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KCTL-TIR001-003/2

#### Report revision history

| Date       | Revision        | Page No |
|------------|-----------------|---------|
| 2020-01-28 | Initial report  | -       |
| 2020-02-04 | Updated version | -       |
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## CONTENTS

|      |                                      |    |
|------|--------------------------------------|----|
| 1.   | General information .....            | 4  |
| 2.   | Device information .....             | 4  |
| 2.1. | Accessory information .....          | 4  |
| 2.2. | Frequency/channel operations.....    | 5  |
| 3.   | Antenna requirement .....            | 5  |
| 4.   | Summary of tests .....               | 6  |
| 5.   | Measurement uncertainty .....        | 7  |
| 6.   | Test results .....                   | 8  |
| 6.1. | 20 dB Bandwidth & 99% Bandwidth..... | 8  |
| 6.2. | Frequency tolerance .....            | 11 |
| 6.3. | Radiated spurious emissions .....    | 14 |
| 7.   | Measurement equipment .....          | 24 |

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## 1. General information

Client : WINNERCOM CO., LTD  
 Address : 158-7, Golden root-ro, Juchon-myeon, Gimhae-si, Gyeongsangnam-do, KOREA  
 Manufacturer : WINNERCOM CO., LTD  
 Address : 158-7, Golden root-ro, Juchon-myeon, Gimhae-si, Gyeongsangnam-do, KOREA  
 Laboratory : KCTL Inc.  
 Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea  
 Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132  
 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056  
 Industry Canada Registration No. : 8035A  
 KOLAS No.: KT231

## 2. Device information

Equipment under test : NFC Touch Door  
 Model : CN7  
 Frequency range : 13.56 MHz  
 Modulation technique : ASK  
 Power source : DC 12 V  
 Antenna specification : Loop Coil Antenna (NFC)  
 Software version : HCNLJ-Z000A\_1.00  
 Hardware version : HCNLJ-ZM01A\_2002  
 Test device serial No. : N/A  
 Operation temperature : -40 °C ~ 80 °C

### 2.1. Accessory information

| Equipment | Manufacturer | Model | Serial No. | Power source |
|-----------|--------------|-------|------------|--------------|
| N/A       | -            | -     | -          | -            |

## 2.2. Frequency/channel operations

This device contains the following capabilities:

| Frequency (MHz) |
|-----------------|
| 13.56           |

Table 2.2.1. NFC mode

## 3. Antenna requirement

Requirement of FCC part 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.

### Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

The transmitter has permanently attached Loop coil Antenna (internal antenna) on board.

#### 4. Summary of tests

| FCC Part section(s) | IC Rule reference                                 | Parameter                     | Test results           |
|---------------------|---------------------------------------------------|-------------------------------|------------------------|
| 15.225(a)           | RSS-210<br>B.6 ( I )                              | In-band Fundamental Emission  | Pass                   |
| 15.225(b)           | RSS-210<br>B.6 ( II )                             | In-band Spurious Emission     | Pass                   |
| 15.225(c)           | RSS-210<br>B.6 ( III )                            | In-band Spurious Emission     | Pass                   |
| 15.225(d)<br>15.209 | RSS-210<br>B.6 ( IV )<br>RSS-Gen<br>Issue 9 (8.9) | Out-of-band Spurious Emission | Pass                   |
| 15.225(e)           | RSS-210<br>B.6 ( b )                              | Frequency Stability Tolerance | Pass                   |
| 15.215(c)           | -                                                 | 20 dB Bandwidth               | Pass                   |
| -                   | RSS-Gen<br>Issue 5 (6.7)                          | Occupied Bandwidth            | Pass                   |
| 15.207(a)           | RSS-Gen<br>Issue 5 (8.8)                          | AC Conducted emissions        | N/A <sup>(note4)</sup> |

#### Notes:

- These tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
- The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z It was determined that X orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X orientation
- The radiated test was performed with and without passive tag. The test results shown in the following sections represent the worst case emissions.
  - ♦ Worst Case : Without passive tag
- The test procedure(s) in this report were performed in accordance as following.
  - ♦ ANSI C63.10-2013
- This test is not applicable because the EUT falls into the automotive device and it's not to be connected to the public utility (AC) power line.

## 5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

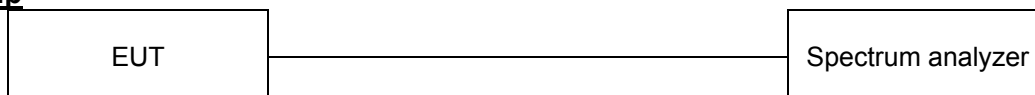
| Parameter                   | Expanded uncertainty ( $\pm$ ) |         |
|-----------------------------|--------------------------------|---------|
| Radiated spurious emissions | 9 kHz ~ 30 MHz                 | 2.28 dB |
|                             | 30 MHz ~ 300 MHz               | 4.98 dB |
|                             | 300 MHz ~ 1 000 MHz            | 5.14 dB |
|                             | 1 GHz ~ 6 GHz                  | 6.70 dB |
|                             | Above 6 GHz                    | 6.60 dB |
| Conducted emissions         | 9 kHz ~ 150 kHz                | 3.66 dB |
|                             | 150 kHz ~ 30 MHz               | 3.26 dB |

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## 6. Test results

### 6.1. 20 dB Bandwidth & 99% Bandwidth

#### Test setup



#### Limit

According to §15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

According to RSS-Gen Issue 5 (6.7) The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

#### Test procedure

ANSI C63.10-2013 - Section 6.9.2



**Test settings**

The occupied bandwidth is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio (or in decibels, a specified number of dB down from the reference value). Typical ratios, expressed in dB, are -6 dB, -20 dB, and -26 dB, corresponding to 6 dB BW, 20 dB BW, and 26 dB BW, respectively. In this subclause, the ratio is designated by “-xx dB.” The reference value is either the level of the unmodulated carrier or the highest level of the spectral envelope of the modulated signal, as stated by the applicable requirement. Some requirements might specify a specific maximum or minimum value for the “-xx dB” bandwidth; other requirements might specify that the “-xx dB” bandwidth be entirely contained within the authorized or designated frequency band.

