



тс					
	SI NEFUNI				
Report No	CHTEW19050090	Report Verification:			
Project No	SHT1904069802EW				
FCC ID:	2AK4CBB20US				
Applicant's name:	Petcube, Inc.				
Address	2711 Centerville Road,Suite 400,Wilmington Delaware United States 19808				
Manufacturer	Petcube, Inc.				
Address	2711 Centerville Road,Suite 400,Wilmington Delaware United States 19808				
Test item description:	Petcube Bites 2				
Trade Mark	Petcube				
Model/Type reference:	BB20US				
Listed Model(s)					
Standard:	part C Section 15.247				
Date of receipt of test sample:	Apr.24, 2019				
Date of testing	Apr.24, 2019- May.22, 2019				
Date of issue	May.23, 2019				
Result	PASS				
Compiled by (Position+Printed name+Signature):	File administrators Fanghui Zhu	Jong Mir Zhu			
Supervised by (Position+Printed name+Signature):	Project Engineer Jerry Zhao	Jerry shaa			
Approved by (position+printedname+signature):	RF Manager Hans Hu	Homsty			
Testing Laboratory Name: :	Shenzhen Huatongwei Intern	ational Inspection Co., Ltd.			
Address	1/F, Bldg 3, Hongfa Hi-tech Ind Tianliao, Gongming, Shenzhen	ustrial Park, Genyu Road, , China			
Shenzhen Huatongwei International Inspection Co., Ltd. All rights reserved.					
This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen Huatongwei International Inspection Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Huatongwei International Inspection Co., Ltd. takes no responsibility for and will					

Shenzhen Huatongwei International Inspection Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Huatongwei International Inspection Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

The test report merely correspond to the test sample.

Contents

<u>1.</u>	TEST STANDARDS AND REPORT VERSION	3
1.1.	Test Standards	3
1.2.	Report version	3
<u>2.</u>	TEST DESCRIPTION	4
<u>3.</u>	SUMMARY	5
3.1.	Client Information	5
3.2.	Product Description	5
3.3.	Operation state	6
3.4.	EUT configuration	6
3.5.	Modifications	6
<u>4.</u>	TEST ENVIRONMENT	7
4.1.	Address of the test laboratory	7
4.2.	Test Facility	7
4.3.	Environmental conditions	8
4.4.	Statement of the measurement uncertainty	8
4.5.	Equipments Used during the Test	9
<u>5.</u>	TEST CONDITIONS AND RESULTS	11
5.1.	Antenna requirement	11
5.2.	Conducted Emissions (AC Main)	12
5.3.	Conducted Peak Output Power	15
5.4.	Power Spectral Density	16
5.5.	6dB bandwidth	20
5.6.	Restricted band	24
5.7.	Band edge and Spurious Emissions (conducted)	28
5.8.	Spurious Emissions (radiated)	41
<u>6.</u>	TEST SETUP PHOTOS	47
<u>7.</u>	EXTERANAL AND INTERNAL PHOTOS	49

1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

<u>FCC Rules Part 15.247</u>: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10:2013: American National Standard forTesting Unlicensed Wireless Devices

<u>KDB 558074 D01 15.247 Meas Guidance v05:</u> Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of The FCC Rules

1.2. Report version

Revision No.	Date of issue	Description
N/A	2019-05-23	Original

2. TEST DESCRIPTION

Test Item	FCC Rule	Result	Test Engineer	
Antenna requirement	15.203/15.247(c)	PASS	Xiaokang Tan	
Line Conducted Emissions (AC Main)	15.207 PASS		Zhiwei Liu	
Conducted Peak Output Power	15.247(b)(3) PASS		Xiaokang Tan	
Power Spectral Density	15.247(e)	PASS	Xiaokang Tan	
6dB Bandwidth	15.247(a)(2)	PASS	Xiaokang Tan	
Restricted band	15.247(d)/15.205	PASS	Xiaokang Tan	
Spurious Emissions	15.247(d)/15.209	PASS	Xiaokang Tan	

Note: The measurement uncertainty is not included in the test result.

3. <u>SUMMARY</u>

3.1. Client Information

Applicant:	Petcube, Inc.
Address:	2711 Centerville Road, Suite 400, Wilmington Delaware United States 19808
Manufacturer:	Petcube, Inc.
Address:	2711 Centerville Road, Suite 400, Wilmington Delaware United States 19808

3.2. Product Description

Name of EUT:	Petcube Bites 2		
Trade Mark:	Petcube		
Model No.:	BB20US		
Listed Model(s):	-		
IMEI:	-		
Power supply:	DC 5V, 2A		
Adapter information:	-		
Hardware version:	v2.2.0.1.5		
Software version:	v2.8.0.3560		
WIFI			
WIFI Supported type:	802.11b/802.11g/802.11n(HT20)		
WIFI Supported type: Modulation:	802.11b/802.11g/802.11n(HT20) DSSS for 802.11b OFDM for 802.11g/802.11n(HT20)		
WIFI Supported type: Modulation: Operation frequency:	802.11b/802.11g/802.11n(HT20) DSSS for 802.11b OFDM for 802.11g/802.11n(HT20) 2412MHz~2462MHz		
WIFI Supported type: Modulation: Operation frequency: Channel number:	802.11b/802.11g/802.11n(HT20) DSSS for 802.11b OFDM for 802.11g/802.11n(HT20) 2412MHz~2462MHz 11		
WIFI Supported type: Modulation: Operation frequency: Channel number: Channel separation:	802.11b/802.11g/802.11n(HT20) DSSS for 802.11b OFDM for 802.11g/802.11n(HT20) 2412MHz~2462MHz 11 5MHz		
WIFISupported type:Modulation:Operation frequency:Channel number:Channel separation:Antenna type:	802.11b/802.11g/802.11n(HT20) DSSS for 802.11b OFDM for 802.11g/802.11n(HT20) 2412MHz~2462MHz 11 5MHz PCB		

3.3. Operation state

Test frequency list

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

802.11b/g/n(HT20)				
Channel Frequency (MHz)				
01	2412			
02	2417			
06	2437			
10	2457			
11	2462			

> <u>Test mode</u>

For RF test items

The engineering test program was provided and enabled to make EUT continuous transmit (duty cycle>98%).

For AC power line conducted emissions:

The EUT was set to connect with the WLAN AP under large package sizes transmission.

For Radiated suprious emissions test item:

The engineering test program was provided and enabled to make EUT continuous transmit(duty cycle>98%). The EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report.

3.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

supplied by the manufacturer

С	- supplied by the lab	

0	0	/	Manufacturer:	/
	0		Model No.:	/
0	0		Manufacturer:	/
	1	Model No.:	/	

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. TEST ENVIRONMENT

4.1. Address of the test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

4.2. Test Facility

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 762235

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files.

