FCC PART 15C TEST REPORT FOR CERTIFICATION

Applicant:	Switchmate Home, LLC
Address:	6601 Owens Drive, Suite 250, Pleasanton, California United States 94588
Manufacturer:	Sungale Electronics (Shenzhen) Limited
Address:	No.02,13 floor, No.6-18,Xinhe Road, Shajing, Baoan, Shenzhen,China
Factory:	Sungale Electronics (Shenzhen) Limited
Address:	No.02,13 floor, No.6-18,Xinhe Road, Shajing, Baoan, Shenzhen,China
E.U.T:	Zip BLE-WiFi Bridge
Model Number:	ZSM009 ;ZSM010
FCC ID:	2AICR-ZSM009
Trade Name:	switchmate Serial No.: ---
Date of Receipt:	May 26, 2017 Date of Test: May 26, 2016~ June 13, 2017
Test Specification:	FCC PART 15.247
Test Result:	The device described above is tested by Dongguan Lepont Testing Service Co., Ltd. The measurement results were contained in this test report and Dongguan Lepont Testing Service Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC PART 15.247 requirements. This report applies to above tested sample only and shall not be reproduced in part without written approval of Dongguan Lepont Testing Service Co., Ltd.

Date: June 13, 2017

Prepared by:	Tested by:	Approved by:
Flora / Assistant	Baret Wu / Engineer	Frank Shen / Manager

Other Aspects:

None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of Dongguan Lepont Testing Service Co., Ltd.

TABLE OF CONTENTS

1.GENERAL INFORMATION

1.1. Description of Device (EUT)

Product Name	:	Zip BLE-WiFi Bridge
Model Number	:	ZSM009 ;ZSM010
FCC ID	:	2AICR-ZSM009
Model Difference	:	Only the model name are different, the others are the same
Adapter	:	None
Power Supply	:	AC 120V 60Hz 500mA
Test Voltage	:	AC 120V/60Hz （only the worst case was recorded in this report）
Hardware Version	:	V2
Software Version	:	V1.266
Note	:	N/A
Technical parameters	:	WIFI
Operation frequency	:	2412-2462MHz for 802.11b/g/n (HT20) 2422-2452MHz for 802.11n (HT40)
Modulation	:	DSSS for 802.11b OFDM for 802.11g/n (HT20)/n(HT40)
Number of channel	:	11 for 802.11b/g/n (HT20) 7 for 802.11n (HT40)
Channel Space	:	5MHz
Date Rate	:	802.11b:1~11Mbps 802.11g:6~54Mbps 802.11n:6.5~135Mbps
Antenna Type	:	PCB Antenna
Antenna Gain	:	0dBi
Technical parameters	:	Bluetooth
Bluetooth Version	:	Bluetooth V4.0 LE
Frequency Range	:	2402-2480MHz
Modulation	:	GFSK
Number of Channel	:	40
Channel Space	:	2MHz
Date Rate	:	1Mbps
Antenna Type	:	PCB Antenna
Antenna Gain	:	1.0dBi

1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AICR-ZSM009 filing to comply with Section 15.247 of the FCC Part 15(2016), Subpart C Rule.

1.3. Test Methodology

Was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters. All other measurements were made in accordance with the procedures in 47 CFR part 2.

1.4. Equipment Modifications

Not available for this EUT intended for grant.

1.5. Test Facility and Location

Listed by FCC, June 03, 2015
The Certificate Registration Number is 374391.

Listed by Industry Canada, November 02, 2015
The Certificate Registration Number is 20133.

Dongguan Lepont Testing Service Co., Ltd.
No.117 Ting Shan Industrial Zone, Houjie Town, Dongguan, 523943 China

2. SUMMARY OF TEST

2.1. Summary of test result

Description of Test Item	Standard	Uncertainty	Results
AC Power Conducted Emissions	FCC Part 15: 15.207(a)	±2.96dB	PASS
Max. Conducted Output Power	FCC Part 15: 15.247(b)(3)	±1.26dB	PASS
6dB Bandwidth	FCC Part 15: 15.247(a)(2)	±1.42 x10^{-4}%	PASS
Power Spectral Density	FCC Part 15: 15.247(e)	±1.09dB	PASS
Band Edge and Conducted Spurious Emissions	FCC Part 15: 15.247(d)	±1.37dB&± 2.33dB	PASS
Radiated Spurious Emissions and Restricted Bands	FCC Part 15: 15.247(d) FCC Part 15: 15.209 FCC Part 15: 15.205	±3.54dB	PASS
Antenna requirement	FCC Part 15: 15.203	---	PASS

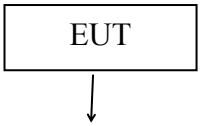
2.2. Assistant equipment used for test

Notebook PC
Manufacturer : ASUS
M/N : K42J
S/N : 32870136206

Adapter
Model : DA90PM111
Input : AC 100-240V~50/60Hz 0.5A
Output : Output: DC 19V/2A

2.3. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 or 1.5 meter high above ground. EUT was be set into BT test mode by software before test.



AC Mains

(EUT: Zip BLE-WiFi Bridge)

2.4. Test mode

According to section 15.31(m), regards to the operating frequency range over 10MHz, the Lowest, middle, and the Highest frequency of channel were selected to perform the test. The selected frequency see below:

Bluetooth		
Mode	Channel	Frequency
GFSK	Low	2402MHz
	Middle	2440MHz
	High	2480MHz

WIFI			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	3	2422
6	2437	6	2437
11	2462	9	2452

2.5. Channel List

Bluetooth							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	11	2422	21	2442	31	2462
2	2404	12	2424	22	2444	32	2464
3	2406	13	2426	23	2446	33	2466
4	2408	14	2428	24	2448	34	2468
5	2410	15	2430	25	2450	35	2470
6	2412	16	2432	26	2452	36	2472
7	2414	17	2434	27	254	37	2474
8	2416	18	2436	28	2456	38	2476
9	2418	19	2438	29	2458	39	2478
10	2420	20	2440	30	2460	40	2480

WIFI			
802.11b/g/n(HT20)		802.11n(HT40)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	---	---
2	2417	---	---
3	2422	3	2422
4	2427	4	2427
5	2432	5	2432
6	2437	6	2437
7	2442	7	2442
8	2447	8	2447
9	2452	9	2452
10	2457	---	---
11	2462	---	---

2.6. Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	8290501003	April,22,17	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	100873	April,22,17	1 Year
Pulse Limiter	Rohde & Schwarz	ESFSHNA-Z2	101100	April,22,17	1 Year
RF Cable	Fujikura	3D-2W	844Charmbrr No1	April,22,17	1 Year
EMI Test Receiver	Rohde & Schwarz	ESR	101849	April,22,17	1 Year
Bilog Antenna	Schwarzbeck	VULB 9163	743	April,22,17	1 Year
Signal Amplifier	HP	8447D	1726A01222	April,22,17	1 Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA9120D1 002	April,26,17	1 Year
Signal Amplifier	SCHWARZBECK	BBV9718	9718-212	April,22,17	1 Year
Spectrum Analyzer	Rohde & Schwarz	FDU26	2004018	April,22,17	1 Year
RF Cable	Huber suhner	RG 214/U	513423	April,22,17	1 Year
RF Cable	Huber suhner	SF-106	N/A	April,22,17	1 Year
Power Meter	Anritsu	ML2495A	1135002	April,22,17	1 Year
Power Sensor	Anritsu	MA2411B	100426	April,22,17	1 Year

2.7. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.8. Special Accessories

Not available for this EUT intended for grant.

2.9. Description of test modes

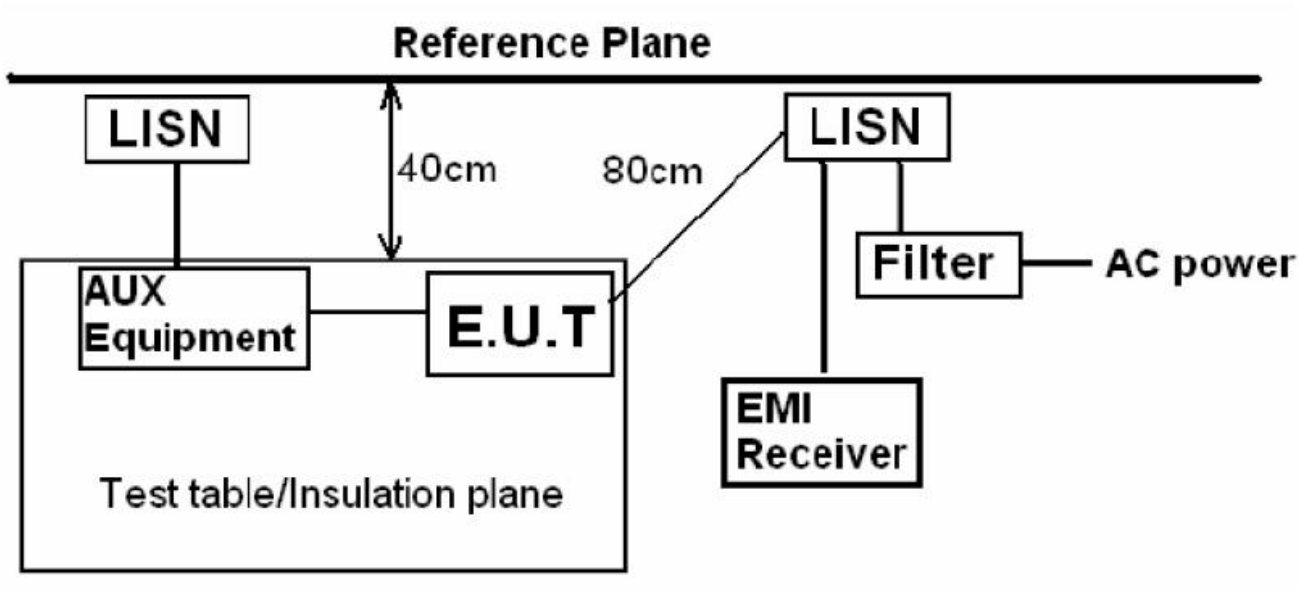
The EUT has been tested under continuous operating condition. Test program used to control the EUT staying in continuous transmitting mode. The Lowest, middle and highest channel were chosen for testing, and modulation type GFSK, CCK, DQPSK, DBPSK, OFDM and all data rate were tested. But only the worst case data is shown in this report.

2.10.EUT Exercise

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

3. CONDUCTED EMISSIONS TEST

3.1. Test SET-UP (Block Diagram of Configuration)



3.2. Test Condition

Test Requirement: FCC Part 15.207
Frequency Range: 150KHz ~ 30MHz
Detector: RBW 9KHz, VBW 30KHz
Operation Mode: WIFI Mode, BT Mode

3.3. Measurement Results

Please refer to following plots of the worst case (802.11b Low channel, BLE High channel).

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 05, 2017	Phase:	L1
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	802.11b Low channel		

Site:Shielded Room

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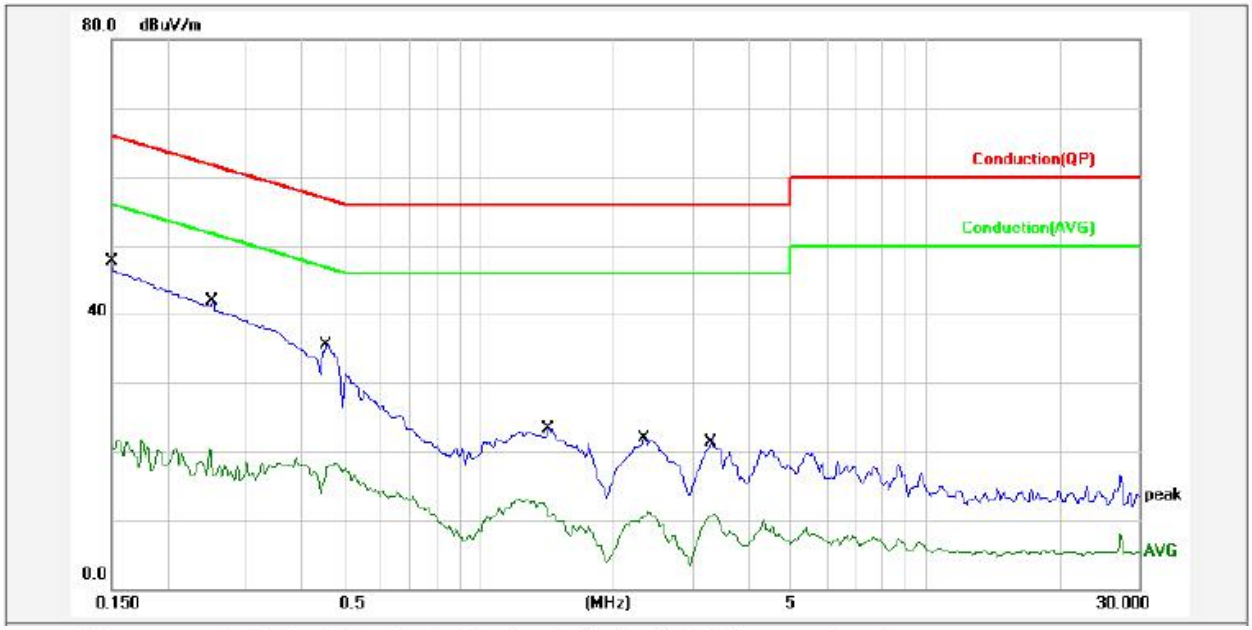

No.	Frequency (MHz)	Factor (dB)	Reading (dBuV/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	0.1500	9.62	33.98	43.60	66.00	-22.40	QP	P	
2	0.1500	9.62	11.62	21.24	56.00	-34.76	AVG	P	
3	0.2533	9.62	28.68	38.30	61.65	-23.35	QP	P	
4	0.2533	9.62	10.60	20.22	51.65	-31.43	AVG	P	
5	0.4557	9.62	22.88	32.50	56.77	-24.27	QP	P	
6	0.4557	9.62	8.24	17.86	46.77	-28.91	AVG	P	
7	1.4290	9.66	9.94	19.60	56.00	-36.40	QP	P	
8	1.4290	9.66	2.16	11.82	46.00	-34.18	AVG	P	
9	2.3372	9.68	8.92	18.60	56.00	-37.40	QP	P	
10	2.3372	9.68	1.03	10.71	46.00	-35.29	AVG	P	
11	3.2998	9.70	7.90	17.60	56.00	-38.40	QP	P	
12	3.2998	9.70	1.21	10.91	46.00	-35.09	AVG	P	

Note: Level=Reading+Factor.
Margin=Level-Limit.

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 05, 2017	Phase:	N
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	802.11b Low channel		

Site:Shielded Room

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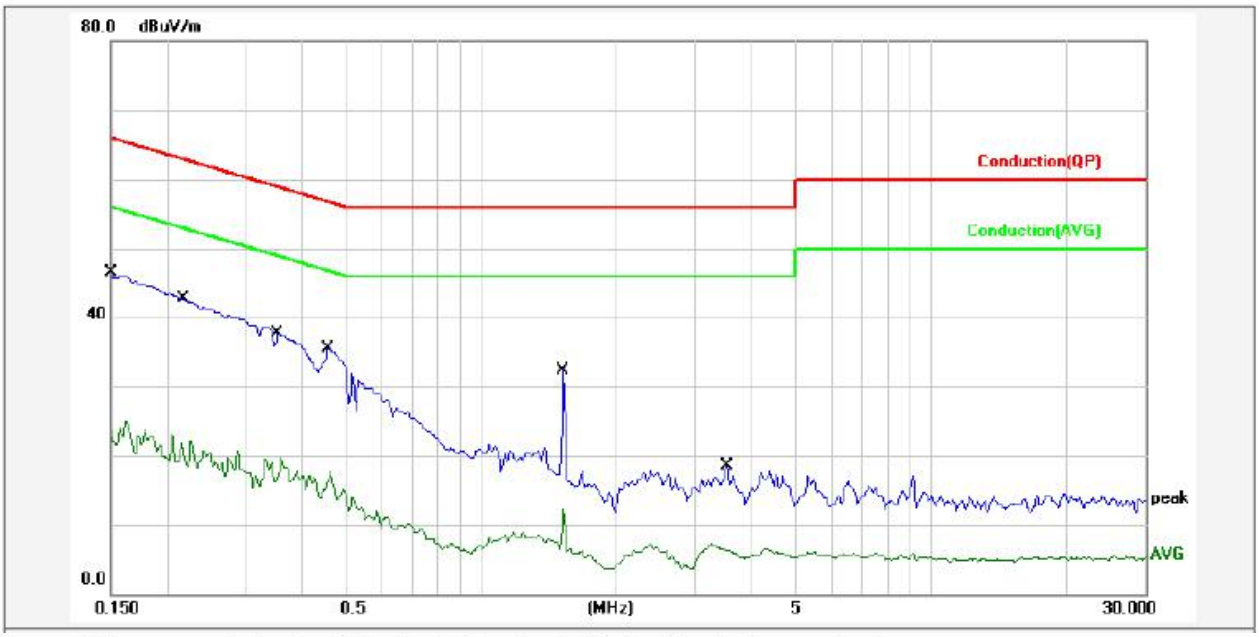

No.	Frequency (MHz)	Factor (dB)	Reading (dBuV/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	0.1500	9.60	34.00	43.60	66.00	-22.40	QP	P	
2	0.1500	9.60	15.01	24.61	56.00	-31.39	AVG	P	
3	0.2196	9.60	29.70	39.30	62.83	-23.53	QP	P	
4	0.2196	9.60	12.13	21.73	52.83	-31.10	AVG	P	
5	0.3535	9.61	24.89	34.50	58.88	-24.38	QP	P	
6	0.3535	9.61	10.13	19.74	48.88	-29.14	AVG	P	
7	0.4557	9.61	22.49	32.10	56.77	-24.67	QP	P	
8	0.4557	9.61	6.69	16.30	46.77	-30.47	AVG	P	
9	1.5226	9.65	24.85	34.50	56.00	-21.50	QP	P	
10	1.5226	9.65	2.69	12.34	46.00	-33.66	AVG	P	
11	3.5161	9.71	2.69	12.40	56.00	-43.60	QP	P	
12	3.5161	9.71	-3.16	6.55	46.00	-39.45	AVG	P	

Note: Level=Reading+Factor.
Margin=Level-Limit.

