

Prüfbericht-Nr.: <i>Test report No.:</i>	60386508 001	Auftrags-Nr.: <i>Order No.:</i>	170245339	Seite 1 von 25 <i>Page 1 of 25</i>	
Kunden-Referenz-Nr.: <i>Client reference No.:</i>	N/A	Auftragsdatum: <i>Order date.:</i>	12.06.2020		
Auftraggeber: <i>Client:</i>	INNOVATIVE TECHNOLOGY ELECTRONICS LLC 1 CHANNEL DRIVE, PORT WASHINGTON, NY 11050, USA				
Prüfgegenstand: <i>Test item:</i>	Bluetooth Boombox				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	VBB-20XXXX (XXXX can be 0-9 or A to Z or blank and means unit color or pattern)				
Auftrags-Inhalt: <i>Order content:</i>	FCC and IC approval				
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247 RSS-247 Issue 2 February 2017 CFR47 FCC Part 15: Subpart C Section 15.207 RSS-Gen Issue 5 March 2019 CFR47 FCC Part 15: Subpart C Section 15.209 RSS-102 Issue 5 March 2015 CFR47 FCC Part 2: Section 2.1091				
Wareneingangsdatum: <i>Date of receipt:</i>	24.06.2020	Please refer to photo documents			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000899019-005				
Prüfzeitraum: <i>Testing period:</i>	Refer to test report				
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Guangdong) Ltd.				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Guangdong) Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
 05.08.2020 Amy Wang / Project Manager		 05.08.2020 Storm Shu / Technical Certifier			
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:					
FCC ID: 2AFHW-VBB20 IC: 9577A-VBB20 HVIN: VBB20					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged:</i>		
* 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 specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

V04

Test Summary

5.1.1 ANTENNA REQUIREMENT*RESULT: Pass***5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER***RESULT: Pass***5.1.3 99% BANDWIDTH***RESULT: Pass***5.1.4 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHz BANDWIDTH***RESULT: Pass***5.1.5 RADIATED SPURIOUS EMISSION***RESULT: Pass***5.1.6 20dB BANDWIDTH***RESULT: Pass***5.1.7 CARRIER FREQUENCY SEPARATION***RESULT: Pass***5.1.8 NUMBER OF HOPPING FREQUENCY***RESULT: Pass***5.1.9 TIME OF OCCUPANCY***RESULT: Pass***5.1.10 CONDUCTED EMISSION ON AC MAINS***RESULT: Pass***6.1.1 ELECTROMAGNETIC FIELDS***RESULT: Pass*

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Guangdong) Ltd.

No.102, 1F of Southwest and No.205, 2F No.767 Tianyuan Road, Tianhe District, Guangzhou 510663,
Guangdong Province P.R. China

FCC Accreditation Designation No.: CN1207

Test site Industry Canada No.: 2932C-1

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

For the measurement Equipment list, refer to the appendix B.

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 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Item		Extended Uncertainty
Conducted Emission		± 3.17 dB
Radiated Emission (30-1000MHz)	Field strength (dBμV/m)	± 5.16 dB
Radiated Emission (above 1000MHz)	Field strength (dBμV/m)	± 2.22 dB
Radio Spectrum		± 4.51 dB

2.6 Location of Original Data

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

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Guangdong) Ltd. Test facility located at No.102, 1F of Southwest and No.205, 2F No.767 Tianyuan Road, Tianhe District, Guangzhou 510663, Guangdong Province P.R. 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 "Bluetooth Boombox" for indoor use. The unit supports BT5.0 wireless technologies.