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.
- b) Span: Two times and five times the OBW.
- c) RBW = 1 % to 5 % of the OBW and VBW  $\geq 3 \times$  RBW
- d) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation.
- e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “-xx dB down” requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
- f) Detector: peak
- g) Trace mode: max hold.
- h) Allow the trace to stabilize.
- i) Determine the “-xx dB down amplitude” using ((reference value) - xx). Alternatively, this calculation may be made by using the marker-delta function of the instrument.
- j) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j)
- k) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “-xx dB down amplitude” determined in step h). If a marker is below this “-xx dB down amplitude” value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the “-xx dB down amplitude” determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

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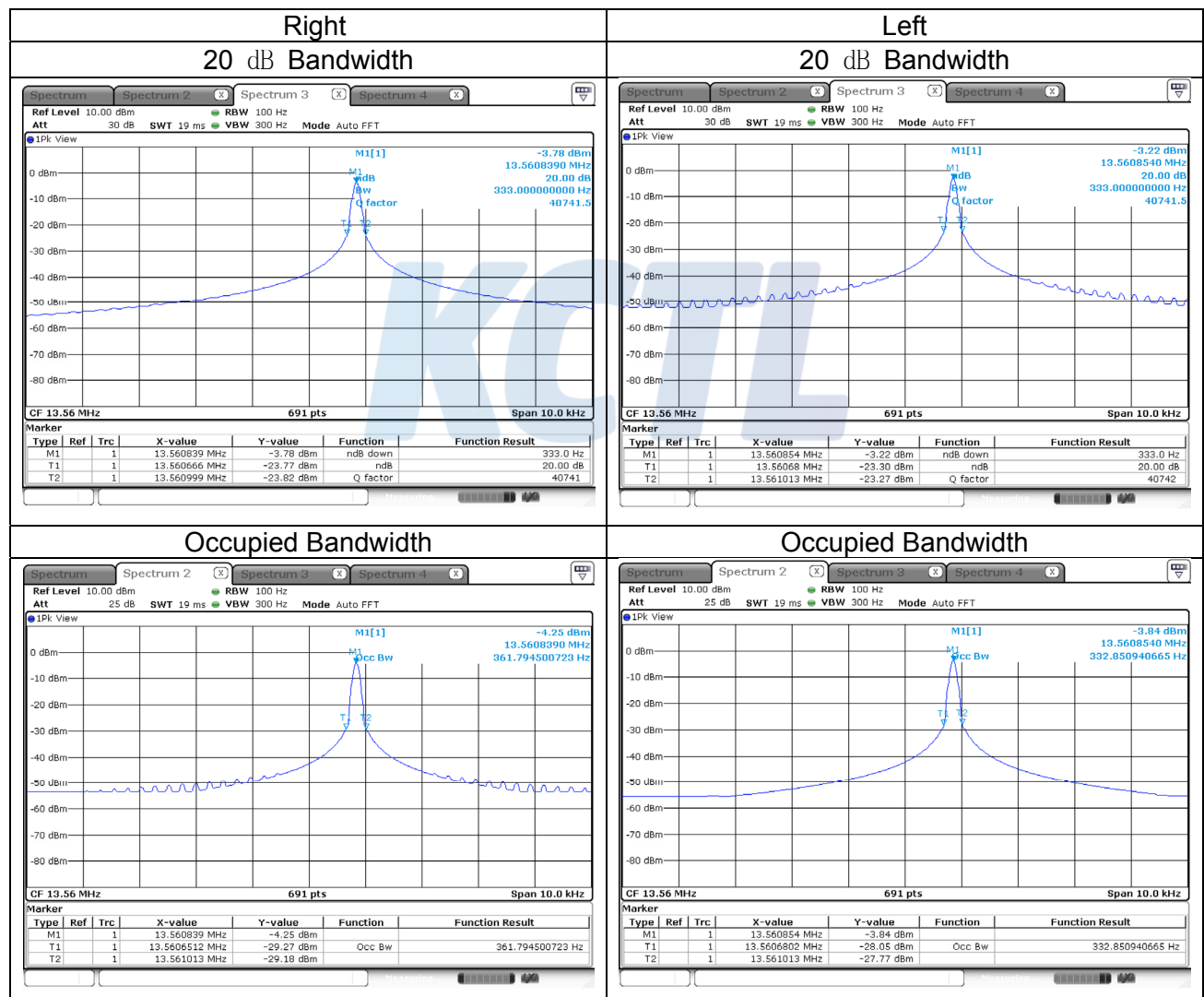
Report No.:  
KR20-SRF0012-A

Page (10) of (24)

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## Test results

| Case  | Frequency<br>[MHz] | 20 dB Bandwidth<br>[MHz] |                      | Limit<br>[MHz] | 20 dB Bandwidth<br>[kHz] | Occupied<br>Bandwidth<br>(99 % BW) [kHz] |
|-------|--------------------|--------------------------|----------------------|----------------|--------------------------|------------------------------------------|
|       |                    | Lowest<br>Frequency      | Highest<br>Frequency |                |                          |                                          |
| Right | 13.56              | 13.560 7                 | 13.561 0             | 13.110 0       | 0.333                    | 0.362                                    |
|       |                    | 13.561 0                 | 14.010 0             | 14.010 0       |                          |                                          |
| Left  | 13.56              | 13.560 7                 | 13.561 0             | 13.110 0       | 0.333                    | 0.333                                    |
|       |                    | 13.561 0                 | 14.010 0             | 14.010 0       |                          |                                          |

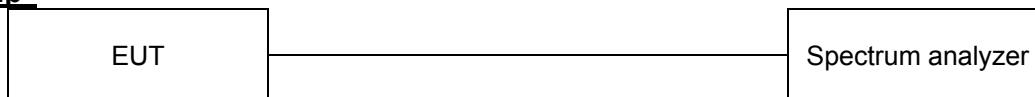


## Note:

Because the measured signal is CW/CW-like, adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW

## 6.2. Frequency tolerance

### Test setup



### Limit

15.225 (e), RSS-210 B.6.(b) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01$  % of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### Test procedure

