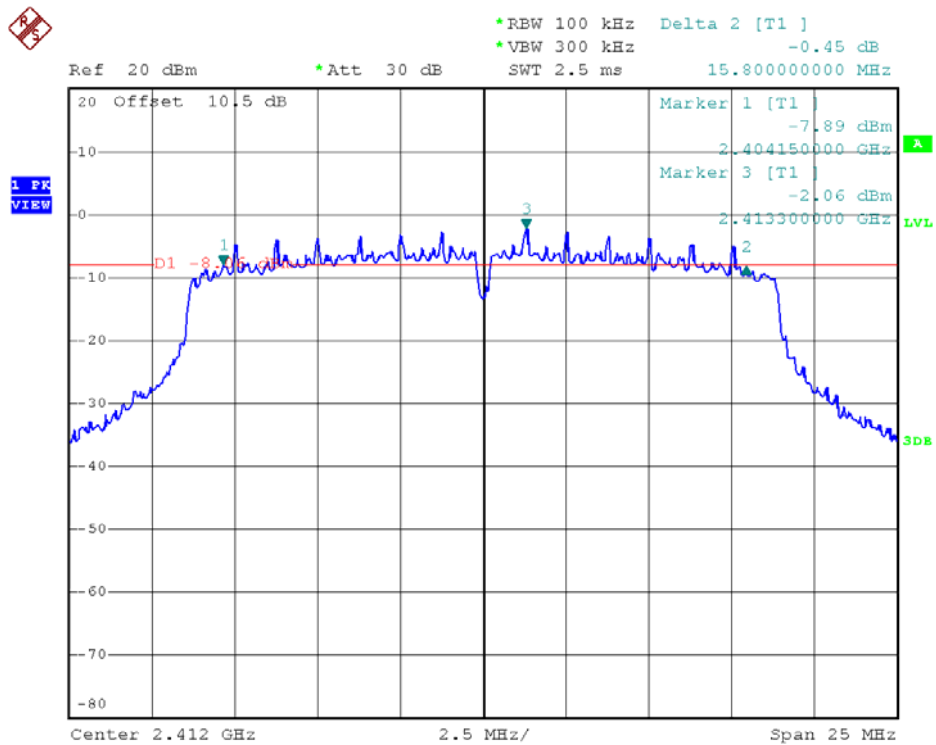
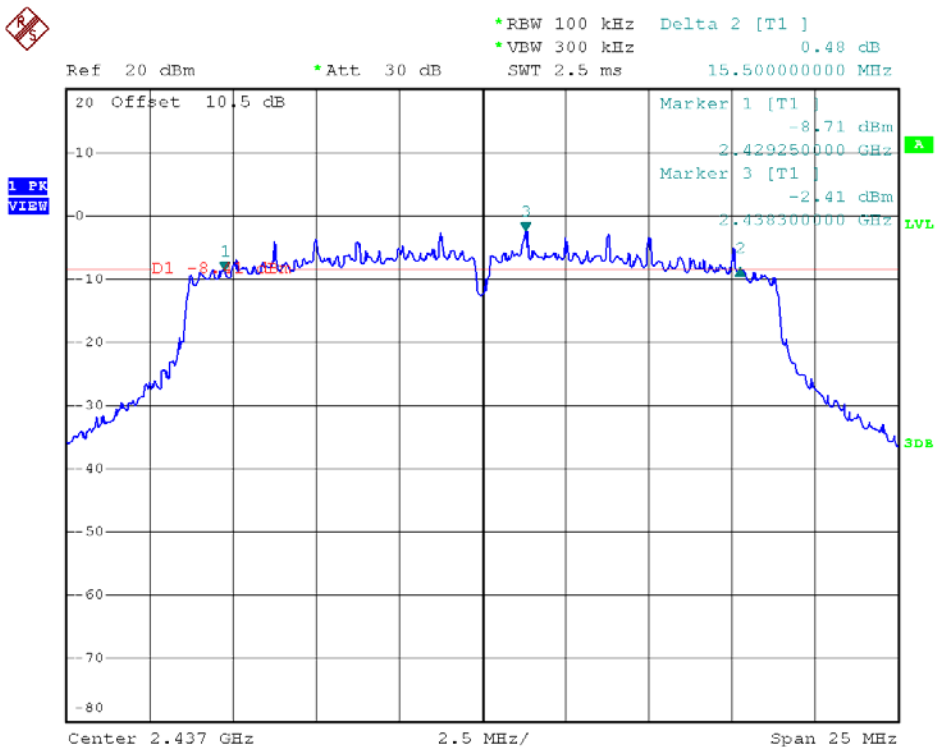


802.11g - 6 dB Bandwidth Plot on channel 6



802.11g - 6 dB Bandwidth Plot on channel 11



**802.11n20 - 6 dB Bandwidth Plot on channel 1****802.11 n20 - 6 dB Bandwidth Plot on channel 6**



Ref 20 dBm *Att 30 dB SWT 2.5 ms Delta 2 [T1] 0.30 dB

2.454300000 GHz -8.52 dBm Marker 1 [T1]

2.463300000 GHz -1.78 dBm Marker 3 [T1]

Center 2.462 GHz 2.5 MHz/ Span 25 MHz

Ref 20 dBm *Att 30 dB SWT 2.5 ms 2.413050000 GHz

20 Offset 10.5 dB

1 PK MAXH

1

T1

Temp 1 [T1 OEW] -9.15 dBm

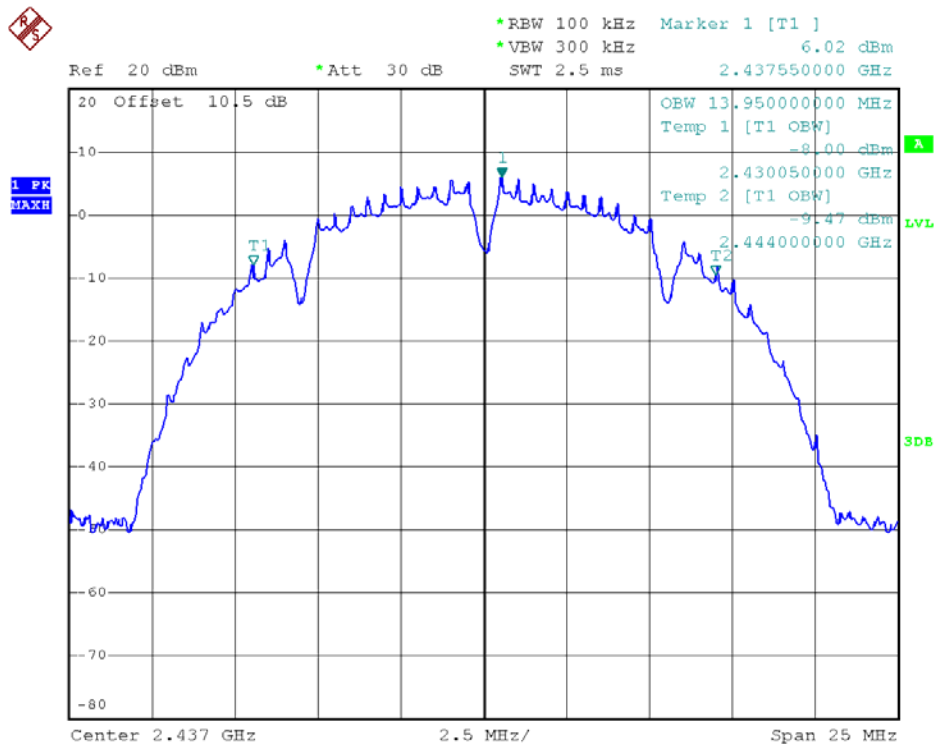
2.405050000 GHz

Temp 2 [T1 OEW] -7.92 dBm

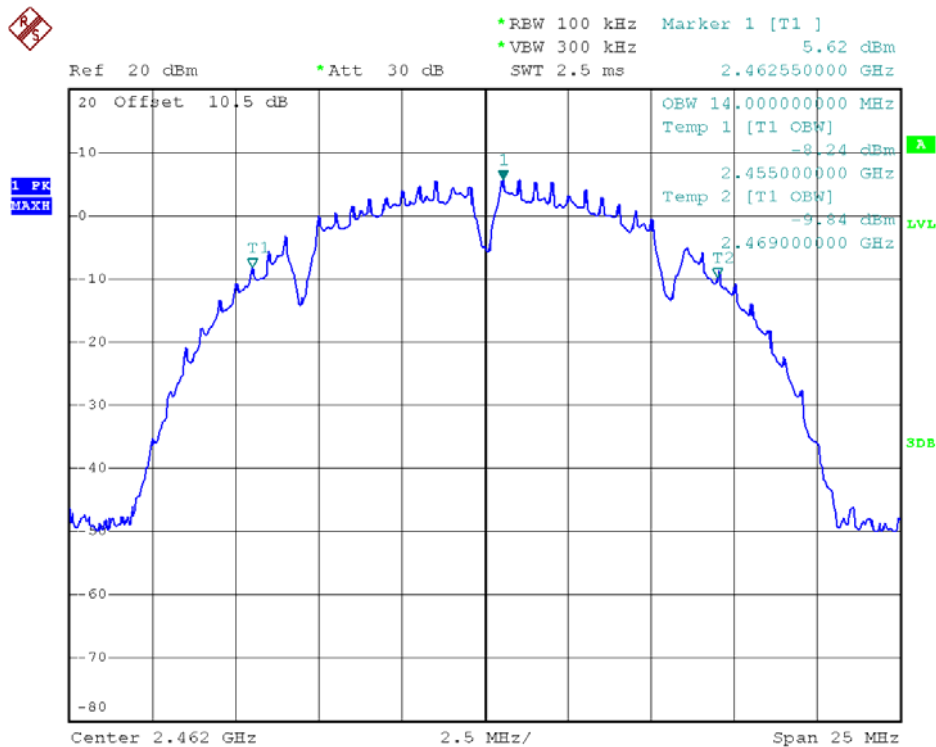
2.419000000 GHz

Center 2.412 GHz 2.5 MHz/ Span 25 MHz

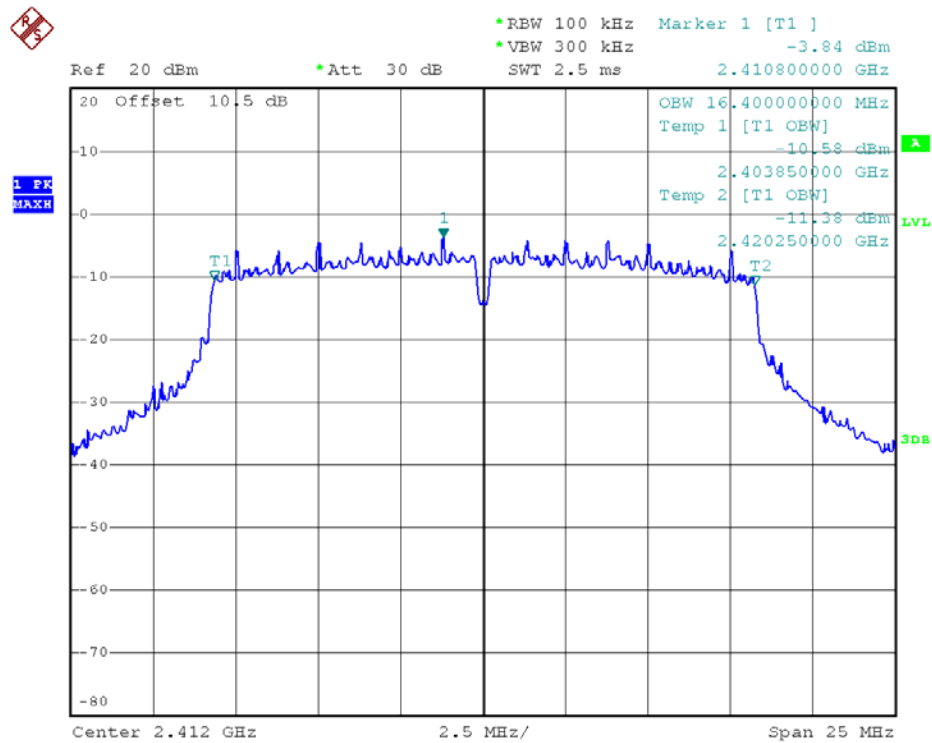
802.11b - 99% Bandwidth Plot on channel 6



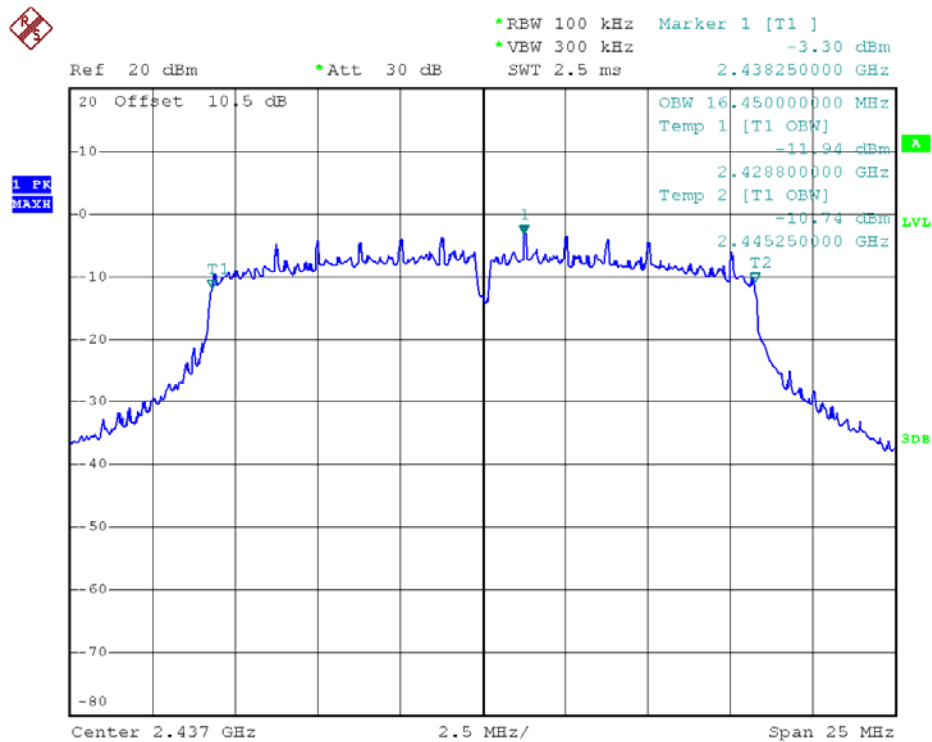
802.11b - 99% Bandwidth Plot on channel 11



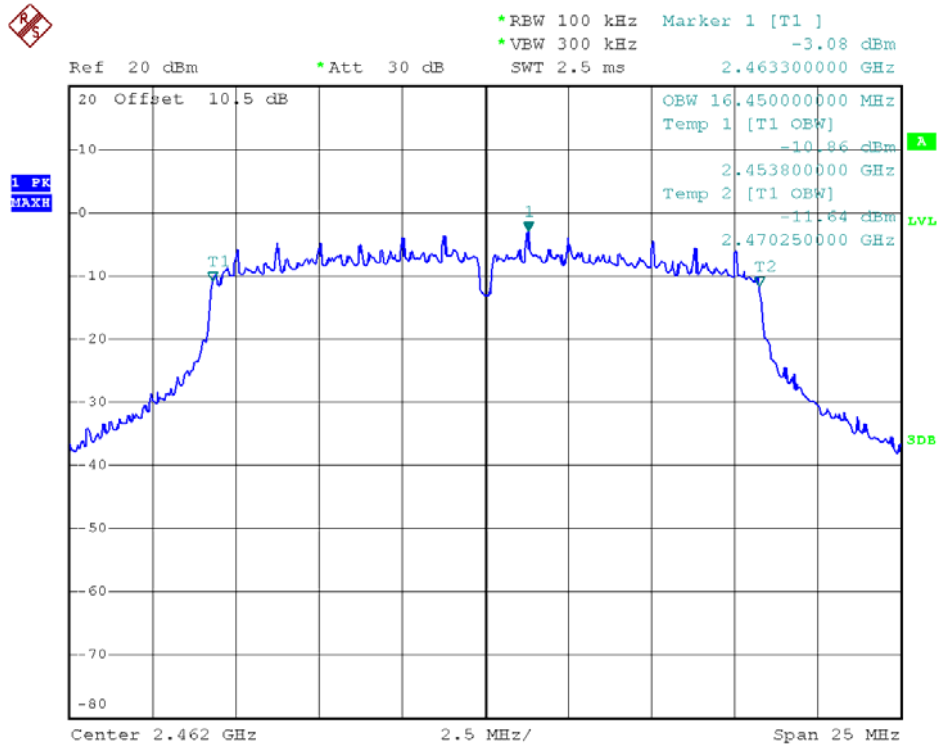
802.11g - 99% Bandwidth Plot on channel 1



