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CNAS L5313



DEKRA

Test Report

FCC Part15 Subpart C

Product Name : Wahoo GPS BIKE COMPUTER

Model No. : WFCC3

FCC ID : PADWF115

IC : 10563A-WF115

Applicant : Wahoo Fitness, LLC.

Address : 90 W. Wieuca Road, #110, Atlanta, Georgia, 30342
United States

Date of Receipt : Dec. 27, 2016

Test Date : Dec. 27, 2016~ Jan. 25, 2017

Issued Date : Feb. 24, 2017

Report No. : 16C2133R-RF-US-P06V03

Report Version : V1.2

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

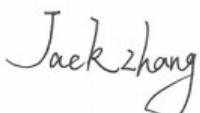
Issued Date : Feb. 24, 2017

Report No. : 16C2133R-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 : GoerTek Inc.
Address : NO 268 DONGFANG RD NEW&HIGH-TECH INDUSTRY DEVELOPMENT ZONE WEIFANG, SHANDONG 261031
Model No. : WFCC3
FCC ID : PADWF115
IC : 10563A-WF115
EUT Voltage : DC 3.8V
Test Voltage : AC120V/60Hz
Brand Name : Wahoo Fitness
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C
ANSI C63.4:2014; ANSI C63.10:2013;
KDB 558074 D01v03r05
Industry Canada RSS-Gen Issue 4 / RSS-247 Issue 1
Test Result : Complied
Performed Location : DEKRA Testing & Certification (Suzhou) Co., Ltd.
No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China
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FCC Registration Number: 800392

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
16C2133R-RF-US-P06V03	V1.0	Initial Issued Report	Jan. 25, 2017
16C2133R-RF-US-P06V03	V1.1	Modified some typo & Manufacturer's address	Feb. 07, 2017
16C2133R-RF-US-P06V03	V1.2	Modified the test mode of CE	Feb. 24, 2017

1. General Information

1.1. EUT Description

Product Name	Wahoo GPS BIKE COMPUTER
Brand Name	Wahoo Fitness
Model No.	WFCC3
EUT Voltage	DC 3.8V
Test Voltage	AC120V/60Hz
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: OFDM
Data Rate	802.11b: 1/2/5.5/11 Mbps 802.11g: 6/9/12/18/24/36/48/54 Mbps 802.11n: up to 150 Mbps
Channel Control	Auto

1.2. Working Frequency of Each Channel:

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

1.3. Antenna information

Model No.	FPC ANTENNA					
Antenna manufacturer	HWCHAN					
Antenna Delivery	☒	1*TX+1*RX	☐	2*TX+2*RX	☐	3*TX+3*RX
Antenna technology	☒	SISO				
	☐	MIMO	☐	Basic		
			☐	CDD		
			☐	Sectorized		
			☐	Beam-forming		
Antenna Type	☐	External	☐	Dipole		
			☐	Sectorized		
	☒	Internal	☒	PIFA		
			☐	PCB		
			☐	Ceramic Chip Antenna		
			☐	Metal plate type F antenna		
Antenna Technology	Ant Gain (dBi)					
☒	SISO	3.09				

1.4. Mode of Operation

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

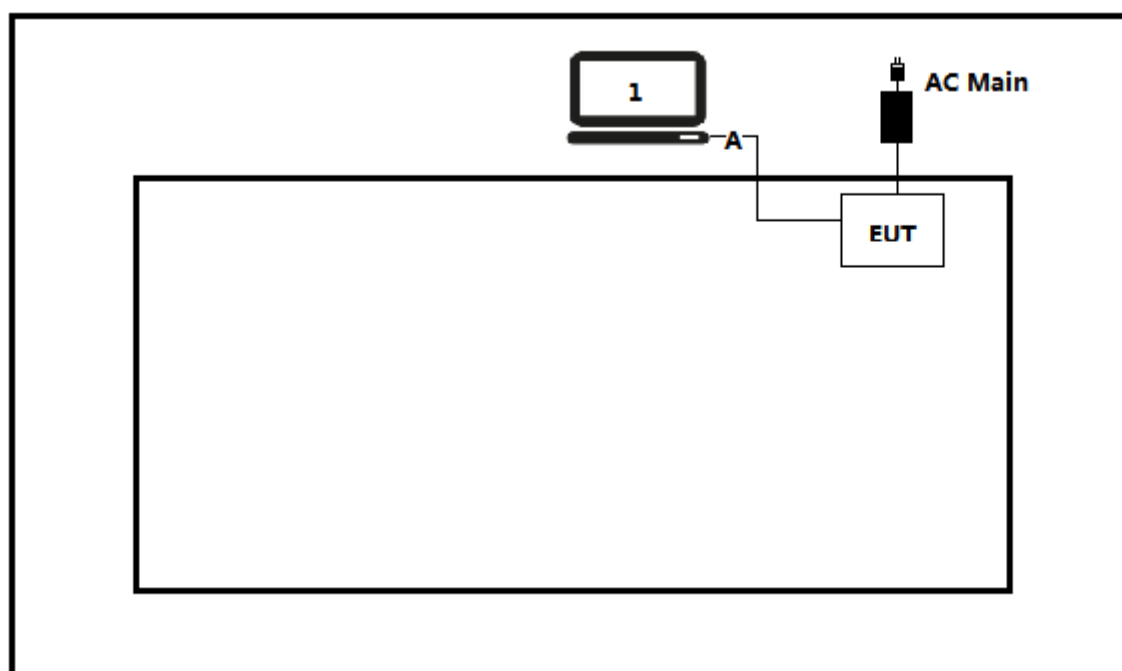
1.5. Tested System Details

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

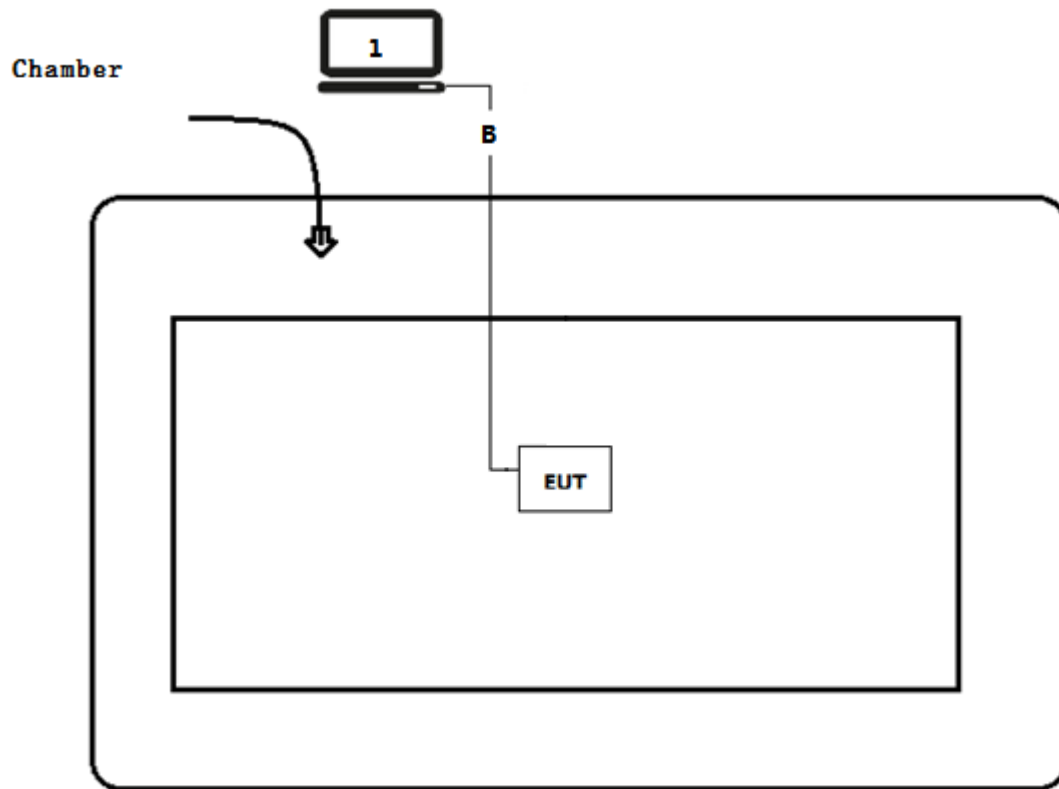
No.	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Lenovo	Think pad x220	SUA0600195	Non-shielded
A	USB cable	N/A	N/A	N/A	shielded,0.5m
B	USB Cable	N/A	N/A	N/A	Shielded, 10m

1.6. Configuration of Tested System

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Radiated Emission



2. Technical Test

2.1. Summary of Test Result

Performed Test Item	Normative References	Worst case mode	Limit	Result
AC Power Line Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.207	Mode 1	FCC 15.207	PASS
Emissions in restricted frequency bands	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.209	Mode 1	FCC 15.209	PASS
Emissions in non-restricted frequency bands	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(d)	Mode 1	$\geq 20\text{dBc}$	PASS
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2015 15.247(d)	Mode 1	FCC 15.209	PASS
Occupied Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(a)(2)	Mode 1	$\geq 500\text{kHz}$	PASS
Fundamental emission output power	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(b)(3)	Mode 1	$\leq 30\text{dBm}$	PASS
Power Spectral Density	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(e)	Mode 1	$\leq 8\text{dBm}/3\text{kHz}$	PASS
Antenna Requirement	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.203	N/A	FCC 15.203	PASS

Performed Test Item	Normative References	Worst case mode	Limit	Result
AC Power Line Conducted Emission	RSS-Gen Issue 4 Section 8.8	Mode 1	RSS-Gen	PASS
Emissions in restricted frequency bands	RSS-Gen Issue 4 Section 8.9	Mode 1	RSS-Gen	PASS
Emissions in non-restricted frequency bands	RSS-247 Issue 1 Section A5.5	Mode 1	$\geq 20\text{dBc}$	PASS
Radiated Emission Band Edge	RSS-247 Issue 1 Section A5.5	Mode 1	RSS-247	PASS
Occupied Bandwidth	RSS-Gen Issue 4 Section 6.6 RSS-247 Issue 1 Section A5.2(1)	Mode 1	$\geq 500\text{kHz}$	PASS

Fundamental emission output power	RSS-247 Issue 1 Section A5.4(4)	Mode 1	$\leq 30\text{dBm}$	PASS
Power Spectral Density	RSS-247 Issue 1 Section A5.2(2)	Mode 1	$\leq 8\text{dBm}/3\text{kHz}$	PASS
Antenna Requirement	RSS-Gen Issue 4 Section 8.3	N/A	RSS-Gen Issue 4	PASS

2.2. Test Frequency configuration:

Modulation Mode	Channel	Frequency	Channel	Frequency	Channel	Frequency
802.11b	01	2412 MHz	06	2437 MHz	11	2462MHz
802.11g	01	2412 MHz	06	2437 MHz	11	2462MHz
802.11n(20MHz)	01	2412 MHz	06	2437 MHz	11	2462MHz

2.3. Power setting parameter

Modulation Mode	Test Frequency	Ant 0
802.11b	2412	18
	2437	20
	2462	20
802.11g	2412	18
	2437	21
	2462	21
802.11n(20MHz)	2412	18
	2437	21
	2462	21

2.4. Power vs Data Rate

MCS Index for 802.11n	Spatial Streams	Data Rate (Mbps)						
		802.11b	802.11g		20MHz Bandwidth		40MHz Bandwidth	
					800ns GI	400ns GI	800ns GI	400ns GI
0	1	1	6	---	6.5	7.2	13.5	15.0
1	1	2	9	---	13.0	14.4	27.0	30.0
2	1	5.5	12	---	19.5	21.7	40.5	45.0
3	1	11	18	---	26.0	28.9	54.0	60.0
4	1	---	24	---	39.0	43.3	81.0	90.0
5	1	---	36	---	52.0	57.8	108.0	120.0
6	1	---	48	---	58.5	65.0	121.5	135.0
7	1	---	54	---	65.0	72.2	135.0	150.0

Note 1 : The blue form is the maximum power data rate

2.5. 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

2.6. Measurement Uncertainty

Test Items	Uncertainty
AC Power Line Conducted Emission	$\pm 2.02\text{dB}$
Radiated Emission	Below 1GHz $\pm 3.8\text{ dB}$
	Above 1GHz $\pm 3.9\text{ dB}$
RF Antenna Port Conducted Emission	$\pm 1.27\text{dB}$
Radiated Emission Band Edge	$\pm 3.9\text{dB}$
Occupied Bandwidth	$\pm 1\text{kHz}$
Power Spectral Density	$\pm 1.27\text{dB}$

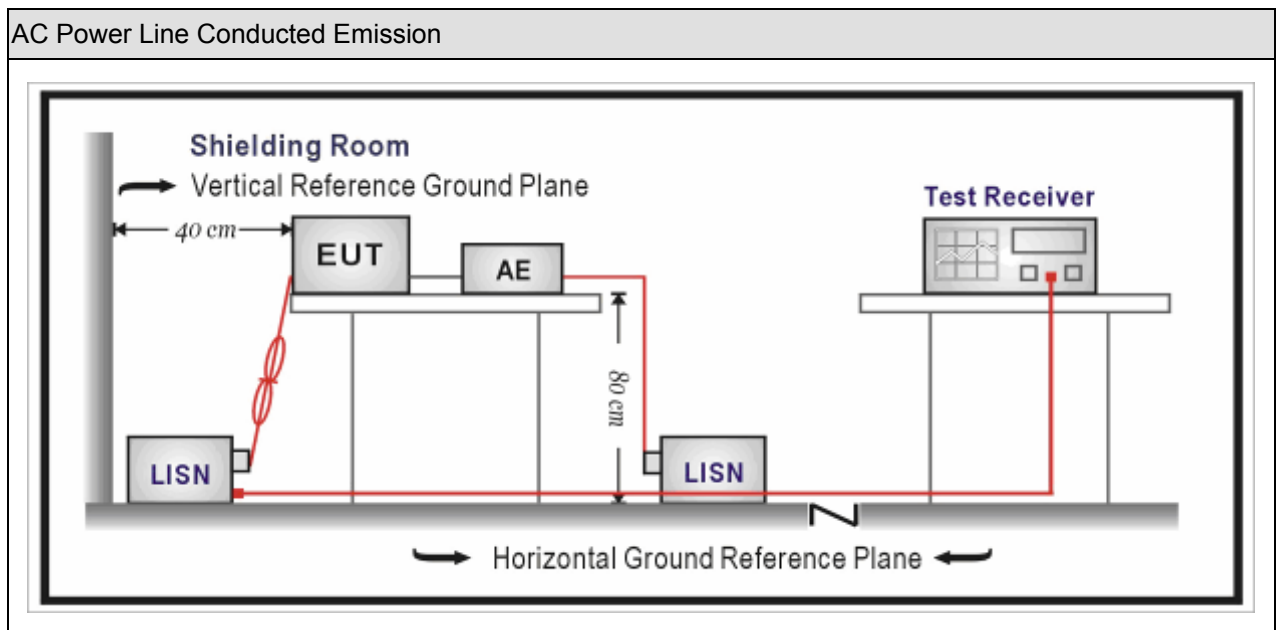
3. AC Power Line Conducted Emission

3.1. Test Equipment

AC Power Line Conducted Emission / TR-1					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100906	2016.03.05	2017.03.05
Two-Line V-Network	R&S	ENV 216	101189	2016.07.16	2017.07.16
Two-Line V-Network	R&S	ENV 216	101044	2016.09.16	2017.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A	N/A
50ohm Termination	SHX	TF2	07081402	2016.09.16	2017.09.16
Temperature/Humidity Meter	Zhichen	ZC1-2	TR1-TH	2017.01.05	2018.01.05

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

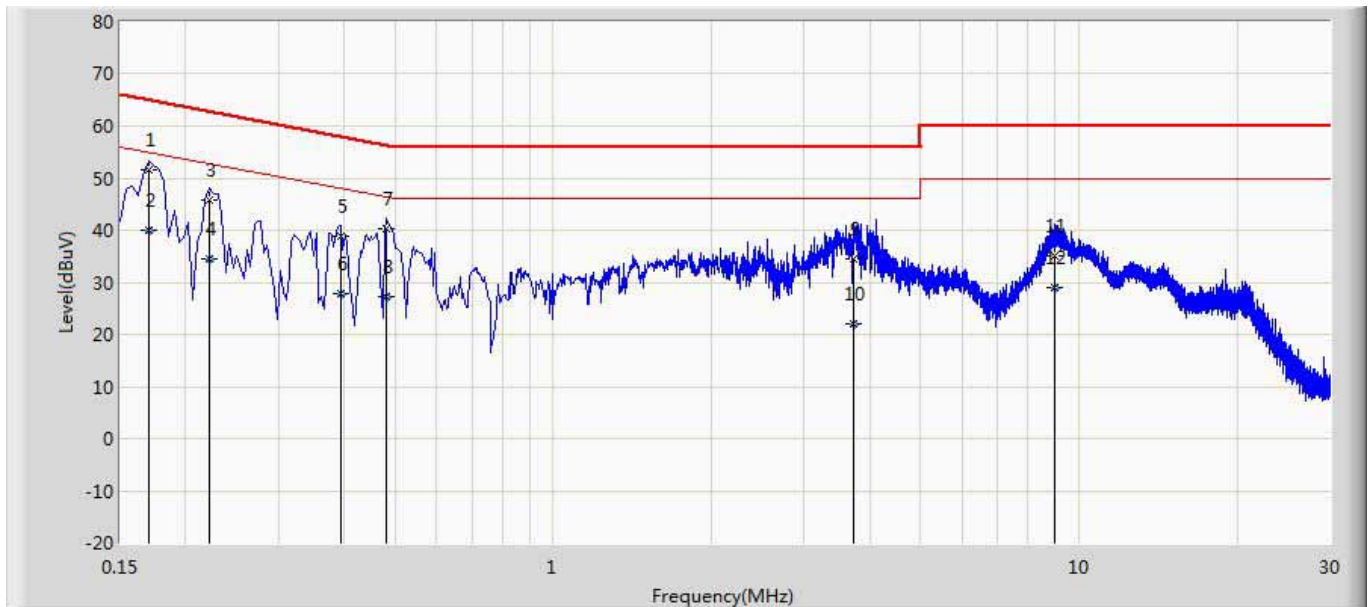
Frequency of Emission (MHz)	Conducted Limit	
	Quasi-peak (dB μ V)	Average (dB μ V)
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50
Note 1: The lower limit shall apply at the transition frequencies.		
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

3.4. Test Procedure

AC Power Line Conducted Emission			
	References Rule	Chapter	Item
☒	ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensed wireless devices
☒	ANSI C63.4-2014	7	AC power-line conducted emission measurements

