SGS Korea Co., Ltd.
4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
Tel. +82 31 428 5700 / Fax. +82 31 427 2370
http://www.sgsgroup.kr

TEST REPORT

of

FCC Part 15 Subpart C §15.249

FCC ID: PBN-EK5

1. Equipment Under Test	:	Wireless microphone
2. Model Name	:	EK5
3. Variant Model Name(s)	:	Refer to page 6
4. Applicant	:	ENTERMEDIA CO., LTD.
5. Manufacturer	:	ENTERMEDIA CO., LTD.
6. Date of Receipt	:	2020.05.19
7. Date of Test(s)	:	2020.05.19 ~ 2020.06.29
8. Date of Issue	:	2020.06.29

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

1) The results of this test report are effective only to the items tested.
2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.

Tested by: **Murphy Kim**

Technical Manager: **Patrick Kang**

SGS Korea Co., Ltd. Gunpo Laboratory

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
-10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
-4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
-Designation number: KR0150
All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.
Phone No. : +82 31 688 0901
Fax No. : +82 31 688 0921

1.2. Details of Applicant

Applicant : ENTERMEDIA CO., LTD.
Address : 157-1, Seongo-ro, Ojeong-gu, Bucheon-si, Gyeonggi-do, Republic of Korea, 14429
Contact Person : Lee, Kyung-ho
Phone No. : +82 32 680 9139

1.3. Details of Manufacturer

Applicant : Same as applicant
Address : Same as applicant

1.4. Description of EUT

Kind of Product	Wireless microphone
Model Name	EK5
Variant Models	ETX50, ATX50
Power Supply	DC 3 V
Frequency Range	905 ㎒ ~ 923 ㎒
Modulation Technique	FM
Number of Channels	8 channels
Antenna Type	Pattern antenna
Antenna Gain	1.90 ㏈i

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	Agilent	E8257D	MY51501169	Nov. 21, 2019	Annual	Nov. 21, 2020
Signal Generator	Agilent	8648D	3847M00534	Mar. 03, 2020	Annual	Mar. 03, 2021
Spectrum Analyzer	R&S	FSV30	103453	Nov. 06, 2019	Annual	Nov. 06, 2020
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 11, 2019	Annual	Sep. 11, 2020
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 03, 2020	Annual	Mar. 03, 2021
High Pass Filter	Wainwright Instrument GmbH	WHKX1.5/15G-6SS	4	Jun. 11, 2020	Annual	Jun. 11, 2021
Low Pass Filter	Mini-Circuits	NLP-1200+	V 9500401023-3	Jun. 01, 2020	Annual	Jun. 01, 2021
Preamplifier	H.P.	8447F	2944A03909	Aug. 07, 2019	Annual	Aug. 07, 2020
Signal Conditioning Unit	R&S	SCU-18	10117	Jun. 10, 2020	Annual	Jun. 10, 2021
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 22 2019	Biennial	Aug. 22, 2021
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB 9163	396	Mar. 21, 2019	Biennial	Mar. 21, 2021
Horn Antenna	R&S	HF906	100326	Feb. 14, 2020	Annual	Feb. 14, 2021
Test Receiver	R&S	ESU26	100109	Feb. 18, 2020	Annual	Feb. 18, 2021
Turn Table	Innco systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/383 30516/L	N.C.R.	N/A	N.C.R.
Antenna Mast	Innco systems GmbH	MA4640-XP-ET	MA4640/536/383 30516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RFONE	PL520-NMNM-4M (4 m)	20200324001	May 06, 2020	Semi-annual	Nov. 06, 2020
Coaxial Cable	RFONE	PL520-NMNM-10M (10 m)	20200324001	May 06, 2020	Semi-annual	Nov. 06, 2020
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 01/20	Feb. 23, 2020	Semi-annual	Aug. 23, 2020

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

Applied Standard: FCC Part15 Subpart C		
Section	**Test Item(s)**	**Result**
15.205 15.209(a) 15.249(a) 15.249(c) 15.249(d)	Fundamental and Radiated Spurious emission	Complied
15.215(c)	20 dB Bandwidth	Complied
15.207	AC Power Line Conducted Emission	N/A[1)]

Note;

1) The AC power line test was not performed because the EUT use battery power for operation and which do not operate from the AC power lines.

