FCC 47 CFR PART 15 SUBPART C: 2014 AND ANSI C63.10: 2013

TEST REPORT

For

Guitar Processor

Model:HEADRUSH PEDALBOARD

Data Applies to: N/A

Brand: HEADRUSH

Issued for

inMusic Brands, Inc.

200 Scenic View Drive, Cumberland, RI 02864, U.S.A.

Issued by

Compliance Certification Services Inc. Tainan Lab. No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.) TEL: 886-6-580-2201 FAX: 886-6-580-2202 Date of Issue: December 15, 2016



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REVISION HISTORY

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 15, 2016	Initial Issue	ALL	Daphne Liang

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1. TEST REPORT CERTIFICATION

Applicant	:	inMusic Brands, Inc. 200 Scenic View Drive, Cumberland, RI 02864, U.S.A.
Manufacturer	:	inMusic Brands, Inc. 200 Scenic View Drive, Cumberland, RI 02864, U.S.A.
Equipment Under Test	:	Guitar Processor
Model	:	HEADRUSH PEDALBOARD
Data Applies To	:	N/A
Brand	:	HEADRUSH
Date of Test	:	August 18, 2016 ~ December 09, 2016

APPLICABLE STANDARD				
STANDARD	TEST RESULT			
FCC Part 15 Subpart C: 2014 AND ANSI C63.10: 2013	No non-compliance noted			

Approved by:

- LeCorton

Jeter Wu Assistant Manager

Reviewed by:

Eric Huang Assistant Section Manager

2. EUT DESCRIPTION

Product Name	Guitar Processor
Model	HEADRUSH PEDALBOARD
Data Applies To	N/A
Brand	HEADRUSH
Received Date	August 18, 2016
Frequency Range	IEEE 802.11b/g, 802.11n HT20: 2412MHz~2462MHz Bluetooth 4.0: 2402MHz~2480MHz
Transmit Power	IEEE 802.11b Mode: 11.61dBm (14.4877mW) IEEE 802.11g Mode: 16.38dBm (43.4510mW) IEEE 802.11n HT20 Mode: 16.27dBm (42.3643mW) Bluetooth 4.0 Mode: 2.35Bm (1.71633mW)
Channel Spacing	IEEE 802.11b/g, 802.11n HT20: 5MHz Bluetooth 4.0: 2MHz
Channel Number	IEEE 802.11b/g, 802.11n HT20: 11 Channels Bluetooth 4.0 : 40 Channels
Transmit Data Rate	IEEE 802.11b : 11, 5.5, 2, 1 Mbps IEEE 802.11g : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT20 : 130, 117 ,104, 78, 65, 58.5, 52, 39, 26, 19.5,13, 6.5 Mbps Bluetooth 4.0: 1 Mbps
Type of Modulation	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK, BPSK) Bluetooth 4.0: GFSK
Frequency Selection	By software / firmware
Antenna Type	Type: PCB Antenna Model: WLA-EM-1508-0008-B Manufacturer: BRITO Gain: 4.6 dBi
Hardware Version	AZ01:AZ01CRB06F
Software Version	MG01-11373c9-develop-MykolaShaforostov.tar
Power Rating	AC 100-240V, 50/60Hz
Temperature Range	25°C

REMARK:

3. For more details, please refer to the User's manual of the EUT.

^{1.} The sample (**HEADRUSH PEDALBOARD**) selected for test was engineering sample that approximated to production product and was provided by manufacturer.

This submittal(s) (test report) is intended for FCC ID: <u>Y40-MG01</u> filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

3. DESCRIPTION OF TEST MODES

The EUT is a 11n router. It has two transmitter chains and two receive chains (2x2 configurations). The 2x2 configuration is implemented with two outside chains (Chain 0).

The RF chipset is manufactured by Realtek Corporation.

The antenna peak gain 4.6dBi (highest gain) were chosen for full testing.

IEEE 802.11 b ,802.11g ,802.11n HT20 mode (DTS Band)

The EUT had been tested under operating condition.

There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b mode: 1Mbps long data rate (worst case) were chosen for full testing. IEEE 802.11g mode: 6Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT20 mode: 6.5Mbps data rate (worst case) were chosen for full testing.

GFSK mode

The EUT had been tested under operating condition.

There are three channels have been tested as following:

Channel	Frequency (MHz)	
Low	2402	
Middle	2442	
High	2480	

Bluetooth 4.0 (GFSK) mode: 1Mbps data rate (worst case) were chosen for full testing.

The worst-case data rates are determined according to the description above, based on the investigations by measuring the PSD, peak power and average power across all the data rates, bandwidths, modulations and spatial stream modes.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10 and FCC CFR 47 15.207, 15.209 and 15.247.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.8, Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 LABORATORY ACCREDITATIONS LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by Taiwan Accreditation Foundation for the specific scope of accreditation under Lab Code: 1109 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by TAF or any agency of the Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: TW-1037 and 455173).

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan TAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, <u>http://www.ccsrf.com</u>

6. CALIBRATION AND UNCERTAINTY

6.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

6.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

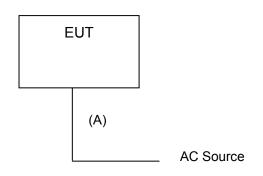
PARAMETER	UNCERTAINTY
Radiated Emission, 150kHz to 30 MHz Test Site : Chamber 966	±5.2dB
Radiated Emission, 30 to 200 MHz Test Site : Chamber 966	±3.21dB
Radiated Emission, 200 to 1000 MHz Test Site : Chamber 966	±3.09dB
Radiated Emission, 1 to 8 GHz	± 2.65dB
Radiated Emission, 8 to 18 GHz	± 2.66dB
Radiated Emission, 18 to 26.5 GHz	± 2.65dB
Radiated Emission, 26 to 40 GHz	± 3.03dB
Power Line Conducted Emission	±1.91dB
Band Width	136.49kHz
Peak Output Power MU	±1.34dB
Band Edge MU	±0.30dBuV
Channel Separation MU	361.69Hz
Duty Cycle MU	0.064ms
Frequency Stability MU	0.223kHz

Uncertainty figures are valid to a confidence level of 95%, K=2

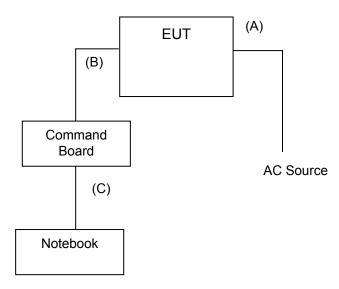
7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT

FOR RF TEST WIFI:

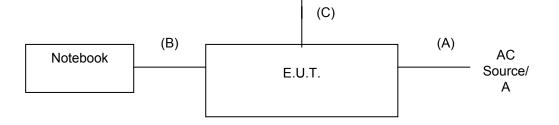


BLUETOOTH:





FOR EMI TEST



7.2 SUPPORT EQUIPMENT

RF test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Notebook	Acer	AS 3830TG	DOC	Power cable, unshd, 1.6m

No.	Signal cable description		
А	Power Unshielded, 1.9m, 1pcs.		
В	Command Unshielded, 0.4m, 1pcs.		
С	USB	Shielded, 1.8m, 1pcs.	

EMI test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Notebook	Acer	AS 3830TG	DOC	Power cable, unshd, 1.6m

No.	Signal cable description		
А	AC Power	Unshielded, 1.8m, 1pcs.	
В	B USB Shielded, 2.0m, 1pcs, with one core.		
С	AUDIO Shielded, 1.0m, 14pcs.		

REMARK:

- 1. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

7.3 EUT OPERATING CONDITION

RF Setup

WIFI :

RF Setup

- 1. Set up a whole system as the setup diagram.
- 2. Turn on power and press "Exit"

3.Keyboard press Ctrl+Alt+F2 and key in "root".

1070-05-01 08-08-15 + 602 TOT-10 80 27 07 8 8 514 08-1 0 0 0 0 0 0	AZO1 Pro	oduction	Tests 1	.29	
B LE PRI B B B B B B Maar Clock: E33.333 Miss BPU Clock: A02 Miss SPU Mastery: 0 MB	Autor Dist Plat	internet .			100
Thermal Zone 1: 31.343 C Thermal Zone 3: 51.818 C	Ramit Harmar Harming	and: activ			100
Annana Andre Maria Barta Salahan Kabu Malana Kabu	Anghtees, Not				
-					
Lingthange Jac	CE vil.1.2 kunit en Aug 26	2014		-	

TX Mode Key in

B Mode : wl down

wl mpc 0

wl country ALL

wl band b

wl up

wl 2g_rate -r 01 -b 20

wl channel 01 (01,06,11)

wl phy_watchdog 0

wl scansuppress 1

wl phy_forcecal 1

wl phy_txpwrctrl 1

wl txpwr1 -0 -d 10

wl pkteng_start 00:90:4c:14:43:19 tx 100 1000 0

G Mode : wl down wl mpc 0 wl country ALL



wl band b

wl up

wl 2g_rate –r 06 –b 20 wl channel 01 (01,06,11)

wl phy_watchdog 0

wl scansuppress 1

wl phy_forcecal 1

wl phy_txpwrctrl 1

wl txpwr1 -0 -d 10

wl pkteng_start 00:90:4c:14:43:19 tx 100 1000 0

HT20 Mode : wI down

wl mpc 0 wl country ALL wl band b wl up wl 2g_rate $-h \ 0 -b \ 20$ wl channel 01/20 (01,06,11) wl phy_watchdog 0 wl scansuppress 1 wl phy_forcecal 1 wl phy_txpwrctrl 1 wl txpwr1 -0 -d 10 (9,10) wl pkteng_start 00:90:4c:14:43:19 tx 100 1000 0

RX Mode Key in

wl down

wl band auto

wl mpc 0

wl country ALL

wl channel 01 (01,06,11)

wl bi 65535

wl up

wl phy_watchdog 0

wl scansuppress 1

wl phy_forcecal 1

4. All of the function are under run.

5. Start test.

BLUETOOTH :

RF Setup

1. Set up a whole system as the setup diagram.

- 2. The "putty.exe" software was used for testing
- 3. Key in "root".

TX Mode Key in

hciconfig hci0 up hcitool cmd 0x03 0x0003 hcitool cmd 0x08 0X0001e 00(00,14,27) 25 00

RX Mode Key in

hciconfig hci0 up hcitool cmd 0x03 0x0003 hcitool cmd 0x3f 0x0052 EE FF C0 88 00 00 E8 03 00(00,27,4E) 04 00 01 FF FF

4. All of the function are under run.

5. Start test.

8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6DB BANDWIDTH

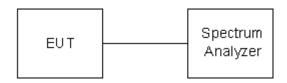
<u>LIMIT</u>

§ 15.247(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	04/29/2017

TEST SETUP



TEST PROCEDURE

- 1. Set resolution bandwidth (RBW) = 1-5 % of the emission bandwidth (EBW).
- 2. Set the video bandwidth (VBW) \ge 3 x RBW.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.
- 7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is 1-5 %.

TEST RESULTS

No non-compliance noted.

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

IEEE 802.11b mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	8.08	500	PASS
Middle	2437	8.07	500	PASS
High	2462	8.08	500	PASS

NOTE : 1. At finial test to get the worst-case emission at 1Mbps long.
 2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	16.39	500	PASS
Middle	2437	16.39	500	PASS
High	2462	16.39	500	PASS

NOTE : 1. At finial test to get the worst-case emission at 6Mbps.

2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT20 mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	2412	17.64	500	PASS
Middle	2437	17.63	500	PASS
High	2462	17.63	500	PASS

NOTE :

1. At finial test to get the worst-case emission at 6.5Mbps.

2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

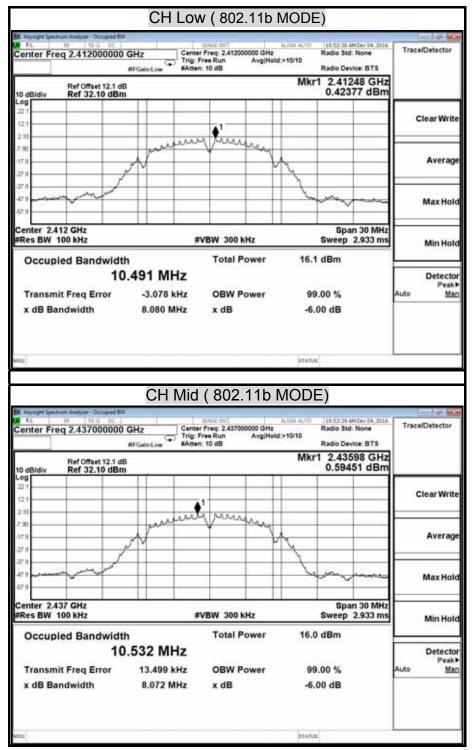
Bluetooth 4.0 (GFSK) mode

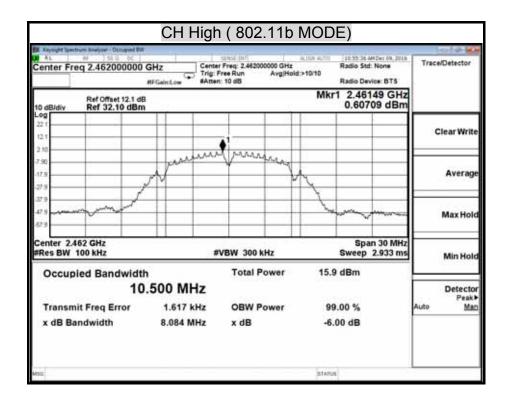
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	2402	710.50	500	PASS
Middle	2440	711.18	500	PASS
High	2480	707.67	500	PASS

NOTE : 1. At finial test to get the worst-case emission at 1Mbps.

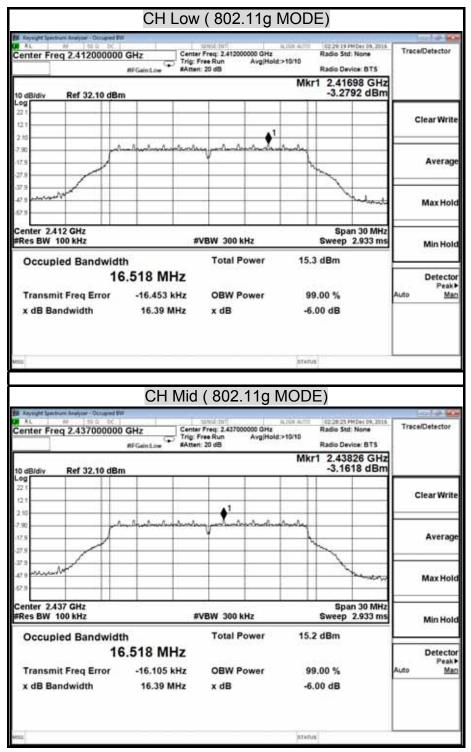
2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

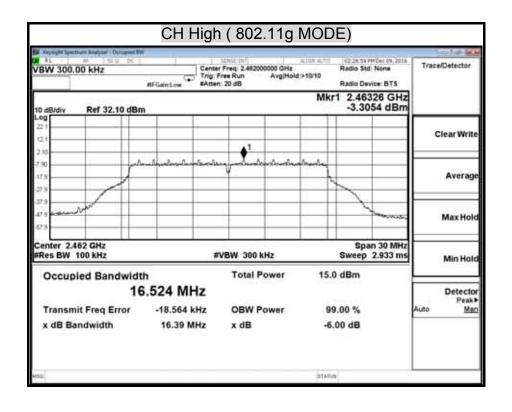
6dB BANDWIDTH (802.11b MODE)