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 05, 2017	Phase:	L1
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	BLE High channel		

Site:Shielded Room

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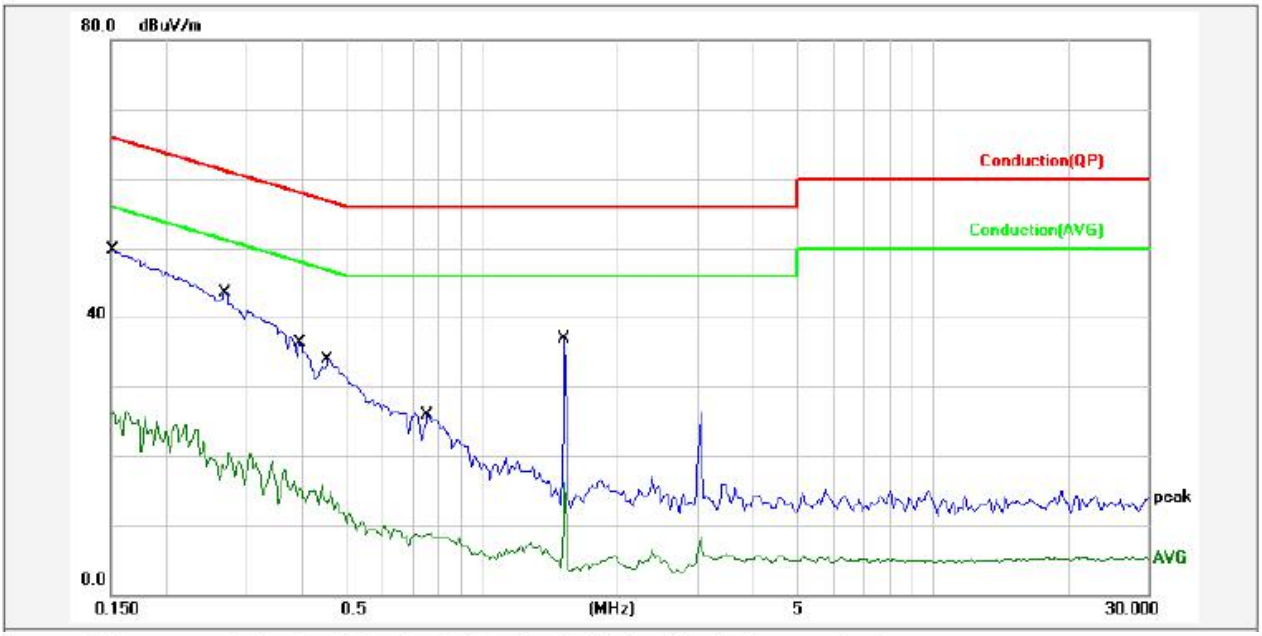

No.	Frequency (MHz)	Factor (dB)	Reading (dBuV/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	0.1524	9.60	37.60	47.20	65.87	-18.67	QP	P	
2	0.1524	9.60	16.73	26.33	55.87	-29.54	AVG	P	
3	0.2700	9.60	30.40	40.00	61.12	-21.12	QP	P	
4	0.2700	9.60	10.87	20.47	51.12	-30.65	AVG	P	
5	0.3950	9.61	23.49	33.10	57.96	-24.86	QP	P	
6	0.3950	9.61	5.77	15.38	47.96	-32.58	AVG	P	
7	0.4564	9.61	21.59	31.20	56.76	-25.56	QP	P	
8	0.4564	9.61	5.27	14.88	46.76	-31.88	AVG	P	
9	0.7573	9.62	12.88	22.50	56.00	-33.50	QP	P	
10	0.7573	9.62	-0.86	8.76	46.00	-37.24	AVG	P	
11	1.5226	9.65	26.05	35.70	56.00	-20.30	QP	P	
12	1.5226	9.65	6.49	16.14	46.00	-29.86	AVG	P	

Note: Level=Reading+Factor.
Margin=Level-Limit.

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 05, 2017	Phase:	L1
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	BLE High channel		

Site:Shielded Room

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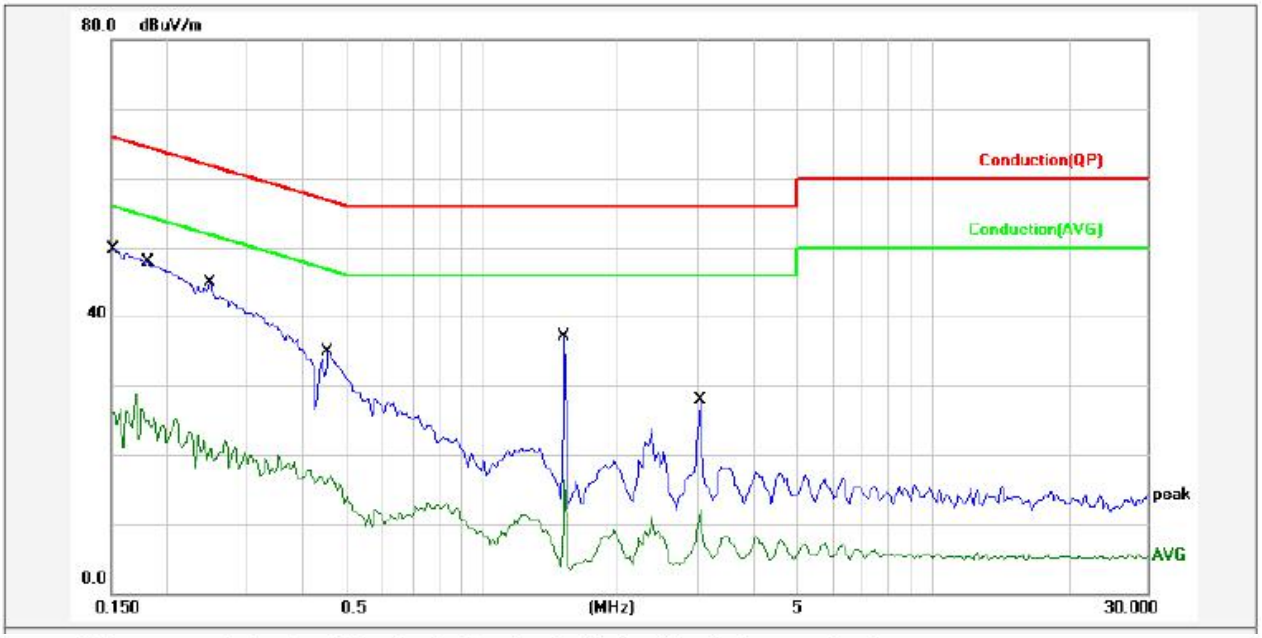


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	0.1524	9.62	37.78	47.40	65.87	-18.47	QP	P	
2	0.1524	9.62	16.54	26.16	55.87	-29.71	AVG	P	
3	0.1815	9.62	35.78	45.40	64.42	-19.02	QP	P	
4	0.1815	9.62	17.00	26.62	54.42	-27.80	AVG	P	
5	0.2493	9.62	31.48	41.10	61.78	-20.68	QP	P	
6	0.2493	9.62	11.45	21.07	51.78	-30.71	AVG	P	
7	0.4557	9.62	22.18	31.80	56.77	-24.97	QP	P	
8	0.4557	9.62	7.14	16.76	46.77	-30.01	AVG	P	
9	1.5226	9.66	25.94	35.60	56.00	-20.40	QP	P	
10	1.5226	9.66	6.73	16.39	46.00	-29.61	AVG	P	
11	3.0480	9.69	19.11	28.80	56.00	-27.20	QP	P	
12	3.0480	9.69	2.40	12.09	46.00	-33.91	AVG	P	

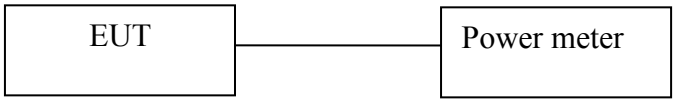
Note: Level=Reading+Factor.
Margin=Level-Limit.

4. MAX. CONDUCTED OUTPUT POWER

4.1. Measurement Procedure

Maximum Conducted Output power at Antenna Terminals, FCC Rules 15.247(b)(3): One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT. The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

4.2. Test SET-UP (Block Diagram of Configuration)



4.3. Measurement Results

PASS

Please refer to following table.

Temperature :	22 ℃	Humidity :	56%
Test By:	Frank	Test Date :	June 05, 2017
Test Result:	PASS		

Frequency MHz	Data Rate Mbps	Peak Output Power dBm	Limit dBm
IEE 802.11b Mode（CCK, Antenna Gain=0.0dBi）			
Low Channel： 2412	1	14.28	30
Middle Channel： 2437	1	15.35	30
High Channel： 2462	1	15.23	30
IEE 802.11g Mode （OFDM, Antenna Gain=0.0dBi）			
Low Channel： 2412	6	11.83	30
Middle Channel： 2437	6	12.89	30
High Channel： 2462	6	12.73	30
IEE 802.11n（HT20）Mode （OFDM, Antenna Gain=0.0dBi）			
Low Channel： 2412	6.5	11.20	30
Middle Channel： 2437	6.5	12.18	30
High Channel： 2462	6.5	12.73	30
IEE 802.11n（HT40）Mode （OFDM, Antenna Gain=0.0dBi）			
Low Channel： 2422	13	11.68	30
Middle Channel： 2437	13	12.03	30
High Channel： 2452	13	12.41	30
BLE Mode (GFSK, Antenna Gain=1.0dBi)			
Low Channel： 2402	1	-5.42	30
Middle Channel： 2440	1	-5.08	30
High Channel： 2480	1	-4.73	30

5. 6dB BANDWIDTH

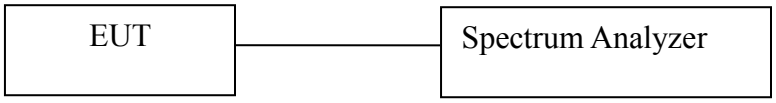
5.1. Measurement Procedure

DTS 6dB Channel Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to FCC KDB558074(v03r03):

1. For 6dB bandwidth, Set the RBW = 100KHz.
2. Set the VBW ≥ 3 x RBW
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully 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 frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.2. Test SET-UP (Block Diagram of Configuration)



5.3. Measurement Results

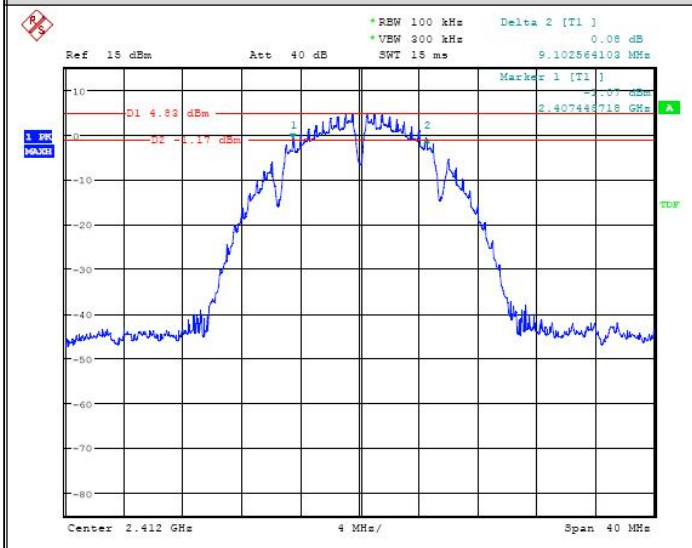
PASS

Please refer to following table.

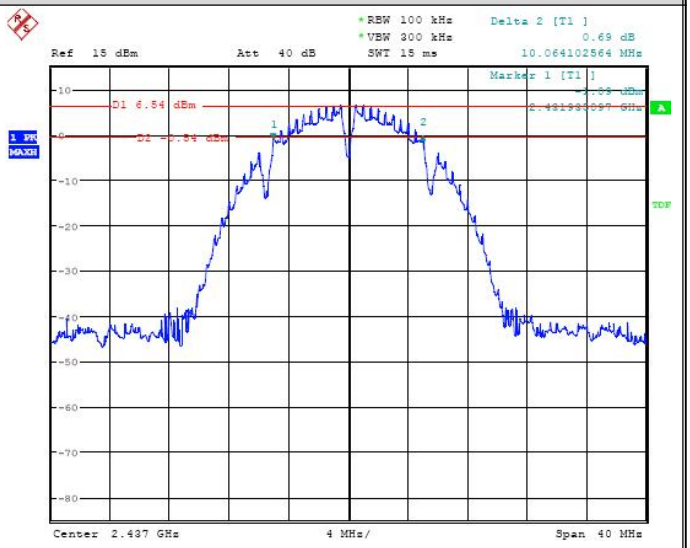
Temperature :	22 ℃	Humidity :	56%
Test By:	Frank	Test Date :	June 05, 2017
Test Result:	PASS		

Frequency MHz	Data Rate Mbps	6dB Bandwidth MHz	Limit
IEE 802.11b Mode （CCK）			
Low Channel： 2412	1	9.10	＞500KHz
Middle Channel： 2437	1	10.06	＞500KHz
High Channel： 2462	1	10.06	＞500KHz
IEE 802.11g Mode （OFDM）			
Low Channel： 2412	6	16.41	＞500KHz
Middle Channel： 2437	6	16.47	＞500KHz
High Channel： 2462	6	16.47	＞500KHz
IEE 802.11n（HT20 Mode （OFDM）			
Low Channel： 2412	6.5	17.69	＞500KHz
Middle Channel： 2437	6.5	17.63	＞500KHz
High Channel： 2462	6.5	17.56	＞500KHz
IEE 802.11n（HT40 Mode （OFDM）			
Low Channel： 2422	13	36.15	＞500KHz
Middle Channel： 2437	13	36.28	＞500KHz
High Channel： 2452	13	36.28	＞500KHz
BLE Mode (GFSK)			
Low Channel： 2402	1	0.697	＞500KHz
Middle Channel： 2440	1	0.712	＞500KHz
High Channel： 2480	1	0.697	＞500KHz

