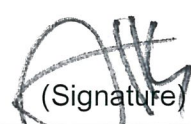




# TEST REPORT

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                      |                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>KCTL Inc.</b><br>65, Sinwon-ro, Yeongtong-gu,<br>Suwon-si, Gyeonggi-do, 16677, Korea<br>TEL: 82-31-285-0894 FAX: 82-505-299-8311<br><a href="http://www.kctl.co.kr">www.kctl.co.kr</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Report No.:<br>KR21-SRF0272-A<br>Page (1) of (35)                                                                                    |    <b>KCTL</b>                                              |
| <p><b>1. Client</b></p> <ul style="list-style-type: none"> <li>Name : CEYON TELINVENTORY CO., LTD.</li> <li>Address : 4F(416), 49, Gangnam-daero 37-gil, Seocho-gu, Seoul, Republic of Korea</li> <li>Date of Receipt : 2020-11-02</li> </ul> <p><b>2. Use of Report</b> : Certification</p> <p><b>3. Name of Product / Model</b> : REEL FINDER / RC2000</p> <p><b>4. Manufacturer / Country of Origin</b> : CEYON TELINVENTORY CO., LTD. / Korea</p> <p><b>5. FCC ID</b> : 2A3J7-RC2000</p> <p><b>6. Date of Test</b> : 2021-07-26 to 2021-07-27</p> <p><b>7. Location of Test</b> : <input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing<br/>         (Address: 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)</p> <p><b>8. Test method used</b> : FCC Part 15 Subpart C, 15.225</p> <p><b>9. Test Result</b> : Refer to the test result in the test report</p> |                                                                                                                                      |                                                                                                                                                |
| Affirmation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Tested by<br><br><br>Name : Sumin Kim (Signature) | Technical Manager<br><br><br>Name : Heesu Ahn (Signature) |
| <div style="text-align: right;">2022-01-03</div> <div style="text-align: center; margin-top: 20px;"> <b>KCTL Inc.</b> </div> <p>As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                      |                                                                                                                                                |

|                                                                                                                                                                                           |                                                   |                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>KCTL Inc.</b><br>65, Sinwon-ro, Yeongtong-gu,<br>Suwon-si, Gyeonggi-do, 16677, Korea<br>TEL: 82-31-285-0894 FAX: 82-505-299-8311<br><a href="http://www.kctl.co.kr">www.kctl.co.kr</a> | Report No.:<br>KR21-SRF0272-A<br>Page (2) of (35) |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------|

## REPORT REVISION HISTORY

| Date       | Revision          | Page No       |
|------------|-------------------|---------------|
| 2021-12-27 | Originally issued | -             |
| 2022-01-03 | Updated           | 6, 19, 23, 35 |
|            |                   |               |
|            |                   |               |
|            |                   |               |

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Note. The report No. KR21-SRF0272 is superseded by the report No. KR21-SRF0272-A.

## General remarks for test reports

### Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

### Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ Statement not required by the standard or client used for type testing

## CONTENTS

|      |                                   |    |
|------|-----------------------------------|----|
| 1.   | General information .....         | 4  |
| 2.   | Device information .....          | 4  |
| 2.1. | Accessory information .....       | 5  |
| 2.2. | Frequency/channel operations..... | 5  |
| 3.   | Antenna requirement .....         | 5  |
| 4.   | Declaration of Test ModeT .....   | 6  |
| 5.   | Summary of tests .....            | 7  |
| 6.   | Measurement uncertainty .....     | 8  |
| 7.   | Test results .....                | 9  |
| 7.1. | 20 dB Bandwidth.....              | 9  |
| 7.2. | Frequency tolerance .....         | 11 |
| 7.3. | Radiated spurious emissions ..... | 15 |
| 7.4. | AC Conducted emission .....       | 33 |
| 8.   | Measurement equipment .....       | 35 |

## 1. General information

Client : CEYON TELINVENTORY CO., LTD.  
 Address : 4F(416), 49, Gangnam-daero 37-gil, Seocho-gu, Seoul, Republic of Korea  
 Manufacturer : CEYON TELINVENTORY CO., LTD.  
 Address : 4F(416), 49, Gangnam-daero 37-gil, Seocho-gu, Seoul, Republic of 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  
                           CAB Identifier: KR0040, ISED Number: 8035A  
                           KOLAS No.: KT231

## 2. Device information

Equipment under test : REEL FINDER  
 Model : RC2000  
 Modulation technique : ASK(NFC)  
 Number of channels : 1 ch  
 Frequency range : 13.56 MHz  
 Power source : DC 12 V  
 Antenna specification : PCB antenna  
 Antenna gain : N/A  
 Software version : Rev 1.0  
 Hardware version : Rev 1.0  
 Test device serial No. : N/A  
 Operation temperature : -20 °C ~ 60 °C

## 2.1. Accessory information

| Equipment  | Manufacturer | Model     | Serial No. | Power source                                            | Note. |
|------------|--------------|-----------|------------|---------------------------------------------------------|-------|
| AC Adapter | Atron        | CAD120121 | -          | Input: 100-240 V,<br>50/60Hz 2.0 A<br>Output: 12 V/10 A | -     |

## 2.2. Frequency/channel operations

This device contains the following capabilities:

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 01  | 13.56           |

Table 2.2.1. NFC

## 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.

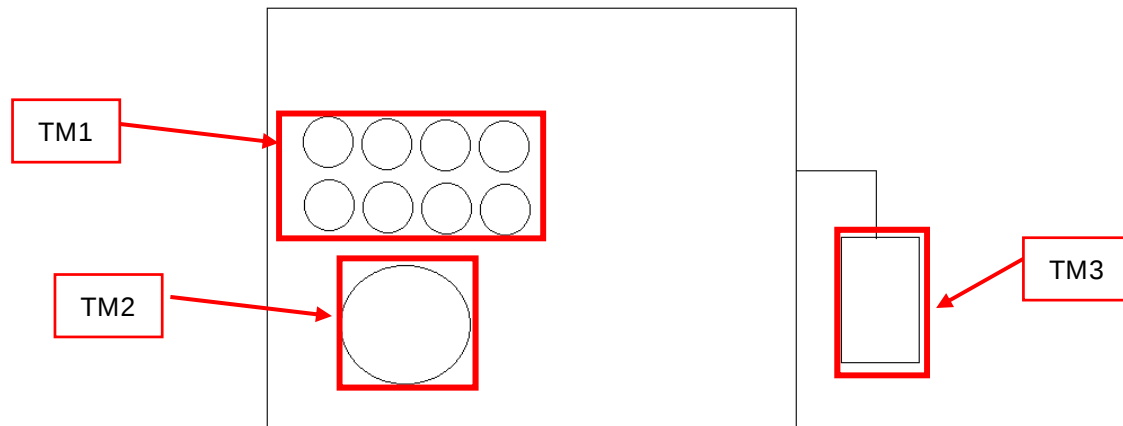
- The transmitters have permanently attached PCB antennas (Internal antenna) on board and a small loop antenna(external)\*.

\* The connector part is fixed with an adhesive or soldering during the assembly process so that the general user cannot take it off.

#### 4. Declaration of Test Mode

| Test modes | Description                          |
|------------|--------------------------------------|
| <b>TM1</b> | Only operated TM1 part               |
| <b>TM2</b> | Only operated TM2 part               |
| <b>TM3</b> | Only operated TM3 part               |
| <b>TM4</b> | Operated all of parts(TM1, TM2, TM3) |

Note : This EUT has 3 transceivers. And EUT was tested in 4 cases.



-The front of device

## 5. Summary of tests

| FCC Part section(s) | Parameter                     | Test Condition | Test results |
|---------------------|-------------------------------|----------------|--------------|
| 15.225(a)           | In-band Fundamental Emission  | Radiated       | Pass         |
| 15.225(b)(c)        | In-band Spurious Emission     |                | Pass         |
| 15.225(d)<br>15.209 | Out-of-band Spurious Emission |                | Pass         |
| 15.225(e)           | Frequency Stability Tolerance | Conducted      | Pass         |
| 15.215(c)           | 20 dB Bandwidth               |                | Pass         |
| 15.207(a)           | AC Conducted emissions        |                | Pass         |

### Notes:

- All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 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 and Z. It was determined that **Y** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Y** 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
- The device was tested in 4 modes.  
 SISO: TM1, TM2, TM3  
 MIMO: TM4

## 6. Measurement uncertainty

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

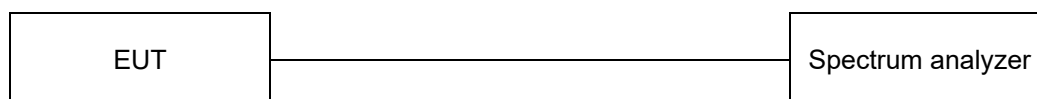
All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified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

| Parameter                   | Expanded uncertainty ( $\pm$ ) |        |
|-----------------------------|--------------------------------|--------|
| Radiated spurious emissions | 9 kHz ~ 30 MHz                 | 2.3 dB |
|                             | 30 MHz ~ 1 000 MHz             | 2.2 dB |
| Conducted emissions         | 9 kHz ~ 150 kHz                | 3.7 dB |
|                             | 150 kHz ~ 30 MHz               | 3.3 dB |

## 7. Test results

### 7.1. 20 dB 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.

#### Test procedure

ANSI C63.10 - Section 6.9.2

#### Test settings

The spectrum analyzer connected receive antenna and the EUT placed on near the receive antenna. The RBW is set to 10 kHz. The VBW is set to 3 times the RBW. The sweep time is coupled.

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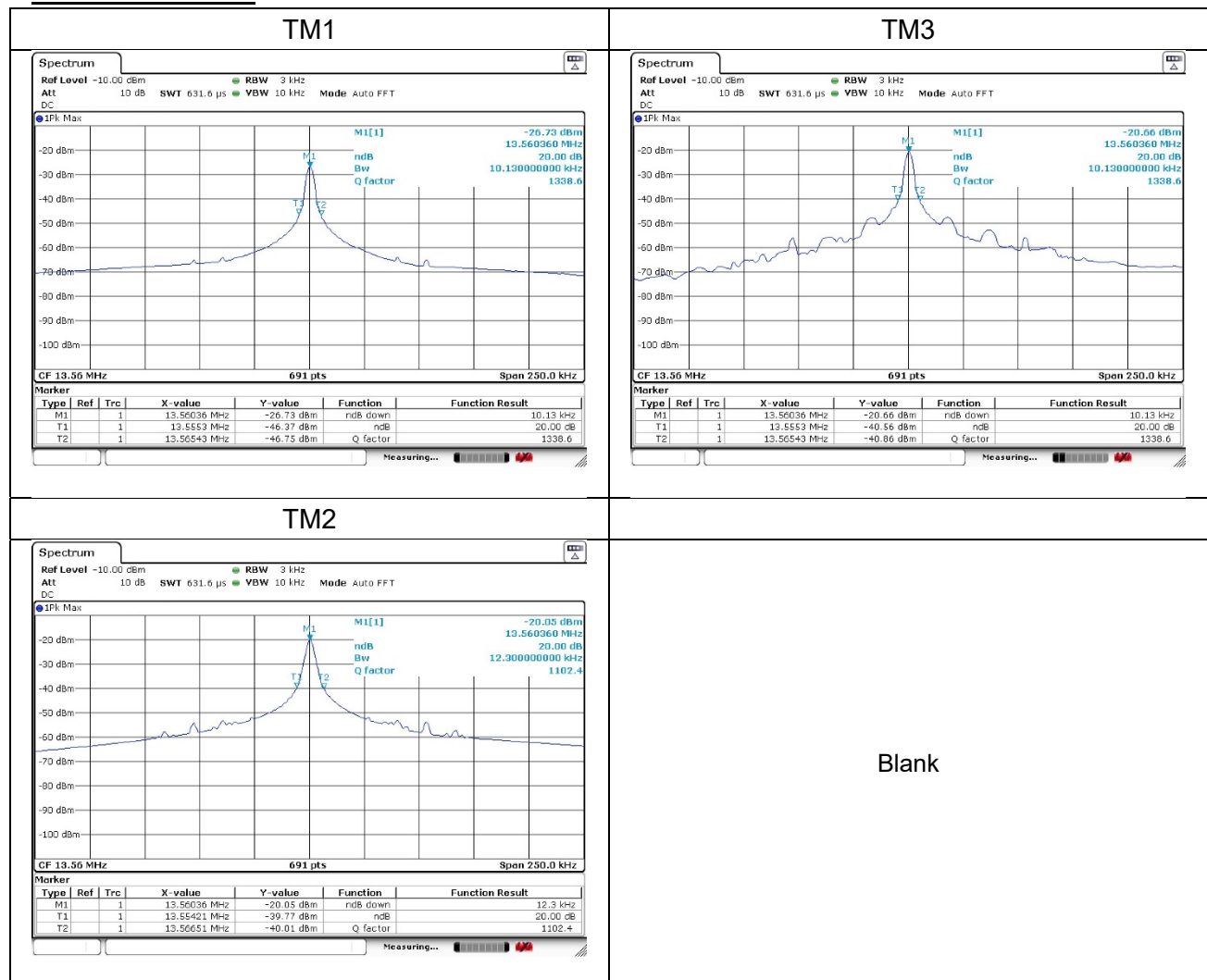
Report No.:  
KR21-SRF0272-A  
Page (10) of (35)



