

Test Report

FCC Part15 Subpart C

Product Name : Wahoo GPS BIKE COMPUTER
Model No. : WFCC1
FCC ID : PADWF112
IC : 10563A-WF112

Applicant : Wahoo Fitness, LLC.
Address : 90 W. Wieuca Road, #110, Atlanta, Georgia,
30342 United States

Date of Receipt : Oct. 12, 2015
Test Date : Oct. 13, 2015~ Nov.04, 2015
Issued Date : Nov. 05, 2015
Report No. : 15A0041R-RF-US-P06V03
Report Version : V1.0

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report Certification

Issued Date : Nov. 05, 2015

Report No. : 15A0041R-RF-US-P06V03



Product Name : Wahoo GPS BIKE COMPUTER
Applicant : Wahoo Fitness, LLC.
Address : 90 W. Wieuca Road, #110, Atlanta, Georgia, 30342 United States
Manufacturer : Weifang GoerTek Electronics Co.,Ltd
Address : Gaoxin 2 Road, Free Trade Zone, Weifang, Shandong, 261205, P.R.China
Model No. : WFCC1
FCC ID : PADWF112
IC : 10563A-WF112
EUT Voltage : DC 3.5V-4.2V
Brand Name : Wahoo
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2014
ANSI C63.4:2014; ANSI C63.10:2013;
KDB 558074 D01v03r03
Industry Canada RSS-Gen Issue 4/ RSS-247 Issue 1
Test Result : Complied
Performed Location : Suzhou EMC Laboratory
No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China
TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
FCC Registration Number: 800392; IC Lab Code: 4075B

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Laboratory Information

We, **Quietek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	:	BSMI, NCC,TAF
USA	:	FCC
Japan	:	VCCI
China	:	CNAS

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site :<http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site :
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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
15A0041R-RF-US-P06V03	V1.0	Initial Issued Report	Nov. 05, 2015

1. General Information

1.1. EUT Description

Product Name	Wahoo GPS BIKE COMPUTER
Brand Name	Wahoo
Model No.	WFCC1
EUT Voltage	DC 3.5V-4.2V
Frequency Range	For 2.4GHz Band 802.11b/g/n(20MHz): 2412~2462MHz
Channel Number	For 2.4GHz Band 802.11b/g/n(20MHz): 11
Type of Modulation	802.11b: DSSS 802.11g/n: OFDM
Data Rate	802.11g: 6/9/12/18/24/36/48/54 Mbps 802.11b: 1/2/5.5/11 Mbps 802.11n: up to 300 Mbps
Channel Control	Auto
Antenna Delivery	1*Tx + 1*Rx
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List

For 2.4GHz Band

802.11b/g/n(20MHz) Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz	04	2427 MHz
05	2432 MHz	06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	10	2457 MHz	11	2462 MHz	N/A	N/A

Antenna List

Antenna	Manufacturer	Model No.	Peak Gain
PIFA Antenna	Walsin	N/A	2.58dBi for 2.4GHz

. Power Parameter Value of the test software

Test Mode	Test Channel	Ant1
802.11b	2412	16
	2437	16
	2462	16
802.11g	2412	15
	2437	16
	2462	15
802.11n(20MHz)	2412	13
	2437	15
	2462	13

Note: the power parameter cannot be configured, use the default value.

The test mode of the test software can support.

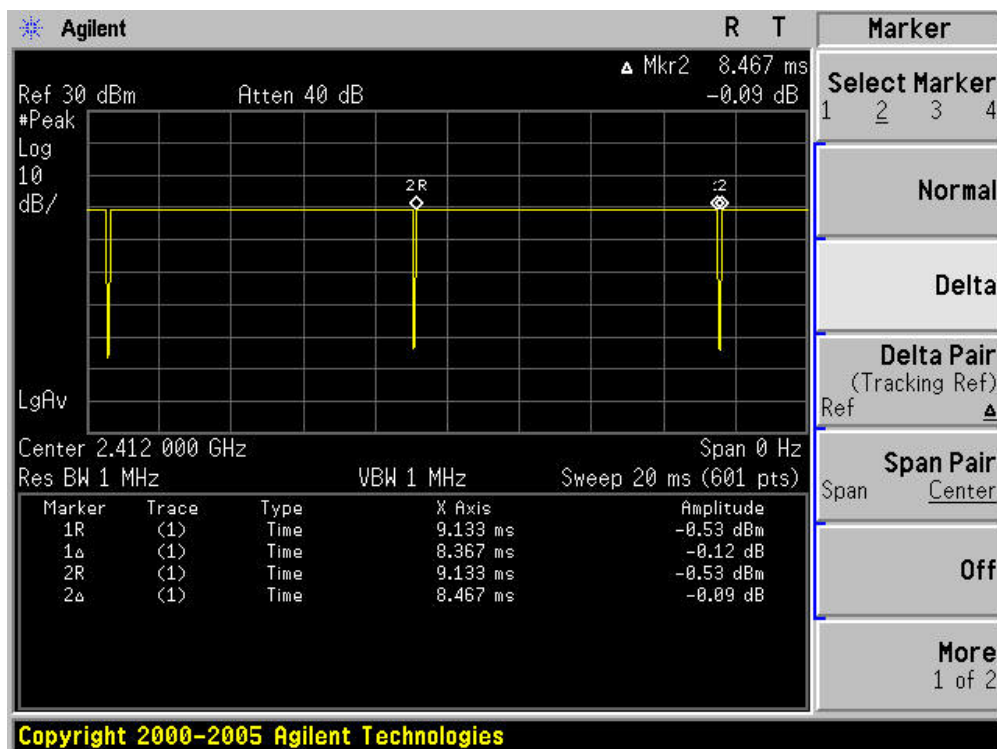
Test Mode	Test Channel	Ant1
802.11b	2412	✓
	2437	✓
	2462	✓
802.11g	2412	✓
	2437	✓
	2462	✓
802.11n(20MHz)	2412	✓
	2437	✓
	2462	✓

Duty Cycle

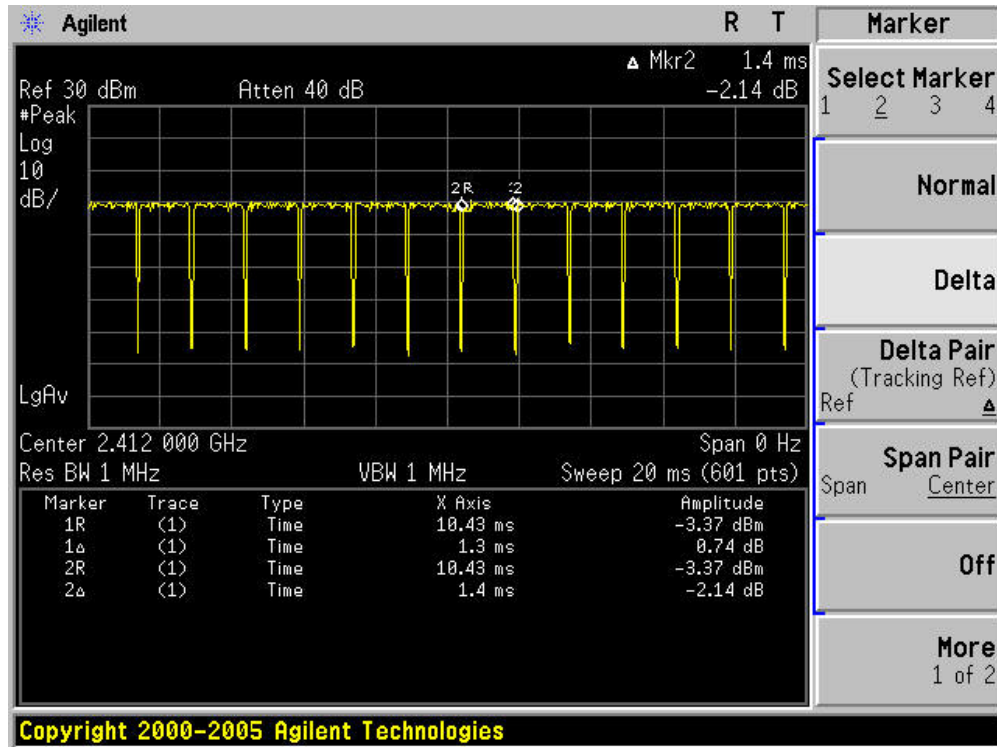
2.4GHz Band

Test Mode	Duty Cycle
802.11b	98.8%
802.11g	92.8%
802.11n(20MHz)	88.4%

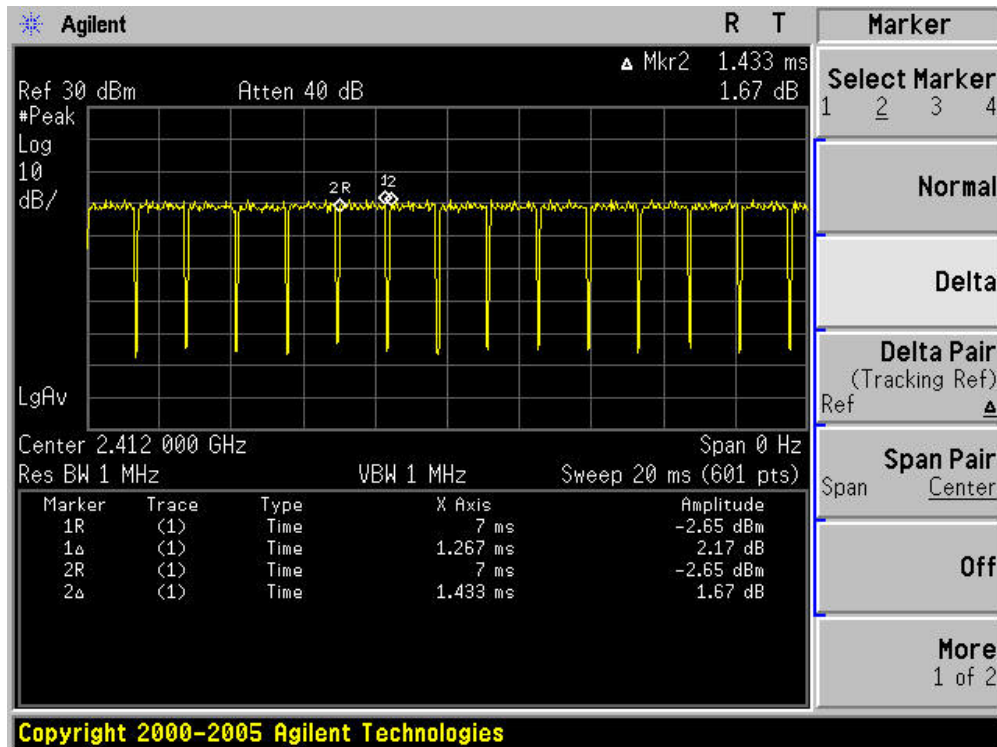
802.11b



802.11g



802.11n20



1.2. Mode of Operation

Quietek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit by 802.11b
Mode 2: Transmit by 802.11g
Mode 3: Transmit by 802.11n(20MHz)

Note:

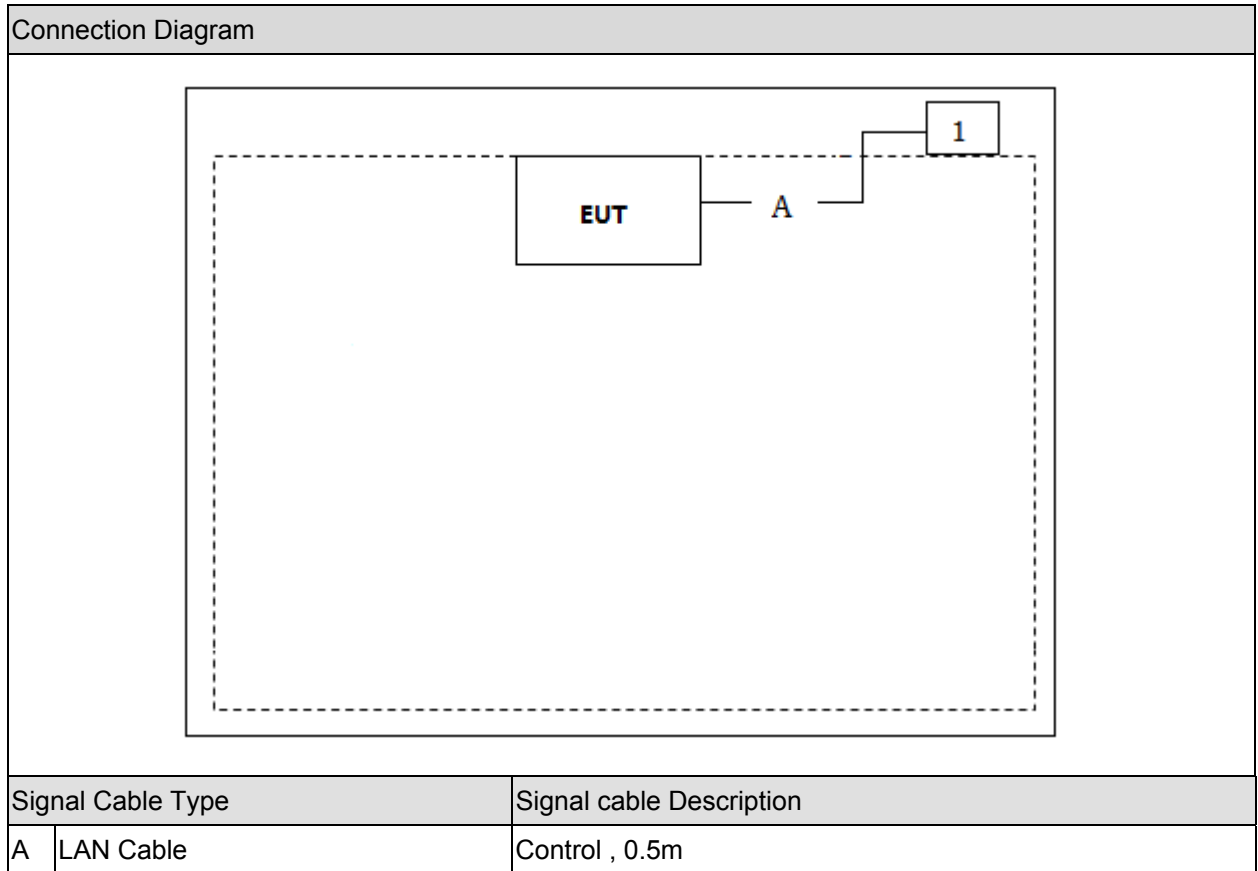
1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.
2. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Asus	N80V	8BN0AS226971468	N/A

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Run the RF test software , and set the test mode and channel, then press OK to start continue Transmit or receive.

2. Technical Test

2.1. Summary of Test Result

- ☒ No deviations from the test standards
☐ Deviations from the test standards as below description:

For FCC

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.207	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.209	Yes	No
RF Antenna Conducted Spurious	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(d)	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2014 15.247(d)	Yes	No
Operation Frequency Range of 20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2014 15.215(c)	Yes	No
Occupied Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(a)(2)	Yes	No
Power Output	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(b)(3)	Yes	No
Power Spectral Density	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(e)	Yes	No

For IC

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	RSS-Gen Issue 4 November 2014 Section 8.8	Yes	No
Radiated Emission	RSS-247 Issue 1 May 2015 Section 5.5	Yes	No
RF Antenna Conducted Spurious	RSS-247 Issue 1 May 2015 Section 5.5	Yes	No
Radiated Emission Band Edge	RSS-Gen Issue 4 November 2014 Section 8.10	Yes	No
Occupied Bandwidth	RSS-Gen Issue 4 November 2014 Section 6.6 RSS-247 Issue 1 May 2015 Section 5.2	Yes	No
Power Output	RSS-247 Issue 1 May 2015 Section 5.4	Yes	No
Power Spectral Density	RSS-247 Issue 1 May 2015 Section 5.2	Yes	No

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

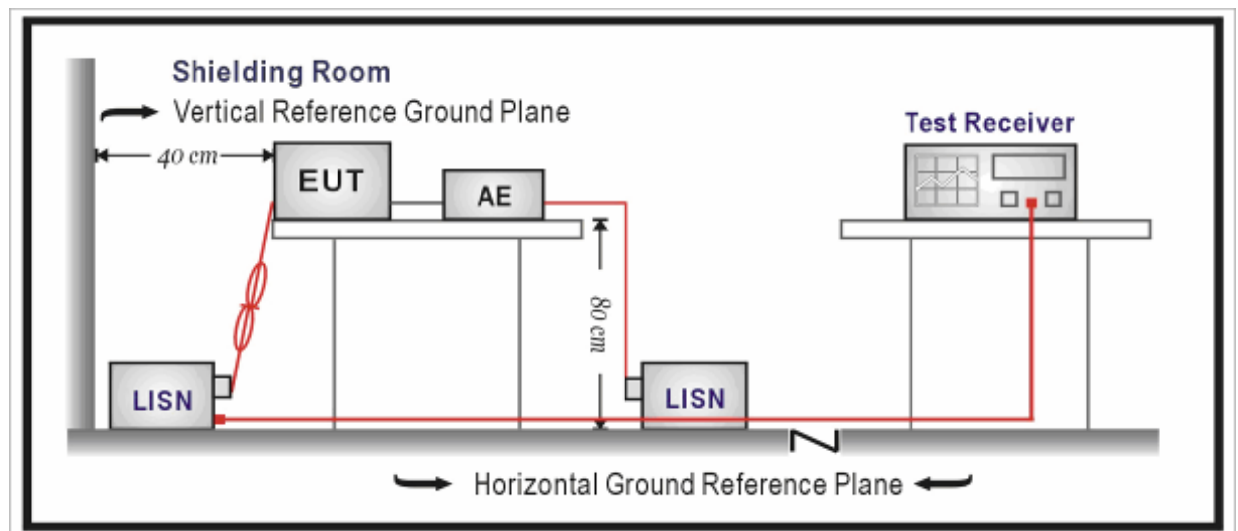
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2016.03.28
Two-Line V-Network	R&S	ENV216	100043	2016.03.28
Two-Line V-Network	R&S	ENV216	100044	2016.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2016.03.01
50ohm Termination	SHX	TF2	07081401	2016.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2016.01.08

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03& Industry Canada RSS-Gen Issue 4& RSS-247 Issue 1

According to KDB 174176 D01 Line Conducted FAQ v01r01, it is required to perform the AC power-line conducted emissions testing and demonstrate compliance with the AC power-line emission requirements in Sections 15.107 or 15.207.