ANSI C63.10-2013 - Section 6.8.1

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**Test results****- Right**

| Voltage | Voltage | TEMP | Maintaining time | Measure frequency | Frequency deviation | Deviation |
|---------|---------|------|------------------|-------------------|---------------------|-----------|
| [%]     | [V]     | [°C] |                  | [Hz]              | [Hz]                | [%]       |
| 100     | 12.00   | 20   | Startup          | 13 560 837        | -837.0              | 0.006 17  |
|         |         |      | 2 minutes        | 13 560 837        | -837.0              | 0.006 17  |
|         |         |      | 5 minutes        | 13 560 837        | -837.0              | 0.006 17  |
|         |         |      | 10 minutes       | 13 560 837        | -837.0              | 0.006 17  |
|         |         | -20  | Startup          | 13 561 902        | -1902.0             | 0.014 03  |
|         |         |      | 2 minutes        | 13 561 902        | -1902.0             | 0.014 03  |
|         |         |      | 5 minutes        | 13 561 901        | -1901.0             | 0.014 02  |
|         |         |      | 10 minutes       | 13 561 902        | -1902.0             | 0.014 03  |
|         |         | -10  | Startup          | 13 561 001        | -1001.0             | 0.007 38  |
|         |         |      | 2 minutes        | 13 561 002        | -1002.0             | 0.007 39  |
|         |         |      | 5 minutes        | 13 561 001        | -1001.0             | 0.007 38  |
|         |         |      | 10 minutes       | 13 561 001        | -1001.0             | 0.007 38  |
|         |         | 0    | Startup          | 13 560 970        | -970.0              | 0.007 15  |
|         |         |      | 2 minutes        | 13 560 970        | -970.0              | 0.007 15  |
|         |         |      | 5 minutes        | 13 560 970        | -970.0              | 0.007 15  |
|         |         |      | 10 minutes       | 13 560 970        | -970.0              | 0.007 15  |
|         |         | 10   | Startup          | 13 560 811        | -811.0              | 0.005 98  |
|         |         |      | 2 minutes        | 13 560 811        | -811.0              | 0.005 98  |
|         |         |      | 5 minutes        | 13 560 811        | -811.0              | 0.005 98  |
|         |         |      | 10 minutes       | 13 560 811        | -811.0              | 0.005 98  |
|         |         | 25   | Startup          | 13 560 737        | -737.0              | 0.005 44  |
|         |         |      | 2 minutes        | 13 560 737        | -737.0              | 0.005 44  |
|         |         |      | 5 minutes        | 13 560 737        | -737.0              | 0.005 44  |
|         |         |      | 10 minutes       | 13 560 737        | -737.0              | 0.005 44  |
|         |         | 30   | Startup          | 13 560 899        | -899.0              | 0.006 63  |
|         |         |      | 2 minutes        | 13 560 898        | -898.0              | 0.006 62  |
|         |         |      | 5 minutes        | 13 560 899        | -899.0              | 0.006 63  |
|         |         |      | 10 minutes       | 13 560 897        | -897.0              | 0.006 62  |
|         |         | 40   | Startup          | 13 561 016        | -1016.0             | 0.007 49  |
|         |         |      | 2 minutes        | 13 561 016        | -1016.0             | 0.007 49  |
|         |         |      | 5 minutes        | 13 561 014        | -1014.0             | 0.007 48  |
|         |         |      | 10 minutes       | 13 561 016        | -1016.0             | 0.007 49  |
|         |         | 50   | Startup          | 13 561 260        | -1260.0             | 0.009 29  |
|         |         |      | 2 minutes        | 13 561 260        | -1260.0             | 0.009 29  |
|         |         |      | 5 minutes        | 13 561 260        | -1260.0             | 0.009 29  |
|         |         |      | 10 minutes       | 13 561 260        | -1260.0             | 0.009 29  |
| 85      | 10.20   | 20   | Startup          | 13 560 801        | -801.0              | 0.005 91  |
|         |         |      | 2 minutes        | 13 560 801        | -801.0              | 0.005 91  |
|         |         |      | 5 minutes        | 13 560 801        | -801.0              | 0.005 91  |
|         |         |      | 10 minutes       | 13 560 801        | -801.0              | 0.005 91  |
| 115     | 13.80   | 20   | Startup          | 13 560 880        | -880.0              | 0.006 49  |
|         |         |      | 2 minutes        | 13 560 797        | -797.0              | 0.005 88  |
|         |         |      | 5 minutes        | 13 560 880        | -880.0              | 0.006 49  |
|         |         |      | 10 minutes       | 13 560 880        | -880.0              | 0.006 49  |

