

FCC Test Report

Product Name	Bike Navigation computer
Model No.	ROX GPS 12.0
FCC ID	M5LROX-12-0

Applicant	SIGMA-ELEKTRO GMBH
Address	Dr.-Julius-Leber-Str. 15, 67433 Neustadt a. d. Weinstrase

Date of Receipt	May 25, 2017
Issued Date	July 27, 2017
Report No.	1750612R-RFUSP15V00
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 report of the equipment and evaluated measurement uncertainty herein.

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Test Report

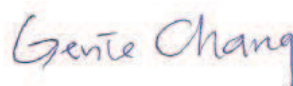
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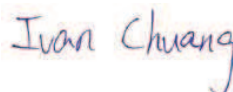
Product Name	Bike Navigation computer
Applicant	SIGMA-ELEKTRO GMBH
Address	Dr.-Julius-Leber-Str. 15, 67433 Neustadt a. d. Weinstrase
Manufacturer	SIGMA-ELEKTRO GMBH
Model No.	ROX GPS 12.0
EUT Rated Voltage	DC 3.7V (Power by Battery) or DC 5V (Power by USB)
EUT Test Voltage	DC 5V (Power by USB)
Trade Name	SIGMA-ELEKTRO GMBH
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2016 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Adm. Specialist / Genie Chang)

Tested By :



(Senior Engineer / Ivan Chuang)

Approved By :



(Director / Vincent Lin)

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- Attachment 1: EUT Test Photographs
- Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Bike Navigation computer
Trade Name	SIGMA-ELEKTRO GMBH
Model No.	ROX GPS 12.0
FCC ID	M5LROX-12-0
Frequency Range	2403~2480MHz
Channel Number	78ch
Channel Control	Auto
Type of Modulation	GFSK
Antenna Type	Ceramic PIFA Antenna
Antenna Gain	Refer to the table "Antenna List"

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	SIGMA-ELEKTRO GMBH	N/A	Ceramic PIFA Antenna	1.1 dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203

Frequency of Each Channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2403 MHz	Channel 01:	2404 MHz	Channel 02:	2405 MHz	Channel 03:	2406 MHz
Channel 04:	2407 MHz	Channel 05:	2408 MHz	Channel 06:	2409 MHz	Channel 07:	2410 MHz
Channel 08:	2411 MHz	Channel 09:	2412 MHz	Channel 10:	2413 MHz	Channel 11:	2414 MHz
Channel 12:	2415 MHz	Channel 13:	2416 MHz	Channel 14:	2417 MHz	Channel 15:	2418 MHz
Channel 16:	2419 MHz	Channel 17:	2420 MHz	Channel 18:	2421 MHz	Channel 19:	2422 MHz
Channel 20:	2423 MHz	Channel 21:	2424 MHz	Channel 22:	2425 MHz	Channel 23:	2426 MHz
Channel 24:	2427 MHz	Channel 25:	2428 MHz	Channel 26:	2429 MHz	Channel 27:	2430 MHz
Channel 28:	2431 MHz	Channel 29:	2432 MHz	Channel 30:	2433 MHz	Channel 31:	2434 MHz
Channel 32:	2435 MHz	Channel 33:	2436 MHz	Channel 34:	2437 MHz	Channel 35:	2438 MHz
Channel 36:	2439 MHz	Channel 37:	2440 MHz	Channel 38:	2441 MHz	Channel 39:	2442 MHz
Channel 40:	2443 MHz	Channel 41:	2444 MHz	Channel 42:	2445 MHz	Channel 43:	2446 MHz
Channel 44:	2447 MHz	Channel 45:	2448 MHz	Channel 46:	2449 MHz	Channel 47:	2450 MHz
Channel 48:	2451 MHz	Channel 49:	2452 MHz	Channel 50:	2453 MHz	Channel 51:	2454 MHz
Channel 52:	2455 MHz	Channel 53:	2456 MHz	Channel 54:	2457 MHz	Channel 55:	2458 MHz
Channel 56:	2459 MHz	Channel 57:	2460 MHz	Channel 58:	2461 MHz	Channel 59:	2462 MHz
Channel 60:	2463 MHz	Channel 61:	2464 MHz	Channel 62:	2465 MHz	Channel 63:	2466 MHz
Channel 64:	2467 MHz	Channel 65:	2468 MHz	Channel 66:	2469 MHz	Channel 67:	2470 MHz
Channel 68:	2471 MHz	Channel 69:	2472 MHz	Channel 70:	2473 MHz	Channel 71:	2474 MHz
Channel 72:	2475 MHz	Channel 73:	2476 MHz	Channel 74:	2477 MHz	Channel 75:	2478 MHz
Channel 76:	2479 MHz	Channel 77:	2480 MHz				

Note:

1. The EUT is a Bike Navigation computer with a built-in 2.4GHz WLAN 、Bluetooth and ANT+ transceiver, this report for ANT+.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance of ANT+ transmitter with Part 15 Subpart C Paragraph 15.249 for spread spectrum devices.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit
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1.2. Operational Description

The EUT is a Bike Navigation computer with built-in ANT+ transceiver. The number of the channels is 78 in ANT+ mode. This device provides a kinds of transmitting speed and modulation, GFSK(1Mbps). The antenna is Ceramic PIFA Antenna.

This equipment includes WLAN 、Bluetooth and ANT+, which can not transmit signals simultaneously.