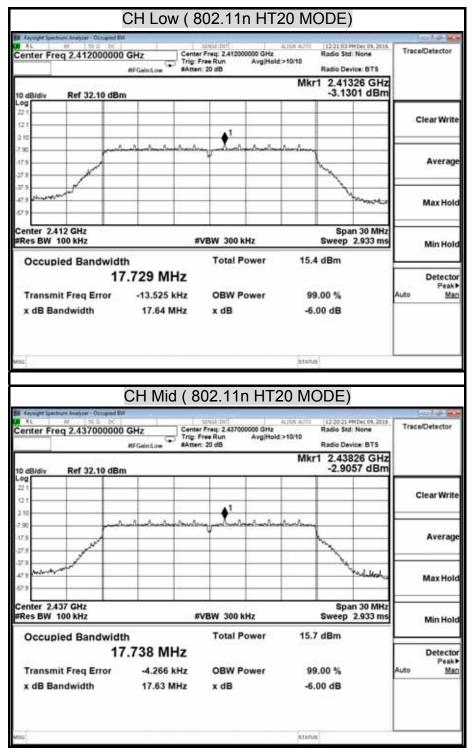


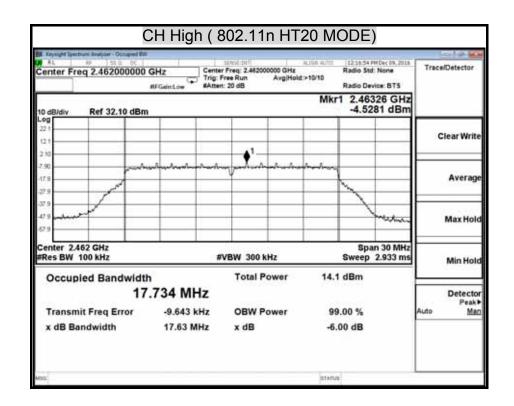
6dB BANDWIDTH (802.11g MODE)



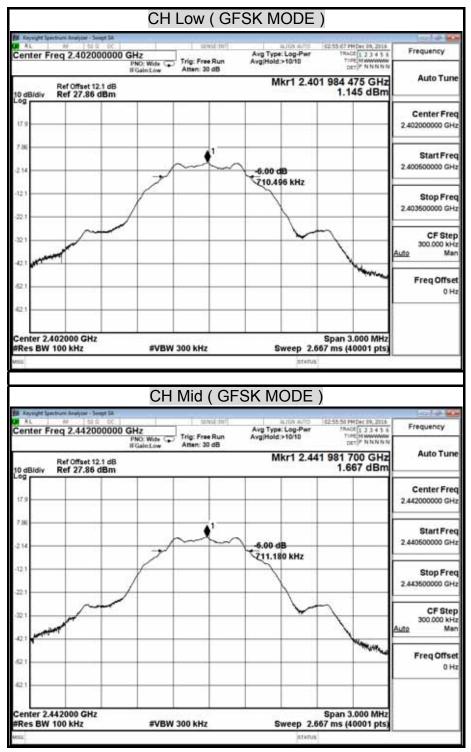


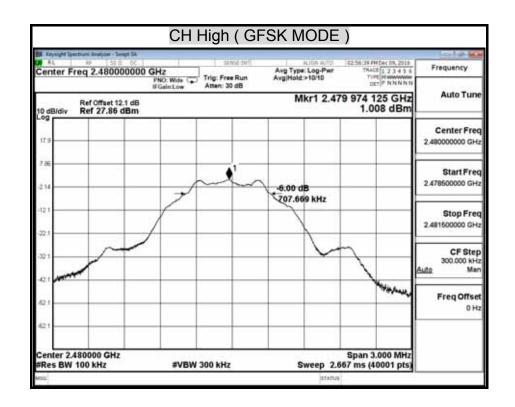
6dB BANDWIDTH (802.11n HT20 MODE)





6dB BANDWIDTH (GFSK MODE)





8.2 MAXIMUM PEAK OUTPUT POWER

<u>LIMIT</u>

§ 15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following :

§ 15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands : 1 watt.

§ 15.247(b) (4) Except as shown in paragraphs (c) of this section , if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section , as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	04/29/2017
Power Meter	Anritsu	ML2487A	6K00003888	03/23/2017

TEST SETUP

For Peak Power



For Average Power



TEST PROCEDURE

The tests were performed in accordance with KDB 558074 5.2.1.2 and 5.2.2.1.

5.2.1.2 Measurement Procedure PK2:

- 1. Set the RBW = 1 MHz.
- 2. Set the VBW \geq 3 RBW
- 3. Set the span \geq 1.5 x DTS bandwidth.
- 4. Detector = peak.
- 5. Sweep time = auto couple.
- 6. Trace mode = max hold.
- 7. Allow trace to fully stabilize.
- 8. Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector). If the instrument does not have a band power function,
- 9. Sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.

Average Power

Connect the EUT to power meter, set the center frequency of the power meter to the channel center frequency.

TEST RESULTS

No non-compliance noted

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

IEEE 802.11b mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	11.61	30.00	-18.39
Middle	2437	11.43	30.00	-18.57
High	2462	11.28	30.00	-18.72

NOTE : 1. At finial test to get the worst-case emission at 1Mbps long.
 2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	16.38	30.00	-13.62
Middle	2437	16.24	30.00	-13.76
High	2462	16.14	30.00	-13.86

NOTE: 1.At finial test to get the worst-case emission at 6Mbps.

2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT20 mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2412	16.13	30.00	-13.87
Middle	2437	16.27	30.00	-13.73
High	2462	15.06	30.00	-14.94

NOTE : 1. At finial test to get the worst-case emission at 6.5Mbps.
 2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

Bluetooth 4.0 (GFSK) mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2402	1.86	30.00	-28.14
Middle	2440	2.35	30.00	-27.65
High	2480	1.70	30.00	-28.30

NOTE : 1. At finial test to get the worst-case emission at 1Mbps.
 2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was entered as an offset in the spectrum analyzer to allow for direct reading of power.

Average Power Data

IEEE 802.11b mode

Channel Channel Frequency (MHz)		Average Power (dBm)	
Low	2412	8.38	
Middle	2437	8.42	
High	2462	8.49	

IEEE 802.11g mode

Channel	Channel Frequency (MHz)	Average Power (dBm)
Low	2412	7.86
Middle	2437	7.87
High	2462	7.79

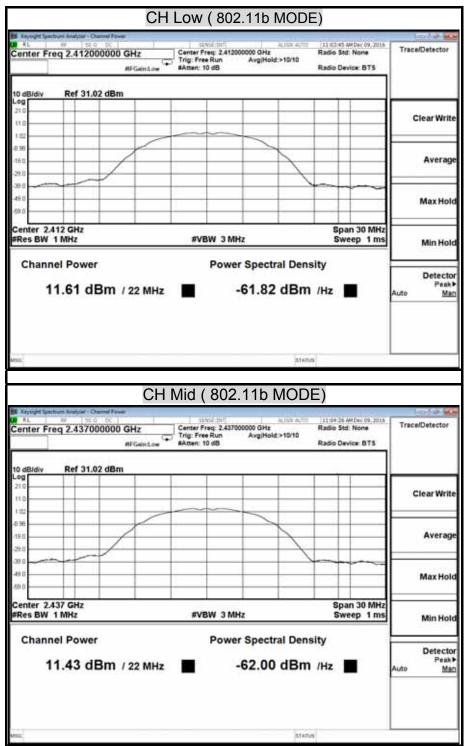
IEEE 802.11n HT20 mode

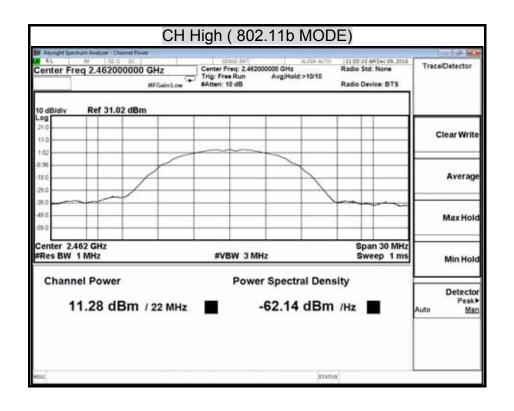
Channel	Channel Frequency	Average Power (dBm)	
(MHz)		Chain 0	
Low	2412	8.03	
Middle	2437	7.91	
High	2462	6.33	

Bluetooth 4.0 (GFSK) mode

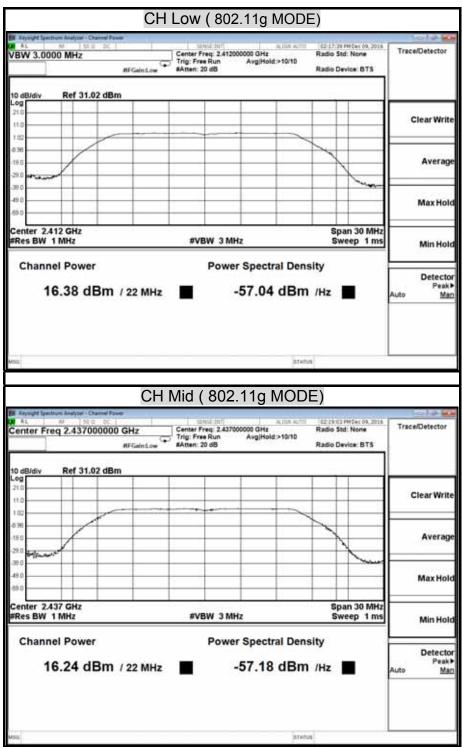
Channel Channel Frequency (MHz)		Average Power (dBm) Chain 0
Low	2402	-0.60
Middle	2440	-0.05
High	2480	-0.75

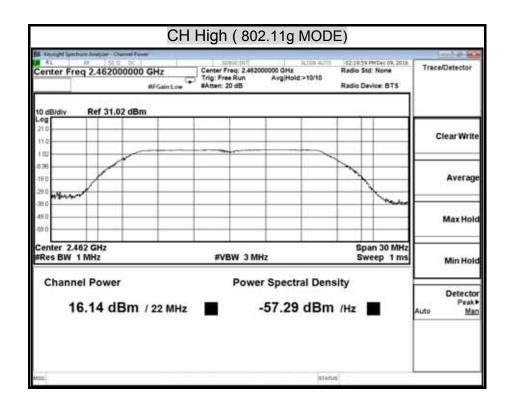
MAXIMUM PEAK OUTPUT POWER (802.11b MODE)

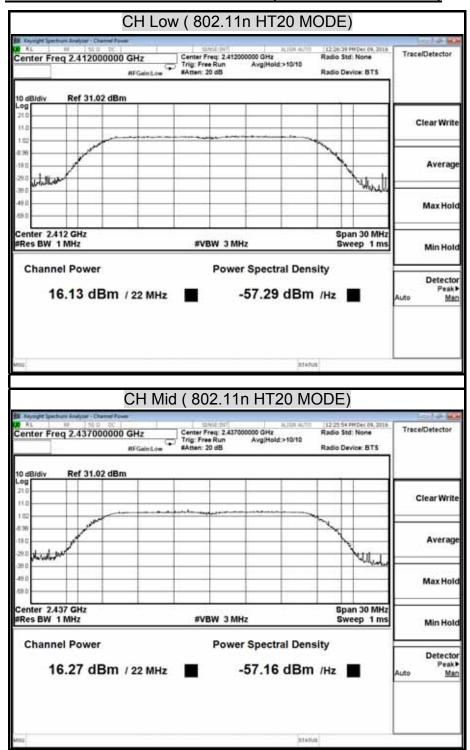




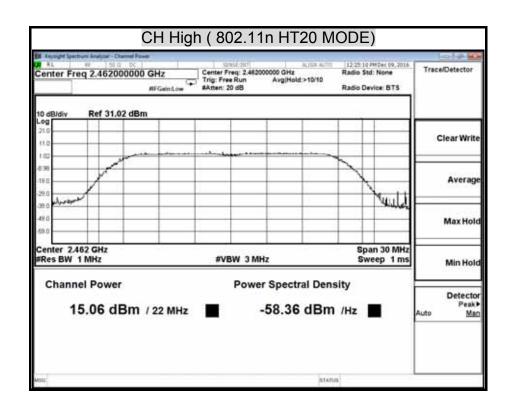








MAXIMUM PEAK OUTPUT POWER (802.11n HT20 MODE)



MAXIMUM PEAK OUTPUT POWER (GFSK MODE) CH Low (GFSK MODE) Image: Sector Se

Center F	req 2.40200				Run	Avg Type: Avg Hold:	Log-Pwr	192 CD - CD	PHDec 09, 2015	Frequency
		1F	NO: Fast Gain:Low	Atten: 30		Avginus.	2057.			Auto Tu
0 dBidiv	Ref Offset 12 Ref 27.86 d	1 dB IBm					Mkr1		220 GHz 358 dBm	Auto Tu
17.9										Center Fr
										2.402000000 G
7.86					♦ ¹					Start Fr
2.14		-			0.000		<			2.399500000 G
12.1										Stop Fr
221										2.404500000 G
121										CF St
										500.000 k Auto N
42.1										Erecoff
21										Freq Off
12.1	_			-						
Center 2	402000 GHz							Spar	5.000 MHz	
	1.5 MHz		#VBW	5.0 MHz		S	weep 1		(1001 pts)	
545							STATUS		1	
515			01		(o E					F
545			СН	l Mid	(GF	SK M				
AL.	ectrum Analyzer - See 19 510	00			(GF	SK M	ODE)	PH Dec 19, 2016	Frequency
AL.	reg 2.44200	0000 G	IZ NO: Fast G	1 90	e Run	SK M)	PH Dec 09, 2018 45 (1 2 3 4 5 6 12 M NN N N N	Frequency
enter F	9F 358 11	0000 GH	łz	Trig: Free	e Run	SK M	ODE) (010250 5% 7% 2.442	CE 1 2 3 4 5 6	
AL.	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run	SK M	ODE) (010250 5% 7% 2.442	195 GHz	Auto Tu
og	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run	SK M	ODE) (010250 5% 7% 2.442	195 GHz	Auto Tu Center Fr
enter F	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.442000000 G
og 17.9	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.44200000 G Start Fr
kL Center F 0 dB/div 0g 17.9 7.86 2.14	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.44200000 G Start Fr 2.439500000 G
AL Center F 0 dBidiv 0 g 7 36 2 14	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.44200000 G Start Fr 2.43950000 G Stop Fr
AL Center F 0 dBidiv 0 g 7 36 2 14	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.44200000 G Start Fr 2.43950000 G Stop Fr 2.444500000 G
og 0 dB/div	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.44200000 0 Start Fr 2.439500000 0 Stop Fr 2.44450000 0 CF St 500.000 1
0 dBidiv 9 7 86 2 14 12 1 12 1 12 1 12 1 12 1	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.442000000 G Start Fr 2.439500000 G Stop Fr 2.444500000 G CF St 500.000 k
AL eenter F 0 dBidiv 7 86 2 14 12 1 12 1 12 1 12 1 12 1 12 1 12 1	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.44200000 G Start Fr 2.43950000 G Stop Fr 2.44450000 G CF St 500.000 M Freq Offr
AL enter F	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.44200000 G Start Fr 2.43950000 G Stop Fr 2.44450000 G CF St 500.000 M Freq Offr
AL enter F	req 2.44200 Ref Offset 12	0000 GH	IZ NO: Fast G	Trig: Free	e Run 9 dB	SK M	ODE) (0.0251 540 71 2.442	195 GHz	Auto Tu Center Fr 2.44200000 G Start Fr 2.43950000 G Stop Fr 2.44450000 G CF St 500.000 M Freq Offr
214 214 214 214 214 214 214 214	req 2.44200 Ref Offset 12	0000 GH	Az NO: Fast GainLow	Trig: Free	PRINT PRINT	SK Mi	DDE Llog-Par 1078 Mkr1) 2.442 2.3 500 70 70 70 70 70 70 70 70 70 70 70 70 7	195 GHz	Auto Tu Center Fr 2.44200000 G Start Fr 2.439500000 G Stop Fr 2.44450000 G CF St 500.000 k

Keysight Spectrum Analyzer - Swept SA AL ## 55.0 DC	-	sine out	ALISA ALISA	63-62-31 PMDec 09, 2016	
enter Freq 2.480000000	PNO: Fast Can Trip	: Free Run	Avg Type: Log-Pwr Avg/Hold:>10/10	TRACE 1 2 3 4 5 6 TIPE MINIMUM	Frequency
Ref Offset 12.1 dB dB/div Ref 27.86 dBm	IFGainLow At	en: 30 dB	Mkr	1 2.479 760 GHz 1.702 dBm	Auto Tune
9					Center Fred 2.480000000 GH
14	-	•			Start Free 2.477600000 GH
					Stop Free 2.482500000 GH
					CF Step 500.000 kH Auto Mar
					Freq Offse 0 H
nter 2.480000 GHz				Span 5.000 MHz	

8.3 DUTY CYCLE

<u>LIMIT</u>

Nil (No dedicated limit specified in the Rules)

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	04/29/2017

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST SETUP



TEST PROCEDURE

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

TEST RESULTS

No non-compliance noted.

