

# RF TEST REPORT

Report number		RAPA21-O-038
Applicant	Name	IDCITI.COM
	Logo	IDCITI
	Address	C405 SUNY Korea, Songdomunhwa-ro 119-2, Yeonsu-gu, Incheon, South Korea.
Manufacturer	Name	IDCITI.COM
	Address	C405 SUNY Korea, Songdomunhwa-ro 119-2, Yeonsu-gu, Incheon, South Korea.
Type of equipment		uGPS-tunnel
Basic model name		uGPS-tunnel-v1
Multi model name		N/A
Serial number		N/A
FCC ID		2A3UX-UGPSTUNNEL-V1
Test duration		December 9, 2021 to December 17, 2021
Date of issue		December 20, 2021
Total page		21 Pages (including this page)

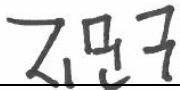
## SUMMARY

The equipment complies with the regulation; FCC CFR 47 PART 15 SUBPART C, SECTION 15.209

This test report only contains the result of a single test of the sample supplied for the examination.  
It is not a general valid assessment of the features of the respective products of the mass-production.

December 20, 2021

December 20, 2021

  
Tested by MinGu Ji  
Tester



Reviewed by Hak Soo Lee  
Executive Technical Manager

## Test Report Version History

Version	Date	Reason for revision
1.0	December 20, 2021	Original Document

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## 1. Description of EUT

### 1.1 Applicant

- Company name : IDCITI.COM
- Address : C405 SUNY Korea, Songdomunhwa-ro 119-2, Yeonsu-gu, Incheon, South Korea.
- Contact person : HongJin Lee/ Operations Director / idciti.com@gmail.com
- Phone/Fax : +82-32-626-1228 / +82-32-626-1149

### 1.2 Manufacturer

- Company name : IDCITI.COM
- Address : C405 SUNY Korea, Songdomunhwa-ro 119-2, Yeonsu-gu, Incheon, South Korea.
- Phone/Fax : +82-32-626-1228 / +82-32-626-1149

### 1.3 Basic description

- Product name : uGPS-tunnel
- Basic model name : uGPS-tunnel-v1
- Alternative model name : N/A

### 1.4 General description

- EQUIPMENT CLASS : DXX – Low Power Communication Device Transmitter
- Frequency Range : 1 575.42 MHz / 1 602.00 MHz
- Modulation Type : PSK
- Antenna Type : Patch Antenna
- Power Supply : DC 12.0 V (AC/DC Adapter)

### 1.5 Alternative type(s)/model(s)

The Following Lists Consist to of the added model and their differences.

Model name	Differences	Tested
uGPS-tunnel-v1	Basic Model	<input checked="" type="checkbox"/>

## 2. General information of test

### 2.1 Test standards and results

Applied Standards : FCC Part 15 Subpart C		
Section	Description of Test	Result
15.215(c)	Additional provisions to the general radiated emission limitations.	Pass
15.207	Conducted Limits	Pass
15.209	Radiated Emission Limits, General Requirement	Pass
15.203	Antenna Requirement	Pass

### 2.2 Description of EUT during the test

During the test, keep the EUT in continuously transmitting mode.

There was no mechanical or circuitry modification to improve RF and spurious characteristic, and any RF and spurious suppression device(s) was not added against the device tested.

The EUT was moved throughout the X, Y, and Z axis and worst case data was recorded in this report.

### 2.3 Test configuration

- Type of peripheral equipment used

Model	Manufacturer	Description	Connected to
ICP30-120-2000	ShenZhenShi Yingyuan Electronics Co., Ltd	DC IN	EUT

### 2.4 Test Facility

- FCC Registration No: 931589
- IC Company address code: 9355B
- RRA Designation Number: KR0027

- Place of Test

Anyang Test Site(RF Test Room)

#101 & B104 Anyang Megavalley, 268, Hagui-ro, Dongan-gu, Anyang-si, Gyeonggi-do, 14056, Korea