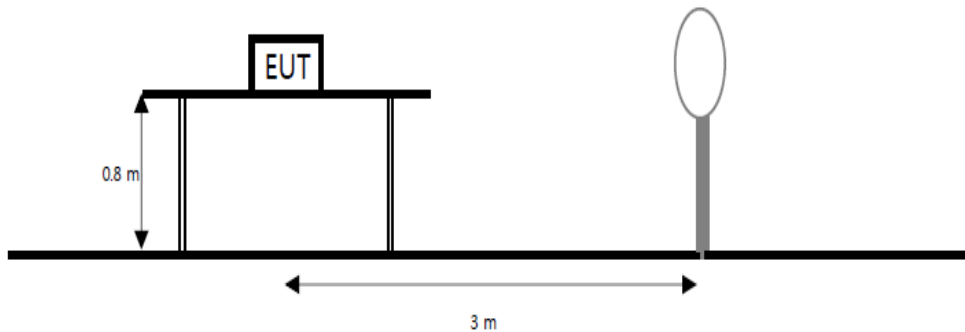
**- Left**

| Voltage | Voltage | TEMP | Maintaining time | Measure frequency | Frequency deviation | Deviation |
|---------|---------|------|------------------|-------------------|---------------------|-----------|
| [%]     | [V]     | [°C] |                  | [Hz]              | [Hz]                | [%]       |
| 100     | 12.00   | 20   | Startup          | 13 560 899        | -899.0              | 0.006 63  |
|         |         |      | 2 minutes        | 13 560 899        | -899.0              | 0.006 63  |
|         |         |      | 5 minutes        | 13 560 899        | -899.0              | 0.006 63  |
|         |         |      | 10 minutes       | 13 560 899        | -899.0              | 0.006 63  |
|         |         | -20  | Startup          | 13 561 112        | -1112.0             | 0.008 20  |
|         |         |      | 2 minutes        | 13 561 112        | -1112.0             | 0.008 20  |
|         |         |      | 5 minutes        | 13 561 112        | -1112.0             | 0.008 20  |
|         |         |      | 10 minutes       | 13 561 113        | -1113.0             | 0.008 21  |
|         |         | -10  | Startup          | 13 560 978        | -978.0              | 0.007 21  |
|         |         |      | 2 minutes        | 13 560 978        | -978.0              | 0.007 21  |
|         |         |      | 5 minutes        | 13 560 978        | -978.0              | 0.007 21  |
|         |         |      | 10 minutes       | 13 560 978        | -978.0              | 0.007 21  |
|         |         | 0    | Startup          | 13 560 912        | -912.0              | 0.006 73  |
|         |         |      | 2 minutes        | 13 560 911        | -911.0              | 0.006 72  |
|         |         |      | 5 minutes        | 13 560 912        | -912.0              | 0.006 73  |
|         |         |      | 10 minutes       | 13 560 912        | -912.0              | 0.006 73  |
|         |         | 10   | Startup          | 13 560 775        | -775.0              | 0.005 72  |
|         |         |      | 2 minutes        | 13 560 771        | -771.0              | 0.005 69  |
|         |         |      | 5 minutes        | 13 560 773        | -773.0              | 0.005 70  |
|         |         |      | 10 minutes       | 13 560 775        | -775.0              | 0.005 72  |
|         |         | 25   | Startup          | 13 560 855        | -855.0              | 0.006 31  |
|         |         |      | 2 minutes        | 13 560 855        | -855.0              | 0.006 31  |
|         |         |      | 5 minutes        | 13 560 855        | -855.0              | 0.006 31  |
|         |         |      | 10 minutes       | 13 560 855        | -855.0              | 0.006 31  |
|         |         | 30   | Startup          | 13 560 786        | -786.0              | 0.005 80  |
|         |         |      | 2 minutes        | 13 560 786        | -786.0              | 0.005 80  |
|         |         |      | 5 minutes        | 13 560 786        | -786.0              | 0.005 80  |
|         |         |      | 10 minutes       | 13 560 786        | -786.0              | 0.005 80  |
|         |         | 40   | Startup          | 13 561 630        | -1630.0             | 0.012 02  |
|         |         |      | 2 minutes        | 13 561 630        | -1630.0             | 0.012 02  |
|         |         |      | 5 minutes        | 13 561 630        | -1630.0             | 0.012 02  |
|         |         |      | 10 minutes       | 13 561 630        | -1630.0             | 0.012 02  |
|         |         | 50   | Startup          | 13 562 456        | -2456.0             | 0.018 11  |
|         |         |      | 2 minutes        | 13 562 456        | -2456.0             | 0.018 11  |
|         |         |      | 5 minutes        | 13 562 456        | -2456.0             | 0.018 11  |
|         |         |      | 10 minutes       | 13 562 456        | -2456.0             | 0.018 11  |
| 85      | 10.20   | 20   | Startup          | 13 560 852        | -852.0              | 0.006 28  |
|         |         |      | 2 minutes        | 13 560 852        | -852.0              | 0.006 28  |
|         |         |      | 5 minutes        | 13 560 852        | -852.0              | 0.006 28  |
|         |         |      | 10 minutes       | 13 560 852        | -852.0              | 0.006 28  |
| 115     | 13.80   | 20   | Startup          | 13 560 839        | -839.0              | 0.006 19  |
|         |         |      | 2 minutes        | 13 560 837        | -837.0              | 0.006 17  |
|         |         |      | 5 minutes        | 13 560 837        | -837.0              | 0.006 17  |
|         |         |      | 10 minutes       | 13 560 839        | -839.0              | 0.006 19  |

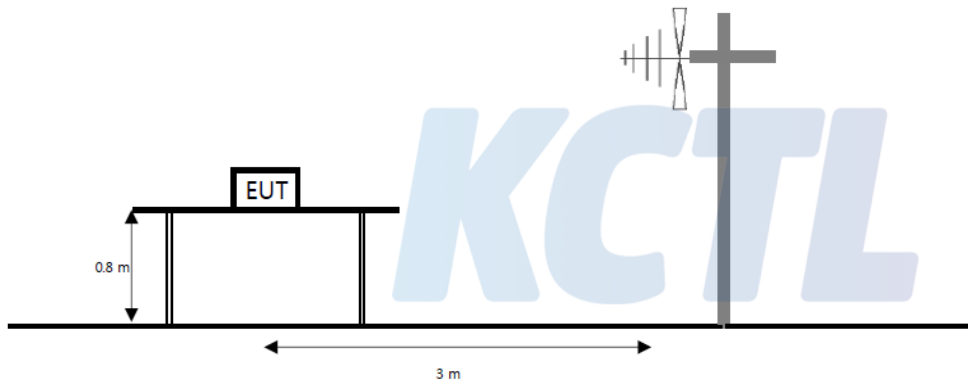
### 6.3. Radiated spurious emissions

#### Test setup

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



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



#### Limit

15.225 (a), RSS-210 B.6.(a).( i ) The field strength of any emission within the band 13.553-13.567 MHz shall not exceed 15, 848 microvolts/meter at 30 meters.

15.225 (b), RSS-210 B.6.(a).( ii ) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225 (c), RSS-210 B.6 (a).(iii) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

15.225 (d), RSS-210 B.6.(a).(iv) RSS-Gen Issue 9 (8.9) The Field Strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in 15.209.

| Frequency<br>(MHz) | Field Strength<br>( $\mu\text{V/m}$ ) | Measurement distance<br>(meters) |
|--------------------|---------------------------------------|----------------------------------|
| 0.009-0.490        | 2400/F(kHz)                           | 300                              |
| 0.490-1.705        | 24000/F(kHz)                          | 30                               |
| 1.705-30.0         | 30(29.54 dB $\mu\text{V/m}$ )         | 30                               |
| 30.0-88.0          | 100(40 dB $\mu\text{V/m}$ )           | 3                                |
| 88-216             | 150(43.5 dB $\mu\text{V/m}$ )         | 3                                |
| 216-960            | 200 (46 dB $\mu\text{V/m}$ )          | 3                                |
| Above 960          | 500 (53.98 dB $\mu\text{V/m}$ )       | 3                                |

### Test procedure

ANSI C63.10-2013 - Section 6.4, 6.5

### Test settings

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW  $\geq 3 \times$  RBW
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

**Table. RBW as a function of frequency**

| Frequency           | RBW                |
|---------------------|--------------------|
| 9 kHz to 150 kHz    | 200 Hz to 300 Hz   |
| 0.15 MHz to 30 MHz  | 9 kHz to 10 kHz    |
| 30 MHz to 1 000 MHz | 100 kHz to 120 kHz |
| > 1 000 MHz         | 1 MHz              |

### Notes:

1.  $f < 30$  MHz, extrapolation factor of 40 dB/decade of distance.  $F_d = 40 \log(D_m/D_s)$   
 $f \geq 30$  MHz, extrapolation factor of 20 dB/decade of distance.  $F_d = 20 \log(D_m/D_s)$   
 Where:  
 $F_d$  = Distance factor in dB  
 $D_m$  = Measurement distance in meters  
 $D_s$  = Specification distance in meters
2. Measurements were performed at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in § 15.31(f)(2). Extrapolation Factor =  $40 \log_{10}(30/3) = 40$  dB.
3. (dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or  $F_d$ (dB)
4. Result = Reading + Cable loss + Amp gain + Ant. factor - Distance factor
5. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
6. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector.
7. Below 30 MHz frequency range, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported and the worse orientations of Face-on and Face-off were set for final test.
8. Face-on = Parallel, Face-off = Perpendicular