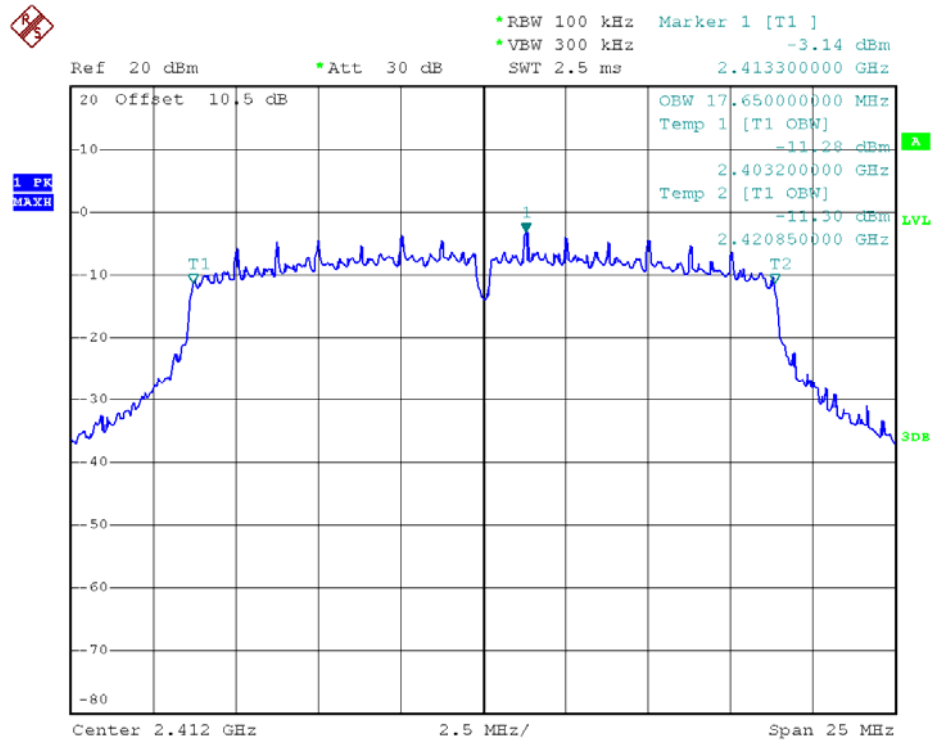
802.11g - 99% Bandwidth Plot on channel 6



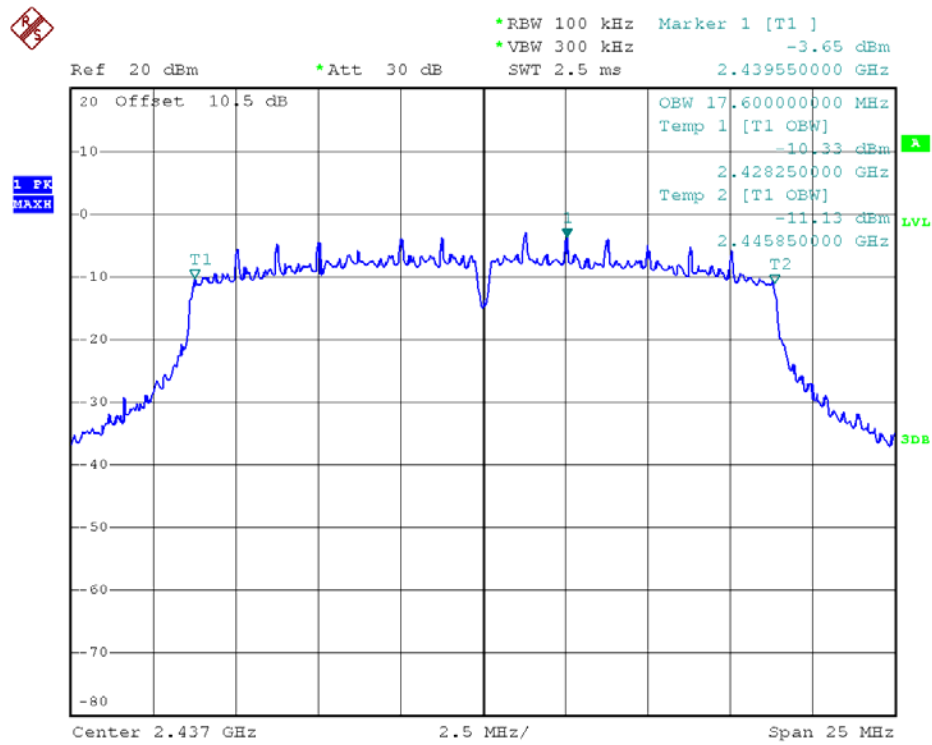
802.11g - 99% Bandwidth Plot on channel 11



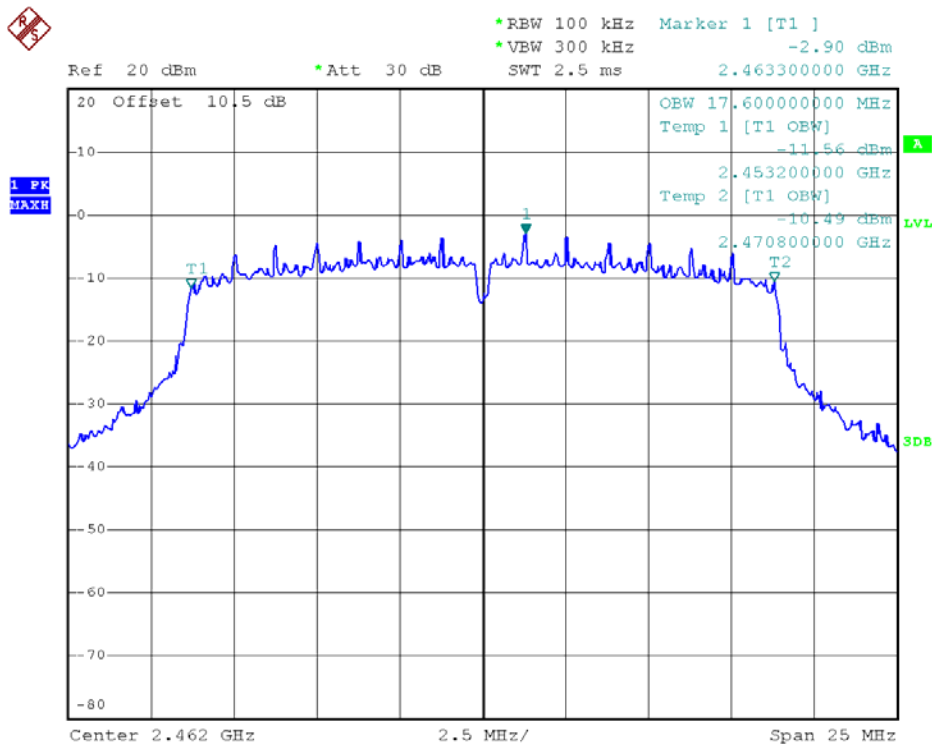
802.11n20 - 99% Bandwidth Plot on channel 1



802.11 n20 - 99% Bandwidth Plot on channel 6



802.11 n20 - 99% Bandwidth Plot on channel 11



2.3.7. Conducted Band Edges and Spurious Emissions

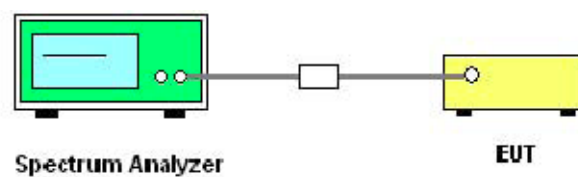
2.3.8. Limit of Conducted Band Edges and Spurious Emissions

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

2.3.9. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

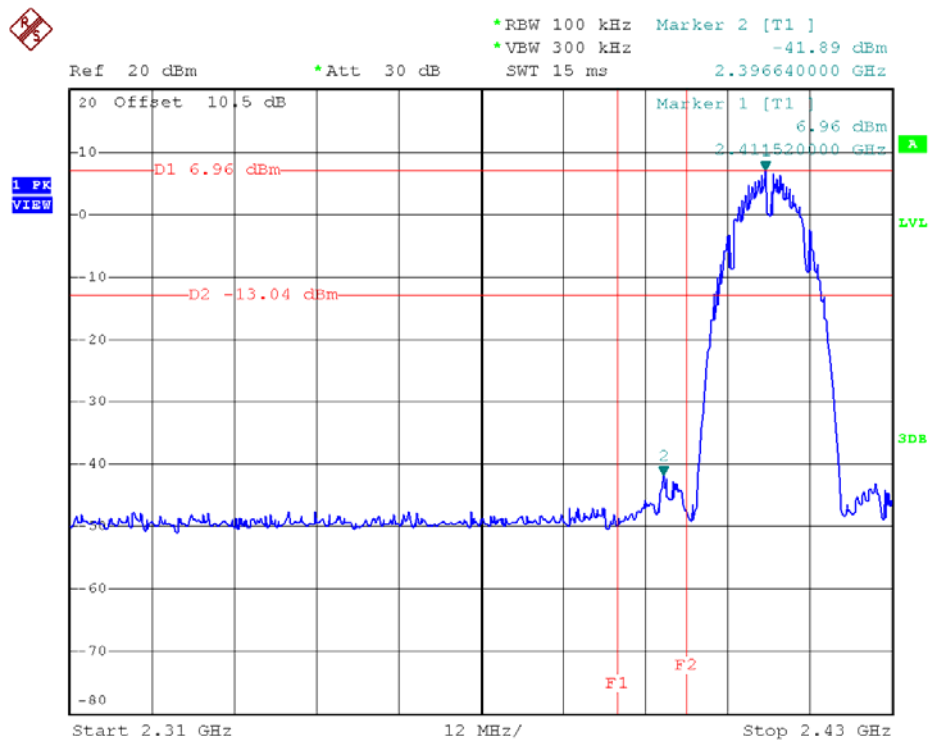
2.3.10. Test Setup



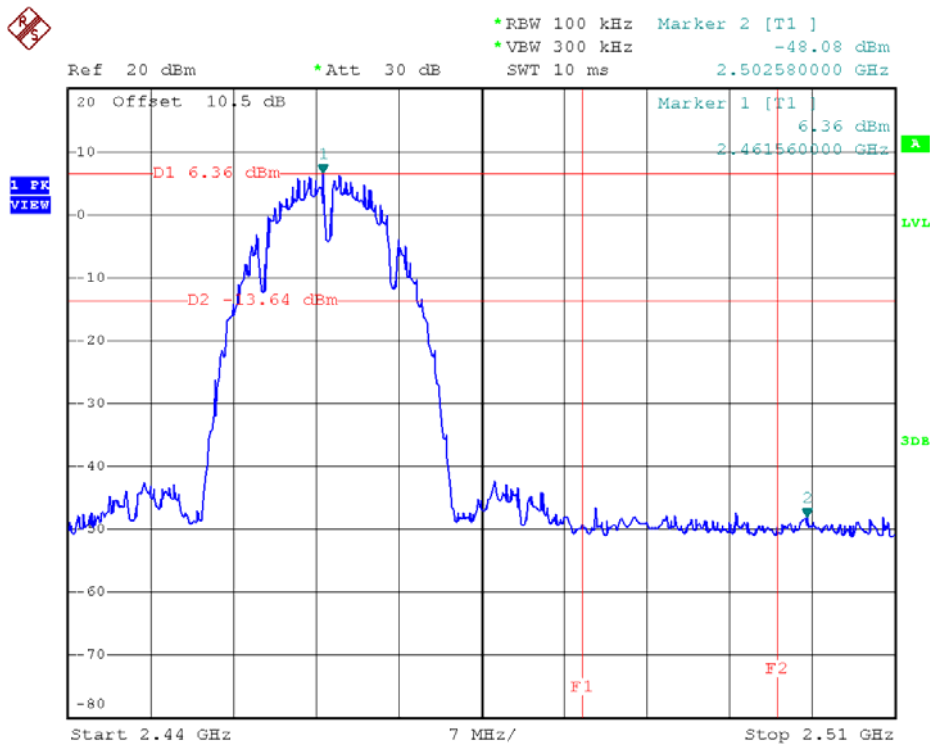
2.3.11. Test Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r03.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. 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 per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

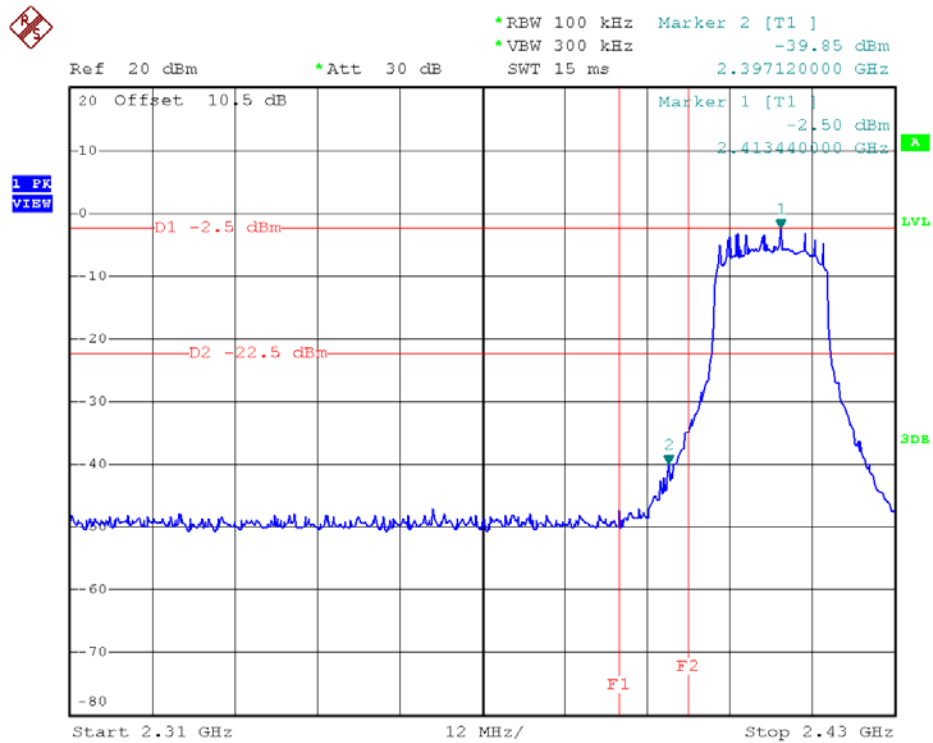
2.3.12. Test Result (Plots) of Conducted Band Edges



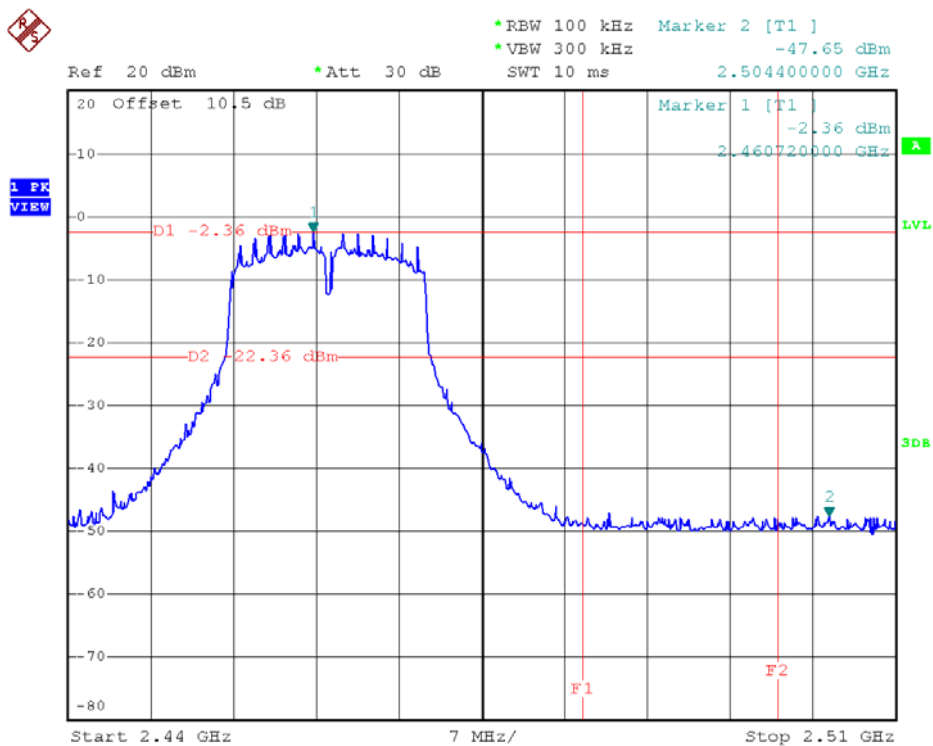
802.11b - Low Band Edge Plot on Channel 1



