Prüfbericht-Nr.: *Test Report No.:*	**50074914 002**	**Auftrags-Nr.:** *Order No.:*	164085698	**Seite 1 von 27** *Page 1 of 27*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	14.02.2017	
Auftraggeber: *Client:*	**Qingdao Intelligent&Precise Electronics Co.,Ltd.** No.218,Qianwangang Road Qingdao Economic&Technological Development Zone, Qingdao, Shandong, China			
Prüfgegenstand: *Test item:*	IEEE 802.11 a/b/g/n/ac 2.4GHz+5GHz 2T2R USB Module			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	ZDGFMT7612U			
Auftrags-Inhalt: *Order content:*	FCC Certification			
Prüfgrundlage: *Test specification:*	CFR47 FCC Part15: Subpart C Section 15.407 CFR47 FCC Part15: Subpart C Section 15.207 CFR47 FCC Part15: Subpart C Section 15.209 CFR47 FCC Part2: Section 2.1091 KDB 447498 D01 General RF Exposure Guidance v06			

Wareneingangsdatum: *Date of receipt:*	14.02.2017	Refer to Photo Document
Prüfmuster-Nr.: *Test sample No.:*	ZDGFMT7612U-003	
Prüfzeitraum: *Testing period:*	14.02.2017 - 27.03.2017	
Ort der Prüfung: *Place of testing:*	EMTEK (Shenzhen) Co., Ltd.	
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.	
Prüfergebnis*: *Test result*:*	PASS	

geprüft von / *tested by:*

01.04.2017 Lin Lin / Project Manager

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by:*

01.04.2017 Sam Lin / Technical Certifier

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other:*
FCC ID: 2AJVQ-ZDGFMT7612U

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 MAXIMUM CONDUCTED OUTPUT POWER
RESULT: Pass

5.1.3 POWER SPECTRAL DENSITY
RESULT: Pass

5.1.4 FREQUENCY STABILITY
RESULT: Pass

5.1.5 26DB BANDWIDTH AND 99% BANDWIDTH
RESULT: Pass

5.1.6 6DB BANDWIDTH
RESULT: Pass

5.1.7 RADIATED SPURIOUS EMISSION
RESULT: Pass

5.1.8 DYNAMIC FREQUENCY SELECTION (DFS)
RESULT: Pass

5.1.9 CONDUCTED EMISSION ON AC MAINS
RESULT: Pass

Table of Contents

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendixes:
Appendix A: Test data of 5GHz bands WiFi
Appendix B: Test data of RF Exposure

2. Test Sites

2.1 Test Facilities

EMTEK (Shenzhen) Co., Ltd.
Address: Bldg. 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China.

FCC Registration No.: 406365

Note: The tests at the test site have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio (EMTEK)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Analyzer	Agilent	N9010A	My53470879	May.28, 2016	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	FSV40	132.1-3008K39-100967-AP	May 28, 2016	1 Year
3.	Power Analyzer	Agilent	PS-X10-200	N/A	May.28, 2016	1 Year
4.	Test Accessories	Agilent	PS-X10-100	N/A	May.28, 2016	1 Year
5.	Cable	Agilent	N/A	3#	May.28, 2016	1 Year
6.	Cable	Agilent	N/A	5#	May.28, 2016	1 Year
7.	Temperature&Humidity test chamber	ESPEC	EL-02KA	12107166	May.28, 2016	1 Year
Spurious Emissions (EMTEK)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	101414	May 28, 2016	1 Year
2.	Loop Antenna	Schwarzbeck	FMZB 1519	1519-012	May 28, 2016	1 Year
3.	Pre-Amplifier	LUNAR-EM	LNA30M3G-25	J101000000071	May 28, 2016	1 Year
4.	Bilog Antenna	Schwarzbeck	VULB9163	660	May 29, 2016	1 Year
5.	Cable	H+B	NmSm-05-C15052		May 29, 2016	1 Year
6.	Cable	H+B	NmSm-2-C15201		May 29, 2016	1 Year
7.	Cable	H+B	NmNm-7-C15702		May 29, 2016	1 Year
8.	EMI Test Receiver	Rohde & Schwarz	FSV40	132.1-3008K39-100967-AP	May 28, 2016	1 Year
9.	Pre-Amplifier	Lunar EM	LNA1G18-48	J101113101000 1	May 28, 2016	1 Year
10.	Pre-Amplifier	Lunar EM	LNA18G26-40	J101213101000 1	May 28, 2016	1 Year
11.	Horn Antenna	Schwarzbeck	BBHA 9120	1178	May 29, 2016	1 Year
12.	Horn Antenna	Schwarzbeck	BBHA 9170	RS1307229170547	May 29, 2016	1 Year
13.	Horn Antenna	AHS/USA	SAS-573	184	May 29, 2016	1 Year
14.	Cable	H+B	SAC-40G-1	414	May 29, 2016	1 Year
15.	Cable	H+B	SUCOFLEX104	MY14871/	May 29, 2016	1 Year