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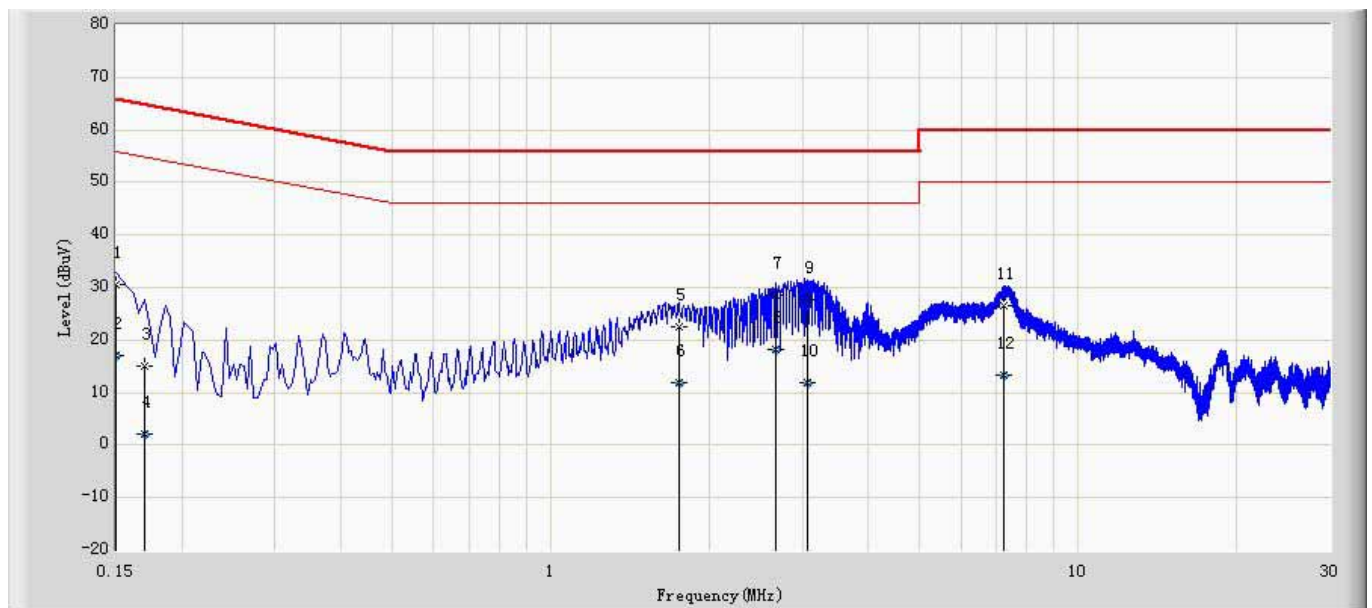
The EUT was setup according to ANSI C63.4, 2014 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

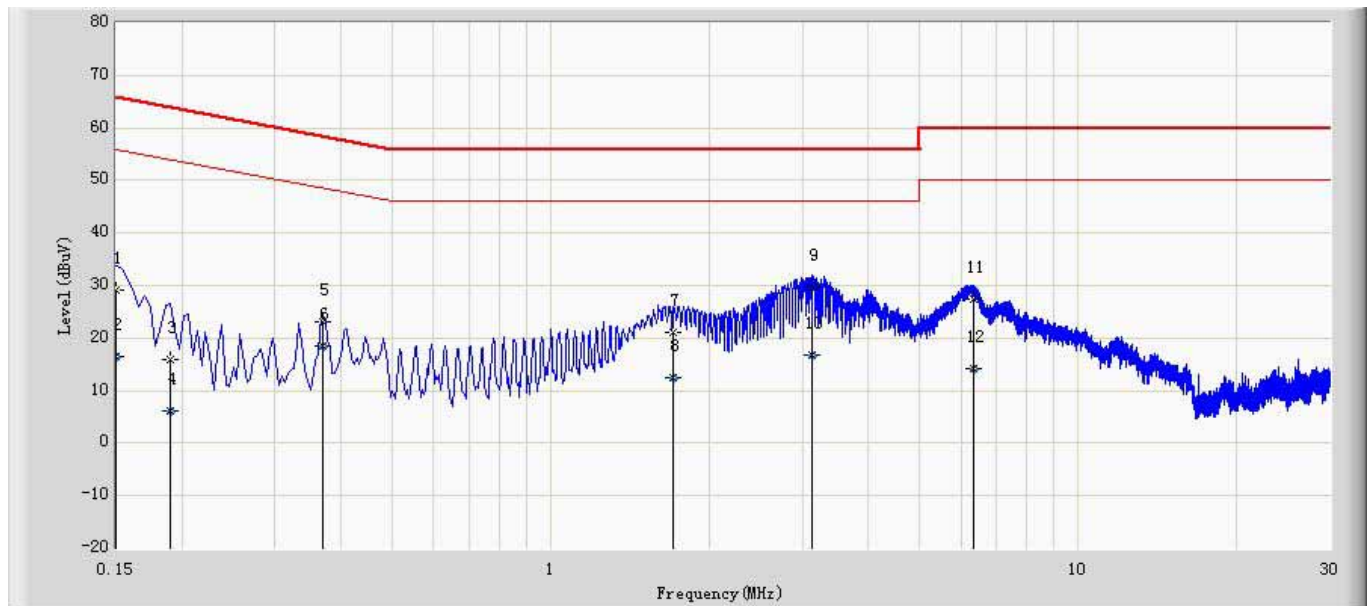
3.6. Test Result

Engineer: Scott	
Site: TR1	Time: 2015/10/21 - 10:25
Limit: FCC_Part15.207_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1		0.150	30.541	20.805	-35.459	66.000	9.676	0.060	0.000	QP
2		0.150	16.938	7.202	-39.062	56.000	9.676	0.060	0.000	AV
3		0.170	15.193	5.470	-49.767	64.960	9.663	0.060	0.000	QP
4		0.170	2.195	-7.528	-52.765	54.960	9.663	0.060	0.000	AV
5		1.750	22.488	12.758	-33.512	56.000	9.640	0.090	0.000	QP
6		1.750	11.775	2.045	-34.225	46.000	9.640	0.090	0.000	AV
7	*	2.674	28.682	18.922	-27.318	56.000	9.650	0.110	0.000	QP
8		2.674	18.112	8.352	-27.888	46.000	9.650	0.110	0.000	AV
9		3.066	27.575	17.805	-28.425	56.000	9.650	0.120	0.000	QP
10		3.066	11.868	2.098	-34.132	46.000	9.650	0.120	0.000	AV
11		7.246	26.592	16.682	-33.408	60.000	9.700	0.210	0.000	QP
12		7.246	13.302	3.392	-36.698	50.000	9.700	0.210	0.000	AV

Engineer: Scott	
Site: TR1	Time: 2015/10/21 - 10:31
Limit: FCC_Part15.207_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 16V
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1		0.150	29.235	19.499	-36.765	66.000	9.676	0.060	0.000	QP
2		0.150	16.571	6.835	-39.429	56.000	9.676	0.060	0.000	AV
3		0.190	16.026	6.306	-48.011	64.037	9.660	0.060	0.000	QP
4		0.190	6.022	-3.698	-48.015	54.037	9.660	0.060	0.000	AV
5		0.370	23.036	13.336	-35.465	58.501	9.640	0.060	0.000	QP
6		0.370	18.565	8.865	-29.936	48.501	9.640	0.060	0.000	AV
7		1.710	21.033	11.303	-34.967	56.000	9.640	0.090	0.000	QP
8		1.710	12.380	2.650	-33.620	46.000	9.640	0.090	0.000	AV
9	*	3.122	29.647	19.877	-26.353	56.000	9.650	0.120	0.000	QP
10		3.122	16.717	6.947	-29.283	46.000	9.650	0.120	0.000	AV
11		6.314	27.514	17.644	-32.486	60.000	9.680	0.190	0.000	QP
12		6.314	14.180	4.310	-35.820	50.000	9.680	0.190	0.000	AV

Note: All the test modes are pretested and mode 1 802.11b mode was found to be the worst mode, so the data of this test mode was recorded.

4. Radiated Emission

4.1. Test Equipment

Radiated Emission / AC-2

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2016.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.17
Bilog Chainenna	Teseq GmbH	CBL6112D	27611	2016.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2016.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2016.01.08

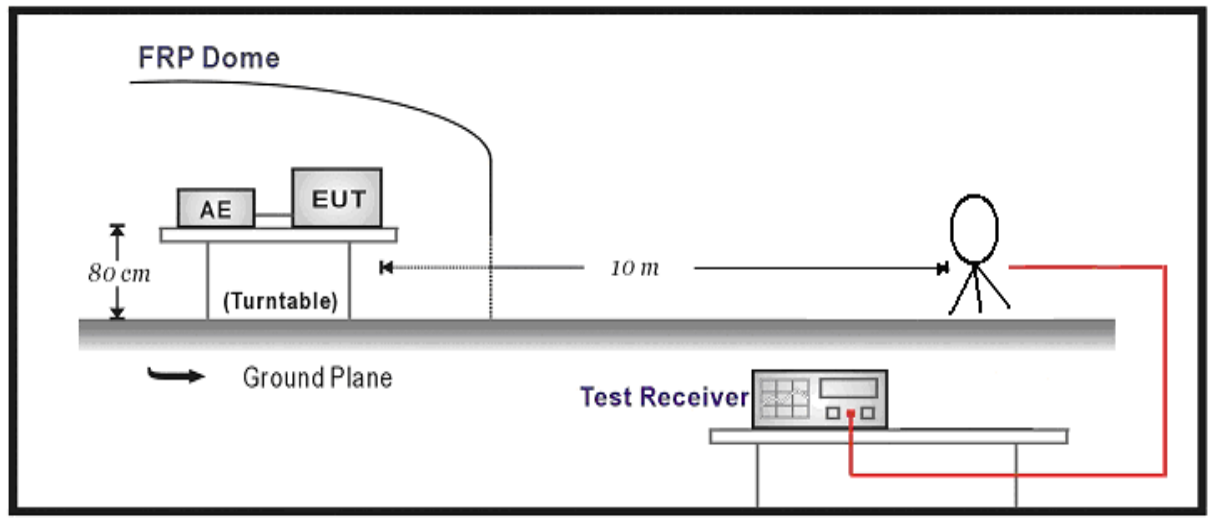
Radiated Emission / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100159	2016.03.28
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.07
Preamplifier	Miteq	NSP1800-25	1364185	2016.05.05
Preamplifier	QuieTek	AP-040G	CHM-0906001	2016.05.05
DRG Horn	ETS-Lindgren	3117	00123988	2016.01.21
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2015.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2016.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2016.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2016.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2016.06.09
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2016.01.08

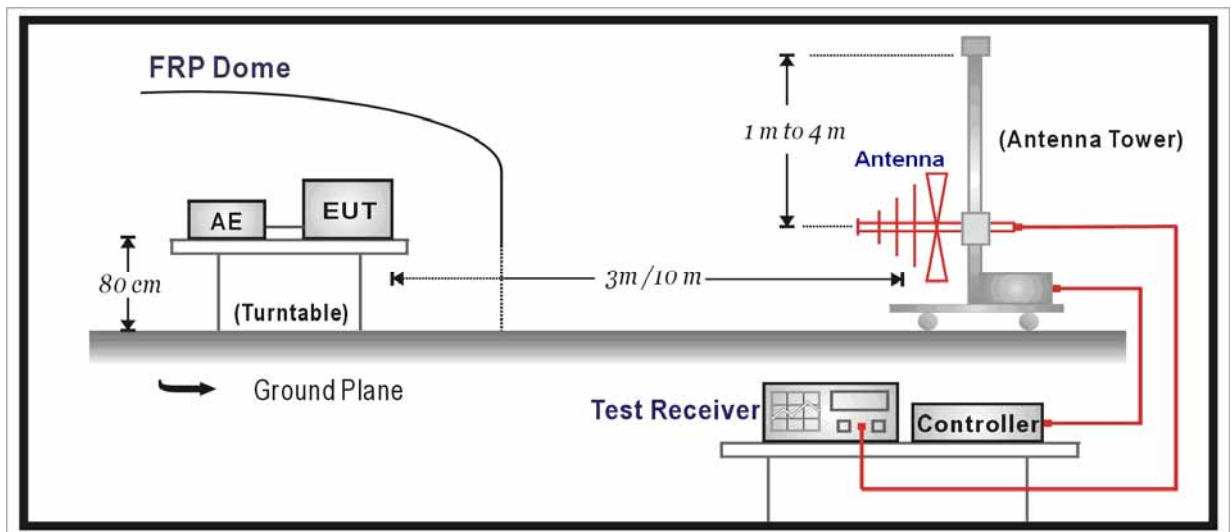
Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

4.2. Test Setup

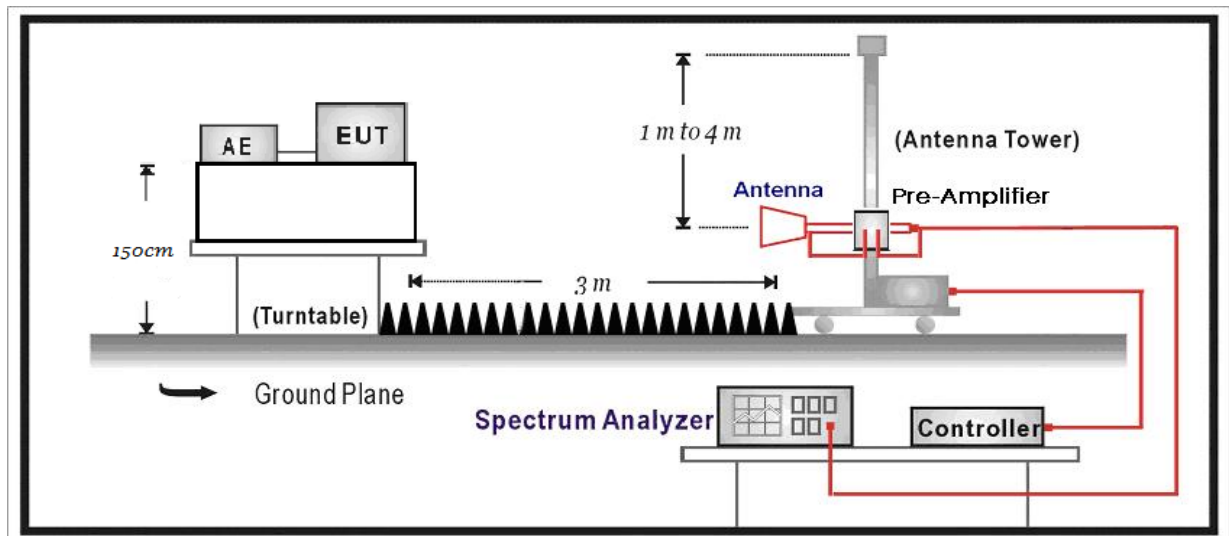
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument Antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03& ndustry Canada RSS-Gen Issue 4& RSS-247 Issue 1

FCC&IC

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from Antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the Antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2014 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Antenna will be bended down a little (as horn Antenna has the narrow beamwidth) in order to keeping the Antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

4.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

below 1G is defined as ± 3.8 dB

4.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

Mode1: Transmit by 802.11b

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	H	4824.4	53.8	-6.7	47.1	54(note3)	-6.9	PK
	H	7236.0	53.7	-2.6	51.1	54(note3)	-2.9	PK
	H	9648.0	48.8	1.0	49.8	54(note3)	-4.2	PK
	V	4825.0	53.5	-6.7	46.8	54(note3)	-7.2	PK
	V	7236.0	52.7	-2.6	50.1	54(note3)	-3.9	PK
	V	9648.0	48.4	1.0	49.4	54(note3)	-4.6	PK
6	H	4876.0	52.7	-6.6	46.1	54(note3)	-7.9	PK
	H	7311.0	52.2	-2.9	49.3	54(note3)	-4.7	PK
	H	9748.0	50.8	1.0	51.8	54(note3)	-2.2	PK
	V	4876.0	52.7	-6.6	46.1	54(note3)	-7.9	PK
	V	7311.0	52.5	-3.0	49.5	54(note3)	-4.5	PK
	V	9748.0	51.1	1.0	52.1	54(note3)	-1.9	PK
11	H	4927.0	53.0	-6.7	46.3	54(note3)	-7.7	PK
	H	7383.5	50.8	-2.4	48.4	54(note3)	-5.6	PK
	H	9848.0	51.1	1.2	52.3	54(note3)	-1.7	PK
	V	4927.0	53.9	-6.7	47.2	54(note3)	-6.8	PK
	V	7386.0	50.1	-2.4	47.7	54(note3)	-6.3	PK
	V	9848.0	50.5	1.2	51.7	54(note3)	-2.3	PK

Note: 1. Measure Level = Reading Level + Factor.

2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.

3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode2: Transmit by 802.11g

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	H	4824.4	54.5	-6.7	47.8	54(note3)	-6.2	PK
	H	7236.0	52.5	-2.6	49.9	54(note3)	-4.1	PK
	H	9648.0	50.0	1.0	51.0	54(note3)	-3.0	PK
	V	4825.0	53.3	-6.6	46.7	54(note3)	-7.3	PK
	V	7236.0	53.4	-2.6	50.8	54(note3)	-3.2	PK
	V	9648.0	49.0	0.9	49.9	54(note3)	-4.1	PK
6	H	4876.0	52.9	-6.6	46.3	54(note3)	-7.7	PK
	H	7311.0	52.3	-3.0	49.3	54(note3)	-4.7	PK
	H	9748.0	51.1	1.1	52.2	54(note3)	-1.8	PK
	V	4876.0	53.6	-6.6	47.0	54(note3)	-7.0	PK
	V	7311.0	52.2	-2.9	49.3	54(note3)	-4.7	PK
	V	9748.0	50.8	1.0	51.8	54(note3)	-2.2	PK
11	H	4927.0	52.2	-6.7	45.5	54(note3)	-8.5	PK
	H	7383.5	50.5	-2.5	48.0	54(note3)	-6.0	PK
	H	9848.0	50.7	1.1	51.8	54(note3)	-2.2	PK
	V	4927.0	52.9	-6.7	46.2	54(note3)	-7.8	PK
	V	7386.0	50.6	-2.4	48.2	54(note3)	-5.8	PK
	V	9848.0	51.4	1.2	52.6	54(note3)	-1.4	PK

Note: 1. Measure Level = Reading Level + Factor.