Model difference:

The models VBB-20XXXX are identical to each other except for model name and unit color or pattern. According to the above information, all applicable tests have been performed on VBB-20.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Bluetooth Boombox
Type Designation	VBB-20XXXX
FCC ID	2AFHW-VBB20
IC	9577A-VBB20
HVIN	VBB20
Operating Voltage	AC 120V, 60Hz
Testing Voltage	AC 120V, 60Hz
Technical Specification of Bluetooth 5.0 (Single mode)	
Operating Frequency	2402 - 2480 MHz
Type of Modulation	GFSK, $\pi/4$ DQPSK
Channel Number	79 channels
Channel Separation	1 MHz
Antenna Type	Integral Antenna
Gain	-0.58 dBi

Table 3: RF Channel and Frequency

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402.00	20	2422.00	40	2442.00	60	2462.00
1	2403.00	21	2423.00	41	2443.00	61	2463.00
2	2404.00	22	2424.00	42	2444.00	62	2464.00
3	2405.00	23	2425.00	43	2445.00	63	2465.00
4	2406.00	24	2426.00	44	2446.00	64	2466.00
5	2407.00	25	2427.00	45	2447.00	65	2467.00
6	2408.00	26	2428.00	46	2448.00	66	2468.00
7	2409.00	27	2429.00	47	2449.00	67	2469.00

8	2410.00	28	2430.00	48	2450.00	68	2470.00
9	2411.00	29	2431.00	49	2451.00	69	2471.00
10	2412.00	30	2432.00	50	2452.00	70	2472.00
11	2413.00	31	2433.00	51	2453.00	71	2473.00
12	2414.00	32	2434.00	52	2454.00	72	2474.00
13	2415.00	33	2435.00	53	2455.00	73	2475.00
14	2416.00	34	2436.00	54	2456.00	74	2476.00
15	2417.00	35	2437.00	55	2457.00	75	2477.00
16	2418.00	36	2438.00	56	2458.00	76	2478.00
17	2419.00	37	2439.00	57	2459.00	77	2479.00
18	2420.00	38	2440.00	58	2460.00	78	2480.00
19	2421.00	39	2441.00	59	2461.00	/	/

Test frequencies are lowest channel: 2402 MHz, middle channel: 2441 MHz and highest channel: 2480 MHz.

Table 4: Frequency Hopping Information

Technical Specification	Description
Hopping Range	Hereby we declare that the frequency range of this device is: 2402-2480MHz. This is according the Bluetooth Core Specification V5.0 (single mode) for devices which will be operated in the USA. This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04-E).
Hopping Sequence	Example of a 79 hopping sequence in data mode: 33,04,21,44,23,42,53,46,55,48,40,59,72,29,76,31,08,73,07,75,09,45,60,39,58,13,47,11,77,52,35,50,65,54,67,56,69,62,71,64, 7,25,27,66,57,70,74,61,78,63,10,41,05,43,15,44,64,68,02,70,06,01,51,03,55,05,03,66,53,49,36,47,
Receiver input bandwidth	The input bandwidth of the receiver is 1MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings. Repeating of a packer has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Traditional Bluetooth
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel
- B. On, Traditional Bluetooth on Hopping channel
- C. On, Normal operation mode
- D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- | | |
|----------------------------------|------------------|
| - Application Form | - Photo Document |
| - Block Diagram | - Schematics |
| - FCC/IC Label and Location Info | - User Manual |
| - Operation Description | |

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.

Emission: 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 and Test Software

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

According to clause 3.1, all tests were performed on model VBB-20 in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 5: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Notebook	Lenovo	E46A	EB24320428	N/A
iPhone	Apple	A1586	/	N/A

