Test Report

Date : 2018-11-13
No. : HMD18070006

Applicant	:	Huizhou Qing Teng Electron Technology Co., Ltd. He-Bei Village, Lilin Town, Zhongkai Hi-tech Development Zone, Huizhou City, Guangdong, China
Supplier / Manufacturer	:	Huizhou Qing Teng Electron Technology Co., Ltd. He-Bei Village, Lilin Town, Zhongkai Hi-tech Development Zone, Huizhou City, Guangdong, China
Description of Sample(s)	:	Submitted sample(s) said to be Product: Doorbell IP Video Camera Brand Name: MIKONA Model No.: WVD-01 FCC ID: 2AAWNWVD01BELL
Date Samples Received	:	2018-06-25
Date Tested	:	2018-06-30 to 2018-11-10
Investigation Requested	:	Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 and ANSI C63.10:2013 for FCC Certification.
Conclusions	:	The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.
Remarks	:	WIFI (802.11b, 802.11g, 802.11n20, 802.11n40)

CHEUNG Chi, Kenneth
Authorized Signatory

Test Report

CONTENT:

1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
Head Office: 10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong
Telephone: 852 2666 1888
Fax: 852 2664 4353

1.2 Equipment Under Test [EUT]

Description of Sample(s)

Product:	Doorbell IP Video Camera
Manufacturer:	Huizhou Qing Teng Electron Technology Co., Ltd. He-Bei Village, Lilin Town, Zhongkai Hi-tech Development Zone, Huizhou City, Guangdong, China
Brand Name:	MIKONA
Model Number:	WVD-01
Rating:	5Vd.c. by USB port/ 3.7Vd.c.(18650 battery*2)

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a Doorbell IP Video Camera. The transmission signal is digital modulated with channel frequency range 2412-2462MHz.

1.3 Date of Order

2018-06-25

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2018-06-30 to 2018-07-27

1.6 Country of Origin

China

2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 Regulations and ANSI C63.10:2013 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Output Power of Fundamental Emissions	FCC 47CFR 15.247(b)(3)	ANSI C63.10:2013	N/A	☒	☐	☐
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.10:2013	N/A	☒	☐	☐
Conducted Emissions	FCC 47CFR 15.207	ANSI C63.10:2013	N/A	☒	☐	☐
Power Spectral Density	FCC 47CFR 15.247(e)	N/A	N/A	☒	☐	☐
6dB Bandwidth	FCC 47CFR 15.247(a)(2)	N/A	N/A	☒	☐	☐
Band Edge Emissions	FCC 47CFR 15.247(d)	N/A	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	☒	☐	☐

Note: N/A - Not Applicable

3.0 Test Results

3.1 Emission

3.1.1 Maximum Peak Output Power

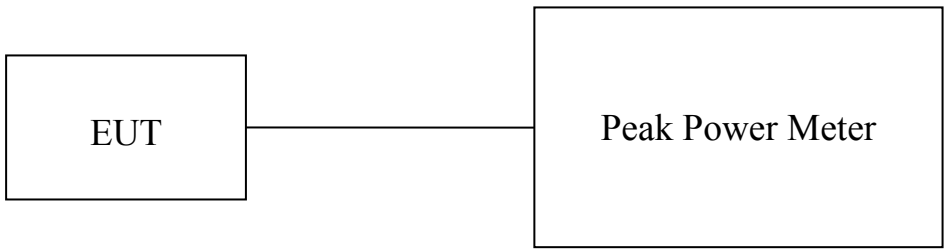
Test Requirement:	FCC 47CFR 15.247(b)(3)
Test Method:	N/A
Test Date:	2018-07-25
Mode of Operation:	Wifi mode

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The RF output of the EUT was connected to the peak power meter. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in Watt.

Test Setup:



Note: a temporary antenna connector was soldered to the RF output.

Limits for Peak Output Power of Fundamental & Harmonics Emissions [FCC 47CFR 15.247]:

For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt (30dBm)

Results of WiFi mode 802.11 b, (2412MHz to 2462MHz) : Pass (TX Unit)
Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
Low	2412	0.093778
Middle	2437	0.100995
High	2462	0.118987

Results of WiFi mode 802.11 g, (2412MHz to 2462MHz) : Pass (TX Unit)
Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
Low	2412	0.090887
Middle	2437	0.099449
High	2462	0.109977

Results of WiFi mode 802.11 n20, (2412MHz to 2462MHz) : Pass (TX Unit)
Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
Low	2412	0.070323
Middle	2437	0.077304
High	2462	0.088695

Results of WiFi mode 802.11 n40, (2422MHz to 2452MHz) : Pass (TX Unit)
Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
Low	2422	0.063009
Middle	2437	0.062907
High	2452	0.066896

Calculated measurement uncertainty : 30MHz to 1GHz 1.7dB
1GHz to 26GHz 1.7dB

3.1.2 Radiated Emissions

Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.10:2013
Test Date:	2018-07-26, 2018-11-10
Mode of Operation:	Tx mode / Wifi mode

Ambient Temperature: 24℃ Relative Humidity: 52% Atmospheric Pressure: 101 kPa

Test Method:

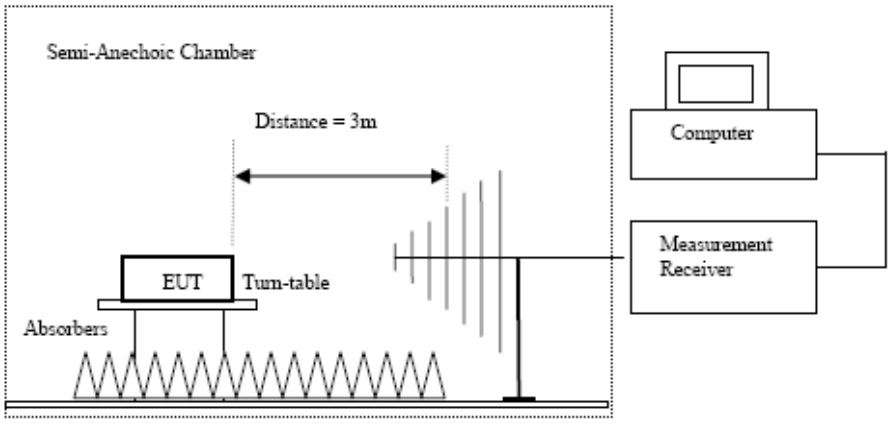
For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

* Semi-Anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd. with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)	RBW:	10kHz
	VBW:	30kHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
30MHz – 1GHz (QP)	RBW:	120kHz
	VBW:	120kHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
Above 1GHz (Pk)	RBW:	1MHz
	VBW:	1MHz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold
Above 1GHz (Av)	RBW:	1MHz
	VBW:	10Hz
	Sweep:	Auto
	Span:	Fully capture the emissions being measured
	Trace:	Max. hold

Test Setup:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

Limits for Radiated Emissions FCC 47 CFR 15.247]:

Frequency Range	Quasi-Peak Limits
[MHz]	[μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of Tx mode (2412.0 MHz) (802.11b) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2412.0 MHz) (802.11b) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dB	E-Field Polarity
4824.0	14.7	41.5	56.2	74.0	17.8	Vertical
4824.0	13.3	42.4	55.7	74.0	18.3	Horizontal
7236.0	10.3	45.1	55.4	74.0	18.6	Vertical
7236.0	8.8	46.2	55.0	74.0	19.0	Horizontal
9648.0	7.5	48	55.5	74.0	18.5	Vertical
9648.0	5.4	48.8	54.2	74.0	19.8	Horizontal
12060.0	3.7	51.5	55.2	74.0	18.8	Vertical
12060.0	2.6	52.4	55.0	74.0	19.0	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4824.0	2.5	41.5	44.0	54.0	10.0	Vertical
4824.0	-0.1	42.4	42.3	54.0	11.7	Horizontal
7236.0	-3.0	45.1	42.1	54.0	11.9	Vertical
7236.0	-4.9	46.2	41.3	54.0	12.7	Horizontal
9648.0	-6.4	48	41.6	54.0	12.4	Vertical
9648.0	-7.6	48.8	41.2	54.0	12.8	Horizontal
12060.0	-10.0	51.5	41.5	54.0	12.5	Vertical
12060.0	-9.8	52.4	42.6	54.0	11.4	Horizontal

Result of Wifi mode (2437.0 MHz) (802.11b) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2437.0 MHz) (802.11b) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4874.0	15.0	41.6	56.6	74.0	17.4	Vertical
4874.0	13.9	42.5	56.4	74.0	17.6	Horizontal
7311.0	10.3	45.2	55.5	74.0	18.5	Vertical
7311.0	9.0	46.3	55.3	74.0	18.7	Horizontal
9748.0	7.3	48.1	55.4	74.0	18.6	Vertical
9748.0	7.2	48.9	56.1	74.0	17.9	Horizontal
12185.0	3.4	51.6	55.0	74.0	19.0	Vertical
12185.0	2.6	52.5	55.1	74.0	18.9	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4874.0	0.4	41.6	42.0	54.0	12.0	Vertical
4874.0	0.2	42.5	42.7	54.0	11.3	Horizontal
7311.0	-3.1	45.2	42.1	54.0	11.9	Vertical
7311.0	-3.8	46.3	42.5	54.0	11.5	Horizontal
9748.0	-6.5	48.1	41.6	54.0	12.4	Vertical
9748.0	-6.4	48.9	42.5	54.0	11.5	Horizontal
12185.0	-9.9	51.6	41.7	54.0	12.3	Vertical
12185.0	-10.2	52.5	42.3	54.0	11.7	Horizontal

Result of Wifi mode (2462.0 MHz) (802.11b) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2462.0 MHz) (802.11b) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4924.0	14.8	41.4	56.2	74.0	17.8	Vertical
4924.0	12.4	42.7	55.1	74.0	18.9	Horizontal
7386.0	8.4	45.6	54.0	74.0	20.0	Vertical
7386.0	8.1	46.5	54.6	74.0	19.4	Horizontal
9848.0	6.9	48.6	55.5	74.0	18.5	Vertical
9848.0	4.9	49.7	54.6	74.0	19.4	Horizontal
12310.0	3.3	51.7	55.0	74.0	19.0	Vertical
12310.0	3.0	52.7	55.7	74.0	18.3	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4924.0	1.1	41.4	42.5	54.0	11.5	Vertical
4924.0	-0.4	42.7	42.3	54.0	11.7	Horizontal
7386.0	-4.0	45.6	41.6	54.0	12.4	Vertical
7386.0	-5.1	46.5	41.4	54.0	12.6	Horizontal
9848.0	-6.5	48.6	42.1	54.0	11.9	Vertical
9848.0	-8.0	49.7	41.7	54.0	12.3	Horizontal
12310.0	-10.3	51.7	41.4	54.0	12.6	Vertical
12310.0	-11.4	52.7	41.3	54.0	12.7	Horizontal

Result of Wifi mode (2412.0 MHz) (802.11g) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2412.0 MHz) (802.11g) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4824.0	14.5	41.5	56.0	74.0	18.0	Vertical
4824.0	13.0	42.4	55.4	74.0	18.6	Horizontal
7236.0	11.0	45.1	56.1	74.0	17.9	Vertical
7236.0	8.3	46.2	54.5	74.0	19.5	Horizontal
9648.0	8.1	48	56.1	74.0	17.9	Vertical
9648.0	5.8	48.8	54.6	74.0	19.4	Horizontal
12060.0	3.5	51.5	55.0	74.0	19.0	Vertical
12060.0	2.9	52.4	55.3	74.0	18.7	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4824.0	0.6	41.5	42.1	54.0	11.9	Vertical
4824.0	-1.2	42.4	41.2	54.0	12.8	Horizontal
7236.0	-2.7	45.1	42.4	54.0	11.6	Vertical
7236.0	-4.2	46.2	42.0	54.0	12.0	Horizontal
9648.0	-6.9	48	41.1	54.0	12.9	Vertical
9648.0	-7.5	48.8	41.3	54.0	12.7	Horizontal
12060.0	-9.3	51.5	42.2	54.0	11.8	Vertical
12060.0	-9.7	52.4	42.7	54.0	11.3	Horizontal

Result of Wifi mode (2437.0 MHz) (802.11g) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2437.0 MHz) (802.11g) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4874.0	14.3	41.6	55.9	74.0	18.1	Vertical
4874.0	13.1	42.5	55.6	74.0	18.4	Horizontal
7311.0	10.0	45.2	55.2	74.0	18.8	Vertical
7311.0	9.0	46.3	55.3	74.0	18.7	Horizontal
9748.0	7.4	48.1	55.5	74.0	18.5	Vertical
9748.0	6.1	48.9	55.0	74.0	19.0	Horizontal
12185.0	3.7	51.6	55.3	74.0	18.7	Vertical
12185.0	3.9	52.5	56.4	74.0	17.6	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4874.0	-0.6	41.6	41.0	54.0	13.0	Vertical
4874.0	-1.1	42.5	41.4	54.0	12.6	Horizontal
7311.0	-3.1	45.2	42.1	54.0	11.9	Vertical
7311.0	-4.8	46.3	41.5	54.0	12.5	Horizontal
9748.0	-6.3	48.1	41.8	54.0	12.2	Vertical
9748.0	-6.7	48.9	42.2	54.0	11.8	Horizontal
12185.0	-9.9	51.6	41.7	54.0	12.3	Vertical
12185.0	-10.0	52.5	42.5	54.0	11.5	Horizontal

Result of Wifi mode (2462.0 MHz) (802.11g) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2462.0 MHz) (802.11g) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4924.0	14.8	41.4	56.2	74.0	17.8	Vertical
4924.0	13.1	42.7	55.8	74.0	18.2	Horizontal
7386.0	9.4	45.6	55.0	74.0	19.0	Vertical
7386.0	7.6	46.5	54.1	74.0	19.9	Horizontal
9848.0	7.6	48.6	56.2	74.0	17.8	Vertical
9848.0	5.8	49.7	55.5	74.0	18.5	Horizontal
12310.0	4.0	51.7	55.7	74.0	18.3	Vertical
12310.0	2.5	52.7	55.2	74.0	18.8	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4924.0	1.0	41.4	42.4	54.0	11.6	Vertical
4924.0	-0.6	42.7	42.1	54.0	11.9	Horizontal
7386.0	-4.0	45.6	41.6	54.0	12.4	Vertical
7386.0	-5.1	46.5	41.4	54.0	12.6	Horizontal
9848.0	-6.5	48.6	42.1	54.0	11.9	Vertical
9848.0	-8.4	49.7	41.3	54.0	12.7	Horizontal
12310.0	-9.7	51.7	42.0	54.0	12.0	Vertical
12310.0	-11.1	52.7	41.6	54.0	12.4	Horizontal

Result of Wifi mode (2412.0 MHz) (802.11n20) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2412.0 MHz) (802.11n20) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4824.0	15.1	41.5	56.6	74.0	17.4	Vertical
4824.0	13.1	42.4	55.5	74.0	18.5	Horizontal
7236.0	9.9	45.1	55.0	74.0	19.0	Vertical
7236.0	9.1	46.2	55.3	74.0	18.7	Horizontal
9648.0	8.1	48	56.1	74.0	17.9	Vertical
9648.0	5.9	48.8	54.7	74.0	19.3	Horizontal
12060.0	5.0	51.5	56.5	74.0	17.5	Vertical
12060.0	2.6	52.4	55.0	74.0	19.0	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4824.0	-0.1	41.5	41.4	54.0	12.6	Vertical
4824.0	-0.2	42.4	42.2	54.0	11.8	Horizontal
7236.0	-2.4	45.1	42.7	54.0	11.3	Vertical
7236.0	-4.1	46.2	42.1	54.0	11.9	Horizontal
9648.0	-6.8	48	41.2	54.0	12.8	Vertical
9648.0	-7.5	48.8	41.3	54.0	12.7	Horizontal
12060.0	-9.1	51.5	42.4	54.0	11.6	Vertical
12060.0	-9.7	52.4	42.7	54.0	11.3	Horizontal

Result of Wifi mode (2437.0 MHz) (802.11n20) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2437.0 MHz) (802.11n20) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4874.0	15.5	41.6	57.1	74.0	16.9	Vertical
4874.0	13.7	42.5	56.2	74.0	17.8	Horizontal
7311.0	10.4	45.2	55.6	74.0	18.4	Vertical
7311.0	9.4	46.3	55.7	74.0	18.3	Horizontal
9748.0	7.9	48.1	56.0	74.0	18.0	Vertical
9748.0	7.6	48.9	56.5	74.0	17.5	Horizontal
12185.0	4.0	51.6	55.6	74.0	18.4	Vertical
12185.0	3.7	52.5	56.2	74.0	17.8	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4874.0	0.4	41.6	42.0	54.0	12.0	Vertical
4874.0	-0.3	42.5	42.2	54.0	11.8	Horizontal
7311.0	-3.9	45.2	41.3	54.0	12.7	Vertical
7311.0	-3.8	46.3	42.5	54.0	11.5	Horizontal
9748.0	-5.7	48.1	42.4	54.0	11.6	Vertical
9748.0	-6.8	48.9	42.1	54.0	11.9	Horizontal
12185.0	-10.3	51.6	41.3	54.0	12.7	Vertical
12185.0	-11.1	52.5	41.4	54.0	12.6	Horizontal