## Test results

| Test mode | Frequency<br>[MHz] | 20 dB Bandwidth<br>[MHz] |            | Limit<br>[MHz] | 20 dB Bandwidth<br>[kHz] |
|-----------|--------------------|--------------------------|------------|----------------|--------------------------|
| TM1       | 13.56              | Lowest<br>Frequency      | 13.555 300 | 13.110 000     | 10.13                    |
|           |                    | Highest<br>Frequency     | 13.565 430 | 14.010 000     |                          |
| TM2       |                    | Lowest<br>Frequency      | 13.554 210 | 13.110 000     | 12.30                    |
|           |                    | Highest<br>Frequency     | 13.566 510 | 14.010 000     |                          |
| TM3       |                    | Lowest<br>Frequency      | 13.555 300 | 13.110 000     | 10.13                    |
|           |                    | Highest<br>Frequency     | 13.565 430 | 14.010 000     |                          |

## 20 dB Bandwidth

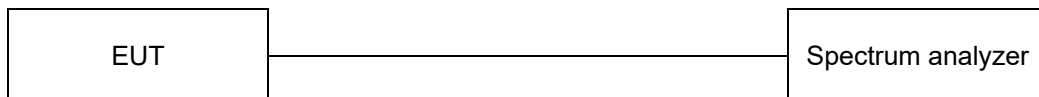


## Note:

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

## 7.2. Frequency tolerance

### Test setup



### Limit

15.225 (e) 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

## Test results

### [TM1]

| Voltage | Voltage | TEMP     | Maintaining time | Measure frequency | Frequency deviation | Deviation |
|---------|---------|----------|------------------|-------------------|---------------------|-----------|
| [%]     | [V]     | [°C]     |                  | [Hz]              | [Hz]                | [%]       |
| 100     | 12.00   | 20(Ref.) | Startup          | 13 560 026        | 26.0                | 0.000 19  |
|         |         |          | 2 minutes        | 13 560 065        | 65.0                | 0.000 48  |
|         |         |          | 5 minutes        | 13 560 064        | 64.0                | 0.000 47  |
|         |         |          | 10 minutes       | 13 560 099        | 99.0                | 0.000 73  |
|         |         | -20      | Startup          | 13 559 961        | -39.0               | -0.000 29 |
|         |         |          | 2 minutes        | 13 559 975        | -25.0               | -0.000 18 |
|         |         |          | 5 minutes        | 13 559 994        | -6.0                | -0.000 04 |
|         |         |          | 10 minutes       | 13 559 998        | -2.0                | -0.000 02 |
|         |         | -10      | Startup          | 13 559 978        | -22.0               | -0.000 16 |
|         |         |          | 2 minutes        | 13 559 986        | -14.0               | -0.000 10 |
|         |         |          | 5 minutes        | 13 559 997        | -3.0                | -0.000 02 |
|         |         |          | 10 minutes       | 13 559 994        | -6.0                | -0.000 04 |
|         |         | 0        | Startup          | 13 560 027        | 27.0                | 0.000 20  |
|         |         |          | 2 minutes        | 13 560 039        | 39.0                | 0.000 29  |
|         |         |          | 5 minutes        | 13 560 042        | 42.0                | 0.000 31  |
|         |         |          | 10 minutes       | 13 560 039        | 39.0                | 0.000 29  |
|         |         | 10       | Startup          | 13 560 041        | 41.0                | 0.000 30  |
|         |         |          | 2 minutes        | 13 560 062        | 62.0                | 0.000 46  |
|         |         |          | 5 minutes        | 13 560 079        | 79.0                | 0.000 58  |
|         |         |          | 10 minutes       | 13 560 082        | 82.0                | 0.000 61  |
|         |         | 25       | Startup          | 13 560 042        | 42.0                | 0.000 31  |
|         |         |          | 2 minutes        | 13 560 070        | 70.0                | 0.000 52  |
|         |         |          | 5 minutes        | 13 560 073        | 73.0                | 0.000 54  |
|         |         |          | 10 minutes       | 13 560 069        | 69.0                | 0.000 51  |
|         |         | 30       | Startup          | 13 560 058        | 58.0                | 0.000 43  |
|         |         |          | 2 minutes        | 13 560 058        | 58.0                | 0.000 43  |
|         |         |          | 5 minutes        | 13 560 069        | 69.0                | 0.000 51  |
|         |         |          | 10 minutes       | 13 560 092        | 92.0                | 0.000 68  |
|         |         | 40       | Startup          | 13 560 093        | 93.0                | 0.000 69  |
|         |         |          | 2 minutes        | 13 560 101        | 101.0               | 0.000 75  |
|         |         |          | 5 minutes        | 13 560 108        | 108.0               | 0.000 80  |
|         |         |          | 10 minutes       | 13 560 128        | 128.0               | 0.000 94  |
|         |         | 50       | Startup          | 13 560 094        | 94.0                | 0.000 69  |
|         |         |          | 2 minutes        | 13 560 109        | 109.0               | 0.000 80  |
|         |         |          | 5 minutes        | 13 560 115        | 115.0               | 0.000 85  |
|         |         |          | 10 minutes       | 13 560 111        | 111.0               | 0.000 82  |
| 85      | 10.20   | 20       | Startup          | 13 560 062        | 62.0                | 0.000 46  |
|         |         |          | 2 minutes        | 13 560 068        | 68.0                | 0.000 50  |
|         |         |          | 5 minutes        | 13 560 081        | 81.0                | 0.000 60  |
|         |         |          | 10 minutes       | 13 560 094        | 94.0                | 0.000 69  |
| 115     | 13.80   | 20       | Startup          | 13 560 040        | 40.0                | 0.000 30  |
|         |         |          | 2 minutes        | 13 560 056        | 56.0                | 0.000 41  |
|         |         |          | 5 minutes        | 13 560 059        | 59.0                | 0.000 44  |
|         |         |          | 10 minutes       | 13 560 079        | 79.0                | 0.000 58  |

**[TM2]**

| Voltage | Voltage | TEMP     | Maintaining time | Measure frequency | Frequency deviation | Deviation |
|---------|---------|----------|------------------|-------------------|---------------------|-----------|
| [%]     | [V]     | [°C]     |                  | [Hz]              | [Hz]                | [%]       |
| 100     | 12.00   | 20(Ref.) | Startup          | 13 560 037        | 37.0                | 0.000 27  |
|         |         |          | 2 minutes        | 13 560 055        | 55.0                | 0.000 41  |
|         |         |          | 5 minutes        | 13 560 083        | 83.0                | 0.000 61  |
|         |         |          | 10 minutes       | 13 560 086        | 86.0                | 0.000 63  |
|         |         | -20      | Startup          | 13 559 963        | -37.0               | -0.000 27 |
|         |         |          | 2 minutes        | 13 559 974        | -26.0               | -0.000 19 |
|         |         |          | 5 minutes        | 13 560 002        | 2.0                 | 0.000 02  |
|         |         |          | 10 minutes       | 13 559 993        | -7.0                | -0.000 05 |
|         |         | -10      | Startup          | 13 559 977        | -23.0               | -0.000 17 |
|         |         |          | 2 minutes        | 13 559 979        | -21.0               | -0.000 16 |
|         |         |          | 5 minutes        | 13 559 997        | -3.0                | -0.000 02 |
|         |         |          | 10 minutes       | 13 559 987        | -13.0               | -0.000 10 |
|         |         | 0        | Startup          | 13 560 015        | 15.0                | 0.000 11  |
|         |         |          | 2 minutes        | 13 560 021        | 21.0                | 0.000 16  |
|         |         |          | 5 minutes        | 13 560 029        | 29.0                | 0.000 21  |
|         |         |          | 10 minutes       | 13 560 051        | 51.0                | 0.000 38  |
|         |         | 10       | Startup          | 13 560 036        | 36.0                | 0.000 27  |
|         |         |          | 2 minutes        | 13 560 063        | 63.0                | 0.000 47  |
|         |         |          | 5 minutes        | 13 560 070        | 70.0                | 0.000 52  |
|         |         |          | 10 minutes       | 13 560 088        | 88.0                | 0.000 65  |
|         |         | 25       | Startup          | 13 560 033        | 33.0                | 0.000 24  |
|         |         |          | 2 minutes        | 13 560 062        | 62.0                | 0.000 46  |
|         |         |          | 5 minutes        | 13 560 076        | 76.0                | 0.000 56  |
|         |         |          | 10 minutes       | 13 560 077        | 77.0                | 0.000 57  |
|         |         | 30       | Startup          | 13 560 040        | 40.0                | 0.000 30  |
|         |         |          | 2 minutes        | 13 560 060        | 60.0                | 0.000 44  |
|         |         |          | 5 minutes        | 13 560 081        | 81.0                | 0.000 60  |
|         |         |          | 10 minutes       | 13 560 087        | 87.0                | 0.000 64  |
|         |         | 40       | Startup          | 13 560 080        | 80.0                | 0.000 59  |
|         |         |          | 2 minutes        | 13 560 097        | 97.0                | 0.000 72  |
|         |         |          | 5 minutes        | 13 560 111        | 111.0               | 0.000 82  |
|         |         |          | 10 minutes       | 13 560 127        | 127.0               | 0.000 94  |
|         |         | 50       | Startup          | 13 560 081        | 81.0                | 0.000 60  |
|         |         |          | 2 minutes        | 13 560 099        | 99.0                | 0.000 73  |
|         |         |          | 5 minutes        | 13 560 112        | 112.0               | 0.000 83  |
|         |         |          | 10 minutes       | 13 560 109        | 109.0               | 0.000 80  |
| 85      | 10.20   | 20       | Startup          | 13 560 051        | 51.0                | 0.000 38  |
|         |         |          | 2 minutes        | 13 560 068        | 68.0                | 0.000 50  |
|         |         |          | 5 minutes        | 13 560 073        | 73.0                | 0.000 54  |
|         |         |          | 10 minutes       | 13 560 081        | 81.0                | 0.000 60  |
| 115     | 13.80   | 20       | Startup          | 13 560 060        | 60.0                | 0.000 44  |
|         |         |          | 2 minutes        | 13 560 064        | 64.0                | 0.000 47  |
|         |         |          | 5 minutes        | 13 560 072        | 72.0                | 0.000 53  |
|         |         |          | 10 minutes       | 13 560 079        | 79.0                | 0.000 58  |