4.4 Countermeasures to Achieve EMC 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)

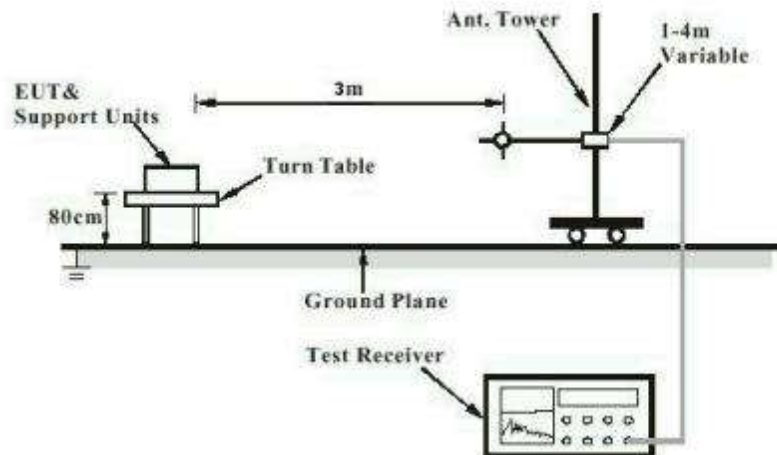


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

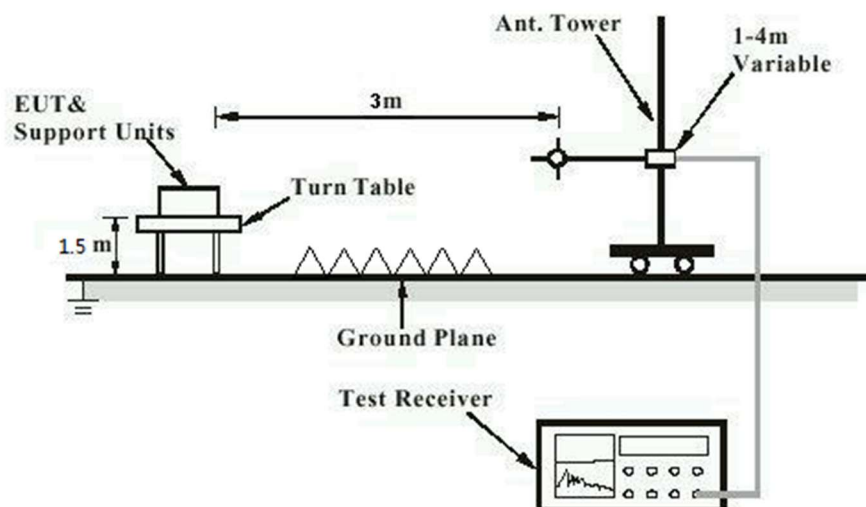


Diagram of Measurement Configuration for Mains Conduction Measurement

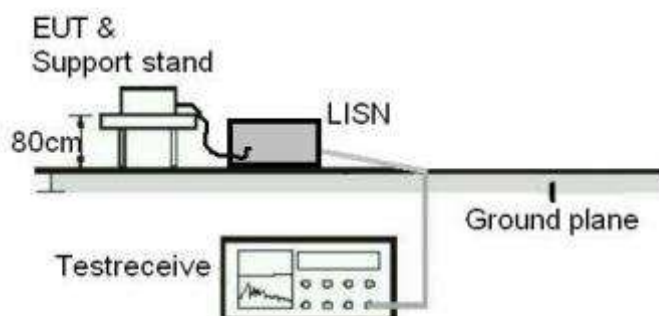
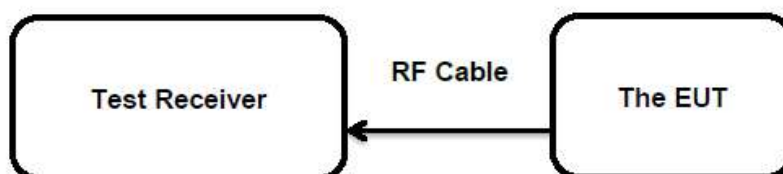


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Pass****Test Specification**

Test standard : FCC Part 15.247(b)(4) and Part 15.203

According to the manufacturer declared, the EUT has one internal antenna, the directional gain of antenna is -0.58dBi, 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 Peak Conducted Output Power

RESULT:
Pass
Test Specification

Test standard	: FCC Part 15.247(b)(1)&(3) RSS-247 Clause 5.4(b)&(d)
Basic standard	: ANSI C63.10: 2013
Limits	: FHSS < 0.125 Watts
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 22.07.2020
Input voltage	: AC 120V, 60Hz
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 24 °C
Relative humidity	: 50 %
Atmospheric pressure	: 101 kPa

For details refer to following test result.