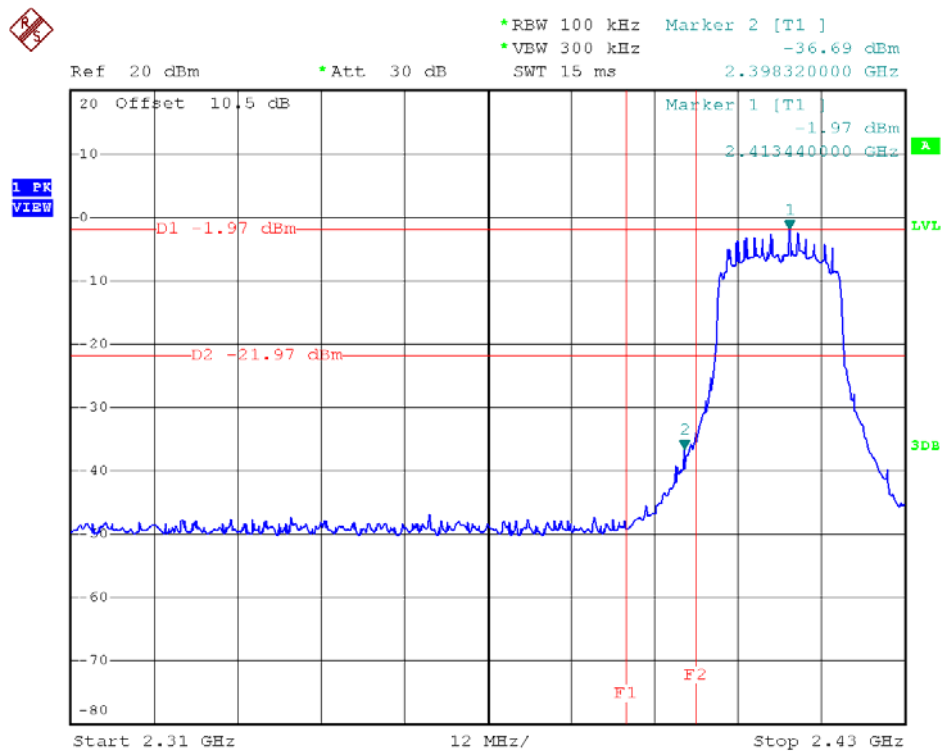
802.11b - High Band Edge Plot on Channel 11



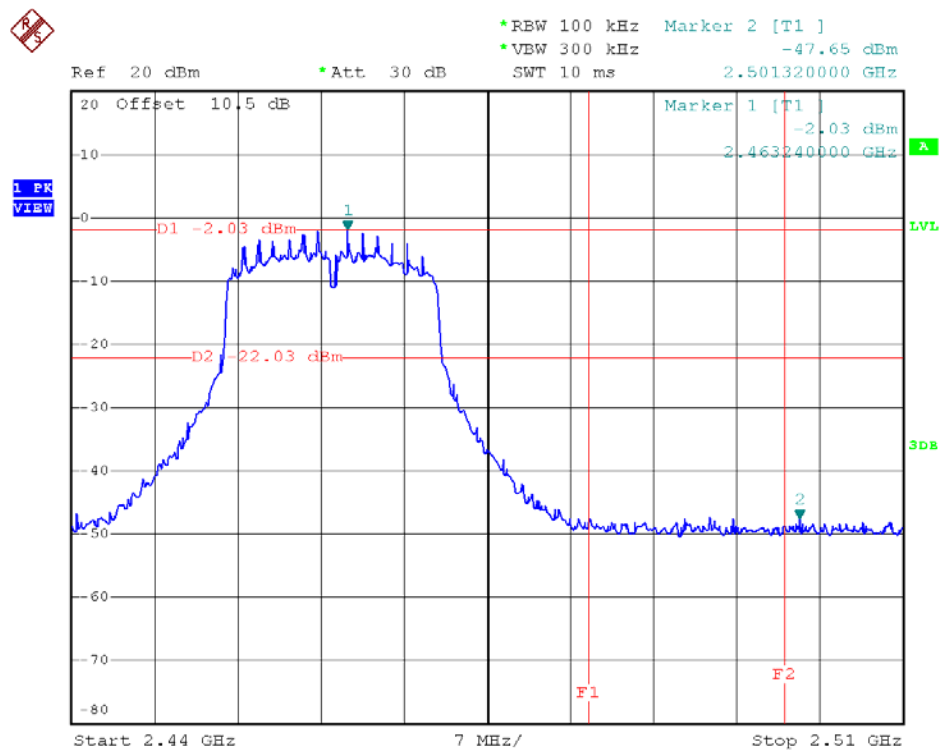
802.11g - Low Band Edge Plot on Channel 1



802.11g - High Band Edge Plot on Channel 11



802.11n20 - Low Band Edge Plot on Channel 1

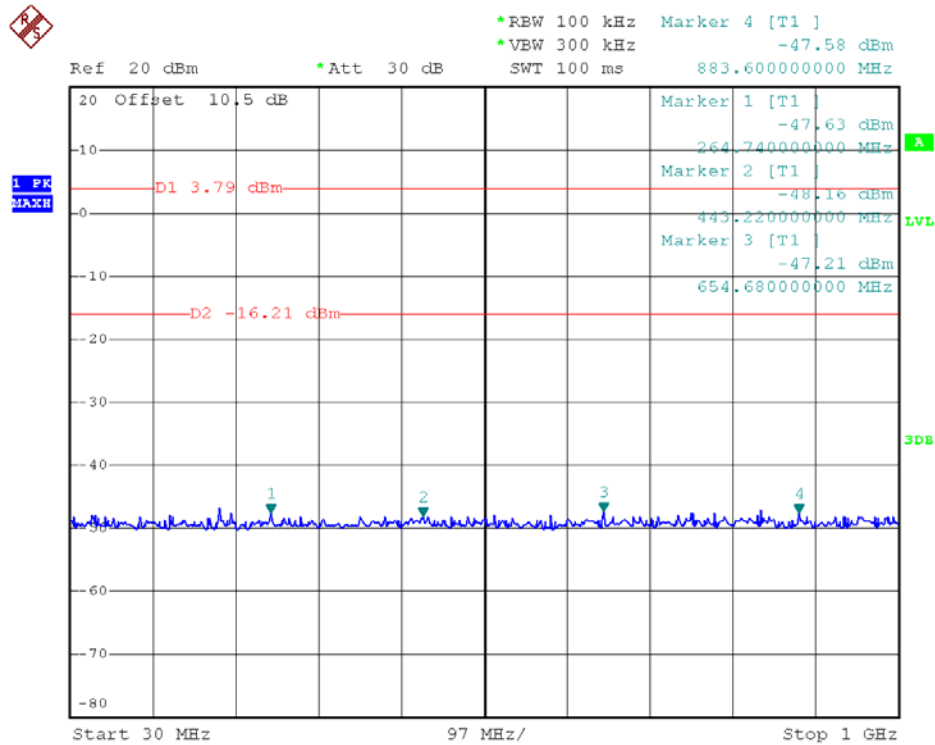


802.11n20 - High Band Edge Plot on Channel 11

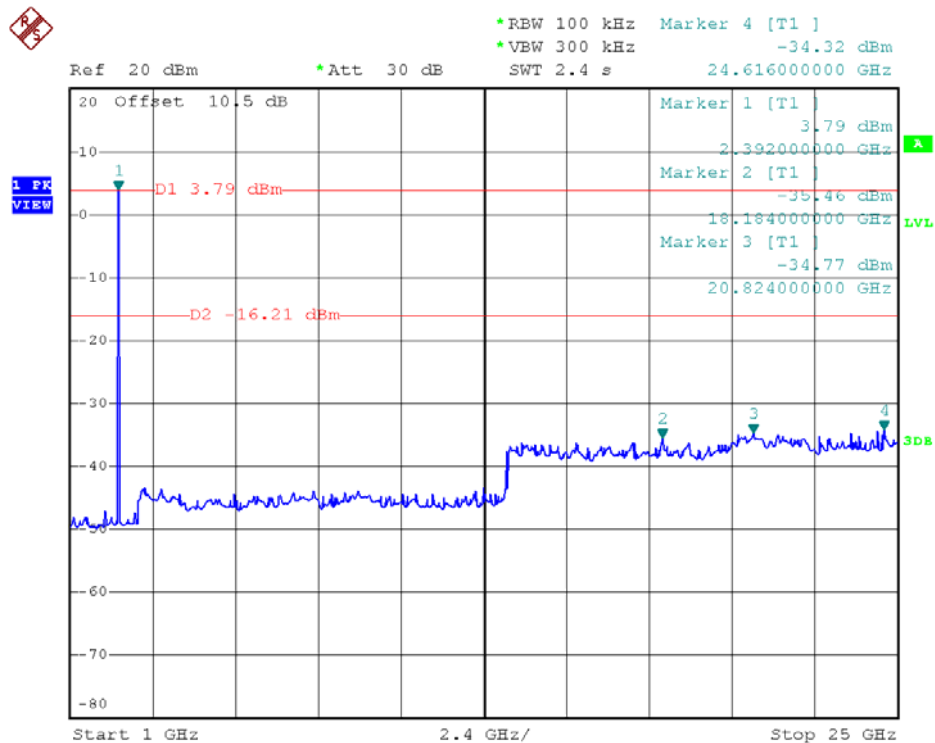
2.3.13. Test Result (Plots) of Conducted Spurious Emission

Note: For 9 kHz to 30MHz the amplitude of conducted spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