## 2.5 PRELIMINARY TEST

### 2.5.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting mode.	X

### 2.5.2 General Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting mode.	X

### 2.5.3 Special conditions for testing

-

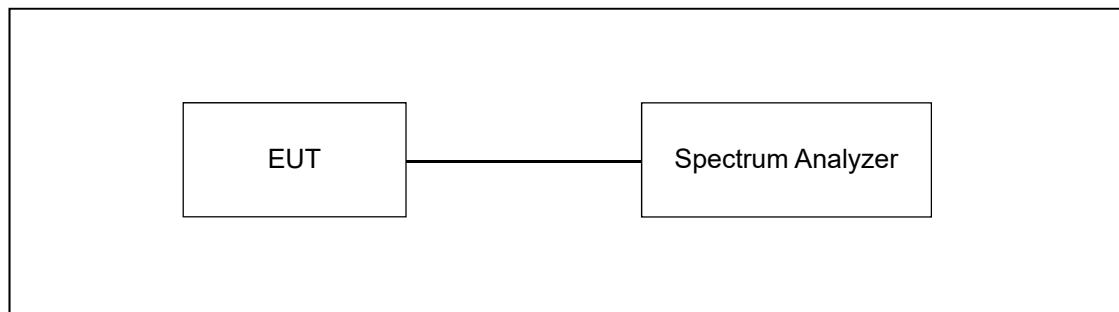
### 3. Measurement data

#### 3.1 Minimum 20 dB Bandwidth

##### 3.1.1 Requirement

- FCC Part15 subpart C Section 15.215(c)

##### 3.1.2 Test Procedure



The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.

##### 3.1.3 Test environment

- 23 °C, 43 % R.H.

##### 3.1.4 Test results

Frequency [MHz]	Measured Value [MHz]
1575.42	4.30
1602.00	4.31

### 3.1.5 Test Plots



## 3.2 Radiated Emission

### 3.2.1 Requirement

- FCC Part15 subpart C Section 15.209

### 3.2.2 Test Procedure

The radiated emissions measurements were performed on the 3 m anechoic chamber. The EUT was placed on a non-conductive turntable above the ground plane. The frequency spectrum from 30 kHz to 10.0 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

### 3.2.3 Test environment

- 23 °C, 45 % R.H.

### 3.2.4 Test results

#### 3.2.4.1 Operation frequency : GPS

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Type of Test : Low Power Transmitter

Result : PASSED

EUT : uGPS-tunnel Date: September 3, 2021

Operating Mode : Transmitting Mode

Detector : Peak

Distance : 3 m

Freq. (MHz)	Reading (dB $\mu$ V)	Ant Pol.	Correction Factors				Total		FCC	
			BW (dB)	Antenna (dB/m)	Cable (dB)	AMP (dB)	(dB $\mu$ V/m)	(uV/m)	Limit ( $\mu$ V/m)	Margin (dB)
1575.42	34.92	H	20.0	25.6	1.3	35.7	46.12	202.3	500	297.7
1575.42	33.56	V	20.0	25.6	1.3	35.7	44.76	173.0	500	327.0

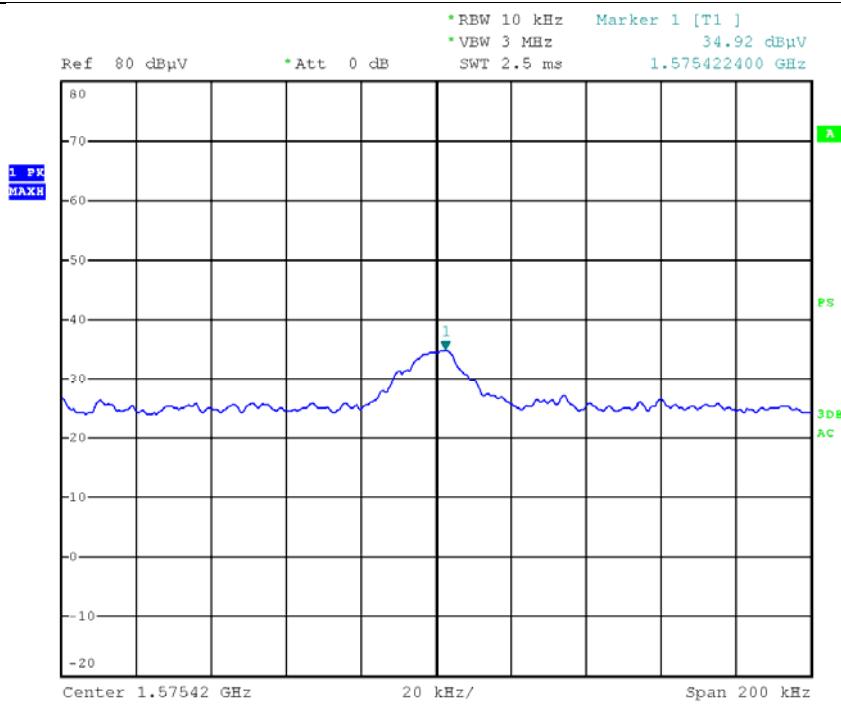
Remark. The EUT was tested at 3 m, so conversation factor was included at above limit.