IC-Registration No.:5377B-1

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.: 5377B-1.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd. quality system according to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Here after the best measurement capability for Shenzhen Huatongwei International Inspection Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.51 dB	(1)
Conducted spurious emissions 9kHz~40GHz	0.63 dB	(1)
Conducted Disturbance 150kHz~30MHz	3.02 dB	(1)
Radiated Emissions below 1GHz	4.90 dB	(1)
Radiated Emissions above 1GHz	4.96 dB	(1)
Occupied Bandwidth	70 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.5. Equipments Used during the Test

•	Conducted Emission						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)	
•	Shielded Room	Albatross projects	N/A	N/A	2018/09/28	2023/09/27	
•	EMI Test Receiver	R&S	ESCI	101247	2018/10/27	2019/10/26	
•	Artificial Mains	SCHWARZBECK	NNLK 8121	573	2018/10/27	2019/10/26	
•	Pulse Limiter	R&S	ESH3-Z2	100499	2018/10/27	2019/10/26	
•	RF Connection Cable	HUBER+SUHNER	EF400	N/A	2018/11/15	2019/11/14	
•	Test Software	R&S	ES-K1	N/A	N/A	N/A	
0	Single Balanced Telecom Pair ISN	FCC	FCC-TLISN-T2-02	20371	2018/10/28	2019/10/27	
0	Two Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T4-02	20373	2018/10/28	2019/10/27	
0	Four Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T8-02	20375	2018/10/28	2019/10/27	
0	V-Network	R&S	ESH3-Z6	100211	2018/10/27	2019/10/26	
0	V-Network	R&S	ESH3-Z6	100210	2018/10/27	2019/10/26	
0	2-Line V-Network	R&S	ESH3-Z5	100049	2018/10/27	2019/10/26	

•	Radiated Emission-6th test site											
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)						
•	Semi-Anechoic Chamber	Albatross projects	SAC-3m-02	N/A	2018/09/30	2021/09/29						
•	EMI Test Receiver	R&S	ESCI	100900	2018/10/28	2019/10/27						
•	Loop Antenna	R&S	HFH2-Z2	100020	2017/11/20	2020/11/19						
•	Ultra-Broadband Antenna	SCHWARZBECK	VULB9163	546	2017/04/05	2020/04/04						
•	Pre-Amplifer	SCHWARZBECK	BBV 9742	N/A	2018/11/15	2019/11/14						
•	RF Connection Cable	HUBER+SUHNER	N/A	N/A	2018/09/28	2019/09/27						
•	RF Connection Cable	HUBER+SUHNER	SUCOFLEX104	501184/4	2018/09/28	2019/09/27						
•	Test Software	R&S	ES-K1	N/A	N/A	N/A						
•	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A						
•	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A						

•	Radiated emission-7th test site											
Used	Test Equipment	est Equipment Manufacturer Model No. Serial N		Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)						
•	Semi-Anechoic Chamber	Albatross projects	SAC-3m-01	N/A	2018/09/30	2021/09/29						
•	Spectrum Analyzer	R&S	FSP40	100597	2018/10/27	2019/10/26						
•	Horn Antenna	SCHWARZBECK	9120D	1011	2017/03/27	2020/03/26						
•	Pre-amplifier	BONN	BLWA0160-2M	1811887	2018/11/14	2019/11/13						
•	Pre-amplifier	CD	PAP-0102	12004	2018/11/14	2019/11/13						
•	Broadband Pre- amplifier	SCHWARZBECK	BBV 9718	9718-248	2019/04/28	2020/04/27						
•	RF Connection Cable	HUBER+SUHNER	RE-7-FH	N/A	2018/11/15	2019/11/14						
•	RF Connection Cable	HUBER+SUHNER	RE-7-FL	N/A	2018/11/15	2019/11/14						
•	Test Software	Audix	E3	N/A	N/A	N/A						

Shenzhen Huatongwei International Inspection Co., Ltd.

Page: 10 of 49

Issued: 2019-05-23

•	Turntable	Maturo Germany	TT2.0-1T	N/A	N/A	N/A
•	Antenna Mast	Maturo Germany	CAM-4.0-P-12	N/A	N/A	N/A

•	RF Conducted Method										
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)					
•	Signal and spectrum Analyzer	R&S	FSV40	100048	2018/10/28	2019/10/27					
•	Spectrum Analyzer	Agilent	N9020A	MY50510187	2018/09/29	2019/09/28					
•	OSP	R&S	OSP120	101317	N/A	N/A					
0	Radio communication tester	R&S	CMW500	137688-Lv	2018/09/29	2019/09/28					
0	Test software	Tonscend	JS1120-1(LTE)	N/A	N/A	N/A					
0	Test software	Tonscend	JS1120-2(WIFI)	N/A	N/A	N/A					
0	Test software	Tonscend	JS1120-3(WCDMA)	N/A	N/A	N/A					
0	Test software	Tonscend	JS1120-4(GSM)	N/A	N/A	N/A					

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement <u>REQUIREMENT:</u>

FCC CFR Title 47 Part 15 Subpart C 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 anantenna that uses a unique coupling to the intentional radiator, 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.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted 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.

TEST RESULTS

☑ Passed □ Not Applicable

The directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



5.2. Conducted Emissions (AC Main)

<u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

	Limit (d	BuV)
Frequency range (MHZ)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
- 3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
- 4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
- 5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
- 6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
- 8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☑ Passed □ Not Applicable

Note:

- 1) Transd=Cable lose+ Pulse Limiter Factor + Artificial Mains Factor
- 2) Margin= Limit -Level





5.3. Conducted Peak Output Power LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): 30dBm

TEST CONFIGURATION



TEST PROCEDURE

- 1. The EUT was tested according to ANSI C63.10: 2013 and KDB 558074 D01 for compliance to FCC 47 CFR 15.247 requirements.
- 2. The maximum peak conducted output power may be measured using a broadband peak RF power meter.
- 3. 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. Record the measurement data.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

🛛 Passed

Not Applicable

Туре	Channel	Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
	01	16.84	14.82		
802.11b	06	16.29	14.33	≤30.00	Pass
	11 15.32		13.26		
	01	18.06	16.64		
802.11g	06	17.71	16.22	≤30.00	Pass
	11	16.52	15.26		
	01	17.75	15.86		
802.11n(HT20)	06	16.85	15.24	≤30.00	Pass
	11	15.78	14.24		

5.4. Power Spectral Density

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e):

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

TEST CONFIGURATION



TEST PROCEDURE

- 1. Connect the antenna port(s) to the spectrum analyzer input,
- Configure the spectrum analyzer as shown below: Center frequency=DTS channel center frequency Span =1.5 times the DTS bandwidth RBW = 3 kHz ≤ RBW ≤ 100 kHz, VBW ≥ 3 × RBW Sweep time = auto couple Detector = peak Trace mode = max hold
- 3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
- 4. Use the peak marker function to determine the maximum amplitude level within the RBW.
- 5. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☑ Passed □ Not Applicable

Туре	Channel	Power Spectral Density (dBm/30KHz)	Limit (dBm/3KHz)	Result	
	01	-2.30			
802.11b	06	-3.21	≤8.00	Pass	
	11	-4.23			
	01	-6.00			
802.11g	06	-6.41	≤8.00	Pass	
	11	-7.70			
	01	-4.84			
802.11n(HT20)	06	-6.42	≤8.00	Pass	
	11	-7.38			

Test plot as follows:



Type: 802.11 g Spectrum Ref Level 20.00 dBm Att 30 dB Count 100/100 1Pk Max M1[1] -6.00 dt 2.4123260 G LO dBm) dBrr phinter and the second of the 10 dBm 20 dBm CH01 30 dBm 1114 An -40 dBm ₩⁰ As0 dBm 60 dBm 70 dBm 691 pt CF 2.412 GH .0 MHz Date: 20 MAY 2019 20:12:33 Spectrum RefLevel 20.00 dBm Offset 1.00 dB ● RBW 30 kHz Att 30 dB SWT 189.6 µs ● VBW 100 kHz Mode Auto FFT Count 100/100 -6.41 dB 2.4373260 G M1[1] 10 dBm 0 dBm-Mandellowand Junan Mandellow 10 dBr 20 dBm CH06 -30 dBm MM -49,044 My. 50 dBm 60 dBm 70 dBm Span 25.0 MHz CF 2.437 GH 691 pt: **1** (4) Date:20 MAY 2019 20:15:0 Spectrum RefLevel 20.00 dBm Offset 1.00 dB — RBW 30 kHz Att 30 dB SWT 189.6 µs — VBW 100 kHz Mode Auto FFT Count 100/100 M1[1] -7.70 dB 2.4623260 GF 10 dBm-0 dBm MAMERICAN MARKAN MARKAN MARKAN 10 dBm 20 dBi CH11 30 dBr Mry M -60 dBm 70 dBm Span 25.0 MHz 691 pts CF 2.462 G III 440 Data: 20 MAY 2019 20:16:4

Type: 802.11n(HT20) Spectrum Ref Level 20.00 dBm Att 30 dB Count 100/100 Offset 1.00 dB ● RBW 30 kHz SWT 189.6 µs ● VBW 100 kHz Mode Auto FFT M1[1] -4.84 dE 2.4117110 G LO dBm) dBrr man man man particular and the second second 10 dBm-VUVV -20 dBm Ň h CH01 30 dBm -40 dB 80 dBm 60 dBm 70 dBm 691 pts CF 2.412 GH Sn i.0 MHz Date: 20 MAY 2019 20:19:53 Spectrum RefLevel 20.00 dBm Offset 1.00 dB ● RBW 30 kHz Att 30 dB SWT 189.6 µs ● VBW 100 kHz Mode Auto FFT Count 100/100 6.42 dE M1[1] 2.436 10 dBm 0 dBm-Marrie Marrie Ma Annal -10 dBm Muyhuhuhu 20 dBm CH06 -30 dBm -40 d9m--50 dBm -60 dBm 70 dBm-CF 2.437 GH 691 pt: Span 25.0 MHz **III** 440 Date:20 MAY 2019 20:22:01 Spectrum RefLevel 20.00 dBm Offset 1.00 dB — RBW 30 kHz Att 30 dB SWT 189.6 µs — VBW 100 kHz Mode Auto FFT Count 100/100 M1[1] -7.38 dB 2.4623620 GF 10 dBm-0 dBm mound was from the second of the second seco -10 dBm 20 dBr CH11 30 dBr 40 dBm **/\/**√ -50 dBm--60 dBm 70 dBm Span 25.0 MHz 691 pts CF 2.462 GH III 440 Date: 20 MAY 2019 20:23:31

5.5. 6dB bandwidth

<u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2):

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

- 1. Connect the antenna port(s) to the spectrum analyzer input.
- 2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

Center Frequency =DTS channel center frequency Span=2 x DTS bandwidth RBW = 100 kHz, VBW ≥ 3 × RBW Sweep time= auto couple Detector = Peak Trace mode = max hold

- Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
- 4. 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, and record the pertinent measurements.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☑ Passed	Not Applicable					
Туре	Channel	6dB Bandwidth (MHz)	Limit (kHz)	Result		
802.11b	01	8.85				
	06	8.97	8.97 ≥500			
	11	8.61				
	01	15.84	15.84			
802.11g	06	16.11	≥500	Pass		
	11	15.81				
	01	17.64				
802.11n(HT20)	06	17.34	≥500	Pass		
	11	17.04				

Test plot as follows:

Туре:	802.11 b
	Spectrum 🕎
	RefLevel 20.50 dBm Offset 1.00 dB RBW 100 kHz
	Count 500/500
	M1[1] -5.70 dBm 2.4074400 GHz
	10 UBIII 0.71 dBm M2[1] 0.71 dBm 2.4130800 GHz
	0 upin D1 -5.286 d8m M
	-10 dam
	-20 dam
	-so dalli
CHUI	50 dam
	-50 dam
	-70 d8m
	CF 2.412 GHz 1001 pts Span 30.0 MHz Marker
	Type Ref Trc X-value Y-value Function Function Result M1 1 2.40744 GHz -5.70 dBm
	M2 1 2.41308 GHz 0.71 d8m D3 M1 1 8.85 MHz -0.02 d8
	Measuring
	Dam: 20 MAY 2019 20:00:45
	Spectrum
	RefLevel 20.50 dBm Offset 1.00 dB ● RBW 100 kHz ● Att 30 dB SWT 75.9 µs ● VBW 300 kHz Mode Auto FFT
	Caunt 500/500
	M1[1] -5.75 dBm 2.4323800 GHz
	10 dBm M2[1] 0.56 dBm 2.4361300 GHz
	0 dBm
	-10 dBm
	-2U dam
01100	-su dem
CH06	Muder and the second seco
	-50 dbm
	-/0 UBII
	CF 2.437 GHz 1001 pts Span 30.0 MHz Marker
	Type Ref Trc X-value Y-value Function Function Result M1 1 2.43238 GHz -5.75 dBm
	M2 1 2.43613 GHz 0.56 dBm D3 M1 1 8.97 MHz 0.10 dB
	Dam: 20 M AY 2019 20:04:52
	Spectrum 🕎
	RefLevel 20.50 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 75.9 µs VBW 300 kHz Mode Auto FFT
	Count 500/500
	M1[1] -5.63 dBm 2 457200 cu-
	10 dBm M2[1] 0.45 dBm M2 2 4656300 CH-
	0 dBm
	-10 dBm
	-20 dBm-
	-30 dBm
CH11	142/Britshing and and a start and a
	-50 dBm
	-60 dBm-
	-70 dBm
	CF 2.462 GHz 1001 pts Span 30.0 MHz
	Type Ref Trc X-value Y-value Function Function Result
	Mil 1 2.457/4 GHz -5.63 GHm M2 1 2.46263 GHz 0.45 dBm D2 M1 1 0.65 MH
	US M1 1 8.61 MH2 -U.86 dB
	Data: 20 MAY 2019 20:07:25

802.11 g Type: Spectrum Ref Level 20.50 dBm Att 30 dB Count 500/500 1Pk View Offset 1.00 dB ● RBW 100 kHz SWT 75.9 µs ● VBW 300 kHz Mode Auto FFT M1[1] -8.42 dE 2.4041100 G -1.10 dE 2.4123300 G 42 d LO dBm M2[1]) dBm 10 dBm -20 dBm -30 dBm CH01 -40 dBmwww -50 dBm 60 dBm 70 dBm CF 2.412 GHz 1001 pts Span 30.0 MHz X-value 2.40411 GHz 2.41233 GHz 15.84 MHz Y-value -8.42 dBm -1.10 dBm 0.64 dB Type Ref Trc Function Function Result M2 M1 Date: 20 M AY 2019 20:12:18 Spectrum
 Ref Level
 20.50 dBm
 Offset
 1.00 dB
 RBW
 100 kHz