TEST DATA

<u>WIFI</u>

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

	us	Times	Ton	Total Ton time(ms)
Ton1	100000.000	1	100000	100
Ton2		0	0	
Ton3			0	
Тр				100

Ton	100
Tp(Ton+Toff)	100
Duty Cycle	1
10 * log (1/x) =	0

%

100

<u>TEST PLOT</u>

<u>Plot</u>

	IEEE 802.11	lb CH Low		
Bit Keyoght Igectrum Analyzer - Swept IA UR AL RA SI D DO	SENSE ONT	ALITA ALITA RAvg Type: RMS	11:12:04 AMDec 09, 2016	Frequency
Center Freq 2.4120000 Ref Offset 12.1 di 10 dBidiv Ref 22.10 dBn	PNC: Feet Trig: Free Run IFGain:Low #Atten: 20 dB B	any ye nos	Mkr1 47.70 ms 3.31 dBm	Auto Tune
12.1				Center Freq 2.41200000 GHz
2 10				Start Freq 2.412000000 GHz
37.9				Stop Freq 2.412000000 GHz
37.9				CF Step 1.000000 MHz Auto Man
67.9				Freq Offset 0 Hz
427.9				
Center 2.412000000 GHz Res BW 1.0 MHz	#VBW 1.0 MHz	Sweep	Span 0 Hz 100.0 ms (1001 pts)	

enter Freq 2.43700000	PNO: East Trig: Free Run	ALTA ALTA AAvg Type: RMS	11:10:41 AM Dec (9, 2018 7RACE 2 3 4 5 6 7:14E WWW WWW DET P 5 P N N N	Frequency
Ref Offset 12.1 dB g dB/div Ref 22.10 dBm	IFGainLow #Atten: 20 dB		Mkr1 42.10 ms 3.11 dBm	Auto Tune
12 1				Center Free 2.437000000 GH
2 10	• ¹			Start Free 2.437000000 GH
27.9				Stop Fre 2.437000000 GH
¥ 9				CF Ste 1.000000 MH Auto Ma
r9				Freq Offse
U 9				

IEEE 802.11b CH High						
and the second se	30 00	SENSE ONT	AUNA AUNA RAvg Type: RMS	11:11:21 AM Dec 09, 2015 7RACE 1 2 3 4 5 6	Frequency	
Ref Offset 10 dBidiv Ref 22.1	PNO: Fast IFGain:Low	Atten: 20 dB		Mkr1 42.00 ms 3.26 dBm	Auto Tune	
12.1		↓ ¹			Center Free 2.46200000 GH	
2 10					Start Free 2.462000000 GH	
37.9					Stop Free 2.46200000 GH	
I.9					CF Step 1.000000 MH Auto Mar	
67.9					Freq Offse 0 H	
67.9						
Center 2.46200000 Res BW 1.0 MHz		V 1.0 MHz	Sweep	Span 0 Hz 100.0 ms (1001 pts)		
86			STAT	15		

Arysight law	trune Analyter - See	ept 1A		EEE 802.1	11g CH Lo	w			-10 B
Center Fre	eq 2.41200			Trig: Free Run	RAvg Type: R		TRACE	Dec 09, 2016	Frequency
4			PNO: Fast ++ FGain:Low	#Atten: 20 dB				PSPNNN	Auto Tun
10 dB/div	Ref Offset 12 Ref 22.10 c					M		6.90 ms 51 dBm	Auto Tun
12.1									Center Fre 2,41200000 GH
2.10				● ¹					
-7 30			photophotop	10/01010/0101010101	****	eleieleiele	*****	albialaia ac	Start Fre 2.412000000 GH
-17.9	11						_		Stop Fre 2.41200000 GH
-37.9									CF Ste 1.000000 MH
47.9	_								Auto Ma
47.9					_				Freq Offse
47.9			-		-	-	_	-	
Center 2.4 Res BW 1.	12000000 G 0 MHz	Hz	#VBW	1.0 MHz	Sw	reep 100		pan 0 Hz 1001 pts)	
MISIS			2.000			STATUS			

Center Freq 2.437000000	PNO: Fast Trig: Free Run	#Avg Type: RMS	12:00:32 PM Dec 09, 2015 3RACE 1 2 3 4 5 6 7/PE WWW WWW DET P 5 P N N N	Frequency
Ref Offset 12.1 dB 0 dB/div Ref 22.10 dBm	IFGainLow #Atten: 20 dB		Mkr1 55.80 ms -0.36 dBm	Auto Tun
12.1				Center Free 2.437000000 GH
2 10 pipinipi pipinipi pinipi pinipi pinipi 7 30		1 Gipppppppppppppppppppppp	k managen an	Start Fre 2.437000000 GH
17.9				Stop Fre 2.437000000 GH
27.9 				CF Ste 1.000000 MH Auto Ma
59 59				Freq Offse
67.9				

Center Freq 2.46200000	I GHz PNO: Feet Trig: Free Run	#Avg Type: RMS	12:01:12 PMDec 09, 2015 TRACE 1 2 3 4 5 6 TrPE WWW WWW DET P 5 P N N N	Frequency
Ref Offset 12.1 dB	IFGainLow #Atten: 20 dB		Mkr1 90.20 ms -0.43 dBm	Auto Tun
				Center Fre 2.46200000 GH
ويوام ادرام ادرام ادرام ادرام ادرام ادرام	hinderidenteridenteridenteridenteride	والقالما ويتمام والمراجع والم	المزداداداداداد	Start Fre
7.90		HILL I		2.462000000 GH
27.5				Stop Fre 2.45200000 GH
279 279				CF Ste 1.000000 MH Auto Ma
0.0				Freq Offse 0 H
67.9				
Center 2.462000000 GHz Res BW 1.0 MHz	#VBW 1.0 MHz	Sweep	Span 0 Hz 00.0 ms (1001 pts)	

N Lo	sight la	action	Realized	1 - 340	14		IE		502	.11n	H120	CH Lo	W			1010
UR A1			1	58.9	0000	GH	7	-	st	No. INT	sAvg	ALTIN ALT		100 PHIDec 09,	45.6	Frequency
Con	ter r	Teq	2.91	200	0000	29	O: Fast - lainLow		ig: Fre tten: 2		1000	100.00		DET PSP	N N N	Auto Tun
10 dE	Bidiv		Offse 1 22.										MKr	3.67 di		Huito Tuin
12.1																Center Fre
1323							100		15		1.00			♦1		2.412000000 GH
2.10	10/17	r i tra	449	0 per		444	en al an	an a	-th	-derich		Appendian .	والدقعية	nter fillsofer	ידי	Start Fre 2.412000000 GH
-17.9	1									,						Stop Fre 2.412000000 GH
37,9		_													_	CF Ste 1.000000 Mi- Auto Ma
47.9																Freq Offs
47.9		-		-		_		+-	-	-		_	-	_	-	
	ter 2. BW			00 G	Hz	-	#VB	W 1.0	MHz			Sweep	100.0 n	Span 0 ns (1001)		
MISIS												STA	PLB .			

Center Freq 2	4370000	00 GHz	Sanse out	ALIIA ALIII AAvg Type: RMS	TRACE 1 2 3 4 5 5	Frequency
	Offset 12.1 de		#Atten: 20 dB		Mkr1 15.00 ms	Auto Tuni
10 dB/div Ref	22.10 dBm	1			3.65 dBm	Center Free
12.1	A ¹					2.437000000 GH
2 10 10 100 100 100 100	ante a between the	2. And a land	*++++++++++++	alite appropriate the second	ang	Start Free 2.437000000 GH
27.9						Stop Fre 2.437000000 GH
.17.9 .17.9						CF Ste 1.000000 MH Auto Ma
47.9						Freq Offse
67.9						
200 C		avev.	(1.0 MHz	Swean	Span 0 Hz 100.0 ms (1001 pts)	

Center Freq 2.46200	00000 GHz		e Run	#Avg Typ	e: RMS	SMAC	#Dec 09,2015	Frequency
	PNO: Fast IFGain:Los						3.70 ms	Auto Tuni
10 dB/div Ref 22.10 c						2.	44 dBm	
12.1								Center Fre 2.462000000 GH
2 10 - 20 - 30	44-14-14-14-14-14-14-14-14-14-14-14-14-1	^น ม่วงหน่างการให้เหน่าง		white and	*****	n	ynnydew	Start Fre 2.45200000 GH
-17.9			1					Stop Fre 2.452000000 GH
37.9								CF Ste 1.000000 MH Auto Ma
47.9								Freq Offse
67.9								
Center 2.462000000 G Res BW 1.0 MHz		BW 1.0 MHz			Sween	S 100.0 ms (pan 0 Hz	

Bluetooth 4.0:

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

	us	Times	Ton	Total Ton time(ms)
Ton1	395.000	1	395	
Ton2		0	0	
Ton3			0	0.395
Тр				0.625

Ton	0.395
Tp(Ton+Toff)	0.625
Duty Cycle	0.632
10 * log (1/x) =	1.992829217

<u>Plot</u>

Ref Offset 12.1 dB Ref Offset 12.1 dB 0 dBidiv Ref 22.10 dBm	ALISA AUTO BAvg Type: RMS	141 30 32 PH Oct 12, 2015 TRACE 1, 2, 3, 4, 5, 6 TUPE P, N.N.N.N.	
enter Freq 2.40200000 GHz PRO: Feat Trig: Free Run IFGeinLow Ref Offset 12.1 dB og Ref 22.10 dBm	sAvg Type: RMS	TRACE 1 2 2 4 5 4	
PHC: Feat		TOPE (WWWWWWW	Frequency
0 dB/d/v Ref 22.10 dBm		DET PNNNNN	9000 PO P
0 dB/d/v Ref 22.10 dBm		Mkr1 20.10 ms	Auto Tun
		1.52 dBm	
12.1			Center Fre
			2.40200000 GH
2 ¹⁰ The second s	NUCLEAR AND A STREET AND A	THE TRACE OF A TRACE	Start Fre
-			2.402000000 GH
7.9			Stop Fre
			2.40200000 GH
79			CF Ste
			1.000000 MH Auto Ma
79			
the exterior balance but the base of the distance and the state of the of	a same as in that only	tradice of facat is	Freq Offse
79			0 H
Approprie Spectrum Analyzer - Swept SA AL 60 50 to 00 enter Freq 2.402000000 GHz	Auto Auto Avg Type: Log-Pwr	11 19 05 PH Oct 12, 2015 TRACE 1 2 3 4 5 6	Frequency
IFGainLow Atten: 20 dB	and the other m	DET P NNNNN	
		DET // PAPARA PARA	
			Auto Tun
Ref Offset 12.1 dB 0 dB/div Ref 22.10 dBm		۵/Mkr3 625.0 µs -0.31 dB	2003 States
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm		Mkr3 625.0 µs	Auto Tun
Ref Offset 12.1 dB 0 dB/div Ref 22.10 dBm Pg		Mkr3 625.0 µs	Auto Tun Center Fre
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm		Mkr3 625.0 µs	Auto Tun
Ref Offset 12.1 dB 0 dB/div Ref 22.10 dBm 12.1 1Δ2 7 50 1Δ2		Mkr3 625.0 µs	Auto Tun Center Fre 2.40200000 GH
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm 12.1 1 7:90 1Δ2 17:30 1		Mkr3 625.0 µs	Auto Tun Center Fre
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm 12.1 1 7:90 1Δ2 77.9 3Δ4		Mkr3 625.0 µs	Auto Tun Center Fre 2.40200000 GH Start Fre
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm 99 1Δ2 12.1 1Δ2 730 3Δ4 73 3Δ4		10000000000000000000000000000000000000	Auto Tun Center Fre 2.402000000 GH Start Fre 2.402000000 GH
Ref Offset 12.1 dB 0 dBudiv Ref 22.10 dBm 12.1 1Δ2 13.1 1Δ2 17.3 1Δ2 10.2 1Δ2 10.3 1Δ2 10.4 1Δ2		Mkr3 625.0 µs	Auto Tun Center Fre 2.40200000 GH Start Fre
Ref Offset 12.1 dB 0 dBJdiv Ref 22.10 dBm 00 1Δ2 12.1 1Δ2 17.9 1Δ2 17.9 3Δ4 27.9 3Δ4 27.9 3Δ4 27.9 4Δ4 27.9 4Δ4		10000000000000000000000000000000000000	Auto Tun Center Fre 2.40200000 GH Start Fre 2.402000000 GH Stop Fre
Ref Offset 12.1 dB 0 dBidiv Ref 22.10 dBm 09 1Δ2 121 1Δ2 730 3Δ4 323 3Δ4 273 3Δ4 2		۵Mkr3 625.0 µs -0.31 dB	Auto Tun Center Fre 2.40200000 GH Start Fre 2.402000000 GH Stop Fre 2.402000000 GH
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm -99 10.2 121 10.2 730 10.2 731 10.4 732 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 30.4 573 57.5 573 57.5 573 57.5 573 57.5 573 57.5 573 57.5 573 57.5 573 57.5 573 57.5 573 57.5 573 57.5 57.5 57.5	sweep 5	۵۵۲ אלג -0.31 dB -0.31 dB -0.31 dB 	Auto Tun Center Fre 2.40200000 GH Start Fre 2.402000000 GH Stop Fre 2.402000000 GH
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm 29 1Δ2 121 1Δ2 210 1Δ2 730 3Δ4 731 3Δ4 732 3Δ4 733 3Δ4 739 3Δ4 730 344 730 344 730 344 730 344 730 344 730 344 730 344 730 344 730 344 730 344 7		۵۵۲ אלג -0.31 dB -0.31 dB -0.31 dB 	Auto Tun Center Fre 2.40200000 GH Start Fre 2.402000000 GH Stop Fre 2.402000000 GH
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm	sweep 5	۵۵۲ אלג -0.31 dB -0.31 dB -0.31 dB 	Auto Tun Center Fre 2.40200000 GH Start Fre 2.402000000 GH Stop Fre 2.402000000 GH
Ref Offset 12.1 dB 0 dBidiv Ref 22.10 dBm 90	sweep 5	۵۵۲ אלג -0.31 dB -0.31 dB -0.31 dB 	Auto Tun Center Fre 2.402000000 GH 2.402000000 GH 2.402000000 GH 2.402000000 GH 2.402000000 GH 1.000000 MH Auto Ma
Ref Offset 12.1 dB 0 dBidiy Ref 22.10 dBm 90 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.1 10.2 12.2 10.0 12.2 10.0 12.2 10.0 12.2 10.0 12.2 10.0 12.2 10.0 12.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.3 0.31 dB	sweep 5	۵۵۲ אלג -0.31 dB -0.31 dB -0.31 dB 	Auto Tur Center Fre 2.40200000 GH 2.40200000 GH 2.40200000 GH 2.40200000 GH CF Ste 1.00000 MH Auto Ma
Ref Offset 12.1 dB 0 dBldiv Ref 22.10 dBm 09 10.2 12.1 10.2 13.1 10.2 17.3 10.2 17.3 30.4 17.3 30.4 17.3 30.4 17.3 30.4 17.3 30.4 17.3 30.4 17.3 30.4 17.3 30.4 17.3 10.2 17.3 10.4 17.3 10.4 17.3 10.4 17.4 10.4 17.5 10.50 ms 17.5 10.50 ms 17.5 10.30 ms 18 10.30 ms	sweep 5	۵۵۲ אלג -0.31 dB -0.31 dB -0.31 dB 	Auto Tur Center Fre 2.40200000 GH 2.40200000 GH 2.40200000 GH 2.40200000 GH CF Ste 1.00000 MH Auto Ma
Ref Offset 12.1 dB 0 dBidiv Ref 22.10 dBm 90 1Δ2 12.1 1Δ2 10 1Δ2 12.1 1Δ2 12.2 1Δ2	sweep 5	۵۵۲ אלג -0.31 dB -0.31 dB -0.31 dB 	Auto Tun Center Fre 2.402000000 GH Start Fre 2.402000000 GH Stop Fre 2.402000000 GH Stop Fre 2.402000000 GH CF Ste 1.000000 MH Mate Freq Offse