Test with RBW reduced to 10 kHz and compensate for the measured value.

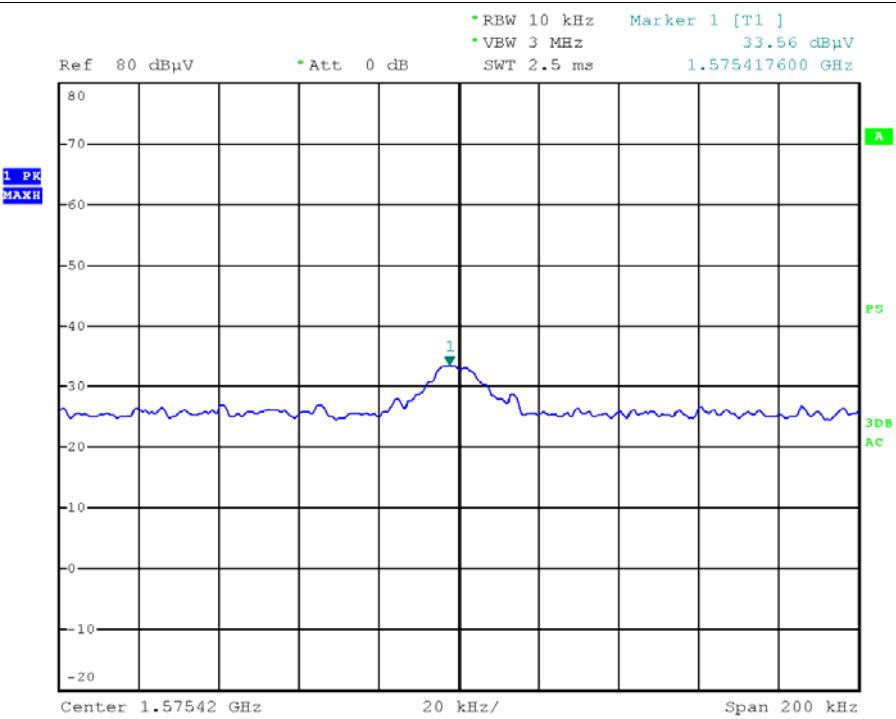
$$- 10 \times \text{Log}(1000 / 10) = 20.0$$

dB $\mu$ V/m to uV/m

$$- (10^{((46.12-120)/20)} \times 1000000) = 202.3 \text{ uV/m}$$



#### GPS Horizontal



#### GPS Vertical

### 3.2.4.2 Operation frequency : GLONASS

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Type of Test : Low Power Transmitter

Result : PASSED

EUT : uGPS-tunnel Date: September 3, 2021

Operating Mode : Transmitting Mode

Detector : Peak

Distance : 3 m

Freq. (MHz)	Reading (dB $\mu$ V)	Ant Pol.	Correction Factors				Total		FCC	
			BW (dB)	Antenna (dB/m)	Cable (dB)	AMP (dB)	(dB $\mu$ V/m)	(uV/m)	Limit ( $\mu$ V/m)	Margin (dB)
1599.92	33.06	H	20.0	25.3	1.3	35.6	44.06	159.6	500	340.4
1599.92	37.28	V	20.0	25.3	1.3	35.6	48.28	259.4	500	240.6