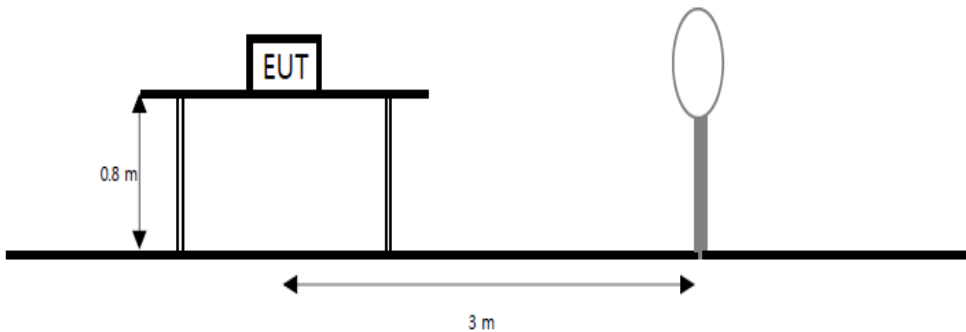
**[TM3]**

| Voltage | Voltage | TEMP     | Maintaining time | Measure frequency | Frequency deviation | Deviation |
|---------|---------|----------|------------------|-------------------|---------------------|-----------|
| [%]     | [V]     | [°C]     |                  | [Hz]              | [Hz]                | [%]       |
| 100     | 12.00   | 20(Ref.) | Startup          | 13 560 025        | 25.0                | 0.000 18  |
|         |         |          | 2 minutes        | 13 560 047        | 47.0                | 0.000 35  |
|         |         |          | 5 minutes        | 13 560 073        | 73.0                | 0.000 54  |
|         |         |          | 10 minutes       | 13 560 094        | 94.0                | 0.000 69  |
|         |         | -20      | Startup          | 13 559 943        | -57.0               | -0.000 42 |
|         |         |          | 2 minutes        | 13 559 987        | -13.0               | -0.000 10 |
|         |         |          | 5 minutes        | 13 559 997        | -3.0                | -0.000 02 |
|         |         |          | 10 minutes       | 13 559 985        | -15.0               | -0.000 11 |
|         |         | -10      | Startup          | 13 559 979        | -21.0               | -0.000 16 |
|         |         |          | 2 minutes        | 13 559 986        | -14.0               | -0.000 10 |
|         |         |          | 5 minutes        | 13 559 990        | -10.0               | -0.000 07 |
|         |         |          | 10 minutes       | 13 559 991        | -9.0                | -0.000 07 |
|         |         | 0        | Startup          | 13 560 031        | 31.0                | 0.000 23  |
|         |         |          | 2 minutes        | 13 560 019        | 19.0                | 0.000 14  |
|         |         |          | 5 minutes        | 13 560 039        | 39.0                | 0.000 29  |
|         |         |          | 10 minutes       | 13 560 042        | 42.0                | 0.000 31  |
|         |         | 10       | Startup          | 13 560 045        | 45.0                | 0.000 33  |
|         |         |          | 2 minutes        | 13 560 054        | 54.0                | 0.000 40  |
|         |         |          | 5 minutes        | 13 560 064        | 64.0                | 0.000 47  |
|         |         |          | 10 minutes       | 13 560 070        | 70.0                | 0.000 52  |
|         |         | 25       | Startup          | 13 560 038        | 38.0                | 0.000 28  |
|         |         |          | 2 minutes        | 13 560 065        | 65.0                | 0.000 48  |
|         |         |          | 5 minutes        | 13 560 080        | 80.0                | 0.000 59  |
|         |         |          | 10 minutes       | 13 560 073        | 73.0                | 0.000 54  |
|         |         | 30       | Startup          | 13 560 057        | 57.0                | 0.000 42  |
|         |         |          | 2 minutes        | 13 560 047        | 47.0                | 0.000 35  |
|         |         |          | 5 minutes        | 13 560 079        | 79.0                | 0.000 58  |
|         |         |          | 10 minutes       | 13 560 094        | 94.0                | 0.000 69  |
|         |         | 40       | Startup          | 13 560 088        | 88.0                | 0.000 65  |
|         |         |          | 2 minutes        | 13 560 103        | 103.0               | 0.000 76  |
|         |         |          | 5 minutes        | 13 560 102        | 102.0               | 0.000 75  |
|         |         |          | 10 minutes       | 13 560 126        | 126.0               | 0.000 93  |
|         |         | 50       | Startup          | 13 560 099        | 99.0                | 0.000 73  |
|         |         |          | 2 minutes        | 13 560 103        | 103.0               | 0.000 76  |
|         |         |          | 5 minutes        | 13 560 103        | 103.0               | 0.000 76  |
|         |         |          | 10 minutes       | 13 560 121        | 121.0               | 0.000 89  |
| 85      | 10.20   | 20       | Startup          | 13 560 066        | 66.0                | 0.000 49  |
|         |         |          | 2 minutes        | 13 560 071        | 71.0                | 0.000 52  |
|         |         |          | 5 minutes        | 13 560 086        | 86.0                | 0.000 63  |
|         |         |          | 10 minutes       | 13 560 083        | 83.0                | 0.000 61  |
| 115     | 13.80   | 20       | Startup          | 13 560 057        | 57.0                | 0.000 42  |
|         |         |          | 2 minutes        | 13 560 070        | 70.0                | 0.000 52  |
|         |         |          | 5 minutes        | 13 560 080        | 80.0                | 0.000 59  |
|         |         |          | 10 minutes       | 13 560 084        | 84.0                | 0.000 62  |

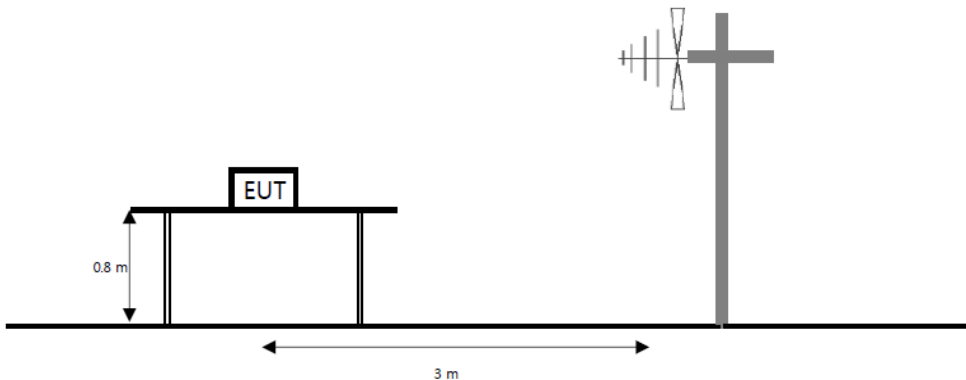
### 7.3. Radiated spurious emissions

#### 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) 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) 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) 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) 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. Factors(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
9. <sup>1)</sup> means restricted band

[TM1]

**Test results for fundamental**

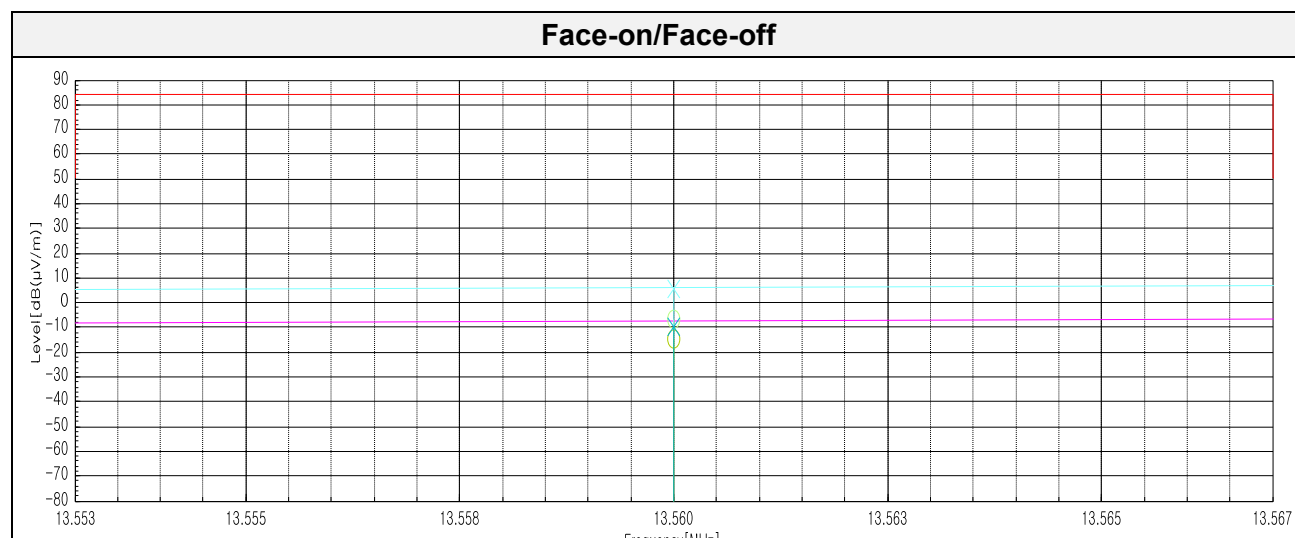
**15.225 (a) 13.553-13.567 MHz**

[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           | 36.10    | 20.20          | -31.09       | 40.00           | -14.79     | 84.00      | 98.79  |

[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           | 40.80    | 20.20          | -31.09       | 40.00           | -10.09     | 84.00      | 94.09  |



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Report No.:  
KR21-SRF0272-A  
Page (18) of (35)

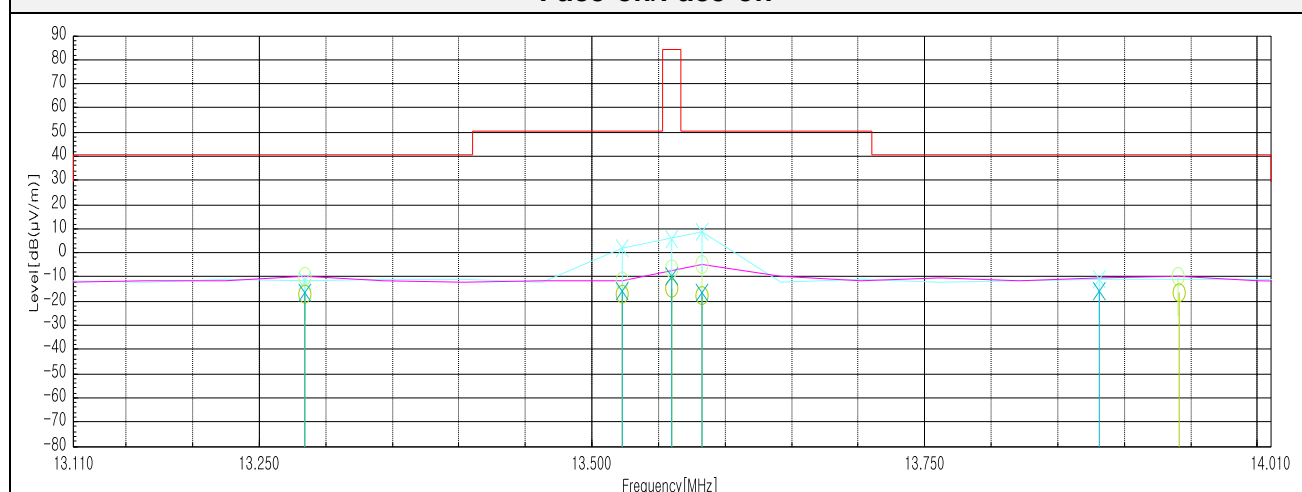
**Test results for in-band & out-band (9 kHz to 30 MHz)****15.225 (b,c) 13.110-14.010 MHz**