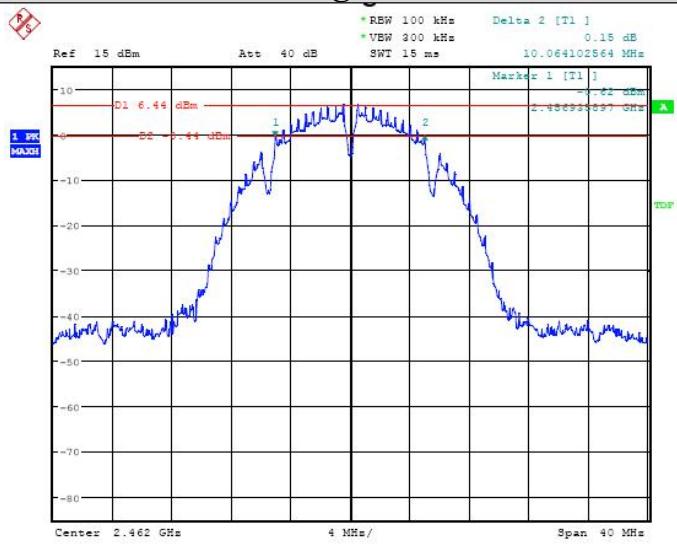
802.11b Low Channel



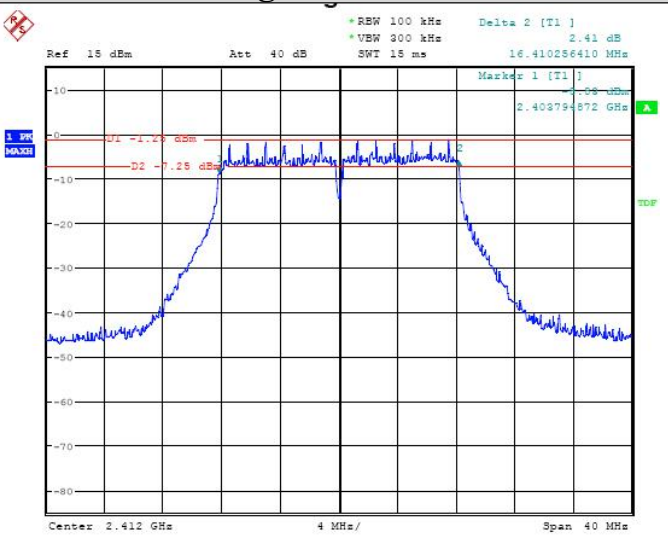
802.11b Middle Channel



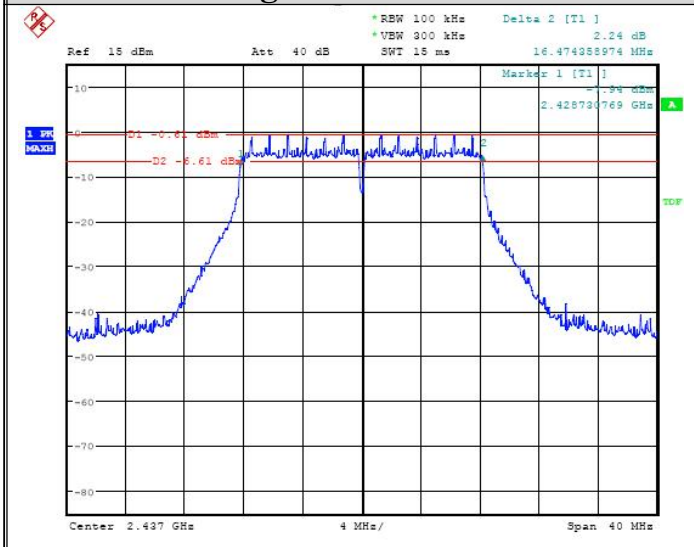
802.11b High Channel



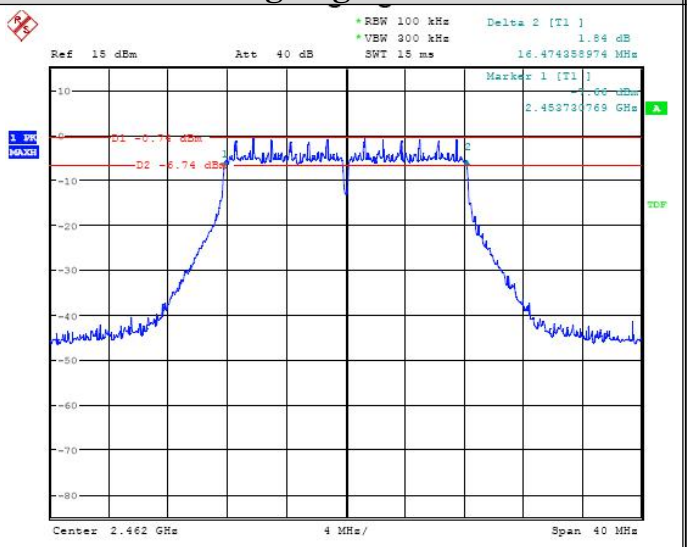
802.11g Low Channel



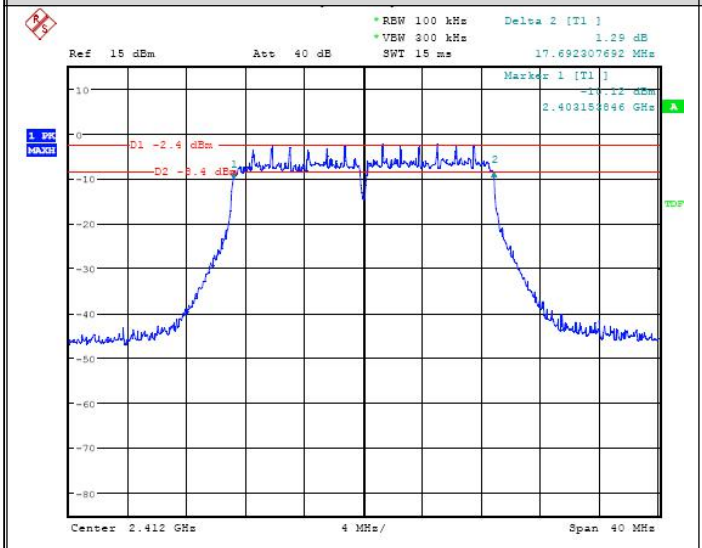
802.11g Middle Channel



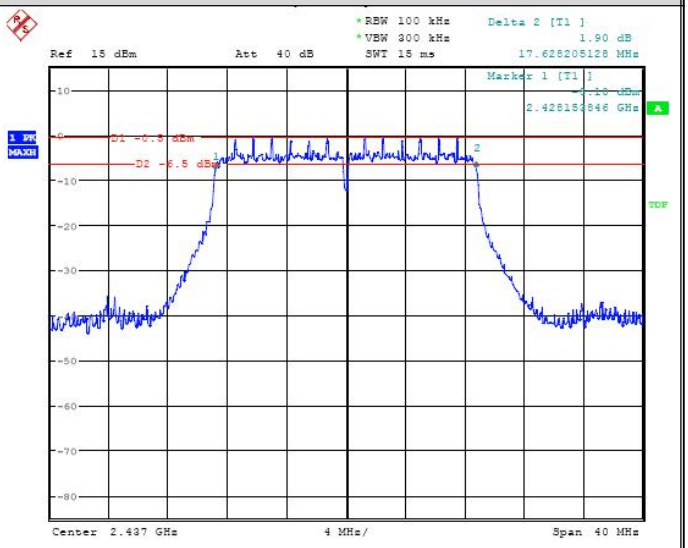
802.11g High Channel



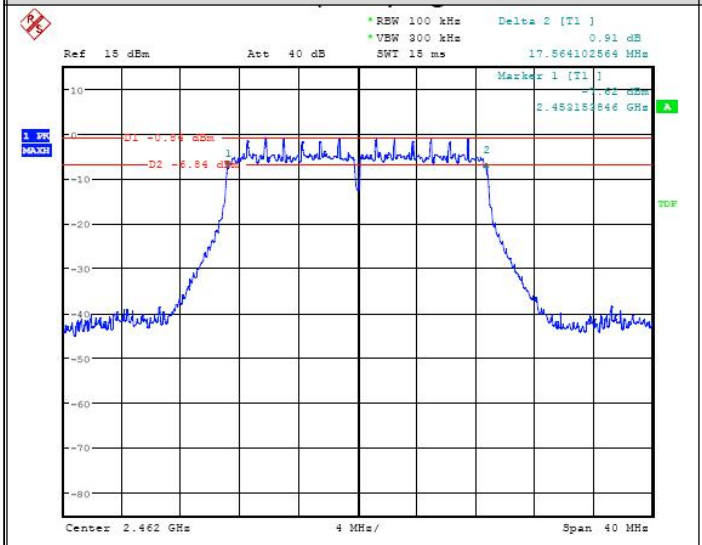
802.11n（HT20） Low Channel



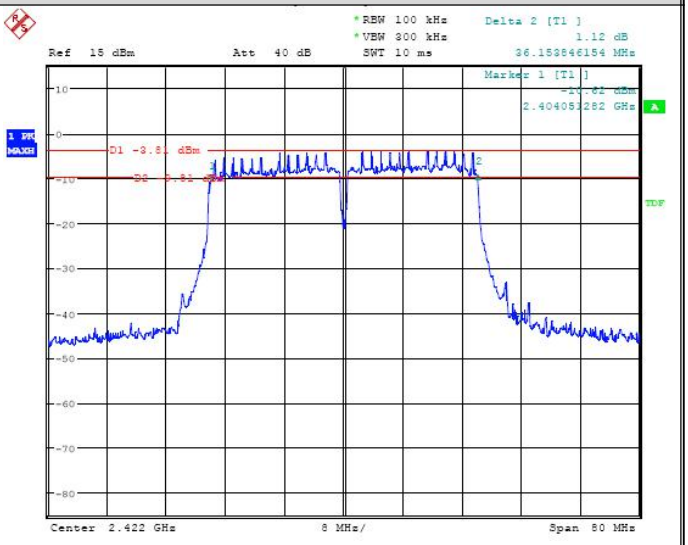
802.11n（HT20） Middle Channel



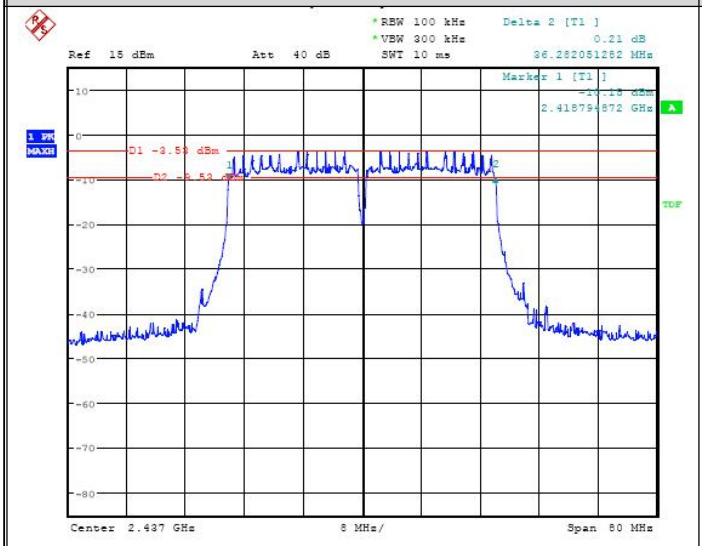
802.11n（HT20） High Channel



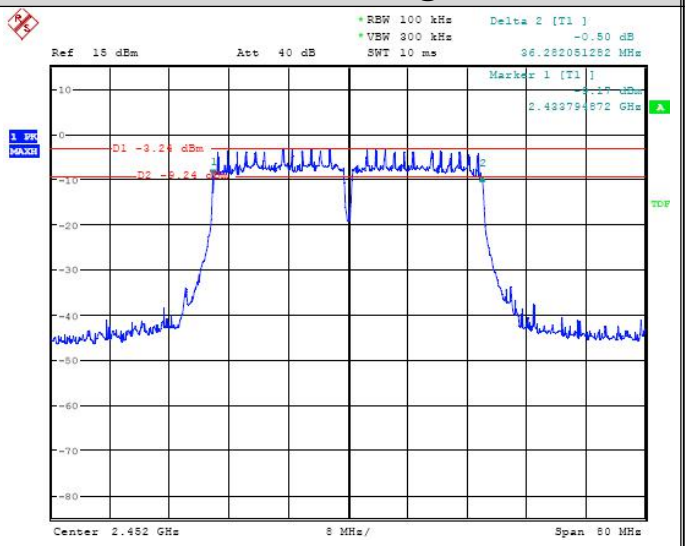
802.11n（HT40） Low Channel



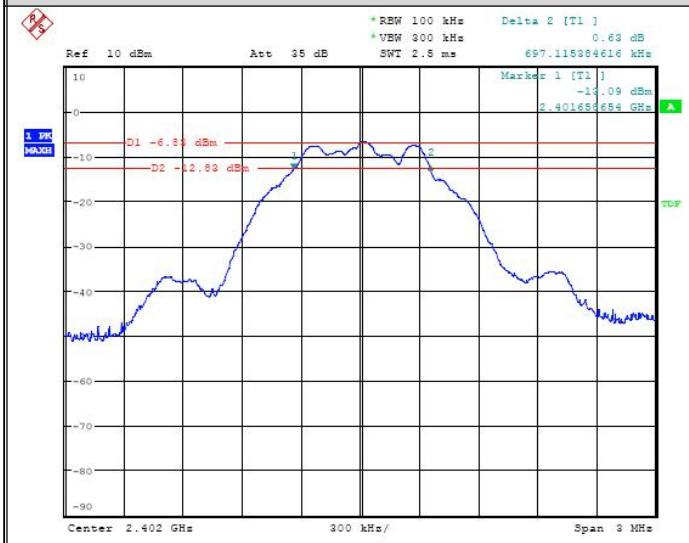
802.11n（HT40） Middle Channel



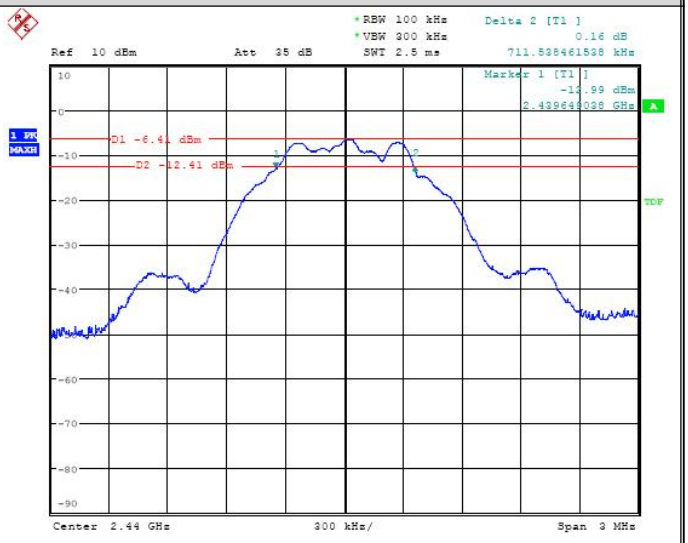
802.11n（HT40） High Channel



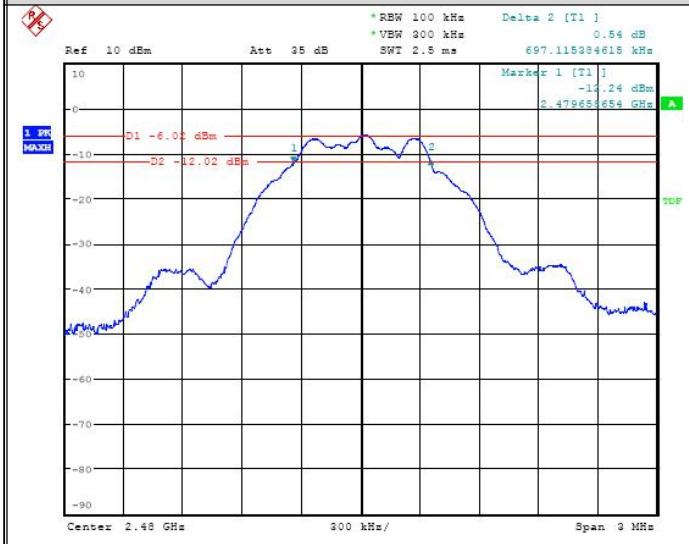
BLE Low Channel



BLE Middle Channel



BLE High Channel



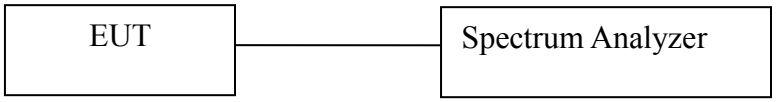
6. POWER SPECTRAL DENSITY

6.1. Measurement Procedure

DTS 6dB Channel Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer.
Analyzer was set as below according to FCC KDB558074 (v03r03):
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz≤RBW≤100KHz
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.2. Test SET-UP (Block Diagram of Configuration)



6.3. Measurement Results

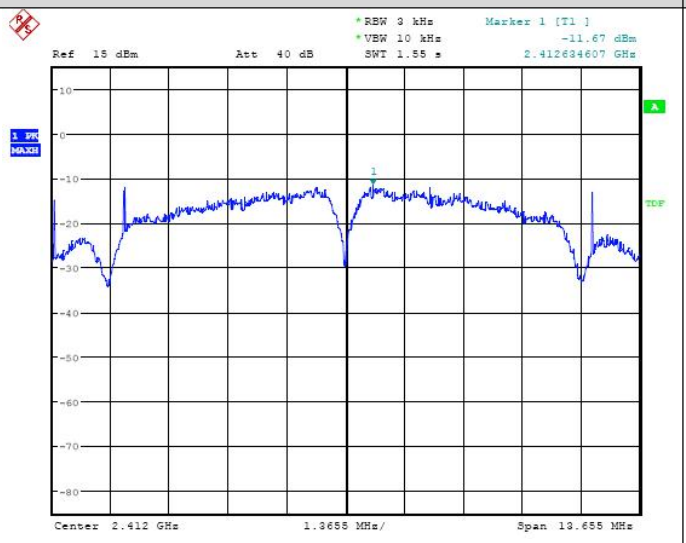
PASS

Please refer to following table.

