

TEST REPORT

DT&C Co., Ltd. 42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel : 031-321-2664, Fax : 031-321-1664	Report No : DRTFCC1603-0043 Pages:(1) / (19) page	
1. Customer • Name : HANDAN BroadInfoCom Co., Ltd. • Address : 4-5 Fl. Shinsung Plaza, 18, Seolleung-ro, 93-gil Gangnam-gu, Seoul, South Korea 2. Use of Report : FCC Original Grant 3. Product Name (FCCID) : Bike Safety Tail Light (2AC4W-R-200) 4. Date of Test : 2016-02-29~ 2016-03-15 5. Test Method Used: FCC Part 15 Subpart C.249 6. Testing Environment : See appended test report 7. Test Result : ☒ Pass ☐ Fail		
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.		
Affirmation	Tested by Name : Inhee Bae (Signature)	Technical Manager Name : GeunKi Son (Signature)
2016 . 03 . 18 . DT&C Co., Ltd.		

Test Report Version

Test Report No.	Date	Description
DRTFCC1603-0043	Mar. 18, 2016	Initial issue

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1. General Information

1.1 Testing Laboratory

DT&C Co., Ltd.		
Standard	Site number	Address
FCC	☒ 165783	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐ 804488	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐ 596748	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐ 678747	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-080
IC	☐ 5740A-3	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐ 5740A-2	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-080
www.dtnet.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.2 Details of Applicant

Applicant : HANDAN BroadInfoCom Co., Ltd.
 Address : 4-5 Fl. Shinsung Plaza, 18, Seolleung-ro, 93-gil Gangnam-gu Seoul South Korea
 Contact person : Kwang Hwan An

1.3 Description of EUT

FCC Equipment Class	Part 15 Low Power Communication Device Transmitter
Equipment type	Bike Safety Tail Light
Model Name	R-200
Add Model Name	NA
Serial Number	Identical prototype
Hardware version	R-200 (5)
Software version	R200-FCC-100
Power Supply	DC 3.7 V
Frequency Range	2403.5 MHz
Number of Channels	1
Antenna Type	Internal Antenna
Antenna Gain	PK : 0.57 dBi

1.4 Declaration by the applicant / manufacturer

- NA

1.5 Test Mode

This device was tested in maximum duty mode at maximum power.

	Test Mode
TM 1	2-FSK
TM 2	-

1.6 Tested Frequency

	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	2403.5	2403.5
Middle Channel	-	-
Highest Channel	-	-

1.7 Test Conditions

Ambient Condition	
▪ Temperature	+22 °C ~ +23 °C
▪ Relative Humidity	40 % ~ 41 %

1.8 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

1.9 Test Equipment List

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
MXA Signal Analyzer	Agilent	N9020A	15/10/19	16/10/19	MY48011075
Digital Multimeter	Agilent	34401A	16/01/05	17/01/05	US36099541
System DC Power Supply	Agilent	6654A	15/10/19	16/10/19	MY40002935
Vector Signal Generator	R&S	SMBV100A	16/01/05	17/01/05	255571
Signal Generator	R&S	SMF100A	15/06/29	16/06/29	102341
Thermohygrometer	BODYCOM	BJ5478	15/05/08	16/05/08	120612-2
Loop Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
TRILOG Broadband Test-Antenna	Schwarzbeck	VULB 9160	14/04/30	16/04/30	3358
Double-Ridged Guide Antenna	ETS	3117	14/05/12	16/05/12	140394
Horn Antenna	A.H.Systems	SAS-574	15/04/30	17/04/30	154
Low Noise Pre Amplifier	tsj	MLA-010K01-B01-27	14/04/09	16/04/09	1844538
PreAmplifier	Agilent	8449B	16/02/24	17/02/24	3008A00370
Highpass Filter	Wainwright Instruments	WHKX12-2580-3000-18000-80SS	15/09/23	16/09/23	3
EMI Test Receiver	R&S	ESR7	15/10/19	16/10/19	101109
EMI Test Receiver	R&S	ESCI7	16/02/25	17/02/25	100910
Single-phase Master	NF	4420	15/09/09	16/09/09	3049354420023
ARTIFICIAL MAINS NETWORK	Narda S.T.S. / PMM	PMM L2-16B	15/06/26	16/06/26	000WX20305