 Att
 30 dB
 SWT
 75.9 μs
 VBW
 300 kHz
 Mode Auto FFT Count 500/500 -7.66 c M1[1] 10 dBm--1.52 dB 2.4373300 Gł M2[1] 0 dBm-Mahala Markadamahan Month March UN AR 10 dBm-20 dBm 30 dBm N CH06 ℆℆ÅÅ℻ hun 50 dBm 60 dBm 70 dBm CF 2.437 GH 1001 pt Span 30.0 MHz larke Type Ref Trc M1 1 X-value 2.42884 GHz 2.43733 GHz 16.11 MHz Y-value -7.66 dBm -1.52 dBm -0.48 dB Function Function Result M2 D3 М1 420 Date: 20 M AY 2019 20:14:54 ♥ Spectrum
 Ref Level
 20.50 dBm
 Offset
 1.00 dB
 ■ RBW
 100 kHz

 Att
 30 dB
 SWT
 75.9 µs
 ■ VBW
 300 kHz
 Mode Auto FFT Count 500/500 M1[1] -8.81 dB 2.4541400 GH 10 dBm M2[1] -2.64 dB 2.4623300 GI 0 dBm uh M1 ۸۵. -8.63 10 dBm -20 dBm 30 dBr CH11 ATE ARM wer -50 dBm 60 dBm 70 dBm CF 2.46 Span 30.0 larke X-value 2.45414 GHz 2.46233 GHz 15.81 MHz
 Y-value
 Function

 -8.81 dBm
 -2.64 dBm

 -0.45 dB
 -0.45 dB
 Function Result Type Ref Trc MI Date: 20 M AY 2019 20:16:33

Type: 802.11n(HT20) Spectrum Ref Level 20.50 dBm Att 30 dB Count 500/500 1Pk View Offset 1.00 dB ● RBW 100 kHz SWT 75.9 µs ● VBW 300 kHz Mode Auto FFT -8.73 df 2.4031800 G -2.44 df 2.4057600 G M1[1] LO dBm M2[1]) dBm marmul haberly man hadred D1 -8.442 mar 10 dBm--20 dBm -30 dBm CH01 -40 dBm Mm 100000 60 dBm 70 dBm CF 2.412 GHz 1001 pts Span 30.0 MHz Y-value X-value 2.40318 GHz 2.40576 GHz 17.64 MHz Type Ref Trc Function Function Result M2 -2.44 dBm -0.57 dB M1 Date: 20 M AY 2019 20:18:31 Spectrum
 Ref Level
 20.50 dBm
 Offset
 1.00 dB
 RBW
 100 kHz

 Att
 30 dB
 SWT
 75.9 µs
 VBW
 300 kHz
 Mode Auto FFT Count 500/500 M1[1] -11.35 dB 2.4281200 GF -2.61 dB 2.4307600 GF 10 dBm M2[1] 0 dBm solunamen man 01 -8.608 -mappa ca A na 10 dBm-20 dBm 30 dBm CH06 .40,d8m∀ MAN 50 dBm 60 dBm 70 dBm CF 2.437 GH 1001 pt Span 30.0 MHz larke Type Ref Trc M1 1 X-value 2.42812 GHz 2.43076 GHz 17.34 MHz Y-value -11.35 dBm -2.61 dBm 2.38 dB Function Function Result 1 M2 D3 М1 110 420 Date:20 MAY 2019 20:21:44 ♥ Spectrum
 Ref Level
 20.50 dBm
 Offset
 1.00 dB
 ■ RBW
 100 kHz

 Att
 30 dB
 SWT
 75.9 µs
 ■ VBW
 300 kHz
 Mode Auto FFT Count 500/500 M1[1] -10.13 dB 2.4535100 GF 10 dBm M2[1] -3.28 dB 2.4623300 GI 0 dBm rook Λ. 1 -9.28 -10 dBm -20 dBm 30 dBr CH11 r49,d8%-MA -50 dBm 60 dBm 70 dBm CF 2.46 Span 30.0 larke X-value 2.45351 GHz 2.46233 GHz 17.04 MHz Function Result Type Ref Trc Y-value Function -10.13 dBm -3.28 dBm -0.45 dB М1 Date: 20 MAY 2019 20:23:18

5.6. Restricted band

<u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C 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, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

- 1) The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
- 2) The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3) The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
- 4) The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find themaximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- The receiver set as follow: RBW=1MHz, VBW=3MHz PEAK detector for Peak value. RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☑ Passed □ Not Applicable

Note:

1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor

802.11b					CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2310.00	17.65	28.05	6.62	0.00	52.32	74.00	-21.68	Vertical	Peak
2390.01	18.11	27.65	6.75	0.00	52.51	74.00	-21.49	Vertical	Peak
2310.00	17.58	28.05	6.62	0.00	52.25	74.00	-21.75	Horizontal	Peak
2390.01	18.19	27.65	6.75	0.00	52.59	74.00	-21.41	Horizontal	Peak
2310.00	11.02	28.05	6.62	0.00	45.69	54.00	-8.31	Vertical	Average
2390.01	10.69	27.65	6.75	0.00	45.09	54.00	-8.91	Vertical	Average
2310.00	11.04	28.05	6.62	0.00	45.71	54.00	-8.29	Horizontal	Average
2390.01	10.67	27.65	6.75	0.00	45.07	54.00	-8.93	Horizontal	Average

802.11b					CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.49	17.56	27.26	6.83	0.00	51.65	74.00	-22.35	Vertical	Peak
2500.00	17.37	27.20	6.84	0.00	51.41	74.00	-22.59	Vertical	Peak
2483.49	18.85	27.26	6.83	0.00	52.94	74.00	-21.06	Horizontal	Peak
2500.00	17.61	27.20	6.84	0.00	51.65	74.00	-22.35	Horizontal	Peak
2483.49	10.91	27.26	6.83	0.00	45.00	54.00	-9.00	Vertical	Average
2500.00	10.72	27.20	6.84	0.00	44.76	54.00	-9.24	Vertical	Average
2483.49	10.88	27.26	6.83	0.00	44.97	54.00	-9.03	Horizontal	Average
2500.00	10.74	27.20	6.84	0.00	44.78	54.00	-9.22	Horizontal	Average

802.11g					CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2310.00	17.12	28.05	6.62	0.00	51.79	74.00	-22.21	Vertical	Peak
2390.01	20.12	27.65	6.75	0.00	54.52	74.00	-19.48	Vertical	Peak
2310.00	19.02	28.05	6.62	0.00	53.69	74.00	-20.31	Horizontal	Peak
2390.01	18.83	27.65	6.75	0.00	53.23	74.00	-20.77	Horizontal	Peak
2310.00	11.11	28.05	6.62	0.00	45.78	54.00	-8.22	Vertical	Average
2390.01	12.03	27.65	6.75	0.00	46.43	54.00	-7.57	Vertical	Average
2310.00	11.11	28.05	6.62	0.00	45.78	54.00	-8.22	Horizontal	Average
2390.01	13.54	27.65	6.75	0.00	47.94	54.00	-6.06	Horizontal	Average

