APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
Qingping Technology (Beijing) Co., Ltd.

ClearGrass Air Monitor
Model No.: CGS1

FCC ID: 2AQ3F-CGS1

Prepared for	:	Qingping Technology (Beijing) Co., Ltd.
Address	:	Room 401, Block B, Fangheng Times Square, No.10 Wangjing Street, Chaoyang District, Beijing, China
Prepared by	:	Shenzhen Accurate Technology Co., Ltd.
Address	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China
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Report No.	:	ATE20181717
Date of Test	:	September 18-21, 2018
Date of Report	:	September 21, 2018

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Test Report Certification

Applicant	:	Qingping Technology (Beijing) Co., Ltd.
Address	:	Room 401, Block B, Fangheng Times Square, No.10 Wangjing Street, Chaoyang District, Beijing, China
Manufacturer	:	Qingping Technology (Beijing) Co., Ltd.
Address	:	Room 401, Block B, Fangheng Times Square, No.10 Wangjing Street, Chaoyang District, Beijing, China
Product	:	ClearGrass Air Monitor
Model No.	:	CGS1
Trade name	:	n.a.

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247: 2018
ANSI C63.10: 2013

The EUT was tested according to DTS test procedure of Apr 05, 2017 KDB558074 D01 DTS Meas Guidance v04 for compliance to FCC 47CFR 15.247 requirements
The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements. This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test : September 18-21, 2018
Date of Report : September 21, 2018

Test Engineer : (Bob Wang, Engineer)

Prepared by : (Bob Wang, Engineer)

Approved & Authorized Signer : (Sean Liu, Manager)

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

EUT	:	ClearGrass Air Monitor
Model Number	:	CGS1
Frequency Range	:	802.11b/g/n(20MHz): 2412-2462MHz 802.11n(40MHz): 2422-2452MHz
Number of Channels	:	802.11b/g/n (20MHz):11 802.11n (40MHz): 7
Antenna Gain	:	0dBi
Type of Antenna	:	IPEX Antenna
Power Supply	:	DC 3.7V
Data Rate	:	802.11b: 11, 5.5, 2, 1 Mbps 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps 802.11n: up to 150Mbps
Modulation Type	:	DSSS, OFDM
Hardware version	:	V01
Software version	:	1.1.1_0038

1.2.Carrier Frequency of Channels

802.11b, 802.11g, 802.11n (20MHz)

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

802.11n (40MHz)

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

1.3.Accessory and Auxiliary Equipment

AC/DC Power Adapter (provided by laboratory)	:	Model:BEK-QC-001 INPUT: 120V~60Hz OUTPUT:5V/1A

1.4.Description of Test Facility

EMC Lab	:	Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358 Listed by Innovation, Science and Economic Development Canada (ISEDC) The Registration Number is 5077A-2 Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193 Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.5.Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 06, 2018	1 Year
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 06, 2018	1 Year
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 06, 2018	1 Year
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 06, 2018	1 Year
Pre-Amplifier	Rohde&Schwarz	CBLU1183540-01	3791	Jan. 06, 2018	1 Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 06, 2018	1 Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 06, 2018	1 Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 06, 2018	1 Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 06, 2018	1 Year
Open Switch and Control Unit	Rohde&Schwarz	OSP120 + OSP-B157	101244 + 100866	Jan. 06, 2018	1 Year
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 06, 2018	1 Year
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 06, 2018	1 Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10SS	N/A	Jan. 06, 2018	1 Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375 /2510-60/11SS	N/A	Jan. 06, 2018	1 Year
RF COAXIAL CABLE	SUHNER	N-5m(Frequency range:9KHz-26.5GHz)	NO.3	Jan. 06, 2018	1 Year
RF COAXIAL CABLE	SUHNER	N-5m(Frequency range:9KHz-26.5GHz)	NO.4	Jan. 06, 2018	1 Year
RF COAXIAL CABLE	SUHNER	N-1m(Frequency range:9KHz-26.5GHz)	NO.5	Jan. 06, 2018	1 Year
RF COAXIAL CABLE	SUHNER	N-1m(Frequency range:9KHz-26.5GHz)	NO.6	Jan. 06, 2018	1 Year
Temporary antenna connector	NTGS	14AE	N/A	Mar. 13, 2018	N/A

Note: The temporary antenna is connected to the antenna jack on the PCB board, in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: **1.802.11b Transmitting mode**
Low Channel: 2412MHz
Middle Channel: 2437MHz
High Channel: 2462MHz

2.802.11g Transmitting mode
Low Channel: 2412MHz
Middle Channel: 2437MHz
High Channel: 2462MHz

3.802.11n (20MHz) Transmitting mode
Low Channel: 2412MHz
Middle Channel: 2437MHz
High Channel: 2462MHz

4.802.11n (40MHz) Transmitting mode
Low Channel: 2422MHz
Middle Channel: 2437MHz
High Channel: 2452MHz

Note: The WiFi has been tested under continuous transmission mode.
EUT is connected to a computer through the usb-serial controller tool and Use test software to set the test mode.
Test software is DutApiWiFi8801BrdigeUart

output power setting table

Test Mode	Set Tx Output Power	Data rate
802.11b	9dBm	11Mbps
802.11g	8dBm	54Mbps
802.11n(HT20)	8dBm	MCS7
802.11n(HT40)	7dBm	MCS7

3.2.Configuration and peripherals

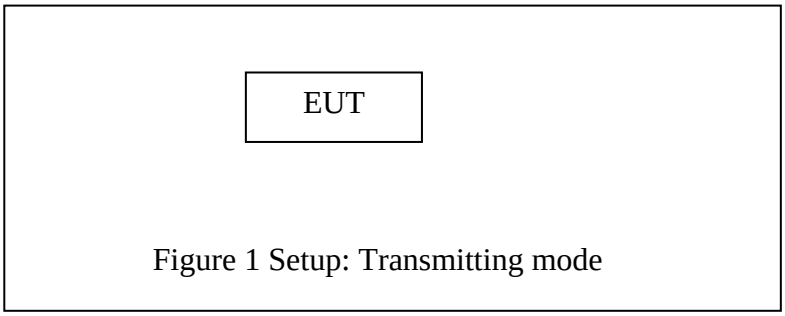


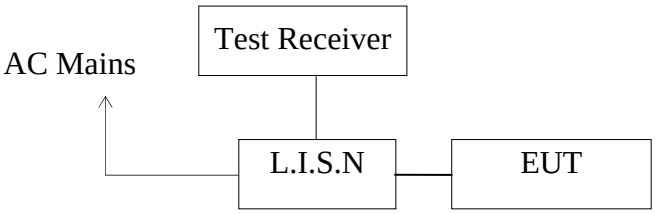
Figure 1 Setup: Transmitting mode

4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	Power Line Conducted Emission	Compliant
Section 15.247(a)(2)	6dB Bandwidth Test	Compliant
KDB558074 D01 DTS Meas Guidance v04	Duty cycle	Compliant
ANSI C63.10: 2013 Section 6.9.3	99% occupied Bandwidth	Compliant
Section 15.247(e)	Power Spectral Density Test	Compliant
Section 15.247(b)(3)	Maximum Peak Output Power Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.247(d) Section 15.209	Radiated Spurious Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

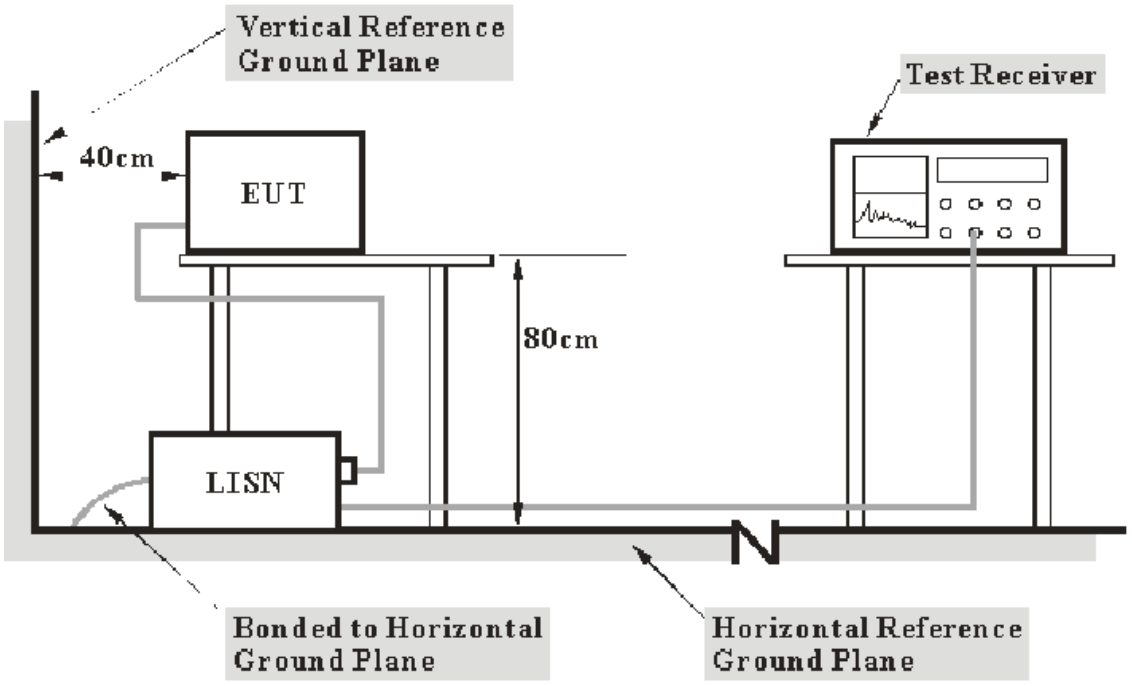
5. POWER LINE CONDUCTED MEASUREMENT

5.1.Block Diagram of Test Setup



(EUT: ClearGrass Air Monitor)

5.1.1. Test System Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

5.2.Power Line Conducted Emission Measurement Limits

Frequency (MHz)	Limit dB(μV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0
NOTE1: The lower limit shall apply at the transition frequencies. NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

5.3.Configuration of EUT on Measurement

The equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

5.4.Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in test mode and measure it.

5.5.Test Procedure

The EUT is put on the plane 0.8 m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

5.6.Data Sample

Frequency (MHz)	Transducer value (dB)	QuasiPeak Level (dBμV)	Average Level (dBμV)	QuasiPeak Limit (dBμV)	Average Limit (dBμV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XX	10.5	51.1	34.2	56.0	46.0	4.9	11.8	Pass

Frequency(MHz) = Emission frequency in MHz
Transducer value(dB) = Insertion loss of LISN + Cable Loss
Level(dBμV) = Quasi-peak Reading/Average Reading + Transducer value
Limit (dBμV) = Limit stated in standard
Margin = Limit (dBμV) - Level (dBμV)

Calculation Formula:
Margin = Limit (dBμV) - Level (dBμV)

5.7.Power Line Conducted Emission Measurement Results

PASS.
Test Lab: Shielding room
Test Engineer: Bob

The frequency range from 150kHz to 30MHz is checked.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.
Emissions attenuated more than 20 dB below the permissible value are not reported.

All data was recorded in the Quasi-peak and average detection mode.

The spectral diagrams are attached as below.

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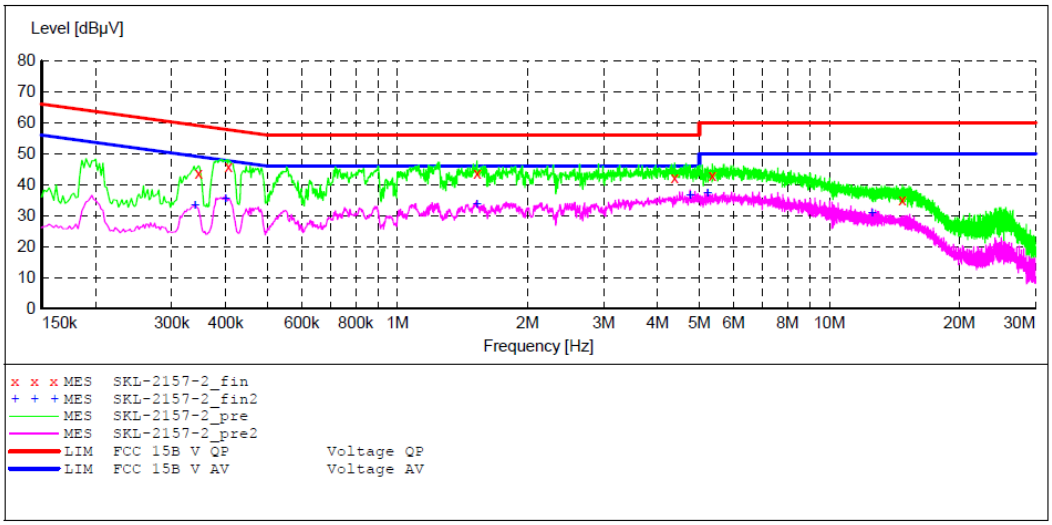
CONDUCTED EMISSION STANDARD FCC PART 15 B

```
EUT:                  ClearGrass Air Monitor M/N:CGS1
Manufacturer:         Qingping
Operating Condition:  WIFI communication
Test Site:            1#Shielding Room
Operator:             Bob
Test Specification:   L  120V/60Hz
Comment:              Report NO.:ATE20181717
Start of Test:        2018-9-18 / 9:09:55
```

SCAN TABLE: "V 150K-30MHz fin"

```
  Short Description:              _SUB_STD_VTERM2 1.70
  Start      Stop       Step       Detector  Meas.     IF       Transducer
  Frequency  Frequency  Width                Time      Bandw.
  150.0 kHz  30.0 MHz   4.5 kHz    QuasiPeak 1.0 s     9 kHz    NSLK8126 2008
                                   Average
```



MEASUREMENT RESULT: "SKL-2157-2_fin"

2018-9-18 9:12

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.346000	43.90	10.9	59	15.2	QP	L1	GND
0.406000	45.70	11.0	58	12.0	QP	L1	GND
1.528000	43.80	11.2	56	12.2	QP	L1	GND
4.380000	42.30	11.4	56	13.7	QP	L1	GND
5.355000	43.00	11.5	60	17.0	QP	L1	GND
14.760000	35.10	11.6	60	24.9	QP	L1	GND

MEASUREMENT RESULT: "SKL-2157-2_fin2"

2018-9-18 9:12

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.340000	33.30	10.9	49	15.9	AV	L1	GND
0.400000	35.50	11.0	48	12.4	AV	L1	GND
1.526000	33.70	11.2	46	12.3	AV	L1	GND
4.755000	36.60	11.4	46	9.4	AV	L1	GND
5.220000	37.50	11.4	50	12.5	AV	L1	GND
12.545000	30.70	11.6	50	19.3	AV	L1	GND

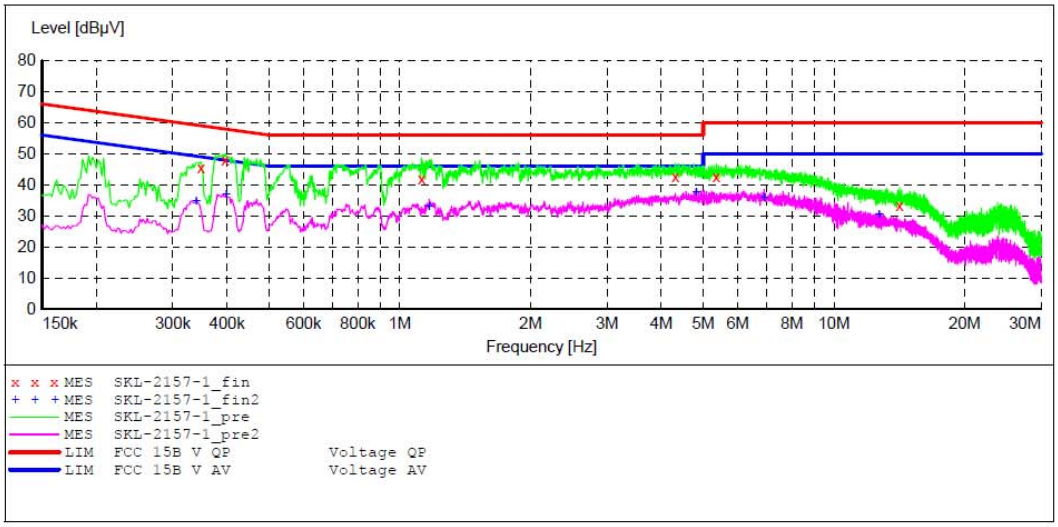
ACCURATE TECHNOLOGY CO.,LTD

CONDUCTED EMISSION STANDARD FCC PART 15 B

```
EUT:                  ClearGrass Air Monitor M/N:CGS1
Manufacturer:         Qingping
Operating Condition:  WIFI communication
Test Site:            1#Shielding Room
Operator:             Bob
Test Specification:   N  120V/60Hz
Comment:              Report NO.:ATE20181717
Start of Test:        2018-9-18 / 9:07:16
```

SCAN TABLE: "V 150K-30MHz fin"

```
  Short Description:           _SUB_STD_VTERM2 1.70
  Start      Stop       Step      Detector  Meas.     IF      Transducer
  Frequency  Frequency  Width               Time      Bandw.
  150.0 kHz  30.0 MHz   4.5 kHz   QuasiPeak 1.0 s     9 kHz   NSLK8126 2008
                                  Average
```



MEASUREMENT RESULT: "SKL-2157-1_fin"

2018-9-18 9:09

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.348000	45.50	10.9	59	13.5	QP	N	GND
0.396000	48.00	11.0	58	9.9	QP	N	GND
1.122000	41.80	11.2	56	14.2	QP	N	GND
4.310000	42.80	11.4	56	13.2	QP	N	GND
5.355000	42.80	11.5	60	17.2	QP	N	GND
14.165000	33.50	11.6	60	26.5	QP	N	GND

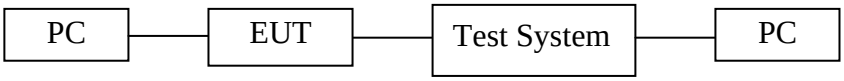
MEASUREMENT RESULT: "SKL-2157-1_fin2"

2018-9-18 9:09

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.340000	34.90	10.9	49	14.3	AV	N	GND
0.398000	36.80	11.0	48	11.1	AV	N	GND
1.168000	33.00	11.2	46	13.0	AV	N	GND
4.820000	37.80	11.4	46	8.2	AV	N	GND
6.905000	35.80	11.5	50	14.2	AV	N	GND
12.715000	30.50	11.6	50	19.5	AV	N	GND

6. 6DB BANDWIDTH MEASUREMENT

6.1.Block Diagram of Test Setup



6.2.The Requirement For Section 15.247(a)(2)

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

6.3.EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4.Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2412-2462 and 2422-2452MHz. We select 2412MHz, 2437MHz, 2462MHz and 2422MHz, 2437MHz, 2452MHz TX frequency to transmit.

6.5.Test Procedure

1. Set resolution bandwidth (RBW) = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.6.Test Result

Test Lab: Shielding room
Test Engineer: Bob

The test was performed with 802.11b			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	9.570	> 0.5MHz
Middle	2437	9.585	> 0.5MHz
High	2462	9.095	> 0.5MHz

The test was performed with 802.11g			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	16.335	> 0.5MHz
Middle	2437	16.340	> 0.5MHz
High	2462	16.340	> 0.5MHz

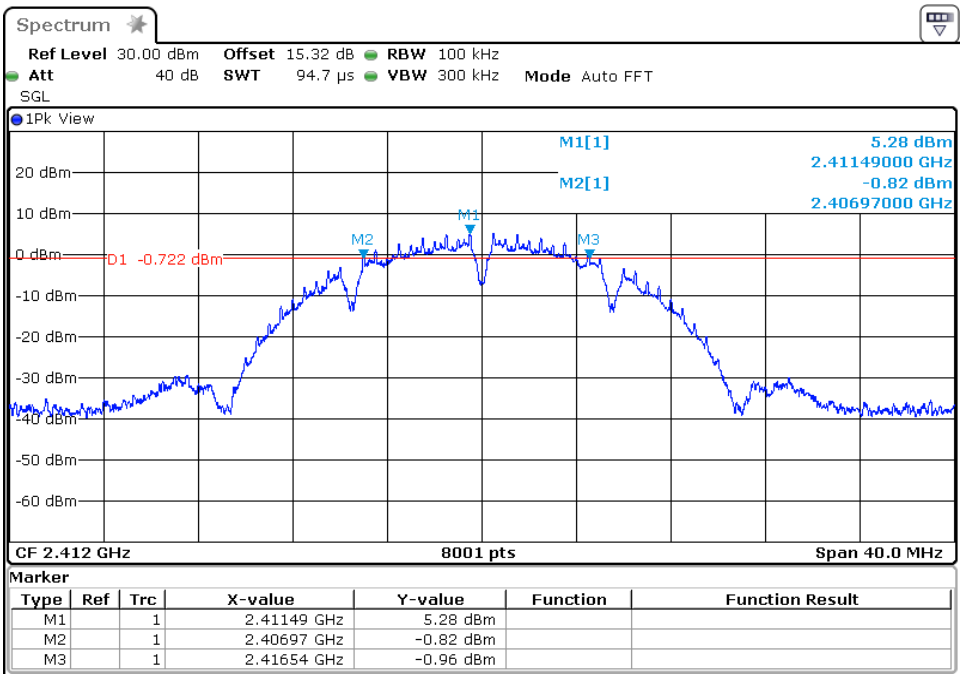
The test was performed with 802.11n (Bandwidth: 20 MHz)			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2412	17.585	> 0.5MHz
Middle	2437	17.580	> 0.5MHz
High	2462	17.590	> 0.5MHz

The test was performed with 802.11n (Bandwidth: 40 MHz)			
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Low	2422	35.690	> 0.5MHz
Middle	2437	35.720	> 0.5MHz
High	2452	35.720	> 0.5MHz

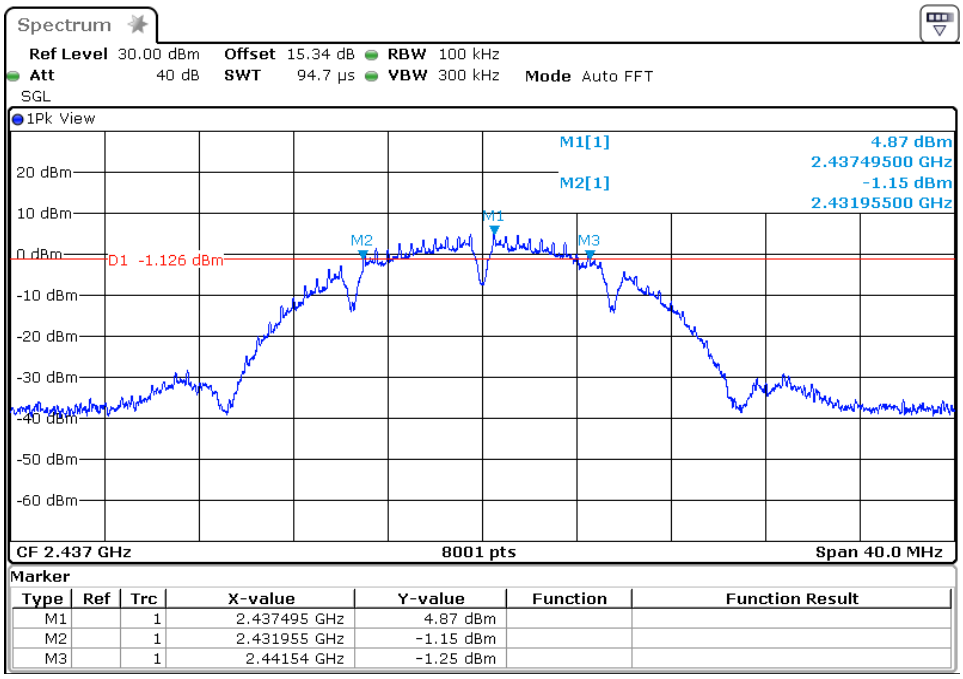
Note: We tested 802.11b/g/n mode the all data rate and recorded the worst case data for this channel to be 11Mbps for 802.11b mode and 54Mbps for 802.11g mode and MCS7 for 802.11n(20MHz) and MCS7 for 802.11n(40MHz)mode.

The spectrum analyzer plots are attached as below.

