Test Report of FCC Part 15 C for FCC Certificate

On Behalf of

Velodyne Acoustics, Inc.

FCC ID:	**YRD-WIC**
Product Description:	**WiConnect System**
Model No.:	**WiConnect System**
Brand Name:	**Velodyne**
Prepared for:	**Velodyne Acoustics, Inc.** 345 Digital Drive,Morgan Hill, CA 95037, USA
Prepared by:	**Shenzhen Laker Testing Technology Co.,Ltd** 15C，Block 1,Sunshine Huayi Building,Nanhai West Road, Nanshan, Shenzhen, China Tel: 86-755-27617110 Fax: 86-755-27617110
Report No.:	LK11CR-00059E
Issue Date:	July 17, 2011
Test Date:	July 01~17, 2011

Test by: **Reviewed By:**

Owen Li

Owen Li

Edmund Zou

Edmund Zou

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	**Velodyne Acoustics, Inc.**
Address of applicant:	345 Digital Drive,Morgan Hill, CA 95037, USA
Manufacturer:	**Lightion Electronic Factory**
Address of manufacturer:	Meilin District, Dalingshan, DongGuan, GuangDong, China

General Description of E.U.T

Items	Description
EUT Description:	WiConnect System
Model No.:	WiConnect System
Type of Modulation:	FHSS
Frequency Band:	2406 MHz ~ 2472 MHz
Hopping Channels of each Sequences:	15
Number of Sequences:	4
Minimum Channel Bandwidth:	2 MHz
Antenna Type:	Built-in FIPA Antenna
Power Supply:	5V DC from Adapter
Adapter Sepcification:	Switching Adapter MODEL: DSC-6PFA-05FUS050100 INPUT: 100-240V~50/60Hz 0.2A OUTPUT: 5V/1A DC

** The test data gathered are from the production sample provided by the manufacturer.*

1.2 Related Submittal(s) / Grant (s)

This submittal(s) is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 - 2009.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.207, and 15.247 rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 - 2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

All measurement required was performed at laboratory of Centre Testing International (ShenZhen) Corporation ,Location at Building C, Hongwei Industrial Zone, Baoan 70 District, Shenzhen, Guangdong, The site and apparatus are constructed in conformance with the requirements of ANSI C63.4, CISPR 16-1-1 and other equivalent standards.

The test facility is recognized, certified, or accredited by the following organizations:

FCC – Registration No.: 510007

CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION,EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. Registration 338263, March 20，2009.

IC Registration No.: 7408B

The 3m alternate test site of CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7408B on December 29，2009.

CNAS - Registration No.: L1910

CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION,. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.The acceptance letter from the CNAS is maintained in our files: Registration:L1910,January 12,2010.

2. SYSTEM TEST CONFIGURATION

The tests documented in this report were performed in accordance with ANSI C63.4-2009 and FCC CFR 47 Part 15 Subpart C.

2.1 EUT Configuration

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

2.2 EUT Exercise

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 or 10 meters from the leading edge of the turntable.

2.3 General Test Procedures

Conducted Emissions The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 7.1 of ANSI C63.4-2009.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

Radiated Emissions The EUT is a placed on as turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

2.4 List of Measuring Equipments Used

Test equipments list of CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION.

Shielding Room No. 1 - Conducted disturbance Test				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
Receiver	R&S	ESCI	100009	07/10/2012
LISN	ETS-LINDGREN	3850/2	00051952	03/29/2012
LISN	R&S	ENV216	100098	07/10/2012
Voltage Probe	R&S	ESH2-Z3	100042	08/25/2011
Current Probe	R&S	EZ17	100106	08/28/2011
ISN	TESEQ GmbH	ISN T800	30297	02/14/2012
Control Room - Conducted disturbance Test (10m part)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
Receiver	R&S	ESCI	100435	10/27/2011
LISN	schwarzbeck	NNLK8121	8121-529	10/25/2011
Voltage Probe	R&S	ESH2-Z3	100042	08/25/2011
Current Probe	R&S	EZ17	100106	08/28/2011

Shielding Room No. 2 - Harmonic / Flicker Test (EN 61000-3-2) / (EN 61000-3-3)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
5KVA AC POWER SOURCE	California instruments	5001iX-400-413	57344	03/29/2012
Flicker & Harmonic Tester	California instruments	PACS-1	72492	03/29/2012
Shielding Room No. 2 - Power-frequency magnetic fields Test (IEC 61000-4-8)				
Compact Generator	EM-Test	UCS500M/6B	V0603101093	07/11/2012
Induction Coil	EM-Test	MS100	0106-02	03/29/2012
Current Transformer	EM-Test	MC2630	0106-02	03/29/2012
Shielding Room No. 2 –Voltage dips and interruptions Test (IEC 61000-4-11)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
5KVA AC POWER SOURCE	California instruments	5001iX-400-413	57344	03/29/2012
Electronic output switch	California instruments	EOS-1	72616	03/29/2012
Shielding Room No. 2 - Continuous conducted disturbances Test (IEC 61000-4-6)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
Signal Generator	IFR	2023B	202307/883	03/29/2012
Power Amplifier	AR	75A 250A	320297	03/29/2012
Attenuator	EM-Test	ATT6/75	0320837	07/10/2012
CDN	EM-Test	CDN M2/M3	0204-01	07/10/2012
EM-Clamp	EM-Test	EM101	35770	07/10/2012

Shielding Room No. 3 - ESD Test (IEC 61000-4-2)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
ESD Simulator	EM TEST	ESD30C	V0603101091	04/05/2012
Shielding Room No. 3 - EFT / Surges Test (IEC 61000-4-4) (IEC 61000-4-5)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
Compact Generator	EM-Test	UCS500M/6B	V0603101093	07/10/2012
Capacitive Clamp	EM-Test	C Clamp HFK	0306-43	07/10/2012
CDN for Telecom Port	EM-Test	CNV504S1	V0603101094	07/10/2012

3M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	07/09/2012
Spectrum Analyzer	Agilent	E4440A	MY46185649	03/29/2012
Biconilog Antenna	ETS-LINGREN	3142C	00044562	07/11/2012
Multi device Controller	ETS-LINGREN	2090	00057230	N/A
Horn Antenna	ETS-LINGREN	3117	00057407	06/07/2012
Microwave Preamplifier	Agilent	8449B	3008A02425	N/A

10M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
Receiver	R&S	ESCI	100435	10/27/2011
Spectrum Analyzer	R&S	FSP40	100416	07/10/2012
Biconilog Antenna	schwarzbeck	VULB9136	9136-401	08/03/2011
Horn Antenna	ETS-LINGREN	3117	00044562	07/31/2012
Microwave Preamplifier	Agilent	8449B	3008A02425	N/A
Microwave Preamplifier	Agilent	11909A	186871	N/A

3M Full-anechoic Chamber - Continuous radiated disturbances Test (IEC 61000-4-3)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	07/09/2012
ESG Vector signal generators	Agilent	E4438C	MY45095744	03/29/2012
Power Amplifier	AR	150W1000	0322288	07/10/2012
Biconilog Antenna	ETS-LINGREN	3142C	00044562	07/11/2012

3. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
15.207	Conducted Emission	Pass
15.247(a)(1)	Hopping Channel Bandwidth	Pass
15.247(a)(1)	Hopping Channel Separation	Pass
15.247(a)(1)	Number of Hopping Frequency Used	Pass
15.247(a)(1)(iii)	Dwell Time of Each Frequency	Pass
15.247(b)(1)	Maximum Peak Output Power	Pass
15.247(d)	Band Edges Emission	Pass
15.247(d)	Spurious Radiated Emission	Pass
15.203/15.247(b)/(c)	Antenna Requirement	Pass

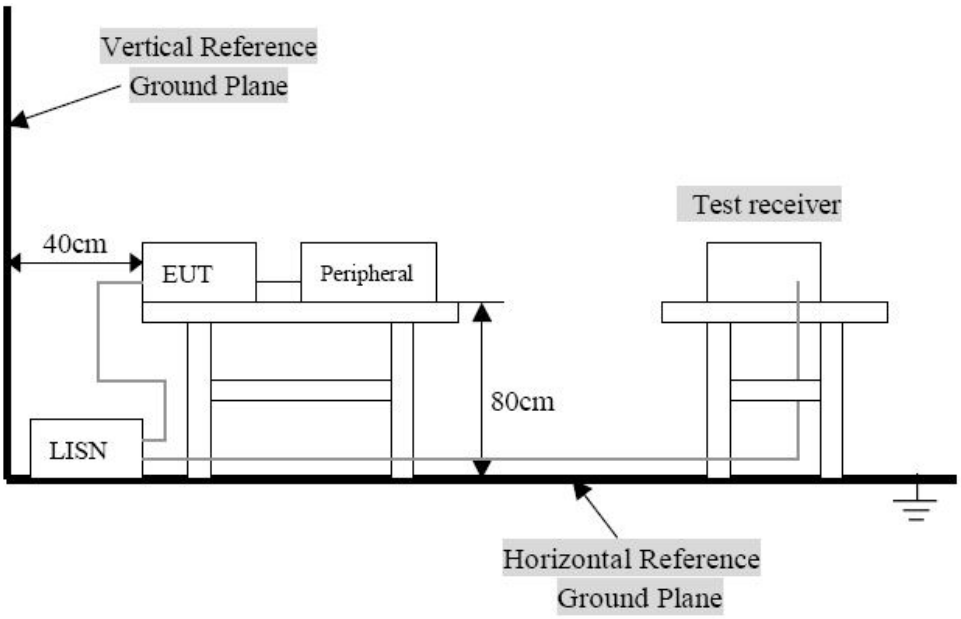
4. TEST OF CONDUCTED EMISSION

4.1 Applicable Standard

Section 15.207: For a Low-power Radio-frequency Device is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150～0.500	66～56	56～46
0.500～5.000	56	46
5.000～30.00	60	50

4.2 Test Setup Diagram



Remark: 1. The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC 15.207 limits.

2. The EUT was charged on the base,and the base was connected to a 120 VAC/ 60Hz power source.

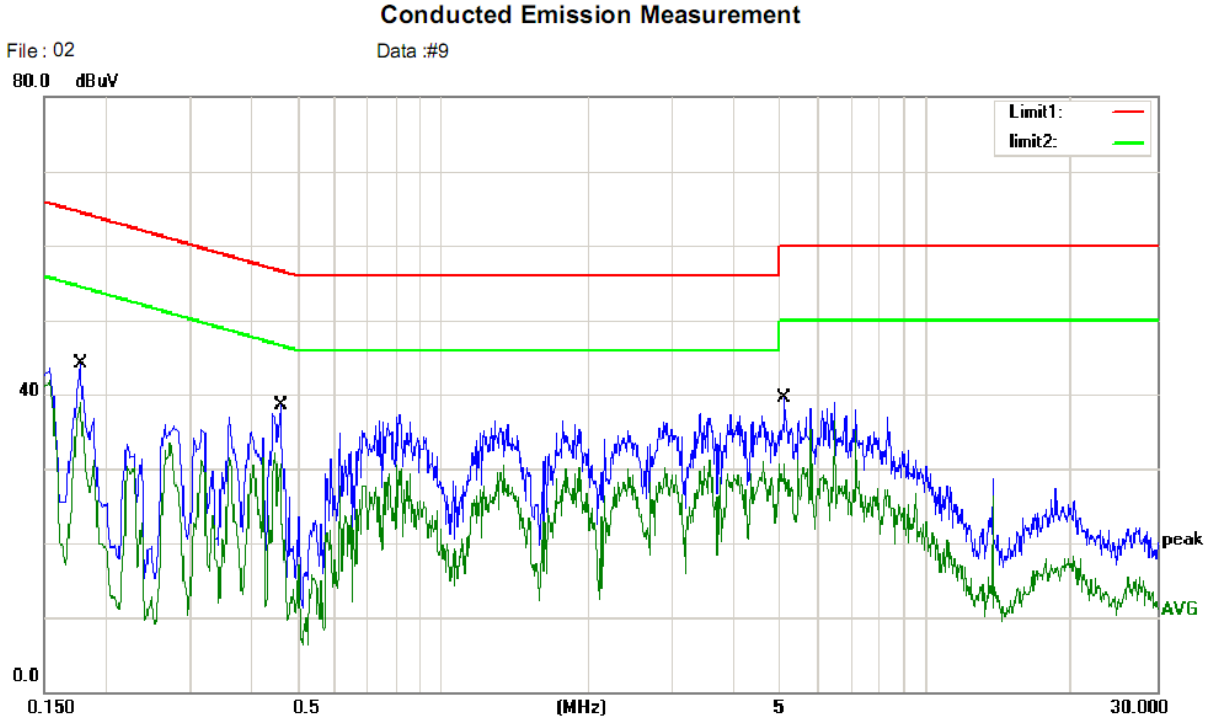
4.3 Test Result

Temperature (℃) : 22~23	EUT: WiConnect System
Humidity (%RH): 50~54	M/N: WiConnect System
Barometric Pressure (mbar): 950~1000	Operation Condition: Continuous Transmit

Note: The below test data is the worst test data that switch 4 channel (Sequence 1), and the low channel 2406MHz.