2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode3: Transmit by 802.11n(20MHz)

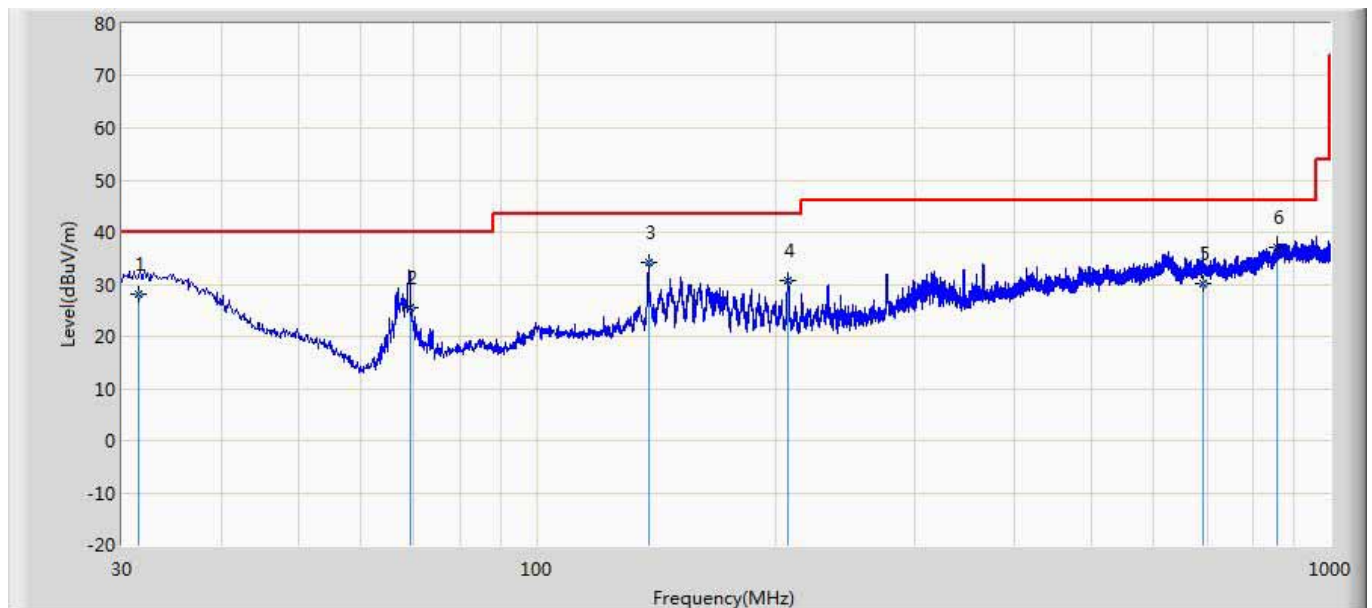
CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	H	4824.4	54.3	-6.7	47.6	54(note3)	-6.4	PK
	H	7236.0	52.5	-2.6	49.9	54(note3)	-4.1	PK
	H	9648.0	49.7	1.0	50.7	54(note3)	-3.3	PK
	V	4825.0	53.6	-6.7	46.9	54(note3)	-7.1	PK
	V	7236.0	52.8	-2.6	50.2	54(note3)	-3.8	PK
	V	9648.0	48.6	1.0	49.6	54(note3)	-4.4	PK
6	H	4876.0	52.6	-6.7	45.9	54(note3)	-8.1	PK
	H	7311.0	52.1	-3.0	49.1	54(note3)	-4.9	PK
	H	9748.0	50.7	1.0	51.7	54(note3)	-2.3	PK
	V	4876.0	52.6	-6.7	45.9	54(note3)	-8.1	PK
	V	7311.0	52.2	-3.0	49.2	54(note3)	-4.8	PK
	V	9748.0	50.3	1.0	51.3	54(note3)	-2.7	PK
11	H	4927.0	52.2	-6.7	45.5	54(note3)	-8.5	PK
	H	7383.5	50.4	-2.4	48.0	54(note3)	-6.0	PK
	H	9848.0	51.1	1.2	52.3	54(note3)	-1.7	PK
	V	4927.0	53.1	-6.7	46.4	54(note3)	-7.6	PK
	V	7386.0	50.3	-2.4	47.9	54(note3)	-6.1	PK
	V	9848.0	50.2	1.2	51.4	54(note3)	-2.6	PK

Note: 1. Measure Level = Reading Level + Factor.

2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

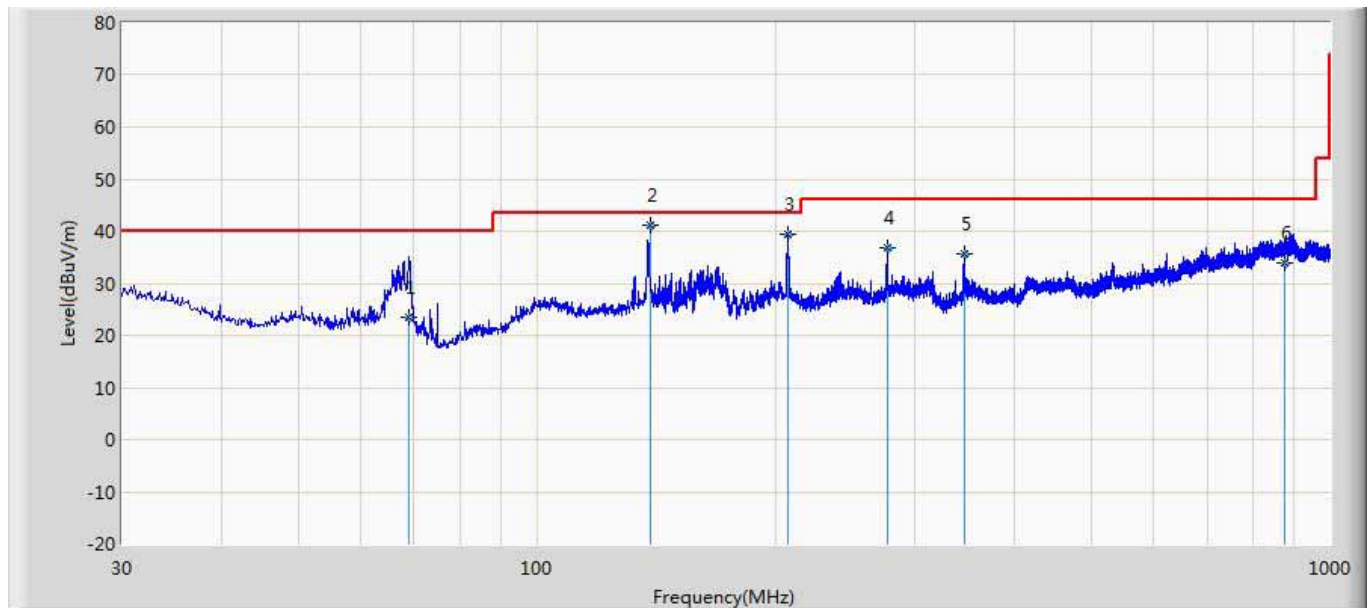
The worst case of Radiated Emission below 1GHz:

Engineer: Scott	
Site: AC2	Time: 2015/10/20 - 11:55
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC2_10M(30-1000M)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		31.516	28.075	0.800	-11.925	40.000	27.275	QP
2		69.430	25.365	13.918	-14.635	40.000	11.447	QP
3		138.393	34.307	16.767	-9.193	43.500	17.540	QP
4		207.731	30.709	13.445	-12.791	43.500	17.264	QP
5		691.703	30.203	1.000	-15.797	46.000	29.203	QP
6	*	859.564	37.235	4.912	-8.765	46.000	32.322	QP

Engineer: Scott	
Site: AC2	Time: 2015/10/20 - 12:15
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC2_10M(30-1000M)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		69.023	23.544	8.333	-16.456	40.000	15.211	QP
2	*	138.919	41.082	22.700	-2.418	43.500	18.382	QP
3		207.612	39.439	16.024	-4.061	43.500	23.414	QP
4		277.014	36.815	12.376	-9.185	46.000	24.439	QP
5		346.305	35.740	11.520	-10.260	46.000	24.220	QP
6		878.403	33.821	0.648	-12.179	46.000	33.173	QP

5. RF Antenna Conducted Spurious

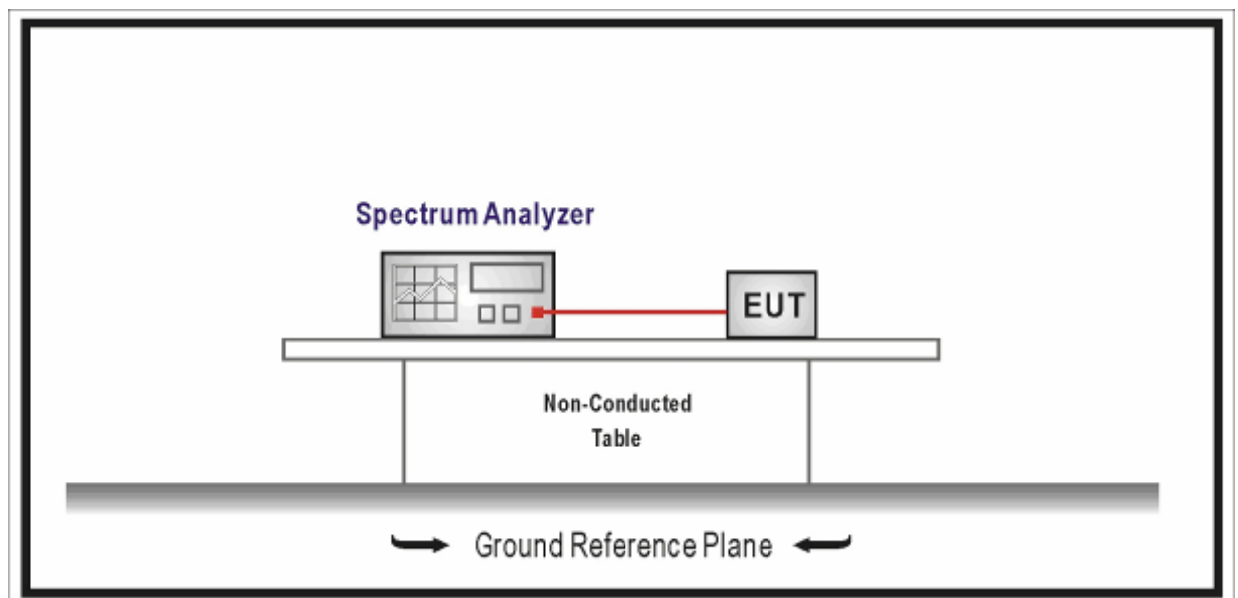
5.1. Test Equipment

RF Antenna Conducted Spurious / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2016.03.10
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2016.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



5.3. Limit

FCC&IC

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

5.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03& Industry Canada RSS-Gen Issue 4& RSS-247 Issue 1

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

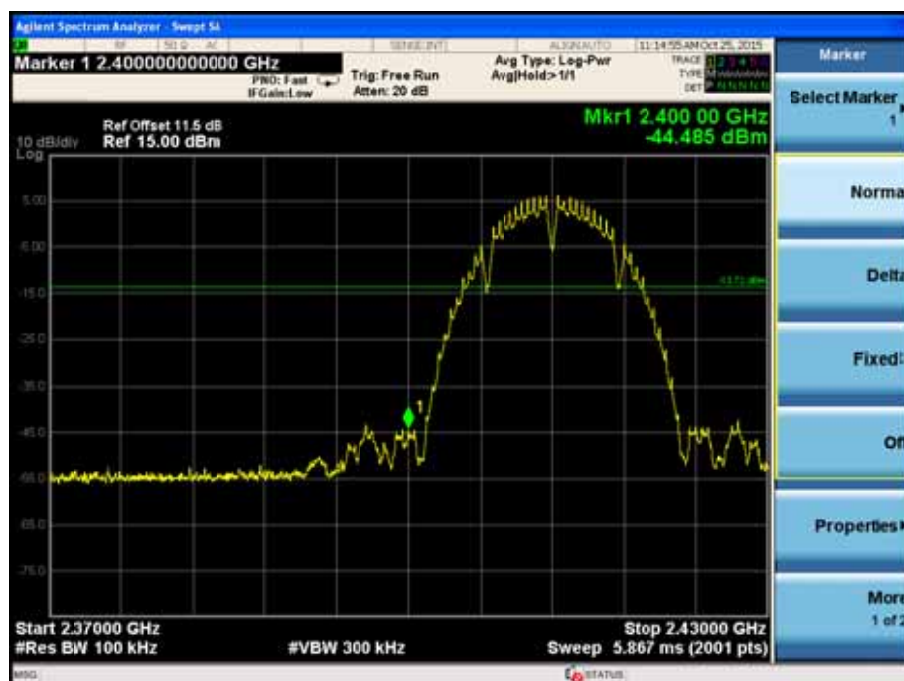
5.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

5.6. Test Result

Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by 802.11b

Channel 01 (2412MHz)

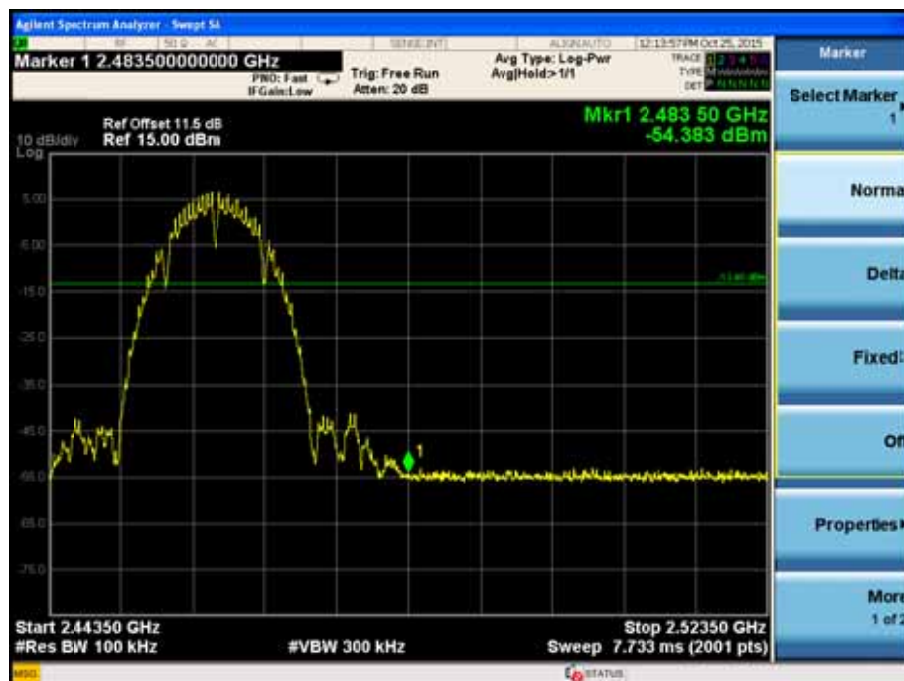




Channel 06 (2437MHz)



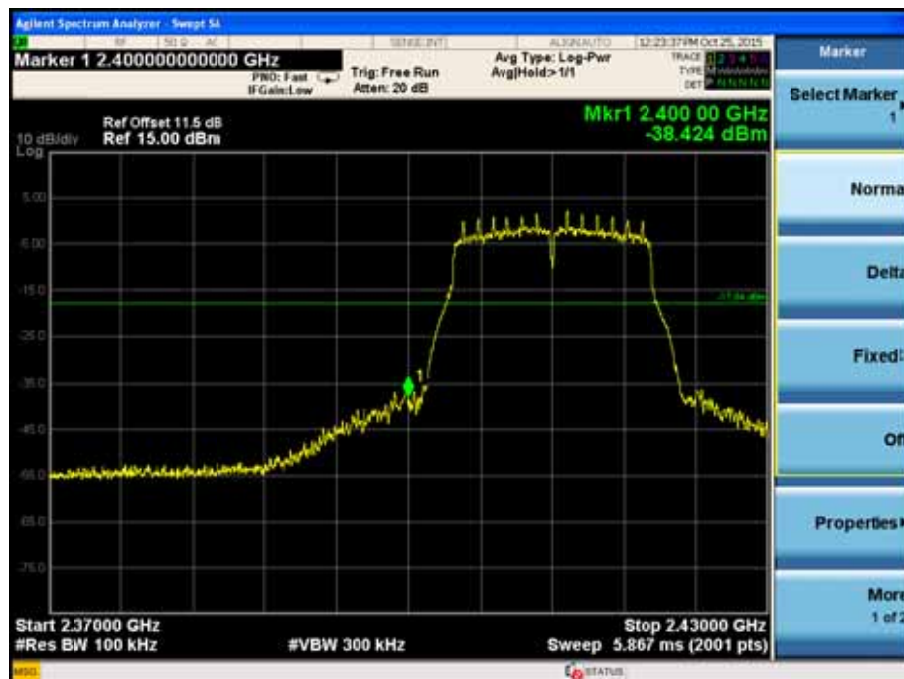
Channel 11 (2462MHz)





Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmit by 802.11g

Channel 01 (2412MHz)

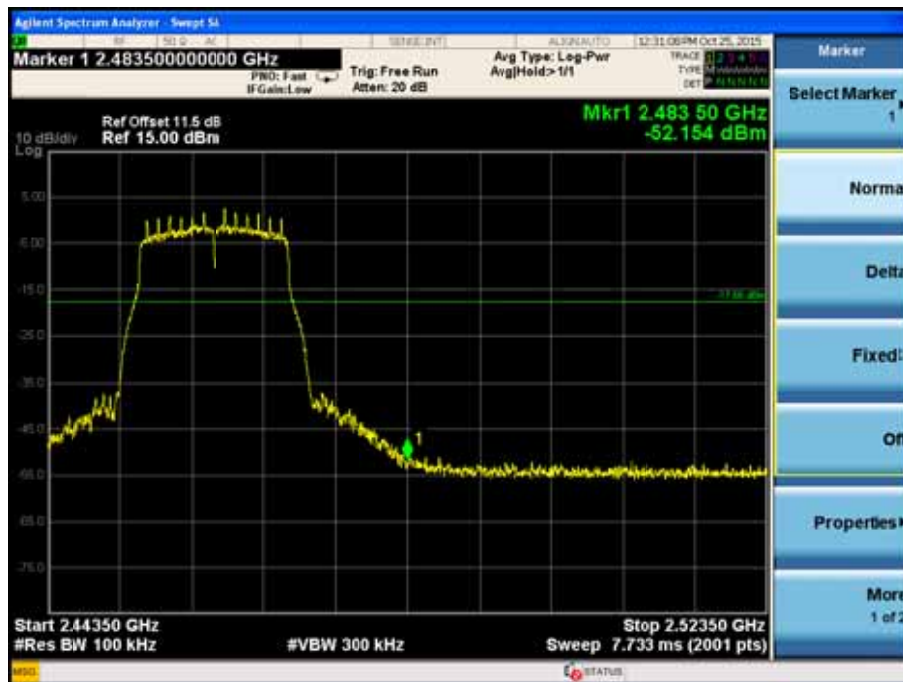




Channel 06 (2437MHz)