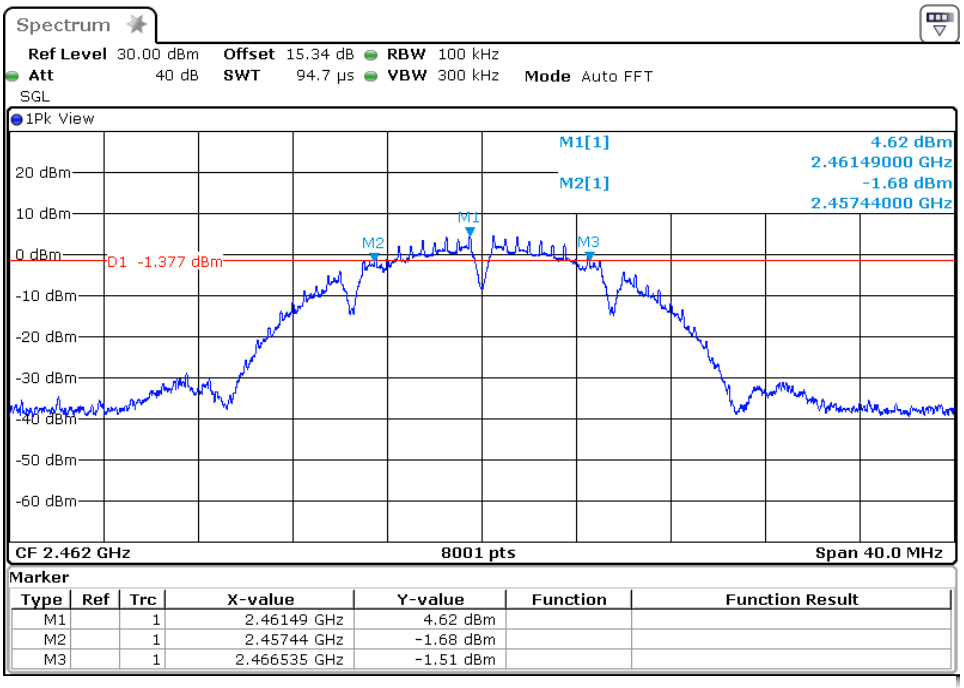
802.11b Channel Low 2412MHz



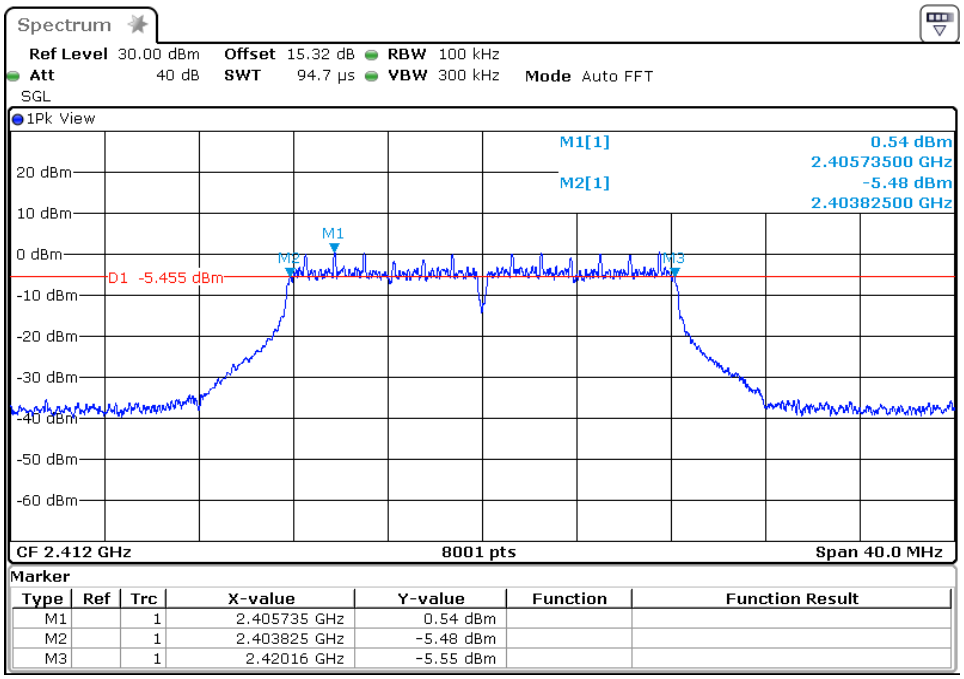
802.11b Channel Middle 2437MHz



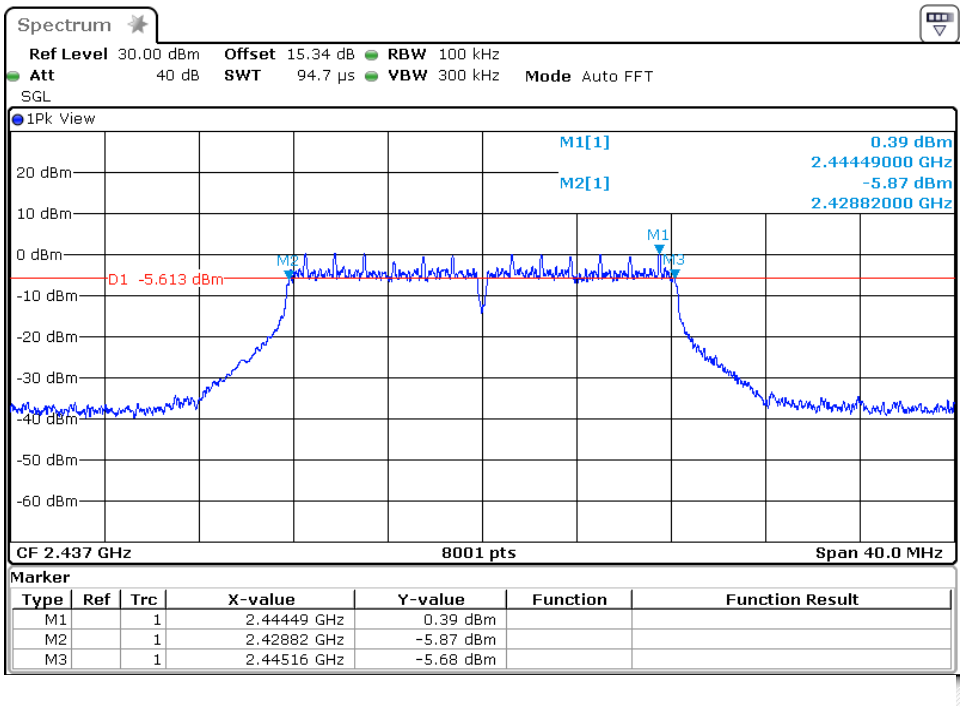
802.11b Channel High 2462MHz



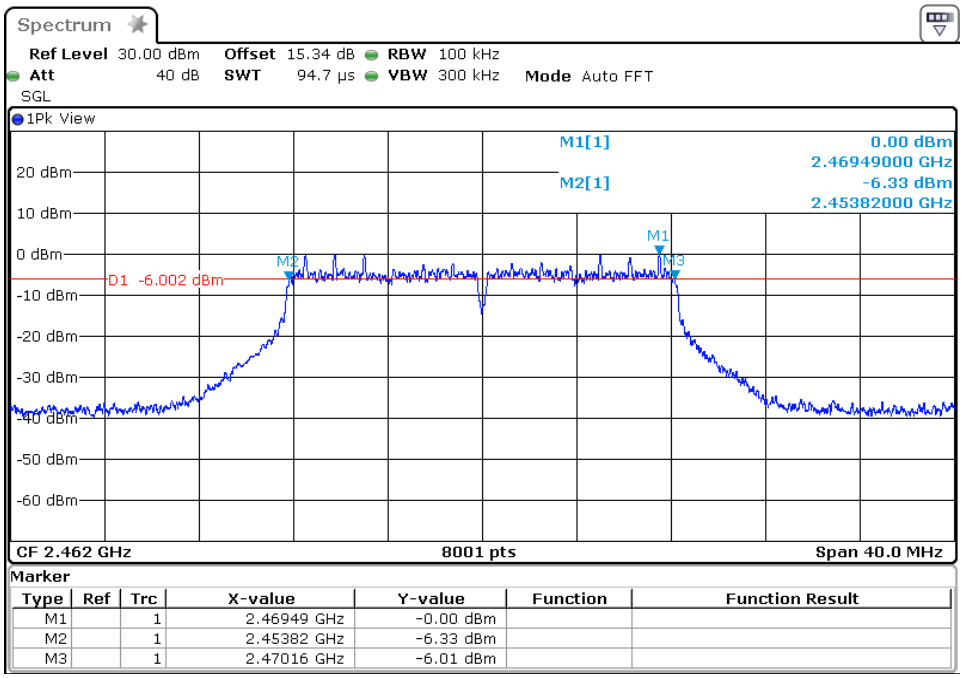
802.11g Channel Low 2412MHz



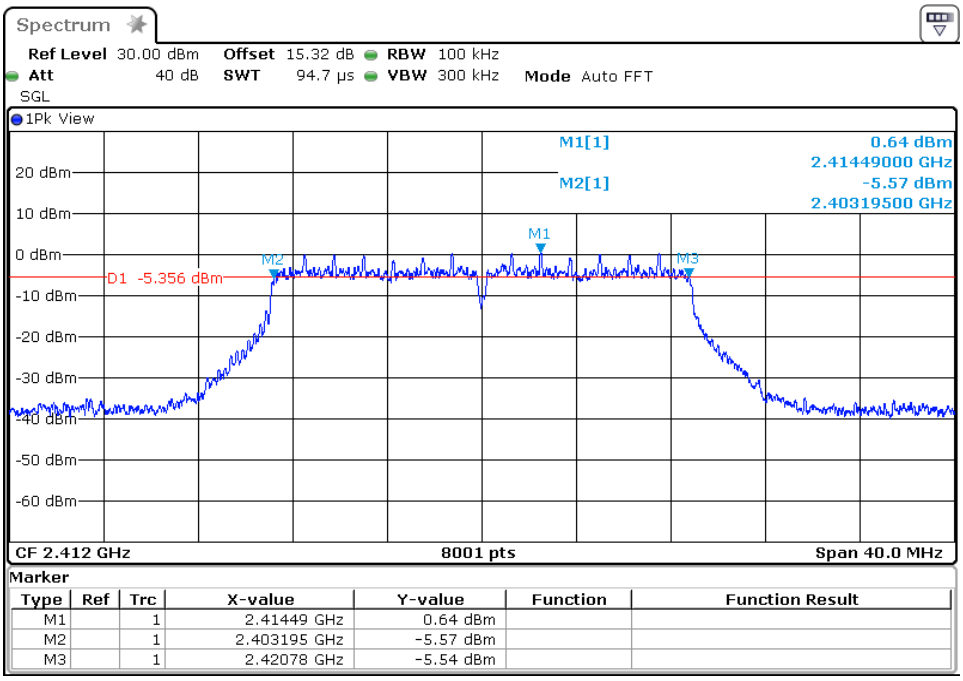
802.11g Channel Middle 2437MHz



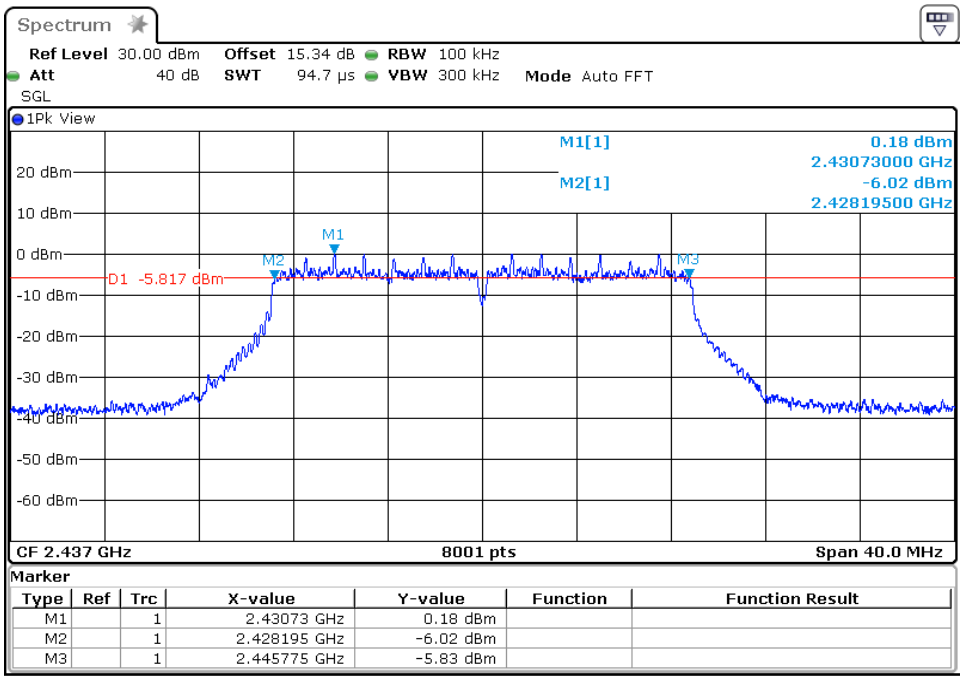
802.11g Channel High 2462MHz



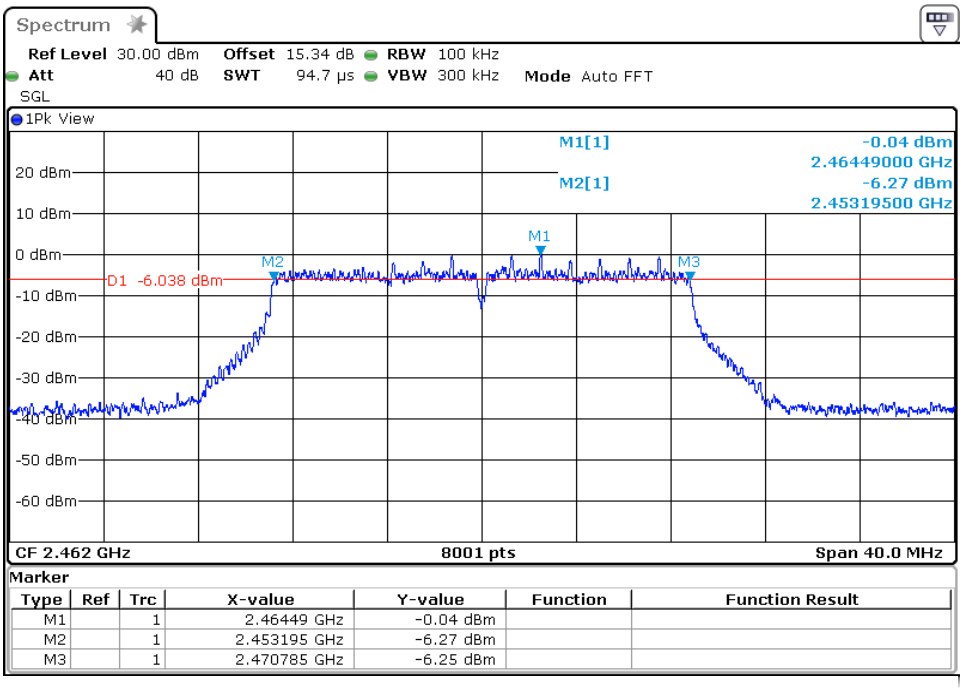
802.11n Channel Low 2412MHz (20MHz)



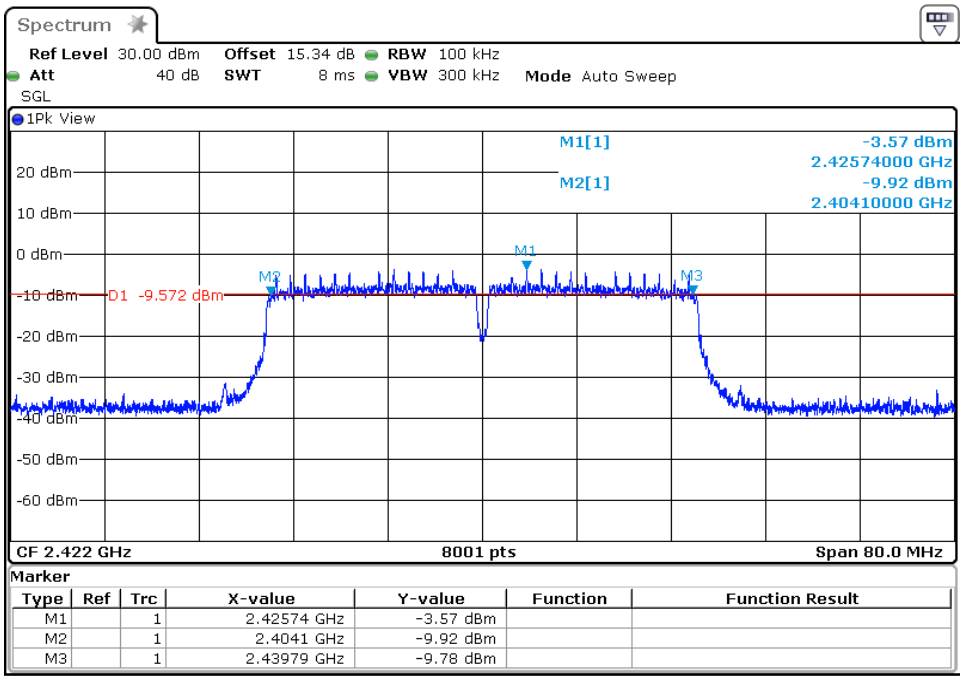
802.11n Channel Middle 2437MHz(20MHz)



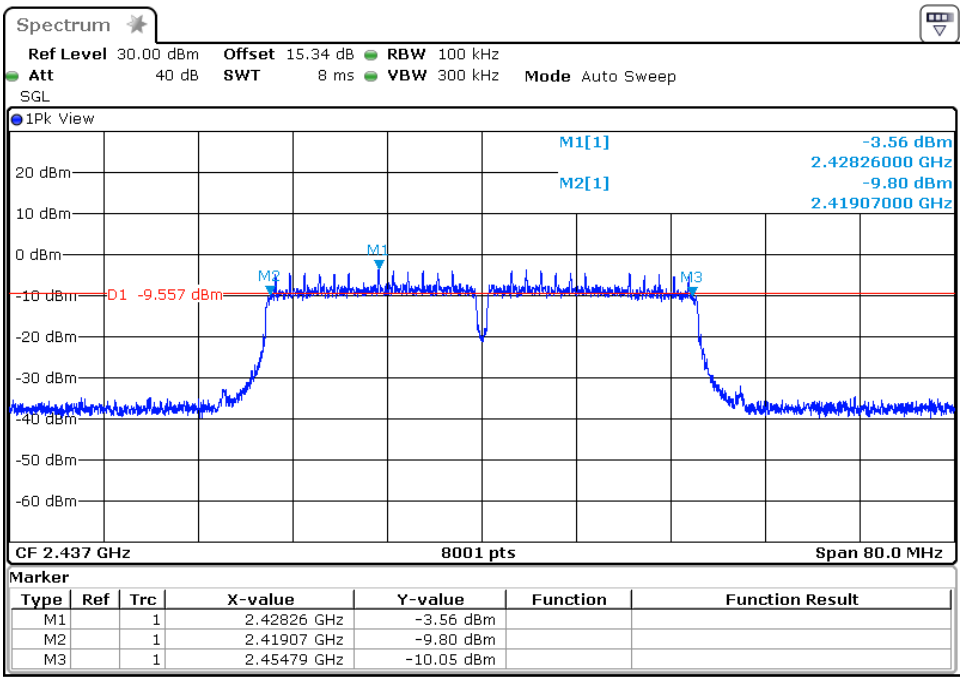
802.11n Channel High 2462MHz(20MHz)



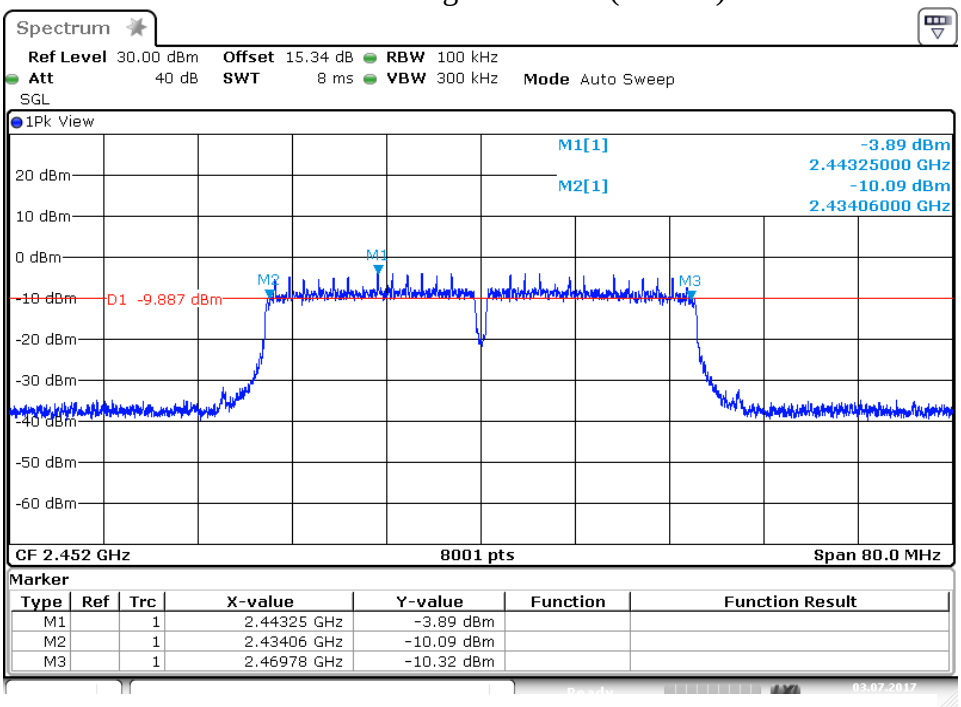
802.11n Channel Low 2422MHz (40MHz)



802.11n Channel Middle 2437MHz(40MHz)

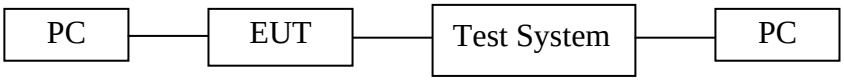


802.11n Channel High 2452MHz(40MHz)



7. DUTY CYCLE MEASUREMENT

7.1.Block Diagram of Test Setup



7.2.EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.3.Operating Condition of EUT

7.3.1.Setup the EUT and simulator as shown as Section 7.1.

7.3.2.Turn on the power of all equipment.

7.3.3.Let the EUT work in TX modes measure it. The transmit frequency are 2412-2462 and 2422-2452MHz. We select 2412MHz, 2437MHz, 2462MHz and 2422MHz, 2437MHz, 2452MHz TX frequency to transmit.

7.4.Test Procedure

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:
1. A diode detector and an oscilloscope that together have sufficiently short response time to permit accurate measurements of the on- and off-times of the transmitted signal.
2. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on- and off-times of the transmitted signal
a. Set the center frequency of the instrument to the centre frequency of the transmission
b. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value(10MHz).
c. Set detector = Peak or average.
d. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100.
(For example, if VBW and/or RBW are limited to 3MHz, then the zero-span method of measuring duty cycle shall not be used if T≤16.7 microseconds.)

7.5.Test Result

Test Lab: Shielding room
Test Engineer: Bob

The test was performed with 802.11b			
Channel	Frequency (MHz)	duty cycle(x)	10log(1/x)
Middle	2437	97.68%	0.10

The test was performed with 802.11g			
Channel	Frequency (MHz)	duty cycle(x)	10log(1/x)
Middle	2437	97.20%	0.12

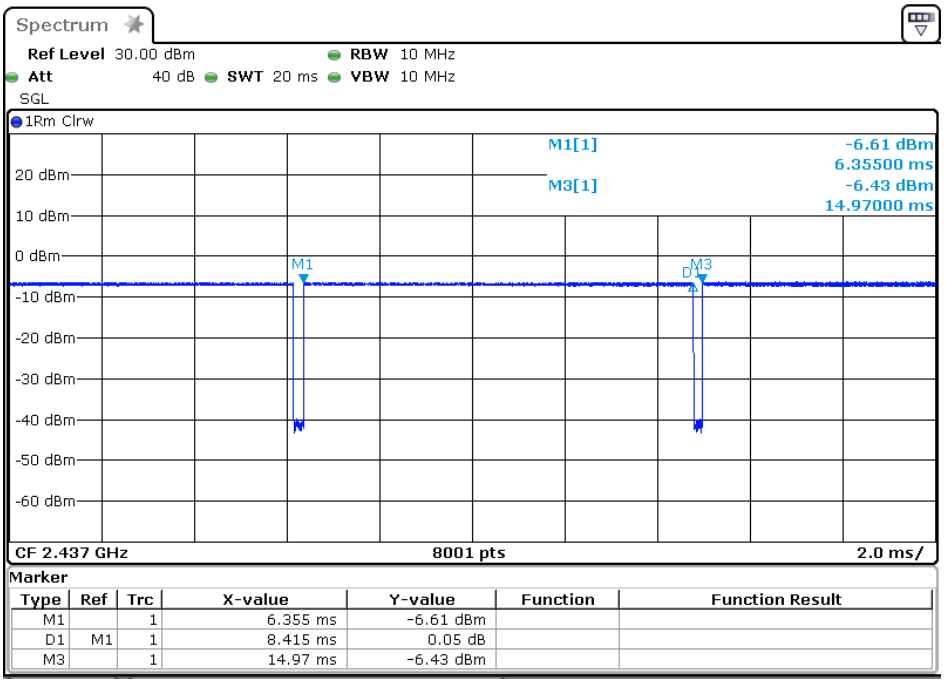
The test was performed with 802.11n (Bandwidth: 20 MHz)			
Channel	Frequency (MHz)	duty cycle(x)	10log(1/x)
Middle	2437	97.00%	0.13

The test was performed with 802.11n (Bandwidth: 40 MHz)			
Channel	Frequency (MHz)	duty cycle(x)	10log(1/x)
Middle	2437	94.14%	0.26

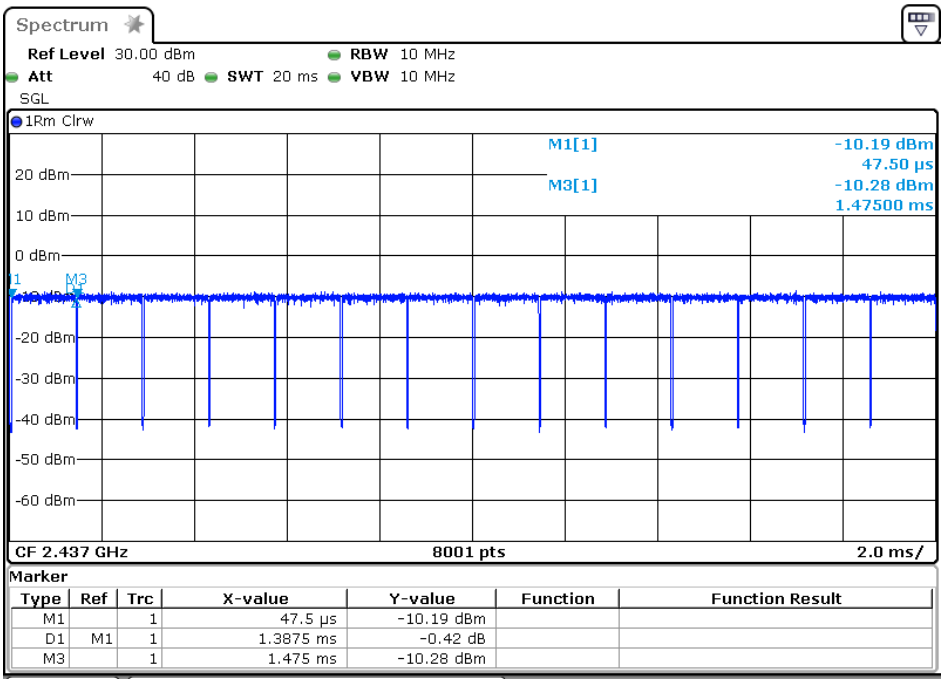
Note: We tested 802.11b/g/n mode the all data rate and recorded the worst case data for this channel to be 11Mbps for 802.11b mode and 54Mbps for 802.11g mode and MCS7 for 802.11n(20MHz) and MCS7 for 802.11n(40MHz)mode.

The spectrum analyzer plots are attached as below.