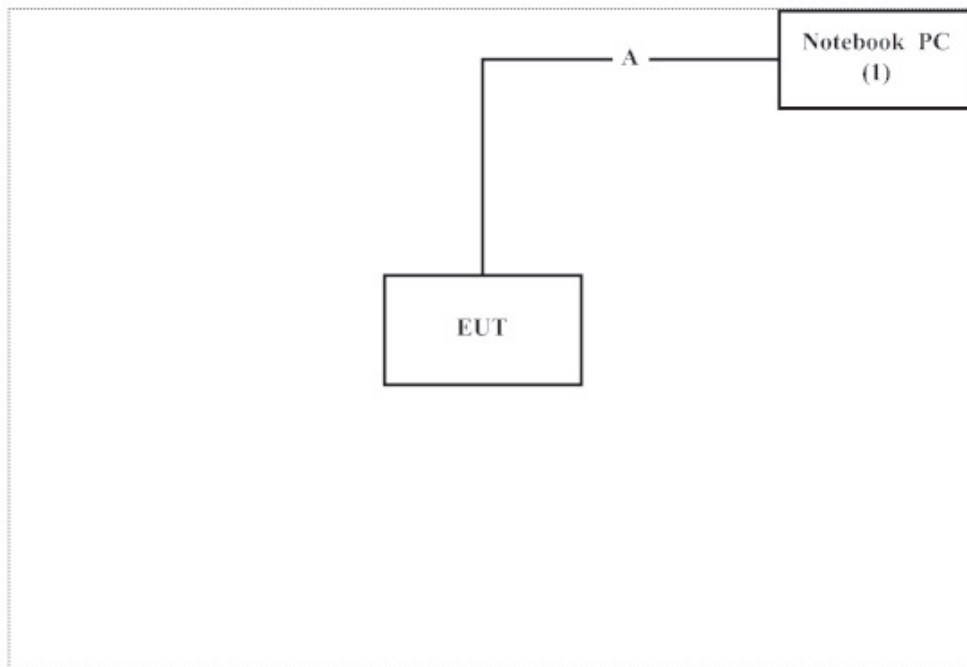
1.3. Tested System Details

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

Product	Manufacturer	Model No.	Serial No.	Power Cord	
1	Notebook PC	DELL	P62G	CY9FJC2	N/A

Signal Cable Type	Signal cable Description
A	Micro USB to USB Cable
	Non-Shielded, 1.5m

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Execute software “Ant RF Test App (Ver 1.00.00)” on the EUT.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Press “OK” to start the continuous Transmit.
- (5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

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Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
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TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW1014

1.7. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	161601	2017.01.06	2018.01.05
X	Two-Line V-Network	R&S	ENV216	101306	2017.02.16	2018.02.15
X	Two-Line V-Network	R&S	ENV216	101307	2017.03.17	2018.03.16
X	Coaxial Cable	Quietek	RG400_BNC	RF001	2017.05.24	2018.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

For Conducted measurements /ASR4

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103464	2017.01.09	2018.01.08
	Power Meter	Anritsu	ML2496A	1548003	2016.12.15	2017.12.14
	Power Sensor	Anritsu	MA2411B	1531024	2016.12.15	2017.12.14
	Power Sensor	Anritsu	MA2411B	1531025	2016.12.15	2017.12.14
	Bluetooth Tester	R&S	CBT	101238	2017.01.03	2018.01.02

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek Conduction Test System V8.0.110

For Radiated measurements /ACB1

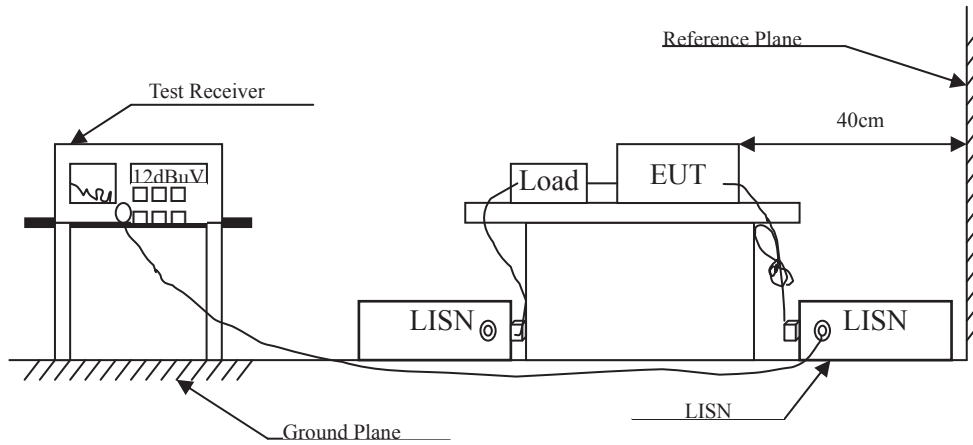
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	TESEQ	HLA6121	37133	2016.03.18	2018.03.17
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2017.02.09	2018.02.08
X	Horn Antenna	ETS-Lindgren	3117	00203800	2016.10.13	2017.10.12
X	Horn Antenna	Com-Power	AH-840	101087	2017.05.24	2018.05.23
X	Pre-Amplifier	EMCI	EMC001330	980316	2017.05.14	2018.05.13
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2017.05.15	2018.05.14
X	Pre-Amplifier	EMCI	EMC05820SE	980310	2017.05.15	2018.05.14
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2017.05.17	2018.05.16
X	Filter	MICRO TRONICS	BRM50702	G251	2016.08.11	2017.08.10
	Filter	MICRO TRONICS	BRM50716	G188	2016.08.11	2017.08.10
X	EMI Test Receiver	R&S	ESR7	101602	2016.12.15	2017.12.14
X	Spectrum Analyzer	R&S	FSV40	101148	2017.01.24	2018.01.23
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2017.05.25	2018.05.24
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2016.08.11	2017.08.10