802.11g					CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.49	20.82	27.26	6.83	0.00	54.91	74.00	-19.09	Vertical	Peak
2500.00	17.85	27.20	6.84	0.00	51.89	74.00	-22.11	Vertical	Peak
2483.49	18.00	27.26	6.83	0.00	52.09	74.00	-21.91	Horizontal	Peak
2500.00	18.63	27.20	6.84	0.00	52.67	74.00	-21.33	Horizontal	Peak
2483.49	13.41	27.26	6.83	0.00	47.50	54.00	-6.50	Vertical	Average
2500.00	11.51	27.20	6.84	0.00	45.55	54.00	-8.45	Vertical	Average
2483.49	12.46	27.26	6.83	0.00	46.55	54.00	-7.45	Horizontal	Average
2500.00	11.08	27.20	6.84	0.00	45.12	54.00	-8.88	Horizontal	Average

802.11n(HT	20)				CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2310.00	17.58	28.05	6.62	0.00	52.25	74.00	-21.75	Vertical	Peak
2390.01	19.58	27.65	6.75	0.00	53.98	74.00	-20.02	Vertical	Peak
2310.00	18.01	28.05	6.62	0.00	52.68	74.00	-21.32	Horizontal	Peak
2390.01	21.55	27.65	6.75	0.00	55.95	74.00	-18.05	Horizontal	Peak
2310.00	11.10	28.05	6.62	0.00	45.77	54.00	-8.23	Vertical	Average
2390.01	12.92	27.65	6.75	0.00	47.32	54.00	-6.68	Vertical	Average
2310.00	11.10	28.05	6.62	0.00	45.77	54.00	-8.23	Horizontal	Average
2390.01	12.36	27.65	6.75	0.00	46.76	54.00	-7.24	Horizontal	Average

802.11n(HT	20)				CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.49	19.41	27.26	6.83	0.00	53.50	74.00	-20.50	Vertical	Peak
2500.00	18.18	27.20	6.84	0.00	52.22	74.00	-21.78	Vertical	Peak
2483.49	18.00	27.26	6.83	0.00	52.09	74.00	-21.91	Horizontal	Peak
2500.00	18.28	27.20	6.84	0.00	52.32	74.00	-21.68	Horizontal	Peak
2483.49	12.42	27.26	6.83	0.00	46.51	54.00	-7.49	Vertical	Average
2500.00	11.20	27.20	6.84	0.00	45.24	54.00	-8.76	Vertical	Average
2483.49	11.68	27.26	6.83	0.00	45.77	54.00	-8.23	Horizontal	Average
2500.00	10.91	27.20	6.84	0.00	44.95	54.00	-9.05	Horizontal	Average

5.7. Band edge and Spurious Emissions (conducted)

FCC CFR Title 47 Part 15 Subpart C Section15.247 (d):

In any 100 kHz 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 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.

TEST CONFIGURATION



TEST PROCEDURE

- 1. Connect the antenna port(s) to the spectrum analyzer input.
- 2. Establish a reference level by using the following procedure

Center frequency=DTS channel center frequency The span = 1.5 times the DTS bandwidth. RBW = 100 kHz, VBW ≥ 3 x RBW Detector = peak, Sweep time = auto couple, Trace mode = max hold Allow trace to fully stabilize Use the peak marker function to determine the maximum PSD level

Note: the channel found to contain the maximum PSD level can be used to establish the reference level. Emission level measurement

 Emission level measurement Set the center frequency and span to encompass frequency range to be measured RBW = 100 kHz, VBW ≥ 3 x RBW Detector = peak, Sweep time = auto couple, Trace mode = max hold Allow trace to fully stabilize Use the peak marker function to determine the maximum amplitude level.
 Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmit

- 4. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
- Ensure that the amplitude of all unwanted emission outside of the authorized frequency band excluding restricted frequency bands) are attenuated by at least the minimum requirements specified (at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz). Report the three highest emission relative to the limit.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☑ Passed □ Not Applicable

Test Item:	Bandedge	Туре:	802.11 b
	Spectra Ref Let Att	JTN el 20.00 dBm Offset 1.00 dB ● RBW 100 kHz 30 dB SWT 246.5 µs ● VBW 300 kHz Mode Auto FFT nor3no	
	0 dBm- - 10 dBm-	MI[1] MI[1] M2[1]	1.36 dBm 2.410410 GHz M31.26 dBm 2.4590800 GHz
CH01	-20 dam -30 dam -40 dam -50 dam		March 1
	-70 dBm- Start 2. Marker	31 GHz 691 pts	Stop 2.422 GHz
	Type M1 M2 M3 M4 M5	Ref Trc X-value Y-value Function 1 2.41041 GHz 1.36 dBm 1 1 2.4 GHz 44.26 dBm 1 1 2.39 GHz -58.60 dBm 1 1 2.31 GHz -59.43 dBm 1 1 2.399464 GHz -39.02 dBm 1	Function Result
	Date: 20 M J	JM	
	Ref Le Att Count 3	rel 20.00 dBm Offset 1.00 dB ● RBW 100 kHz 30 dB SWT 113.8 μs ● VBW 300 kHz Mode Auto FFT 0/300	
	10 dBm-	M1 M2[1]	0.40 dBm 2.4608570 GHz -53.06 dBm 2.4835000 GHz
CH11	-10 dBm- <mark>-20 dBg/</mark> -30 dBm- ~40 dBm-	01 -19.600 dBm	
CHII	-50 dBm- -60 dBm- -70 dBm-	- M2 - MALANA	wind a runte from sol
	Start 2. Marker Type M1 M2 M3 M4	S2 GHz 691 pts Ref Trc X-value Y-value Function 1 2.460857 GHz 0.40 dBm 1 2.4635 GHz -53.06 dBm 1 2.4835 GHz -53.06 dBm -53.06 dBm -1 2.483513 GHz -53.06 dBm	Function Result
	Date: 20 M J	VY 2019 20.08:00	444 WARNEN

Test Item:	Bandedge	Туре:	802.11 g
		Spectrum Ref Level 20:00 dBm Offset 1:00 dB RBW 100 kHz Att 30 dB SWT 246.5 µs VBW 300 kHz Mode Auto FFT Count 30//000 Count 30//000 SWT 246.5 µs VBW 300 kHz Mode Auto FFT	(₩)
		0 1Pk Max M1[1] 10 dBm M2[1] -10 dBm M2[1] -20dBm 01 -21.070 dBm	-1.07 dBm 2.412360 GHz -14.57 dBm 2.40600 GHz
CH01		-00 dBm -40 dBm -50 dBm -60 dBm -60 dBm -70 dBm -70 dBm	
		Start 2.31 GHz 691 pts Marker Type [Ref Trc] X-value Y-value Function F M1 1 2.41236 GHz -1.07 dBm F Marker M2 1 2.46142 -41.57 dBm F M3 1 2.39 GHz -41.57 dBm M4 M4 1 2.31 GHz -59.05 dBm M4 M4 1 2.33 GHz -59.05 dBm M4 M4 1 2.3398951 GHz -40.75 dBm M4 M4 1 2.3398951 GHz -40.75 dBm M4 M4	Stop 2.422 GHz
		Spectrum Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWT 113.8 µs VBW 300 kHz Mode Auto FFT Count 300/3000 Count 300/3000 SWT 113.8 µs VBW 300 kHz Mode Auto FFT	(m)
		10 dBm	-2.65 dBm 2.4623150 GHz -50.15 dBm 2.4835000 GHz
CH11		-10 dBm 124/4/4/4/4/4/10 10 10 10 10 10 10 10 10 10 10 10 10 1	
CITT		-50 dBm	Stop 2.5 GHz
		Marker Correction Function F Type Ref Trc X-value Y-value Function F M1 1 2.462315 GHz -2.65 GBm F <td< td=""><td>unction Résult</td></td<>	unction Résult
		Data: 20 M AY 2019 20 LT 500	() 4/4