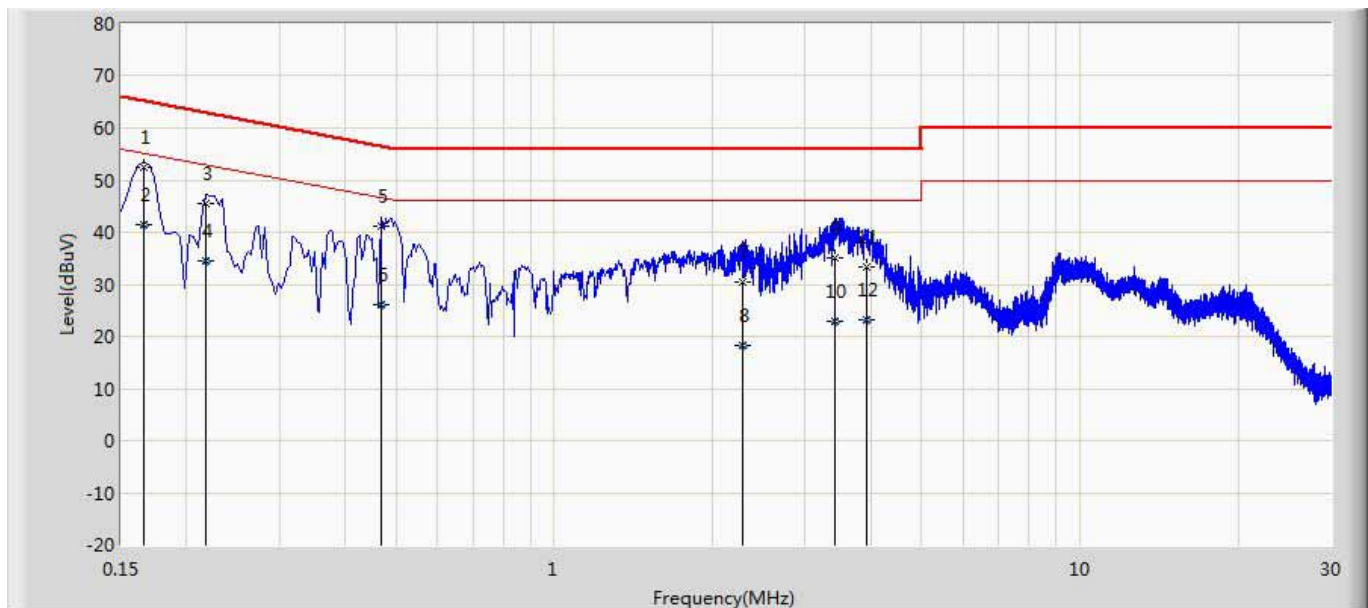
3.5. Test Result

Engineer: Bob	
Site: TR1	Time: 2016/12/28 - 16:51
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: WIFI+BT	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1	*	0.170	51.703	42.084	-13.257	64.960	9.620	QP
2		0.170	39.867	30.247	-15.094	54.960	9.620	AV
3		0.222	45.714	36.093	-17.030	62.744	9.621	QP
4		0.222	34.578	24.957	-18.165	52.744	9.621	AV
5		0.394	38.859	29.229	-19.120	57.979	9.630	QP
6		0.394	27.808	18.178	-20.171	47.979	9.630	AV
7		0.482	40.396	30.763	-15.909	56.305	9.632	QP
8		0.482	27.317	17.685	-18.988	46.305	9.632	AV
9		3.714	34.476	24.737	-21.524	56.000	9.739	QP
10		3.714	22.145	12.406	-23.855	46.000	9.739	AV
11		8.998	35.101	25.265	-24.899	60.000	9.836	QP
12		8.998	29.115	19.279	-20.885	50.000	9.836	AV

Engineer: Bob	
Site: TR1	Time: 2016/12/28 - 16:56
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: Wahoo GPS BIKE COMPUTER	Power: AC 120V/60Hz
Note: WIFI+BT	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1	*	0.166	52.595	42.995	-12.563	65.158	9.600	QP
2		0.166	41.379	31.779	-13.779	55.158	9.600	AV
3		0.218	45.486	35.883	-17.409	62.895	9.603	QP
4		0.218	34.609	25.006	-18.286	52.895	9.603	AV
5		0.470	41.251	31.629	-15.263	56.514	9.622	QP
6		0.470	26.059	16.437	-20.455	46.514	9.622	AV
7		2.282	30.320	20.636	-25.680	56.000	9.684	QP
8		2.282	18.357	8.673	-27.643	46.000	9.684	AV
9		3.418	35.167	25.448	-20.833	56.000	9.719	QP
10		3.418	22.764	13.045	-23.236	46.000	9.719	AV
11		3.934	33.382	23.650	-22.618	56.000	9.732	QP
12		3.934	23.205	13.472	-22.795	46.000	9.732	AV

4. Emissions in restricted frequency bands

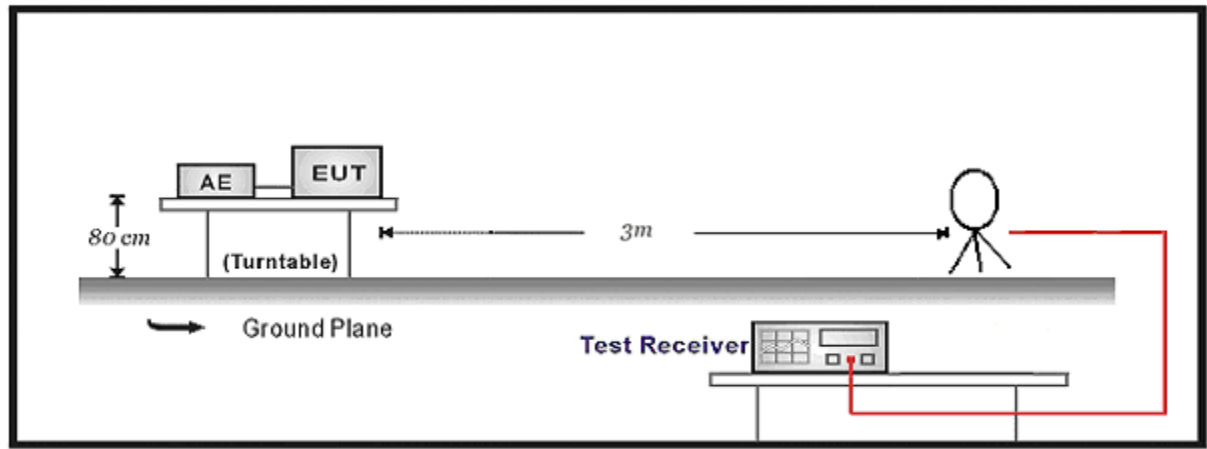
4.1. Test Equipment

Emissions in restricted frequency bands (Below 1GHz) / AC-2					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2016.03.29	2017.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.16	2017.11.15
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2015.10.16	2017.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2016.03.02	2017.03.01
Temperature/Humidity Meter	Zhichen	ZC1-2	AC2-TH	2017.01.03	2018.01.02
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

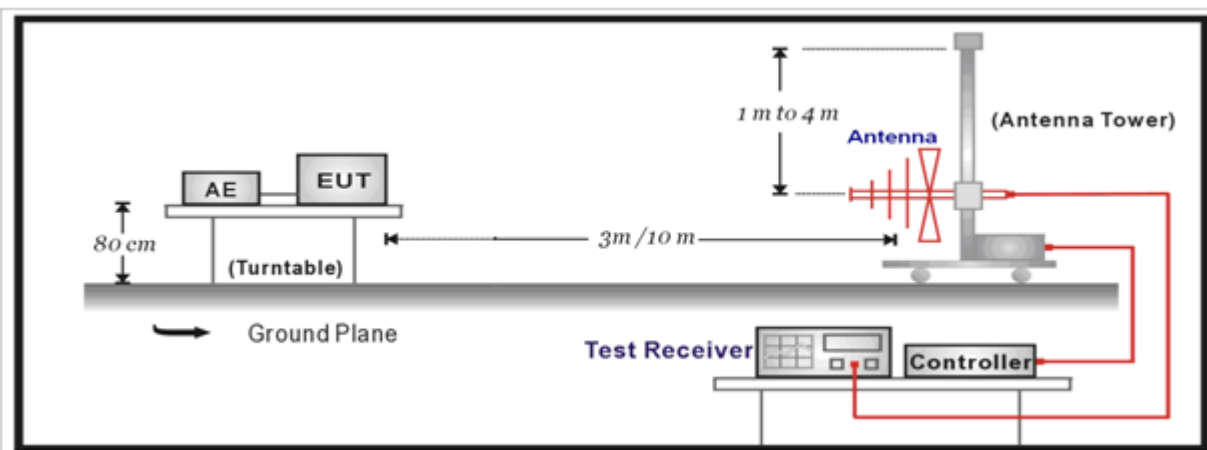
Emissions in restricted frequency bands (Above 1GHz) / AC-5					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2017.01.04	2018.01.03
Preamplifier	Miteq	NSP1800-25	1364185	2016.05.06	2017.05.05
Preamplifier	QuieTek	AP-040G	CHM-0906001	2016.05.06	2017.05.05
DRG Horn	ETS-Lindgren	3117	00123988	2017.01.22	2018.01.21
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2016.11.25	2017.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2016.03.02	2017.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2016.03.02	2017.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2016.03.02	2017.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2016.06.10	2017.06.09
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2017.01.04	2018.01.03
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

4.2. Test Setup

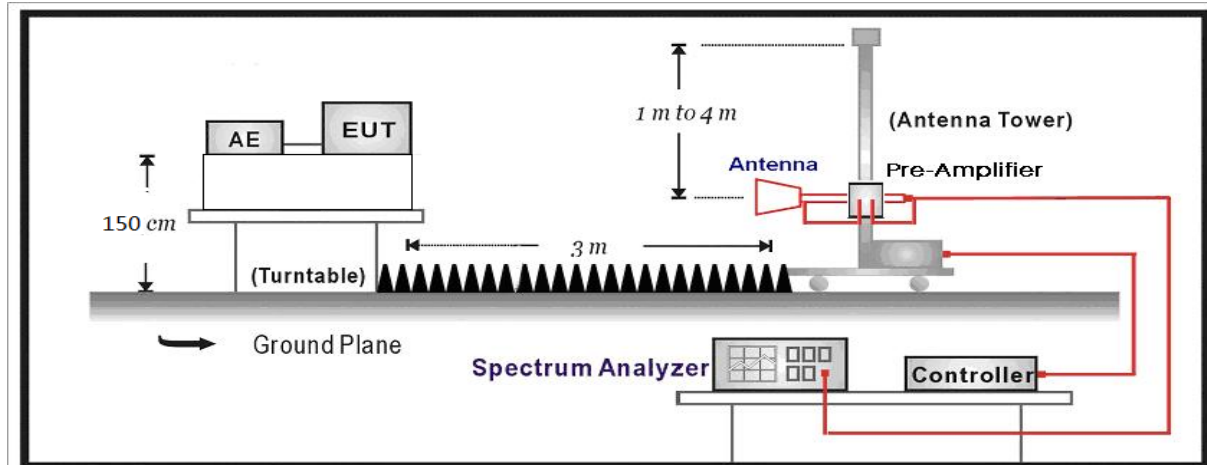
Below 30MHz Test Setup:



30MHz-1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

For FCC:

Restricted Bands of operation			
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
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	2690 – 2900	22.01 – 23.12
8.81425 – 8.81475	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 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	
13.36 – 13.41			

For IC:

Restricted Bands of operation			
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090-0.110	13.36-13.41	1645.5-1646.5	13.25-13.4
2.1735-2.1905	16.42-16.423	1660-1710	14.47-14.5
3.020-3.026	16.69475-16.69525	1718.8-1722.2	15.35-16.2
4.125-4.128	16.80425-16.80475	2200-2300	17.7-21.4
4.17725-4.17775	25.5-25.67	2310-2390	22.01-23.12
4.20725-4.20775	37.5-38.25	2655-2900	23.6-24.0
5.677-5.683	73-74.6	3260-3267	31.2-31.8
6.215-6.218	74.8-75.2	3332-3339	36.43-36.5
6.26775-6.26825	108-138	3345.8-3358	Above 38.6
6.31175-6.31225	156.52475-156.52525	3500-4400	
8.291-8.294	156.7-156.9	4500-5150	
8.362-8.366	240-285	5350-5460	
8.37625-8.38675	322-335.4	7250-7750	
8.41425-8.41475	399.9-410	8025-8500	
12.29-12.293	608-614	9.0-9.2	
12.51975-12.52025	960-1427	9.3-9.5	
12.57675-12.57725	1435-1626.5	10.6-12.7	

Restricted Band Emissions Limit			
Frequency (MHz)	Field strength (μ V/m)	Field strength (dB μ V/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300 _(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30 _(Note 1)
1.705 - 30	30	29.5	30 _(Note 1)
30 - 88	100	40	3 _(Note 2)
88 - 216	150	43.5	3 _(Note 2)
216 - 960	200	46	3 _(Note 2)
Above 960	500	54	3 _(Note 2)

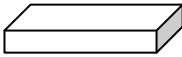
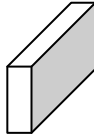
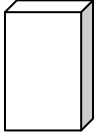
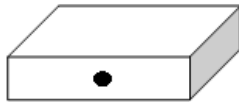
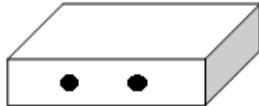
Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.4. Test Procedure

Emissions in restricted frequency bands						
	References Rule		Chapter	Description		
☐	ANSI C63.10		11.11	Emissions in non-restricted frequency bands		
	☐	ANSI C63.10	11.11.2	Reference level measurement		
	☐	ANSI C63.10	11.11.3	Emission level measurement		
☒	ANSI C63.10		11.12	Emissions in restricted frequency bands		
	☒	ANSI C63.10	11.12.1	Radiated emission measurements		
	☒	ANSI C63.10	11.12.2.7	Radiated spurious emission test		
		☒	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz	
		☒	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz	
		☒	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz	
		☐	ANSI C63.10	11.12.2.3	Quasi-peak measurement procedure	
		☒	ANSI C63.10	11.12.2.4	Peak power measurement procedure	
		☒	ANSI C63.10	11.12.2.5	Average power measurement procedures	
			☐	ANSI C63.10	11.12.2.5.1	Trace averaging with continuous EUT transmission at full power
			☐	ANSI C63.10	11.12.2.5.2	Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction
			☒	ANSI C63.10	11.12.2.5.3	Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold

4.5. EUT test Axis definition

Item	Emissions in restricted frequency bands			
Device Category	☐	Fixed point-to-point		
	☐	Emit multiple directional beams, simultaneously or sequentially		
	☒	Other cases		
Test mode	Mode 1~3			
Test method	☒	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis ☒	Worst Axis ☐	Worst Axis ☐
	☐	Conducted		
	☐	Chain 1		
				
	☐	Chain 1	Chain 2	
				
	☐	Chain 1	Chain 2	Chain 3
				

4.6. Test Result

Product Name	:	Wahoo GPS BIKE COMPUTER	Power	:	AC 120V/60Hz
Test Mode	:	Mode 1	Test Site	:	AC-5
Test Date	:	2017.01.18			

CH	Antenna Polarity	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measured Level (dB μ V/m)	Limit (dB μ V/m)	Over Limit (dB)	Detector
1	H	4824	49.664	-7.731	41.933	54(note3)	-12.067	PK
	H	7236	46.349	-4.473	41.876	54(note3)	-12.124	PK
	H	9648	43.143	-0.989	42.154	54(note3)	-11.846	PK
	V	4824	49.962	-7.731	42.231	54(note3)	-11.769	PK
	V	7236	46.537	-4.473	42.064	54(note3)	-11.936	PK
	V	9648	43.526	-0.989	42.537	54(note3)	-11.463	PK
6	H	4874	49.701	-7.543	42.158	54(note3)	-11.842	PK
	H	7311	46.183	-4.348	41.835	54(note3)	-12.165	PK
	H	9748	45.077	-1.548	43.529	54(note3)	-10.471	PK
	V	4874	49.341	-7.543	41.798	54(note3)	-12.202	PK
	V	7311	46.108	-4.348	41.760	54(note3)	-12.240	PK
	V	9748	45.289	-1.548	43.741	54(note3)	-10.259	PK
11	H	4924	49.845	-7.694	42.151	54(note3)	-11.849	PK
	H	7386	47.592	-3.897	43.695	54(note3)	-10.305	PK
	H	9848	44.110	-1.196	42.914	54(note3)	-11.086	PK
	V	4924	49.456	-7.694	41.762	54(note3)	-12.238	PK
	V	7386	48.474	-3.897	44.577	54(note3)	-9.423	PK
	V	9848	44.336	-1.196	43.140	54(note3)	-10.860	PK

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

Note: 2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 20dB below the limits, therefore no data appear in the report.

Note: 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.

Note: 4. The VBW setting for average testing, see Clause 6.6.

Product Name	:	Wahoo GPS BIKE COMPUTER	Power	:	AC 120V/60Hz
Test Site	:	Mode 2	Test Site	:	AC-5
Test Date	:	2017.01.18			

CH	Antenna Polarity	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measured Level (dB μ V/m)	Limit (dB μ V/m)	Over Limit (dB)	Detector
1	H	4824	48.644	-7.731	40.913	54(note3)	-13.087	PK
	H	7236	46.155	-4.473	41.682	54(note3)	-12.318	PK
	H	9648	43.561	-0.989	42.572	54(note3)	-11.428	PK
	V	4824	49.493	-7.731	41.762	54(note3)	-12.238	PK
	V	7236	46.401	-4.473	41.928	54(note3)	-12.072	PK
	V	9648	43.152	-0.989	42.163	54(note3)	-11.837	PK
6	H	4874	48.792	-7.543	41.249	54(note3)	-12.751	PK
	H	7311	46.071	-4.348	41.723	54(note3)	-12.277	PK
	H	9748	44.641	-1.548	43.093	54(note3)	-10.907	PK
	V	4874	49.294	-7.543	41.751	54(note3)	-12.249	PK
	V	7311	46.313	-4.348	41.965	54(note3)	-12.035	PK
	V	9748	45.160	-1.548	43.612	54(note3)	-10.388	PK
11	H	4924	48.731	-7.694	41.037	54(note3)	-12.963	PK
	H	7386	47.224	-3.897	43.327	54(note3)	-10.673	PK
	H	9848	44.057	-1.196	42.861	54(note3)	-11.139	PK
	V	4924	48.730	-7.694	41.036	54(note3)	-12.964	PK
	V	7386	47.291	-3.897	43.394	54(note3)	-10.606	PK
	V	9848	44.587	-1.196	43.391	54(note3)	-10.609	PK

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

Note: 2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 20dB below the limits, therefore no data appear in the report.