Table 6: Test Result of Maximum Peak Conducted Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
BDR	2402	-18.02	0.016	< 0.125
	2441	-20.46	0.009	
	2480	-21.28	0.007	
Maximum Measured Value		-18.02	0.016	

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
EDR	2402	-18.87	0.013	< 0.125
	2441	-20.11	0.010	
	2480	-20.98	0.008	
Maximum Measured Value		-18.87	0.013	

Note:

- 1) The cable loss is taken into account in results.
- 2) Antenna gain(G) of FHSS: -0.58dBi,
The Maximum peak conducted output power (e.i.r.p.)= $P_{(Peak\ power)} + G$, which is far below the 4 W

5.1.3 99% Bandwidth

RESULT:**Pass****Test Specification**

Test standard : RSS-Gen Clause 6.6
Basic standard : ANSI C63.10: 2013
Kind of test site : Shielded Room

Test Setup

Date of testing : 22.07.2020
Input voltage : AC 120V, 60Hz
Operation mode : A
Test channel : Low / Middle / High
Ambient temperature : 24 °C
Relative humidity : 50 %
Atmospheric pressure : 101 kPa

For details refer to following test result.

Table 7: Test Result of 99% Bandwidth

Test Mode	Test Channel (MHz)	99% Bandwidth (MHz)	Limit
BDR	2402	0.86	/
	2441	0.85	
	2480	0.86	
Maximum Measured Value		0.86	

Test Mode	Test Channel (MHz)	99% Bandwidth (MHz)	Limit
EDR	2402	1.19	/
	2441	1.19	
	2480	1.18	
Maximum Measured Value		1.19	

5.1.4 Conducted Spurious Emissions Measured in 100 kHz Bandwidth**RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.247(d) RSS-247 Clause 5.5
Basic standard	: ANSI C63.10: 2013
Limits	: 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: Refer to test result
Input voltage	: AC 120V, 60Hz
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 24 °C
Relative humidity	: 50 %
Atmospheric pressure	: 101 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix B.

5.1.5 Radiated Spurious Emission

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Clause 3.3
Basic standard	: ANSI C63.10: 2013
Limits	: Refer to 15.209(a) of FCC part 15.247(d) RSS-Gen Issue 5 Table 4
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: Refer to test result
Input voltage	: AC 120V, 60Hz
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 22 °C
Relative humidity	: 53 %
Atmospheric pressure	: 101 kPa

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix B.

5.1.6 20dB Bandwidth

RESULT:
Pass
Test Specification

Test standard : FCC Part 15.247(a)(1)
RSS-247 Clause 5.1(a)
Basic standard : ANSI C63.10: 2013
Kind of test site : Shielded Room

Test Setup

Date of testing : 22.07.2020
Input voltage : AC 120V, 60Hz
Operation mode : A
Test channel : Low / Middle / High
Ambient temperature : 24 °C
Relative humidity : 50 %
Atmospheric pressure : 101 kPa

For details refer to following test result.

Table 8: Test Result of 20dB Bandwidth

Test Mode	Test Channel (MHz)	20dB Bandwidth (kHz)	2/3 of 20dB Bandwidth (kHz)	Limit (MHz)
BDR	2402	955.77	637.180	/
	2441	952.56	635.040	
	2480	950.64	633.760	
Maximum Measured Value		955.77	637.180	

Test Mode	Test Channel (MHz)	20dB Bandwidth (kHz)	2/3 of 20dB Bandwidth (kHz)	Limit (MHz)
EDR	2402	1312.18	874.787	/
	2441	1313.46	875.640	
	2480	1315.39	876.927	
Maximum Measured Value		1315.39	876.927	

5.1.7 Carrier Frequency Separation

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.247(a)(1) RSS-247 Clause 5.1(b)
Basic standard	: ANSI C63.10: 2013
Limits	: $\geq 25\text{kHz}$ or $2/3$ of 20dB bandwidth, whichever is greater
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 22.07.2020
Input voltage	: AC 120V, 60Hz
Operation mode	: C
Test channel	: Low / Middle / High
Ambient temperature	: 24 °C
Relative humidity	: 50 %
Atmospheric pressure	: 101 kPa

For details refer to following test result.