1.10 Summary of Test Results

FCC Part	Parameter	Limit	Test Condition	Status Note 1
15.249 (a)	Field Strength Limits	Refer to the FCC 15.249(a)	Radiated	C
15.205, 209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits	Radiated	C
15.207	AC Conducted Emissions	< FCC 15.207 limits	AC Line Conducted	C
Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable Note 2: The sample was tested according to the following specification: ANSI C63.10-2013				

2. Test Report

2.1 Transmitter requirements

2.1.1 AC Conducted Emissions

2.1.1.1 Test Requirements and limit, §15.207

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

2.1.1.2 Test Configuration

See test photographs for the actual connections.

2.1.1.3 Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10.

1. The test procedure is performed in a 6.5 m $\times$ 3.5 m $\times$ 3.5 m (L $\times$ W $\times$ H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) $\times$ 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

2.1.1.4 Test Result

AC Line Conducted Emissions (Graph)

Test Mode: TM 1 & 2403.5 MHz

Results of Conducted Emission

DTNC

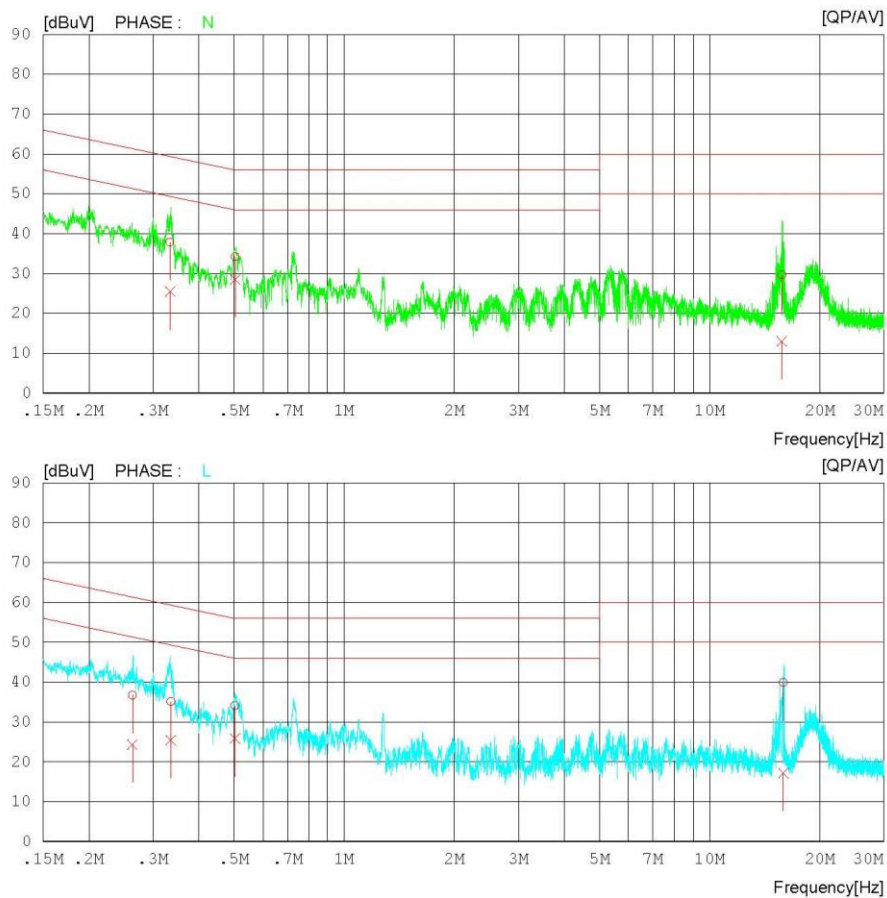
Date : 2016-03-15

Order No. :
Model No. : R-200
Serial No. : Identical prototype
Test Condition :