1.7. Test Procedure(s)

The measurement procedures described in the American National Standard of Procedure for Compliance Testing of unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of the DUT.

1.8. Sample Calculation

Where relevant, the following sample calculation is provided

1.8.1. Radiation Test

Field strength level (dBμV/m) = Measured level (dBμV) + Antenna factor (dB) + Cable loss (dB) - Amplifier gain (dB)

1.9. Measurement Uncertainty

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

Parameter	Uncertainty
Occupied Bandwidth	± 9.66 ㎑
Radiated Emission, 9 ㎑ to 30 ㎒	± 3.59 ㏈
Radiated Emission, below 1 ㎓	± 5.88 ㏈
Radiated Emission, above 1 ㎓	± 5.94 ㏈

Uncertainty figures are valid to a confidence level of 95 %.

1.10. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL000858	2020.06.29	Initial

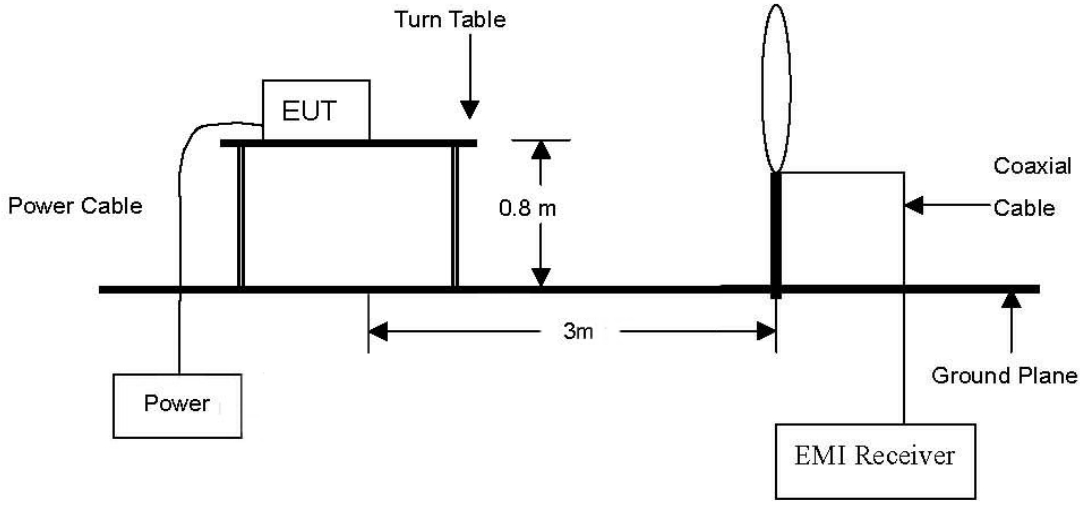
1.11. Information of Variant Models

Model Name	Description
EK5	- Basic model
ETX50	- Same as basic model, but different management models according to buyers.
ATX50	