				(сн м	Ia				
Keysight Spectrum	Analyzer - Swept SA	5	-		10.0	1.1 510	an a		11.11	- 10 M
ideo BW 1.	0 MHz		1	SING		#Avg Type: R		TRACE 1 2 3	5.6	BW
		PNO: IFGain		Trig: Free Ru #Atten: 20 di	B			DET P N NT	N N N	Res BV
P.	f Offset 12.1 dE						Mk	1 14.70		1.0 MH
	ef 22.10 dBm							2.05 dE	3m	11.002.10
· · · · · · · · · · · · · · · · · · ·		_								Video BV
12.1								_	Aut	1.0 MH 0 <u>Ma</u>
17.1	▲ 1								-	
2.10			AN AN AN AN AN AN		mmm				III V	BW:3dB RBW
2.90									ALC:	0 Ma
17.9									- SI	pan:3dB RBW
									AUS	106 0 Ma
27.9										
37.9									- F	RBW Control
									[G	aussian,-3 dB)
0.9										
	when the set		to before a	oran a a	a 11 day	off a most h	a se alca	sind about	- T	
7.9									-	
7.9		-	-	-	-		_	-		
enter 2.4420			2 autority	111.241-0			682.67	Span 0	Hz	
tes BW 1.0 N	MHz		#VBW 1	.0 MHz		SW	eep 100.0	ms (1001 p		
tes BW 1.0 N	MHz		#VBW 1	.0 MHz		Sw	status	ms (1001 p		
es BW 1.0 N	MHz		#VBW 1	.0 MHz		Sw	_	ms (1001 p		
95		1	#VBW 1	.0 MHz		Sw	_	ms (1001 p		Lol # 4
NS Reysound Spectrum RL R	e Analyter - Swept DA 19 51 12 DC		#VBW 1	.0 MHz strid	28/5	4.15	314948 8 4470 [443	22 57 PM Get 12 1	ots)	
No Keysogitt Spectrum A.L. R		00 GHz	Fast -++	stree Ri	un.	17 514	314948 8 4470 [443	22.57 PH Gd 12.1	8118	Frequency
Xaysight Spectrum AL R	e Analyter - Swept DA 19 51 12 DC	00 GHz	Fast -++	strid	un.	4.15	a arto (413 og-Pwr	22.57 PH Oct 12.1 TRACE TriPE WWW DET P NN	2115	Frequency
enter Freq	a Analyse - Sweet 12 51 2 00 2.44200000 ef Offset 12.1 dt	DO GHz PNO: IFGain	Fast -++	stree Ri	un.	4.15	a arto (413 og-Pwr	22.57 PM Oct 12. TRACE 1.2.3 TOPE WWW DET P NN		Frequency
Annal Annal AL S Center Freq Re	2.4420000	DO GHz PNO: IFGain	Fast -++	stree Ri	un.	4.15	a arto (413 og-Pwr	22.57 PH Oct 12.1 TRACE TriPE WWW DET P NN		Frequency
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8.4 POWER SPECTRAL DENSITY

<u>LIMIT</u>

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

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	04/29/2017

TEST SETUP



TEST PROCEDURE

The tests were performed in accordance with KDB 558074 5.3.1.

5.3.1 Measurement Procedure PKPSD:

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. Set the span to 1.5 times the *DTS bandwidth*.
- 3. Set the RBW to: $3 \text{ kHz} \le \text{RBW} \le 100 \text{ kHz}$.
- 4. Set the VBW \geq 3 RBW.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level within the RBW.
- 10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST RESULTS

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

IEEE 802.11b mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	2412	0.42	8.00	-7.58	PASS
Middle	2437	0.59	8.00	-7.41	PASS
High	2462	0.61	8.00	-7.39	PASS

NOTE: 1. At finial test to get the worst-case emission at 1long Mbps long.

2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11g mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	2412	-3.28	8.00	-11.28	PASS
Middle	2437	-3.16	8.00	-11.16	PASS
High	2462	-3.31	8.00	-11.31	PASS

NOTE: 1. At finial test to get the worst-case emission at 6Mbps long.

2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT20 mode

Channel	Frequency (MHz)	PPSD Chain0 (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	2412	-3.13	8.00	-11.13	PASS
Middle	2437	-2.91	8.00	-10.91	PASS
High	2462	-4.53	8.00	-12.53	PASS

NOTE : 1. At finial test to get the worst-case emission at 6.5Mbps long.

2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

Bluetooth 4.0 (GFSK) mode

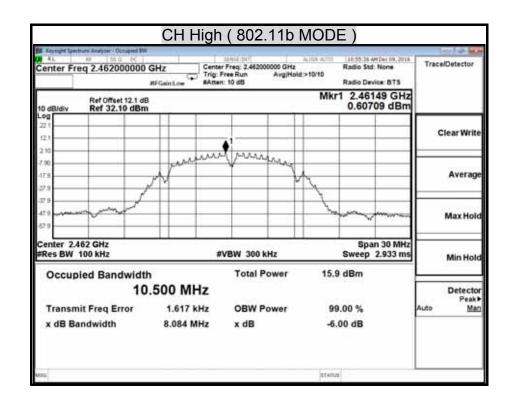
Channel	Frequency	PPSD Chain0	ain0 Limit Ma		Pass / Fail
	(MHz)	(dBm)	(dBm)	(dB)	
Low	2402	1.15	8.00	-6.86	PASS
Middle	2440	1.67	8.00	-6.33	PASS
High	2480	1.01	8.00	-6.99	PASS

NOTE : 1. At finial test to get the worst-case emission at 1Mbps long.

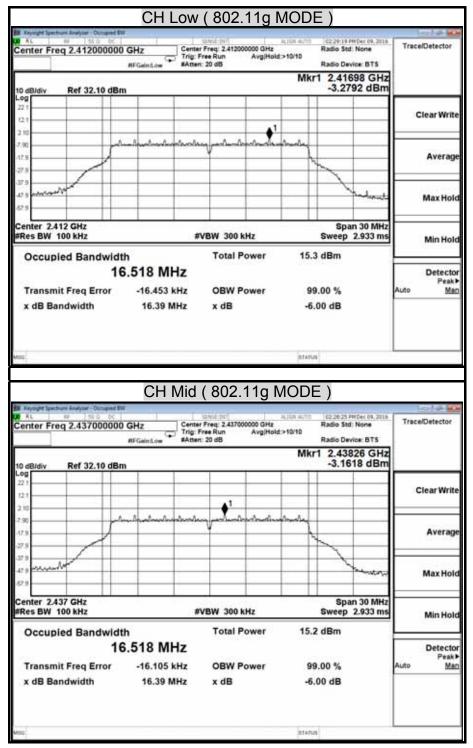
2. The cable assembly insertion loss of 11.1dB (including 10 dB pad and 1.1 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

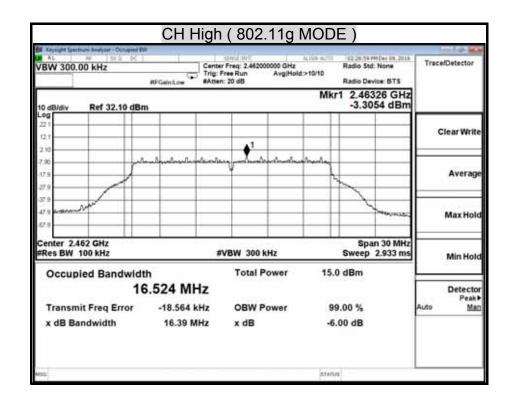
CH Low (802.11b MODE) 41 10.52 30 AMDec 09, 2015 Radio Std: None Center Freq: 2.412000000 GHz Trig: Free Run Avg|Hold:>10/10 #Atten: 10 dB Trace/Detector Center Freq 2.412000000 GHz Radio Device: BTS #FGainLow Mkr1 2.41248 GHz 0.42377 dBm Ref Offset 12.1 dB Ref 32.10 dBm **Clear Write** \$ AAAA AAAA N Average Max Hold Center 2.412 GHz Span 30 MHz Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms Min Hold **Total Power** 16.1 dBm **Occupied Bandwidth** 10.491 MHz Detector Peak Man **Transmit Freq Error** -3.078 kHz **OBW Power** 99.00 % Auto x dB Bandwidth 8.080 MHz x dB -6.00 dB STATUS CH Mid (802.11b MODE) Radio Std: None Center Freq: 2.43700000 GHz Trig: Free Run Avg|Hold:>10/10 #Atten: 10 dB Trace/Detector Center Freq 2.437000000 GHz Radio Device: BTS #FGainLow Mkr1 2.43598 GHz Ref Offset 12.1 dB Ref 32.10 dBm 0.59451 dBm 10 dB/div **Clear Write** M winn. Average Max Hold Center 2.437 GHz #Res BW 100 kHz Span 30 MHz Sweep 2.933 ms #VBW 300 kHz Min Hold **Total Power** 16.0 dBm **Occupied Bandwidth** 10.532 MHz Detector Peak* 13.499 kHz **Transmit Freq Error OBW Power** 99.00 % Auto Man x dB Bandwidth 8.072 MHz x dB -6.00 dB STATUS

POWER SPECTRAL DENSITY (IEEE 802.11b MODE)



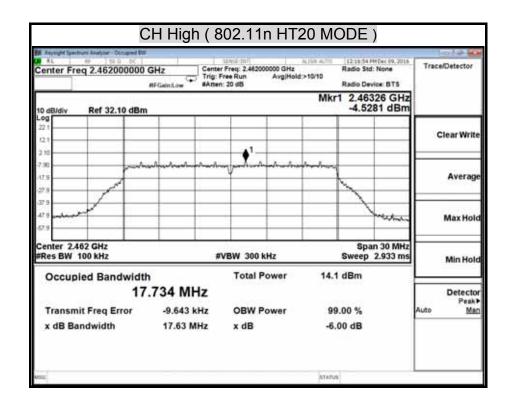
POWER SPECTRAL DENSITY (IEEE 802.11g MODE)

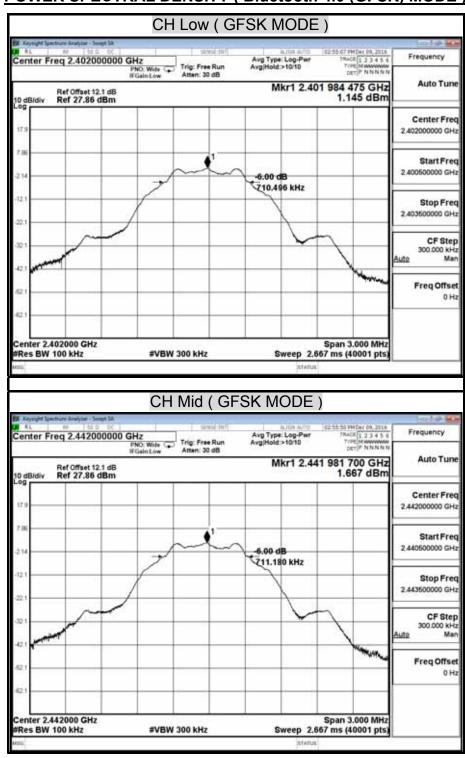




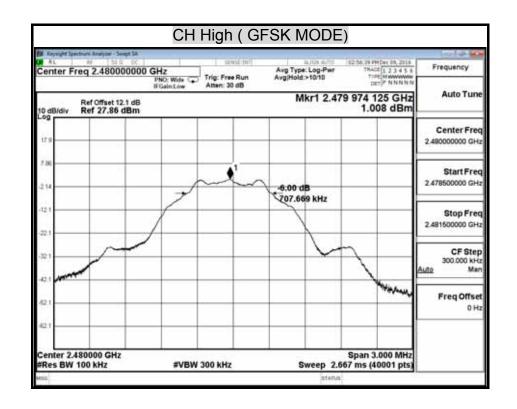
CH Low (802.11n HT20 MODE) 12-21:03 PMDec 09, 2016 Radio Std: None Trace/Detector GHz Center Freq: 2.41200000 GHz Trig: Free Run Avg/Hold:>10/10 #FGainLow Atten: 20 dB Center Freq 2.412000000 GHz Radio Device: BTS Mkr1 2.41326 GHz -3.1301 dBm Ref 32.10 dBm Clear Write Average Max Hold Center 2.412 GHz Span 30 MHz #VBW 300 kHz Res BW 100 kHz Sweep 2.933 ms Min Hold **Total Power** 15.4 dBm **Occupied Bandwidth** 17.729 MHz Detector Peak Man -13.525 kHz **OBW Power Transmit Freq Error** 99.00 % x dB Bandwidth 17.64 MHz -6.00 dB x dB STATUS CH Mid (802.11n HT20 MODE) 12-20:21 PMDec 09, 2015 Radio Std: None Center Freq: 2.43700000 GHz Center Freq: 2.43700000 GHz Trig: Free Run Avg|Hold:>10/10 #Atten: 20 dB Trace/Detector Center Freq 2.437000000 GHz Radio Device: BTS #FGaint.ow Mkr1 2.43826 GHz -2.9057 dBm Ref 32.10 dBm 0 dB/div **Clear Write** Averag udillal, Max Hold Span 30 MHz Sweep 2.933 ms Center 2.437 GHz Res BW 100 kHz #VBW 300 kHz Min Hold Total Power 15.7 dBm **Occupied Bandwidth** 17.738 MHz Detector Peak **Transmit Freq Error** -4.266 kHz **OBW Power** 99.00 % Man Auto x dB Bandwidth 17.63 MHz x dB -6.00 dB STATUS

POWER SPECTRAL DENSITY (802.11n HT20 MODE)





POWER SPECTRAL DENSITY (Bluetooth 4.0 (GFSK) MODE)



8.5 CONDUCTED SPURIOUS EMISSION

<u>LIMITS</u>

§ 15.247(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 and that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	04/29/2017

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

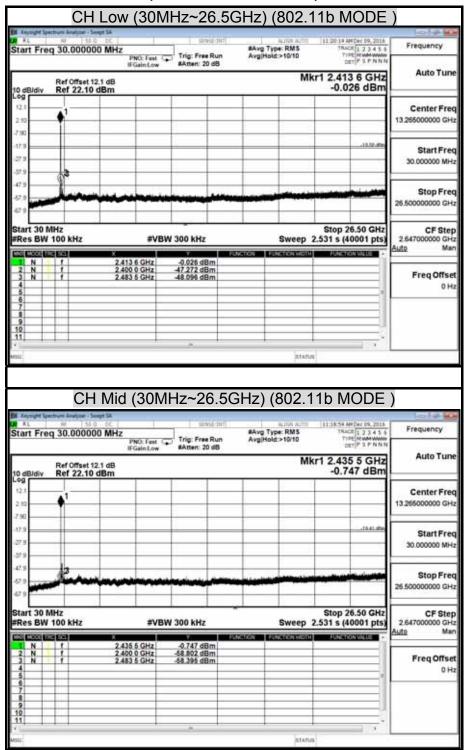
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

TEST RESULTS

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

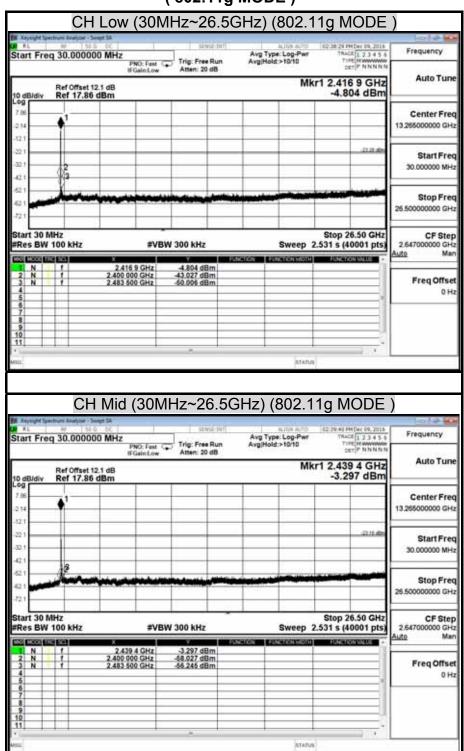
Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

(IEEE 802.11b MODE)



	THACE 123456 THE NUMMWWW DET PSPNNN		#Avg Type: RM5 Avg/Hold:>10/10		Trig: Free	NO: Fast C	1	q 30.000	rt Fre	
Auto Tun	Ref Offset 12.1 dB Mkr1 2.462 6 GHz 0 dBidiv Ref 22.10 dBm -0.262 dBm									
Center Free 13.26500000 GH							-	•1		
Start Free 30.000000 MH	-13,32,496									
Stop Fre 25.50000000 GH		-			******		****	, len	-	
CF Step 2.547000000 GH Auto Ma	top 26.50 GHz 1 s (40001 pts)		Sweep		V 300 kHz	#VB		IHZ 100 kHz	rt 30 f is BW	
Freq Offse 0 H	EUROPEON WALLE	10111		n	-0.262 dB -58.510 dB -56.739 dB	6 GHz 0 GHz 5 GHz	2.400	1 1 1	N N N	
		fattus	STA		-					