Reference No. :
Power Supply : 120 V / 60 Hz
Temp/Humi. : 23 °C / 40 % R.H.
Operator : I.H.BAE

Memo : 2403.5 MHz

LIMIT : FCC P15.207 QP
FCC P15.207 AV



AC Line Conducted Emissions (List)

Test Mode: TM 1 & 2403.5 MHz

Results of Conducted Emission

DTNC

Date : 2016-03-15

Order No.	:		Reference No.	:	
Model No.	:	R-200	Power Supply	:	120 V / 60 Hz
Serial No.	:	Identical prototype	Temp/Humi.	:	23 'C / 40 % R.H.
Test Condition	:		Operator	:	I.H.BAE

Memo : 2403.5 MHz

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.33413	27.8	15.4	10.1	37.9	25.5	59.3	49.3	21.4	23.8	N
2	0.50341	24.2	18.4	10.1	34.3	28.5	56.0	46.0	21.7	17.5	N
3	15.75620	19.1	2.4	10.6	29.7	13.0	60.0	50.0	30.3	37.0	N
4	0.26301	26.6	14.2	10.1	36.7	24.3	61.3	51.3	24.6	27.0	L
5	0.33538	24.9	15.2	10.1	35.0	25.3	59.3	49.3	24.3	24.0	L
6	0.50259	23.9	15.7	10.1	34.0	25.8	56.0	46.0	22.0	20.2	L
7	15.92960	29.0	6.3	10.8	39.8	17.1	60.0	50.0	20.2	32.9	L

2.1.2 Radiated Emission

Test Requirements and limit, §15.205

▪ Fundamental / Harmonics emission: FCC Part 15.249(a)

Frequency (MHz)	Limit @ 3m	
	Fundamental (mV/m)	Harmonics (uV/m)
2400 ~ 2483.5	50	500

▪ FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 – 0.490	2400/F(KHz)	300
0.490 – 1.705	24000/F(KHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	12.29 ~ 12.293	149.9 ~ 150.05	1645.5 ~ 1646.5	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.51975 ~	156.52475 ~	1660 ~ 1710	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.52025	156.52525	1718.8 ~ 1722.2	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~	156.7 ~ 156.9	2200 ~ 2300	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57725	162.0125 ~ 167.17	2310 ~ 2390	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	13.36 ~ 13.41	167.72 ~ 173.2	2483.5 ~ 2500	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.42 ~ 16.423	240 ~ 285	2655 ~ 2900	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.69475 ~	322 ~ 335.4	3260 ~ 3267	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	16.69525	399.90 ~ 410	3332 ~ 3339		
8.291 ~ 8.294	16.80425 ~	608 ~ 614	3345.8 ~ 3358		
8.362 ~ 8.366	16.80475	960 ~ 1240	3600 ~ 4400		
8.37625 ~ 8.38675	25.5 ~ 25.67	1300 ~ 1427			
8.41425 ~ 8.41475	37.5 ~ 38.25	1435 ~ 1626.5			
	73 ~ 74.6				
	74.8 ~ 75.2				
	108 ~ 121.94				
	123 ~ 138				

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

2.1.2.1 Test Configuration

Refer to the APPENDIX I.

2.1.2.2 Test Procedures for Radiated Spurious Emissions

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
4. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed.
5. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
6. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
7. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
8. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Note 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.

Note 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.

Note 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1 GHz.