Note:

1. Loop Antenna is calibrated every two year, the other equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

2. Conducted Emission

2.1. Test Setup



2.2. Limits

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

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Uncertainty

± 2.35 dB

2.5. Test Result of Conducted Emission

Product : Bike Navigation computer
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Date : 2017/06/21
 Test Mode : Mode 1: Transmit (2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 1					
Quasi-Peak					
0.164	9.703	36.365	46.068	-19.532	65.600
0.490	9.736	27.229	36.964	-19.322	56.286
0.930	9.752	14.612	24.364	-31.636	56.000
1.400	9.760	16.557	26.316	-29.684	56.000
3.300	9.836	20.931	30.767	-25.233	56.000
9.700	9.990	18.742	28.733	-31.267	60.000
Average					
0.164	9.703	22.961	32.664	-22.936	55.600
0.490	9.736	20.606	30.342	-15.944	46.286
0.930	9.752	8.314	18.066	-27.934	46.000
1.400	9.760	10.901	20.660	-25.340	46.000
3.300	9.836	11.771	21.607	-24.393	46.000
9.700	9.990	14.287	24.278	-25.722	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Bike Navigation computer
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Date : 2017/06/21
 Test Mode : Mode 1: Transmit (2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 2					
Quasi-Peak					
0.164	9.696	35.493	45.189	-20.411	65.600
0.480	9.725	28.029	37.754	-18.817	56.571
0.950	9.754	15.132	24.886	-31.114	56.000
1.400	9.760	19.056	28.816	-27.184	56.000
3.500	9.843	21.227	31.070	-24.930	56.000
10.000	9.996	11.342	21.338	-38.662	60.000
Average					
0.164	9.696	22.524	32.220	-23.380	55.600
0.480	9.725	19.522	29.247	-17.324	46.571
0.950	9.754	8.882	18.636	-27.364	46.000
1.400	9.760	13.551	23.311	-22.689	46.000
3.500	9.843	10.860	20.703	-25.297	46.000
10.000	9.996	6.859	16.855	-33.145	50.000

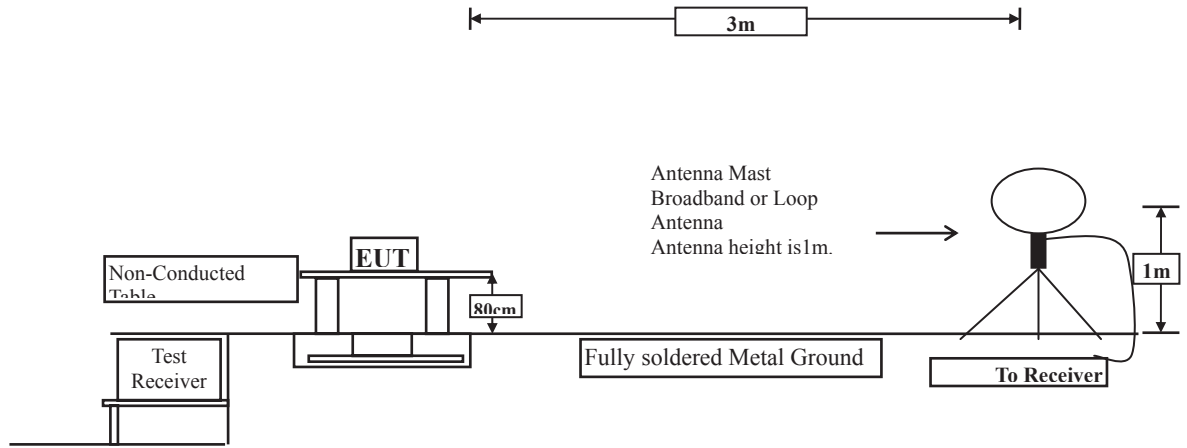
Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