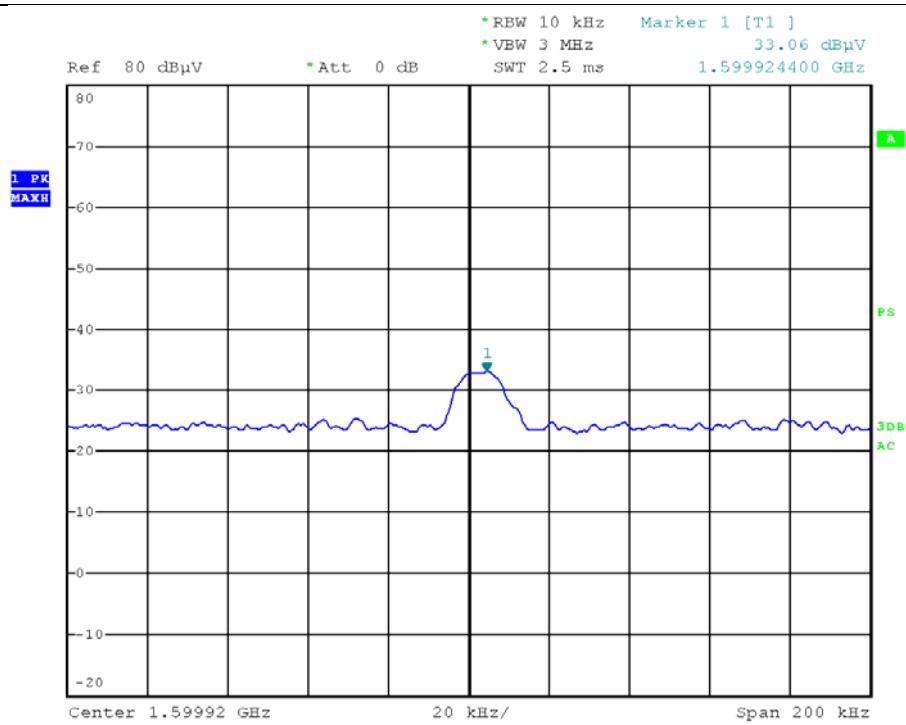
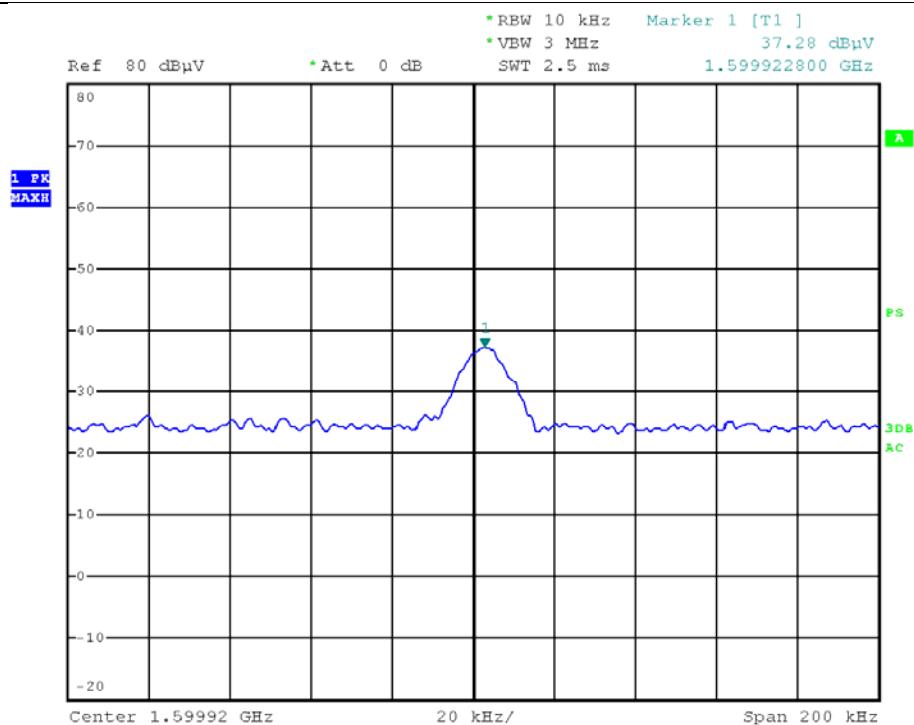
Remark. The EUT was tested at 3 m, so conversation factor was included at above limit.

Test with RBW reduced to 10 kHz and compensate for the measured value.