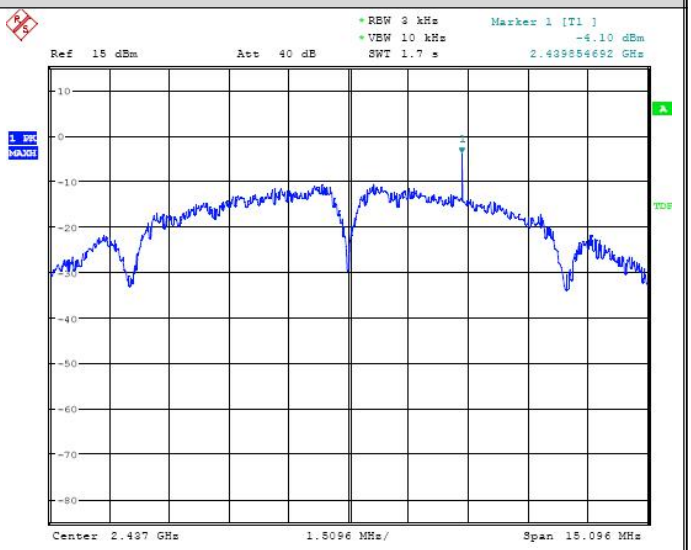
Temperature :	22 ℃	Humidity :	56%
Test By:	Frank	Test Date :	June 05, 2017
Test Result:	PASS		

Frequency MHz	Data Rate Mbps	PSD dBm/3kHz	Limit dBm/3kHz
IEE 802.11b Mode （CCK）			
Low Channel： 2412	1	-11.67	8
Middle Channel： 2437	1	-4.10	8
High Channel： 2462	1	-0.66	8
IEE 802.11g Mode （OFDM）			
Low Channel： 2412	6	-16.72	8
Middle Channel： 2437	6	-17.17	8
High Channel： 2462	6	-16.57	8
IEE 802.11n（HT20 Mode （OFDM）			
Low Channel： 2412	6.5	-17.13	8
Middle Channel： 2437	6.5	-16.36	8
High Channel： 2462	6.5	-16.03	8
IEE 802.11n（HT40 Mode （OFDM）			
Low Channel： 2422	13	-18.96	8
Middle Channel： 2437	13	-18.65	8
High Channel： 2452	13	-20.53	8
BLE Mode (GFSK)			
Low Channel： 2402	1	-25.36	8
Middle Channel： 2440	1	-25.06	8
High Channel： 2480	1	-24.57	8

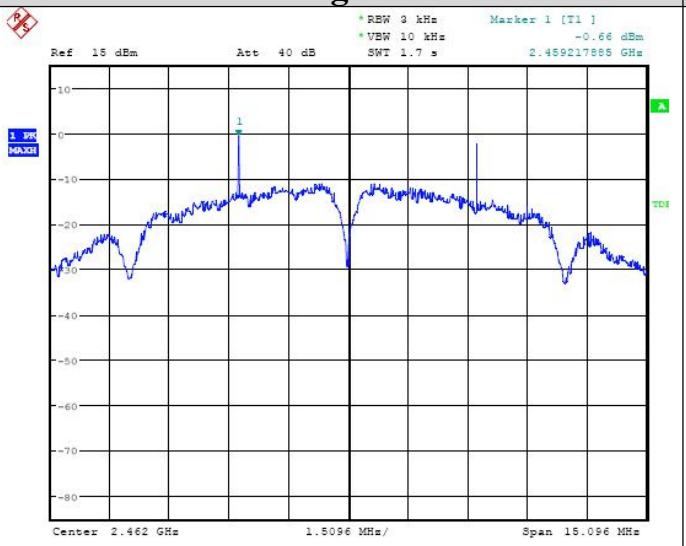
802.11b Low Channel



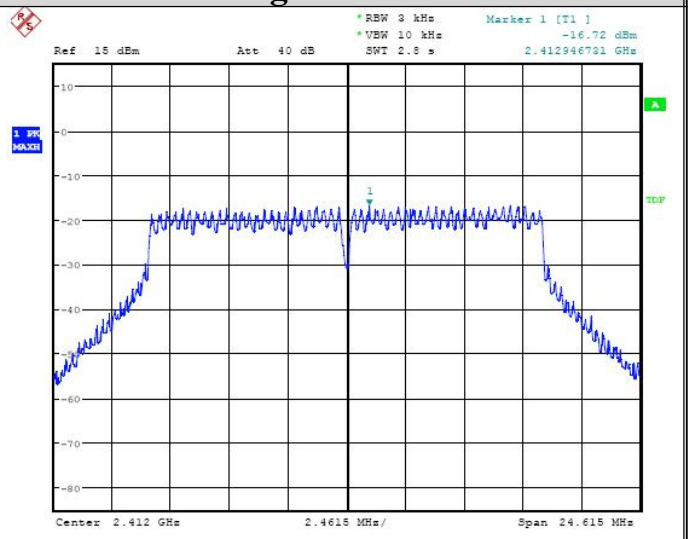
802.11b Middle Channel



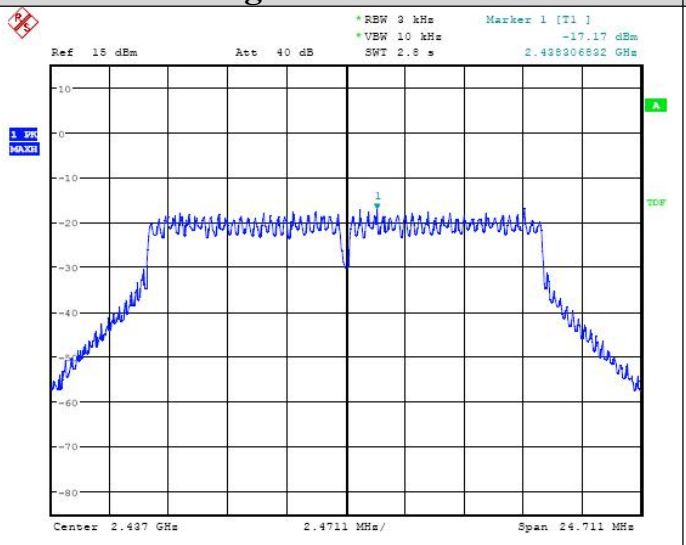
802.11b High Channel



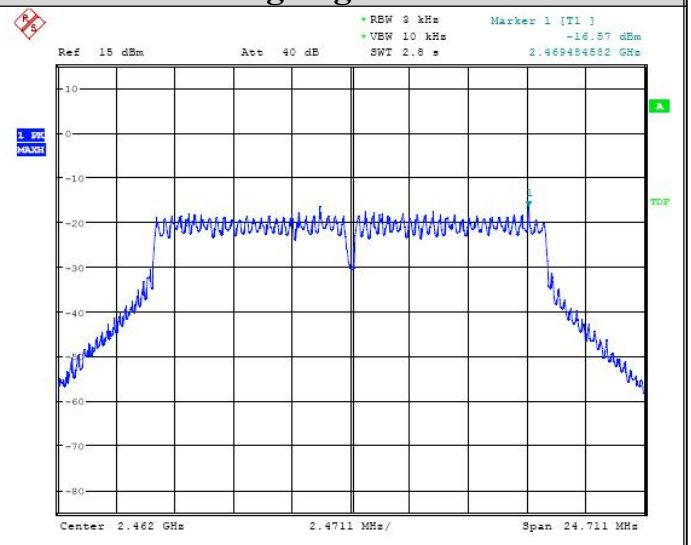
802.11g Low Channel



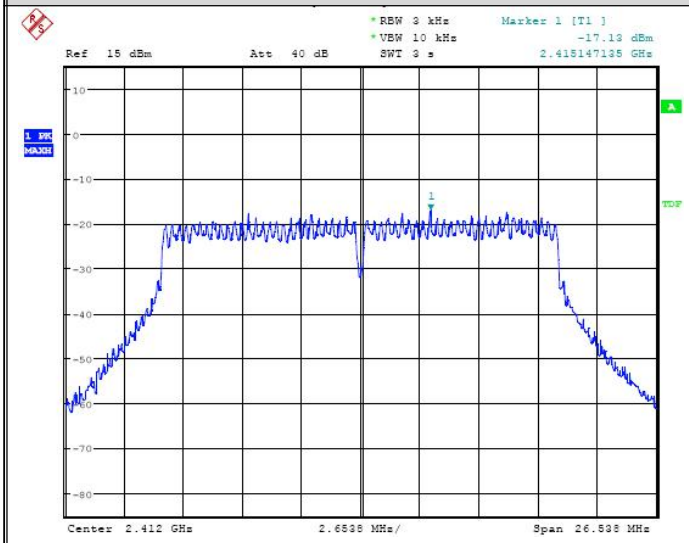
802.11g Middle Channel



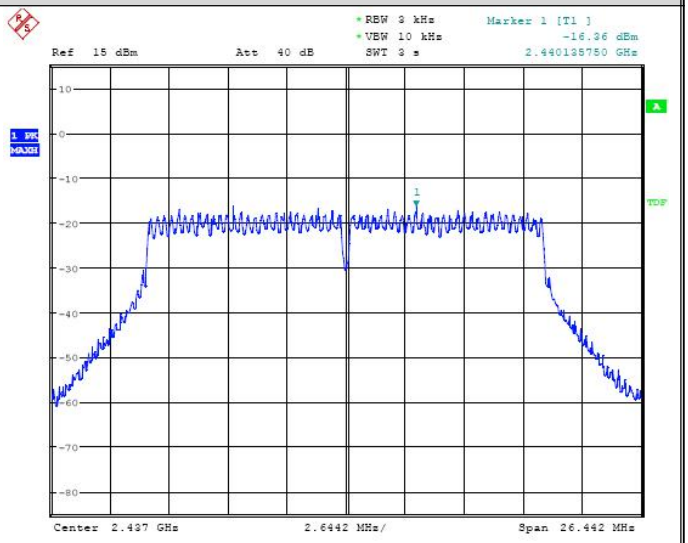
802.11g High Channel



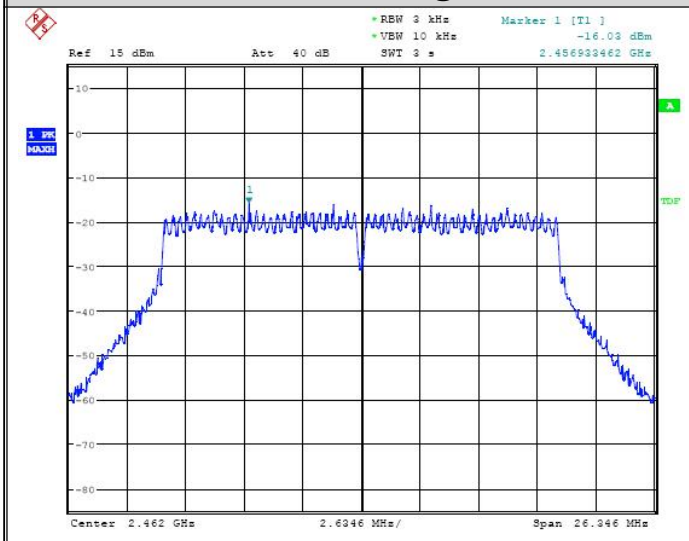
802.11n（HT20） Low Channel



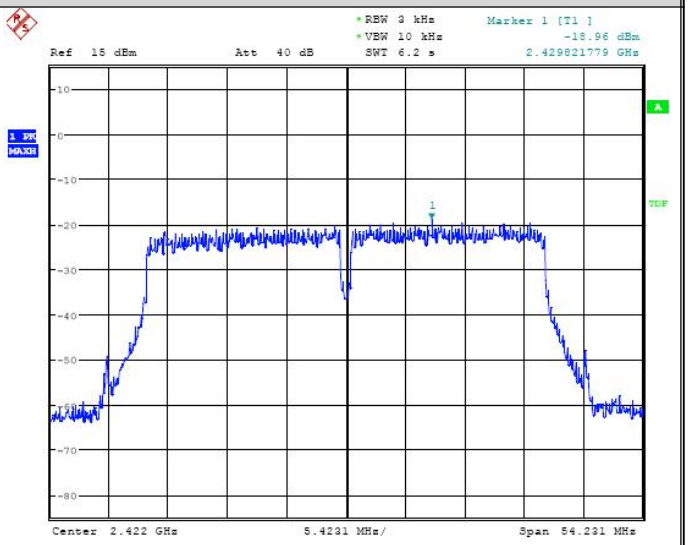
802.11n（HT20） Middle Channel



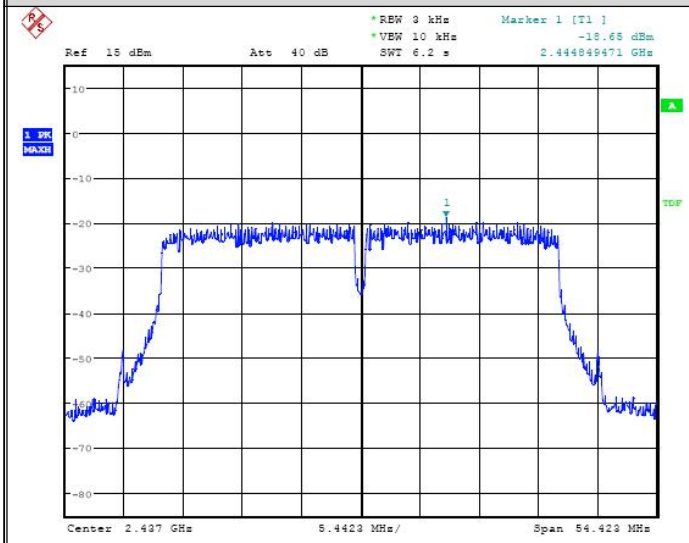
802.11n（HT20） High Channel



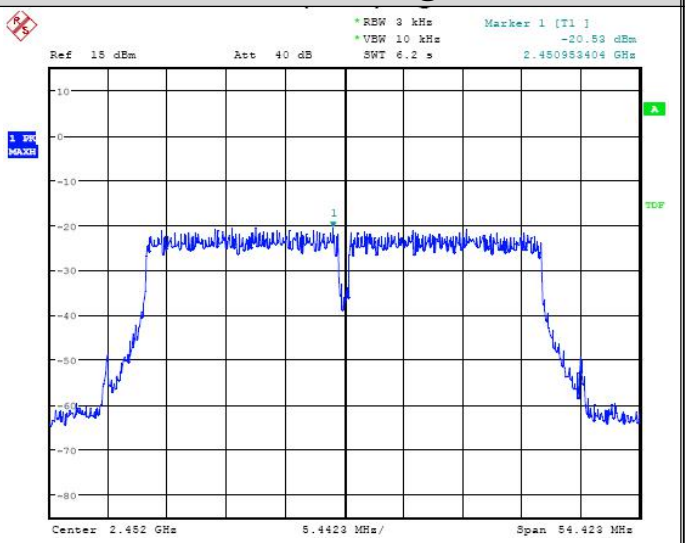
802.11n（HT40） Low Channel



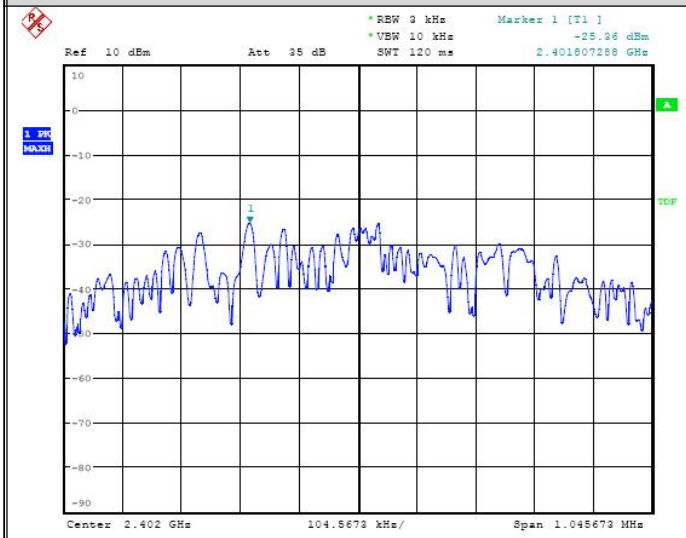
802.11n（HT40） Middle Channel



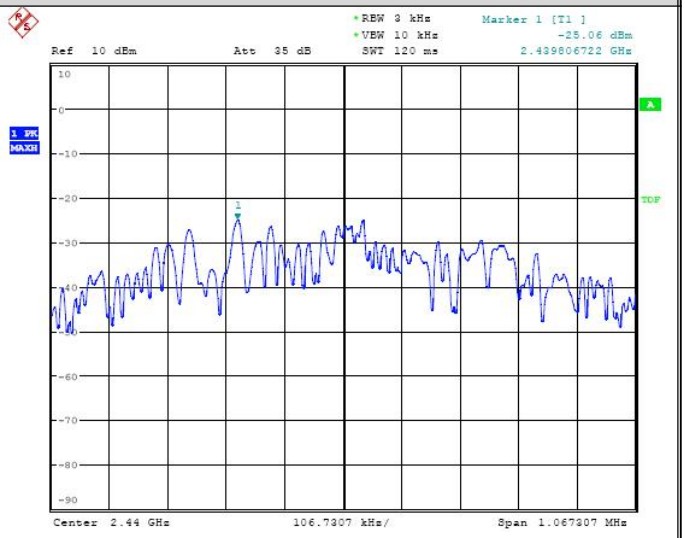
802.11n（HT40） High Channel



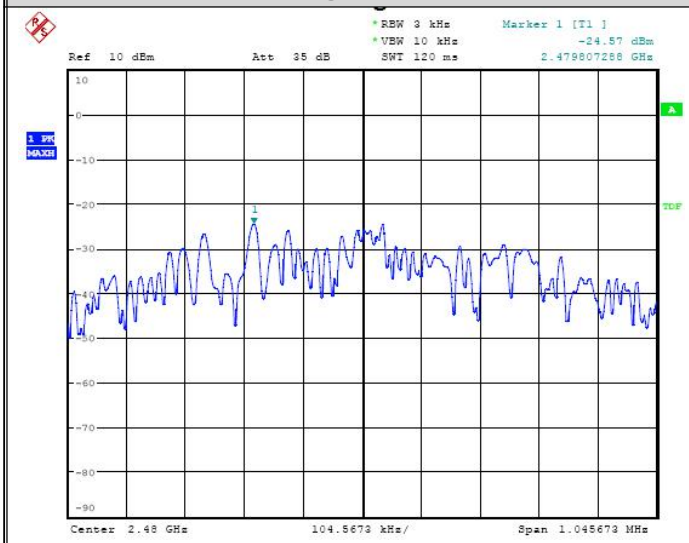
BLE Low Channel



BLE Middle Channel



BLE High Channel



7. BAND EDGE AND CONDUCTED SPURIOUS EMISSIONS

7.1. Requirement and Measurement Procedure

In any 100KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
The antenna port of the EUT was connected to the input of a spectrum analyzer.
Analyzer was set as below.
A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Level	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120KHz	300KHz
Above 1000	Peak	1MHz	3MHz
	Average	1MHz	10Hz

7.2. Test Procedure

1. Connect the antenna port of the EUT to the spectrum analyzer by a low lost cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency = measured channel, RBW = 1MHz, VBW= 1MHz, Frequency Span = 0 Hz.
4. Set sweep time properly to capture the entire dwell time per hopping channel.
5. Set detector type to Peak and trace mode to Max Hold and make the measurement.
6. Repeat step 3-5 until all channels measured were complete.