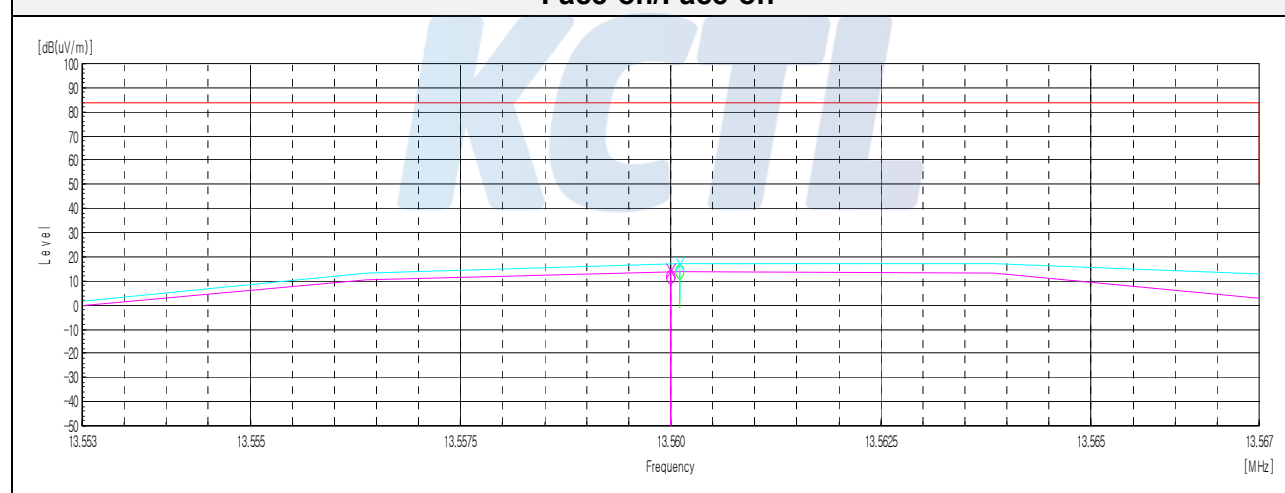
**Test results for fundamental****15.225 (a) 13.553-13.567 MHz****-Right**

[Face-on]

| Frequency       | Reading         | Antenna Factor | Amp. + Cable | Distance Factor | Result            | Limit             | Margin |
|-----------------|-----------------|----------------|--------------|-----------------|-------------------|-------------------|--------|
| (MHz)           | (dB( $\mu V$ )) | (dB)           | (dB)         | (dB)            | (dB( $\mu V/m$ )) | (dB( $\mu V/m$ )) | (dB)   |
| Quasi peak data |                 |                |              |                 |                   |                   |        |
| 13.56           | 62.70           | 20.27          | -31.27       | 40.00           | 11.70             | 84.00             | 72.30  |

[Face-off]

| Frequency       | Reading         | Antenna Factor | Amp. + Cable | Distance Factor | Result            | Limit             | Margin |
|-----------------|-----------------|----------------|--------------|-----------------|-------------------|-------------------|--------|
| (MHz)           | (dB( $\mu V$ )) | (dB)           | (dB)         | (dB)            | (dB( $\mu V/m$ )) | (dB( $\mu V/m$ )) | (dB)   |
| Quasi peak data |                 |                |              |                 |                   |                   |        |
| 13.56           | 65.40           | 20.27          | -31.27       | 40.00           | 14.40             | 84.00             | 69.60  |

**Face-on/Face-off**



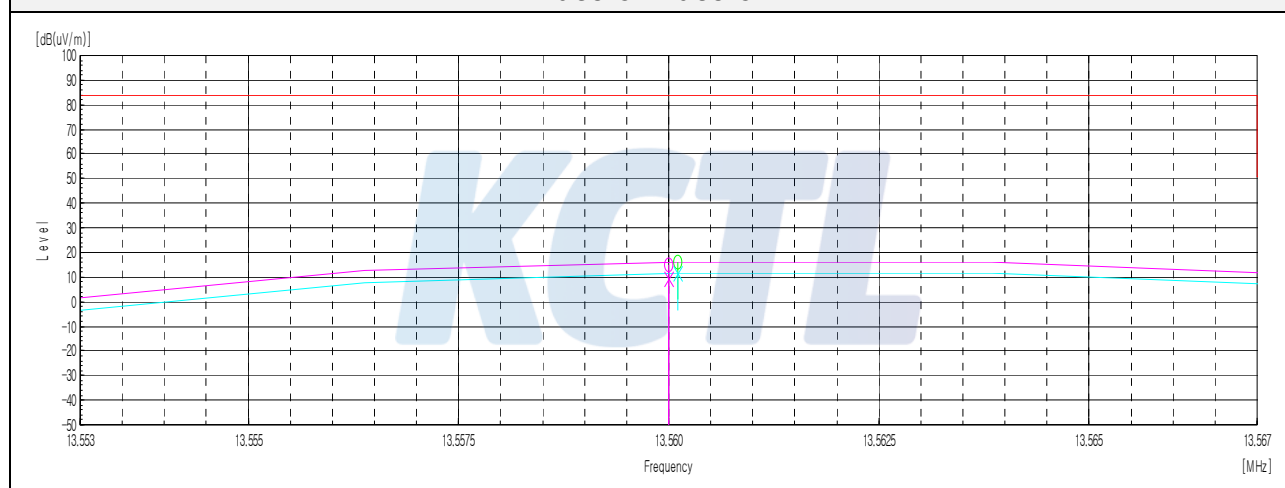
**-Left**

[Face-on]

| Frequency       | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|-----------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)           | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| Quasi peak data |          |                |              |                 |            |            |        |
| 13.56           | 65.70    | 20.27          | -31.27       | 40.00           | 14.70      | 84.00      | 69.30  |

[Face-off]

| Frequency       | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|-----------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)           | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| Quasi peak data |          |                |              |                 |            |            |        |
| 13.56           | 60.20    | 20.27          | -31.27       | 40.00           | 9.20       | 84.00      | 74.80  |