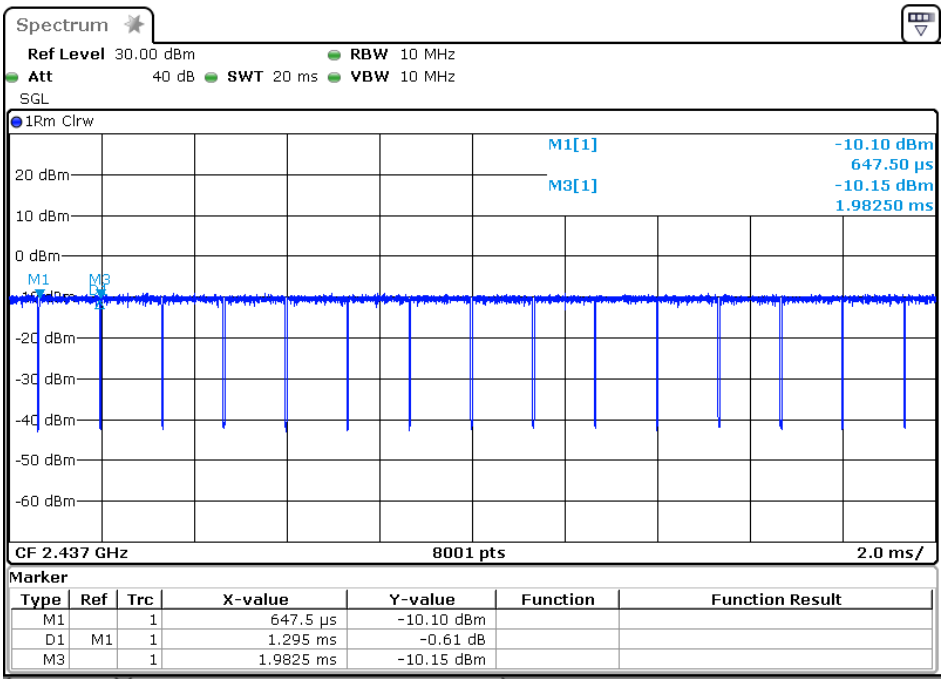
802.11b Channel Middle 2437MHz



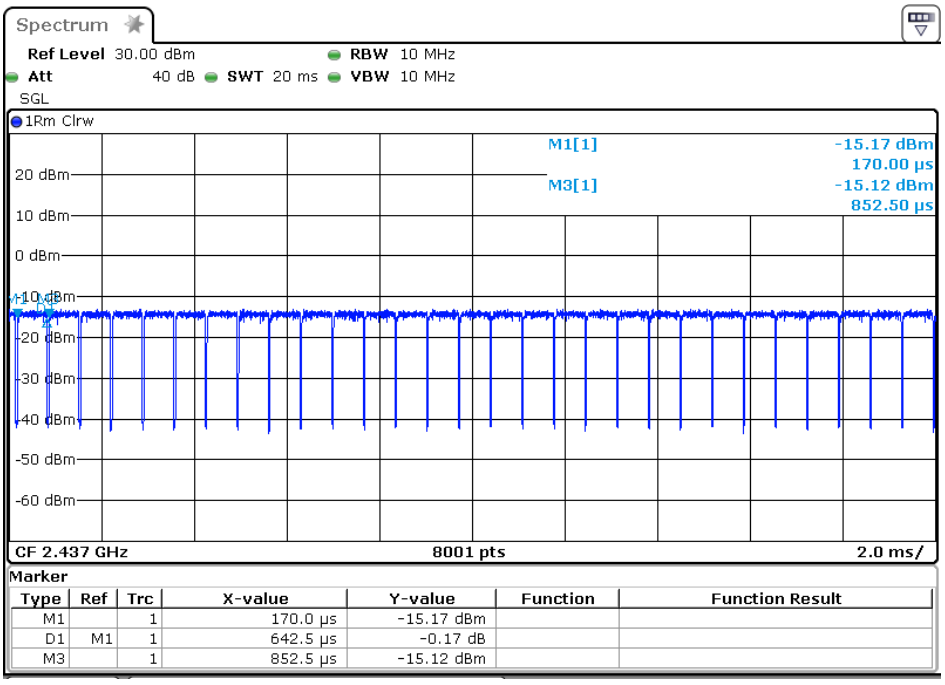
802.11g Channel Middle 2437MHz



802.11n Channel Middle 2437MHz(20MHz)

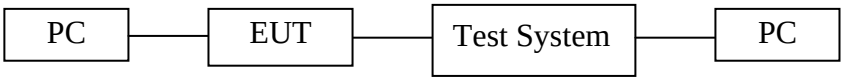


802.11n Channel Middle 2437MHz(40MHz)



8. MAXIMUM CONDUCTED (AVERAGE) OUTPUT POWER

8.1.Block Diagram of Test Setup



8.2.The Requirement For Section 15.247(b)(3)

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

8.3.EUT Configuration on Measurement

The equipment is installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4.Operating Condition of EUT

8.4.1.Setup the EUT and simulator as shown as Section 8.1.

8.4.2.Turn on the power of all equipment.

8.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2412-2462 and 2422-2452MHz. We select 2412MHz, 2437MHz, 2462MHz and 2422MHz, 2437MHz, 2452MHz TX frequency to transmit.

8.5.Test Procedure

8.5.1.The EUT was tested according to DTS test procedure of Apr 05, 2017 KDB5580 74 D01 DTS Meas Guidance v04 for compliance to FCC 47CFR 15.247 requirements.

8.5.2.The transmitter output was connected to the spectrum analyzer through a low loss cable.

8.5.3.Set RBW = 1-5% of the OBW, not to exceed 1 MHz, VBW $\geqslant$ 3 x RBW, Sweep time = auto, Set span to at least 1.5 times the OBW, Detector = RMS.

8.5.4.Measurement the Maximum conducted (average) output power.

8.6.Test Result

Test Lab: Shielding room
Test Engineer: Bob
Final power= Ave output power+10log(1/ duty cycle)

The test was performed with 802.11b

Channel	Frequency (MHz)	Ave output power (dBm)	10log(1/ duty cycle)	Final power (dBm)	Final power (mW)	Limits dBm / W
Low	2412	9.18	0.10	9.28	8.47	30 dBm / 1 W
Middle	2437	9.30	0.10	9.40	8.71	30 dBm / 1 W
High	2462	9.24	0.10	9.34	8.59	30 dBm / 1 W

The test was performed with 802.11g

Channel	Frequency (MHz)	Ave output power (dBm)	10log(1/ duty cycle)	Final power (dBm)	Final power (mW)	Limits dBm / W
Low	2412	8.39	0.12	8.51	7.10	30 dBm / 1 W
Middle	2437	8.74	0.12	8.86	7.69	30 dBm / 1 W
High	2462	8.85	0.12	8.97	7.89	30 dBm / 1 W

The test was performed with 802.11n (20MHz)

Channel	Frequency (MHz)	Ave output power (dBm)	10log(1/ duty cycle)	Final power (dBm)	Final power (mW)	Limits dBm / W
Low	2412	8.86	0.13	8.99	7.93	30 dBm / 1 W
Middle	2437	8.73	0.13	8.86	7.69	30 dBm / 1 W
High	2462	8.42	0.13	8.55	7.16	30 dBm / 1 W

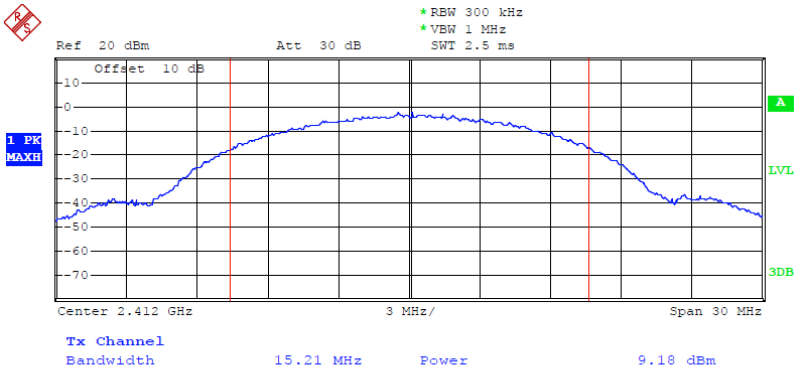
The test was performed with 802.11n (40MHz)

Channel	Frequency (MHz)	Ave output power (dBm)	10log(1/ duty cycle)	Final power (dBm)	Final power (mW)	Limits dBm / W
Low	2422	7.20	0.26	7.46	5.57	30 dBm / 1 W
Middle	2437	7.03	0.26	7.29	5.36	30 dBm / 1 W
High	2452	7.11	0.26	7.37	5.46	30 dBm / 1 W

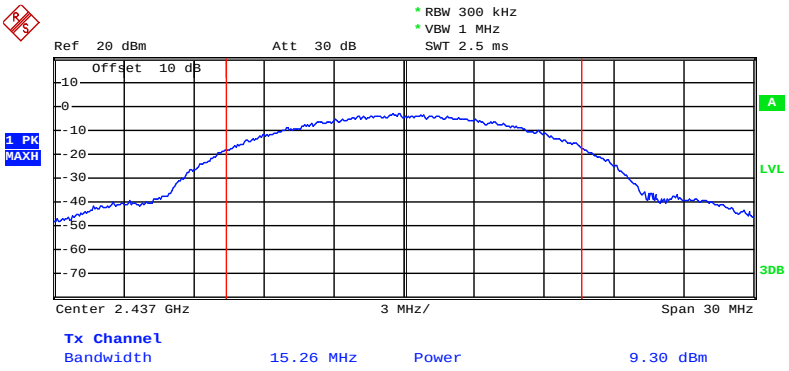
Note: We tested 802.11b/g/n mode the all data rate and recorded the worst case data for this channel to be 11Mbps for 802.11b mode and 54Mbps for 802.11g mode and MCS7 for 802.11n(20MHz) and MCS7 for 802.11n(40MHz) mode.

The spectrum analyzer plots are attached as below.

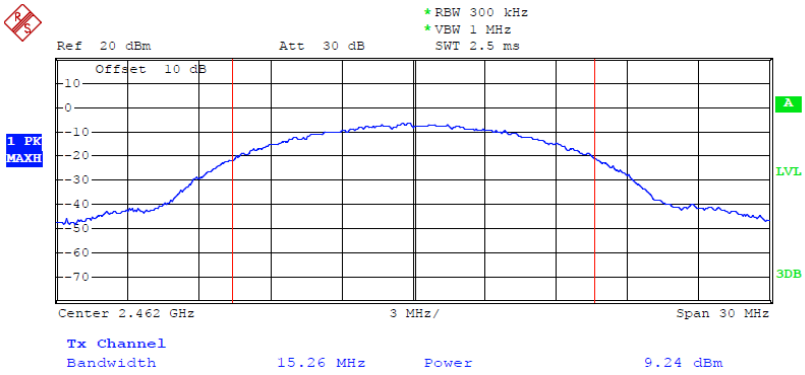
802.11b Channel Low 2412MHz



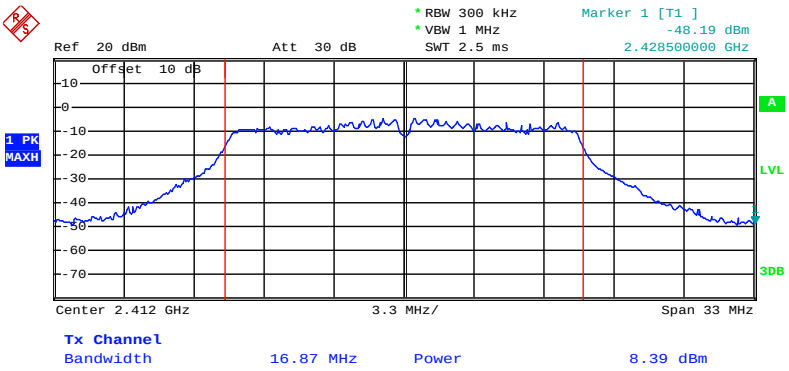
802.11b Channel Middle 2437MHz



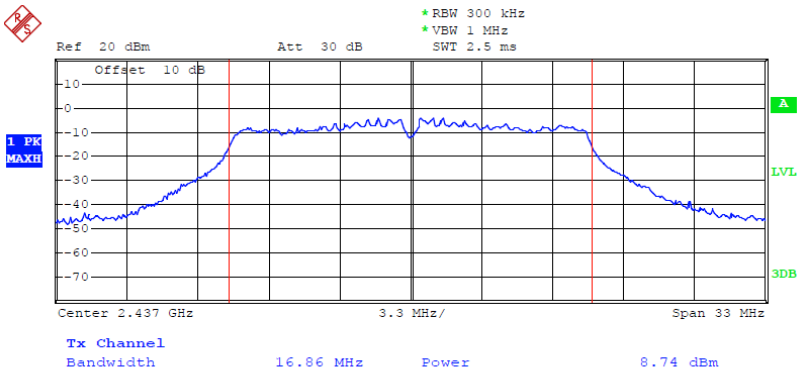
802.11b Channel High 2462MHz



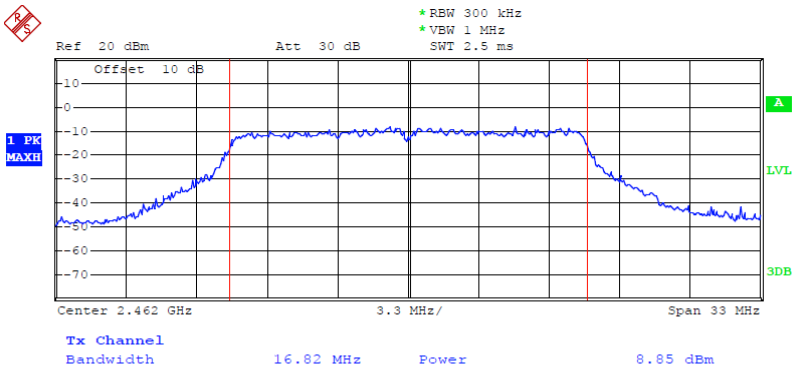
802.11g Channel Low 2412MHz



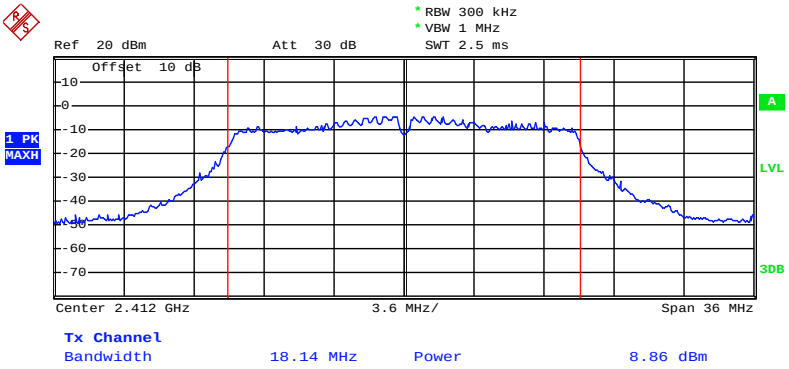
802.11g Channel Middle 2437MHz



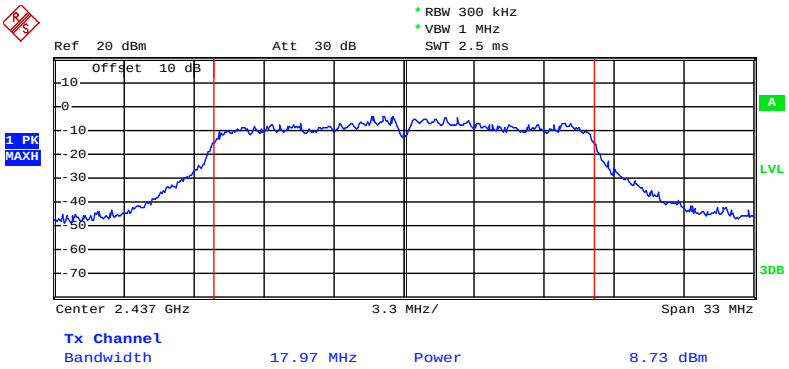
802.11g Channel High 2462MHz



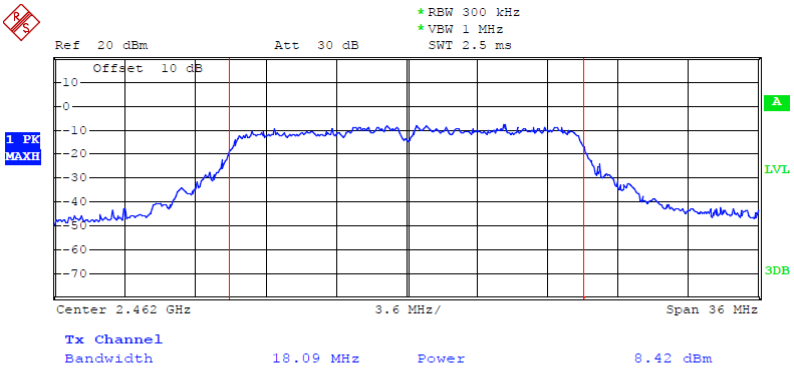
802.11n Channel Low 2412MHz (20MHz)



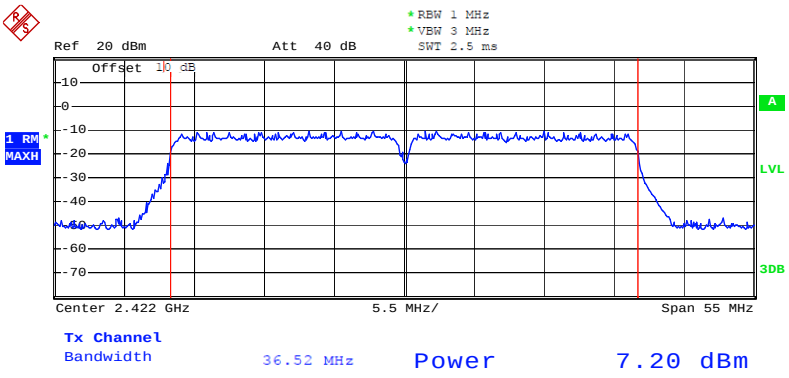
802.11n Channel Middle 2437MHz (20MHz)



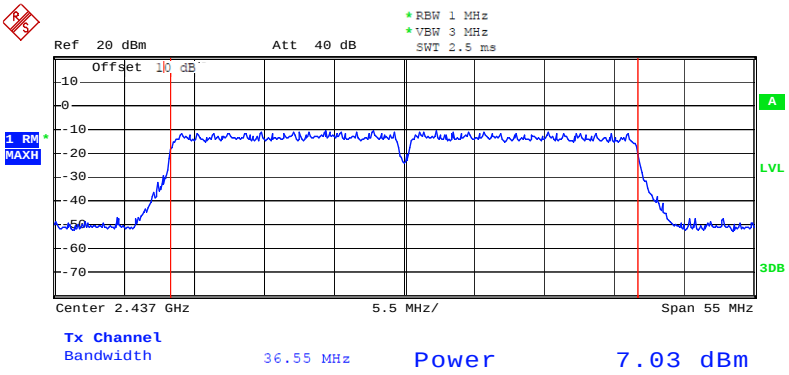
802.11n Channel High 2462MHz (20MHz)



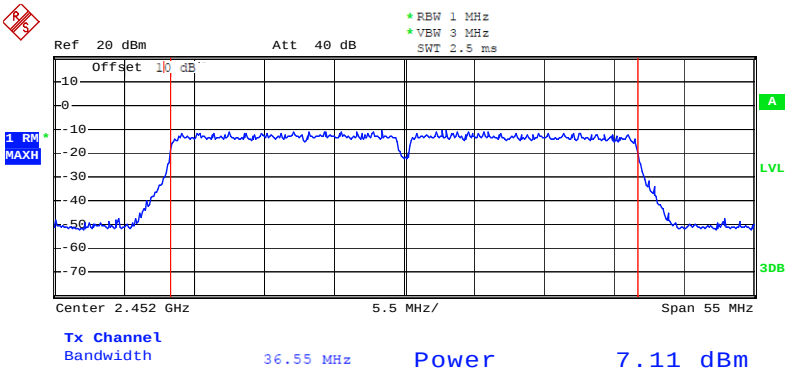
802.11n Channel Low 2422MHz (40MHz)



802.11n Channel Middle 2437MHz (40MHz)

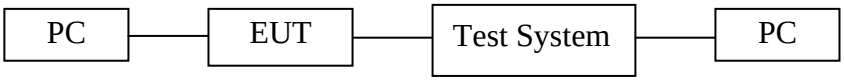


802.11n Channel High 2452MHz (40MHz)



9. POWER SPECTRAL DENSITY MEASUREMENT

9.1.Block Diagram of Test Setup



9.2.The Requirement For Section 15.247(e)

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4.Operating Condition of EUT

9.4.1.Setup the EUT and simulator as shown as Section 9.1.

9.4.2.Turn on the power of all equipment.

9.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2412-2462 and 2422-2452MHz. We select 2412MHz, 2437MHz, 2462MHz and 2422MHz, 2437MHz, 2452MHz TX frequency to transmit.

9.5.Test Procedure

9.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

9.5.2.Measurement Procedure AVGPSD-2:

This procedure is applicable when the EUT cannot be configured to transmit continuously(i.e., duty cycle<98%), and when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty is constant(i.e., duty cycle variations are less than ±2%):

Measure the dyty cycle(x) of the transmitter output signal as described in Section 6.0.

Set instrument center frequency to DTS channel center frequency.
Set span to at least 1.5×OBW.
Set RBW to: 3kHz≤ RBW≤100kHz.
Set VBW≥ 3×RBW
Detector=power averaging(RMS) or sample detector(when RMS not available).
Ensure that the number of measurement points in sweep≥2×span/RBW.
Sweep time=auto couple.
Do not use sweep triggering. Allow sweep to “free run”.
Employ trace averaging(RMS) mode over a minimum of 100 traces.
Use the peak maker function to determine the maximum amplitude level.
Add 10log(1/x), where x is the duty cycle measured in step(a, to the measured PSD to compute the average PSD during the actual transmission time.
If resultant value exceeds the limit, then reduce RBW(no less than 3kHz) and repeat(note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

9.6.Test Result

Test Lab: Shielding room
Test Engineer: Bob

The test was performed with 802.11b					
Channel	Frequency (MHz)	AVG Power Spectral Density (dBm)	10log(1/ duty cycle)	Final Power Spectral Density (dBm)	Limits (dBm)
Low	2412	-2.26	0.10	-2.16	8 dBm
Middle	2437	-3.89	0.10	-3.79	8 dBm
High	2462	-4.03	0.10	-3.93	8 dBm

The test was performed with 802.11g					
Channel	Frequency (MHz)	AVG Power Spectral Density (dBm)	10log(1/ duty cycle)	Final Power Spectral Density (dBm)	Limits (dBm)
Low	2412	-16.01	0.12	-15.89	8 dBm
Middle	2437	-17.33	0.12	-17.21	8 dBm
High	2462	-16.86	0.12	-16.74	8 dBm

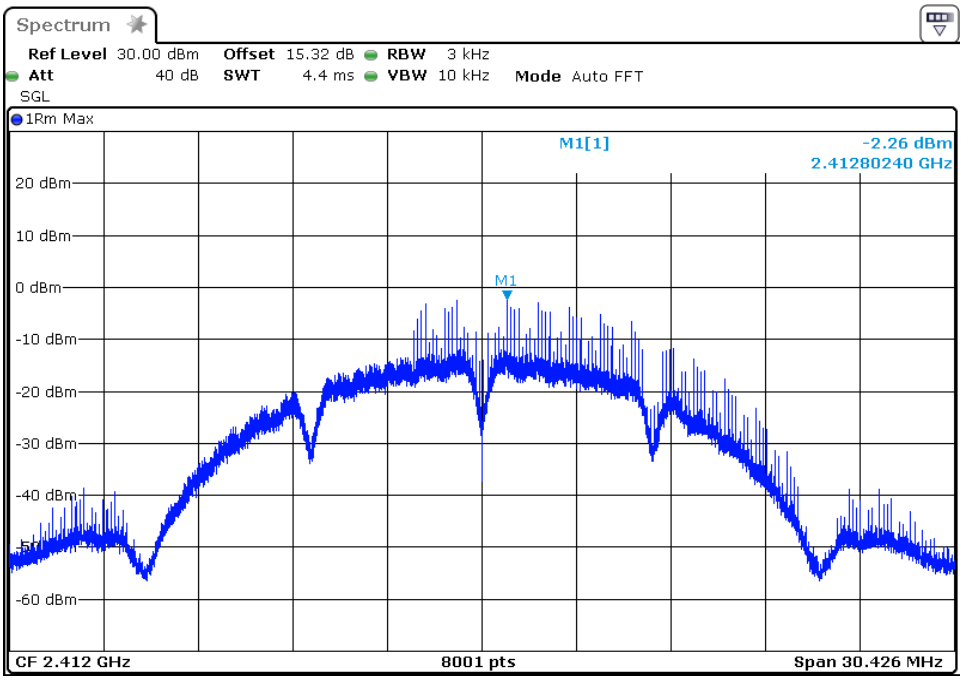
The test was performed with 802.11n (20MHz)					
Channel	Frequency (MHz)	AVG Power Spectral Density (dBm)	10log(1/ duty cycle)	Final Power Spectral Density (dBm)	Limits (dBm)
Low	2412	-16.43	0.13	-16.30	8 dBm
Middle	2437	-16.29	0.13	-16.16	8 dBm
High	2462	-16.86	0.13	-16.73	8 dBm

The test was performed with 802.11n (40MHz)					
Channel	Frequency (MHz)	AVG Power Spectral Density (dBm)	10log(1/ duty cycle)	Final Power Spectral Density (dBm)	Limits (dBm)
Low	2422	-21.11	0.26	-20.85	8 dBm
Middle	2437	-21.21	0.26	-20.95	8 dBm
High	2452	-21.25	0.26	-20.99	8 dBm

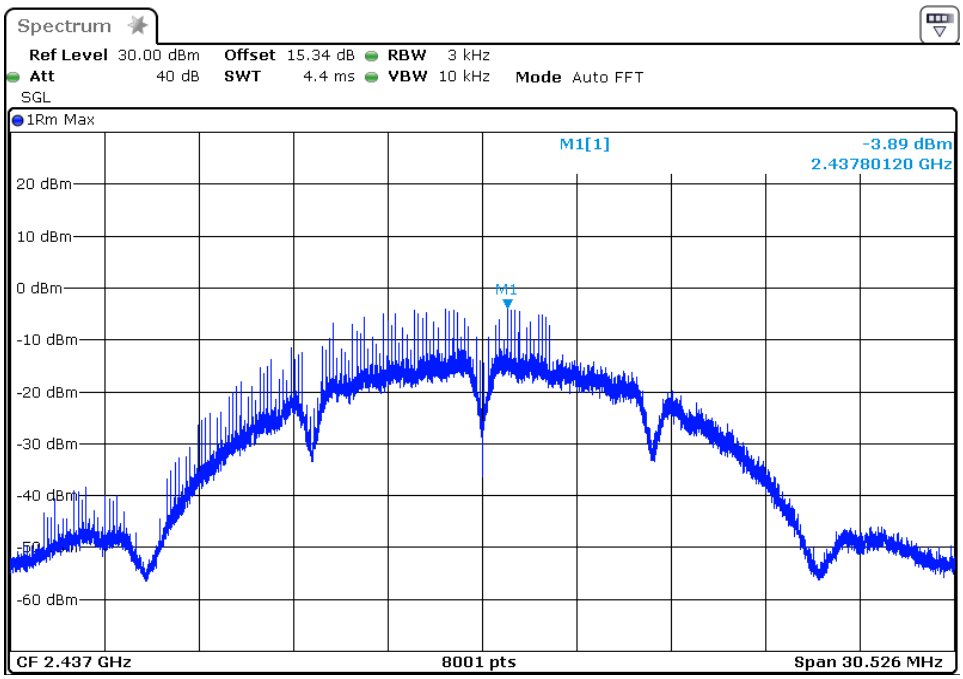
Note: We tested 802.11b/g/n mode the all data rate and recorded the worst case data for this channel to be 11Mbps for 802.11b mode and 54Mbps for 802.11g mode and MCS7 for 802.11n(20MHz) and MCS7 for 802.11n(40MHz) mode.