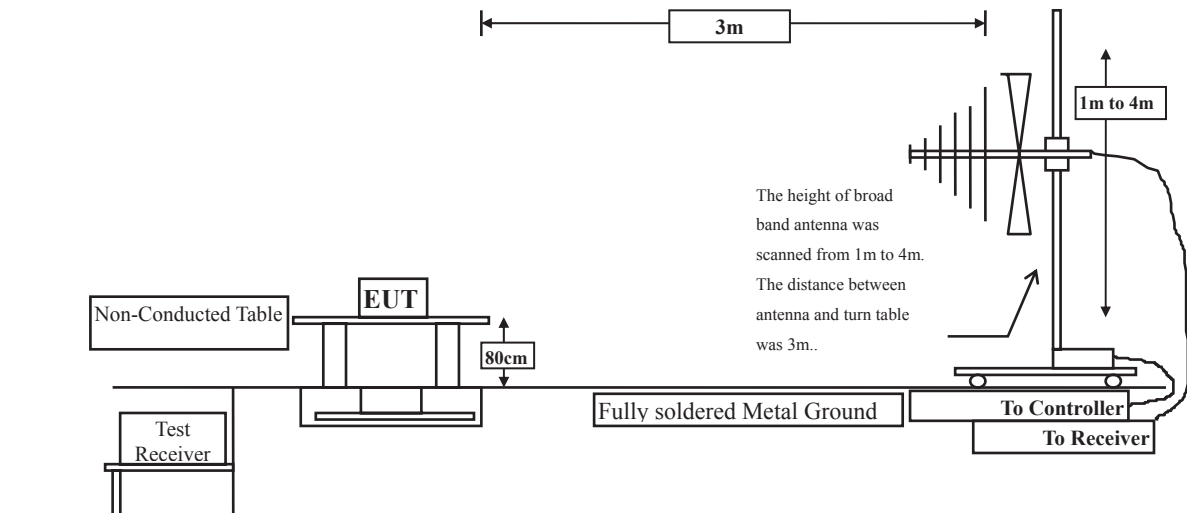
3. Radiated Emission

3.1. Test Setup

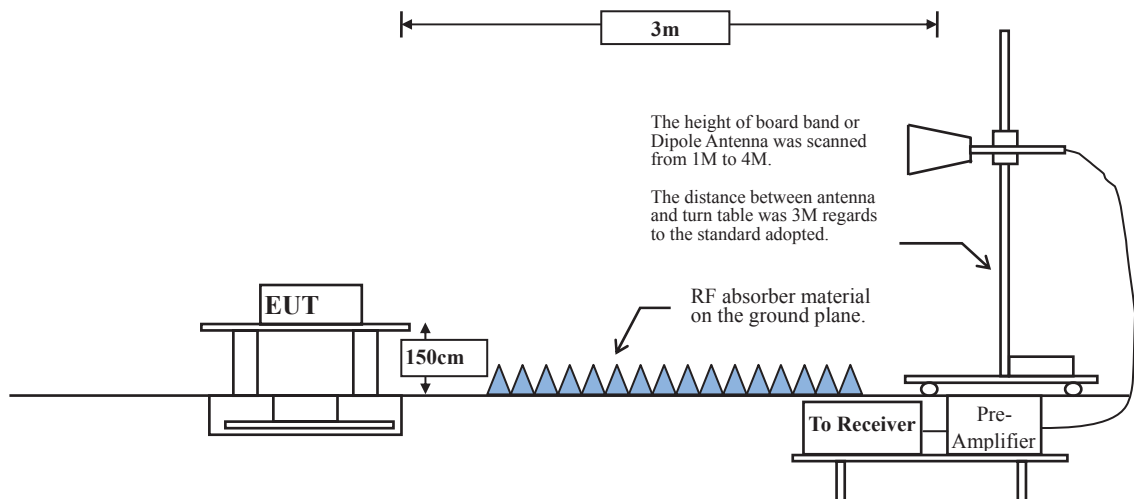
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.2. Limits

➤ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.249 Limits				
Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m @3m)	(dBuV/m @3m)	(uV/m @3m)	(dBuV/m @3m)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54

Remarks : 1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)

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.

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

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

3.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.249 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, 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 between 1 meter and 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 C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna. The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

3.4. Uncertainty

Horizontal :

30-300MHz: ± 4.08 dB ; 300M-1GHz: ± 3.86 dB ; 1-18GHz: ± 3.77 dB ; 18-40GHz: ± 3.98 dB ◦

Vertical :

30-300MHz: ± 4.81 dB ; 300M-1GHz: ± 3.87 dB ; 1-18GHz: ± 3.83 dB ; 18-40GHz: ± 3.98 dB ◦

3.5. Test Result of Radiated Emission

Product : Bike Navigation computer
 Test Item : Fundamental Radiated Emission
 Test Date : 2017/07/21
 Test Mode : Mode 1: Transmit (X-Axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2403.000	10.316	84.820	95.136	-18.864	114.000
2441.000	10.470	86.500	96.970	-17.030	114.000
2480.000	10.628	82.810	93.438	-20.562	114.000
Vertical					
Peak Detector:					
2403.000	10.316	75.690	86.006	-27.994	114.000
2441.000	10.470	78.770	89.240	-24.760	114.000
2480.000	10.628	74.620	85.248	-28.752	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
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Horizontal**Average Detector:**

2403.000	95.136	-27.234	67.902	-26.098	94.000
2441.000	96.970	-27.234	69.736	-24.264	94.000
2480.000	93.438	-27.234	66.204	-27.796	94.000

Vertical**Average Detector:**

2403.000	86.006	-27.234	58.772	-35.228	94.000
2441.000	89.240	-27.234	62.006	-31.994	94.000
2480.000	85.248	-27.234	58.014	-35.986	94.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Fundamental Radiated Emission
 Test Date : 2017/07/21
 Test Mode : Mode 1: Transmit (Y-Axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2403.000	10.316	81.680	91.996	-22.004	114.000
2441.000	10.470	85.250	95.720	-18.280	114.000
2480.000	10.628	81.460	92.088	-21.912	114.000
Vertical					
Peak Detector:					
2403.000	10.316	83.640	93.956	-20.044	114.000
2441.000	10.470	86.510	96.980	-17.020	114.000
2480.000	10.628	82.320	92.948	-21.052	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
2403.000	91.996	-27.234	64.762	-29.238	94.000
2441.000	95.720	-27.234	68.486	-25.514	94.000
2480.000	92.088	-27.234	64.854	-29.146	94.000
Vertical					
Average Detector:					
2403.000	93.956	-27.234	66.722	-27.278	94.000
2441.000	96.980	-27.234	69.746	-24.254	94.000
2480.000	92.948	-27.234	65.714	-28.286	94.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Fundamental Radiated Emission
 Test Date : 2017/07/21
 Test Mode : Mode 1: Transmit (Z-Axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2403.000	10.316	82.310	92.626	-21.374	114.000
2441.000	10.470	85.130	95.600	-18.400	114.000
2480.000	10.628	81.540	92.168	-21.832	114.000
Vertical					
Peak Detector:					
2403.000	10.316	81.440	91.756	-22.244	114.000
2441.000	10.470	84.120	94.590	-19.410	114.000
2480.000	10.628	79.910	90.538	-23.462	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
2403.000	92.626	-27.234	65.392	-28.608	94.000
2441.000	95.600	-27.234	68.366	-25.634	94.000
2480.000	92.168	-27.234	64.934	-29.066	94.000
Vertical					
Average Detector:					
2403.000	91.756	-27.234	64.522	-29.478	94.000
2441.000	94.590	-27.234	67.356	-26.644	94.000
2480.000	90.538	-27.234	63.304	-30.696	94.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit (2403MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4806.000	-3.770	46.620	42.849	-31.151	74.000
7209.000	-0.781	45.170	44.389	-29.611	74.000
9612.000	1.074	44.150	45.224	-28.776	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
--					54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit (2403MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Vertical					
Peak Detector:					
4806.000	-3.770	46.330	42.559	-31.441	74.000
7209.000	-0.781	44.830	44.049	-29.951	74.000
9612.000	1.074	44.880	45.954	-28.046	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Vertical					
Average Detector:					
--					54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit (2441MHz)