Note: 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.

Note: 4. The VBW setting for average testing, see Clause 6.6.

Product Name	:	Wahoo GPS BIKE COMPUTER	Power	:	AC 120V/60Hz
Test Site	:	Mode 3	Test Site	:	AC-5
Test Date	:	2017.01.18			

CH	Antenna Polarity	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measured Level (dB μ V/m)	Limit (dB μ V/m)	Over Limit (dB)	Detector
1	H	4824	48.771	-7.731	41.040	54(note3)	-12.960	PK
	H	7236	46.136	-4.473	41.663	54(note3)	-12.337	PK
	H	9648	43.426	-0.989	42.437	54(note3)	-11.563	PK
	V	4824	48.886	-7.731	41.155	54(note3)	-12.845	PK
	V	7236	46.013	-4.473	41.540	54(note3)	-12.460	PK
	V	9648	43.263	-0.989	42.274	54(note3)	-11.726	PK
6	H	4874	49.314	-7.543	41.771	54(note3)	-12.229	PK
	H	7311	46.280	-4.348	41.932	54(note3)	-12.068	PK
	H	9748	45.025	-1.548	43.477	54(note3)	-10.523	PK
	V	4874	49.724	-7.543	42.181	54(note3)	-11.819	PK
	V	7311	46.403	-4.348	42.055	54(note3)	-11.945	PK
	V	9748	46.468	-1.548	44.920	54(note3)	-9.080	PK
11	H	4924	49.073	-7.694	41.379	54(note3)	-12.621	PK
	H	7386	47.391	-3.897	43.494	54(note3)	-10.506	PK
	H	9848	43.945	-1.196	42.749	54(note3)	-11.251	PK
	V	4924	49.840	-7.694	42.146	54(note3)	-11.854	PK
	V	7386	47.882	-3.897	43.985	54(note3)	-10.015	PK
	V	9848	43.882	-1.196	42.686	54(note3)	-11.314	PK

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

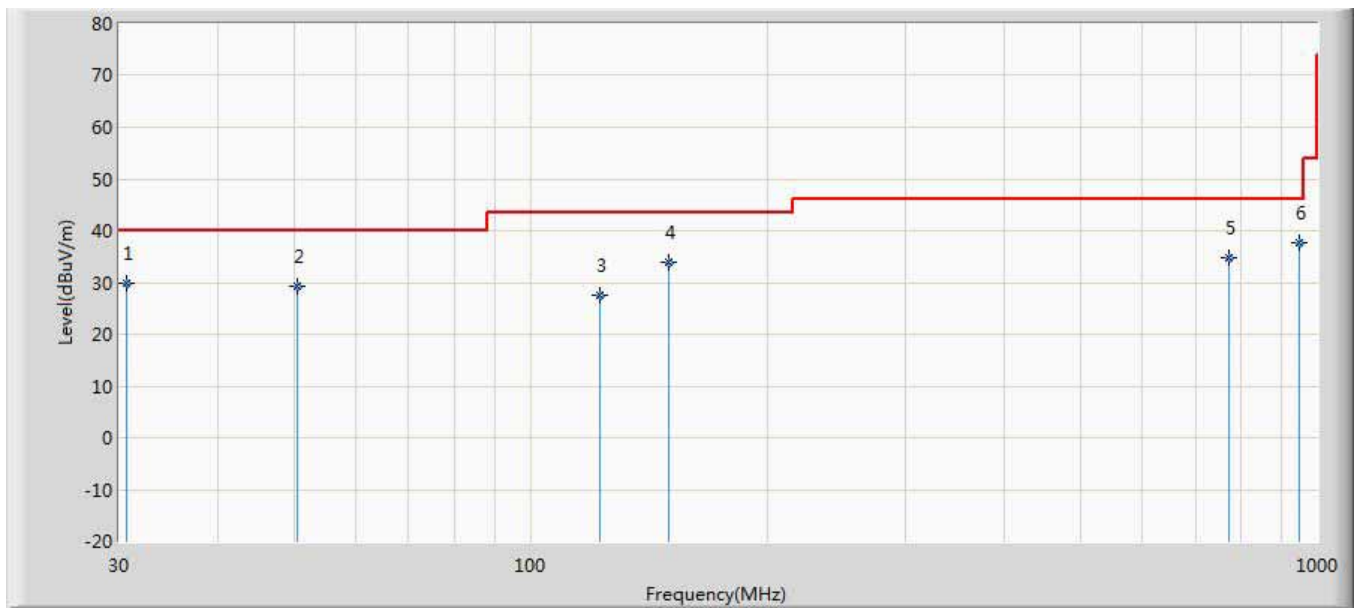
Note: 2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 20dB below the limits, therefore no data appear in the report.

Note: 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.

Note: 4. The VBW setting for average testing, see Clause 6.6.

The worst case of Radiated Emission below 1GHz:

Engineer: Whiteside	
Site: AC3	Time: 2017/01/18 - 14:18
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC3_3m (30-1000MHz)	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		30.728	29.759	23.300	-10.241	40.000	6.459	QP
2		50.491	29.391	22.800	-10.609	40.000	6.591	QP
3		122.393	27.557	20.600	-15.943	43.500	6.957	QP
4		149.916	33.784	26.700	-9.716	43.500	7.084	QP
5		773.020	34.829	26.000	-11.171	46.000	8.829	QP
6	*	948.469	37.797	28.600	-8.203	46.000	9.197	QP

Engineer: Whiteside

Site: AC3

Time: 2017/01/18 - 14:20

Limit: FCC_Part15.109_RE(3m)_ClassB

Margin: 0

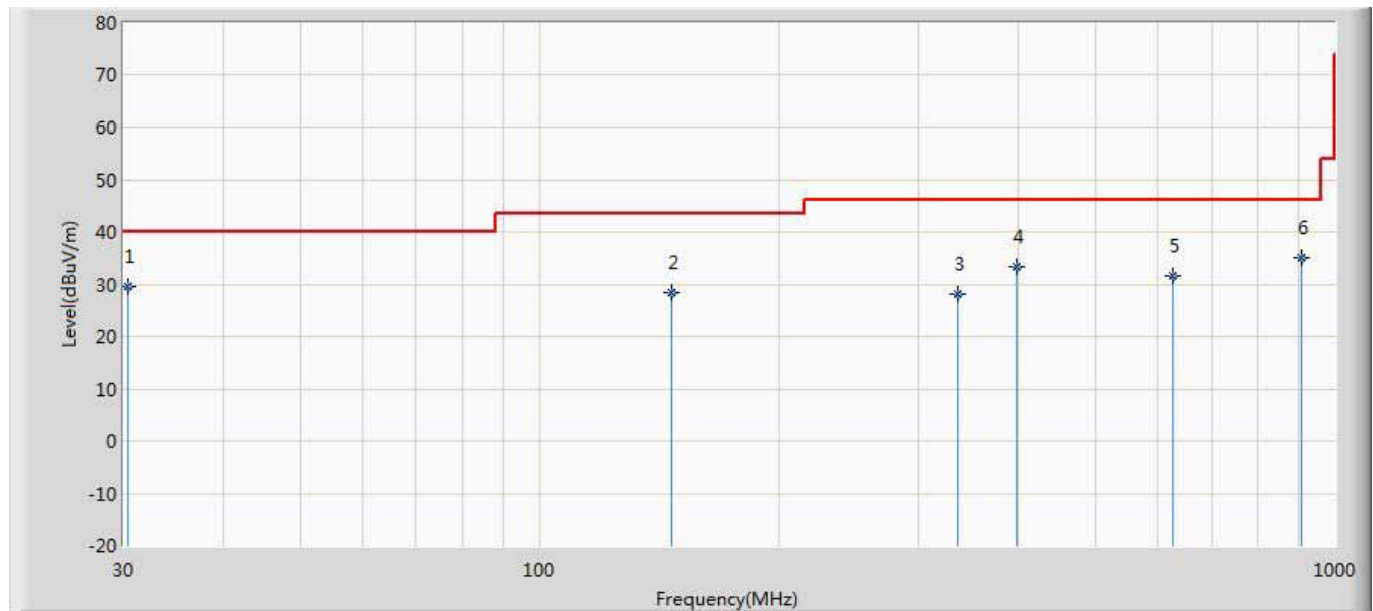
Probe: AC3_3m (30-1000MHz)

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	*	30.364	29.456	23.000	-10.544	40.000	6.456	QP
2		146.400	28.368	21.300	-15.132	43.500	7.068	QP
3		336.035	28.125	20.400	-17.875	46.000	7.725	QP
4		399.085	33.204	25.300	-12.796	46.000	7.904	QP
5		626.307	31.696	23.200	-14.304	46.000	8.496	QP
6		908.214	35.216	26.100	-10.784	46.000	9.116	QP

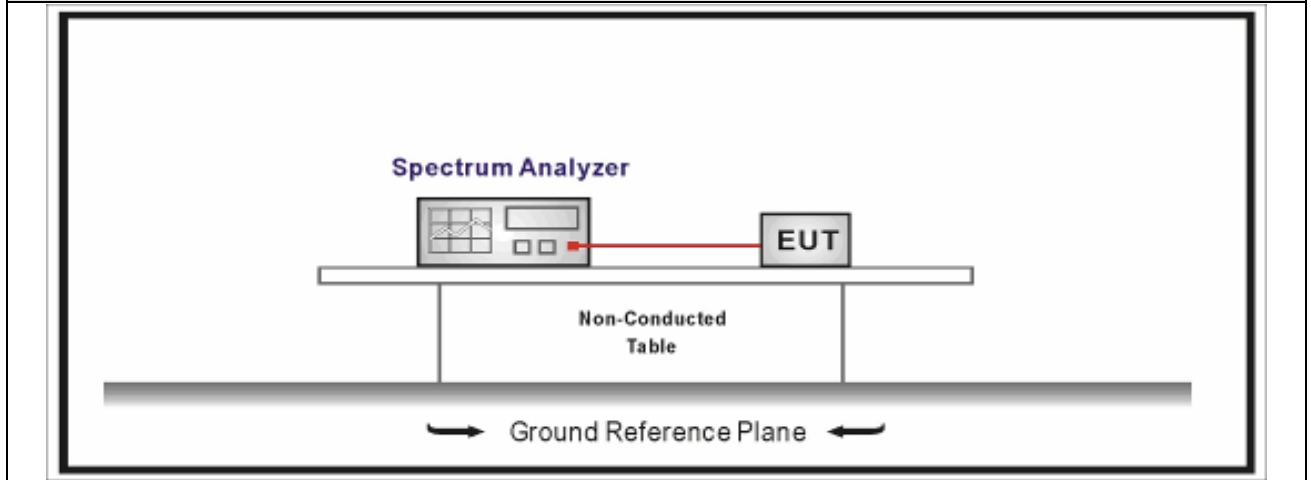
5. Emissions in non-restricted frequency bands

5.1. Test Equipment

Emissions in non-restricted frequency bands / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04	2018.02.03
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2016.04.09	2017.04.09
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2016.04.09	2017.04.09
Temperature/Humidity Meter	zhichen	ZC1-2	TR8-TH	2016.04.10	2017.04.10
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

5.2. Test Setup

Emissions in non-restricted frequency bands



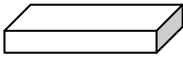
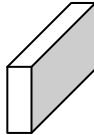
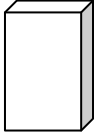
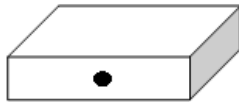
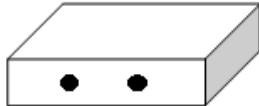
5.3. Limit

Un-Restricted Band Emissions Limit	
RF Output power (Detection methods)	Limit(dB)
RF Output power(Average detector)	30c(Note1)
RF Output power(PK detector)	20c(Note2)
Note 1: If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc). Note 2: If the maximum peak conducted output power procedure was used, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).	

5.4. Test Procedure

Emissions in non-restricted frequency bands				
	References Rule		Chapter	Description
☒	ANSI C63.10		11.11	Emissions in non-restricted frequency bands
	☒	ANSI C63.10	11.11.2	Reference level measurement
	☒	ANSI C63.10	11.11.3	Emission level measurement
☐	ANSI C63.10		11.12	Emissions in restricted frequency bands
	☐	ANSI C63.10	11.12.1	Radiated emission measurements
	☐	ANSI C63.10	11.12.2.7	Radiated spurious emission test
☐	ANSI C63.10		6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
☐	ANSI C63.10		6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
☒	ANSI C63.10		6.6	Radiated emissions from unlicensed wireless devices above 1 GHz
	☒	ANSI C63.10	11.12.2	Antenna-port conducted measurements
	☐	ANSI C63.10	11.12.2.3	Quasi-peak measurement procedure
		☒	ANSI C63.10	Peak power measurement procedure
		☐	ANSI C63.10	Average power measurement procedures
	☐	☐	ANSI C63.10	11.12.2.5.1 Trace averaging with continuous EUT transmission at full power
		☐	ANSI C63.10	11.12.2.5.2 Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction
		☐	ANSI C63.10	11.12.2.5.3 Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold

5.5. EUT test Axis definition

Item	Emissions in non-restricted frequency bands			
Device Category	☐	Fixed point-to-point		
	☐	Emit multiple directional beams, simultaneously or sequentially		
	☒	Other cases		
Test mode	Mode 1 ~ Mode 3			
Test method	☐	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis ☐	Worst Axis ☐	Worst Axis ☐
	☒	Conducted		
	☒	Chain 0		
				
	☐	Chain 0	Chain 1	
				
	☐	Chain 0	Chain 1	Chain 2
				

5.6. Test Result

Product Name	: Wahoo GPS BIKE COMPUTER	Power	: AC 120V/60Hz
Test Mode	: Mode1~3	Test Site	: TR8
Test Date	: 2017.01.06		

Mode	Channel	Test Frequency (MHz)	In-Band PSD[a] (dBm/100kHz)	Frequency (MHz)	Out-Band PSD[b] (dBm/100kHz)	[a]-[b] (dB)	Limit (dB)	Result
1	01	2412	4.884	2400	-47.047	51.9	>20	Pass
1	11	2462	6.697	2483.5	-55.573	62.3	>20	Pass
2	01	2412	-0.118	2400	-44.591	44.5	>20	Pass
2	11	2462	0.534	2483.5	-56.927	57.5	>20	Pass
3	01	2412	-0.872	2400	-43.945	43.1	>20	Pass
3	11	2462	-0.040	2483.5	-56.789	56.7	>20	Pass

Note: The worst case of emissions in non-restricted frequency bands as below:

Mode 3 CH01(2412MHz)

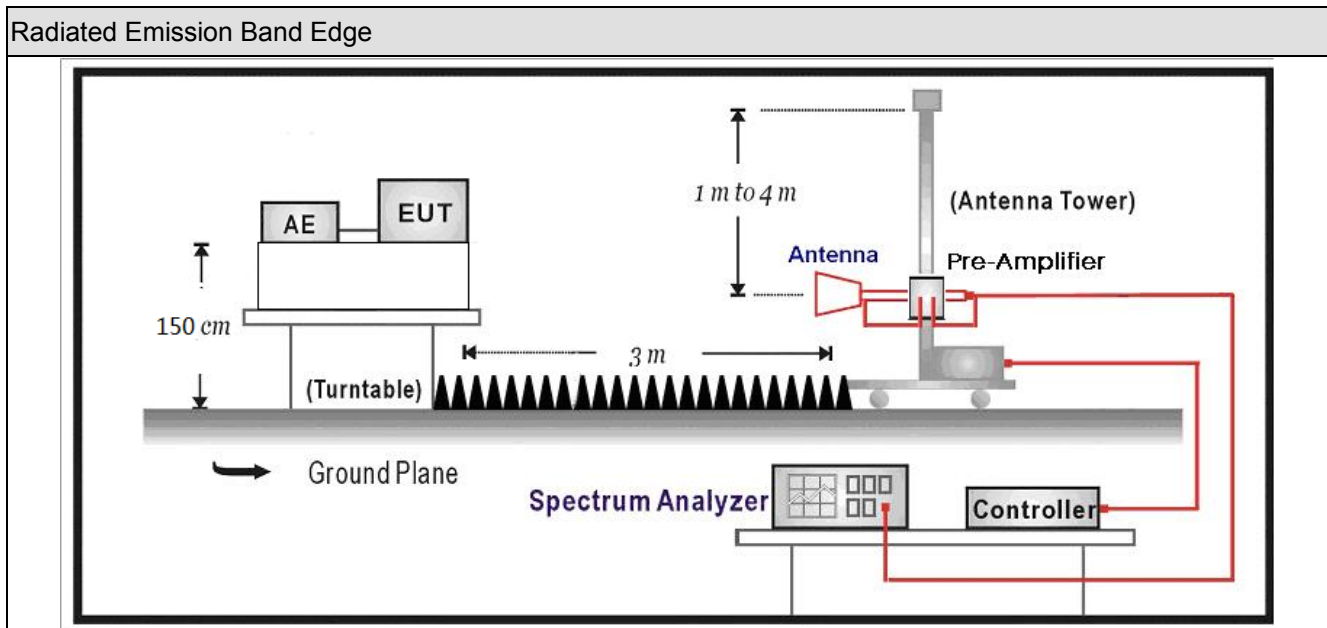


6. Radiated Emission Band Edge

6.1. Test Equipment

Radiated Emission Band Edge / AC-5					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Receiver	Agilent	N9038A	MY51210196	2016.07.16	2017.07.16
Pre-Amplifier	Miteq	NSP1800-25	1364185	2016.05.03	2017.05.03
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2016.07.12	2017.07.12
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2016.09.18	2017.09.18
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2016.02.28	2017.02.28
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2016.02.28	2017.02.28
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2017.01.05	2018.01.05
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

6.2. Test Setup



6.3. Limit

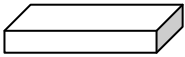
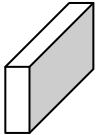
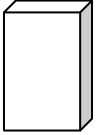
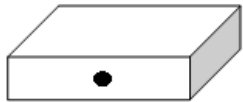
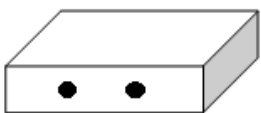
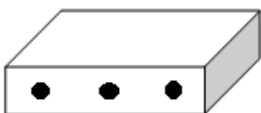
Band edge Limit				
Frequency bands (MHz)	Detector	Limit (dB μ V/m)	RBW (MHz)	Distance (m)
2310-2390	PK	74	1	3
2483.5-2500	AV	54	1	3

Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits.