The Worst Conducted Emission Test Data

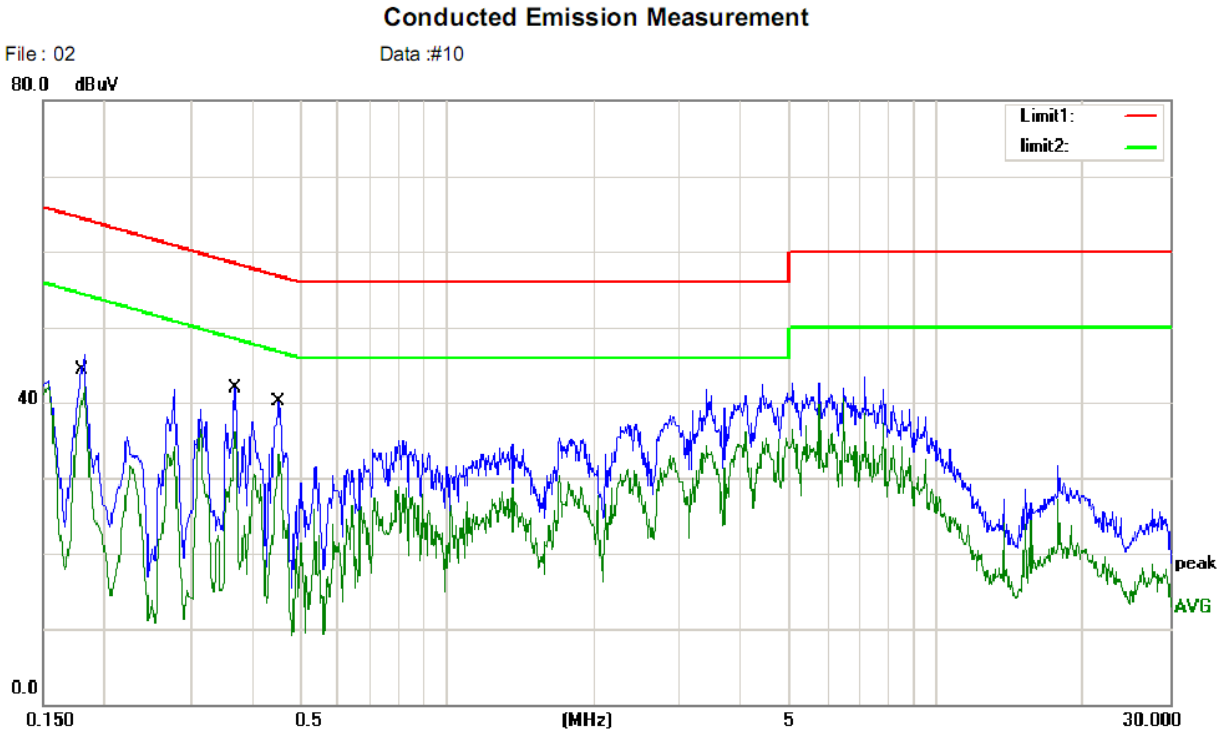
EUT: WiConnect System MN: WiConnect System
Operating Condition: Continuous Transmit
Test Site: Shielded Room
Operator: Owen
Test Specification: AC 120V/60Hz For adapter 5V
Tem:25 ℃ Hum:50%
Start of Test: 5/07/2011
Phase: L
Note: TX Part



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1776	31.50	10.00	41.50	64.60	-23.10	QP	
2	*	0.1776	27.45	10.00	37.45	54.60	-17.15	AVG	
3		0.4604	25.94	10.00	35.94	56.69	-20.75	QP	
4		0.4604	17.20	10.00	27.20	46.69	-19.49	AVG	
5		5.1030	26.57	10.00	36.57	60.00	-23.43	QP	
6		5.1030	19.93	10.00	29.93	50.00	-20.07	AVG	

The Worst Conducted Emission Test Data

EUT: WiConnect System MN: WiConnect System
Operating Condition: Continuous Transmit
Test Site: Shielded Room
Operator: Owen
Test Specification: AC 120V/60Hz For adapter 5V
Tem:25 ℃ Hum:50%
Start of Test: 5/07/2010
Phase: N
Note: TX Part



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1778	33.61	10.00	43.61	64.59	-20.98	QP	
2	*	0.1778	28.53	10.00	38.53	54.59	-16.06	AVG	
3		0.3715	27.72	10.00	37.72	58.47	-20.75	QP	
4		0.3715	15.92	10.00	25.92	48.47	-22.55	AVG	
5		0.4500	28.12	10.00	38.12	56.88	-18.76	QP	
6		0.4500	19.62	10.00	29.62	46.88	-17.26	AVG	

5. Test of Hopping Channel Bandwidth

5.1 Applicable Standard

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.2 EUT Setup

Spectrum Analyzer

5.3 Test Equipment List and Details

See section 2.4.

5.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Set RBW of spectrum analyzer to 30KHz and VBW to 100KHz.

3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.

4. The spectrum width with level higher than 20dB below the peak level.

5. Repeat above 1~3 points for the middle and highest channel of the EUT.

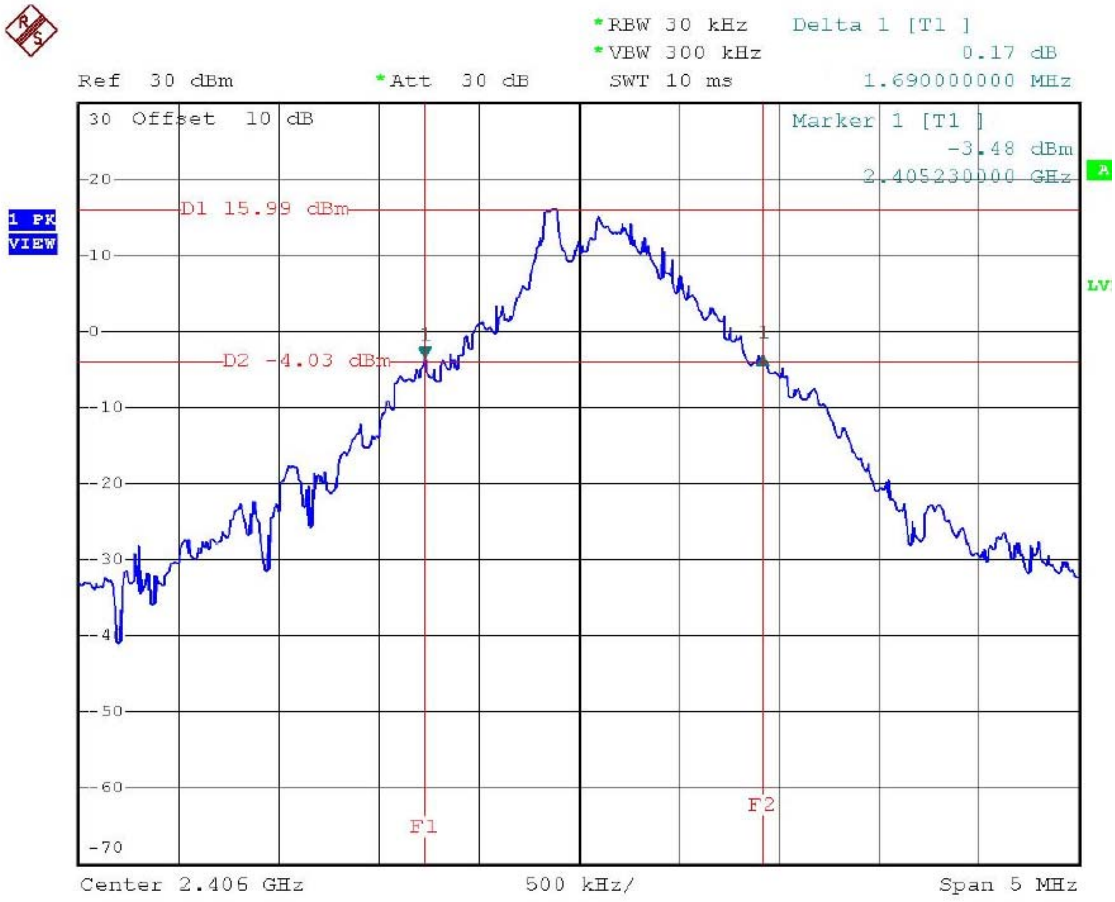
5.5 Test Result

Temperature (℃) : 22~23	EUT: WiConnect System
Humidity (%RH): 50~54	M/N: WiConnect System
Barometric Pressure (mbar): 950~1000	Operation Condition: Continuous Transmit

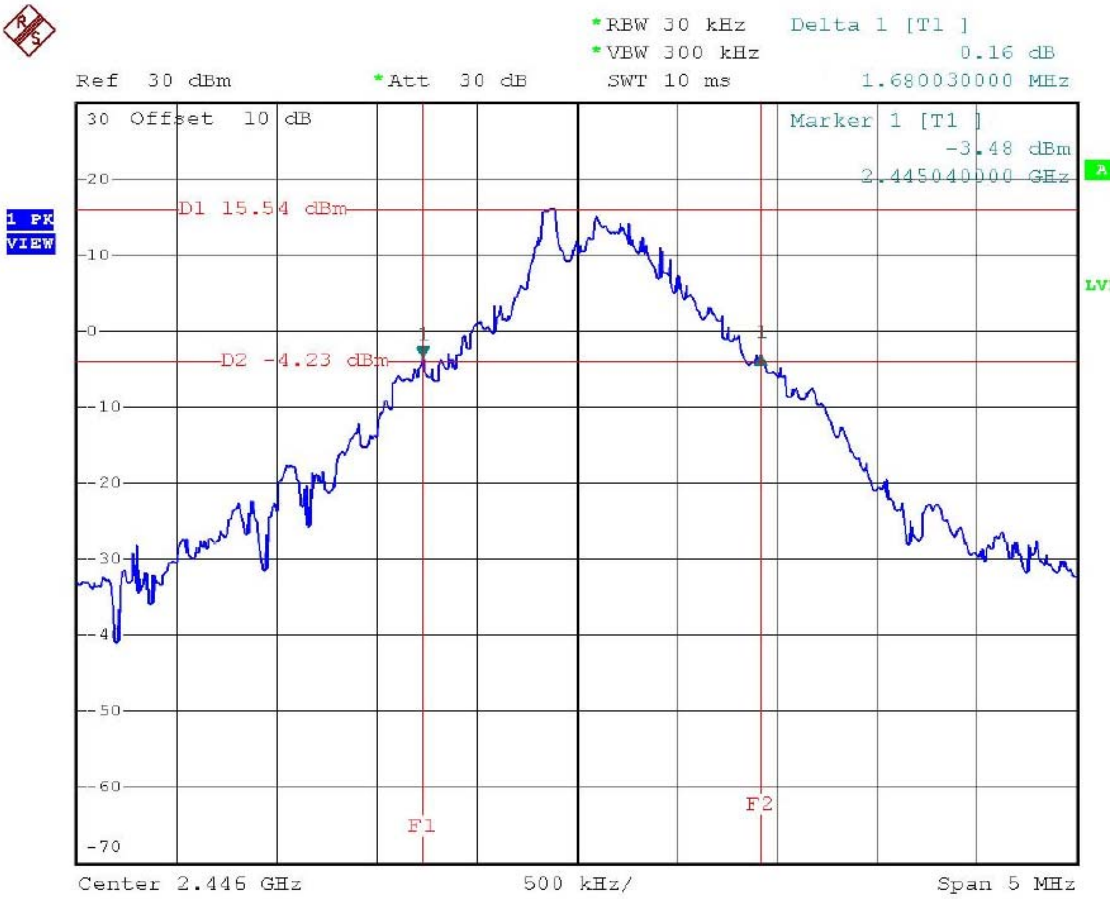
Note: The below test data is the worst test data that switch 4 channel (Sequence 1)

Modulation Type	Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Min. Limit (kHz)
FHSS	Low	2406.03	1690	>25
FHSS	Middle	2446.05	1680	>25
FHSS	High	2472.04	1670	>25