Frequency MHz	Correct Factor Db	Reading Level dBuV	Measurement Level dBuV/m	Margin Db	Limit dBuV/m
Horizontal					
Peak Detector:					
4882.000	-3.770	45.940	42.170	-31.830	74.000
7323.000	-0.712	45.810	45.098	-28.902	74.000
9764.000	1.371	45.100	46.472	-27.528	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Average Detector:					
--					54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit (2441MHz)

Frequency MHz	Correct Factor Db	Reading Level dBuV	Measurement Level dBuV/m	Margin Db	Limit dBuV/m
Vertical					
Peak Detector:					
4882.000	-3.770	45.760	41.990	-32.010	74.000
7323.000	-0.712	45.620	44.908	-29.092	74.000
9764.000	1.371	45.220	46.592	-27.408	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Vertical					
Average Detector:					
--					54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit (2480MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4960.000	-3.732	45.710	41.978	-32.022	74.000
7440.000	-0.646	45.750	45.103	-28.897	74.000
9920.000	1.687	44.280	45.967	-28.033	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------------	------------------------------------	--------------------------------	--------------	-----------------

**Horizontal
Average Detector:**

--					54.000
----	--	--	--	--	--------

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit (2480MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Vertical					
Peak Detector:					
4960.000	-3.732	45.410	41.678	-32.322	74.000
7440.000	-0.646	44.870	44.223	-29.777	74.000
9920.000	1.687	44.650	46.337	-27.663	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------------	------------------------------------	--------------------------------	--------------	-----------------

Vertical

Average Detector:

--					54.000
----	--	--	--	--	--------

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : General Radiated Emission Data
 Test Date : 2017/06/22
 Test Mode : Mode 1: Transmit (2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
80.609	-15.509	35.687	20.178	-19.822	40.000
146.681	-10.855	32.573	21.718	-21.782	43.500
202.913	-13.531	42.189	28.659	-14.841	43.500
323.812	-9.555	30.404	20.849	-25.151	46.000
402.536	-7.524	29.485	21.961	-24.039	46.000
524.841	-5.044	29.382	24.338	-21.662	46.000
Vertical					
58.116	-11.732	39.704	27.972	-12.028	40.000
138.246	-11.258	30.267	19.009	-24.491	43.500
171.986	-11.311	30.656	19.345	-24.155	43.500
298.507	-10.106	30.714	20.608	-25.392	46.000
405.348	-7.459	29.714	22.255	-23.745	46.000
499.536	-5.553	28.483	22.929	-23.071	46.000

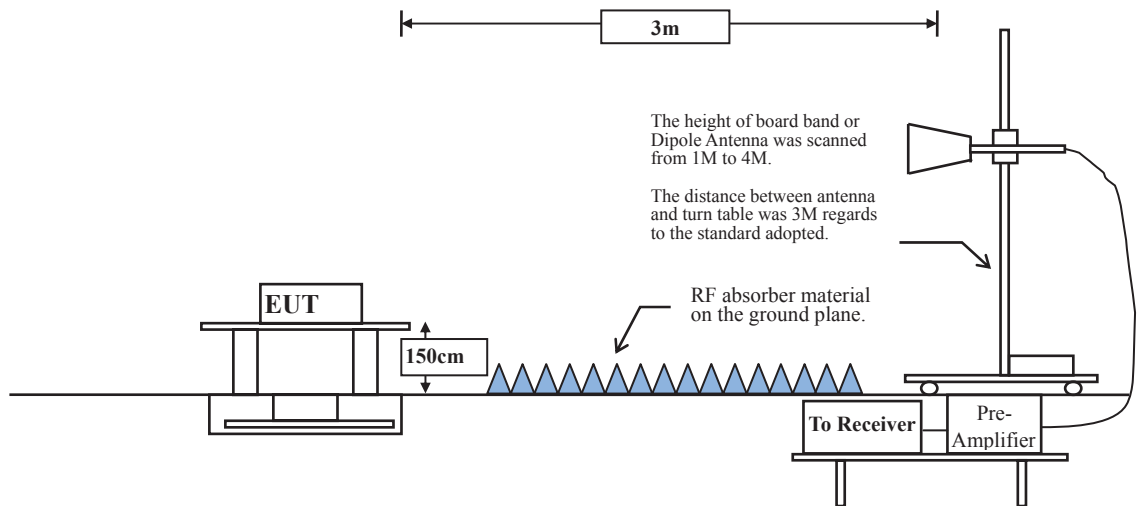
Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.
7. No emission found between lowest internal used/generated frequency to 30MHz.