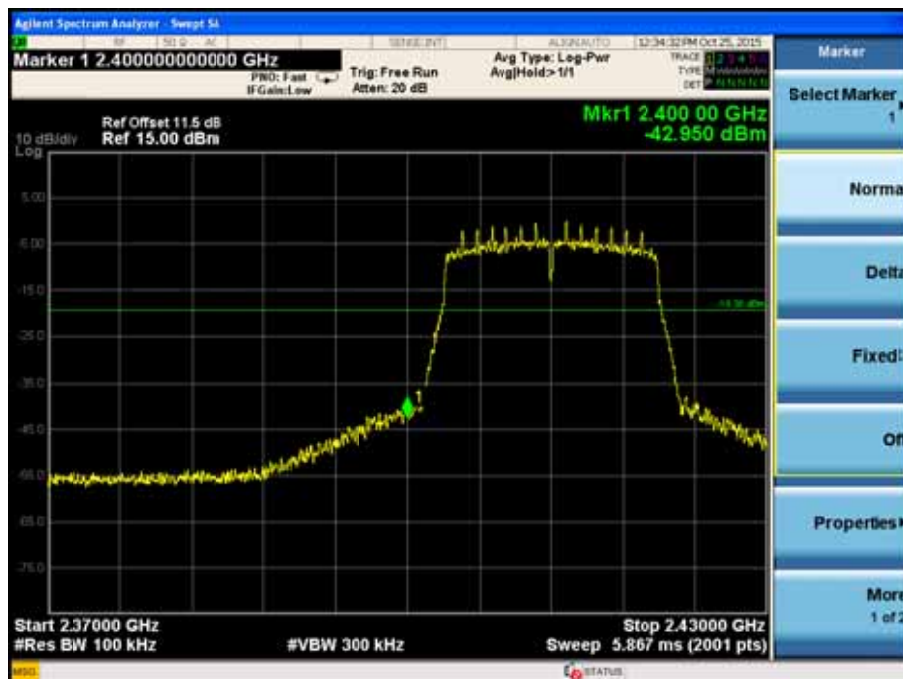
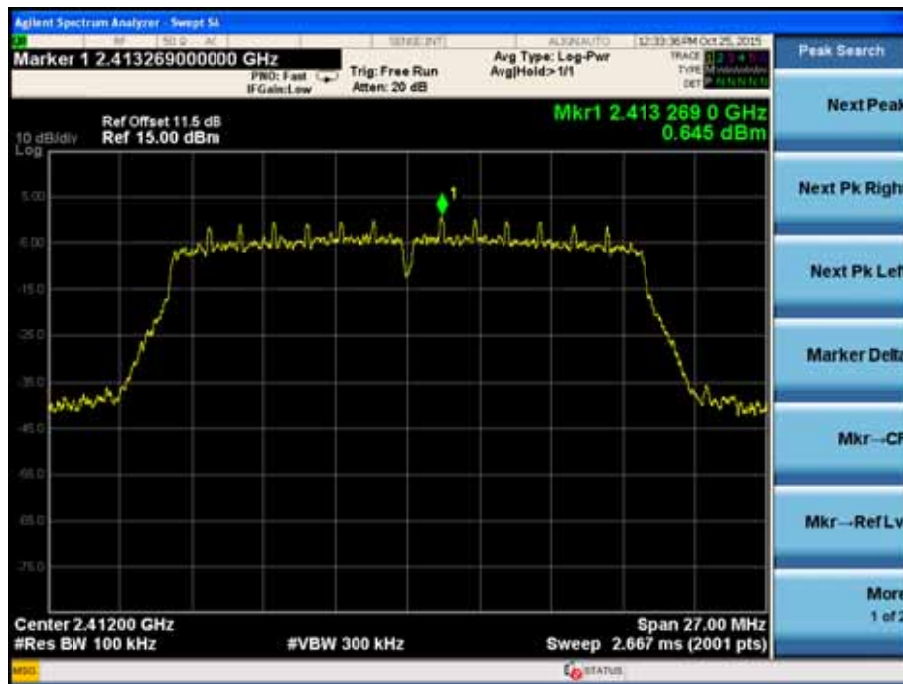
Channel 11 (2462MHz)





Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmit by 802.11n(20MHz)

Channel 01 (2412MHz)

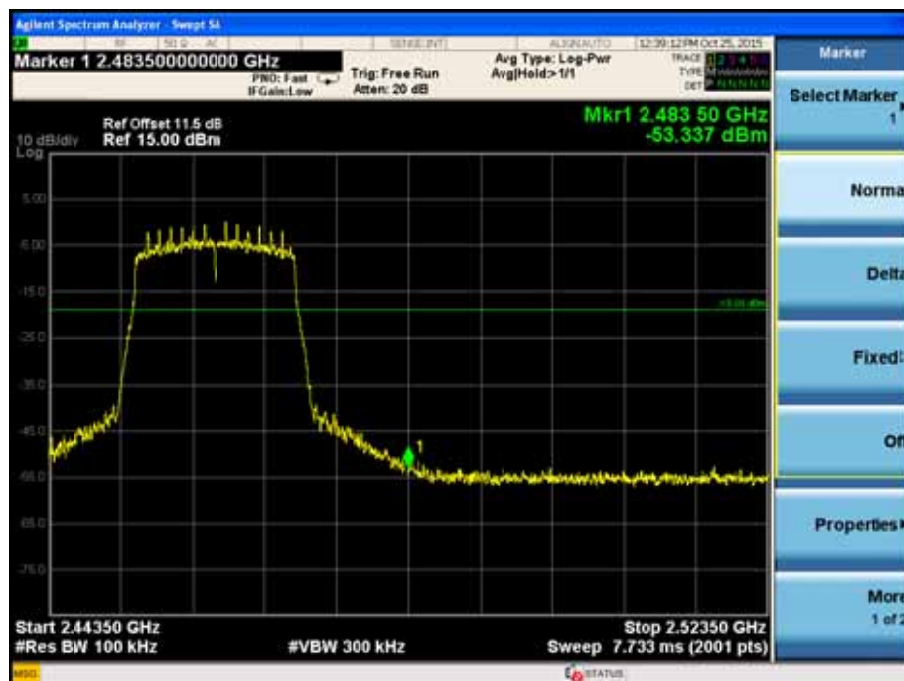
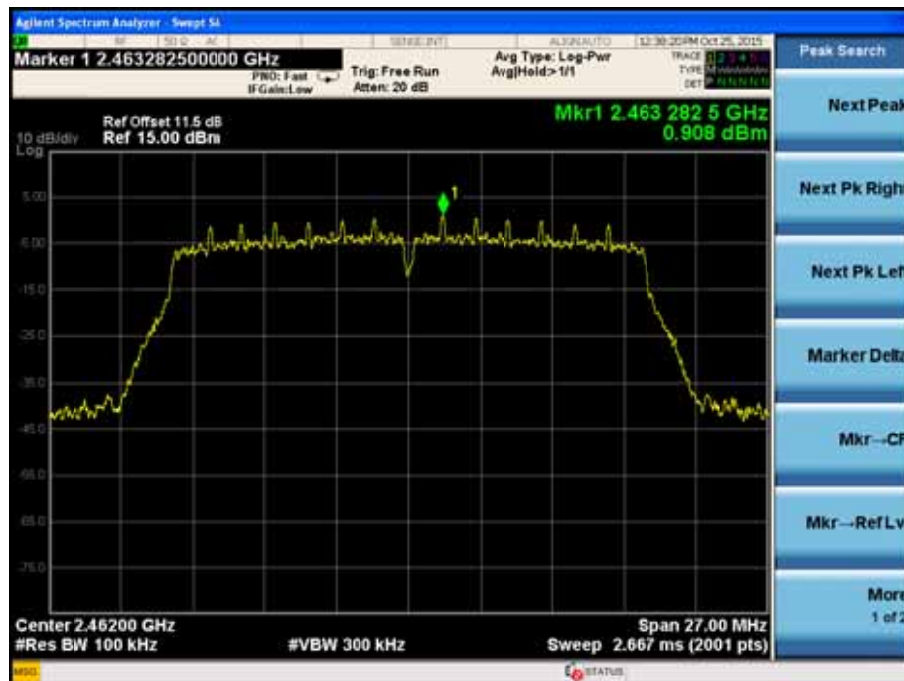




Channel 06 (2437MHz)



Channel 11 (2462MHz)





6. Radiated Emission Band Edge

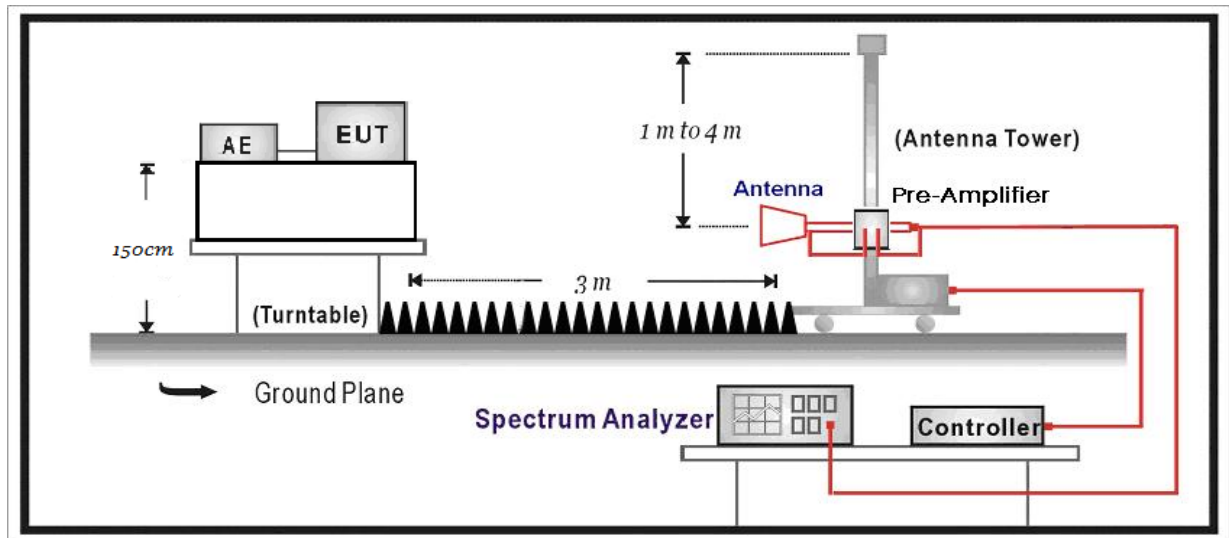
6.1. Test Equipment

☒ Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2016.03.10
Preamplifier	Miteq	NSP1800-25	1364185	2016.05.03
Preamplifier	QuieTek	AP-040G	CHM-0906001	2016.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2016.10.15
DRG Horn	ETS-Lindgren	3117	00123988	2016.01.07
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2016.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2016.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2016.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2016.06.09
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2016.01.08

Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. Limit

FCC&IC

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03& Industry Canada RSS-Gen Issue 4& RSS-247 Issue 1

This test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205 of FCC part 15. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a

high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b) of FCC part 15.

Now set the VBW $\geq 1 / T$ (the minimum transmission duration), while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209 of FCC Part 15.

If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative “marker-delta” method may be employed.

6.5. Uncertainty

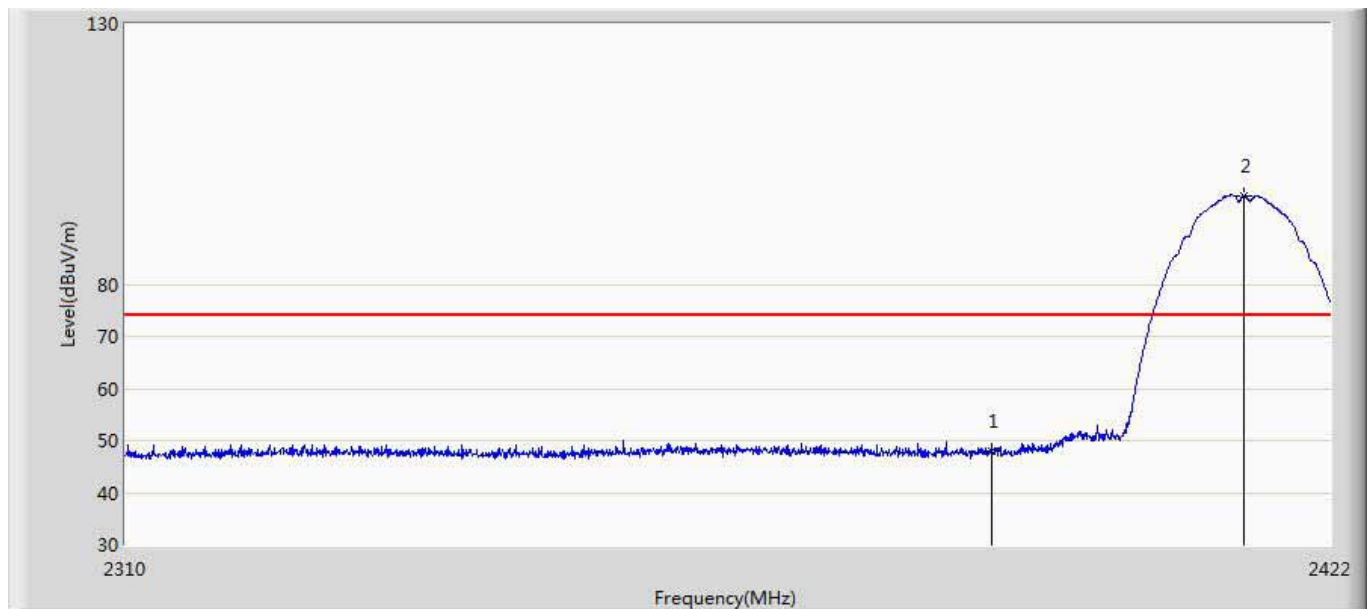
The measurement uncertainty above 1G is defined as ± 3.9 dB

6.6. Test Result

Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain

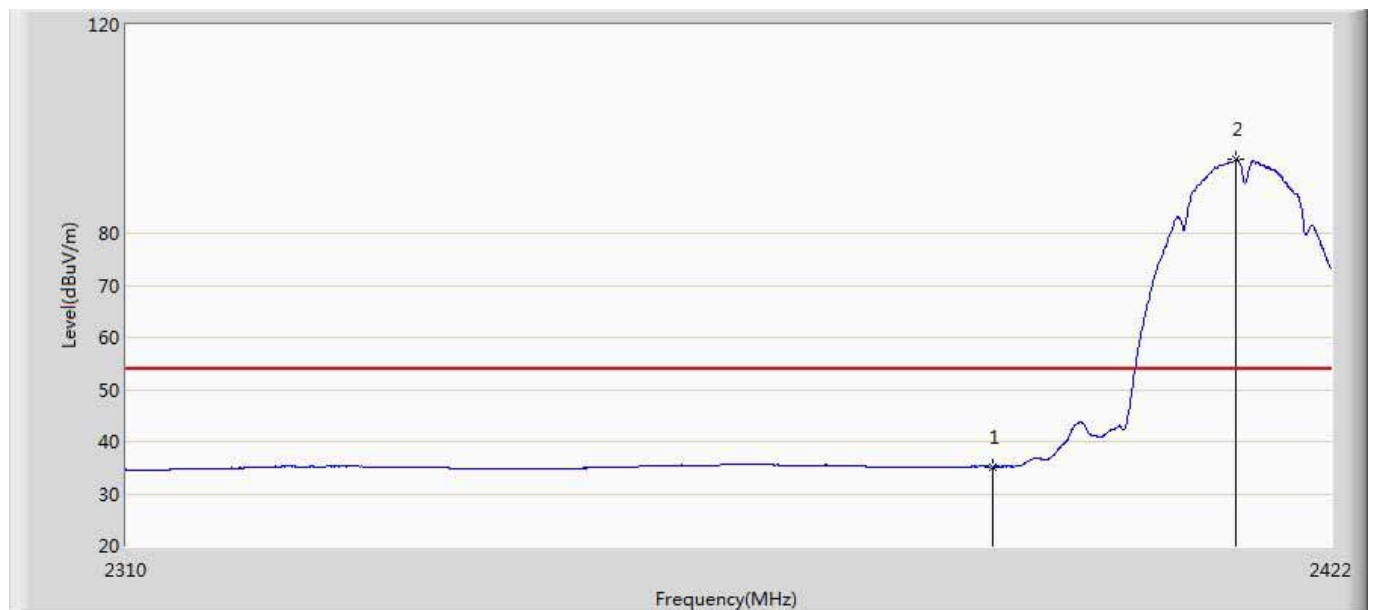
Note: when the duty cycle is less than 98%, a duty cycle factor is calculated in the correction factor.

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 13:36
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



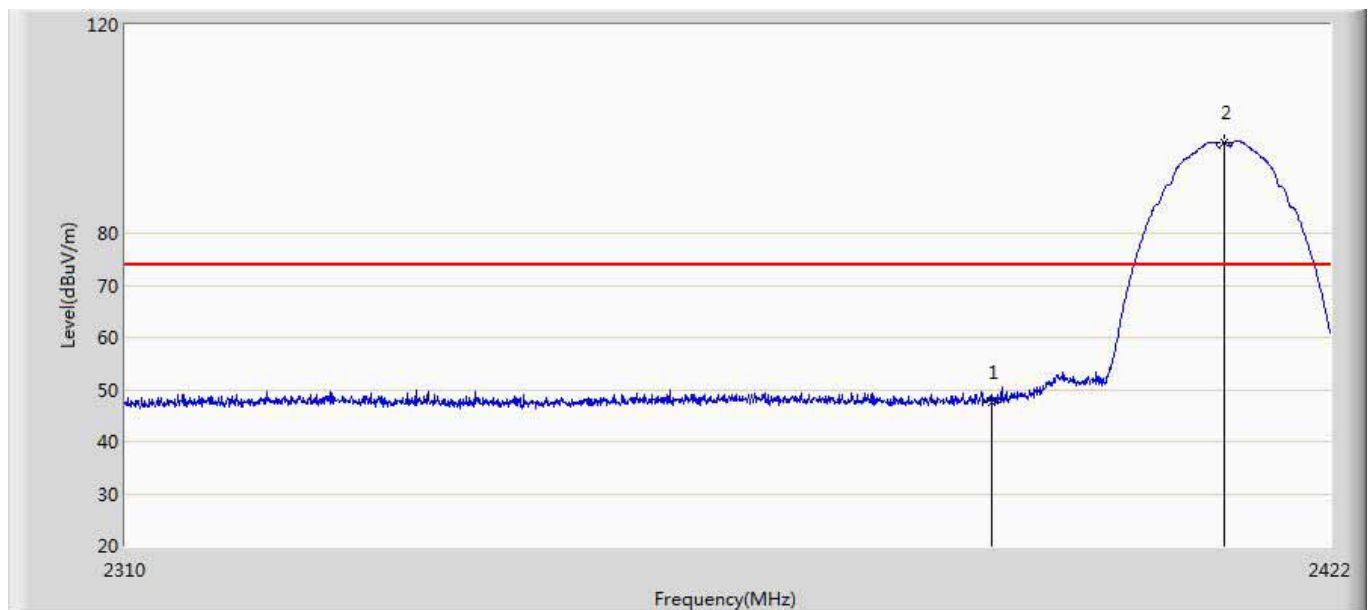
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	48.094	10.739	-25.906	74.000	37.355	PK
2	*	2413.768	96.955	59.609	N/A	N/A	37.346	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 13:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