**Face-on/Face-off**

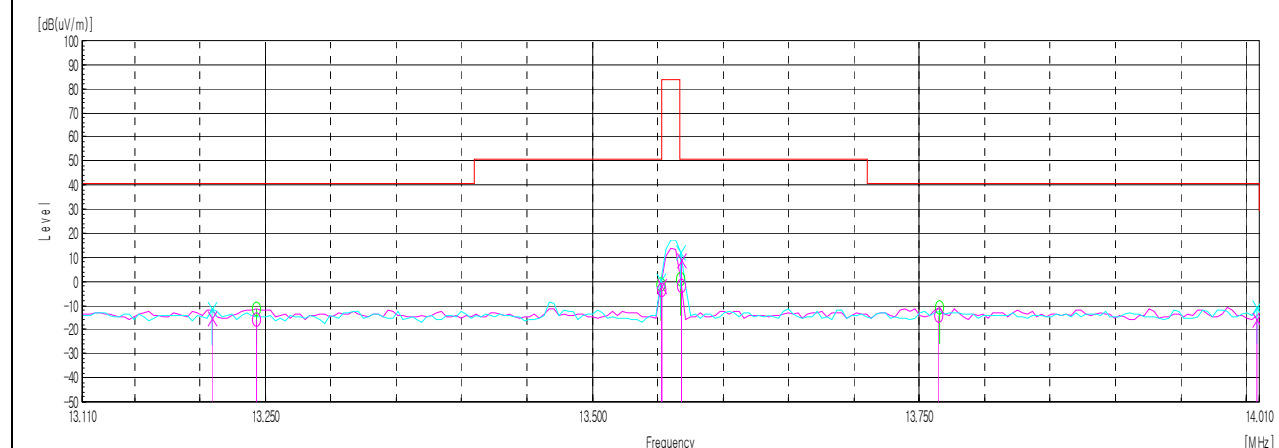
**Test results for in-band & out-band (9 kHz to 30 MHz)****15.225 (b,c) 13.110-14.010 MHz****-Right**

[Face-on]

| Frequency       | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|-----------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)           | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| Quasi peak data |          |                |              |                 |            |            |        |
| 13.24           | 35.40    | 20.26          | -31.26       | 40.00           | -15.60     | 40.51      | 56.11  |
| 13.55           | 47.20    | 20.27          | -31.27       | 40.00           | -3.80      | 50.47      | 54.27  |
| 13.57           | 49.10    | 20.27          | -31.27       | 40.00           | -1.90      | 50.47      | 52.37  |
| 13.77           | 36.70    | 20.28          | -31.28       | 40.00           | -14.30     | 40.51      | 54.81  |

[Face-off]

| Frequency       | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|-----------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)           | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| Quasi peak data |          |                |              |                 |            |            |        |
| 13.21           | 35.50    | 20.26          | -31.26       | 40.00           | -15.50     | 40.51      | 56.01  |
| 13.55           | 49.00    | 20.27          | -31.27       | 40.00           | -2.00      | 50.47      | 52.47  |
| 13.57           | 60.50    | 20.27          | -31.27       | 40.00           | 9.50       | 50.47      | 40.97  |
| 14.01           | 35.30    | 20.28          | -31.18       | 40.00           | -15.60     | 40.51      | 56.11  |

**Face-on/Face-off**

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Report No.:  
KR20-SRF0012-A

Page (19) of (24)

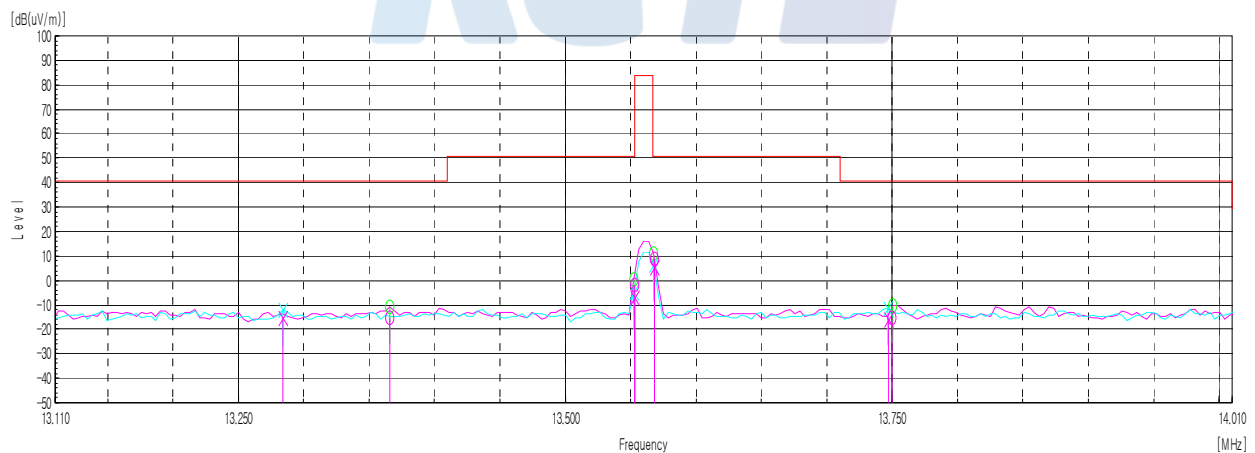
**-Left**

[Face-on]

| Frequency              | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|------------------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)                  | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| <b>Quasi peak data</b> |          |                |              |                 |            |            |        |
| 13.37                  | 35.80    | 20.27          | -31.27       | 40.00           | -15.20     | 40.51      | 55.71  |
| 13.55                  | 48.90    | 20.27          | -31.27       | 40.00           | -2.10      | 50.47      | 52.57  |
| 13.57                  | 59.90    | 20.27          | -31.27       | 40.00           | 8.90       | 50.47      | 41.57  |
| 13.75                  | 35.60    | 20.28          | -31.28       | 40.00           | -15.40     | 40.51      | 55.91  |

[Face-off]

| Frequency              | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|------------------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)                  | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| <b>Quasi peak data</b> |          |                |              |                 |            |            |        |
| 13.28                  | 35.70    | 20.27          | -31.27       | 40.00           | -15.30     | 40.51      | 55.81  |
| 13.55                  | 44.10    | 20.27          | -31.27       | 40.00           | -6.90      | 50.47      | 57.37  |
| 13.57                  | 56.50    | 20.27          | -31.27       | 40.00           | 5.50       | 50.47      | 44.97  |
| 13.75                  | 35.10    | 20.28          | -31.28       | 40.00           | -15.90     | 40.51      | 56.41  |