4. Band Edge

4.1. Test Setup

RF Radiated Measurement:



4.2. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dBμV /m) = 20 log E field strength (uV/m)

4.3. Test Procedure

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 can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

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

4.4. Uncertainty

Horizontal polarization : 1-18GHz: ± 3.77 dB

Vertical polarization : 1-18GHz : ± 3.83 dB

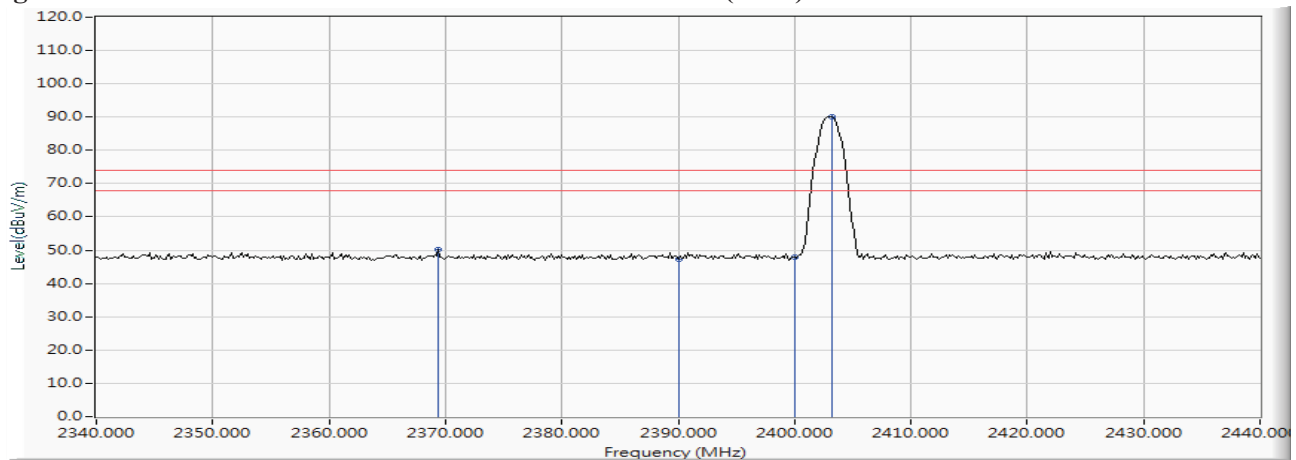
4.5. Test Result of Band Edge

Product : Bike Navigation computer
 Test Item : Band Edge Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
0 (Peak)	2369.420	11.492	38.631	50.123	74.00	54.00	Pass
0 (Peak)	2390.000	11.556	35.675	47.231	74.00	54.00	Pass
0 (Peak)	2400.000	11.579	36.259	47.838	74.00	54.00	Pass
0 (Peak)	2403.188	11.586	78.428	90.014	--	--	--

Figure Channel 0: Horizontal (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
0 (Average)	2369.420	50.123	-27.234	22.889	74.00	54.00	Pass
0 (Average)	2390.000	47.231	-27.234	19.997	74.00	54.00	Pass
0 (Average)	2400.000	47.838	-27.234	20.604	74.00	54.00	Pass

Note:

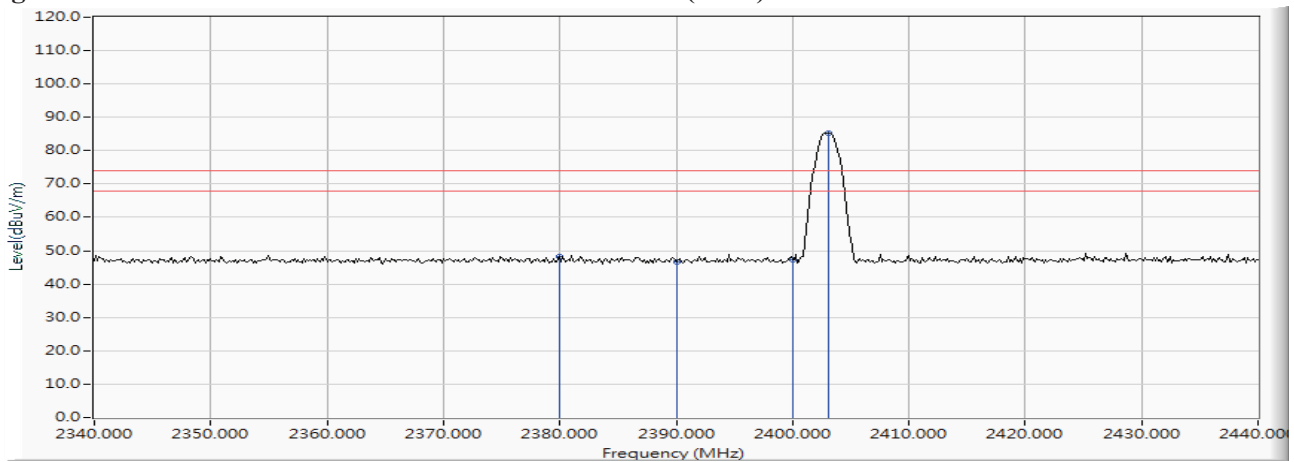
1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Band Edge Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
0 (Peak)	2380.000	11.529	36.790	48.319	74.00	54.00	Pass
0 (Peak)	2390.000	11.556	35.094	46.650	74.00	54.00	Pass
0 (Peak)	2400.000	11.579	35.867	47.446	74.00	54.00	Pass
0 (Peak)	2403.043	11.586	73.800	85.386	--	--	--

Figure Channel 0: Vertical (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
0 (Average)	2380.000	48.319	-27.234	21.085	74.00	54.00	Pass
0 (Average)	2390.000	46.650	-27.234	19.416	74.00	54.00	Pass
0 (Average)	2400.000	47.446	-27.234	20.212	74.00	54.00	Pass