[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> |          |                |              |                 |            |            |        |
| 13.28                  | 33.60    | 20.20          | -31.09       | 40.00           | -17.29     | 40.50      | 57.79  |
| 13.52                  | 33.90    | 20.20          | -31.09       | 40.00           | -16.99     | 50.50      | 67.49  |
| 13.58                  | 33.10    | 20.20          | -31.09       | 40.00           | -17.79     | 50.50      | 68.29  |
| 13.94                  | 34.10    | 20.20          | -31.07       | 40.00           | -16.77     | 40.50      | 57.27  |

[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                  | 34.50    | 20.20          | -31.09       | 40.00           | -16.39     | 40.50      | 56.89  |
| 13.52                  | 34.70    | 20.20          | -31.09       | 40.00           | -16.19     | 50.50      | 66.69  |
| 13.58                  | 34.60    | 20.20          | -31.09       | 40.00           | -16.29     | 50.50      | 66.79  |
| 13.88                  | 34.90    | 20.20          | -31.07       | 40.00           | -15.97     | 40.50      | 56.47  |

**Face-on/Face-off**

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Report No.:  
KR21-SRF0272-A  
Page (19) of (35)

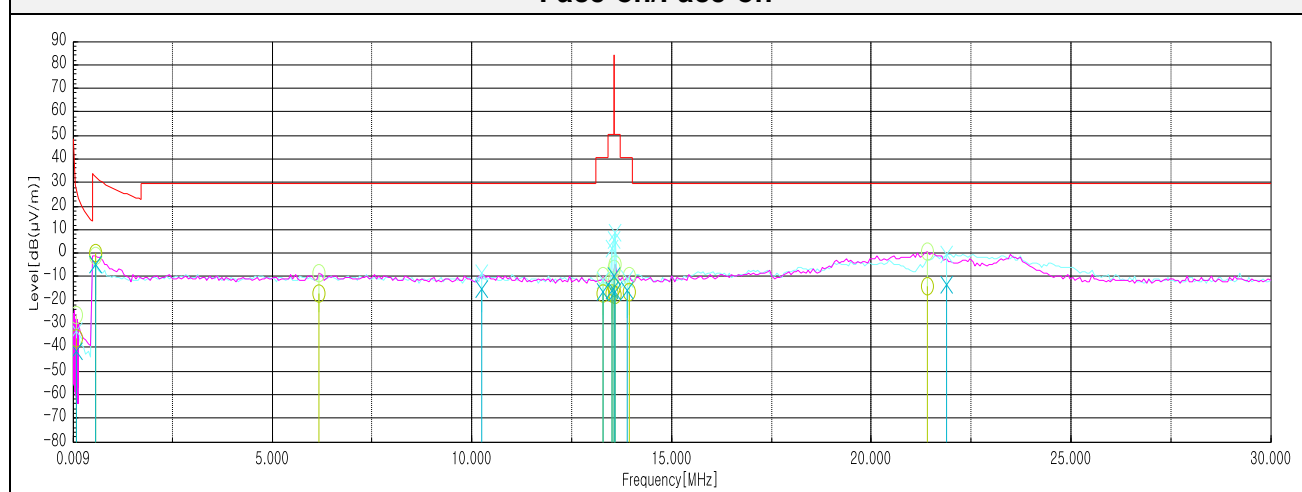
**Test results (9 kHz to 30 MHz)****15.225 (d) 0.009-30 MHz**

[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> |          |                |              |                 |            |            |        |
| 0.10*                  | 56.40    | 19.90          | -32.31       | 80.00           | -36.01     | 27.70      | 63.71  |
| 0.57*                  | 52.30    | 19.90          | -32.12       | 40.00           | 0.08       | 32.50      | 32.42  |
| 6.18                   | 34.20    | 20.12          | -31.56       | 40.00           | -17.24     | 29.50      | 46.74  |
| 21.40                  | 35.60    | 20.66          | -30.78       | 40.00           | -14.52     | 29.54      | 44.06  |

[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> |          |                |              |                 |            |            |        |
| 0.10*                  | 50.50    | 19.90          | -32.31       | 80.00           | -41.91     | 27.70      | 69.61  |
| 0.57*                  | 47.50    | 19.90          | -32.12       | 40.00           | -4.72      | 32.50      | 37.22  |
| 10.24                  | 35.60    | 20.20          | -31.20       | 40.00           | -15.40     | 29.50      | 44.90  |
| 21.88                  | 36.40    | 20.68          | -30.76       | 40.00           | -13.68     | 29.54      | 43.22  |

**Face-on/Face-off**

\* Noise floor signal.

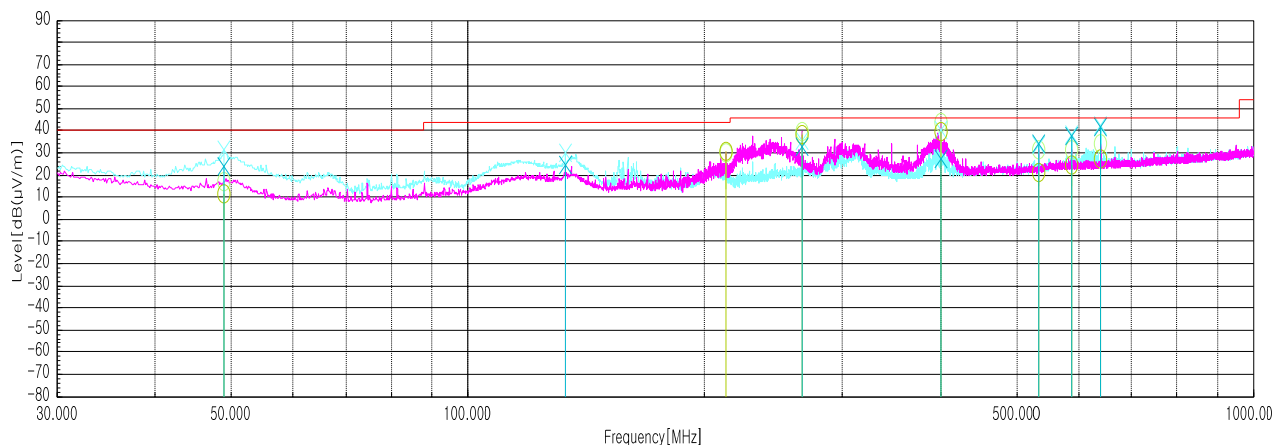
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Report No.:  
KR21-SRF0272-A  
Page (20) of (35)

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

| 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      |       |          |                |              |                 |            |            |        |
| 49.04                | H     | 27.30    | 14.34          | -30.00       | -               | 11.64      | 40.00      | 28.36  |
| 49.04                | V     | 39.30    | 14.34          | -30.00       | -               | 23.64      | 40.00      | 16.36  |
| 133.31 <sup>1)</sup> | V     | 34.60    | 17.47          | -28.62       | -               | 23.45      | 43.50      | 20.05  |
| 213.33               | H     | 43.00    | 16.05          | -27.56       | -               | 31.49      | 43.50      | 12.01  |
| 266.68 <sup>1)</sup> | H     | 45.10    | 18.63          | -26.97       | -               | 36.76      | 46.00      | 9.24   |
| 266.68 <sup>1)</sup> | V     | 39.90    | 18.63          | -26.97       | -               | 31.56      | 46.00      | 14.44  |
| 400.06 <sup>1)</sup> | H     | 42.70    | 21.70          | -25.69       | -               | 38.71      | 46.00      | 7.29   |
| 400.06 <sup>1)</sup> | V     | 30.30    | 21.70          | -25.69       | -               | 26.31      | 46.00      | 19.69  |
| 533.31               | H     | 21.00    | 23.70          | -24.59       | -               | 20.11      | 46.00      | 25.89  |
| 533.43               | V     | 34.00    | 23.70          | -24.59       | -               | 33.11      | 46.00      | 12.89  |
| 586.66               | H     | 22.90    | 24.50          | -24.13       | -               | 23.27      | 46.00      | 22.73  |
| 586.66               | V     | 35.60    | 24.50          | -24.13       | -               | 35.97      | 46.00      | 10.03  |
| 640.01               | H     | 25.00    | 24.78          | -23.71       | -               | 26.07      | 46.00      | 19.93  |
| 640.01               | V     | 39.20    | 24.78          | -23.71       | -               | 40.27      | 46.00      | 5.73   |

**Horizontal/Vertical**

[TM2]

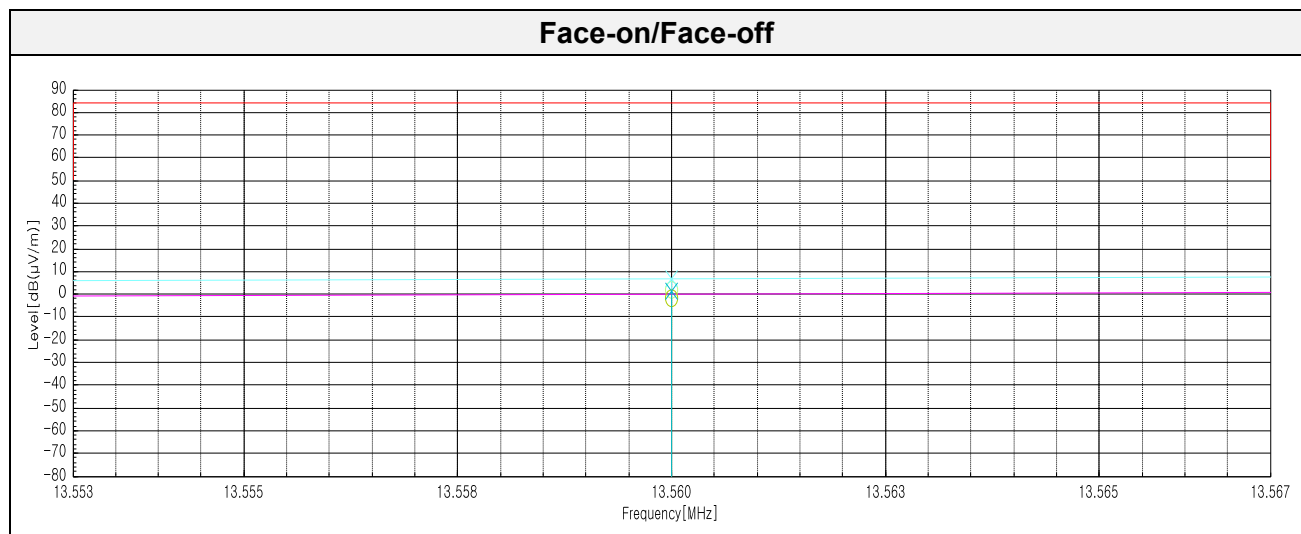
**Test results for fundamental**  
**15.225 (a) 13.553-13.567 MHz**

[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           | 49.30    | 20.20          | -31.09       | 40.00           | -1.59      | 84.00      | 85.59  |

[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           | 52.00    | 20.20          | -31.09       | 40.00           | 1.11       | 84.00      | 82.89  |



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Report No.:  
KR21-SRF0272-A  
Page (22) of (35)