**Face-on/Face-off**

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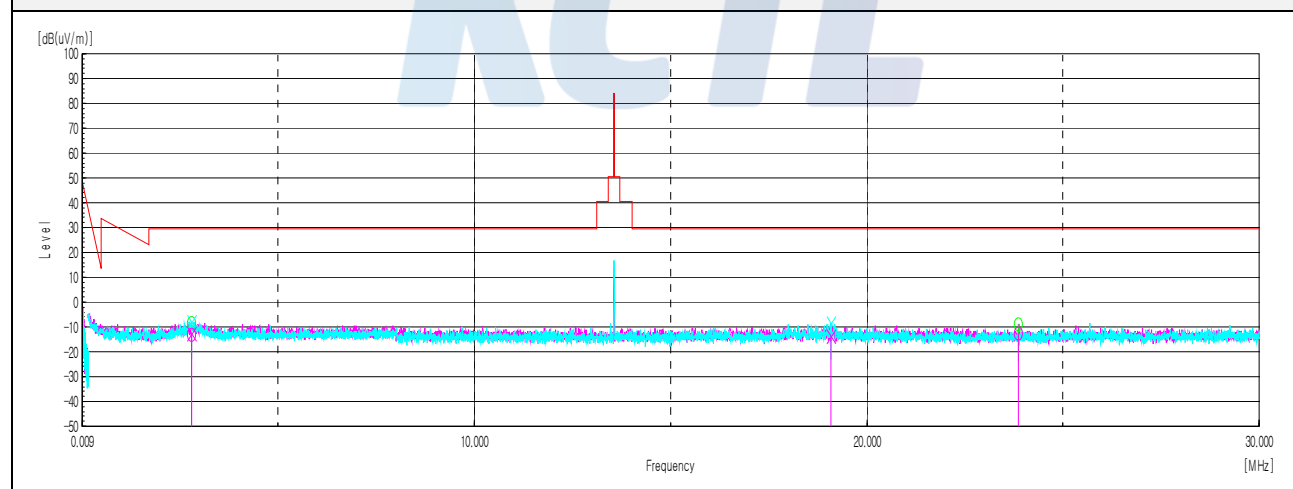
Page (20) of (24)

**KCTL****Test results (9 kHz to 30 MHz)****15.225 (d) 0.009-30 MHz****-Right****[Face-on]**

| Frequency              | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|------------------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)                  | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| <b>Quasi peak data</b> |          |                |              |                 |            |            |        |
| 2.79                   | 38.80    | 20.13          | -31.93       | 40.00           | -13.00     | 29.54      | 42.54  |
| 23.87                  | 37.40    | 20.93          | -30.83       | 40.00           | -12.50     | 29.54      | 42.04  |

**[Face-off]**

| Frequency              | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|------------------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)                  | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| <b>Quasi peak data</b> |          |                |              |                 |            |            |        |
| 2.80                   | 39.10    | 20.14          | -31.94       | 40.00           | -12.70     | 29.54      | 42.24  |
| 19.09                  | 36.70    | 20.63          | -31.03       | 40.00           | -13.70     | 29.54      | 43.24  |

**Face-on/Face-off**

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Report No.:  
KR20-SRF0012-A

Page (21) of (24)

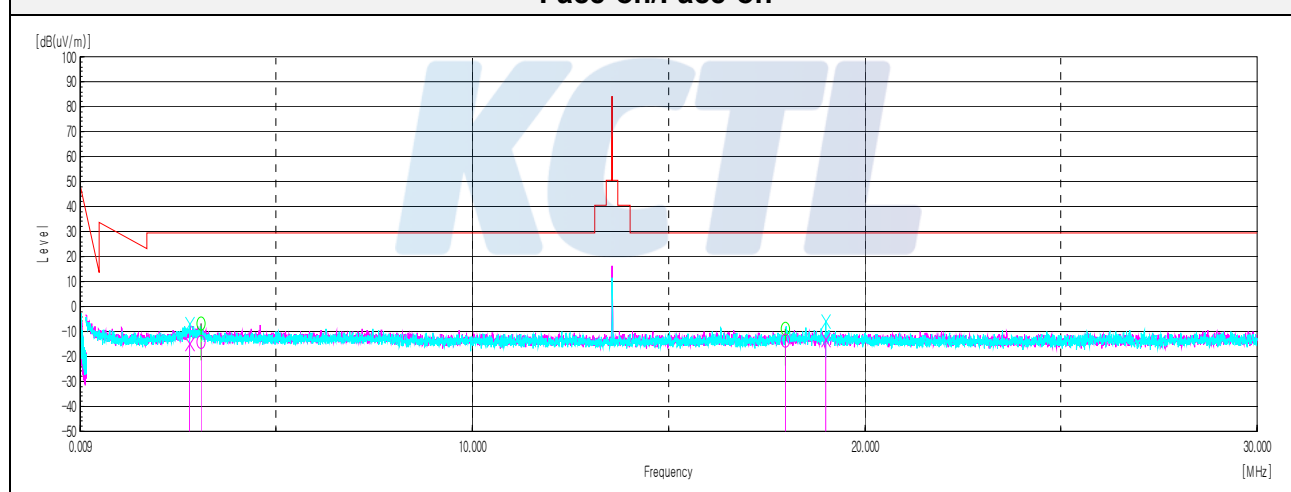
**KCTL****-Left**

[Face-on]

| Frequency              | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|------------------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)                  | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| <b>Quasi peak data</b> |          |                |              |                 |            |            |        |
| 3.09                   | 37.60    | 20.16          | -31.96       | 40.00           | -14.20     | 29.54      | 43.74  |
| 17.97                  | 36.90    | 20.54          | -31.04       | 40.00           | -13.60     | 29.54      | 43.14  |

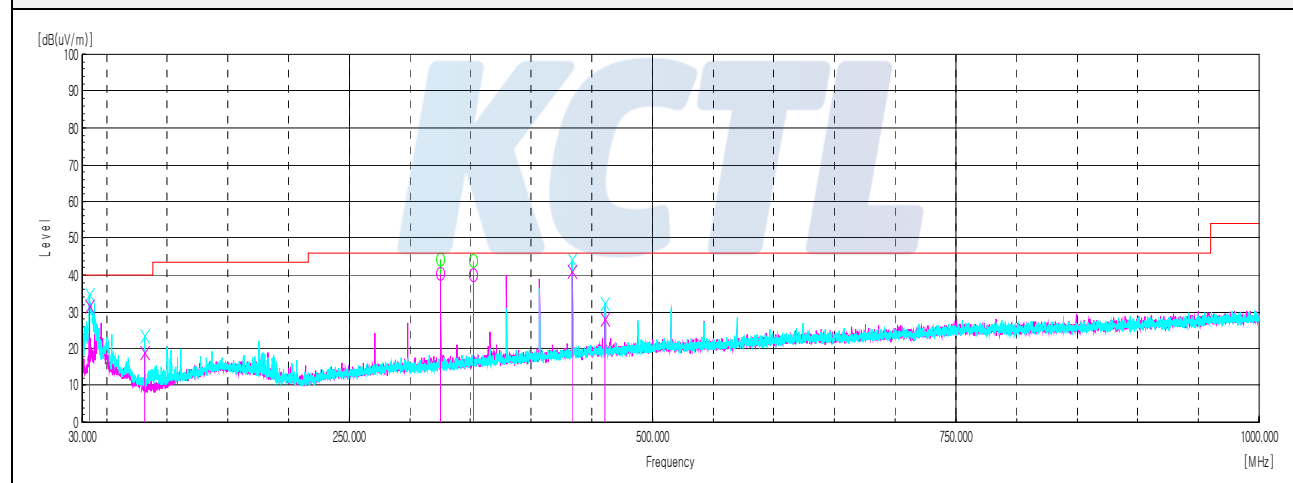
[Face-off]

| Frequency              | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|------------------------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)                  | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| <b>Quasi peak data</b> |          |                |              |                 |            |            |        |
| 2.80                   | 37.10    | 20.14          | -31.94       | 40.00           | -14.70     | 29.54      | 44.24  |
| 19.00                  | 37.50    | 20.62          | -31.02       | 40.00           | -12.90     | 29.54      | 42.44  |