Note:

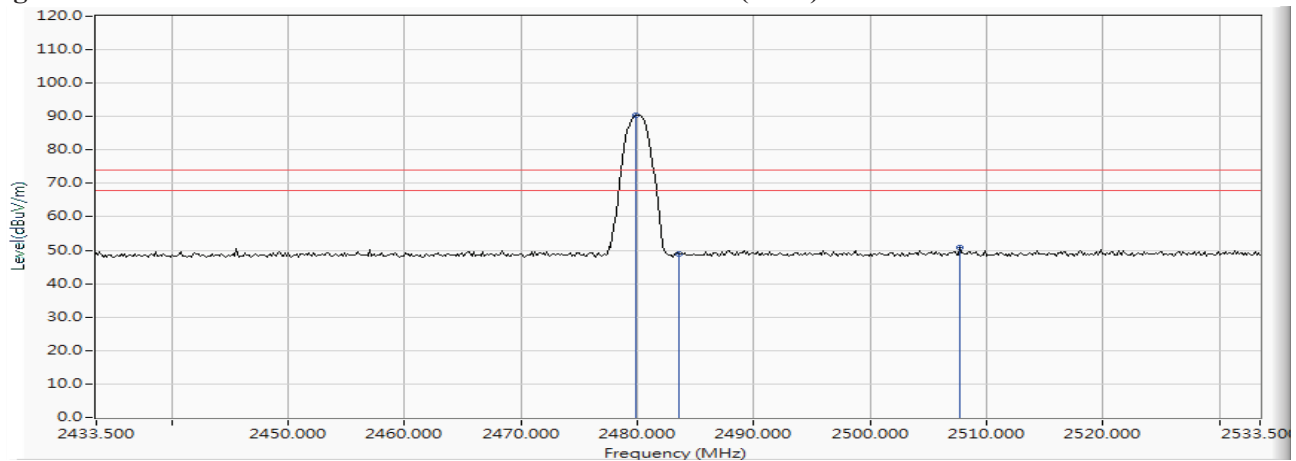
1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Band Edge Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
77 (Peak)	2479.877	11.791	78.501	90.292	--	--	--
77 (Peak)	2483.500	11.800	36.962	48.762	74.00	54.00	Pass
77 (Peak)	2507.703	11.855	38.916	50.771	74.00	54.00	Pass

Figure Channel 77: Horizontal (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
77 (Average)	2483.500	48.762	-27.234	21.528	74.00	54.00	Pass
77 (Average)	2507.703	50.771	-27.234	23.537	74.00	54.00	Pass

Note:

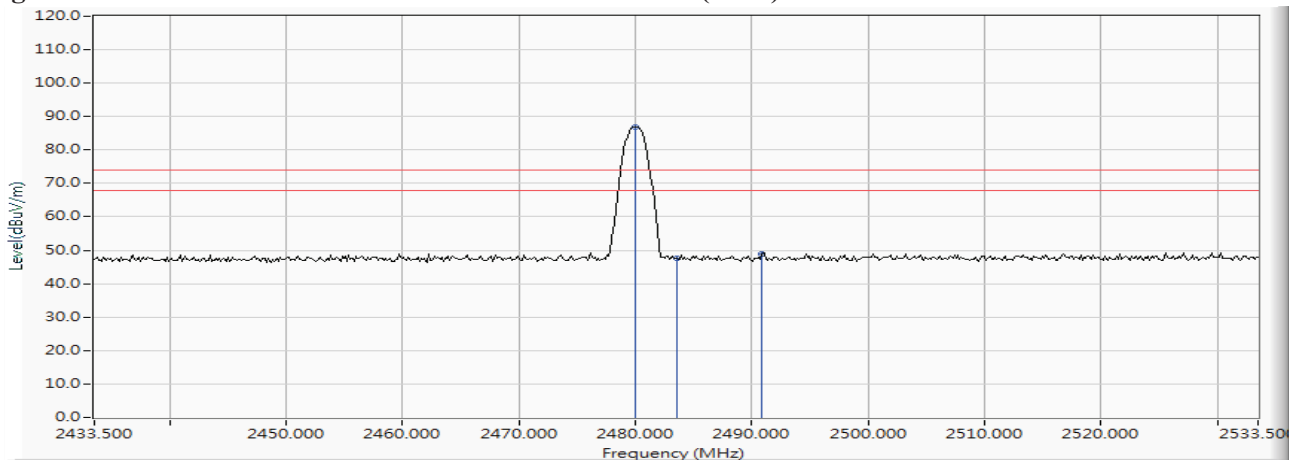
1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 5.

Product : Bike Navigation computer
 Test Item : Band Edge Data
 Test Date : 2017/07/06
 Test Mode : Mode 1: Transmit

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
77 (Peak)	2480.022	11.791	75.056	86.847	--	--	--
77 (Peak)	2483.500	11.800	35.821	47.621	74.00	54.00	Pass
77 (Peak)	2490.891	11.817	36.944	48.761	74.00	54.00	Pass

Figure Channel 77: Vertical (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

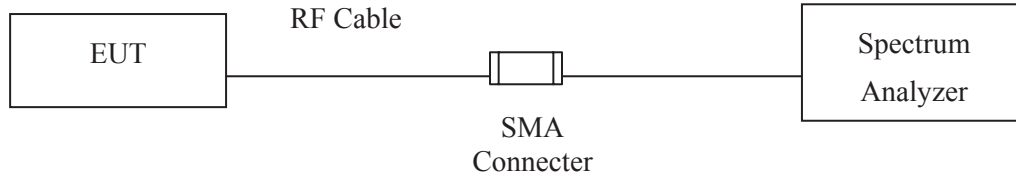
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
77 (Average)	2483.500	47.621	-27.234	20.387	74.00	54.00	Pass
77 (Average)	2490.891	48.761	-27.234	21.527	74.00	54.00	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 5.