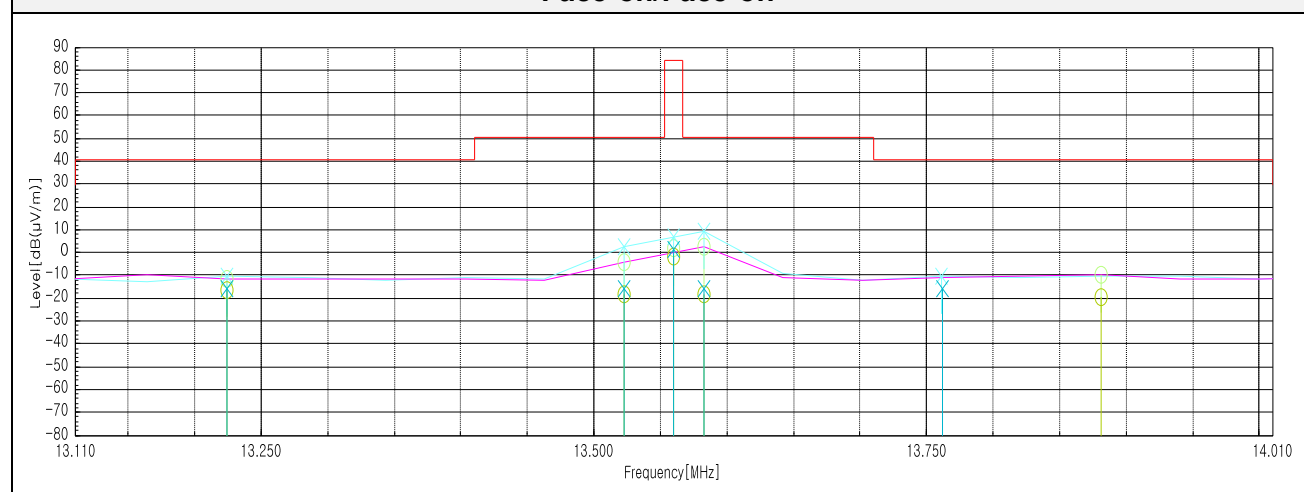
**Test results for in-band & out-band (9 kHz to 30 MHz)****15.225 (b,c) 13.110-14.010 MHz**

[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> |          |                |              |                 |            |            |        |
| 13.22                  | 34.50    | 20.20          | -31.10       | 40.00           | -16.40     | 40.50      | 56.90  |
| 13.52                  | 32.50    | 20.20          | -31.09       | 40.00           | -18.39     | 50.50      | 68.89  |
| 13.58                  | 32.40    | 20.20          | -31.09       | 40.00           | -18.49     | 50.50      | 68.99  |
| 13.88                  | 31.20    | 20.20          | -31.07       | 40.00           | -19.67     | 40.50      | 60.17  |

[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> |          |                |              |                 |            |            |        |
| 13.22                  | 34.90    | 20.20          | -31.10       | 40.00           | -16.00     | 40.50      | 56.50  |
| 13.52                  | 35.00    | 20.20          | -31.09       | 40.00           | -15.89     | 50.50      | 66.39  |
| 13.58                  | 35.10    | 20.20          | -31.09       | 40.00           | -15.79     | 50.50      | 66.29  |
| 13.76                  | 35.10    | 20.20          | -31.08       | 40.00           | -15.78     | 40.50      | 56.28  |

**Face-on/Face-off**

## Test results (9 kHz to 30 MHz)

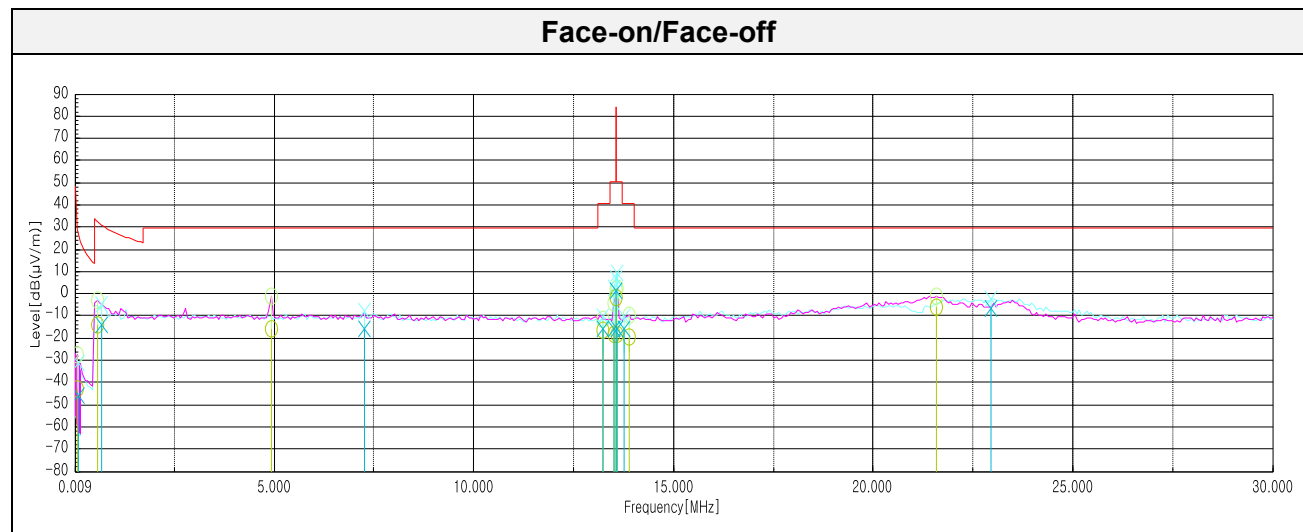
### 15.225 (d) 0.009-30 MHz

[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 |          |                |              |                 |            |            |        |
| 0.08*           | 49.60    | 20.00          | -32.31       | 80.00           | -42.71     | 30.10      | 72.81  |
| 0.57            | 38.20    | 19.90          | -32.12       | 40.00           | -14.02     | 32.50      | 46.52  |
| 4.93            | 35.30    | 20.10          | -31.64       | 40.00           | -16.24     | 29.50      | 45.74  |
| 21.58           | 43.60    | 20.66          | -30.78       | 40.00           | -6.52      | 29.54      | 36.06  |

[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 |          |                |              |                 |            |            |        |
| 0.10            | 46.20    | 19.90          | -32.31       | 80.00           | -46.21     | 27.70      | 73.91  |
| 0.69            | 37.80    | 19.90          | -32.09       | 40.00           | -14.39     | 30.90      | 45.29  |
| 7.25            | 35.40    | 20.15          | -31.50       | 40.00           | -15.95     | 29.50      | 45.45  |
| 22.96           | 42.90    | 20.72          | -30.74       | 40.00           | -7.12      | 29.54      | 36.66  |



\* Noise floor signal.

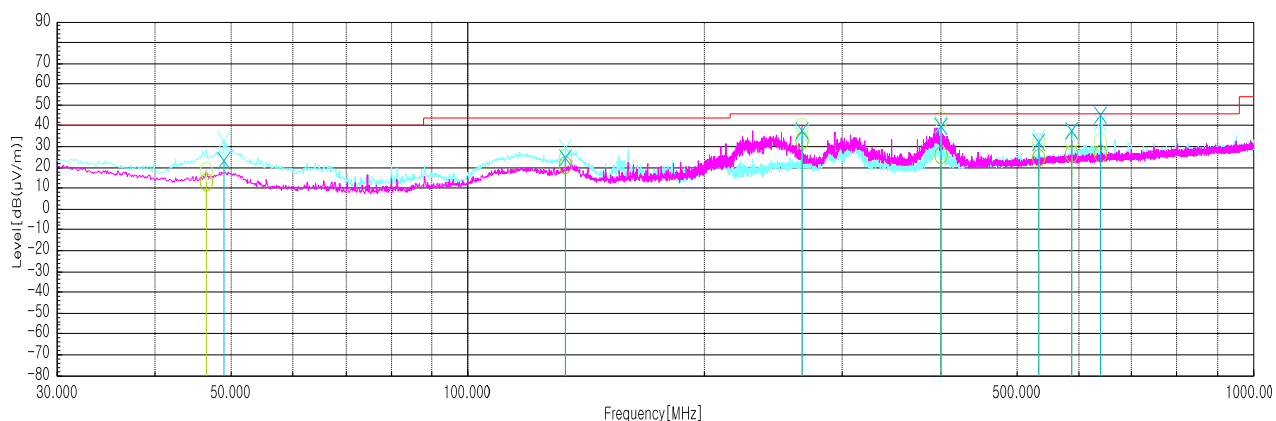
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Report No.:  
KR21-SRF0272-A  
Page (24) of (35)

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

| 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      |       |          |                |              |                 |            |            |        |
| 46.49                | H     | 27.60    | 15.51          | -30.06       | -               | 13.05      | 40.00      | 26.95  |
| 49.04                | V     | 38.70    | 14.34          | -30.00       | -               | 23.04      | 40.00      | 16.96  |
| 133.31 <sup>1)</sup> | V     | 34.90    | 17.47          | -28.62       | -               | 23.75      | 43.50      | 19.75  |
| 133.31 <sup>1)</sup> | H     | 31.40    | 17.47          | -28.62       | -               | 20.25      | 43.50      | 23.25  |
| 266.68 <sup>1)</sup> | H     | 44.20    | 18.63          | -26.97       | -               | 35.86      | 46.00      | 10.14  |
| 266.68 <sup>1)</sup> | V     | 39.50    | 18.63          | -26.97       | -               | 31.16      | 46.00      | 14.84  |
| 400.06 <sup>1)</sup> | H     | 42.20    | 21.70          | -25.69       | -               | 38.21      | 46.00      | 7.79   |
| 400.06 <sup>1)</sup> | V     | 29.10    | 21.70          | -25.69       | -               | 25.11      | 46.00      | 20.89  |
| 533.31               | H     | 32.10    | 23.70          | -24.59       | -               | 31.21      | 46.00      | 14.79  |
| 533.31               | V     | 24.50    | 23.70          | -24.59       | -               | 23.61      | 46.00      | 22.39  |
| 586.66               | H     | 36.10    | 24.50          | -24.13       | -               | 36.47      | 46.00      | 9.53   |
| 586.66               | V     | 24.50    | 24.50          | -24.13       | -               | 24.87      | 46.00      | 21.13  |
| 640.01               | H     | 42.60    | 24.78          | -23.71       | -               | 43.67      | 46.00      | 2.33   |
| 640.01               | V     | 24.10    | 24.78          | -23.71       | -               | 25.17      | 46.00      | 20.83  |

**Horizontal/Vertical**

[TM3]