802.11b - Conducted Spurious Emission Plot on channel 1

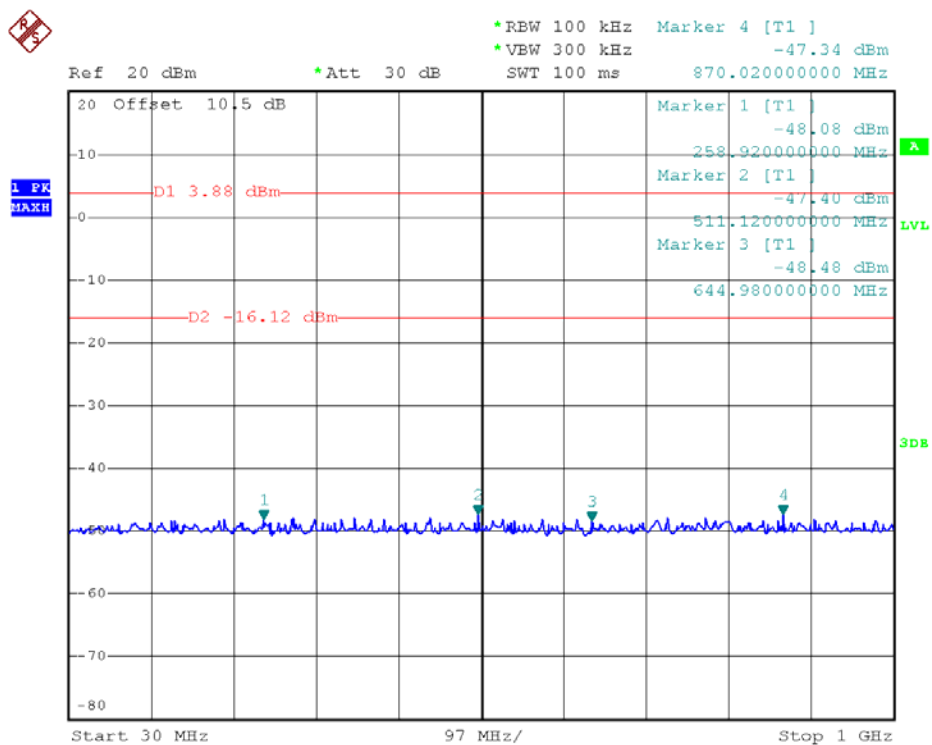


Channel = 1, 30MHz to 1GHz

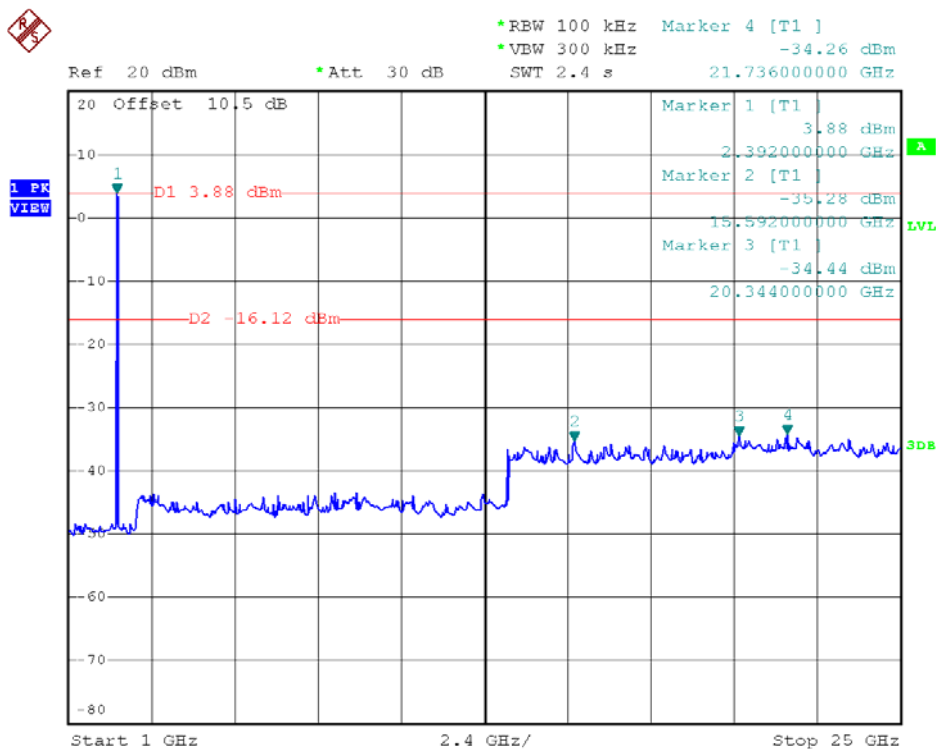


Channel = 1, 1GHz to 25GHz

802.11b - Conducted Spurious Emission Plot on channel 6

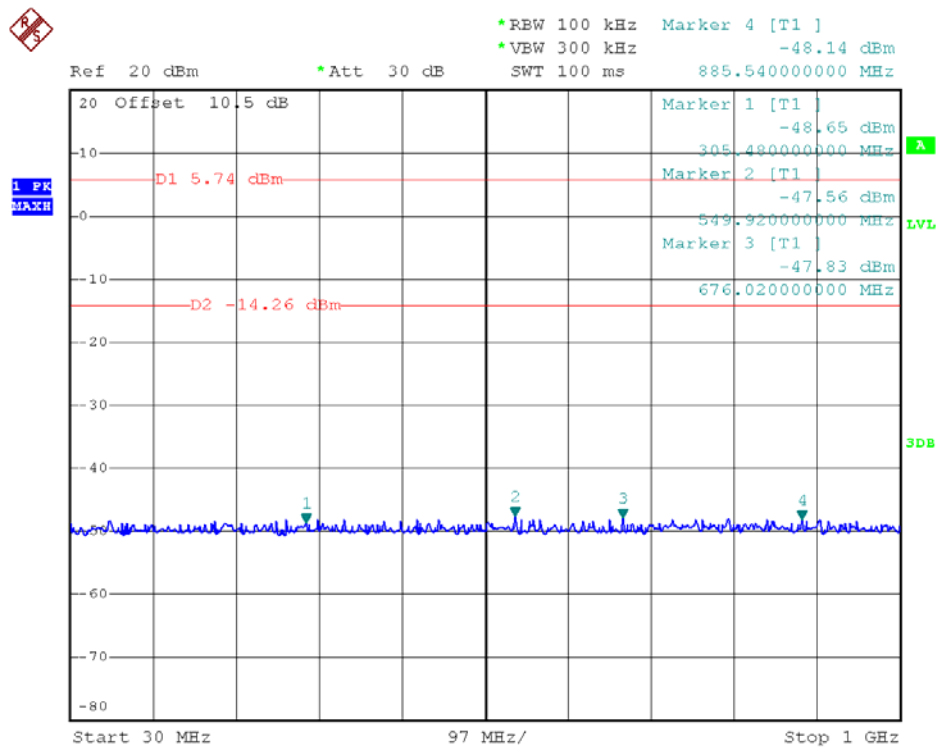


Channel = 1, 30MHz to 1GHz

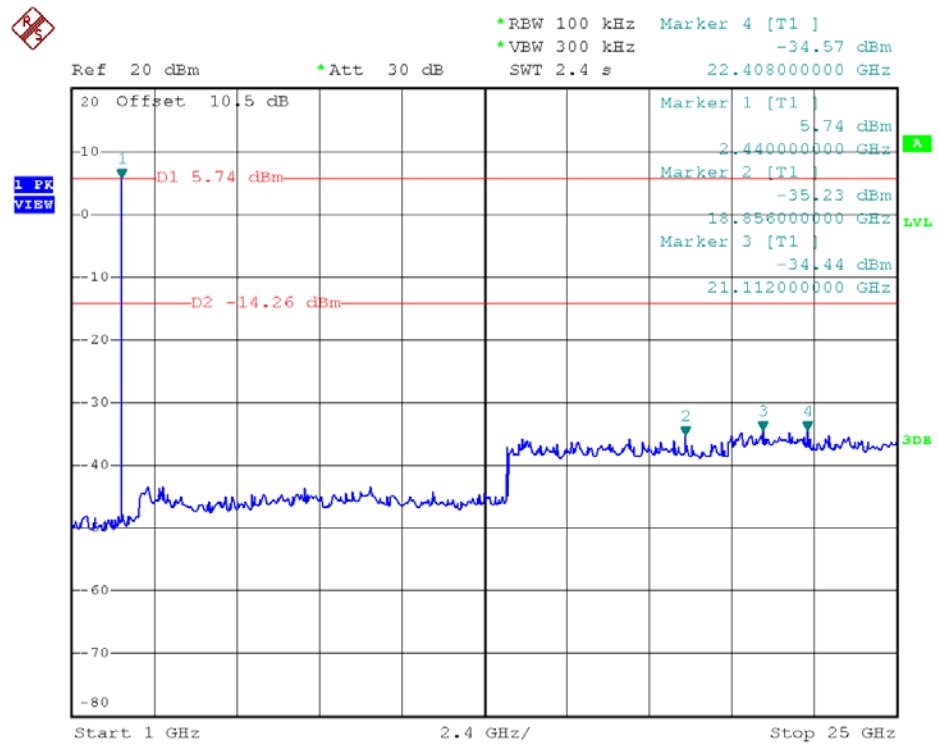


Channel = 1, 1GHz to 25GHz

802.11b - Conducted Spurious Emission Plot on channel 11

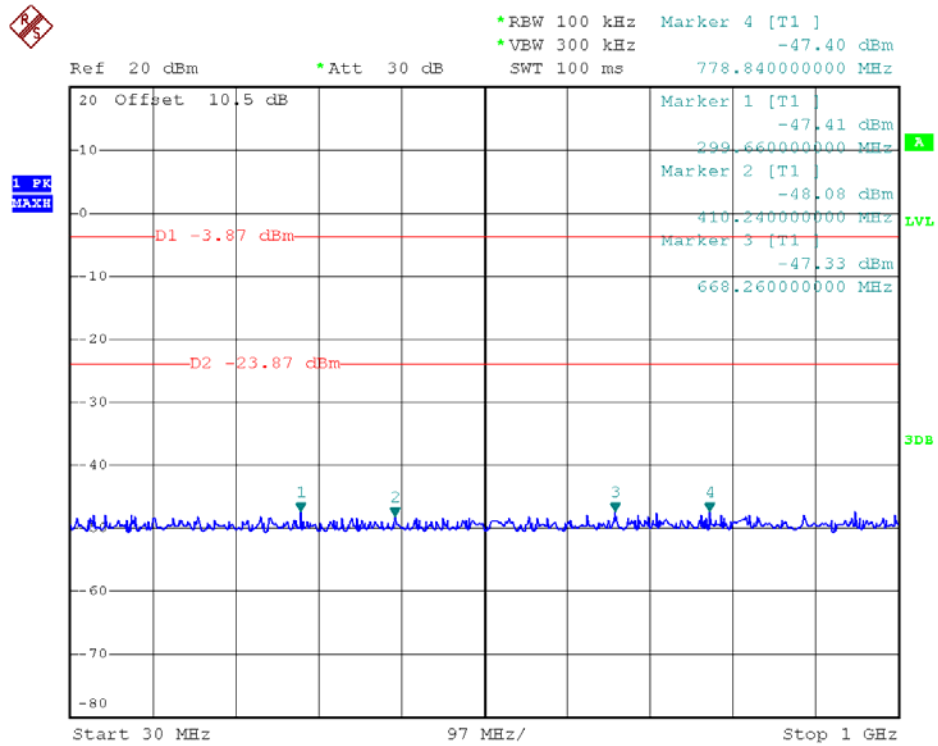


Channel = 1, 30MHz to 1GHz

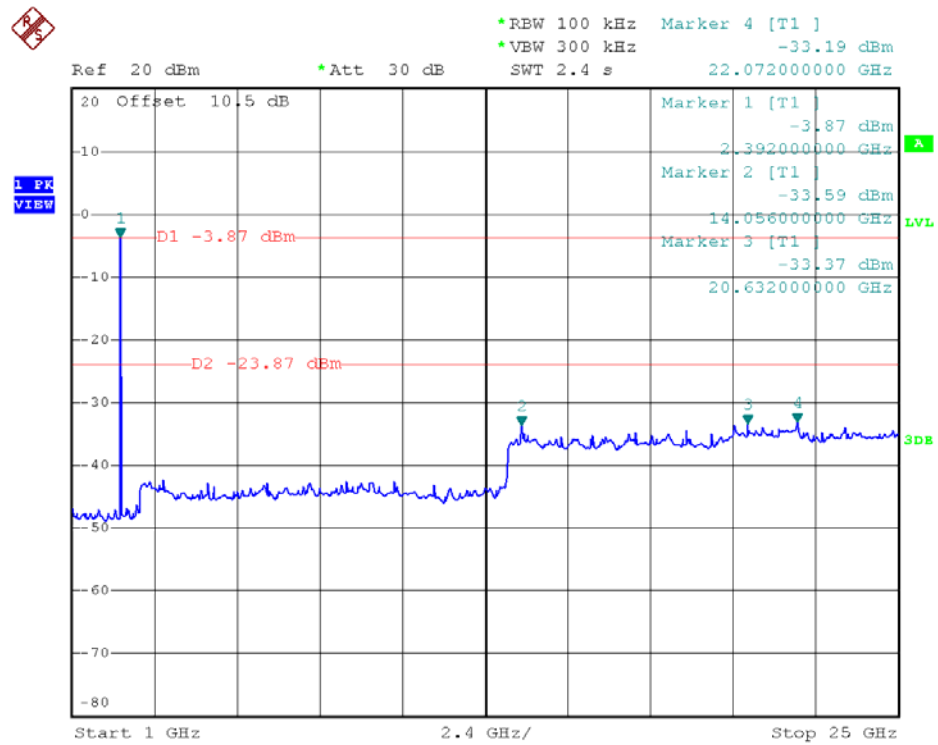


Channel = 1, 1GHz to 25GHz

802.11g - Conducted Spurious Emission Plot on channel 1

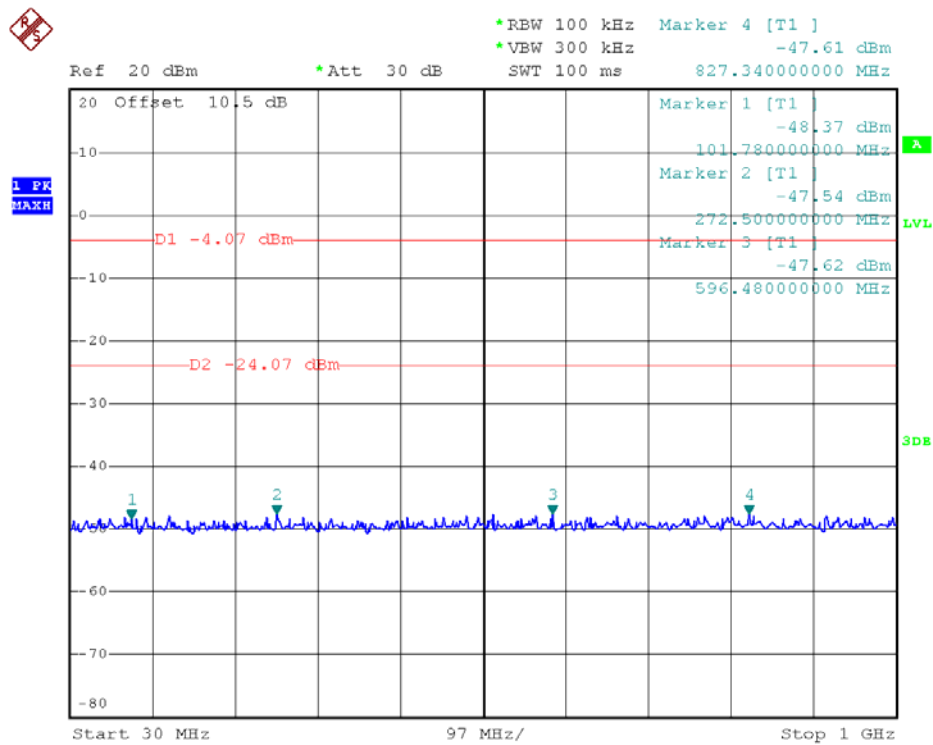


Channel = 1, 30MHz to 1GHz

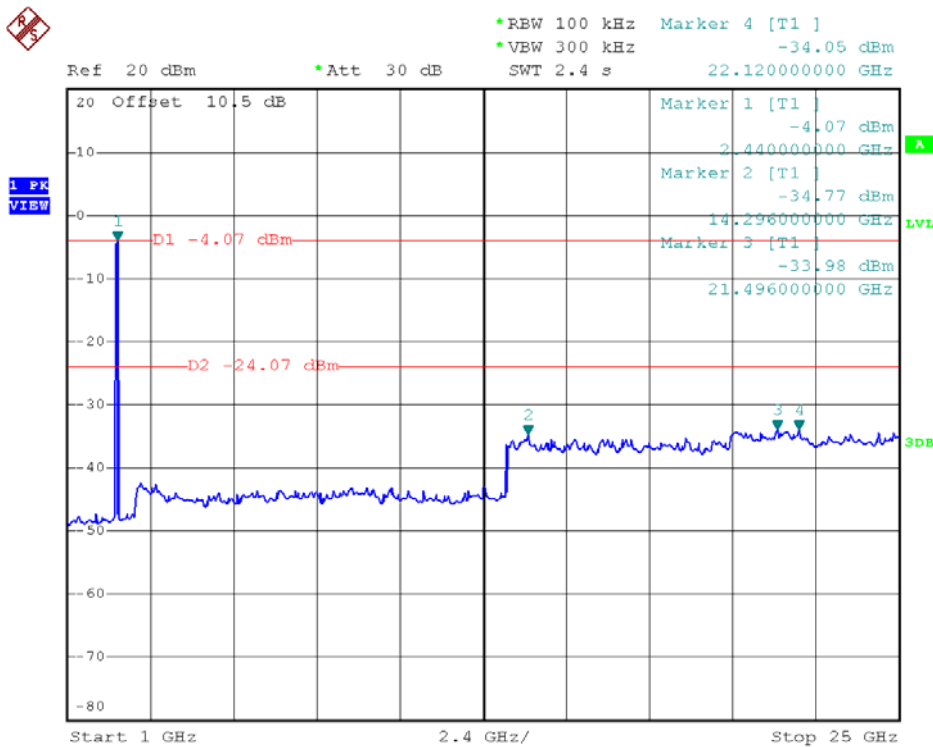


Channel = 1, 1GHz to 25GHz

802.11g - Conducted Spurious Emission Plot on channel 6

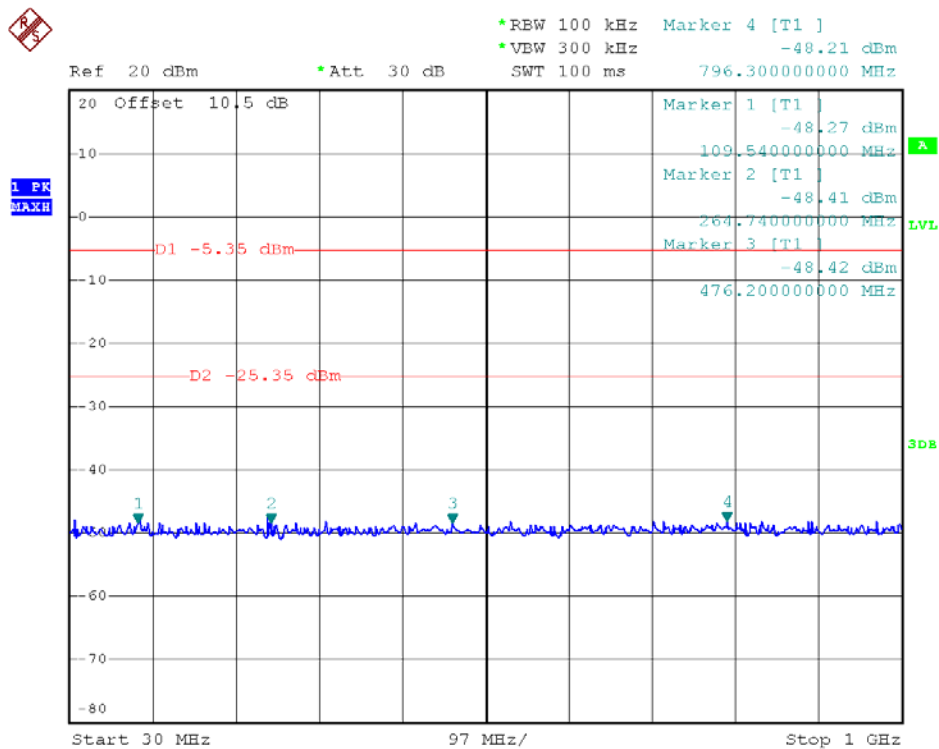


Channel = 1, 30MHz to 1GHz

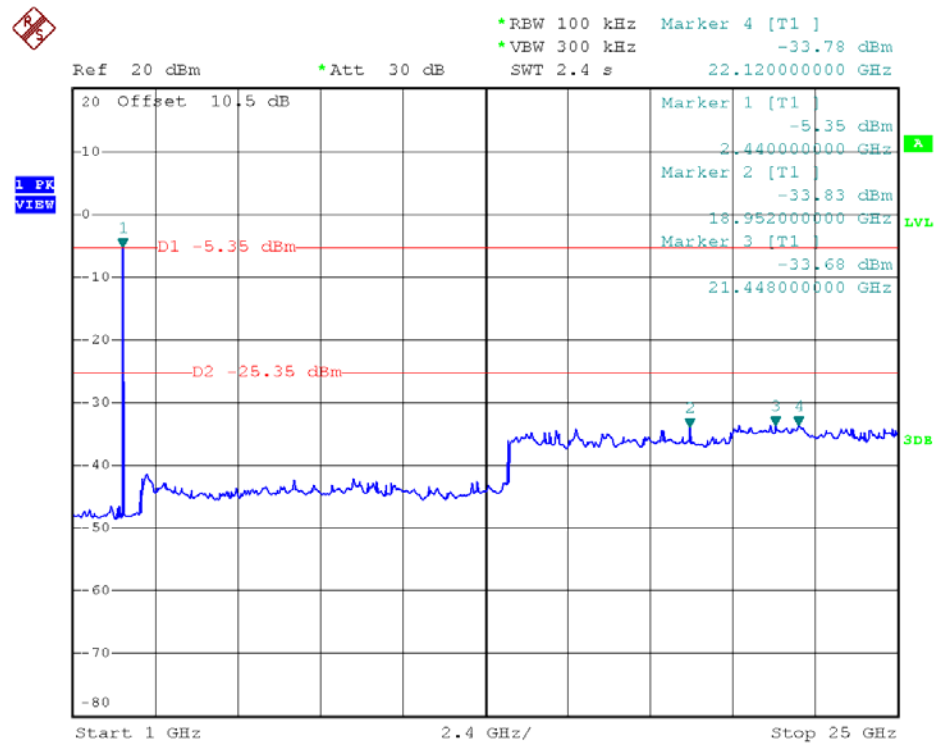


Channel = 1, 1GHz to 25GHz

802.11g - Conducted Spurious Emission Plot on channel 11

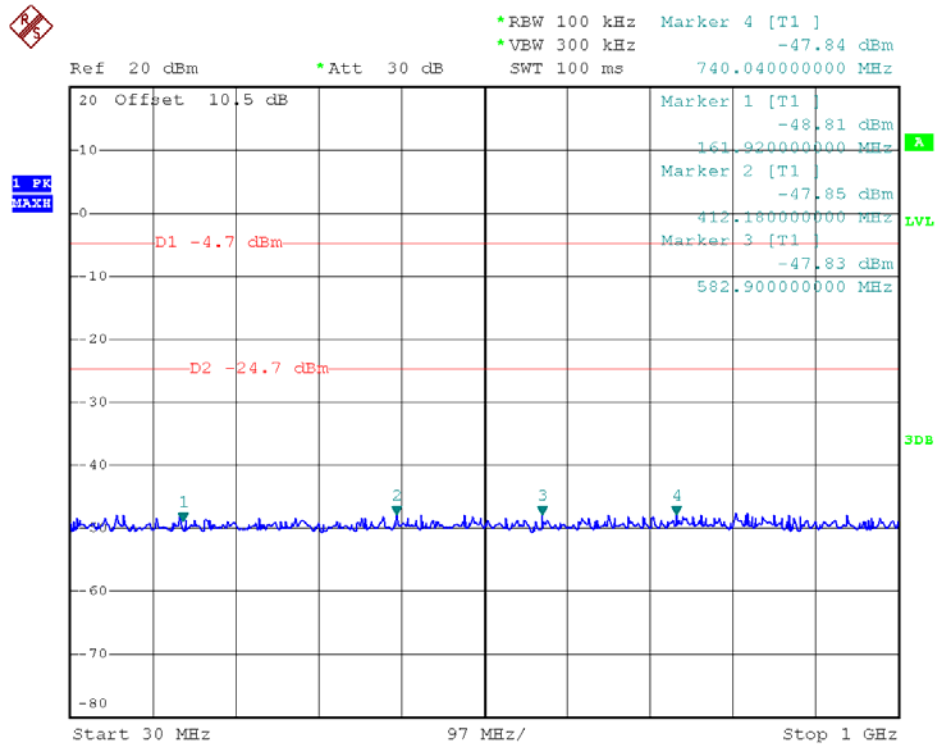


Channel = 1, 30MHz to 1GHz

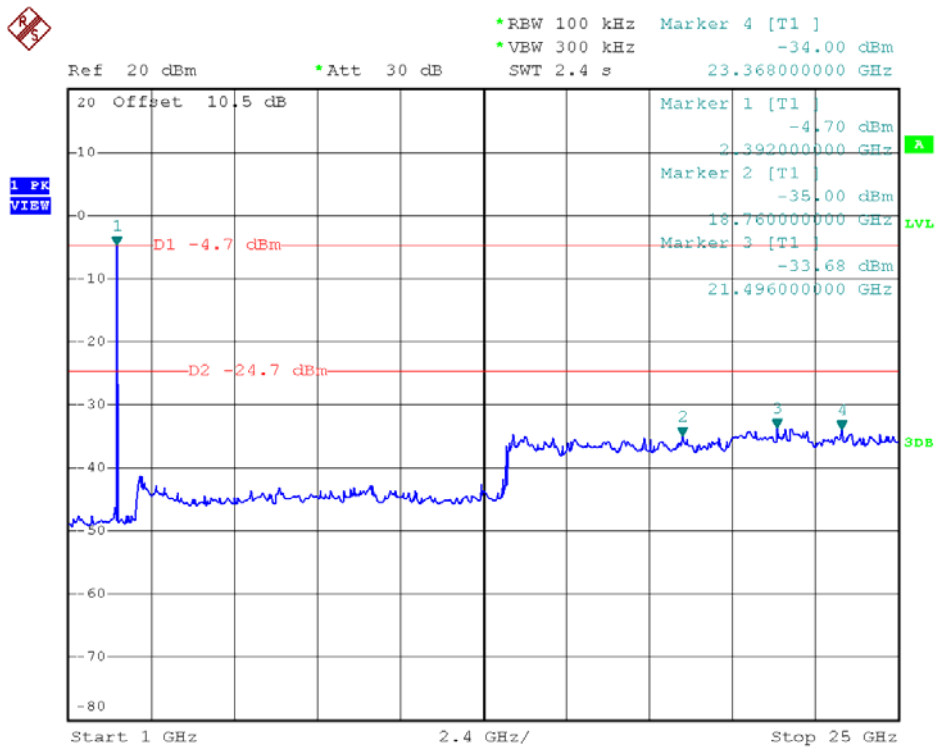


Channel = 1, 1GHz to 25GHz

802.11n20 - Conducted Spurious Emission Plot on channel 1