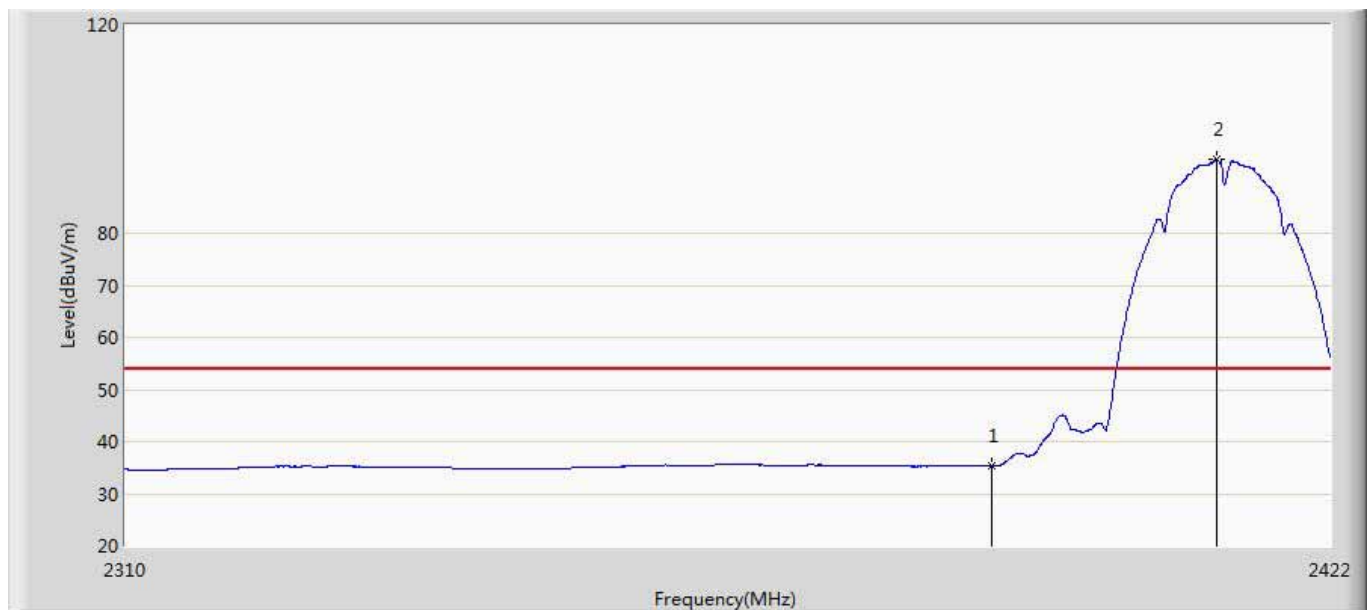
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	35.206	-2.149	-18.794	54.000	37.355	AV
2	*	2412.928	94.090	56.749	N/A	N/A	37.340	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 13:42
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



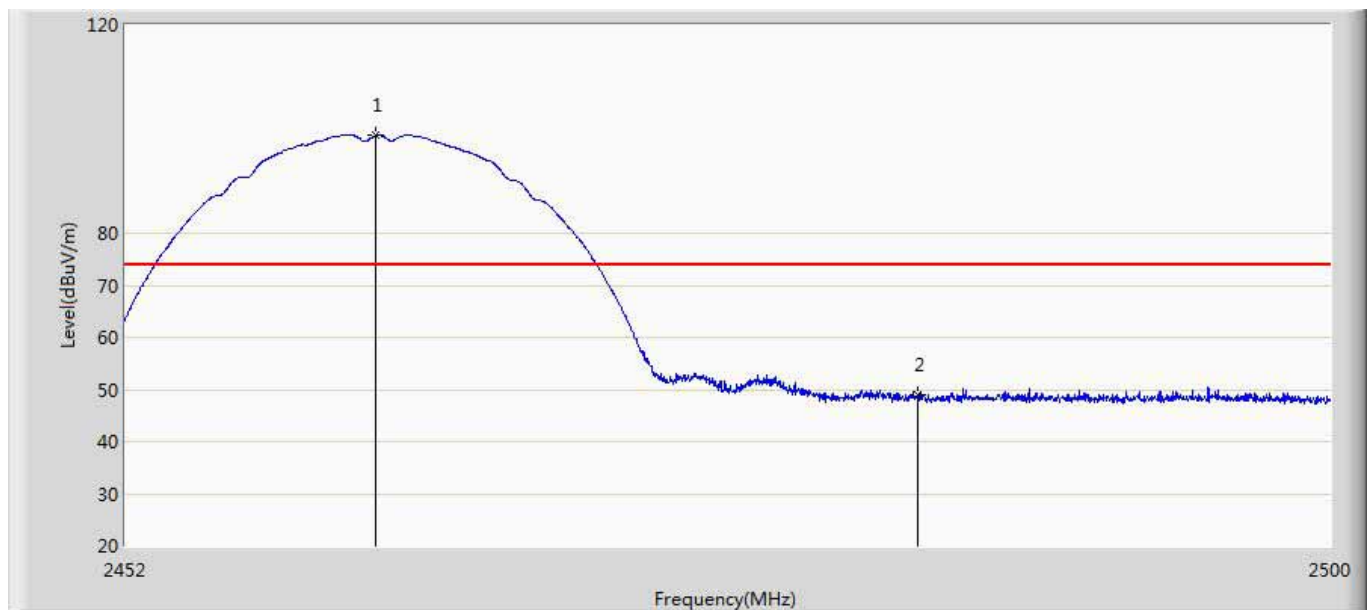
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	47.430	10.075	-26.570	74.000	37.355	PK
2	*	2411.976	97.492	60.158	N/A	N/A	37.334	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 13:43
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2412MHz by 802.11b	



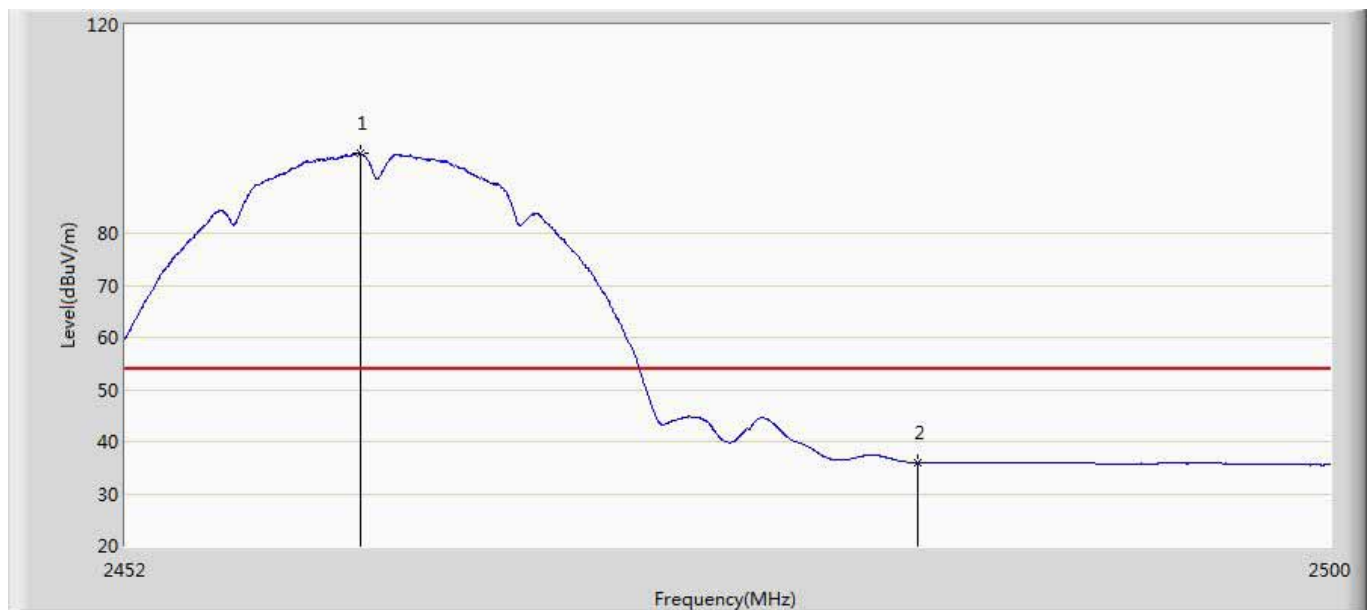
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	35.408	-1.947	-18.592	54.000	37.355	AV
2	*	2411.192	94.200	56.871	N/A	N/A	37.329	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:02
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2462MHz by 802.11b	



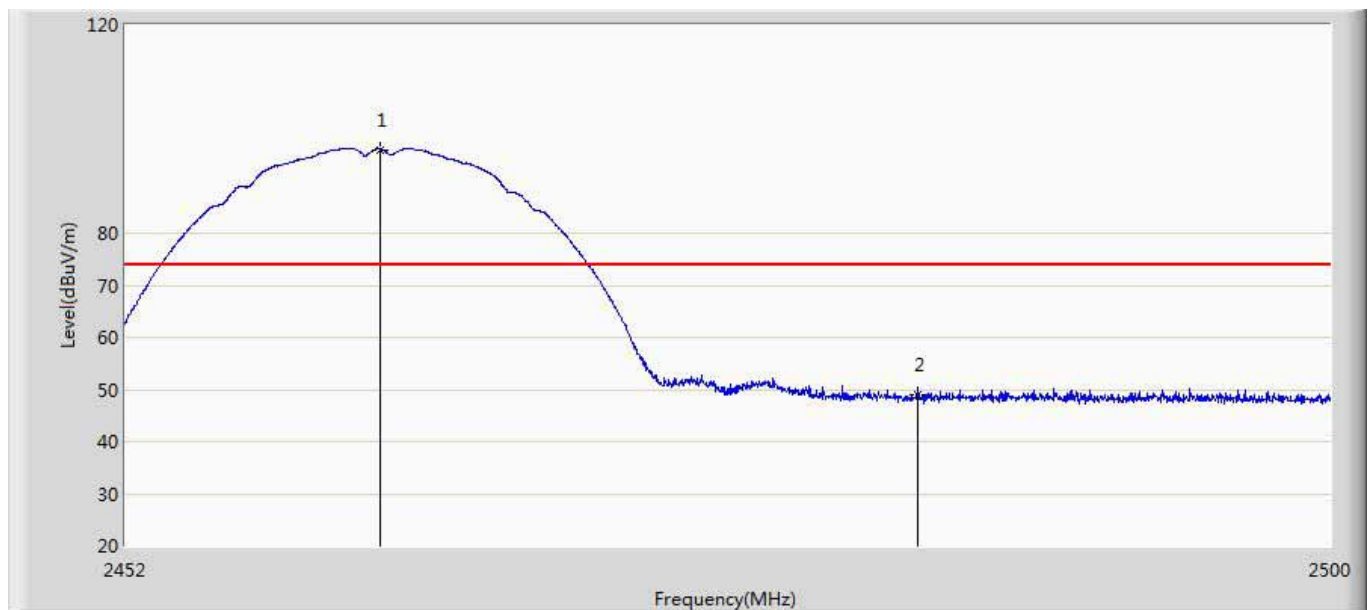
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2461.912	98.737	61.317	N/A	N/A	37.421	PK
2		2483.500	48.854	11.343	-25.146	74.000	37.511	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:04
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2462MHz by 802.11b	



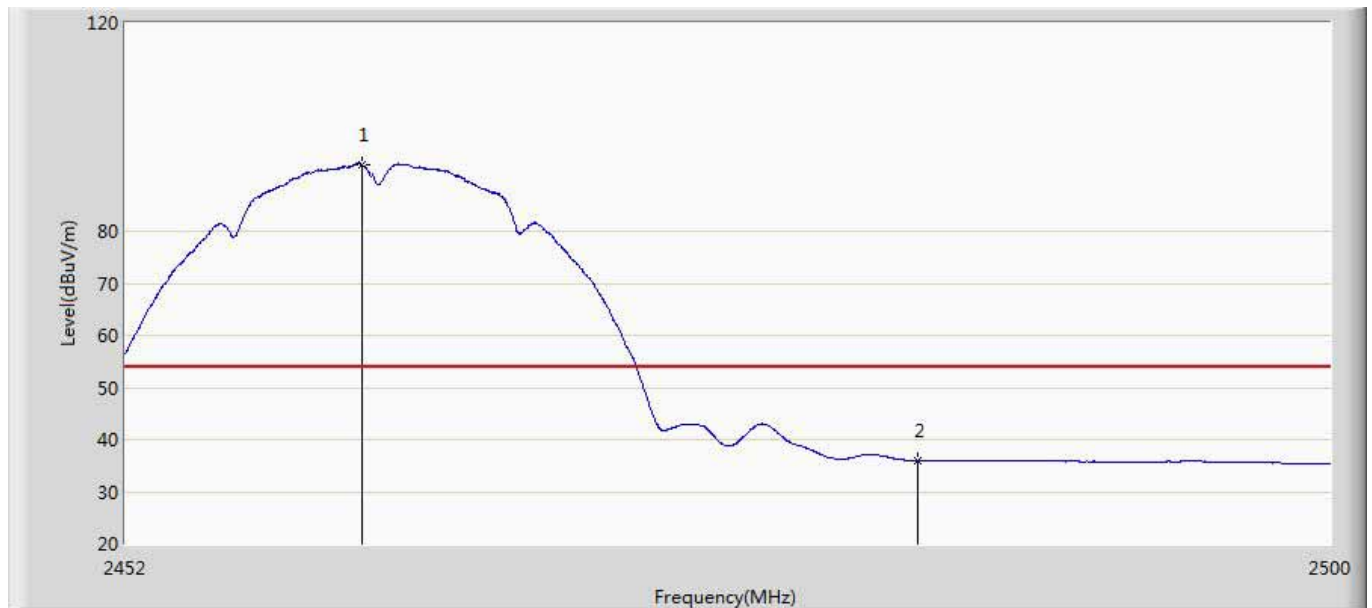
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2461.288	95.320	57.899	N/A	N/A	37.421	AV
2		2483.500	35.923	-1.588	-18.077	54.000	37.511	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:08
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2462MHz by 802.11b	



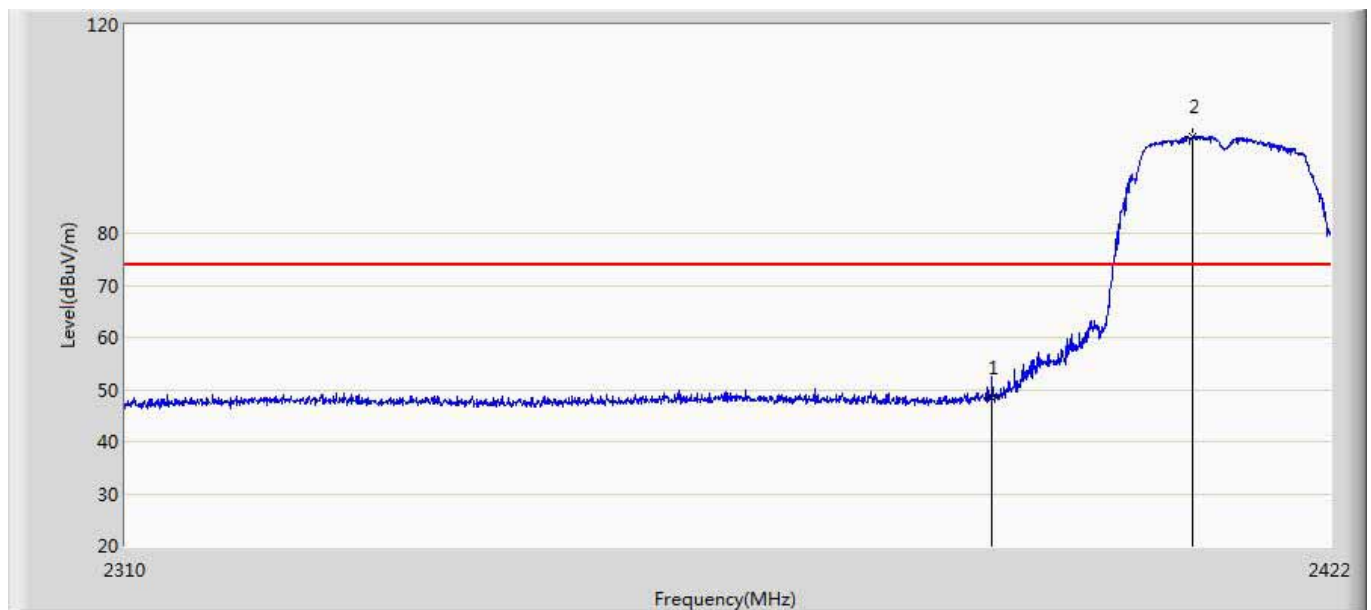
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2462.104	96.074	58.653	N/A	N/A	37.421	PK
2		2483.500	48.955	11.444	-25.045	74.000	37.511	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:09
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 1: Transmit at channel 2462MHz by 802.11b	



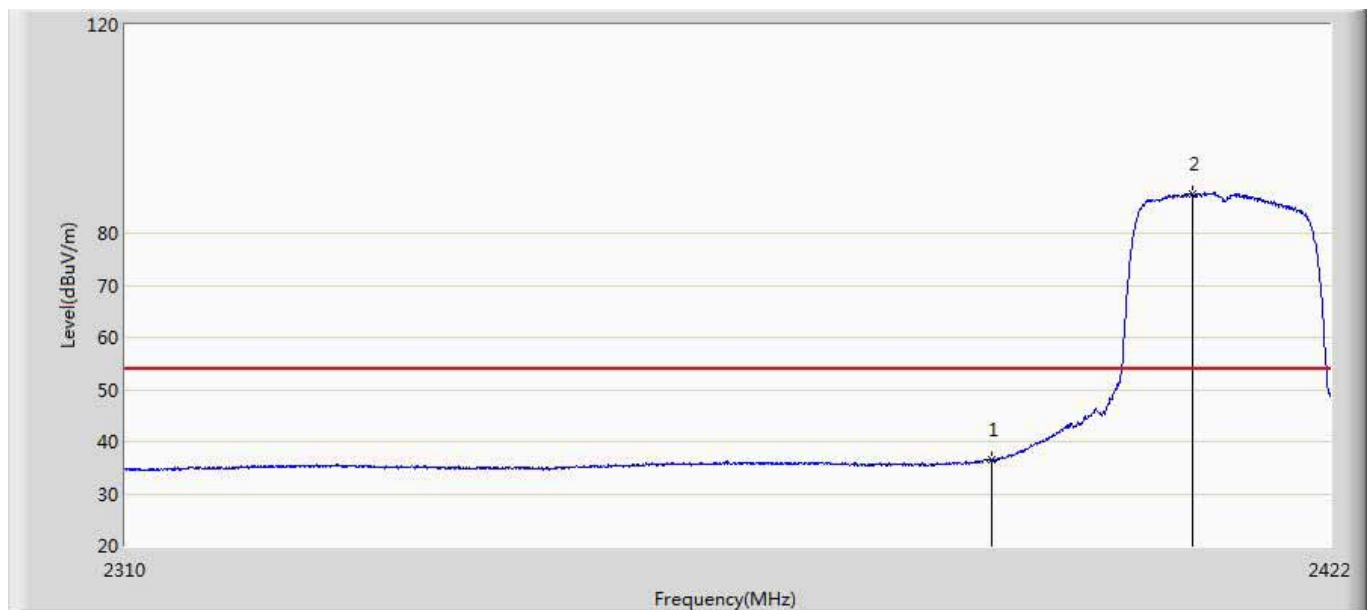
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2461.360	92.887	55.466	N/A	N/A	37.421	AV
2		2483.500	35.868	-1.643	-18.132	54.000	37.511	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:13
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