7.3. Test SET-UP (Block Diagram of Configuration)

7.4. Measurement Results

PASS

Please refer to following table.

Operation Mode:	TX		
Frequency Range :	Above 1GHz	Test Date :	June 06, 2017
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Result:	PASS		

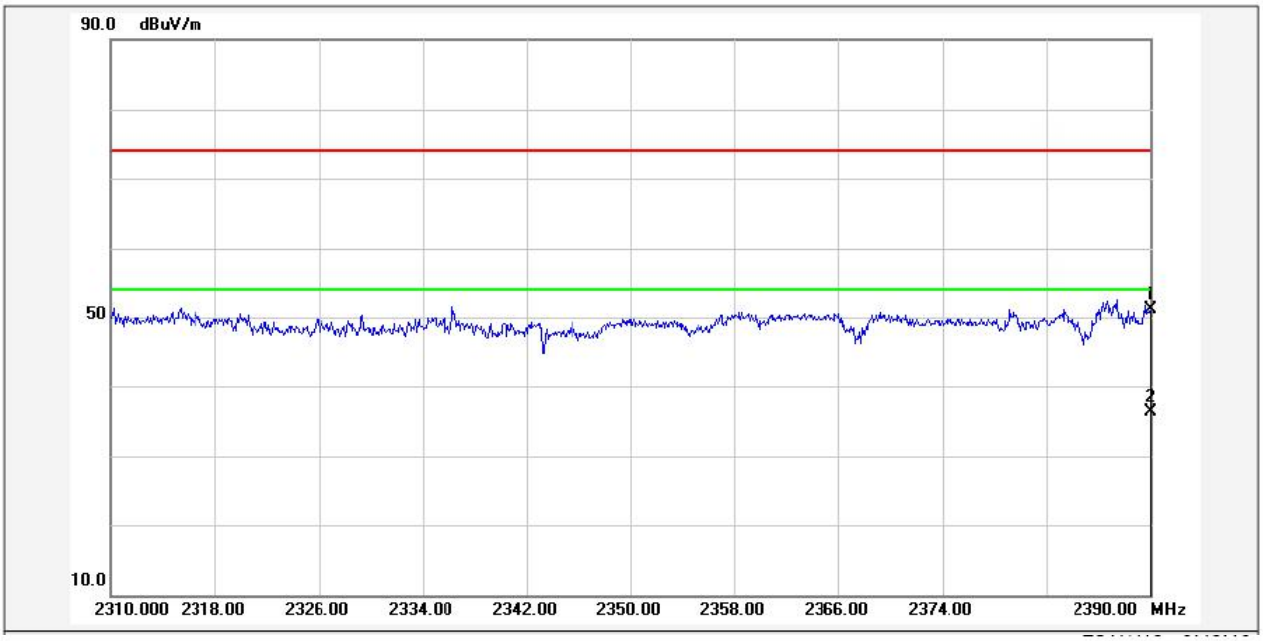
Freq (MHz)	Ant.Pol (H/V)	Reading Level (dBuV)		Factor (dB/m)	Emission Level (dBuV)		Limit 3m (dBuV)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
The worst case:(WIFI) Test Mode:802.11b										
2390.000	H	52.11	36.38	-5.58	46.53	30.80	74	54	-27.47	-23.20
2390.000	V	52.49	35.20	-1.50	50.99	33.70	74	54	-23.01	-20.30
2483.500	H	51.22	35.72	-5.52	45.70	30.20	74	54	-28.30	-23.80
2483.500	V	52.73	37.62	-1.42	51.31	36.20	74	54	-22.69	-17.80
BLE										
2390.000	H	51.22	35.72	-5.52	45.70	30.20	74	54	-28.30	-23.80
2390.000	V	52.73	37.62	-1.42	51.31	36.20	74	54	-22.69	-17.80
2483.500	H	52.11	36.38	-5.58	46.53	30.80	74	54	-27.47	-23.20
2483.000	V	52.49	35.20	-1.50	50.99	33.70	74	54	-23.01	-20.30

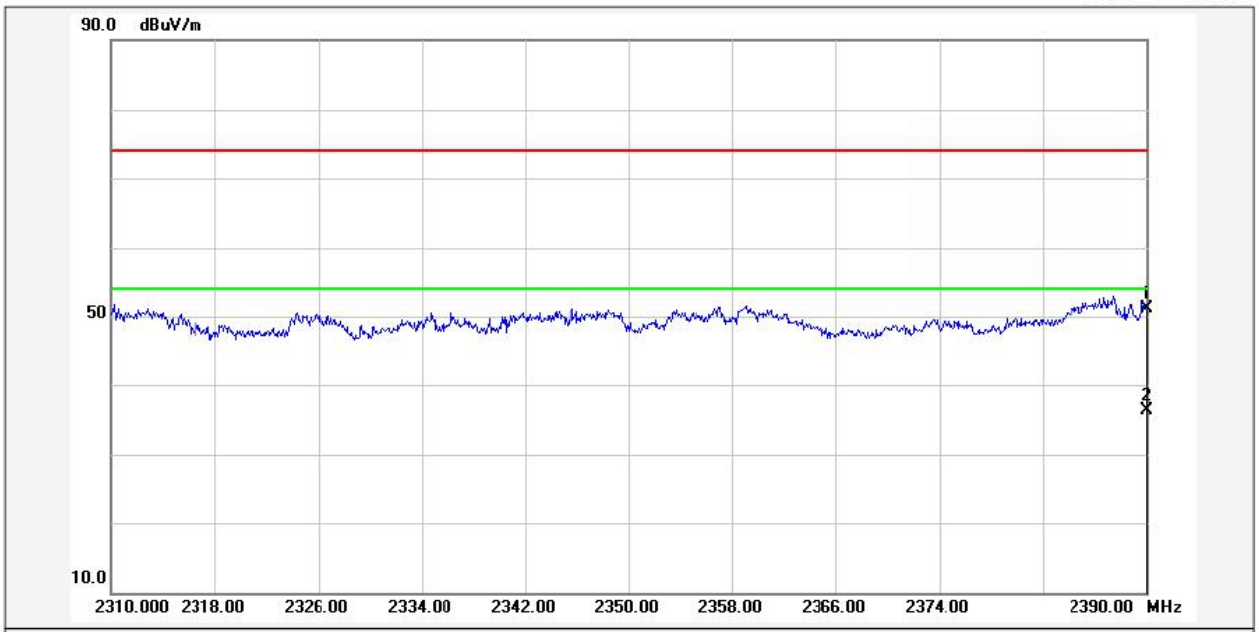
Note: (1) All Readings are Peak Value and AV.

(2) Emission Level= Reading Level+Probe Factor +Cable Loss

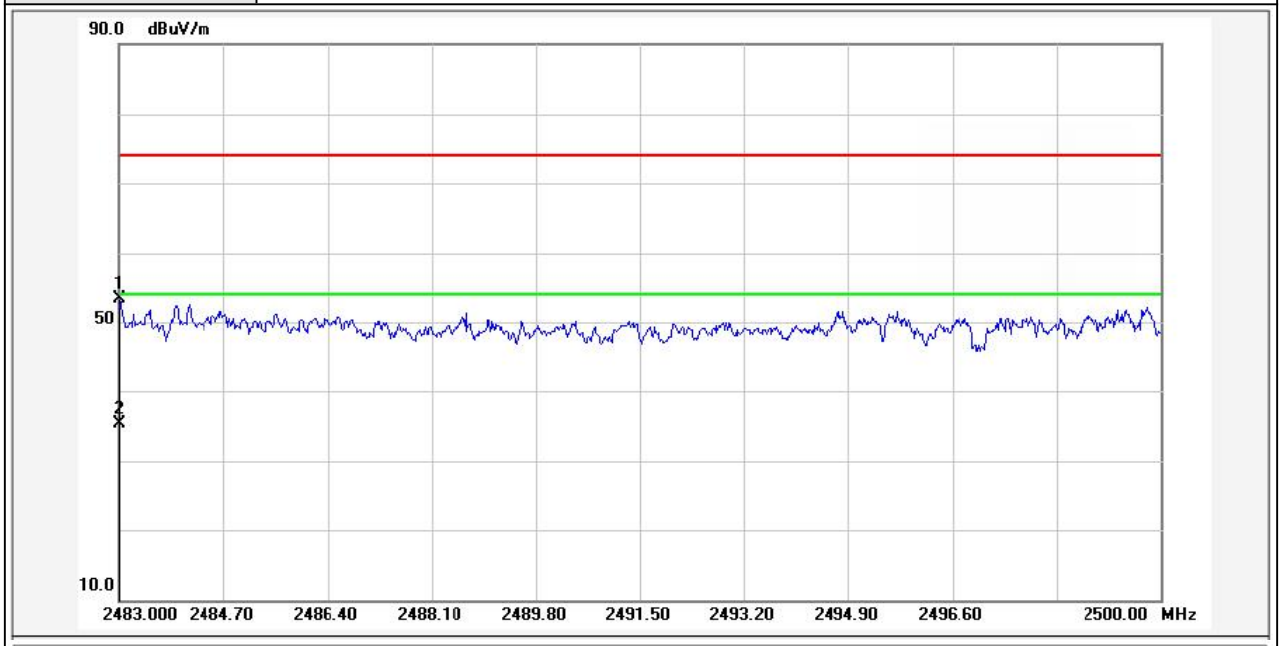
(3) Measurement uncertainty : ±3.54dB

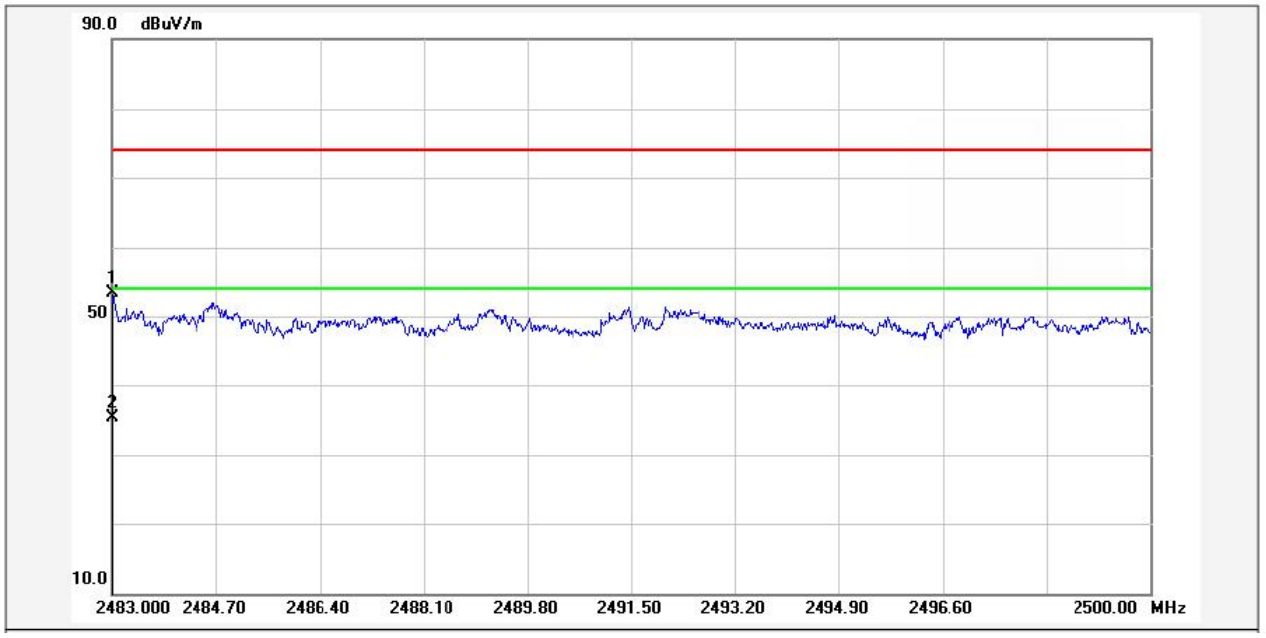
EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Phase:	Vertical & Horizontal
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	802.11b		



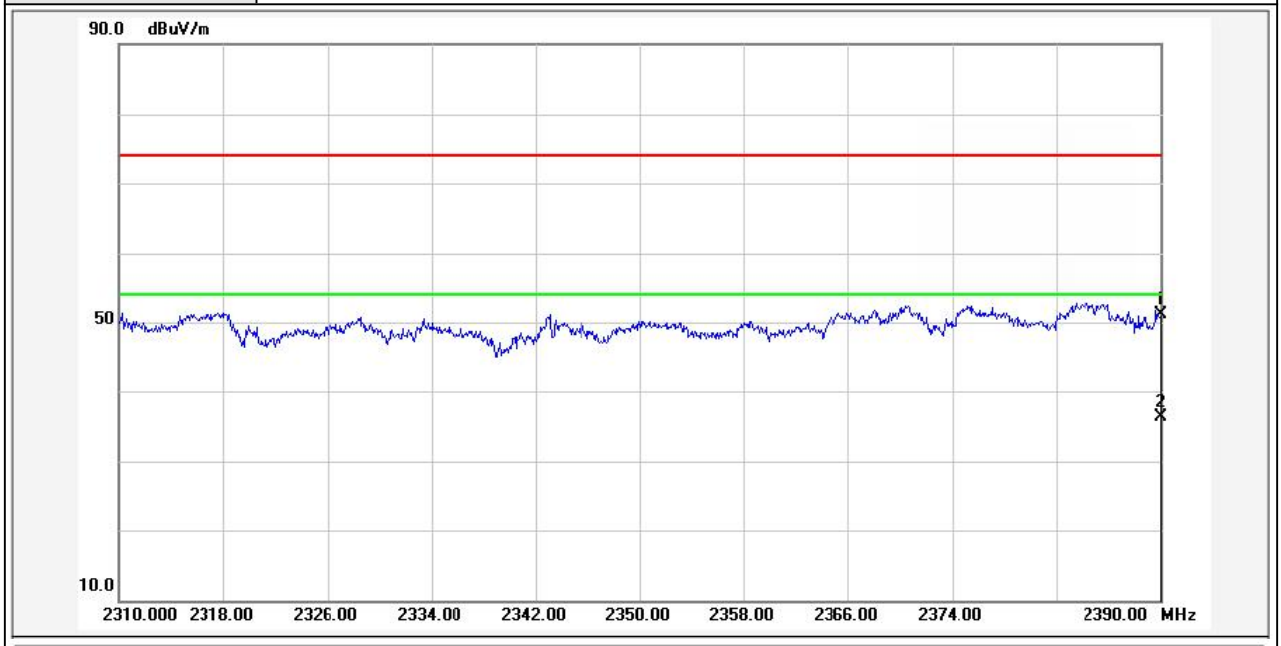


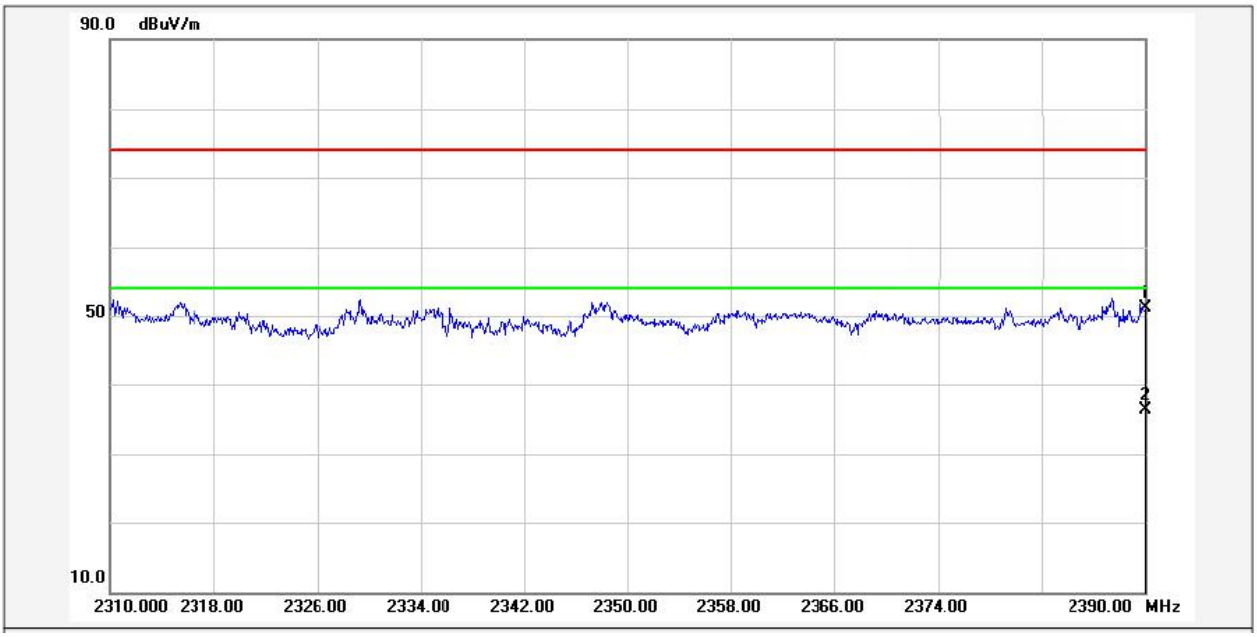
EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Phase:	Vertical & Horizontal
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	802.11b		