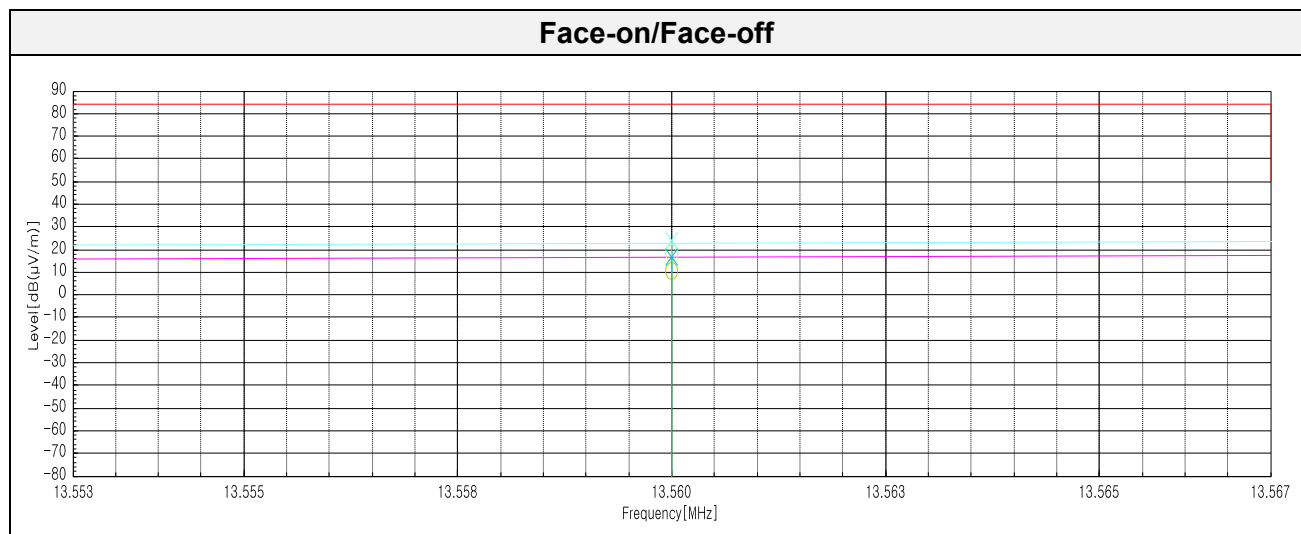
**Test results for fundamental**  
**15.225 (a) 13.553-13.567 MHz**

[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> |          |                |              |                 |            |            |        |
| 13.56                  | 61.20    | 20.20          | -31.09       | 40.00           | 10.31      | 84.00      | 73.69  |

[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> |          |                |              |                 |            |            |        |
| 13.56                  | 67.30    | 20.20          | -31.09       | 40.00           | 16.41      | 84.00      | 67.59  |



## Test results for in-band & out-band (9 kHz to 30 MHz)

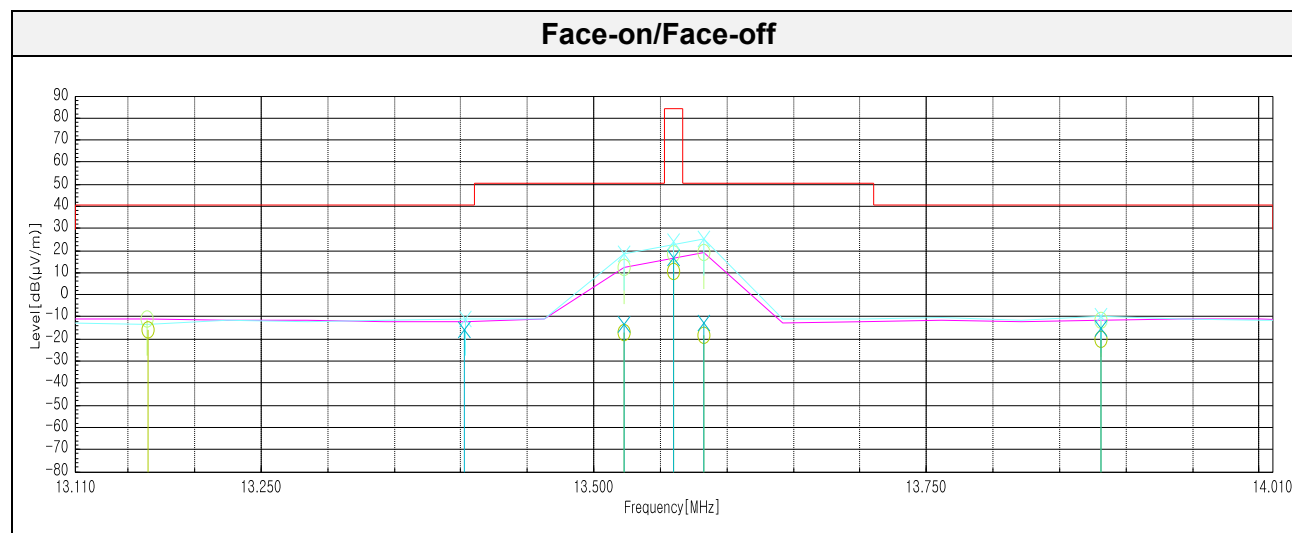
### 15.225 (b,c) 13.110-14.010 MHz

[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> |          |                |              |                 |            |            |        |
| 13.17                  | 35.00    | 20.20          | -31.10       | 40.00           | -15.90     | 40.50      | 56.40  |
| 13.52                  | 33.50    | 20.20          | -31.09       | 40.00           | -17.39     | 50.50      | 67.89  |
| 13.58                  | 32.40    | 20.20          | -31.09       | 40.00           | -18.49     | 50.50      | 68.99  |
| 13.88                  | 30.50    | 20.20          | -31.07       | 40.00           | -20.37     | 40.50      | 60.87  |

[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> |          |                |              |                 |            |            |        |
| 13.40                  | 35.10    | 20.20          | -31.09       | 40.00           | -15.79     | 40.50      | 56.29  |
| 13.52                  | 37.50    | 20.20          | -31.09       | 40.00           | -13.39     | 50.50      | 63.89  |
| 13.58                  | 37.90    | 20.20          | -31.09       | 40.00           | -12.99     | 50.50      | 63.49  |
| 13.88                  | 35.30    | 20.20          | -31.07       | 40.00           | -15.57     | 40.50      | 56.07  |



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Report No.:  
KR21-SRF0272-A  
Page (27) of (35)

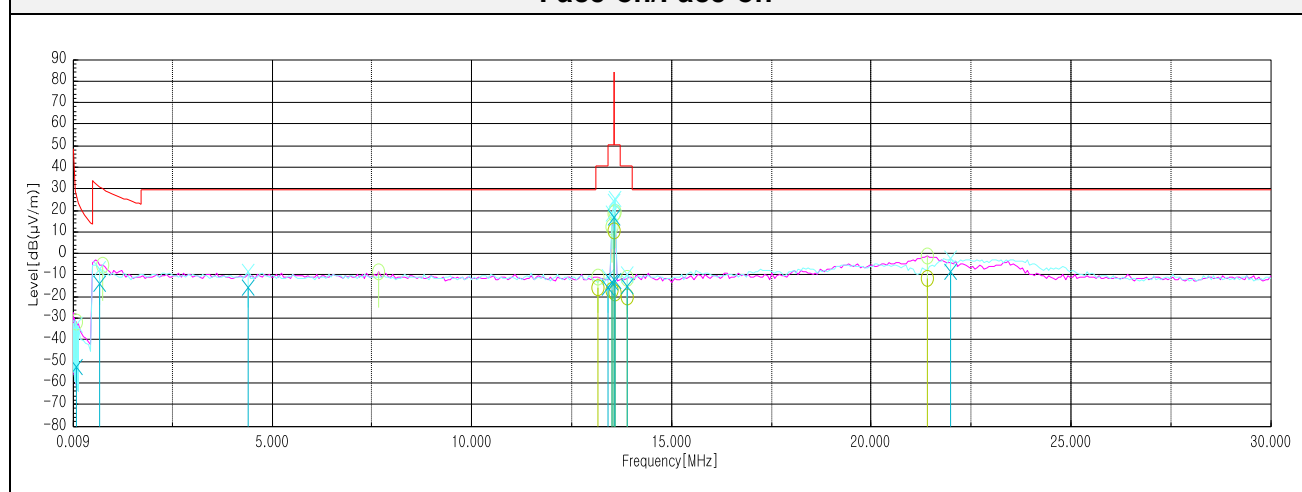
**Test results (9 kHz to 30 MHz)****15.225 (d) 0.009-30 MHz**

[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 |          |                |              |                 |            |            |        |
| 0.10            | 42.00    | 19.90          | -32.31       | 80.00           | -50.41     | 27.70      | 78.11  |
| 0.75            | 36.60    | 19.90          | -32.08       | 40.00           | -15.58     | 30.10      | 45.68  |
| 7.67            | 37.50    | 20.15          | -31.48       | 40.00           | -13.83     | 29.50      | 43.33  |
| 21.40           | 38.40    | 20.66          | -30.78       | 40.00           | -11.72     | 29.54      | 41.26  |

[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 |          |                |              |                 |            |            |        |
| 0.10            | 39.80    | 19.90          | -32.31       | 80.00           | -52.61     | 27.70      | 80.31  |
| 0.69            | 38.00    | 19.90          | -32.09       | 40.00           | -14.19     | 30.90      | 45.09  |
| 4.39            | 35.50    | 20.10          | -31.67       | 40.00           | -16.07     | 29.50      | 45.57  |
| 22.00           | 41.30    | 20.68          | -30.76       | 40.00           | -8.78      | 29.54      | 38.32  |

**Face-on/Face-off**

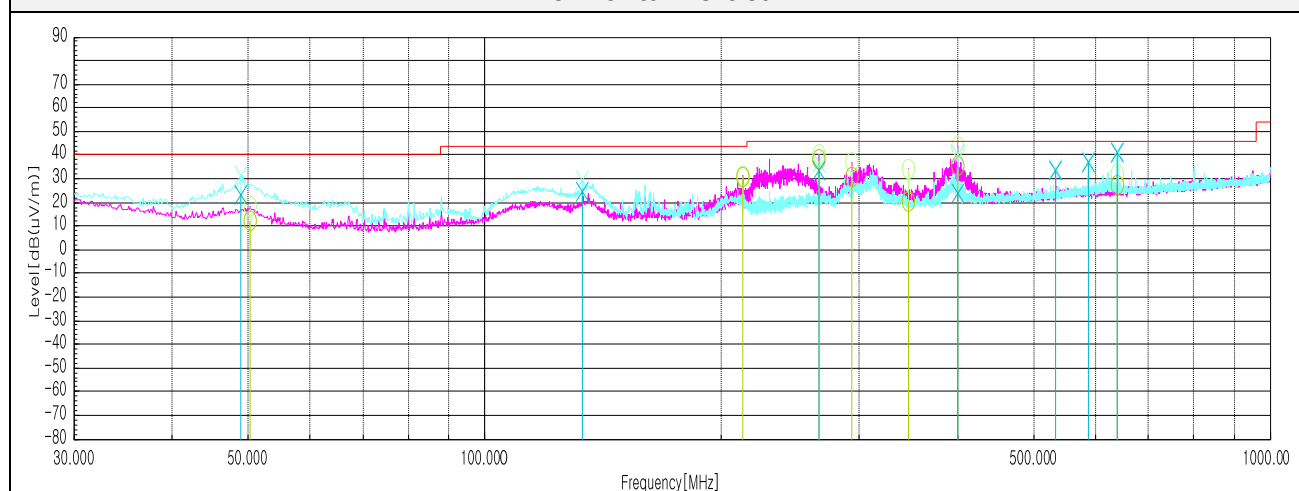
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Report No.:  
KR21-SRF0272-A  
Page (28) of (35)