$$- 10 \times \text{Log}(1000 / 10) = 20.0$$

dB $\mu$ V/m to uV/m

$$- (10^{((44.06-120)/20)} \times 1000000) = 159.6 \text{ uV/m}$$


**GLONASS Horizontal**

**GLONASS Vertical**

### 3.2.4.3 Spurious Radiated Emission

#### 3.2.4.3.1 Test Data for Below 30 MHz

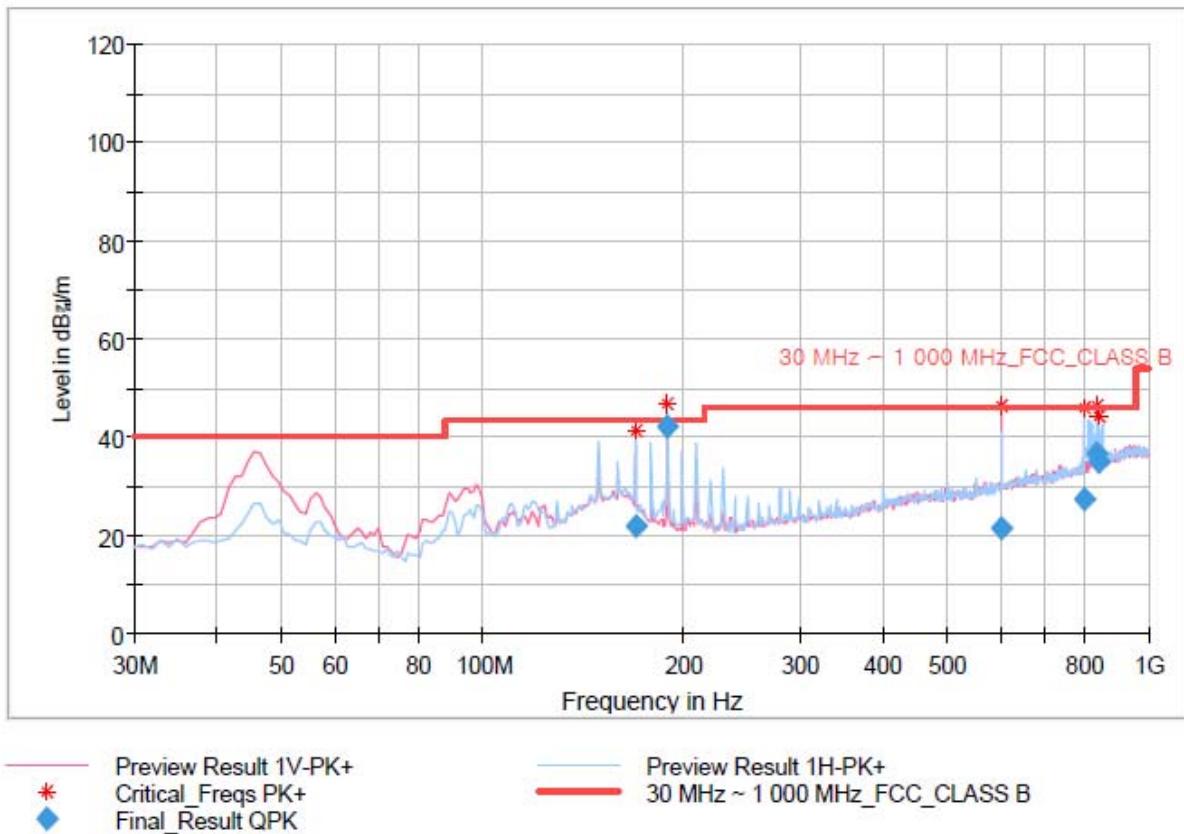
- . Detector : Quasi-Peak (6 dB Bandwidth: 200 Hz, 9 kHz)
- . Measurement distance : 3 m
- . Frequency range : 9 kHz ~ 30 MHz
- . Operating Condition : Highest Output Power Transmitting Mode
- . Result : PASS

Frequency (MHz)	Reading (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
Emissions observed were 20dB below the limit and thus not reported								

### 3.2.4.3.2 Test Data for 30 MHz ~ 1000 MHz

- . Detector : Quasi-Peak (6 dB Bandwidth: 120 kHz)
- . Measurement distance : 3 m
- . Frequency range : 30 MHz ~ 1000 MHz
- . Operating Condition : Highest Output Power Transmitting Mode
- . Result : PASS

## RE Test Report



### Final Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
169.68	21.92	43.50	21.58	15000.0	200.0	H	110.0	-17.2
190.05	42.12	43.50	1.38	15000.0	200.0	H	23.0	-20.8
600.36	21.38	46.00	24.62	15000.0	100.0	V	138.0	-12.5
800.18	27.52	46.00	18.48	15000.0	100.0	H	219.0	-9.1
835.10	36.83	46.00	9.17	15000.0	100.0	H	253.0	-8.1
841.89	34.89	46.00	11.11	15000.0	400.0	H	90.0	-7.9