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT



(802.11g MODE)

100 M 100 M	THE NNNN	ype: Log-Pwr Nd:>10/10	Â	Trig: Free Run Atten: 20 dB	PNO: Fast 4	000000 1	eq 30.0	rt Fre
Auto Tun	2.468 5 GHz -3.881 dBm	Mkr1				offset 12.1 o 17.86 dB		Bidiv
Center Free 13.26500000 GH							•	
Start Free 30.000000 MH	.22.21.000		-					
Stop Fre 25.50000000 GH			-		~~~~~	*	Ř	-
CF Ste 2.64700000 GH	Stop 26.50 GHz 31 s (40001 pts)			W 300 kHz	#VB	Hz	MHz V 100 k	
Auto Mar	FUNCTION WALLE	UNCTION MODE	UNIVERSE OF	1.004.47	100 5 0010			
Freq Offse 0 H				-3.881 dBm -58.527 dBm -55.081 dBm	468 5 GHz 0 000 GHz 3 500 GHz		1	NNN
							-+-+	-

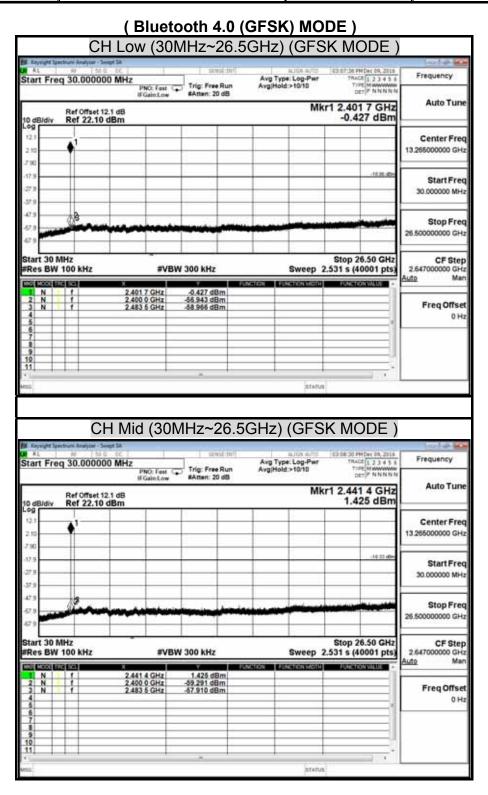
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

(802.11n HT20 MODE)

0148	MDec 09, 2015	12:11:52 P	A DA AND		Server -			wept IA	ctrure Analyter -	ysight lip		
Frequency	ET PSPNNN	TRAC		#Avg Typ Avg(Hold	Run		NO: Fast C	1	30.0000	rt Fre		
Auto Tun	Ref Offset 12.1 dB Mkr1 2.467 2 GHz 0 dB/div Ref 22.10 dBm -7.353 dBm											
Center Fre 13.265000000 GH									↓1			
Start Fre 30.000000 MH	-24.53 (8%											
Stop Fre 25.50000000 GH		-	-	-		-		~~~	se.	-		
CF Ste 2.647000000 GH Auto Ma	6.50 GHz 0001 pts)	2.531 s (4	The Division of Low Column 2 is not	-		/ 300 kHz	#VB		100 kHz	Contractor of the		
Freq Offse		FUNCTO			3m 3m	-7.353 dE -59.011 dE -67.088 dE	2 GHz 0 GHz 5 GHz	2.400		N N N		
							-					

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08



Cł	High (30)MHz~26.5	5GHz) (GFS	SK MODE)						
M Keysight Spectrum Analyzer - 3	wept SA	1. Sec. 19	177 STARSTON							
Start Freg 30.0000	00 MHz	SENSE ONT	Avg Type: Log-Pwr	03:09:20 PH/Dec 09, 2015 TRACE 1 2 3 4 5 6	Frequency					
	PNO: Fast IFGain:Low	#Atten: 20 dB	Avg/Hold:>10/10	DET PNNNN	Auto Tun					
	Ref Offset 12.1 dB Mkr1 2.480 5 GHz 10 dB/dv Ref 22.10 dBm -0.421 dBm									
12.1					Comber Free					
2.10					Center Free 13,26500000 GH					
.790					10.2000000000					
17.9				-12.25.401						
(27.9					Start Fre 30.000000 MH					
.27.9					30.00000 MP					
47.9										
21	Annone and the second	Martin Constantion		and the second designed to	Stop Fre 25.50000000 GH					
42.9					20.000000000					
Start 30 MHz	-			Stop 26.50 GHz	CF Ste					
#Res BW 100 kHz	#VE	W 300 kHz	Sweep	2.531 s (40001 pts)	2.647000000 GH Auto Ma					
100 (1000) (100 (100)	×		ACTION FUNCTION MOTH	FUNCTION WALLE	Auto Ma					
1 N 1 2 N 1	2,480 5 GHz 2,400 0 GHz	-0.421 dBm -58 234 dBm		()						
3 N 1	2.483 5 GHz	-68.458 dBm			Freq Offse					
5 6										
7 8										
9										
10				Q						
<		1.00	(5))	200 C						
00			STATU							

8.6 RADIATED EMISSIONS

8.6.1 TRANSMITTER RADIATED SUPURIOUS EMSSIONS

<u>LIMITS</u>

§ 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 -1710	10.6 -12.7
6.26775 - 6.26825	108 -121.94	1718.8 - 1722.2	13.25 -13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 – 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 -16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 -335.4	3600 - 4400	(²)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§ 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz, However, operation within these frequency bands is permitted under other sections of this Part, e-g, Sections 15.231 and 15.241.

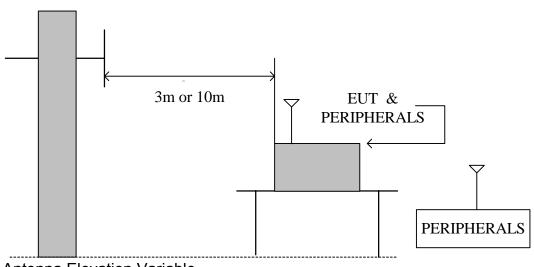
§ 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

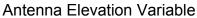
<u>TEST EQUIPMENTS</u> The following test equipments are utilized in making the measurements contained in this report.

	C	hamber 966							
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due					
Amplifier	HP	8447F	2443A01671	01/14/2017					
Bi-Log Antenna	Sunol	JB1	A070506-2	07/22/2017					
Cable	HUBER+SUHNER	SUCOFLEX 104PEA	SN25737 /4PEA	12/04/2017					
EMI Test Receiver	R&S	ESCS 30	100294	12/01/2017					
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	04/29/2017					
Horn Antenna	Com-Power	AH-118	071032	01/20/2017					
Pre-Amplifier	EMCI	EMC012645	980098	01/17/2017					
Software		Excel							

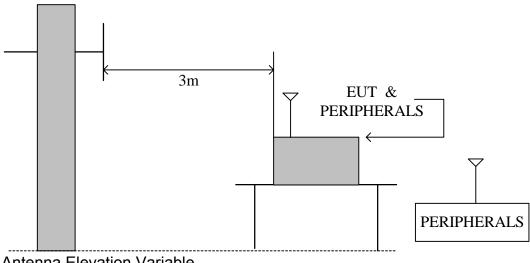
TEST SETUP

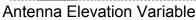
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 to 1GHz.





The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.





TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8/1.5 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. White measuring the radiated emission below 1GHz, the EUT was set 3/10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. White measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. The tests were performed in accordance with 558074 D01 DTS Meas Guidance v03r03.

NOTE :

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.
- No emission is found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)

TEST RESULTS

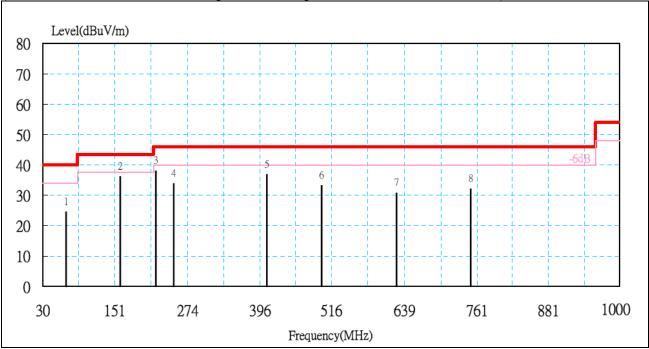
No non-compliance noted.

8.6.2 WORST-CASE RADIATED EMISSION BELOW 1 GHz

Product Name	Guitar Processor	Test Date	2016/12/09
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	Normal Operation	TEMP& Humidity	24.5 /52%

Horizontal

(The chart below shows the highest readings taken from the final data.)



	Freq-	Meter Reading	Antenna	Cable	Emission	Limits	Margin	Detector
No.	Uency	at 3 m Level	Factor	Loss	at 3 m Level	Linits	wargin	Mode
	(MHz)	(dBµV)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	PK/QP
1	69.61	14.86	8.36	1.28	24.50	40.00	-15.50	QP
2	160.12	21.40	12.72	1.99	36.11	43.50	-7.39	QP
3	220.37	22.47	13.04	2.45	37.97	46.00	-8.03	QP
4	250.01	18.76	12.33	2.68	33.77	46.00	-12.23	QP
5	407.57	17.13	16.32	3.36	36.81	46.00	-9.19	QP
6	499.98	10.28	18.13	4.74	33.15	46.00	-12.85	QP
7	625.04	5.76	19.63 5.31 30.70 46		46.00	-15.30	QP	
8	750.06	5.38	20.86	5.75	31.98	46.00	-14.02	QP

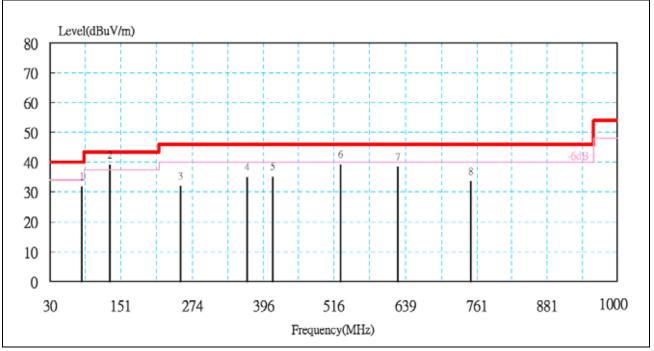
Note: 1. QP= Quasi-peak Reading.

2. The other emission levels were very low against the limit

Product Name	Guitar Processor	Test Date	2016/08/16
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	Normal Operation	TEMP& Humidity	26.4 /52%

Vertical

(The chart below shows the highest readings taken from the final data.)



	Freq-	Meter Reading	Antenna	Cable	Emission	Limits	Margin	Detector
No.	Uency	at 3 m Level	Factor	Loss	at 3 m Level			Mode
	(MHz)	(dBµV)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	PK/QP
1	84.00	22.37	8.01	1.40	31.77	40.00	-8.23	QP
2	132.12	23.43	13.78	1.77	38.99	43.50	-4.51	QP
3	253.62	16.76	12.45	2.71	31.91	46.00	-14.09	QP
4	367.47	16.26	15.44	3.19	34.89	46.00	-11.11	QP
5	411.80	15.16	16.40	3.43	34.99	46.00	-11.01	QP
6	527.90	15.78	18.46	4.87	39.11	46.00	-6.89	QP
7	625.03	13.43	19.63	5.31	38.37	46.00	-7.63	QP
8	750.03	6.85	20.86	5.75	33.45	46.00	-12.55	QP

Note: 1. QP= Quasi-peak Reading.

2. The other emission levels were very low against the limit

8.6.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz

Product Name	Guitar Processor	Test Date	2016/12/08	
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang	
Test Mode	IEEE 802.11b TX (CH Low)	TEMP& Humidity	24.3 , 48%	

	TX / IE	EE 802.11	lb mode	/ CH Low	Measurement Distance at 3m Horizontal polarit					polarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.35	55.07	25.70	1.94	47.17	0.43	35.98	74.00	-38.02	Р
	1290.35	46.38	25.70	1.94	47.17	0.43	27.29	54.00	-26.71	А
*	1607.20	58.32	27.40	2.18	46.97	0.57	41.50	74.00	-32.50	Р
*	1607.20	49.06	27.40	2.18	46.97	0.57	32.24	54.00	-21.76	А
	1942.10	58.44	30.21	2.42	46.80	0.92	45.19	74.00	-28.81	Р
	1942.10	49.68	30.21	2.42	46.80	0.92	36.43	54.00	-17.57	А
	N/A									Р
	N/A									А

	TX / IE	EE 802.11	lb mode	e / CH Low	Measurement Distance at 3m				Vertical polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.79	55.76	25.26	1.84	47.25	0.42	36.03	74.00	-37.97	Р
*	1172.79	46.37	25.26	1.84	47.25	0.42	26.64	54.00	-27.36	А
*	1605.62	63.58	27.39	2.18	46.97	0.57	46.75	74.00	-27.25	Р
*	1605.62	53.77	27.39	2.18	46.97	0.57	36.94	54.00	-17.06	А
	1999.30	57.42	30.69	2.46	46.78	0.98	44.78	74.00	-29.22	Р
	1999.30	48.63	30.69	2.46	46.78	0.98	35.99	54.00	-18.01	А
	N/A									Р
	N/A									А

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz

3. The result basic equation calculation is as follow:

Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit

4. The other emission levels were 20dB below the limit

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	IEEE 802.11b TX (CH Middle)	TEMP& Humidity	24.3 , 48%

	TX / IEE	E 802.11t	o mode /	CH Middle	Measurement Distance at 3m				Horizontal polarity	
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.38	55.26	25.70	1.94	47.17	0.43	36.17	74.00	-37.83	Р
	1290.38	46.45	25.70	1.94	47.17	0.43	27.36	54.00	-26.64	А
*	1607.16	58.68	27.40	2.18	46.97	0.57	41.86	74.00	-32.14	Р
*	1607.16	49.37	27.40	2.18	46.97	0.57	32.55	54.00	-21.45	А
	1942.15	58.46	30.21	2.42	46.80	0.92	45.21	74.00	-28.79	Р
	1942.15	49.52	30.21	2.42	46.80	0.92	36.27	54.00	-17.73	А
	N/A									Р
	N/A									А

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	TX / IEE	E 802.11b	o mode /	CH Middle	Measu	Measurement Distance at 3m				Vertical polarity		
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark		
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)		
*	1172.82	55.85	25.26	1.84	47.25	0.42	36.12	74.00	-37.88	Р		
*	1172.82	46.48	25.26	1.84	47.25	0.42	26.75	54.00	-27.25	А		
*	1605.66	63.47	27.39	2.18	46.97	0.57	46.64	74.00	-27.36	Р		
*	1605.66	53.53	27.39	2.18	46.97	0.57	36.70	54.00	-17.30	А		
	1999.35	57.86	30.69	2.46	46.78	0.98	45.23	74.00	-28.77	Р		
	1999.35	48.49	30.69	2.46	46.78	0.98	35.86	54.00	-18.14	А		
	N/A									Р		
	N/A									А		

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz 2.

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The result basic equation calculation is as follow: Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit The other emission levels were 20dB below the limit 4.