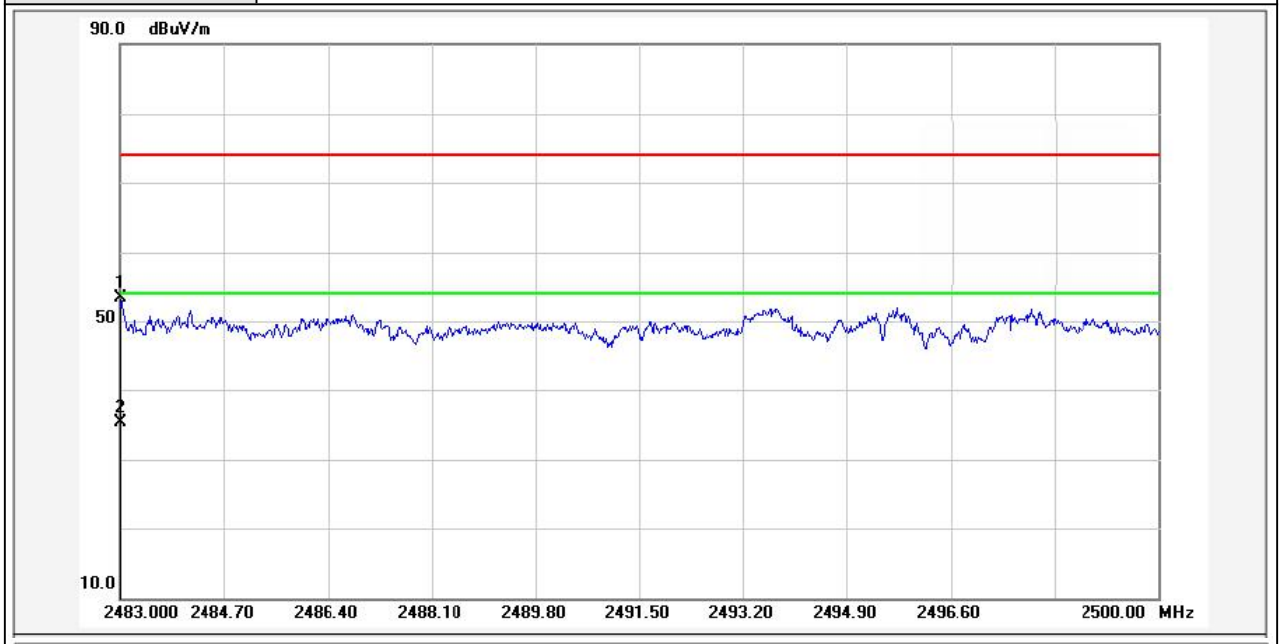


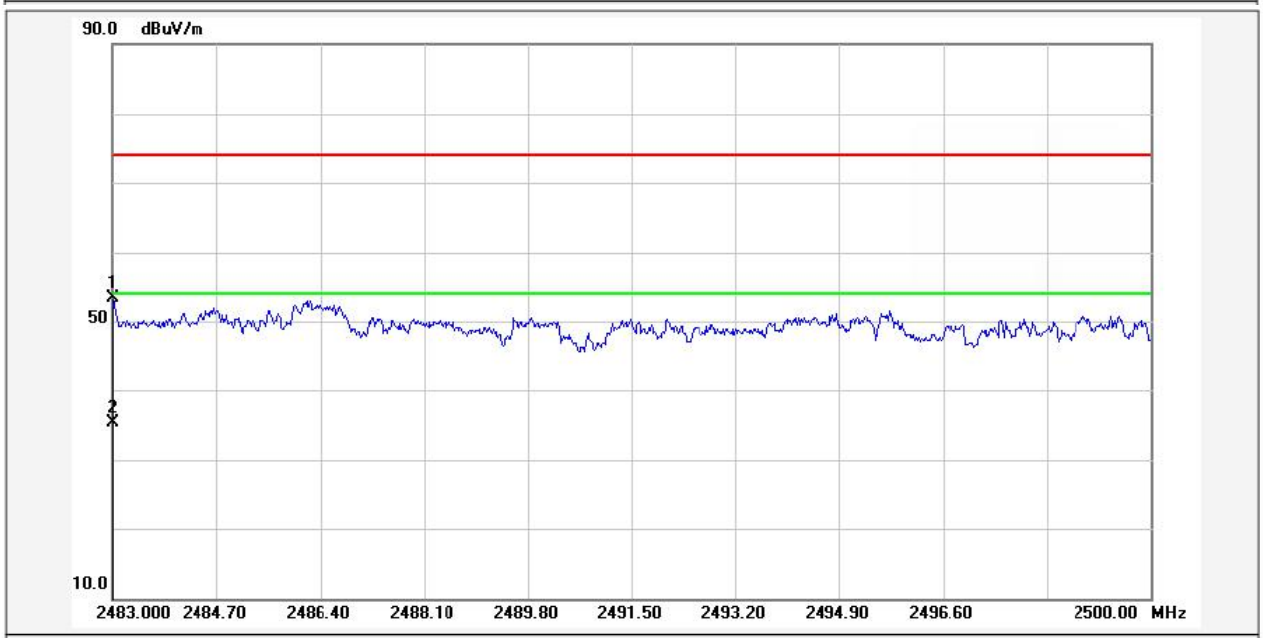
EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Phase:	Vertical & Horizontal
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	BLE		



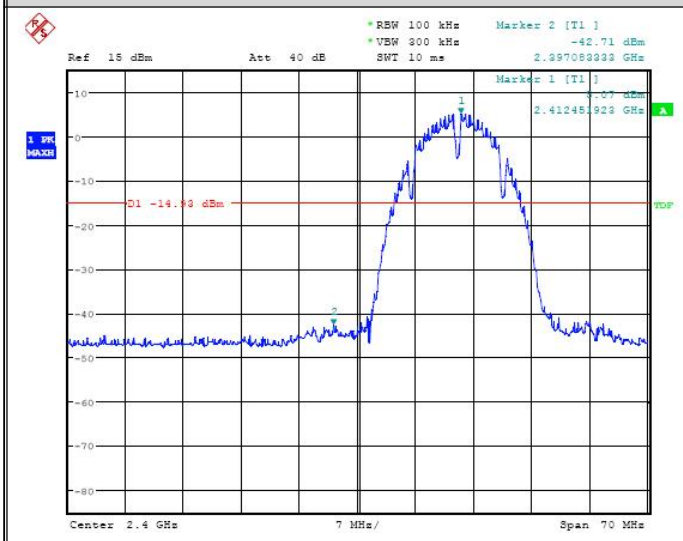


EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Phase:	Vertical & Horizontal
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	BLE		