The spectrum analyzer plots are attached as below.

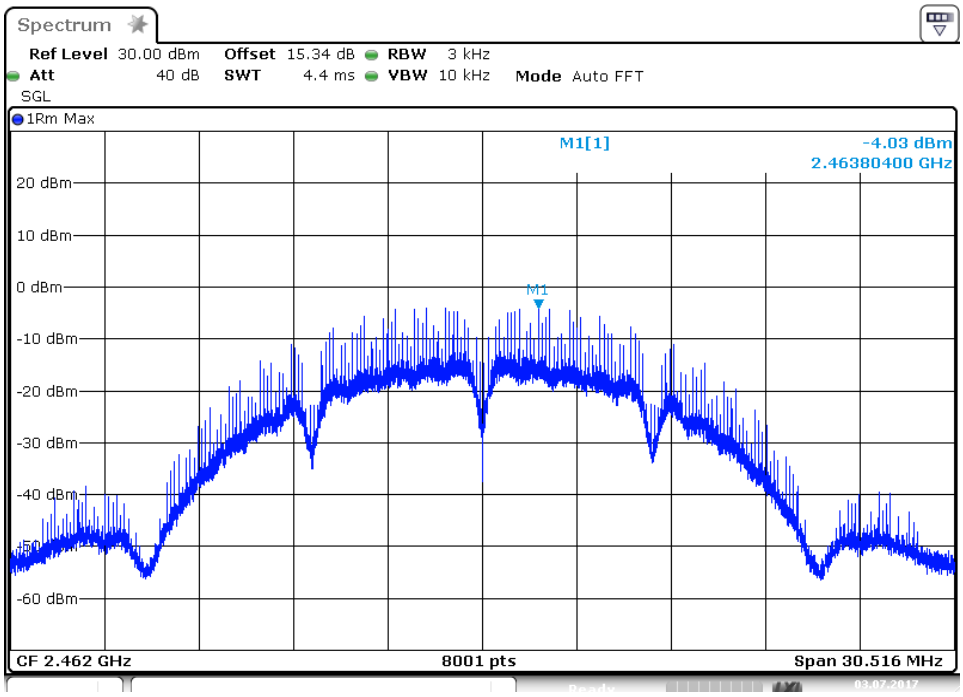
802.11b Channel Low 2412MHz



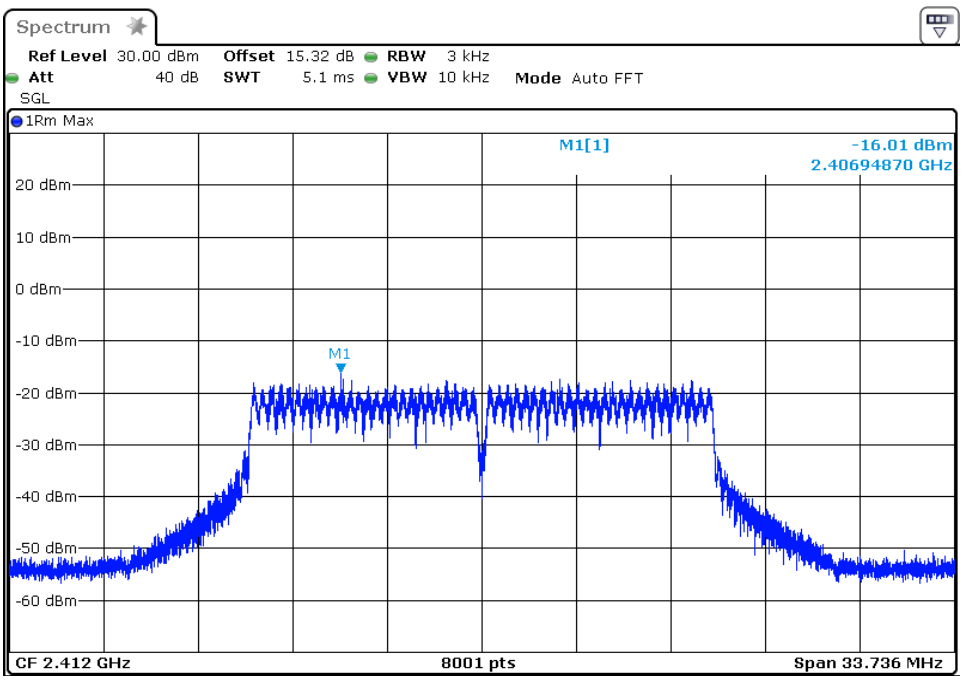
802.11b Channel Middle 2437MHz



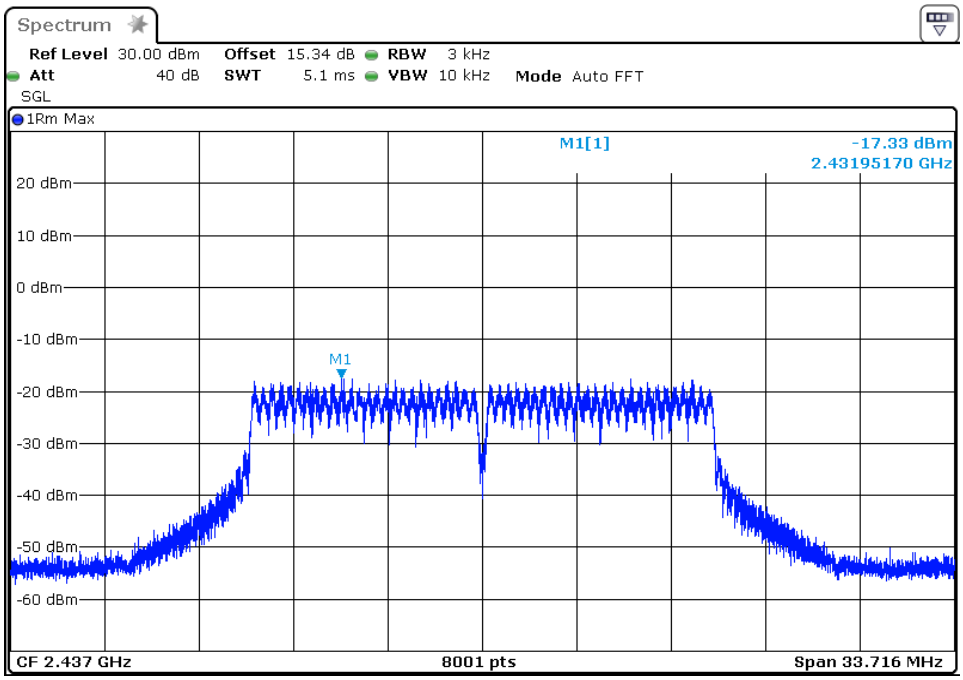
802.11b Channel High 2462MHz



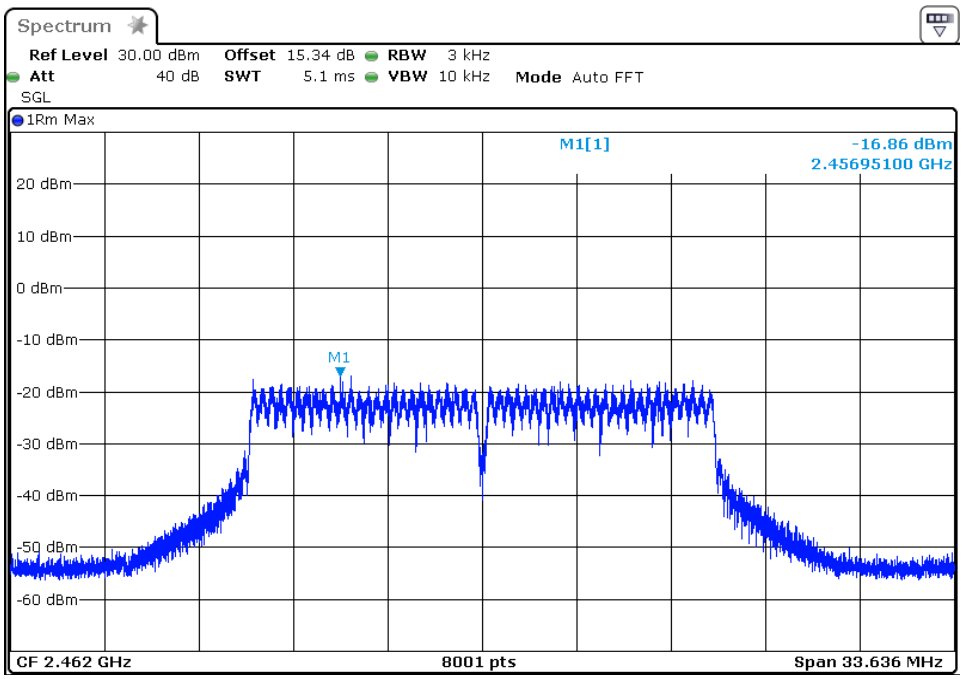
802.11g Channel Low 2412MHz



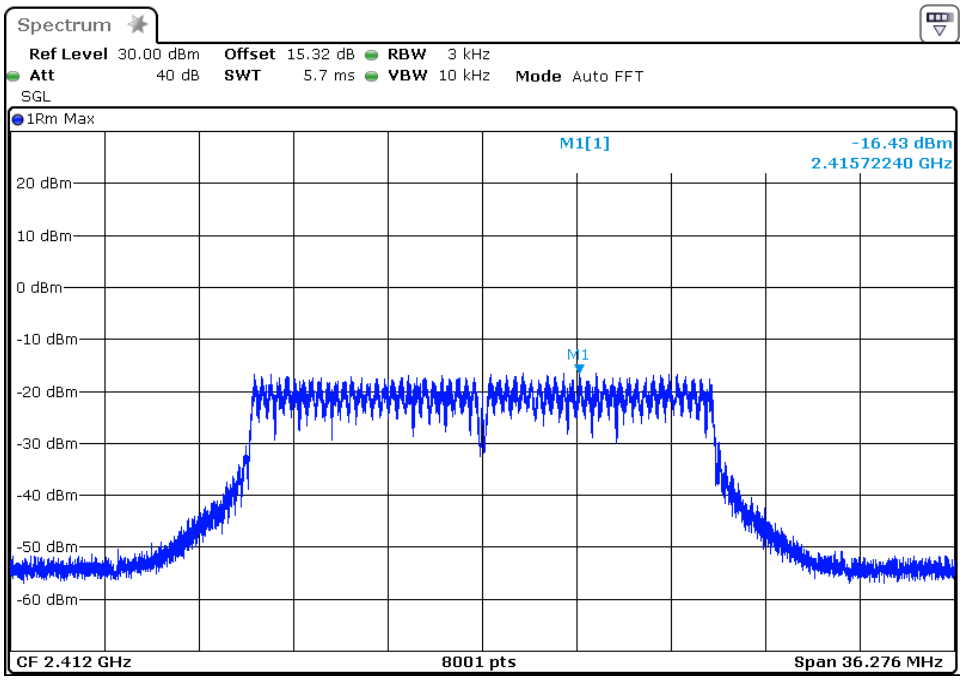
802.11g Channel Middle 2437MHz



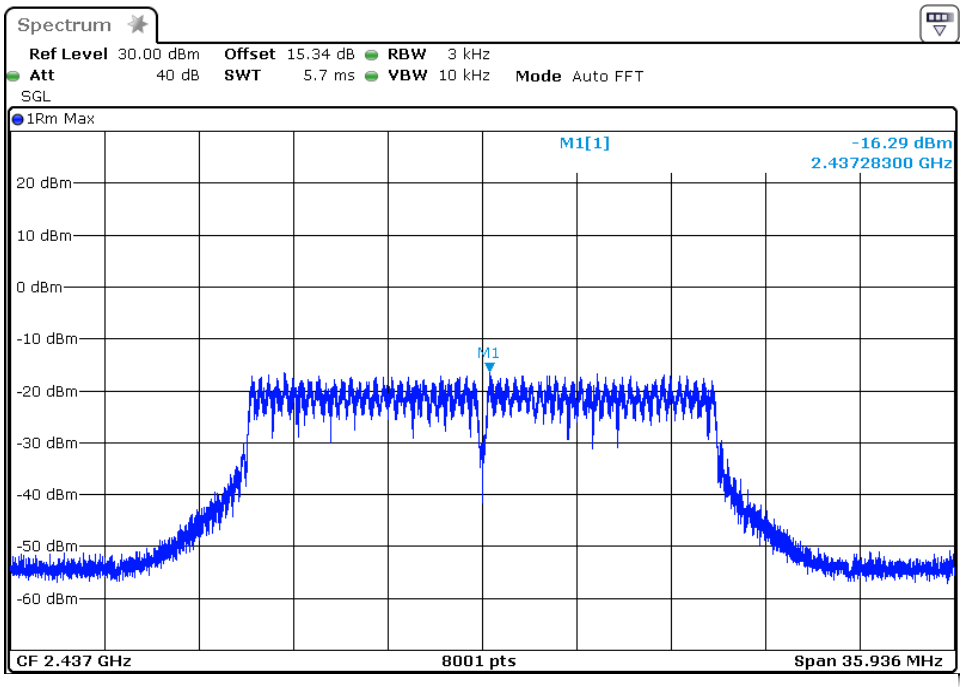
802.11g Channel High 2462MHz



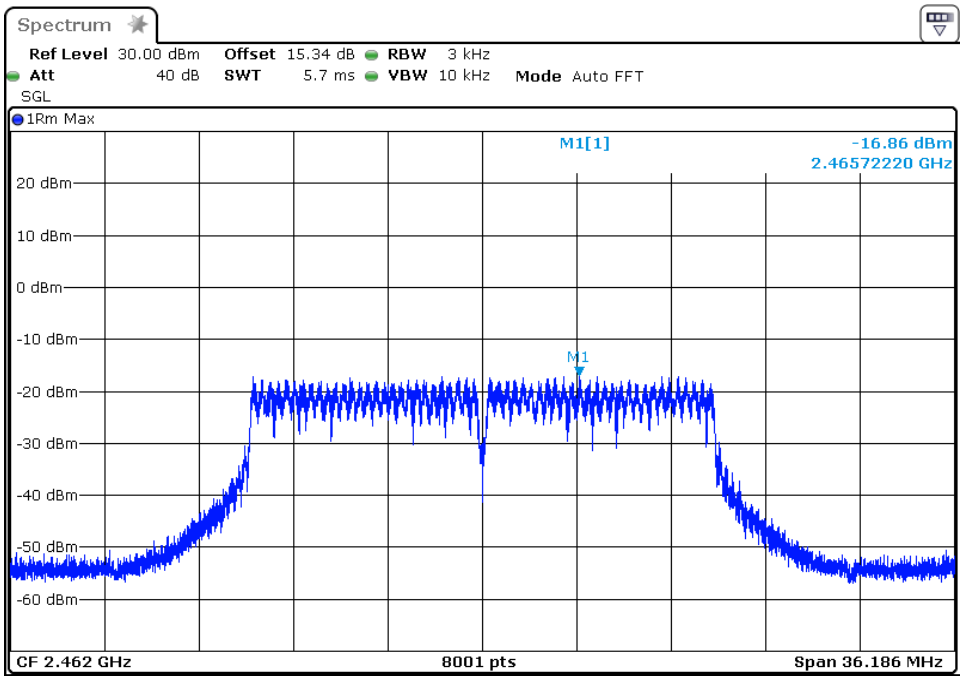
802.11n Channel Low 2412MHz (20MHz)



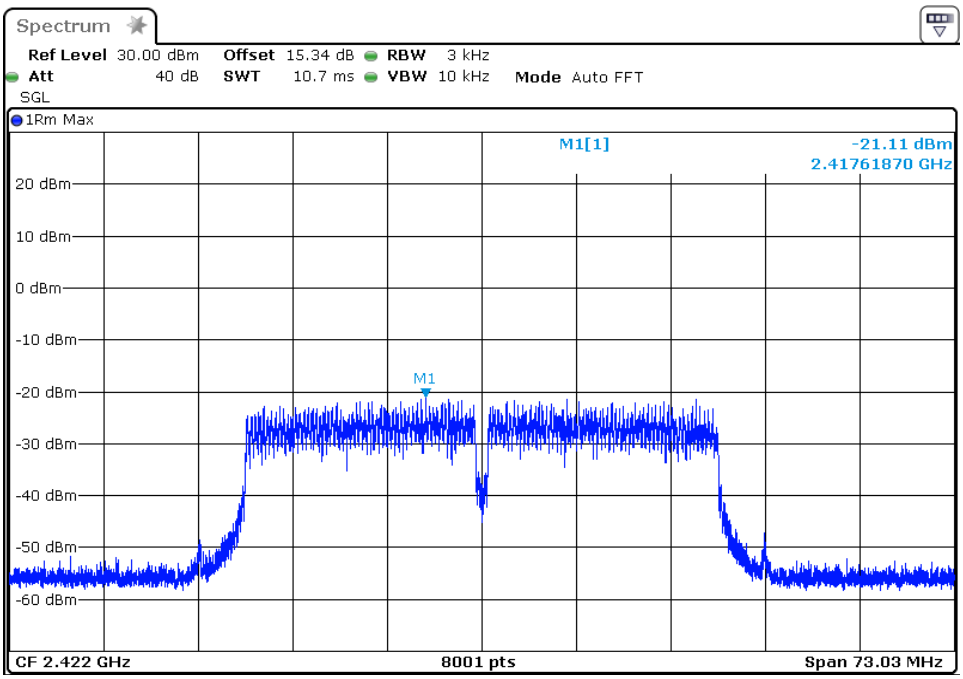
802.11n Channel Middle 2437MHz (20MHz)



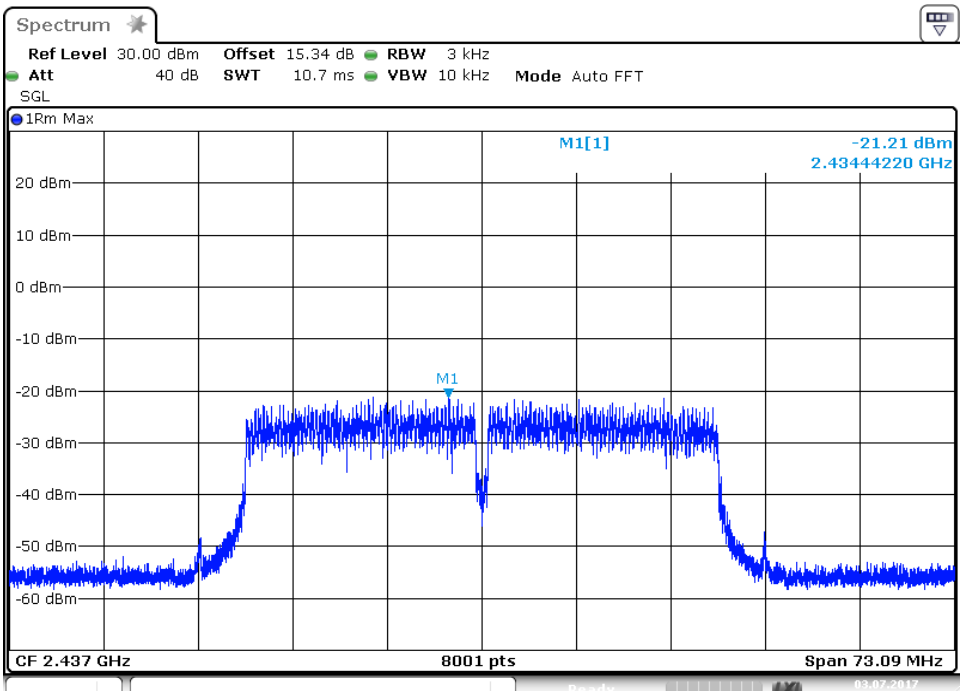
802.11n Channel High 2462MHz(20MHz)



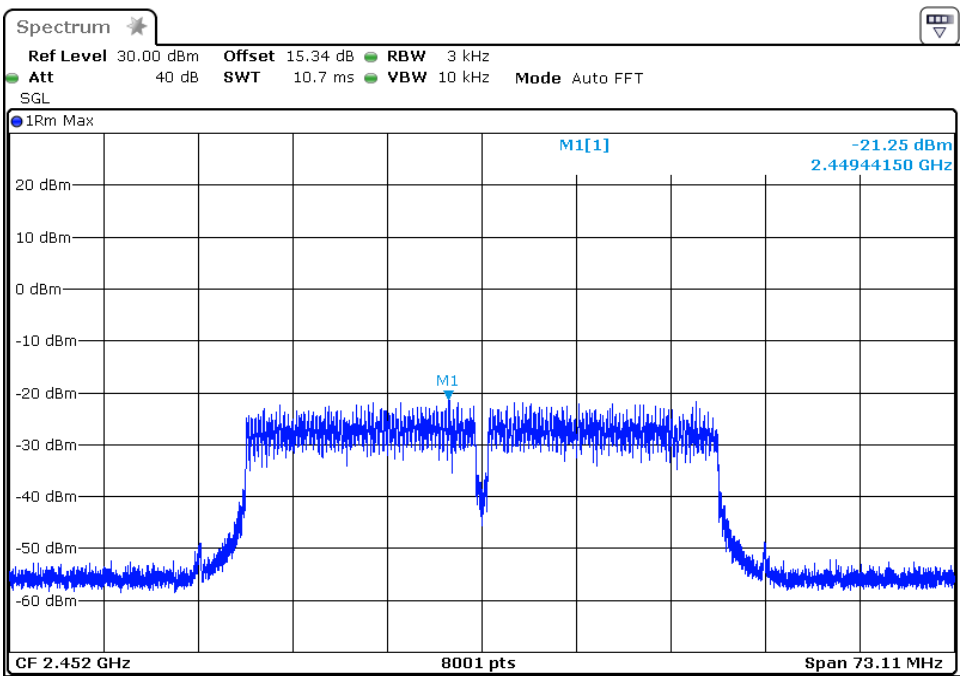
802.11n Channel Low 2422MHz (40MHz)



802.11n Channel Middle 2437MHz(40MHz)

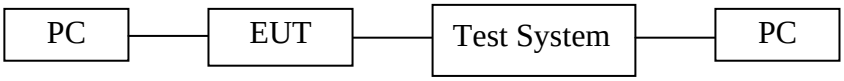


802.11n Channel High 2452MHz(40MHz)



10.BAND EDGE COMPLIANCE TEST

10.1.Block Diagram of Test Setup



10.2.The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

10.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.4.Operating Condition of EUT

10.4.1.Setup the EUT and simulator as shown as Section 9.1.

10.4.2.Turn on the power of all equipment.

10.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2412-2462 and 2422-2452MHz MHz. We select 2412MHz, 2462MHz and 2422MHz, 2452MHz TX frequency to transmit.

10.5.Test Procedure

Conducted Band Edge:

10.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

10.5.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.

Radiate Band Edge:

10.5.3.The EUT is placed on a turntable, which is 1.5m above the ground plane and worked at highest radiated power.

10.5.4.The turntable was rotated for 360 degrees to determine the position of maximum emission level.

10.5.5.EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

10.5.6.Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

10.5.7.RBW=1MHz, VBW=1MHz

10.5.8.The band edges was measured and recorded.

10.6.Test Result

Test Lab: Shielding room
Test Engineer: Bob

The test was performed with 802.11b		
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2400	36.37	> 30dBc
2483.5	43.34	> 30dBc

The test was performed with 802.11g		
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2400	38.00	> 30dBc
2483.5	36.75	> 30dBc

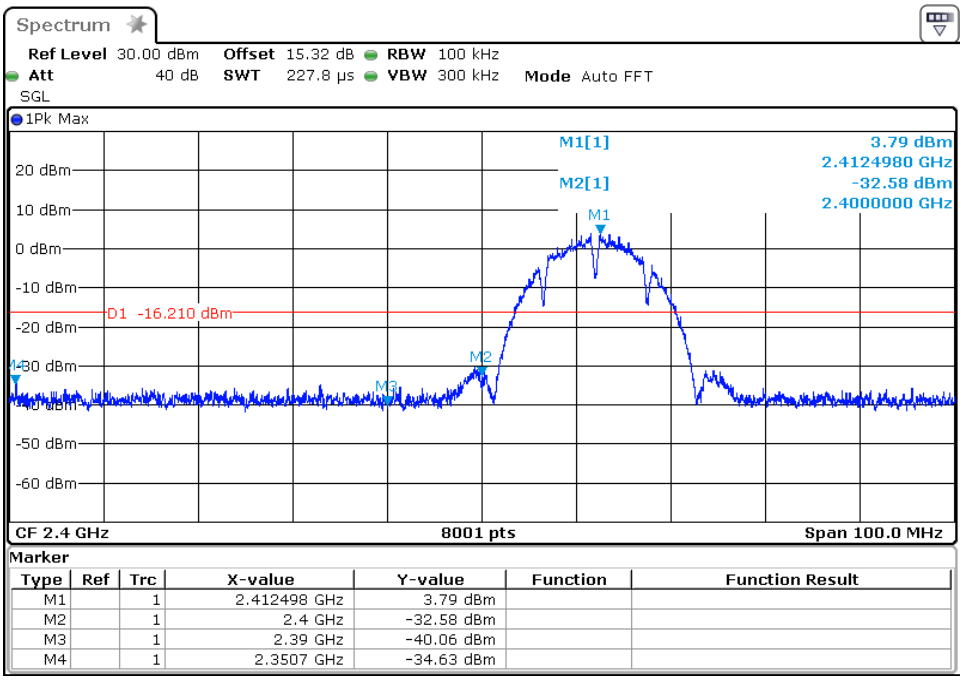
The test was performed with 802.11n (20MHz)		
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2400	37.19	> 30dBc
2483.5	38.84	> 30dBc

The test was performed with 802.11n (40MHz)		
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2400	32.68	> 30dBc
2483.5	37.39	> 30dBc

Note: We tested 802.11b/g/n mode the all data rate and recorded the worst case data for this channel to be 11Mbps for 802.11b mode and 54Mbps for 802.11g mode and MCS7 for 802.11n(20MHz) and MCS7 for 802.11n(40MHz) mode.