2.1.2.3 Test Result

9 KHz ~ 25GHz Radiated Spurious Emissions

▪ 2403.5 MHz

	Freq. (MHz)	ANT Pol	The worst case EUT Position	Detect or Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
F	2403.420	H	Z axis	PK	83.73	1.31	85.04	114.00	28.96
F	2403.460	H	Z axis	AV	82.03	1.31	83.34	94.00	10.66
BE	2389.200	H	Z axis	PK	51.84	1.28	53.12	74.00	20.88
BE	2389.990	H	Z axis	AV	29.70	1.28	30.98	54.00	23.02
BE	2486.362	H	Z axis	PK	40.99	1.57	42.56	74.00	31.44
BE	2486.470	H	Z axis	AV	28.21	1.57	29.78	54.00	24.22
S	4806.955	H	Z axis	PK	48.55	7.49	56.04	74.00	17.96
S	4807.010	H	Z axis	AV	40.82	7.49	48.31	54.00	5.69

Note.

- No other spurious and harmonic emissions were detected greater than listed emissions on above table. And above listed data is the worst case data.
- Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

2.1.3 Antenna Requirements

2.1.3.1 Test Procedure

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

2.1.3.2 Conclusion : **Comply**

The antenna is permanently attached.(Refer to Internal Photo file.)

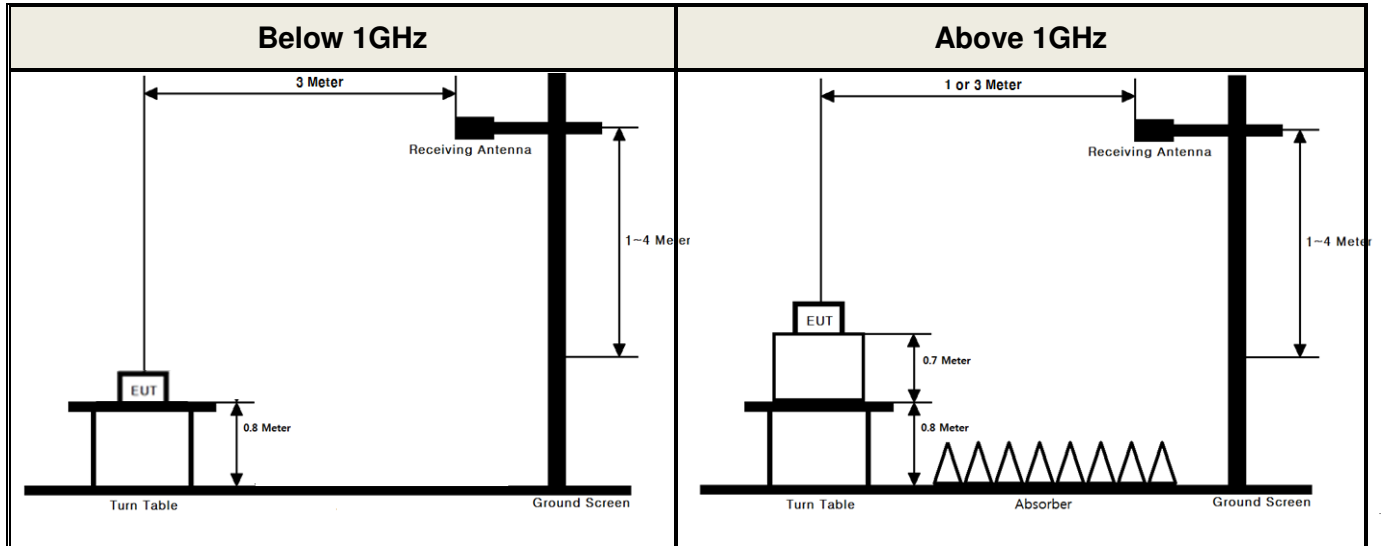
- Minimum Standard:

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.