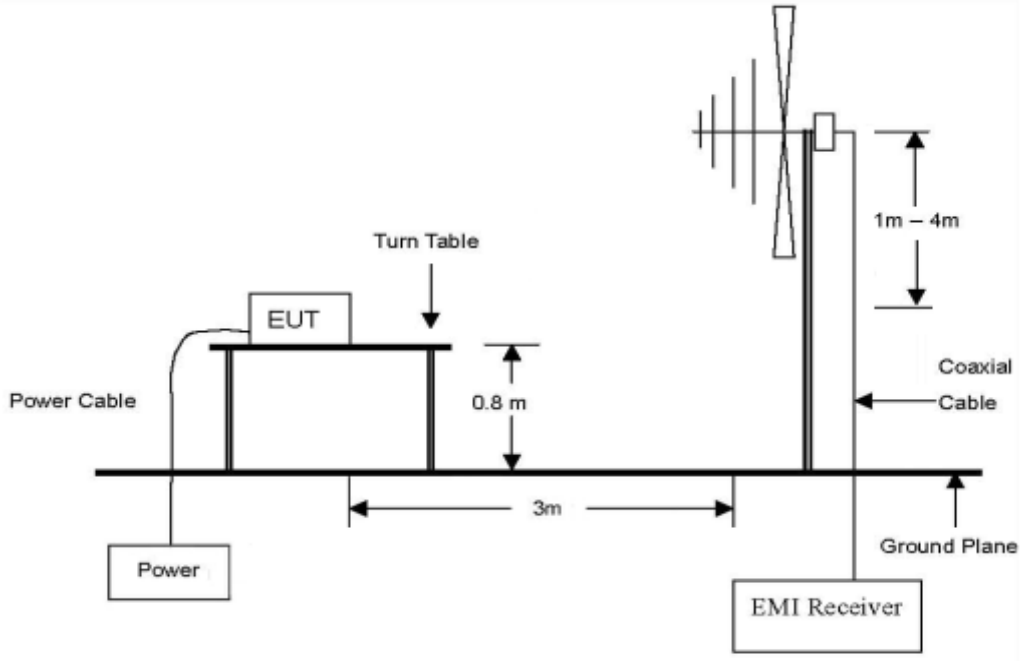
2. Fundamental and Radiated Spurious Emission

2.1. Test Setup

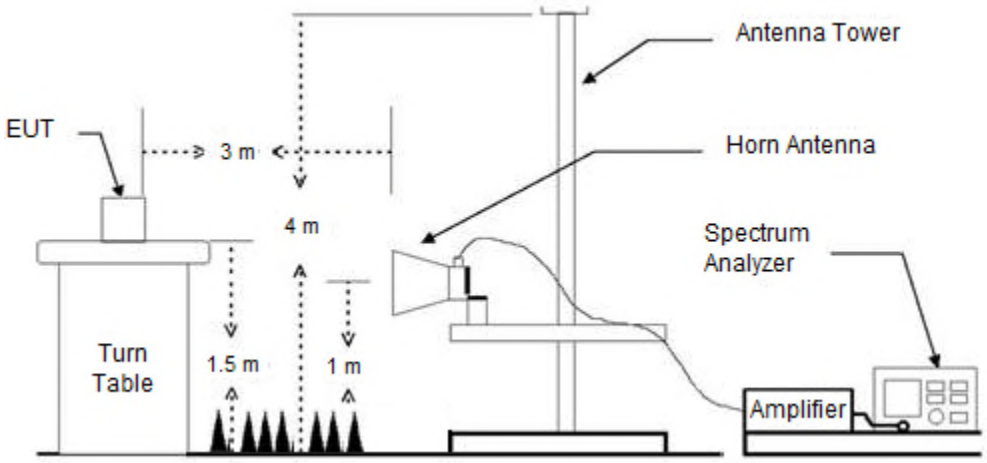
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



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



The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated form 1 ㎓ to the 10th harmonic of the highest fundamental frequency or 40 ㎓, whichever is lower.



2.2. Limit

According to §15.249(a), Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (㎷/m)	Field strength of harmonics (㎶/m)
902-928 ㎒	50	500
2 400-2 483.5 ㎒	50	500
5 725-5 875 ㎒	50	500
24.0-24.25 ㎓	250	2 500

According to §15.249(d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 ㏈ below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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

Frequency (㎒)	Field strength (㎶/m)	Measurement distance (Meters)
0.009-0.490	2 400/F(㎑)	300
0.490-1.705	24 000/F(㎑)	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 paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 ㎒, 76-88 ㎒, 174-216 ㎒ or 470-806 ㎒. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10-2013.

2.3.1. Test procedures for emission below 30 ㎒

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum Hold Mode.

2.3.2. Test procedures for emission above 30 ㎒

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site below 1 ㎓ and 1.5 meters above the ground at a 3 meter anechoic chamber test site above 1 ㎓. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 ㎓, 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 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a bi-log antenna, a horn 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.
4. 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.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note;

1. For frequency below 1 ㎓, set spectrum analyzer detector to peak, and resolution bandwidth is 100 ㎑ and video bandwidth is 300 ㎑.
2. For frequency above 1 ㎓, set spectrum analyzer detector to peak, and resolution bandwidth is 1 ㎒ and video bandwidth is 3 ㎒.
3. To get a maximum emission level from the EUT, the EUT is manipulated through three orthogonal planes (X, Y, Z). Worst orthogonal plan of EUT is **Y – axis** during radiation test.