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	IEEE 802.11b TX (CH High)	TEMP& Humidity	24.3 , 48%

	TX / IEI	EE 802.11	b mod	e / CH High	Measu	rement	Distance	at 3m	Horizontal p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.42	55.62	25.70	1.94	47.17	0.43	36.53	74.00	-37.47	Р
	1290.42	46.43	25.70	1.94	47.17	0.43	27.34	54.00	-26.66	А
*	1607.15	58.66	27.40	2.18	46.97	0.57	41.84	74.00	-32.16	Р
*	1607.15	49.48	27.40	2.18	46.97	0.57	32.66	54.00	-21.34	А
	1942.08	58.53	30.21	2.42	46.80	0.92	45.28	74.00	-28.72	Р
	1942.08	49.76	30.21	2.42	46.80	0.92	36.51	54.00	-17.49	А
	N/A									Р
	N/A									А

	TX / IEE	EE 802.11	b mode	e / CH High	Measu	iremen	t Distance	at 3m	Vertical p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.86	56.34	25.26	1.84	47.25	0.42	36.61	74.00	-37.39	Р
*	1172.86	46.88	25.26	1.84	47.25	0.42	27.15	54.00	-26.85	А
*	1605.66	63.42	27.39	2.18	46.97	0.57	46.59	74.00	-27.41	Р
*	1605.66	53.56	27.39	2.18	46.97	0.57	36.73	54.00	-17.27	А
	1999.42	57.76	30.70	2.46	46.78	0.98	45.13	74.00	-28.87	Р
	1999.42	48.82	30.70	2.46	46.78	0.98	36.19	54.00	-17.81	А
	N/A									Р
	N/A									А

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz

3. The result basic equation calculation is as follow:

Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit 4. The other emission levels were 20dB below the limit

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	IEEE 802.11g TX (CH Low)	TEMP& Humidity	24.3 , 48%

	TX / IE	EE 802.11	lg mod	e / CH Low	Measu	rement	t Distance	at 3m	Horizontal p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.38	55.26	25.70	1.94	47.17	0.43	36.17	74.00	-37.83	Р
	1290.38	46.42	25.70	1.94	47.17	0.43	27.33	54.00	-26.67	А
*	1607.18	58.62	27.40	2.18	46.97	0.57	41.80	74.00	-32.20	Р
*	1607.18	49.25	27.40	2.18	46.97	0.57	32.43	54.00	-21.57	А
	1942.08	58.48	30.21	2.42	46.80	0.92	45.23	74.00	-28.77	Р
	1942.08	49.76	30.21	2.42	46.80	0.92	36.51	54.00	-17.49	А
	N/A									Р
	N/A									А

	TX / IEI	EE 802.11	lg mod	e / CH Low	Measu	iremen	t Distance	e at 3m	Vertical p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.83	55.75	25.26	1.84	47.25	0.42	36.02	74.00	-37.98	Р
*	1172.83	46.62	25.26	1.84	47.25	0.42	26.89	54.00	-27.11	А
*	1605.65	63.58	27.39	2.18	46.97	0.57	46.75	74.00	-27.25	Р
*	1605.65	53.78	27.39	2.18	46.97	0.57	36.95	54.00	-17.05	А
	1999.28	57.42	30.69	2.46	46.78	0.98	44.78	74.00	-29.22	Р
	1999.28	48.72	30.69	2.46	46.78	0.98	36.08	54.00	-17.92	А
	N/A									Р
	N/A									А

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz 2.

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The result basic equation calculation is as follow: Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit The other emission levels were 20dB below the limit 4.

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	IEEE 802.11g TX (CH Middle)	TEMP& Humidity	24.3 , 48%

	TX / IEEE	E 802.11g	mode /	CH Middle	Measur	rement	Distance	at 3m	Horizontal p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.43	55.35	25.70	1.94	47.17	0.43	36.26	74.00	-37.74	Р
	1290.43	46.48	25.70	1.94	47.17	0.43	27.39	54.00	-26.61	А
*	1607.24	58.77	27.40	2.18	46.97	0.57	41.95	74.00	-32.05	Р
*	1607.24	49.48	27.40	2.18	46.97	0.57	32.66	54.00	-21.34	А
	1942.23	58.46	30.21	2.42	46.80	0.92	45.22	74.00	-28.78	Р
	1942.23	49.76	30.21	2.42	46.80	0.92	36.52	54.00	-17.48	А
	N/A									Р
	N/A									А

	TX / IEE	E 802.11g	j mode /	CH Middle	Meas	ureme	nt Distanc	e at 3m	Vertical p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.83	55.92	25.26	1.84	47.25	0.42	36.19	74.00	-37.81	Р
*	1172.83	46.63	25.26	1.84	47.25	0.42	26.90	54.00	-27.10	А
*	1605.68	63.62	27.39	2.18	46.97	0.57	46.79	74.00	-27.21	Р
*	1605.68	53.77	27.39	2.18	46.97	0.57	36.94	54.00	-17.06	А
	1999.37	57.76	30.69	2.46	46.78	0.98	45.13	74.00	-28.87	Р
	1999.37	48.64	30.69	2.46	46.78	0.98	36.01	54.00	-17.99	А
	N/A									Р
	N/A									А

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz 2.

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The result basic equation calculation is as follow: Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit The other emission levels were 20dB below the limit 4.

Product Name	Guitar Processor	Test Date	2016/12/08		
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang		
Test Mode	IEEE 802.11g TX (CH High)	TEMP& Humidity	24.3 , 48%		

	TX / IEI	EE 802.11	g mod	e / CH High	Measu	rement	t Distance	at 3m	Horizontal p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.36	55.52	25.70	1.94	47.17	0.43	36.43	74.00	-37.57	Р
	1290.36	46.72	25.70	1.94	47.17	0.43	27.63	54.00	-26.37	А
*	1607.26	58.68	27.40	2.18	46.97	0.57	41.86	74.00	-32.14	Р
*	1607.26	49.57	27.40	2.18	46.97	0.57	32.75	54.00	-21.25	А
	1942.16	58.65	30.21	2.42	46.80	0.92	45.41	74.00	-28.59	Р
	1942.16	49.84	30.21	2.42	46.80	0.92	36.60	54.00	-17.40	А
	N/A									Р
	N/A									А

	TX / IEE	EE 802.11	g mode	e / CH High	Meas	ureme	nt Distanc	e at 3m	Vertical po	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.88	56.48	25.26	1.84	47.25	0.42	36.75	74.00	-37.25	Р
*	1172.88	47.24	25.26	1.84	47.25	0.42	27.51	54.00	-26.49	А
*	1605.69	63.56	27.39	2.18	46.97	0.57	46.73	74.00	-27.27	Р
*	1605.69	53.68	27.39	2.18	46.97	0.57	36.85	54.00	-17.15	А
	1999.51	57.79	30.70	2.46	46.78	0.98	45.16	74.00	-28.84	Р
	1999.51	48.96	30.70	2.46	46.78	0.98	36.33	54.00	-17.67	А
	N/A									Р
	N/A									А

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz

3. The result basic equation calculation is as follow: Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit

4. The other emission levels were 20dB below the limit

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	IEEE 802.11n HT20 TX (CH Low)	TEMP& Humidity	24.3 , 48%

	TX / IEEE	802.11n H	IT20 moo	de / CH Low	Measur	rement	Distance a	at 3m 🛛 I	Horizontal	polarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.41	55.43	25.70	1.94	47.17	0.43	36.34	74.00	-37.66	Р
	1290.41	46.75	25.70	1.94	47.17	0.43	27.66	54.00	-26.34	А
*	1607.26	58.56	27.40	2.18	46.97	0.57	41.74	74.00	-32.26	Р
*	1607.26	49.28	27.40	2.18	46.97	0.57	32.46	54.00	-21.54	А
	1942.23	58.66	30.21	2.42	46.80	0.92	45.42	74.00	-28.58	Р
	1942.23	49.76	30.21	2.42	46.80	0.92	36.52	54.00	-17.48	А
	N/A									Р
	N/A									А

	TX / IEEE	802.11n H	IT20 mo	de / CH Low	Measu	Measurement Distance at 3m Vertical polar					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark	
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)	
*	1172.67	55.82	25.26	1.84	47.25	0.42	36.09	74.00	-37.91	Р	
*	1172.67	46.42	25.26	1.84	47.25	0.42	26.69	54.00	-27.31	А	
*	1605.58	63.63	27.39	2.18	46.97	0.57	46.80	74.00	-27.20	Р	
*	1605.58	53.57	27.39	2.18	46.97	0.57	36.74	54.00	-17.26	А	
	1999.26	57.33	30.69	2.46	46.78	0.98	44.69	74.00	-29.31	Р	
	1999.26	48.62	30.69	2.46	46.78	0.98	35.98	54.00	-18.02	Α	
	N/A									Р	
	N/A									А	

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz 2.

З.

The result basic equation calculation is as follow: Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit The other emission levels were 20dB below the limit 4.

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	IEEE 802.11n HT20 TX (CH Middle)	TEMP& Humidity	24.3 , 48%

	TX / IEEE	802.11n HT	۲20 mode	/ CH Middle	Measur	rement	Distance	at 3m 🛛	Horizontal J	polarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.41	55.33	25.70	1.94	47.17	0.43	36.24	74.00	-37.76	Р
	1290.41	46.58	25.70	1.94	47.17	0.43	27.49	54.00	-26.51	А
*	1607.18	58.82	27.40	2.18	46.97	0.57	42.00	74.00	-32.00	Р
*	1607.18	49.67	27.40	2.18	46.97	0.57	32.85	54.00	-21.15	А
	1942.09	58.59	30.21	2.42	46.80	0.92	45.34	74.00	-28.66	Р
	1942.09	49.76	30.21	2.42	46.80	0.92	36.51	54.00	-17.49	А
	N/A									Р
	N/A									А

	TX / IEEE 8	802.11n HT	20 mode /	CH Middle	Measu	remen	t Distance	at 3m	Vertical po	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.76	56.24	25.26	1.84	47.25	0.42	36.51	74.00	-37.49	Р
*	1172.76	46.57	25.26	1.84	47.25	0.42	26.84	54.00	-27.16	А
*	1605.63	63.63	27.39	2.18	46.97	0.57	46.80	74.00	-27.20	Р
*	1605.63	53.75	27.39	2.18	46.97	0.57	36.92	54.00	-17.08	А
	1999.38	58.15	30.69	2.46	46.78	0.98	45.52	74.00	-28.48	Р
	1999.38	48.67	30.69	2.46	46.78	0.98	36.04	54.00	-17.96	А
	N/A									Р
	N/A									А

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz 2.

З.

The result basic equation calculation is as follow: Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit The other emission levels were 20dB below the limit 4.

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	IEEE 802.11n HT20 TX (CH High)	TEMP& Humidity	24.3 , 48%

	TX / IEEE	802.11n H	T20 mod	e / CH High	Measurement Distance at 3m Horizonta					olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.45	55.78	25.70	1.94	47.17	0.43	36.69	74.00	-37.31	Р
	1290.45	46.52	25.70	1.94	47.17	0.43	27.43	54.00	-26.57	А
*	1607.26	58.66	27.40	2.18	46.97	0.57	41.84	74.00	-32.16	Р
*	1607.26	49.65	27.40	2.18	46.97	0.57	32.83	54.00	-21.17	А
	1942.13	58.58	30.21	2.42	46.80	0.92	45.33	74.00	-28.67	Р
	1942.13	49.82	30.21	2.42	46.80	0.92	36.57	54.00	-17.43	А
	N/A									Р
	N/A									А

	TX / IEEE	802.11n H	T20 mod	e / CH High	Measu	Measurement Distance at 3m Vertical					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark	
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)	
*	1172.80	56.52	25.26	1.84	47.25	0.42	36.79	74.00	-37.21	Р	
*	1172.80	47.12	25.26	1.84	47.25	0.42	27.39	54.00	-26.61	А	
*	1605.73	63.46	27.39	2.18	46.97	0.57	46.63	74.00	-27.37	Р	
*	1605.73	53.62	27.39	2.18	46.97	0.57	36.79	54.00	-17.21	А	
	1999.56	57.82	30.70	2.46	46.78	0.98	45.19	74.00	-28.81	Р	
	1999.56	48.96	30.70	2.46	46.78	0.98	36.33	54.00	-17.67	А	
	N/A									Р	
	N/A									A	

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz

3. The result basic equation calculation is as follow: Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit

4. The other emission levels were 20dB below the limit

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	Bluetooth 4.0 TX (CH Low)	TEMP& Humidity	24.3 , 48%

	TX / Bluet	ooth 4.0 (C	GFSK) mo	de / CH Low	Measur	ement	Distance a	at 3m 🛛 🖁	lorizontal p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.42	55.74	25.70	1.94	47.17	0.43	36.65	74.00	-37.35	Р
	1290.42	46.57	25.70	1.94	47.17	0.43	27.48	54.00	-26.52	А
*	1607.26	59.67	27.40	2.18	46.97	0.57	42.85	74.00	-31.15	Р
*	1607.26	50.28	27.40	2.18	46.97	0.57	33.46	54.00	-20.54	А
*	4804.01	53.63	33.07	4.11	46.66	0.22	44.37	74.00	-29.63	Р
*	4804.01	44.75	33.07	4.11	46.66	0.22	35.49	54.00	-18.51	А
	N/A									Р
	N/A									Α

	TX / Bluete	ooth 4.0 (G	GFSK) mo	de / CH Low	Measur	ement	Distance	at 3m	Vertical p	olarity
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.73	55.87	25.26	1.84	47.25	0.42	36.14	74.00	-37.86	Р
*	1172.73	46.46	25.26	1.84	47.25	0.42	26.73	54.00	-27.27	Α
*	1605.38	67.59	27.39	2.18	46.97	0.57	50.75	74.00	-23.25	Р
*	1605.38	58.33	27.39	2.18	46.97	0.57	41.49	54.00	-12.51	Α
*	4803.98	55.85	33.07	4.11	46.66	0.22	46.59	74.00	-27.41	Р
*	4803.98	46.72	33.07	4.11	46.66	0.22	37.46	54.00	-16.54	Α
	N/A									Р
	N/A									Α

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz

3. The result basic equation calculation is as follow:

Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit

4. The other emission levels were 20dB below the limit

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	Bluetooth 4.0 TX (CH Middle)	TEMP& Humidity	24.3 , 48%

	TX / Blueto	oth 4.0 (GF	SK) mode	e / CH Middle	Measurement Distance at 3m Horizontal polarity					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.38	55.63	25.70	1.94	47.17	0.43	36.54	74.00	-37.46	Р
	1290.38	46.75	25.70	1.94	47.17	0.43	27.66	54.00	-26.34	Α
*	1607.35	59.78	27.40	2.18	46.97	0.57	42.96	74.00	-31.04	Р
*	1607.35	50.56	27.40	2.18	46.97	0.57	33.74	54.00	-20.26	А
*	4884.25	54.48	33.33	4.16	46.68	0.23	45.52	74.00	-28.48	Р
*	4884.25	45.36	33.33	4.16	46.68	0.23	36.40	54.00	-17.60	Α
	N/A									Р
	N/A									А

	TX / Blueto	oth 4.0 (GF	SK) mode	/ CH Middle	e Measurement Distance at 3m Vertical polarity					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.76	55.68	25.26	1.84	47.25	0.42	35.95	74.00	-38.05	Р
*	1172.76	46.62	25.26	1.84	47.25	0.42	26.89	54.00	-27.11	А
*	1605.43	67.62	27.39	2.18	46.97	0.57	50.78	74.00	-23.22	Р
*	1605.43	58.45	27.39	2.18	46.97	0.57	41.61	54.00	-12.39	А
*	4884.13	56.43	33.33	4.16	46.68	0.23	47.47	74.00	-26.53	Р
*	4884.13	47.58	33.33	4.16	46.68	0.23	38.62	54.00	-15.38	А
	N/A									Р
	N/A									А

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz

3. The result basic equation calculation is as follow: Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit

4. The other emission levels were 20dB below the limit

Product Name	Guitar Processor	Test Date	2016/12/08
Model	HEADRUSH PEDALBOARD	Test By	Ted Huang
Test Mode	Bluetooth 4.0 TX (CH High)	TEMP& Humidity	24.3 , 48%

	TX / Blueto	ooth 4.0 (G	FSK) mod	de / CH High	Measurement Distance at 3m Horizontal pola					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
	1290.37	55.48	25.70	1.94	47.17	0.43	36.39	74.00	-37.61	Р
	1290.37	46.57	25.70	1.94	47.17	0.43	27.48	54.00	-26.52	А
*	1607.45	59.76	27.40	2.18	46.97	0.57	42.95	74.00	-31.05	Р
*	1607.45	49.92	27.40	2.18	46.97	0.57	33.11	54.00	-20.89	А
*	4959.43	53.82	33.57	4.21	46.70	0.24	45.14	74.00	-28.86	Р
*	4959.43	44.08	33.57	4.21	46.70	0.24	35.40	54.00	-18.60	А
	N/A									Р
	N/A									А

	TX / Blueto	ooth 4.0 (G	FSK) mod	de / CH High	Measurement Distance at 3m Vertical polar					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBµV)	(dB/m)	(dB)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(P/Q/A)
*	1172.65	55.82	25.26	1.84	47.25	0.42	36.09	74.00	-37.91	Р
*	1172.65	46.28	25.26	1.84	47.25	0.42	26.55	54.00	-27.45	А
*	1605.47	65.37	27.39	2.18	46.97	0.57	48.53	74.00	-25.47	Р
*	1605.47	55.87	27.39	2.18	46.97	0.57	39.03	54.00	-14.97	А
*	4960.23	53.86	33.57	4.21	46.70	0.24	45.18	74.00	-28.82	Р
*	4960.23	44.28	33.57	4.21	46.70	0.24	35.60	54.00	-18.40	А
	N/A									Р
	N/A									А