6.4. Test Procedure

Radiated Emission Band Edge						
	References Rule			Chapter	Description	
☒	ANSI C63.10			6.10	Band-edge testing	
	☒	ANSI C63.10		6.10.5	Restricted-band band-edge measurements	
	☐	ANSI C63.10		6.10.6	Marker-delta method	
☒	ANSI C63.10			11.12	Emissions in restricted frequency bands	
	☒	ANSI C63.10		11.12.1	Radiated emission measurements	
	☒	ANSI C63.10		11.12.2.7	Radiated spurious emission test	
☐	ANSI C63.10			6.4	Radiated emissions from unlicensed wireless devices below 30 MHz	
☐	ANSI C63.10			6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz	
☒	ANSI C63.10			6.6	Radiated emissions from unlicensed wireless devices above 1 GHz	
		☐	ANSI C63.10	11.12.2.3	Quasi-peak measurement procedure	
		☒	ANSI C63.10	11.12.2.4	Peak power measurement procedure	
		☒	ANSI C63.10	11.12.2.5	Average power measurement procedures	
			☐	ANSI C63.10	11.12.2.5.1	Trace averaging with continuous EUT transmission at full power
			☐	ANSI C63.10	11.12.2.5.2	Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction
			☒	ANSI C63.10	11.12.2.5.3	Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold

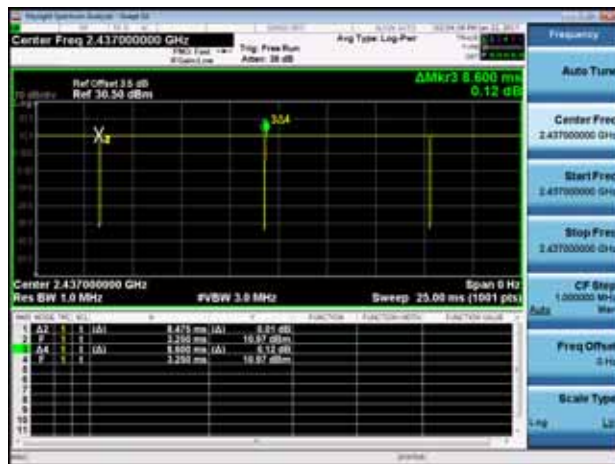
6.5. EUT test definition

Item	Radiated Emission Band Edge			
Device Category	☐	Fixed point-to-point		
	☐	Emit multiple directional beams, simultaneously or sequentially		
	☒	Other cases		
Test mode	Mode 1~3			
Test method	☒	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis ☒	Worst Axis ☐	Worst Axis ☐
	☐	Conducted		
	☐	Chain 0		
				
	☐	Chain 0	Chain 1	
				
	☐	Chain 0	Chain 1	Chain 2
				

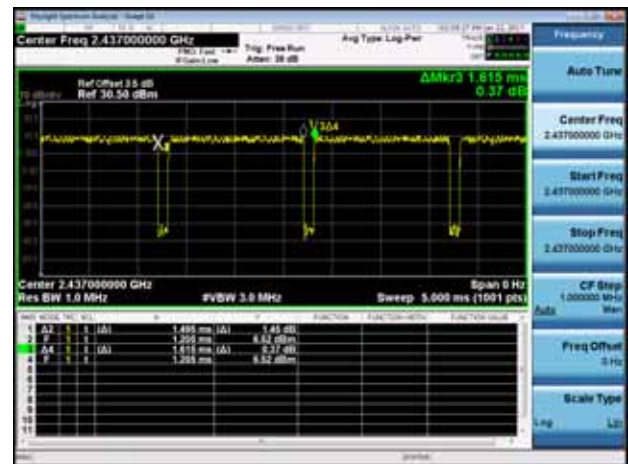
6.6. Duty Cycle

Test Mode	Tx On (ms)	Tx Off (ms)	VBW	Tx On + Tx Off (ms)	Duty Cycle
802.11b	8.475	0.125	120Hz	8.600	98.5%
802.11g	1.495	0.120	680Hz	1.615	92.6%
802.11n(20MHz)	1.395	0.120	750Hz	1.515	92.1%

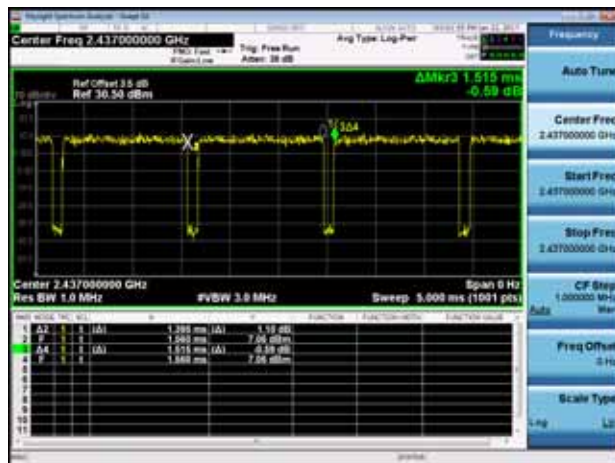
802.11b



802.11g

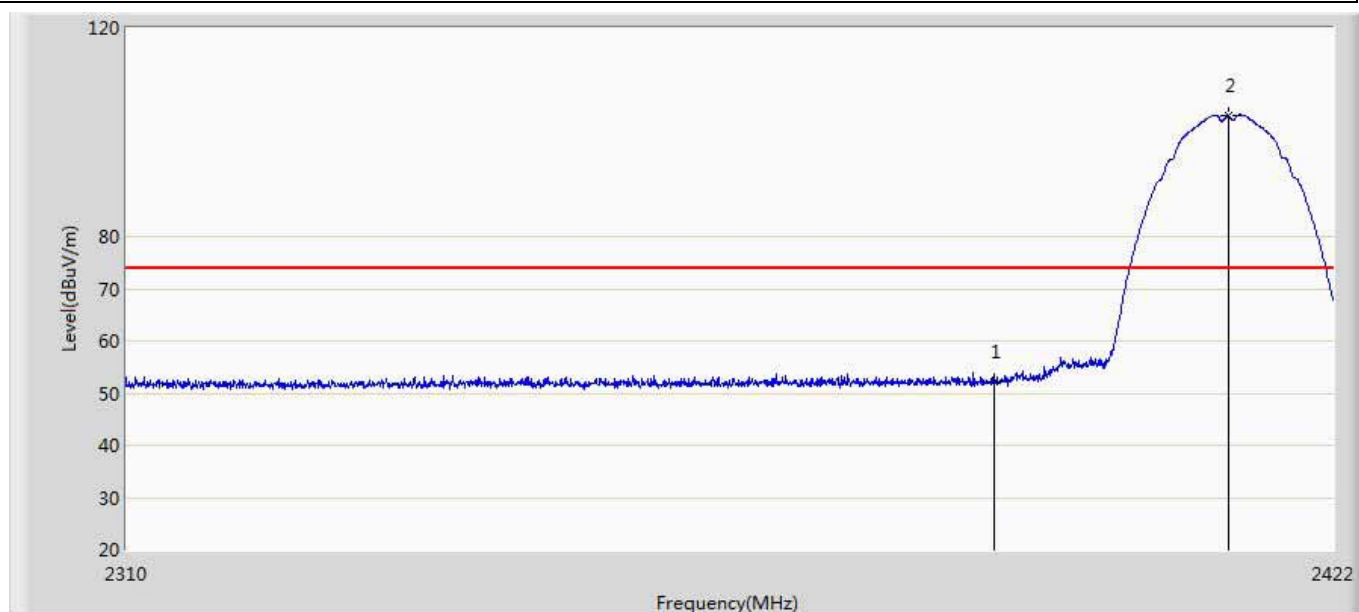


802.11n(20MHz)



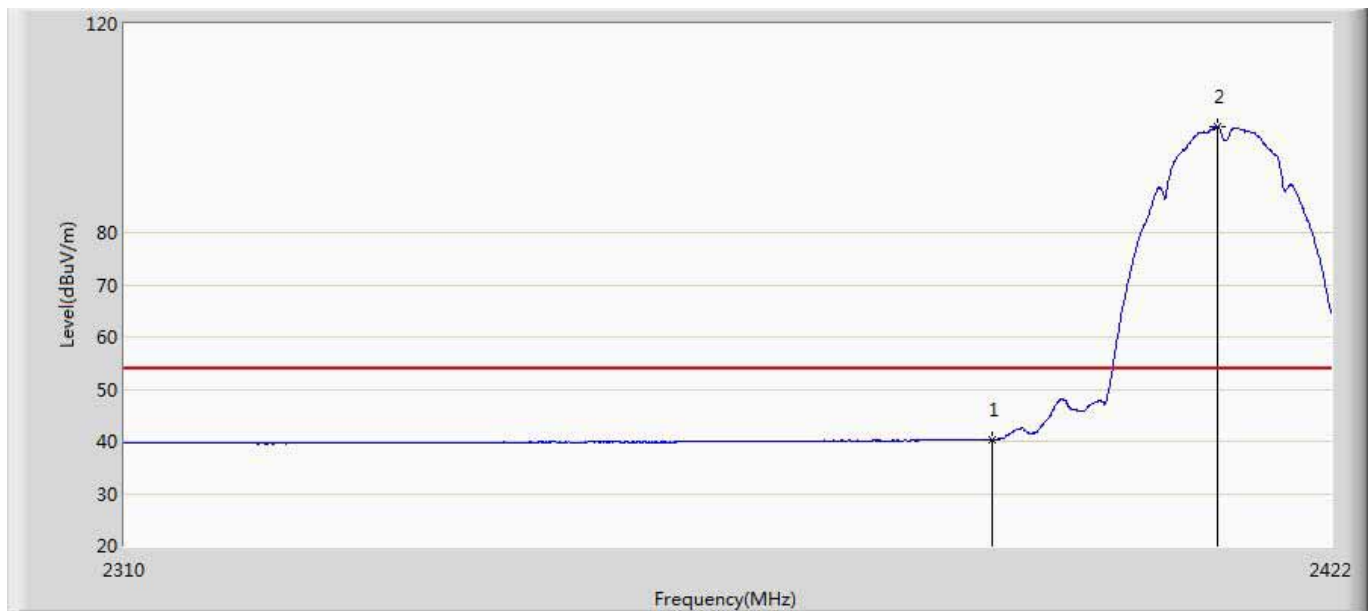
6.7. Test Result

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 15:38
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode1:Transmit at 2412MHz by 802.11b	



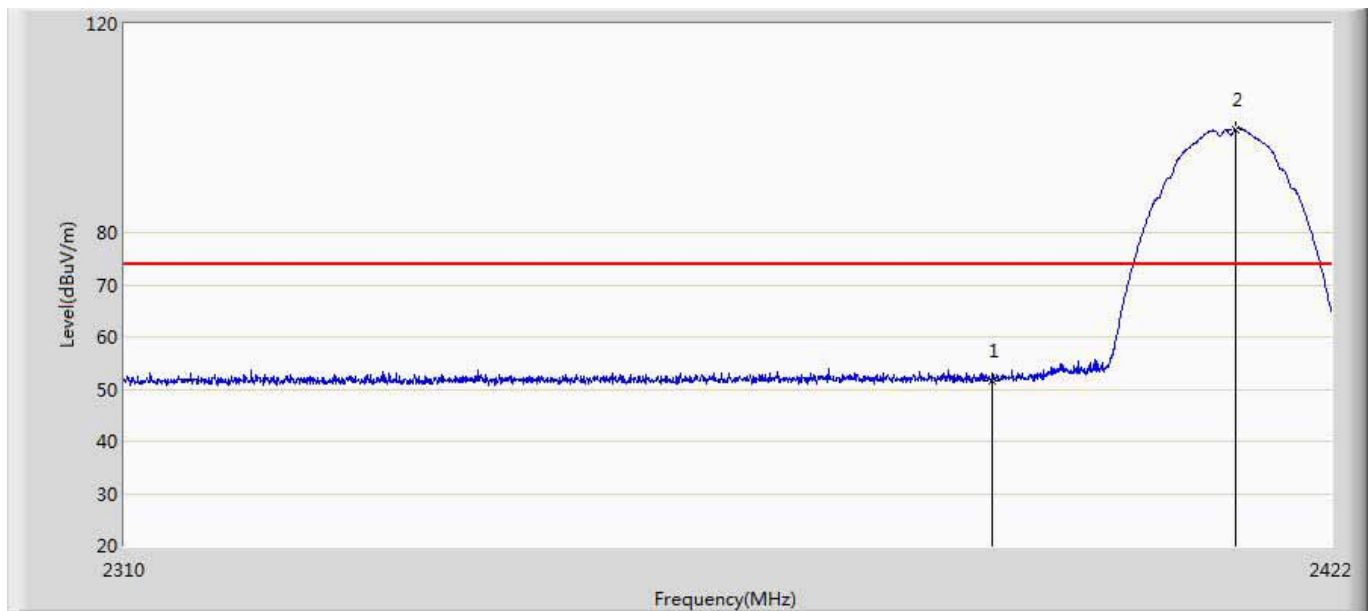
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	52.103	15.773	-21.897	74.000	36.329	PK
2	*	2412.088	103.160	66.816	N/A	N/A	36.344	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 15:57
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode1:Transmit at 2412MHz by 802.11b	



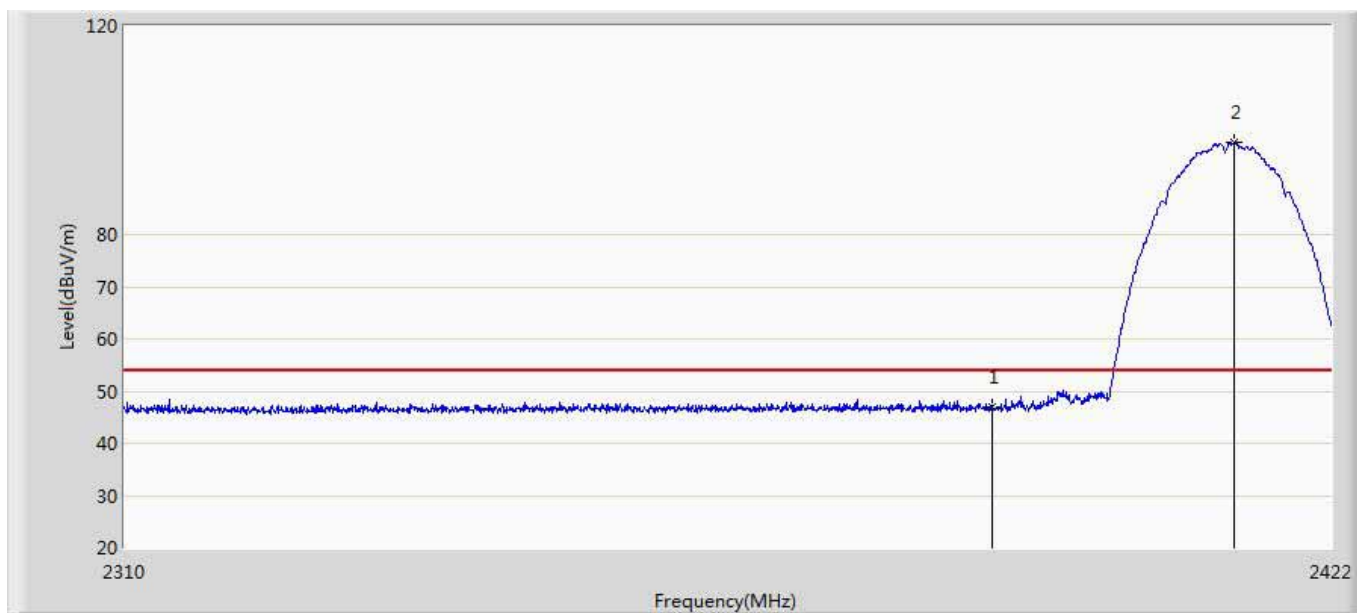
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	40.312	3.982	-13.688	54.000	36.329	AV
2	*	2411.192	100.332	64.002	N/A	N/A	36.330	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode1:Transmit at 2412MHz by 802.11b	



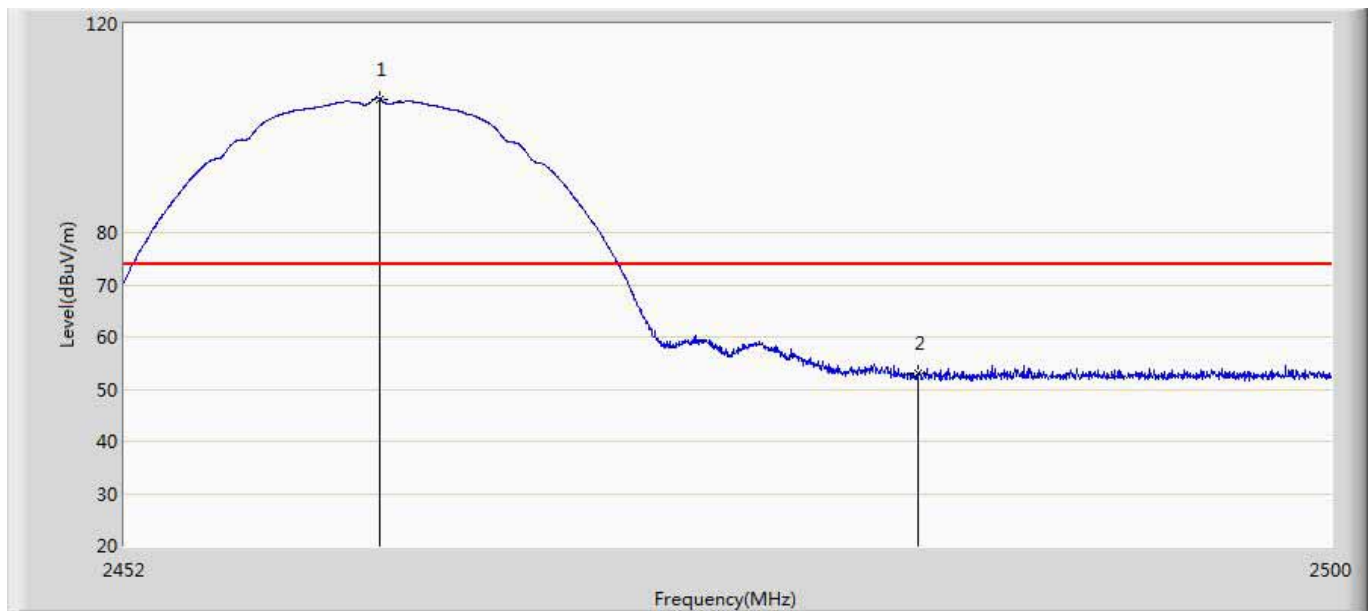
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	51.534	15.204	-22.466	74.000	36.329	PK
2	*	2412.928	99.749	63.391	N/A	N/A	36.357	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:02
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode1:Transmit at 2412MHz by 802.11b	