2.4. Test Result

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

2.4.1. Field Strength of Fundamental

The following table shows only the worst case emissions and all positions were investigated for radiated spurious emissions.

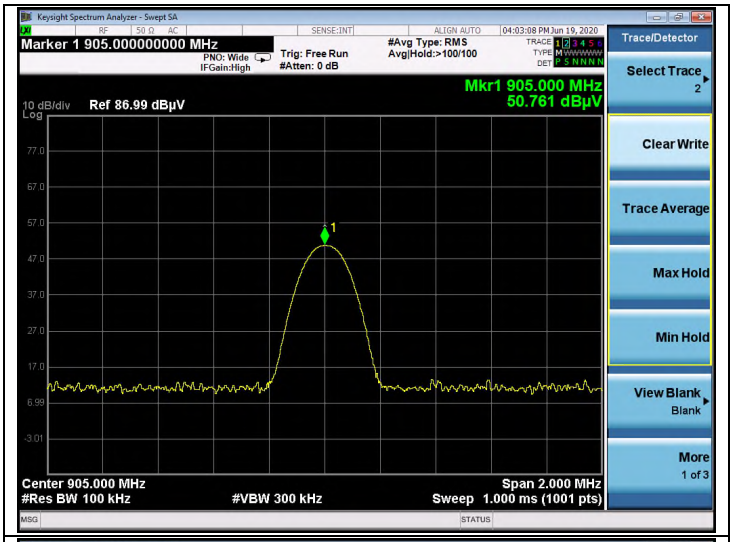
Frequency (㎒)	Detect Mode	Ant. Pol.	Reading (dB㎶)	AF (dB/m)	CL (dB)	Result (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
<Low channel 905 ㎒>								
905.00	Peak	H	50.76	28.20	3.42	82.38	93.98	11.60
<Middle channel 908 ㎒>								
908.01	Peak	H	50.46	28.26	3.45	82.17	93.98	11.81
<High channel 923 ㎒>								
923.01	Peak	H	48.96	28.30	3.46	80.72	93.98	13.26

Remark;