5. Duty Cycle

5.1. Test Setup

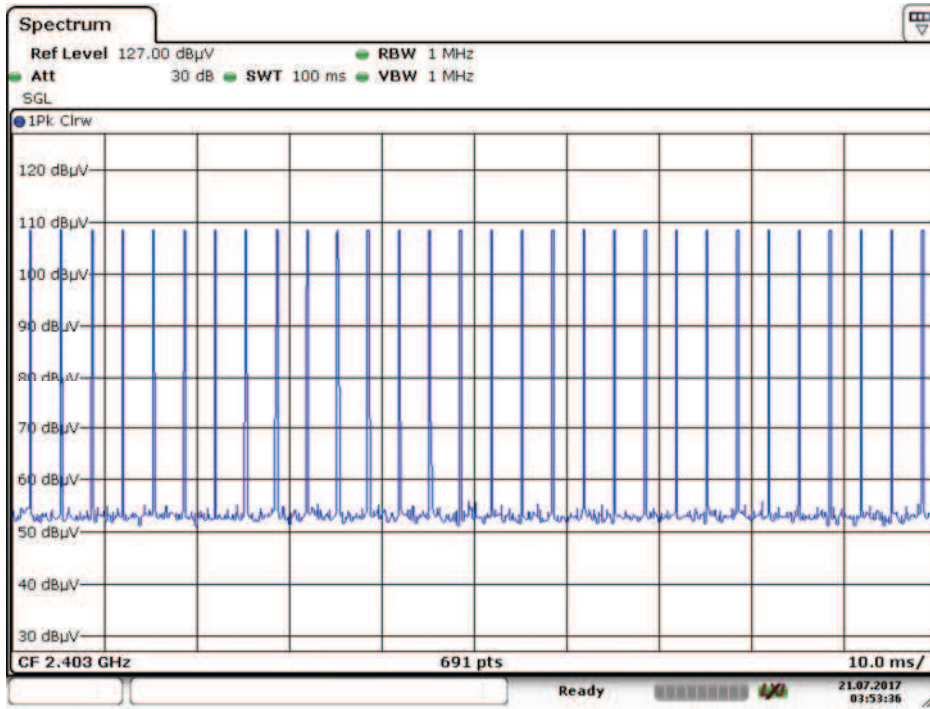


5.2. Uncertainty

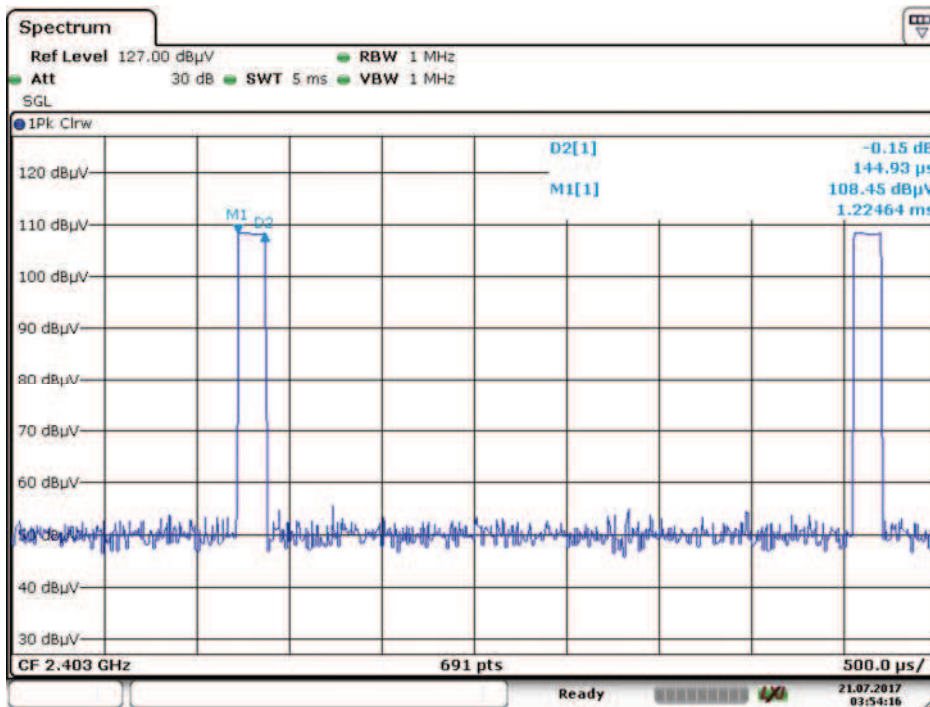
$\pm 2.31\text{ms}$

5.3. Test Result of Duty Cycle

Product : Bike Navigation computer
 Test Item : Duty Cycle Data
 Test Mode : Mode 1: Transmit



Date: 21 JUL 2017 03:53:36



Date: 21 JUL 2017 03:54:17

Time on of 100ms= $0.1449\text{ms} \times 30 = 4.348\text{ms}$

Duty Cycle= $4.348\text{ms} / 100\text{ms} = 0.04348$

Duty Cycle correction factor= $20 \text{ LOG } 0.04348 = -27.234 \text{ dB}$

Duty Cycle correction factor	-27.234	dB
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6. EMI Reduction Method During Compliance Testing

No modification was made during testing.