Table 9: Test Result of Carrier Frequency Separation

Test Mode	Test Channel	Test Channel (MHz)	Measured Channel Separation (KHz)	Limit (kHz)
FHSS	Low Channel	2402	1000.0	≥ 25kHz or 2/3 of 20dB bandwidth
	Adjacency Channel	2403		
	Middle Channel	2441	1000.0	
	Adjacency Channel	2442		
	High Channel	2480	1000.0	
	Adjacency Channel	2479		

Note: The limit is maximum 2/3 of the 20 dB bandwidth: 637.180 KHz.
Only the worst case BDR (DH5 packet) were recorded in this report.

5.1.8 Number of Hopping Frequency

RESULT:**Pass****Test Specification**

Test standard : FCC part 15.247(a)(1)(iii)
RSS-247 Clause 5.1(d)
Basic standard : ANSI C63.10: 2013
Limits : ≥ 15 non-overlapping channels
Kind of test site : Shielded Room

Test Setup

Date of testing : 22.07.2020
Input voltage : AC 120V, 60Hz
Operation mode : C
Ambient temperature : 24 °C
Relative humidity : 50 %
Atmospheric pressure : 101 kPa

For details refer to following test result.

Table 10: Test Result of Number of Hopping Frequency

Test Mode	Frequency Range	Measured Quantity of Hopping Channel	Limit
FHSS	2402 - 2480 MHz	79	≥ 15

5.1.9 Time of Occupancy

RESULT:
Pass
Test Specification

Test standard : FCC part 15.247(a)(1)(iii)
RSS-247 Clause 5.1(d)

Basic standard : ANSI C63.10: 2013

Limits : < 0.4s

Kind of test site : Shielded Room

Test Setup

Date of testing : 22.07.2020

Input voltage : AC 120V, 60Hz

Operation mode : B

Test channel : Low / Middle / High

Ambient temperature : 24 °C

Relative humidity : 50 %

Atmospheric pressure : 101 kPa

For details refer to following test result.

Table 11: Test Result of Time of Occupancy

Test Mode	Test Channel (MHz)	Pulse Width(ms)	Number of Channels	Measured Dwell Time(s)	Limit (s)
BDR	2402	2.894	110	0.318	0.4s
	2441	2.894	110	0.318	
	2480	2.894	110	0.318	

Test Mode	Test Channel (MHz)	Pulse Width(ms)	Number of Channels	Measured Dwell Time(s)	Limit (s)
EDR	2402	2.904	110	0.319	0.4s
	2441	2.904	110	0.319	
	2480	2.904	110	0.319	

Note:

Dwell time = Pulse width x Number of channels in Period

Period = 0.4 (seconds/ channel) x 79 (channel) = 31.6 seconds

Pre-test the different type of Modulation for this test. Only the worst case BDR (DH5 packet) and EDR (2DH5 packet) were recorded in this report.

5.1.10 Conducted Emission on AC Mains**RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.207(a) RSS-Gen Clause 8.8
Basic standard	: ANSI C63.10: 2013
Frequency range	: 0.15 – 30MHz
Limits	: FCC Part 15.207(a) RSS-Gen Table 3
Kind of test site	: Shielded Room

Test Setup

Date of testing	: Refer to test result
Input voltage	: AC 120V, 60Hz
Operation mode	: C
Earthing	: Not connected
Ambient temperature	: 25 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix B.

6 Safety Human Exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:**Pass****Test Specification**

Test standard : CFR47 FCC Part 2: Section 2.1091
CFR47 FCC Part 1: Section 1.1310
FCC KDB Publication 447498 D01 v06
RSS-102 Issue 5 March 2015

The minimum distance for the EUT is less than 5mm.
Since maximum peak output power of the transmitter is 0.016 mW <10 mW.

Hence the EUT is excluded from SAR evaluation according to FCC KDB Publication 447498 D01 General RF Exposure Guidance v06.

The maximum peak output power of the transmitter is -18.02 dBm (0.016 mW), which is far below the SAR exclusion threshold level 4 mW $\approx$ 6.02 dBm.

Hence the EUT is exempted from routine evaluation limits (SAR Evaluation) according to clause 2.5.1 of RSS-102 Issue 5.

7 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

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