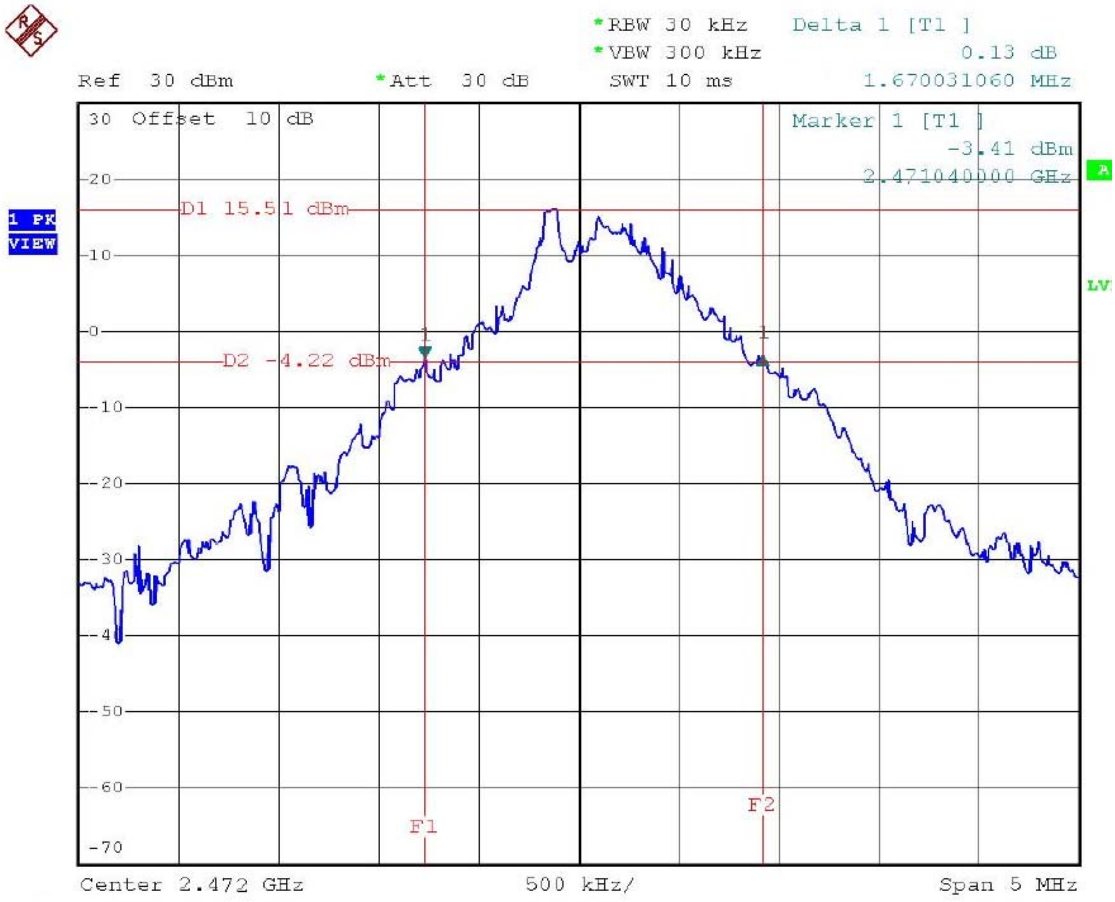
Channel Low：


*RBW 30 kHz
*VBW 300 kHz
Delta 1 [T1]
0.17 dB
1.690000000 MHz
Ref 30 dBm
*Att 30 dB
SWT 10 ms
30 Offset 10 dB
Marker 1 [T1]
-3.48 dBm
2.405230000 GHz
1 PK
VIEW
D1 15.99 dBm
D2 -4.03 dBm
F1
F2
Center 2.406 GHz
500 kHz/
Span 5 MHz

Channel Middle：



Channel High：



6. Test of Hopping Channel Separation

6.1 Applicable Standard

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

6.2 EUT Setup

Spectrum Analyzer

6.3 Test Equipment List and Details

See section 2.4.

6.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.

3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.

4. The Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.

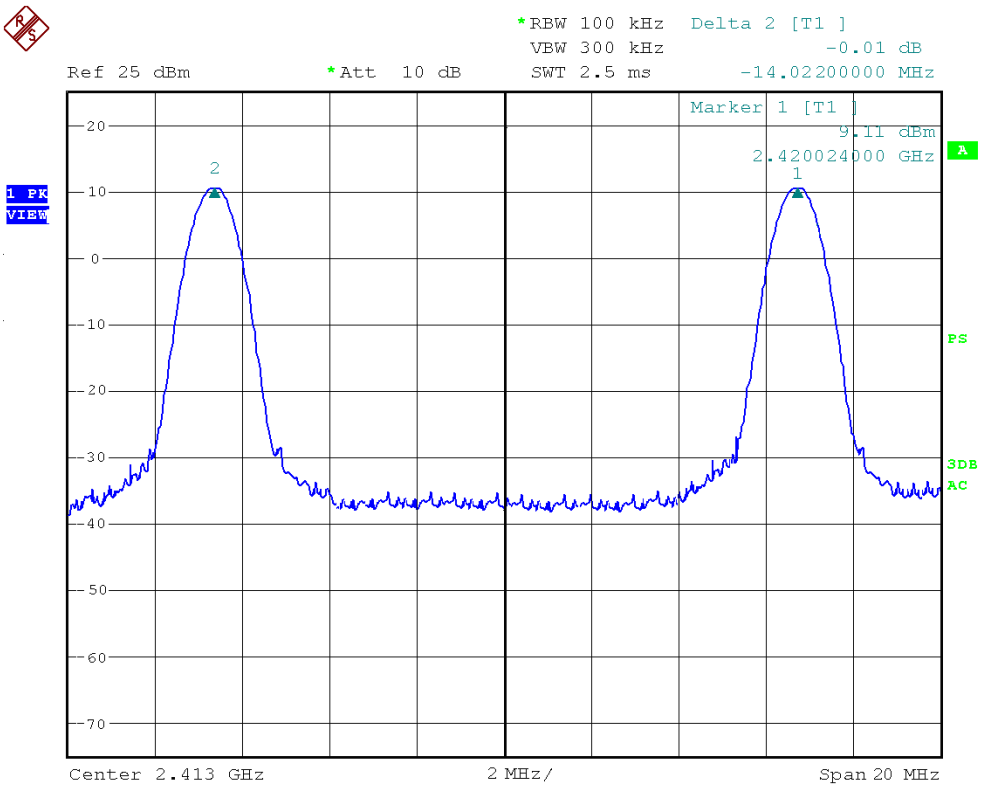
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

6.5 Test Result

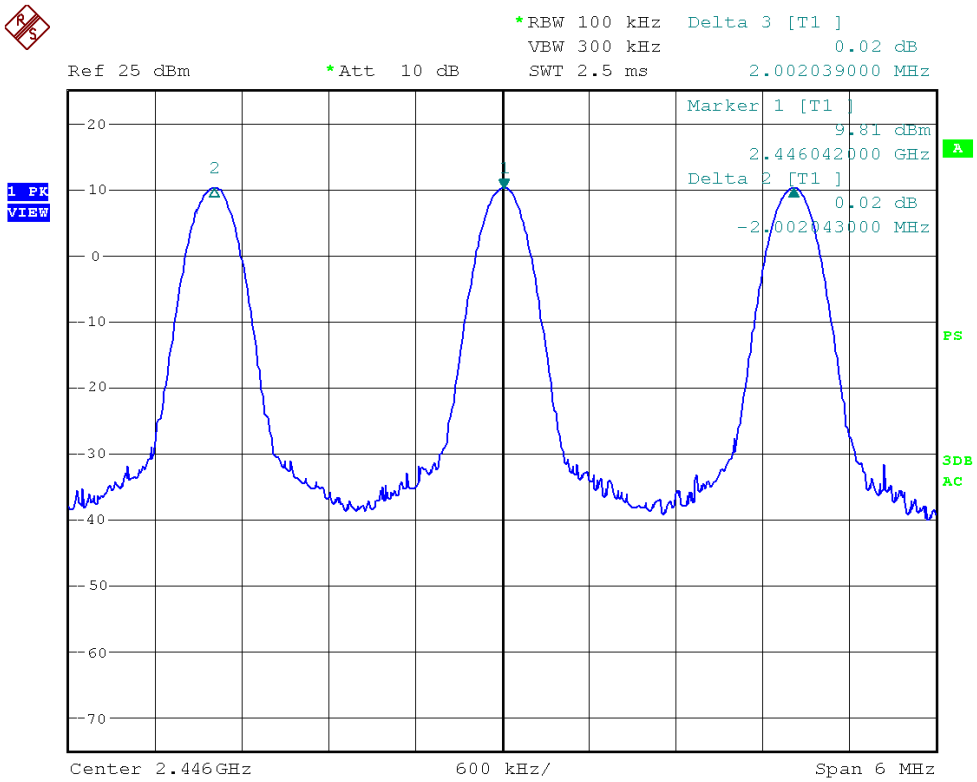
Temperature (℃) : 22~23	EUT: WiConnect System
Humidity (%RH): 50~54	M/N: WiConnect System
Barometric Pressure (mbar): 950~1000	Operation Condition:Transmit

Note: The below test data is the worst test data that switch 4 channel (Sequence 1)

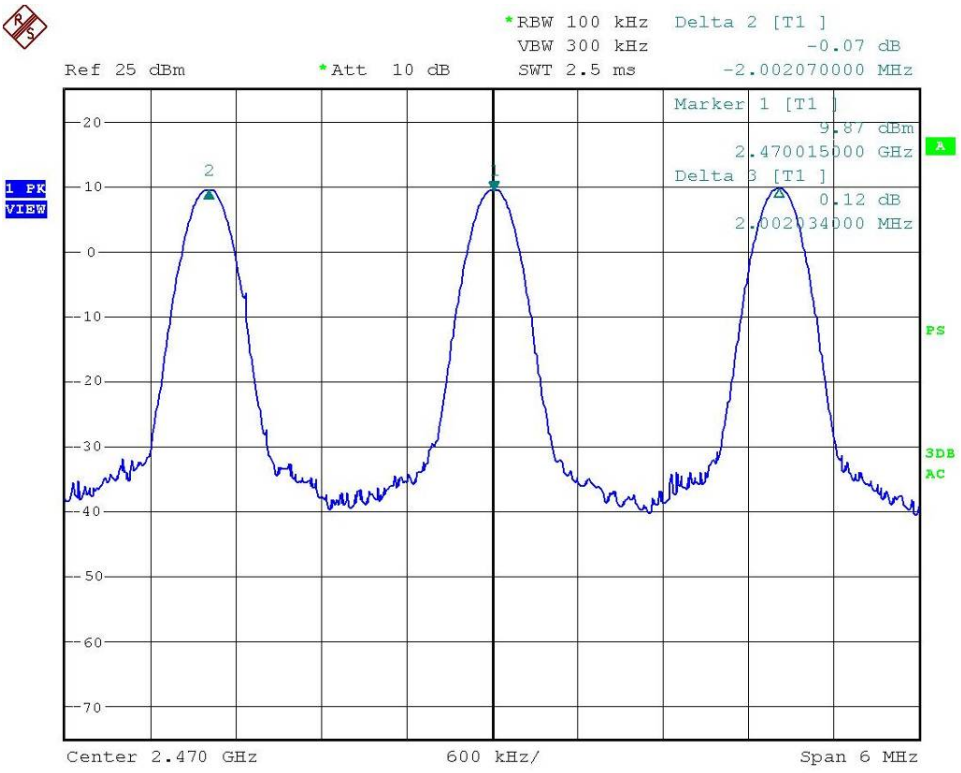
Channel Low：


*RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 2 [T1]
-0.01 dB
-14.02200000 MHz
Ref 25 dBm
*Att 10 dB
Marker 1 [T1]
9.11 dBm
2.420024000 GHz
1 PK
VIEW
A
PS
3DB
AC
Center 2.413 GHz
2 MHz/
Span 20 MHz

Channel Middle：



Channel High：



7. Test of Number of Hopping Frequency

7.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 15 non-overlapping hopping channels. Frequency hopping system which use fewer than 75 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping system may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

7.2 EUT Setup

Spectrum Analyzer

7.3 Test Equipment List and Details

See section 2.4.

7.4 Test Procedure

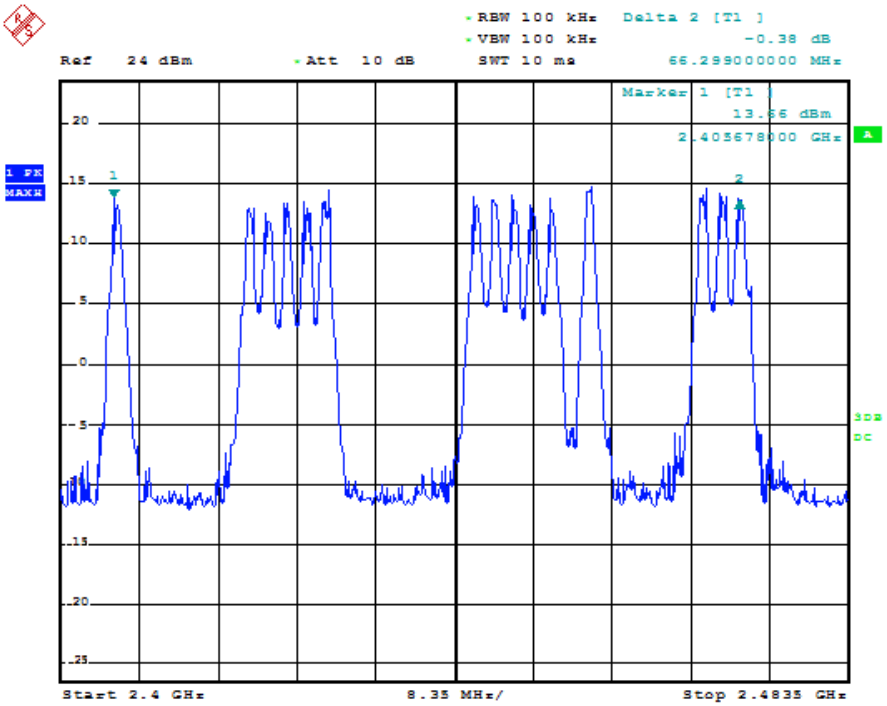
1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. Observe frequency hopping in 2400MHz~2483.5MHz, there are at least 15 non-overlapping channels.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