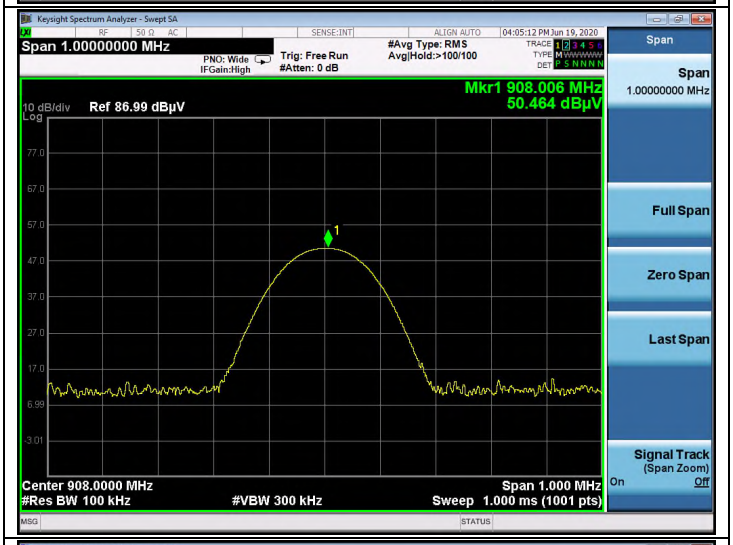
1. Result = Reading + AF + CL

- Test plots

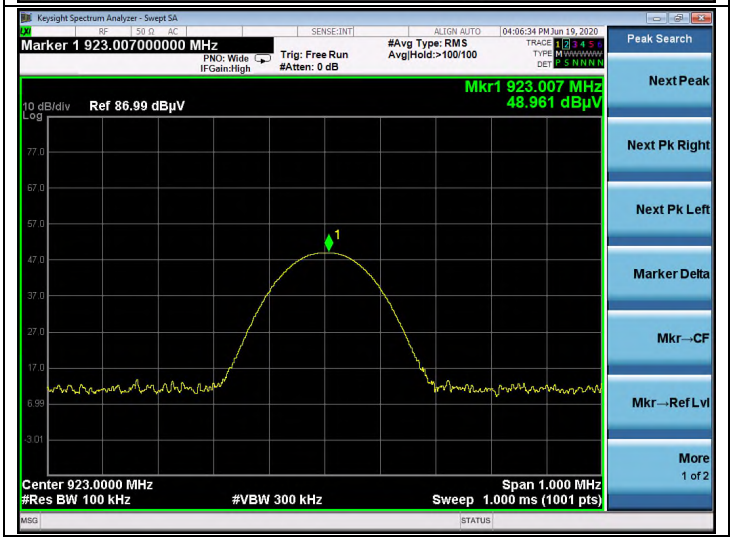
Low Channel



Middle Channel



High Channel



2.4.2. Radiated Spurious Emission below 1 000 ㎒

The frequency spectrum from 9 ㎑ to 1 000 ㎒ was investigated. All reading values are peak values.

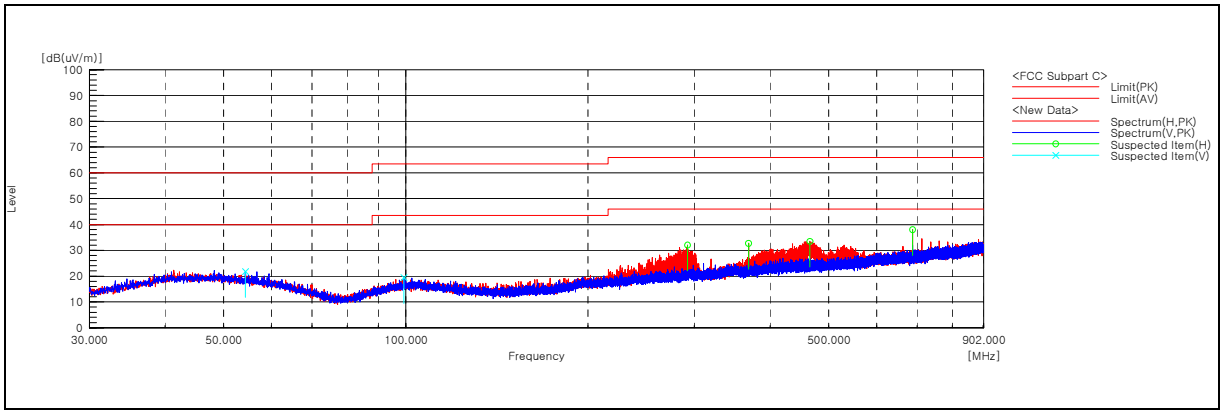
Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
368.63	37.90	Peak	H	20.45	-26.33	32.02	46.02	14.00
465.53	37.50	Peak	H	22.21	-26.23	33.48	46.02	12.54
688.18	38.30	Peak	H	25.46	-25.18	38.58	46.02	7.44
929.65	31.70	Peak	H	28.21	-24.40	35.51	46.02	10.51
937.76	31.50	Peak	V	28.10	-24.26	35.34	46.02	10.68
951.48	31.30	Peak	H	28.10	-24.28	35.12	46.02	10.90

Remark;