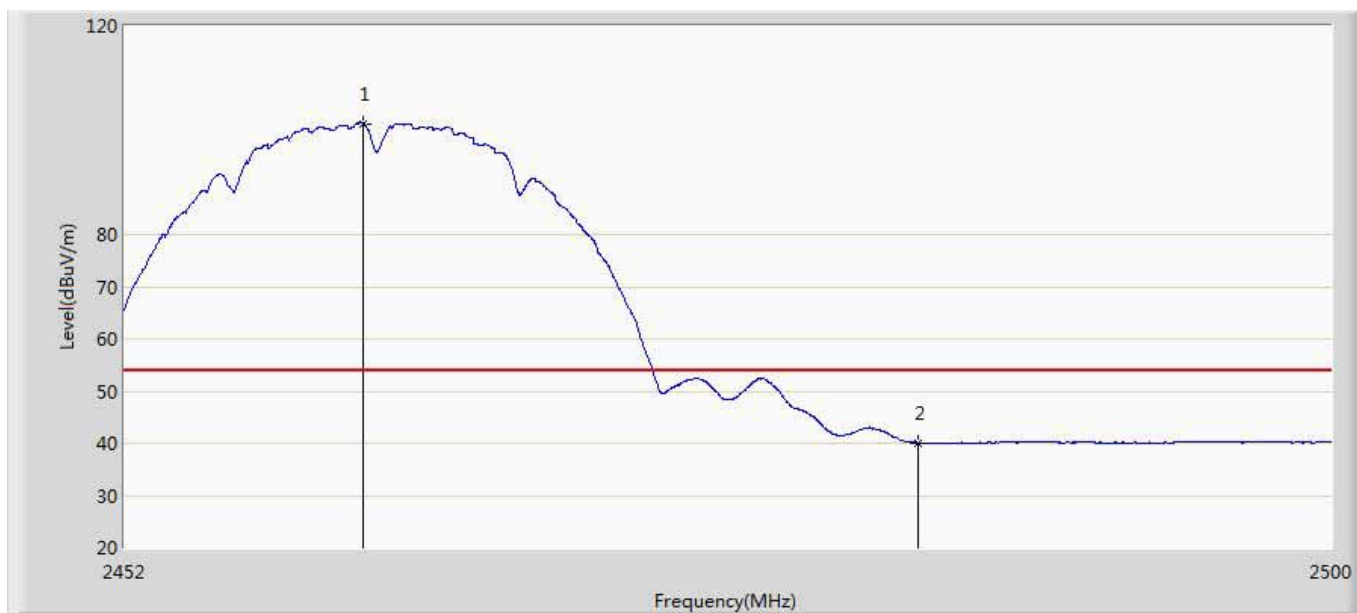
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	46.895	10.565	-7.105	54.000	36.329	AV
2	*	2412.872	97.554	61.197	N/A	N/A	36.356	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode1:Transmit at 2462MHz by 802.11b	



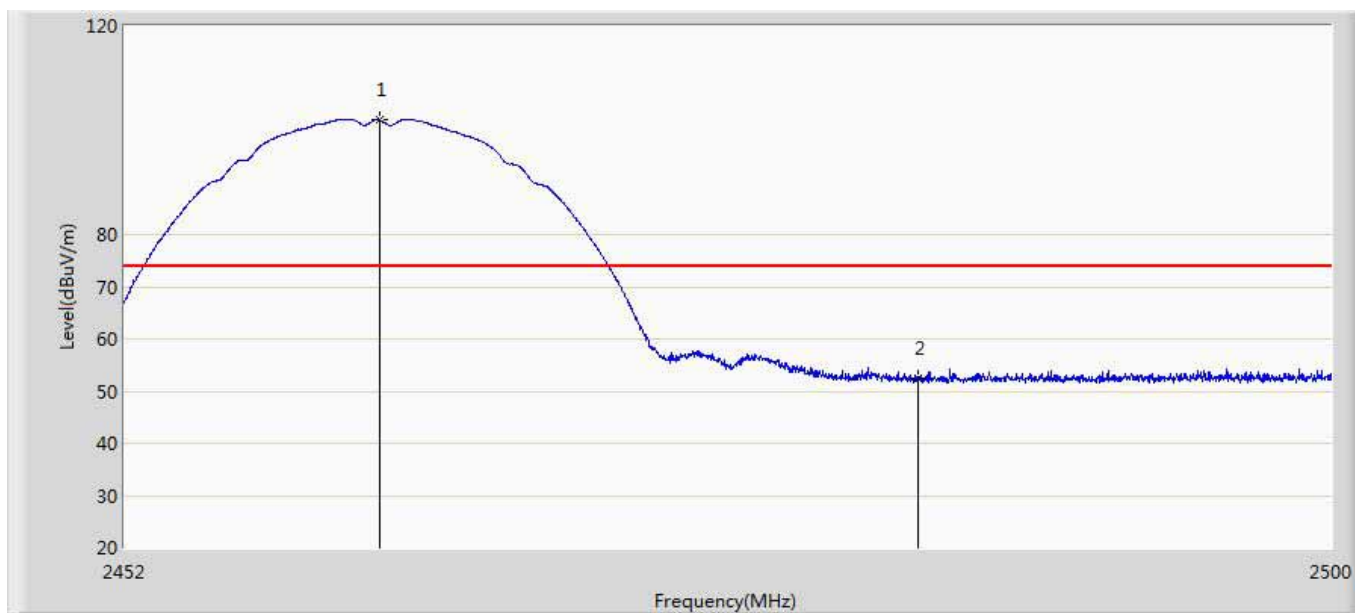
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2462.104	105.612	68.984	N/A	N/A	36.627	PK
2		2483.500	53.041	16.574	-20.959	74.000	36.467	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:10
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode1:Transmit at 2462MHz by 802.11b	



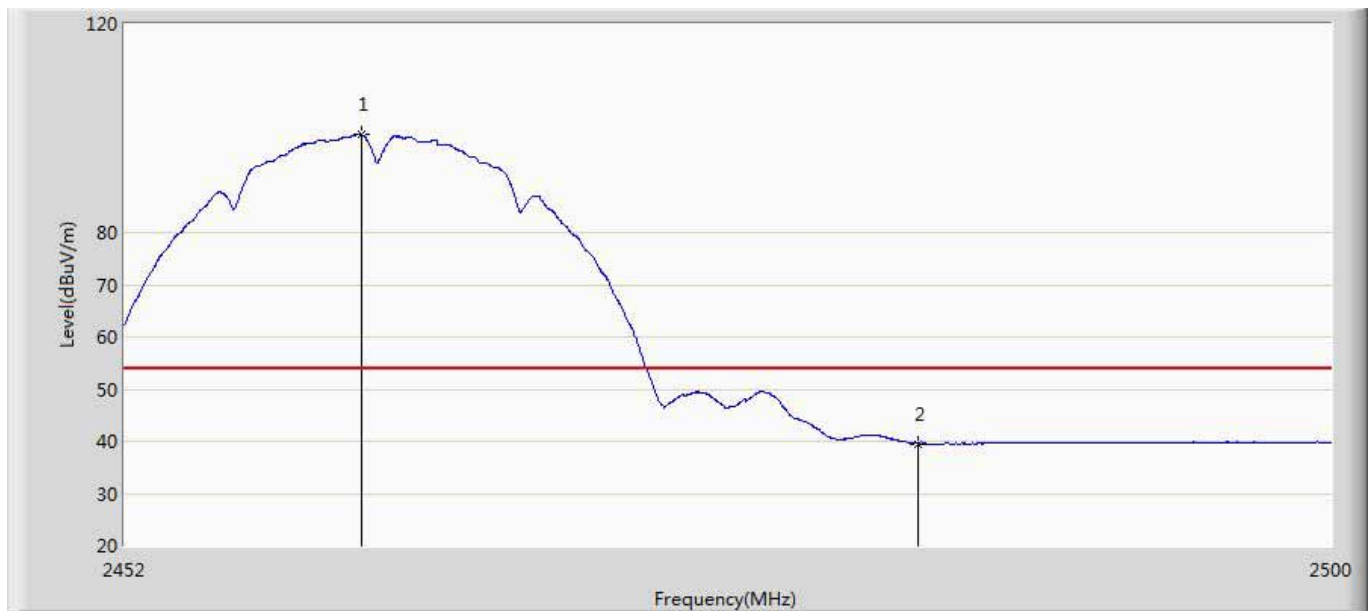
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2461.432	101.249	64.631	N/A	N/A	36.617	AV
2		2483.500	40.119	3.652	-13.881	54.000	36.467	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:13
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode1:Transmit at 2462MHz by 802.11b	



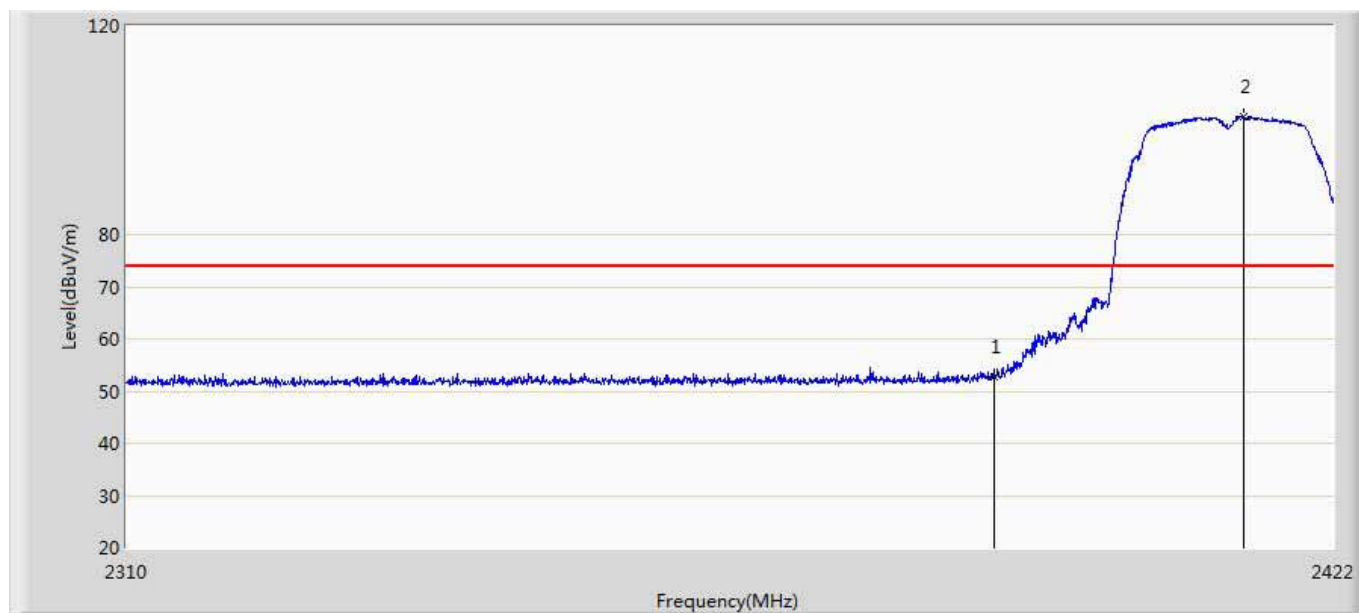
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2462.104	101.897	65.269	N/A	N/A	36.627	PK
2		2483.500	52.433	15.966	-21.567	74.000	36.467	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:15
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode1:Transmit at 2462MHz by 802.11b	



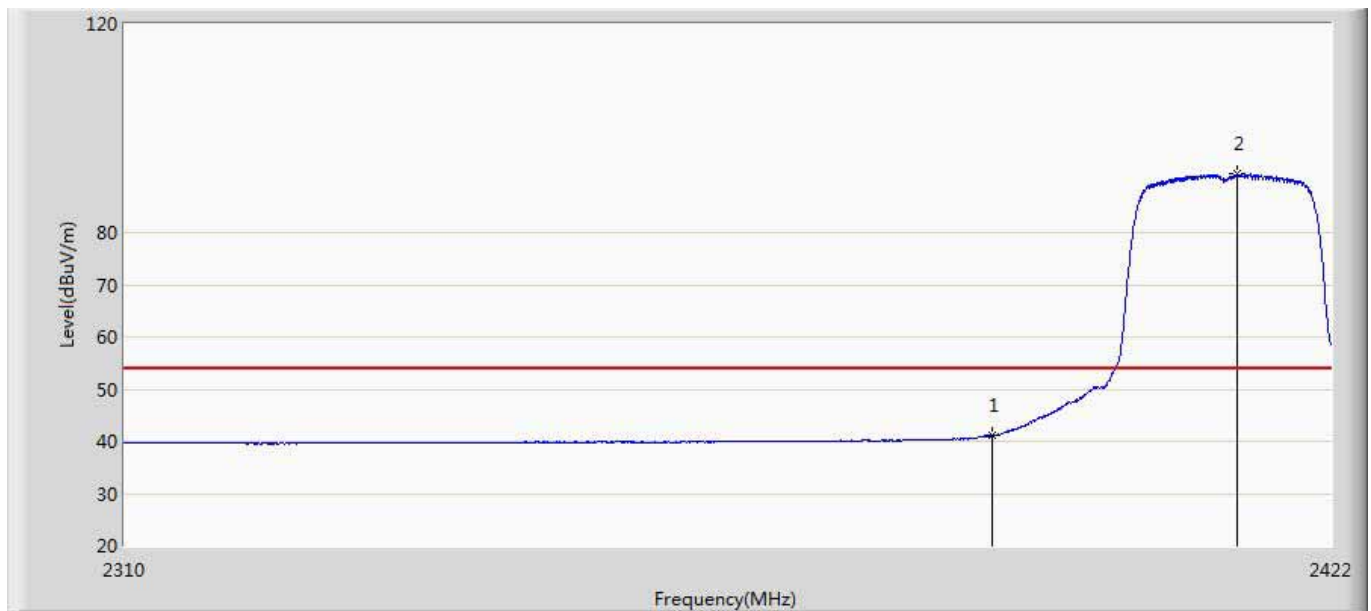
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2461.360	98.805	62.189	N/A	N/A	36.616	AV
2		2483.500	39.565	3.098	-14.435	54.000	36.467	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:17
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode2:Transmit at 2412MHz by 802.11g	



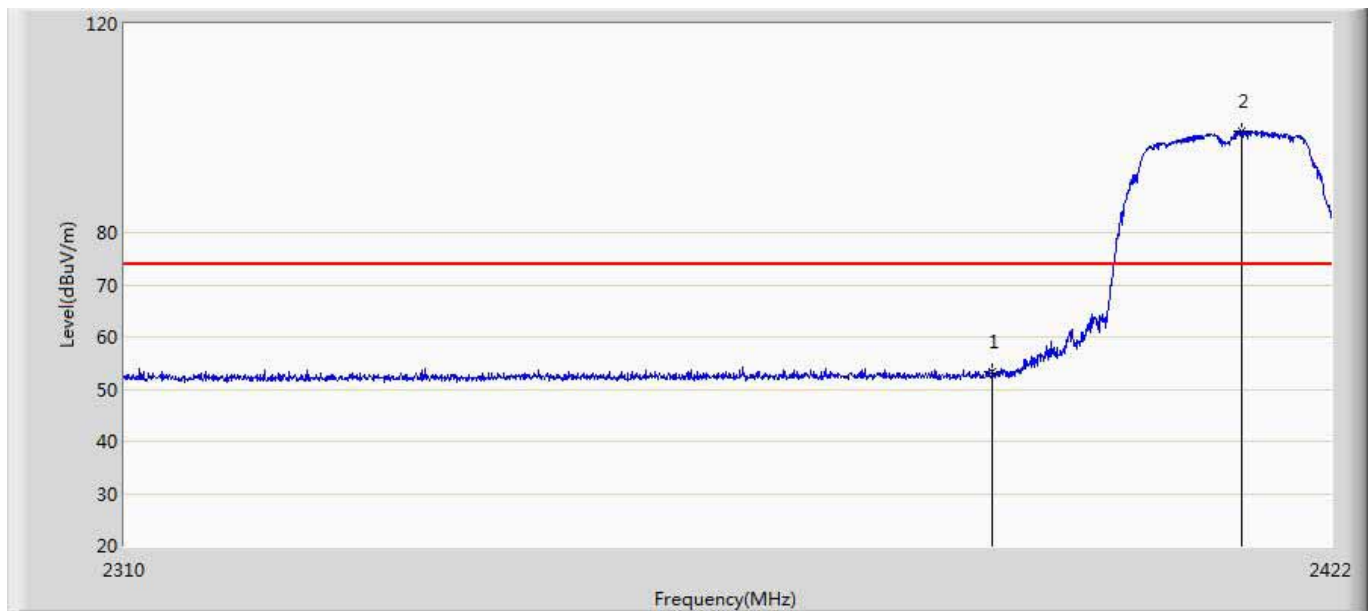
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	52.767	16.437	-21.233	74.000	36.329	PK
2	*	2413.600	102.528	66.160	N/A	N/A	36.368	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode2:Transmit at 2412MHz by 802.11g	