7.5 Test Result

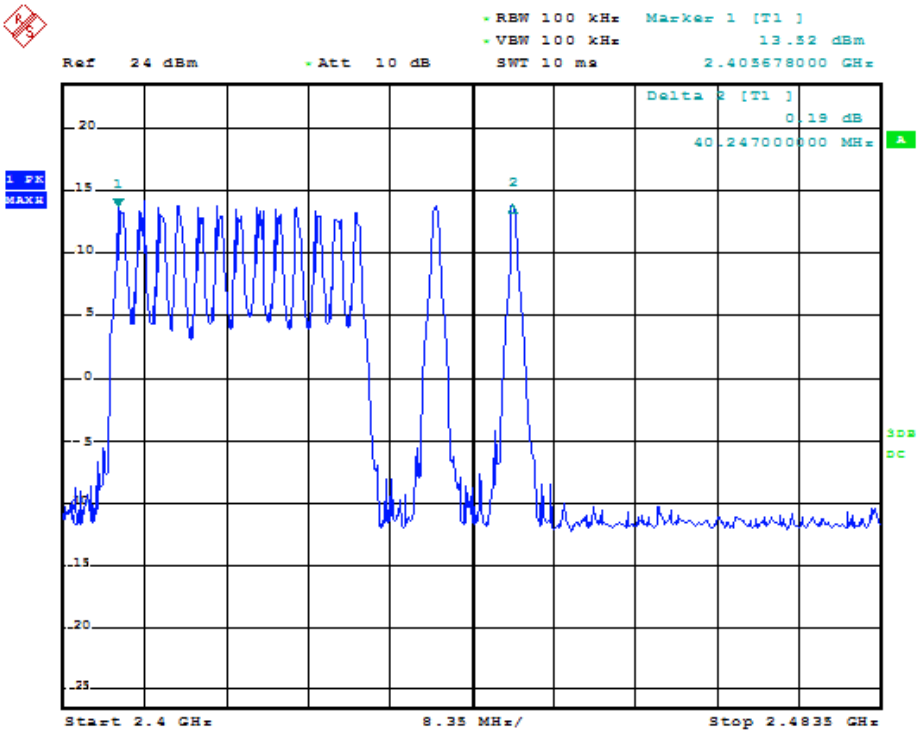
Temperature (℃) : 22~23	EUT: WiConnect System
Humidity (%RH): 50~54	M/N: WiConnect System
Barometric Pressure (mbar): 950~1000	Operation Condition: Transmit

Sequence Number	Frequency (MHz)	Number of Hopping Channels	Min. Limit (kHz)
Sequence 1	2406~2472	15	>=15
Sequence 2	2406~2446	15	>=15
Sequence 3	2432~2472	15	>=15
Sequence 4	2406~2472	15	>=15

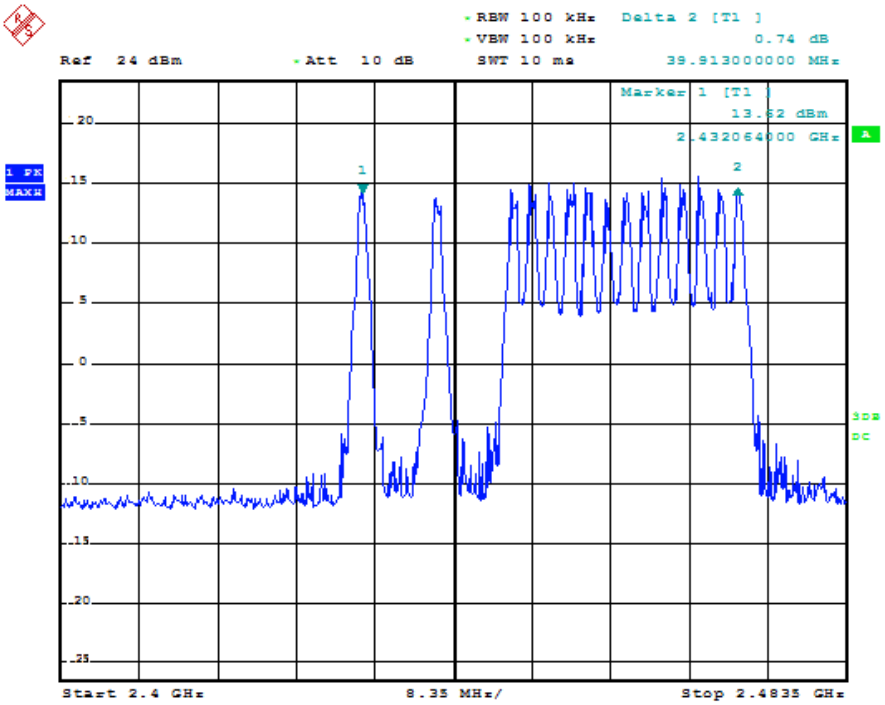
Sequence 1:



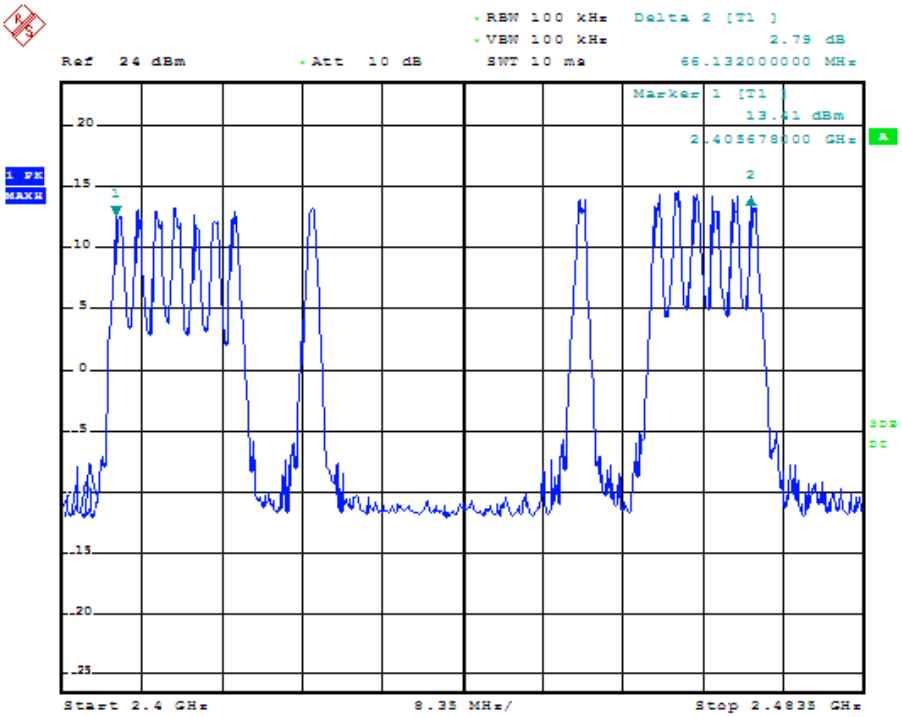
Sequence 2:



Sequence 3:



Sequence 4:



8. Test of Dwell Time of Each Frequency

8.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4seconds multiplied by the number of hopping channels employed.

8.2 EUT Setup

Spectrum Analyzer

8.3 Test Equipment List and Details

See section 2.4.

8.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.

2. Set RBW of spectrum analyzer to 1000kHz and VBW to 1000kHz.

3. Set Detector to Peak, Trace to Max Hold and Sweep Time is more than once pulse time.

4. Set the center frequency on any frequency would be measure and set the frequency span to zero span.

5. Measure the maximum time duration of one single pulse.

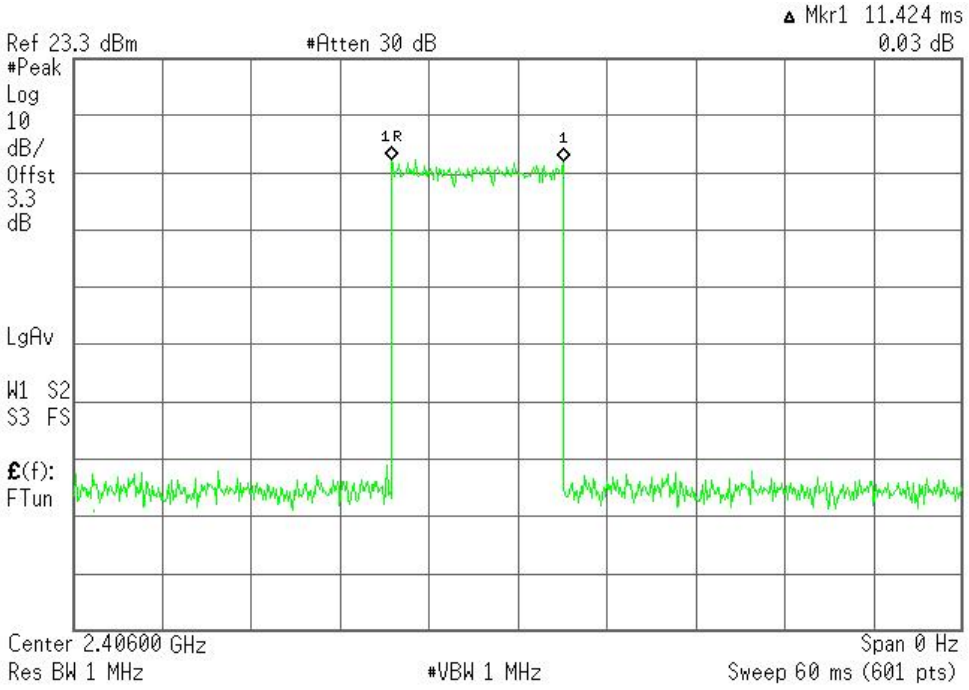
8.5 Test Result

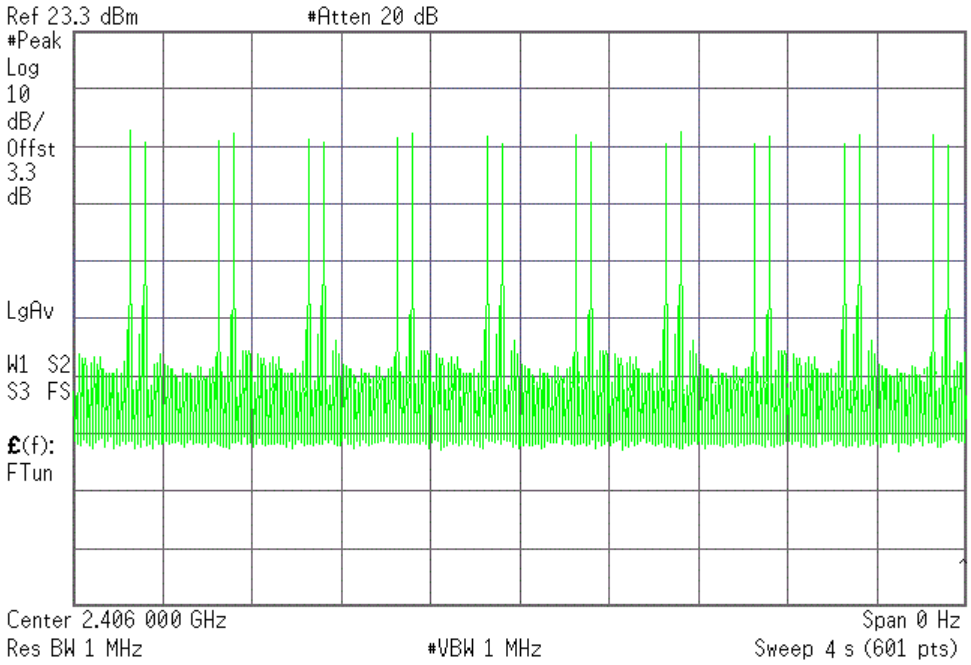
Temperature (℃) : 22~23	EUT: WiConnect System
Humidity (%RH): 50~54	M/N: WiConnect System
Barometric Pressure (mbar): 950~1000	Operation Condition: Continuous Transmit

Note: The below test data is the worst test data that switch 4 channel (Sequence 1)

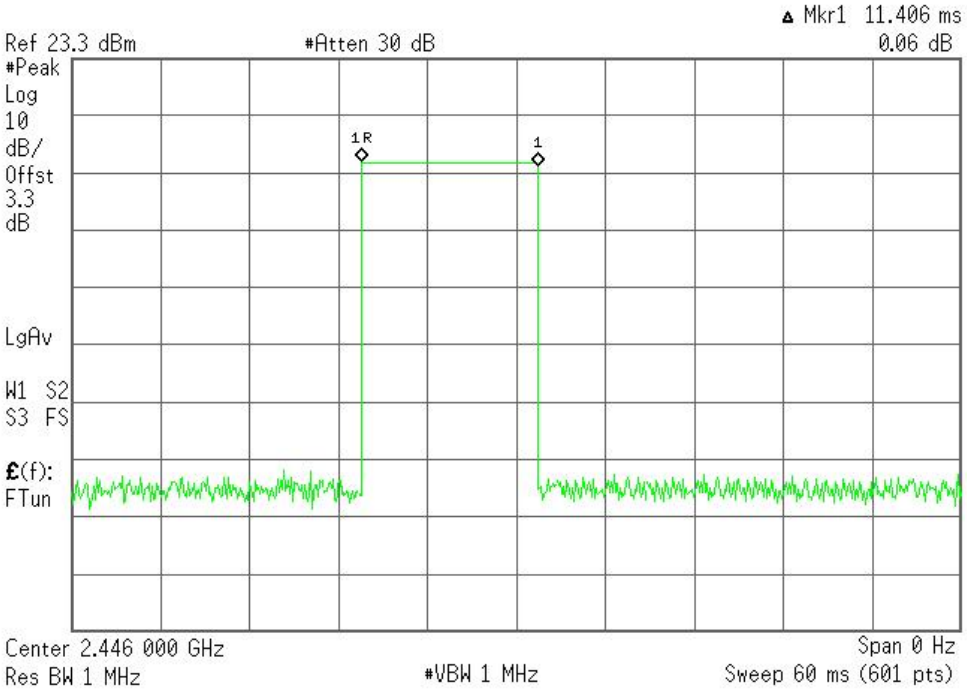
Channel No.	Frequency (MHz)	Pulse Wide （ms）	Number of Hopping Pulses in 0.4*channel number(15)	Dwell Time (ms)	Limit (ms)
Low	2406.00	11.424	0.4*15*20/4	342.72	400
Middle	2446.00	11.406	0.4*15*20/4	342.18	400
High	2472.00	11.419	0.4*15*20/4	342.57	400