APPENDIX I

Test set up diagrams

▪ Radiated Measurement



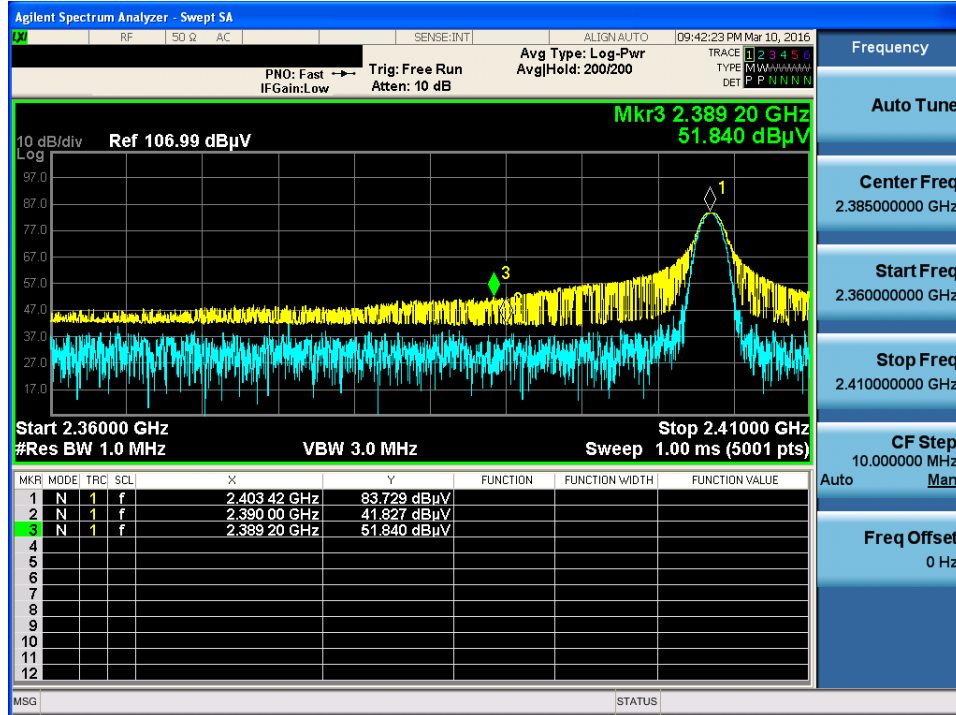
APPENDIX II

Restricted band edge(Test plot of radiated)

Note: The offset was not include in test plot. (Reading value). The results refer to the clause 2.1.2.3.