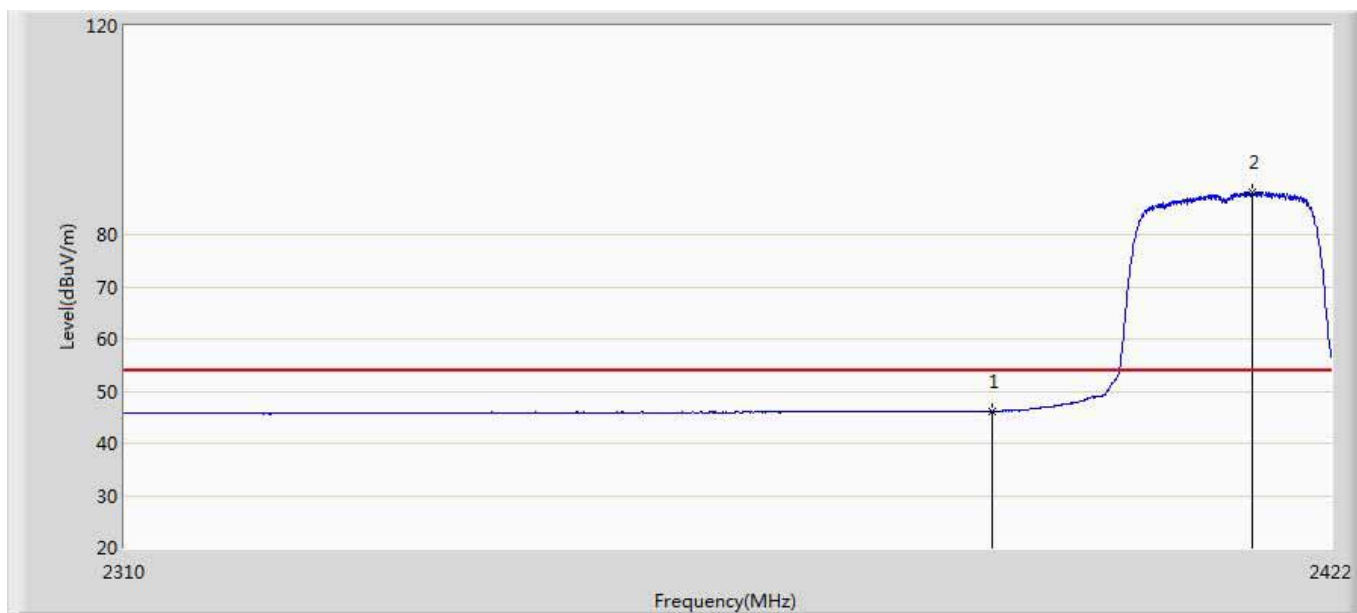
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	41.188	4.858	-12.812	54.000	36.329	AV
2	*	2413.096	91.191	54.831	N/A	N/A	36.361	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode2:Transmit at 2412MHz by 802.11g	



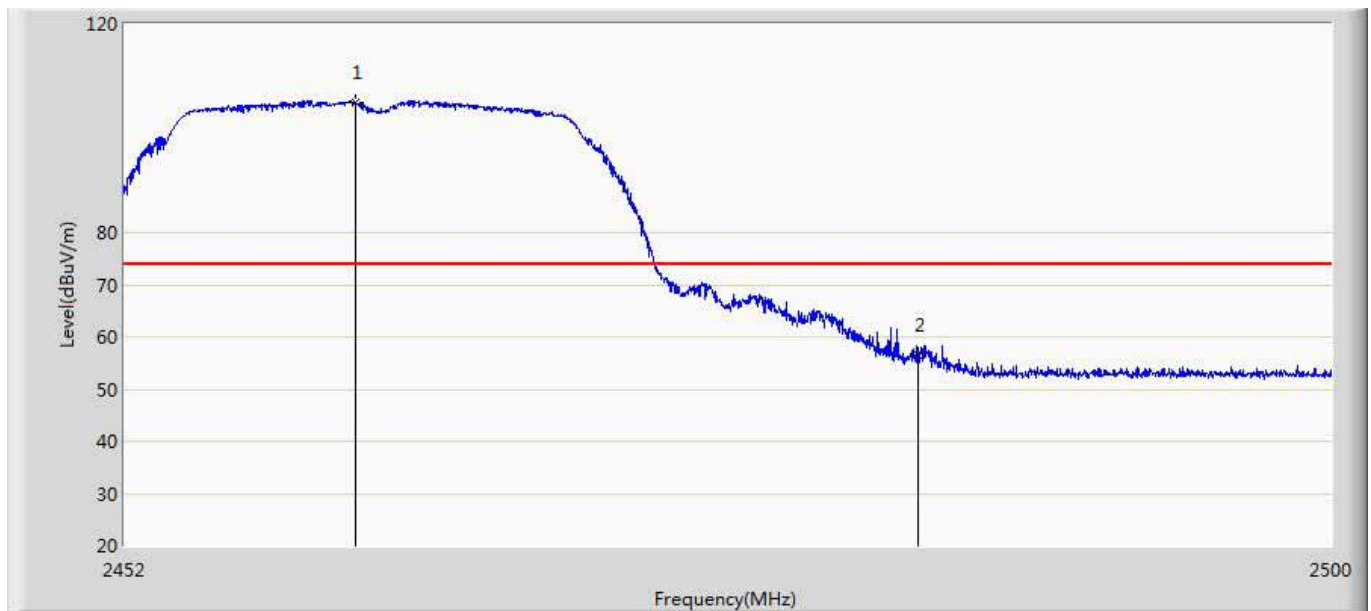
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	53.191	16.861	-20.809	74.000	36.329	PK
2	*	2413.544	99.494	63.127	N/A	N/A	36.367	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:30
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode2:Transmit at 2412MHz by 802.11g	



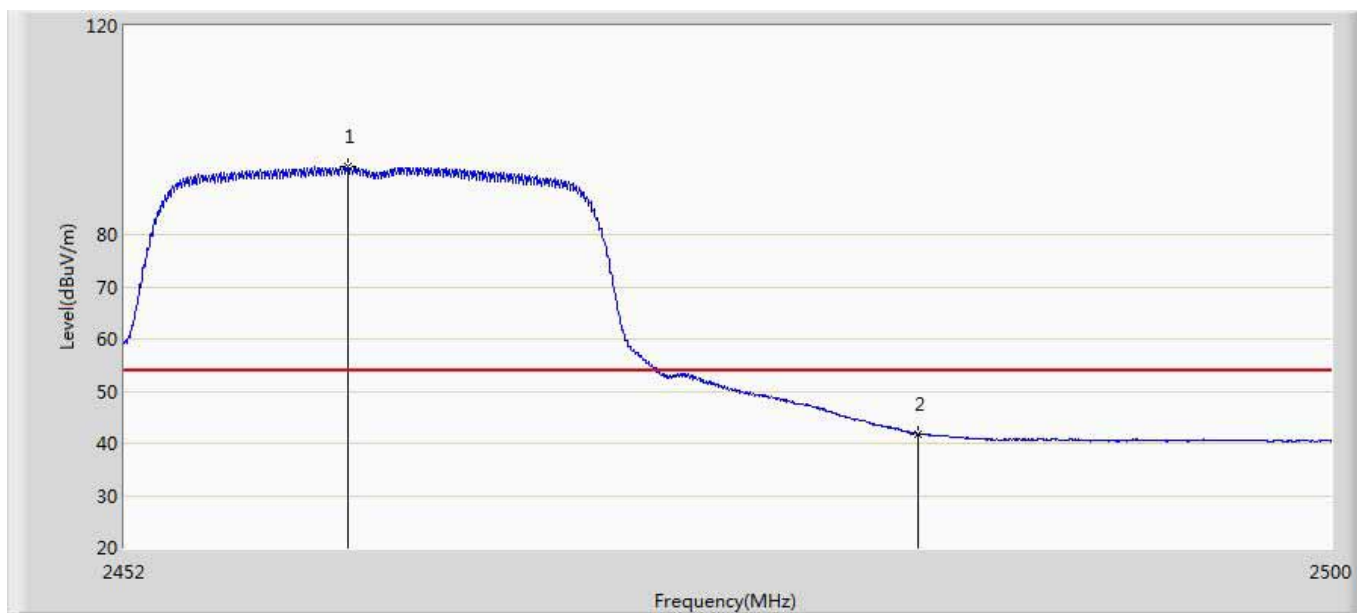
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	46.116	9.786	-7.884	54.000	36.329	AV
2	*	2414.552	88.223	51.840	N/A	N/A	36.383	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode2:Transmit at 2462MHz by 802.11g	



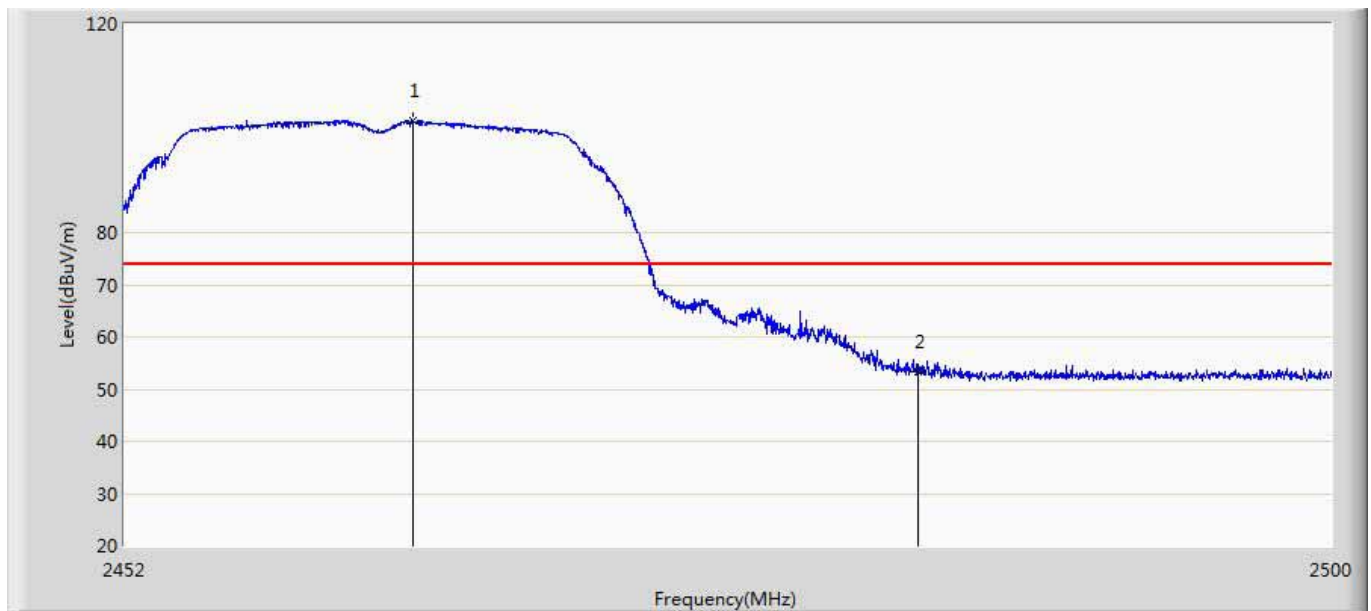
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2461.144	105.037	68.425	N/A	N/A	36.612	PK
2		2483.500	56.579	20.112	-17.421	74.000	36.467	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:37
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode2:Transmit at 2462MHz by 802.11g	



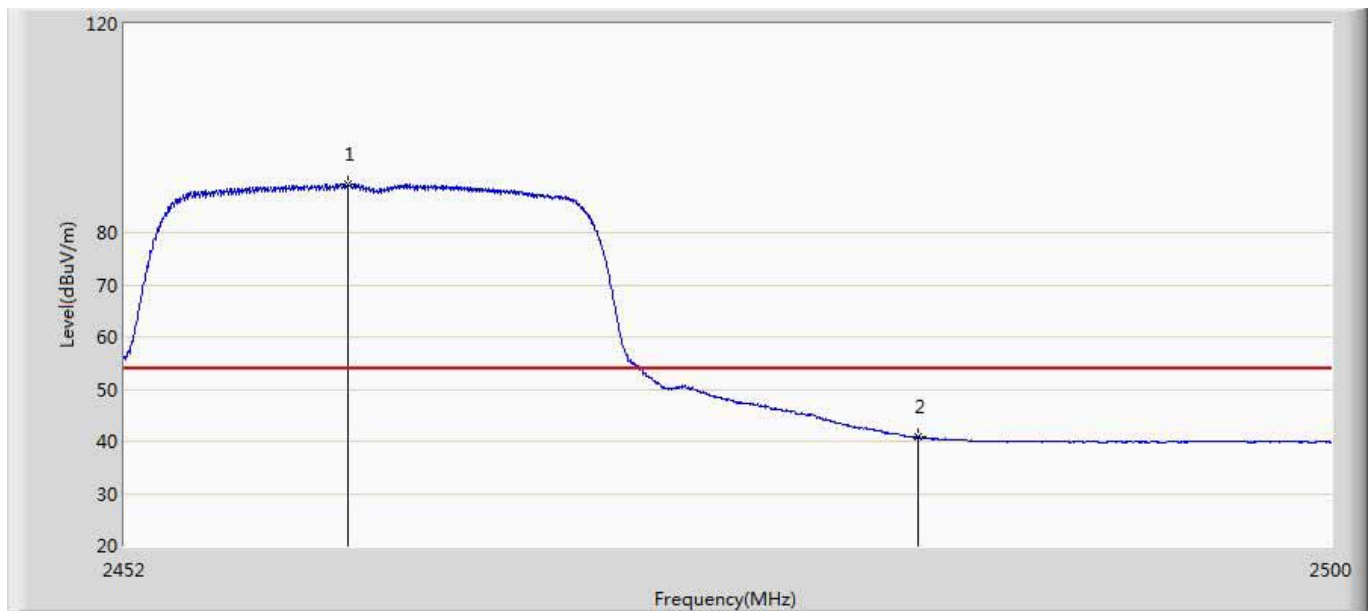
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2460.832	92.905	56.299	N/A	N/A	36.606	AV
2		2483.500	41.881	5.414	-12.119	54.000	36.467	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:38
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode2:Transmit at 2462MHz by 802.11g	



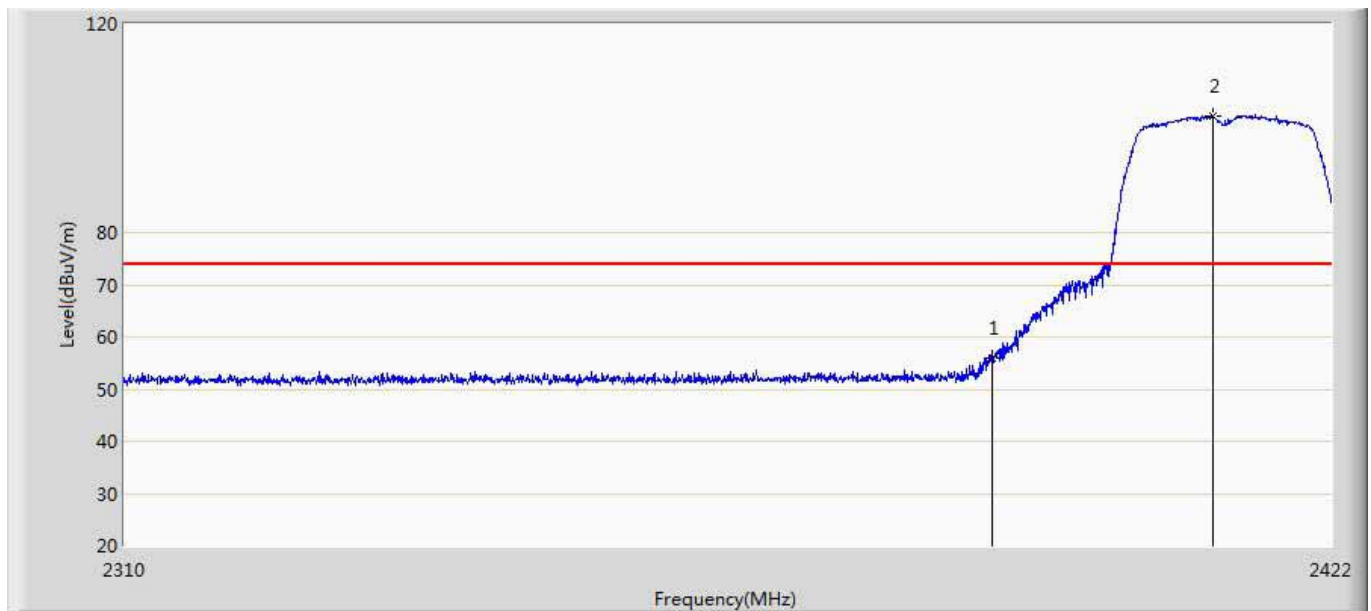
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2463.400	101.364	64.754	N/A	N/A	36.610	PK
2		2483.500	53.333	16.866	-20.667	74.000	36.467	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:40
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode2:Transmit at 2462MHz by 802.11g	



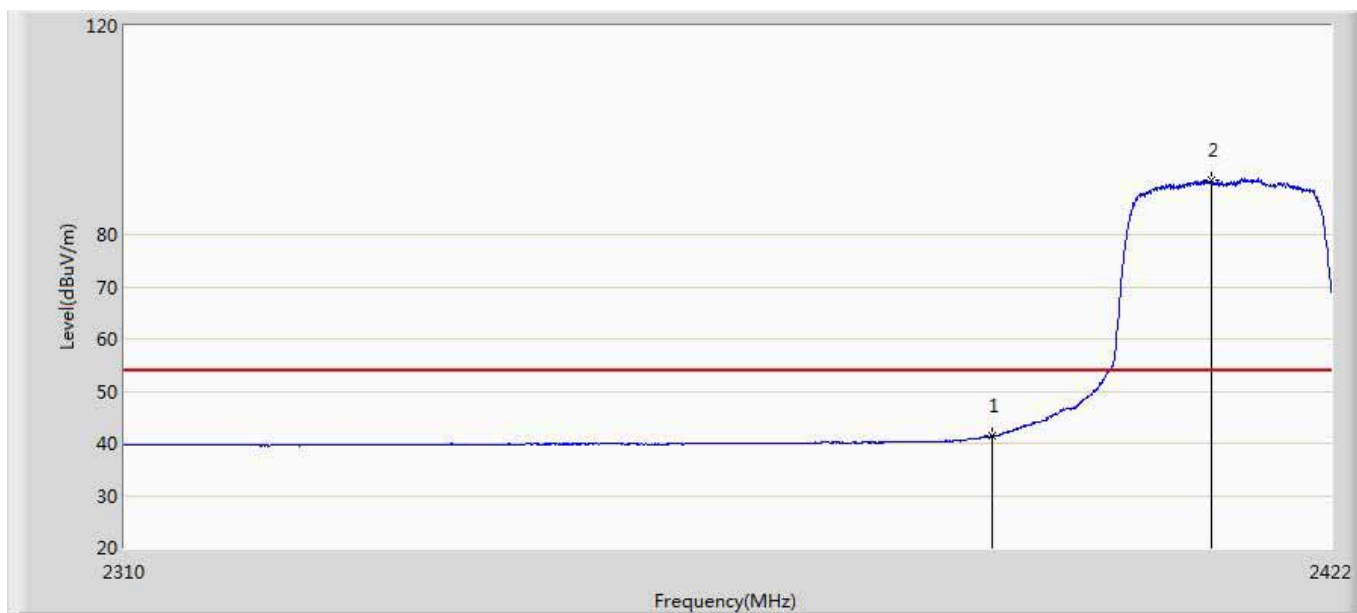
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2460.832	89.245	52.639	N/A	N/A	36.606	AV
2		2483.500	40.765	4.298	-13.235	54.000	36.467	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:43
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode3:Transmit at 2412MHz by 802.11n20	