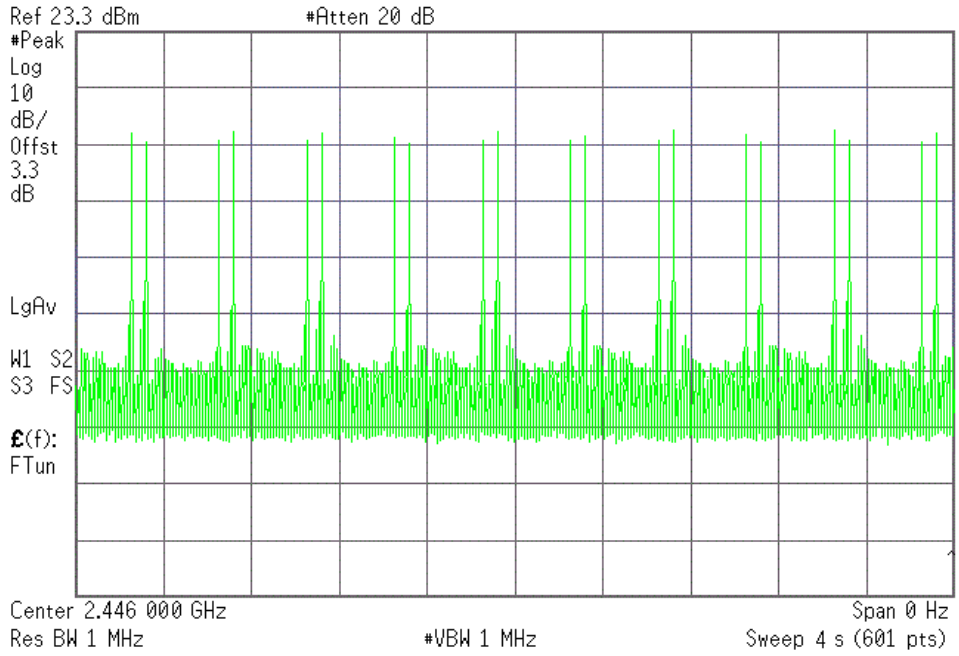
Channel Low：


Mkr1 11.424 ms
Ref 23.3 dBm
#Atten 30 dB
0.03 dB
#Peak
Log
10
dB/
Offst
3.3
dB
1R
1
LgAv
W1 S2
S3 FS
£(f):
FTun
Center 2.40600 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 60 ms (601 pts)

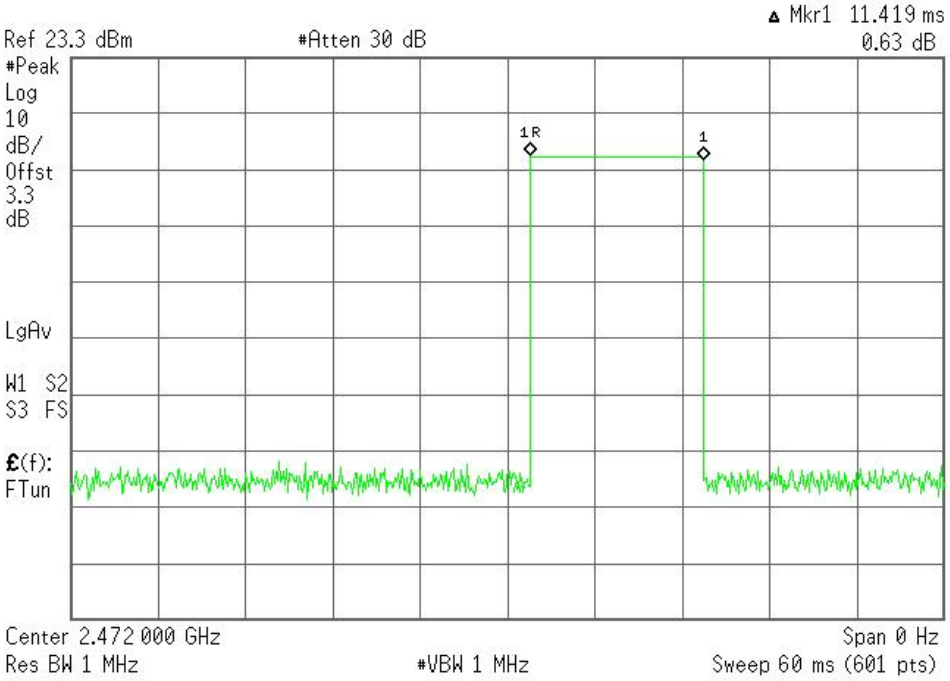

Ref 23.3 dBm
#Atten 20 dB
#Peak
Log
10
dB/
Offst
3.3
dB
LgAv
W1 S2
S3 FS
£(f):
FTun
Center 2.406 000 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 4 s (601 pts)

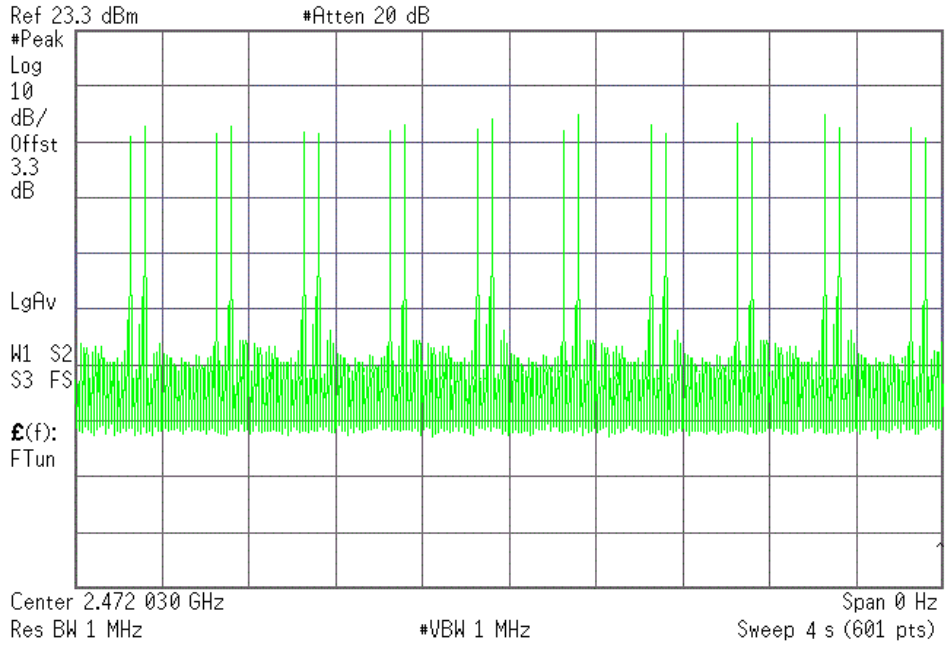
Channel Middle：





Channel High：





9. Test of Maximum Peak Output Power

9.1 Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels and The maximum peak output power shall not exceed 1 watt. For all other frequency hopping systems in this frequency band, The maximum peak output power shall not exceed 0.125 watt.

9.2 EUT Setup

Spectrum Analyzer

9.3 Test Equipment List and Details

See section 2.4.

9.4 Test Procedure

1. The transmitter output was connected to the peak power meter and recorded the peak value.

2. Peak power meter parameter set to auto attenuator and filter is the same as.

3. Repeated the 1 for the middle and highest channel of the EUT.

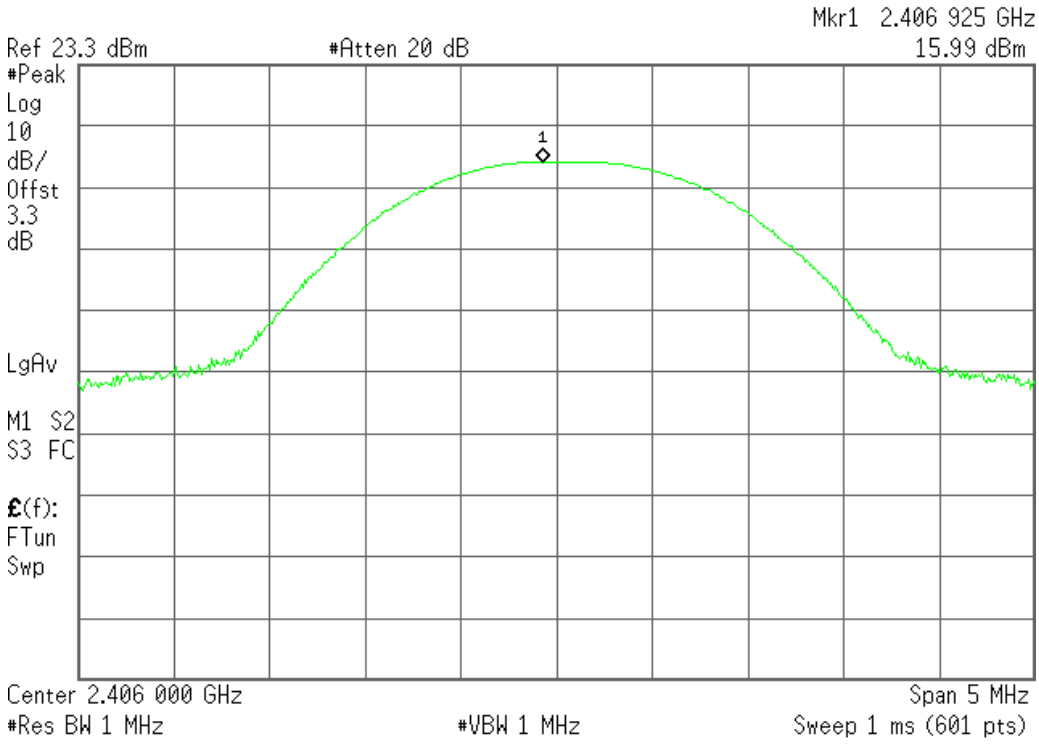
9.5 Test Result

Temperature (℃) : 22~23	EUT: WiConnect System
Humidity (%RH): 50~54	M/N: WiConnect System
Barometric Pressure (mbar): 950~1000	Operation Condition: Continuous Transmit

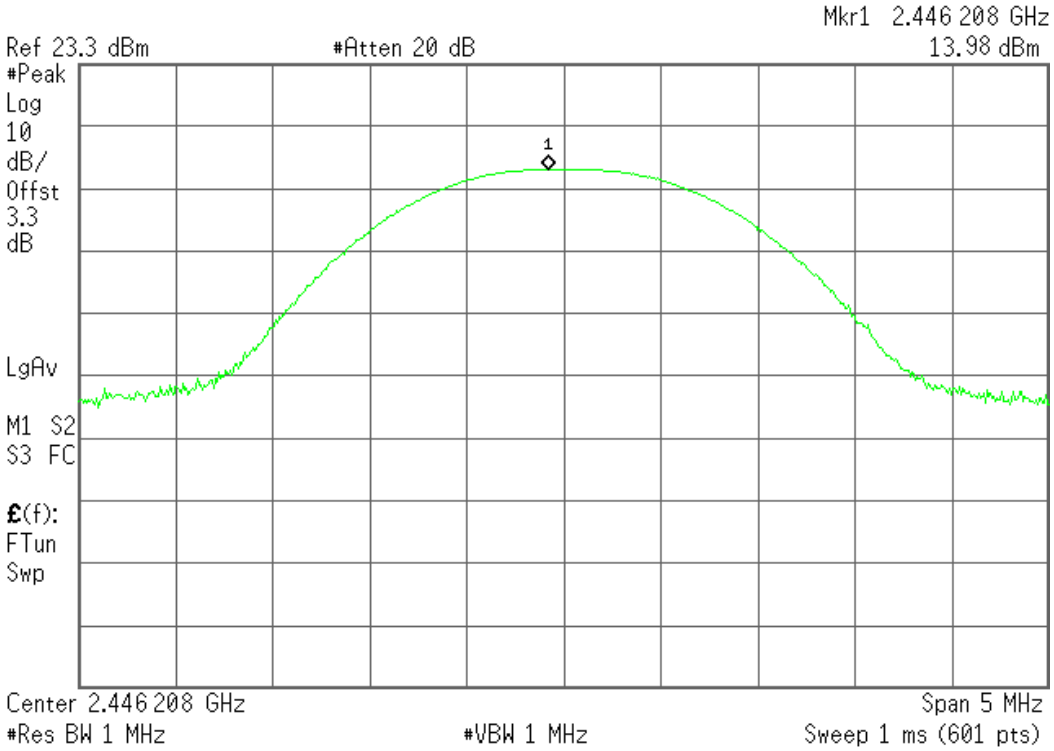
Note: The below test data is the worst test data that switch 4 channel (Sequence 1)