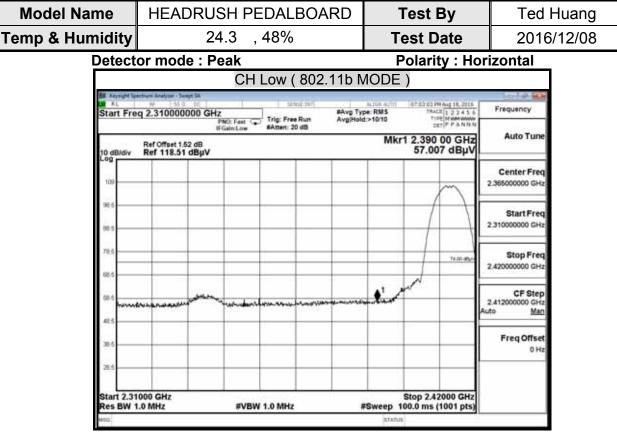
1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: 2.4GHz~2.5GHz Filter Insertion Loss

2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz

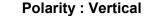
3. The result basic equation calculation is as follow:

Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit 4. The other emission levels were 20dB below the limit

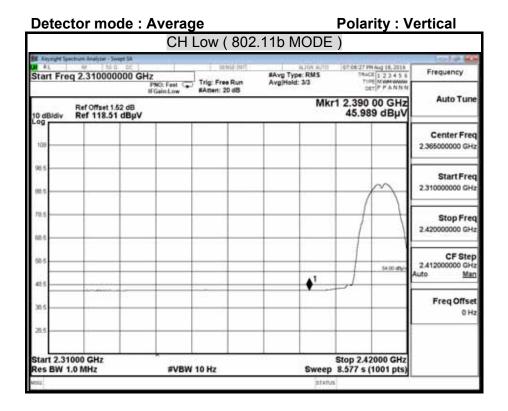
8.6.4 RESTRICTED BAND EDGES



		CI	H Low (802	2.11b MODE)	
	ctrure Realyter - 1		1711-1111-111-111-111-111-111-111-111-1	NA STRATTON	1012000.0000000000000000000000000000000	
Start Fre	g 2.31000	0000 GHz	SENSE:3N7	#Avg Type: RMS	06:59:18 PH Aug 18, 2016 TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast IFGain:Low	Atten: 20 dB	Avg(Hold: 3/3	DET P P A N N N	9035 P247
10 dB/div	Ref Offset			Mkr	1 2.390 00 GHz 47.516 dBµV	Auto Tun
109						Center Fre
98.5	_				-m	2.36500000 GH
88.5						
70.6	-					Start Free
58.5		02			2	2.31000000 GH
43.5		X		()	54.00.06/9	
38.5	1.5					Stop Free 2.42000000 GH
20.5						2.42000000 GH
Start 2.31 Res BW 1			3W 10 Hz	Swaan	Stop 2.42000 GHz 8.577 s (1001 pts)	CF Step 2.412000000 GH
CE COOL		#41		Sweep		Auto Ma
1 N 2 N	1	2.390 00 GHz 2.338 49 GHz	47.516 dBuV 52.179 dBuV			
3 4	11	2.000 49 0/12	32.1/9 0000			Freq Offse
5 6						он
7 8						
9					1	
11	1.1					
100				STATU		

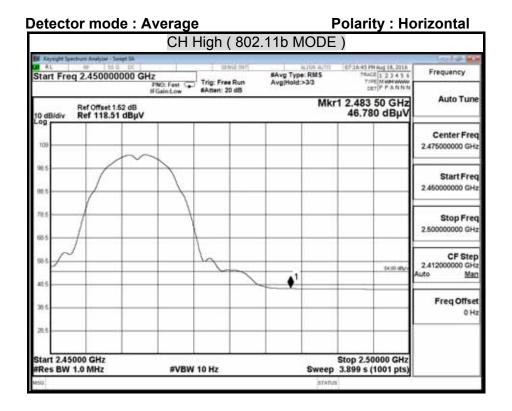


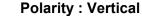
Keysoft Spectrum Analyzer - See	CH Low (802		/	
Start Freq 2.310000	DC SENSE ONT	#Avg Type: RMS Avg(Hold:>10/10	67:00:44 PR Aug 18, 2016 7RACE 1 2 3 4 5 6 7:/PE N 044 WMM DET /F P A N N N	Frequency
Ref Offset 1.6 10 dB/div Ref 118.51	IFGainLow #Atten: 20 dB	Mkr	1 2.390 00 GHz 55.156 dBµV	Auto Tun
109				Center Fre 2.36500000 GH
965 685			\square	Start Fre 2.31000000 GH
785			74.00.000	Stop Fre 2.42000000 GH
50.5				CF Ste 2.41200000 GH Auto <u>Ma</u>
20.5				Freq Offse
28.5 Start 2.31000 GHz			Stop 2.42000 GHz	
Res BW 1.0 MHz	#VBW 1.0 MHz		00.0 ms (1001 pts)	



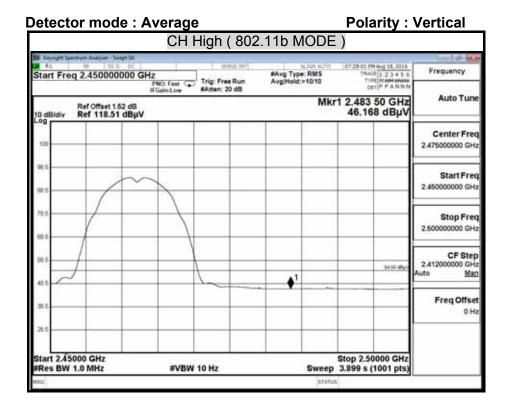


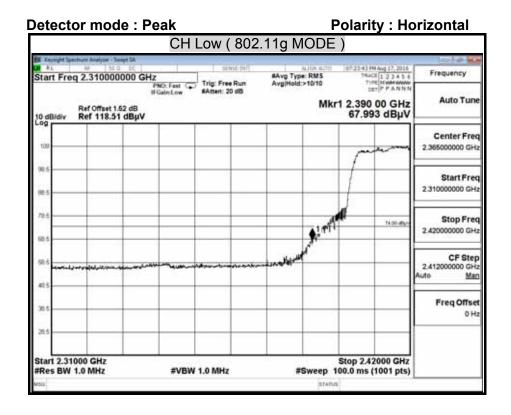
	CH High (802	2.11b MODE	.)	
M Keysight Spectrum Analyzer - Swept SA		to a second	100000000000000000000000000000000000000	
Start Freq 2.450000000 C	PNO: Feat () Trig: Free Run	#Avg Type: RMS Avg(Hold:>10/10	07:18:02 PH Aug 18, 2016 TRACE 1 2 3 4 5 6 TUPE A MMM WHAT	Frequency
Ref Offset 1.52 dB 10 dB/div Ref 118.51 dBµ\	IFGain:Low #Atten: 20 dB	Mk	1 2.483 50 GHz 56.282 dBµV	Auto Tune
109				Center Fred 2.475000000 GHz
985				Start Free 2.45000000 GH
78.5			74.00 (6%)-	Stop Free 2.50000000 GH2
(0.5 415	man	mahandraphan and	4 -8-8-732472.2000.200	CF Ster 2.41200000 GH Auto Mar
38.5				Freq Offse 0 H
28.5 Start 2.45000 GHz #Res BW 1.0 MHz	#VBW 1.0 MHz	#Sweep	Stop 2.50000 GHz	
MSIG	2 1 Mart 1/2 (101 M	STAPU		

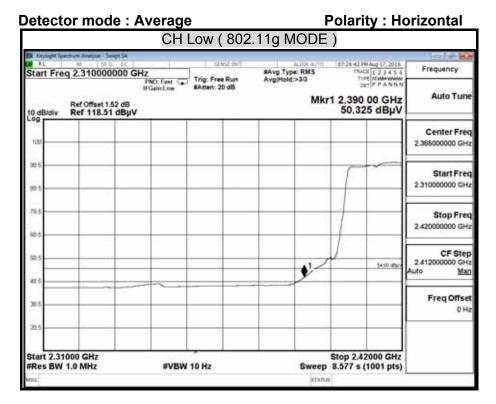


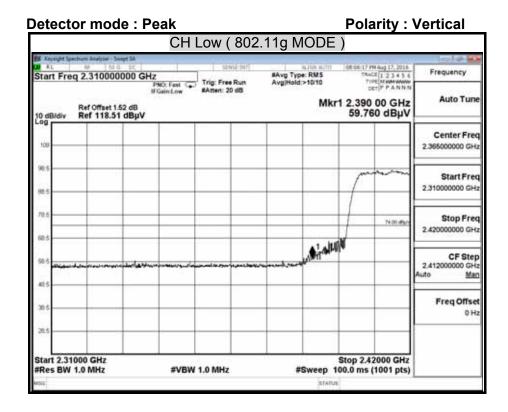


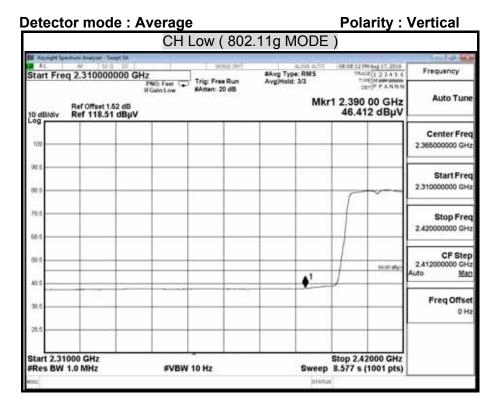
					1	High				
Provide and the	115 PH Aug 18, 2016	147.25	ALISA AUTO	- and the	AND INT			0.00		AL COL
Frequency	THACE 123456 THE NUMERANNE DET PPANNE		ype: RM5 (d:>10/10	RAvg T Avg(Ho		Trig: Fre	PNO: Fast Ca	0000 GH	2.45000	Start Fre
Auto Tun	183 50 GHz	-1 2 4	MIL	1.0	20 dB	#Atten:	IFGainLow			2
	5.795 dBµV		MIK						Ref Offset Ref 118.	0 dB/div
Center Fre										-09
2.475000000 GH		+	+	+	+				+	109
Start Fre		-	-		-		-		-	98.5
2.45000000 GH			_	_				1	1	(RE 5
									1	78.6
Stop Fre 2.50000000 GH	74.00 (8)/1	-			-			-	1	
							1		/	68.5
2.412000000 GH	And a second second second	-	1	and a		human			-1	105 000
Auto <u>Ma</u>					2000	- 22				415
Freq Offse										38.5
0 H										
		-	-				-	-	-	29.6
	2.50000 GHz	Stop							00 GHz	Start 2.45
	ms (1001 pts)	100.0 r	#Sweep		z	1.0 MH	#VBW		.0 MHz	Res BW

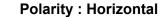




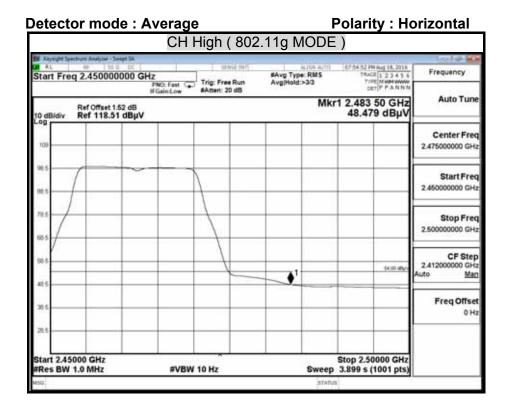






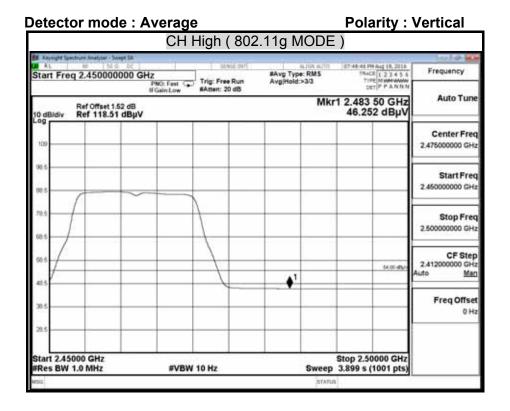


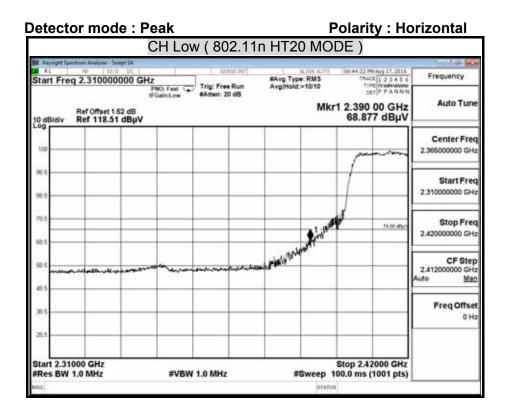
)	10DE	.11g N	(802	High	CH			
			1.1				elycer - Swept BA	lipectry	
Frequency	075318 PH Aud 18, 2016 TRACE 1 2 3 4 5 6 TUPE N WHW DET P P A N N N		#Avg Typ Avg/Hold		Trig: Fre	PNO: Fast C	0000000 GH	eq	tart Fr
Auto Tune	2.483 50 GHz 60.381 dBµV	Mkr	100/00/00/00	20 88	#Atten: 2	IFGain:Low	ffset 1.52 dB 118.51 dBµV		0 dB/div
Center Fred 2.475000000 GH								/	109
Start Free 2.45000000 GH					A			/	×5 ×5 /
Stop Free 2.50000000 GH	74.00 (%)/-							_	nt 6
CF Step 2.41200000 GH Auto Mar	urthan materic such	jihajyi palikury	- Anting the Constant	a survivelar					505 et 5
Freq Offse 0 H						-	_		x8.6
	Stop 2.50000 GHz						Hz	500	atart 2.4
	0.0 ms (1001 pts)		#	z	V 1.0 MHz	#VBV	łz	V 1.0	Res B

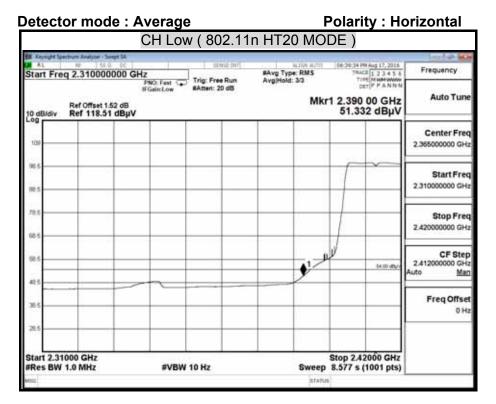


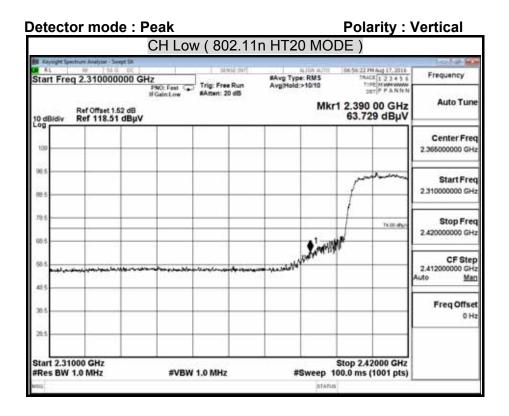
Polarity : Vertical

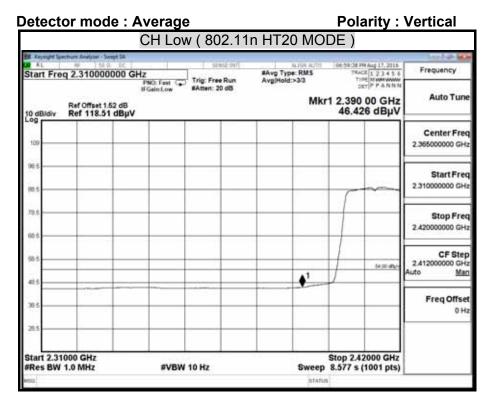
	CH High (802	2.11g MODE)	
BI Keysight Spectrum Analyzer - Swept SA	the second second	17 Distantin		
Start Freq 2.450000000 G	PNO: Fast (Trig: Free Run	#Avg Type: RMS Avg(Hold:>1010	0747:18 PR Aug 18, 2016 TRACE 1 2 3 4 5 6 TUPE N WARWARD DET P P A N N N	Frequency
Ref Offset 1.52 dB 10 dB/div Ref 118.51 dBµV	IFGainLow #Atten: 20 dB	Mkr	1 2.483 50 GHz 55.351 dBµV	Auto Tune
109				Center Fred 2.475000000 GHz
985				Start Free 2.45000000 GHz
78.5			74.00.4860	Stop Free 2.50000000 GH
415	han		غبيب معدمه بالمهموا مح	CF Step 2.412000000 GH Auto Mar
38.5				Freq Offse 0 H
Start 2.45000 GHz #Res BW 1.0 MHz	#VBW 1.0 MHz	#Swaan 1	Stop 2.50000 GHz 00.0 ms (1001 pts)	
uss	SADAL I'V HILT	status		