The spectrum analyzer plots are attached as below.

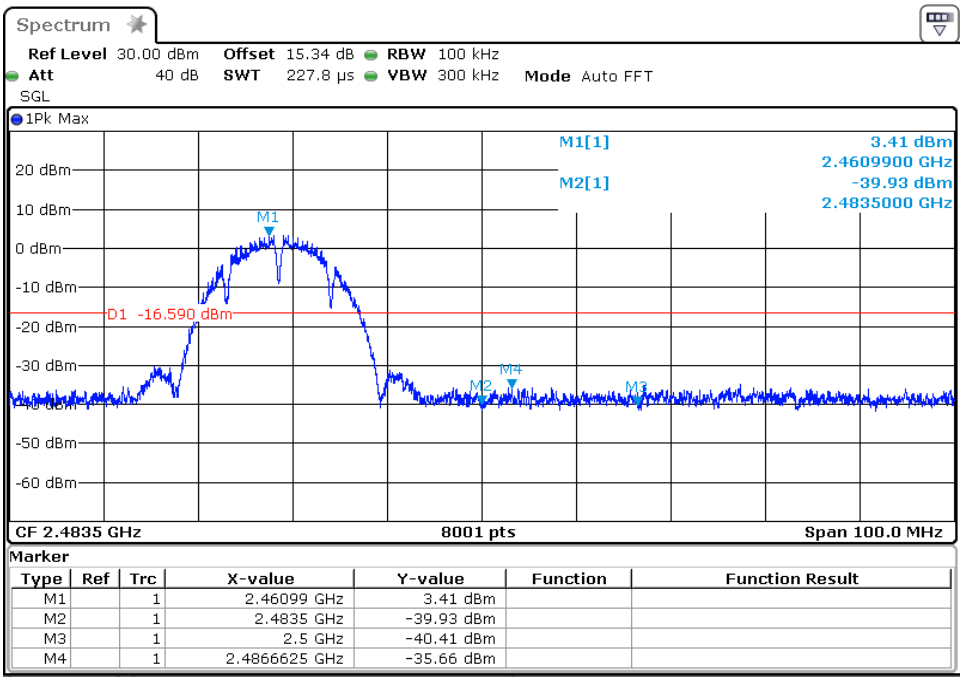
802.11b Channel Low 2412MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.412498 GHz	3.79 dBm		
M2		1	2.4 GHz	-32.58 dBm		
M3		1	2.39 GHz	-40.06 dBm		
M4		1	2.3507 GHz	-34.63 dBm		

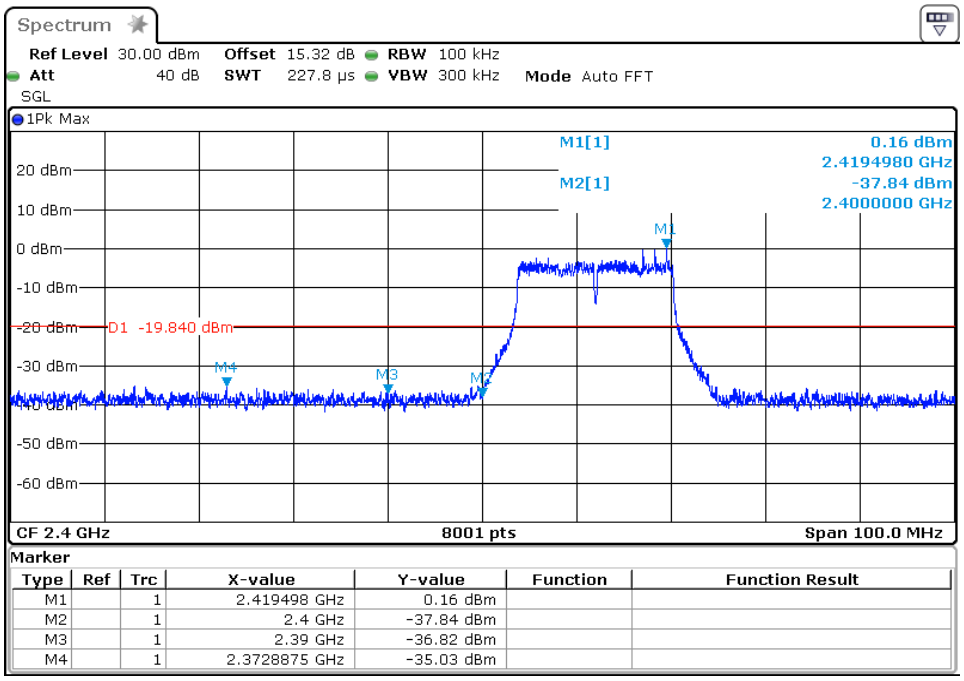
802.11b Channel High 2462MHz



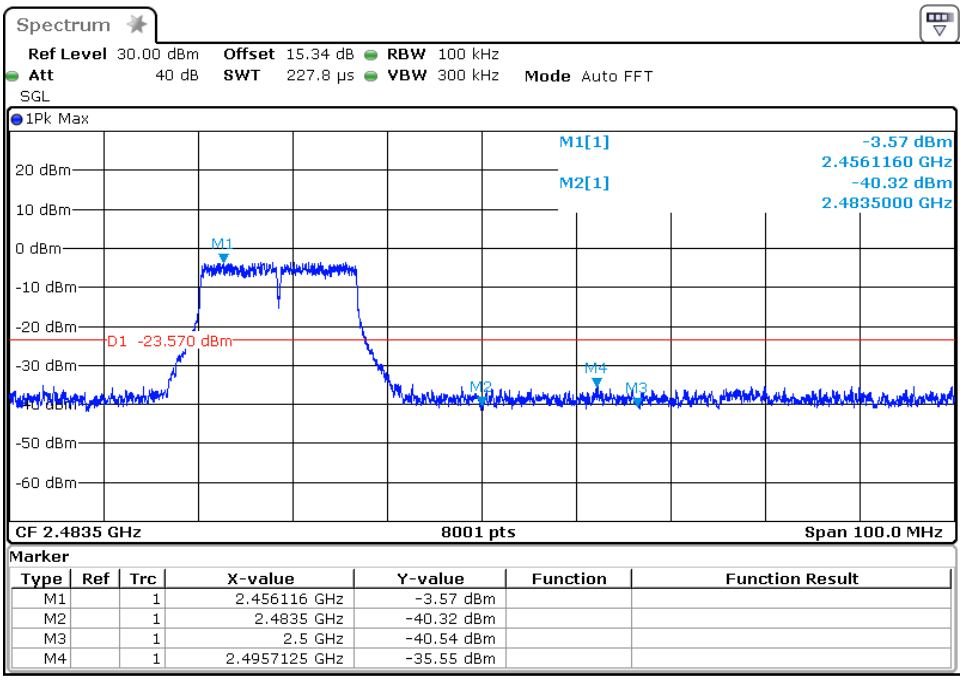
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46099 GHz	3.41 dBm		
M2		1	2.4835 GHz	-39.93 dBm		
M3		1	2.5 GHz	-40.41 dBm		
M4		1	2.4866625 GHz	-35.66 dBm		

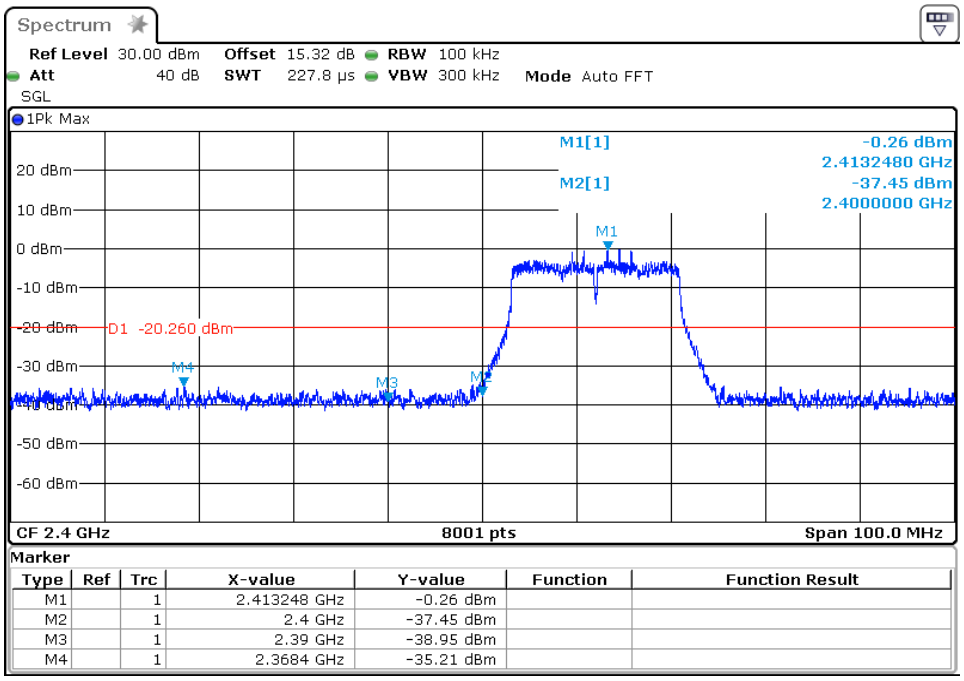
802.11g Channel Low 2412MHz



802.11g Channel High 2462MHz



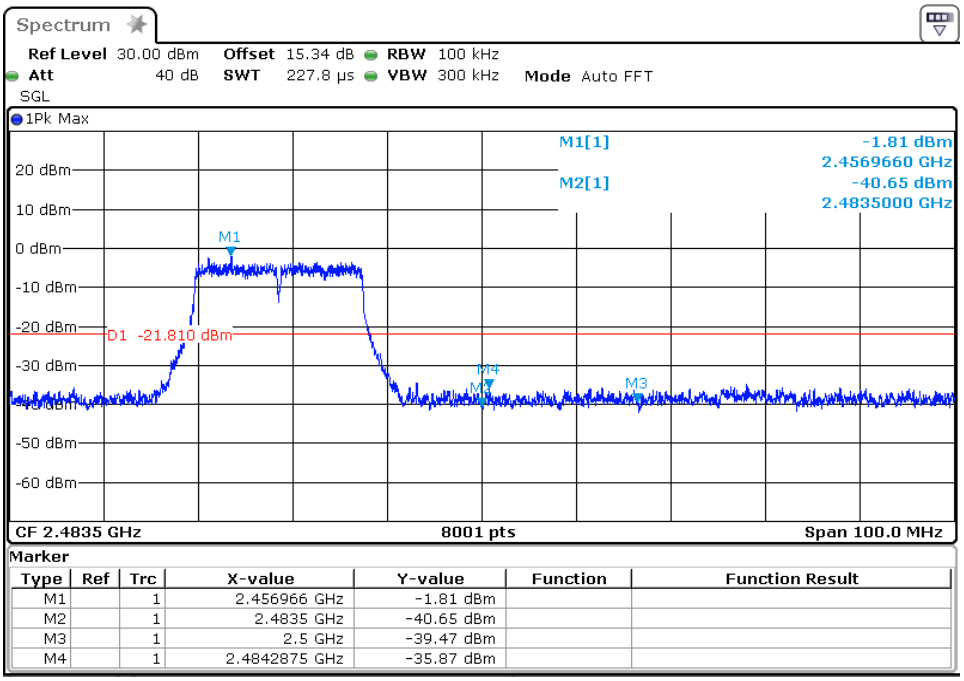
802.11n Channel Low 2412MHz (20MHz)



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.413248 GHz	-0.26 dBm		
M2		1	2.4 GHz	-37.45 dBm		
M3		1	2.39 GHz	-38.95 dBm		
M4		1	2.3684 GHz	-35.21 dBm		

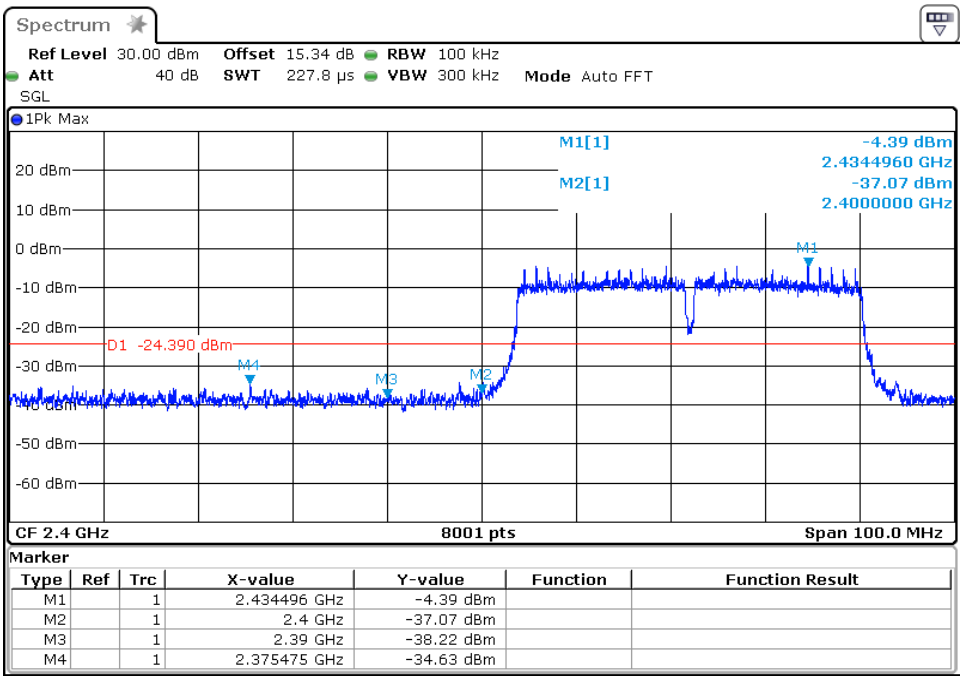
802.11n Channel High 2462MHz (20MHz)



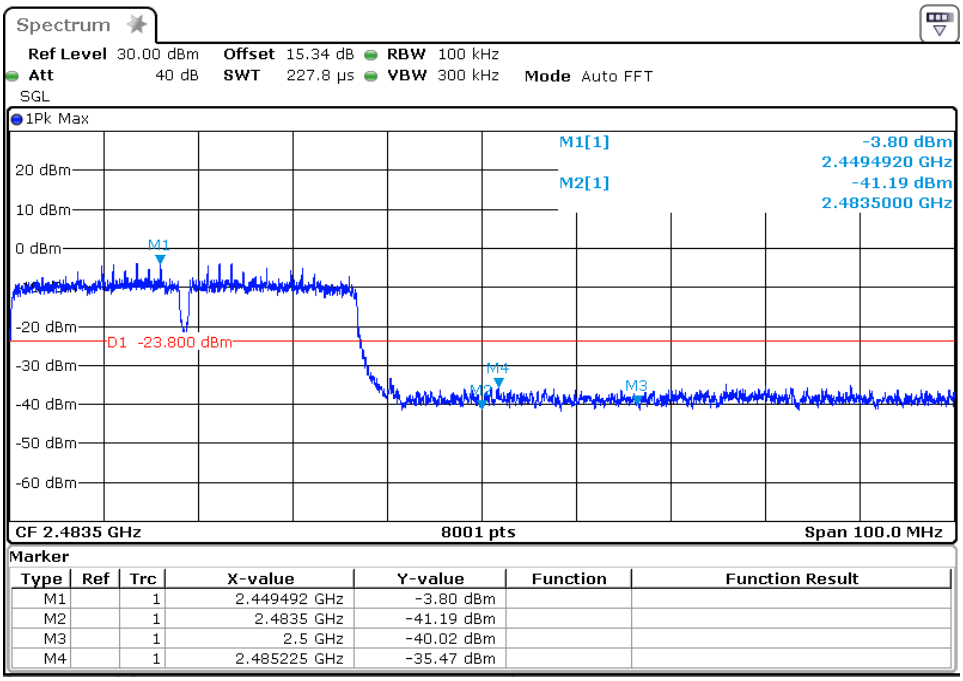
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.456966 GHz	-1.81 dBm		
M2		1	2.4835 GHz	-40.65 dBm		
M3		1	2.5 GHz	-39.47 dBm		
M4		1	2.4842875 GHz	-35.87 dBm		

802.11n Channel Low 2422MHz (40MHz)



802.11n Channel High 2452MHz (40MHz)



Radiated Band Edge Result

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

   Result = Reading + Corrected Factor
3. Display the measurement of peak values.

Test Procedure:

The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Let the EUT work in TX modes then measure it.
We select 2412MHz, 2462MHz TX frequency to transmit(802.11b/g/n20 mode).
We select 2422MHz, 2452MHz TX frequency to transmit(802.11n40 mode).

During the radiated emission test, the spectrum analyzer was set with the following configurations:
1.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
2.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
3.We tested 802.11b/g/n mode the all and the worst-case(802.11b) emissions are reported.

Test Lab: 3m Anechoic chamber
Test Engineer: Bob

Note: We tested 802.11b/g/n mode the all data rate and the worst case data for this channel to be 11Mbps for 802.11b mode.

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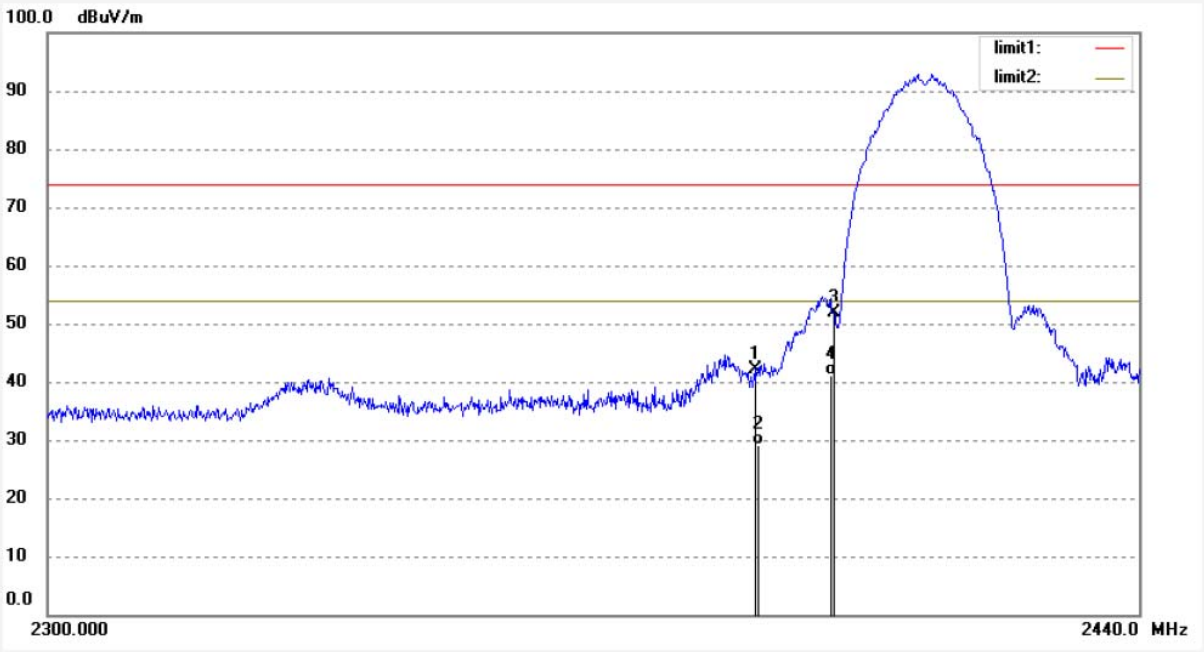
Fax:+86-0755-26503396

Job No.: BOB #760	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/09/20/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16/07/12
EUT: ClearGrass Air Monitor	Engineer Signature: Bob
Mode: TX Channel 1(802.11b)	Distance: 3m
Model: CGS1	
Manufacturer: Qingping	

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	48.12	-5.89	42.23	74.00	-31.77	peak			
2	2390.000	35.14	-5.89	29.25	54.00	-24.75	AVG			
3	2400.000	57.74	-5.80	51.94	74.00	-22.06	peak			
4	2400.000	46.97	-5.80	41.17	54.00	-12.83	AVG			

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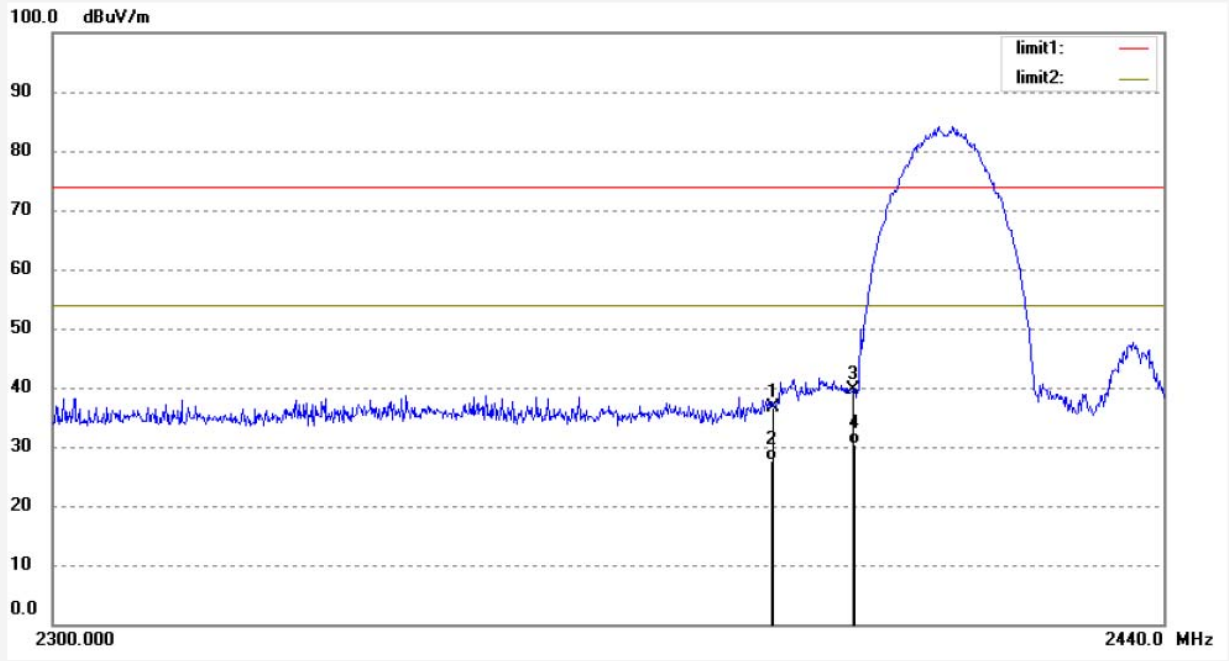
Job No.: BOB #761
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: ClearGrass Air Monitor
Mode: TX Channel 1(802.11b)
Model: CGS1
Manufacturer: Qingping

Polarization: Vertical
Power Source: DC 3.7V
Date: 18/09/20/
Time: 16/08/41
Engineer Signature: Bob
Distance: 3m

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	42.58	-5.89	36.69	74.00	-37.31	peak			
2	2390.000	33.57	-5.89	27.68	54.00	-26.32	AVG			
3	2400.000	45.36	-5.80	39.56	74.00	-34.44	peak			
4	2400.000	36.17	-5.80	30.37	54.00	-23.63	AVG			

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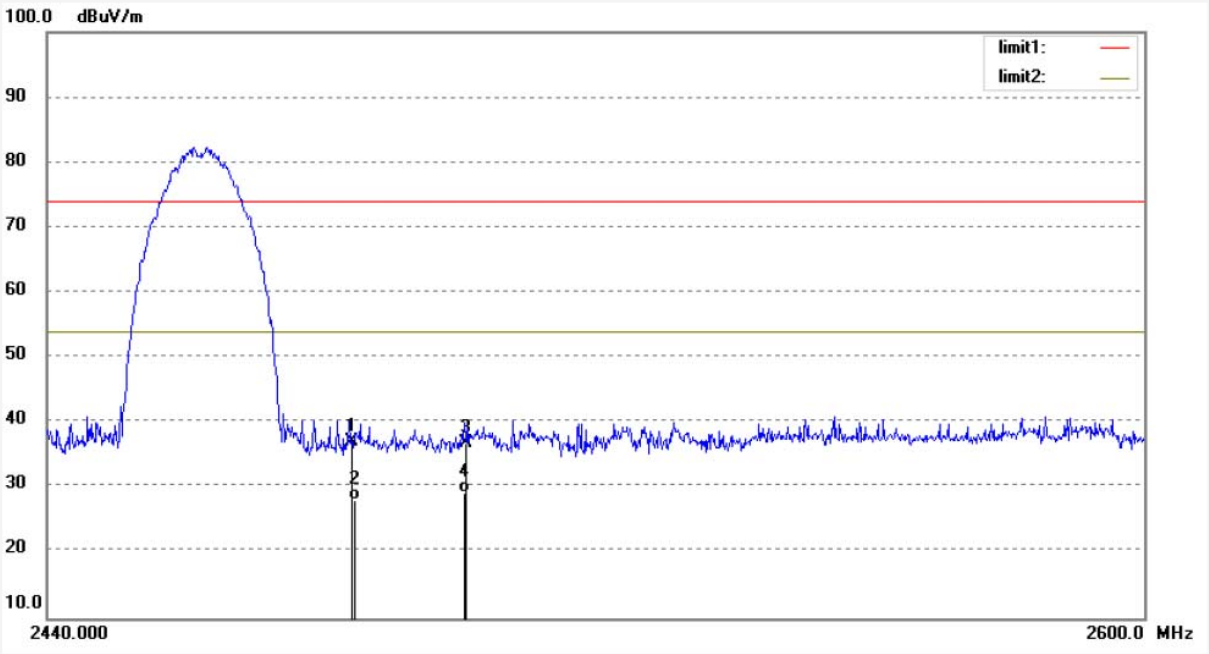
Fax:+86-0755-26503396

Job No.: BOB #762	Polarization: Vertical
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/09/20/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16/10/41
EUT: ClearGrass Air Monitor	Engineer Signature: Bob
Mode: TX Channel 11(802.11b)	Distance: 3m
Model: CGS1	
Manufacturer: Qingping	