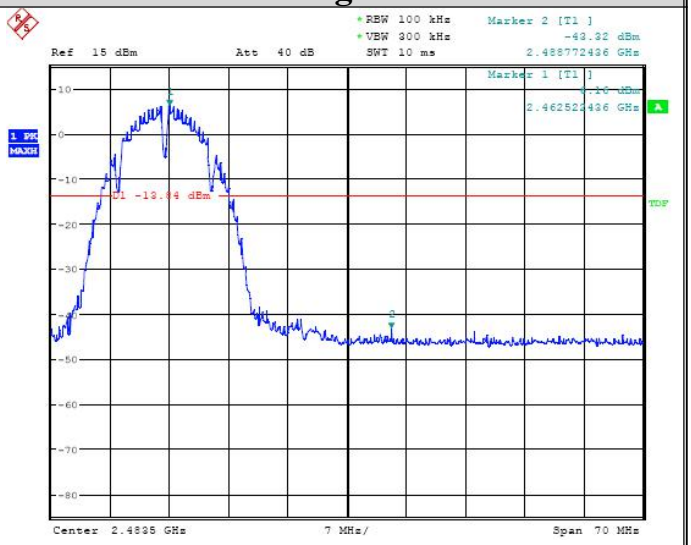




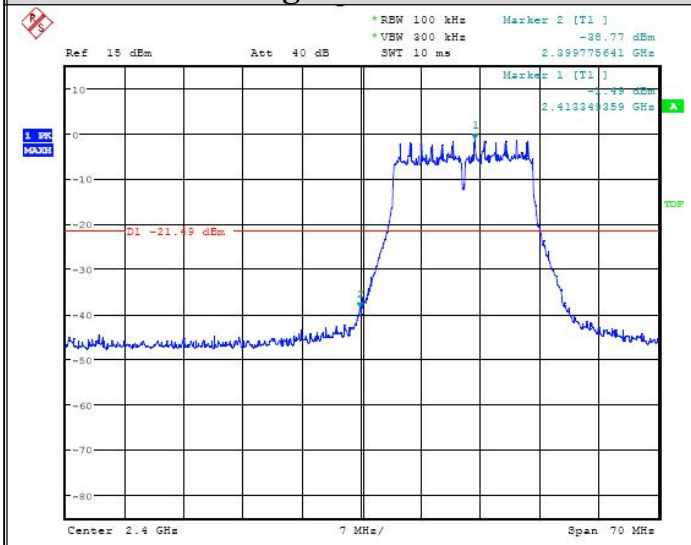
802.11b Low Channel



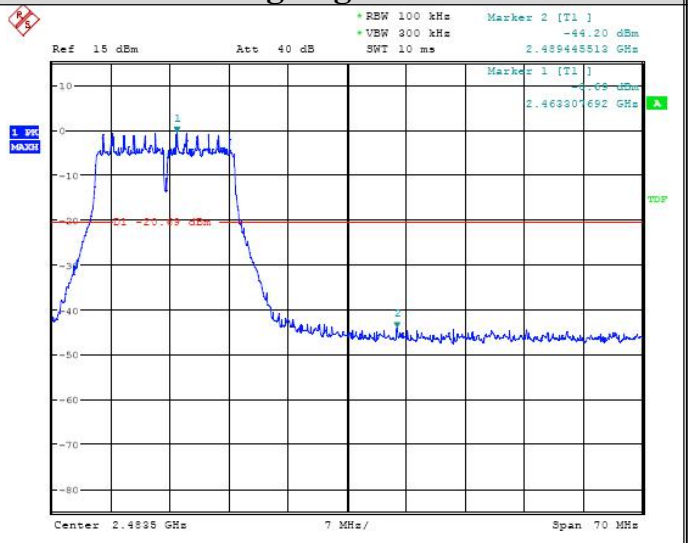
802.11b High Channel



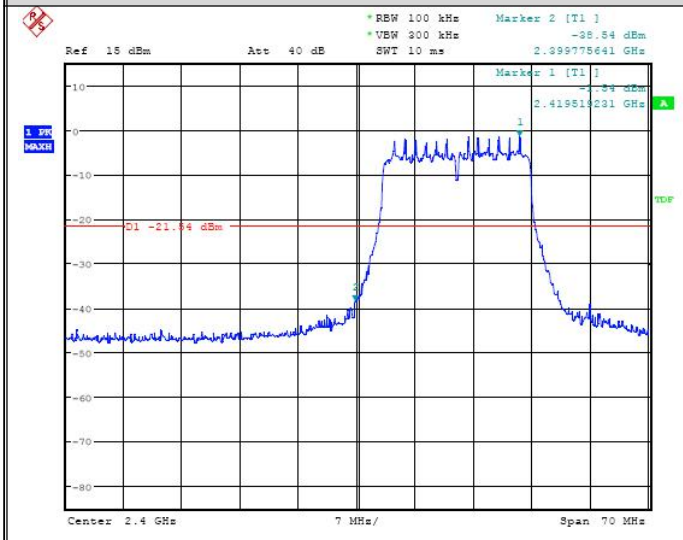
802.11g Low Channel



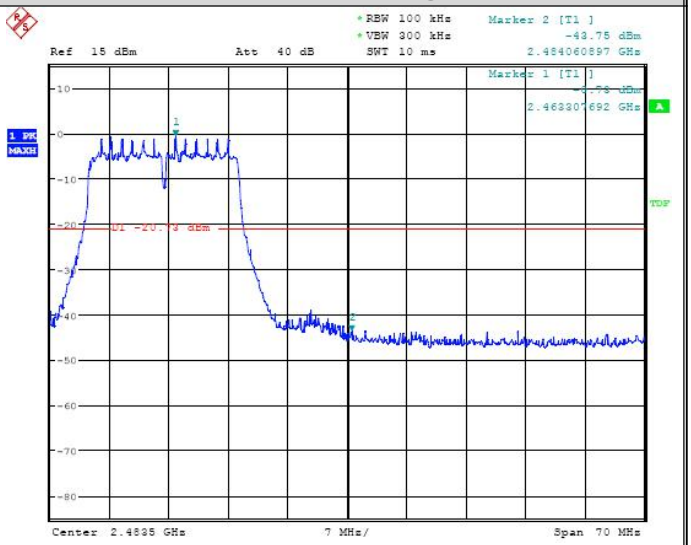
802.11g High Channel



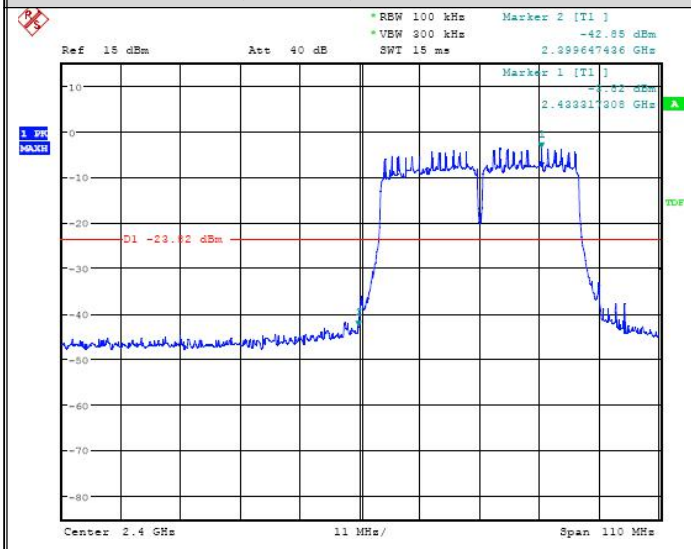
802.11n（HT20） Low Channel



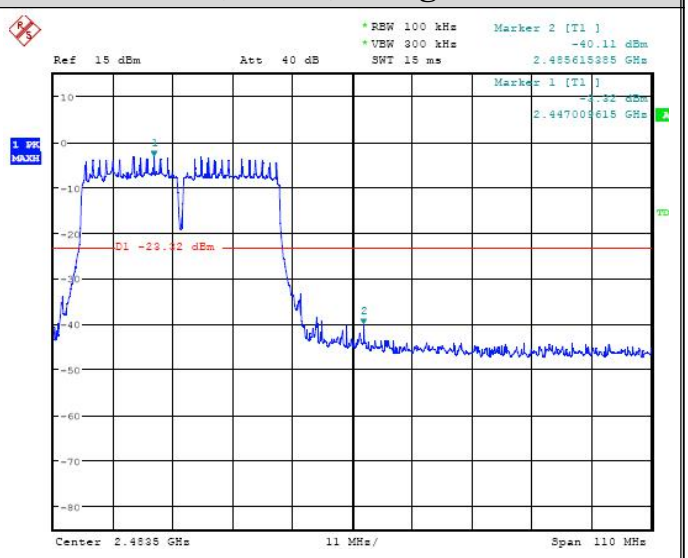
802.11n（HT20） High Channel



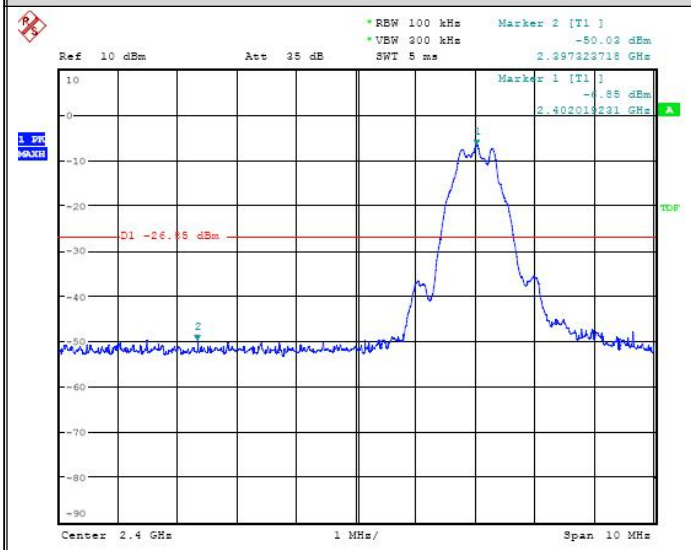
802.11n（HT40） Low Channel



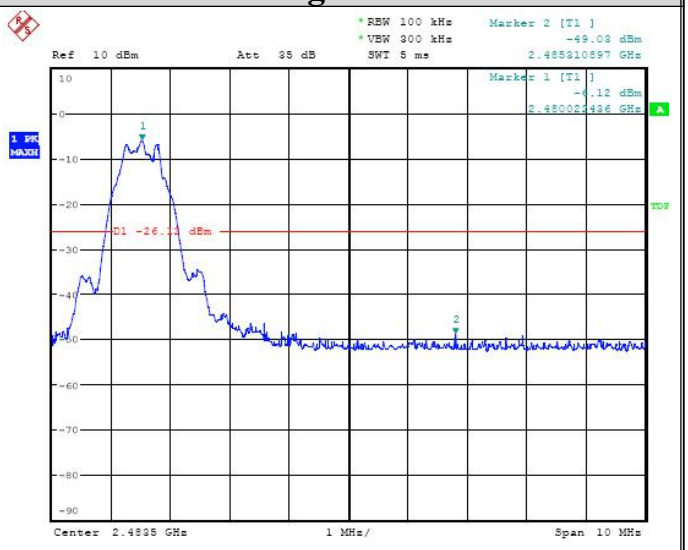
802.11n（HT40） High Channel



BLE Low Channel



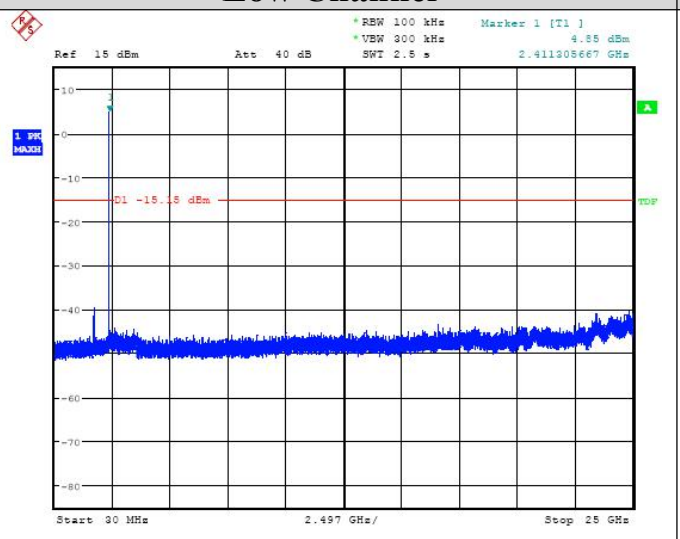
BLE High Channel



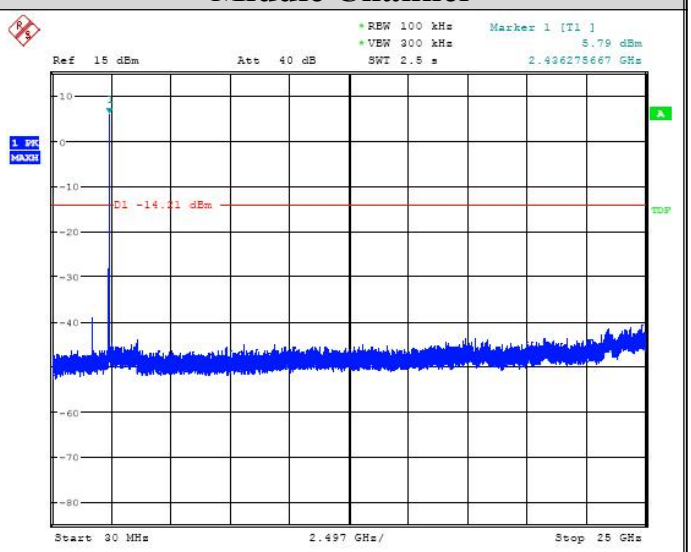
Conducted Spurious Emissions

The worst case: 802.11b

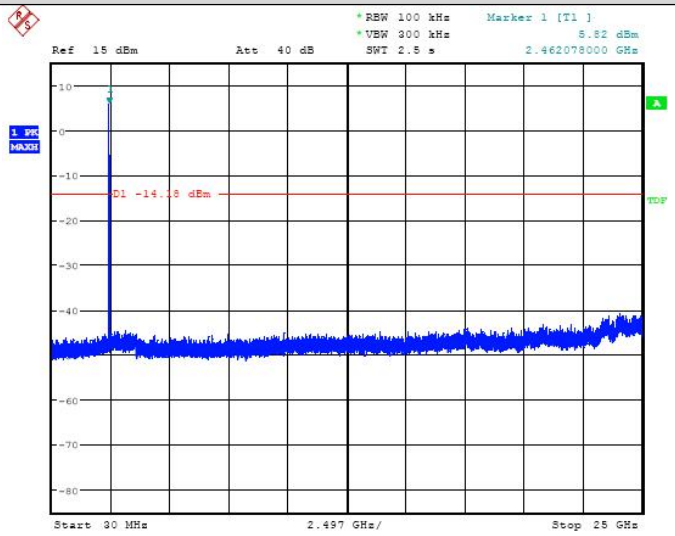
Low Channel



Middle Channel



High Channel

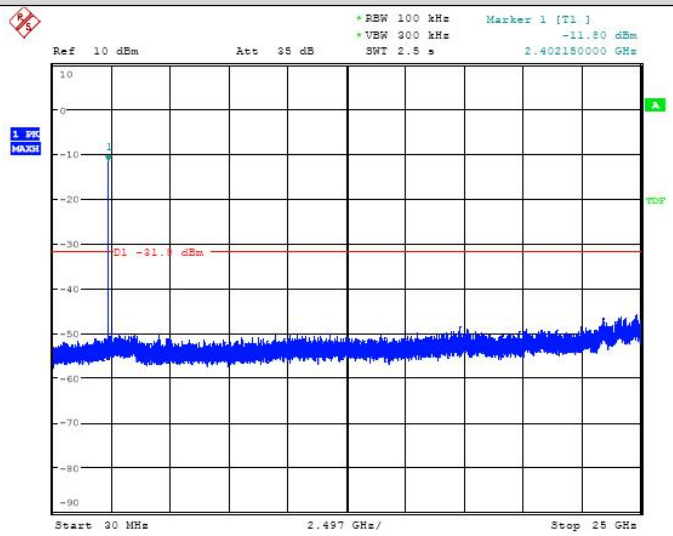


Note: Sweep points=30001pts

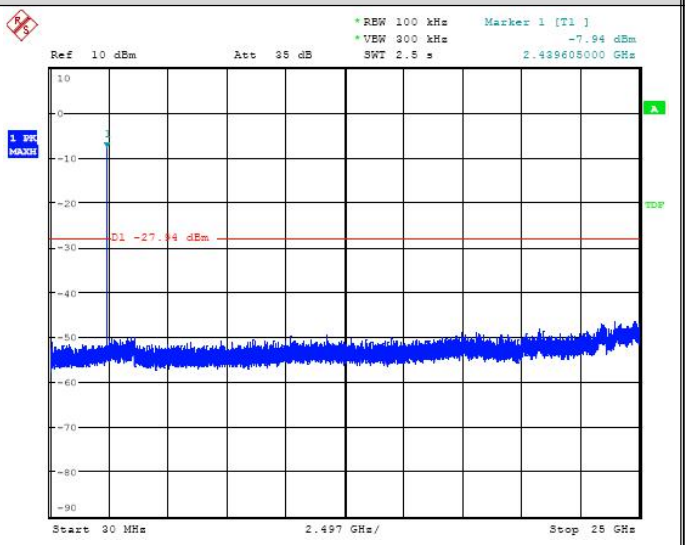
Conducted Spurious Emissions

BLE

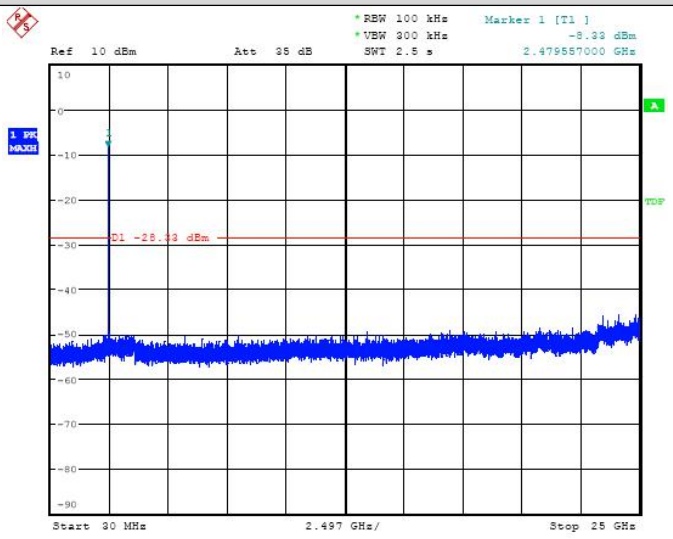
Low Channel



Middle Channel



High Channel

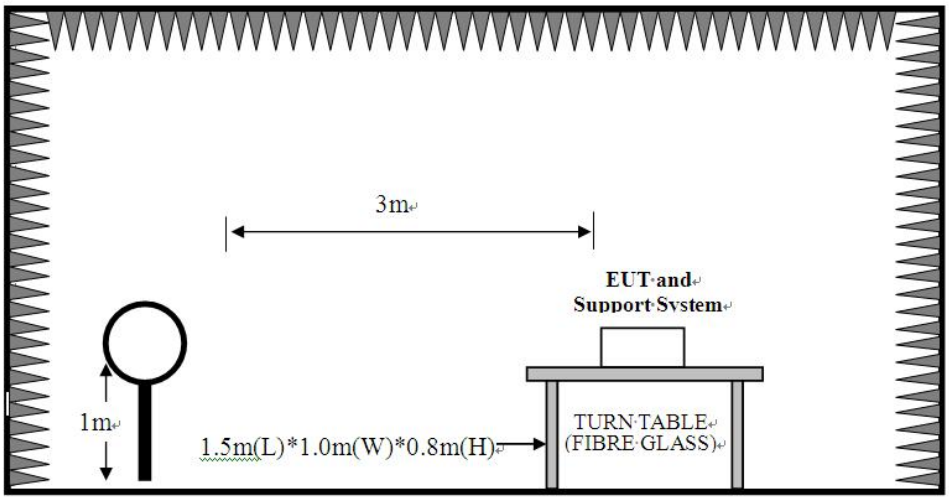


Note: Sweep points=30001pts

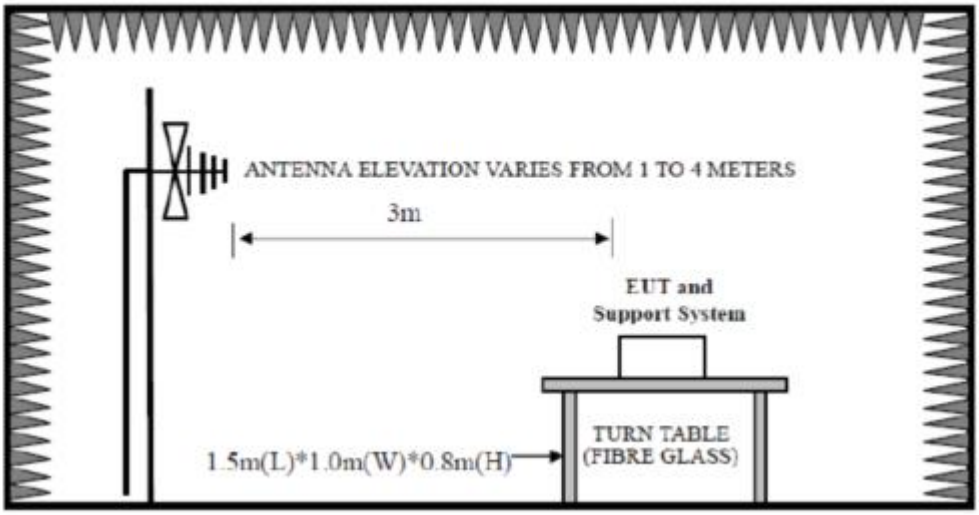
8. RADIATED SPURIOUS EMISSIONS AND RESTRICTED BANDS

8.1. Radiated Emission Test Set-Up, Frequency Below 30MHz

9kHz~30MHz

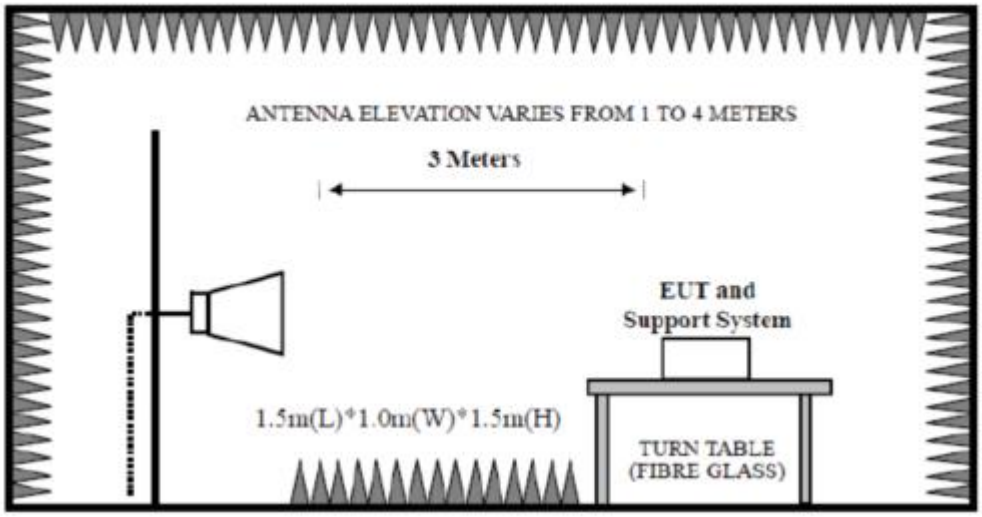


30~1000MHz



8.2. Radiated Emission Test Set-Up, Frequency above 1GHz

Above 1GHz



8.3. Measurement Procedure

a. Blow 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic chamber room.

b. For the radiated emission test above 1GHz:
The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter full anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.

f. A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Level	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120KHz	300KHz
Above 1000	Peak	1MHz	3MHz
	Average	1MHz	10Hz

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209) μV/m
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
1.705 ~ 30	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960	3	500

8.4. Limit

Remark: (1) Emission level (dB) V = 20 log Emission level V/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

(4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

(5) §15.247(d) specifies that emissions which fall in the restricted bands, as defined in §15.205 comply with radiated emission limits specified in §15.209.

8.5. Measurement Results

Please refer to following plots of the worst case (802.11b, Low channel, BLE, High channel).

Test Result:Radiated Test Data , Frequency 9KHz--- 30MHz

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Relative Humidity:	54%
Temperature:	20℃	Test by:	Frank
Pressure:	101.0KPa	Test Mode:	TX Mode
RBW/VBW:	9KHz-150KHz/RB 200Hz for QP,150KHz-30MHz-30MHz/RB 9KHz for QP		
Remark:	The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.		