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)	Margin (dB)
FHSS	Low	2406.00	15.99	20.9	4.91
FHSS	Middle	2446.00	13.98	20.9	6.92
FHSS	High	2472.00	14.73	20.9	6.17

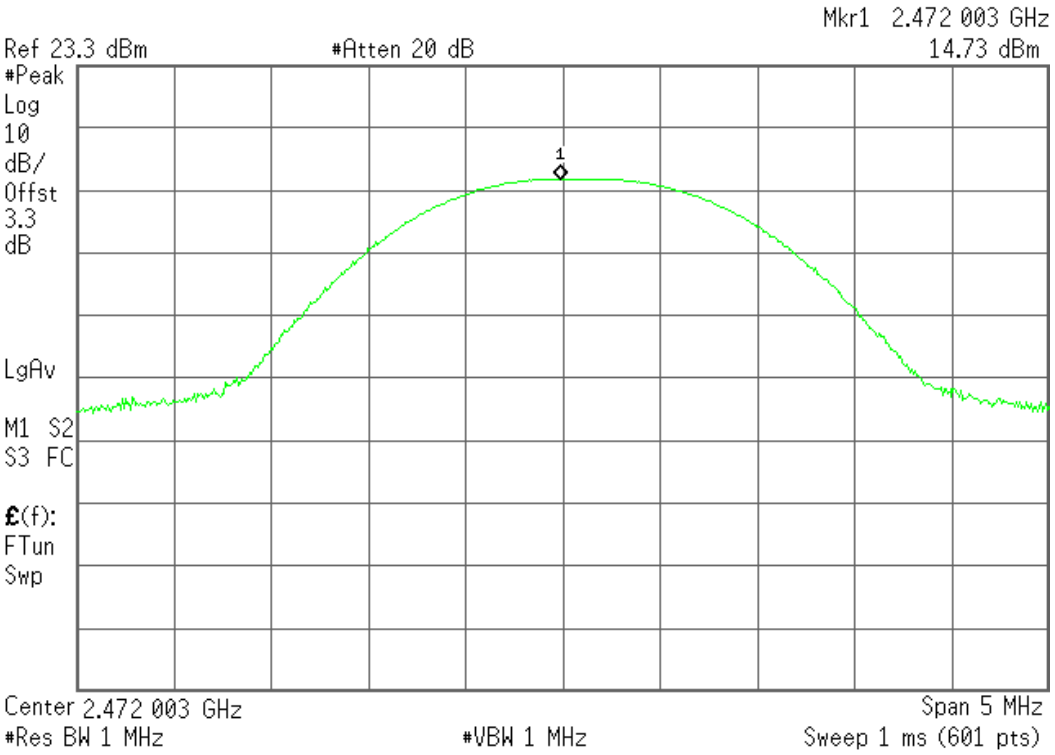
Channel Low：


Mkr1 2.406 925 GHz
Ref 23.3 dBm
#Atten 20 dB
15.99 dBm
#Peak
Log
10
dB/
Offst
3.3
dB
1
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Center 2.406 000 GHz
Span 5 MHz
#Res BW 1 MHz
#VBW 1 MHz
Sweep 1 ms (601 pts)

Channel Middle：



Channel High：



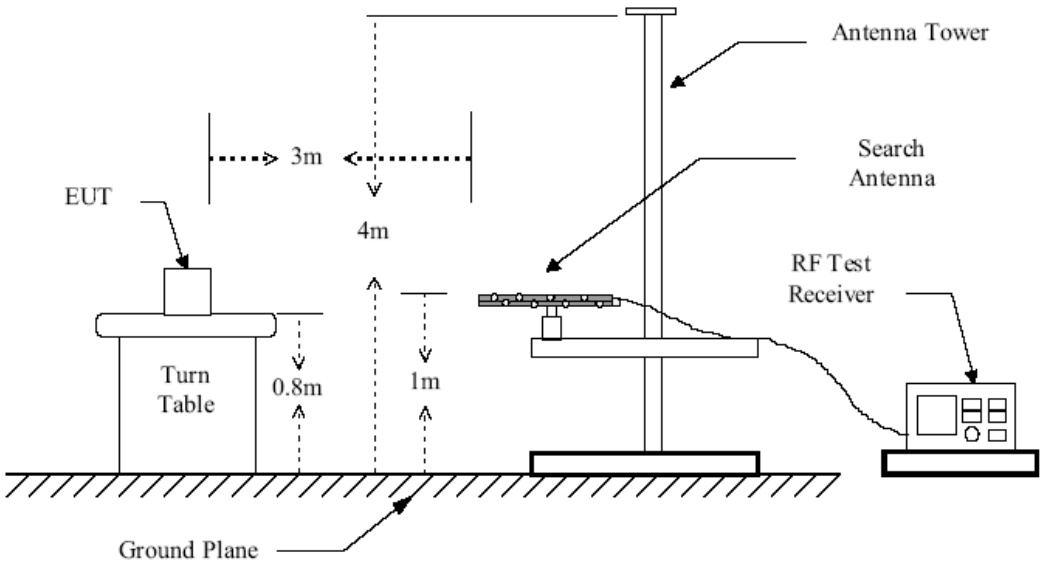
10. Test of Band Edges Emission

10.1 Applicable Standard

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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

10.2 EUT Setup

Radiated Measurement Setup



Conducted Measurement Setup

Spectrum Analyzer

10.3 Test Equipment List and Details

See section 2.4.

10.4 Test Procedure

Conducted Measurement
1. The transmitter is set to the lowest channel.

2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.

3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge. Then detector set to peak and max hold this trace.

4. The lowest band edges emission was measured and recorded.

5. The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement
1. Configure the EUT according to ANSI C63.4-2009

2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.

4. For band edge emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.

5. For band edge emission, use 1MHz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1MHz RBW for reading under PK.

10.5 Test Result

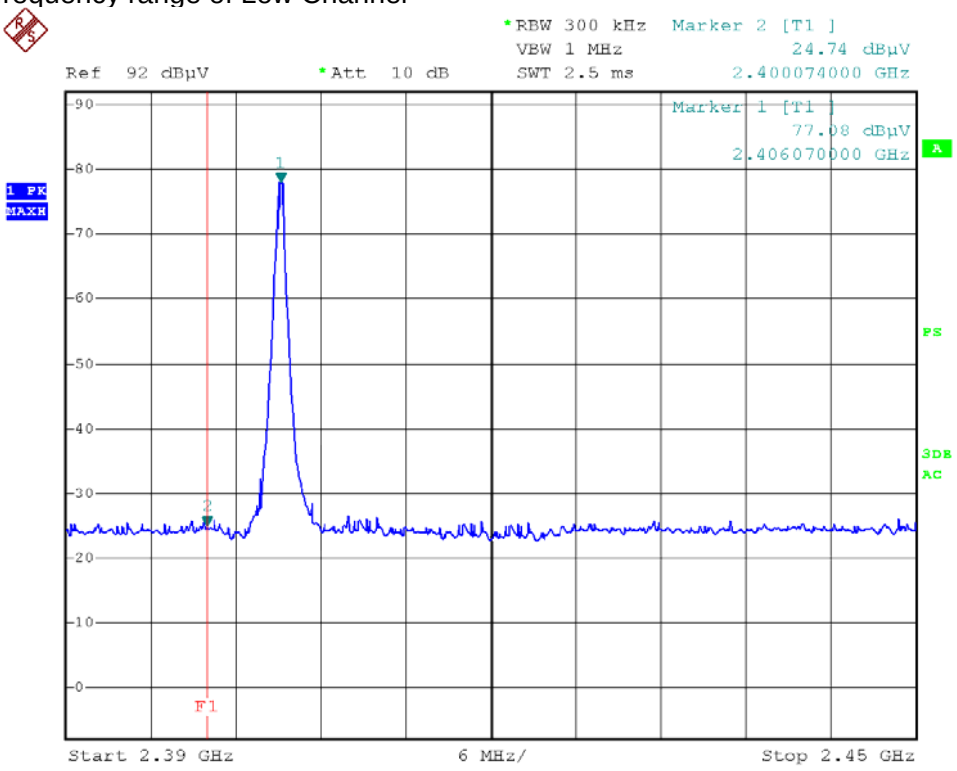
Temperature (℃) : 22~23	EUT: WiConnect System
Humidity (%RH): 50~54	M/N: WiConnect System
Barometric Pressure (mbar): 950~1000	Operation Condition: Continuous Transmit

Note: The below test data is the worst test data that switch 4 channel (Sequence 1)

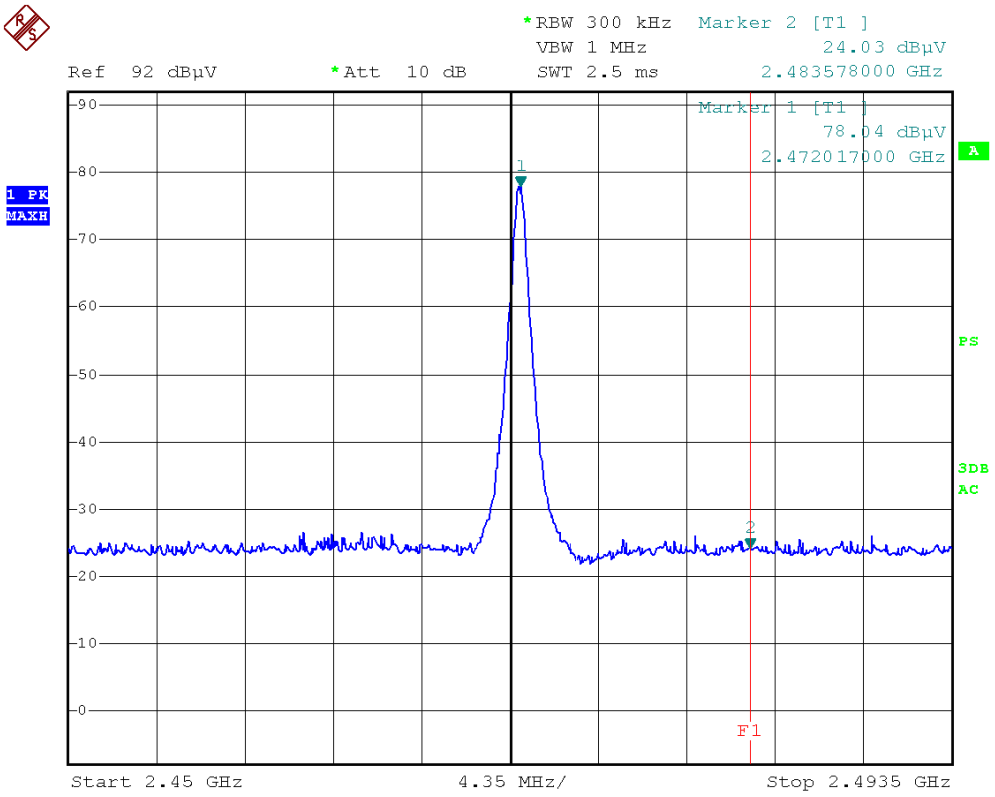
Radiated Test Result

Frequency(MHz)
<2400
>2483.5

The worst frequency range of Low Channel



The worst frequency range of High Channel



11. Test of Spurious Radiated Emission

11.1 Applicable Standard

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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