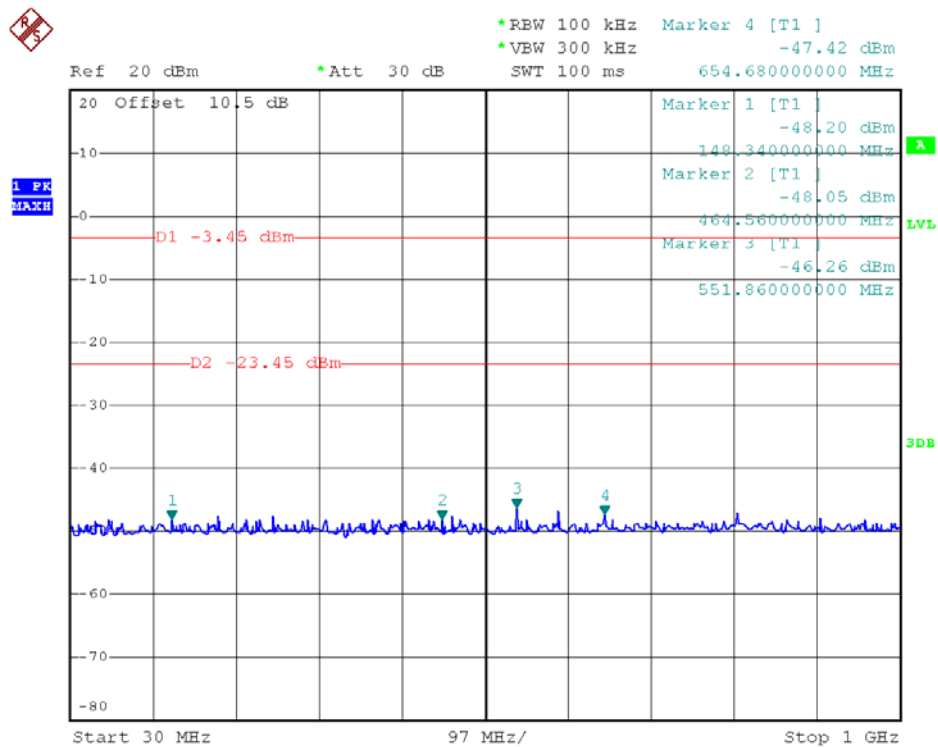


Channel = 1, 30MHz to 1GHz

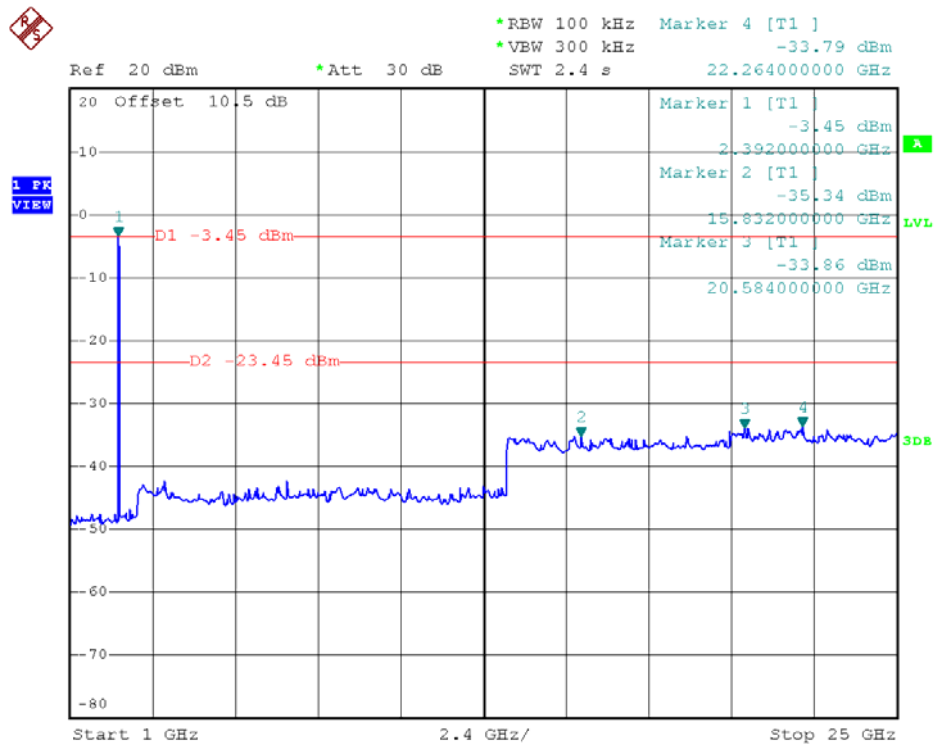


Channel = 1, 1GHz to 25GHz

802.11n20 - Conducted Spurious Emission Plot on channel 6

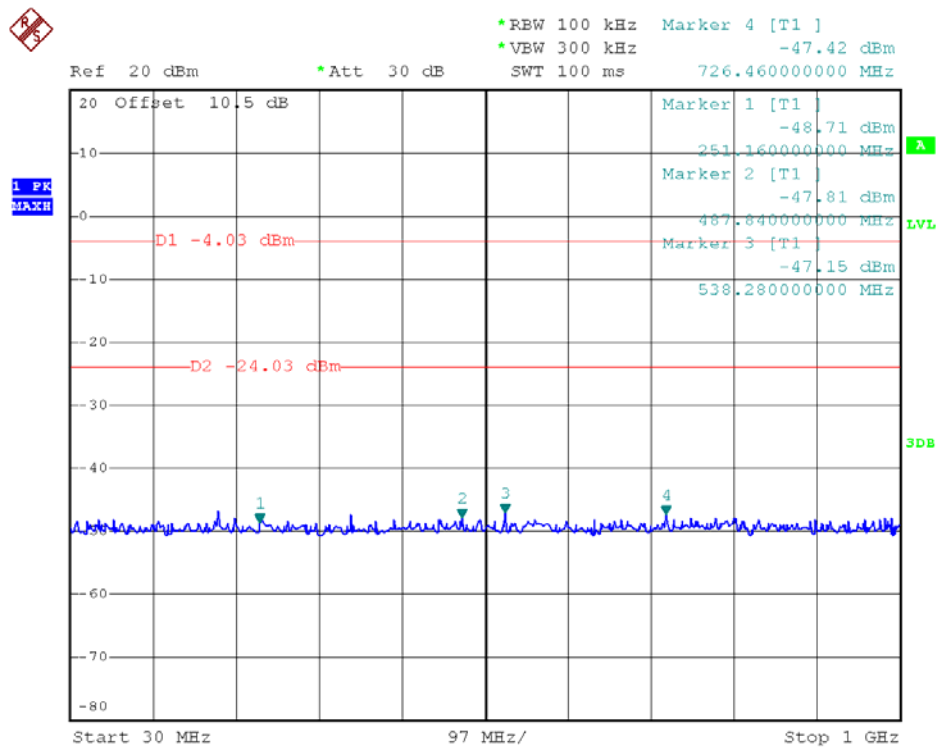


Channel = 1, 30MHz to 1GHz

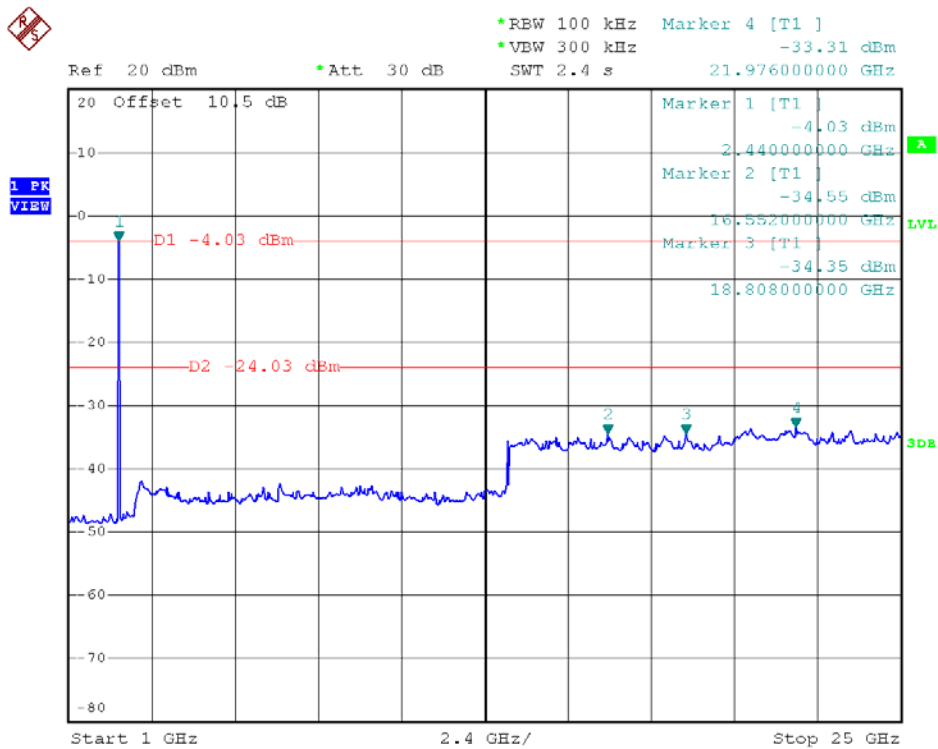


Channel = 1, 1GHz to 25GHz

802.11n20 - Conducted Spurious Emission Plot on channel 11



Channel = 1, 30MHz to 1GHz



Channel = 1, 1GHz to 25GHz

2.4. Power spectral density (PSD)

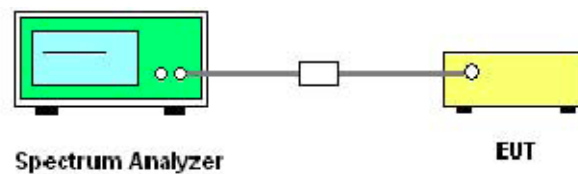
2.4.1. Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.4.3. Test Setup



2.4.4. Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No.558074 D01 DTS Meas. Guidance v03r03
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

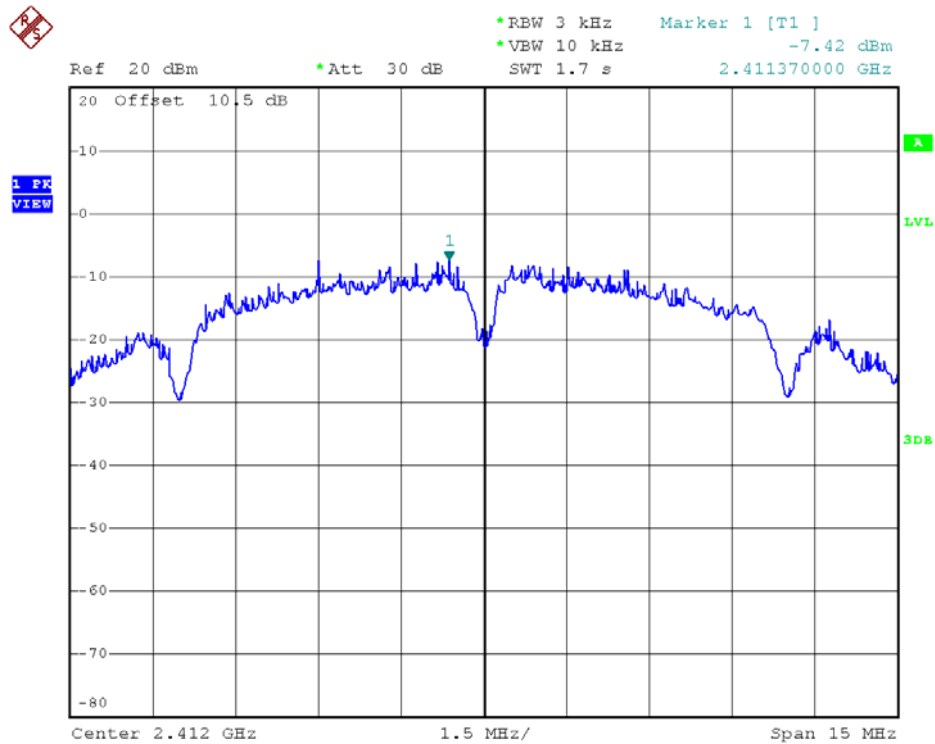
2.4.5. Test Results of Power spectral density

Spectral power density (dBm)					
Test mode	Channel	Frequency (MHz)	PSD/3kHz (dBm)	Limit (dBm/3kHz)	Verdict
802.11b	1	2412	-7.42	8	PASS
	6	2437	-8.08		PASS
	11	2462	-8.02		PASS
802.11g	1	2412	-16.85		PASS
	6	2437	-16.04		PASS
	11	2462	-15.81		PASS
802.11n20	1	2412	-16.90		PASS
	6	2437	-15.75		PASS
	11	2462	-17.31		PASS
Measurement uncertainty: ±1.3dB					

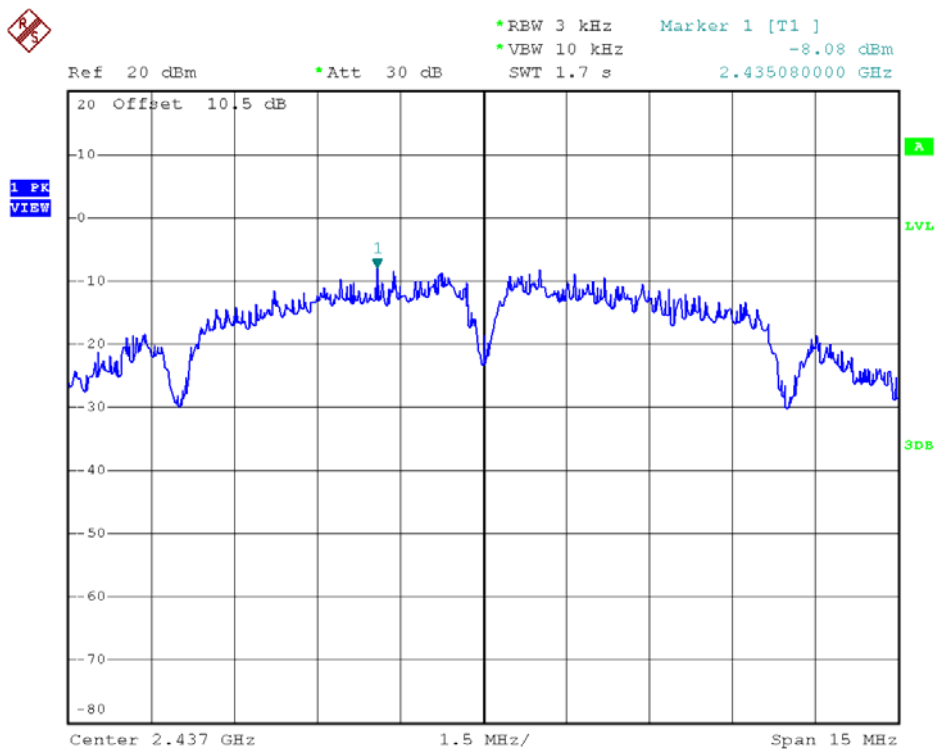
Note:

1. Measured power density (dBm) has offset with cable loss.

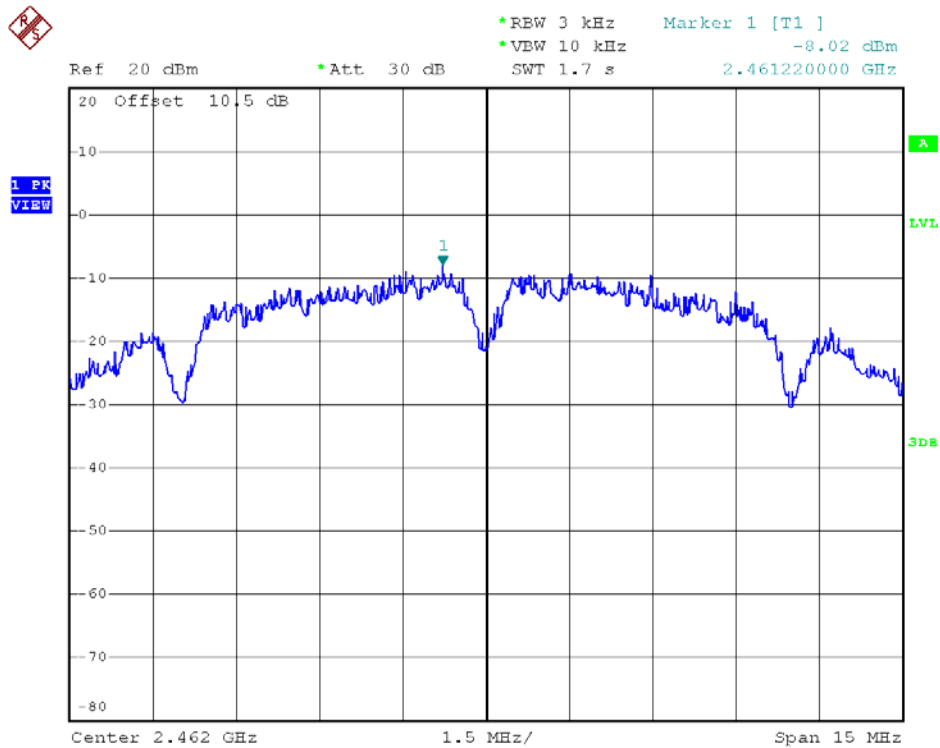
2.4.6. Test Results (plots) of Power spectral density



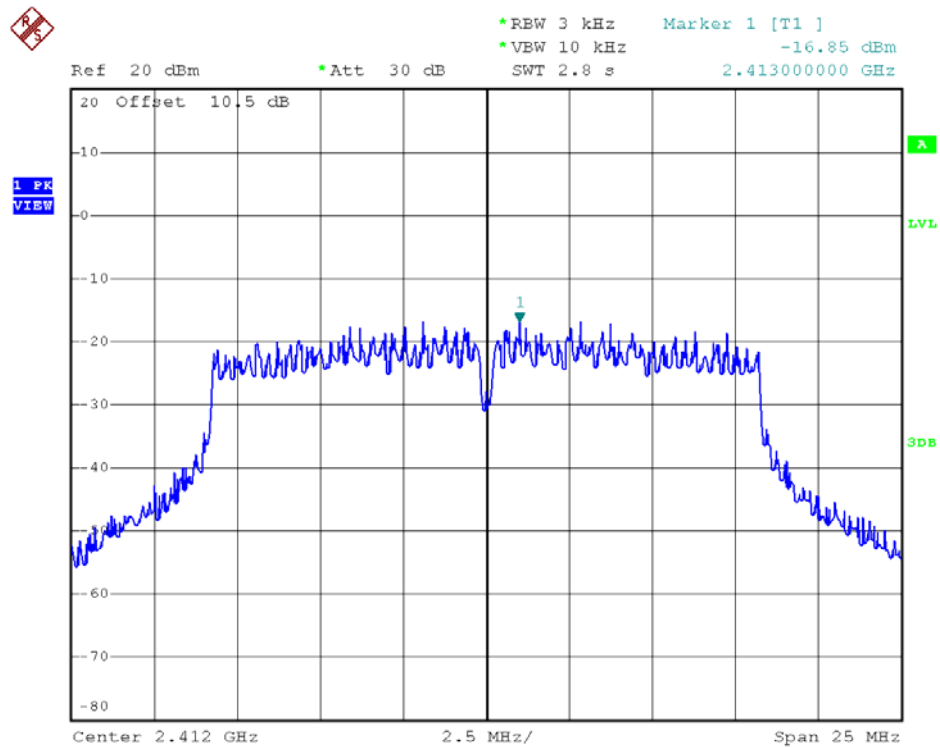
802.11b - Channel 1



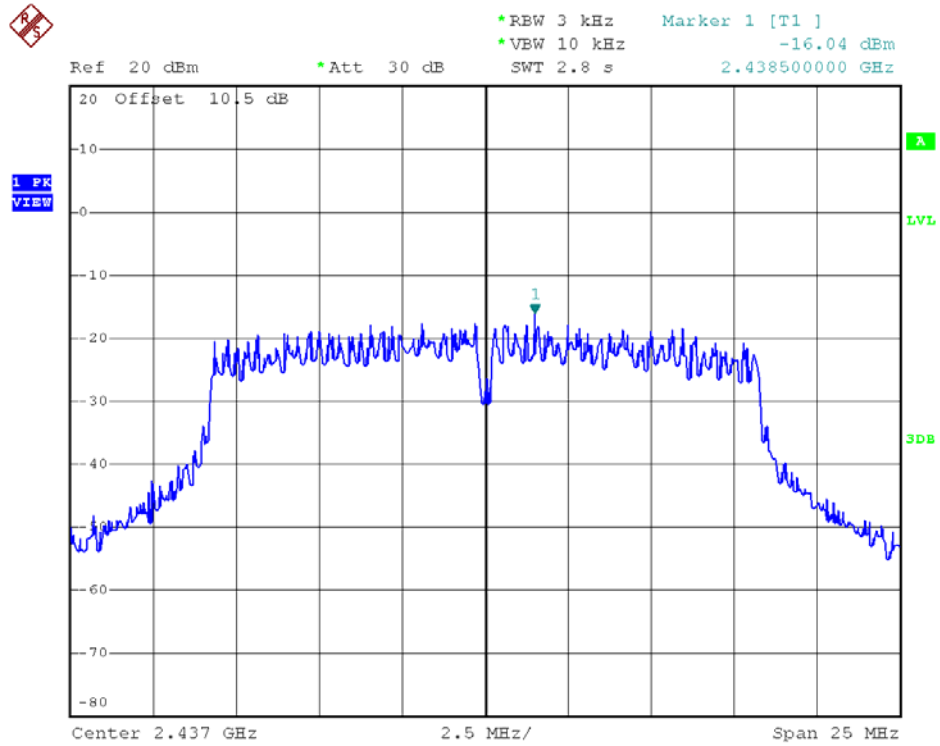
802.11b - Channel 6



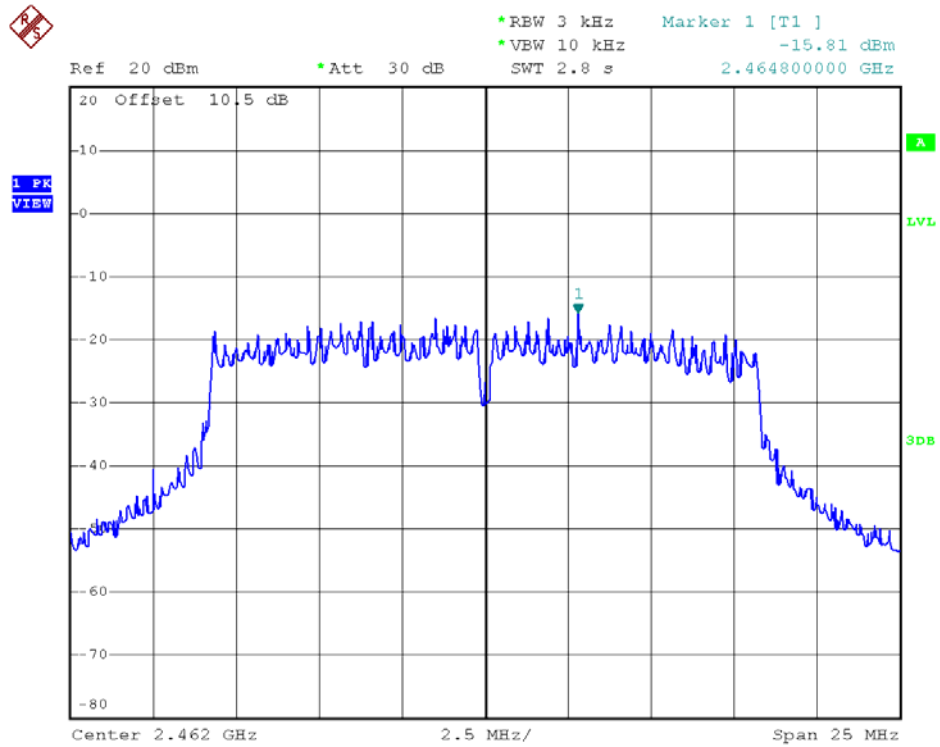
802.11b - Channel 11



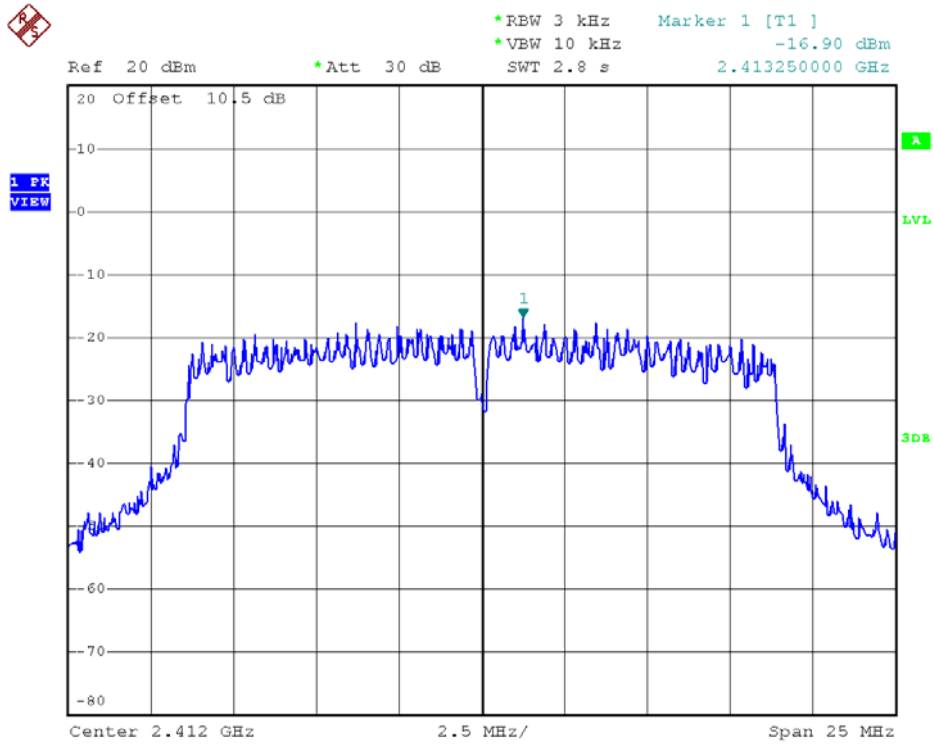
802.11g - Channel 1



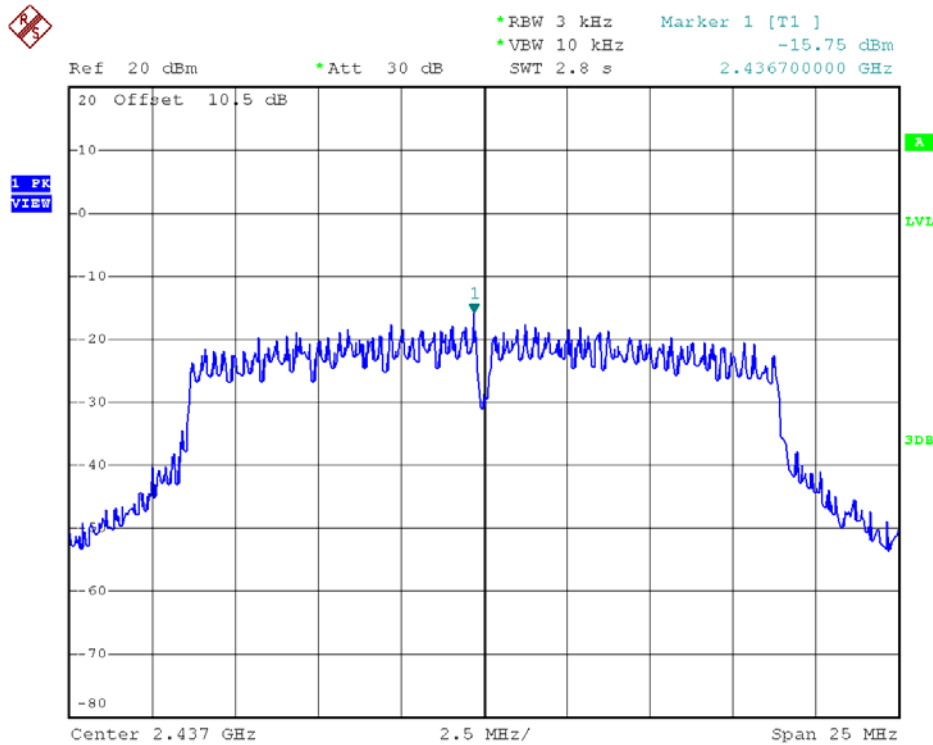
802.11g - Channel 6



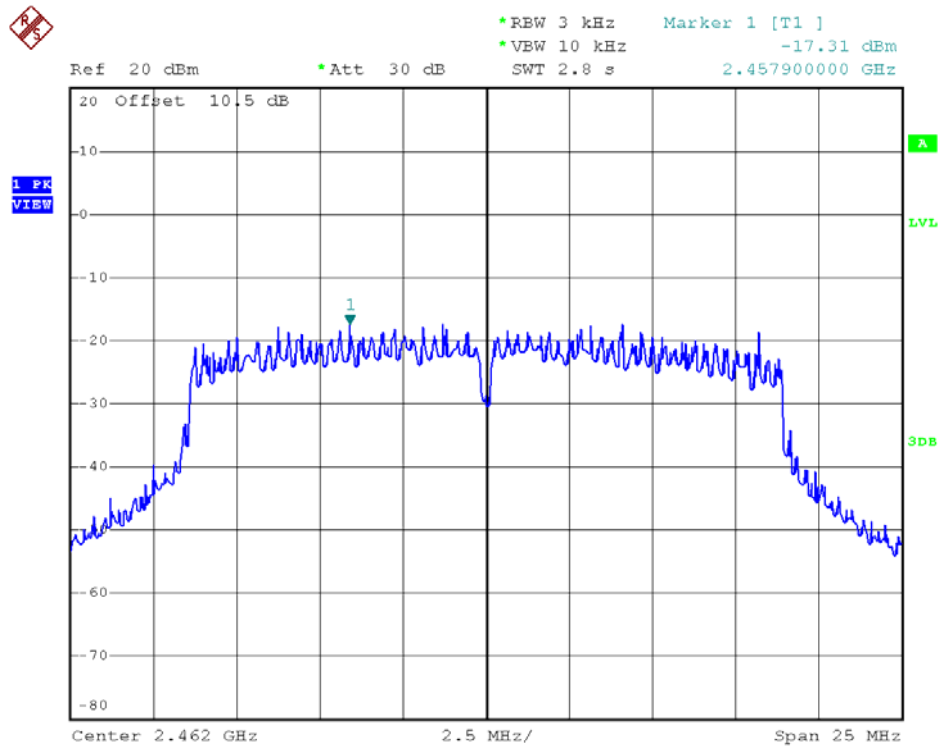
802.11g - Channel 11



802.11n20 - Channel 1



802.11n20 - Channel 6



802.11n20 - Channel 11

2.5. Conducted Emission

2.5.1. Limit of Conducted Emission

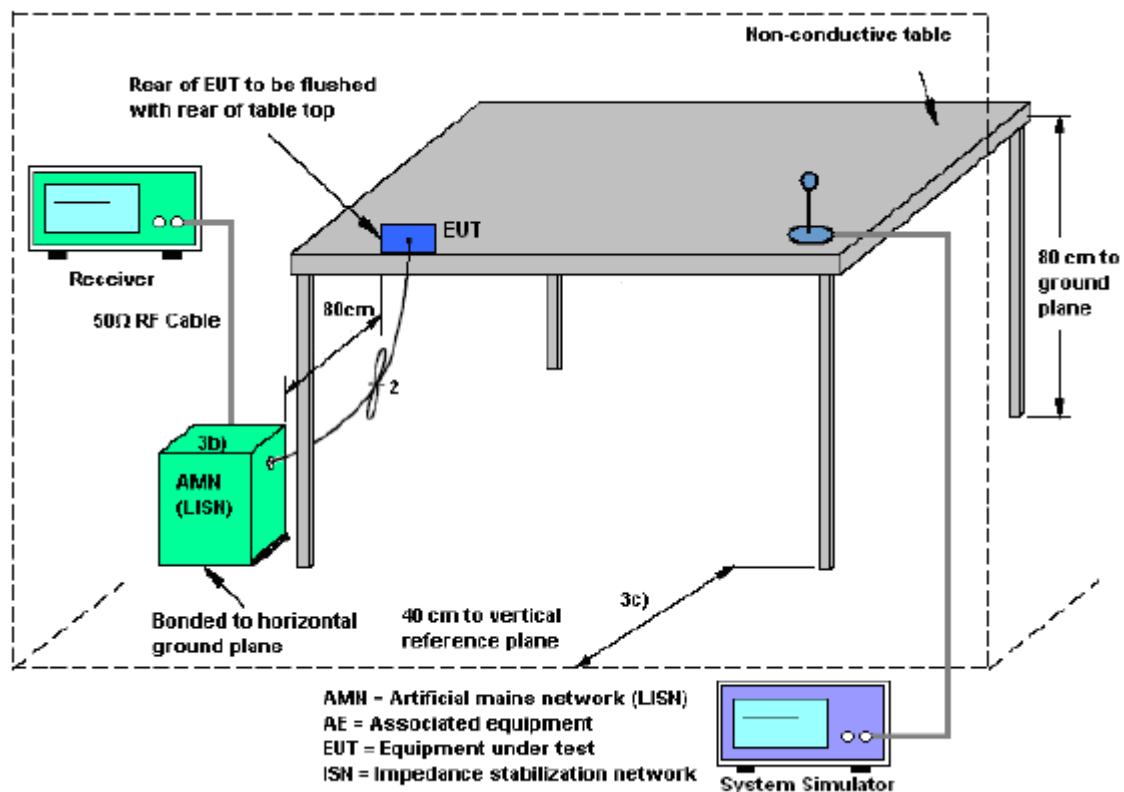
For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