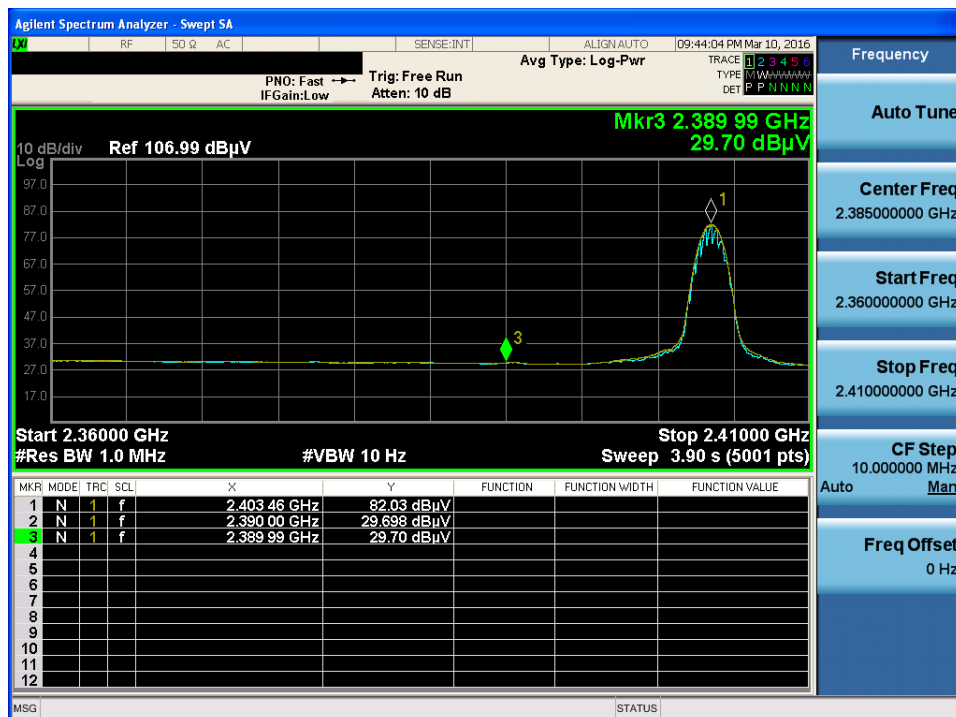
BE & Lowest & Z & Hor

Detector Mode : PK



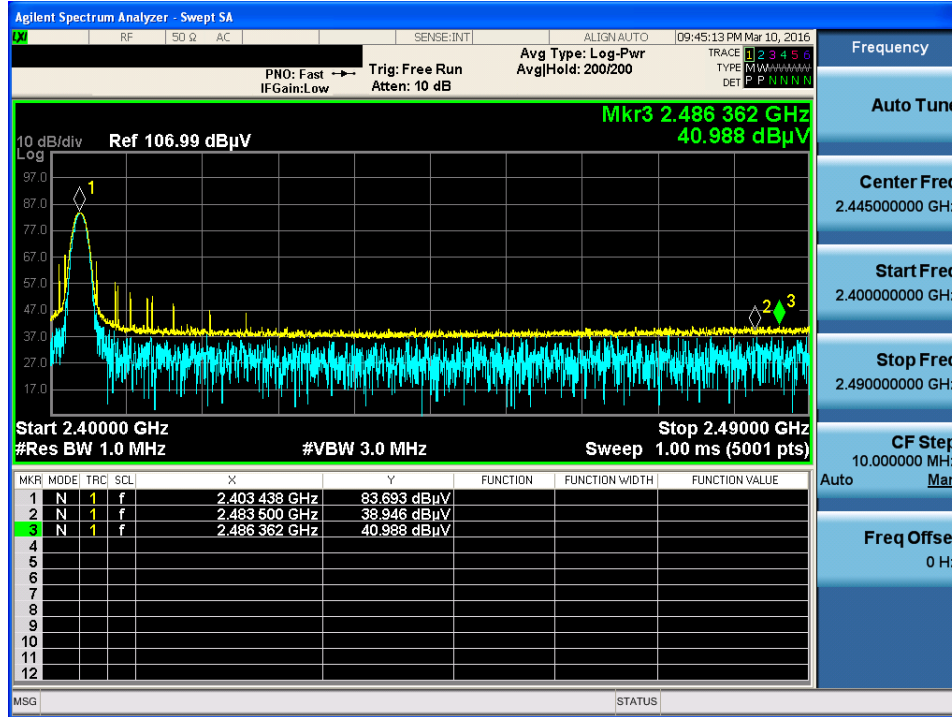
BE & Lowest & Z & Hor

Detector Mode : AV



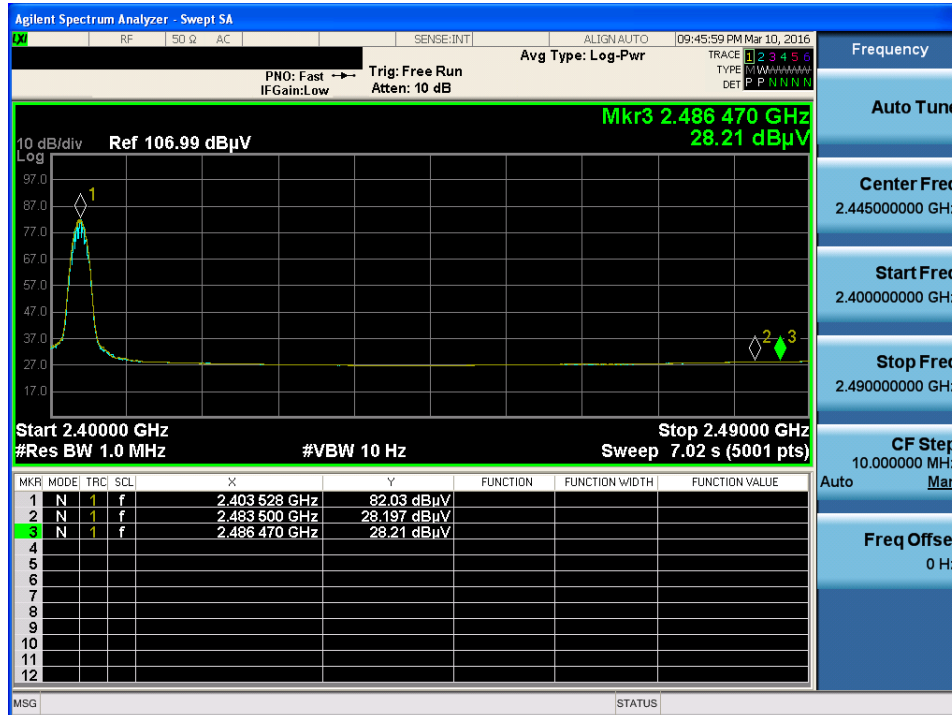