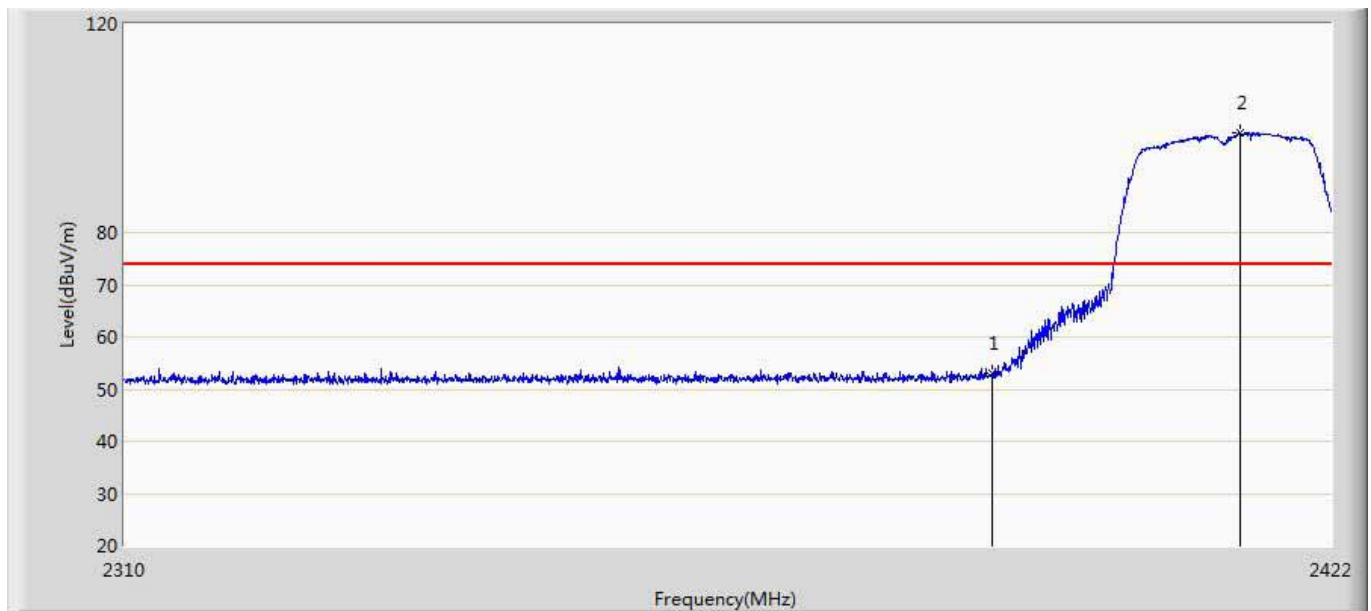
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	56.045	19.715	-17.955	74.000	36.329	PK
2	*	2410.856	102.204	65.877	N/A	N/A	36.327	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:46
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode3:Transmit at 2412MHz by 802.11n20	



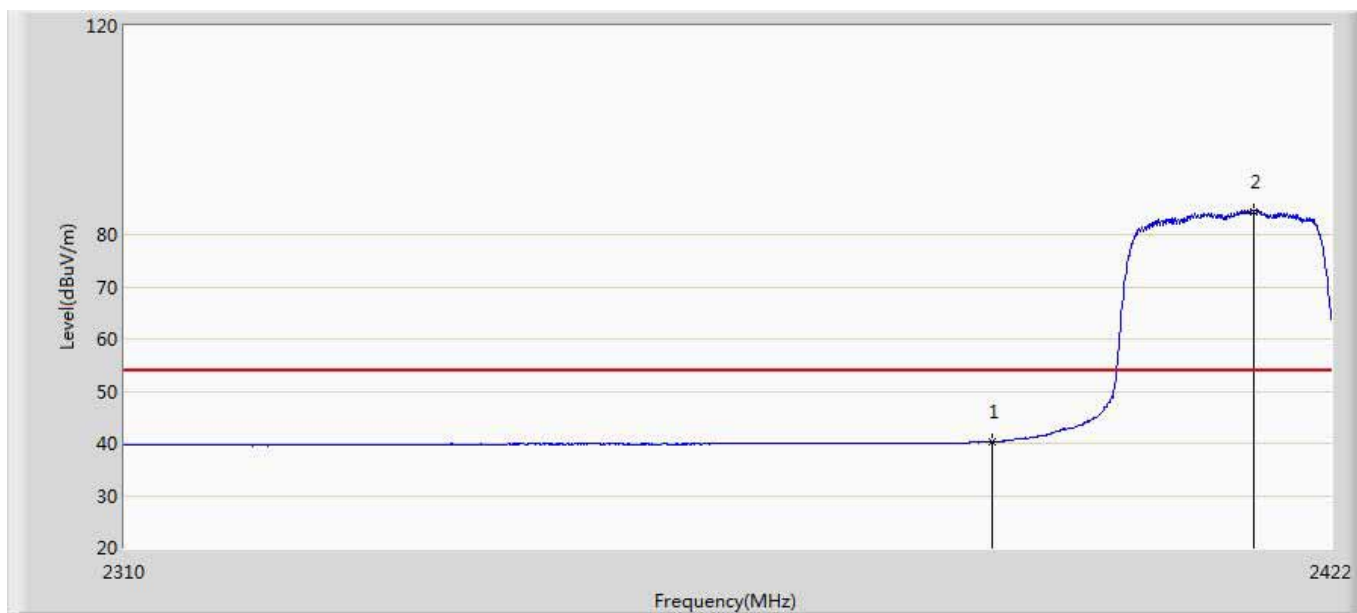
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	41.410	5.080	-12.590	54.000	36.329	AV
2	*	2410.688	90.365	54.038	N/A	N/A	36.327	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:47
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode3:Transmit at 2412MHz by 802.11n20	



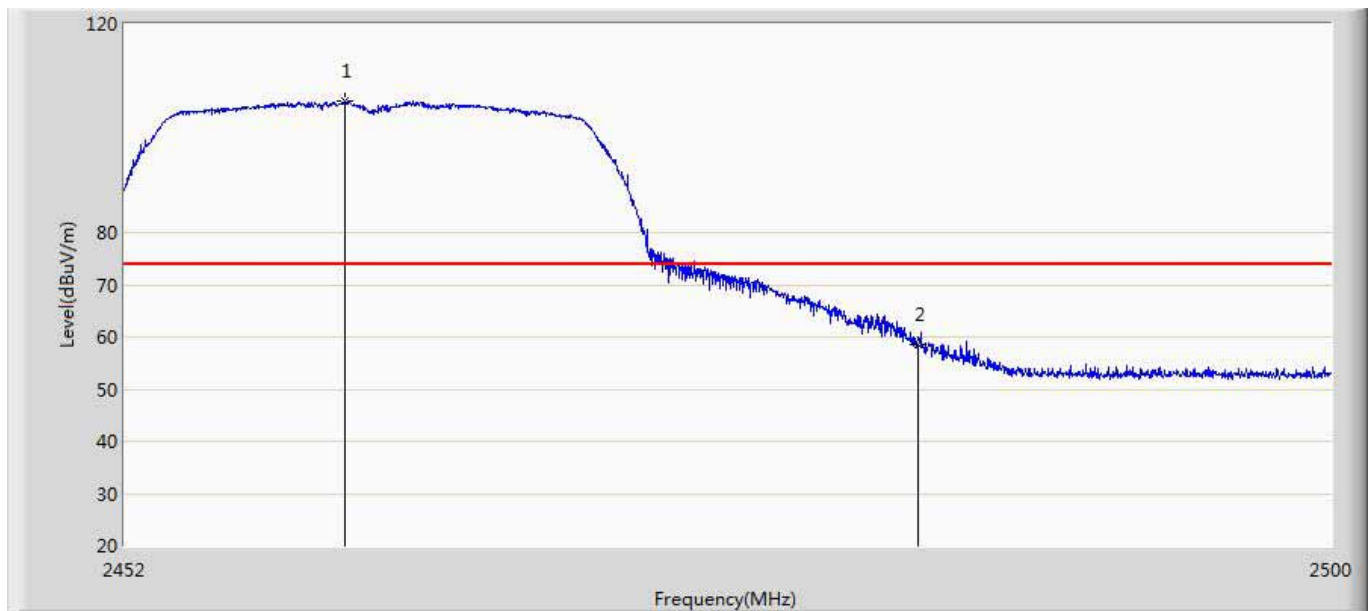
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	52.952	16.622	-21.048	74.000	36.329	PK
2	*	2413.376	99.098	62.733	N/A	N/A	36.365	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:49
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode3:Transmit at 2412MHz by 802.11n20	



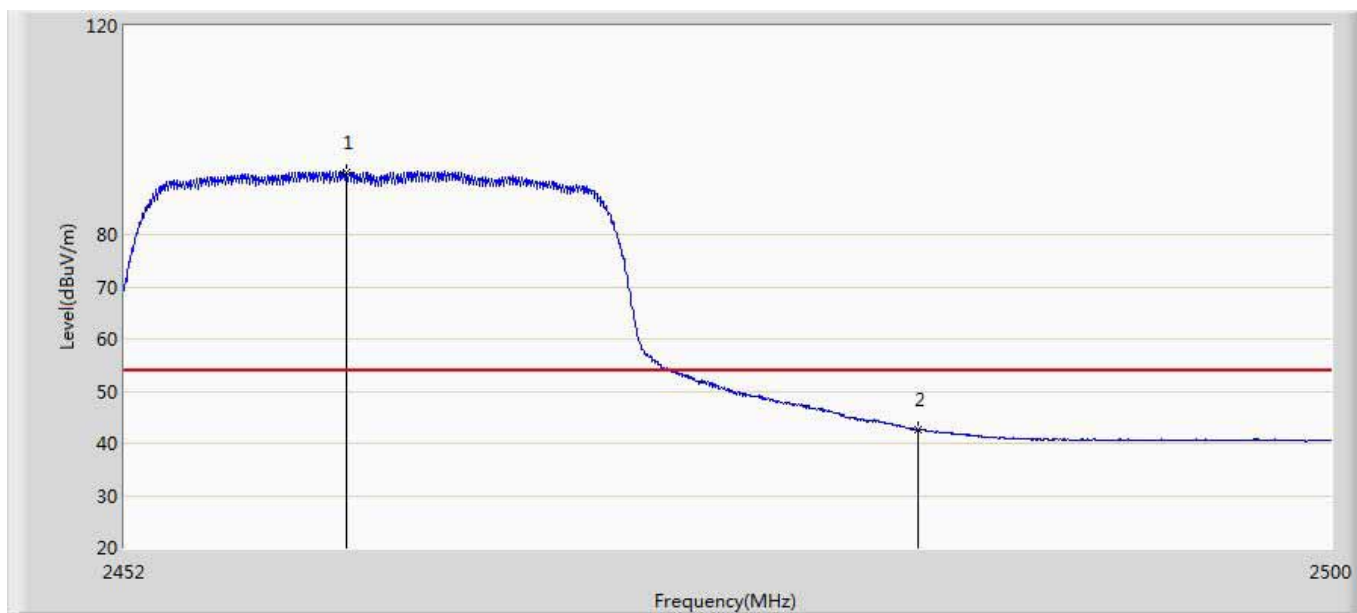
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	40.308	3.978	-13.692	54.000	36.329	AV
2	*	2414.664	84.471	48.086	N/A	N/A	36.386	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:51
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode3:Transmit at 2462MHz by 802.11n20	



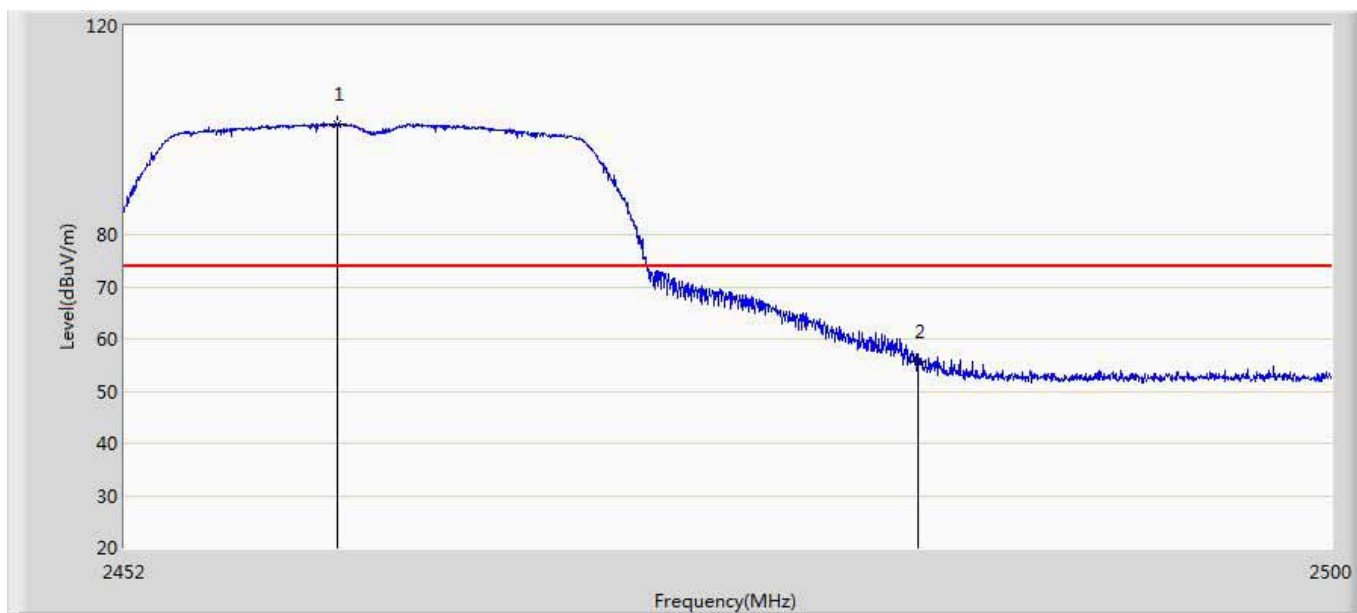
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2460.688	105.257	68.654	N/A	N/A	36.603	PK
2		2483.500	58.436	21.969	-15.564	74.000	36.467	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:54
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode3:Transmit at 2462MHz by 802.11n20	



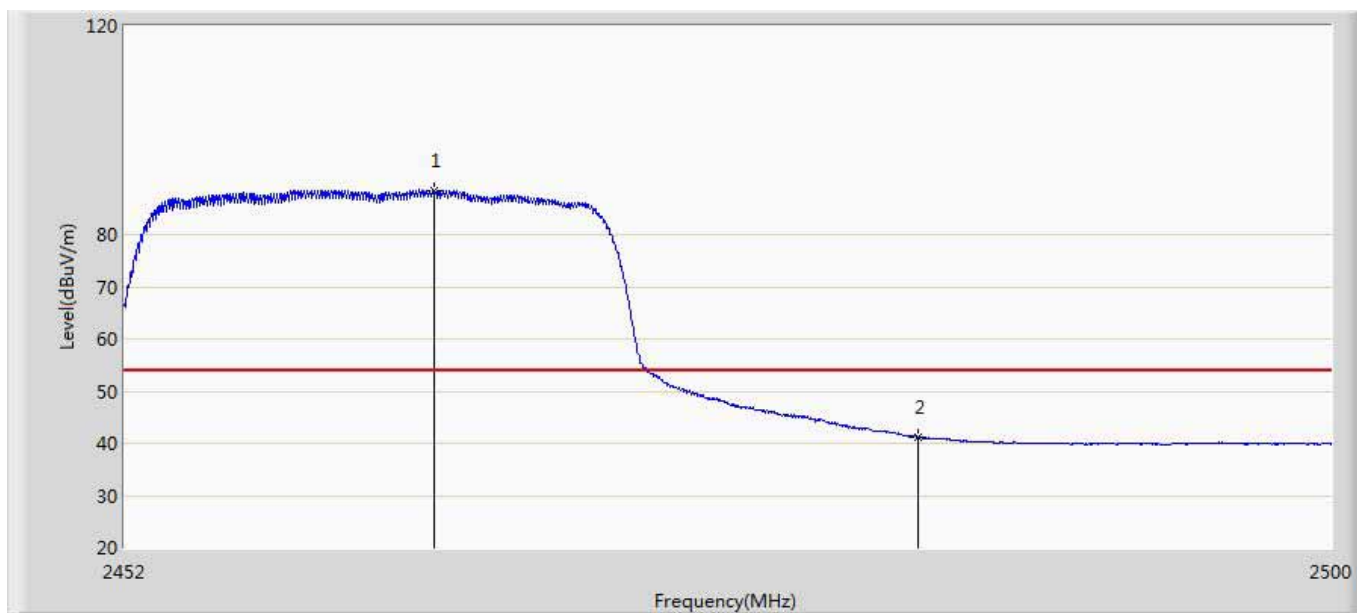
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2460.784	92.015	55.410	N/A	N/A	36.605	AV
2		2483.500	42.532	6.065	-11.468	54.000	36.467	AV

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:55
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode3:Transmit at 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	*	2460.424	101.268	64.670	N/A	N/A	36.598	PK
2		2483.500	55.632	19.165	-18.368	74.000	36.467	PK

Engineer: Ronny	
Site: AC5	Time: 2017/01/18 - 16:57
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Wahoo GPS BIKE COMPUTER	Power: 120V/60Hz
Note: Mode3:Transmit at 2462MHz by 802.11n20	