**Face-on/Face-off**

**Test results (Below 1 000 MHz)****15.225 (d) 30-1000 MHz****-Right**

| Frequency       | Pol.  | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|-----------------|-------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)           | (V/H) | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| Quasi peak data |       |          |                |              |                 |            |            |        |
| 35.82           | V     | 44.70    | 17.56          | -30.53       | -               | 31.73      | 40.00      | 8.27   |
| 81.29           | V     | 34.40    | 14.25          | -29.66       | -               | 18.99      | 40.00      | 21.01  |
| 325.49          | H     | 48.20    | 19.86          | -27.61       | -               | 40.45      | 46.00      | 5.55   |
| 352.65          | H     | 47.10    | 20.38          | -27.42       | -               | 40.06      | 46.00      | 5.94   |
| 434.01          | V     | 45.30    | 22.68          | -26.81       | -               | 41.17      | 46.00      | 4.83   |
| 461.04          | V     | 31.60    | 23.11          | -26.60       | -               | 28.11      | 46.00      | 17.89  |

**Horizontal/Vertical**

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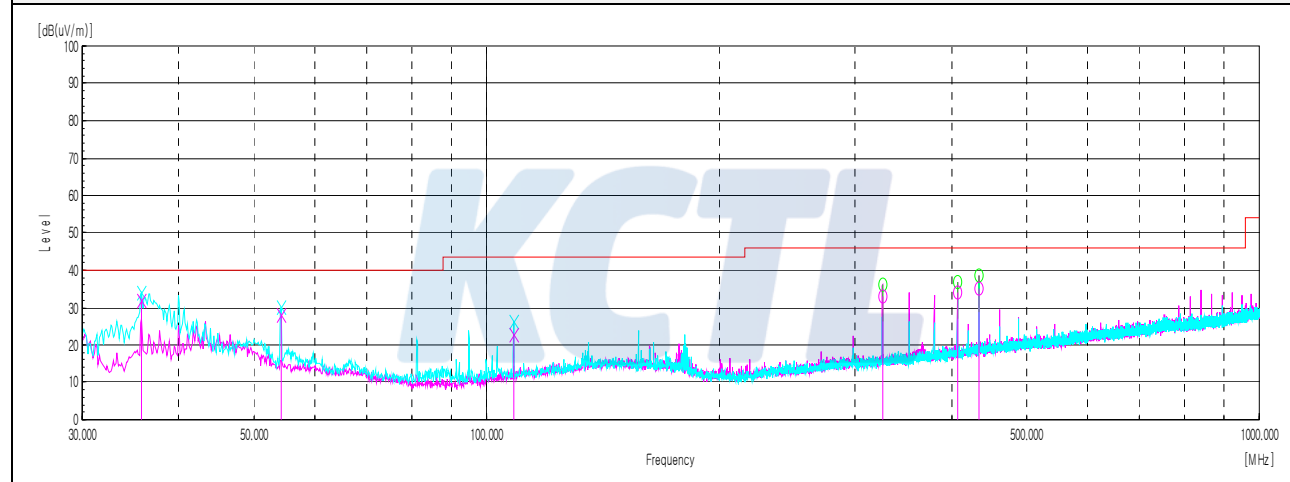
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Report No.:  
KR20-SRF0012-A

Page (23) of (24)

**KCTL****-Left**

| Frequency       | Pol.  | Reading  | Antenna Factor | Amp. + Cable | Distance Factor | Result     | Limit      | Margin |
|-----------------|-------|----------|----------------|--------------|-----------------|------------|------------|--------|
| (MHz)           | (V/H) | (dB(μV)) | (dB)           | (dB)         | (dB)            | (dB(μV/m)) | (dB(μV/m)) | (dB)   |
| Quasi peak data |       |          |                |              |                 |            |            |        |
| 35.82           | V     | 45.10    | 17.56          | -30.53       | -               | 32.13      | 40.00      | 7.87   |
| 54.25           | V     | 39.70    | 18.32          | -30.18       | -               | 27.84      | 40.00      | 12.16  |
| 108.45          | V     | 35.80    | 16.18          | -29.26       | -               | 22.72      | 43.50      | 20.78  |
| 325.49          | H     | 40.80    | 19.86          | -27.61       | -               | 33.05      | 46.00      | 12.95  |
| 406.85          | H     | 39.20    | 21.84          | -27.03       | -               | 34.01      | 46.00      | 11.99  |
| 433.884         | H     | 39.30    | 22.68          | -26.81       | -               | 35.17      | 46.00      | 10.83  |

**Horizontal/Vertical**

## 7. Measurement equipment

| Equipment Name           | Manufacturer      | Model No.           | Serial No. | Next Cal. Date |
|--------------------------|-------------------|---------------------|------------|----------------|
| Spectrum Analyzer        | R&S               | FSV30               | 100808     | 20.07.30       |
| Temp & Humid Chamber     | ESPEC CORP.       | SH-641              | 92005476   | 20.07.30       |
| EMI TEST RECEIVER        | R&S               | ESCI7               | 100732     | 20.08.22       |
| Bi-Log Antenna           | SCHWARZBECK       | VULB 9168           | 583        | 20.05.04       |
| Amplifier                | SONOMA INSTRUMENT | 310N                | 284608     | 20.08.22       |
| COAXIAL FIXED ATTENUATOR | Agilent           | 8491B-003           | 2708A18758 | 20.05.04       |
| AMPLIFIER                | L-3 Narda-MITEQ   | JS44-18004000-33-8P | 2000997    | 20.08.01       |
| LOOP Antenna             | R&S               | HFH2-Z2             | 100355     | 20.08.24       |
| Antenna Mast             | Innco Systems     | MA4640-XP-ET        | -          | -              |
| Turn Table               | Innco Systems     | DT2000              | 79         | -              |
| Vector Signal Generator  | R&S               | SMBV100A            | 257566     | 20.07.16       |
| Signal Generator         | R&S               | SMB100A             | 176206     | 20.01.25       |

**End of test report**