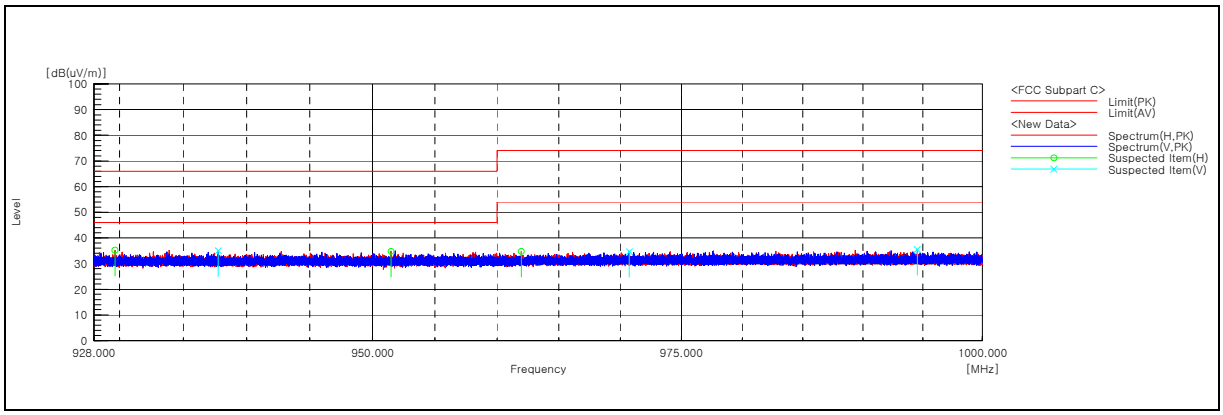
1. Spurious emissions for all channels were investigated and almost the same below 1 ㎓.
2. Reported spurious emissions are in **Low channel** as worst case among other channels.
3. Radiated spurious emission measurement as below.
   (Actual = Reading + AF + Amp + CL)
4. According to §15.31(o), emission levels are not report much lower than the limits by over 20 ㏈.

- Test plots

- 30 ㎒ - 902 ㎒



- 928 ㎒ - 1 000 ㎒



Radiated Band Edge

Low Channel (905 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
901.88	28.02	Peak	H	28.14	-24.63	31.53	46.02	14.49
902.00	26.05	Peak	H	28.14	-24.62	29.57	46.02	16.45

High Channel (923 ㎒)

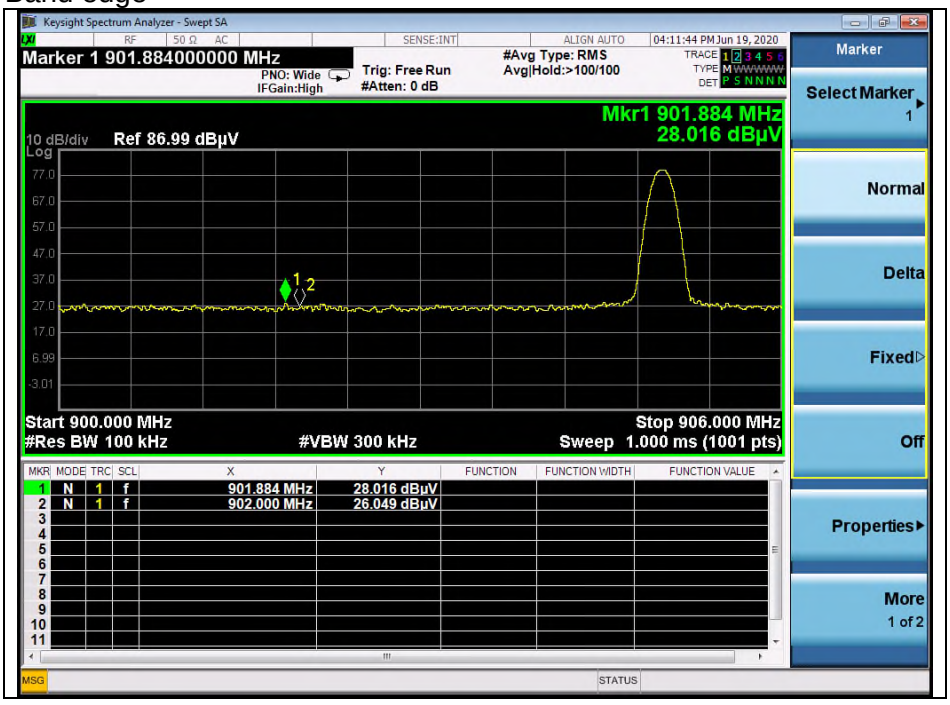
Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
928.00	25.49	Peak	H	28.24	-24.41	29.32	46.02	16.70
928.62	28.25	Peak	H	28.23	-24.40	32.08	46.02	13.94