2.5.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.5.3. Test Setup

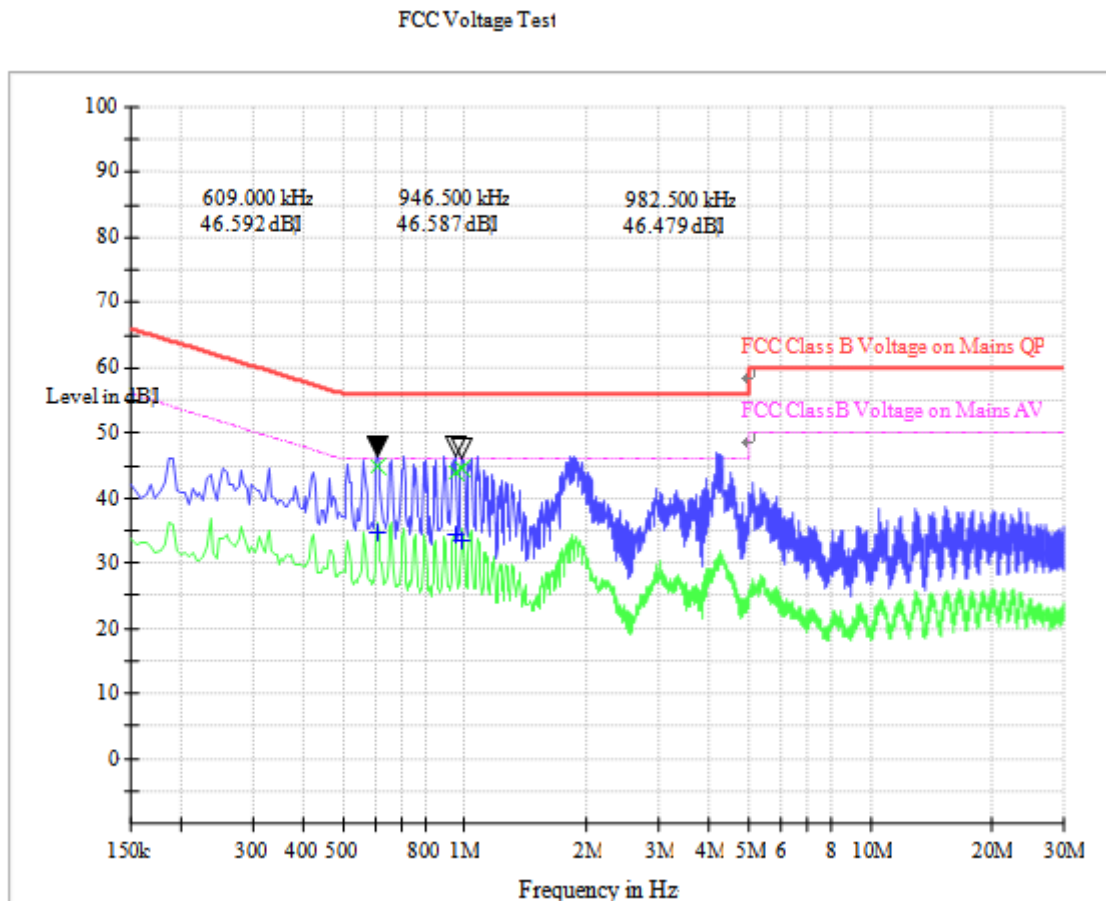


2.5.4. Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

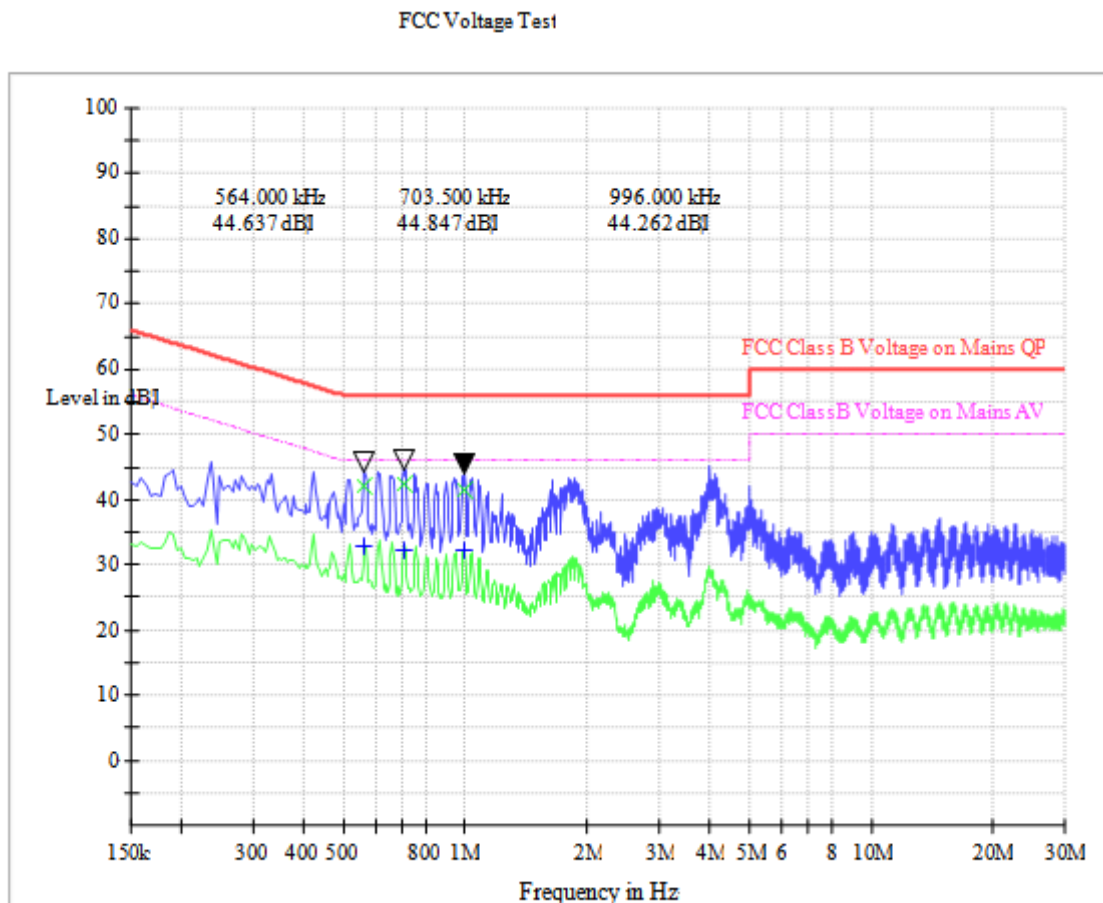
2.5.5. Test Results of Conducted Emission

1. The EUT configuration of the emission tests is WLAN Link + USB Cable (Charging from Adapter).
2. The power adapter support (100~240V AC, 50/60Hz), the EUT was tested at the both available voltages (120, 240V AC), and 60Hz. Only the worst-case mode (120V/60Hz) was record in this report.



(Plot A: L Phase)

Conducted Disturbance at Mains Terminals					
L Test Data					
QP			AV		
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)
0.609000	56.0	46.59	0.609000	46.0	35.65
0.946500	56.0	46.59	0.946500	46.0	34.59
0.982500	56.0	46.48	0.982500	46.0	33.46



(Plot B: N Phase)

Conducted Disturbance at Mains Terminals					
N Test Data					
QP			AV		
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)
0.564000	56.0	44.64	0.564000	46.0	33.70
0.703500	56.0	44.85	0.703500	46.0	33.30
0.996000	56.0	44.26	0.996000	46.0	33.35

Test Result: PASS

2.6. Radiated Band Edge and Spurious Emission

2.6.1. Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Note: Wireless charger configuration was evaluated.

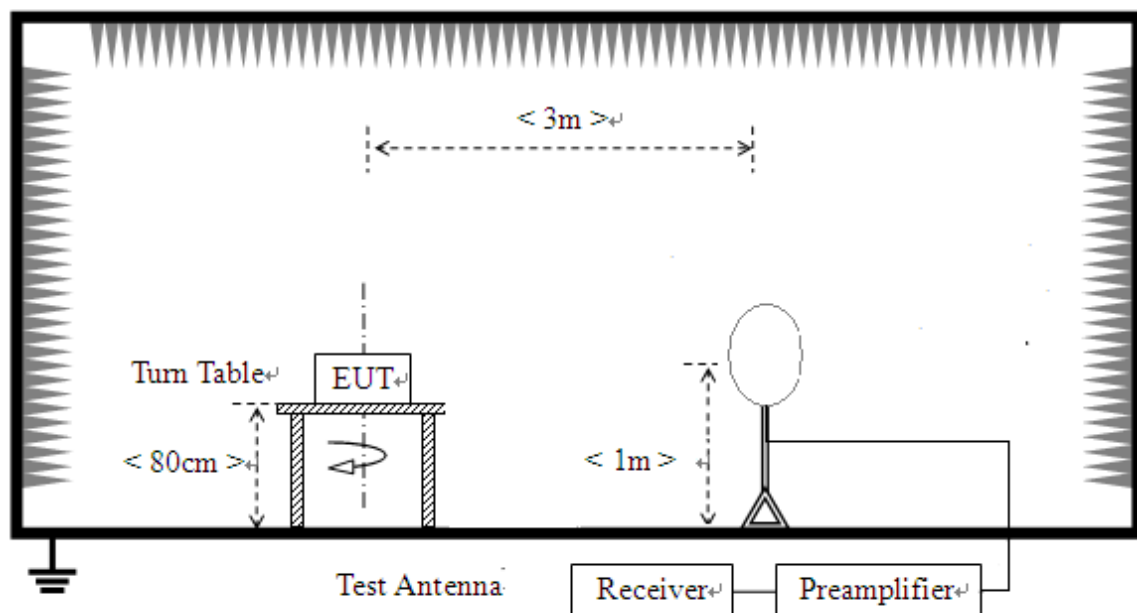
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

2.6.2. Measuring Instruments

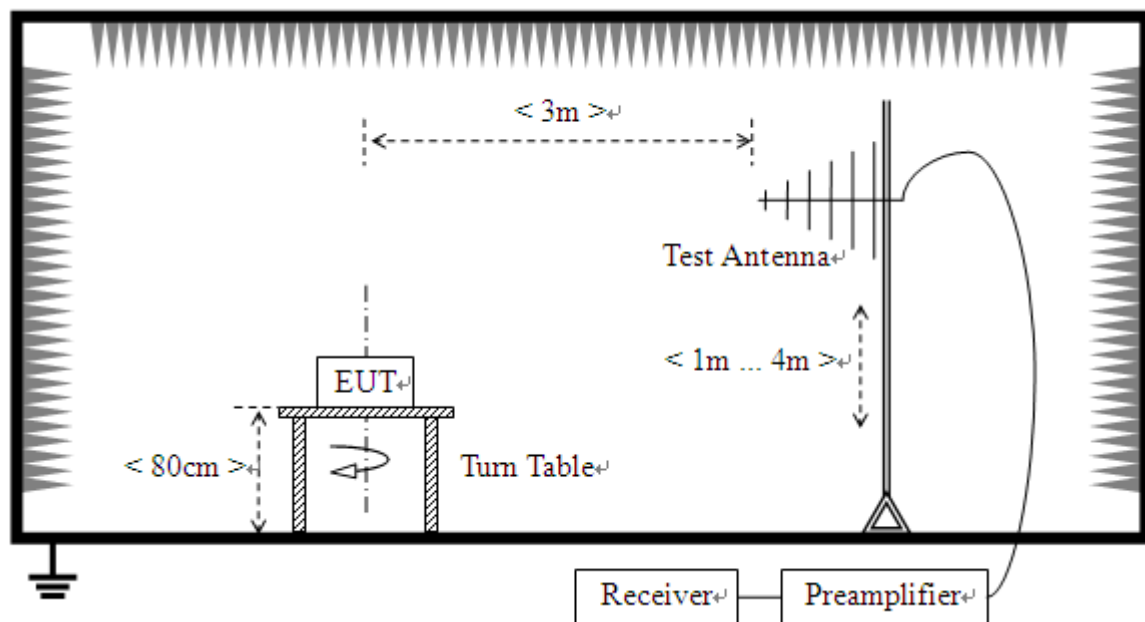
The measuring equipment is listed in the section 3 of this test report.

2.6.3. Test Setup

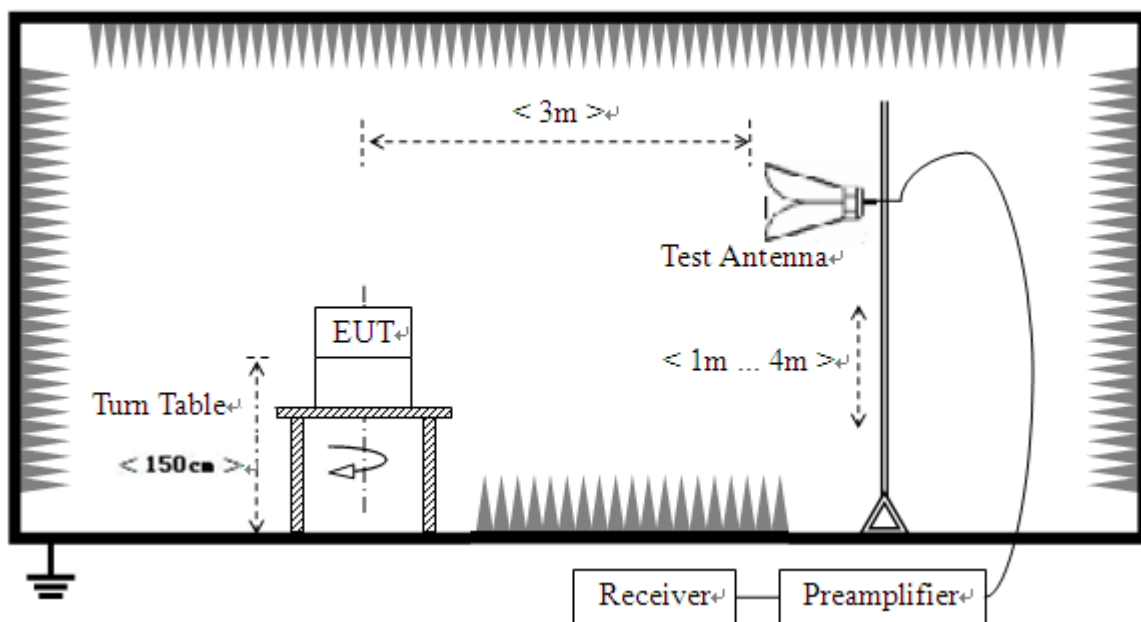
- 1) For radiated emissions from 9kHz to 30MHz



- 2) For radiated emissions from 30MHz to 1GHz



- 3) For radiated emissions above 1GHz



2.6.4. Test Procedures

1. The EUT was placed on the top of a rotating table 0.8/1.5 meters above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. Height of receiving antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

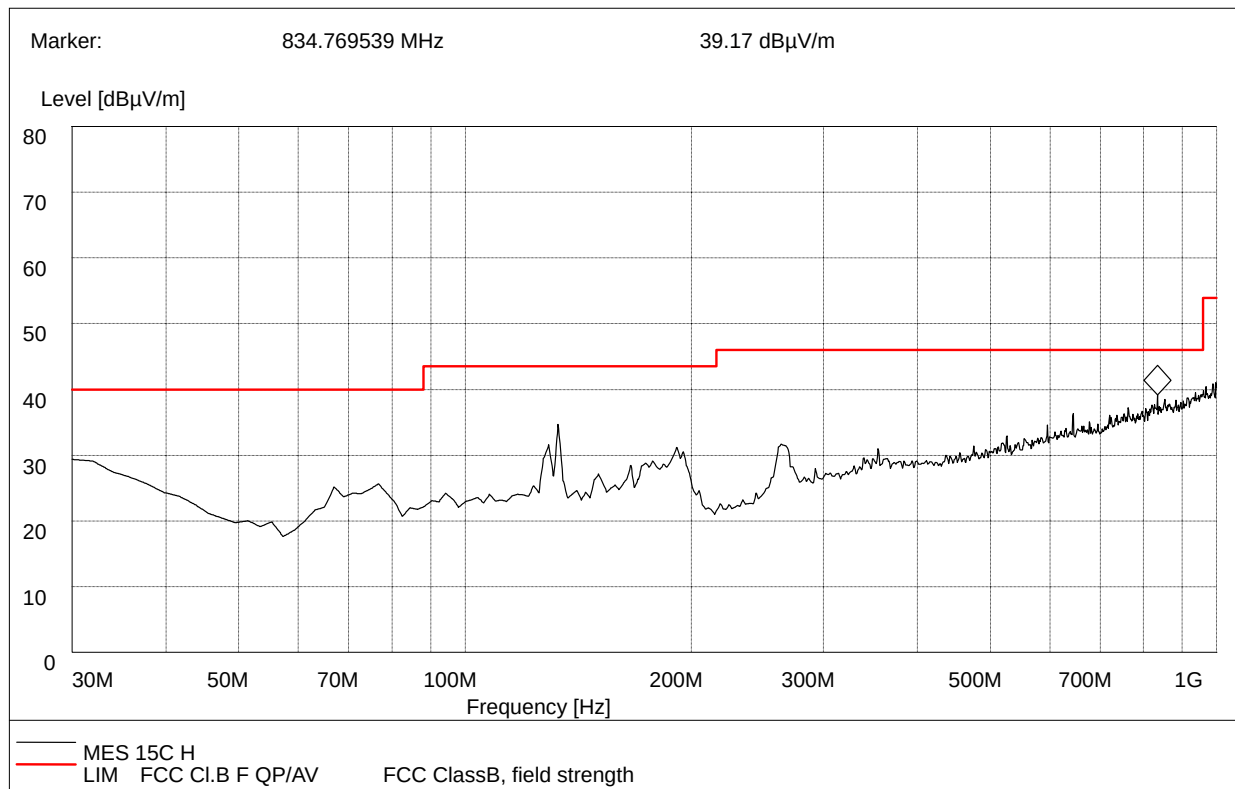
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes (three orthogonal orientations) of operation were investigated and the worst-case emissions are reported.