Test Item:	Bandedge	Туре:	802.11 n(HT20)
	Spectrum Ref Level 2 Att	20.00 dBm Offset 1.00 dB • RBW 100 kHz 30 dB SWT 246.5 µs • VBW 300 kHz Mode Auto FFT	(III)
	● 1Pk Max 10 dBm	M1[1] M2[1]	-2.34 dBm 2.405710 GHz 41.56 dBm
	0 dBm	1.22.340.480	12.40000 GHz
CH01	-30 dBm		MET
Chor	-50 مەسىلىرىمە ئەرمەلىرىمە -70 dBm	nging hallow and from the second second grade from from the second second second second second second second se	
	Start 2.31 G Marker Type Ref	Hz 691 pts Trc X-value Y-value Function 1 2 40571 GHz -2 34 dBm	Stop 2.422 GHz Function Result
	M2 M3 M4 M5	1 2.4 GHz -41.55 dBm 1 2.39 GHz -41.55 dBm 1 2.39 GHz -50.26 dBm 1 2.398301 GHz -43.26 dBm	
	Date: 20 M AY 20	19 202012	
	Spectrum Ref Level 2 Att Count 300/30	20.00 dBm Offset 1.00 dB RBW 100 kHz 30 dB SWT 113.8 µs VBW 300 kHz Mode Auto FFT 30	
	PPk Max I0 dBm	M1[1] M2[1]	-3.30 dBm 2.4623150 GHz -51.78 dBm 2.4835000 GHz
	- 15 dBm- -20 dBm- -20 dBm-	Mart, or John Minhadon, ballan	
CH11	-30 dBm	Wey how we have a start	
	-60 dBm		
	Start 2.452 (Marker Type Ref	SHz 691 pts Trc X-value Function 1 2.462316.041 -2.32.0.08m	Stop 2.5 GHz Function Result
	M2 M3 M4	1 2.4835 GHz -51.78 dbm 1 2.4835 GHz -51.78 dbm 1 2.4834 GHz -57.10 dbm 1 2.4942783 GHz -49.11 dbm	
	Date: 20 MAY 20	119 20:24:43	

Test Item:	SE	Туре:	802.11 b
	Spectrum		
	Ref Level 21.00 dBm Att 30 dB Count 100/100	OTTSET 1.00 dB ● RBW 100 kHz SWT 75.9 µs ● VBW 300 kHz Mode Auto FFT	
	IPk Max	M1[1]	1.67 dBm
	10 dBm		2.4125640 GHz
	0 dBm	man Mil Mil market	
	-10 dBm		
	-20 dBm		
CH01	-30 dBm		V
Reference level	AD ARD MAN MANNA		When Mary and all
	-50 dBm		
	-60 dBm		
	-70 dBm		
	CF 2.412 GHz	691 pts	Span 30.0 MHz
		Measuring	4/4
	Date:20 MAY 2019 20:03:27		
			Ē
	Spectrum Ref Level 20.00 dBm	Offset 1.00 dB ● RBW 100 kHz	(∀
	Count 10/10	ຣທ ≀ 30.1 ms ອັນມີທ ີ່ 300 KHz Mode Auto Sweep	
		M1[1]	-52.64 dBm 848.7340 MHz
	10 dBm		
	0 dBm		
	-10 dBm		
	-20 dBm101 -18.330 dBr		
30MHz~1000MHz	-30 dBm		
	-40 dBm		
	-50 dBm		Mil Ian o established bere some for sto
	PADER DIGITI TATA AND A DIA AND	an di fandarang pengan panya panjang kenangka kenangka malamat kenangkan pengan pengan panya sa panya panya pa An di fandarang pengan penga	1. A second s
	-70 dBm		
	Start 30.0 MHz	30001 pts	Stop 1.0 GHz
	Date: 20 M AY 2019 20:03:43	MCASUPINA	CHARLES INC.
	Spectrum		
	Ref Level 20.00 dBm Att 30 dB Count 10/10	Offset 1.00 dB ● RBW 100 kHz SWT 250 ms ● VBW 300 kHz Mode Auto Sweep	
	PIK Max	M1[1]	-44.50 dBm
	10 dBm		15.659167 GHz
	0 dBm		
	-10 dBm		
	-20 dBm	n	
CH01	-30 d8m		
1GHz~26GHz	-40 dem	M1	
	-50 dem		Valja Induces opposed and businessed
	and the second se		and the second sec
	-70 dBm		
	Start 1.0 GHz	30001 pts	Stop 26.0 GHz
	Date: 20 M AY 2019 20:04:00		





Test Item:	SE	Туре:	802.11 g
	Spectrum		
	RefLevel 21.00 dBm Att 30 dB Count 100/100	Offset 1.00 dB ● RBW 100 kHz SWT 75.9 µs ● VBW 300 kHz Mode Auto FFT	
	● 1Pk Max	M1[1]	-0.98 dBm
	10 dBm		2.4123470 GHz
	0 dBm	A A A BA ANALASA MAANA A A A A	
	-10 dBm	month providence of the standparticularly	\
01104	-20 dBm		
CH01 Reference level	-30 dBm		
	-Marina		- Www.W
	-50 dBm		
	-60 dBm		
	-70 dBm		
	CF 2.412 GHz	691 pts Measuring.	Span 30.0 MHz
	Date:20 M AY 2019 20:13:16		
	Spectrum Ref Level 20.00 dBm	Offset 1.00 dB 🖷 RBW 100 kHz	
	Att 30 dB Count 10/10 TPk May	SWT 30.1 ms 🖶 VBW 300 kHz Mode Auto Sweep	
		M1[1]	-52.61 dBm 874.9230 MHz
	10 dBm		
	-10 dBm		
	-20 dBm		
CH01	-30 dBm		
30MHz~1000MHz	-40 dBm		
	-50 dBm		<u>M1.</u>
	A the state of the	kana ji munaka mala ang ang munakan na pang mula dara ji munakan na pang munakan na pang munakan na pang munak Mang dan pang mang munakan na pang munakan na p Mang dan pang munakan na pang m	n sen en en fan en en fan e Fan en fan en
	-70 dBm		
	Start 30.0 MHz	30001 pts	Stop 1.0 GHz
	Date: 20 M AY 2019 20:13:33	Measuring	() () () () () () () () () () () () () (
	Spectrum		
	Ref Level 20.00 dBm Att 30 dB Count 10/10	Offset 1.00 dB ● RBW 100 kHz SWT 250 ms ● VBW 300 kHz Mode Auto Sweep	
	e 1Pk Max	M1[1]	-44.15 dBm
	10 dBm		15.665833 GHZ
	0 dBm		
	-10 dBm		
	<u>20 dB</u> m	3m	
1GHz~26GHz	-30 dBm		
10112~200112	-40 dBm	1011 1011 1011 1011 1011 1011 1011 101	a bet her and a second second second second
			n, en la fact ^{ion} te al constante de la constante de
	-70 dBm		
	Chart 10 Olla	20001 ptc	Stop 26 0 CH2
		Suud 1 pts	
	Date:20 M AY 2019 20:13:49		