### 3.2.4.3.2 Test Data for Above 1 GHz GPS

- . Detector : Peak, Average (6 dB Bandwidth: 1 MHz)
- . Measurement distance : 3 m
- . Frequency range : 1 GHz ~ 10.0 GHz
- . Operating Condition : Highest Output Power Transmitting Mode
- . Result : PASS

Frequency (MHz)	Reading (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
3150.84	46.34	H	30.8	1.53	35.1	43.57	74.00	30.43
3150.84	36.27	H	30.8	1.53	35.1	33.50	54.00	20.50
3150.84	48.16	V	30.8	1.53	35.1	45.39	74.00	28.61
3150.84	34.82	V	30.8	1.53	35.1	32.05	54.00	21.95

### 3.2.4.3.2 Test Data for Above 1 GHz GLONASS

- . Detector : Peak, Average (6 dB Bandwidth: 1 MHz)
- . Measurement distance : 3 m
- . Frequency range : 1 GHz ~ 10.0 GHz
- . Operating Condition : Highest Output Power Transmitting Mode
- . Result : PASS

Frequency (MHz)	Reading (dB $\mu$ V)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
3199.84	45.72	H	31.1	1.55	35.1	43.27	74.00	30.73
3199.84	34.84	H	31.1	1.55	35.1	32.39	54.00	21.61
3199.84	46.31	V	31.1	1.55	35.1	43.86	74.00	30.14
3199.84	34.94	V	31.1	1.55	35.1	32.49	54.00	21.51