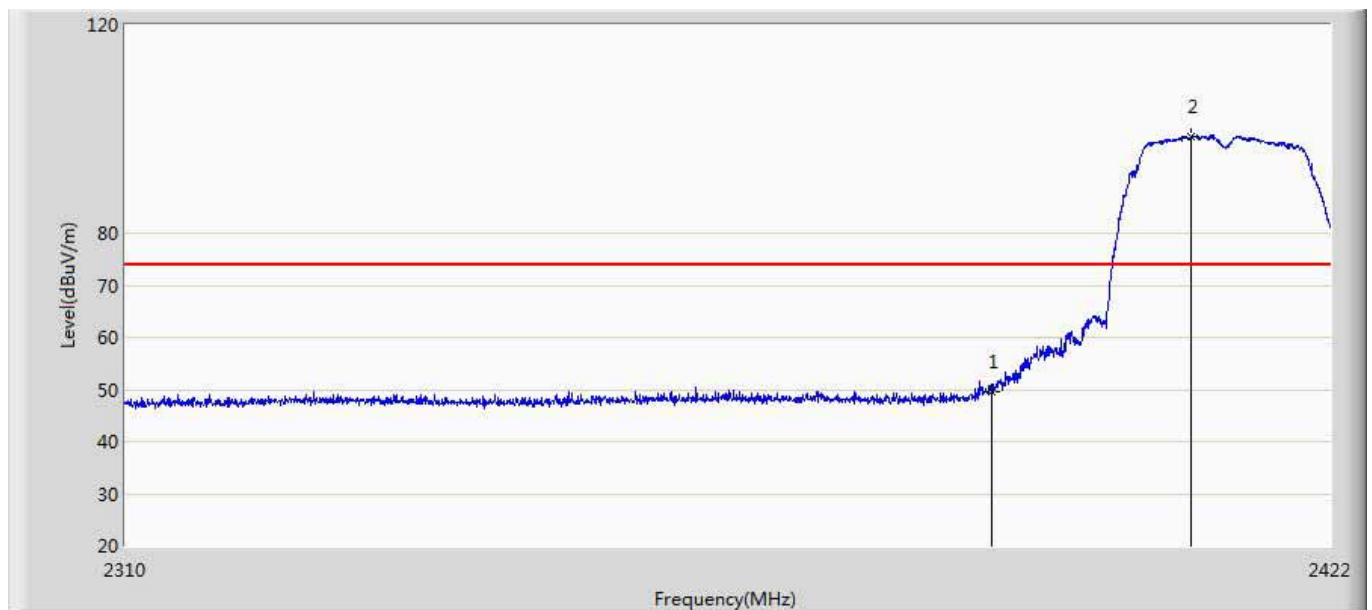
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	48.298	10.943	-25.702	74.000	37.355	PK
2	*	2409.008	98.576	61.245	N/A	N/A	37.331	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:14
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



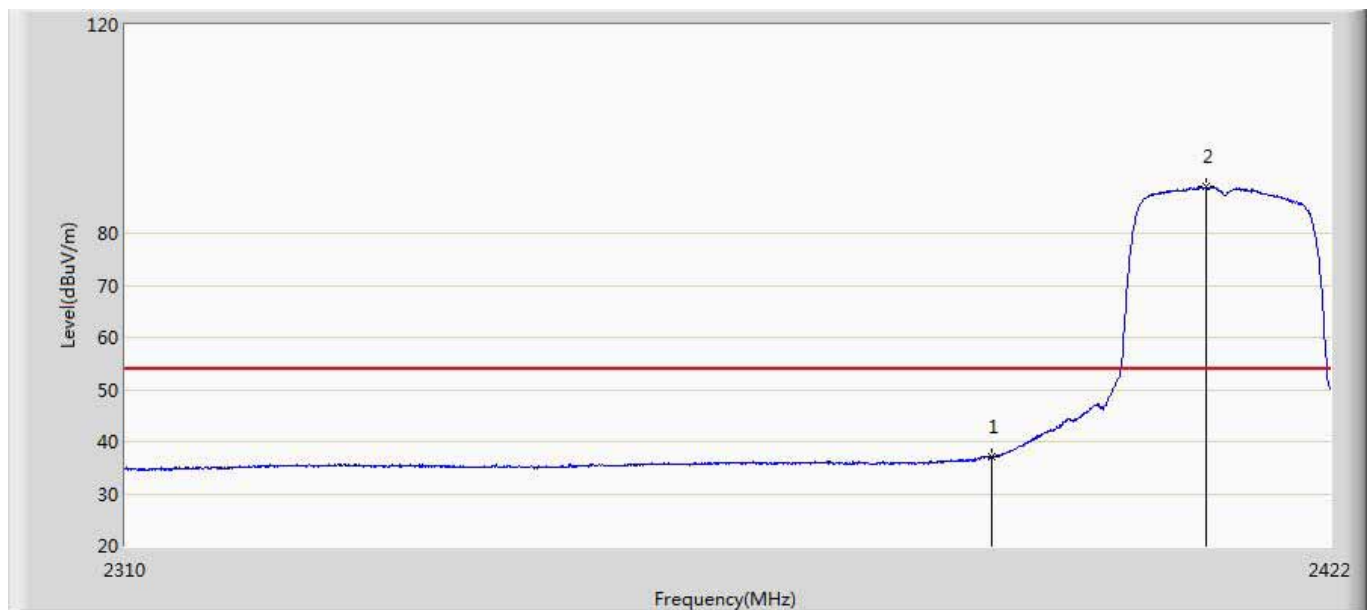
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	36.394	-0.961	-17.606	54.000	37.355	AV
2	*	2408.952	87.646	50.315	N/A	N/A	37.331	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:22
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



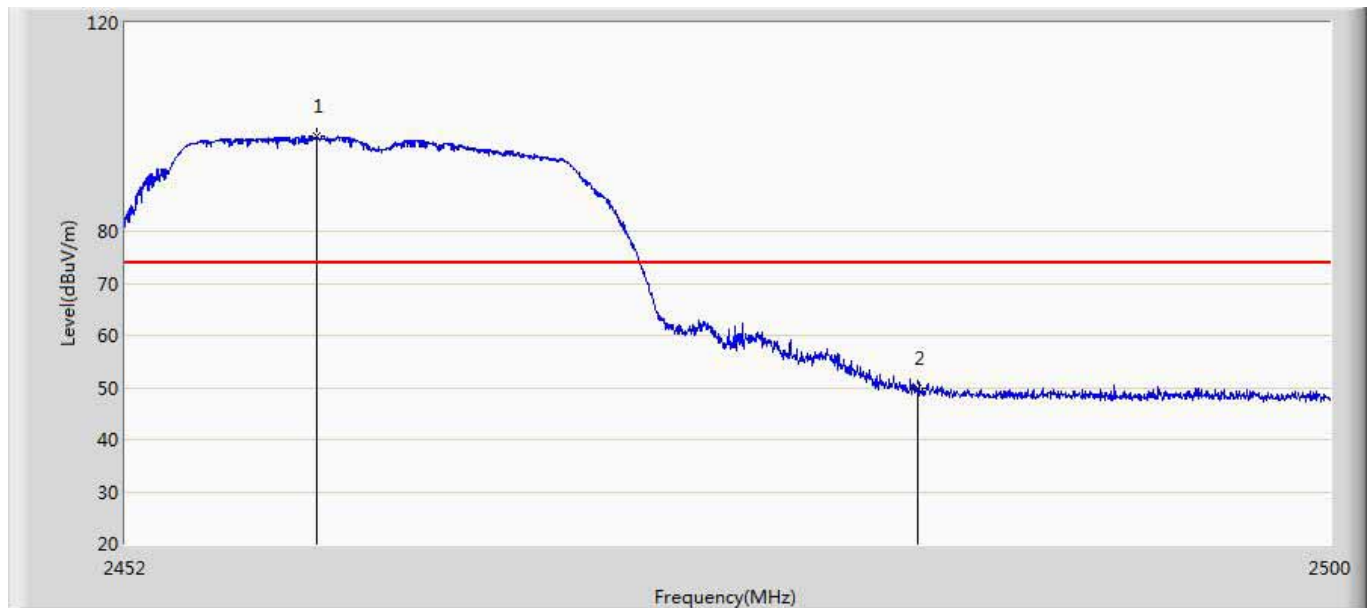
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	49.530	12.175	-24.470	74.000	37.355	PK
2	*	2408.840	98.600	61.269	N/A	N/A	37.330	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



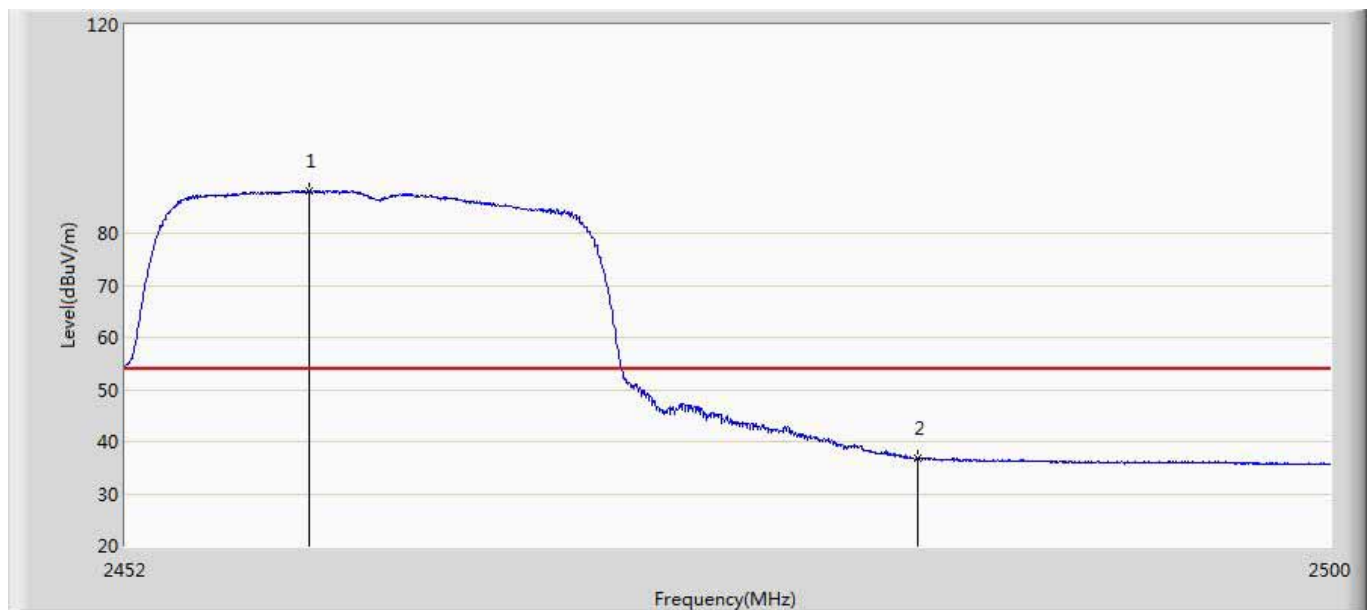
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	37.046	-0.309	-16.954	54.000	37.355	AV
2	*	2410.240	88.937	51.608	N/A	N/A	37.329	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:27
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



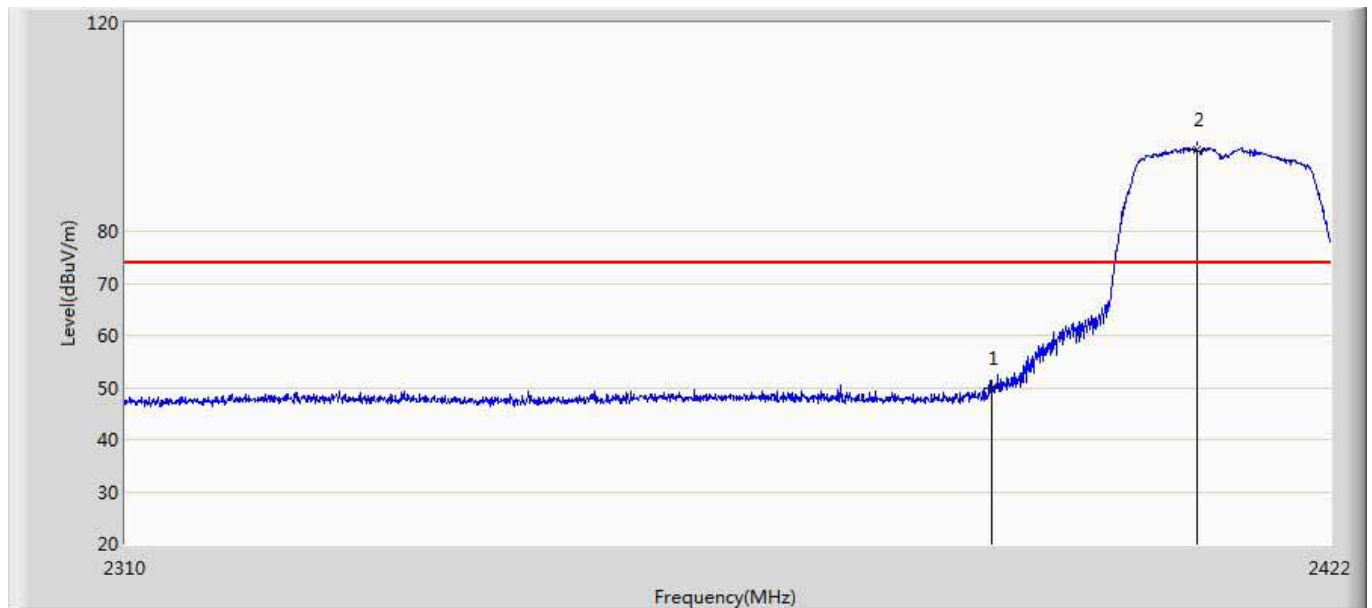
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2459.584	98.401	60.979	N/A	N/A	37.422	PK
2		2483.500	49.953	12.442	-24.047	74.000	37.511	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:28
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 2: Transmit at channel 2462MHz by 802.11g	



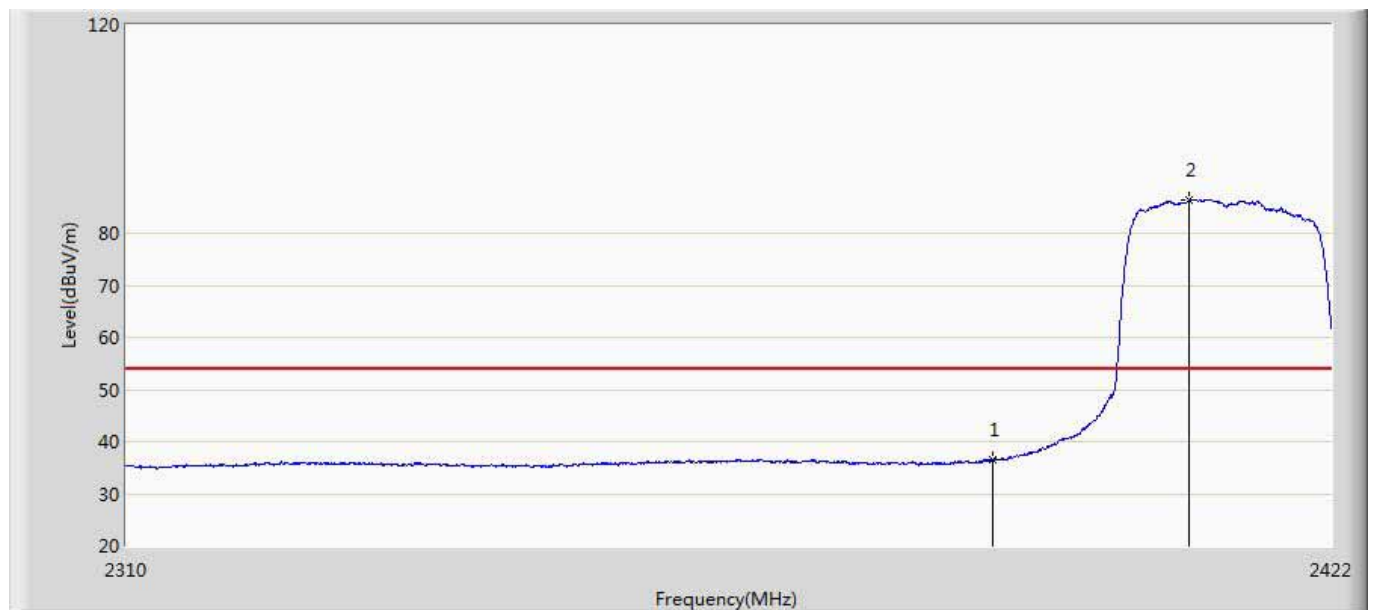
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2459.272	88.006	50.584	N/A	N/A	37.423	AV
2		2483.500	36.919	-0.592	-17.081	54.000	37.511	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:33
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2412MHz by 802.11n20	



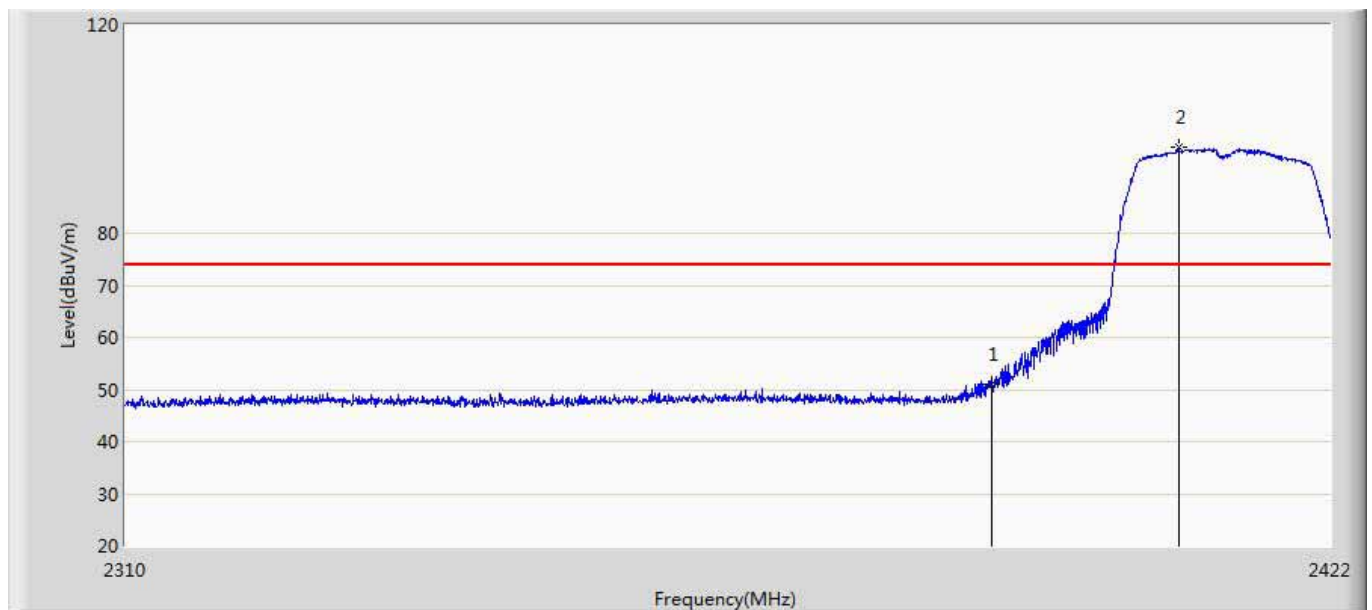
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	49.733	12.378	-24.267	74.000	37.355	PK
2	*	2409.400	95.715	58.385	N/A	N/A	37.330	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:33
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2412MHz by 802.11n20	