Test Item:	SE	Туре:	802.11 n(HT20)
	Spectrum		
	Ref Level 21.00 dt Att 30 Coupt 100/100	am Offset 1.00 dB	
	Plk Max	M1[1]	-2.33 dBm
	10 dBm		2.4057480 GHz
	0 dBm		
	-10 dBm	mandentration mandentration	۵۰۰۹
	-20 dBm		
CH01	-30 dBm		Nu
Reference level	-40 dBm		
	-50 dBm		www
	-60 dBm		
	-70 dBm		
	CE 2 412 CH2	601 ptc	Span 20.0 MHz
		Dat brz	
	Date:20 M AY 2019 20:2	2 40	
	Spectrum Ref Level 20.00 dF	am Offset 1.00 dB 👄 RBW 100 kHz	
	Att 30 Count 10/10	dB SWT 30.1 ms 🖶 VBW 300 kHz Mode Auto Sweep	
	● 1Pk Max	M1[1]	-52.24 dBm
	10 dBm		003.0190 MHZ
	0 dBm		
	-10 dBm		
	-20 dBm D1 -22.33	30 dBm	
CH01	-30 dBm		
30MHz~1000MHz	-40 dBm		
	-50 dBm	le en al contra de contra la contra de la c	M1 Derfolgel service of the contract
	Length (1991) and (1991) and (1991) and (1992) and (199		and a feature of the second
	-70 dBm		
	Start 30.0 MHz	30001 pts	Stop 1.0 GHz
		Neasuring	(IIIIIII) 43G
	Date:20MAY 2019 20:20	2.65	
	Spectrum		
	Ref Level 20.00 da	3m Offset 1.00 dB ● RBW 100 kHz dB SWT 250 ms ● VBW 300 kHz Mode Auto Sween	
	Count 10/10		
		M1[1]	-43.60 dBm 15.801667 GHz
	10 dBm		
	0 dBm		
	-10 dBm		
CH01	-20 dBmD1 -22.33	30 dBm	
1GHz~26GHz	-30 dBm		
	-40 dBm		elle del rener l'ar anna la constante de series de
	-50 dBm		the first state of the second state of the sec
	na di kiti marti		+ + + - +
	-70 dBm		
	Start 1.0 GHz	30001 pts	Stop 26.0 GHz
		Measuring	
	Date:20 MAY 2019 20:2		





5.8. Spurious Emissions (radiated) LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

Frequency	Limit (dBuV/m @3m)	Value
30MHz-88MHz	40.00	Quasi-peak
88MHz-216MHz	43.50	Quasi-peak
216MHz-960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

> 9kHz ~30MHz



> 30MHz ~ 1GHz



Above 1GHz



TEST PROCEDURE

- 1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
- 2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 5. Set to the maximum power setting and enable the EUT transmit continuously.
- 6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:
 - RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold; If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) From 1 GHz to 10th harmonic: RBW=1MHz, VBW=3MHz Peak detector for Peak value. RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☑ Passed □ Not Applicable

Note:

- 1) Final Level =Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2) The emission levels of other frequencies are very lower than the limit and not show in test report.

> 9kHz ~ 30MHz

The EUT was pre-scanned the frequency band (9kHz~30MHz), found the radiated level lower than the limit, so don't show on the report.

➢ 30MHz ~1000MHz

Have pre-scan all modulation mode, found the 802.11b mode CH01 which it was worst case, so only the worst case's data on the test report.

> 30MHz ~ 1GHz



30.000000	22.10	-13.4	40.0	17.9	QP	100.0	04.00	VERITCAL
443.220000	28.60	-3.7	46.0	17.4	QP	100.0	84.00	VERTICAL
606.180000	40.30	0.9	46.0	5.7	QP	100.0	21.00	VERTICAL
619.760000	36.70	1.0	46.0	9.3	QP	100.0	21.00	VERTICAL
699.300000	37.40	2.2	46.0	8.6	QP	100.0	21.00	VERTICAL
937.920000	34.00	6.8	46.0	12.0	QP	100.0	325.00	VERTICAL



MEASUREMENT RESULT: "GM1904296103 red"

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
41.640000	19.10	-9.6	40.0	20.9	QP	100.0	359.00	HORIZONTAL
59.100000	16.70	-9.9	40.0	23.3	QP	100.0	224.00	HORIZONTAL
105.660000	17.10	-10.7	43.5	26.4	QP	100.0	236.00	HORIZONTAL
256.980000	19.50	-8.4	46.0	26.5	QP	100.0	293.00	HORIZONTAL
385.020000	27.00	-5.1	46.0	19.0	QP	100.0	188.00	HORIZONTAL
906.880000	33.90	6.5	46.0	12.1	OP	100.0	293.00	HORIZONTAL

➢ 1 GHz ~ 25 GHz

802.11b					CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
1904.12	37.41	25.34	6.94	37.51	32.18	74.00	-41.82	Vertical	Peak
3883.62	36.40	29.68	10.35	36.84	39.59	74.00	-34.41	Vertical	Peak
5112.49	33.57	31.85	12.04	35.16	42.30	74.00	-31.70	Vertical	Peak
7245.81	33.66	36.25	14.53	33.45	50.99	74.00	-23.01	Vertical	Peak
1188.98	37.06	26.22	5.49	37.23	31.54	74.00	-42.46	Horizontal	Peak
3208.66	36.98	28.75	9.46	37.39	37.80	74.00	-36.20	Horizontal	Peak
4772.91	33.23	31.49	11.76	35.78	40.70	74.00	-33.30	Horizontal	Peak
7245.81	32.63	36.25	14.53	33.45	49.96	74.00	-24.04	Horizontal	Peak

802.11b					CH06				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
1303.09	36.87	26.19	5.79	37.17	31.68	74.00	-42.32	Vertical	Peak
3463.29	36.53	28.71	9.79	37.17	37.86	74.00	-36.14	Vertical	Peak
4321.84	34.50	30.27	10.93	36.45	39.25	74.00	-34.75	Vertical	Peak
7338.62	32.69	36.30	14.62	33.29	50.32	74.00	-23.68	Vertical	Peak
1746.25	37.84	25.29	6.63	37.35	32.41	74.00	-41.59	Horizontal	Peak
3786.01	35.82	29.56	10.17	36.92	38.63	74.00	-35.37	Horizontal	Peak
4871.10	34.31	31.46	11.69	35.61	41.85	74.00	-32.15	Horizontal	Peak
7338.62	32.16	36.30	14.62	33.29	49.79	74.00	-24.21	Horizontal	Peak