### 3.3 Conducted Emission Test

#### 3.3.1 Requirement

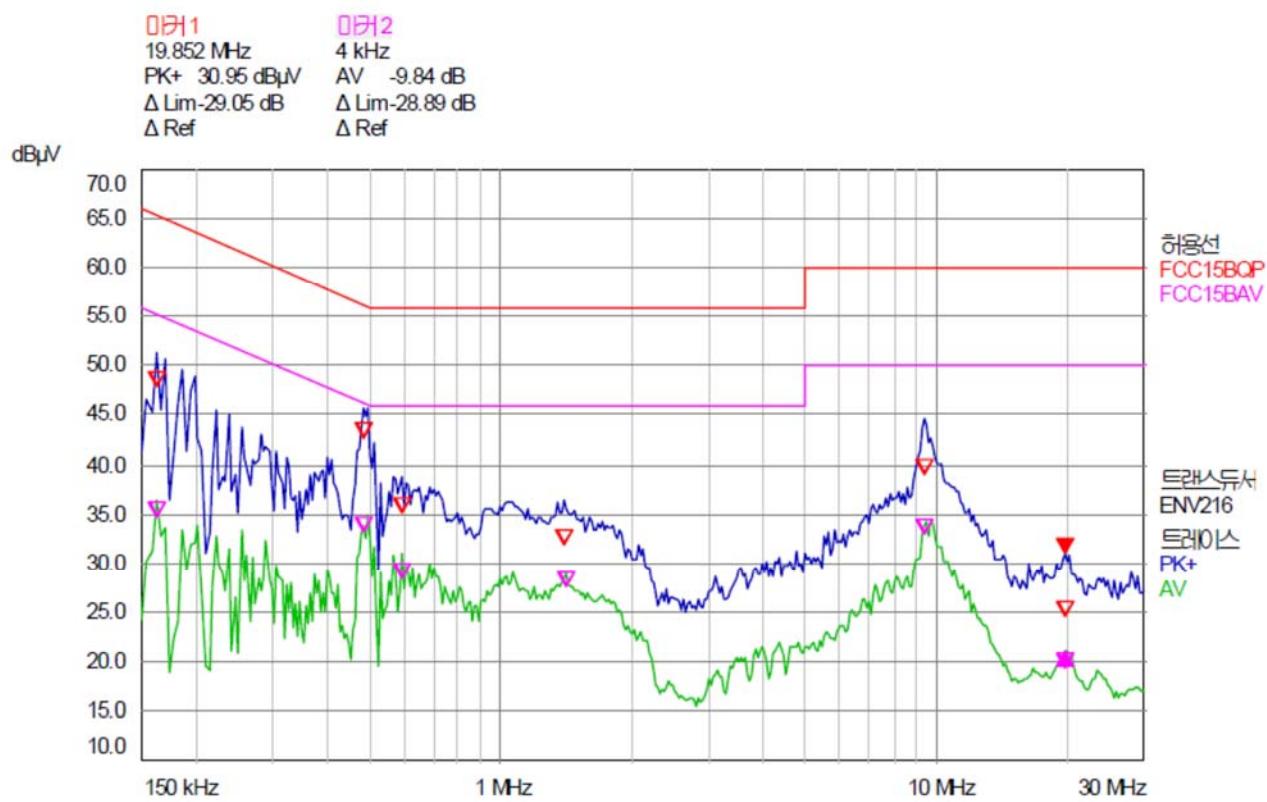
- FCC Part15 subpart C Section 15.207

#### 3.3.2 Test Procedure

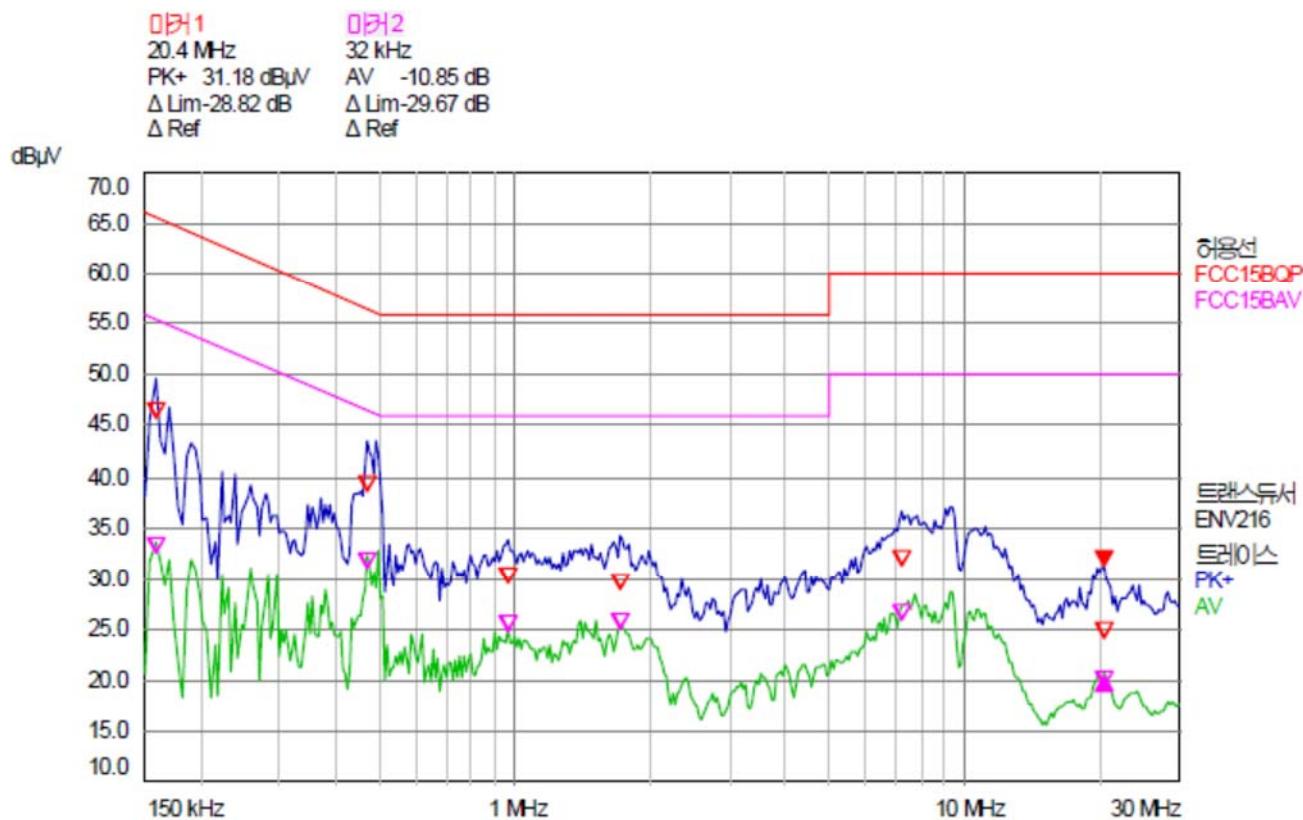
The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a  $50 \Omega / 50 \mu\text{H} + 5 \Omega$  Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