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	42.64	-5.51	37.13	74.00	-36.87	peak			
2	2483.500	33.70	-5.51	28.19	54.00	-25.81	AVG			
3	2500.000	42.45	-5.50	36.95	74.00	-37.05	peak			
4	2500.000	34.72	-5.50	29.22	54.00	-24.78	AVG			

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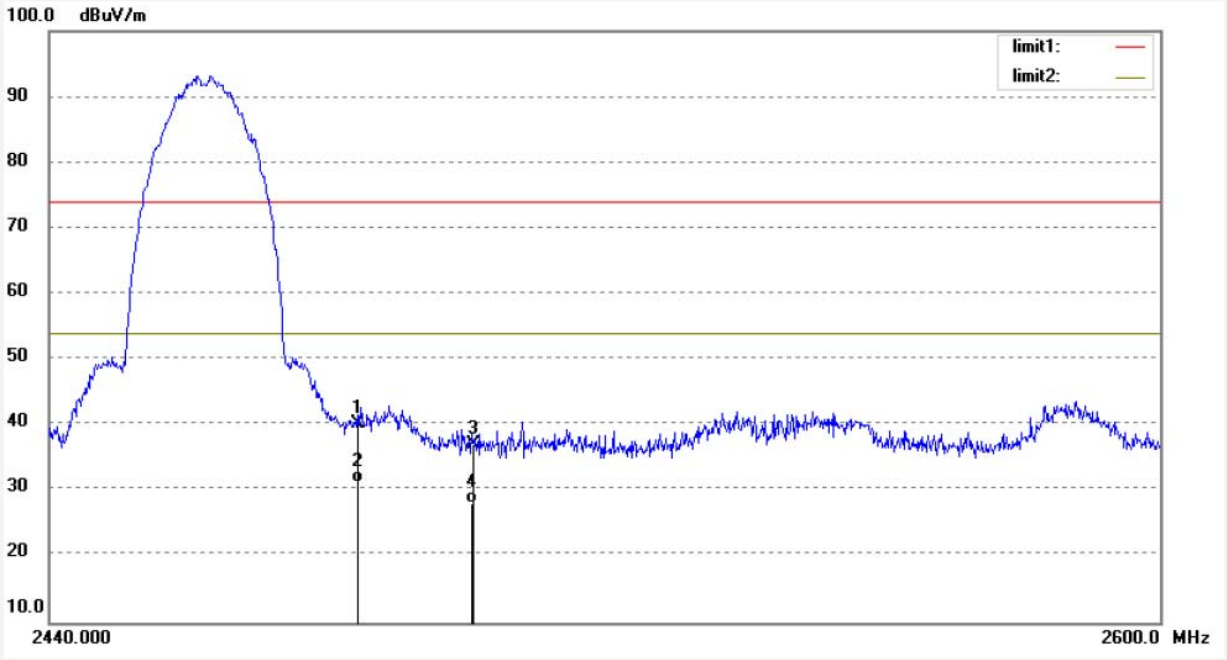
Fax:+86-0755-26503396

Job No.: BOB #763	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/09/20/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16/12/06
EUT: ClearGrass Air Monitor	Engineer Signature: Bob
Mode: TX Channel 11(802.11b)	Distance: 3m
Model: CGS1	
Manufacturer: Qingping	

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	45.69	-5.51	40.18	74.00	-33.82	peak			
2	2483.500	36.70	-5.51	31.19	54.00	-22.81	AVG			
3	2500.000	42.71	-5.50	37.21	74.00	-36.79	peak			
4	2500.000	33.69	-5.50	28.19	54.00	-25.81	AVG			

11.RADIATED SPURIOUS EMISSION TEST

11.1.Block Diagram of Test Setup

11.1.1.Block diagram of connection between the EUT and peripherals

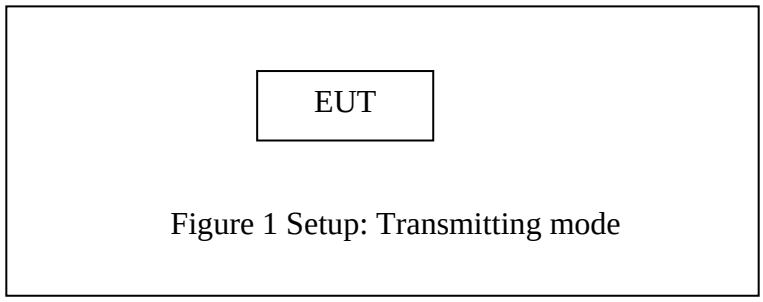
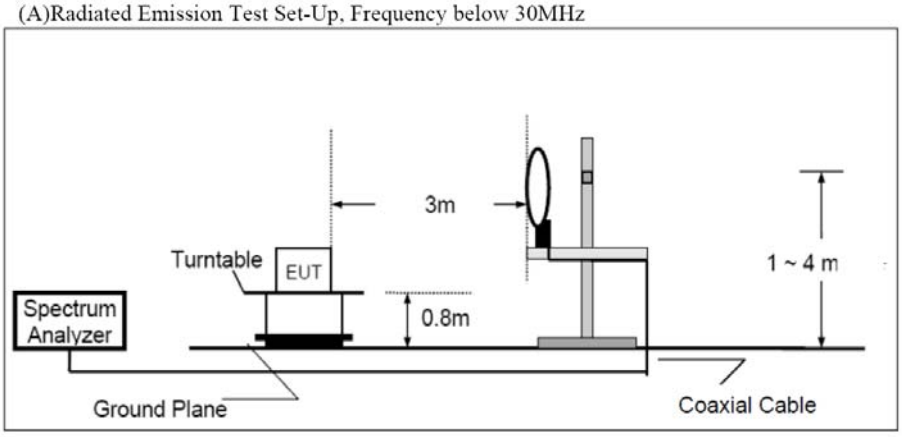


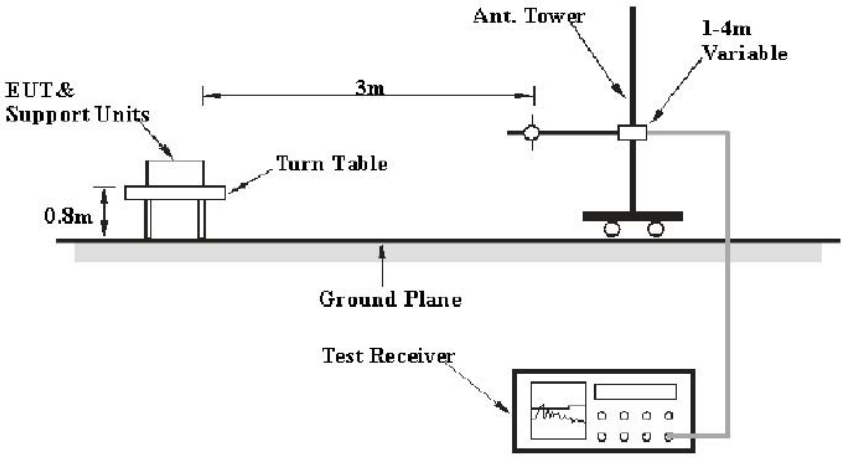
Figure 1 Setup: Transmitting mode

11.1.2.Semi-Anechoic Chamber Test Setup Diagram

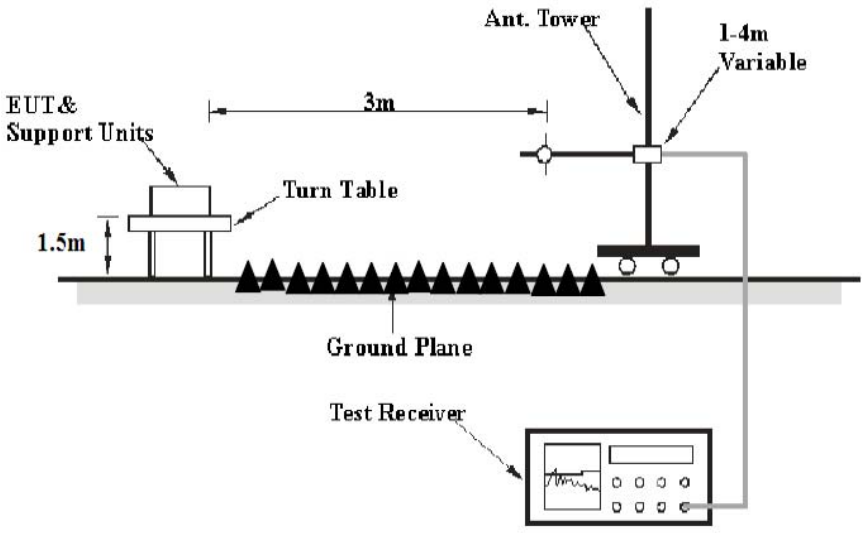
(A)Radiated Emission Test Set-Up, Frequency below 30MHz



(B)Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



11.2.The Limit For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

11.3.Restricted bands of operation

11.3.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510
[2]Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

11.4.Configuration of EUT on Measurement

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.5.Operating Condition of EUT

11.5.1.Setup the EUT and simulator as shown as Section 10.1.

11.5.2.Turn on the power of all equipment.

11.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2412-2462 and 2422-2452MHz. We select 2412MHz, 2437MHz, 2462MHz and 2422MHz, 2437MHz, 2452MHz TX frequency to transmit.

11.6.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement.

The frequency range from 30MHz to 26500MHz is checked.
Result = Reading + Corrected Factor
Where Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain
During the radiated emission test, the spectrum analyzer was set with the following configurations:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

11.7.Data Sample

Frequency (MHz)	Reading (dBμv)	Factor (dB/m)	Result (dBμv/m)	Limit (dBμv/m)	Margin (dB)	Remark
X.XX	48.69	-13.35	35.34	46	-10.66	QP

Frequency(MHz) = Emission frequency in MHz
Reading(dBμv) = Uncorrected Analyzer/Receiver reading
Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain
Result(dBμv/m) = Reading(dBμv) + Factor(dB/m)
Limit (dBμv/m) = Limit stated in standard
Margin (dB) = Result(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

Calculation Formula:
Margin(dB) = Result (dBμV/m)–Limit(dBμV/m)
Result(dBμV/m)= Reading(dBμV)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

11.8.The Field Strength of Radiation Emission Measurement Results

Test Lab: 3m Anechoic chamber
Test Engineer: Bob

Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.

2. *: Denotes restricted band of operation.

3. The radiation emissions from 18-26.5GHz and 9KHz-30MHz are not reported, because the test values lower than the limits of 20dB.

4. We tested 802.11b/g/n mode the all data rate and the worst case data for this channel to be 11Mbps for 802.11b mode.

Below 1G

ACCURATE TECHNOLOGY CO., LTD.
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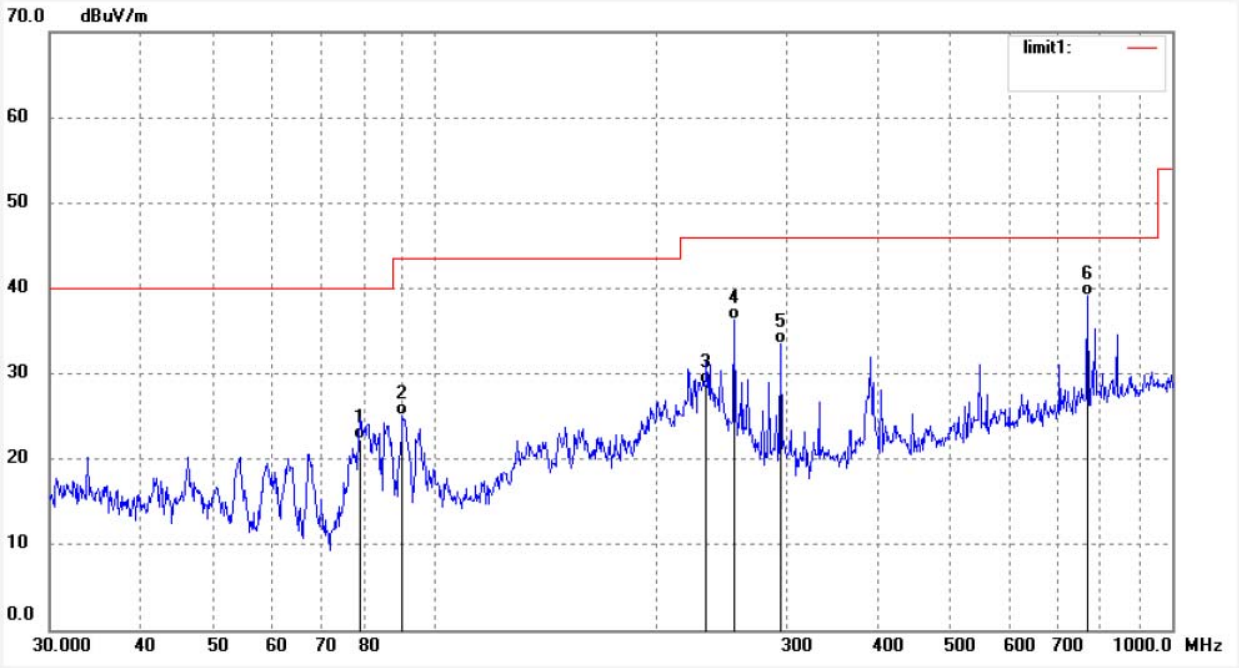
Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: BOB #742	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/09/19/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 10/13/32
EUT: ClearGrass Air Monitor	Engineer Signature: Bob
Mode: TX Channel 1(802.11b)	Distance:
Model: CGS1	
Manufacturer: Qingping	

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	79.1185	45.84	-23.47	22.37	40.00	-17.63	QP	100	74	
2	90.4198	45.60	-20.55	25.05	43.50	-18.45	QP	100	111	
3	233.4881	46.87	-18.04	28.83	46.00	-17.17	QP	100	69	
4	254.9253	54.12	-17.83	36.29	46.00	-9.71	QP	100	248	
5	294.4260	50.26	-16.69	33.57	46.00	-12.43	QP	100	167	
6	768.3431	46.83	-7.65	39.18	46.00	-6.82	QP	100	45	

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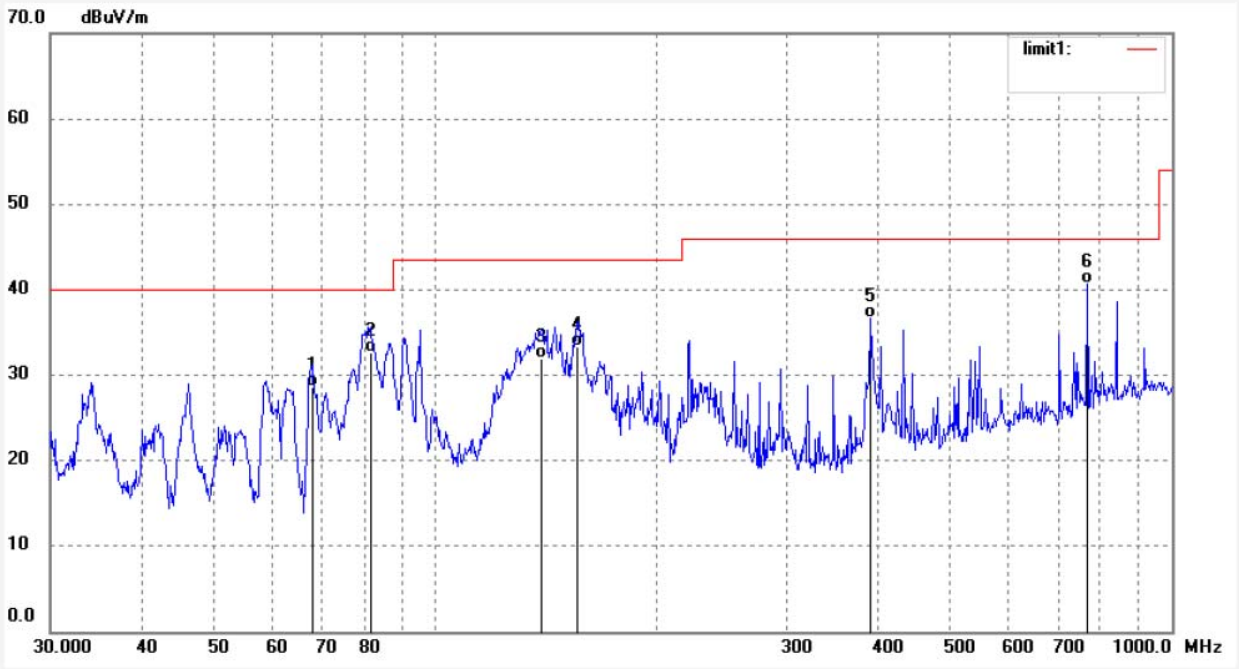
Job No.: BOB #743
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: ClearGrass Air Monitor
Mode: TX Channel 1(802.11b)
Model: CGS1
Manufacturer: Qingping

Polarization: Vertical
Power Source: DC 3.7V
Date: 18/09/19/
Time: 10/15/38
Engineer Signature: Bob
Distance:

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	68.0241	54.22	-25.63	28.59	40.00	-11.41	QP	100	48	
2	81.6604	56.32	-23.68	32.64	40.00	-7.36	QP	100	246	
3	139.3006	53.35	-21.36	31.99	43.50	-11.51	QP	100	222	
4	155.8771	54.66	-21.29	33.37	43.50	-10.13	QP	100	157	
5	389.9874	51.27	-14.60	36.67	46.00	-9.33	QP	100	164	
6	768.3431	48.31	-7.65	40.66	46.00	-5.34	QP	100	245	

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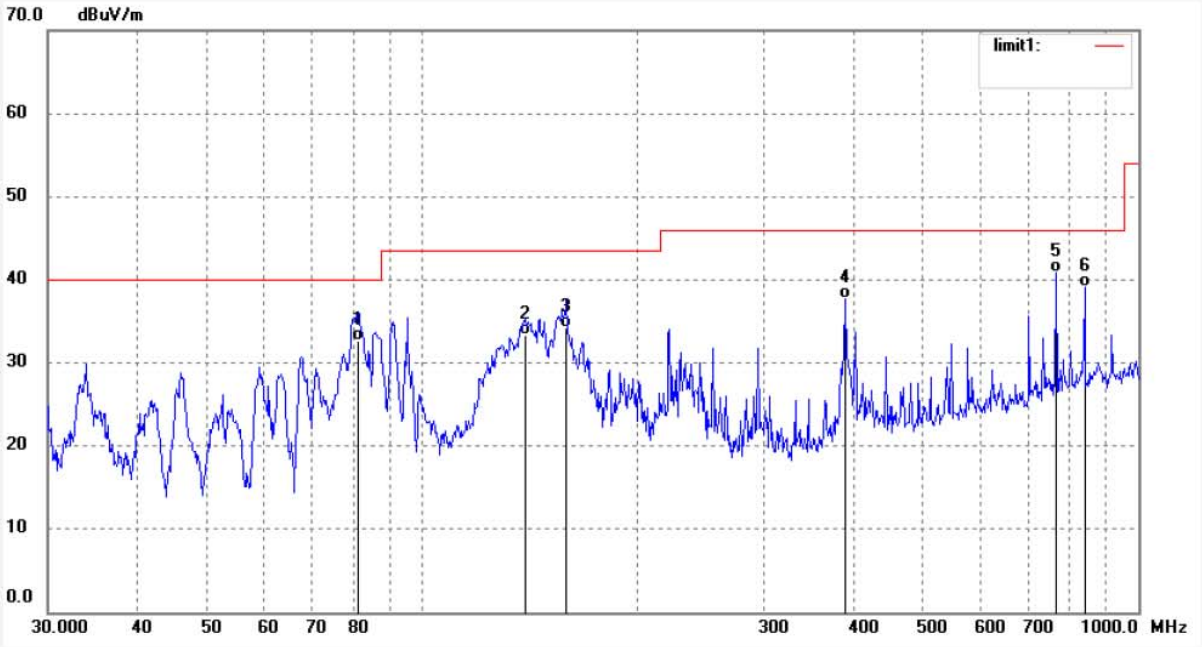
Job No.: BOB #744	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/09/19/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 10/17/34
EUT: ClearGrass Air Monitor	Engineer Signature: Bob
Mode: TX Channel 6(802.11b)	Distance:
Model: CGS1	
Manufacturer: Qingping	

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	81.3740	56.35	-23.78	32.57	40.00	-7.43	QP	100	124	
2	139.3006	54.78	-21.36	33.42	43.50	-10.08	QP	100	351	
3	159.1983	55.21	-20.93	34.28	43.50	-9.22	QP	100	265	
4	389.9874	52.37	-14.60	37.77	46.00	-8.23	QP	100	122	
5	768.3431	48.47	-7.65	40.82	46.00	-5.18	QP	100	245	
6	841.8397	45.47	-6.39	39.08	46.00	-6.92	QP	100	48	

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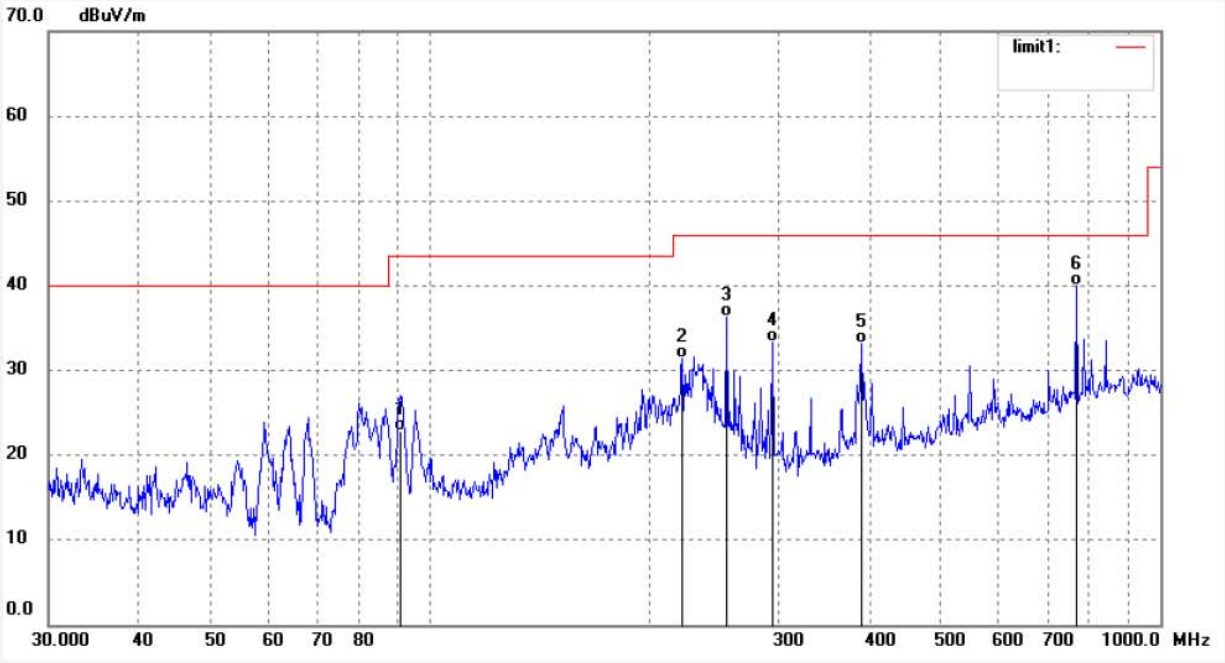
Job No.: BOB #745
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: ClearGrass Air Monitor
Mode: TX Channel 6(802.11b)
Model: CGS1
Manufacturer: Qingping

Polarization: Horizontal
Power Source: DC 3.7V
Date: 18/09/19/
Time: 10/19/31
Engineer Signature: Bob
Distance:

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	91.0574	43.25	-20.44	22.81	43.50	-20.69	QP	100	33	
2	221.5010	49.79	-18.45	31.34	46.00	-14.66	QP	100	125	
3	254.9253	54.06	-17.83	36.23	46.00	-9.77	QP	100	57	
4	294.4260	50.05	-16.69	33.36	46.00	-12.64	QP	100	222	
5	389.9874	47.78	-14.60	33.18	46.00	-12.82	QP	100	132	
6	768.3431	47.72	-7.65	40.07	46.00	-5.93	QP	100	245	

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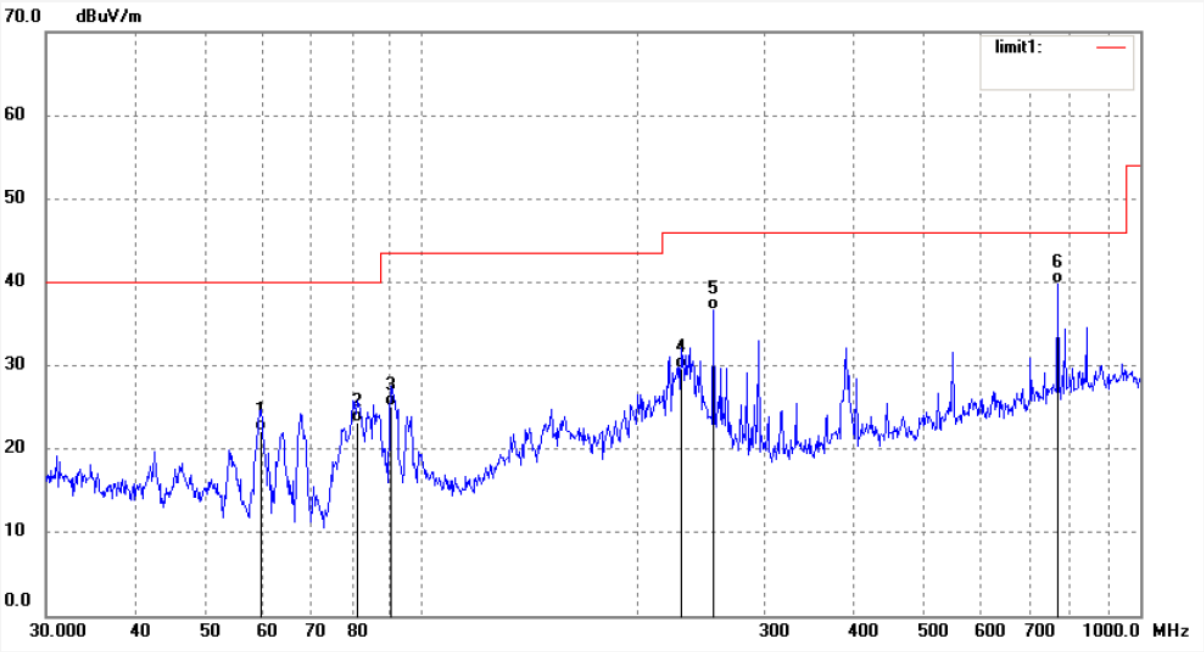
Job No.: BOB #746
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: ClearGrass Air Monitor
Mode: TX Channel 11(802.11b)
Model: CGS1
Manufacturer: Qingping