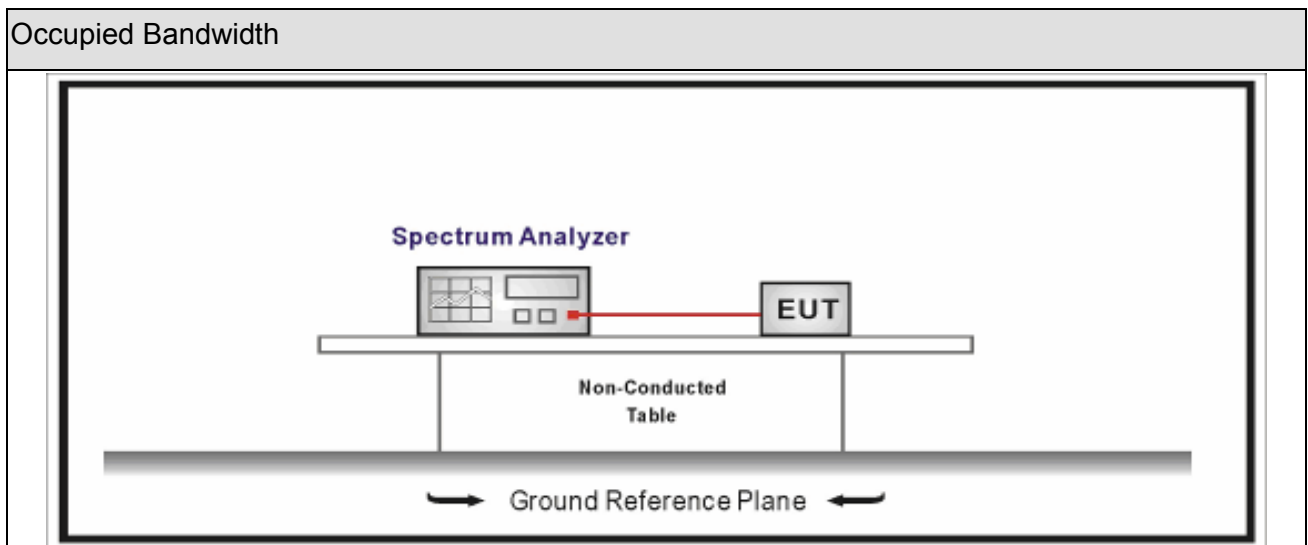
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2464.216	88.482	51.883	N/A	N/A	36.599	AV
2		2483.500	41.206	4.739	-12.794	54.000	36.467	AV

7. Occupied Bandwidth

7.1. Test Equipment

Occupied Bandwidth / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04	2018.02.03
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2016.04.09	2017.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2016.04.09	2017.04.08
Temperature/Humidity Meter	zhichen	ZC1-2	TR8-TH	2016.04.10	2017.04.09
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

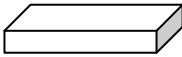
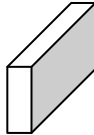
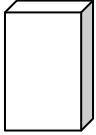
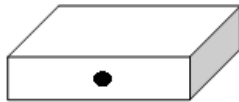
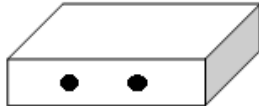
Occupied Bandwidth

Systems using digital modulation techniques operate in the 2400-2483.5 MHz. The minimum 6 dB bandwidth shall be at least 500 kHz

7.4. Test Procedure

Occupied Bandwidth				
	Reference Rule		Chapter	Description
☒	ANSI C63.10		11.8	DTS bandwidth
	☐	ANSI C63.10	11.8.1	Option 1
	☒	ANSI C63.10	11.8.2	Option 2

7.5. EUT test definition

Item	Occupied Bandwidth			
Device Category	☐	Fixed point-to-point		
	☐	Emit multiple directional beams, simultaneously or sequentially		
	☒	Other cases		
Test mode	Mode 1~3			
Test method	☐	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis ☐	Worst Axis ☐	Worst Axis ☐
	☒	Conducted		
	☒	Chain 0		
				
	☐	Chain 0	Chain 1	
				
	☐	Chain 0	Chain 1	Chain 2
				

7.6. Test Result

Product Name	: Wahoo GPS BIKE COMPUTER	Power	: AC 120V/60Hz
Test Mode	: Mode1~3	Test Site	: TR8
Test Date	: 2017.01.09		

Mode	CH.	Test Freq. (MHz)	99% Occupied Bandwidth (MHz)	6dB Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	01	2412	13.385	9.034	>500	Pass
1	06	2437	13.398	9.034	>500	Pass
1	11	2462	13.294	9.027	>500	Pass
2	01	2412	16.370	15.92	>500	Pass
2	06	2437	16.367	15.47	>500	Pass
2	11	2462	16.368	16.06	>500	Pass
3	01	2412	17.557	16.39	>500	Pass
3	06	2437	17.579	16.66	>500	Pass
3	11	2462	17.556	17.17	>500	Pass

Note : The worst case of Occupied Bandwidth as below in next page:

Mode 1 CH11 (2462MHz)



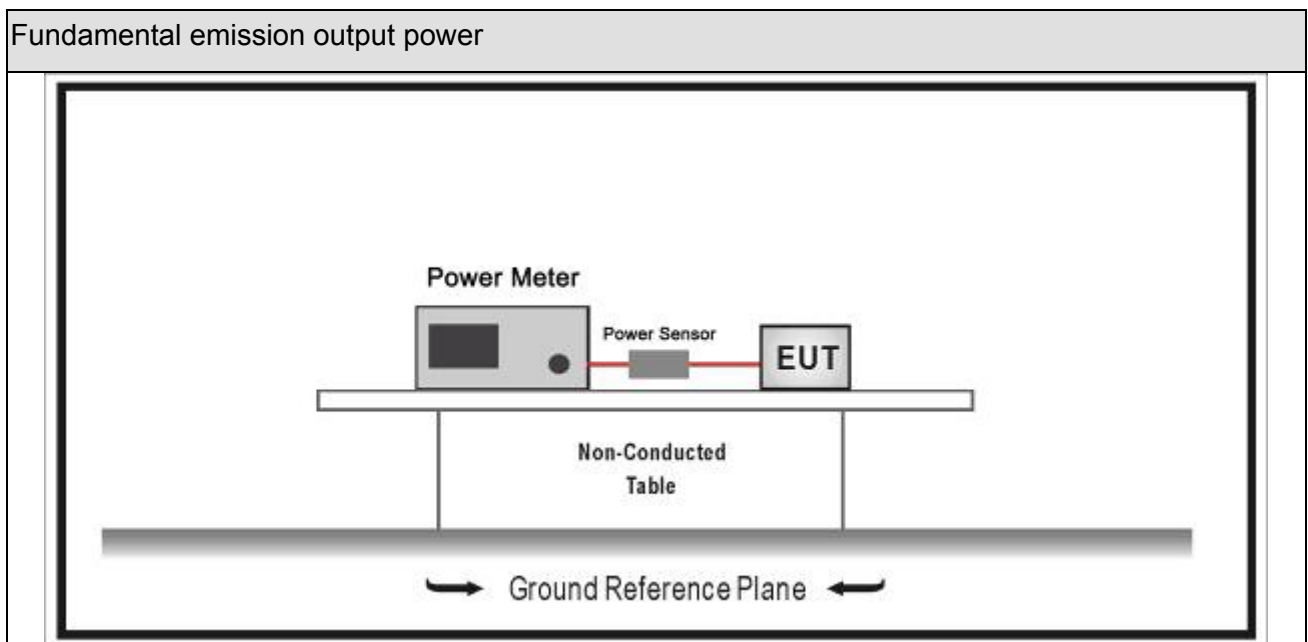
8. Fundamental emission output power

8.1. Test Equipment

Fundamental emission output power/ TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2017.02.04	2018.02.03
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04	2018.02.03
Wideband Peak Power Meter	Anritsu	ML2495A	0905006	2016.10.14	2017.10.13
Power Sensor	Anritsu	MA2411B	0846014	2016.10.14	2017.10.13
Temperature/Humidity Meter	zhicheng	ZC1-2	TR8-TH	2016.04.10	2017.04.09

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

8.2. Test Setup



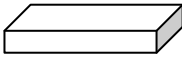
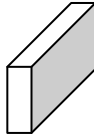
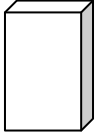
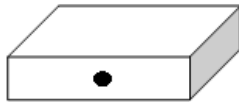
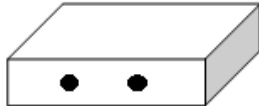
8.3. Limit

Fundamental emission output power Limit		
☒	$G_{TX} < 6\text{dBi}$	$P_{out} \leq 30\text{dBm}$
☐	$G_{TX} > 6\text{dBi}$	
☐	Non-Fix point-point	$P_{out} \leq 30 - (G_{TX} - 6)$
☐	Fix point-point	$P_{out} \leq 30 - [(G_{TX} - 6)]/3$
☐	Point-to-multipoint	$P_{out} \leq 30 - (G_{TX} - 6)$
☐	Overlap Beams	$P_{out} \leq 30 - [(G_{TX} - 6)]/3$
☐	Aggregate power transmitted simultaneously on all beams	$P_{out} \leq 30 - [(G_{TX} - 6)]/3$
☐	single directional beam	$P_{out} \leq 30 - [(G_{TX} - 6)]/3 + 8\text{dB}$
Note 1 : G_{TX} directional gain of transmitting antennas.		
Note 2 : P_{out} is maximum peak conducted output power .		

8.4. Test Procedure

Fundamental emission output power Test Method						
	References Rule			Chapter	Description	
☒	ANSI C63.10			11.9	Fundamental emission output power	
	☒	ANSI C63.10		11.9.1	Maximum peak conducted output power	
		☐	ANSI C63.10	11.9.1.1	RBW ≥ DTS bandwidth	
		☐	ANSI C63.10	11.9.1.2	Integrated band power method	
		☒	ANSI C63.10	11.9.1.3	PKPM1 Peak power meter method	
	☐	ANSI C63.10		11.9.2	Maximum conducted (average) output power	
		☐	ANSI C63.10		11.9.2.2	Measurement using a spectrum analyzer (SA)
			☐	ANSI C63.10	11.9.2.2.2	Method AVGSA-1(Duty cycle ≥ 98%)
			☐	ANSI C63.10	11.9.2.2.3	Method AVGSA-1A(Duty cycle ≥ 98%)
			☐	ANSI C63.10	11.9.2.2.4	Method AVGSA-2(Duty cycle ≤ 98%)
			☐	ANSI C63.10	11.9.2.2.5	Method AVGSA-2A(Duty cycle ≤ 98%)
			☐	ANSI C63.10	11.9.2.2.4	Method AVGSA-3
			☐	ANSI C63.10	11.9.2.2.5	Method AVGSA-3A
		☐	ANSI C63.10		11.9.2.3	Measurement using a power meter (PM)
			☐	ANSI C63.10	11.9.2.3.1	Method AVGPM
			☐	ANSI C63.10	11.9.2.3.2	Method AVGPM-G

8.5. EUT test definition

Item	Fundamental emission output power			
Device Category	☐	Fixed point-to-point		
	☐	Emit multiple directional beams, simultaneously or sequentially		
	☒	Other cases		
Test mode	Mode 1~3			
Test method	☐	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis ☐	Worst Axis ☐	Worst Axis ☐
	☒	Conducted		
	☒	Chain 0		
				
	☐	Chain 0	Chain 1	
				
	☐	Chain 0	Chain 1	Chain 2
				

8.6. Test Result

Product Name	:	Wahoo GPS BIKE COMPUTER	Power	:	AC 120V/60Hz
Test Mode	:	Mode1~3	Test Site	:	TR8
Test Date	:	2017.01.08			

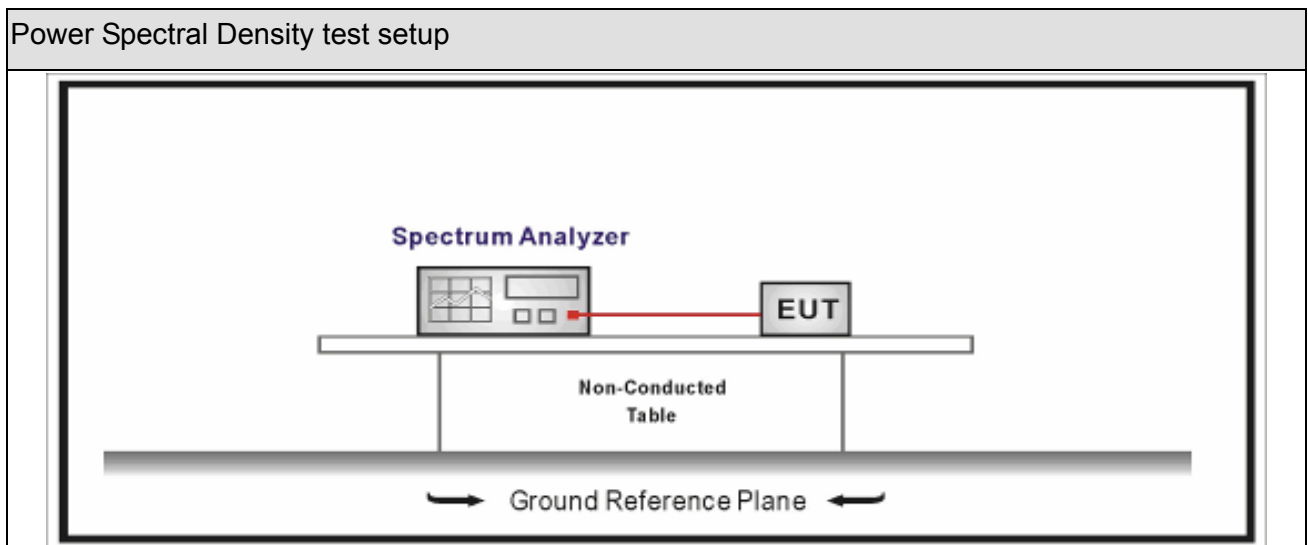
Mode	Channel	Test Frequency (MHz)	Peak Power Output (dBm)	Antenna Gain (dBi)	Limit (dBm)	Result
1	01	2412	16.11	3.09	30	Pass
1	06	2437	17.45	3.09	30	Pass
1	11	2462	17.72	3.09	30	Pass
2	01	2412	20.79	3.09	30	Pass
2	06	2437	23.46	3.09	30	Pass
2	11	2462	23.30	3.09	30	Pass
3	01	2412	22.74	3.09	30	Pass
3	06	2437	24.13	3.09	30	Pass
3	11	2462	23.97	3.09	30	Pass

9. Power Spectral Density

9.1. Test Equipment

Power Spectral Density / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04	2018.02.03
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2016.04.09	2017.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2016.04.09	2017.04.08
Temperature/Humidity Meter	zhichen	ZC1-2	TR8-TH	2016.04.10	2017.04.09
Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

9.2. Test Setup



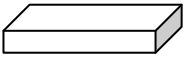
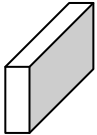
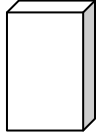
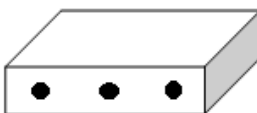
9.3. Limit

Power Spectral Density Limit
Power Spectral Density $\leq 8\text{dBm}/3\text{kHz}$

9.4. Test Procedure

Power Spectral Density Test Method				
	References Rule		Chapter	Description
☒	ANSI C63.10		11.10	Maximum power spectral density level in the fundamental emission
	☒	ANSI C63.10	11.10.2	Method PKPSD (peak PSD)
	☐	ANSI C63.10	11.10.3	Method AVGPSD-1(Duty cycle $\geq 98\%$)
	☐	ANSI C63.10	11.10.4	Method AVGPSD-1A(Duty cycle $\geq 98\%$)
	☐	ANSI C63.10	11.10.5	Method AVGPSD-2(Duty cycle $< 98\%$)
	☐	ANSI C63.10	11.10.6	Method AVGPSD-2A(Duty cycle $< 98\%$)
	☐	ANSI C63.10	11.10.7	Method AVGPSD-3
	☐	ANSI C63.10	11.10.8	Method AVGPSD-3A

9.5. EUT test definition

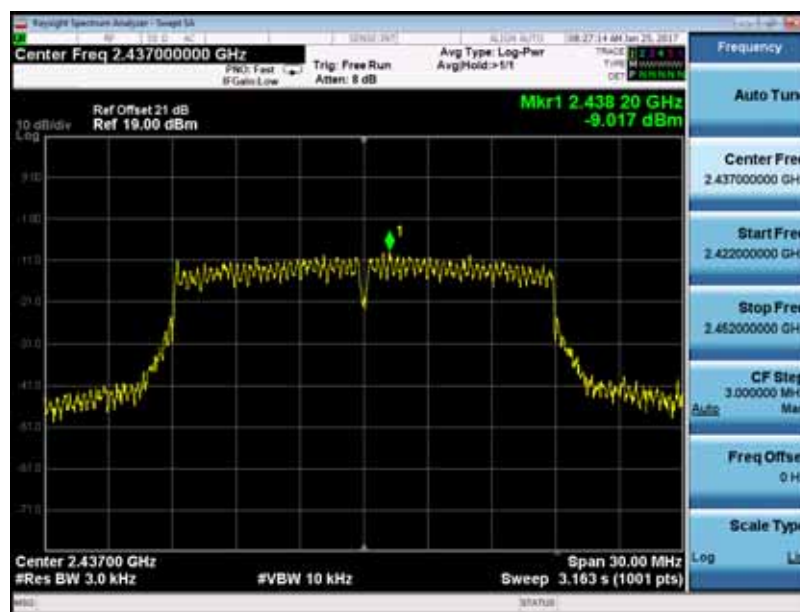
Item	Power Spectral Density Test Method			
Device Category	☐	Fixed point-to-point		
	☐	Emit multiple directional beams, simultaneously or sequentially		
	☒	Other cases		
Test mode	Mode 1~3			
Test method	☐	Radiated		
		X Axis	Y Axis	Z Axis
				
		Worst Axis ☐	Worst Axis ☐	Worst Axis ☐
	☒	Conducted		
	☒	Chain 0		
				
	☐	Chain 0	Chain 1	
				
	☐	Chain 0	Chain 1	Chain 2
				

9.6. Test Result

Product Name	: Wahoo GPS BIKE COMPUTER	Power	: AC 120V/60Hz
Test Mode	: Mode1~3	Test Site	: TR8
Test Date	: 2017.01.19		

Mode	Channel	Test Frequency (MHz)	Measurement PSD (dBm/3kHz)	Directional Gain (dBi)	Limit (dBm/3kHz)	Result
1	01	2412	-12.063	3.09	8.0	Pass
1	06	2437	-10.841	3.09	8.0	Pass
1	11	2462	-10.507	3.09	8.0	Pass
2	01	2412	-16.104	3.09	8.0	Pass
2	06	2437	-11.056	3.09	8.0	Pass
2	11	2462	-15.114	3.09	8.0	Pass
3	01	2412	-15.059	3.09	8.0	Pass
3	06	2437	-9.017	3.09	8.0	Pass
3	11	2462	-14.605	3.09	8.0	Pass

Mode 1 CH06(2437MHz)



10. Antenna Requirement

10.1. Limit

Antenna Requirement Limit	
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	

10.2. Antenna Connector Construction

Antenna Connector Construction	
☐	The use of a permanently attached antenna
☐	The antenna use of a unique coupling to the intentional radiator
☒	The use of a nonstandard antenna jack or electrical connector
Please refer to the attached document "Internal Photograph" to show the antenna connector.	

_____ The End _____