				4		
16.	Cable	H+B	BLU18A-NmSm-6500	D8501	May 29, 2016	1 Year
17.	Cable	A.H	SAC-40G-1	413	May 29, 2016	1 Year
Conducted Emissions (EMTEK)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	26115-010-0027	May 28, 2016	1 Year
2.	L.I.S.N.	Rohde & Schwarz	ENV216	101161	May 28, 2016	1 Year
3.	50Ω Coaxial Switch	Anritsu	MP59B	6100175589	May 29, 2016	1 Year
4.	Voltage Probe	Rohde & Schwarz	ESH2-Z3	100122	May 29, 2016	1 Year

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Uncertainty of Measurement

The value of the measurement uncertainty of each parameter is listed as below:

Table 2: Measurement Uncertainty

Test Item	**Uncertainty**
RF Output Power	±1.5 dB
Power Spectral Density	±3.0 dB
Frequency Error	±3.3%
Occupied Channel Bandwidth	±5%
Conducted Spurious Emissions	±3.0 dB
Radiated Spurious Emissions	±3.7dB (below 30MHz) ±3.78dB (30MHz~1GHz) ±4.46dB (1~6GHz) ±4.96dB (6~18GHz)
Conducted Emissions	±2.9dB
Temperature	±3.2%
Humidity	±2.5%

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A and Appendix B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The EMTEK (Shenzhen) Co., Ltd. Test facility located at Bldg. 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a WiFi module which that support IEEE 802.11 a/b/g/n/ac protocols.

Note: This report is for 5GHz Bands only.

For details refer to user manual and circuit diagram.

3.2 Ratings and System Details

Table 3: Technical Specification

Technical Specification	Value	
Frequency Bands	2400-2483.5MHz 5150-5350MHz 5470-5725MHz 5725-5850MHz	
Operating Frequency/Channels/Protocol	20MHz Bandwidth	2412-2462MHz/11CH/802.11b/g/n-HT20 5180-5320MHz/8CH/802.11a/n-HT20/ac20 5500-5700MHz/11CH/802.11a/n-HT20/ac20 5745-5825MHz/5CH/802.11a/n-HT20/ac20
	40MHz Bandwidth	2422-2452MHz/7CH/802.11n-HT40 5190-5310MHz/4CH/802.11n-HT40/ac40 5510-5670MHz/5CH/802.11n-HT40/ac40 5755-5795MHz/2CH/802.11n-HT40/ac40
	80MHz Bandwidth	5210-5290MHz/2CH/802.11ac80 5530-5610MHz/2CH/802.11ac80 5775MHz/1CH/802.11ac80
Channel Spacing	5 MHz	
Extreme Temperature Range	-10~+70 ℃	
Type of Product	Client Device without Radar Detection	
TX Power Control (TPC)	Not Supported	
Modulation	CCK, DSSS, OFDM	
Antenna Number	2	
Antenna Type	Onboard Omni-directional antenna	
Antenna Gain	Ant0: 2.9dBi, Ant1: 2.9dBi	
Operation Voltage	USB Operated	

Table 4: 2.4GHz Band channel and frequency (2.4GHz Band, 20MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

Table 5: 2.4GHz Band channel and frequency (2.4GHz Band, 40MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)

3	2422	8	2447
4	2427	9	2452
5	2432	10	2457
6	2437	11	2462
7	2442		

Table 6: 5GHz Bands channel and frequency (U-NII-1 and U-NII-2A Bands, 20MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
36	5180	52	5260
40	5200	56	5280
44	5220	60	5300
48	5240	64	5320