Polarization: Horizontal
Power Source: DC 3.7V
Date: 18/09/19/
Time: 10/21/14
Engineer Signature: Bob
Distance:

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	59.7314	44.63	-22.51	22.12	40.00	-17.88	QP	100	154	
2	81.3739	45.99	-22.78	23.21	40.00	-16.79	QP	100	175	
3	90.7379	45.65	-20.49	25.16	43.50	-18.34	QP	100	12	
4	229.4219	47.84	-18.21	29.63	46.00	-16.37	QP	100	124	
5	254.9252	54.42	-17.83	36.59	46.00	-9.41	QP	100	154	
6	768.3431	47.40	-7.65	39.75	46.00	-6.25	QP	100	155	

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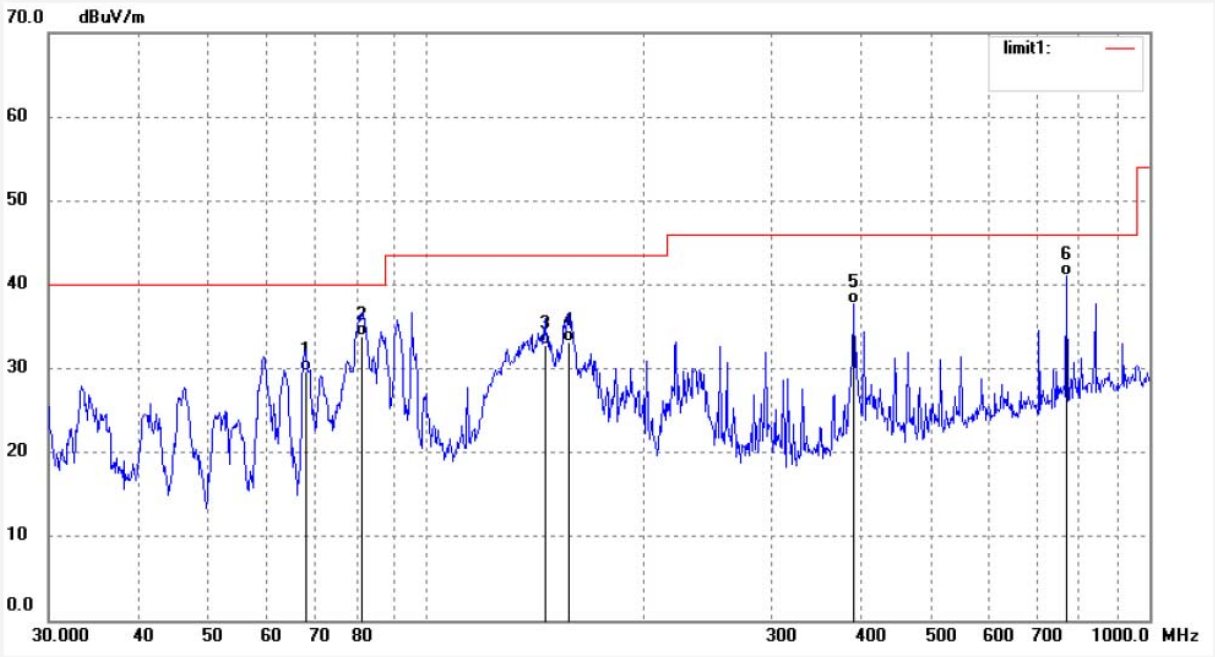
Job No.: BOB #747
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: ClearGrass Air Monitor
Mode: TX Channel 11(802.11b)
Model: CGS1
Manufacturer: Qingping

Polarization: Vertical
Power Source: DC 3.7V
Date: 18/09/19/
Time: 10/22/07
Engineer Signature: Bob
Distance:

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	68.0241	55.21	-25.63	29.58	40.00	-10.42	QP	100	135	
2	81.3739	57.62	-23.78	33.84	40.00	-6.16	QP	100	125	
3	145.8109	54.21	-21.48	32.73	43.50	-10.77	QP	100	65	
4	157.5289	54.33	-21.12	33.21	43.50	-10.29	QP	100	45	
5	389.9873	52.28	-14.60	37.68	46.00	-8.32	QP	100	126	
6	768.3431	48.69	-7.65	41.04	46.00	-4.96	QP	100	111	

Above 1G

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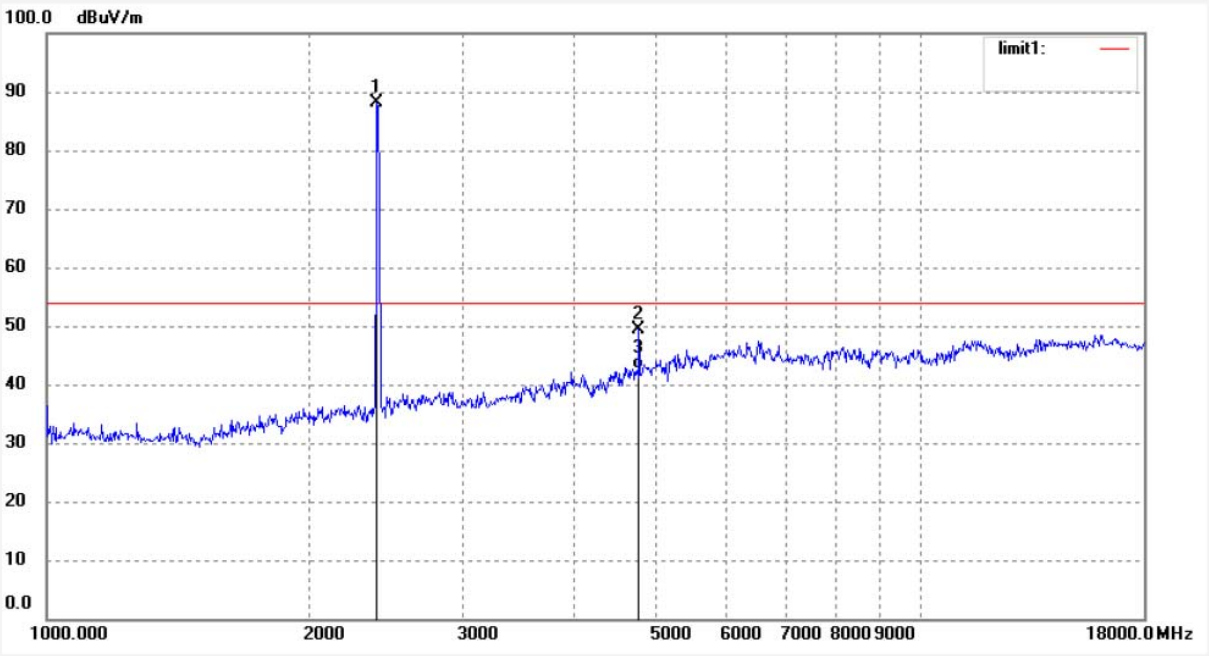
Job No.: BOB #754	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/09/20/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14/51/11
EUT: ClearGrass Air Monitor	Engineer Signature: Bob
Mode: TX Channel 1(802.11b)	Distance: 3m
Model: CGS1	
Manufacturer: Qingping	

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2412.059	93.93	-5.91	88.02			peak			
2	4824.084	46.20	3.30	49.50	74.00	-24.50	peak			
3	4824.084	39.25	3.30	42.55	54.00	-11.45	AVG			

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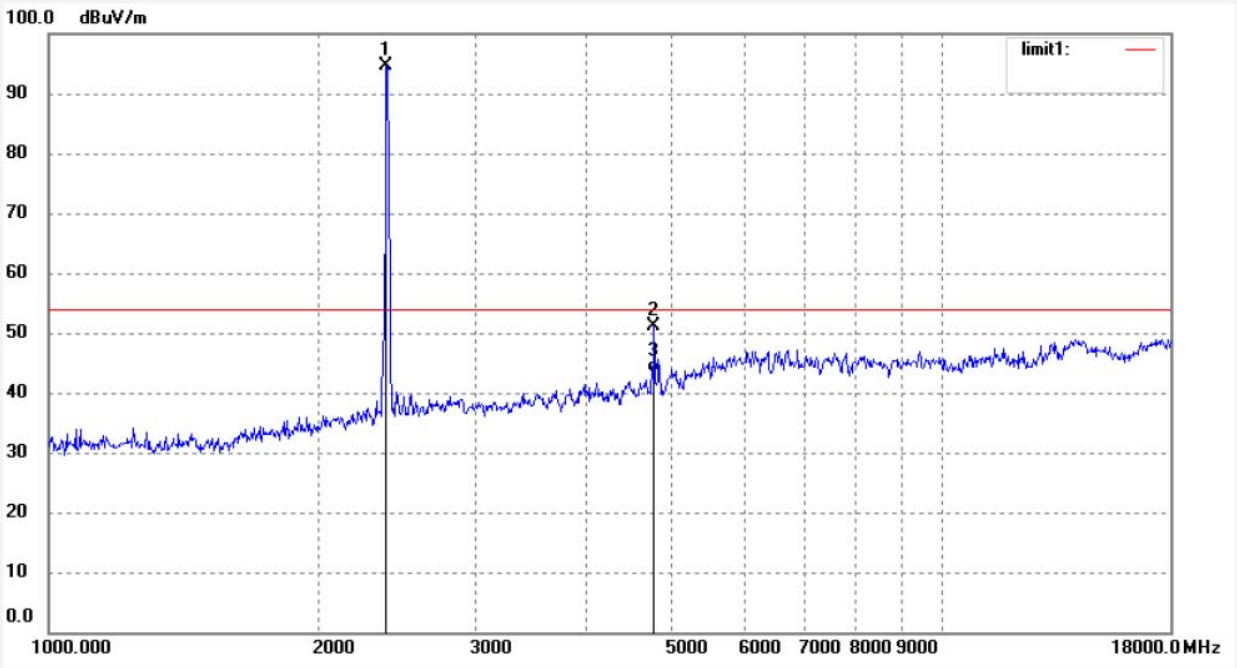
Job No.: BOB #755
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: ClearGrass Air Monitor
Mode: TX Channel 1(802.11b)
Model: CGS1
Manufacturer: Qingping

Polarization: Horizontal
Power Source: DC 3.7V
Date: 18/09/20/
Time: 14/52/37
Engineer Signature: Bob
Distance: 3m

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2412.059	100.45	-5.91	94.54			peak			
2	4824.084	47.95	3.30	51.25	74.00	-22.75	peak			
3	4824.084	40.15	3.30	43.45	54.00	-10.55	AVG			

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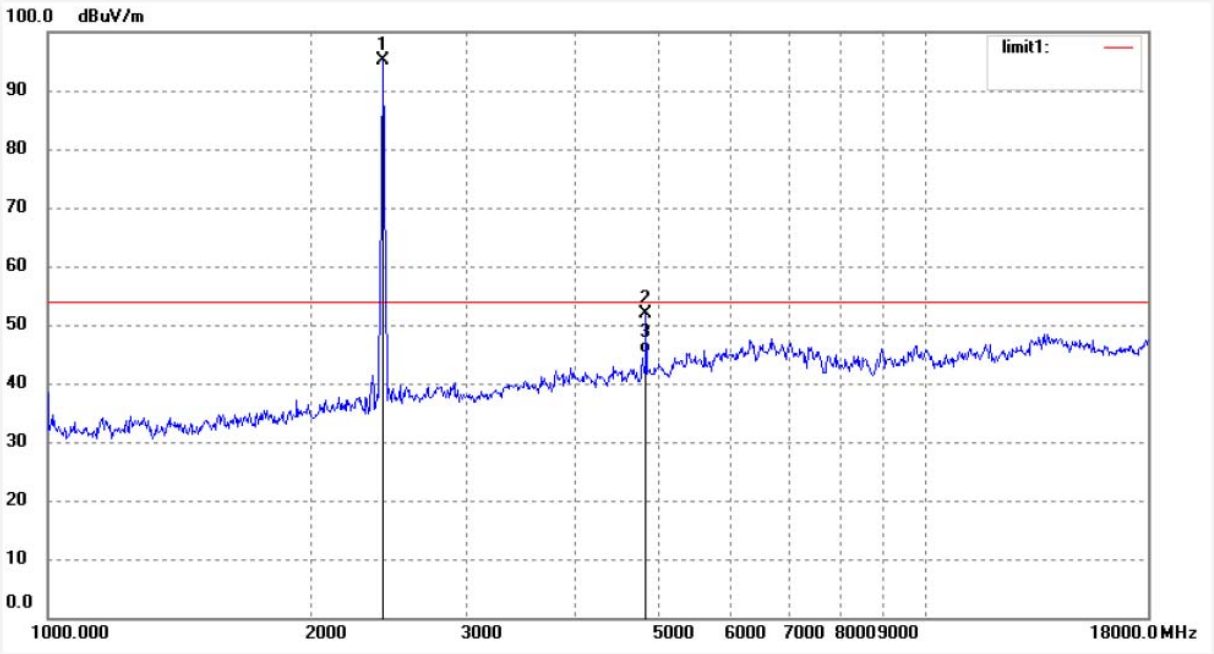
Job No.: BOB #756
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: ClearGrass Air Monitor
Mode: TX Channel 6(802.11b)
Model: CGS1
Manufacturer: Qingping

Polarization: Horizontal
Power Source: DC 3.7V
Date: 18/09/20/
Time: 14/55/35
Engineer Signature: Bob
Distance: 3m

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2437.100	100.96	-5.76	95.20			peak			
2	4874.024	48.32	3.67	51.99	74.00	-22.01	peak			
3	4874.024	41.45	3.67	45.12	54.00	-8.88	AVG			

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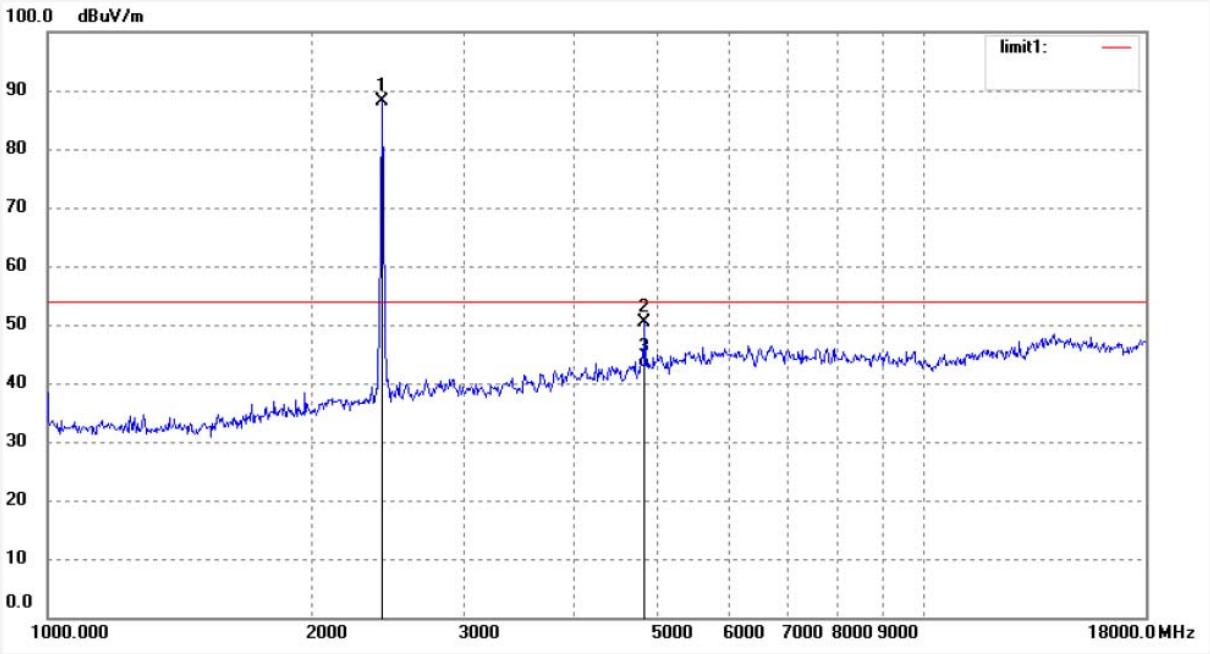
Job No.: BOB #757	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/09/20/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 14/58/09
EUT: ClearGrass Air Monitor	Engineer Signature: Bob
Mode: TX Channel 6(802.11b)	Distance: 3m
Model: CGS1	
Manufacturer: Qingping	

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2437.100	93.96	-5.76	88.20			peak			
2	4874.124	46.82	3.67	50.49	74.00	-23.51	peak			
3	4874.124	38.97	3.67	42.64	54.00	-11.36	AVG			

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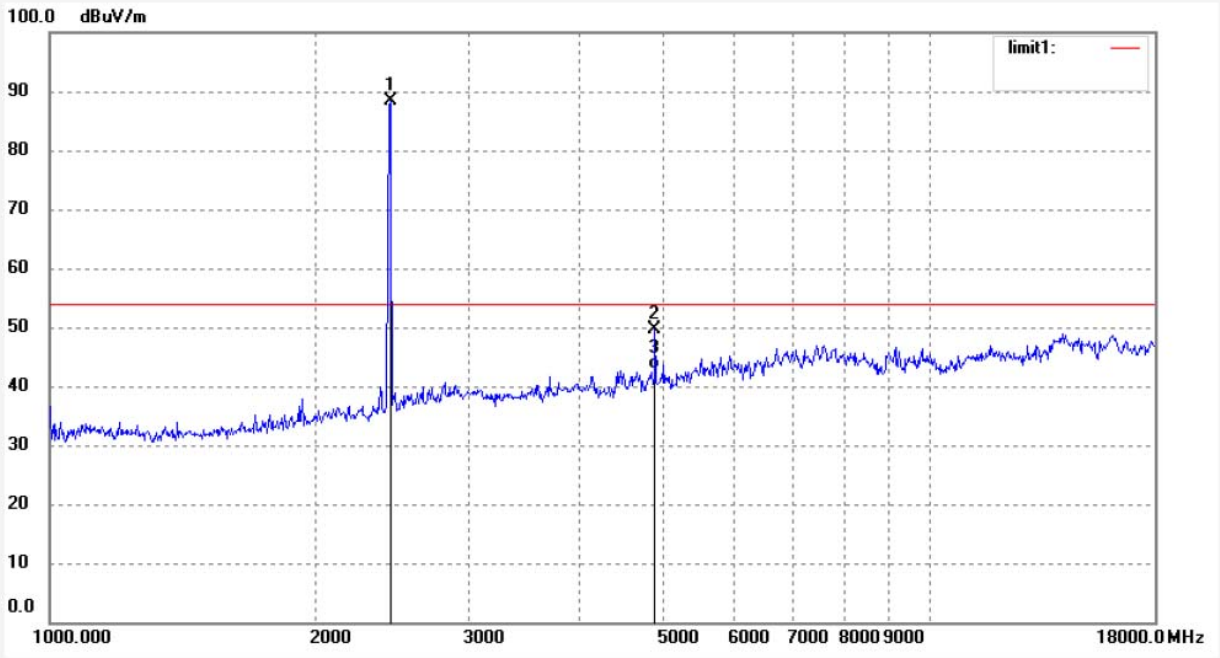
Job No.: BOB #758
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: ClearGrass Air Monitor
Mode: TX Channel 11(802.11b)
Model: CGS1
Manufacturer: Qingping

Polarization: Vertical
Power Source: DC 3.7V
Date: 18/09/20/
Time: 15/03/30
Engineer Signature: Bob
Distance: 3m

Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2462.007	94.10	-5.61	88.49			peak			
2	4924.017	45.37	4.20	49.57	74.00	-24.43	peak			
3	4924.017	38.67	4.20	42.87	54.00	-11.13	AVG			

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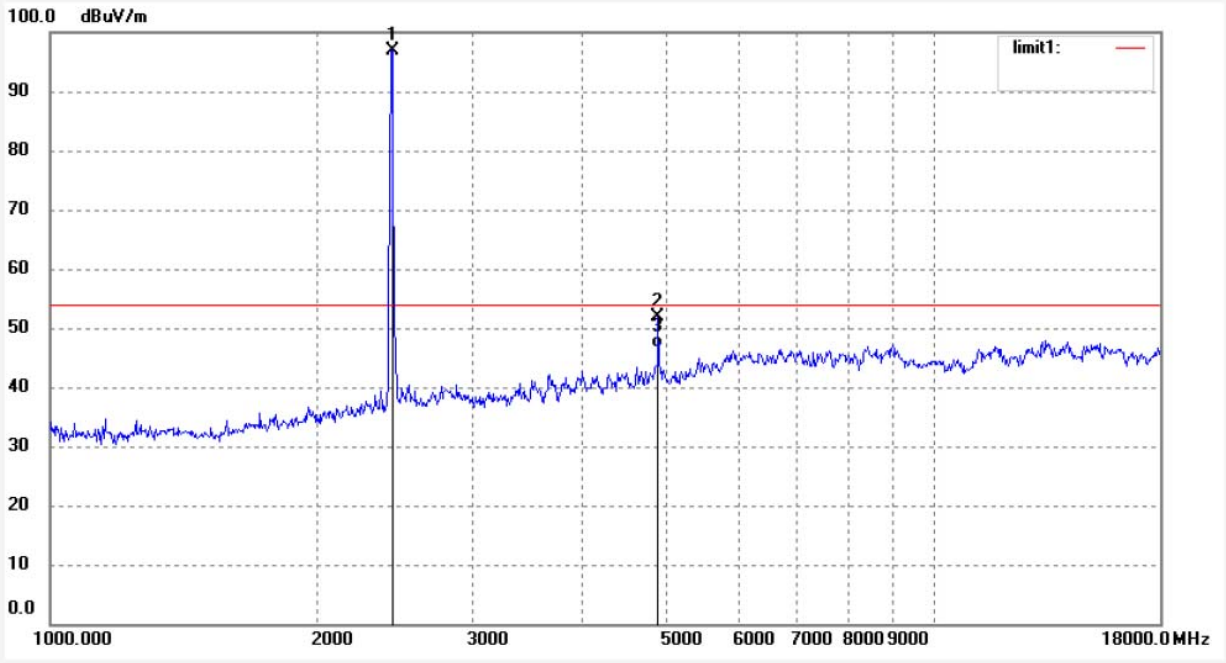
Job No.: BOB #759	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/09/20/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 15/05/20
EUT: ClearGrass Air Monitor	Engineer Signature: Bob
Mode: TX Channel 11(802.11b)	Distance: 3m
Model: CGS1	
Manufacturer: Qingping	

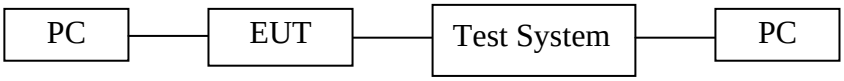
Note: Report No.:ATE20181717



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2462.007	102.59	-5.61	96.98			peak			
2	4924.117	47.65	4.20	51.85	74.00	-22.15	peak			
3	4924.117	42.45	4.20	46.65	54.00	-7.35	AVG			

12.99% OCCUPIED BANDWIDTH

12.1.Block Diagram of Test Setup



12.2.The Requirement For ANSI C63.10: 2013 Section 6.9.3

ANSI C63.10: 2013 Section 6.9.3: The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

12.3.EUT Configuration on Measurement

The following equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

12.4.Operating Condition of EUT

12.4.1.Setup the EUT and simulator as shown as Section 12.1.

12.4.2.Turn on the power of all equipment.

12.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2412-2462 and 2422-2452MHz. We select 2412MHz, 2437MHz, 2462MHz and 2422MHz, 2437MHz, 2452MHz TX frequency to transmit.

12.5.Test Procedure

12.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable. The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

12.5.2.The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

12.5.3.A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

12.5.4.Set SPA “Meas” function, Select “Occupied Bandwidth” function, Select “99% Power Bandwidth”. The frequency of the upper and lower markers indicating the edges of the transmitters “99% Power” emission bandwidth shall be recorded to automate by SPA.

12.6.Measurement Result

Test Lab: Shielding room
Test Engineer: Bob

The test was performed with 802.11b		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
Low	2412	15.213
Middle	2437	15.263
High	2462	15.258

The test was performed with 802.11g		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
Low	2412	16.868
Middle	2437	16.858
High	2462	16.818

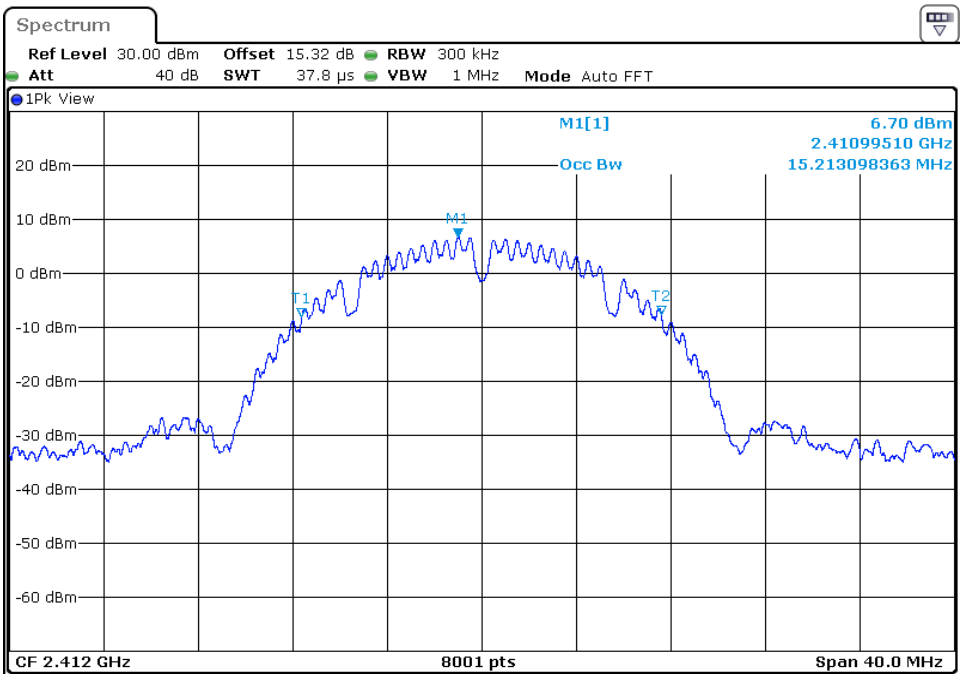
The test was performed with 802.11n (Bandwidth: 20 MHz)		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
Low	2412	18.138
Middle	2437	17.968
High	2462	18.093

The test was performed with 802.11n (Bandwidth: 40 MHz)		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
Low	2422	36.515
Middle	2437	36.545
High	2452	36.555

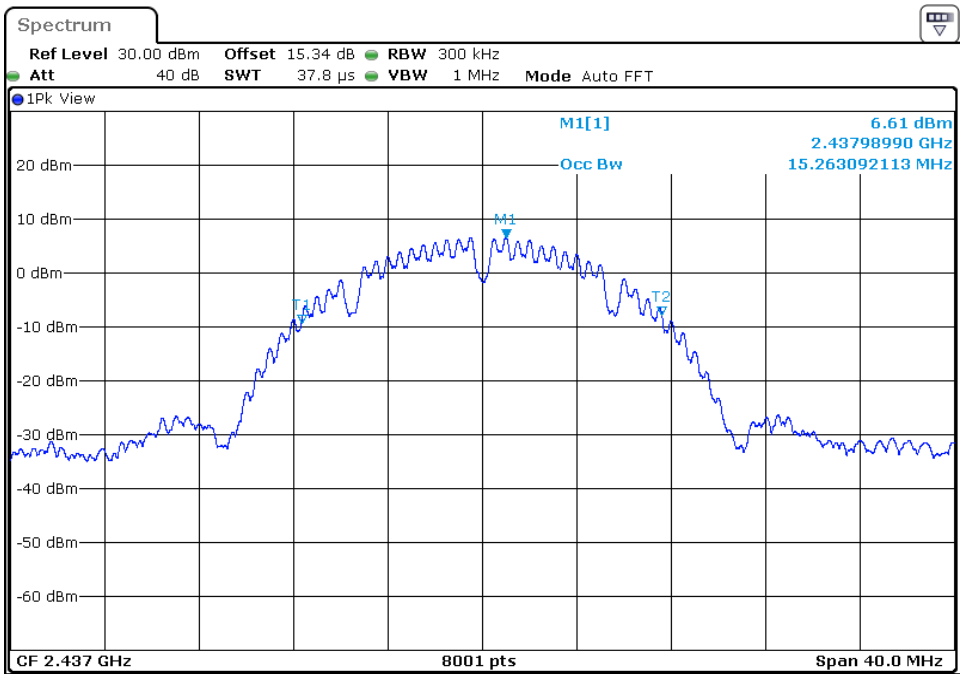
Note: We tested 802.11b/g/n mode the all data rate and recorded the worst case data for this channel to be 11Mbps for 802.11b mode and 54Mbps for 802.11g mode and MCS7 for 802.11n(20MHz) and MCS7 for 802.11n(40MHz) mode.