2.6.5. Test Results of Radiated Band Edge and Spurious Emission

For 9KHz to 30MHz

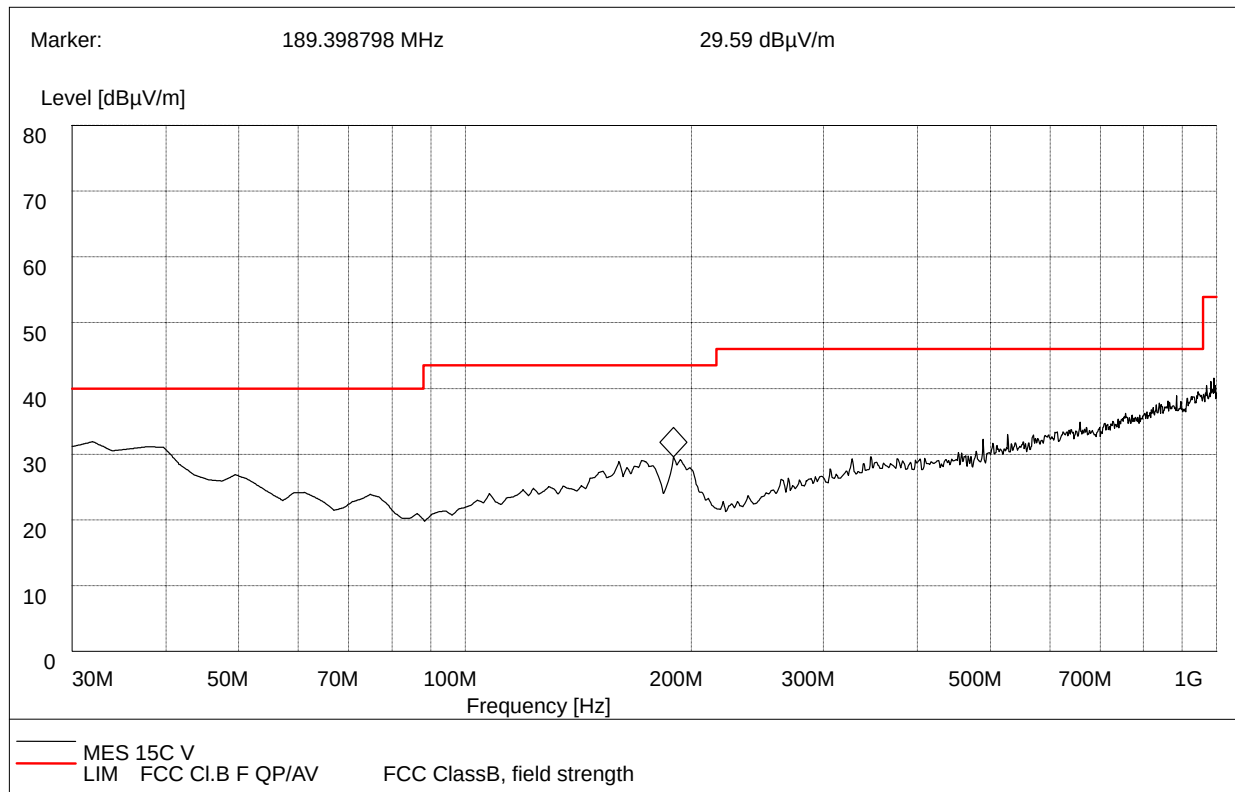
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For 30MHz to 1000 MHz



(Plot A: 30MHz to 1GHz, Antenna Horizontal)

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBμV/m)	Antenna	Verdict
133.7200	33.17	120.000	100.0	43.5	Horizontal	Pass
834.7695	39.17	120.000	100.0	46.0	Horizontal	Pass



(Plot B: 30MHz to 1GHz, Antenna Vertical)

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Antenna	Verdict
32.4900	32.41	120.000	100.0	40.0	Vertical	Pass
189.1500	29.43	120.000	100.0	43.5	Vertical	Pass

For 1GHz to 25 GHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b_2412MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	2390.00	56.40	PK	74.00	-17.60	1.01 H	228	24.20	32.20
2	2390.00	43.60	AV	54.00	-10.40	1.01 H	228	11.40	32.20
3	*2412.00	101.70	PK	/	/	1.03 H	112	69.50	32.20
4	*2412.00	97.70	AV	/	/	1.03 H	112	65.50	32.20
5	4824.00	51.40	PK	74.00	-22.60	1.00 H	254	46.10	5.30
6	4824.00	46.50	AV	54.00	-7.50	1.00 H	254	41.20	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b_2412MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	2390.00	55.4	PK	74.00	-18.6	1.11 V	228	23.20	32.20
2	2390.00	44.3	AV	54.00	-9.7	1.11 V	228	12.10	32.20
3	*2412.00	114.7	PK	/	/	1.09 V	112	82.50	32.20
4	*2412.00	112.9	AV	/	/	1.03 V	112	80.70	32.20
5	4824.00	54.4	PK	74.00	-19.6	1.21 V	254	49.10	5.30
6	4824.00	43.5	AV	54.00	-10.5	1.21 V	254	38.20	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b_2437MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2437.00	107.7	PK	/	/	1.01 H	210	75.50	32.20
2	*2437.00	106.4	AV	/	/	1.01 H	210	74.20	32.20
3	4874.00	54.2	PK	74.00	-19.8	1.03 H	272	48.90	5.30
4	4874.00	44.0	AV	54.00	-10.0	1.03 H	272	38.70	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b_2437MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2437.00	109.00	PK	/	/	1.09 V	112	76.80	32.20
2	*2437.00	105.30	AV	/	/	1.09 V	112	73.10	32.20
3	4874.00	56.80	PK	74.00	-17.20	1.21 V	254	51.50	5.30
4	4874.00	46.50	AV	54.00	-7.50	1.21 V	254	41.20	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b_2462MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2462.00	107.7	PK	/	/	1.05 H	215	75.40	32.30
2	*2462.00	105.5	AV	/	/	1.05 H	215	73.20	32.30
3	2483.50	56.8	PK	74.00	-17.2	1.05 H	211	24.40	32.40
4	2483.50	44.5	AV	54.00	-9.5	1.05 H	211	12.10	32.40
5	4924.00	52.1	PK	74.00	-21.9	1.45 H	320	46.60	5.50
6	4924.00	46.3	AV	54.00	-7.7	1.45 H	320	40.80	5.50

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b_2462MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2462.00	114.5	PK	/	/	1.05 V	174	82.20	32.30
2	*2462.00	113.8	AV	/	/	1.05 V	174	81.50	32.30
3	2483.50	57.5	PK	74.00	-16.5	1.05 V	177	25.10	32.40
4	2483.50	44.7	AV	54.00	-9.3	1.05 V	177	12.30	32.40
5	4924.00	54.9	PK	74.00	-19.1	1.45 V	201	49.40	5.50
6	4924.00	45.6	AV	54.00	-8.4	1.45 V	201	40.10	5.50

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11g_2412MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	2390.00	56.3	PK	74.0	-17.7	1.01 H	228	24.10	32.20
2	2390.00	43.4	AV	54.0	-10.6	1.01 H	228	11.20	32.20
3	*2412.00	102.1	PK	/	/	1.03 H	112	69.90	32.20
4	*2412.00	97.6	AV	/	/	1.03 H	112	65.40	32.20
5	4824.00	51.7	PK	74.00	-22.3	1.00 H	254	46.40	5.30
6	4824.00	48.5	AV	54.00	-5.5	1.00 H	254	43.20	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11g_2412MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	2390.00	56.1	PK	74.0	-17.9	1.11 V	228	23.90	32.20
2	2390.00	43.4	AV	54.0	-10.6	1.11 V	228	11.20	32.20
3	*2412.00	116.9	PK	/	/	1.09 V	112	84.70	32.20
4	*2412.00	113.6	AV	/	/	1.03 V	112	81.40	32.20
5	4824.00	54.4	PK	74.00	-19.6	1.21 V	254	49.10	5.30
6	4824.00	44.7	AV	54.00	-9.3	1.21 V	254	39.40	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11g_2437MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2437.00	108.0	PK	/	/	1.01 H	210	75.80	32.20
2	*2437.00	105.6	AV	/	/	1.01 H	210	73.40	32.20
3	4874.00	53.4	PK	74.00	-20.6	1.03 H	272	48.10	5.30
4	4874.00	44.0	AV	54.00	-10.0	1.03 H	272	38.70	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11g_2437MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2437.00	108.3	PK	/	/	1.09 V	112	76.10	32.20
2	*2437.00	107.7	AV	/	/	1.09 V	112	75.50	32.20
3	4874.00	56.8	PK	74.00	-17.2	1.21 V	254	51.50	5.30
4	4874.00	44.5	AV	54.00	-9.5	1.21 V	254	39.20	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11g_2462MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2462.00	109.7	PK	/	/	1.05 H	215	77.40	32.30
2	*2462.00	107.9	AV	/	/	1.05 H	215	75.60	32.30
3	2483.50	57.3	PK	74.0	-16.7	1.05 H	211	24.90	32.40
4	2483.50	44.2	AV	54.0	-9.8	1.05 H	211	11.80	32.40
5	4924.00	52.4	PK	74.0	-21.6	1.45 H	320	46.90	5.50
6	4924.00	44.2	AV	54.0	-9.8	1.45 H	320	38.70	5.50

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11g_2462MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2462.00	120.6	PK	/	/	1.05 V	174	88.30	32.30
2	*2462.00	116.8	AV	/	/	1.05 V	174	84.50	32.30
3	2483.50	55.5	PK	74.0	-18.5	1.05 V	177	23.10	32.40
4	2483.50	44.7	AV	54.0	-9.3	1.05 V	177	12.30	32.40
5	4924.00	53.9	PK	74.0	-20.1	1.45 V	201	48.40	5.50
6	4924.00	45.9	AV	54.0	-8.1	1.45 V	201	40.40	5.50

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_2412MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	2390.00	59.3	PK	74.0	-14.7	1.01 H	228	27.10	32.20
2	2390.00	42.7	AV	54.0	-11.3	1.01 H	228	10.50	32.20
3	*2412.00	104.4	PK	/	/	1.03 H	112	72.20	32.20
4	*2412.00	102.0	AV	/	/	1.03 H	112	69.80	32.20
5	4824.00	54.8	PK	74.00	-19.2	1.00 H	254	49.50	5.30
6	4824.00	46.6	AV	54.00	-7.4	1.00 H	254	41.30	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_2412MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	2390.00	57.7	PK	74.0	-16.3	1.11 V	228	25.50	32.20
2	2390.00	43.7	AV	54.0	-10.3	1.11 V	228	11.50	32.20
3	*2412.00	117.1	PK	/	/	1.09 V	112	84.90	32.20
4	*2412.00	115	AV	/	/	1.03 V	112	82.80	32.20
5	4824.00	54.4	PK	74.00	-19.6	1.21 V	254	49.10	5.30
6	4824.00	44.9	AV	54.00	-9.1	1.21 V	254	39.60	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_2437MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2437.00	114.3	PK	/	/	1.01 H	210	82.10	32.20
2	*2437.00	114.1	AV	/	/	1.01 H	210	81.90	32.20
3	4874.00	57.8	PK	74.00	-16.2	1.03 H	272	52.50	5.30
4	4874.00	45.2	AV	54.00	-8.8	1.03 H	272	39.90	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_2437MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2437.00	114.0	PK	/	/	1.09 V	112	81.80	32.20
2	*2437.00	115.3	AV	/	/	1.09 V	112	83.10	32.20
3	4874.00	56.8	PK	74.00	-17.2	1.21 V	254	51.50	5.30
4	4874.00	45.5	AV	54.00	-8.5	1.21 V	254	40.20	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_2462MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2462.00	111.2	PK	/	/	1.05 H	215	78.90	32.30
2	*2462.00	109.9	AV	/	/	1.05 H	215	77.60	32.30
3	2483.50	56.3	PK	74.0	-17.7	1.05 H	211	23.90	32.40
4	2483.50	44.1	AV	54.0	-9.9	1.05 H	211	11.70	32.40
5	4924.00	53.4	PK	74.0	-20.6	1.45 H	320	47.90	5.50
6	4924.00	46.3	AV	54.0	-7.7	1.45 H	320	40.80	5.50

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_2462MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	*2462.00	110.5	PK	/	/	1.05 V	174	78.20	32.30
2	*2462.00	107.8	AV	/	/	1.05 V	174	75.50	32.30
3	2483.50	55.5	PK	74.0	-18.5	1.05 V	177	23.10	32.40
4	2483.50	44.7	AV	54.0	-9.3	1.05 V	177	12.30	32.40
5	4924.00	55.9	PK	74.0	-18.1	1.45 V	201	50.40	5.50
6	4924.00	46.4	AV	54.0	-7.6	1.45 V	201	40.90	5.50

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
- Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level - Limit value
5. " * ": Fundamental frequency.

3. List of measuring equipment

Description	Manufacturer	Model	Serial No.	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESIB26	A0304218	2015.06.02	2016.06.01	Radiation
Full-Anechoic Chamber	Albatross	12.8m*6.8m *6.4m	A0412372	2015.06.02	2016.06.01	Radiation
Loop Antenna	Schwarz beck	HFH2-Z2	100047	2015.06.02	2016.06.01	Radiation
Bilog Antenna	Schwarzbeck	VULB 9163	9163-274	2015.06.02	2016.06.01	Radiation
Double ridge horn antenna	R&S	HF906	100150	2015.06.02	2016.06.01	Radiation
Ultra-wideband antenna	R&S	HL562	100089	2015.06.02	2016.06.01	Radiation
Test Antenna – Horn (18-26.5GHz)	ETS	3160-09	A0902607	2015.06.02	2016.06.01	Radiation
Amplifier 20M~3GHz	R&S	PAP-0203H	22018	2015.06.02	2016.06.01	Radiation
Ampilier 1G~18GHz	R&S	MITEQ AFS42-0010 1800	25-S-42	2015.06.02	2016.06.01	Radiation
Ampilier 18G~40GHz	R&S	JS42-180026 00-28-5A	12111.0980.00	2015.06.02	2016.06.01	Radiation
Spectrum Analyzer	R&S	FSP40	1164.4391.40	2015.07.07	2016.07.06	Conducted
Power Meter	R&S	NRP2	1020.1809.02	2015.06.02	2016.06.01	Conducted
Power Sensor	R&S	NRP-Z81	823.3618.03	2015.06.02	2016.06.01	Conducted
LISN	ROHDE&SC HWARZ	ESH2-Z5	A0304221	2015.06.02	2016.06.01	Conducted
Test Receiver	R&S	ESCS30	A0304260	2015.06.02	2016.06.01	Conducted
Cable	SUNHNER	SUCOFLEX 100	/	2015.06.02	2016.06.01	Radiation
Cable	SUNHNER	SUCOFLEX 104	/	2015.06.02	2016.06.01	Radiation

4. Uncertainty of Evaluation

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz~30MHz	2.35dB
Radiated emissions	30MHz~1000MHz	2.45dB
	1G~18GHz	2.21dB
	18G~40GHz	1.96dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

**** END OF REPORT ****