Result of Wifi mode (2462.0 MHz) (802.11n20) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2462.0 MHz) (802.11n20) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4924.0	15.0	41.4	56.4	74.0	17.6	Vertical
4924.0	12.4	42.7	55.1	74.0	18.9	Horizontal
7386.0	8.9	45.6	54.5	74.0	19.5	Vertical
7386.0	8.9	46.5	55.4	74.0	18.6	Horizontal
9848.0	7.0	48.6	55.6	74.0	18.4	Vertical
9848.0	4.9	49.7	54.6	74.0	19.4	Horizontal
12310.0	4.0	51.7	55.7	74.0	18.3	Vertical
12310.0	3.0	52.7	55.7	74.0	18.3	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4924.0	2.2	41.4	43.6	54.0	10.4	Vertical
4924.0	-0.5	42.7	42.2	54.0	11.8	Horizontal
7386.0	-4.0	45.6	41.6	54.0	12.4	Vertical
7386.0	-5.3	46.5	41.2	54.0	12.8	Horizontal
9848.0	-6.5	48.6	42.1	54.0	11.9	Vertical
9848.0	-8.4	49.7	41.3	54.0	12.7	Horizontal
12310.0	-10.7	51.7	41.0	54.0	13.0	Vertical
12310.0	-11.2	52.7	41.5	54.0	12.5	Horizontal

Result of Wifi mode (2422.0 MHz) (802.11n40) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2422.0 MHz) (802.11n40) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4844.0	13.5	41.5	55.0	74.0	19.0	Vertical
4844.0	12.2	42.4	54.6	74.0	19.4	Horizontal
7266.0	10.0	45.1	55.1	74.0	18.9	Vertical
7266.0	9.0	46.2	55.2	74.0	18.8	Horizontal
9688.0	7.3	48	55.3	74.0	18.7	Vertical
9688.0	6.1	48.8	54.9	74.0	19.1	Horizontal
12110.0	4.5	51.5	56.0	74.0	18.0	Vertical
12110.0	2.8	52.4	55.2	74.0	18.8	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4844.0	-1.4	41.5	40.1	54.0	13.9	Vertical
4844.0	-3.3	42.4	39.1	54.0	14.9	Horizontal
7266.0	-4.4	45.1	40.7	54.0	13.3	Vertical
7266.0	-5.9	46.2	40.3	54.0	13.7	Horizontal
9688.0	-7.0	48	41.0	54.0	13.0	Vertical
9688.0	-7.7	48.8	41.1	54.0	12.9	Horizontal
12110.0	-9.4	51.5	42.1	54.0	11.9	Vertical
12110.0	-10.9	52.4	41.5	54.0	12.5	Horizontal

Result of Wifi mode (2437.0 MHz) (802.11n40) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2437.0 MHz) (802.11n40) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4874.0	14.2	41.6	55.8	74.0	18.2	Vertical
4874.0	12.7	42.5	55.2	74.0	18.8	Horizontal
7311.0	10.3	45.2	55.5	74.0	18.5	Vertical
7311.0	9.0	46.3	55.3	74.0	18.7	Horizontal
9748.0	7.7	48.1	55.8	74.0	18.2	Vertical
9748.0	7.1	48.9	56.0	74.0	18.0	Horizontal
12185.0	4.3	51.6	55.9	74.0	18.1	Vertical
12185.0	3.6	52.5	56.1	74.0	17.9	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4874.0	-1.6	41.6	40.0	54.0	14.0	Vertical
4874.0	-1.2	42.5	41.3	54.0	12.7	Horizontal
7311.0	-4.4	45.2	40.8	54.0	13.2	Vertical
7311.0	-5.8	46.3	40.5	54.0	13.5	Horizontal
9748.0	-6.1	48.1	42.0	54.0	12.0	Vertical
9748.0	-6.8	48.9	42.1	54.0	11.9	Horizontal
12185.0	-10.2	51.6	41.4	54.0	12.6	Vertical
12185.0	-11.3	52.5	41.2	54.0	12.8	Horizontal

Result of Wifi mode (2452.0 MHz) (802.11n40) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dBµV	Correction Factor dB/m	Field Strength dBµV/m	Field Strength dBµV/m	Limit dBµV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Wifi mode (2452.0 MHz) (802.11n40) (1GHz-25GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
4904.0	14.6	41.4	56.0	74.0	18.0	Vertical
4904.0	12.7	42.7	55.4	74.0	18.6	Horizontal
7356.0	9.3	45.6	54.9	74.0	19.1	Vertical
7356.0	9.2	46.5	55.7	74.0	18.3	Horizontal
9808.0	7.1	48.6	55.7	74.0	18.3	Vertical
9808.0	5.1	49.7	54.8	74.0	19.2	Horizontal
12260.0	4.1	51.7	55.8	74.0	18.2	Vertical
12260.0	2.9	52.7	55.6	74.0	18.4	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4904.0	0.7	41.4	42.1	54.0	11.9	Vertical
4904.0	-1.4	42.7	41.3	54.0	12.7	Horizontal
7356.0	-4.6	45.6	41.0	54.0	13.0	Vertical
7356.0	-5.2	46.5	41.3	54.0	12.7	Horizontal
9808.0	-6.6	48.6	42.0	54.0	12.0	Vertical
9808.0	-8.7	49.7	41.0	54.0	13.0	Horizontal
12260.0	-11.1	51.7	40.6	54.0	13.4	Vertical
12260.0	-11.3	52.7	41.4	54.0	12.6	Horizontal

Remarks:
No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

* Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty (9kHz-30MHz): 2.0dB
(30MHz -1GHz): 4.9dB
(1GHz -26GHz): 4.02dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

Radiated Emissions Measurement:

Limit：

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 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 5.205(c)).

Result： RF Radiated Emissions (Lowest)-802.11b

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	25.8	36.8	62.6	74.0	11.4	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	5.6	36.8	42.4	54.0	11.6	Vertical

Result： RF Radiated Emissions (Highest) -802.11b

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	23.9	36.4	60.3	74.0	13.7	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	3.3	36.4	39.7	54.0	14.3	Horizontal

Result： RF Radiated Emissions (Lowest)-802.11g

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	26.6	36.8	63.4	74.0	10.6	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	6.4	36.8	43.2	54.0	10.8	Vertical

Result： RF Radiated Emissions (Highest) -802.11g

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	23.7	36.4	60.1	74.0	13.9	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	4.0	36.4	40.4	54.0	13.6	Horizontal

Result： RF Radiated Emissions (Lowest)-802.11n20

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	25.5	36.8	62.3	74.0	11.7	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	4.3	36.8	41.1	54.0	12.9	Vertical

Result： RF Radiated Emissions (Highest) -802.11n20

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	23.4	36.4	59.8	74.0	14.2	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	3.2	36.4	39.6	54.0	14.4	Horizontal

Result： RF Radiated Emissions (Lowest)-802.11n40

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	27.1	36.8	63.9	74.0	10.1	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2390.0	5.4	36.8	42.2	54.0	11.8	Vertical

Result： RF Radiated Emissions (Highest) -802.11n40

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	25.0	36.4	61.4	74.0	12.6	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBµV	Correction Factor dB/m	Field Strength dBµV/m	Limit @3m dBµV/m	Margin dB	E-Field Polarity
2483.5	3.3	36.4	39.7	54.0	14.3	Horizontal

Limits for Radiated Emissions FCC 47 CFR 15.247]:

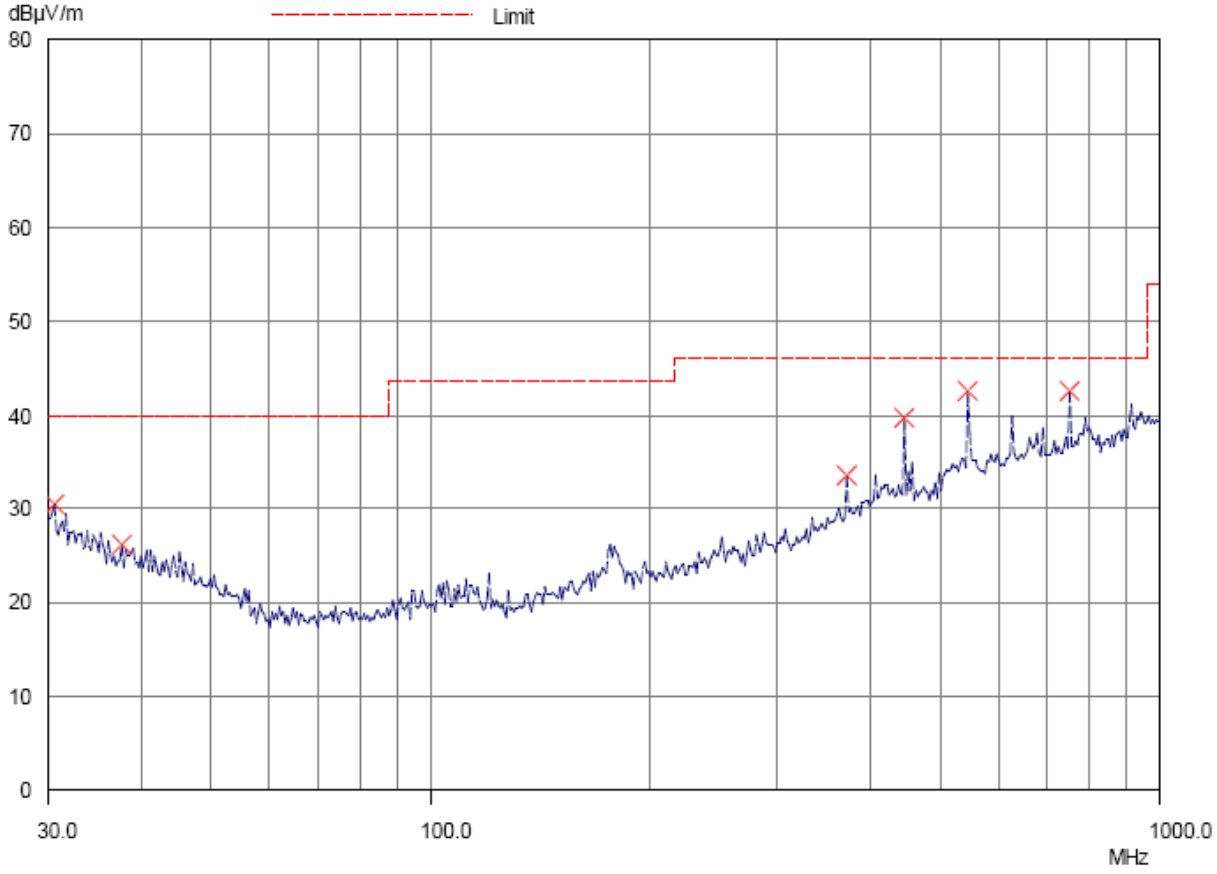
Frequency Range	Quasi-Peak Limits
[MHz]	[μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results of WiFi mode (2412MHz, 802.11b) (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Horizontal



Result of WiFi mode (2412MHz, 802.11b) (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBµV/m	Limit @3m dBµV/m	Level @3m µV/m	Limit @3m µV/m
30.4	Horizontal	30.4	40.0	33.1	100
37.7	Horizontal	26.1	40.0	20.2	100
371.3	Horizontal	33.7	46.0	48.4	200
445.5	Horizontal	39.7	46.0	96.6	200
544.6	Horizontal	42.6	46.0	134.9	200
750.1	Horizontal	42.7	46.0	136.5	200

Limits for Radiated Emissions FCC 47 CFR 15.247 Class B]:

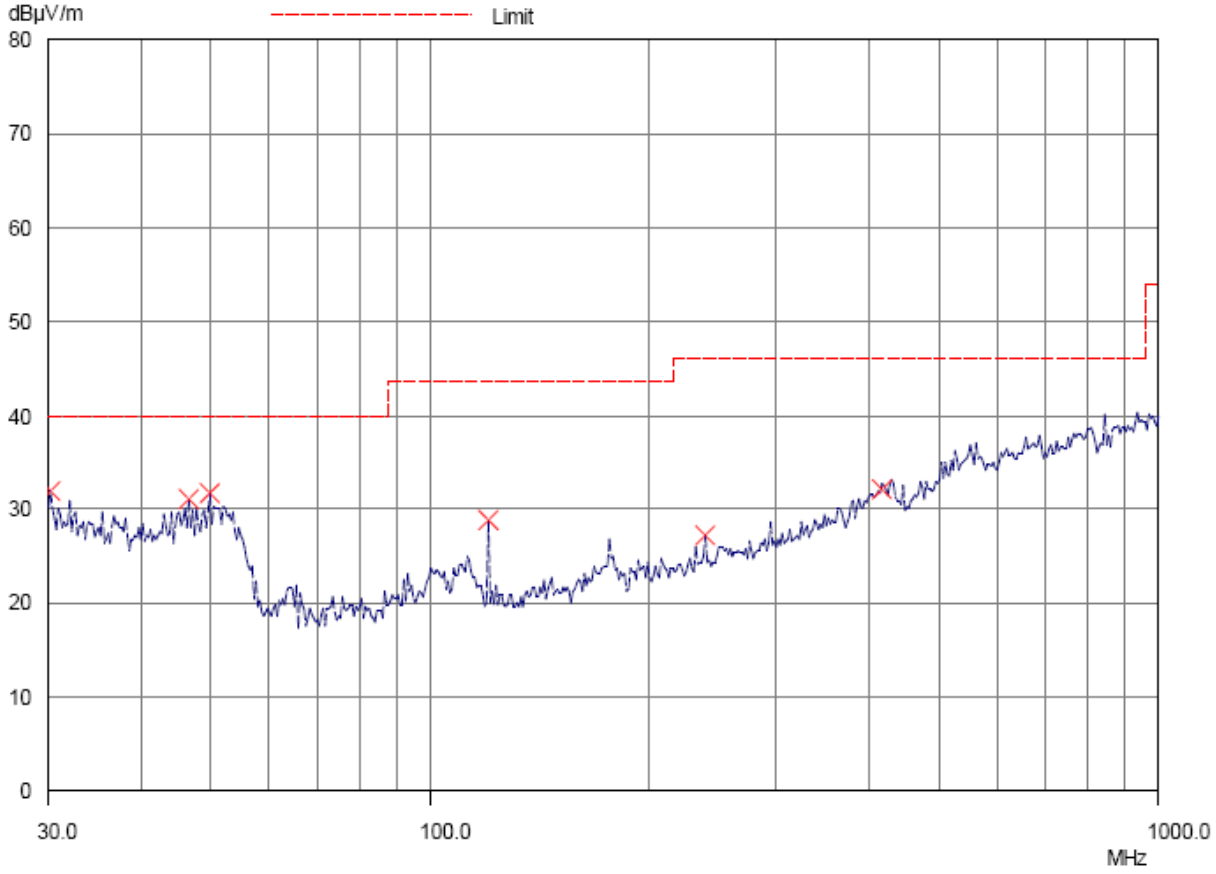
Frequency Range	Quasi-Peak Limits
[MHz]	[μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results of WiFi mode (2412MHz, 802.11b) (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Vertical



Result of WiFi mode (2412MHz, 802.11b) (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBµV/m	Limit @3m dBµV/m	Level @3m µV/m	Limit @3m µV/m
30.1	Vertical	31.9	40.0	39.4	100
46.5	Vertical	31.1	40.0	35.9	100
49.9	Vertical	31.7	40.0	38.5	100
120.0	Vertical	28.9	43.5	27.9	150
237.1	Vertical	27.3	46.0	23.2	200
415.1	Vertical	32.2	46.0	40.7	200

Remarks:
Calculated measurement uncertainty (30MHz – 1GHz): 4.9dB
Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

3.1.3 AC Mains Conducted Emissions (0.15MHz to 30MHz)

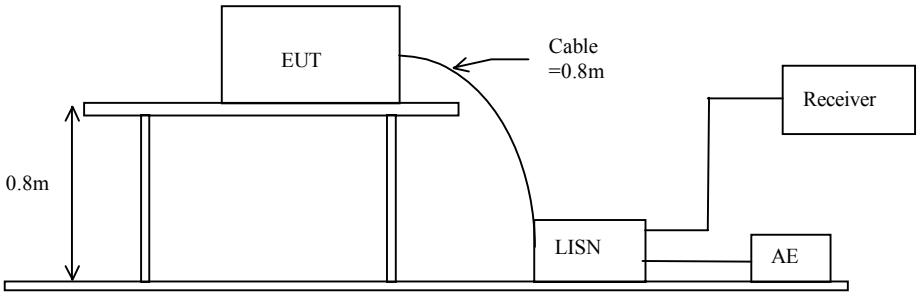
Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.10:2013
Test Date:	2018-06-30
Mode of Operation:	Wifi mode
Test Voltage:	120Va.c. 60Hz

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The test was performed in accordance with ANSI ANSI C63.10:2013, with the following: an initial measurement was performed in peak and average detection mode on the live line, any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

Test Setup:



Limits for Conducted Emissions (FCC 47 CFR 15.207):

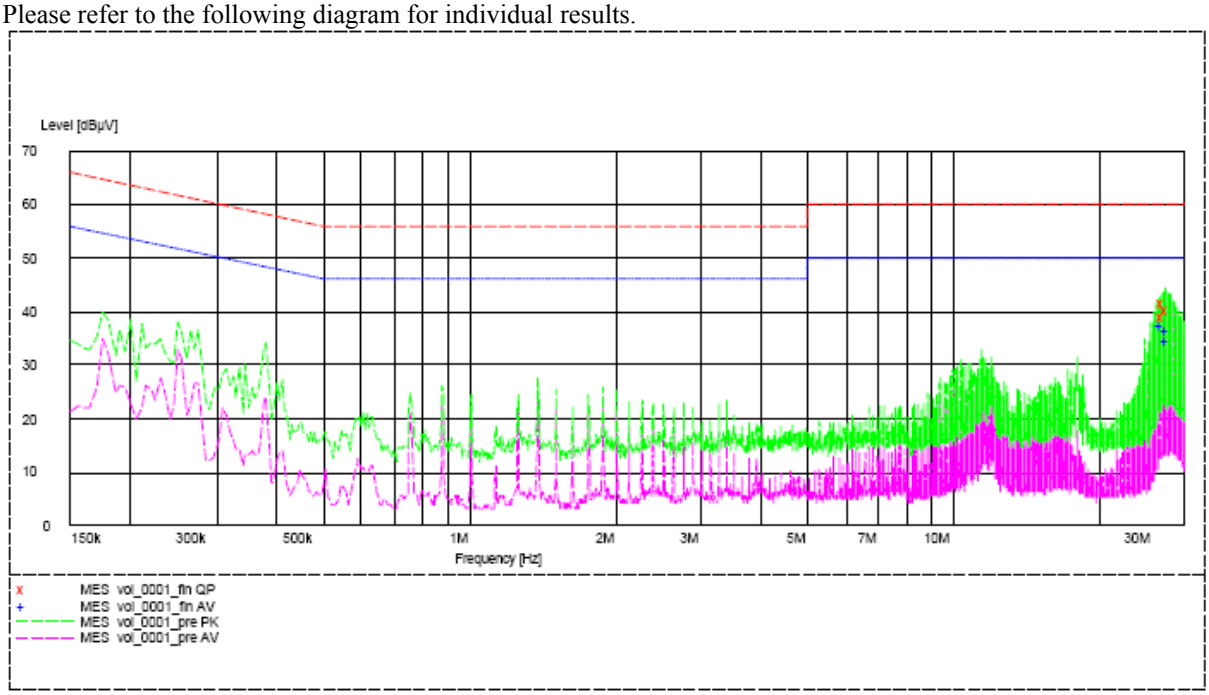
Frequency Range [MHz]	Quasi-Peak Limits [dBµV]	Average [dBµV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

Results of Wifi mode (L): PASS

Please refer to the following diagram for individual results.