The spectrum analyzer plots are attached as below.

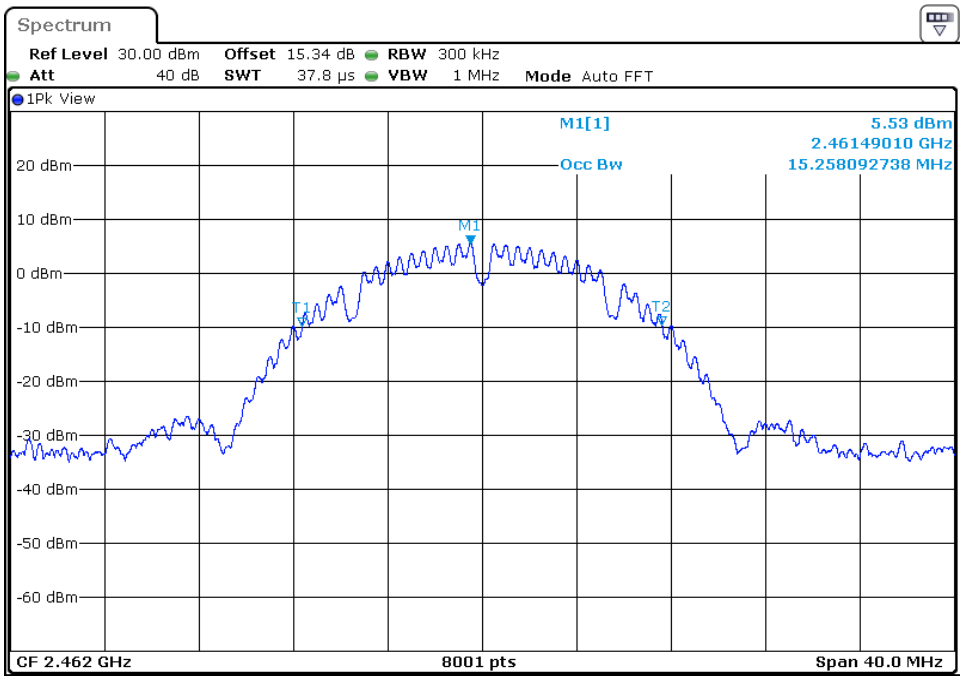
802.11b Channel Low 2412MHz



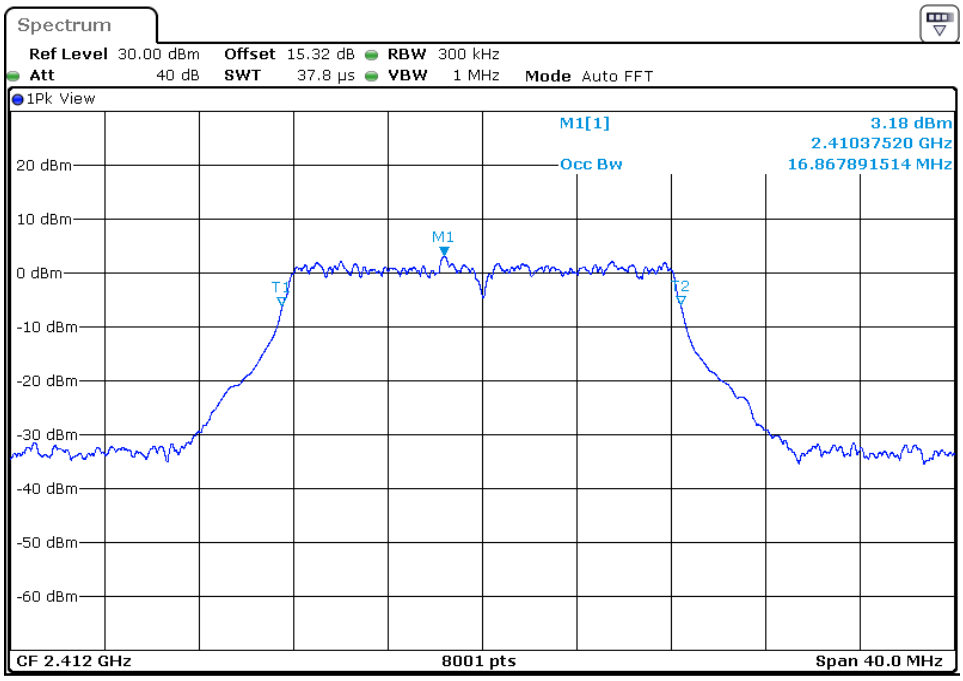
802.11b Channel Middle 2437MHz



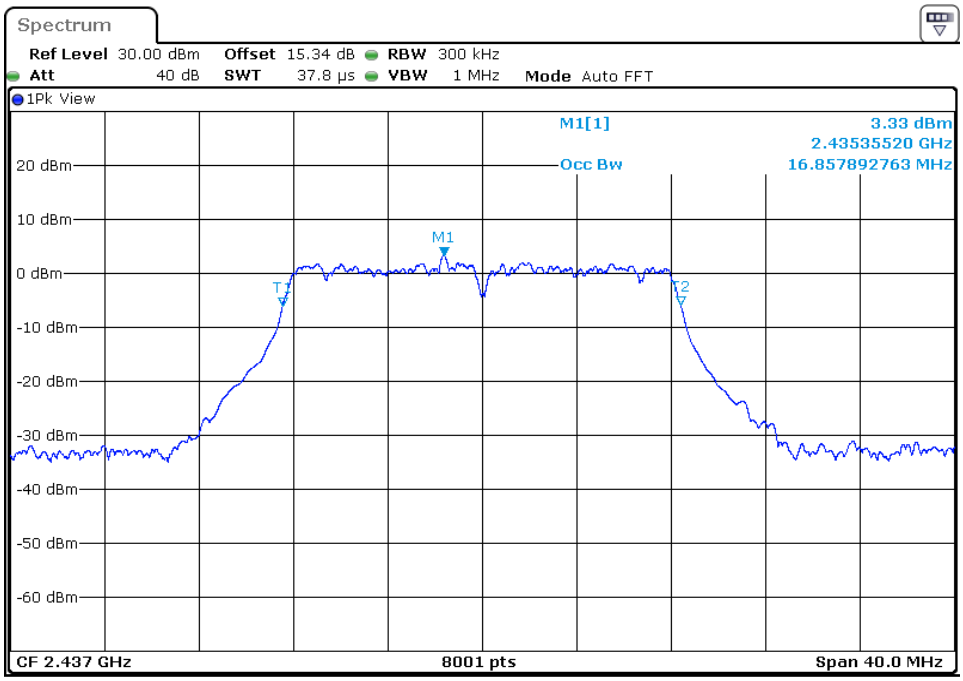
802.11b Channel High 2462MHz



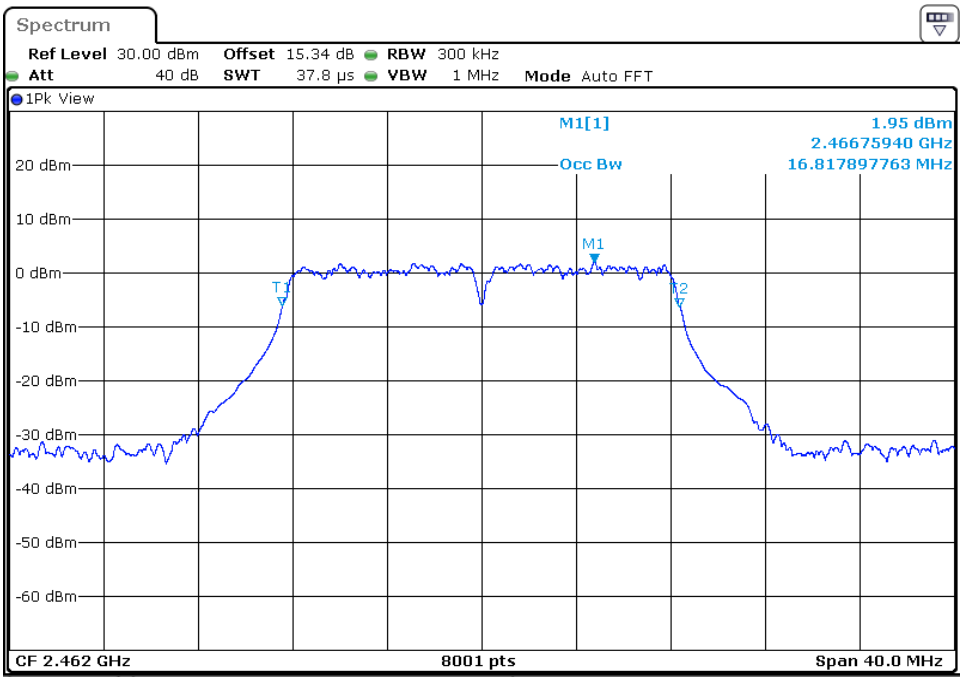
802.11g Channel Low 2412MHz



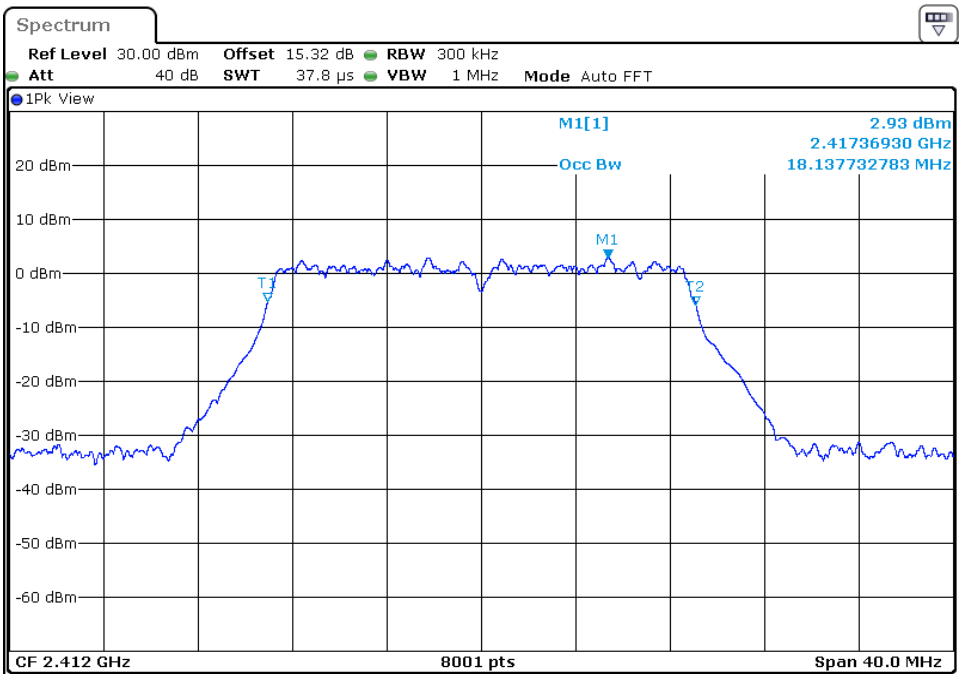
802.11g Channel Middle 2437MHz



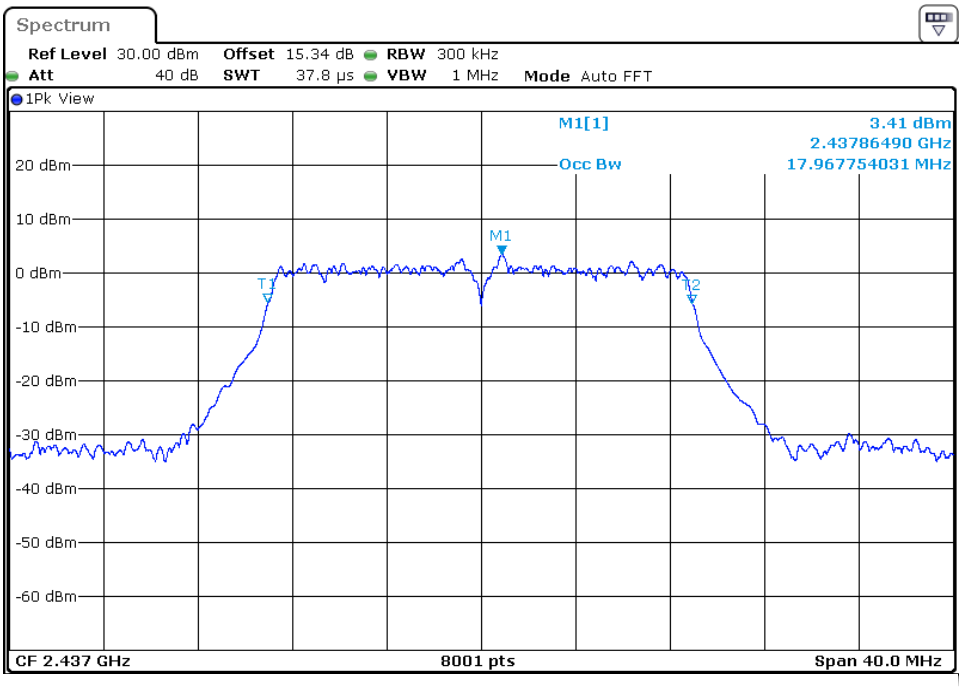
802.11g Channel High 2462MHz



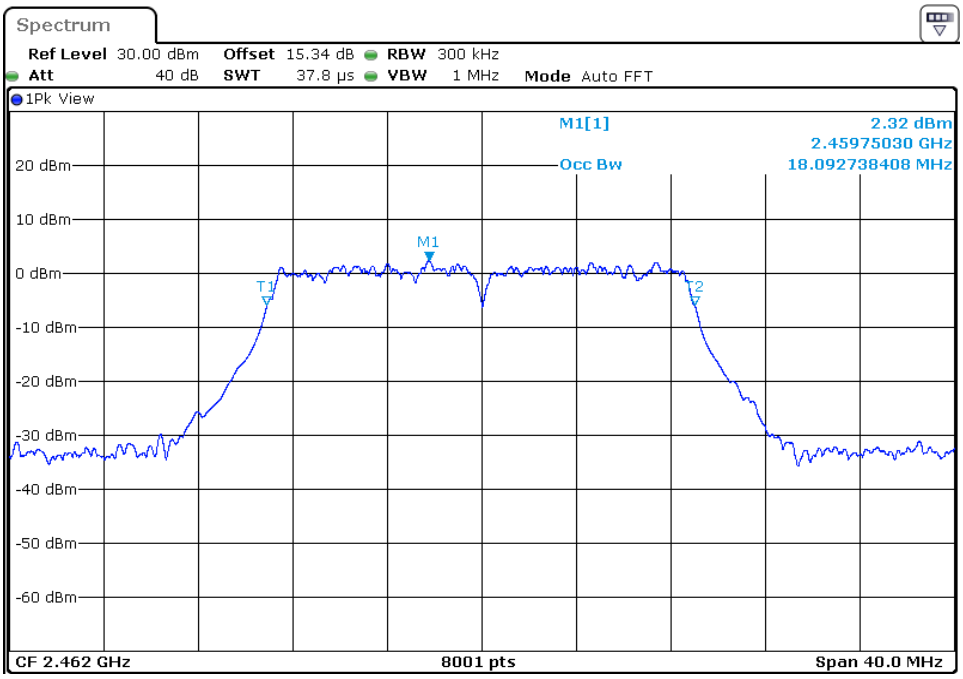
802.11n Channel Low 2412MHz (20MHz)



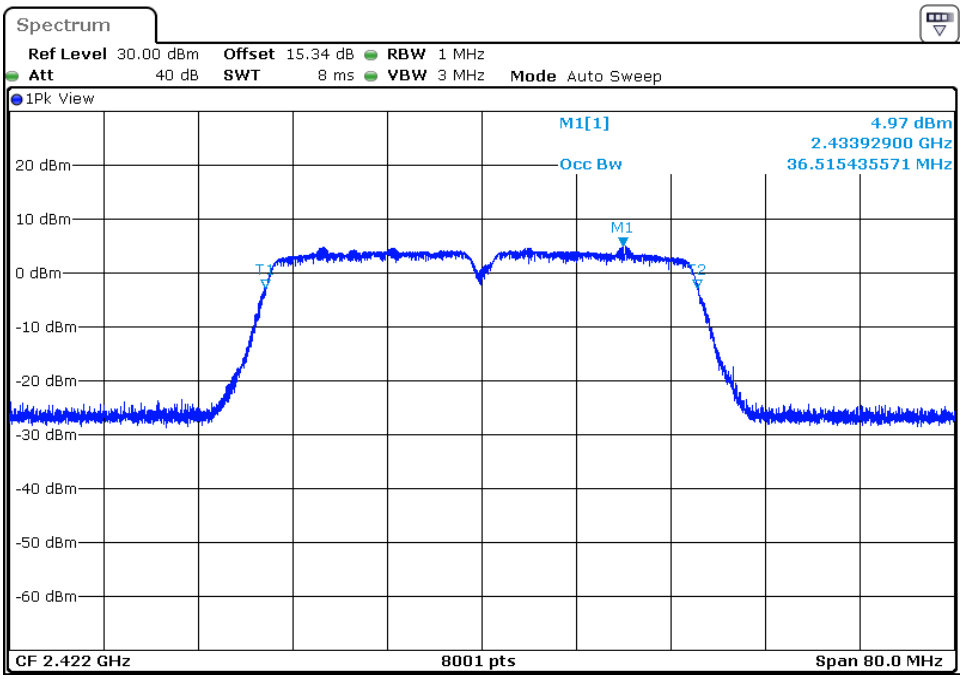
802.11n Channel Middle 2437MHz(20MHz)



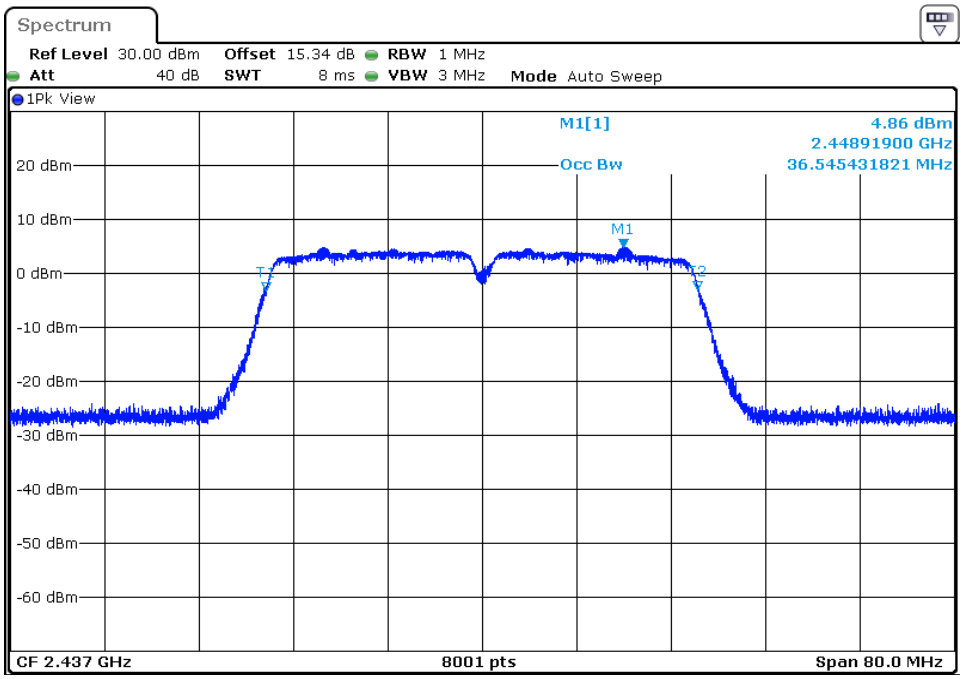
802.11n Channel High 2462MHz(20MHz)



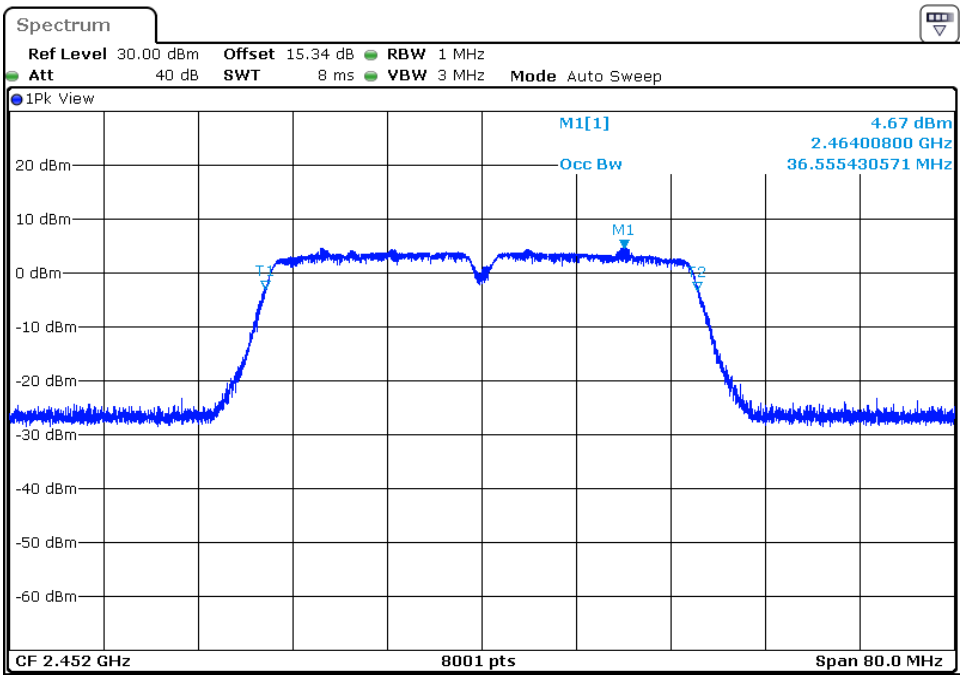
802.11n Channel Low 2422MHz (40MHz)



802.11n Channel Middle 2437MHz(40MHz)



802.11n Channel High 2452MHz(40MHz)



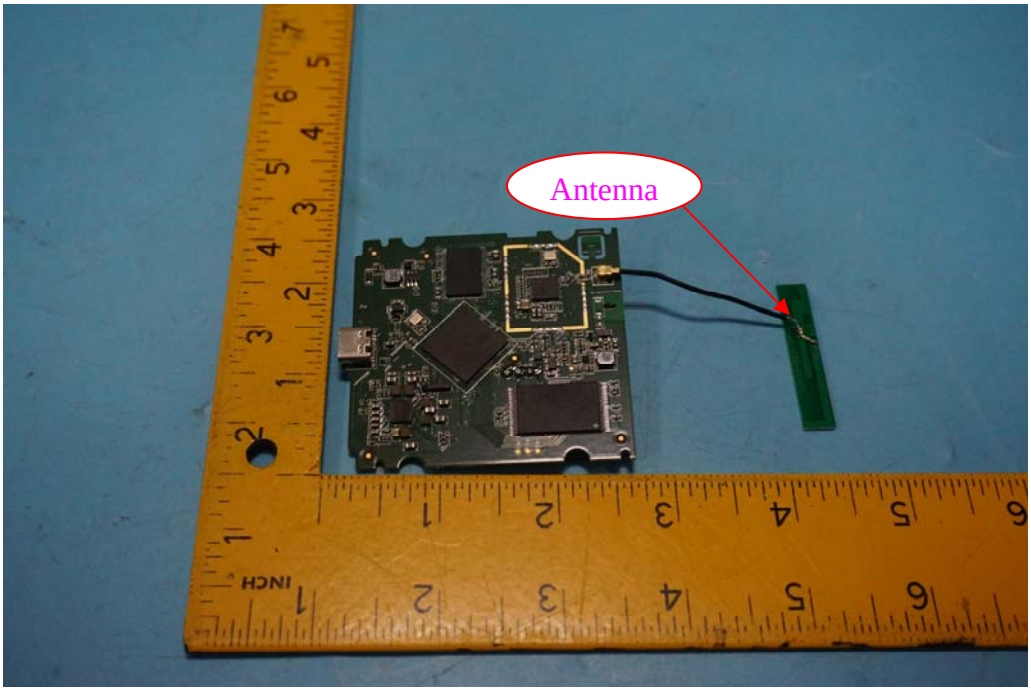
13. ANTENNA REQUIREMENT

13.1. The Requirement

According to Section 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.

13.2. Antenna Construction

The antenna use 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. The antenna connector used in this product is the ipex connector. The Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



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