BE & Highest & Z & Hor

Detector Mode : PK



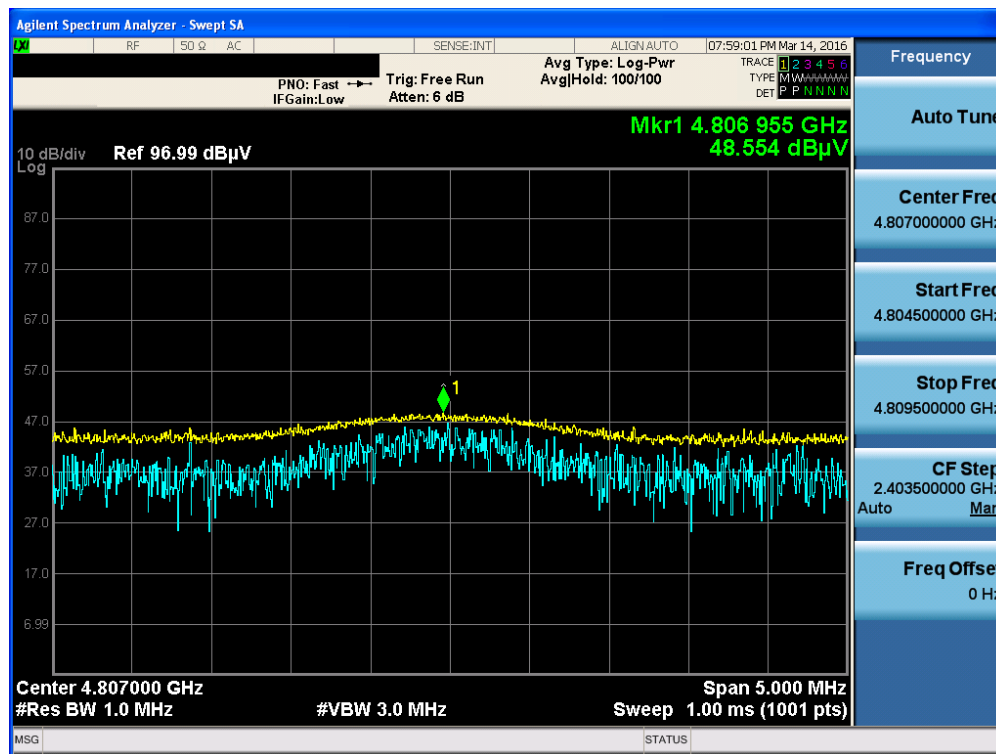
BE & Highest & Z & Hor

Detector Mode : AV



Harmonic & Z & Hor

Detector Mode : PK



Harmonic & Z & Hor

Detector Mode : AV