11.2 EUT Setup

Radiated Measurement Setup

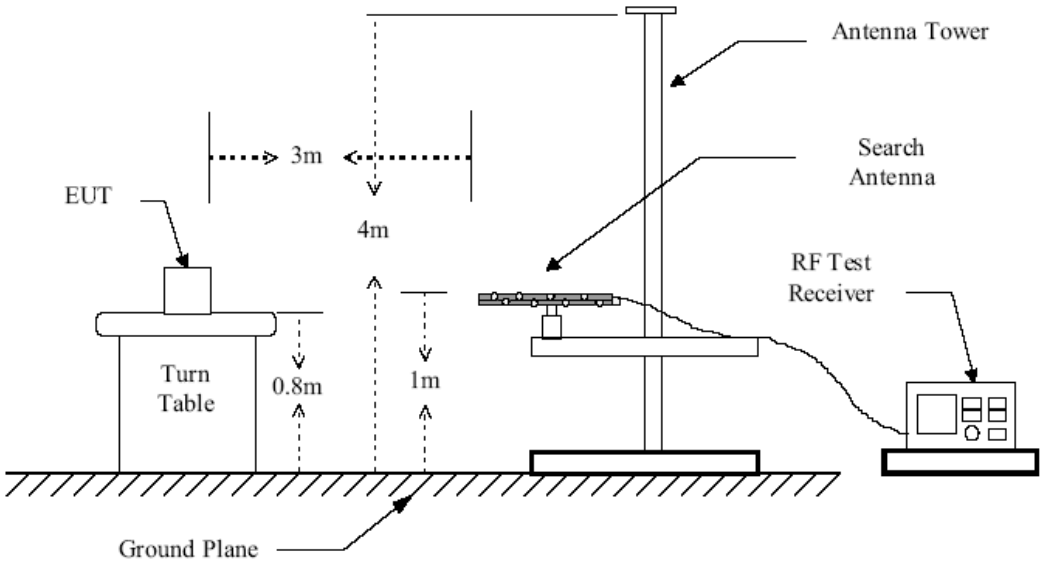


Figure 1 : Frequencies measured below 1 GHz configuration

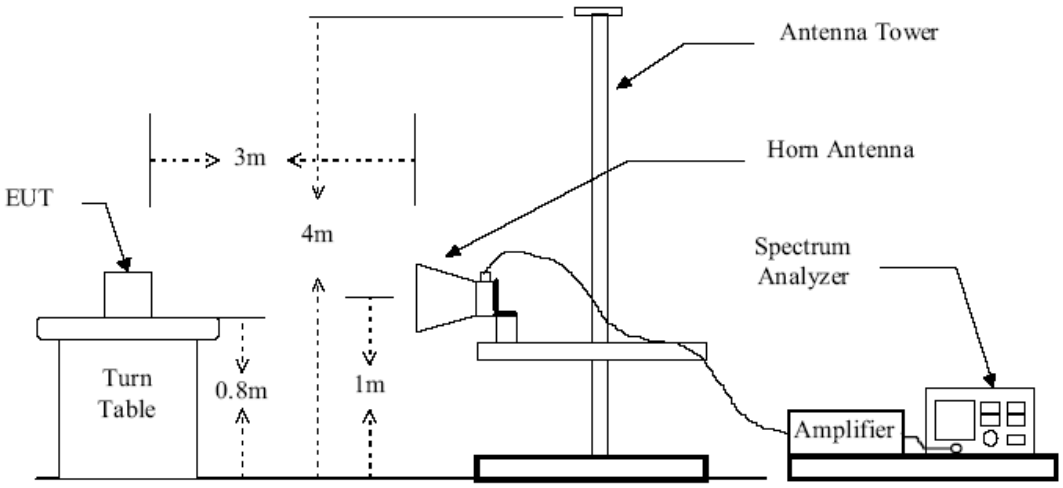


Figure 2 : Frequencies measured above 1 GHz configuration

Conducted Measurement Setup

Spectrum Analyzer

11.3 Test Equipment List and Details

See section 2.4.

11.4 Test Procedure

Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2009

2. The EUT was placed on the top of the turntable 0.8 meter above ground.

3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.

4. Power on the EUT and all the supporting units.

5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.

7. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.

8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.

Conducted Measurement

1. For emission above 1GHz,conducted measurement method is used.

2. The transmitter is set to the lowest channel.

3. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.

4. Set RBW to 1 MHz and VBW to 3 MHz, Then detector set to peak and max hold this trace.

5. The lowest band edges emission was measured and recorded.

6. The transmitter set to the highest channel and repeated 2~4.

11.5 Test Result

Temperature (℃) : 22~23	EUT: WiConnect System
Humidity (%RH): 50~54	M/N: WiConnect System
Barometric Pressure (mbar): 950~1000	Operation Condition: Continuous Transmit

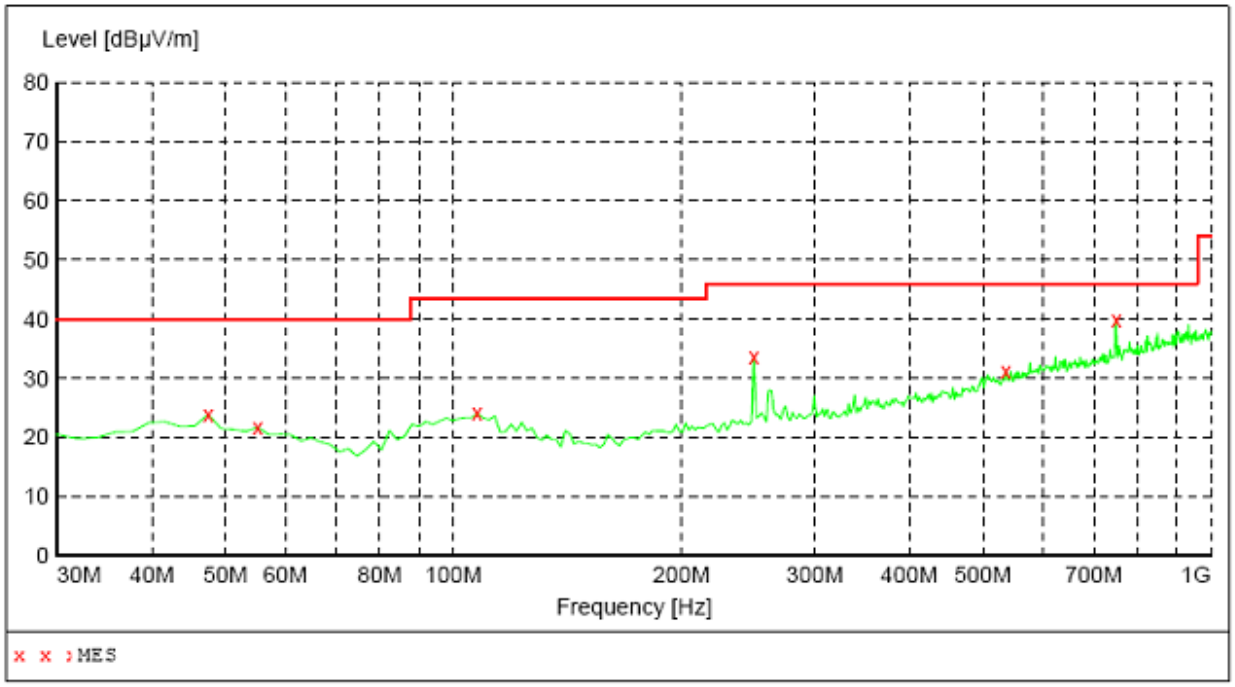
Note: The below test data is the worst test data that switch 4 channel (Sequence 1)

Channel Low Spurious Emission (30~1000MHz) Of Horizontal

EUT:	WiConnect System
M/N:	WiConnect System
Operating Condition:	Continuous Transmit
Test Site:	3m CHAMBER
Operator:	Owen Li
Test Specification:	DC 5V from adapter
Comment:	Polarization: Horizontal
	Tem:23℃ Hum:50%

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT:

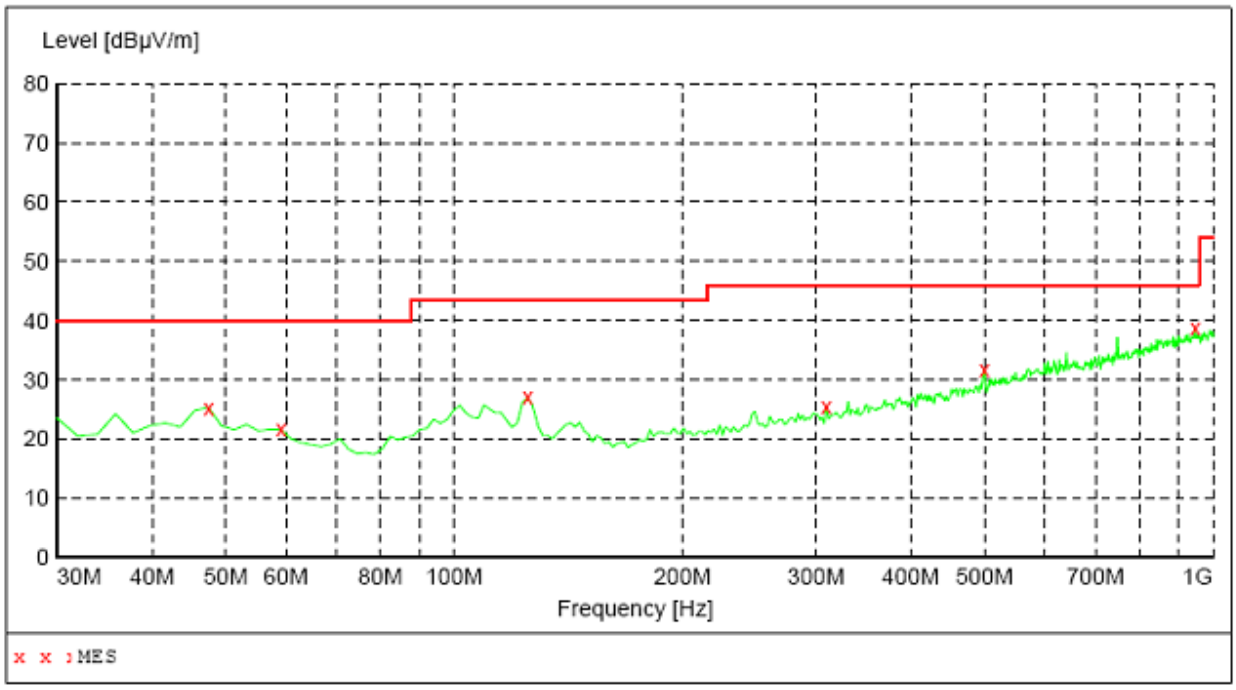
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	23.80	15.8	40.0	16.2	---	100.0	0.00	HORIZONTAL
55.220000	21.70	15.6	40.0	18.3	---	100.0	0.00	HORIZONTAL
107.600000	24.00	16.9	43.5	19.5	---	100.0	0.00	HORIZONTAL
249.220000	33.60	17.2	46.0	12.4	---	100.0	0.00	HORIZONTAL
536.340000	31.30	24.8	46.0	14.7	---	100.0	0.00	HORIZONTAL
749.740000	39.90	28.5	46.0	6.1	---	100.0	0.00	HORIZONTAL

Channel Low Spurious Emission (30~1000MHz) Of Vertical

EUT:	WiConnect System
M/N:	WiConnect System
Operating Condition:	Continuous Transmit
Test Site:	3m CHAMBER
Operator:	Owen Li
Test Specification:	DC 5V from adapter
Comment:	Polarization: Vertical
	Tem:23℃ Hum:50%

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT:

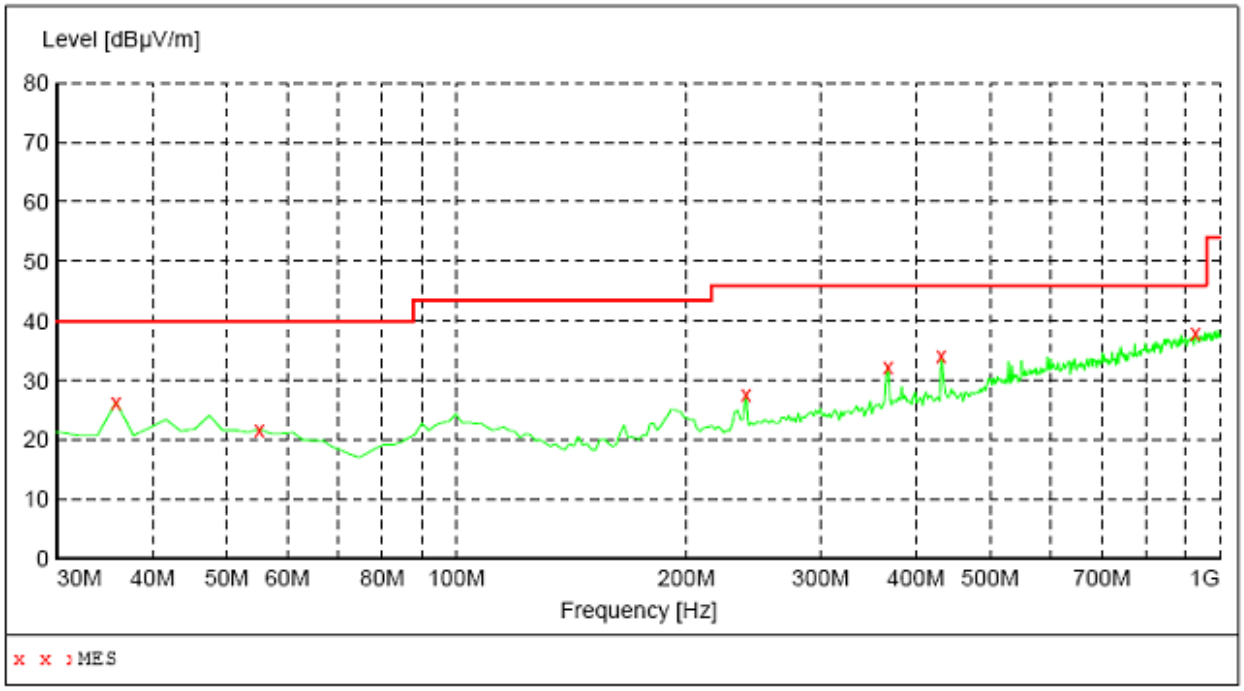
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	25.30	15.8	40.0	14.7	---	100.0	0.00	VERTICAL
59.100000	21.60	14.6	40.0	18.4	---	100.0	0.00	VERTICAL
125.060000	27.00	14.4	43.5	16.5	---	100.0	0.00	VERTICAL
309.360000	25.60	18.9	46.0	20.4	---	100.0	0.00	VERTICAL
499.480000	31.80	23.8	46.0	14.2	---	100.0	0.00	VERTICAL
947.620000	38.70	31.7	46.0	7.3	---	100.0	0.00	VERTICAL