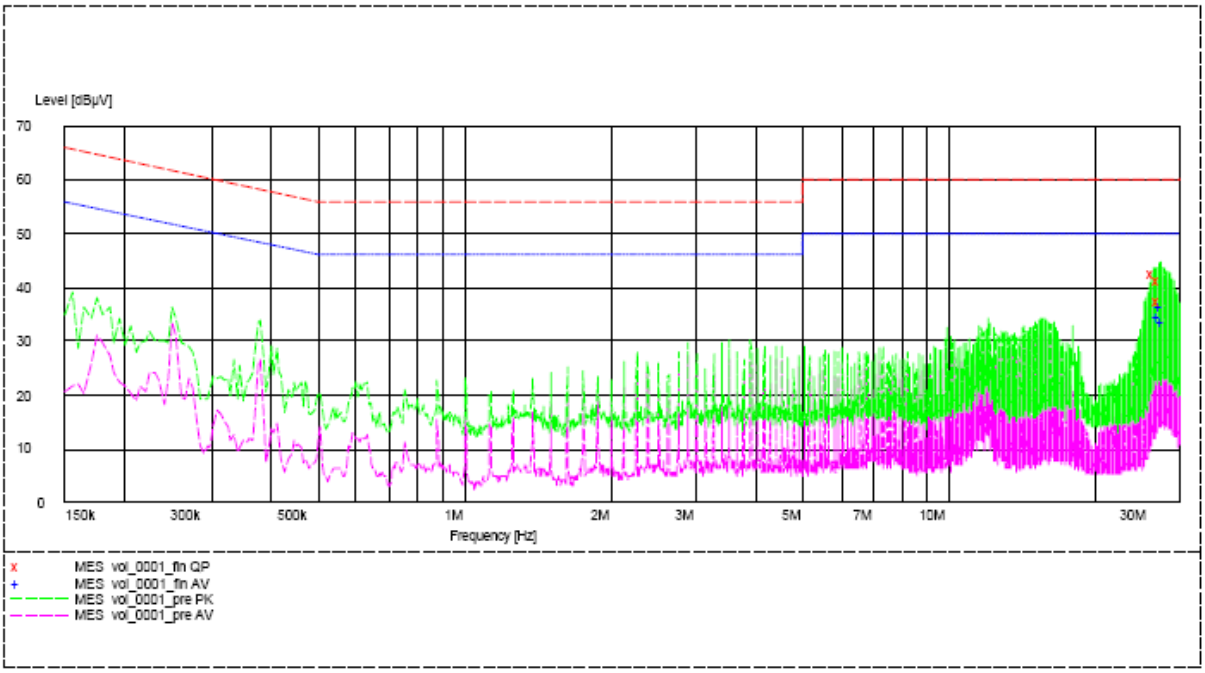


Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dBµV	Limit dBµV	Level dBµV	Limit dBµV
Live	27.095	41.4	60.0	-*-	-*-
Live	27.345	39.0	60.0	-*-	-*-
Live	27.725	40.5	60.0	-*-	-*-
Live	26.970	-*-	-*-	37.5	50.0
Live	27.600	-*-	-*-	36.8	50.0
Live	27.726	-*-	-*-	34.5	50.0

Frequency Range [MHz]	Quasi-Peak Limits [dBµV]	Average [dBµV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.
Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

Results of Wifi mode (N): PASS
Please refer to the following diagram for individual results.



Conductor Live or Neutral	Frequency MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Average Level dBµV	Average Limit dBµV
Neutral	26.570	42.6	60.0	-*-	-*-
Neutral	27.070	41.0	60.0	-*-	-*-
Neutral	27.320	37.4	60.0	-*-	-*-
Neutral	27.070	-*-	-*-	34.4	50.0
Neutral	27.575	-*-	-*-	36.7	50.0
Neutral	27.700	-*-	-*-	33.6	50.0

Remarks:
Calculated measurement uncertainty (0.15MHz – 30MHz): 3.25dB
-*- Emission(s) that is far below the corresponding limit line.

3.1.4 Power Spectral Density

Test Requirement:	FCC 47CFR 15.247(e)
Test Method:	ANSI C63.10:2013
Test Date:	2018-07-25
Mode of Operation:	Wifi mode

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The RF output of the EUT was connected to the spectrum analyzer. Set the fundamental frequency as the center frequency of the spectral analyzer. Use RBW=3kHz , VBW= 10KHz , Set the span to 1.5 times the DTS channel bandwidth. Detector = peak, Sweep time = auto couple , Trace mode = max hold. Measure the Power Spectral Density (PSD) and record the results in dBm.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Test Limit:
The maximum power spectral density (PSD) shall not exceeded 8dBm in any 3kHz band.

Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF=10log (3 kHz/100 kHz=-15.2dB)

Results of WiFi Mode 802.11 b (Tx:2412MHz to 2462MHz) : Pass (TX Unit)
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2412.0	-6.69	8dBm
2437.0	-5.11	8dBm
2462.0	-5.87	8dBm

Results of WiFi Mode 802.11 g (Tx:2412MHz to 2462MHz) : Pass (TX Unit)
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2412.0	-9.94	8dBm
2437.0	-9.22	8dBm
2462.0	-9.10	8dBm

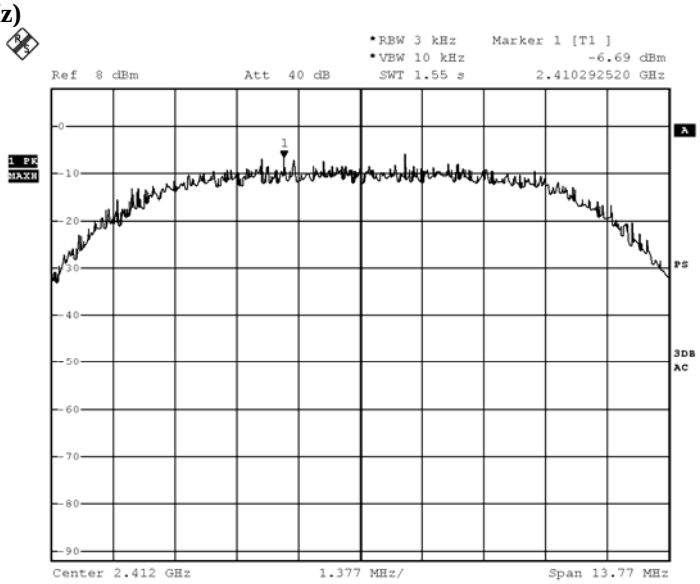
Results of WiFi Mode 802.11 n20 (Tx:2412MHz to 2462MHz) : Pass (TX Unit)
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2412.0	-10.78	8dBm
2437.0	-10.84	8dBm
2462.0	-10.22	8dBm

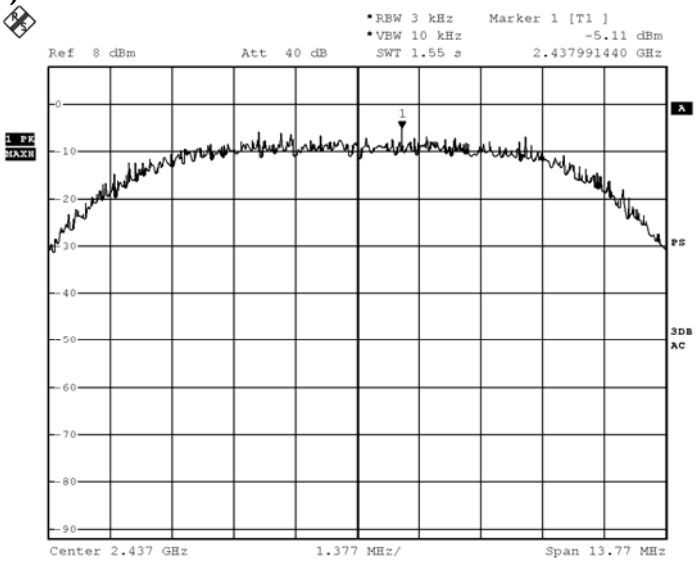
Results of WiFi Mode 802.11 n40 (Tx:2422MHz to 2452MHz) : Pass (TX Unit)
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2422.0	-13.70	8dBm
2437.0	-13.20	8dBm
2452.0	-13.25	8dBm

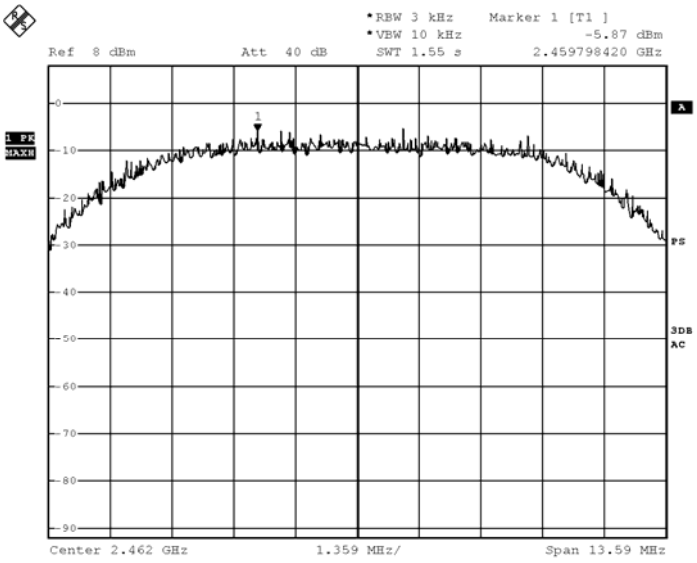
WiFi mode 802.11 b, (Tx: 2412MHz to 2462MHz)
CH 1 (2412.0 MHz)



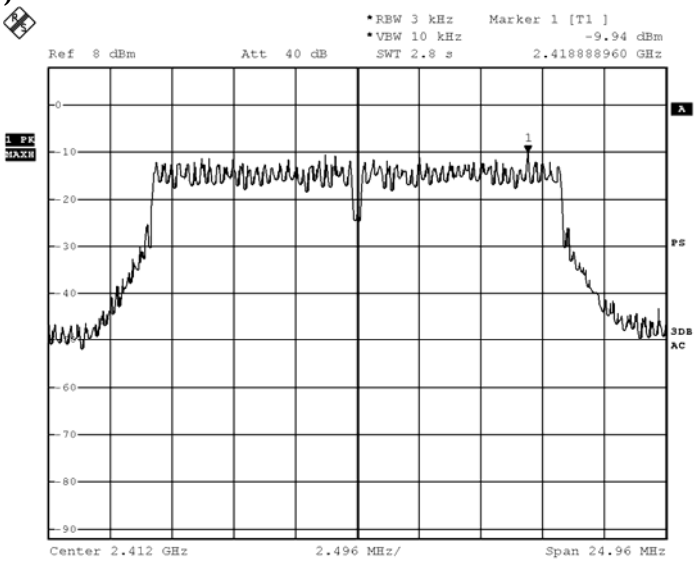
CH 6 (2437.0 MHz)



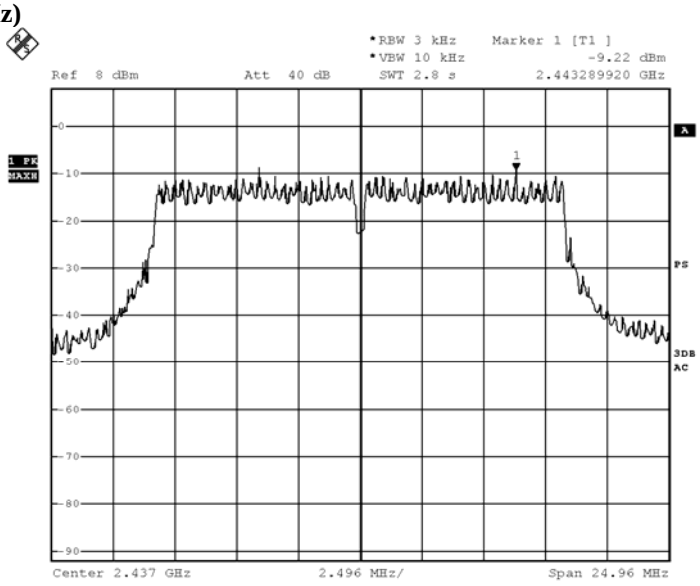
CH 11 (2462.0 MHz)



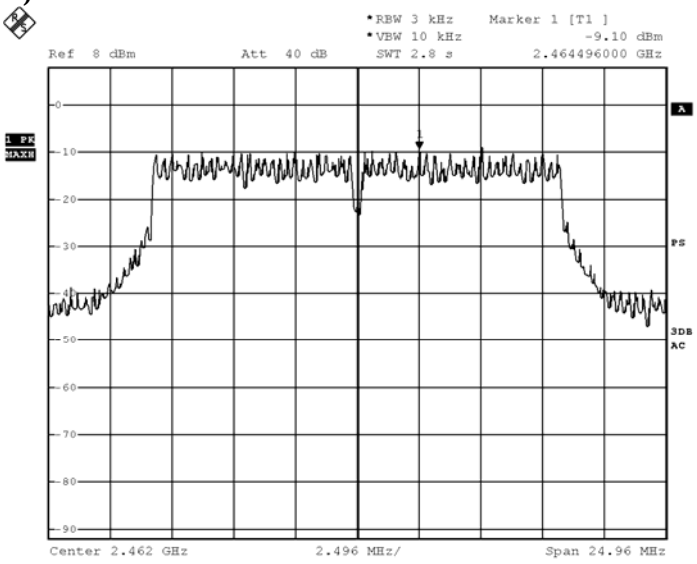
WiFi mode 802.11 g, (Tx:2412MHz to 2462MHz)
Ch 1 (2412.0 MHz)



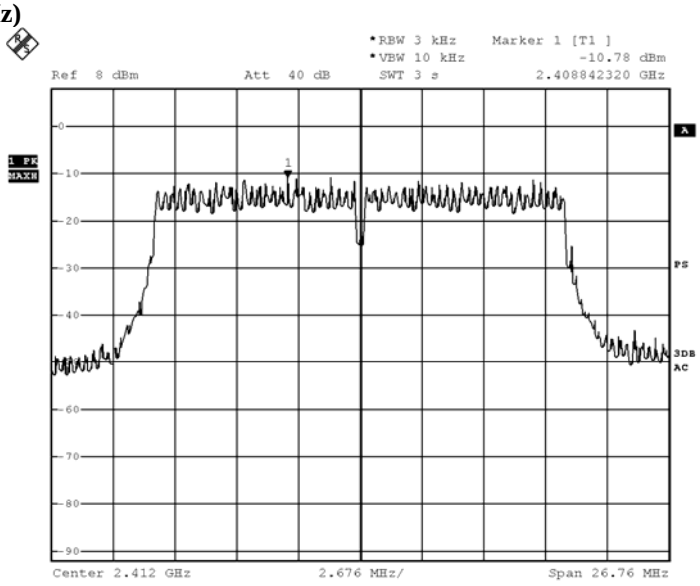
CH 6 (2437.0 MHz)



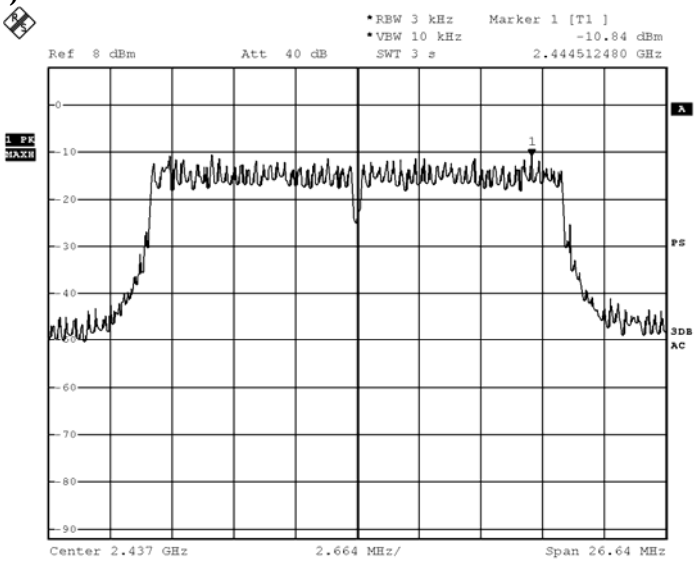
CH 11 (2462.0 MHz)