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

| 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      |       |          |                |              |                 |            |            |        |
| 49.04                | V     | 39.00    | 14.34          | -30.00       | -               | 23.34      | 40.00      | 16.66  |
| 50.37                | H     | 28.00    | 13.84          | -29.96       | -               | 11.88      | 40.00      | 28.12  |
| 133.31 <sup>1)</sup> | V     | 34.70    | 17.47          | -28.62       | -               | 23.55      | 43.50      | 19.95  |
| 213.33               | H     | 43.00    | 16.05          | -27.56       | -               | 31.49      | 43.50      | 12.01  |
| 266.68 <sup>1)</sup> | H     | 45.30    | 18.63          | -26.97       | -               | 36.96      | 46.00      | 9.04   |
| 266.68 <sup>1)</sup> | V     | 40.40    | 18.63          | -26.97       | -               | 32.06      | 46.00      | 13.94  |
| 293.36               | H     | 37.40    | 19.01          | -26.67       | -               | 29.74      | 46.00      | 16.26  |
| 346.71 <sup>1)</sup> | H     | 25.50    | 20.31          | -26.17       | -               | 19.64      | 46.00      | 26.36  |
| 400.06 <sup>1)</sup> | H     | 38.10    | 21.70          | -25.69       | -               | 34.11      | 46.00      | 11.89  |
| 400.06 <sup>1)</sup> | V     | 26.60    | 21.70          | -25.69       | -               | 22.61      | 46.00      | 23.39  |
| 533.31               | V     | 33.00    | 23.70          | -24.59       | -               | 32.11      | 46.00      | 13.89  |
| 586.66               | V     | 35.10    | 24.50          | -24.13       | -               | 35.47      | 46.00      | 10.53  |
| 640.01               | H     | 24.90    | 24.78          | -23.71       | -               | 25.97      | 46.00      | 20.03  |
| 640.01               | V     | 38.20    | 24.78          | -23.71       | -               | 39.27      | 46.00      | 6.73   |

**Horizontal/Vertical**

[TM4]

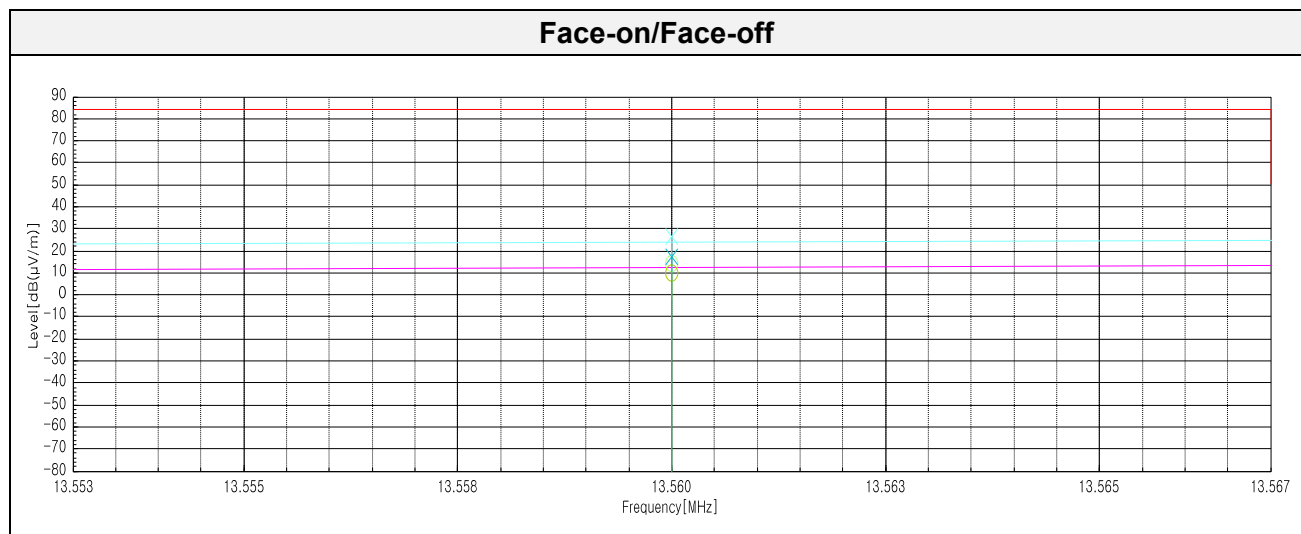
**Test results for fundamental**  
**15.225 (a) 13.553-13.567 MHz**

[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           | 60.70    | 20.20          | -31.09       | 40.00           | 9.81       | 84.00      | 74.19  |

[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           | 68.30    | 20.20          | -31.09       | 40.00           | 17.41      | 84.00      | 66.59  |



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Report No.:  
KR21-SRF0272-A  
Page (30) of (35)

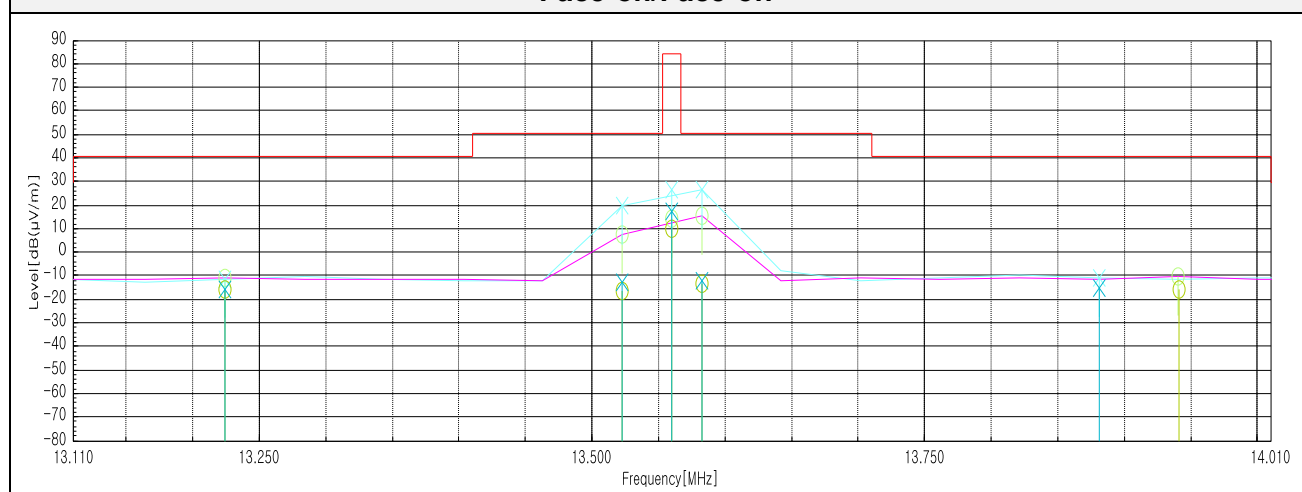
**Test results for in-band & out-band (9 kHz to 30 MHz)****15.225 (b,c) 13.110-14.010 MHz**

[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 |          |                |              |                 |            |            |        |
| 13.22           | 34.80    | 20.20          | -31.10       | 40.00           | -16.10     | 40.50      | 56.60  |
| 13.52           | 34.20    | 20.20          | -31.09       | 40.00           | -16.69     | 50.50      | 67.19  |
| 13.58           | 37.20    | 20.20          | -31.09       | 40.00           | -13.69     | 50.50      | 64.19  |
| 13.94           | 34.80    | 20.20          | -31.07       | 40.00           | -16.07     | 40.50      | 56.57  |

[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 |          |                |              |                 |            |            |        |
| 13.22           | 35.20    | 20.20          | -31.10       | 40.00           | -15.70     | 40.50      | 56.20  |
| 13.52           | 37.70    | 20.20          | -31.09       | 40.00           | -13.19     | 50.50      | 63.69  |
| 13.58           | 38.40    | 20.20          | -31.09       | 40.00           | -12.49     | 50.50      | 62.99  |
| 13.88           | 35.30    | 20.20          | -31.07       | 40.00           | -15.57     | 40.50      | 56.07  |

**Face-on/Face-off**

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Report No.:  
KR21-SRF0272-A  
Page (31) of (35)

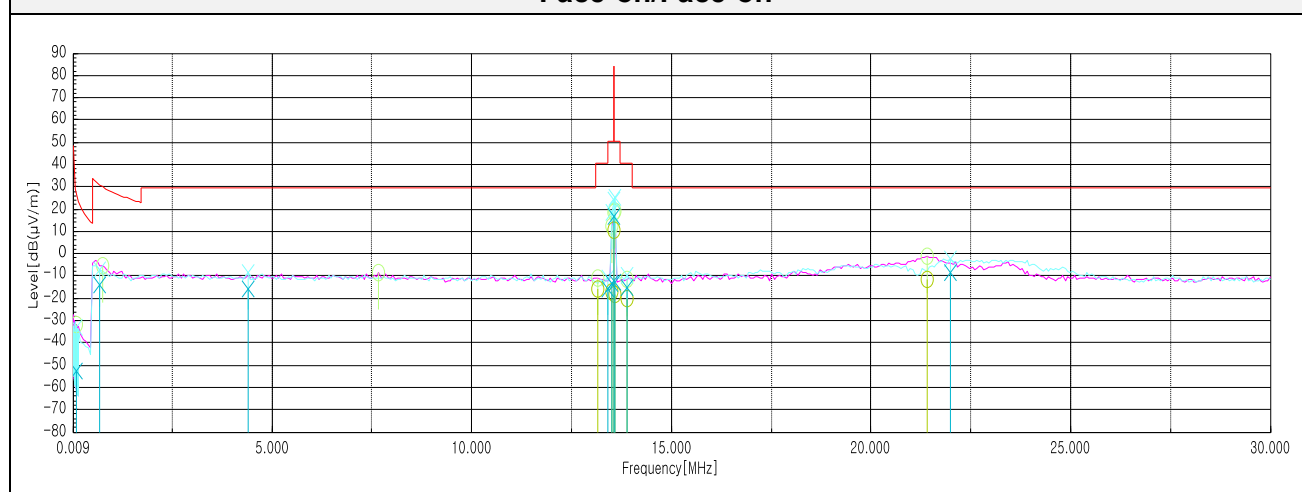
**Test results (9 kHz to 30 MHz)****15.225 (d) 0.009-30 MHz**

[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 |          |                |              |                 |            |            |        |
| 0.07            | 42.30    | 20.00          | -32.31       | 80.00           | -50.01     | 30.20      | 80.21  |
| 0.51            | 41.30    | 19.90          | -32.16       | 40.00           | -10.96     | 33.50      | 44.46  |
| 8.75            | 35.20    | 20.17          | -31.42       | 40.00           | -16.05     | 29.50      | 45.55  |
| 21.64           | 37.80    | 20.67          | -30.77       | 40.00           | -12.30     | 29.54      | 41.84  |

[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 |          |                |              |                 |            |            |        |
| 0.05            | 45.40    | 20.10          | -32.31       | 80.00           | -46.81     | 33.60      | 80.41  |
| 0.51            | 38.40    | 19.90          | -32.16       | 40.00           | -13.86     | 33.50      | 47.36  |
| 8.75            | 35.70    | 20.17          | -31.42       | 40.00           | -15.55     | 29.50      | 45.05  |
| 21.64           | 41.80    | 20.67          | -30.77       | 40.00           | -8.30      | 29.54      | 37.84  |

**Face-on/Face-off**

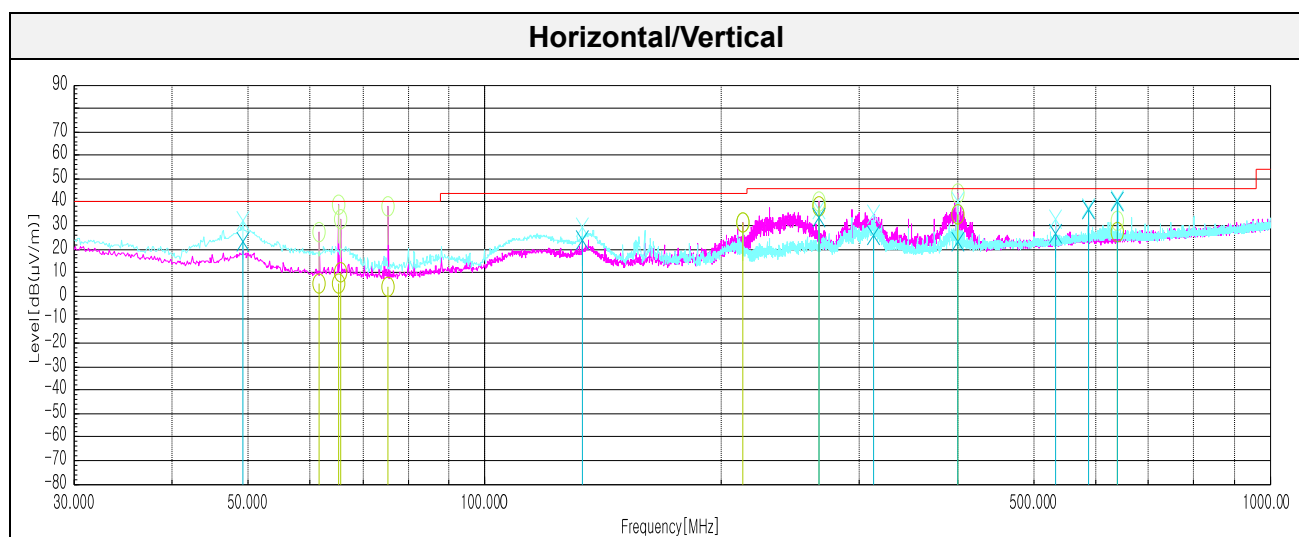
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Report No.:  
KR21-SRF0272-A  
Page (32) of (35)