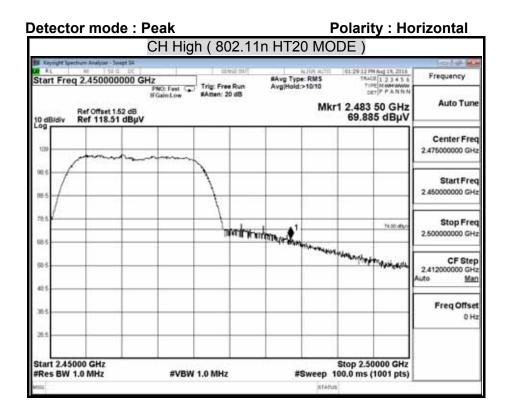


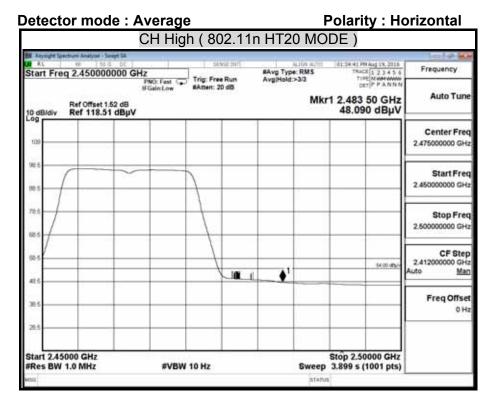


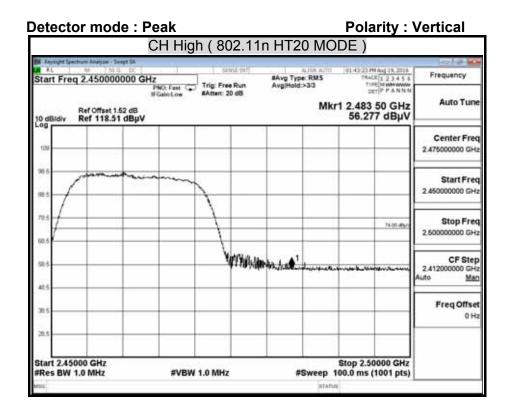


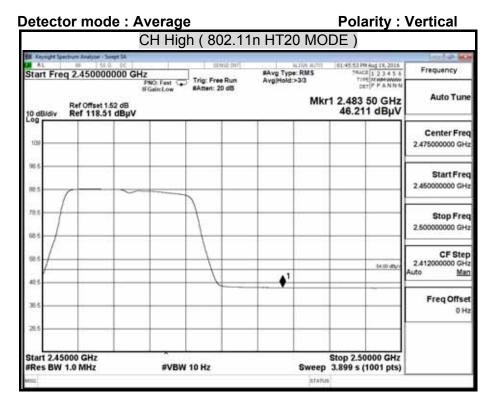










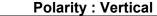


Bluetooth 4.0

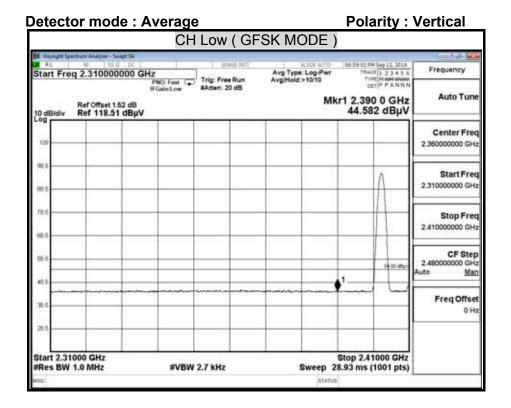
Model Name	HEADRUSH PEDALBOARD	Test By	Ted Huang
Temp & Humidity	24.3 , 48%	Test Date	2016/12/08

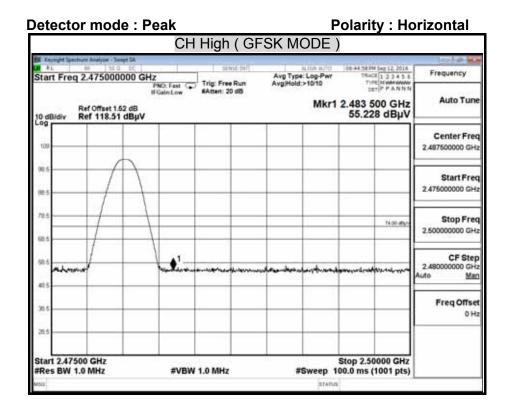
	CH	Low	(GFS	SK MC	DDE)			
Keysight Spectrum Analyzer - Swept SA			1. Miles	14 5	Concernance.			
Start Freg 2.310000000 GHz	6	Sector 1	68:397	Avg Type:		TRACI	Sep 12, 2018	
	NO: Fast Gain:Low	#Atten: 2		Avg Hold:		DE	PPANNN	
Ref Offset 1.52 dB 0 dB/div Ref 118.51 dBµV					MK	r1 2.390 54.16	6 dBµV	
109								Center Free 2.36000000 GH
98.5							A	-
開ち								Start Free 2.31000000 GH
78.6							TR.OD #Part	Stop Free
68.5		-		_			+	2.41000000 GH
68.5						1	1	CF Step 2.48000000 GH
455 AND 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10	lengnewervio	construction	and the second second	-tomato	-shared	assessed	Marin	Auto Mar
38.5								Freq Offse
20.5					_			
Start 2.31000 GHz	#VBW	1.0 MHz		#5		Stop 2.41 00.0 ms (1		

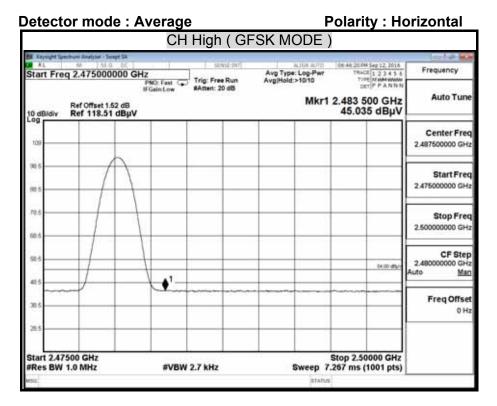
		C	H Low (GI	FSK MODE)		
Keysight lan	ectrure Analyzer - Swep	194 · · · ·	The second states	17 010001000		0100
	q 2.3100000		Trig: Free Run	Avg Type: Log-Pwr Avg/Hold:>10/10	06:51:28 04 540 12, 2018 TRACE 1 2 3 4 5 6 T/PE M MM WWW	Frequency
10 dB/div	Ref Offset 1.52 Ref 118.51		#Atten: 20 dB	0.07535010 PP-PL	tr1 2.390 0 GHz 44.546 dBμV	Auto Tur
109						Center Fre 2.36000000 GF
96.5						Start Fre 2.31000000 GH
78.5						Stop Fre 2.41000000 GP
(0.5					5-00 etu-	CF Str 2.480000000 Gi Auto M
38.5			+		Canal Sur	Freq Offs 01
28.6						
Start 2.31 #Res BW		#VI	3W 2.7 kHz	Sweep 2	Stop 2.41000 GHz 8.93 ms (1001 pts)	

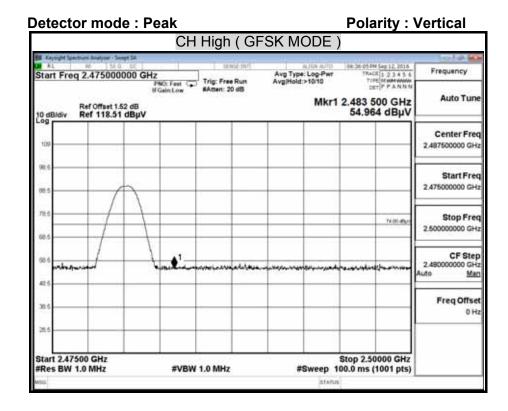


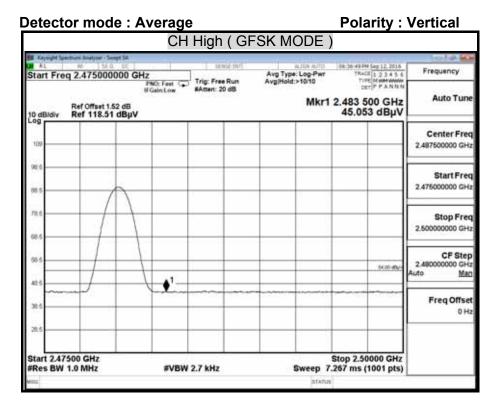
		CH	l Low (GF	SK MODE)		
	rectrum Analyzer - Swept SA		and an entitles	and the second	- COLORIA AND	1. Sector Sector	
Start Fre	g 2.310000000 G	Hz	SENSE (NT)	Avg Type: Log-Pwr	TRAC	5ep 12, 2016	Frequency
10 dBidiv	Ref Offset 1.52 dB Ref 118.51 dBµV	PNO: Fast G	Trig: Free Run #Atten: 20 dB	AvgiHold:>10/10	kr1 2.390	0 0 GHz 6 dBµV	Auto Tune
109							Center Fred 2.36000000 GHz
965 (85						A	Start Free 2.31000000 GHz
78.6						14:00-05/1	Stop Free 2.41000000 GH:
50.5 ent.5	200.811.445+195=P-6-31	an suun der linn kähen hal	****	4.J.a., 1.a., 1.John Mar. 10.	and own	he	CF Step 2.480000000 GHz Auto Mar
38.5					_		Freq Offse 0 H
28.5 Start 2.3	1000 GHz		America de la		Stop 2.41	000 GHz	
#Res BW	1.0 MHz	#VBW	1.0 MHz	#Sweep	100.0 ms (-











8.7 POWERLINE CONDUCTED EMISSIONS

<u>LIMITS</u>

§ 15.207 (a) Except as shown in paragraph (b) and (c) this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

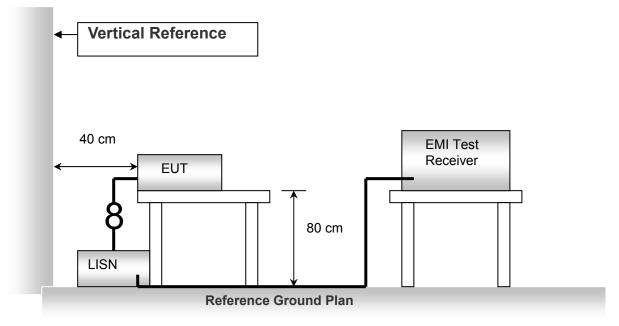
Frequency of Emission (MHz)	Conducted limit (dBµv)		
	Quasi-peak	Average	
0.15 - 0.5	66 to 56	56 to 46	
0.5 - 5	56	46	
5 - 30	60	50	

TEST EQUIPMENTS

The following test equipments are used during the conducted power line tests :

Conducted Emission room #1						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due		
BNC Coaxial Cable	CCS	BNC50	11	12/04/2017		
EMI Test Receiver	R&S	ESCS 30	100348	12/11/2017		
LISN	SCHWARZBECK	NNLK8130	8130124	11/07/2017		
LISN	FCC	FCC-LISN-50-32-2	08009	05/03/2017		
Pulse Limiter	R&S	ESH3-Z2	100116	12/04/2017		
Software	e-3 (5.04211j)					

TEST SETUP



TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80cm above the horizontal ground plane. The EUT IS CONFIGURED IN ACCORDANCE WITH ANSI C63.10.

The resolution bandwidth is set to 9 kHz for both quasi-peak detection and average detection measurements.

Line conducted data is recorded for both NEUTRAL and LINE.

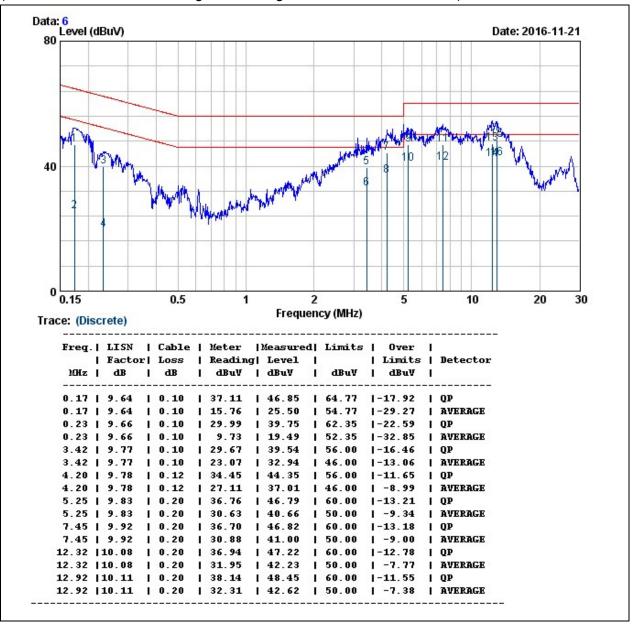
TEST RESULTS

No non-compliance noted.

Model No.	HEADRUSH PEDALBOARD	Test Mode	Normal Operation
Environmental Conditions	125 51% RH	Resolution Bandwidth	9 kHz
Tested by	Event Cheng		

Line

(The chart below shows the highest readings taken from the final data.)



NOTE:

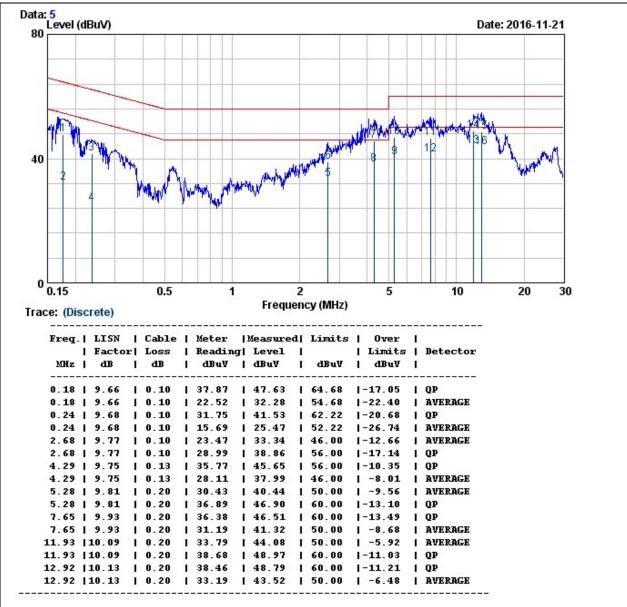
1. Measured Level (dBuV) = LISN Factor (dB) + Cable Loss (dB)+ Meter Reading (dBuV)

2. Over Limit (dBuV) = Measured Level (dBuV) – Limits (dBuV)

Model No.	HEADRUSH PEDALBOARD	Test Mode	Normal Operation
Environmental Conditions	125 51% RH	Resolution Bandwidth	9 kHz
Tested by	Event Cheng		

Neutral

(The chart below shows the highest readings taken from the final data.)



NOTE:

1. Measured Level (dBuV) = LISN Factor (dB) + Cable Loss (dB)+ Meter Reading (dBuV)

2. Over Limit (dBuV) = Measured Level (dBuV) – Limits (dBuV)

9. ANTENNA REQUIREMENT

9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2 ANTENNA CONNECTED CONSTRUCTION

Type: PCB Antenna Model: WLA-EM-1508-0008-B Manufacturer: BRITO Gain: 4.6 dBi