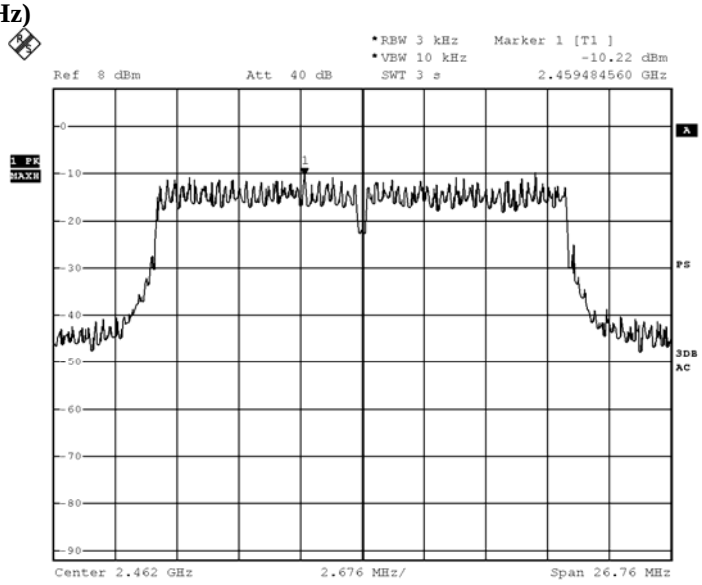
WiFi mode 802.11 n20, (Tx: 2412MHz to 2462MHz)
CH 1 (2412.0 MHz)



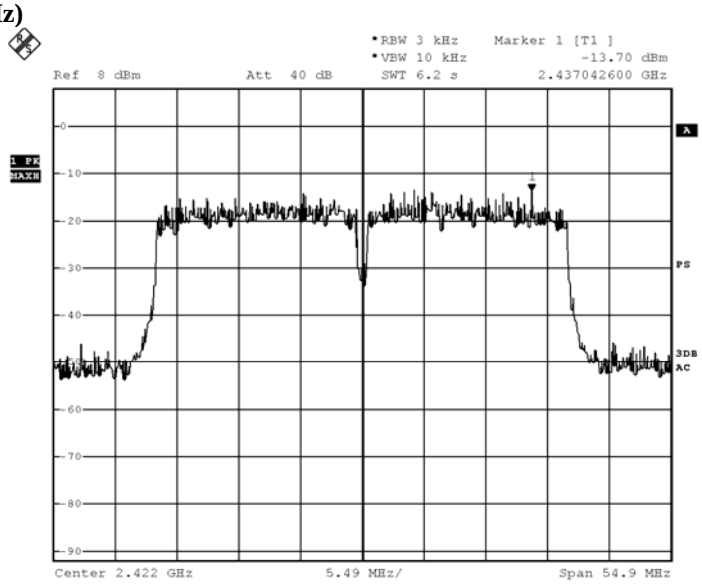
CH 6 (2437.0 MHz)



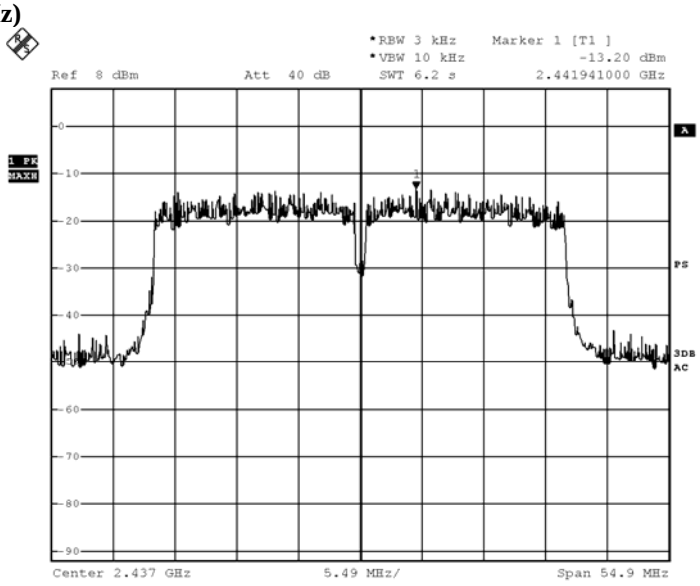
Ch 11 (2462.0 MHz)



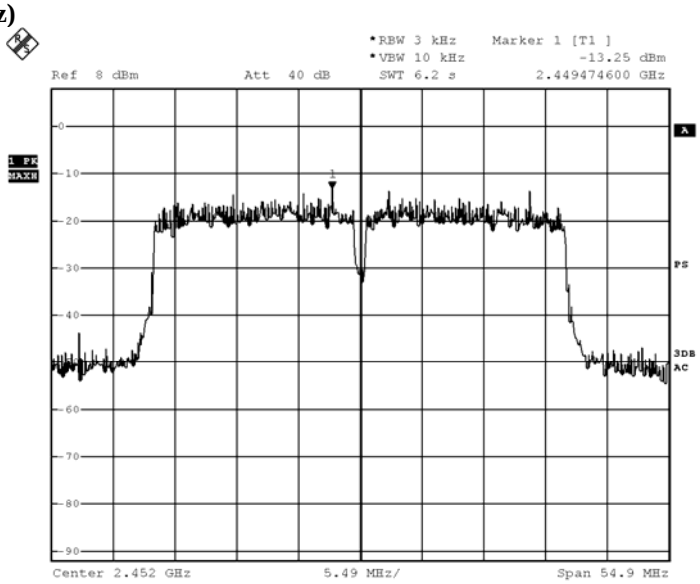
WiFi mode 802.11 n40, (Tx: 2422MHz to 2452MHz)
CH 3 (2422.0 MHz)



CH 6 (2437.0 MHz)



Ch 9 (2452.0 MHz)



3.1.5 6dB Spectrum Bandwidth Measurement

Test Requirement:	FCC 47CFR 15.247(a)(2)
Test Method:	ANSI C63.10:2013
Test Date:	2018-07-24
Mode of Operation:	WiFi mode

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Spectrum Analyzer Setting:

RBW = 100kHz, VBW ≥ 3*RBW, Sweep = Auto couple
Detector = Peak, Trace = Max. hold

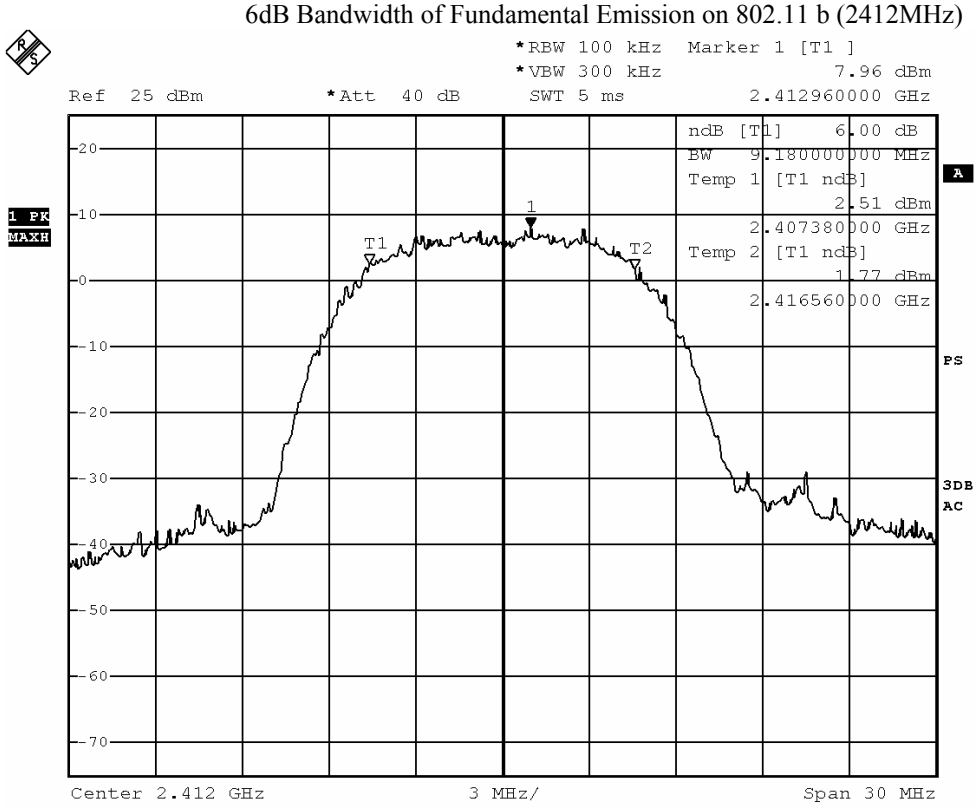
Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	9.18	> 500

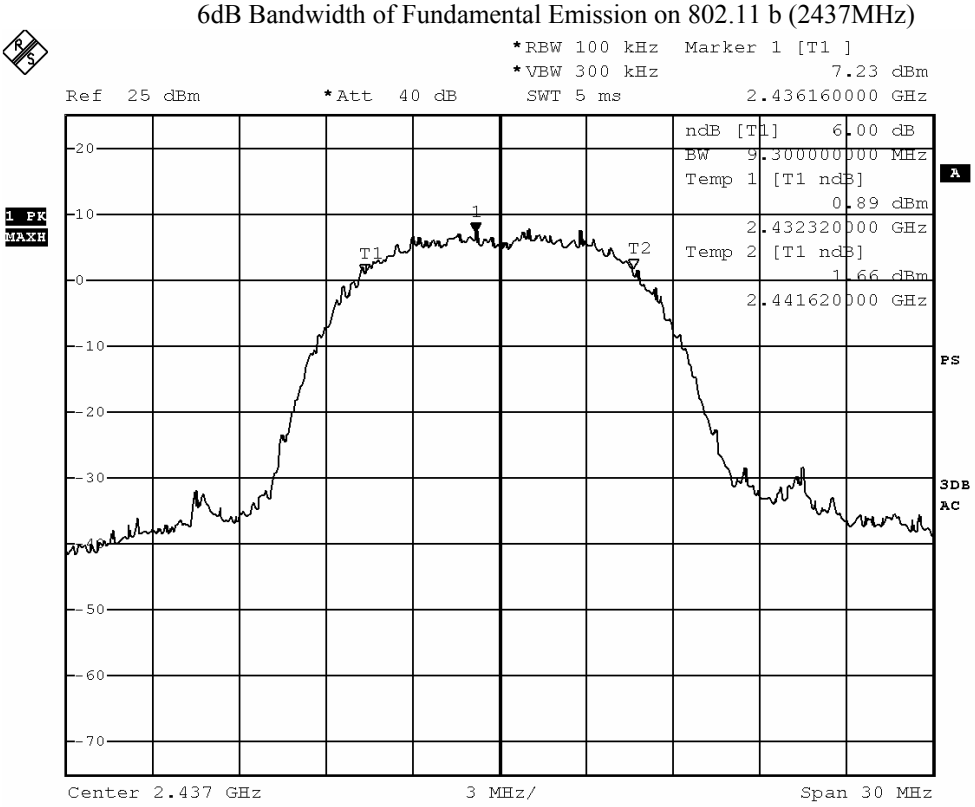
6dB Bandwidth of Fundamental Emission on 802.11 b (2412MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	9.30	> 500

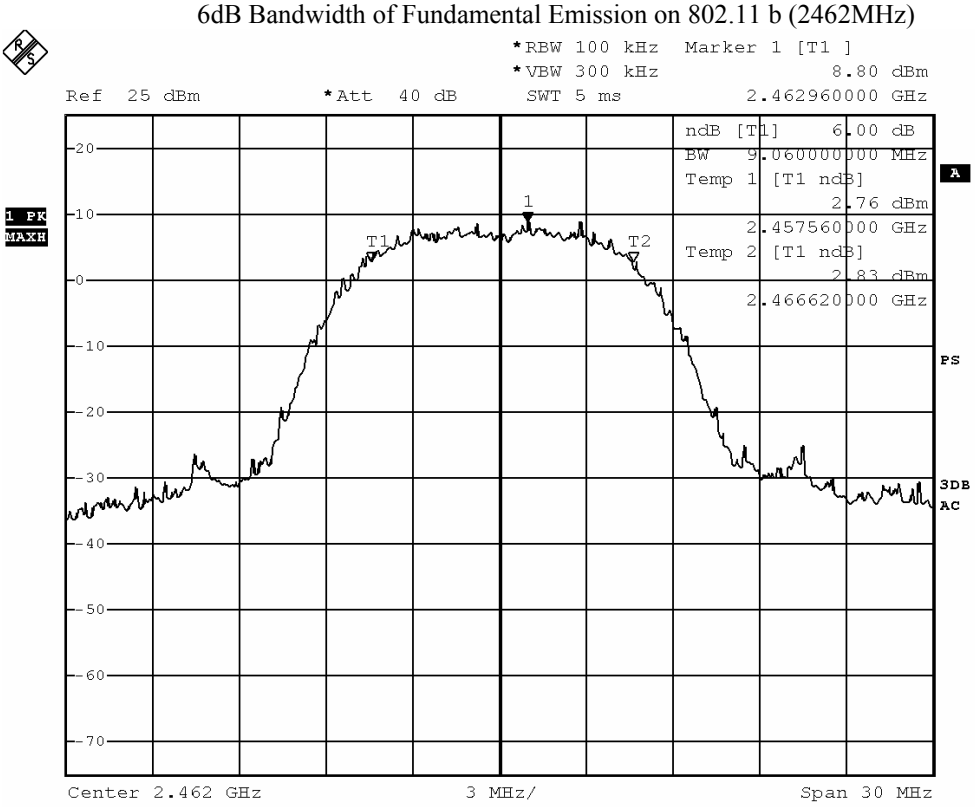
6dB Bandwidth of Fundamental Emission on 802.11 b (2437MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	9.06	> 500

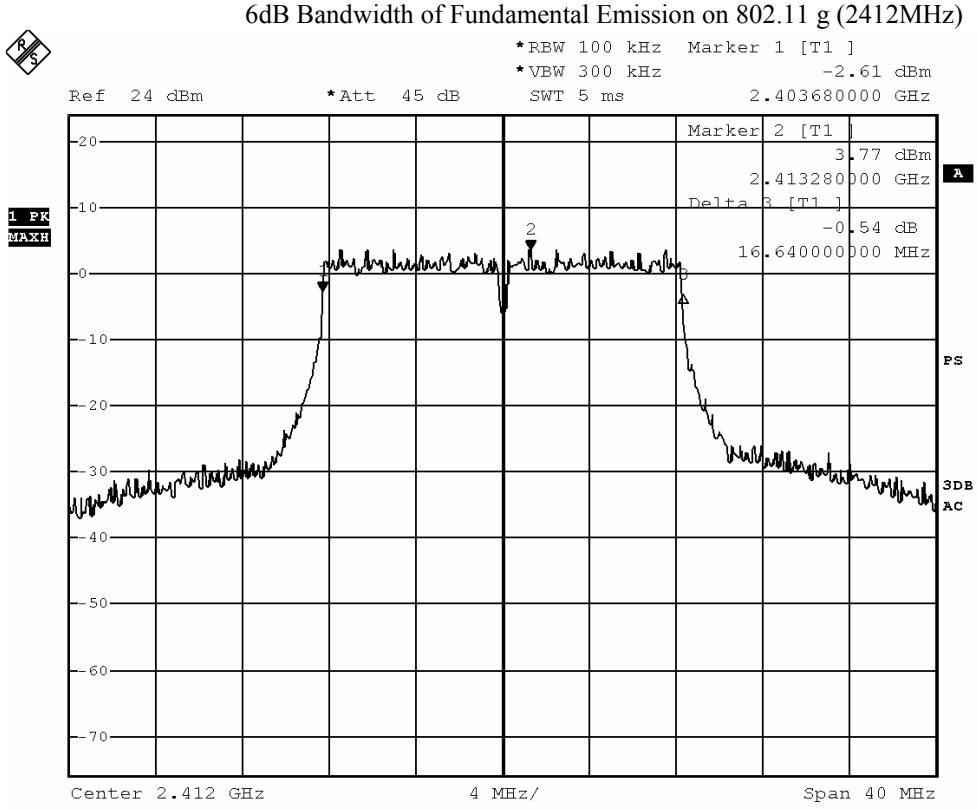
6dB Bandwidth of Fundamental Emission on 802.11 b (2462MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	16.64	> 500