Remarks;

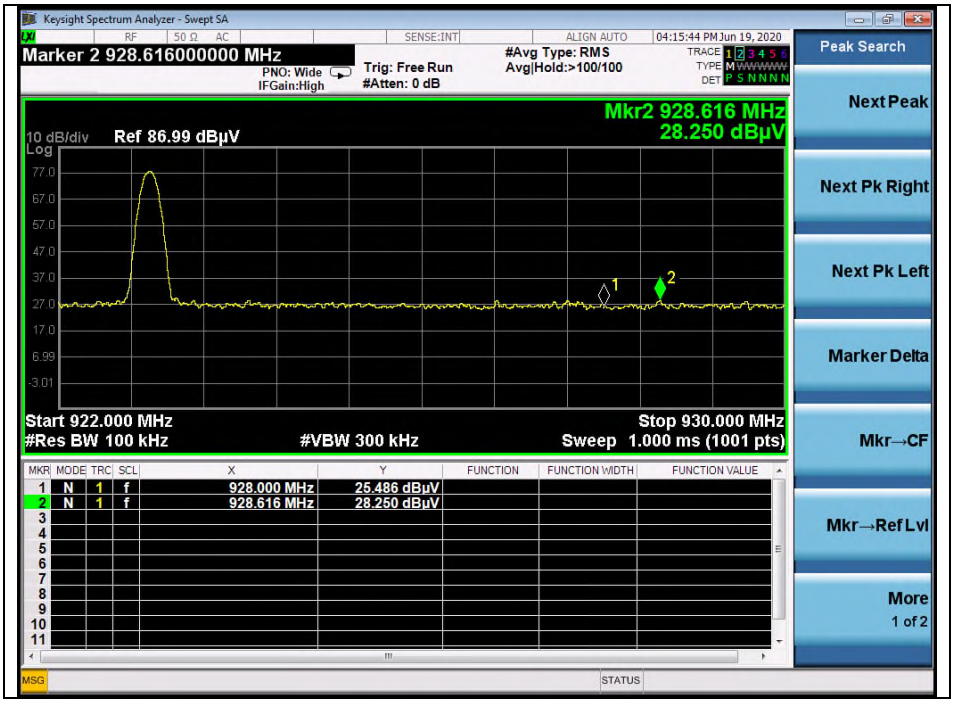
1. Radiated spurious emission measurement as below.
   (Actual = Reading + AF + Amp + CL)

- Test plots

Low channel Band edge



High channel Band edge



2.4.3. Radiated Spurious Emission above 1 000 ㎒

A. Low Channel (905 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (908 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

C. High Channel (923 ㎒)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

Remarks;

1. "*" means the restricted band.
2. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental frequency.
3. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument using peak/average detector mode.
4. Actual = Reading + AF + AMP + CL.
5. According to § 15.31(o), emission levels are not reported much lower than the limits by over 20 ㏈.
6. The maximized peak measured value complies with the average limit, to perform an average measurement is unnecessary.

3. 20 dB Bandwidth

3.1. Test Setup

3.2. Limit

Limit: Not Applicable

3.3. Test Procedure

The test follows ANSI C63.10-2013.

The 20 dB bandwidth was measured with a spectrum analyzer connected to RF antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency.

Use the following spectrum analyzer setting:

Span = approximately 2 to 5 times the 20 dB bandwidth.
RBW ≥ 1 % to 5 % of the 20 dB bandwidth.
VBW ≥ 3 x RBW
Sweep = auto
Detector = peak
Trace = max hold

The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 dB bandwidth of the emission.