Table 7: 5GHz Bands channel and frequency (U-NII-2C Band, 20MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
100	5500	124	5620
104	5520	128	5640
108	5540	132	5660
112	5560	136	5680
116	5580	140	5700
120	5600		

Table 8: 5GHz Bands channel and frequency (U-NII-3 Band, 20MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785		

Table 9: 5GHz Bands channel and frequency (U-NII-1 and U-NII-2A Bands, 40MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
38	5190	54	5270
46	5230	62	5310

Table 10: 5GHz Bands channel and frequency (U-NII-2C Band, 40MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
102	5510	126	5630
110	5550	134	5670
118	5590		

Table 11: 5GHz Bands channel and frequency (U-NII-3 Band, 40MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
151	5755	159	5795

Table 12: 5GHz Bands channel and frequency (U-NII-1 and U-NII-2A Bands, 80MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
42	5210	58	5290

Table 13: 5GHz Band channel and frequency (U-NII-2C Band, 80MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
106	5530	122	5610

Table 14: 5GHz Band channel and frequency (U-NII-3 Band, 80MHz bandwidth)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
155	5775		

3.3 Independent Operation Modes

The basic operation modes are:

A. Tx, (5GHz Bands, 802.11a/n/ac)
   1. Lowest channel
   2. Middle channel
   3. Highest channel

B. WiFi on

C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Application Form
- Circuit Diagram
- Instruction Manual
- Photo Documents
- Technical Description
- Bill of Material
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emissions: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10:2013.

Table 15: 5GHz bands Test channels

Test channels	20MHz Bandwidth	CH36-5180/CH40-5200/CH48-5240MHz CH52-5260/CH56-5280/CH64-5320MHz CH100-5500/CH120-5600/CH140-5700MHz CH149-5745/CH157-5785/CH165-5825MHz
	40MHz Bandwidth	CH38-5190/CH46-5230MHz CH54-5270/CH62-5310MHz CH102-5510/CH118-5590/CH134-5670MHz CH151-5755/CH159-5795MHz
	80MHz Bandwidth	CH42-5210 CH58-5290 CH106-5530MHz/CH122-5610MHz CH155-5775MHz

Table 16: Antenna operation modes

Operating Mode	1Tx/1Rx	2Tx/2Rx
802.11a/n/ac	Ant0	
802.11n/ac		Ant0+Ant1

Table 17: Worst case test modes

Operating Mode	Worst Test Mode	
	Mode	Duty Cycle
802.11a	54 Mbit/s	>98%
802.11ac	MCS0	>98%
802.11n-HT20	MCS0 and MCS8	>98%
802.11n-HT40	MCS0 and MCS8	>98%

4.3 Special Accessories and Auxiliary Equipment

Table 18: List of Accessories and Auxiliary Equipment

Description	**Manufacturer**	**Model**	**S/N**
Notebook	LENOVO	WB0205140E	WB06355728
Monitor	DELL	E2013HC	CN-0841PW-64180-341-0KRS
PC	LENOVO	9702	L3C4410
Printer	HP	C89520	CN25S182N6
Wireless Access Point	Cisco	AIR-CAP3702E-A-K9	FTX182276QD FCC ID: LDK102087

			IC ID: 2461B-102087
USB Cable	Hisense	Shielded, 30cm	--

4.4 Countermeasures to Achieve ERM Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF). No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