802.11b					CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
1518.11	36.23	25.63	6.25	37.09	31.02	74.00	-42.98	Vertical	Peak
3844.28	35.15	29.64	10.29	36.87	38.21	74.00	-35.79	Vertical	Peak
5747.59	32.68	31.84	12.83	34.28	43.07	74.00	-30.93	Vertical	Peak
7319.96	31.40	36.30	14.58	33.32	48.96	74.00	-25.04	Vertical	Peak
1659.57	37.60	25.08	6.49	37.26	31.91	74.00	-42.09	Horizontal	Peak
4343.90	35.19	30.33	10.97	36.43	40.06	74.00	-33.94	Horizontal	Peak
5518.20	32.86	31.88	12.58	34.41	42.91	74.00	-31.09	Horizontal	Peak
7413.73	32.20	36.27	14.77	33.16	50.08	74.00	-23.92	Horizontal	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

2. The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

3. The emission levels of other frequencies(test frequency band is 1GHz to 25GHz) are very lower than the limit and not show in test report.

802.11g					CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
1676.56	37.47	25.13	6.52	37.28	31.84	74.00	-42.16	Vertical	Peak
3690.85	36.40	29.30	9.99	36.99	38.70	74.00	-35.30	Vertical	Peak
5086.52	33.37	31.85	12.03	35.21	42.04	74.00	-31.96	Vertical	Peak
7045.74	31.73	35.44	14.50	33.80	47.87	74.00	-26.13	Vertical	Peak
1289.89	36.68	26.21	5.76	37.17	31.48	74.00	-42.52	Horizontal	Peak
3543.55	35.22	29.13	9.98	37.11	37.22	74.00	-36.78	Horizontal	Peak
5073.59	33.17	31.80	12.03	35.23	41.77	74.00	-32.23	Horizontal	Peak
6662.01	31.95	34.20	14.14	33.71	46.58	74.00	-27.42	Horizontal	Peak

802.11g					CH06				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
1182.94	37.07	26.17	5.48	37.23	31.49	74.00	-42.51	Vertical	Peak
3498.74	36.43	28.99	9.88	37.14	38.16	74.00	-35.84	Vertical	Peak
5099.49	31.81	31.90	12.03	35.18	40.56	74.00	-33.44	Vertical	Peak
6645.07	32.45	34.20	14.12	33.70	47.07	74.00	-26.93	Vertical	Peak
1768.62	37.22	25.34	6.68	37.37	31.87	74.00	-42.13	Horizontal	Peak
3552.58	35.54	29.16	10.00	37.10	37.60	74.00	-36.40	Horizontal	Peak
5490.18	31.88	31.86	12.54	34.44	41.84	74.00	-32.16	Horizontal	Peak
7319.96	32.72	36.30	14.58	33.32	50.28	74.00	-23.72	Horizontal	Peak

802.11g					CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
1357.25	37.05	26.03	5.93	37.14	31.87	74.00	-42.13	Vertical	Peak
3463.29	35.60	28.71	9.79	37.17	36.93	74.00	-37.07	Vertical	Peak
4501.49	34.11	30.70	11.24	36.29	39.76	74.00	-34.24	Vertical	Peak
5703.86	32.82	31.62	12.81	34.31	42.94	74.00	-31.06	Vertical	Peak
1165.01	37.97	26.03	5.43	37.24	32.19	74.00	-41.81	Horizontal	Peak
3815.03	34.94	29.62	10.23	36.89	37.90	74.00	-36.10	Horizontal	Peak
4920.96	34.10	31.42	11.72	35.52	41.72	74.00	-32.28	Horizontal	Peak
6511.12	31.61	34.02	13.88	33.63	45.88	74.00	-28.12	Horizontal	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss - Preamplifier Factor

2. The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

3. The emission levels of other frequencies(test frequency band is 1GHz to 25GHz) are very lower than the limit and not show in test report.

802.11n(HT	20)				CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
3176.16	37.72	28.80	9.37	37.42	38.47	74.00	-35.53	Vertical	Peak
3883.62	36.65	29.68	10.35	36.84	39.84	74.00	-34.16	Vertical	Peak
5125.52	33.13	31.80	12.04	35.13	41.84	74.00	-32.16	Vertical	Peak
6696.01	33.02	34.20	14.19	33.72	47.69	74.00	-26.31	Vertical	Peak
3128.01	37.46	28.80	9.24	37.46	38.04	74.00	-35.96	Horizontal	Peak
3672.11	36.92	29.30	9.99	37.00	39.21	74.00	-34.79	Horizontal	Peak
5434.56	32.33	31.64	12.51	34.54	41.94	74.00	-32.06	Horizontal	Peak
7489.60	31.58	36.12	14.87	33.04	49.53	74.00	-24.47	Horizontal	Peak

802.11n(HT20) CH06									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
4234.72	34.91	30.07	10.81	36.53	39.26	74.00	-34.74	Vertical	Peak
5151.68	33.68	31.69	12.05	35.08	42.34	74.00	-31.66	Vertical	Peak
6594.52	31.80	34.19	14.06	33.67	46.38	74.00	-27.62	Vertical	Peak
7338.62	32.06	36.30	14.62	33.29	49.69	74.00	-24.31	Vertical	Peak
3018.50	37.89	28.64	8.99	37.56	37.96	74.00	-36.04	Horizontal	Peak
3709.69	36.78	29.33	10.01	36.97	39.15	74.00	-34.85	Horizontal	Peak
5546.36	32.66	31.85	12.62	34.39	42.74	74.00	-31.26	Horizontal	Peak
7527.83	32.61	36.13	14.89	33.02	50.61	74.00	-23.39	Horizontal	Peak

802.11n(HT	20)				CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
3184.25	37.40	28.80	9.39	37.41	38.18	74.00	-35.82	Vertical	Peak
3993.90	35.74	29.70	10.51	36.76	39.19	74.00	-34.81	Vertical	Peak
5532.26	33.50	31.87	12.60	34.40	43.57	74.00	-30.43	Vertical	Peak
7376.08	32.76	36.30	14.69	33.23	50.52	74.00	-23.48	Vertical	Peak
3883.62	36.05	29.68	10.35	36.84	39.24	74.00	-34.76	Horizontal	Peak
5546.36	33.23	31.85	12.62	34.39	43.31	74.00	-30.69	Horizontal	Peak
7357.33	31.20	36.30	14.66	33.26	48.90	74.00	-25.10	Horizontal	Peak
8042.90	31.19	37.06	15.67	33.06	50.86	74.00	-23.14	Horizontal	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss - Preamplifier Factor

2. The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

3. The emission levels of other frequencies(test frequency band is 1GHz to 25GHz) are very lower than the limit and not show in test report.

6. <u>TEST SETUP PHOTOS</u>

Conducted Emissions (AC Mains)



Radiated Emissions





7. EXTERANAL AND INTERNAL PHOTOS

Reference to the test report No.: CHTEW19050088.

-----End of Report------