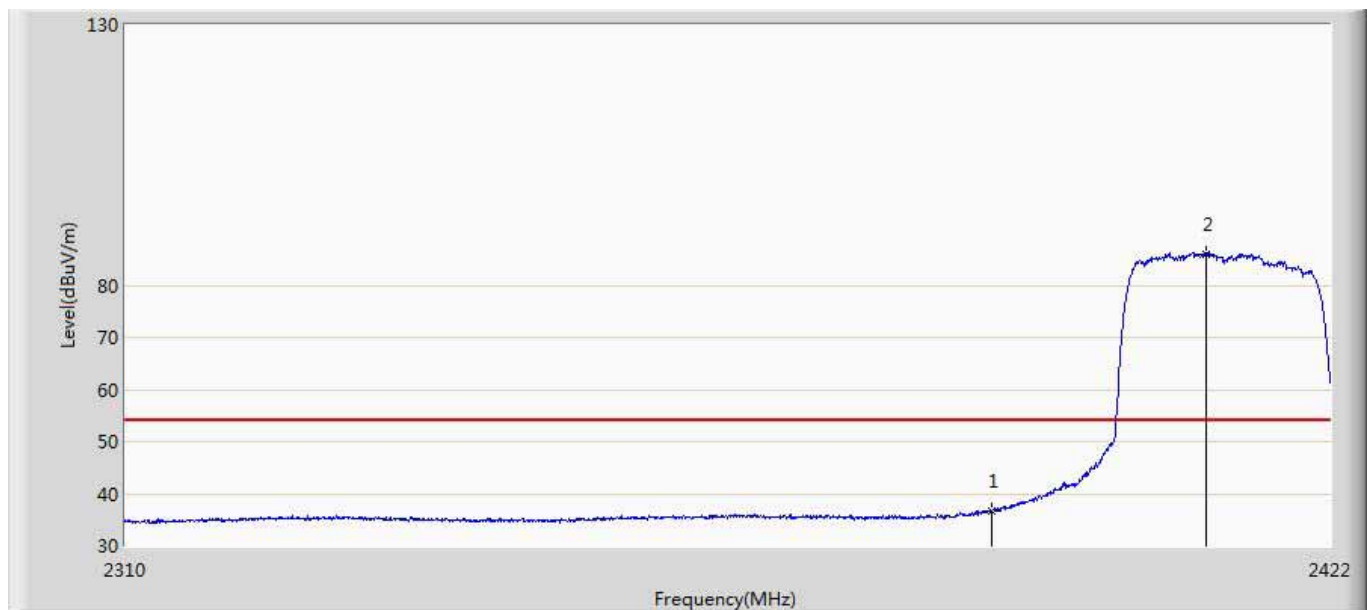
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	36.397	-0.958	-17.603	54.000	37.355	AV
2	*	2408.560	86.368	49.037	N/A	N/A	37.331	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:37
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2412MHz by 802.11n20	



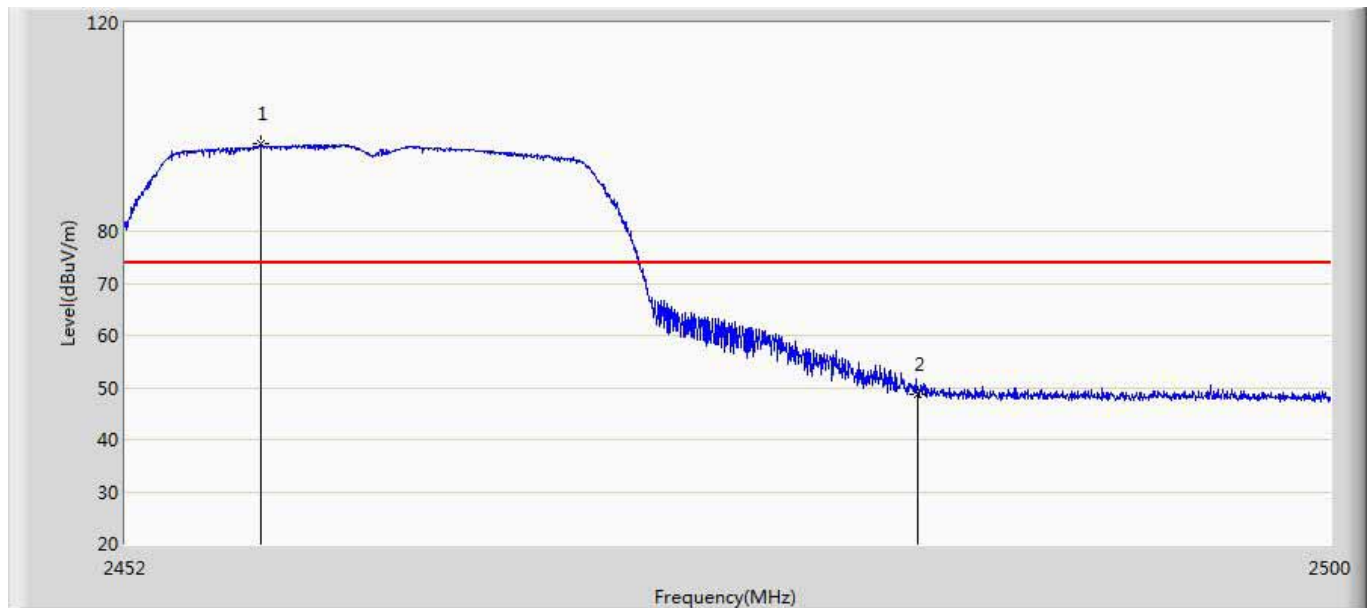
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.088	13.733	-22.912	74.000	37.355	PK
2	*	2407.608	96.659	59.326	N/A	N/A	37.333	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:38
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2412MHz by 802.11n20	



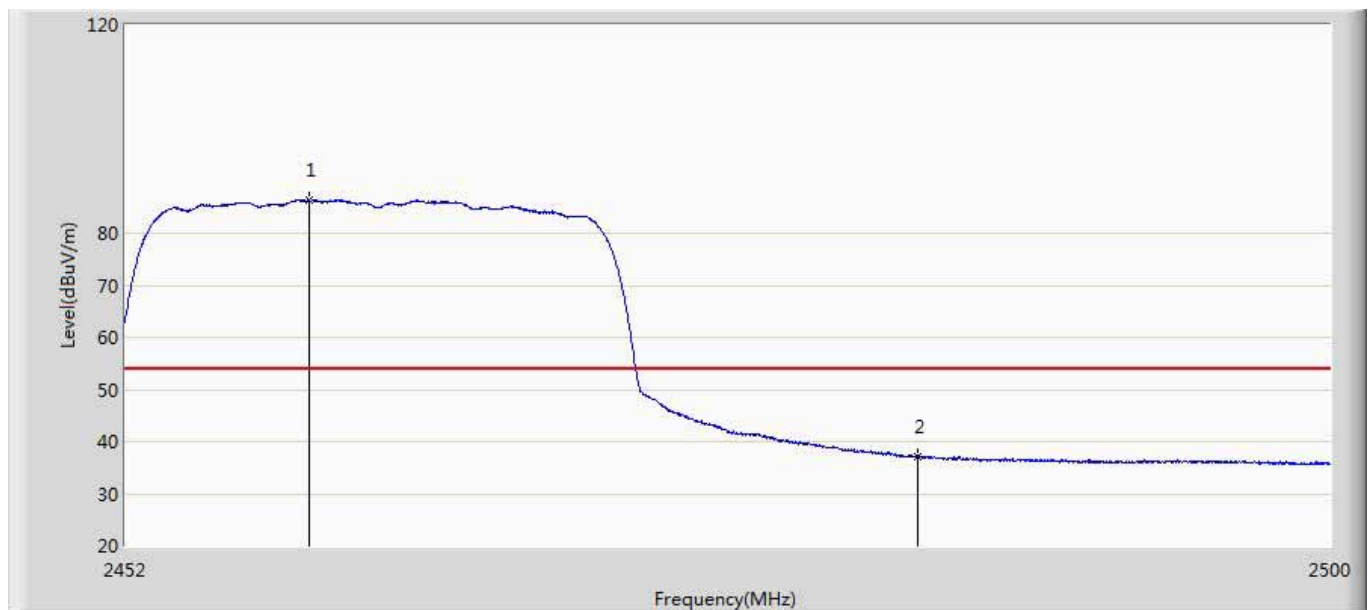
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	36.638	-0.717	-17.362	54.000	37.355	AV
2	*	2410.240	86.010	48.681	N/A	N/A	37.329	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:42
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2462MHz by 802.11n20	



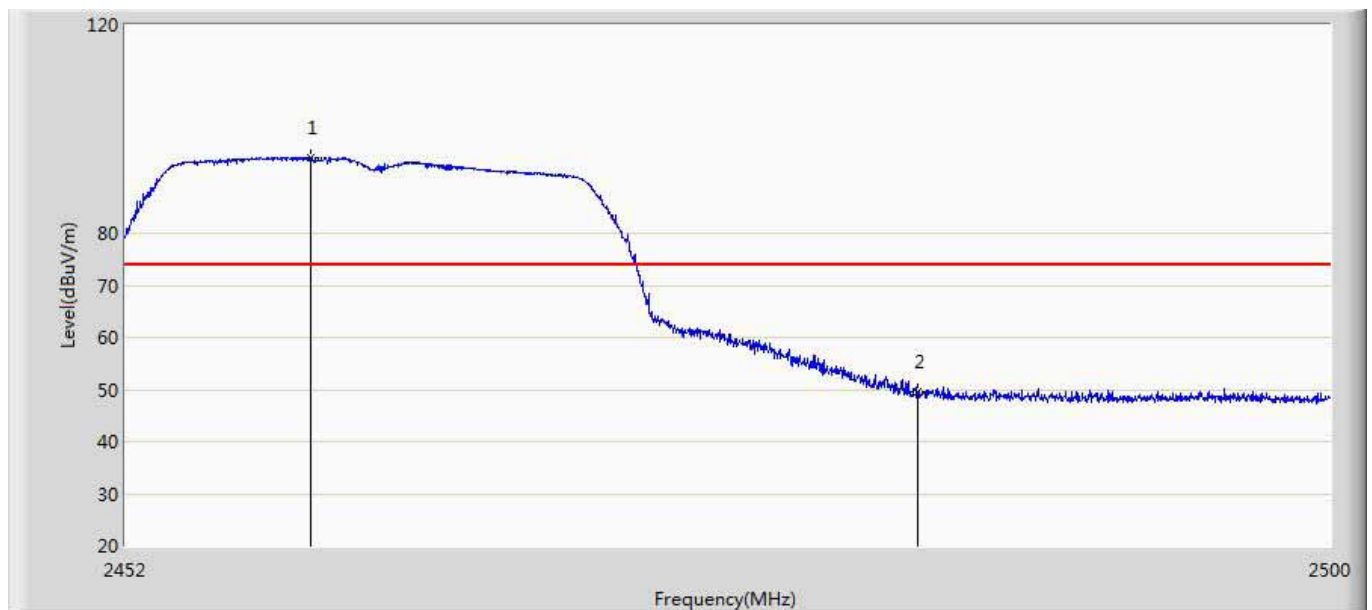
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2457.352	96.919	59.495	N/A	N/A	37.424	PK
2		2483.500	48.573	11.062	-25.427	74.000	37.511	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:45
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2462MHz by 802.11n20	



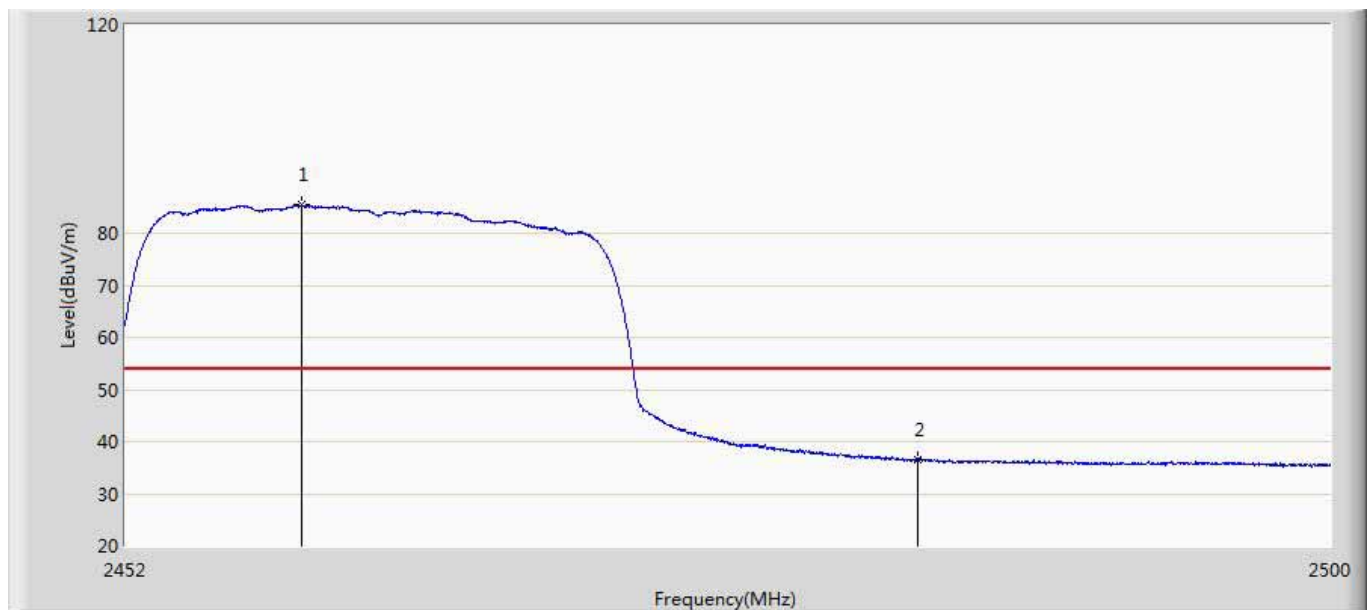
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2459.272	86.446	49.024	N/A	N/A	37.423	AV
2		2483.500	36.987	-0.524	-17.013	54.000	37.511	AV

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:46
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2462MHz by 802.11n20	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2459.344	94.438	57.016	N/A	N/A	37.423	PK
2		2483.500	49.507	11.996	-24.493	74.000	37.511	PK

Engineer: Jack	
Site: AC5	Time: 2015/10/24 - 14:46
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: Mode 3: Transmit at channel 2462MHz by 802.11n20	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2459.008	85.402	47.979	N/A	N/A	37.422	AV
2		2483.500	36.612	-0.899	-17.388	54.000	37.511	AV

7. Occupied Bandwidth

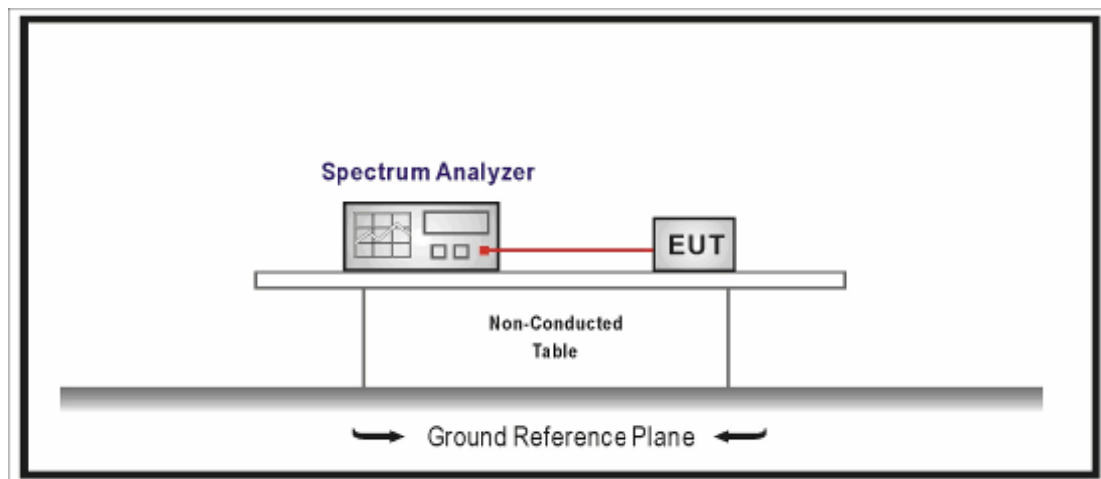
7.1. Test Equipment

Occupied Bandwidth / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2016.03.10
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2016.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

7.2. Test Setup



7.3. Limit

For FCC

99% occupied bandwidth should be less than the nominal bandwidth.

For IC

The minimum 6dB bandwidth shall be at least 500 kHz.

7.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03& Industry Canada RSS-Gen Issue 4& RSS-247 Issue 1

- Set RBW = in the range of 1% to 5% of the OBW.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.

- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Use the 99% power bandwidth and -6dBm function of the instrument (if available) and report the measured bandwidth.