Test Result:Radiated Test Data , Frequency 30MHz--- 1000MHz

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Phase:	Vertical
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	802.11b, Low channel		

Site:966 Chamber

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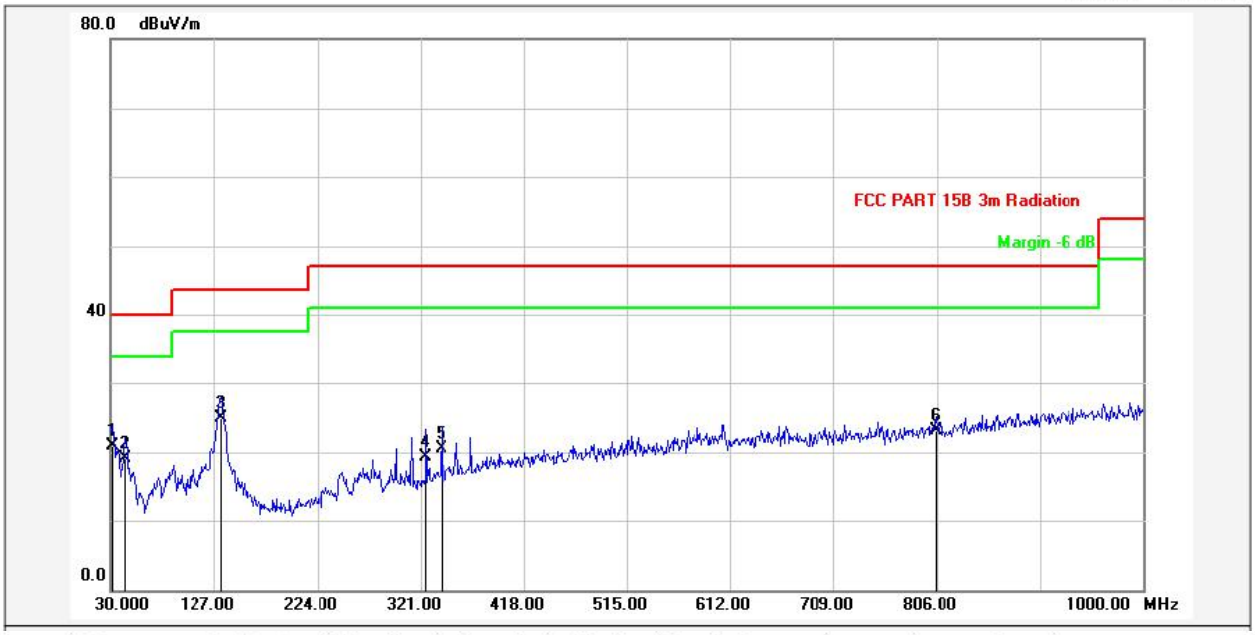

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	31.9400	-15.98	36.79	20.81	40.00	-19.19	QP			P	
2	43.5800	-14.48	33.67	19.19	40.00	-20.81	QP			P	
3	133.7900	-12.72	37.57	24.85	43.50	-18.65	QP			P	
4	325.8500	-9.61	28.95	19.34	47.00	-27.66	QP			P	
5	340.4000	-9.14	29.74	20.60	47.00	-26.40	QP			P	
6	805.0300	-1.21	24.30	23.09	47.00	-23.91	QP			P	

Note: Level=Reading+Factor.
Margin=Level-Limit.

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Phase:	Horizontal
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	802.11b, Low channel		

Site:966 Chamber

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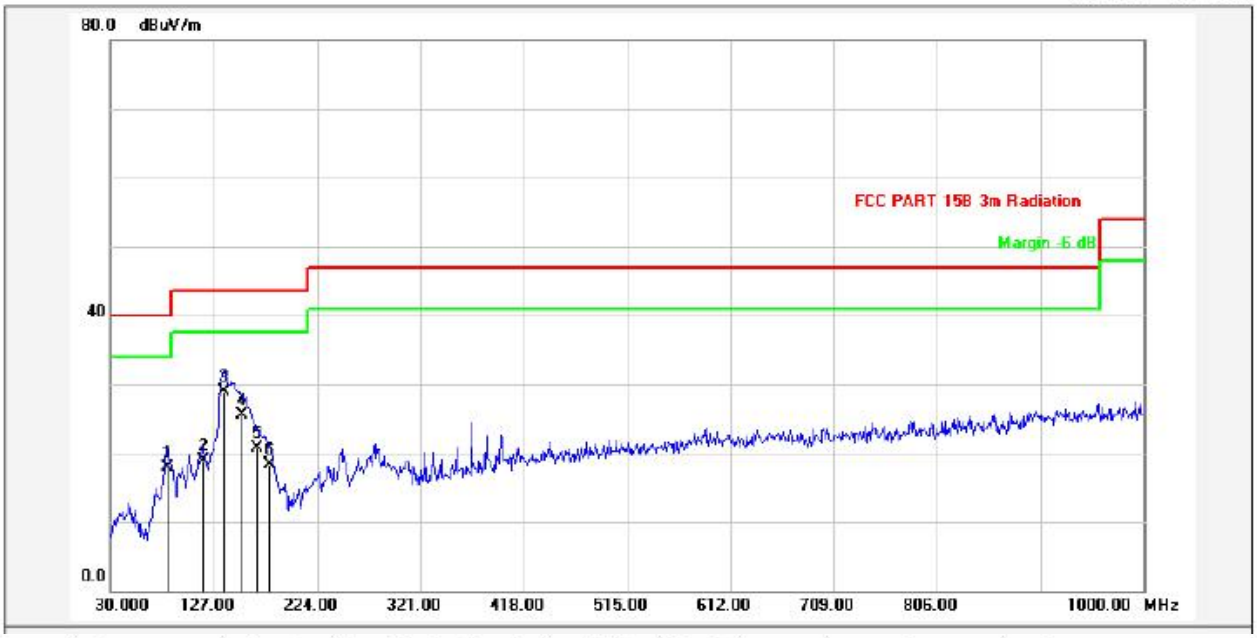

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	83.3500	-13.56	31.56	18.00	40.00	-22.00	QP			P	
2	117.3000	-7.54	26.37	18.83	43.50	-24.67	QP			P	
3	136.7000	-7.76	36.59	28.83	43.50	-14.67	QP			P	
4	153.1900	-7.94	33.53	25.59	43.50	-17.91	QP			P	
5	167.7400	-8.11	28.83	20.72	43.50	-22.78	QP			P	
6	179.3800	-8.23	26.44	18.21	43.50	-25.29	QP			P	

Note: Level=Reading+Factor.
Margin=Level-Limit.

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Phase:	Vertical
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	BLE, High channel		

Site:966 Chamber

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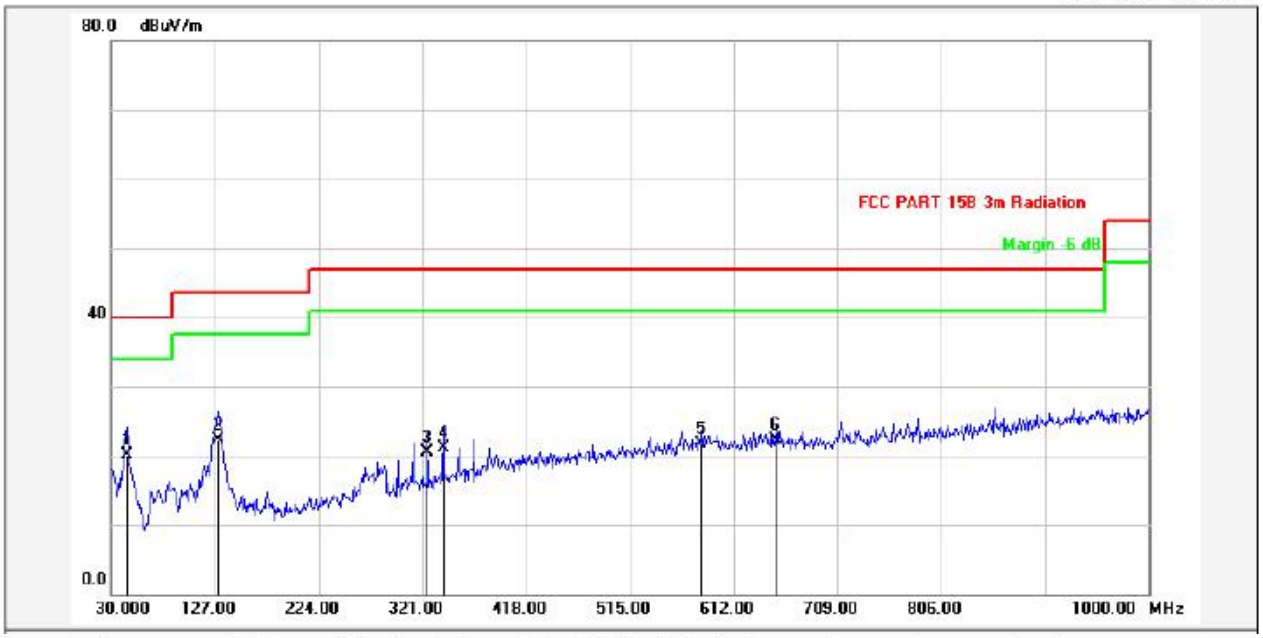

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	44.5500	-14.44	34.59	20.15	40.00	-19.85	QP			P	
2	129.9100	-12.67	34.97	22.30	43.50	-21.20	QP			P	
3	325.8500	-9.61	30.20	20.59	47.00	-26.41	QP			P	
4	340.4000	-9.14	30.32	21.18	47.00	-25.82	QP			P	
5	581.9300	-3.76	25.39	21.63	47.00	-25.37	QP			P	
6	651.7700	-2.95	25.28	22.33	47.00	-24.67	QP			P	

Note: Level=Reading+Factor.
Margin=Level-Limit.

EUT:	Zip BLE-WiFi Bridge		
M/N :	ZSM009	Test Voltage:	AC 120V/60Hz
Test Date :	June 07, 2017	Phase:	Horizontal
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test by:	Frank
Test Mode:	BLE, High channel		

Site:966 Chamber

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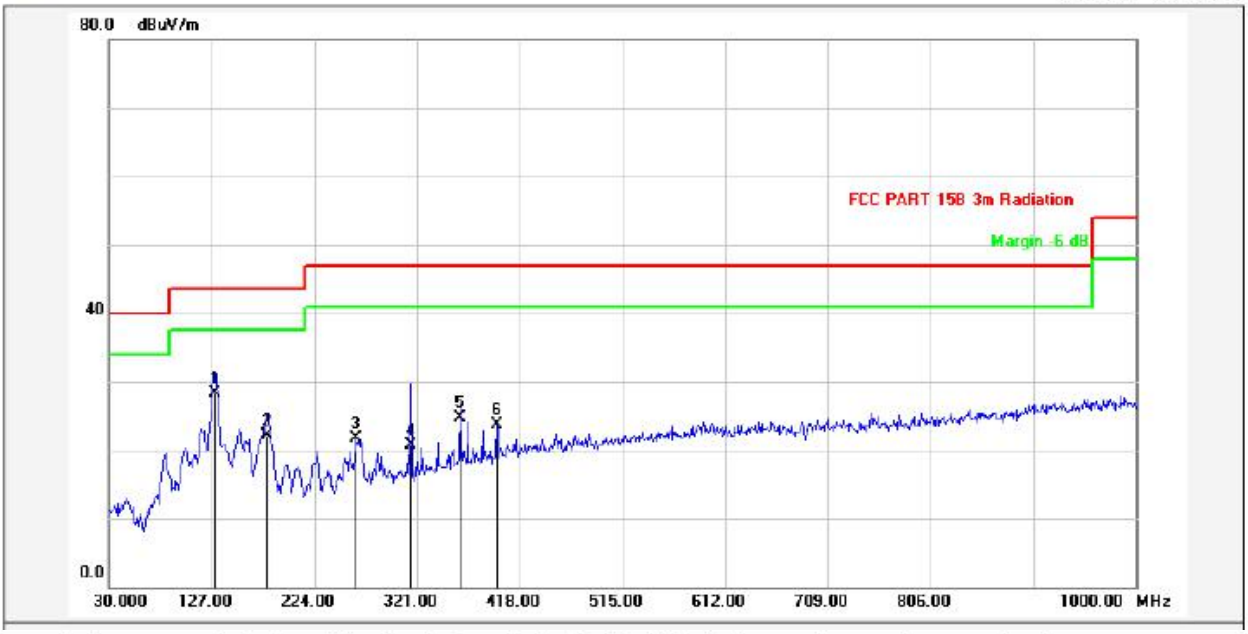

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	129.9100	-7.67	36.06	28.39	43.50	-15.11	QP			P	
2	179.3800	-8.23	30.37	22.14	43.50	-21.36	QP			P	
3	263.7700	-9.73	31.52	21.79	47.00	-25.21	QP			P	
4	315.1800	-9.96	30.63	20.67	47.00	-26.33	QP			P	
5	361.7400	-8.45	33.22	24.77	47.00	-22.23	QP			P	
6	396.6600	-7.30	31.09	23.79	47.00	-23.21	QP			P	

Note: Level=Reading+Factor.
Margin=Level-Limit.

Test Result:Radiated Test Data , Frequency Above 1GHz

Operation Mode:	The worst case:802.11b		
Frequency Range :	Above 1GHz	Measured Distance:	3m
Test Date :	June 07, 2017	Test by:	Frank
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test Result:	PASS

Freq (MHz)	Ant.Pol (H/V)	Reading Level (dBuV)		Factor (dB/m)	Emission Level (dBuV)		Limit 3m (dBuV)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
Operation Mode:TX Mode(Low)										
4824	V	48.61	36.89	14.05	62.66	50.94	74.00	54.00	-11.34	-3.06
7236	V	37.84	26.11	18.81	56.65	44.92	74.00	54.00	-17.35	-9.08

4824	H	47.24	36.71	14.05	61.29	50.76	74.00	54.00	-12.71	-3.24
7236	H	38.84	25.97	18.18	56.65	44.15	74.00	54.00	-17.75	-9.8

Operation Mode:TX Mode(Mid)										
4874	V	46.40	35.89	14.41	60.81	50.30	74.00	54.00	-13.19	-3.70
7311	V	39.50	26.96	18.36	57.41	45.32	74.00	54.00	-16.59	-8.68

4874	H	45.26	34.82	14.41	59.67	49.23	74.00	54.00	-14.33	-4.77
7311	H	39.04	27.04	18.36	57.40	45.40	74.00	54.00	-16.60	-8.60

Operation Mode:TX Mode(High)										
4924	V	45.59	34.32	14.76	60.35	49.08	74.00	54.00	-13.65	-4.92
7386	V	38.27	26.63	18.55	56.82	45.18	74.00	54.00	-17.18	-8.82

4924	H	45.68	35.01	14.76	60.44	49.77	74.00	54.00	-13.56	-4.23
7386	H	38.77	26.56	18.55	57.32	45.11	74.00	54.00	-16.68	-8.89

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level + Factor
(3) Factor= Antenna Gain + Cable Loss – Amplifier Gain
(4) Data of measurement within this frequency range shown " ---" in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.
(5) Measurement uncertainty : ±3.54dB.
(6) Horn antenna used for the emission over 1000MHz.

Operation Mode:	BLE(GFSK)		
Frequency Range :	Above 1GHz	Measured Distance:	3m
Test Date :	June 07, 2017	Test by:	Frank
Temperature:	20℃	Relative Humidity:	54%
Pressure:	101.0KPa	Test Result:	PASS

Freq (MHz)	Ant.Pol (H/V)	Reading Level (dBuV)		Factor (dB/m)	Emission Level (dBuV)		Limit 3m (dBuV)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
Operation Mode:TX Mode(Low)										
4804	V	48.61	36.89	14.05	62.66	50.94	74.00	54.00	-11.34	-3.06
7206	V	37.84	26.11	18.81	56.65	44.92	74.00	54.00	-17.35	-9.08

4804	H	47.24	36.71	14.05	61.29	50.76	74.00	54.00	-12.71	-3.24
7206	H	38.84	25.97	18.18	56.65	44.15	74.00	54.00	-17.75	-9.8

Operation Mode:TX Mode(Mid)										
4880	V	46.40	35.89	14.41	60.81	50.30	74.00	54.00	-13.19	-3.70
7320	V	39.50	26.96	18.36	57.41	45.32	74.00	54.00	-16.59	-8.68

4880	H	45.26	34.82	14.41	59.67	49.23	74.00	54.00	-14.33	-4.77
7320	H	39.04	27.04	18.36	57.40	45.40	74.00	54.00	-16.60	-8.60

Operation Mode:TX Mode(High)										
4960	V	45.59	34.32	14.76	60.35	49.08	74.00	54.00	-13.65	-4.92
7440	V	38.27	26.63	18.55	56.82	45.18	74.00	54.00	-17.18	-8.82

4960	H	45.68	35.01	14.76	60.44	49.77	74.00	54.00	-13.56	-4.23
7440	H	38.77	26.56	18.55	57.32	45.11	74.00	54.00	-16.68	-8.89

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level + Factor
(3) Factor= Antenna Gain + Cable Loss – Amplifier Gain
(4) Data of measurement within this frequency range shown " ---" in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.
(5) Measurement uncertainty : ±3.54dB.
(6) Horn antenna used for the emission over 1000MHz.

9. ANTENNA APPLICATION

9.1. Antenna requirement

According to of FCC part 15C section 15.203 and 15.240: 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, the manufacturer may design the unit so that a broken antenna ca be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. Systems operating in the 2400-2483.5MHz band that are used exclusively for fixed point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

9.2. Measurement Results

The antenna are PCB antenna and Internal, and no consideration of replacement, and the best case gain of the antenna is 1.0dBi. So, the antenna is consider meet the requirement.

---END---