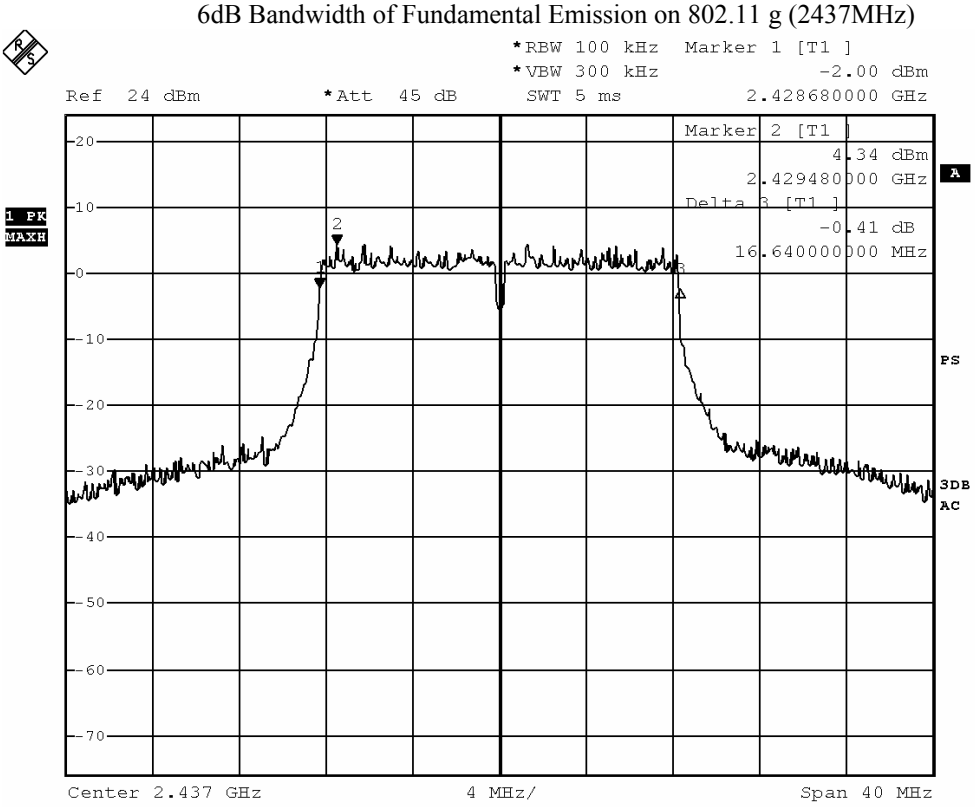
6dB Bandwidth of Fundamental Emission on 802.11 g (2412MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	16.64	> 500

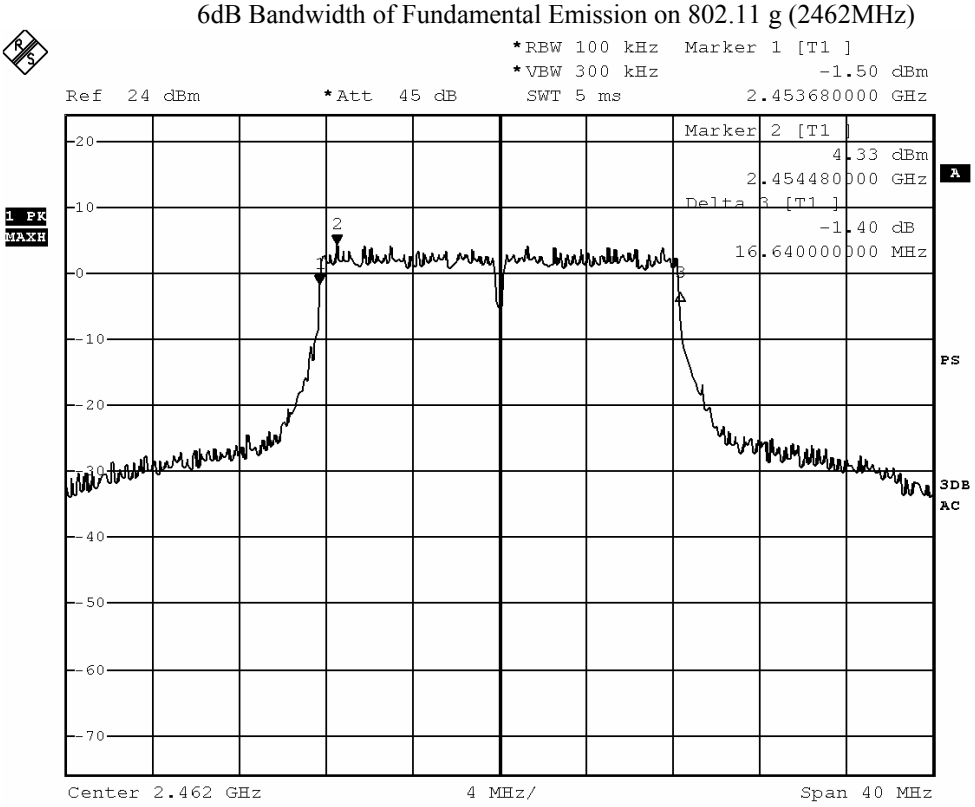
6dB Bandwidth of Fundamental Emission on 802.11 g (2437MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	16.64	> 500

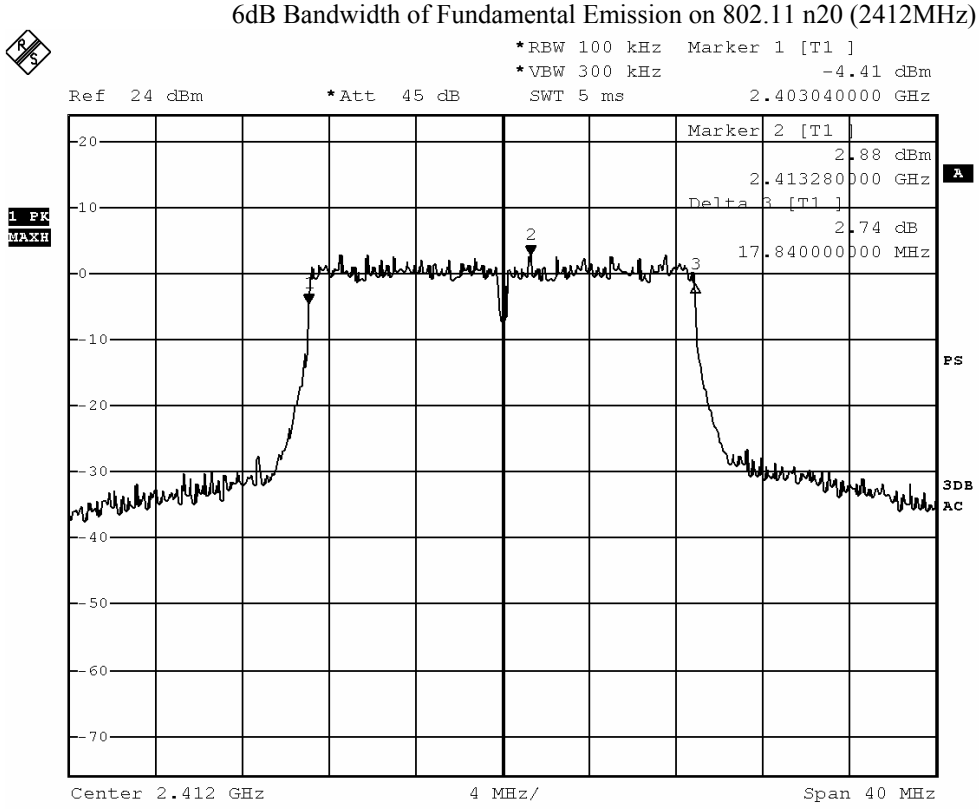
6dB Bandwidth of Fundamental Emission on 802.11 g (2462MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	17.84	> 500

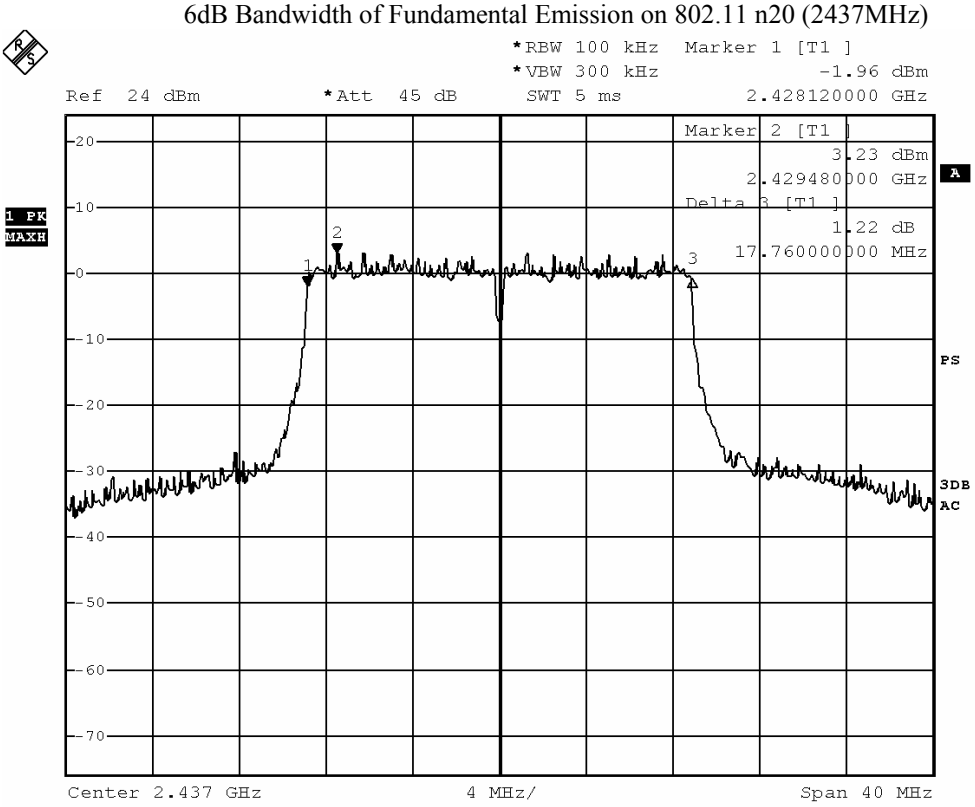
6dB Bandwidth of Fundamental Emission on 802.11 n20 (2412MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	17.76	> 500

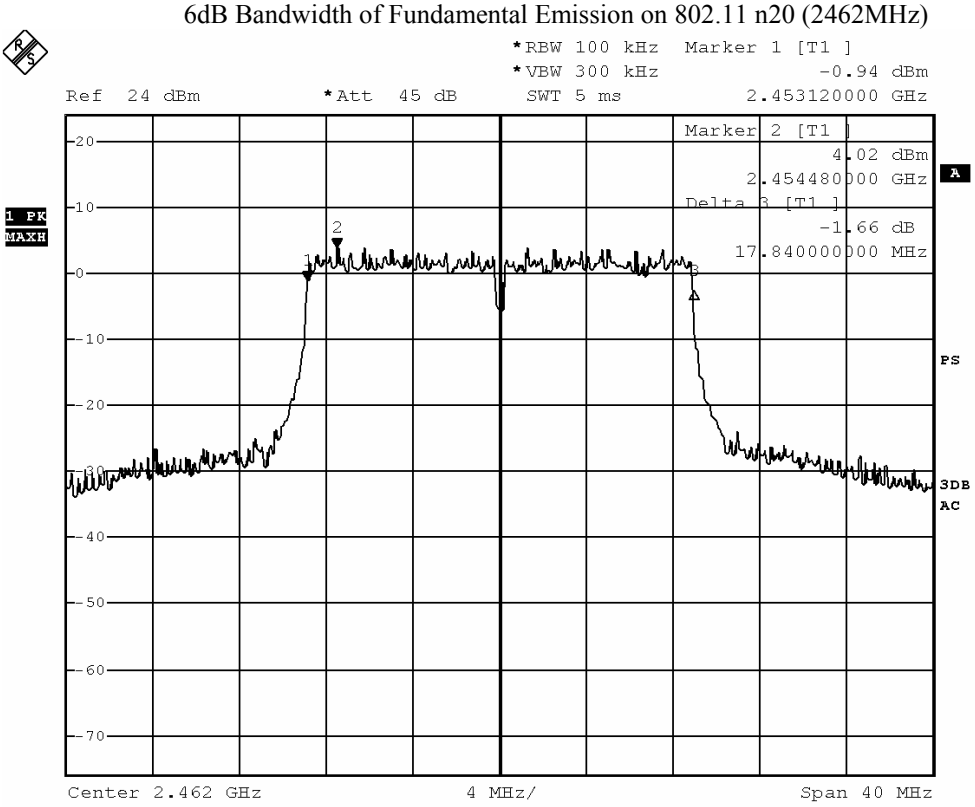
6dB Bandwidth of Fundamental Emission on 802.11 n20 (2437MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	17.84	> 500

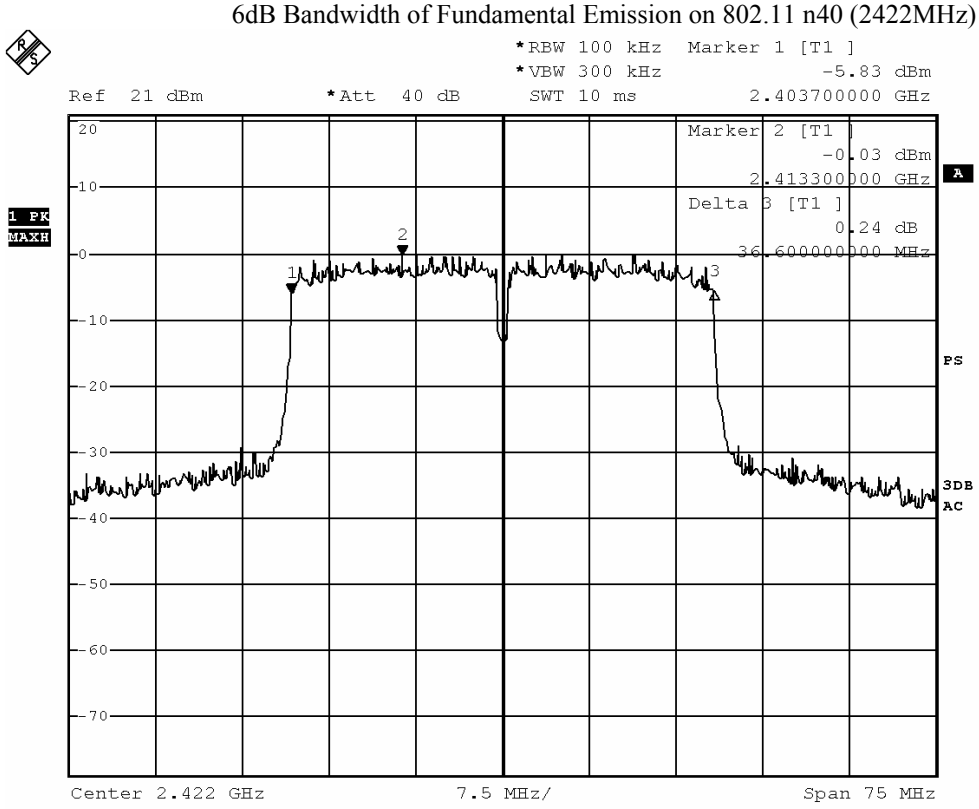
6dB Bandwidth of Fundamental Emission on 802.11 n20 (2462MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2422.0	36.60	> 500

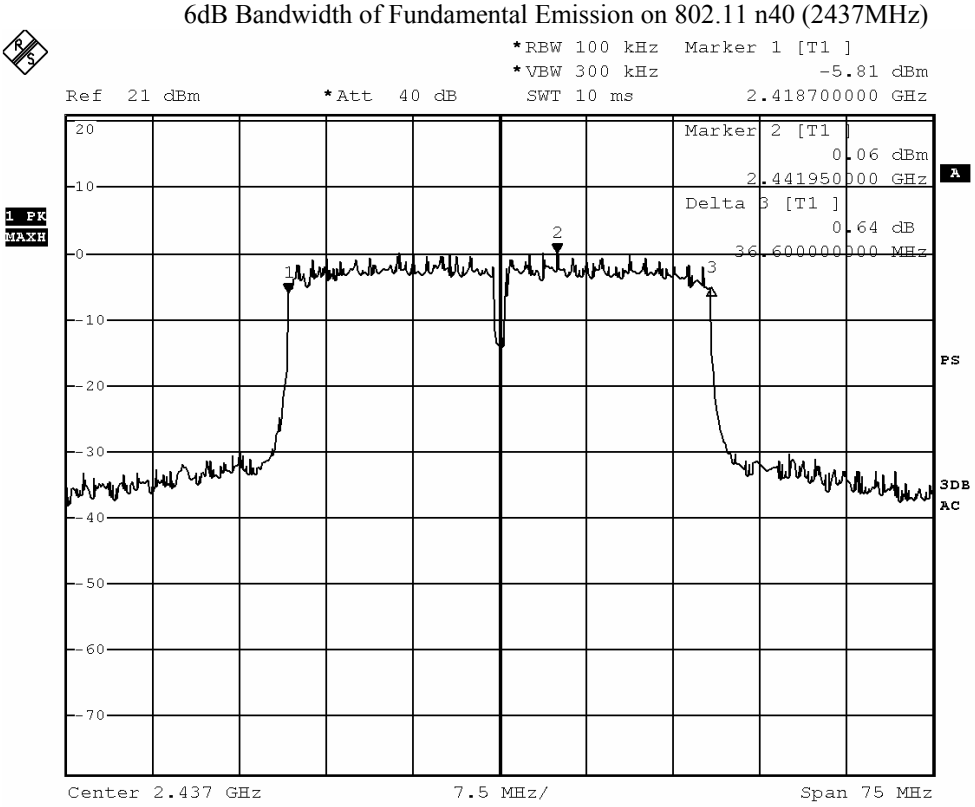
6dB Bandwidth of Fundamental Emission on 802.11 n40 (2422MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	36.60	> 500