7.5. Uncertainty

The measurement uncertainty is defined as ± 1 kHz

7.6. Test Result

Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	6dB Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by 802.11b

Channel No.	Frequency (MHz)	99%Occupied Bandwidth (kHz)	6dB Occupied Bandwidth (kHz)	Limit (kHz)	Result
01	2412	13351	9067.0	500	Pass
06	2437	13337	9060.0	500	Pass
11	2462	13270	9053.0	500	Pass

Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



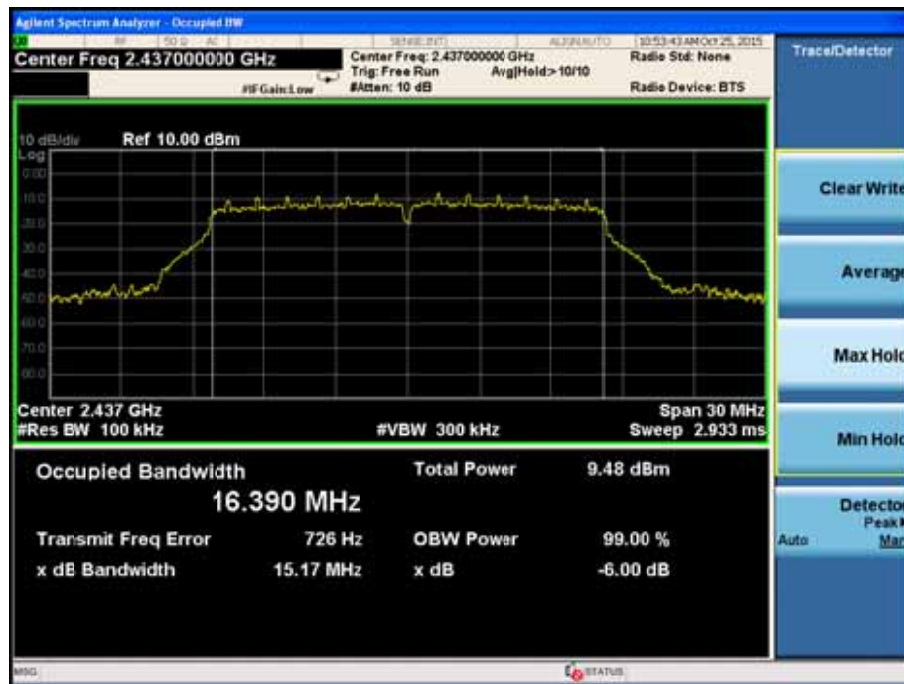
Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	6dB Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmit by 802.11g

Channel No.	Frequency (MHz)	99%Occupied Bandwidth (kHz)	6dB Occupied Bandwidth (kHz)	Limit (kHz)	Result
01	2412	16385	1571.0	500	Pass
06	2437	16390	1517.0	500	Pass
11	2462	16380	1517.0	500	Pass

Channel 01 (2412MHz)



Channel 06 (2437MHz)



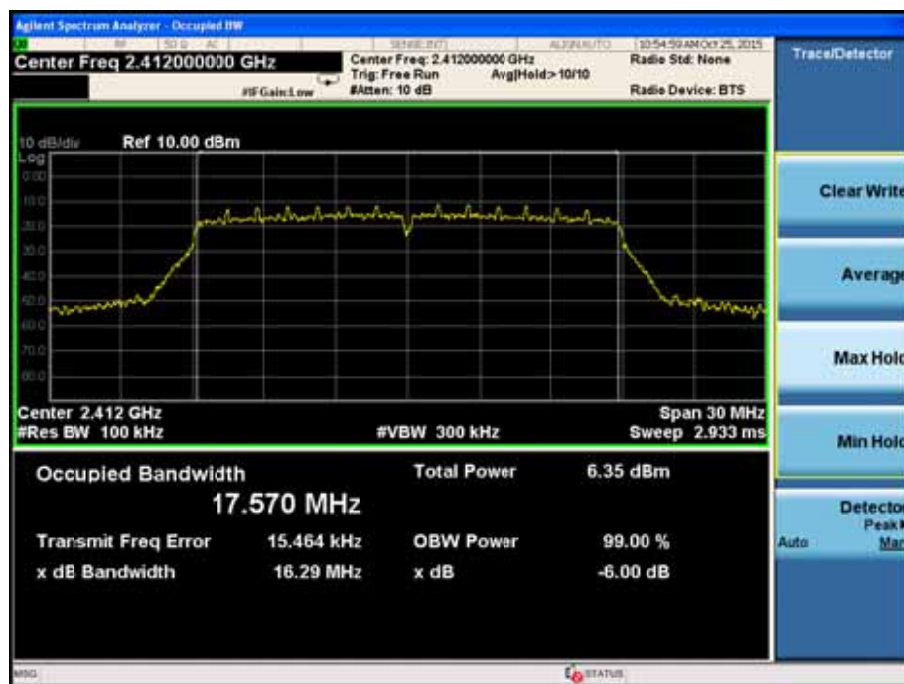
Channel 11 (2462MHz)



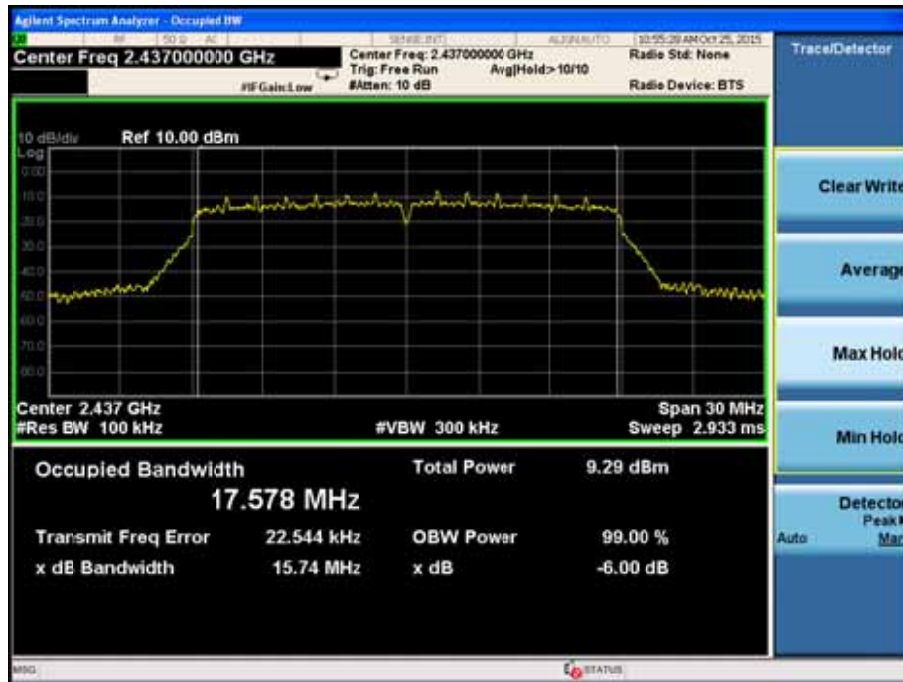
Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	6dB Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmit by 802.11 n(20MHz)

Channel No.	Frequency (MHz)	99%Occupied Bandwidth (kHz)	6dB Occupied Bandwidth (kHz)	Limit (kHz)	Result
01	2412	17570	1629.0	500	Pass
06	2437	17578	1574.0	500	Pass
11	2462	17564	1517.0	500	Pass

Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



8. Power Output

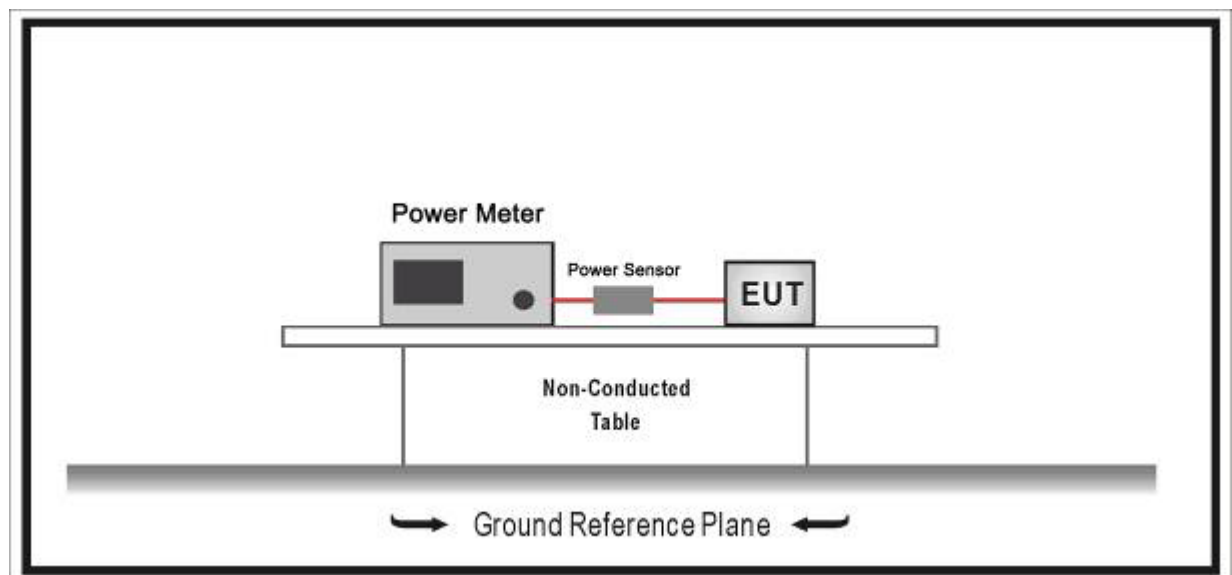
8.1. Test Equipment

Power Output / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Wideband Peak Power Meter	Anritsu	ML2495A	0905006	2015.11.10
Power Sensor	Anritsu	MA2411B	0846014	2015.11.10
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2016.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

8.2. Test Setup



8.3. Limit

For FCC&IC

The maximum peak power shall be less 1 Watt (30dBm).

Note: the conducted output power limit specified above is based on the use the antennas with directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

8.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03& Industry Canada RSS-Gen Issue 4& RSS-247 Issue 1

1. Power meter and sensor's minimum video bandwidth is 50MHz, larger than 802.11n(40MHz) bandwidth;
2. Fast responding diode sensors respond immediately to changes in power level to reduce total test time.
3. Use PK detector to test.

8.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

8.6. Test Result

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (blue marker) for final test of each channel.

Power output at various data rates:

Test Mode	Bandwidth	Frequency (MHz)	Channel	Data Rate	Peak Power (dBm)
802.11b	20	2437	6	1	16.44
				5.5	16.21
				11	16.05
802.11g	20	2437	6	6	19.68
				24	19.49
				54	19.32
802.11n	20	2437	6	MCS0	18.86
				MCS4	18.61
				MCS7	18.43

Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	Power Output
Test Site	:	TR8
Test Mode	:	Mode 1: Transmit by 802.11b

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Total Power (dBm)	Limit (dBm)	Result
1	2412	16.39	16.39	30.00	Pass
6	2437	16.44	16.44	30.00	Pass
11	2462	16.61	16.61	30.00	Pass

Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	Power Output
Test Site	:	TR8
Test Mode	:	Mode 2: Transmit by 802.11g

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Total Power (dBm)	Limit (dBm)	Result
1	2412	18.55	18.55	30.00	Pass
6	2437	19.68	19.68	30.00	Pass
11	2462	18.76	18.76	30.00	Pass

Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	Power Output
Test Site	:	TR8
Test Mode	:	Mode 3: Transmit by 802.11n(20MHz)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Total Power (dBm)	Limit (dBm)	Result
1	2412	17.28	17.28	30.00	Pass
6	2437	18.86	18.86	30.00	Pass
11	2462	17.56	17.56	30.00	Pass

9. Power Spectral Density

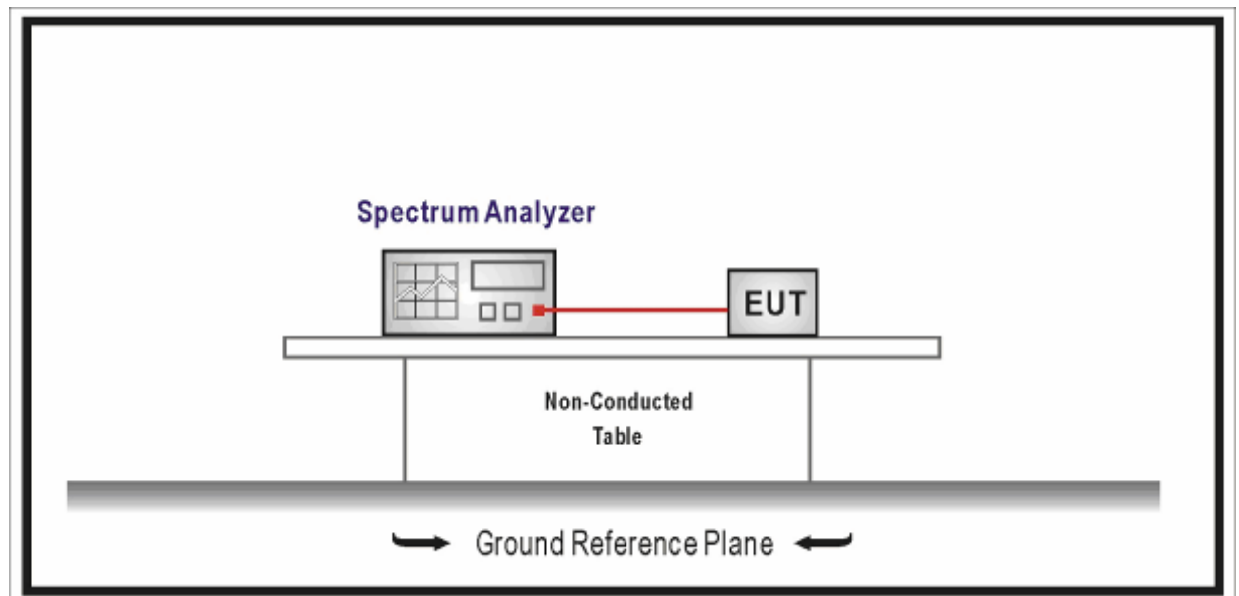
9.1. Test Equipment

Power Spectral Density / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2016.03.10
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2016.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

9.2. Test Setup



9.3. Limit

For FCC&IC

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

9.4. Test Procedure

According to ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03& Industry Canada RSS-Gen Issue 4& RSS-247 Issue 1

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$. (Actually we use 3kHz RBW)
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the band.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

9.5. Uncertainty

The measurement uncertainty is defined as $\pm 1.27 \text{ dB}$

9.6. Test Result

Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	Power Spectral Density
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by 802.11b

Channel No.	Frequency (MHz)	Measurement PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Result
01	2412	2.705	2.705	8	Pass
06	2437	3.149	3.149	8	Pass
11	2462	-0.549	-0.549	8	Pass

Channel 01 (2412MHz)



Channel 06 (2437MHz)



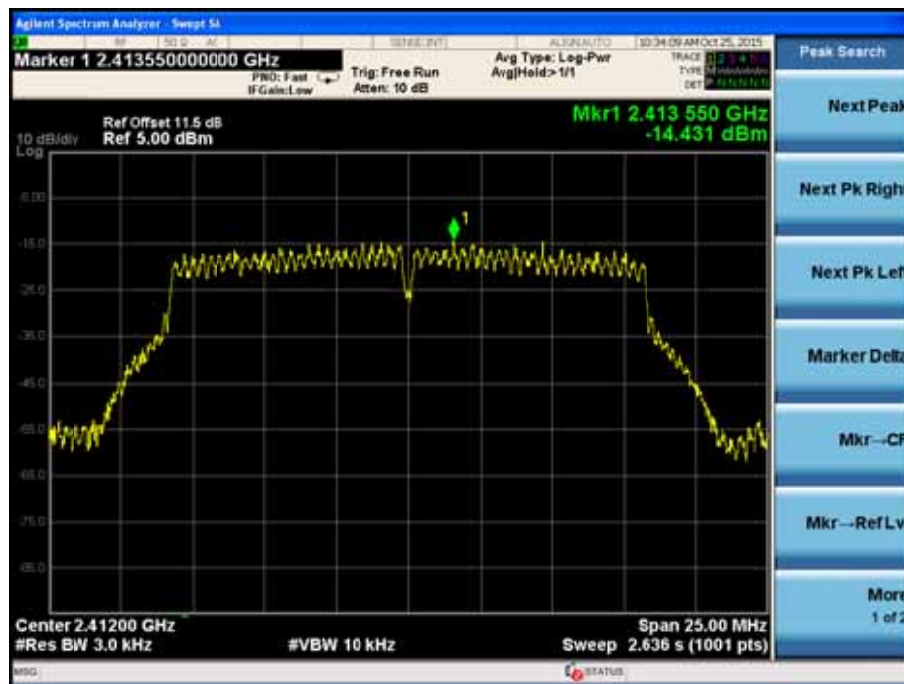
Channel 11 (2462MHz)



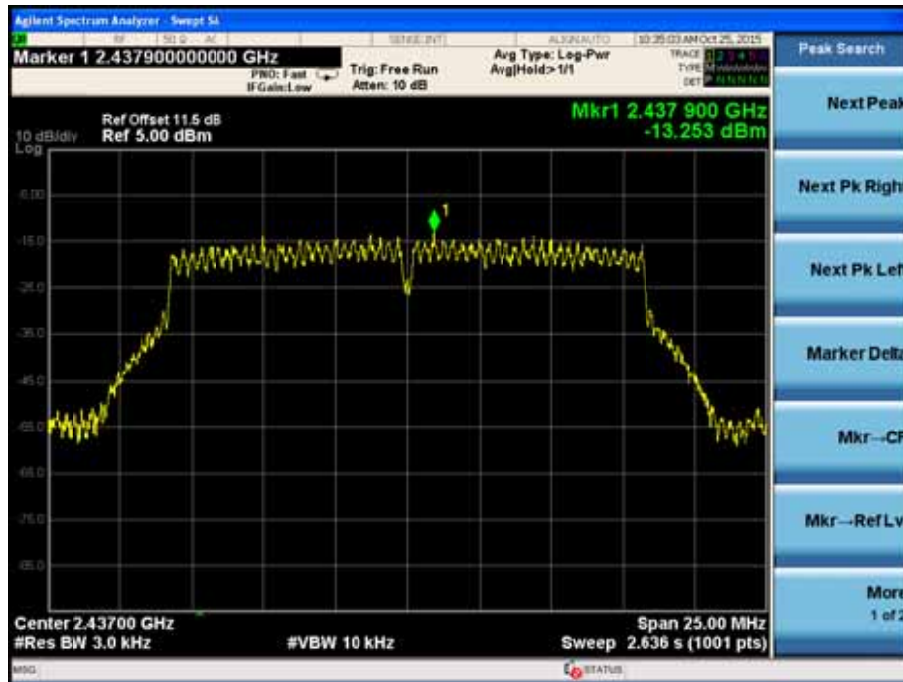
Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	Power Spectral Density
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmit by 802.11g

Channel No.	Frequency (MHz)	Measurement PPSP (dBm)	Total PPSP (dBm)	Limit (dBm)	Result
01	2412	-14.431	-14.431	8	Pass
06	2437	-13.253	-13.253	8	Pass
11	2462	-14.573	-14.573	8	Pass

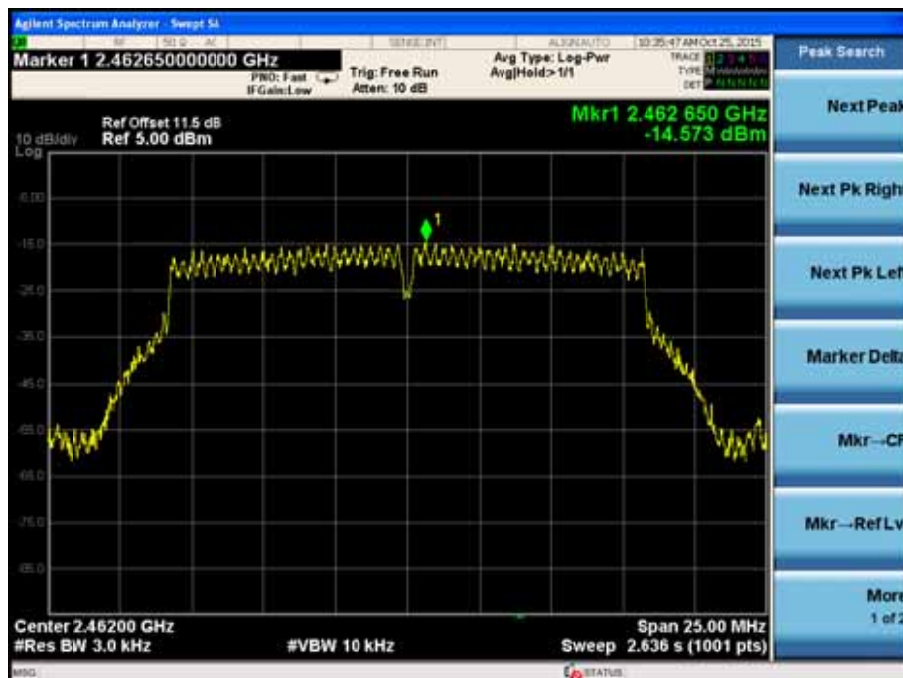
Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



Product	:	Wahoo GPS BIKE COMPUTER
Test Item	:	Power Spectral Density
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmit by 802.11n(20MHz)

Channel No.	Frequency (MHz)	Measurement PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Result
01	2412	-16.193	-16.193	8	Pass
06	2437	-13.549	-13.549	8	Pass
11	2462	-15.742	-15.742	8	Pass

Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



The End