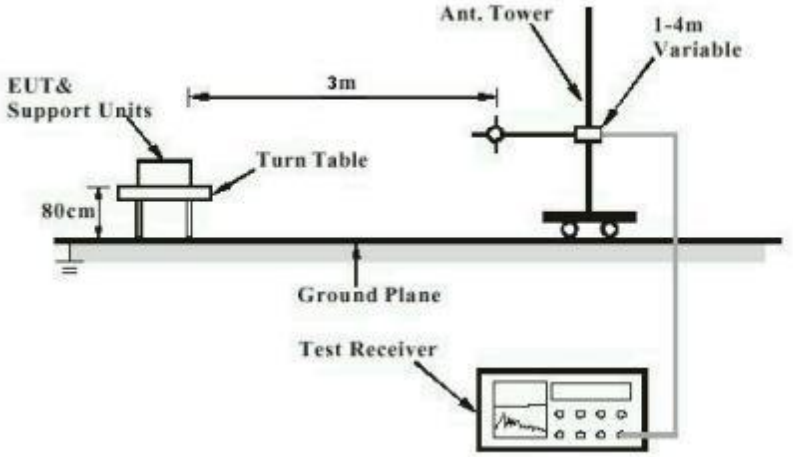


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

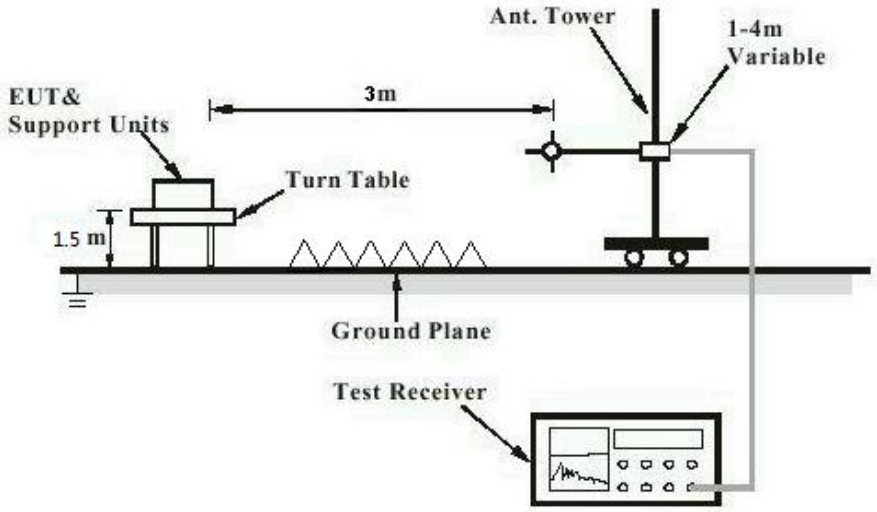


Diagram of Measurement Configuration for Mains Conduction Measurement

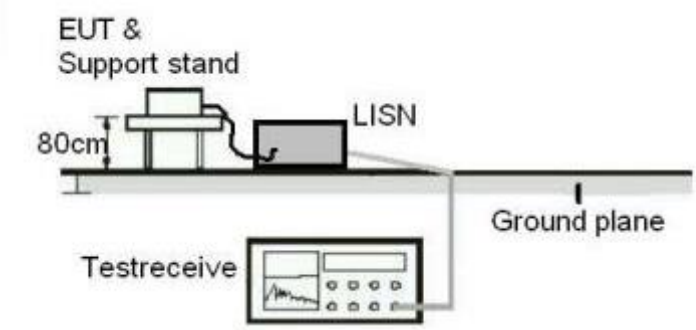


Diagram of Measurement Configuration for Conducted Transmitter Measurement

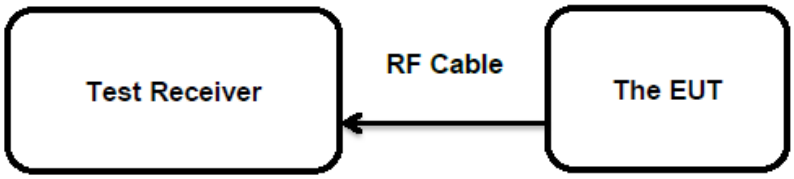
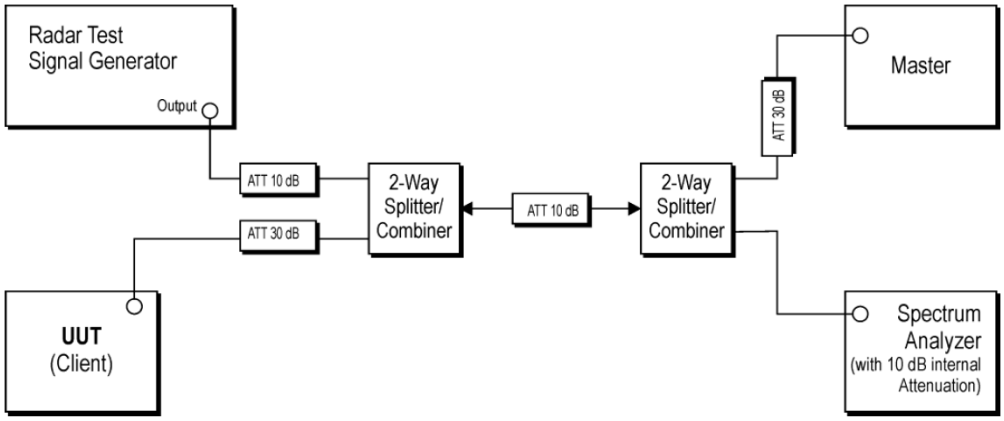