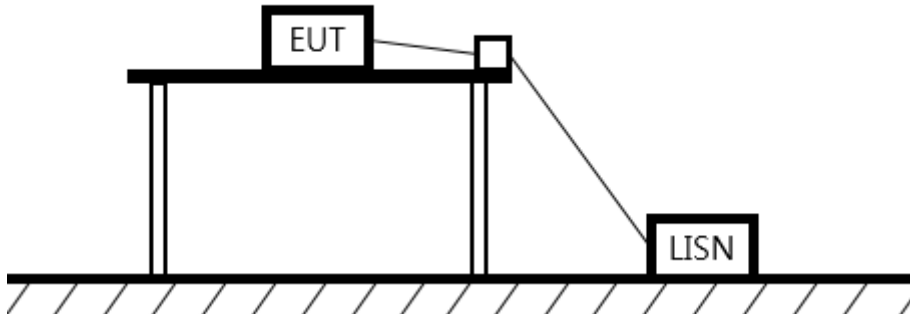
**Test results (Below 1 000 MHz)****15.225 (d) 30-1 000 MHz**

| 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      |       |          |                |              |                 |            |            |        |
| 49.28                | V     | 39.00    | 14.23          | -29.99       | -               | 23.24      | 40.00      | 16.76  |
| 61.65                | H     | 22.90    | 12.30          | -29.73       | -               | 5.47       | 40.00      | 34.53  |
| 65.16                | H     | 22.90    | 12.30          | -29.65       | -               | 5.55       | 40.00      | 34.45  |
| 65.65                | H     | 27.60    | 12.30          | -29.64       | -               | 10.26      | 40.00      | 29.74  |
| 75.47                | H     | 20.80    | 12.68          | -29.47       | -               | 4.01       | 40.00      | 35.99  |
| 133.31 <sup>1)</sup> | V     | 34.40    | 17.47          | -28.62       | -               | 23.25      | 43.50      | 20.25  |
| 213.33               | H     | 43.20    | 16.05          | -27.56       | -               | 31.69      | 43.50      | 11.81  |
| 266.68 <sup>1)</sup> | H     | 45.30    | 18.63          | -26.97       | -               | 36.96      | 46.00      | 9.04   |
| 266.68 <sup>1)</sup> | V     | 40.50    | 18.63          | -26.97       | -               | 32.16      | 46.00      | 13.84  |
| 312.51               | V     | 31.90    | 19.43          | -26.48       | -               | 24.85      | 46.00      | 21.15  |
| 400.06 <sup>1)</sup> | H     | 37.90    | 21.70          | -25.69       | -               | 33.91      | 46.00      | 12.09  |
| 400.06 <sup>1)</sup> | V     | 26.40    | 21.70          | -25.69       | -               | 22.41      | 46.00      | 23.59  |
| 533.43               | V     | 26.40    | 23.70          | -24.59       | -               | 25.51      | 46.00      | 20.49  |
| 586.66               | V     | 34.90    | 24.50          | -24.13       | -               | 35.27      | 46.00      | 10.73  |
| 640.01               | H     | 24.80    | 24.78          | -23.71       | -               | 25.87      | 46.00      | 20.13  |
| 640.01               | V     | 37.60    | 24.78          | -23.71       | -               | 38.67      | 46.00      | 7.33   |



## 7.4. AC Conducted emission

### Test setup



### Limit

According to 15.207(a), RSS-Gen Issue 5 (8.8) 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 $\mu$ H/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall be 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 frequencies ranges.

| Frequency of Emission (MHz) | Conducted limit (dB $\mu$ V/m) |          |
|-----------------------------|--------------------------------|----------|
|                             | Quasi-peak                     | Average  |
| 0.15 – 0.50                 | 66 - 56*                       | 56 - 46* |
| 0.50 – 5.00                 | 56                             | 46       |
| 5.00 – 30.0                 | 60                             | 50       |

### Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50 $\Omega$ /50 $\mu$ H LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity — Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 kHz or to quasi-peak and average within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

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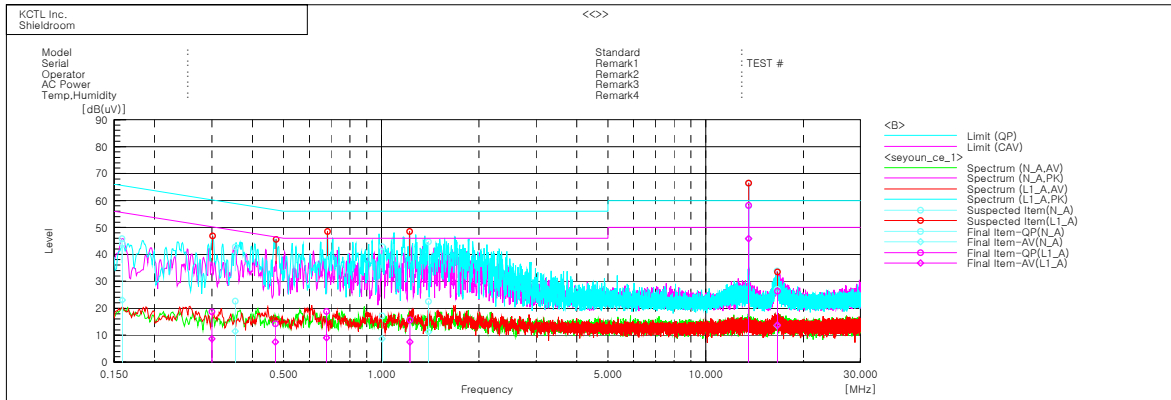
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Report No.:  
KR21-SRF0272-A  
Page (34) of (35)



## Test results

### [TM4]



#### Final Result

| --- N_A Phase --- |           |          |          |      |          |          |          |          |        |        |
|-------------------|-----------|----------|----------|------|----------|----------|----------|----------|--------|--------|
| No.               | Frequency | Reading  | Reading  | c.f  | Result   | Result   | Limit    | Limit    | Margin | Margin |
|                   | [MHz]     | QP       | CAV      |      | QP       | CAV      | QP       | AV       | QP     | CAV    |
|                   |           | [dB(uV)] | [dB(uV)] | [dB] | [dB(uV)] | [dB(uV)] | [dB(uV)] | [dB(uV)] | [dB]   | [dB]   |
| 1                 | 0.15897   | 33.9     | 13.1     | 10.0 | 43.9     | 23.1     | 65.5     | 55.5     | 21.6   | 32.4   |
| 2                 | 0.35426   | 12.7     | 1.5      | 9.9  | 22.6     | 11.4     | 58.9     | 48.9     | 36.3   | 37.5   |
| 3                 | 1.00451   | 7.4      | -1.1     | 9.8  | 17.2     | 8.7      | 56.0     | 46.0     | 38.8   | 37.3   |
| 4                 | 1.39557   | 12.7     | 1.4      | 9.8  | 22.5     | 11.2     | 56.0     | 46.0     | 33.5   | 34.8   |
| 5                 | 13.55994  | 47.7     | 35.5     | 10.3 | 58.0     | 45.8     | 60.0     | 50.0     | 2.0    | 4.2    |
| 6                 | 16.58335  | 16.6     | 3.2      | 10.4 | 27.0     | 13.6     | 60.0     | 50.0     | 33.0   | 36.4   |

| --- L1_A Phase --- |           |          |          |      |          |          |          |          |        |        |
|--------------------|-----------|----------|----------|------|----------|----------|----------|----------|--------|--------|
| No.                | Frequency | Reading  | Reading  | c.f  | Result   | Result   | Limit    | Limit    | Margin | Margin |
|                    |           | QP       | CAV      |      | QP       | CAV      | QP       | AV       | QP     | CAV    |
|                    |           | [dB(uV)] | [dB(uV)] | [dB] | [dB(uV)] | [dB(uV)] | [dB(uV)] | [dB(uV)] | [dB]   | [dB]   |
| 1                  | 0.30054   | 9.0      | -1.2     | 9.8  | 18.8     | 8.6      | 60.2     | 50.2     | 41.4   | 41.6   |
| 2                  | 0.47081   | 4.3      | -2.3     | 9.9  | 14.2     | 7.6      | 56.5     | 46.5     | 42.3   | 38.9   |
| 3                  | 0.67754   | 8.9      | -0.8     | 9.9  | 18.8     | 9.1      | 56.0     | 46.0     | 37.2   | 36.9   |
| 4                  | 1.22337   | 5.9      | -2.3     | 9.8  | 15.7     | 7.5      | 56.0     | 46.0     | 40.3   | 38.5   |
| 5                  | 13.56071  | 47.8     | 35.5     | 10.4 | 58.2     | 45.9     | 60.0     | 50.0     | 1.8    | 4.1    |
| 6                  | 16.65553  | 15.8     | 3.3      | 10.5 | 26.3     | 13.8     | 60.0     | 50.0     | 33.7   | 36.2   |

## 8. Measurement equipment

| Equipment Name              | Manufacturer         | Model No.    | Serial No. | Next Cal. Date |
|-----------------------------|----------------------|--------------|------------|----------------|
| EMI TEST RECEIVER           | R&S                  | ESC17        | 100732     | 22.03.05       |
| Bi-Log Antenna              | TESEQ                | CBL 6112D    | 55545      | 23.01.14       |
| Amplifier                   | SONOMA<br>INSTRUMENT | 310N         | 284608     | 21.08.20       |
| COAXIAL FIXED<br>ATTENUATOR | Agilent              | 8491B-003    | 2708A18758 | 22.04.23       |
| LOOP Antenna                | R&S                  | HFH2-Z2      | 100355     | 22.08.21       |
| Antenna Mast                | Innco Systems        | MA4640-XP-ET | -          | -              |
| Turn Table                  | Innco Systems        | DT2000       | 79         | -              |
| TWO-LINE V -<br>NETWORK     | R&S                  | ENV216       | 101584     | 22.04.05       |
| EMI TEST RECEIVER           | R&S                  | ESC13        | 100001     | 21.08.20       |
| Spectrum Analyzer           | R&S                  | FSV30        | 100807     | 21.07.29       |
| Signal Generator            | R&S                  | SMB100A      | 176206     | 22.01.20       |
| Vector Signal<br>Generator  | R&S                  | SMBV100A     | 257566     | 22.07.09       |
| Temp & Humid<br>Chamber     | Daejin Engineering   | DJ-THR11000  | 10041      | 22.01.20       |
| DC Power Supply             | AGILENT              | E3632A       | KR73001026 | 22.04.01       |

**End of test report**