Channel Middle Spurious Emission (30~1000MHz) Of Horizontal

EUT:	WiConnect System
M/N:	WiConnect System
Operating Condition:	Continuous Transmit
Test Site:	3m CHAMBER
Operator:	Owen Li
Test Specification:	DC 5V from adapter
Comment:	Polarization: Horizontal
	Tem:23℃ Hum:50%

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT:

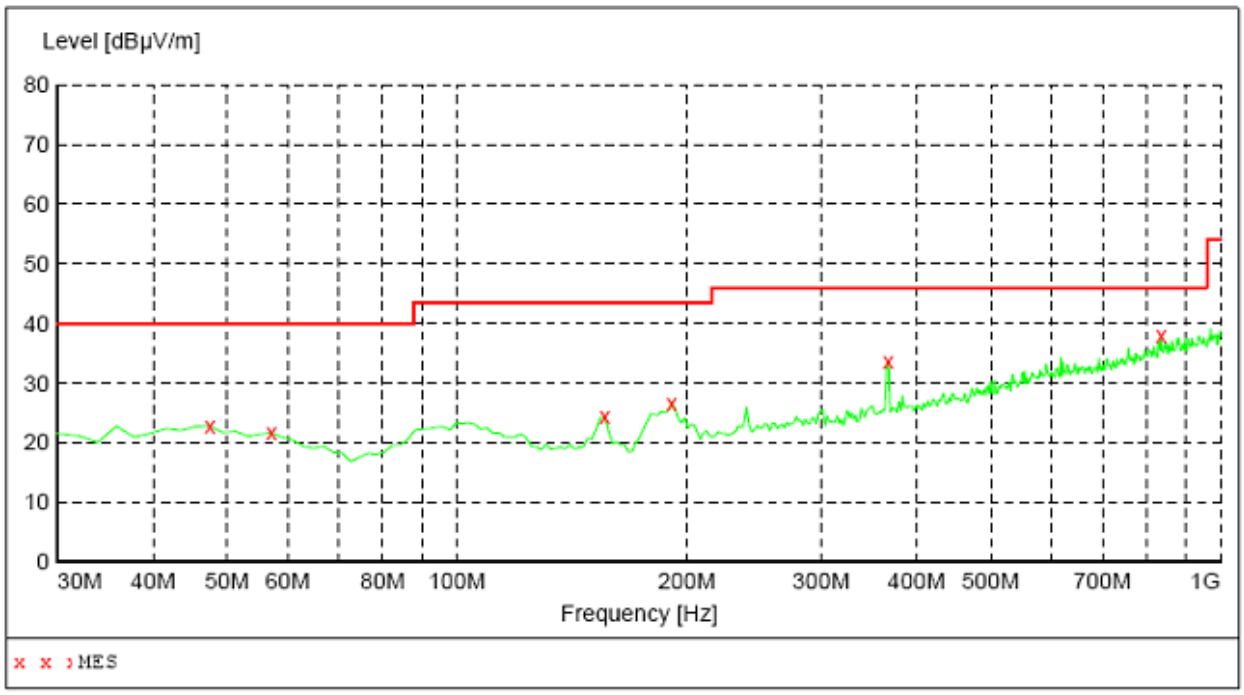
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
35.820000	26.40	14.7	40.0	13.6	QP	300.0	0.00	HORIZONTAL
55.220000	21.80	15.6	40.0	18.2	QP	100.0	0.00	HORIZONTAL
239.520000	27.80	17.1	46.0	18.2	QP	100.0	0.00	HORIZONTAL
367.560000	32.30	20.7	46.0	13.7	QP	100.0	0.00	HORIZONTAL
431.580000	34.20	22.0	46.0	11.8	QP	100.0	0.00	HORIZONTAL
928.220000	38.10	31.5	46.0	7.9	QP	100.0	0.00	HORIZONTAL

Channel Middle Spurious Emission (30~1000MHz) Of Vertical

EUT:	WiConnect System
M/N:	WiConnect System
Operating Condition:	Continuous Transmit
Test Site:	3m CHAMBER
Operator:	Owen Li
Test Specification:	DC 5V from adapter
Comment:	Polarization: Vertical
	Tem:23℃ Hum:50%

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT:

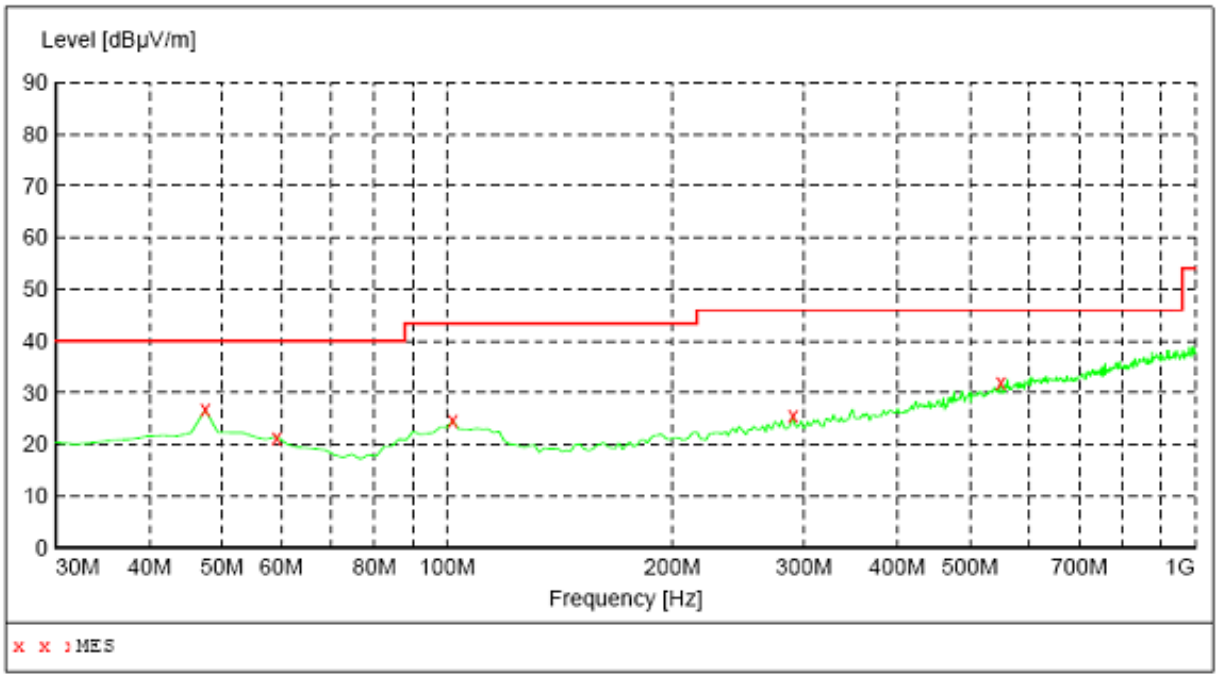
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	22.80	15.8	40.0	17.2	QP	100.0	0.00	VERTICAL
57.160000	21.60	15.1	40.0	18.4	QP	100.0	0.00	VERTICAL
156.100000	24.30	13.6	43.5	19.2	QP	100.0	0.00	VERTICAL
191.020000	26.70	16.1	43.5	16.8	QP	100.0	0.00	VERTICAL
367.560000	33.60	20.7	46.0	12.4	QP	100.0	0.00	VERTICAL
835.100000	37.90	30.1	46.0	8.1	QP	100.0	0.00	VERTICAL

Channel High Spurious Emission (30~1000MHz) Of Horizontal

EUT:	WiConnect System
M/N:	WiConnect System
Operating Condition:	Continuous Transmit
Test Site:	3m CHAMBER
Operator:	Owen Li
Test Specification:	DC 5V from adapter
Comment:	Polarization: Horizontal
	Tem:26℃ Hum:50%

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT:

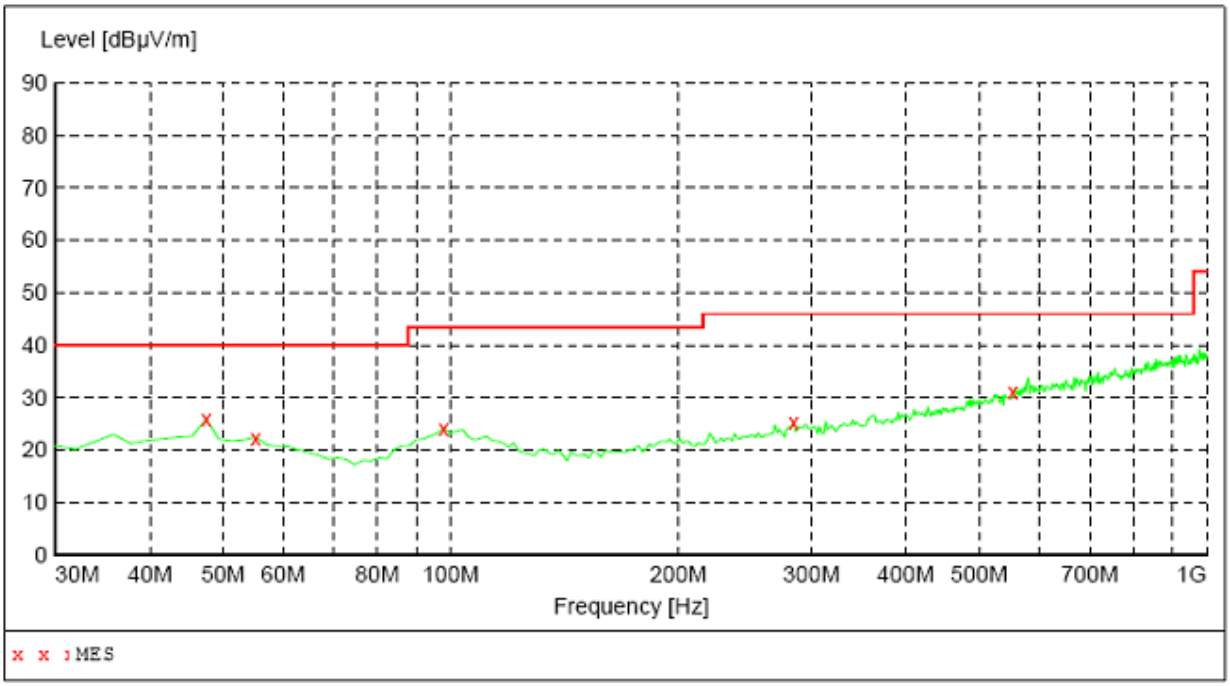
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	26.70	15.8	40.0	13.3	QP	100.0	0.00	HORIZONTAL
59.100000	21.50	14.6	40.0	18.5	QP	100.0	0.00	HORIZONTAL
101.780000	24.60	17.4	43.5	18.9	QP	100.0	0.00	HORIZONTAL
289.960000	25.60	18.4	46.0	20.4	QP	100.0	0.00	HORIZONTAL
549.920000	31.90	25.2	46.0	14.1	QP	100.0	0.00	HORIZONTAL

Channel High Spurious Emission (30~1000MHz) Of Vertical

EUT:	WiConnect System
M/N:	WiConnect System
Operating Condition:	Continuous Transmit
Test Site:	3m CHAMBER
Operator:	Owen Li
Test Specification:	DC 5V from adapter
Comment:	Polarization: Vertical
	Tem:26℃ Hum:50%

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	25.90	15.8	40.0	14.1	QP	100.0	0.00	VERTICAL
55.220000	22.40	15.6	40.0	17.6	QP	100.0	0.00	VERTICAL
97.900000	24.20	17.4	43.5	19.3	QP	100.0	0.00	VERTICAL
284.140000	25.20	18.3	46.0	20.8	QP	100.0	0.00	VERTICAL
553.800000	31.20	25.3	46.0	14.8	QP	100.0	0.00	VERTICAL

Spurious Emission (1~26GHz)

Indicated		Table	Test Antenna		Correction Factor dB	Absolute Level dBuV/m	Limit dBuV/m	Margin dB
Frequency MHz	Meter Reading dBuV/m	Angle Degree	Height Meter	Polar H/V				
Tx mode								
LowChannel								
4812.03	53.37	45	1.5	v	-3.24	50.13	54	3.87
4812.15	53.12	45	1.5	V	-3.24	49.88	54	4.12
7218.26	48.42	45	1.5	H	-3.06	45.36	54	8.64
7218.38	47.85	45	1.5	V	-3.06	44.79	54	9.21
Middle Channel								
4892.19	53.26	60	1.6	H	-3.21	50.05	54	3.95
4892.63	52.45	180	1.6	V	-3.21	49.24	54	4.76
7338.87	48.54	45	1.5	H	-3.11	45.43	54	8.57
7338.71	47.74	45	1.5	V	-3.11	44.63	54	9.37
High Channel								
4944.51	53.23	60	1.6	H	-3.21	50.02	54	3.98
4944.93	52.35	180	1.6	V	-3.21	49.14	54	4.86
7416.72	48.14	45	1.5	H	-3.06	45.08	54	8.92
7416.49	47.28	45	1.5	V	-3.06	44.22	54	9.78

12. ANTENNA REQUIREMENT

12.1 Standard Applicable

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Section 15.247(b)/(c):

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

12.2 Antenna Connected Construction

The antenna connector is designed with permanent attachment and no consideration of replacement.