Diagram of Measurement Configuration for Dynamic Frequency Selection (DFS)



5. Test Results

5.1 Radio Test Requirement & Test Suites (5GHz Bands)

5.1.1 Antenna Requirement

RESULT: **Pass**

Test Specification
Test standard : FCC Part 15.203

The EUT has an Onboard Omni-directional antenna, the directional gain of antenna is 2.9dBi for Ant0, 2.9dBi for Ant1 and Total antenna gain (Ant0+Ant1) is 5.9dBi (KDB 662911 D01), and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Maximum conducted output power

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (a)
Basic standard	:	ANSI C63.10:2013
Limits	:	<250mW (24dBm) (5150-5250MHz) *<250mW (24dBm) (5250-5350MHz, 5470-5725MHz) *250 mW (24dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz, where is lesser. <1W (30dBm) (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2017.03.09
Input voltage	:	USB Operated
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix A for details of test data.

5.1.3 Power Spectral Density

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (a)
Basic standard	:	ANSI C63.10:2013
Limits	:	<11dBm/MHz (5150-5250MHz 5250-5350MHz, 5470-5725MHz) <30dBm/500KHz (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2017.03.09
Input voltage	:	USB Operated
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix A for details of test data.

5.1.4 Frequency Stability

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (g)
Basic standard	:	ANSI C63.10:2013
Limits	:	Within assigned bands
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2017.03.09
Input voltage	:	USB Operated
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix A for details of test data.

5.1.5 26dB Bandwidth and 99% Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407
Basic standard	:	ANSI C63.10:2013
Limits	:	N/A
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2017.03.08 to 2017.03.09
Input voltage	:	USB Operated
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix A for details of test data.

5.1.6 6dB Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407 (e)
Basic standard	:	ANSI C63.10:2013
Limits	:	At least 500KHz (5725-5850MHz)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2017.03.08
Input voltage	:	USB Operated
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix A for details of test data.

5.1.7 Radiated Spurious Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(b) & FCC Part 15.205 & FCC Part 15.209
Basic standard	:	ANSI C63.10:2013
Limits	:	• For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. • For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. • For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz. • For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. • Restricted Bands meet the requirement of 15.209 limit
Kind of test site	:	3m Semi-Anechoic Chamber (below 1GHz) 3m Anechoic Chamber (above 1GHz)

Test Setup

Date of testing	:	2017.03.05 to 2017.03.24
Input voltage	:	USB Operated
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	23 ℃
Relative humidity	:	48 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix A for details of test data.

5.1.8 Dynamic Frequency Selection (DFS)

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.407(h) 5250-5350MHz, 5470-5725MHz Channel Move Time: Within 10 seconds.
Limits	:	Channel Closing Transmission Time: 200ms+aggregate of 60ms over remaining 10s period; Non-Occupancy Period: at least 30 minutes.
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2017.03.21
Input voltage	:	USB Operated
Operation mode	:	A
Test channel	:	CH58 and CH122
Ambient temperature	:	23 ℃
Relative humidity	:	48 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix A for details of test data.

5.1.9 Conducted Emission on AC Mains

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.207
Basic standard	:	ANSI C63.10:2013
Frequency range	:	0.15 - 30MHz
Limits	:	FCC Part 15.207
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2017.03.10
Input voltage	:	USB Operated from PC
Operation mode	:	B
Earthing	:	Not connected
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Refer to attached Appendix A for details of test data.