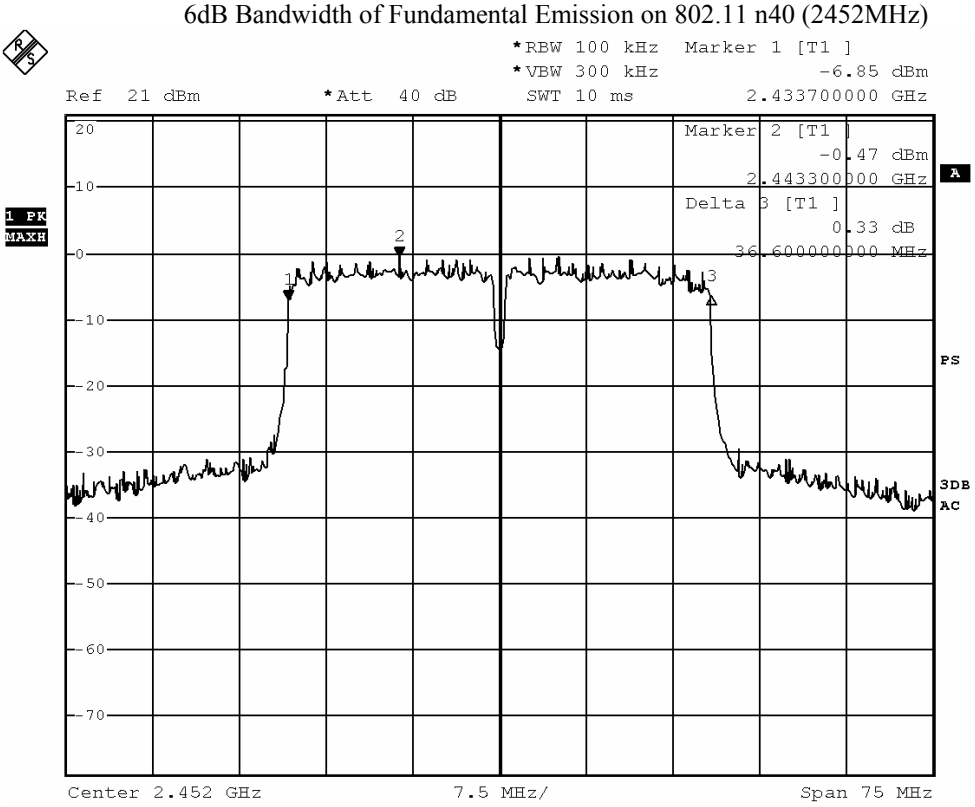
6dB Bandwidth of Fundamental Emission on 802.11 n40 (2437MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2452.0	36.60	> 500

6dB Bandwidth of Fundamental Emission on 802.11 n40 (2452MHz)



3.1.6 Band Edges Measurement

Test Requirement:	FCC 47CFR 15.247
Test Method:	ANSI C63.10:2013
Test Date:	2018-07-26
Mode of Operation:	Wifi mode

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Method:

The band edge is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. The RBW are set to 100kHz and VBW are set to 300kHz for this measurement.

Test Setup:

As Test Setup of clause 3.1.2 in this test report.

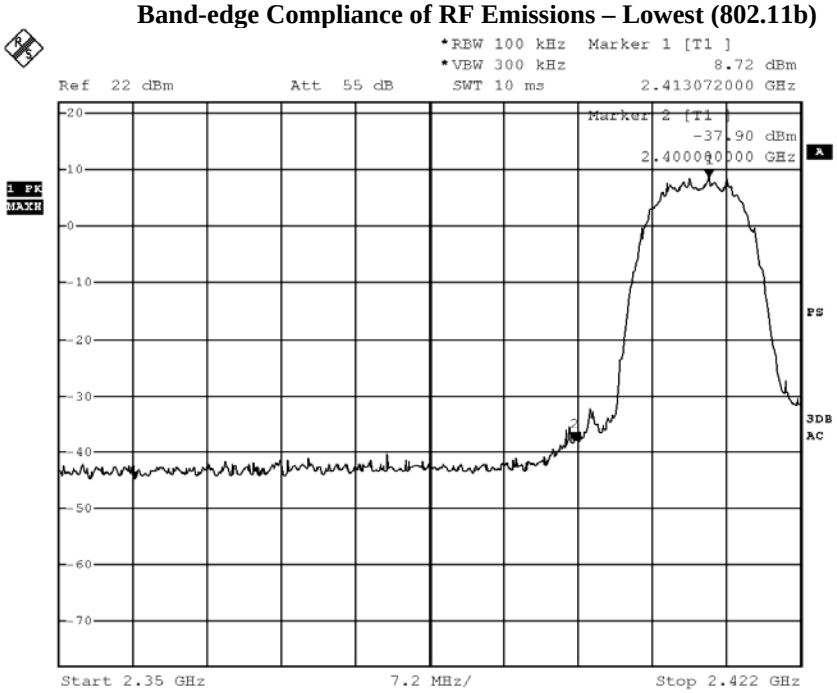
Band-edge Compliance of RF Conducted Emissions Measurement:

Limit：
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 a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Remark: Emissions under the fixed frequency mode and hopping mode have been investigated, the worst-case measurement results were recorded in the test report

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	46.60

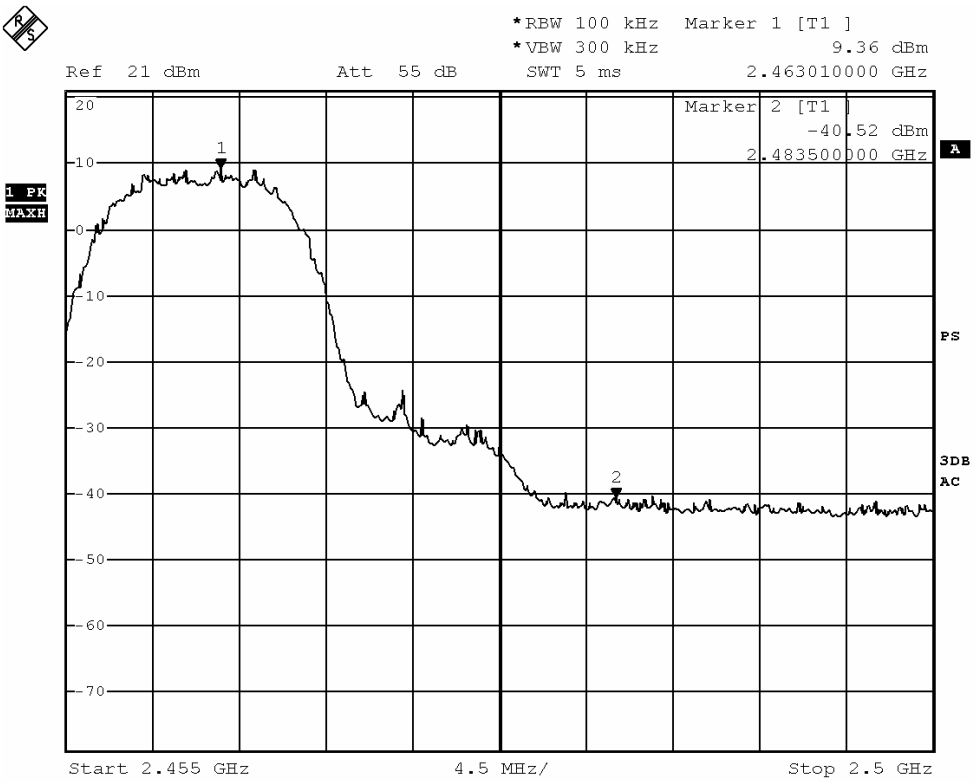
Band-edge Compliance of RF Emissions – Lowest (802.11b)



Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	49.88

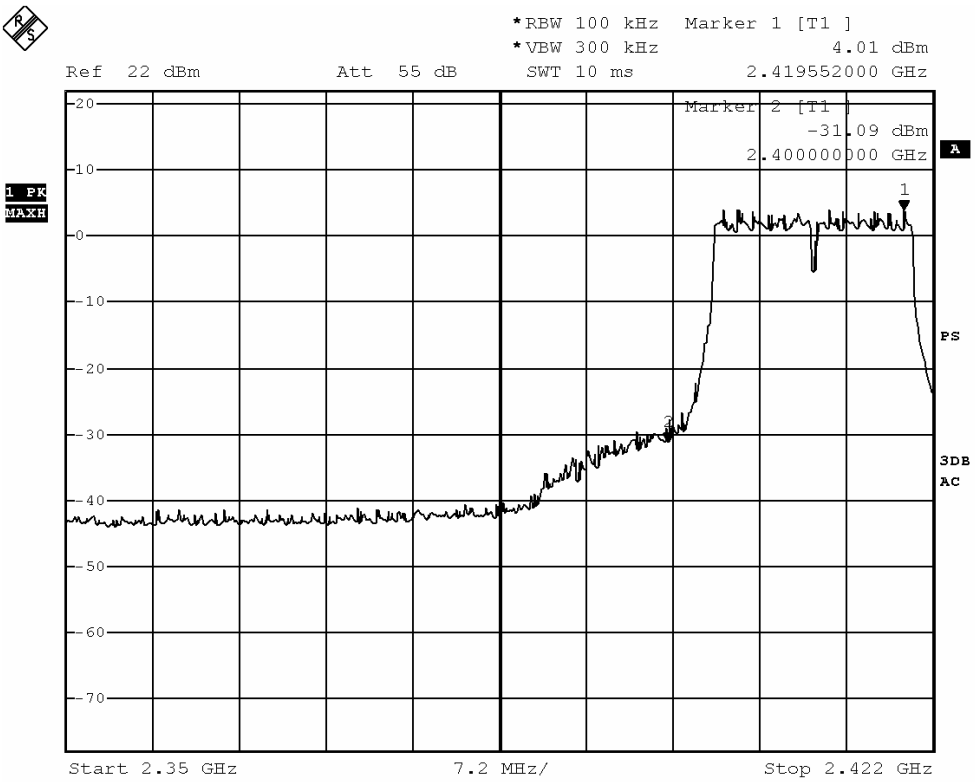
Band-edge Compliance of RF Emissions – Highest (802.11b)



Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2400 - Lowest Fundamental (2402)	35.10

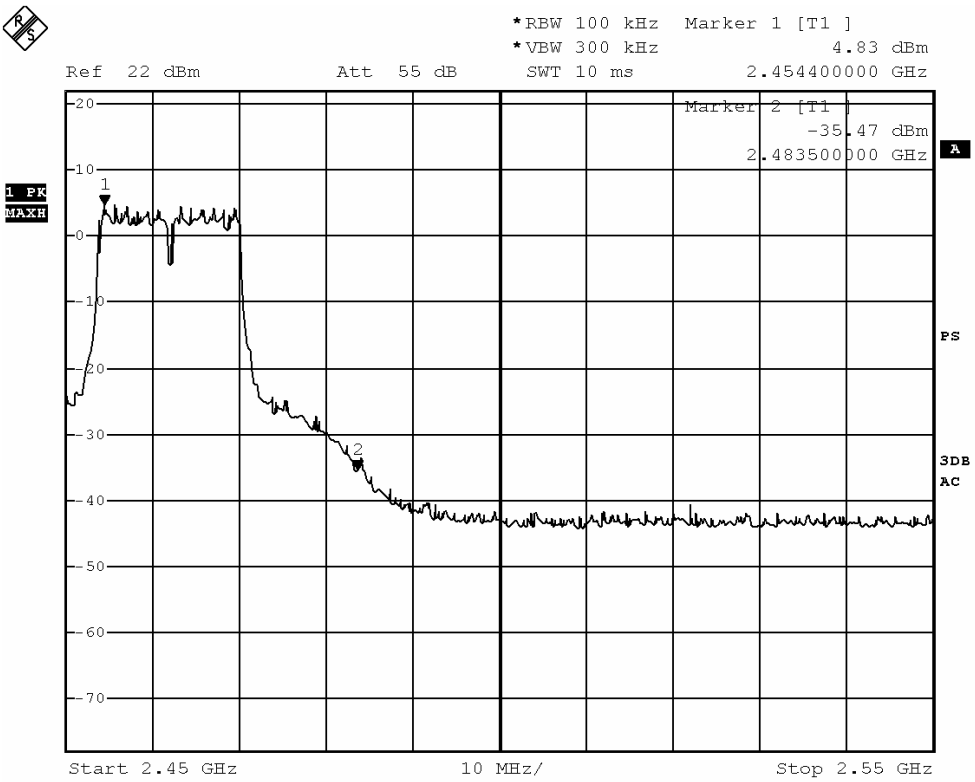
Band-edge Compliance of RF Emissions – Lowest (802.11g)



Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	40.30

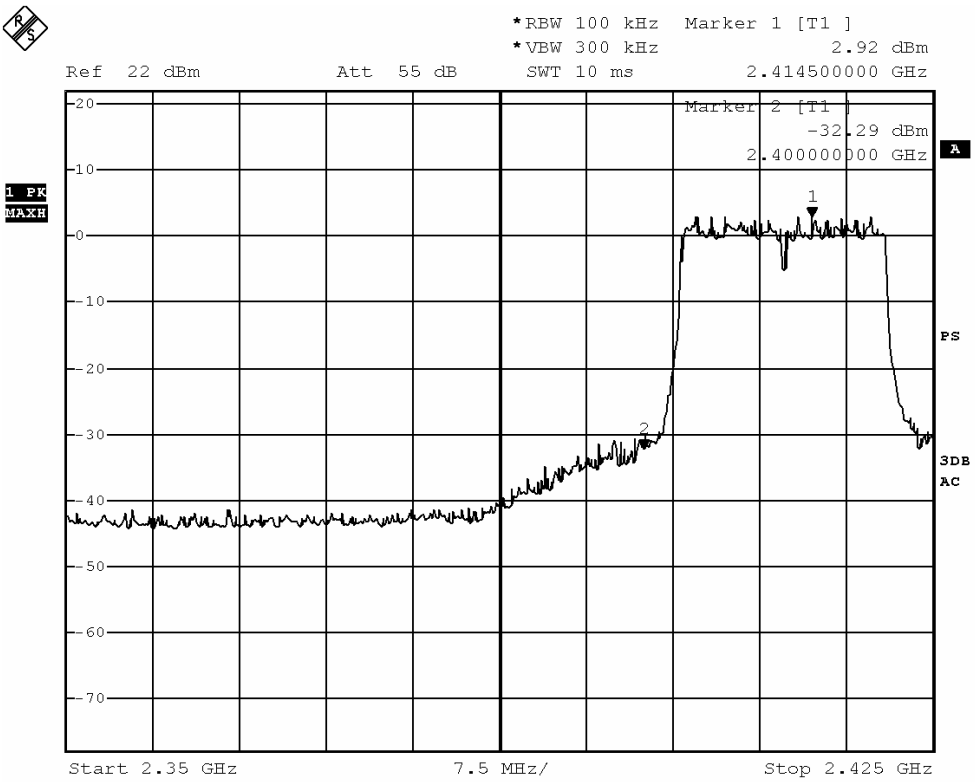
Band-edge Compliance of RF Emissions – Highest (802.11g)



Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2400 - Lowest Fundamental (2402)	35.21

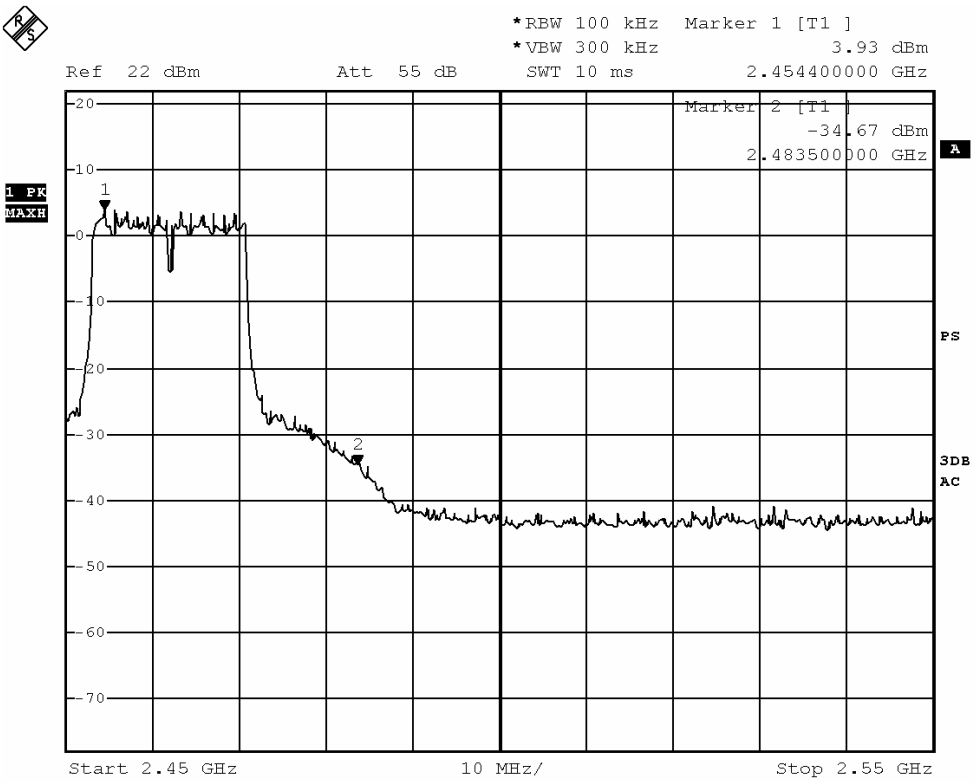
Band-edge Compliance of RF Emissions – Lowest (802.11n20)



Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	38.60

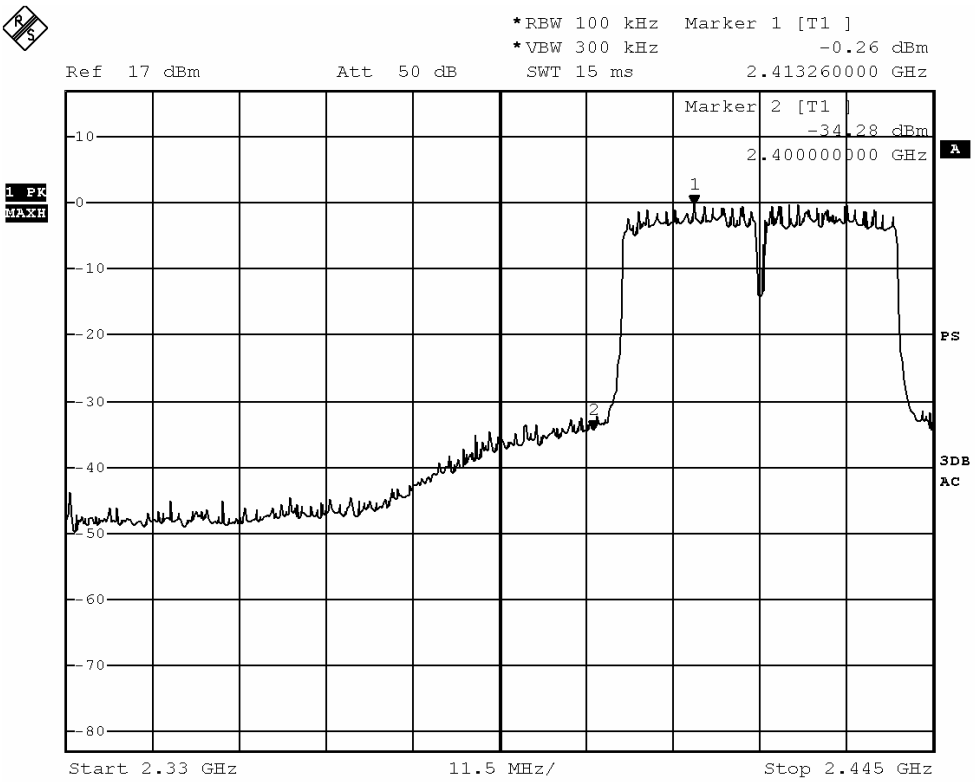
Band-edge Compliance of RF Emissions – Highest (802.11n20)



Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2400 - Lowest Fundamental (2402)	34.02

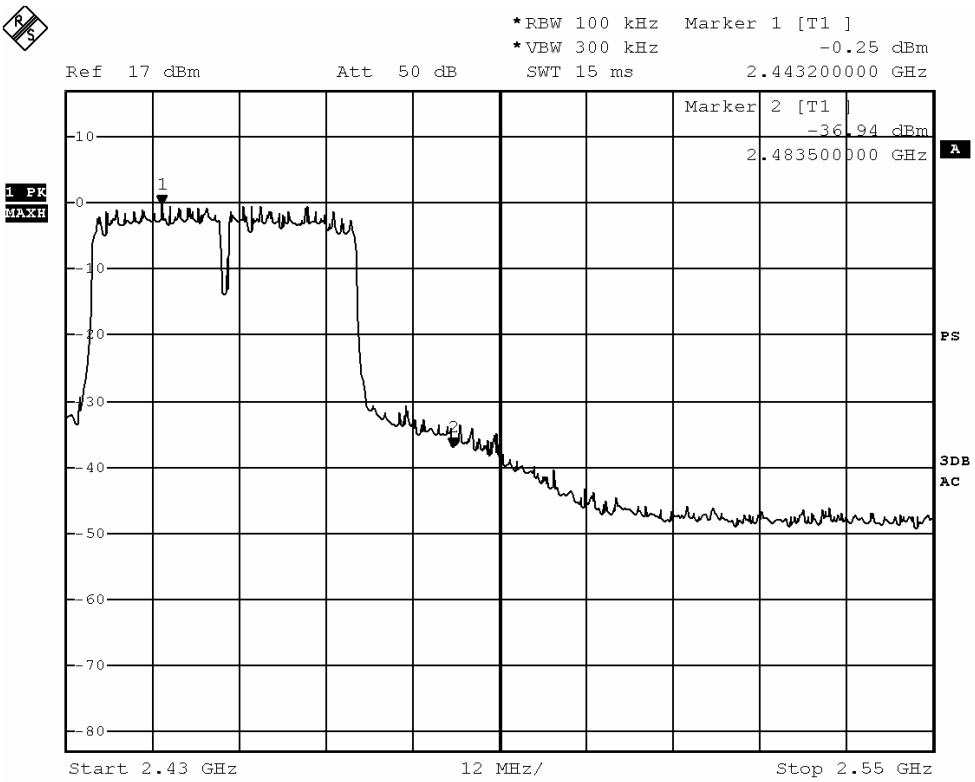
Band-edge Compliance of RF Emissions – Lowest (802.11n40)



Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Conducted Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	36.69

Band-edge Compliance of RF Emissions – Highest (802.11n40)



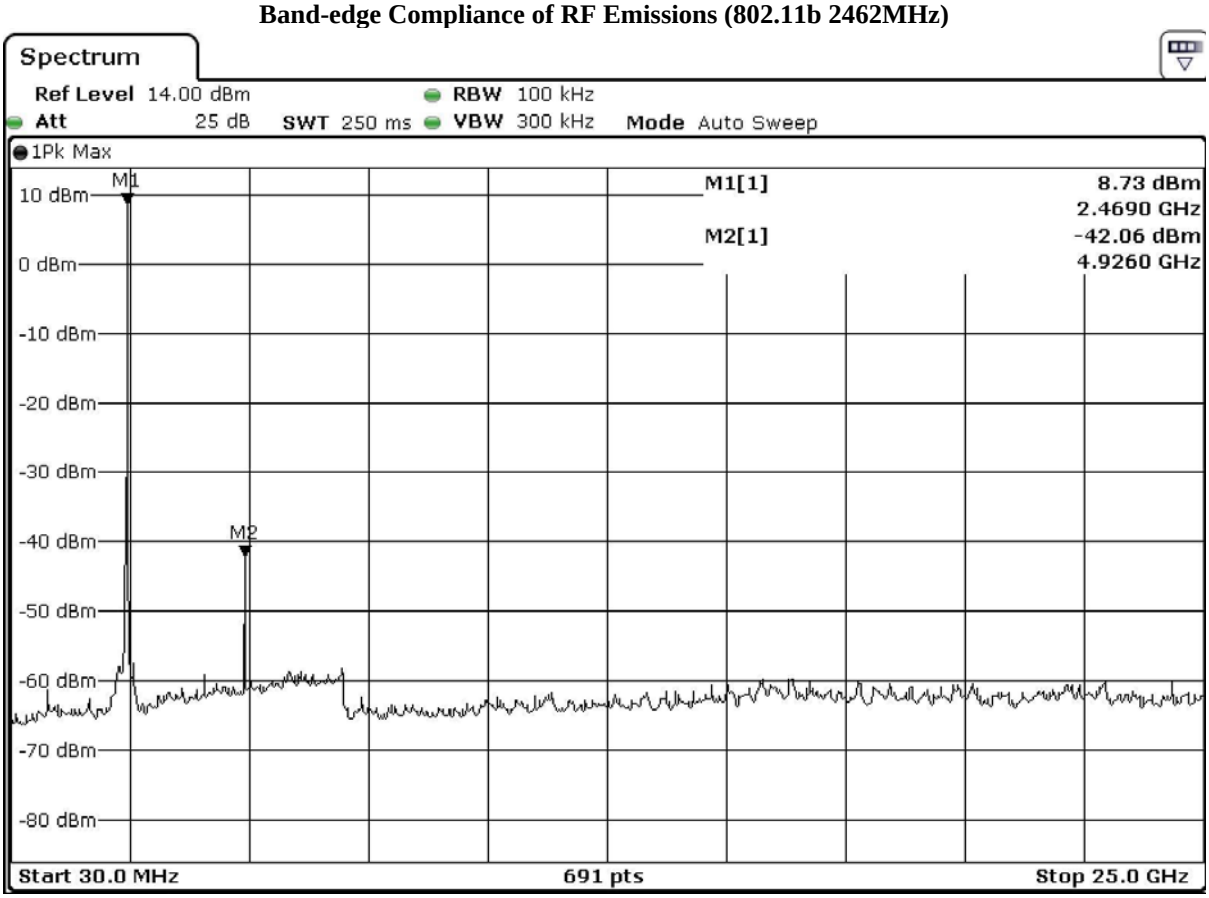
Band-edge Compliance of RF Conducted Emissions Measurement:

Limit：

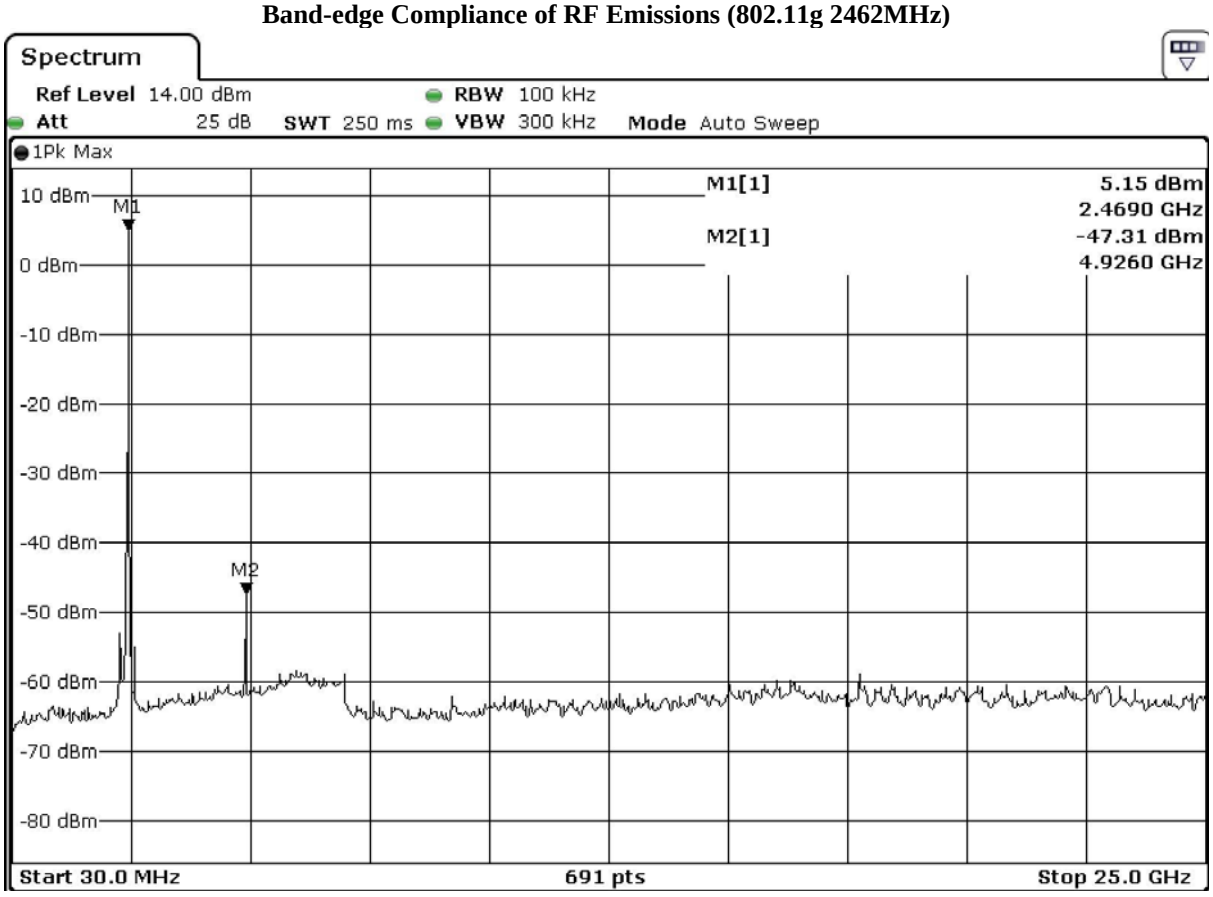
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Remark: Emissions under the fixed frequency mode and hopping mode have been investigated, the worst-case measurement results were recorded in the test report

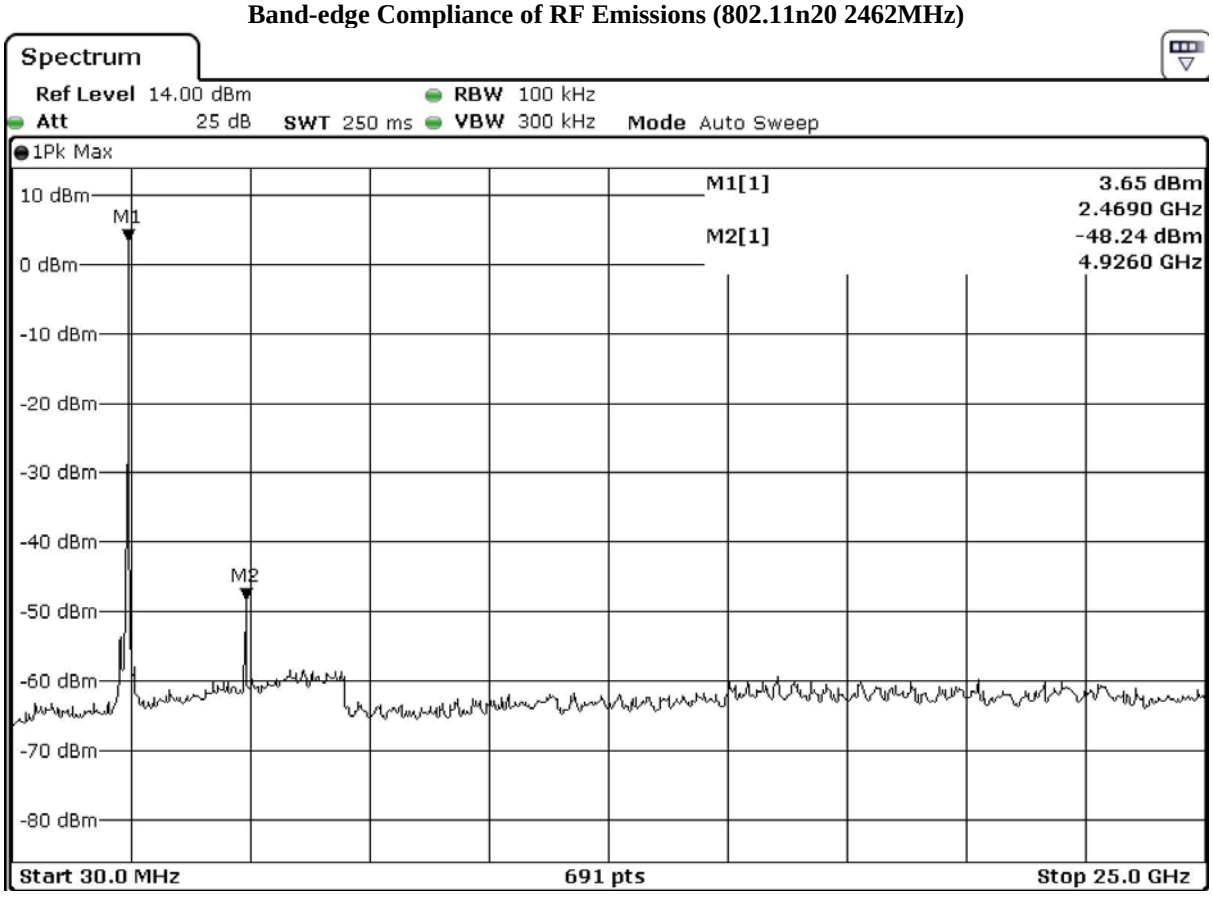
Band-edge Compliance of RF Emissions (802.11b 2462MHz)



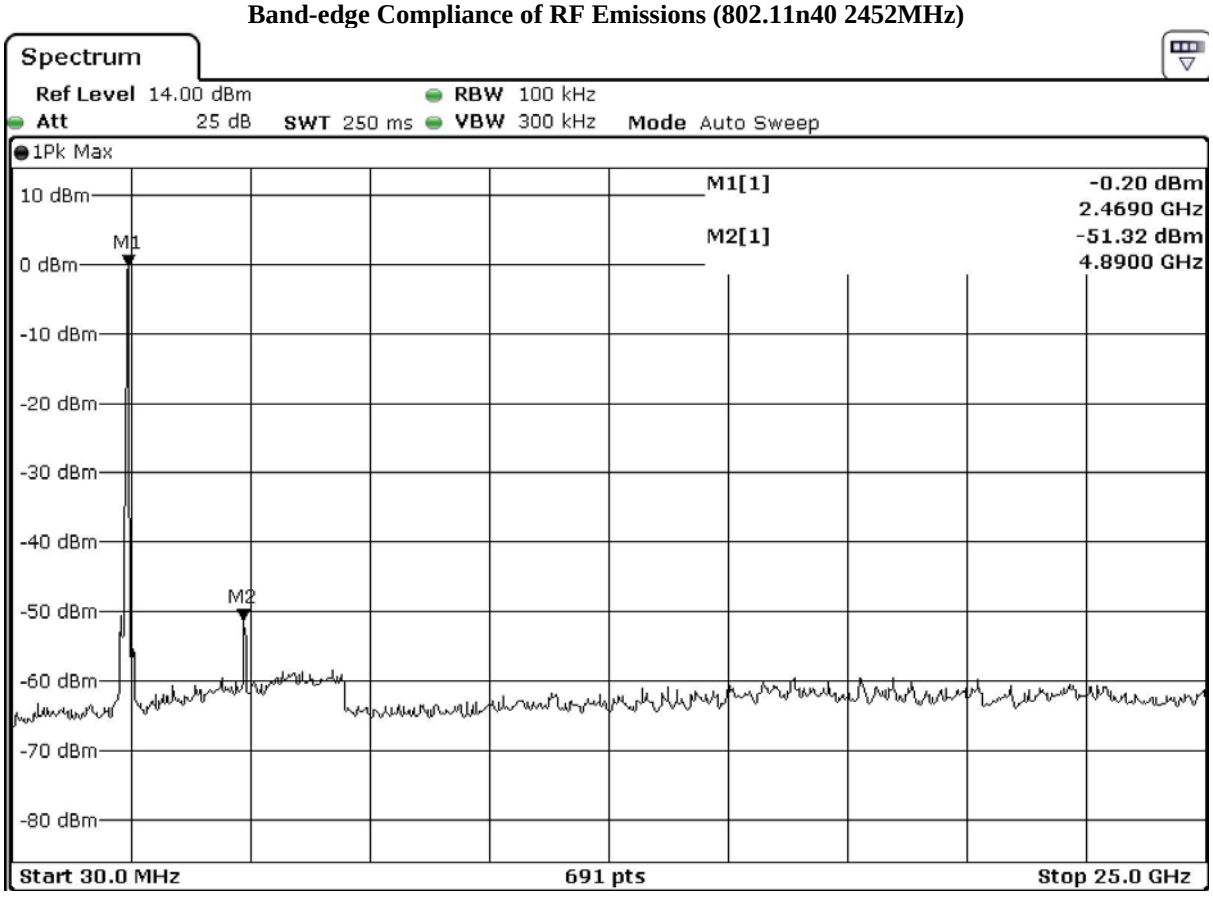
Band-edge Compliance of RF Emissions (802.11g 2462MHz)



Band-edge Compliance of RF Emissions (802.11n20 2462MHz)



Band-edge Compliance of RF Emissions (802.11n40 2452MHz)



3.1.7 Antenna Requirement

Ambient Temperature: 25℃ Relative Humidity: 51% Atmospheric Pressure: 101 kPa

Test Requirements: § 15.203

Test Specification:

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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Results:

This is PCB antenna. There is no external antenna, the antenna gain = 2412MHz: 2.46dBi/2422MHz: 2.71dBi/ 2437MHz: 2.58dBi/ 2452MHz: 2.56dBi/ 2462MHz: 2.94dBi. User is unable to remove or changed the Antenna.

Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2018/01/24	2019/01/24
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM354	BICONILOG ANTENNA	ETS-LINDGREN	3143B	00142073	2018/03/29	2020/03/29
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2018/06/01	2019/06/01
EM276	BROADBAND HORN ANTENNA	A-INFOMW	JXTXLB-10180-SF	J203109090300 7	2018/04/27	2020/04/27
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2018/05/13	2019/05/13
EM301	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-10	00130988	2018/05/13	2019/05/13
EM302	PRECISION OMNIDIRECTIONAL DIPOLE (1 – 6GHZ)	SEIBERSDORF LABORATORIES	POD 16	161806/L	2018/05/11	2020/05/11
EM303	PRECISION OMNIDIRECTIONAL DIPOLE (6 – 18GHZ)	SEIBERSDORF LABORATORIES	POD 618	6181908/L	2018/05/11	2020/05/11
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2018/04/16	2020/04/16
EM045	POWER METER	ROHDE & SCHWARZ	NRVD	843246/028	2017/10/14	2018/10/14

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	2017/11/29	2018/11/29
EM145	EMI TEST RECEIVER	R & S	ESCS 30	830245/021	2018/06/01	2019/06/01
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2018/01/11	2019/01/11
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2017/02/02	2022/02/02
N/A	MEASUREMENT AND EVALUATION SOFTWARE	ROHDE & SCHWARZ	BSIB-K1	V1.20	N/A	N/A

Remarks:-

CM Corrective Maintenance
N/A Not Applicable
TBD To Be Determined

Appendix B

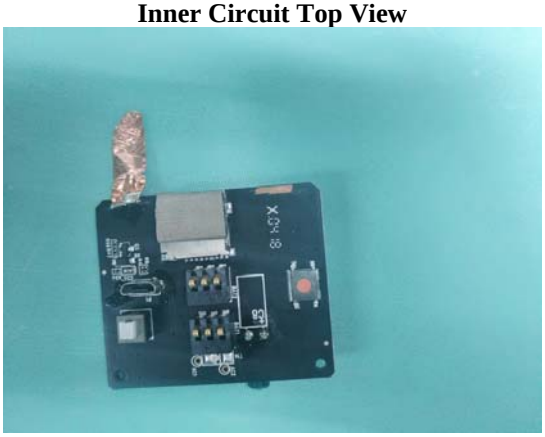
Photographs of EUT

Front View of the product

Rear View of the product

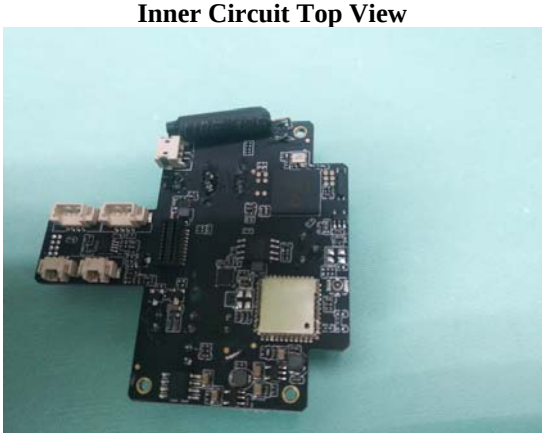
Inside View of the product

Inner Circuit Top View



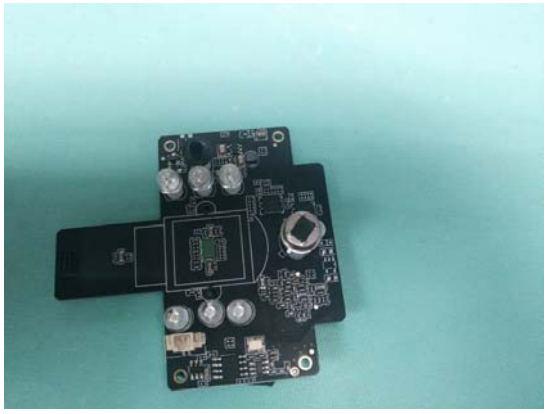
Inner Circuit Bottom View

Inner Circuit Top View

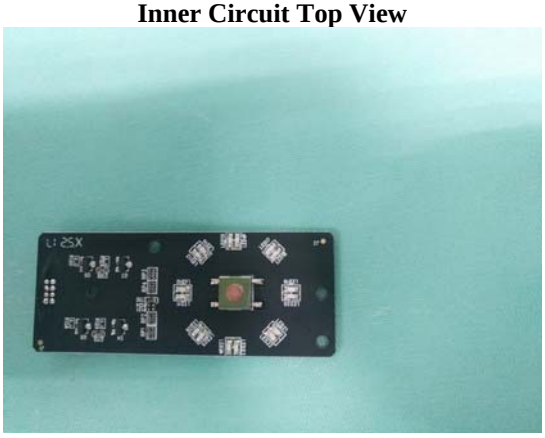


Photographs of EUT

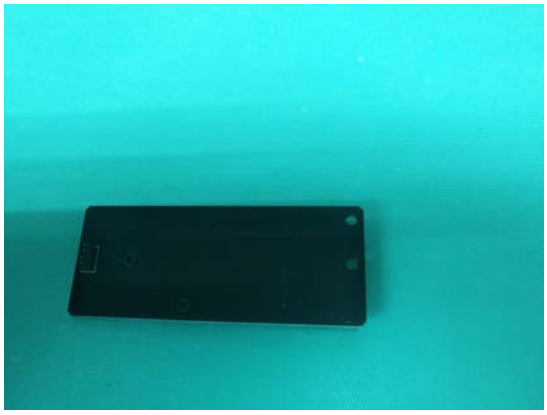
Inner Circuit Bottom View



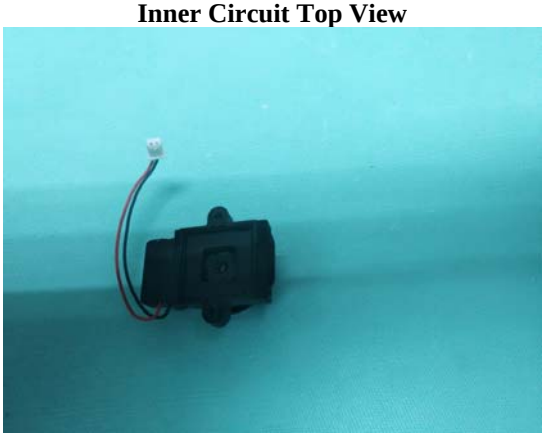
Inner Circuit Top View



Inner Circuit Bottom View



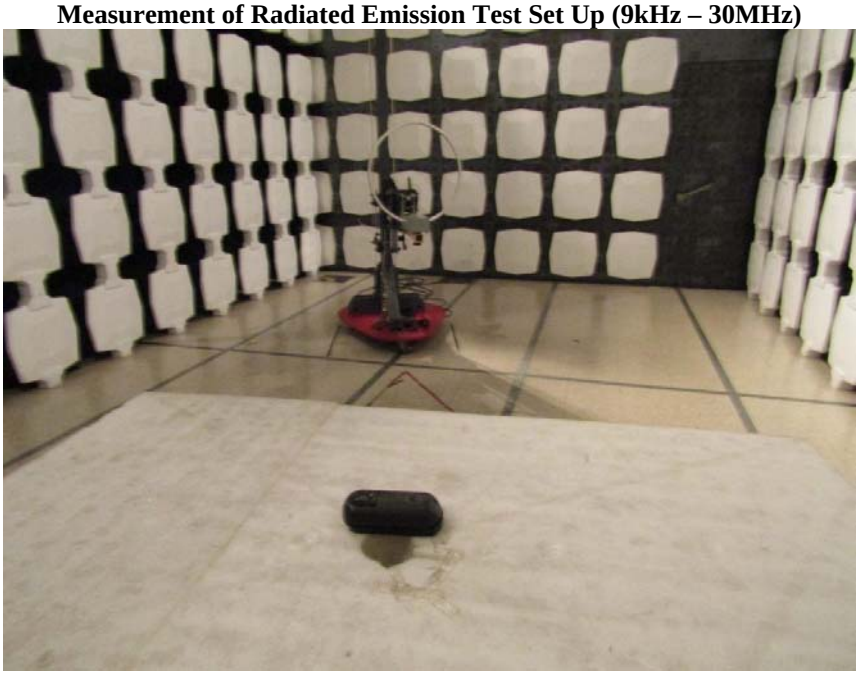
Inner Circuit Top View



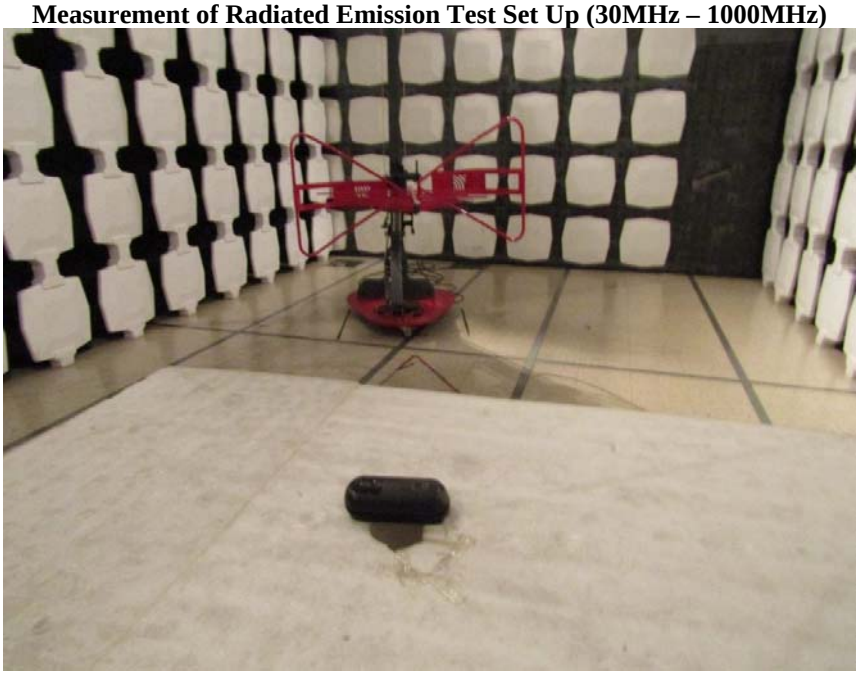
Inner Circuit Bottom View

Photographs of EUT

Measurement of Radiated Emission Test Set Up (9kHz – 30MHz)

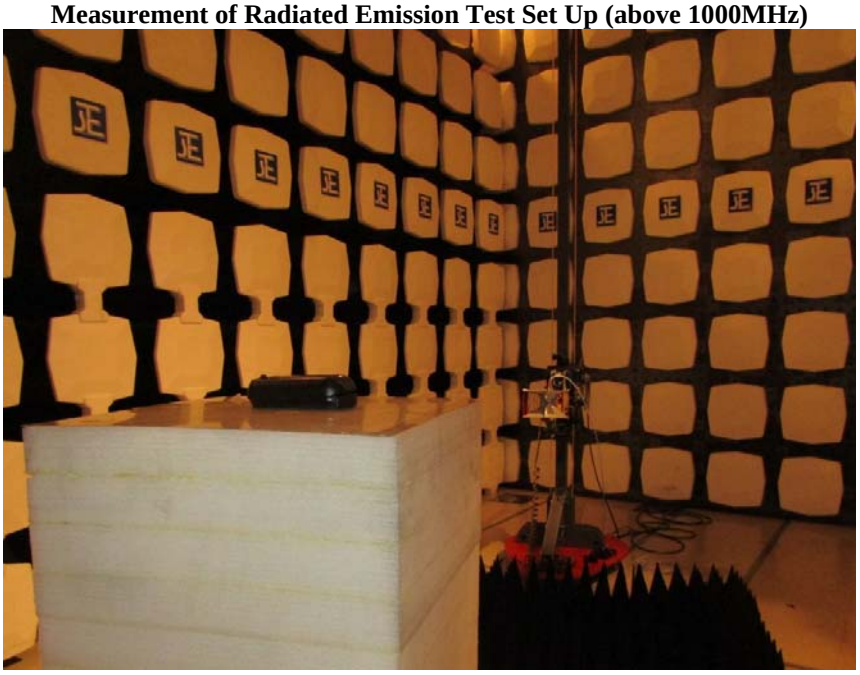


Measurement of Radiated Emission Test Set Up (30MHz – 1000MHz)

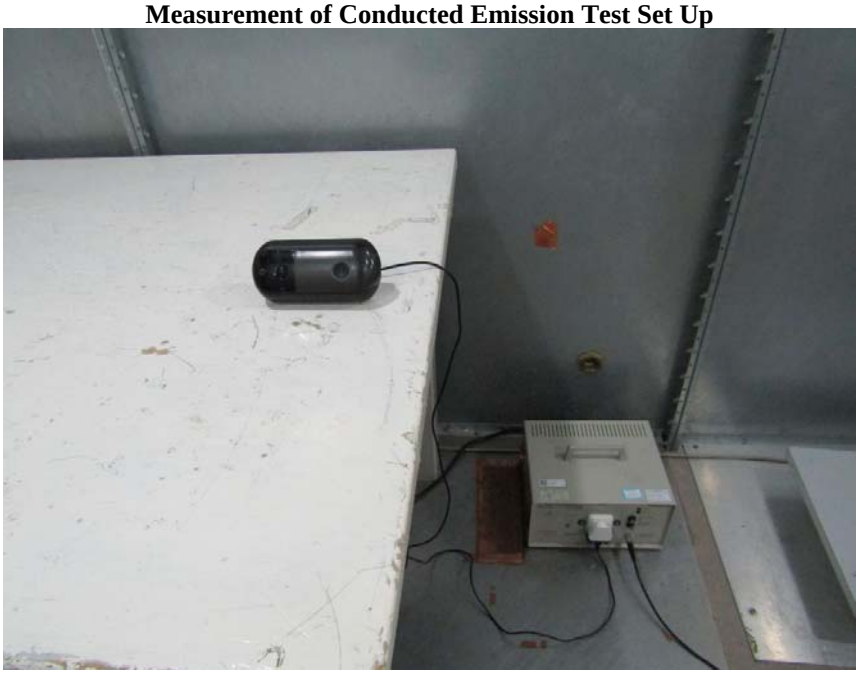


Photographs of EUT

Measurement of Radiated Emission Test Set Up (above 1000MHz)



Measurement of Conducted Emission Test Set Up



******* End of Test Report *******

Conditions of Issuance of Test Reports

1. All samples and goods are accepted by The Hong Kong Standards & Testing Centre Limited (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The Company provides its services on the basis that such terms and conditions constitute express agreement between the Company and any person, firm or company requesting its services (the "Clients").

2. Any report issued by the Company as a result of this application for testing service (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to his customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.

3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.

4. The Report refers only to the sample tested and does not apply to the bulk, unless the sampling has been carried out by the Company and is stated as such in the Report.

5. In the event of the improper use the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

6. Sample submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

7. The Company will not be liable for or accept responsibility for any loss or damage howsoever arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

8. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

9. Subject to the variable length of retention time for test data and report stored hereinto as to otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of this test report for a period of three years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after the retention period. Under no circumstances shall we be liable for damages of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

10. Issuance records of the Report are available on the internet at www.stc-group.org. Further enquiry of validity or verification of the Reports should be addressed to the Company.