#### 3.3.3 Test data

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



- Tested Line : NEUTRAL LINE



FREQ [MHz]	Corr.Factor [dB]		[H/N]	Quasi-peak [dB $\mu$ V]			C-Average [dB $\mu$ V]		
	LISN	Cables		Measured	Limit	Margin	Measured	Limit	Margin
0.16	9.52	9.90	H	47.92	65.36	17.44	34.68	55.36	20.68
0.49	9.55	9.92	H	42.73	56.24	13.51	33.15	46.24	13.09
0.96	9.56	9.96	N	29.57	56.00	26.43	24.69	46.00	21.31
1.40	9.56	9.97	H	31.79	56.00	24.21	27.65	46.00	18.35
9.38	9.71	10.17	H	38.97	60.00	21.03	33.03	50.00	16.97
19.85	9.73	10.35	H	24.44	60.00	35.56	19.26	50.00	30.74

### 3.4 Antenna Requirement

#### 3.4.1 Requirement

- FCC Part15 subpart C 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 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.

#### 3.4.2 Result

- The antenna of the EUT is a Patch Antenna on the board in the EUT.

#### 4. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses.

$$\begin{array}{rcl} + & \text{Meter reading} & (\text{dB}\mu\text{V}) \\ - & \text{Amplifier Gain} & (\text{dB}) \\ + & \text{Cable Loss} & (\text{dB}) \\ - & \text{Antenna Factor} & (\text{dB}/\text{m}) \\ \hline = & \text{Corrected Result} & (\text{dB}\mu\text{V}/\text{m}) \end{array}$$

Margin (dB)

$$\begin{array}{rcl} & \text{Specification Limit} & (\text{dBuV}/\text{m}) \\ - & \text{Corrected Result} & (\text{dBuV}/\text{m}) \\ \hline = & \text{dB Relative to Spec} & (\pm \text{dB}) \end{array}$$

## 5. Test equipment list

Use	Model Number	Manufacturer	Description	Serial Number	Cal. Date.(Interval)
<input checked="" type="checkbox"/>	AMP 20-1000	INFINITECH	BROADBAND PRE-AMP	2013 05 00003	Jan 14, 2021(1Y)
<input type="checkbox"/>	GP-4303DU	EZ Digital Co.,Ltd.	DC Power Supply	2100196	Jan 14, 2021(1Y)
<input checked="" type="checkbox"/>	DS 2000S	Innco GmbH	Turn Table	N/A	N/A
<input checked="" type="checkbox"/>	MA4000-EP-HS	Innco GmbH	Antenna Mast	N/A	N/A
<input checked="" type="checkbox"/>	MA4640-XP-ET	Innco GmbH	Tilt Antenna Mast	N/A	N/A
<input checked="" type="checkbox"/>	CO3000	Innco GmbH	Controller	N/A	N/A
<input checked="" type="checkbox"/>	CO3000	Innco GmbH	Controller	N/A	N/A
<input checked="" type="checkbox"/>	N9020A	Agilent	Spectrum Analyzer	MY50200260	Jan 14, 2021(1Y)
<input checked="" type="checkbox"/>	6502	EMCO	Loop Antenna	9609-3087	Nov 11, 2021(2Y)
<input checked="" type="checkbox"/>	VULB 9168	SCHWARZBECK	Trilog-Broadband Antenna	9168-735	Nov 17, 2021(2Y)
<input checked="" type="checkbox"/>	8449B	Agilent	Preamplifier	3008A02013	Jan 14, 2021(1Y)
<input checked="" type="checkbox"/>	3115	ETS	Horn Antenna	9402-4229	July 28, 2020(2Y)
<input checked="" type="checkbox"/>	ESCI7	Rohde & Schwarz	EMI Test Receiver	100938	Jan 14, 2021(1Y)
<input checked="" type="checkbox"/>	ESH-Z2	Rohde & Schwarz	Pulse Limter	101631	Jan 14, 2021(1Y)
<input checked="" type="checkbox"/>	ENV216	Rohde & Schwarz	LISN	101264	July 14, 2021(1Y)
<input checked="" type="checkbox"/>	ES-SCAN	Rohde & Schwarz	EMI Software	N/A	N/A
<input checked="" type="checkbox"/>	EMC32	Rohde & Schwarz	EMI Software	N/A	N/A
<input checked="" type="checkbox"/>	FSV	Rohde & Schwarz	Spectrum Analyzer	101673	Jan 14, 2021(1Y)