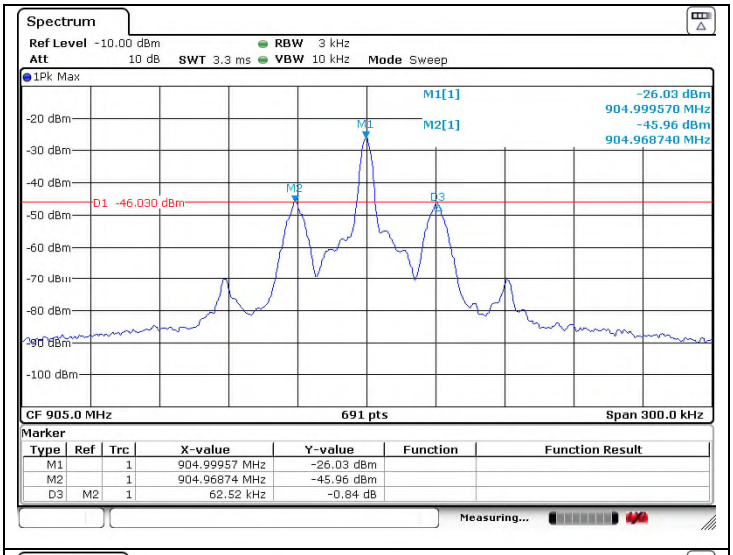
3.4. Test Results

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

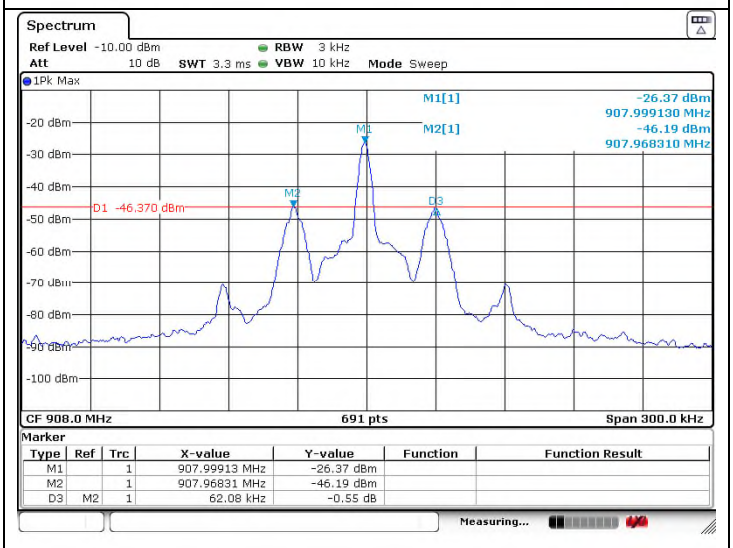
Channel	Frequency (㎒)	20 ㏈ Bandwidth (㎑)
Low	905	62.52
Middle	908	62.08
High	923	61.22

- Test plots

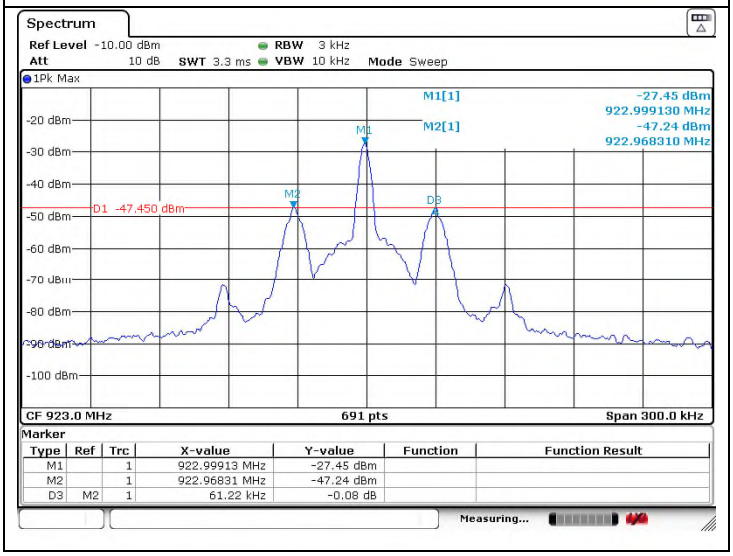
Low Channel



Middle Channel



High Channel



4.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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.

4.2. Antenna Connected Construction

Antenna used in this product is Pattern Antenna with gain of 1.90 dBi.

- End of the Test Report -